ENVIRONMENTAL ENGINEERING, INC.
2680 Bishop Drive, Suite 203, San Ramon, CA 94583
TEL (925) 244-6600 * FAX (925) 244-6601

HUMAN HEALTH RISK ASSESSMENT
AND REQUEST FOR SITE CLOSURE AT
THE FORMER GLOVATORIUM SITE
3820 MANILA AVENUE
OAKLAND, CALIFORNIA

September 30, 2004

Project 2512

Prepared by:
SOMA Environmental Engineering, Inc.
2680 Bishop Drive, Suite 203
San Ramon, California 94583

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SOMA
ENVIRONMENTAL ENGINEERING, INC
2680 Bishop Drive • Suite 203 • San Ramon, CA 94583
TEL (925) 244-6600 • FAX (925) 244-6601

September 30 ,2004

Mr. Ariu Levi
Alameda County Department of
Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Alameda County
OCT 04 2004
Environmental Health

Subject: Site Located at 3820 Manila Avenue, Oakland, California
Former Glovatorium Facility

Dear Mr. Levi:

Enclosed for your review is a copy of SOMA's report entitled "Human Health Risk Assessment and Request for Site Closure" for the subject property.

Thank you for your time in reviewing our report. Please do not hesitate to call me at (925) 244-6600, if you have any questions or comments.

Sincerely,

Mansour Sepehr, Ph.D.,P.E.
Principal Hydrogeologist

REGISTERED PROFESSIONAL ENGINEER
MANSOUR SEPEHR
No. C042928
Exp. 3-31-06
CIVIL
STATE OF CALIFORNIA

Stuart Depper

Enclosure

cc: Mr. Albert M. Cohen, LOEB&LOEB LLP w/enclosure
Ms. Betty Graham, Regional Water Quality Control Board w/enclosure
Dr. Bruce Page, Bruce W. Page Consulting w/enclosure
Mr. Peter W. McGaw, ARCHER.NORRIS w/enclosure

Certification

This report has been prepared by SOMA Environmental Engineering, Inc. (SOMA) for Law Offices of Loeb & Loeb, LLP, to comply with the Alameda County Department of Environmental Health's requirements, and is based on SOMA's approved workplan, dated June 15, 2001.

Mansour Sepehr, Ph.D., P.E.	William Bosan, Ph.D.
Principal Hydrogeologist	Principal Toxicologist

REGISTERED PROFESSIONAL ENGINEER
MANSOUR SEPEHR
No. C042928
Exp. 3-31-06
CIVIL
STATE OF CALIFORNIA

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1.0 INTRODUCTION

This report has been prepared by SOMA Environmental Engineering, Inc. (SOMA) on behalf of the owners of the former Glovatorium. The property, the former Glovatorium, is located at 3820 Manila Avenue (formerly 3815 Broadway Avenue), Oakland, California (the "Site"). The Site is located in an area consisting primarily of commercial and residential uses. Figure 1 illustrates the vicinity of the Site.

SOMA's workplan, dated June 15, 2001, as approved by the Alameda County Health Care Services (ACHCS) on August 27, 2001, proposed a two-phase approach for assessing the nature and extent of the soil and groundwater contamination and defining the Site's regulatory status. The first phase included the installation of additional groundwater monitoring wells, soil and groundwater sampling, conducting hydraulic testing, and a sensitive receptor survey. Phase II of the workplan included defining the Site's regulatory status by conducting groundwater flow, chemical fate and transport modeling, and a human health risk assessment.

SOMA's "Report on Conducting Additional Field Investigation to Evaluate the Site's Conceptual Model," dated January 3, 2002, describes the results of the investigations conducted in Phase I. The modeling aspect of Phase II was conducted using the results collected in Phase I and the analytical data from quarterly monitoring events. In addition, during the groundwater monitoring events free phase petroleum hydrocarbons were encountered in a few groundwater monitoring wells. To comply with the Regional Water Quality Control Board's (RWQCB's) Interim Guidance document, dated December 1995, SOMA conducted free product removal from several groundwater monitoring wells. SOMA's report, dated June 8, 2004, describes the field activities performed to identify, delineate, and initiate removing the free phase petroleum product from the groundwater. This report describes the results of the human health risk assessment, as part of the second phase of investigations, as described in the approved workplan.

1.1 Site Description

The Site is located between Manila Avenue and Broadway, near the intersection of 38th Street in Oakland, California. The ground surface of the Site is covered with concrete and asphalt and slopes gently southwest, with surface elevations ranging from approximately 78 to 84 feet above mean sea level (msl).

A 54-inch inside-diameter storm drain culvert passes under the property, from Manila Avenue on the west to 38th Street on the south. The storm drain closely follows the path of a historical creek that appears on old maps of the area. The depth of the storm drain invert is approximately 8.5 feet under the sidewalk on the eastern side of Manila Avenue and approximately 13.2 feet below ground surface (bgs) at the far end, approximately 60 feet south of GW-4. In addition to a storm drain system, a 10-inch diameter cast iron sanitary sewer conduit runs in a westerly direction from the on-site building and discharges into the sanitary sewer line, which runs north to south along Manila Avenue. The floor drain inside the building is less than 2 feet bgs. However, the depth of the sanitary sewer line inside the building gradually increases and then slopes more steeply downward near the western wall of the building, where it plunges underneath the 54-inch storm drain (LFR, January 2001). Figure 2 shows the location of the sanitary sewer line.

Reportedly, there were six underground storage tanks (USTs) at the Site. Two USTs were located under the sidewalk on 38th Street and four USTs were located inside the building. The volumes of the USTs have been variously reported as ranging from 800 gallons to 5,000 gallons. They reportedly contained Stoddard solvent, fuel oil, and possibly waste oil. In June 1997, HK2 obtained the City of Oakland Fire Prevention Bureau permit No. 52-97 to decommission the existing USTs. .In August 1997, the six USTs were abandoned in-place by backfilling the tanks with either cement-sand slurry or pea gravel. In addition, there are three USTs located under the sidewalk on 38th Street, in front of property owned by Mr. Earl Thompson. Currently, SOMA is in process of decommissioning these USTs.

The surrounding properties are primarily commercial businesses and residential housing. TOSCO Marketing Company (TOSCO) is located north and up-gradient of the Site, at 40th Street and Broadway, and contains a number of groundwater monitoring wells. Figure 2 shows the location of the main building and the on-site and off-site groundwater monitoring wells. The groundwater monitoring wells are currently monitored on a semi-annual basis. Past groundwater monitoring events have indicated the presence of volatile organic compounds (VOCs) and petroleum hydrocarbons in the groundwater beneath the Site. The source of the contamination is believed to be either the former USTs, which were used to store Stoddard solvent and VOCs at the Site, or releases from the piping on the washer system and from washing the floors with Stoddard solvent.

1.2 Background

The following is a brief description of site investigations conducted by other environmental firms and SOMA.

In August 1997, Geosolv, LLC (Geosolv) initiated the first soil and groundwater investigation at the Site. Geosolv drilled fourteen soil borings to approximate depths of 10 to 24 feet bgs using the direct push method. Seven of the soil borings (B-2, B-3, B-7 through B-10 and B-13) were converted into temporary groundwater monitoring wells where grab groundwater samples were collected. In September 1998, Geosolv conducted further soil and groundwater investigations by drilling twelve additional soil borings to approximate depths of 19 to 25 feet bgs. All twelve soil borings were converted into temporary groundwater sampling points, and are labeled E-15 through E-26. After collecting grab groundwater samples from the temporary "E" sampling points, they were abandoned and grouted.

In July 1999, based upon the request of the ACHCS, an investigation of potential groundwater preferential flow paths was initiated by Levine.Fricke.Recon (LFR). LFR drilled ten soil borings (GW-1 through GW-8, GW-5A, and GW-6A) primarily along the 54-inch diameter storm drain and sanitary sewer systems, to depths ranging from 8 to 20 feet bgs using a direct push drilling method. During drilling operations, soil samples were collected from various depth intervals. In August 1999, LFR collected grab groundwater samples from seven of the nine "GW" wells.

Based on the Alameda County's approved workplan, in January and April 2000, LFR conducted quarterly groundwater monitoring events at the Site. During the groundwater monitoring events, groundwater elevations were measured in the temporary sampling points installed by LFR and Geolsolv, and in off-site wells MW-8, MW-9 and MW-11. Groundwater samples were collected from the temporary sampling points installed by LFR and from off-site well MW-11.

