

**Risk-Based Corrective Action (RBCA) Evaluation
9th Street and Broadway
Oakland, California**

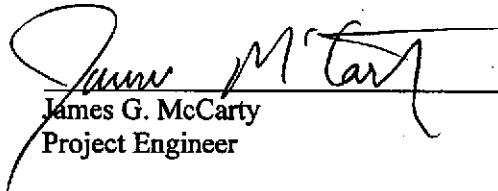
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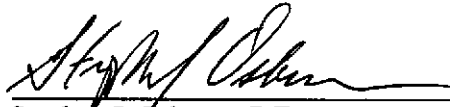
HLA Project No. 47729 4



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CONTENTS

1.0	INTRODUCTION.....	1
2.0	SITE BACKGROUND	4
3.0	SOIL AND GROUNDWATER INVESTIGATION.....	5
3.1	Soil Sampling	5
3.1.1	HLA 1993 Investigation	5
3.1.2	Secor 1998 Investigation.....	5
3.1.3	HLA 1999 Investigation	6
3.2	Groundwater Measurements	6
3.3	Groundwater Sampling.....	7
3.3.1	HLA 1993 Investigation	7
3.3.2	Secor 1998 Investigation.....	7
3.3.3	HLA 1999 Investigation	7
4.0	SITE SPECIFIC CONSIDERATIONS.....	8
4.1	Ongoing Sources	8
4.2	Site Characterization.....	8
4.3	Dissolved Plume	8
4.4	Other Potential Receptors.....	8
5.0	HUMAN HEALTH RISK EVALUATION.....	10
5.1	Hazard Identification.....	10
5.1.1	Soil Analytical Data	10
5.1.2	Groundwater Analytical Data	11
5.1.3	Selection of Chemicals of Potential Concern for Groundwater	11
5.2	Exposure Assessment.....	12
5.2.1	Potential Receptors and Exposure Pathways.....	12
5.2.2	Exposure Point Concentrations	13
5.3	RBCA Evaluation	13
5.3.1	Tier 1 RBCA Soil Evaluation	13
5.3.2	Tier 1 RBCA Groundwater Evaluation	14
5.3.3	COPCs without Screening Levels.....	14
5.3.4	Tier 2 RBCA Soil Evaluation	14
5.4	Uncertainty Evaluation.....	15

6.0	ECOLOGICAL EVALUATION.....	16
7.0	CONCLUSIONS AND RECOMMENDATIONS.....	17
7.1	Conclusions	17
7.2	Recommendations	18
8.0	REFERENCES.....	19

TABLES

3.1	Tier I Comparison – Surface Soil (0 to 3 Feet)
3.2	Tier I Comparison – Subsurface Soil (3 to 23 Feet)
3.3	Tier I Comparison - Groundwater
3.4	Tier II Comparison – Surface Soil (0 to 3 Feet)
5.1	Soil Data Summary – Surface (0 to 3 Feet)
5.2	Soil Data Summary – Subsurface (3 to 23 Feet)
5.3	Groundwater Data Summary
5.4	Comparison of Groundwater Data to MCLs

PLATES

1	Vicinity Map
2	Site Map
3	Groundwater Elevation and Gradient, August 20, 1999
4	Location of BART Well Sumps
5	Surface Soil Samples (0 to 3 feet) Evaluated under Tier 2

APPENDIX

A	Well Search
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DISTRIBUTION

1.0 INTRODUCTION

Harding Lawson Associates (HLA) has prepared a Risk-Based Corrective Action (RBCA) Evaluation on behalf of the City of Oakland for the location of the planned Chinatown Hotel at 9th Street and Broadway (the Site), Oakland, California (Plate 1). The RBCA Evaluation was conducted to assess whether the petroleum release at the Site could be classified as a "low-risk groundwater case" according to San Francisco Bay Regional Water Quality Control Board (RWQCB) criteria. The study also evaluated soil and groundwater conditions and potential impacts on human health and ecological receptors from petroleum hydrocarbons, metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs).

In the *Interim Guidance on Required Cleanup at Low-Risk Fuel Sites*, the RWQCB (1996a) published the following criteria for defining a fuel release site as a "low risk groundwater site":

1. The leak has been stopped and sources including free product, have been removed or remediated
2. The site has been adequately characterized
3. The dissolved plume is not migrating
4. No water wells, deeper drinking water aquifers, surface water, or other sensitive [environmental] receptors are likely to be impacted
5. The site presents no significant risk to human health
6. The site presents no significant risk to the environment.

The first four points are addressed in Section 4 of this report and the 6th point in Section 6. To address the 5th point listed above, HLA conducted a human health risk evaluation using the RBCA approach recommended by the City of Oakland in *Oakland Risk-Based Corrective Action: Technical Background Document*

(*Oakland, 1999*), which is based on methods developed by the American Society of Testing and Materials (ASTM) in *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM, 1995).

The U.S. Environmental Protection Agency (U.S. EPA) and RWQCB (1996a) have endorsed the ASTM (1995) RBCA approach. The ASTM (1995) RBCA is not a risk assessment *per se*, but a tiered, risk-based site investigation that may or may not include a baseline risk assessment. Tiers 1 and 2 are semi-quantitative screening steps in which chemical concentrations detected in soil and groundwater at the site are compared to risk-based screening levels. Tier 1 Risk-Based Screening Levels (RBSLs) are the least site-specific, most conservative (i.e., lowest) and health-protective. If detected soil and/or groundwater concentrations are lower than Tier 1 screening levels, the site is considered unlikely to pose a human health risk. In such a case a Tier 2 evaluation, in which detected chemical concentrations are compared to less conservative, Site-Specific Target Levels (SSTLs), is not required. However, if detected concentrations exceed Tier 1 RBSLs, then the more refined Tier 2 evaluation is conducted on the basis of site-specific parameters such as exposure assumptions and parameters used to estimate rates of volatilization from soil and groundwater. If site concentrations are lower than Tier 2 SSTLs, then the site is considered unlikely to pose a significant health risk and further risk evaluation is not conducted. In situations where Tier 2 SSTLs are still exceeded by site concentrations, further risk evaluation, such as a Tier 3 evaluation which may include additional site assessment, probabilistic evaluations, and fate/transport modeling, may be conducted, or Tier 2 SSTLs may be adopted as remedial goals.

The Oakland (1999) RBCA methodology was developed under the auspices of the Urban Land Redevelopment Program. It is based on the

ASTM (1995) approach and provides a technical basis for conducting RBCA evaluations specific to the City of Oakland. The Oakland RBCA approach has been peer-reviewed and incorporates input from Alameda County Department of Environmental Health, California EPA Department of Toxic Substances Control (Cal/EPA-DTSC), RWQCB and U.S. EPA (Oakland, 1999). In addition, substantial input and feedback was solicited from a citizens' review panel representing various community organizations.

The Oakland RBCA approach employs a tiered, risk-based analysis similar to ASTM (1995). Tier 1 RBSLs are developed using Oakland-specific input parameters such as soil- and non-soil-specific chemical transport parameter values that reflect the geology that may be found at any site in Oakland in lieu of the default Tier I values provided by ASTM. In addition, EPA- and Cal/EPA-recommended exposure assumptions and toxicity values are utilized. Tier 1 RBSLs are considered to be the least site-specific and most conservative (i.e. health-protective) screening levels. If chemical concentrations exceed Tier 1 levels, a Tier 2 analysis may be undertaken and site concentrations compared with Tier 2 SSTLs. The Oakland Tier 2 SSTLs differ from Tier 1 RBSLs in the use of more site-specific soil parameters and a less-conservative cancer risk level. Exposure and other parameters are the same as Tier 1.

Oakland (1999) has developed SSTLs for three predominant types of soil found in Oakland:

- Merritt sands which are characterized by low moisture content and high permeability and consist of fine-grained, silty-sand with some sandy clay and clay. Merritt sands are found west of Lake Merritt in the flatland area, and generally apply to the downtown area.
- Sandy silts which are located throughout Oakland and consist of moderately sorted sand, silt and clay sediments. They have moderate permeability and average moisture content.

- Clayey silts which are found along San Francisco Bay and estuary and in land fills. They can be made of small lenses of sand, organic materials and peaty layers. They have high moisture content and low permeability.

If chemical concentrations exceed Tier 2 values, a Tier 3 analysis may be necessary. A Tier 3 analysis incorporates more complex and detailed site investigations, including site-specific fate and transport modeling and exposure evaluation. Further risk evaluation (such as a baseline risk assessment) may be conducted, or Tier 2 SSTLs may be adopted as remedial goals.

As described above, Oakland (1999) RBCA methodology follows the same basic approach as ASTM (1995). However, in addition to incorporating Oakland-specific input parameters, the Oakland RBCA approach differs from the ASTM RBCA approach in the following ways:

- A combined residential child/adult receptor (six years for child and 24 years for adult) is used to evaluate potential carcinogenic health effects. ASTM assumes an entirely adult exposure. Using a child/adult receptor scenario results in a more conservative (i.e., lower) screening level.
- To evaluate non-cancer health effects, the residential receptor is assumed to be a child throughout entire exposure duration, whereas ASTM assumes an adult residential receptor. This results in a more conservative, health-protective screening level.

In the absence of specific state recommendations for conducting RBCA evaluations of fuel release sites within California, Oakland adapted ASTM-recommended methods on the basis of general risk assessment guidance provided by Cal/EPA and U.S. EPA. The Oakland (1999) RBCA guidance provides RBSLs and SSTLs for a number of chemicals unrelated to fuel releases, such as metals and chlorinated VOCs. This approach is consistent with more recent ASTM (1998) recommendations for the general

application of RBCA methods to sites with chemical releases to soil and groundwater.

The RWQCB has not to date provided specific recommendations for adopting a RBCA approach to non-fuel chemicals. However, the San Francisco Bay RWQCB and County of Alameda, as well as Cal/EPA-DTSC and U.S. EPA, contributed to the Oakland guidance. RBSLs and SSTLs were developed on the basis of conservative methods and assumptions consistent with standard risk assessment methods recommended by the agencies. Accordingly, chemicals detected in soil or groundwater at concentrations below Oakland RBSLs or SSTLs are unlikely to pose an unacceptable human health risk or hazard, and are unlikely to require further evaluation or action.

The report is divided into the following sections:

- Section 1 – Introduction
- Section 2 – Site Background
- Section 3 – Soil and Groundwater Investigation
- Section 4 – Site Specific Considerations
- Section 5 – Human Health Risk Evaluation
- Section 6 – Ecological Evaluation
- Section 7 – Conclusions and Recommendations
- Section 8 – References.

2.0 SITE BACKGROUND

The 9th Street and Broadway property is currently used as a public parking lot, serving shoppers in the downtown Chinatown area. The area of interest consists of approximately 55,000 square feet of asphalt covered parking area bounded by Broadway on the northwest, 9th Street on the southwest, Franklin Street on the southeast, and the Transpacific Building on the northeast, (Plate 2).

According to information provided by the Oakland Redevelopment Agency, the Site's previous uses included print shops, paint supply shops, a battery shop, a garage, a laundry, and a janitorial supply distributor (HLA, 1993). Two Bay Area Rapid Transit (BART) tunnels carrying the KAL and KAR lines transverse the Site as shown on Plate 2. The top of the shallower tunnel is approximately 17 feet below ground surface (bgs).

Directly across Franklin Street from the Site is the Pacific Renaissance Plaza Building (PRPB). During construction of the PRPB, two underground storage tanks (USTs) were discovered beneath the sidewalk along Franklin Street. Soil contaminated with petroleum hydrocarbons was observed during the excavation and removal of these tanks and during construction of the PRPB. As part of a larger groundwater monitoring program in the area, HLA installed three monitoring wells, MW-7, MW-20, and MW-21 (see Plate 2), between 1989 and 1990. MW-7 is located off the Site to the east and MW-20 and MW-21 are both located on the Site.

The 9th Street and Broadway property has been subjected to three separate environmental investigations: HLA conducted a preliminary soil investigation in 1993; Secor International, Inc. (Secor) collected and prepared a summary report of the soil and groundwater data in 1998; and, in 1999, HLA collected and presented the results of the most recent chemical data on soil and

groundwater samples. Plate 2 shows the sample locations from these three investigations.

In 1993 HLA conducted an investigation at the Site to characterize the soil prior to planned development. Twenty-seven soil borings were drilled to depths ranging from 3.5 to 30 feet bgs. Soil samples were tested for total petroleum hydrocarbons as gasoline (TPHg), total petroleum hydrocarbons as diesel (TPHd), benzene, toluene, ethylbenzene and xylenes (BTEX), VOCs, SVOCs, and California Code of Regulations Title 22 list of metals (CAM-17) (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc). HLA's investigation also included a geophysical survey of the Site (HLA, 1993).

In 1998, Secor collected groundwater samples from monitoring wells MW-7, MW-20, and MW-21 and advanced 4 soil borings on the Site ranging in depth from 4 to 32 feet bgs. The groundwater and soil samples were tested for TPHg, TPHd, BTEX, and VOCs. The soil samples were also tested for lead (Secor, 1998).

In 1999, HLA collected groundwater samples from monitoring wells MW-7, MW-20, and MW-21 and advanced 2 soil borings on the Site. The borings were completed to a final depth of 32 feet bgs after which groundwater grab samples were collected through temporary well casings. The groundwater and soil samples were tested for TPHg, TPHd, VOCs, SVOCs, polyaromatic hydrocarbons (PAHs) and CAM-17 metals (HLA, 1999).

3.0 SOIL AND GROUNDWATER INVESTIGATION

This section presents a description of soil sampling and groundwater measurements at the Site performed by HLA and Secor. The data presented in Tables 3.1 through 3.4 include only the data that is used in the Human Health Risk Evaluation, e.g. chemical concentrations in soil below the capillary fringe were evaluated as impacts to groundwater rather than impact to soil. The complete data set for samples collected is provided in HLA and Secor reports.

3.1 Soil Sampling

Soil sampling on the Site has included 27 borings by HLA in 1993, four borings by Secor in 1998, and 2 borings by HLA in 1999. HLA's 1993 investigation consisted of 8 shallow borings to depths of 5.0 feet or less, 4 borings to approximately 15 feet, and 14 deep borings to depths of 25 to 29.5 feet bgs. The remaining boring, SB-8, was terminated at 8 feet bgs because of drilling refusal at that depth. The Secor investigation consisted of three deep borings ranging in depths from 25 to 32 feet bgs. The fourth and final boring was completed to a depth of 4 feet bgs because of drilling refusal at that depth. HLA's 1999 investigation consisted of two deep soil borings completed to final depths of 32 feet bgs.

3.1.1 HLA 1993 Investigation

Soil samples collected during HLA's 1993 investigation were analyzed for TPHd and TPHg in accordance with EPA Test Method 8015 modified, BTEX in accordance with EPA Test Method 8020, VOCs in accordance with EPA Test Method 8010, SVOCs in accordance with EPA Test Method 8270, and CAM-17 metals in accordance with EPA Test Methods 6010, 7060, 7421, or 7740. Twenty-two soil samples from depths of 10 feet or less were analyzed for organic compounds. TPHd was detected in 13, with one sample containing 1,600 milligrams per kilogram (mg/kg) and the other 12 containing less

than 100 mg/kg. None of the shallow soil samples contained TPHg or BTEX. Three of the shallow soil samples contained PCE at concentrations ranging from 2.6 to 7.5 micrograms per kilogram ($\mu\text{g}/\text{kg}$). Twenty-one of the shallow soil samples were analyzed for metals. Only zinc was found to be present above background levels (HLA 1993). Zinc was reported in one sample collected at 5.0 feet bgs at a concentration of 17,000 mg/kg. TPHd, TPHg, and BTEX were found in the deep soil borings (20 feet and deeper) along the southern edge of the Site. TPHd concentrations ranged from 470 to 1,000 mg/kg and TPHg concentrations ranged from 350 to 2,000 mg/kg. BTEX constituents were reported in three of the deep soil samples at concentrations as high as 8,200 micrograms per kilogram ($\mu\text{g}/\text{kg}$) benzene, 4,200 $\mu\text{g}/\text{kg}$ toluene, 4,000 $\mu\text{g}/\text{kg}$ ethylbenzene, and 15,000 total xylenes. All of the TPHg and BTEX concentrations were detected in samples collected from below the capillary fringe, at depths of 24.5 and 25 feet bgs.