In July and August 2000, LFR installed four groundwater monitoring wells, LFR-1 through LFR-4, and conducted the Third Quarter 2000 groundwater monitoring event. This was the first sampling event in which bioattenuation parameters were collected. The measured bioattenuation parameters included: dissolved oxygen (DO), nitrate (NO_3^-), sulfate (SO_4^{-2}) ferrous iron (Fe^{+2}), total iron, methane, oxidation-reduction potential (ORP), alkalinity, chloride, carbon dioxide, nitrite, sulfide, ethene, and ethane. The results from this sampling event provided a baseline for these parameters and a means to compare their concentrations at locations within the apparent source area against surrounding up-gradient, down-gradient, and cross-gradient locations. During this monitoring event, groundwater elevations were measured and groundwater samples were collected from the newly installed groundwater monitoring wells (LFR-1 through LFR-4), from temporary sampling points installed by LFR and Geosolv, and from upgradient monitoring well MW-11, which is owned by TOSCO. Groundwater elevations were also collected from MW-8 and MW-9.

In late October and early November 2000, LFR conducted the Fourth Quarter 2000 groundwater monitoring event, including another bioattenuation study. During the fourth quarter monitoring event, LFR sampled nine groundwater monitoring wells and temporary groundwater sampling points and measured groundwater elevations in nineteen groundwater monitoring wells and temporary sampling points (LFR, January 2001).

In late January, LFR conducted the First Quarter 2001 groundwater monitoring event. However, SOMA prepared the First Quarter 2001 monitoring report (SOMA, May 2001). The results of the First Quarter 2001 groundwater monitoring event demonstrated the occurrence of strong anaerobic biodegradation activities and dechlorination of PCE beneath the Site.

The Second Quarter 2001 groundwater monitoring event was conducted by SOMA on April 26 and 27, 2001 and reported on July 5, 2001. During this period bioattenuation parameters were also collected. The results of the Second Quarter 2001 monitoring event indicated a strong occurrence of the dechlorination process of PCE in the subsurface.

The Third Quarter 2001 groundwater monitoring event was conducted by SOMA on July 26 and 27, 2001. During this monitoring event ten groundwater monitoring wells were sampled and depths to groundwater were measured in 20 groundwater monitoring wells and temporary sampling points. SOMA submitted a workplan to the ACHCS that proposed conducting additional investigations to better define the groundwater plume conditions, conduct groundwater flow and chemical transport modeling and perform a RBCA, in order to define the Site's regulatory status. This workplan was approved on June 15, 2001.

In compliance with the workplan, SOMA installed five on-site groundwater monitoring wells, SOMA-1 through SOMA-5, on October 4, 11, and 12, 2001. During the installation of the groundwater monitoring wells, boreholes were continuously logged and soil samples were collected at 5-foot depth intervals. The objective of this investigation was to delineate the vertical extent of the soil and groundwater contamination and install larger diameter monitoring wells at the suspected chemical source areas, in order to collect more reliable bioattenuation parameters (i.e., dissolved oxygen) in the groundwater. SOMA's "Report on Conducting Additional Field Investigation to Evaluate the Site's Conceptual Model," dated January 3, 2002, describes the results of the investigations conducted in Phase I of the workplan.

The Third Quarter 2001 groundwater monitoring event was conducted by SOMA on October 18 and 19, 2001. During this monitoring event 11 groundwater monitoring wells were sampled and depths to groundwater were measured in 20 groundwater monitoring wells and temporary sampling points.

The First Quarter 2002 groundwater monitoring event was conducted by SOMA on January 30 and 31, 2002. During this monitoring event 11 groundwater monitoring wells were sampled, and depths to groundwater and free product were measured in 23 groundwater monitoring wells and temporary sampling points.

The Second Quarter 2002 groundwater monitoring event was conducted by SOMA on April 16 and 17, 2002. During this monitoring event 11 groundwater monitoring wells were sampled, and depths to groundwater and free product were measured in 22 groundwater monitoring wells and temporary sampling points.

The Third Quarter 2002 groundwater monitoring event was conducted by SOMA on July 17 and 18, 2002. During this monitoring event 11 groundwater monitoring wells were sampled, and depths to groundwater and free product were measured in 23 wells and temporary sampling points.

The Fourth Quarter 2002 groundwater monitoring event was conducted by SOMA on October 22 and 23, 2002. During this monitoring event, 11 groundwater monitoring wells were sampled, and depths to groundwater and free product were measured in 23 wells and temporary sampling points.

Groundwater flow, chemical transport and bioattenuation modeling for the Site were conducted by SOMA in February and March of 2003. The modeling was conducted in accordance with SOMA's approved workplan, dated June 15, 2001, that proposed a two-phase approach for assessing the nature and extent of soil and groundwater contamination and defining the Site's regulatory status. The objective of the modeling was to predict the groundwater chemical concentrations down-gradient from the Site and beneath the nearest residential neighboring properties. The modeling results confirmed the occurrence of biodegradation beneath the Site and indicated that the bioattenuation processes would be able to remove PCE in the groundwater in seven to ten years, trichloroethylene (TCE) in approximately three to nine years, cis-1,2-dichloroethylene (cis-1,2-DCE) in approximately four to thirteen years. SOMA's March 7, 2003 report entitled, "Groundwater Flow, Chemical Transport and Bioattenuation Modeling," describes the details of this study.

The First Quarter 2003 groundwater monitoring event was conducted by SOMA on February 18 and 19, 2003. During this monitoring event 11 groundwater monitoring wells were sampled, and depths to groundwater and free product were measured in 23 wells and temporary sampling points. The data collected from this monitoring event and previous monitoring events are sufficient to completely define the extent of the groundwater and soil contamination and the occurrence of biodegradation at the Site. Consequently, in the modeling report and the First Quarter 2003 monitoring report, SOMA recommended that groundwater monitoring be conducted on a semi-annual basis instead of a quarterly basis. SOMA's recommendation was approved by the ACHCS upon their review of these reports. Therefore, the Second Quarter 2003 monitoring event was eliminated, and the Third Quarter 2003 monitoring event, conducted on July 29 and 30, became the second semi-annual monitoring event. During this event 11 groundwater monitoring wells were sampled, and depths to water levels were measured in 24 groundwater monitoring wells and temporary sampling points. Due to the presence of floating product in SOMA-4, this well was not sampled.

Due to the presence of several feet of free phase petroleum hydrocarbons in SOMA-4, a passive skimmer pump was installed inside this well in June 2002. That system removed 19.75 gallons of free product between June and mid-October 2002. From mid-October 2002 until February 2004 no product was removed from SOMA-4. In February 2004, a Flexible Axial Peristaltic (FAP) pump was installed in SOMA-4, and from February 2004 until June 2004, over 400 gallons of free product was removed from SOMA-4. Currently, up to three inches of free product still remains in SOMA-4. However, while it is being removed, less than one inch product remains in B-3 and B-8. Recently, SOMA converted B-3 and B-8 into two-inch diameter product removal wells and initiated free product removal from these locations.

1.3 Site Geology and Hydrogeology

The Site is located on the alluvial plain between the San Francisco Bay shoreline and the Oakland hills. Surface sediments in the Site's vicinity consist of Holocene alluvial deposits that are representative of an alluvial fan depositional environment. These deposits consist of brown, medium dense sand that fines upward to sandy or silty clay. The pattern of stream channel deposition results in a three-dimensional network of coarse-grained sediments interspersed with finer grained silts and clays. The individual units tend to be discontinuous lenses aligned parallel to the axis of the former stream flow direction (LFR, 2001).

According to LFR, sediments encountered in the on-site soil borings are typical of those encountered in an alluvial fan depositional environment. The sediments are predominantly fine-grained, consisting of clay, silty clay, sandy clay, gravelly clay and clayey silt. Discontinuous layers of coarse-grained sediments (clayey sand, silty sand, and clayey gravel) generally also contain relatively high percentages of silt and clay, which tend to reduce their permeability. Based on previous investigations conducted by Geosolv and LFR, a relatively coarse-grained layer of silty sand, clayey sand, and clayey gravel was encountered in soil borings E-23, E-25, E-26, GW-2, GW-3, GW-7, and GW-8 at depths of approximately 4.5 to 14 feet bgs. A discontinuous layer of silty to clayey sand was encountered at depths of 17 to 21 bgs in borings B-11, E-23, E-25, GW-7 and GW-8.

Based on the October 2001 results of the field investigation conducted by SOMA, no major water-bearing zone was encountered at a deeper depth. However, as the lithological logs of the newly installed groundwater monitoring wells indicate, the water-bearing zone is composed of fine-grained clayey silt sediments separated by very low permeable intervening clay layers, which in some locations are unsaturated. For instance, SOMA-5, which was screened from 21 to 26 feet bgs, within a significantly thick clay layer beneath the first water-bearing zone, using the dual tubing method, was a dry well until the First Quarter 2002 sampling event. Due to the presence of unsaturated and low permeable intervening clay layers between the shallow and deep layers, there is a significant vertical downward gradient between the shallow and deep wells.

According to the results of historical groundwater monitoring activities, groundwater occurs at 4 to 14 feet bgs, and flows from the northeast to the southwest with an approximate groundwater flow gradient of 0.019 ft/ft to 0.035 ft/ft. The results of slug tests indicated that the hydraulic conductivity of the saturated sediments ranged between 1.2 x 10^{-4} and 6.9 x 10^{-4} cm/sec, which is equivalent to 0.34 ft/day to 1.95 ft/day. Using the average groundwater flow gradient of 0.027 and aquifer porosity of 0.32, the groundwater flow velocity ranges between 10.5 and 60.1 ft/year.

1.4 Nature and Extent of Groundwater Contamination

The monitoring events at the Site indicate that the groundwater contains petroleum hydrocarbons and volatile organic compounds. Petroleum hydrocarbons and its additives detected in the groundwater beneath the Site include:

- Stoddard Solvent (TPH-ss);
- Total Petroleum Hydrocarbons as gasoline (TPH-g);
- Methyl tertiary Butyl Ether (MtBE); and
- Benzene, toluene, ethylbenzene, and total xylenes, collectively referred to as BTEX.

Volatile organic compounds detected in the groundwater beneath the Site include:

- Tetrachloroethene (PCE);
- Trichloroethene (TCE);
- cis-1,2-dichloroethene (cis-1,2-DCE);
- trans-1,2-dichloroethene (trans-1,2-DCE);
- Vinyl Chloride; and
- 1,2-Dichloropropane (1,2-DCP).

Tables 1 and 2 present the site-wide average, standard deviation, and 95% upper confidence limit (UCL) of petroleum hydrocarbon and volatile organic compound concentrations in the groundwater, respectively. The statistics are calculated using groundwater monitoring data collected from August 2000 through January 2004. One-half of the detection limit was used for non-detect samples in the statistical calculations. Due to the detection of free product in SOMA-4, chemical concentrations from this well were not available for the calculations.

Table 3 presents the average petroleum hydrocarbon concentrations and the 95% UCL in each well. The highest TPH-ss and TPH-g concentrations were detected in B-7 at levels of 16,167 µg/L and 26,133 µg/L, respectively. High concentrations of TPH-ss and TPH-g were also detected in B-10, GW-4, LFR-2, SOMA-2, and SOMA-3. The highest MtBE and ethylbenzene concentrations were detected in SOMA-3 at levels of 266 µg/L and 50 µg/L, respectively. The highest benzene concentration was 61 µg/L, detected in GW-7. The highest toluene and total xylenes concentrations were detected in B-7 at levels of 59 µg/L and 146 µg/L. MtBE and BTEX constituents were also found in B-10, SOMA-1, SOMA-2, and SOMA-3.

Table 4 presents the average, and 95% UCL concentrations of VOCs in each well. The highest PCE, TCE, cis-1,2-DCE, and trans-1,2-DCE concentrations were found in B-10 at levels of 1,862 µg/L, 1,618 µg/L, 8,017 µg/L, and 55 µg/L, respectively. The highest levels of vinyl chloride and 1,2-DCP were detected in SOMA-3 at levels of 100 µg/L and 51 µg/L, respectively. Elevated levels of PCE were also present in GW-2, GW-3, GW-8, LFR-1, SOMA-2, and SOMA-3. Elevated levels of TCE were also present in GW-8, LFR-1, SOMA-2, and SOMA-3. High levels of cis-1,2-DCE were also detected in B-2, GW-8, LFR-1, LFR-2, SOMA-1, SOMA-2, and SOMA-3. A high level of trans-1,2-DCE was also detected in SOMA-3, and lastly, high concentrations of vinyl chloride and 1,2-DCP were also found in SOMA-2.

According to the data averages, the most chemically impacted areas appear to be on-site in the vicinity of B-7, B-10, LFR-1, SOMA-2, SOMA-3, and SOMA-4. Petroleum hydrocarbons and VOCs were detected in down-gradient wells GW-2, GW-3, LFR-1, and LFR-2, but groundwater contamination has not moved beyond LFR-3. Based on the groundwater monitoring data, the groundwater flow, and the chemical transport and bioattenuation modeling conducted in 2003, it appears that low concentrations of contaminant plumes (less than 10 parts per billion) will continue to migrate with the flow of groundwater toward LFR-3 and does not seem to pass beyond this well.

1.5 Groundwater Chemical Concentration Trends

Chemical concentration trends for each well are shown in Figures 3 through 9. Wells and chemicals with mostly non-detectable (ND) concentrations are not included in the concentration plots. Figures 3 and 4 display the chemical concentration trends in B-7, B-10, GW-2, and GW-3. Overall, chemical concentrations appear to be decreasing in B-7, B-10, and GW-2. TPH-ss, TPH-g, and cis-1,2-DCE levels in GW-3 appear to be decreasing, while PCE and TCE concentrations are fairly stabilized. TPH-ss and TPH-g concentrations are decreasing in GW-4. PCE and cis-1,2-DCE in GW-4 have been detected only once during the last 2.5 years. Figure 6 shows the concentration trends in LFR-1 and LFR-2. All detected chemical concentrations in LFR-1 appear to have decreasing trends. In LFR-2, concentrations of TPH-ss and TPH-g have been stabilized, while cis-1,2-DCE and vinyl chloride are decreasing. Figure 7 displays the concentration trends in LFR-4 and SOMA-1. The overall concentration trend in LFR-4 and SOMA-1 appears to be stabilized. Figure 8 displays the concentration trends of SOMA-2 and SOMA-3. The overall concentration trend in SOMA-2 appears to be decreasing, while the overall trend in SOMA-3 appears to be increasing. SOMA-3 is located inside the chemical source area and it will take longer time to see any significant chemical concentrations reduction in this well. It should be noted that the dehalogenation processes starts from the outer edge of the chemicals plume and gradually moves inward toward the center. That is the major reason why the chemical concentrations in SOMA-3 are still increasing.

As indicated by the contaminant trend analyses, it appears that the petroleum hydrocarbon plumes are attenuating. The detected concentrations of these chemicals were found to have mostly decreasing trends during the period of August 2000 through January 2004. Further monitoring is recommended to confirm that the VOC plumes are shrinking.

1.6 Nature and Extent of Soil Contamination

1.6.1 Petroleum Hydrocarbons in Soil

The results of the laboratory analyses showed elevated levels of petroleum hydrocarbons and Stoddard Solvent, as well as volatile organic compounds (VOCs) in the soil and groundwater beneath the Glovatorium building. The maximum concentration of total petroleum hydrocarbon as gasoline (TPH-g) was 7,600 mg/Kg, which was detected in a soil sample collected from SOMA-5 at 16 feet bgs. The maximum concentration of TPH-ss was 5,000 mg/Kg, which was detected in a soil sample collected from E-21 at 8.5 feet bgs.

No benzene and only minor concentrations of toluene, ethylbenzene and xylenes were detected in the soil samples collected at various locations.

MtBE was detected in soil samples collected from greater depths. For instance, MtBE was detected in every soil sample collected from the 22 to 30 feet depths at concentrations ranging from 11 to 79 μg/Kg at SOMA-3. At SOMA-5, MtBE was detected in the soil samples collected from 18 to 26 feet at concentrations ranging up to 31 μg/Kg. Table 5 shows the analytical results of the soil samples analyzed for petroleum hydrocarbons. It is believed that the MtBE source is the upgradient TOSCO facility. The presence of MtBE in subsurface sediments below the watertable is due to the contact of MtBE-impacted groundwater with these sediments.

1.6.2 Volatile Organic Compounds in Soil

Low levels of acetone were detected in 11 of the 28 soil samples collected from borings SOMA-3 and SOMA-5. Table 6 presents the laboratory results of soil samples collected at different depths. Acetone concentrations ranged from ND (less than 5.1 μg/Kg) to 130 μg/Kg. Acetone is believed to be a laboratory contaminant and due to its low toxicity and high degradation rate it is not believed to pose a significant human health risk to the exposed population.

cis-1,2-DCE was detected in 20 out of 67 soil samples collected throughout the Site. The concentration of cis-1,2-DCE ranged from ND (less than 5 μg/Kg) to 3,200 μg/Kg at the E-20 sampling location at 5 feet bgs. The widespread presence of cis-1,2-DCE in the soil samples indicates the occurrence of dehalogenation processes in the subsurface.