Resident at PPO for zinc test 22,000ppm
~~877ppm~~
Only in one soil sample @ 25' bgs

3.1.2 Secor 1998 Investigation

During Secor's 1998 investigation, soil samples were analyzed for TPHg, TPHd in accordance with EPA Test Method 8015 modified, BTEX and MTBE in accordance with EPA Test Method 8020, VOCs in accordance with EPA Test Method 8010 and total lead in accordance with EPA Test Method 7420A. Shallow samples, mid-depth samples, and deep samples were submitted for chemical analyses from each boring except the shallow boring. TPHd was detected in all soil samples except one, ranging in concentration from 1.1 mg/kg to 180 mg/kg. The highest concentration was found in a sample collected from a boring along the southern edge of the Site at a depth of 27 feet bgs. TPHg was not reported in any of the soil samples, though xylenes were reported at 1,600 $\mu\text{g}/\text{kg}$ in the same sample with the highest diesel concentration.

Lead was detected in only one sample, at 20 mg/kg, at a depth of 3.5 feet bgs.

3.1.3 HLA 1999 Investigation

HLA collected shallow, mid-depth, and deep soil samples from two soil borings during this investigation. The samples were analyzed for TPHg, TPHd, and total petroleum hydrocarbons as motor oil (TPHmo) in accordance with EPA Test Method 8015 modified, VOCs in accordance with EPA Test Method 8260, SVOCs in accordance with EPA Test Method 8270, PAHs in accordance with EPA Test Method 8310, and CAM-17 metals in accordance with EPA Test Methods 6010 or 7060, 7191, or 7470A.

TPHd and TPHmo were reported in the shallow soil samples (at 2.0 feet bgs) from both borings and at 9.5 feet bgs from the boring along the northern edge of the Site at concentrations ranging from 10 to 160 mg/kg for TPHd and 53 to 1,200 mg/kg for TPHmo. TPHd and TPHg were reported in the soil sample within the capillary fringe in the boring along the southern edge of the Site at concentrations of 460 and 1,900 mg/kg, respectively. Components of BTEX were also detected in this sample: ethylbenzene at 800 µg/kg and total xylenes at 4,080 µg/kg. Other VOCs detected included isopropylbenzene at 1,100 µg/kg, propylbenzene at 1,700 µg/kg, 1,3,5-trimethylbenzene at 4,200 µg/kg, 1,2,4-trimethylbenzene at 12,000 µg/kg, sec-butylbenzene at 670 µg/kg, para-isopropyltoluene at 1,700 µg/kg, n-butylbenzene at 2,300 µg/kg, and naphthalene at 2,300 µg/kg.

SVOCs and PAHs were detected in soil samples from both borings at depths where the petroleum hydrocarbons were detected. The highest concentrations were from a sample from the boring (SB-28) along the southern edge of the Site at 2.0 feet bgs, which contained a concentration of phenanthrene at 1,600 µg/kg, fluoranthene at 2,100 µg/kg, pyrene at 2,000 µg/kg, benzo(a)anthracene at 1,100 µg/kg, chrysene at 1,400 µg/kg, benzo(b)fluoranthene at 770 µg/kg, benzo(k)fluoranthene at 430 µg/kg,

benzo(g,h,i)perylene at 850 µg/kg, benzo(a)pyrene at 1,200 µg/kg, and indeno(1,2,3-cd)pyrene at 1,100 µg/kg.

3.2 Groundwater Measurements

Groundwater elevation data from the three investigations indicates that the depth to groundwater, as measured in the monitoring wells, ranges from 23.32 to 27.52 feet below the top of the well casing. The maximum variance in MW-7 was 2.51 feet, in MW-20 2.11 feet and in MW-21 1.34 feet. The boring logs from HLA's 1993 investigation indicated the soil was wet or saturated at depths ranging from 22.5 feet to 28 feet bgs. During the HLA's 1999 investigation, depth to groundwater was measured in the soil borings through the temporary well casings at 26.7 feet bgs (HLA, 1993, 1999).

Groundwater elevations as measured in the monitoring wells have indicated that groundwater flows in a westerly direction across the Site. However, local groundwater flow in the area is probably affected by subterranean structures. The PRPB was constructed with foundations to a final depth of 38 feet bgs, where a clay layer is present. The building foundation is expected to act as a local barrier to groundwater flow (HLA, 1992). The BART tunnels that pass beneath the Site may also act as a local barrier to local groundwater flow because of the low permeability characteristics of tunnel construction. The top of the shallower tunnel is reported to be at a depth of 17 feet bgs (HLA, 1993) and a typical BART underground tunnel section extends approximately 20 feet from top to bottom. HLA believes that in the years since the construction of the building foundation and the BART tunnel, the piezometric levels in the subsurface and the groundwater flow directions have reached equilibrium around these local barriers. Plate 3 shows that groundwater flows to the west in a manner that does not appear to be obstructed by the BART tunnels.

BART tunnel construction typically does not include external groundwater pumps for the purpose of de-watering soils adjacent to the

underground sections of the tunnel and is therefore not expected to influence groundwater movement.

3.3 Groundwater Sampling

The three monitoring wells, MW-7, MW-20, MW-21, were sampled during HLA's 1993 investigation, Secor's 1998 investigation and HLA's 1999 investigation. In 1999, HLA also collected grab groundwater samples from two soil borings, SB-28 and SB-29.

3.3.1 HLA 1993 Investigation

In HLA's 1993 investigation, the groundwater samples collected from MW-7 and MW-21 were analyzed for TPHg in accordance with EPA Test Method 8015 (modified) and samples from MW-7, MW-20, and MW-21 were analyzed for BTEX in accordance with EPA Test Method 8020. TPHg and BTEX were not detected above the reporting limits in Groundwater samples collected from the three wells during HLA's 1993 investigation.

3.3.2 Secor 1998 Investigation

Secor collected the groundwater samples from the three groundwater monitoring wells, MW-7, MW-20, and MW-21. Analyses included TPHg and TPHd in accordance with EPA Test Method 8015 modified, BTEX and methyl t-butyl ether (MTBE) in accordance with EPA Test Method 8020, and VOCs in accordance with EPA Test Method 8010. Secor reported no detections of TPHg, TPHd, BTEX, or MTBE above the laboratory's reporting limits in the groundwater samples from MW-7, MW-20, and MW-21. The samples did contain reportable concentrations of chloroform at 17 micrograms per liter ($\mu\text{g/L}$) in MW-20 and 27 $\mu\text{g/L}$ in MW-21; 1,2-dichloroethane (1,2-DCA) at 2.0 $\mu\text{g/L}$ in MW-20; and tetrachloroethene (PCE) at 4.8 $\mu\text{g/L}$ in MW-21.

3.3.3 HLA 1999 Investigation

HLA submitted for analysis groundwater samples collected from MW-7, MW-20, MW-21, and from soil borings SB-28 and SB-29. The analyses included TPHg, TPHd, TPHmo in accordance with EPA Test Method 8015 modified, VOCs in accordance with EPA Test Method 8260, SVOCs in accordance with EPA Test Method 8270, PAHs in accordance with EPA Test Method 8310, and CAM-17 metals in accordance with EPA Test Methods 6010 or 7060, 7191, or 7470A.

Analyses of the groundwater samples from the three wells did not detect TPHg, TPHd, BTEX or MTBE. The wells also did not detect concentrations of TPHmo. Sample results did report detectable concentrations of chloroform at 17 $\mu\text{g/L}$ in MW-20 and 7.4 $\mu\text{g/L}$ in MW-21, and 6.6 $\mu\text{g/L}$ of PCE in MW-21. No other VOCs, SVOC and no PAHs were detected. The groundwater grab samples from the boring located on the southern portion of the Site (SB-28) contained TPHd at 120 milligrams per liter (mg/L), TPHg at 17 mg/L, benzene at 16 $\mu\text{g/L}$, toluene at 29 $\mu\text{g/L}$, ethylbenzene at 41 $\mu\text{g/L}$, and total xylenes at 366 $\mu\text{g/L}$. Other VOCs detected in this sample were isopropylbenzene at 130 $\mu\text{g/L}$, propylbenzene at 140 $\mu\text{g/L}$, 1,2,4-trimethylbenzene at 990 $\mu\text{g/L}$, sec-butylbenzene at 36 $\mu\text{g/L}$, para-isopropyltoluene at 80 $\mu\text{g/L}$, n-butylbenzene at 92 $\mu\text{g/L}$, 1,3,5 trimethylbenzene at 180 $\mu\text{g/L}$ and naphthalene at 290 $\mu\text{g/L}$. SVOC and PAH analyses found this sample to contain 3,4-methylphenol at 8.4 $\mu\text{g/L}$, 2-methylnaphthalene at 44 $\mu\text{g/L}$, acenaphthylene at 230 $\mu\text{g/L}$ and fluorene at 36 $\mu\text{g/L}$. The other grab sample did not contain any detectable TPHg, TPHd, TPHmo, VOCs, SVOCs, or PAHs.

The groundwater samples contained low concentrations of barium, chromium, and zinc. The sample from SB-29 contained 40.7 $\mu\text{g/L}$ of molybdenum.

4.0 SITE SPECIFIC CONSIDERATIONS

This section addresses items #1 through #4 of the *Interim Guidance on Required Cleanup at Low-Risk Fuel Sites*, listed in Section 1.0 of this document.

4.1 Ongoing Sources

Soil and groundwater samples collected from 36 locations at the Site have not identified any ongoing source of contamination. Free product has not been found in any of the monitoring wells or identified in any of the soil borings where groundwater samples were collected. HLA's 1993 investigation included a geophysical survey which, using electromagnetic profiling, detected eight localized anomalous areas along the southern and western perimeter of the Site indicative of possible buried metals. However, using ground-penetrating radar, HLA was not able to identify any USTs within the upper five feet. Organic and inorganic compounds identified in the soil above the capillary fringe do not appear to contain sufficiently mobile constituents at high enough concentrations to migrate into the groundwater aquifer and significantly impact its beneficial use. With the exception of PCE and chloroform, groundwater samples from the monitoring wells have not contained detectable concentrations of VOCs, SVOCs, or petroleum hydrocarbons.

4.2 Site Characterization

Soil samples have been collected and analyzed from shallow and deep borings at 33 locations across the Site ranging in depth from 1.5 to 29.5 feet bgs. Groundwater samples have been collected and analyzed from the three monitoring wells, and from two soil borings. Both groundwater and soil samples have been subjected to some or all of the following chemical analyses: metals, VOCs, SVOCs, PAHs, TPHd, TPHmo, and TPHg. On the basis of the known site history, it is unlikely that the other classes of chemicals are present. Moreover, laboratory

reporting limits have been reviewed and are considered adequate to detect concentrations at levels that could impact health. The Site contains elevated concentrations of TPHd in the shallow surface soils in an area running from the center of the Site toward MW-7. Zinc, lead, and arsenic have also been found in the shallow soils toward the middle of the Site. TPHd and TPHg have been found at the groundwater/soil interface along the southern edge of the Site. PCE and chloroform have been identified at low concentrations in groundwater samples from the wells. On the basis of the extent of information, HLA concludes that the Site has been adequately characterized.

4.3 Dissolved Plume

Results from the groundwater monitoring wells do not indicate a contaminant plume emanating from the Site. PCE was detected in the groundwater sample from MW-21 at 4.8 µg/L in 1998 and 6 µg/L in 1999. 1, 2-dichloroethane (1,2-DCA) was detected at 2.0 µg/L in 1998 though not detected above the 5.0 µg/L detection limit in 1999. However, neither of these VOCs were detected in the groundwater samples collected from the borings. TPHg, TPHd and their constituents (BTEX and PAHs), detected in soil samples within the capillary fringe and groundwater samples collected in borings in the southern portion of the Site, have not been detected in the nearest downgradient monitoring well, MW-21. Recent studies by Lawrence Livermore National Laboratory (*Rice et al., 1997*) found that petroleum hydrocarbon plumes rarely migrate more than 300 feet from the source area. The results of groundwater monitoring do not indicate a stable well-defined contaminant plume emanating from the Site.

4.4 Other Potential Receptors

The City of Oakland receives its drinking water from the Sierra Nevada Mountains. HLA

contracted Environmental Data Resources, Inc. to perform a database search of drinking water wells within a one-mile radius of the Site (Appendix A). No drinking water wells were found. The nearest surface water bodies are; Lake Merritt, located approximately 3/4 mile to the east and the San Francisco Bay, located approximately 1/2 mile to the southwest. The groundwater gradient direction is towards the San Francisco Bay and away from Lake Merritt. As stated in Section 4.3, it is unlikely that petroleum hydrocarbons can migrate via the groundwater for long distances. The concentrations of VOCs detected in the groundwater are very low and dispersion would be expected to decrease the groundwater concentrations to nondetectable concentrations before the groundwater enters the San Francisco Bay. HLA therefore concludes that no water wells, deeper drinking water aquifers, surface water, or other seismic receptors are likely to be impacted by chemicals detected at the Site.

On October 27, 1999, HLA met with Mr. Jerry E. McCleery, a Principal Engineer for BART in charge of the electrical and mechanical engineering to discuss the dewatering activities that BART conducts in the 9th and Broadway area. BART construction includes water collection well sumps within underground sections to collect water that enters the tunnel. Two well sumps are located at each low spot within any particular underground section and extend approximately 20 feet below the bottom of the tunnel. The closest well sumps to the 9th Street and Broadway property are located at 9th Street and Webster Street, 7th Street and Broadway, and 23rd Street between Northgate Avenue and Telegraph Avenue as shown on Plate 4.

The tunnel sections under the 9th Street and Broadway property were constructed by drilling through the soil and then inserting a 2.5-foot section of steel tube. The sections are joined together with lead gaskets and any annular space remaining on the outside of the tunnel is backfilled under pressure with bentonite slurry. Contributing sources of water entering the tunnel

are surface infiltration (air vents and emergency exit access points) and groundwater infiltration at the section joints. Mr. McCleery stated that groundwater entering the tunnel from the 9th Street and Broadway site would migrate toward the 9th Street and Webster Street well sumps or the 7th Street and Broadway well sumps. The well sumps contain pumps that have a pumping rate of 500 gallons-per-minute and pump the water directly to the storm sewer system.

The pumps were replaced in August of 1998 and the hours each has run as of October 27, 1999, was recorded; 0.34 hours and 0.33 hours at 9th Street and Webster Street, 0.52 and 0.54 hours at 7th Street and Broadway. The average rate of discharge for the 9th Street and Webster Street pumps together was 17,000 gallons-per-year (gpy) or 47 gallons-per-day (gpd) and for the 7th Street and Broadway pumps 26,000 gpy or 71 gpd. However, most of this discharge occurs during the winter months, and Mr. McCleery estimated that of these totals, groundwater infiltration only contributed 10 to 20 percent. The groundwater from the 9th Street and Broadway site would only be expected to contribute a small portion of any groundwater infiltrating into the tunnel and therefore BART's activities are not considered to be contributing to a significant migration of groundwater from the Site.

Sections 5 and 6 address the final two RWQCB criteria discussed in Section 1.

5.0 HUMAN HEALTH RISK EVALUATION

This section describes the Human Health Risk Evaluation (HRE) conducted for the Site. This HRE evaluates potential impacts on human health from exposure to chemicals detected in soil and groundwater at the Site, in accordance with requirements of the San Francisco RWQCB, and consistent with guidance provided by the City of Oakland (*Oakland, 1999*).

The objective of the HRE is to address the 5th criterion, "The site presents no significant risk to human health" (*RWQCB, 1996a*). Consistent with the above-cited RWQCB guidance, the HRE was conducted using the RBCA approach established by the City of Oakland in *Oakland Risk-Based Corrective Action: Technical Background Document (Oakland, 1999)*, which is based on methods developed by the American Society of Testing and Materials (ASTM) in *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM, 1995)*.

This approach is discussed below, followed by a summary of chemicals detected at the Site and selection of chemicals of potential concern (Section 5.1), exposure assessment (Section 5.2), RBWCB evaluation (Section 5.2), and uncertainty evaluation (Section 5.4).

5.1 Hazard Identification

This section provides statistical summaries of soil and groundwater analytical data for evaluation in the HRE (Tables 5.1 through 5.3), followed by a comparison of detected chemical concentrations to regulatory screening values for groundwater. The soil and groundwater sampling and analytical programs are described in detail in Section 3.0.