Similar to cis-1,2-DCE, TCE was detected in 13 soil samples collected. The maximum concentration of TCE was 270,000 μg/Kg, at 16 feet bgs in boring B-10. TCE was also detected at a high concentration (81,000 μg/Kg) in the same soil boring at 15.5 feet bgs. Dehologenation of PCE in subsurface is the main reason for presence of TCE in subsurface.

PCE was detected at high concentrations in both near surface (the upper 10 feet) and deeper soil samples. The sample collected at 8 feet bgs from SOMA-3 reportedly had a PCE concentration of 34,000 μg/Kg. However, the laboratory reported that this exceeded the linear range of their instrument. PCE at a higher concentration of 5,500,000 μg/Kg was detected in boring B-10 (installed in 1998) at a 16-foot depth. PCE was detected in 20 out of 67 soil samples collected throughout the Site. Similarity between the distribution of PCE and TCE indicates that TCE is the by-product of PCE degradation during the dehologenation processes.

Naphthalene at a concentration of 9,300 µg/Kg was detected in one soil sample collected at a 10-foot depth from SOMA-3. It was also detected in four soil samples collected from SOMA-5, with concentrations ranging from 6.2 µg/Kg and 2,900 µg/Kg. Due to the low solubility and high retardation of naphthalene in groundwater, so far no groundwater monitoring well has shown naphthalene contamination. However, a grab groundwater sample (unfiltered) collected from SOMA-3 showed 23 µg/L of naphthalene. Naphthalene is believed to be used in dry cleaning facilities and is used in common mothballs as a moth repellant. Because of its low solubility and volatility has a limited exposure pathway to impact the exposed population.

1.6.3 Other Chemicals Detected In Soil Samples

As the results of the laboratory analyses show, in addition to the chemicals that routinely appear in groundwater samples, other petroleum hydrocarbons constituents were reported in the soil samples collected from various depths. These chemicals appeared sporadically in different samples less than 10 percent of the time. Therefore, they do not appear in tabulated form in this report.

1.7 Land Use and Zoning

To evaluate the land use type in close proximity of the Site, a copy of the zoning map for the area was obtained from the City of Oakland (see Figure 10). As shown in Figure 10, the Site itself is zoned for commercial use. The surrounding properties are zoned for residential use.

The groundwater beneath the Site primarily flows from the northeast to the southwest towards Manila Avenue and 38th Street. As indicated by Figures 2 and 10, the properties located immediately down-gradient of the Site are primarily residential.

2.0 SCOPE OF WORK

Based on the results of recent site investigation activities, the scope of this investigation was to conduct a sensitive receptor survey and human health risk assessment at the Site. The following sections provide descriptions of the sensitive receptor survey and the human health screening evaluation.

3.0 SENSITIVE RECEPTOR SURVEY

Sensitive receptors include schools, day care centers, hospitals, adolescence homes, groundwater wells and surface water bodies such as lakes, estuaries, and reservoirs. Using the Internet, the BayArea.com Yellow Pages were searched in order to locate any sensitive receptors in close proximity of the Site. Appendix F shows the results of our computer search. The following is a brief description of each search category:

3.1 Groundwater Wells

In order to locate any water supply wells including domestic, irrigation, industrial, or public drinking water wells, SOMA's staff searched the State Department of Water Resources (DWR) records in Sacramento. The results of our file review indicated that there are no domestic, industrial, irrigation or any other water supply wells within a 2,000-foot radius of the Site. The only wells reported within that radius were monitoring wells. According to the results of our file review, groundwater monitoring wells can be found in the following downgradient areas:

1. Kaiser Foundation Hospital
280 W. MacArthur Boulevard
6 monitoring wells, of which at least two are inside the building.

2. Chevron
3701 Broadway (NW corner of Broadway and W. MacArthur)
Approximately 11 monitoring wells

3. Shell
230 MacArthur Boulevard
3 monitoring wells

4. Firestone Tire and Rubber
2785 Broadway
1 monitoring well

5. Unocal
411 W. MacArthur Boulevard
6 monitoring wells

6. Kaiser Health Plan
3505 Broadway
3 monitoring wells

The following cross or upgradient locations also have monitoring wells.

1. Unocal
3943 Broadway (at 40th Street)
10 monitoring wells and 1 recovery well

2. Freidkin-Beckel
3810 Broadway
2 monitoring wells

3. Piedmont Plaza
175 41st Street
3 monitoring wells

Due to a lack of water supply wells in close proximity of the Site, there is no likelihood of current and future ingestion of chemically-impacted groundwater.

3.2 Child-care Services

According to the results of our search, there are a total of 16 child-care facilities at distances ranging from 0.69 mile to 1.17 mile from the Site. The closest child-care facility is First Step Children's Center, which is located at 111 Fairmount Avenue in Oakland. Appendix F shows the results of our search.

3.3 Schools and Hospitals

There are a total of 28 schools within a 1.18-mile radius of the Site. The closest school is Leo's School, which is located 0.39 mile from the Site at 4238 Howe Street.

There are eight hospitals within a 1.18-mile radius of the Site, The closest hospital, Kaiser Foundation Hospital, is located 0.14-mile distance from the Site, at 260 West MacArthur Boulevard in Oakland.

3.4 Nursing and Convalescent Homes

There are twelve nursing and convalescent homes within a 1.5-mile radius of the Site. The closest facility is located 0.14-mile from the Site at 210 40th Street Way in Oakland.

3.5 Adult Day-Care Centers

Within a 1.70-mile radius of the Site, there are four day-care centers for adults. The closest is located 1.2-miles from the Site at 459 22nd Street in Oakland.

4.0 HUMAN HEALTH SCREENING EVALUATION

The following section presents the Human Health Screening Evaluation for the Site. The human health screening evaluation utilizes maximum on-site and maximum-modeled off-site concentrations of identified chemicals of potential concern (COPCs) in shallow groundwater to estimate emissions into the indoor air environment and subsequent contaminant intakes through the inhalation route of exposure. These potential indoor air carcinogenic risks and noncarcinogenic health hazards were estimated using health-based toxicity criteria developed by the EPA and State of California (Office of Environmental Health Hazard Assessment (OEHHA)).

The human health screening assessment is organized into the following sections:

Exposure Pathways and Media of Concern: reviews the conceptual site model (CSM) in light of existing contamination (i.e., COPCs), identifies the receptors of concern, and identifies all relevant potential exposure pathways.

Exposure Concentrations and Chemicals: identifies the COPCs and estimates the concentration of each COPC, in each medium of concern (e.g., soil, air or water) to which receptors may be exposed.

Toxicity Values: describes the process of characterizing the relationship between the exposure to a chemical and the incidence of adverse health effects.

Risk Characterization Summary: presents the results of the human health screening evaluation and provides the framework for using these results in decision-making.

4.1 Exposure Pathways and Media of Concern

4.1.1 Conceptual Site Model

It was conservatively assumed that volatile contaminants in the shallow groundwater beneath the Site could migrate beneath on-site buildings, off-site residences and into the indoor air environment. Consistent with the Cal/EPA, Department of Toxic Substances Control (DTSC) Preliminary Endangerment Assessment (PEA) Guidance Manual (DTSC 1994, 1999), health effects were conservatively evaluated for 1) off-site residential receptors (i.e., unrestricted, residential land use scenario); and 2) on-site workers (i.e., industrial/commercial land use scenario).

For the off-site residential land use scenario, estimated carcinogenic risks were evaluated for a combined child and adult over an assumed 30-year exposure period. Noncarcinogenic health effects were evaluated for a child, since this is a sensitive receptor and would maximize potential exposures. For on-site workers under a commercial/industrial land use scenario, estimated carcinogenic risks were evaluated for an adult over an assumed 25-year exposure period. Noncarcinogenic health effects were also evaluated for an adult worker.

4.1.2 Soil Exposure Pathways

COPCs in soil include VOCs that were previously detected in on-site soils between 3- and 10 feet bgs. Consistent with the CSM discussed above, only potential on-site worker exposure to VOCs detected in the soil matrix was evaluated through incidental ingestion and dermal contact. Exposures by these two routes were estimated according to the following equations.

Intake of Soil Contaminants

$$\text{Incidental Ingestion Intake (mg/Kg-day)} = \frac{C_S * IngR * EF * ED * CF_1}{BW * AT}$$

Where,

C_s = Maximum reported COPC soil concentration, mg/Kg

IngR = Worker soil ingestion rate, 50 mg/day (EPA 1991)

EF = Worker exposure frequency, 250 days/year (EPA 1991)

ED = Worker exposure duration, 25 years (EPA 1991)

CF_1 = Conversion factor, 1×10^{-6} kg/mg

BW = Adult body weight, 70 kg

AT = Averaging time, days

= ED * 365 days/year for noncarcinogens

= 70 years * 365 days/year for carcinogens

Using the above exposure parameters, the Lifetime Average Daily Intake (LADI) would be as follows:

LADI = Worker Intake

= Cs * 1.75E-07

Using the above exposure parameters, the Average Daily Intake (ADI) would be as follows:

ADI = Worker Intake

= Cs * 4.89E-07

Dermal Contact Intake (mg/kg-day) = $\frac{C_S * SA * AF * CF_1 * EF * ED}{BW * AT}$

Where,

Cs = Maximum reported COPC soil concentration, mg/kg

SA = Worker skin surface area for exposure, 3300 cm^2 (DTSC 2000)

AF = Worker soil-to-skin adherence factor, 1.0 mg/cm^2 (DTSC 2000)

CF_1 = Conversion factor, 1 x 10^{-6} kg/mg

EF = Worker exposure frequency, 250 days/year (EPA 1991)

ED = Worker exposure duration, 25 years (EPA 1991)

BW = Adult body weight, 70 kg

AT = Averaging time, days

= ED * 365 days/year for noncarcinogens

= 70 years * 365 days/year for carcinogens

Using the above exposure parameters, the Lifetime Average Daily Intake (LADI) would be as follows:

LADI = Worker Intake

= Cs * ABS * 1.15E-05

Using the above exposure parameters, the Average Daily Intake (ADI) would be as follows:

ADI = Worker Intake

= Cs * ABS * 3.23E-05

Contaminated soils and sediments below groundwater may serve as a source for potential exposure during future construction and/or maintenance activities. However, potential exposure to contaminated soils and sediments during construction/maintenance will be addressed through a site-wide Health and Safety Plan (HSP), appropriate air monitoring during these activities and appropriate personal protective equipment for any workers involved.

4.1.3 Water Exposure Pathways

Based on the October 2001 results of the field investigation conducted by SOMA, no major water-bearing zone at a deeper depth was encountered. However, as the lithological logs of the newly installed groundwater monitoring wells indicate, the water-bearing zone is composed of fine-grained, clayey silt sediments separated by very low permeable intervening clay layers, which in some locations are unsaturated. Due to the presence of unsaturated and low permeable intervening clay layers between the shallow and deep layers, the saturated sediments do not yield significant amount of groundwater to the existing wells.

The results of the slug tests indicated that the hydraulic conductivity of the saturated sediments ranges between 1.2×10^{-4} and 6.9×10^{-4} cm/sec, which is equivalent to 0.34 ft/day to 1.95 ft/day. Using the maximum measured hydraulic conductivity of the saturated sediments the maximum flow rate into a groundwater well can be calculated as:

$$Q= 2\pi rKhi$$

Where:

Q = Flow rate ft^3/day

r = Effective radius of well (ft), 4" = .33'

K = hydraulic conductivity of saturated sediments, 1.95 ft/day

h = Thickness of saturated sediments, 10 ft.

i = Hydraulic gradient, 0.20

Therefore:

$$Q = 2 \times 3.14 \times .33 \times 1.95 \times 10 \times 0.2 = 8.1 \text{ ft}^3\text{/day} = 60 \text{ gallon/day}$$

Based on the given parameter values the maximum volume of water can be pumped from any given water well at the site would be about 60 gallon per day. Therefore, based on State Water Board Resolution 88-63 (See Appendix A), since a typical water producing well cannot produce more than 200 gallon per day, the water-bearing zone beneath the Site is not classified as a drinking water source.

For the above reason, the ingestion of groundwater and direct contact with groundwater through household use were not considered complete exposure pathways and were not evaluated in this human health screening evaluation.

However, potential emissions of groundwater VOCs into indoor air was considered a complete exposure pathway and evaluated in this risk assessment, as discussed in more detail in the following section.

4.1.4 Air Exposure Pathways

Potential exposure to COPCs detected in the shallow groundwater was evaluated for inhalation of volatile emissions in indoor air using the Johnson and Ettinger Indoor Air Risk Model, as modified by DTSC to include Cal/EPA slope factors and reference exposure levels (RELs). Exposure through the inhalation route was estimated according to the following equation.

Intake of Air Contaminants

$$\text{Inhalation Intake (mg/Kg-day)} = \frac{C_a * InhR * EF * ED}{BW * AT}$$

Where,

C_a = Estimated COPC concentration in air, mg/m^3

InhR = Adult inhalation rate, 20 m^3/day (EPA 1991)

= Child inhalation rate, 10 m^3/day (EPA 1991)

EF = Residential exposure frequency, 350 days/year (EPA 1991)

ED = Adult exposure duration, 24 years (EPA 1991)

= Child exposure duration, 6 years (EPA 1991)

BW = Adult body weight, 70 Kg

= Child body weight, 15 Kg

AT = Averaging time, days

= ED * 365 days/year for noncarcinogens

= 70 years * 365 days/year for carcinogens

Inhalation of emissions into outdoor air rarely, if ever, drive risks at a site. Since emissions from shallow groundwater were conservatively evaluated for the indoor air pathway, emissions into outdoor or ambient air were not estimated in this risk assessment.

Potential exposure to volatile COPCs detected in the soil vapor was evaluated for inhalation of indoor air as a result of potential vapor intrusion into the indoor environment. In order to evaluate the potential indoor air concentrations from VOCs detected in the shallow groundwater, the DTSC-Modified Johnson and Ettinger (J&E) Model was utilized, specifically the Screening Groundwater Model for Fine Soil (GW-SCREEN, version 3.0-mod2, 11/01/03). The J&E Model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces and provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. For the purposes of this human health screening evaluation, the screening level J&E model was used. This model conservatively assumes a steady-state or non-diminishing source of contamination.

4.1.5 Further Verification of Air Exposure Pathway

VOCs found in soil and groundwater beneath a site can potentially become air borne and enter into enclosed air spaces at on-site buildings or the residential units adjacent to the site. The results of quarterly and semi-annual groundwater monitoring events indicate the presence of VOCs in the groundwater beneath the Site and the surrounding areas. As Figure 2 shows the closest residents to the Site are located on the southwest corner of the former Glovatorium facility. In order to evaluate the presence of VOCs in void spaces of the vadose zone next to the two nearby residents, a soil gas survey was conducted.

On August 16, 2004, a SOMA field geologist oversaw soil gas survey activities conducted by Vironex. SOMA retained a mobile laboratory to analyze the soil gas samples at the Site. Using a Geoprobe™ drilling rig fitted with soil-gas sampling rods and a Geoprobe™ vacuum system, Vironex initially advanced the soil gas sampling rods to approximately 5 feet bgs. Figure 11 shows the locations of soil gas sampling rods. The rods were then retracted to disconnect and leave the expendable tip at the bottom of the borehole and open the bottom of the sampling rods. With the bottom one foot of the borehole exposed from 4 to 5 feet bgs, the drilling rig operator then purged the vacuum line to observe substantial resistance to vacuum applied during this procedure. The Vironex technician then applied a negative (vacuum) pressure of 20 to 25 inches of mercury* to the line and was not able to withdraw a soil gas sample. This procedure was repeated four times with the same result.

SOMA then decided to core near one of the proposed soil-gas survey locations to identify more permeable zones and determine the depth to first encountered groundwater. The sample core revealed depth to first groundwater at approximately 7.5 feet bgs and silty clay lithology throughout with an increase in sand content below 7.5 feet bgs. To prevent groundwater-bearing contaminants from entering the soil-gas sample, the probes were advanced to approximately 6 feet bgs. After retracting the soil-gas sampling rods to approximately 5 feet bgs, a vacuum of approximately 20 to 25 inches of mercury was again applied for 15 to 20 minutes. With three of the ten proposed locations inaccessible, Vironex repeated this procedure at seven sampling locations but was unable to collect a soil-gas sample. This is largely due to the low permeability of the unsaturated soils with respect to the air/gas.

At two locations designated SGN (north side) and SGS (south side), soil samples were collected from 5 to 6 feet bgs for physical parameters analysis such as bulk density and total organic carbon content. The field geologist sealed and capped the samples with Teflon tape and plastic end caps and then labeled the samples before placing them in a chilled cooler. Chain of custody documentation (COC) was maintained until delivery to C&T Laboratories. The results of laboratory analysis is presented in Table 10 and used in estimation of emission rate of

VOCs from subsurface. Appendix B shows the laboratory report and chain of custody form.