The statistical data summaries provided in Tables 5.1 through 5.3 include minimum and maximum detected concentrations, frequency of detection (FOD), arithmetic mean, standard

deviation on the mean, and 95 percent upper confidence limit (95% UCL) on the arithmetic mean for all detected chemicals. In the statistical calculations, for analytes with at least one detection, HLA used a concentration equal to one-half the reporting limit for results reported as non-detect, except in cases where this value exceeded the maximum detected concentration (*U.S.EPA, 1989*). If one-half the reporting limit exceeded the maximum detected concentration, the samples with non-detect results were not used in the statistical evaluations. According to *Cal/EPA (1992)* and *ASTM (1995)* guidance, the 95% UCL may be used to evaluate chemicals for risk evaluations, except when there are less than 10 samples analyzed. For several chemicals in soil and all chemicals in groundwater detected at the Site, less than 10 samples were analyzed. Consequently, 95% UCL concentrations were not calculated for those chemicals, as indicated in Tables 5.1 through 5.3, and the maximum detected concentration was, instead, used in the HRE.

5.1.1 Soil Analytical Data

Soil data were compiled from three sampling events (*HLA, 1993; Secor, 1998; and HLA, 1999*) described in Section 3.0 and shown in Tables 5.1 and 5.2. Soil data was divided into two intervals: surface soil, defined as the top one meter (or 3.3 feet) of soil, and subsurface soil, defined as vadose zone soil deeper than one meter and excluding the capillary fringe zone above the saturated zone. This division is consistent with the Oakland (1999) RBCA approach. Chemicals detected in soil samples collected from the saturated zone were assumed to be associated with groundwater and were therefore not evaluated as soil data. During the 1993 HLA sampling event, the saturated soils were found at depths ranging from 22.5 to 28 feet bgs; during the 1998 Secor sampling event, depth of the water table, as measured in the monitoring wells, was found to be 23.3 to 26.4 feet bgs; and during

the 1999 HLA sampling event, depth of the water table, as measured in the monitoring wells, was found to be 23.7 to 26.2 feet bgs. On the basis of these measurements, the soil data from 3.3 to 22 feet bgs from the 1993 HLA data sets and the soil data from 3.3 to 23 feet bgs from the 1998 Secor and 1999 HLA data set were evaluated as subsurface soil data in the HRE.

In 1993, U.S. EPA Test Method 8270 was used by HLA to analyze SVOCs. Method 8270 has higher detection limits than Method 8310, the more sensitive method used by HLA in 1999 to analyze for the SVOCs identified as PAHs in soil and groundwater. As a result, PAHs that may have been present but were not detected in soil in 1993 were detected in 1999. Use of half of the elevated detection limits for these SVOCs would bias the soil data set because of the elevated 1993 detection limits, and were, therefore, not used. For SVOCs, only 1999 HLA data analyzed by U.S. EPA Method 8310 were used in the HRE.

5.1.2 Groundwater Analytical Data

Groundwater analytical results from HLA's 1993 investigation were not used in this HRE because these results are not considered representative of current conditions. Groundwater data were compiled from the 1998 Secor and 1999 HLA data sets as shown in Table 5.3. A detailed description of the site groundwater monitoring program is provided in Section 3.0. Monitoring well samples, as well as grab groundwater samples (at borings SB-28 and SB-29), were included in the HRE data set. Typically, grab groundwater samples have higher detected chemical concentrations than monitoring well samples because well samples are collected after purging the well. As such, well samples more accurately represent groundwater concentrations. However, these samples were conservatively included in the evaluation. As described above, 95% UCL concentrations were not calculated for chemicals detected in groundwater because less than 10 samples were analyzed.

5.1.3 Selection of Chemicals of Potential Concern for Groundwater

To select chemicals of potential concern (COPCs) for further evaluation in the HRE, HLA compared the maximum chemical concentrations in groundwater to Maximum Contaminant Levels (MCLs) (*Cal/EPA, 1998, U.S.EPA, 1999*) or Action Levels (ALs) (*Cal/EPA, 1998*). Because no State or federal equivalents of MCLs, which are enforceable cleanup goals, are available for soil, this prescreening step was not conducted for soil and all detected chemicals were, therefore, evaluated as COPCs.

MCLs are enforceable drinking water goals developed on the basis of both protection of human health and the technical feasibility of attaining the standards. An exceedance of MCLs does not disqualify a fuel site from classification as a "low-risk groundwater case" according to RWQCB guidance (*1996a*), as long as the "low-risk" criteria are satisfied (see Section 4.0). According to the RWQCB, fuel sites where MCLs are exceeded can still qualify for closure as low-risk cases (*RWQCB, 1996b*). ALs, which are non-enforceable health-based advisory levels, were developed by the State for chemicals without MCLs.

Table 5.4 provides a comparison of maximum detected concentrations to MCLs or ALs. The following chemicals exceeded MCLs or ALs and were identified as groundwater COPCs for the HRE: acenaphthylene, fluorene, naphthalene, 2-methylnaphthalene, 1,2-dichloroethane, ~~n~~^{ns chloroform?} butylbenzene, PCE, and benzene. In the absence of MCLs or ALs, the following chemicals were also retained for further evaluation as COPCs: molybdenum, 3,4-methylphenol, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, isopropylbenzene, para-isopropyltoluene, propylbenzene, and sec-butylbenzene.

5.2 Exposure Assessment

As discussed in Section 3.0, the HRE considers possible human health impacts from exposure to chemicals in soil and groundwater at the Site. First, an evaluation of possible human receptors and exposure pathways at the Site is presented.

5.2.1 Potential Receptors and Exposure Pathways

For an exposure pathway to be considered complete, four elements are necessary (*U.S.EPA, 1989*):

- A source and mechanism of chemical release
- An environmental transport medium
- A point of potential human contact with the medium
- An exposure route at the contact point.

The Site is located within the Chinatown Redevelopment Project Area in downtown Oakland, a predominantly commercial area. The Site is currently an asphalt-paved parking lot. The site developer plans to construct a 5-story hotel onsite, which may include a swimming pool and small landscaped areas. It is assumed that the remainder of the Site will be paved in the future. In addition, any exposed soil in landscaped areas is assumed to be comprised of imported, fill material. Therefore, direct contact with existing soil is unlikely to occur in the present or future, except during construction. In addition, the shallow aquifer is not used for drinking water or other known beneficial purposes. Therefore, direct contact with groundwater at the Site is also unlikely.

Future use of the Site is assumed to be commercial. Visitors staying at the hotel will be present at the Site for a substantially shorter period than hotel workers. HLA expects that the Site will not be used for residential purposes. Accordingly, the following potential receptors may be present:

- Future hotel worker

- Future construction worker.

Because the presence of structures and pavement will preclude direct contact with soil and groundwater by future hotel workers, the only potentially complete exposure pathway at the Site for these receptors is inhalation of vapors emitted by VOCs in soil and groundwater. VOCs detected in soil and groundwater at the Site can potentially migrate in the vapor phase from soil or groundwater to ambient air, although the presence of paving and building foundations is expected to substantially retard this process. Therefore, for subsurface soil and groundwater, the pathways evaluated in the HRE were inhalation of vapors in indoor and outdoor air. Consistent with Oakland (1999) guidance, RBSLs and SSTLs for subsurface soil and groundwater were used for this evaluation. (The surficial soil pathway only applies in the Oakland RBCA approach for direct contact with exposed soils.)

Accordingly, the following receptors and pathways were evaluated using the Oakland RBCA approach:

- Future commercial (i.e. hotel) workers – inhalation of vapors from subsurface soil and groundwater in indoor and outdoor air
- Future commercial (i.e. construction) workers – direct contact with surficial soil

Note that the Oakland RBSLs and SSTLs for workers are based on commercial worker exposure assumptions, such as 25 years exposure duration at the Site. This assumption is highly conservative because construction workers are expected to be present at the Site for less than one year. Accordingly, RBSLs and SSTLs developed by Oakland (1999) for commercial workers are lower than strictly necessary to protect the health of construction workers.

Note: Future excavation

5.2.2 Exposure Point Concentrations

Exposure point concentrations (EPCs) are concentrations of the COPCs at locations where exposure of the receptors is assumed to take place (i.e., exposure points). The EPCs used for the evaluation are the lesser of the 95% UCL (where available) and the maximum detected concentration. Use of the 95% UCL (which is an upperbound measure of the average concentration) rather than the more conservative maximum concentration as the EPC reflects the fact that receptors are expected to move around the Site rather than stay at one point (for instance, at the location of the maximum concentration). Receptors are likely, in real life, to incur exposure to an average concentration, so use of the 95 percent UCL or the maximum detected concentration is a conservative approach. Accordingly, the EPCs provided in Tables 3.1 through 3.4 were compared to RBSLs and SSTLs, where applicable.

TPH mixtures such as TPHd, TPHg, and TPHmo are generally not evaluated *per se* in risk assessments due to a number of factors including a lack of U.S.EPA and Cal/EPA screening criteria and toxicity factors. HLA has evaluated these by their "indicator chemicals": TPHg is evaluated as BTEX; TPHd is evaluated as BTEX and PAHs; and TPHmo is evaluated as PAHs. This procedure is consistent with Cal/EPA (1994) and ASTM (1995) guidance. Therefore, concentrations of BTEX and PAHs, and not TPHg, TPHd, and TPHmo in soil and groundwater, were evaluated in the HRE.

5.3 RBCA Evaluation

The following sections describe the results from the Oakland RBCA evaluation of potential health risks from exposure to COPCs in soil and groundwater at the Site (Oakland, 1999).

Tier 1 RBSLs were compiled for the potential receptors and potentially complete exposure pathways as follows:

- Construction worker – direct surface soil contact (i.e., soil ingestion, dermal contact, dust inhalation, and outdoor vapor inhalation) sk
- Hotel worker - volatilization from subsurface soil to indoor and outdoor air
- Hotel worker – volatilization from groundwater to indoor and outdoor air.

Toxic effects of chemicals are generally divided into two categories: carcinogenic (cancer causing) and noncarcinogenic. Potential toxic effects of chemicals are evaluated using noncancer reference doses (RfDs) and cancer slope factors (SFs). Accordingly, Oakland (1999) developed screening levels for carcinogenic and noncancer health effects. Chemicals may have both a cancer and noncancer screening level, or only one of these. RBSLs and SSTLs were compiled for both cancer and noncancer effects, where applicable (Tables 3.1 through 3.4). Generally, the cancer screening level is the lower of the two.

5.3.1 Tier 1 RBCA Soil Evaluation

Tables 3.1 and 3.2 provide comparisons of the EPCs of the COPCs to Tier 1 RBSLs for surficial and subsurface soil, respectively. Results are summarized as follows:

- The RBSLs for arsenic, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene are exceeded for the commercial worker for direct surface soil contact pathway.
- RBSLs are not exceeded for the other surface soil COPCs.
- RBSLs are not exceeded for subsurface soil.

Because of these exceedances, HLA has conducted further assessment of arsenic, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene for the commercial worker for direct surface soil contact by the more site-specific Tier 2 RBCA step. The results indicate that potential exposure to the remaining COPCs is unlikely to be associated with

unacceptable health risks and hazards for the commercial worker receptor, even under the conservative conditions evaluated. Soil exposure for these COPCs will not, therefore, be further evaluated in the HRE.

It is important to note that RBSLs developed for a commercial worker were used to evaluate a construction worker, who is expected to be the only receptor to be directly exposed to soil in the future. This approach is very conservative.

5.3.2 Tier 1 RBCA Groundwater Evaluation

A comparison of site groundwater EPCs for the COPCs to Tier 1 RBSLs is provided in Table 3.3. Results are summarized as follows:

- The EPCs do not exceed RBSLs for any COPC.

These results indicate that adverse health effects from potential inhalation of vapors from groundwater in indoor and outdoor air are unlikely to occur for the commercial worker receptor under the conservative exposure conditions evaluated. These chemicals and this pathway will not, therefore, be evaluated further in the HRE.

5.3.3 COPCs without Screening Levels

RBSLs were not available for the following COPCs in surface soil: cobalt and lead. The EPCs of these chemicals were, therefore, compared to U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for soil for industrial workers (*U.S. EPA, 1998*). PRGs are non-enforceable screening levels developed on the basis of U.S. EPA risk assessment guidance and conservative default exposure and chemical migration assumptions. PRGs for soil were developed for ingestion, dermal contact, dust inhalation, and vapor inhalation. The PRG for cobalt is 29,000 mg/kg, which is well above the cobalt EPC of 7.8 mg/kg. The PRG for lead is

1,000 mg/kg, which is also well above the lead EPC of 59 mg/kg. Exposure of commercial workers to these chemicals is, therefore, unlikely to be associated with unacceptable health risks or hazards. No further evaluation is recommended for cobalt and lead in surface soil. This evaluation is shown on Table 3.1.

Neither MCLs nor RBSLs were available for the following COPCs in groundwater: molybdenum; 3,4-methylphenol; 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; isopropylbenzene; para-isopropyltoluene; propylbenzene; and sec-butylbenzene. EPCs for these COPCs were compared to their EPA Region IX PRGs for tapwater, which are conservative, risk-based screening levels corresponding to ingestion of, and dermal contact with, water. This evaluation is shown on Table 3.3.

EPCs of the following COPCs exceeded tap water PRGs: 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; isopropylbenzene; and propylbenzene. This evaluation is highly conservative because no direct contact with groundwater is assumed to occur at the Site. Moreover, these chemicals are likely petroleum-related. As discussed above, petroleum was evaluated as BTEX, of which benzene was detected below RBSLs at the Site. In addition, HLA evaluated the maximum and not 95% UCL concentrations. As such, these COPCs are unlikely to pose an unacceptable human health risk at the Site, given the depth to groundwater (approximately 23 feet) and the fact that vapor inhalation is the only potentially complete exposure pathway. The future presence of paving, building foundations, and landscaped areas at the Site are likely to substantially retard emission of vapors from groundwater and air.

5.3.4 Tier 2 RBCA Soil Evaluation

The SSTLs developed for the commercial worker for the direct soil contact pathway are provided in Table 3.4. Merritt sands are considered to be the predominant soil type at the Site and SSTLs developed by Oakland (*1999*) for this specific soil type were, therefore, used for the Tier 2

evaluation (Table 3.4). Plate 5 presents the locations of the samples used in the Tier 2 Evaluation. Results are summarized as follows:

- The EPCs for all chemicals evaluated [i.e., arsenic, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene] are lower than corresponding Merritt sands SSTLs.

These results indicate that, using the combined conservative and soil-specific Tier 2 input parameters, exposure to chemicals in soil via ingestion, dermal contact, dust inhalation, and vapor inhalation by a commercial worker receptor is considered unlikely to result in unacceptable health risks at the Site.

5.4 Uncertainty Evaluation

The following factors contribute to the conservatism of the Health Risk Evaluation:

- It is assumed that concentrations of chemicals in soil and groundwater do not decrease over the exposure duration (i.e., up to 25 years), when in fact they are likely to decrease due to natural attenuation processes such as biodegradation, dispersion, and volatilization.
- Grab groundwater samples, which tend to have higher chemical concentrations, as well as monitoring well samples were evaluated.
- Only an upper-bound exposure scenario was evaluated for both Tiers 1 and 2 of the RBCA evaluation. A more conservative maximum detected concentration was used in lieu of the 95% UCL concentration for several chemicals. More realistic, average exposure was not evaluated for the receptors.
- Cal/EPA and U.S. EPA toxicity factors used to evaluate the COPCs are developed using conservative methods and tend to result in conservative risk evaluations.
- Cal/EPA and U.S. EPA exposure assumptions used to evaluate the receptors are conservative and tend to result in conservative RBSLs and SSTLs. For

instance, commercial workers are assumed to work at the Site for 250 days every year for 25 years for both Tiers 1 and 2.

- Tier 1 RBSLs were developed using volatilization factors (VFs) that were based on default, non-site-specific parameters, leading to conservative VFs that likely represent an overestimate of vapor emissions from site soil and groundwater.
- Data from subsurface soil to a depth of 23 feet bgs were evaluated. Cal/EPA requires evaluation of soil chemical data to a depth of 10 feet bgs only.
- Screening levels used to evaluate surface soil were developed for commercial workers with an exposure period of 250 days per year over a period of 25 years. The only future receptors likely to have direct contact with soil are construction workers, who will likely be at the Site less than one year. Use of commercial screening levels for these receptors is very conservative.

Use of these conservative factors results in a conservative and health-protective HRE. Tier 1 RBSLs and Tier 2 SSTLs compiled for the Site are, therefore, likely lower than necessary to reasonably protect human health.

6.0 ECOLOGICAL EVALUATION

The Site is currently an asphalt-paved parking lot. The site developer is planning to construct a 5-story hotel onsite. It is located approximately 0.5 mile from San Francisco Bay. The direction of flow in the uppermost aquifer is west (from the northeast corner to the southwest corner of the Site) towards San Francisco Bay.

For reasons discussed above, HLA believes that the analytes detected in groundwater at the Site are unlikely to reach the Bay. In the unlikely event that analytes detected at the Site were transported to the Bay, they would undergo substantial, instantaneous dilution upon entering the Bay.

The presence of complete exposure pathways for chemicals in soil and groundwater at the Site for either terrestrial or aquatic receptors is considered unlikely. Adverse health effects on ecological receptors from chemicals at the Site are, therefore, considered unlikely.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

HLA has evaluated site conditions in comparison to the RWQCB's *Interim Guidance on Required Cleanup at Low-Risk Fuel Sites*. Site-specific data have been evaluated to demonstrate that the Site meets the six criteria for designating the Site as a "low risk groundwater site". Section 2 presented the background information available on site conditions, and Section 3 compiled the soil and groundwater data that HLA and Secor have obtained at the Site. Section 4 shows that the available information satisfies the first four criteria: no ongoing sources are present; the Site has been adequately characterized; no dissolved plume is present; and drinking water and other sensitive receptors are not likely to be impacted by the chemicals encountered at the Site.

In Section 5 HLA presented the Human Health Risk Evaluation (HRE) and used the Risk-Based Corrective Action approach (*Oakland, 1999*) to evaluate potential human health risks from exposure to chemicals detected in soil and groundwater at the Site. This section demonstrated that the Site is unlikely to present significant risk to human health. We summarize below the basis for this conclusion.

Maximum detected groundwater concentrations were screened against U.S.EPA and Cal/EPA screening levels. Chemicals exceeding these levels were selected as groundwater COPCs for further evaluation. All detected chemicals in soil were selected as soil COPCs.

Tier 1 Risk-Based Screening Levels (RBSLs) *Oakland (1999)* were compiled for the following potential receptors and exposure pathways:

- Commercial (construction) worker receptor – direct exposure to surface soil via ingestion, dermal contact, dust inhalation, and outdoor vapor inhalation
 - Commercial (hotel) worker receptor – inhalation of vapors from subsurface soil in indoor and outdoor air
 - Commercial (hotel) worker receptor – inhalation of vapors from groundwater in indoor and outdoor air.
- * Tier 1 RBSLs were ^{higher} lower than the EPCs for COPCs in subsurface soil and groundwater, demonstrating that adverse health effects are not anticipated to occur for commercial receptors exposed to vapors from subsurface soil and groundwater under the exposure conditions evaluated.

A Tier 2 evaluation was, however, conducted for surface soil for commercial workers potentially exposed to arsenic, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene. This evaluation was conducted because the EPCs for these chemicals were greater than RBSLs for the direct soil contact pathway. All other COPCs evaluated for direct soil contact pathway did not exceed Tier 1 RBSLs. SSTLs for Merritt Sands were used for Tier 2.

Results of the Tier 2 RBCA evaluation indicate that potential exposure to arsenic, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene in soil via ingestion, dermal contact, dust inhalation, and vapor inhalation are considered unlikely to result in unacceptable health risks at the Site under the exposure conditions evaluated.

For surface soil, COPCs without RBSLs were evaluated using U.S. EPA Region 9 PRGs. No exceedances were noted. For groundwater, several chemicals were without RBSLs or MCLs. Accordingly, concentrations were compared to tap water PRGs, a very conservative evaluation indicating exceedances of PRGs by the maximum detected concentrations of 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene,

isopropylbenzene, and propylbenzene. These chemicals are likely related to petroleum, which was evaluated using benzene. The maximum concentration of benzene did not exceed the RBSL. Moreover, while PRGs correspond to ingestion of and dermal contact with groundwater, inhalation of vapors is likely the only potentially complete exposure pathway at the Site for groundwater. The depth to groundwater and the future presence of paving are likely to substantially retard emission of vapors from groundwater to air.

To summarize, the RBCA evaluation of detected chemicals at the Site demonstrated that unacceptable cancer risks and noncancer health effects are unlikely to occur for commercial receptors potentially exposed to chemicals in soil and groundwater.

Section 6 indicated that adverse health effects on ecological receptors from chemicals at the site are considered unlikely, thereby completing the compliance with the six criteria for a "low risk groundwater site".

7.2 Recommendations

HLA recommends abandonment of the two groundwater monitoring wells located onsite prior to beginning construction activities. After the Site has been cleared of the overlaying asphalt, shallow soil samples should be collected and analyzed to characterize the soils that will be removed during grading as part of a waste management plan. Limited excavation with a backhoe should be performed at the locations of the electromagnetic anomalies that were identified in order to confirm/deny the presence of USTs. The City should remove and close any USTs that are identified.

HLA recommends that the City of Oakland submit this report to the Alameda County Department of Environmental Health and request site closure pending the following:

- Abandonment of the two groundwater monitoring wells

- Presentation of a waste management plan to handle the disposal of soils from the Site, and
- The confirmation that anomalies mentioned in HLA's 1993 report are not of environmental concern.

8.0 REFERENCES

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Table 3.1. Tier I Comparison - Surface Soil (0 to 3 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California

Analyte	Site EPC		Tier I Commercial		EPC Exceeds Lowest RBSL?	Region IX Industrial Soil PRG ^b	EPC Exceeds PRG?
	Maximum Detected Value	95% UCL	Ingestion/Dermal/Dust and Vapor RBSL ^a	Noncancer			
Inorganics (mg/kg)							
Arsenic	--	2.3	1.5	250	X	NA	
Barium	--	83	NA	94000		NA	
Beryllium	0.24	--	17000	6800		NA	
Cadmium	--	4.0	7900	680		NA	
Chromium	--	34	NA	1400000		NA	
Cobalt	--	7.8	NA	NA		29,000	
Copper	--	21	NA	50000		NA	
Lead	--	59	NA	NA		1,000	
Mercury	--	0.257	NA	30		NA	
Nickel	--	32	130000	27000		NA	
Silver	--	13.5	NA	6800		NA	
Vanadium	--	28	NA	9500		NA	
Zinc	--	46	NA	410000		NA	
Volatile Organic Compounds (mg/kg)							
Tetrachloroethene	--	0.0028	18	3000		NA	
Semivolatile Organic Compounds (mg/kg)							
Benzo (a) anthracene	1.1	--	0.79	NA	X	NA	
Benzo (a) pyrene	1.2	--	0.079	NA	X	NA	
Benzo (b) fluoranthene	0.77	--	0.79	NA		NA	
Benzo (g,h,i) perylene	0.85	--	NA	1400		NA	
Benzo (k) fluoranthene	0.43	--	0.79	NA		NA	
Chrysene	1.4	--	7.9	NA		NA	
Fluoranthene	2.1	--	NA	14000		NA	
Indeno (1, 2, 3-cd) pyrene	1.1	--	0.79	NA	X	NA	
Phenanthrene	1.6	--	NA	100000		NA	
Pyrene	2.0	--	NA	10000		NA	

^a From: *Oakland, 1999.*

^b From: *U.S. EPA, 1998.*

EPC Exposure point concentration.
95% UCL 95 percent upper confidence limit on the arithmetic mean.
PRG Preliminary Remedial Goal.
RBSL Risk based screening level.
mg/kg Milligrams per kilogram.
-- 95% UCL not calculated for chemicals with less than 10 analyses.
NA Not available/applicable.

Note: Benzo(b,k) fluoranthene was detected but not evaluated. Instead benzo(b)- and benzo(k)fluoranthene were evaluated.

**Table 3.2. Tier I Comparison - Subsurface Soil (3 to 23 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California**

Analyte	Site EPC		Tier I Commercial Outdoor Vapor Inhalation		Tier I Commercial Indoor Vapor Inhalation		EPC Exceeds Lowest RBSL?
	Maximum Detected Value	95% UCL	RBSL ^a		RBSL ^a		
			Carcinogenic	Noncancer	Carcinogenic	Noncancer	
Inorganics (mg/kg)							
Arsenic	-	1.6	NA	NA	NA	NA	
Barium	-	50	NA	NA	NA	NA	
Beryllium	0.20	-	NA	NA	NA	NA	
Cadmium	-	4.3	NA	NA	NA	NA	
Chromium	-	47	NA	NA	NA	NA	
Cobalt	-	7.2	NA	NA	NA	NA	
Copper	-	18	NA	NA	NA	NA	
Lead	-	43	NA	NA	NA	NA	
Mercury	-	0.053	NA	230	NA	NA	
Nickel	-	35	NA	NA	NA	NA	
Vanadium	-	31	NA	NA	NA	NA	
Zinc	-	2947	NA	NA	NA	NA	
Volatile Organic Compounds (mg/kg)							
Tetrachloroethene	-	0.0051	3.2	240	5.5	SAT	
Semivolatile Organic Compounds (mg/kg)							
Benzo (a) anthracene	0.0042	-	SAT	NA	SAT	NA	
Benzo (a) pyrene	0.0044	-	SAT	NA	SAT	NA	
Chrysene	0.0057	-	SAT	NA	SAT	NA	
Indeno (1, 2, 3-cd) pyrene	0.0034	-	SAT	NA	SAT	NA	

^a From: *Oakland, 1999.*

EPC Exposure point concentration.
 95% UCL 95 percent upper confidence limit on the arithmetic mean.
 RBSL Risk based screening level.
 mg/kg Milligrams per kilogram.
 - 95% UCL not calculated for chemicals with less than 10 analyses.
 NA Not available/applicable..
 SAT RBSL exceeds saturated soil concentration of chemical.

**Table 3.3. Tier I Comparison - Groundwater
Screening Health Risk Evaluation
9th and Broadway
Oakland, California**

Analyte	Site EPC ^a Maximum Detected Value	Tier I Commercial Outdoor Vapor Inhalation RBSL ^b		Tier I Commercial Indoor Vapor Inhalation RBSL ^b		EPC Exceeds Lowest RBSL?	Region IX Tap Water PRG ^c	EPC Exceeds PRG?
		Carcinogenic	Noncancer	Carcinogenic	Noncancer			
Metals (mg/L)								
Molybdenum	0.0407	NA	NA	NA	NA		0.18	
Semivolatile Organic Compounds (mg/L)								
Acenaphthylene	0.23	NA	> Sol	NA	> Sol		NA	
Fluorene	0.036	NA	> Sol	NA	> Sol		NA	
Naphthalene	0.11	NA	> Sol	NA	> Sol		NA	
3,4-Methylphenol	0.0084	NA	NA	NA	NA		0.18 ^d	
2-Methylnaphthalene	0.044	NA	> Sol	NA	> Sol		NA	
Volatile Organic Compounds (mg/L)								
1,2,4-Trimethylbenzene	0.99	NA	NA	NA	NA		0.012	X
1,2-Dichloroethane	0.002	69	5000	13	940		NA	
1,3,5-Trimethylbenzene	0.18	NA	NA	NA	NA		0.012	X
Isopropylbenzene	0.13	NA	NA	NA	NA		0.061	X
n-Butylbenzene	0.092	NA	NA	NA	NA		NA	
para-Isopropyl Toluene	0.08	NA	NA	NA	NA		0.72 ^e	
Propylbenzene	0.14	NA	NA	NA	NA		0.061	X
sec-Butylbenzene	0.036	NA	NA	NA	NA		0.061	
Tetrachloroethene	0.0066	51	> Sol	3.6	> Sol		NA	
BTEX (mg/L)								
Benzene	0.016	21	1300	2	120		NA	

^a Maximum concentration used as EPC because 95% UCL not calculated for chemicals with less than 10 analyses.

^b From: *Oakland, 1999*.

^c From: *U.S. EPA, 1998*.

^d PRG for 4-methylphenol.

^e PRG for toluene.

EPC Exposure point concentration.

95% UCL 95 percent upper confidence limit on the arithmetic mean.

PRG Preliminary Remedial Goal.

RBSL Risk based screening level.

mg/L Milligrams per liter.

BTEX Benzene, toluene, ethylbenzene, and xylenes.

NA Not available/applicable.

> Sol RBSL exceeds solubility of chemical in water.

**Table 3.4. Tier II Comparison - Surface Soil (0 to 3 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California**

Analyte	Site EPC		Tier II Commercial/Industrial Ingestion/Dermal/Inhalation SSTL *		EPC Exceeds Lowest SSTL?
	Maximum Detected Value	95% UCL	Carcinogenic	Noncancer	
Inorganics (mg/kg)					
Arsenic	-	2.3	24	380	
Semivolatile Organic Compounds (mg/kg)					
Benzo (a) anthracene	1.1	-	16	NA	
Benzo (a) pyrene	1.2	-	1.6	NA	
Indeno (1, 2, 3-cd) pyrene	1.1	-	16	NA	

* Oakland Tier 2 SSTL for Merritt Sands (*Oakland, 1999*).

EPC Exposure point concentration.
 95% UCL 95 percent upper confidence limit on the arithmetic mean.
 SSTL Site specific target level.
 mg/kg Milligrams per kilogram.
 - 95% UCL not calculated for chemicals with less than 10 analyses.

Table 5.1. Soil Data Summary - Surface (0 to 3 Feet)

Screening Health Risk Evaluation

8th and Broadway
Oakland, California

Data Source	HLA 1993															
	SB-1	SB-2	SB-4	SB-6	SB-7	SB-10	SB-11	SB-14	SB-15	SB-16	SB-18	SB-19	SB-20	SB-21	SB-22	
Boring Number	SB-1	SB-2	SB-4	SB-6	SB-7	SB-10	SB-11	SB-14	SB-15	SB-16	SB-18	SB-19	SB-20	SB-21	SB-22	
Depth (feet)	1.5	2.0	1.5	1.5	2.0	1.5	1.0	1.5	1.5	1.5	3.0	1.5	1.5	1.5	1.5	
Detected	93012201	93011901	93011905	93012203	93011908	93012205	93012207	93011910	93012212	93012215	93051312	93051301	93051302	93051304	93051303	
Analyte	Sample Date	1/19/1993	1/19/1993	1/19/1993	1/21/1993	1/19/1993	1/21/1993	1/20/1993	1/19/1993	1/20/1993	1/21/1993	5/13/1993	5/13/1993	5/13/1993	5/13/1993	
Inorganics (mg/kg)																
Arsenic	3.0	1.3	2.0	2.4	1.7	3.6	1.1	0.25	1.0	1.1	--	--	--	--	--	
Barium	170	46	85	82	59	81	43	49	42	28	--	--	--	--	--	
Beryllium	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	--	--	--	--	--	
Cadmium	4.5	4.2	4.1	4.6	3.9	5.8	2.3	2.7	2.0	2.6	--	--	--	--	--	
Chromium	35	44	37	28	34	18	27	29	30	30	--	--	--	--	--	
Cobalt	14	7.3	6.9	8.1	6.3	9.4	2.5	2.5	2.2	2.5	--	--	--	--	--	
Copper	27	18	17	26	17	31	14	12	12	16	--	--	--	--	--	
Lead	50	11	17	230	29	29	2	2.9	5.1	3.7	--	99	2.7	3.2	22	
Mercury	0.05	0.05	0.05	0.23	0.05	0.05	0.05	0.05	0.05	0.05	--	--	--	--	--	
Nickel	55	40	30	25	32	16	15	16	12	14	--	--	--	--	--	
Silver	1.0	55	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	--	--	--	--	--	
Vanadium	32	28	28	28	26	39	21	18	18	20	--	--	--	--	--	
Zinc	48	26	33	69	49	67	14	34	15	33	--	--	--	--	--	
Petroleum (mg/kg)																
TPHd	23	0.5	68	1600	83	57	0.5	0.5	0.5	11	0.5	100	24	13	26	
TPHmo	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Volatile Organic Compounds (µg/kg)																
Tetrachloroethene	1.0	1.0	1.0	5.4	1.0	1.0	1.0	1.0	1.0	1.0	--	2.6	7.5	1.0	1.0	
Semivolatile Organic Compounds (µg/kg)																
Benzo (a) anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzo (a) pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzo (b) fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzo (b,k) fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzo (g,h,i) perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzo (k) fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Indeno (1, 2, 3-cd) pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
%	Percent															
95% UCL	95 percent upper confidence limit on the arithmetic mean.															
EPC	Exposure point concentration.															
mg/kg	Milligrams per kilogram.															
µg/kg	Micrograms per kilogram.															
TPHd	Total petroleum hydrocarbons as diesel.															
TPHmo	Total petroleum hydrocarbons as motor oil.															
--	Not tested or not detected.															
N/A	Not applicable.															
>max ()	Not detected; half reporting limit entered.															
>max ()	Nondetect value exceeds the maximum value; excluded from calculations.															