The result of this investigation demonstrated that the vadose zone beneath the residential units is not conducive of the subsurface contaminant vapors. This is due to the low permeability of subsurface soils with respect to air.

4.2 Exposure Concentrations and Chemicals

All VOCs detected in soil were considered COPCs. Table 7 presents the maximum reported soil matrix concentrations for on-site VOCs. All VOCs detected in shallow groundwater on-site were considered COPCs. Table 8 presents the VOCs detected in monitoring wells B-2, B-3, B-7, B-8, B-9, B-10, B-13, GW-2, GW-3, GW-4, GW-5, GW-6A, GW-8, LFR-1, LFR-2, LFR-3, LFR-4, SOMA-1, SOMA-2, SOMA-3 and SOMA-4. Table 8 presents the groundwater data for the most recent sampling event, as well as groundwater concentrations averaged over all sampling events to date. For the purposes of this risk assessment, the higher of the site average or most recently sampled concentration was used as the input term for the Johnson and Ettinger Model; this was done to estimate potential indoor air risks for future on-site workers.

SOMA evaluated the potential for on-site groundwater contaminants to migrate off-site in a report entitled "Groundwater Flow, Chemical Transport and Bioattenuation Modeling for the Former Glovatorium Facility", dated March 7, 2003 (SOMA 2003). The more conservative modeling approach accounted for chemical advection, dispersion, sorption and the natural decay process for chlorinated solvents, but does not take into account active microbial biodegradation. Consequently, only PCE, TCE and cis-1,2-DCE were predicted to migrate off-site and reach the downgradient/nearest residential neighborhood.

Based on SOMA's modeling result, the maximum estimated PCE concentration in the shallow groundwater beneath the nearest, downgradient residential area was 394 µg/L, which was predicted to decrease to a non-detectable concentration within 20 years (see Table 9). The maximum estimated TCE concentration in shallow groundwater beneath the nearest residential area was 293 µg/L, which was predicted to decrease to a non-detectable concentration within 11 years. The maximum estimated cis-1,2-DCE concentration in the shallow groundwater beneath the nearest residential area was 1,564 µg/L, which was predicted to decrease to a non-detectable concentration within 12 years. Finally, the maximum estimated vinyl chloride concentration in shallow groundwater beneath the nearest residential area was 31 µg/L, which was predicted to decrease to a non-detectable concentration within 8 years. Table 9 presents the maximum off-site concentrations of PCE, TCE, cis-1,2-DCE and vinyl chloride in the groundwater, as well as the average off-site groundwater concentrations over the time period predicted to reach non-detectable concentrations. Both the maximum and average predicted off-site groundwater concentrations were used as input concentrations for the Johnson and Ettinger Indoor Air Model.

Site-specific physical parameters such as porosity and organic carbon content were measured and used in evaluation of emission rate of chemicals at the Site. Table 10 summarizes the physical parameters used as input parameters in the Johnson and Ettinger Indoor Air Model. A conservative, 5 liters per minute flow rate into a building (Q_{soil}) was assumed. This default model parameter is based on empirical data of flow rates into buildings using tracer gases and conservatively assumes a course, sand soil beneath a home. Consequently, using this default Q_{soil} value, there is no difference between the course and fine soil models, as this parameter actually overrides the site-specific inputs. Actual model outputs, for each chemical, are presented in Appendix C.

4.3 Toxicity Values

This section describes the process of characterizing the relationship between the exposure to an agent and the incidence of adverse health effects in exposed populations. In a quantitative carcinogenic risk assessment, the dose-response relationship of a carcinogen is expressed in terms of a slope factor (oral) or unit risk (inhalation), which are used to estimate the probability of risk of cancer associated with a given exposure pathway. Cancer slope factors and unit risk factors, as published by Cal-EPA (05/2002) and EPA (Integrated Risk Information System (IRIS)), were used in this human health risk assessment.

For noncarcinogenic effects, toxicity data developed from animal or human studies are typically used to develop non-cancer acceptable levels, or reference doses (RfDs). A chronic reference dose is defined as an estimate of a daily exposure for the human population, including sensitive subpopulations, that is likely to be without appreciable risk of deleterious effects during a lifetime. Inhalation reference doses were calculated from the Cal/EPA Reference Exposure Levels (RELs), as published by the Office of Environmental Health Hazard Assessment (OEHHA, 2003). If an REL was unavailable for a particular chemical, the inhalation reference dose from IRIS, EPA's Health Effects Summary Tables (HEAST) or EPA's National Center for Environmental Assessment (NCEA) was used.

Table 11 summarizes the oral cancer slope factors and oral reference doses for VOCs detected in soil, which were evaluated for direct contact by on-site workers through the ingestion and dermal routes of exposure. Table 12 summarizes the inhalation toxicity criteria used in the DTSC-modified Johnson and Ettinger Model to estimate potential indoor air risks and hazards for both on-site workers and off-site residents.

4.4 Risk Characterization Summary

This section describes the approach used to assess the potential carcinogenic risk and noncarcinogenic health hazard for the populations of concern presented by the chemical contaminants in soil at the Site. Potential carcinogenic effects were estimated from the predicted intakes and chemical-specific dose-response information. Potential noncarcinogenic effects were estimated by comparing the predicted intakes of COPCs to their respective toxicity criteria (i.e., inhalation reference doses (RfD_i)).

4.4.1 *Noncarcinogenic Health Effects for Soil Contaminants*

In order to estimate the potential effects from exposure to multiple COPCs, the hazard index (HI) approach was used. The HI is defined as the summation of the hazard quotients for each COPC, for each route of exposure, and is represented by the following equation:

$$HI = \frac{\text{Predicted Dose}_a}{RfD_a} + \frac{\text{Predicted Dose}_b}{RfD_b} + \ldots + \frac{\text{Predicted Dose}_i}{RfD_i}$$

A total HI less than or equal to unity is indicative of acceptable levels of exposure for chemicals assumed to exhibit additive health effects. To be truly additive, chemicals must affect the same target organ system or result in the same critical toxic endpoint. A HI less than or equal to 1.0 suggests that adverse health effects would not be expected following a lifetime of exposure, even in sensitive members of the population.

4.4.2 *Carcinogenic Health Effects for Soil Contaminants*

Quantitative estimates of upper-bound incremental cancer risks due to site-related contamination were evaluated for each COPC according to the following equation:

$$R_i = Intake_i \times SF_i$$

Where,

R_i = Estimated incremental risk of cancer associated with the ith chemical

$Intake_i$ = Intake or lifetime average daily dose for the ith chemical, mg/kg-day

SF_i = Cancer slope factor for the ith chemical, $(mg/kg\text{-}day)^{-1}$

Carcinogenic risk was assumed to be additive and was estimated by summing the upper-limit incremental cancer risk for all carcinogenic COPCs.

4.4.2.1 On-Site Risks and Hazards

Table 13 summarizes the noncarcinogenic health hazards and carcinogenic risks associated with potential ingestion of and dermal contact with maximum reported concentrations of VOCs detected in the soil matrix for future on-site workers. Future workers were conservatively assumed to be outdoor workers with unlimited exposure to the Site's soils, (e.g., no asphalt or concrete surfaces were assumed). The total noncarcinogenic health hazard was 0.02, which is well below the level of concern (HI = 1.0). The estimated carcinogenic risk was 1.5E-06, which is at the lower end of the acceptable risk range (e.g., EPA Risk Management Range, one-in-one million [1E-06] to one-in-ten thousand [1E-04]). The carcinogenic risk was primarily attributable to direct contact with PCE in the soil.

Table 14 summarizes the noncarcinogenic health hazards and carcinogenic risks associated with inhalation of estimated indoor air concentrations of VOCs from the shallow groundwater for future on-site workers. Indoor air concentrations were based on the higher of the most recent COPC concentration in the groundwater or the average site-wide concentration. Future workers were conservatively assumed to be exposed to these indoor air concentrations 5 days per week, 50 weeks per year for a total of 25 years. These calculations conservatively do not account for the future reduction of chemical concentrations in soil and groundwater as discussed earlier. Therefore, the calculations are quite conservative and represent a worst case scenario. The Johnson and Ettinger

Model Outputs are included in Appendix C. The occupational hazard index for indoor air was estimated to be 1.2, which is just above the threshold level of concern (HI = 1). The on-site hazard for workers is primarily associated with the maximum concentration of cis-1,2-DCE (approximately 83 percent of the total hazard).