Table 5.1. Soil Data Summary - Surface (0 to 3 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California

Detected Analyte	Data Source		Statistical Summary									EPC Lesser of Maximum & 95% UCL
	Boring Number	HLA 1999	Minimum Detected Value	Maximum Detected Value	Number of Detections	Number of Analyses	Frequency of Detection (%)	Arithmetic Mean	Standard Deviation	95% UCL		
	SB-28	SB-29										
	Depth (feet)	2.0	2.0									
	Sample Number	SB28-2-2.5	SB29-2-2.5									
	Sample Date	8/23/1999	8/23/1999									
Inorganics (mg/kg)												
Arsenic	2.1	2.2	1.0	3.6	11	12	91.7	1.8	0.93	2.3	2.3	
Barium	31	33	28	170	12	12	100	62	39	83	83	
Beryllium	0.15	0.24	0.15	0.24	2	2	100	0.20	0.06	N/A	0.24	
Cadmium	0.27	0.39	0.27	5.8	12	12	100	3.11	1.70	4.0	4.0	
Chromium	20	36	18	44	12	12	100	31	7.2	34	34	
Cobalt	2.6	6.4	2.6	14	8	12	66.7	5.9	3.6	7.8	7.8	
Copper	13	5.6	5.6	31	12	12	100	17	7.3	21	21	
Lead	27	3.0	2	230	16	16	100	34	58	59	59	
Mercury	0.87	0.058	0.058	0.87	3	12	25.0	0.134	0.237	0.257	0.257	
Nickel	16	34	12	55	12	12	100	25	13	32	32	
Silver	0.25	0.235	55	55	1	12	8.3	5.37	15.6	13.5	13.5	
Vanadium	15	26	15	39	12	12	100	25	6.8	28	28	
Zinc	31	17	14	69	12	12	100	36	19	46	46	
Petroleum (mg/kg)												
TPHd	160	10	10	1600	12	17	70.6	128	382	290	290	
TPHmo	1200	53	53	1200	2	2	100	627	811	N/A	1200	
Volatile Organic Compounds (µg/kg)												
Tetrachloroethene	2.3	2.4	2.6	7.5	3	16	18.75	2.0	1.9	2.8	2.8	
Semivolatile Organic Compounds (µg/kg)												
Benzo (a) anthracene	1100	12	12	1100	2	2	100	556	769	N/A	1100	
Benzo (a) pyrene	1200	23	23	1200	2	2	100	612	832	N/A	1200	
Benzo (b) fluoranthene	770	18	18	770	2	2	100	394	532	N/A	770	
Benzo (b,k) fluoranthene	840	335	840	840	1	2	50	588	357	N/A	840	
Benzo (g,h,i) perylene	850	19	19	850	2	2	100	435	588	N/A	850	
Benzo (k) fluoranthene	430	8.4	8.4	430	2	2	100	219	298	N/A	430	
Chrysene	1400	8.9	8.9	1400	2	2	100	704	984	N/A	1400	
Fluoranthene	2100	15	15	2100	2	2	100	1058	1474	N/A	2100	
Indeno (1, 2, 3-cd) pyrene	1100	32	32	1100	2	2	100	566	755	N/A	1100	
Phenanthrene	1600	8.3	1600	1600	1	2	50	804	1125	N/A	1600	
Pyrene	2000	16	16	2000	2	2	100	1008	1403	N/A	2000	

% Percent
95% UCL 95 percent upper confidence limit on the arithmetic mean.
EPC Exposure point concentration.
mg/kg Milligrams per kilogram.
µg/kg Micrograms per kilogram.
TPHd Total petroleum hydrocarbons as diesel.
TPHmo Total petroleum hydrocarbons as motor oil.
-- Not tested or not detected.
N/A Not applicable.
Not detected; half reporting limit entered.
>max () Nondetect value exceeds the maximum value; excluded from calculations.

Table 5.2. Soil Data Summary - Subsurface (3 to 23 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California

Data Source	HLA 1993												
	Boring Number	SB-2	SB-3	SB-4	SB-5	SB-7	SB-9	SB-11	SB-12	SB-13	SB-15	SB-17	SB-18
Depth (feet)	20.0	5.0	10.0	15.0	15.0	10.0	20	10	5	20	5	8.0	15.5
Sample Number	93011902	93011903	93011906	93012202	93011909	93012204	93012208	93012210	93012211	93012213	93012217	93051313	93051314
Sample Date	1/19/1993	1/19/1993	1/19/1993	1/20/1993	1/19/1993	1/21/1993	1/20/1993	1/21/1993	1/21/1993	1/20/1993	1/22/1993	5/13/1993	5/13/1993
Inorganics (mg/kg)													
Arsenic	0.8	1.3	1.1	0.25	1.6	0.6	--	1.4	1.9	--	>max (2.5)	1.7	--
Barium	28	61	42	34	46	41	--	40	65	--	48	--	--
Beryllium	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	>max (1.0)	--	>max (1.0)	>max (1.0)	--	>max (1.0)	>max (1.0)	--
Cadmium	3.4	4.1	4.3	3.8	4.3	2.8	--	3.6	3.8	--	7.6	1.0	--
Chromium	37	42	44	53	48	33	--	44	49	--	3.2	58	--
Cobalt	5.9	7.2	6.8	9.2	8.9	5.3	--	6.8	5.7	--	2.5	--	--
Copper	14	19	18	16	18	19	--	21	21	--	16	9.1	--
Lead	1.7	7.5	17	2.3	2.9	2.2	--	6.3	2.8	--	320	10	--
Mercury	0.05	0.05	0.05	0.05	0.05	0.05	--	0.05	0.05	--	0.05	0.05	--
Nickel	31	32	35	39	32	26	--	28	33	--	6.7	39	--
Vanadium	24	30	28	32	33	23	--	34	32	--	6	--	--
Zinc	21	33	23	21	19	20	--	24	22	--	17000	26	--
Petroleum (mg/kg)													
TPHd	0.5	65	21	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.6	0.5	0.5
TPHmo	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (µg/kg)													
Tetrachloroethene	1.0	1.0	1.0	1.0	1.0	1.0	--	--	--	1.0	22	--	--
Semivolatile Organic Compounds (µg/kg)													
Benzo (a) anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo (a) pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno (1, 2, 3-cd) pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--
%	Percent.												
95% UCL	95 percent upper confidence limit on the arithmetic mean.												
EPC	Exposure point concentration.												
mg/kg	Milligrams per kilogram.												
µg/kg	Micrograms per kilogram.												
TPHd	Total petroleum hydrocarbons as diesel.												
TPHmo	Total petroleum hydrocarbons as motor oil.												
--	Not tested or not detected.												
N/A	Not applicable.												
	Not detected; half reporting limit entered.												
>max ()	Nondetect value exceeds the maximum value; excluded from calculations.												

**Table 5.2. Soil Data Summary - Subsurface (3 to 23 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California**

Data Source	HLA 1993						Secor 1998							
	Boring Number	SB-23	SB-24	SB-25	SB-26	SB-27	SB-27	SB-1	SB-1	SB-2	SB-2	SB-3	SB-3	SB-4
Depth (feet)	5	5	5	5	15.5	20.5	7	23	7.5	15	7.5	15.5	3.5	
Detected	Sample Number	93051308	93051306	93051307	93051305	93051309	93051310	SB-1-7	SB-1-23	SB-2-7.5	SB-2-15	SB-3-7.5	SB-3-15.5	SB-4-3.5
Analyte	Sample Date	5/13/1993	5/13/1993	5/13/1993	5/13/1993	5/13/1993	5/13/1993	1/21/1998	1/21/1998	1/21/1998	1/21/1998	1/21/1998	1/21/1998	1/21/1998
Inorganics (mg/kg)														
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	4.7	4.4	2.2	2.2	--	--	2.5	2.5	2.5	2.5	2.5	2.5	2.5	20
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	27	55	56	16	--	--	--	--	--	--	--	--	--	--
Petroleum (mg/kg)														
TPHd	--	--	--	--	0.5	0.5	5.0	1.5	7.9	1.1	13	2.4	1.5	--
TPHmo	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (µg/kg)														
Tetrachloroethene	--	--	--	--	--	--	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Semivolatile Organic Compounds (µg/kg)														
Benzo (a) anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo (a) pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno (1, 2, 3-cd) pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
%	Percent.													
95% UCL	95 percent upper confidence limit on the arithmetic mean.													
EPC	Exposure point concentration.													
mg/kg	Milligrams per kilogram.													
µg/kg	Micrograms per kilogram.													
TPHd	Total petroleum hydrocarbons as diesel.													
TPHmo	Total petroleum hydrocarbons as motor oil.													
--	Not tested or not detected.													
N/A	Not applicable.													
Not detected	Not detected; half reporting limit entered.													
>max ()	Nondetect value exceeds the maximum value; excluded from calculations.													

**Table 5.2. Soil Data Summary - Subsurface (3 to 23 Feet)
Screening Health Risk Evaluation
9th and Broadway
Oakland, California**

Detected Analyte	Data Source		HLA 1999		Statistical Summary							EPC	
	Boring Number	Depth (feet)	SB-28	SB-29	Minimum Detected Value	Maximum Detected Value	Number of Detections	Number of Analyses	Frequency of Detection (%)	Arithmetic Mean	Standard Deviation	95% UCL	Lesser of Maximum & 95% UCL
	Sample Number	Sample Date	SB28-9.5-10	SB29-9.5-10									
Inorganics (mg/kg)													
Arsenic			2.0	1.9	0.6	2.0	10	11	90.9	1.3	0.6	1.6	1.6
Barium			26	44	26	65	11	11	100	43	12	50	50
Beryllium			0.20	0.20	0.20	0.20	2	2	100	0.20	N/A	N/A	0.20
Cadmium			0.41	0.39	0.39	7.6	11	12	91.7	3.3	2.0	4.3	4.3
Chromium			31	38	3.2	58	12	12	100	40	14	47	47
Cobalt			5.0	5.0	5.0	9.2	10	11	90.9	6.2	1.9	7.2	7.2
Copper			5.4	6.1	5.4	21	12	12	100	15	5.5	18	18
Lead			23	5.0	1.7	320	16	23	69.6	20	66	43	43
Mercury			0.019	0.058	0.058	0.058	1	12	8.3	0.048	0.009	0.053	0.053
Nickel			34	35	6.7	39	12	12	100	31	9	35	35
Vanadium			25	23	6	34	11	11	100	26	7.9	31	31
Zinc			19	21	16	17000	16	16	100	1088	4243	2947	2947
Petroleum (mg/kg)													
TPHd			0.5	26	0.0011	65	11	24	45.8	6.4	14	11	11
TPHmo			2.5	62	62	62	1	2	50	32	42	N/A	62
Volatile Organic Compounds (µg/kg)													
Tetrachloroethene			2.35	2.4	22	22	1	17	5.9	3.0	4.9	5.1	5.1
Semivolatile Organic Compounds (µg/kg)													
Benzo (a) anthracene			1.65	4.2	4.2	4.2	1	2	50	2.9	1.8	N/A	4.2
Benzo (a) pyrene			1.65	4.4	4.4	4.4	1	2	50	3.0	1.9	N/A	4.4
Chrysene			1.65	5.7	5.7	5.7	1	2	50	3.7	2.9	N/A	5.7
Indeno (1, 2, 3-cd) pyrene			1.65	3.4	3.4	3.4	1	2	50	2.5	1.2	N/A	3.4

% Percent.
95% UCL 95 percent upper confidence limit on the arithmetic mean.
EPC Exposure point concentration.
mg/kg Milligrams per kilogram.
µg/kg Micrograms per kilogram.
TPHd Total petroleum hydrocarbons as diesel.
TPHmo Total petroleum hydrocarbons as motor oil.
-- Not tested or not detected.
N/A Not applicable.
Not detected; half reporting limit entered.
>max () Nondetect value exceeds the maximum value; excluded from calculations.

**Table 5.3. Groundwater Data Summary
Screening Health Risk Evaluation
9th Street and Broadway
Oakland, California**

Detected Analyte	Data Source Sample Location Sample Date	HLA 1999								Statistical Summary							EPC	
		Secor 1998			SB-28 36395	SB-29 36395	MW-7 8/20/99	MW-20 8/20/99	MW-21 8/20/99	Minimum Detected Value	Maximum Detected Value	Number of Detections	Number of Analyses	Frequency of Detection (%)	Arithmetic Mean	Standard Deviation	95% UCL	Lesser of Maximum & 95% UCL
		MW-7 1/20/98	MW-20 1/20/98	MW-21 1/20/98														
Metals (µg/L)																		
Barium	--	--	--	114	37.3	23.3	101	23.4	23.3	114	5	5	100	59.8	44	N/A	114	
Chromium	--	--	--	2.5	2.5	2.5	7.66	9.45	7.66	9.45	2	5	40	4.92	3.38	N/A	9.45	
Copper	--	--	--	23	21.9	5	5	5	21.9	23	2	5	40	12	10	N/A	23	
Molybdenum	--	--	--	10	40.7	10	10	10	40.7	40.7	1	5	20	16.1	13.7	N/A	40.7	
Nickel	--	--	--	5	14.3	5	5	5	14.3	14.3	1	5	20	6.86	4.16	N/A	14.3	
Zinc	--	--	--	27.3	41.8	23.6	20.2	36.6	20.2	41.8	5	5	100	29.9	9.0	N/A	41.8	
Semivolatile Organic Compounds (µg/L)																		
Acenaphthylene	--	--	--	230	5.5	4.85	4.8	4.85	230	230	1	5	20	50	101	N/A	230	
Fluorene	--	--	--	36	0.55	0.485	0.48	0.485	36	36	1	5	20	7.6	16	N/A	36	
Naphthalene	--	--	--	110	2.75	2.45	2.4	2.45	110	110	1	5	20	24	48	N/A	110	
3,4-Methylphenol	--	--	--	8.4	5.5	4.85	5	4.95	8.4	8.4	1	5	20	5.7	1.5	N/A	8.4	
2-Methylnaphthalene	--	--	--	44	5.5	4.85	5	4.95	44	44	1	5	20	13	17.4	N/A	44	
Volatile Organic Compounds (µg/L)																		
1,2,4-Trimethylbenzene	--	--	--	990	2.5	2.5	2.5	2.5	990	990	1	5	20	200	442	N/A	990	
1,2-Dichloroethane	0.25	2	0.25	>max (12.5)	>max (2.5)	>max (2.5)	>max (2.5)	>max (2.5)	2	2	1	3	33.3	0.83	1	N/A	2	
1,3,5-Trimethylbenzene	--	--	--	180	2.5	2.5	2.5	2.5	180	180	1	5	20	38	79	N/A	180	
Chloroform	0.25	17	27	12.5	2.5	2.5	17	7.4	7.4	27	4	8	50	11	9.3	N/A	27	
Isopropylbenzene	--	--	--	130	2.5	2.5	2.5	2.5	130	130	1	5	20	28	57	N/A	130	
n-Butylbenzene	--	--	--	92	2.5	2.5	2.5	2.5	92	92	1	5	20	20	40	N/A	92	
para-Isopropyl Toluene	--	--	--	80	2.5	2.5	2.5	2.5	80	80	1	5	20	18	35	N/A	80	
Propylbenzene	--	--	--	140	2.5	2.5	2.5	2.5	140	140	1	5	20	30	61	N/A	140	
sec-Butylbenzene	--	--	--	36	2.5	2.5	2.5	2.5	36	36	1	5	20	9.2	15	N/A	36	
Tetrachloroethene	0.25	0.25	4.8	>max (12.5)	2.5	2.5	2.5	6.6	4.8	6.6	2	7	28.6	2.8	2.3	N/A	6.6	
BTEX (µg/L)																		
Benzene	0.25	0.25	0.25	16	2.5	2.5	2.5	2.5	16	16	1	8	12.5	3.3	5.2	N/A	16	
Toluene	0.25	0.25	0.25	29	2.5	2.5	2.5	2.5	29	29	1	8	12.5	5.0	10	N/A	29	
Ethylbenzene	0.25	0.25	0.25	41	2.5	2.5	2.5	2.5	41	41	1	8	12.5	6.5	14	N/A	41	
Xylenes (total)	0.25	0.25	0.25	366	5	5	5	5	366	366	1	8	12.5	48.3	128	N/A	366	
Petroleum (µg/L)																		
TPHd	25	25	25	120000	25	24	23.5	24	120000	120000	1	8	12.5	15021	42418	N/A	120000	
TPHg	25	25	25	17000	25	25	25	25	17000	17000	1	8	12.5	2147	6002	N/A	17000	

% Percent
95% UCL 95 percent upper confidence limit on the arithmetic mean.
EPC Exposure point concentration.
µg/L Micrograms per liter.
-- Not tested or not detected.
N/A Not applicable.
Not detected; half reporting limit entered.
>max () Nondetect value exceeds the maximum value; excluded from calculations.

**Table 5.4. Comparison of Groundwater Data to MCLs
Screening Health Risk Evaluation
9th Street and Broadway
Oakland, California**

Analyte	Maximum Detected Value	Cal/EPA MCL ^a	EPA MCL ^b	Maximum Exceeds MCL
Metals (µg/L)				
Barium	114	1000	2000	No
Chromium	9.45	50	100	No
Copper	23	1300 ^c	1300 ^c	No
Molybdenum	40.7	NA	NA	-
Nickel	14.3	100	NA	No
Zinc	41.8	5000 ^d	5000 ^d	No
Semivolatile Organic Compounds (µg/L)				
Acenaphthylene	230	NA	0.2 ^f	Yes
Fluorene	36	NA	0.2 ^f	Yes
Naphthalene	110	NA	0.2 ^f	Yes
3,4-Methylphenol	8.4	NA	NA	-
2-Methylnaphthalene	44	NA	0.2 ^f	Yes
Volatile Organic Compounds (µg/L)				
1,2,4-Trimethylbenzene	990	NA	NA	-
1,2-Dichloroethane	2	0.5	5	Yes
1,3,5-Trimethylbenzene	180	NA	NA	-
Chloroform	27	100 ^g	80 ^g	No
Isopropylbenzene	130	NA	NA	-
n-Butylbenzene	92	45 ^c	NA	Yes
para-Isopropyl Toluene	80	NA	NA	-
Propylbenzene	140	NA	NA	-
sec-Butylbenzene	36	NA	NA	-
Tetrachloroethene	6.6	5	5	Yes
BTEX (µg/L)				
Benzene	16	1	5	Yes
Toluene	29	150	1000	No
Ethylbenzene	41	700	700	No
Xylenes (total)	366	1750	10000	No

RBCA Risk-based corrective action.
 Cal/EPA California Environmental Protection Agency.
 EPA United States Environmental Protection Agency.
 MCL Maximum contaminant level.
 µg/L Micrograms per liter.
 BTEX Benzene, toluene, ethylbenzene, and xylenes.
 - Not applicable.
 NA Not available.
 [] Chemicals retained for further evaluation.

^a Cal/EPA, 1998.

^b EPA, 1999.

^c Action level - non enforceable health-based advisory level for unregulated chemicals.

^d Secondary MCL - Set for taste, odor, or appearance of drinking water.

^e Treatment technique triggered at action level of 1300 g/L.

^f MCL for polycyclic aromatic hydrocarbons.

^g Total trihalomethanes - sum of bromoform, chloroform, bromodichloromethane, and dibromochloromethane.



Reference: Thomas Brother's Map, 1997



Harding Lawson Associates
Engineering and
Environmental Services

DRAWN
hdl

PROJECT NUMBER
47729

APPROVED

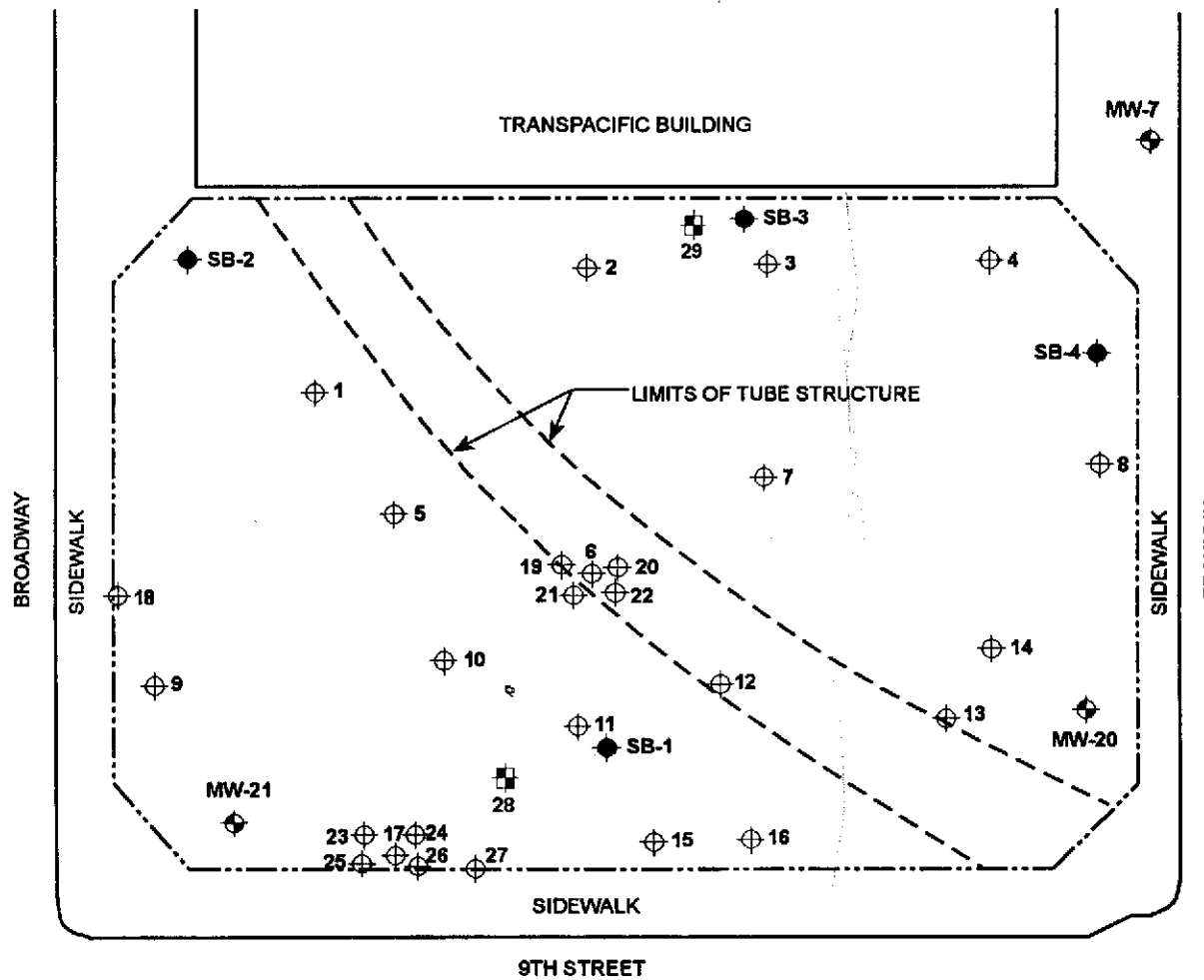
VICINITY MAP
9th Street and Broadway
Oakland, California

DATE
07/99

REVISED DATE

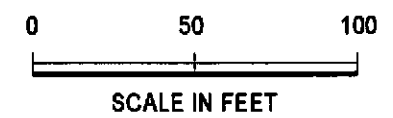
PLATE

1



LEGEND

	MW-20	Groundwater Monitoring Well Location
	10	Soil Boring Location (HLA, 1993)
	SB-3	Soil Boring Location (SECOR, 1998)
	28	Soil Boring Location (HLA, 1999)
		Property Line

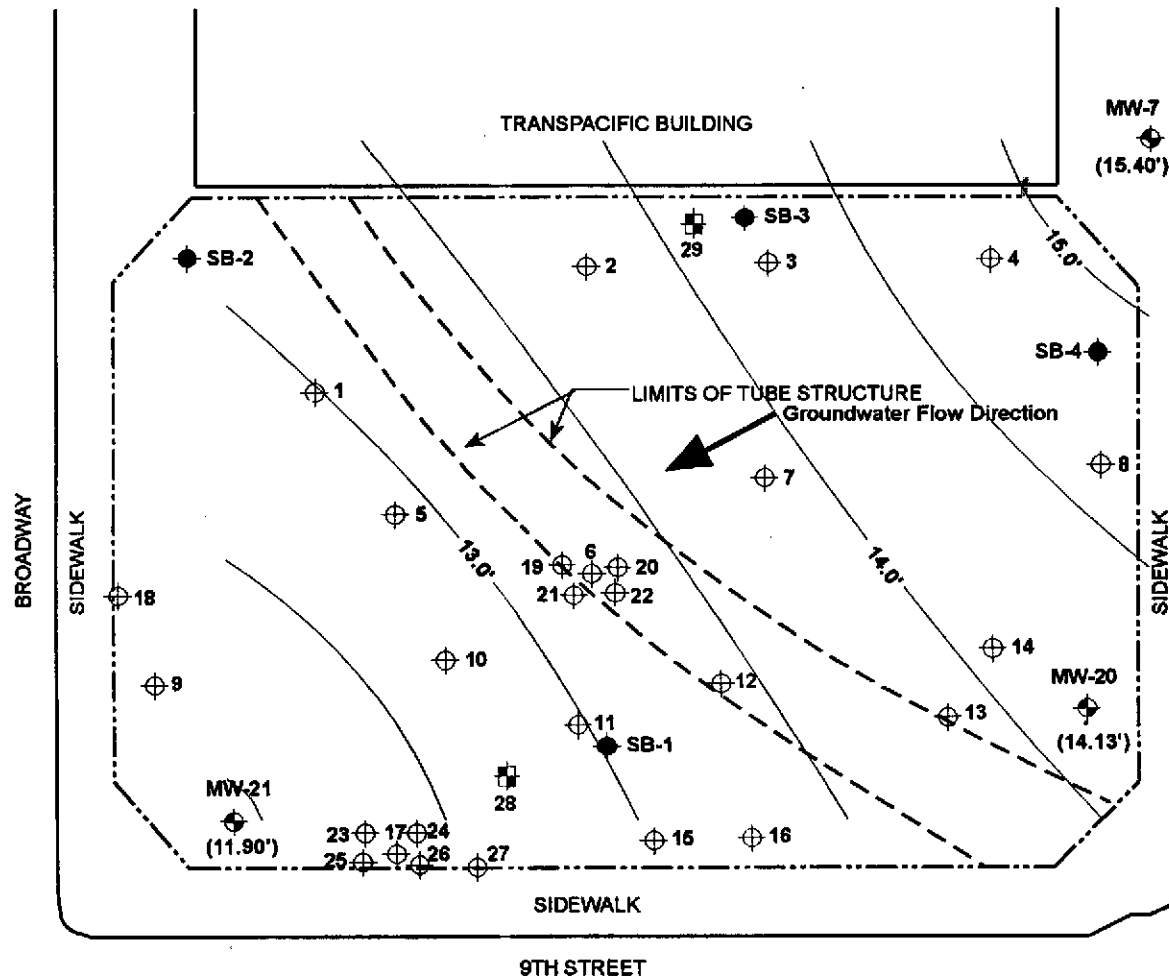


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Engineering and
Environmental Services

Site Map
9th Street and Broadway
Oakland, California

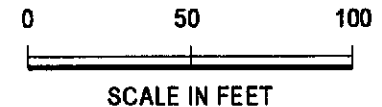
PLATE
2

DRAWN hdl	PROJECT NUMBER 47729	APPROVED	DATE 07/99	REVISED DATE
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LEGEND

- MW-20 Groundwater Monitoring Well Location
- 10 Soil Boring Location (HLA, 1993)
- SB-3 Soil Boring Location (SECOR, 1998)
- 28 Soil Boring Location (HLA, 1999)
- Property Line
- (14.13') Groundwater Elevation (MSL)
- 14.0' Groundwater Elevation Contours



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Groundwater Elevation and Gradient, August 20, 1999
Soil and Groundwater Investigation
9th Street and Broadway
Oakland, California

PLATE
3

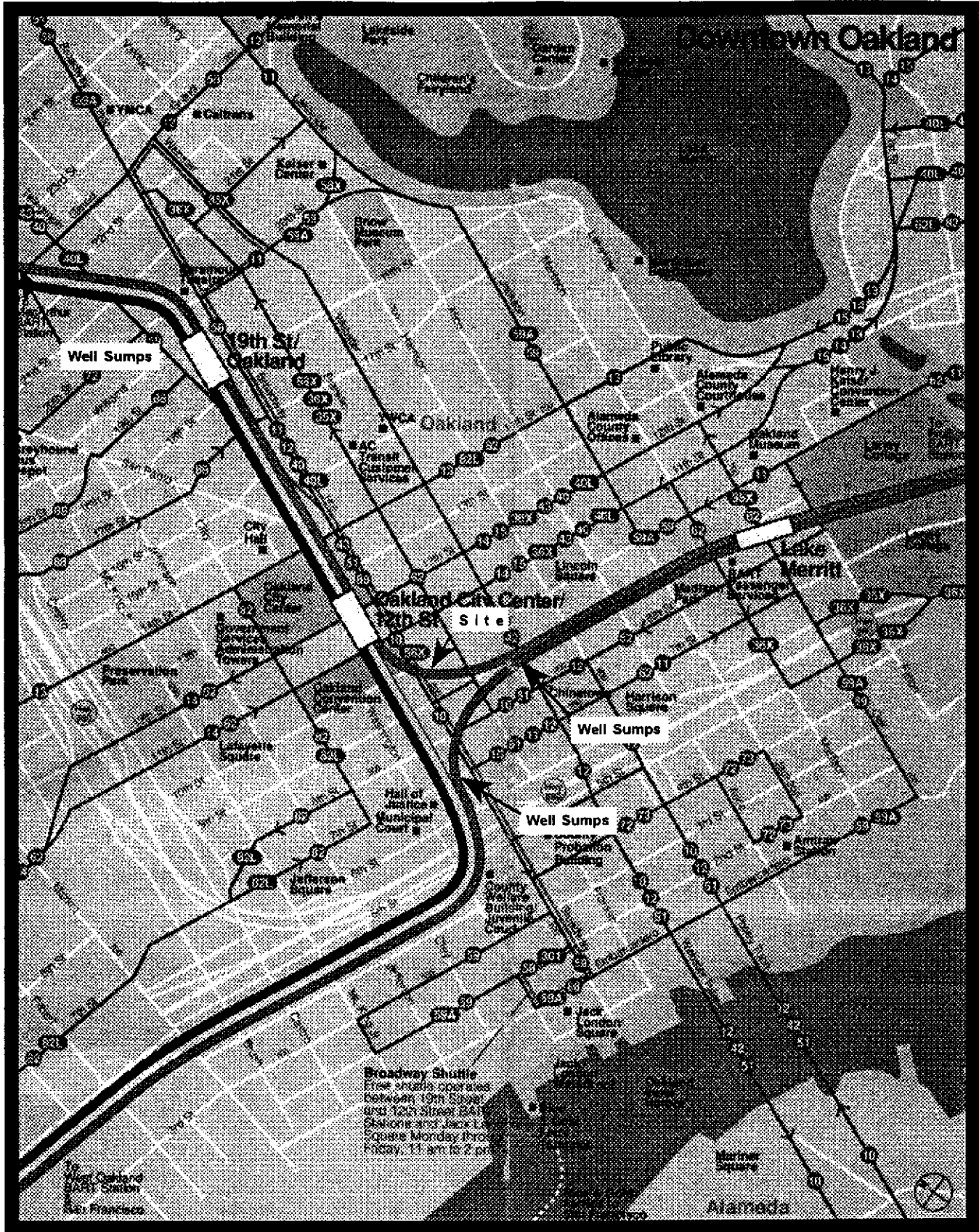
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PROJECT NUMBER
47729.3