The total excess cancer risk for indoor air was estimated to be 2.0E-05, which is in the middle of the acceptable range of risk defined by regulatory agencies (e.g., EPA Risk Management Range, one-in-one million [1E-06] to one-in-ten thousand [1E-04]). The estimated indoor air risk is primarily associated with PCE (approximately 50 percent of the total risk) and TCE (approximately 26 percent of the total risk).

4.4.2.2 Off-Site Risks and Hazards

Table 15 summarizes the noncarcinogenic health hazards and carcinogenic risks associated with the inhalation of maximum estimated indoor air concentrations of VOCs from the shallow groundwater for the nearest residential area. These estimated risks are worst-case, as they are based on the maximum estimated groundwater concentrations for 30-year exposure duration and assume steady-state conditions, (i.e., no degradation over time). The Johnson and Ettinger Model Outputs are included in Appendix D. The worst-case residential hazard index for indoor air was estimated to be 0.2, which is well below the threshold level of concern (HI = 1). The worst-case residential indoor air cancer risk was estimated to be 1.2E-05, which is in the middle of the acceptable risk management range.

Table 16 summarizes the noncarcinogenic health hazards and carcinogenic risks associated with the inhalation of average estimated indoor air concentrations of VOCs from the shallow groundwater for the nearest residential area. These estimated risks are based on groundwater concentrations averaged over the time period of degradation to non-detectable concentrations. The time to reach non-detectable was used as the exposure duration for inhalation of indoor air emissions. The Johnson and Ettinger Model Outputs are included in Appendix E. The average residential hazard index for indoor air was estimated to be 0.05, which is well below the threshold level of concern (HI = 1). The average residential indoor air cancer risk was estimated to be 1.9E-06, which is at the lower end of the risk management range.

4.4.3 Uncertainty Analysis

The on-site noncarcinogenic health hazard and carcinogenic risk associated with VOCs in the soil from ingestion and dermal contact were based on the maximum reported soil concentrations, collected in either 1998 or 2001, which would not be representative of current soil conditions, which would likely have lower VOC concentrations between the surface and 10 feet bgs. The occurrence of dehalogenation processes which has been proved through groundwater monitoring events is the major factor for reduction of chemical concentrations in the vadose zone and groundwater beneath the Site. Therefore, the actual site-wide average soil concentrations which would be significantly less than the maximum detected concentration in 1998 and 2001 would result in lower risks. Consequently, the true risks and hazards were likely overestimated and would be even lower.

The on-site noncarcinogenic health hazard and carcinogenic risk associated with VOCs in the shallow groundwater from inhalation of indoor emissions were based on the higher of the maximum concentration from the most recent sampling episode or the average site concentration for each well. Actual site-wide average concentrations would result in lower groundwater concentrations and subsequent indoor air risks. This screening evaluation assumed that a future worker or building would be placed directly on the location of each maximum on-site groundwater concentration. Consequently, the true risks and hazards were likely overestimated and would be even lower. If groundwater degradation were considered, the risk and hazard associated with this structure would be considerably less than those risks and hazards estimated. The assumed building was also conservative, in that it was equivalent to a residential home with commercial exposure parameters. A true commercial building would have greater ventilation and air turnover, which would result in substantially lower indoor air concentrations and associated indoor air risks. It should be emphasized that the impact of surface pavement such as concrete or asphalt has not been incorporated in the calculation of chemical emission rates from subsurface. This makes the estimated risks more conservative.

The upper-bound exposure parameters actually represent 95th-percentile estimates used to define an RME exposure scenario. This upper-bound RME scenario, coupled with upper-bound slope factors of carcinogenic risk, result in an upper-bound "point" estimate of carcinogenic risk. If exposure parameter data distributions were used and simulated using a Monte Carlo approach, the most likely estimate of carcinogenic risk would be substantially lower than the single "point" estimates used in this assessment. The upper-bound "point" estimate would actually represent greater than the 99th-percentile estimate of risk from the probabilistic cancer risk range. Consequently, the estimates of carcinogenic risk in this document most likely overstate the true cancer risks.

4.4.4 Human Health Evaluation Conclusions and Recommendations

Based on the results of the human health screening evaluation, the following site-specific findings were made:

1. For a future on-site worker, the total noncarcinogenic health hazard for direct contact with VOCs in the soil was 0.02, which is well below the threshold level of concern (HI = 1). For a future outdoor worker (such as plumber or cable-man) , the total excess cancer risk for exposure to VOCs in the soil (specifically PCE) was 1.5E-06, which is at the lower end of the acceptable range of risk (1E-06 to 1E-04).

2. For a future on-site worker, the total noncarcinogenic health hazard for indoor air emissions arising from VOCs in the groundwater (specifically cis-1,2-DCE) was 1.2, which is just above the threshold level of concern (HI = 1). However, given the extremely conservative nature of the estimated hazards, no adverse health effects would be expected. For a future on-site worker, the total excess cancer risk for exposure to indoor air emissions arising from VOCs in the groundwater (specifically PCE) was 2E-05, which is well within the acceptable range of risk (1E-06 to 1E-04).

3. For the nearest residential area, the total noncarcinogenic health hazard for indoor air from maximum estimated VOCs in the groundwater was 0.2, which is below the threshold level of concern (HI = 1). For the nearest residential area, the total excess cancer risk for exposure to indoor air emissions arising from maximum estimated VOCs in the groundwater was 1E-05, which is well within the acceptable range of risk (1E-06 to 1E-04).

4. Since no vapor could be extracted beneath the nearby residents, the calculated human risks in connection with the inhalation exposure pathways are very conservative. As such, the actual human health risk should be significantly lower than the calculated risks and hazards.

5. Using average estimated off-site VOC concentrations in the groundwater that take into account degradation over time, the total noncarcinogenic health hazard for the nearest residential area was 0.05, which is well below the threshold level of concern. The average estimated indoor air risk for the nearest residential area was 2E-06, which is at the lower end of the risk management range.

Based on the above findings, VOCs in the groundwater beneath the Site would not pose an unacceptable risk to human health for future on-site workers or nearest off-site residents. Since the risk estimates were based on modeled groundwater concentrations, it is recommended that groundwater monitoring events be conducted on a yearly basis to validate the predicted groundwater concentrations and indoor air risks. Likewise, VOCs in on-site soils would not pose an unacceptable risk to human health for future on-site workers.

5.0 Conclusions and Recommendations

Based on the California Regional Water Quality Control Board's Interim Guidance Document dated December 8, 1995, the Site fits into the "Low-Risk" chemical release site category for the following reasons:

1) The source of the petroleum hydrocarbons is being removed. As discussed earlier, free-phase petroleum product still exists in SOMA-4, B-3 and B-8 and SOMA is actively removing free product from these wells. The presence of dissolved phase petroleum hydrocarbons in groundwater is contributing to the presence of anaerobic conditions in subsurface which are promoting the dehalogenation process in subsurface;

2) There are no drinking water wells or sensitive receptors in close proximity of the Site and the groundwater chemical plume is limited and has not migrated beyond LFR-3;

3) Due to the occurrence of dehalogenation processes in subsurface, the existing plume of chemicals in the groundwater is a shrinking plume_, as such the concentration of VOCs have significantly decreased during the past several groundwater monitoring events;

4) Based on the results of the site-specific human health risk assessment study, under current and future conditions, the Site-related chemicals do not pose a significant health risk to current and future on-site workers, as well as current and future off-site residents.

Therefore, SOMA recommends the following actions:

1) No active soil or groundwater remediation is required;

2) As the results of the groundwater modeling suggest, the existing chemical plume in the groundwater is a shrinking plume. As such, SOMA recommends reducing the frequency of groundwater monitoring program to an annual basis.

TABLES

Table 1
Statistics of Site-Wide Petroleum Hydrocarbon Concentrations in Groundwater, 3820 Manila Street, Oakland, Californina

Well Name	TPH-ss (µg/L)	TPH-g (µg/L)	MtBE (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)
Sample Size	160	159	161	163	163	162	163
Average Concentration	1,078	1,791	36	8.1	8.6	6.4	14
Standard Deviation	5,178	8,224	99	21	22	20	40
95% Uppler Confidence Limit	1,880	3,069	51	11	12	9.5	20

Notes:
All analyses are based on data from August 2000 through January 2004.
One-half of the detection limit was used for non-detect samples in the statistic calculations.