APPROVED

DATE
9/15/99

REVISED DATE



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Location of BART Well Sumps
Soil and Groundwater Investigation
9th Street and Broadway
Oakland, California

PLATE

4

DRAWN
jgm

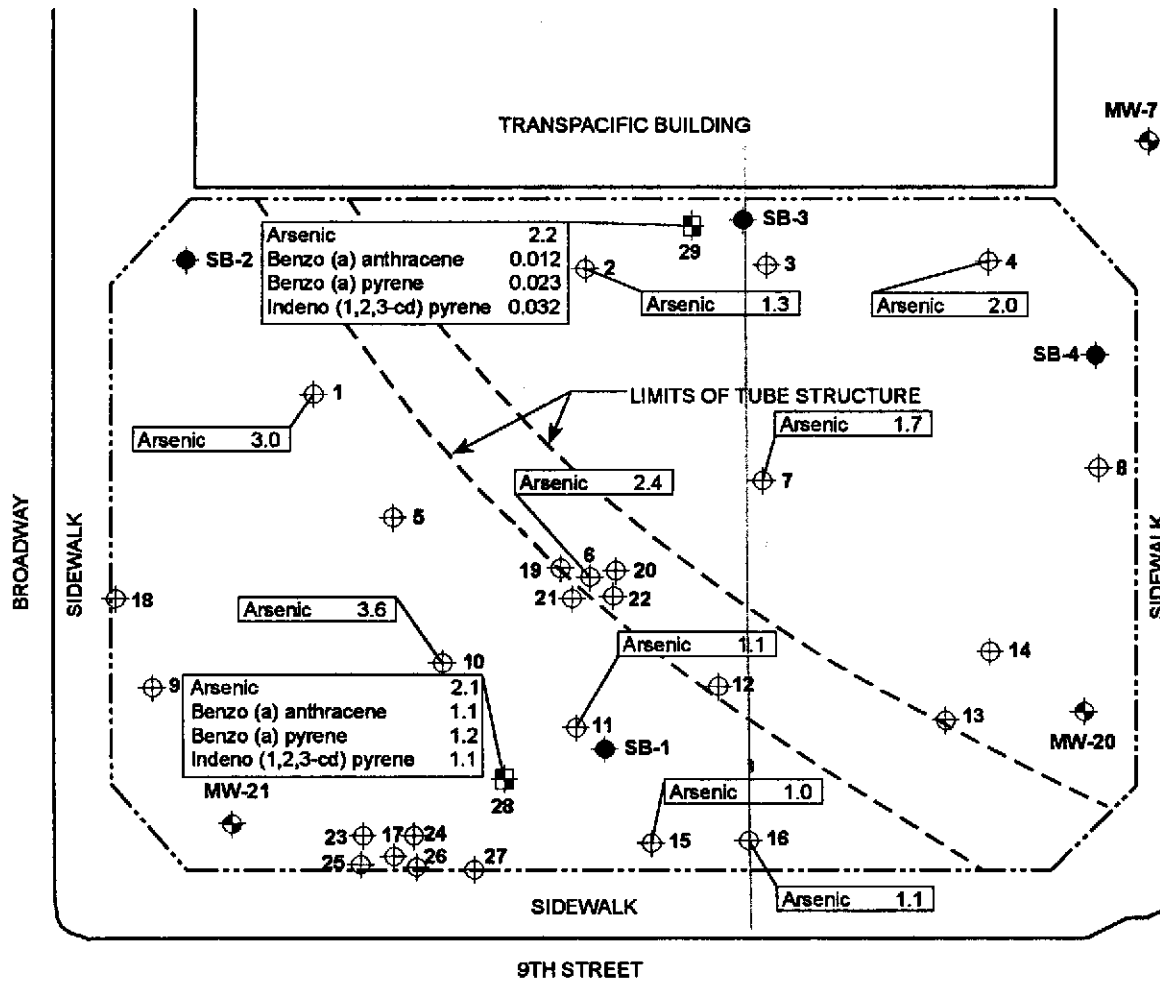
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47729.3

APPROVED

DATE
10/27/99

REVISED DATE

P:/9th & Broadway/itemap.fl3

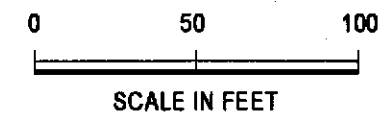


LEGEND

- ◆ MW-20 Groundwater Monitoring Well Location
- ⊕ 10 Soil Boring Location (HLA, 1993)
- ◆ SB-3 Soil Boring Location (SECOR, 1998)
- ⊕ 28 Soil Boring Location (HLA, 1999)
- Property Line

COPCs	EPCs	Tier II	SSTL
Arsenic	2.3	24	
Benzo (a) anthracene	1.1	16	
Benzo (a) pyrene	1.2	1.6	
Indeno (1,2,3-cd) pyrene	1.1	16	

Concentrations in milligrams per kilogram
 COPCs Chemicals of Potential Concern
 EPCs Exposure Point Concentration
 SSTL Site Specific Target Level



Harding Lawson Associates
 Engineering and
 Environmental Services

Surface Soil Samples (0 to 3 feet)
 Evaluated under Tier 2
 9th Street and Broadway
 Oakland, California

PLATE
5

DRAWN hdl PROJECT NUMBER 47729 APPROVED DATE 07/99 REVISED DATE

P:9th & Broadway/Itemap.#3



The EDR-GeoCheck[®] Report

9th Street and Broadway
9th Street/Broadway
Oakland, CA 94607

Inquiry Number: 0416593.1r

September 28, 1999

The Source For Environmental Risk Management Data

3530 Post Road
Southport, Connecticut 06490

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Introduction.....	1
Topographic Map.....	2
GeoCheck Summary.....	3
 <u>APPENDICES</u>	
GeoCheck Version 2.1.....	A1
Government Records Searched.....	A7

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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THE EDR GEOCHECK™ REPORT

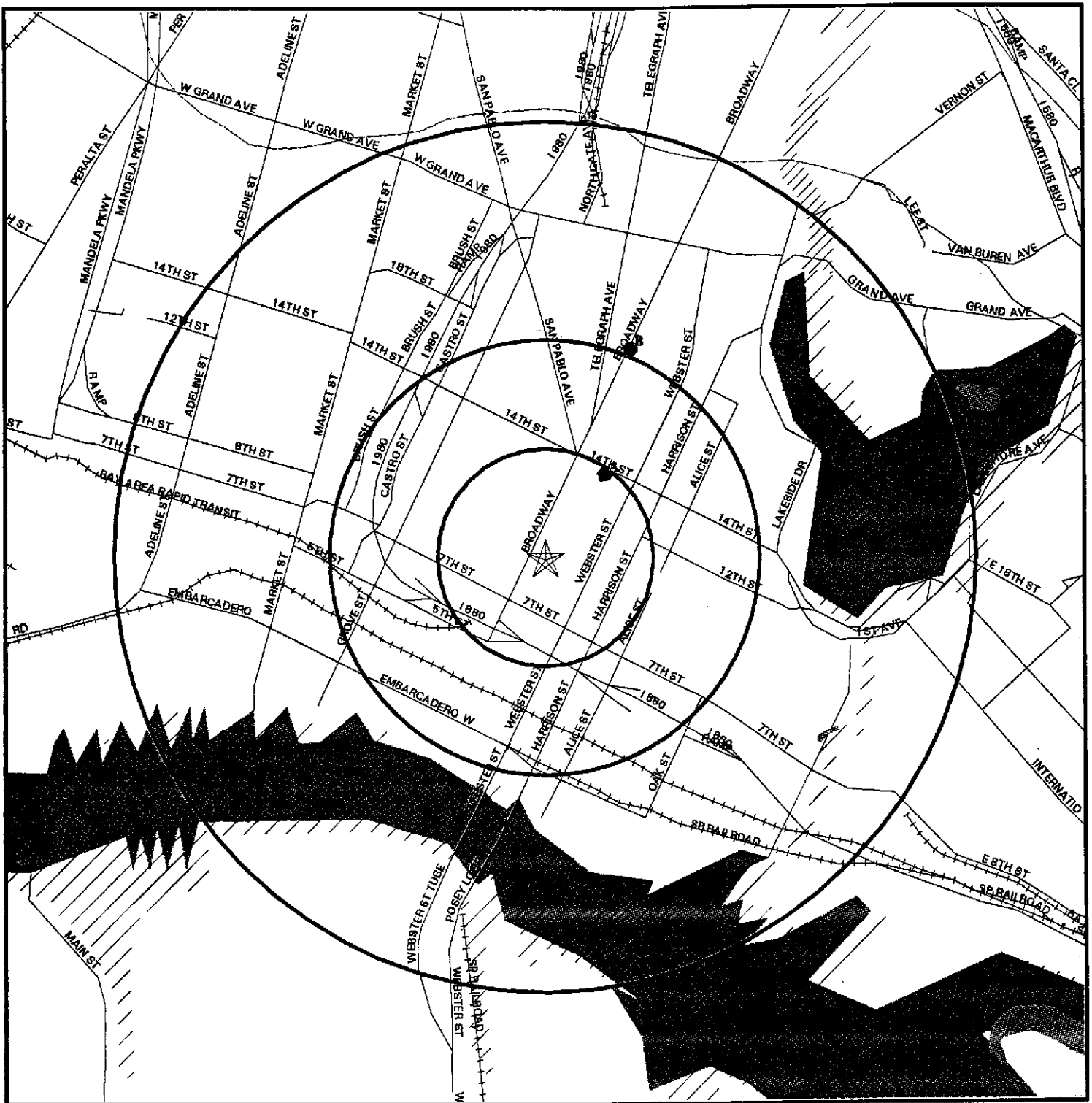
The EDR GeoCheck™ Report is a screening tool designed to assist in the hydrogeological assessment of a particular geographic area based upon publicly available information.

The EDR GeoCheck™ Report consists of the following information within a customer specified radius of the target property.

- topography (25 foot intervals unless otherwise shown)
- major roads
- surface water bodies
- railroad tracks
- flood plains (available in selected counties)
- wetlands (available in selected counties)
- wells including depth to water table and water level variability (in federal and selected state databases)
- public water supply wells (including violations information)
- geologic data
- radon data.

The EDR GeoCheck™ Report is a general area study. It may or may not be accurate at any specific location.

TOPOGRAPHIC MAP -0416593.1r - 'Harding Lawson Associates'



Source: US Geological Survey 1-Degree Digital Elevation Model
Compiled 09/15/92



scale in miles

- Major Roads
- Contour lines (25 foot interval unless otherwise shown)
- Waterways
- Wells within search distance to Target Property
- Earthquake Epicenters (Richter 5 or greater)
- Power lines
- Pipe lines
- Fault lines
- Water
- Wetlands
- 100-year flood zone
- 500-year flood zone



TARGET PROPERTY: 9th Street and Broadway
ADDRESS: 9th Street/Broadway
CITY/STATE/ZIP: Oakland CA 94607
LAT/LONG: 37.8014 / 122.2720

CUSTOMER: Harding Lawson Associates
CONTACT: Jim McCarty
INQUIRY #: 0416593.1r
DATE: September 28, 1999

WELL SEARCH SUMMARY

GEOLOGIC AGE IDENTIFICATION†

Geologic Code:	Q
Era:	Cenozoic
System:	Quaternary
Series:	Quaternary

ROCK STRATIGRAPHIC UNIT†

Category:	Stratified Sequence
-----------	---------------------

SEARCH DISTANCE RADIUS INFORMATION

<u>DATABASE</u>	<u>SEARCH DISTANCE (miles)</u>
Federal Database	1.000
State Database	1.000
PWS Database	1.000

FEDERAL DATABASE WELL INFORMATION

<u>MAP ID</u>	<u>WELL ID</u>	<u>LOCATION FROM TP</u>
NO WELLS FOUND		

STATE DATABASE WELL INFORMATION

<u>MAP ID</u>	<u>WELL ID</u>	<u>LOCATION FROM TP</u>
NO WELLS FOUND		

PUBLIC WATER SUPPLY SYSTEM INFORMATION

Map ID:	A1	
PWS ID:	CA3200019	
Location Relative to TP:	1/8 - 1/4 Mile NE	
PWS Name:	OAKLAND FEATHER RIVER CAMP OAKLAND FEATHER RIVER CAMP OAKLAND CAMP RD QUINCY, CA 95971	
PWS currently has or has had major violation(s) or enforcement:		No
Map ID:	A2	
PWS ID:	CA5304106	
Location Relative to TP:	1/8 - 1/4 Mile NE	
PWS Name:	DEL LOMA CABINS GABE BURKE HIGHWAY 299 OAKLAND, CA 94604	
PWS currently has or has had major violation(s) or enforcement:		No
Map ID:	A3	
PWS ID:	CA3200108	
Location Relative to TP:	1/8 - 1/4 Mile NE	
PWS Name:	TEN-TWO BAR AND CAFE GAIL DIANE 1232 BUCKS LAKE RD MEADOW VALLEY, CA 95956	
PWS currently has or has had major violation(s) or enforcement:		No

† Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map. USGS Digital Data Series DDS - 11 (1994)

WELL SEARCH SUMMARY

PUBLIC WATER SUPPLY SYSTEM INFORMATION

Map ID: A4
PWS ID: CA2900604
Location Relative to TP: 1/8 - 1/4 Mile NE
PWS Name: TRI LODGE ASSOCIATION
TRI LODGE ASSOCIATION
200 MONTECITO AVE
OAKLAND, CA 94610
PWS currently has or has had major violation(s) or enforcement: No

Map ID: A5
PWS ID: CA2400009
Location Relative to TP: 1/8 - 1/4 Mile NE
PWS Name: MULBERRY APARTMENTS
CALIFORNIA PROPERTY MANAGEMENT
1233 BELLEVUE
ATWATER, CA 95301
PWS currently has or has had major violation(s) or enforcement: Yes

Map ID: A6
PWS ID: CA1200690
Location Relative to TP: 1/8 - 1/4 Mile NE
PWS Name: HIDDEN VALLEY HOMEOWNERS ASSOC
CITY CORP BANK
WALKER PT & HDN VLLY R
BAYSIDE, CA 95524
PWS currently has or has had major violation(s) or enforcement: Yes

Map ID: A7
PWS ID: CA2300668
Location Relative to TP: 1/8 - 1/4 Mile NE
PWS Name: POINT CABRILLO CAMPGROUND
ED KOWKS
13500 POINT CABRILLO DR
MENDOCINO, CA 95460
PWS currently has or has had major violation(s) or enforcement: Yes

Map ID: B8
PWS ID: CA0110005
Location Relative to TP: 1/2 - 1 Mile NNE
PWS Name: EAST BAY MUD
P.O. BOX 24055
OAKLAND, CA 946231055
PWS currently has or has had major violation(s) or enforcement: Yes

Map ID: B9
PWS ID: CA0500053
Location Relative to TP: 1/2 - 1 Mile NNE
PWS Name: PARDEE CENTER
CAMP PARDEE
CAMP PARDEE N OF VAL
VALLEY SPRINGS, CA 95252
PWS currently has or has had major violation(s) or enforcement: Yes

AREA RADON INFORMATION

WELL SEARCH SUMMARY

AREA RADON INFORMATION

ALAMEDA COUNTY, CA

Number of sites tested: 49

<u>Area</u>	<u>Average Activity</u>	<u>% <4 pCi/L</u>	<u>% 4-20 pCi/L</u>	<u>% >20 pCi/L</u>
Living Area - 1st Floor	0.776 pCi/L	100%	0%	0%
Living Area - 2nd Floor	-0.400 pCi/L	100%	0%	0%
Basement	1.338 pCi/L	100%	0%	0%

WELL SEARCH FINDINGS

Map ID
Direction
Distance

A1
NE
1/8 - 1/4 Mile

PWS ID: CA3200019 PWS Status: Active Info. Source: FRDS
 Date Initiated: June / 1977 Date Deactivated: Not Reported
 PWS Name: OAKLAND FEATHER RIVER CAMP
 OAKLAND FEATHER RIVER CAMP
 OAKLAND CAMP RD
 QUINCY, CA 95971

Addressee / Facility: System Owner/Responsible Party
 OAKLAND FEATHER RIVER CAMP
 7101 EDGEWATER DRIVE
 OAKLAND, CA 94621

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
 City Served: Not Reported
 Treatment Class: Treated Population Served: 101 - 500 Persons

PWS currently has or has had major violation(s) or enforcement: No

A2
NE
1/8 - 1/4 Mile

PWS ID: CA5304106 PWS Status: Active Info. Source: FRDS
 Date Initiated: June / 1977 Date Deactivated: Not Reported
 PWS Name: DEL LOMA CABINS
 GABE BURKE
 HIGHWAY 299
 OAKLAND, CA 94604

Addressee / Facility: System Owner/Responsible Party
 GABE BURKE
 P O BOX 123
 OAKLAND, CA 94604

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
 City Served: Not Reported
 Treatment Class: Treated Population Served: Under 101 Persons

PWS currently has or has had major violation(s) or enforcement: No

A3
NE
1/8 - 1/4 Mile

PWS ID: CA3200108 PWS Status: Active Info. Source: FRDS
 Date Initiated: November / 1993 Date Deactivated: Not Reported
 PWS Name: TEN-TWO BAR AND CAFE
 GAIL DIANE
 1232 BUCKS LAKE RD
 MEADOW VALLEY, CA 95956

Addressee / Facility: System Owner/Responsible Party
 GAIL DIANE
 1232 BUCKS LAKE ROAD
 MEADOW VALLEY, CA 95956

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
 City Served: Not Reported
 Treatment Class: Untreated Population Served: Under 101 Persons

PWS currently has or has had major violation(s) or enforcement: No

A4
NE
1/8 - 1/4 Mile

PWS ID: CA2900604 PWS Status: Active Info. Source: FRDS
 Date Initiated: June / 1977 Date Deactivated: Not Reported
 PWS Name: TRI LODGE ASSOCIATION
 TRI LODGE ASSOCIATION
 200 MONTECITO AVE
 OAKLAND, CA 94610

WELL SEARCH FINDINGS

Map ID
Direction
Distance

Addressee / Facility: System Owner/Responsible Party
TRI LODGE ASSOCIATION
200 MONTECITO AVENUE 3
OAKLAND, CA 94610

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
City Served: Not Reported
Treatment Class: Untreated Population Served: Under 101 Persons

PWS currently has or has had major violation(s) or enforcement: No

A5
NE
1/8 - 1/4 Mile

PWS ID:	CA2400009	PWS Status:	Active	Info. Source:	FRDS
Date Initiated:	June / 1977	Date Deactivated:	Not Reported		
PWS Name:	MULBERRY APARTMENTS CALIFORNIA PROPERTY MANAGEMENT 1233 BELLEVUE ATWATER, CA 95301				

Addressee / Facility: System Owner/Responsible Party
CALIFORNIA PROPERTY MANAGEMENT
P O BOX 56
WALNUT CREEK, CA 94596

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
City Served: Not Reported
Treatment Class: Untreated Population Served: Under 101 Persons

PWS currently has or has had major violation(s) or enforcement: Yes

VIOLATIONS INFORMATION:

Violation ID:	9300002	Source ID:	Not Reported	PWS Phone:	Not Reported
Vio. beginning Date:	11/01/92	Vio. end Date:	11/30/92	Vio. Period:	1 Month
Num of required Samples:	Not Reported	Number of Samples Taken:		Not Reported	
Analysis Result:	Not Reported	Maximum Contaminant Level:		Not Reported	
Analysis Method:	Not Reported				
Violation Type:	Monitoring, Routine Major (TCR)				
Contaminant:	COLIFORM (TCR)				
Vio. Awareness Date:	123092				

Violation ID:	9300001	Source ID:	Not Reported	PWS Phone:	Not Reported
Vio. beginning Date:	01/01/93	Vio. end Date:	01/31/93	Vio. Period:	1 Month
Num of required Samples:	Not Reported	Number of Samples Taken:		Not Reported	
Analysis Result:	Not Reported	Maximum Contaminant Level:		Not Reported	
Analysis Method:	Not Reported				
Violation Type:	Monitoring, Routine Major (TCR)				
Contaminant:	COLIFORM (TCR)				
Vio. Awareness Date:	030293				

A6
NE
1/8 - 1/4 Mile

PWS ID:	CA1200690	PWS Status:	Active	Info. Source:	FRDS
Date Initiated:	April / 1984	Date Deactivated:	Not Reported		
PWS Name:	HIDDEN VALLEY HOMEOWNERS ASSOC CITY CORP BANK WALKER PT & HDN VLLY R BAYSIDE, CA 95524				

Addressee / Facility: System Owner/Responsible Party
CITY CORP BANK
P O BOX 20
OAKLAND, CA 946042082

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
City Served: Not Reported

WELL SEARCH FINDINGS

Map ID
Direction
Distance

Treatment Class: Treated Population Served: Under 101 Persons

PWS currently has or has had major violation(s) or enforcement: Yes

VIOLATIONS INFORMATION:

Violation ID: 9300005 Source ID: Not Reported PWS Phone: Not Reported
 Vio. beginning Date: 02/01/93 Vio. end Date: 02/28/93 Vio. Period: 1 Month
 Num of required Samples: Not Reported Number of Samples Taken: Not Reported
 Analysis Result: Not Reported Maximum Contaminant Level: Not Reported
 Analysis Method: Not Reported
 Violation Type: Monitoring, Routine Major (TCR)
 Contaminant: COLIFORM (TCR)
 Vio. Awareness Date: 033093

Violation ID: 9300004 Source ID: Not Reported PWS Phone: Not Reported
 Vio. beginning Date: 01/01/93 Vio. end Date: 01/31/93 Vio. Period: 1 Month
 Num of required Samples: Not Reported Number of Samples Taken: Not Reported
 Analysis Result: Not Reported Maximum Contaminant Level: Not Reported
 Analysis Method: Not Reported
 Violation Type: Monitoring, Routine Major (TCR)
 Contaminant: COLIFORM (TCR)
 Vio. Awareness Date: 030293

Violation ID: 9300003 Source ID: Not Reported PWS Phone: Not Reported
 Vio. beginning Date: 12/01/92 Vio. end Date: 12/31/92 Vio. Period: 1 Month
 Num of required Samples: Not Reported Number of Samples Taken: Not Reported
 Analysis Result: Not Reported Maximum Contaminant Level: Not Reported
 Analysis Method: Not Reported
 Violation Type: Monitoring, Routine Major (TCR)
 Contaminant: COLIFORM (TCR)
 Vio. Awareness Date: 013093

Violation ID: 9300002 Source ID: Not Reported PWS Phone: Not Reported
 Vio. beginning Date: 10/01/92 Vio. end Date: 10/31/92 Vio. Period: 1 Month
 Num of required Samples: Not Reported Number of Samples Taken: Not Reported
 Analysis Result: Not Reported Maximum Contaminant Level: Not Reported
 Analysis Method: Not Reported
 Violation Type: Monitoring, Routine Major (TCR)
 Contaminant: COLIFORM (TCR)
 Vio. Awareness Date: 113092

Violation ID: 9301003 Source ID: Not Reported PWS Phone: Not Reported
 Vio. beginning Date: 09/01/93 Vio. end Date: 09/30/93 Vio. Period: 1 Month
 Num of required Samples: Not Reported Number of Samples Taken: Not Reported
 Analysis Result: Not Reported Maximum Contaminant Level: Not Reported
 Analysis Method: Not Reported
 Violation Type: Monitoring, Routine Major (TCR)
 Contaminant: COLIFORM (TCR)
 Vio. Awareness Date: 111593

PWS ID: CA2300668 PWS Status: Active Info. Source: FRDS
 Date Initiated: April / 1984 Date Deactivated: Not Reported
 PWS Name: POINT CABRILLO CAMPGROUND
 ED KOWKS
 13500 POINT CABRILLO DR
 MENDOCINO, CA 95460

A7
NE
1/8 - 1/4 Mile

WELL SEARCH FINDINGS

Map ID
Direction
Distance

Addressee / Facility: System Owner/Responsible Party
ED KOWKS
13500 POINT CABRILLO DRIVE
MENDOCINO, CA 95460

Facility Latitude: 37 48 15 Facility Longitude: 122 16 10
City Served: Not Reported
Treatment Class: Untreated Population Served: Under 101 Persons

PWS currently has or has had major violation(s) or enforcement: Yes

VIOLATIONS INFORMATION:

Violation ID:	9403001	Source ID:	Not Reported	PWS Phone:	Not Reported
Vio. beginning Date:	04/01/94	Vio. end Date:	06/30/94	Vio. Period:	3 Months
Num of required Samples:	Not Reported	Number of Samples Taken:	Not Reported		
Analysis Result:	Not Reported	Maximum Contaminant Level:	Not Reported		
Analysis Method:	Not Reported				
Violation Type:	Monitoring, Routine Major (TCR)				
Contaminant:	COLIFORM (TCR)				
Vio. Awareness Date:	070194				

ENFORCEMENT INFORMATION:

System Name:	POINT CABRILLO CAMPGROUND				
Violation Type:	Monitoring, Routine Major (TCR)				
Contaminant:	COLIFORM (TCR)				
Compliance Period:	1994-04-01 - 1994-06-30	Analytical Value:	00000000.00		
Violation ID:	9403001	Enforcement ID:	Not Reported		
Enforcement Date:	Not Reported	Enf. Action:	Not Reported		
System Name:	POINT CABRILLO CAMPGROUND				
Violation Type:	Monitoring, Routine Major (TCR)				
Contaminant:	COLIFORM (TCR)				
Compliance Period:	1994-10-01 - 1994-12-31	Analytical Value:	00000000.00		
Violation ID:	9503002	Enforcement ID:	9503002		
Enforcement Date:	1995-03-03	Enf. Action:	State Formal NOV Issued		

B8
NNE
1/2 - 1 Mile

PWS ID:	CA0110005	PWS Status:	Active	Info. Source:	FRDS
Date Initiated:	March / 1992	Date Deactivated:	Not Reported		
PWS Name:	EAST BAY MUD P.O. BOX 24055 OAKLAND, CA 946231055				

Addresssee / Facility: Not Reported

Facility Latitude: 37 48 30 Facility Longitude: 122 16 06
City Served: W ALAMEDA/CONTR
Treatment Class: Mixed (treated and untreated) Population Served: over 100,000 Persons

PWS currently has or has had major violation(s) or enforcement: Yes

VIOLATIONS INFORMATION:

Violation ID:	9404007	Source ID:	Not Reported	PWS Phone:	Not Reported
Vio. beginning Date:	07/01/94	Vio. end Date:	07/31/94	Vio. Period:	Not Reported
Num of required Samples:	Not Reported	Number of Samples Taken:	Not Reported		
Analysis Result:	Not Reported	Maximum Contaminant Level:	Not Reported		
Analysis Method:	Not Reported				
Violation Type:	Operations Report				
Contaminant:	Not Reported				
Vio. Awareness Date:	Not Reported				

WELL SEARCH FINDINGS

Map ID
Direction
Distance

Violation ID:	9204005	Source ID:	Not Reported	PWS Phone:	Not Reported
Vio. beginning Date:	09/01/93	Vio. end Date:	09/30/93	Vio. Period:	1 Month
Num of required Samples:	34	Number of Samples Taken:	Not Reported		
Analysis Result:	Not Reported	Maximum Contaminant Level:	Not Reported		
Analysis Method:	Not Reported				
Violation Type:	Operations Report				
Contaminant:	Not Reported				
Vio. Awareness Date:	111593				

ENFORCEMENT INFORMATION:

System Name:	EAST BAY MUD		
Violation Type:	Operations Report		
Contaminant:	Not Reported		
Compliance Period:	1994-07-01 - 1994-07-31	Analytical Value:	00000000.00
Violation ID:	9404007	Enforcement ID:	Not Reported
Enforcement Date:	Not Reported	Enf. Action:	Not Reported
System Name:	EAST BAY MUD		
Violation Type:	Monitoring, Routine Minor (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	1994-07-01 - 1994-07-31	Analytical Value:	00000000.00
Violation ID:	9404006	Enforcement ID:	9404011
Enforcement Date:	1994-07-19	Enf. Action:	State Violation/Reminder Notice
System Name:	EAST BAY MUD		
Violation Type:	Operations Report		
Contaminant:	Not Reported		
Compliance Period:	1995-11-01 - 1995-11-30	Analytical Value:	00000000.00
Violation ID:	9604008	Enforcement ID:	Not Reported
Enforcement Date:	Not Reported	Enf. Action:	Not Reported

B9
NNE
1/2 - 1 Mile

PWS ID:	CA0500053	PWS Status:	Active	Info. Source:	FRDS
Date Initiated:	July / 1993	Date Deactivated:	Not Reported		
PWS Name:	PARDEE CENTER CAMP PARDEE CAMP PARDEE N OF VAL VALLEY SPRINGS, CA 95252				
Addressee / Facility:	System Owner/Responsible Party CAMP PARDEE P O BOX 240 OAKLAND, CA 94623				
Facility Latitude:	37 48 30	Facility Longitude:	122 16 06		
City Served:	Not Reported				
Treatment Class:	Mixed (treated and untreated)	Population Served:	Under 101 Persons		
PWS currently has or has had major violation(s) or enforcement:	Yes				

VIOLATIONS INFORMATION:

Violation ID:	9310002	Source ID:	Not Reported	PWS Phone:	Not Reported
Vio. beginning Date:	09/01/93	Vio. end Date:	09/30/93	Vio. Period:	1 Month
Num of required Samples:	Not Reported	Number of Samples Taken:	Not Reported		
Analysis Result:	Not Reported	Maximum Contaminant Level:	Not Reported		
Analysis Method:	Not Reported				
Violation Type:	Record Keeping				
Contaminant:	Not Reported				
Vio. Awareness Date:	111593				

WELL SEARCH FINDINGS

Map ID
Direction
Distance

ENFORCEMENT INFORMATION:

System Name: PARDEE CENTER
Violation Type: Max Contaminant Level, Average
Contaminant: Turbidity
Compliance Period: 1995-01-01 - 1995-01-31
Violation ID: 9510007
Enforcement Date: 1995-03-28

Analytical Value: 00000000.00
Enforcement ID: 9510004
Enf. Action: State Violation/Reminder Notice

System Name: PARDEE CENTER
Violation Type: Max Contaminant Level, Average
Contaminant: Turbidity
Compliance Period: 1995-02-01 - 1995-02-28
Violation ID: 9510006
Enforcement Date: 1995-03-28

Analytical Value: 00000000.00
Enforcement ID: 9510002
Enf. Action: State Compliance Achieved

CALIFORNIA GOVERNMENT WELL RECORDS SEARCHED

PWS: Public Water Systems

Source: EPA/Office of Drinking Water

Telephone: 202-260-2805

Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data

Source: EPA/Office of Drinking Water

Telephone: 202-260-2805

Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SWDIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

Area Radon Information: The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones: Sections 307 & 309 of IRRA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

USGS Water Wells: In November 1971 the United States Geological Survey (USGS) implemented a national water resource information tracking system. This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on more than 900,000 wells, springs, and other sources of groundwater.

Water Dams: National Inventory of Dams

Source: Federal Emergency Management Agency

Telephone: 202-646-2801

National computer database of more than 74,000 dams maintained by the Federal Emergency Management Agency.

California Drinking Water Quality Database

Source: Department of Health Services

Telephone: 916-324-2319

The database includes all drinking water compliance and special studies monitoring for the state of California since 1984. It consists of over 3,200,000 individual analyses along with well and water system information.

California Oil and Gas Well Locations for District 2 and 6

Source: Department of Conservation

Telephone: 916-323-1779

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October 25, 1999

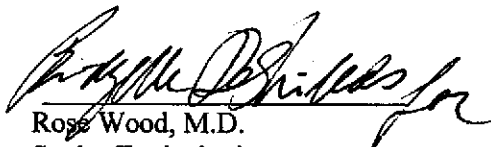
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