Table 2
Statistics of Site-Wide Volatile Organic Compound Concentrations in Groundwater 3820 Manila Avenue, Oakland, Californina

Well Name	PCE (µg/L)	TCE (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	1,2-DCP (µg/L)
Sample Size	164	164	164	164	164	164
Average	160	74	579	8.5	13	6.8
Standard Deviation	454	318	1,854	22	39	19
95% Upper Confidence Limit	229	123	863	12	19	9.8

Notes:
All analyses are based on data from August 2000 through January 2004.
One-half of the detection limit was used for non-detect samples in the statistic calculations.

Table 3
Average, and 95% Upper Confidence Limits of Pertoelum Hydrocarbons in Groundwater
3820 Manila Avenue, Oakland, California

Well Name		TPH-ss (μg/L)	TPH-g (μg/L)	MtBE (μg/L)	Benzene (μg/L)	Toluene (μg/L)	Ethyl-benzene (μg/L)	Total Xylenes (μg/L)
B-7	Average	16,167	26,133	13	8.4	59	18	146
	95% UCL	34,778	55,251	19	10	65	41	209
B-10	Average	2,317	4,283	30	4.3	12	5.8	21
	95% UCL	2,605	5,086	81	6.4	19	15	30
GW-2	Average	33	50	2.1	1.3	2.9	1.3	1.4
	95% UCL	50	83	2.6	1.9	5.9	1.9	2.0
GW-3	Average	78	136	2.3	1.5	1.5	1.5	1.9
	95% UCL	115	205	3.1	2.4	2.4	2.4	3.1
GW-4	Average	1,049	1,678	1.7	1.4	1.4	1.4	1.9
	95% UCL	1,926	2,957	2.2	2.0	2.0	2.0	2.7
GW-5	Average	33	59	0.7	0.3	0.3	0.3	0.3
	95% UCL	50	100	1.0	0.5	0.5	0.5	0.5
GW-6A	Average	25	56	5.2	0.3	0.3	0.3	0.3
	95% UCL	---	81	9.3	---	---	---	---
GW-7	Average	---	---	1.3	61	0.8	0.9	1.7
	95% UCL	---	---	---	76	1.2	1.1	3.1
GW-8	Average	120	211	5.7	0.3	0.3	0.3	0.6
	95% UCL	206	374	11	0.5	0.5	---	1.2
MW-11	Average	25	34	3.6	1.4	1.4	1.4	1.6
	95% UCL	25	46	5.3	2.0	2.0	2.0	2.4
LFR-1	Average	151	280	4.9	3.0	3.1	3.0	4.1
	95% UCL	219	431	7.0	5.2	5.3	5.2	8.3
LFR-2	Average	1,124	1,868	2.1	1.9	1.6	1.7	5.1
	95% UCL	1,761	2,798	2.7	2.5	2.3	2.5	8.3
LFR-3	Average	25	28	2.0	1.4	1.7	1.4	1.6
	95% UCL	25	34	2.5	2.0	2.5	2.0	2.3
LFR-4	Average	263	433	5.8	17	1.6	1.3	1.4
	95% UCL	345	558	7.6	28	2.4	2.0	2.1

Table 3
Average, and 95% Upper Confidence Limits of Pertoelum Hydrocarbons in Groundwater
3820 Manila Avenue, Oakland, California

Well Name		TPH-ss (µg/L)	TPH-g (µg/L)	MtBE (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)
SOMA-1	Average	54	93	132	2.4	2.4	2.4	2.7
	95% UCL	101	192	166	2.9	3.0	3.0	3.6
SOMA-2	Average	971	1,705	167	29	34	29	49
	95% UCL	1,551	2,733	248	57	61	57	106
SOMA-3	Average	1,671	2,666	266	50	50	50	51
	95% UCL	2,682	4,277	413	87	87	87	88
SOMA-4	Average	FP	FP	FP	FP	FP	FP	FP
	95% UCL	FP	FP	FP	FP	FP	FP	FP

Notes:
All analyses are based on data from August 2000 through January 2004.
One-half of the detection limit was used for non-detect samples in the statistic calculations.
---: Not calculated due to insufficient data points.
FP: Free product detected in SOMA-4.

Table 4
Average, and 95% Upper Confidence Limit Concentrations of Volatile Organics Compounds in Groundwater
3820 Manila Avenue, Oakland, California

Well Name		PCE (µg/L)	TCE (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	1,2-DCP (µg/L)
B-7	Average	3.2	4.4	928	5.0	1.8	1.8
	95% UCL	5.8	9.3	999	5.8	2.0	2.0
B-10	Average	1,862	1,618	8,017	55	16	16
	95% UCL	2,468	2,041	10,376	70	22	22
GW-2	Average	37	4.9	2.7	1.5	2.8	1.5
	95% UCL	57	7.6	3.2	2.0	4.0	2.0
GW-3	Average	165	2.2	4.4	1.7	2.9	1.7
	95% UCL	217	2.9	6.7	2.5	4.4	2.5
GW-4	Average	2.1	1.5	3.2	1.5	3.0	2.1
	95% UCL	3.1	2.1	4.3	2.1	4.3	2.4
GW-5	Average	0.3	0.3	0.3	0.3	0.3	0.3
	95% UCL	0.5	0.5	0.5	0.5	0.5	0.5
GW-6A	Average	0.3	0.3	0.3	0.3	0.3	0.3
	95% UCL	---	---	---	---	---	---
GW-7	Average	0.8	0.8	3.8	0.8	0.8	0.9
	95% UCL	1.2	1.2	4.0	1.2	1.2	1.1
GW-8	Average	111	124	34	7.5	3.2	0.3
	95% UCL	170	203	57	12	4.8	0.3
MW-11	Average	1.5	1.5	1.8	1.5	2.8	1.5
	95% UCL	2.1	2.1	2.7	2.0	4.0	2.0
LFR-1	Average	624	37	10	4.0	7.2	4.0
	95% UCL	977	47	15	6.0	11	6.0
LFR-2	Average	1.7	1.6	36	1.6	4.7	1.6
	95% UCL	2.3	2.3	64	2.3	6.7	2.2
LFR-3	Average	1.8	1.5	1.5	1.5	3.0	1.5
	95% UCL	2.3	2.1	2.1	2.1	4.2	2.1
LFR-4	Average	1.5	1.5	1.9	1.5	2.8	1.5
	95% UCL	2.2	2.2	2.4	2.2	4.3	2.2

Table 4

Average, and 95% Upper Confidence Limit Concentrations of Volatile Organics Compounds in Groundwater

3820 Manila Avenue, Oakland, California

Well Name		PCE (µg/L)	TCE (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	1,2-DCP (µg/L)
SOMA-1	Average	8.7	2.6	23	2.6	5.3	4.5
	95% UCL	13	2.9	35	2.9	5.7	5.8
SOMA-2	Average	203	65	1,681	37	71	36
	95% UCL	538	146	2,788	65	128	65
SOMA-3	Average	71	79	3,003	51	100	51
	95% UCL	109	130	5,057	87	174	87
SOMA-4	Average	FP	FP	FP	FP	FP	FP
	95% UCL	FP	FP	FP	FP	FP	FP

Notes:
All analyses are based on data from August 2000 through January 2004.
One-half of the detection limit was used for non-detect samples in the statistic calculations.
---: Not calculated due to insufficient data points.
FP: Free product detected in SOMA-4.

Table 5

Analytical Results of Soil Samples Analyzed for Petroleum Hydrocarbons

Former Glovatorium Site

3820 Manila Avenue, Oakland, California

Sample ID	Date	Stoddard Solvent C7-C12 (mg/Kg)	Gasoline C7-C12 (mg/Kg)	MtBE (µg/Kg)	Benzene (µg/Kg)	Toluene (µg/Kg)	Ethyl benzene (µg/Kg)	Total Xylenes (µg/Kg)
E-15-5'	9/14/1998	ND	NA	ND	ND	18.0	ND	ND
E-15-10'	9/14/1998	1,200.0	NA	ND	ND	130.0	600.0	890.0
E-15-14.5'	9/14/1998	500.0	NA	ND	ND	ND	100.0	ND
E-15-19'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-16-5'	9/14/1998	3.5	NA	ND	ND	17.0	ND	ND
E-16-10'	9/14/1998	430.0	NA	ND	ND	ND	ND	ND
E-16-12.5'	9/14/1998	990.0	NA	ND	ND	ND	ND	ND
E-16-15.5'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-17-3'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-17-7'	9/14/1998	650.0	NA	ND	ND	ND	340.0	ND
E-17-14.5'	9/14/1998	71.0	NA	ND	ND	8.0	8.0	270.0
E-17-16.5'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-17-19'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-18-3'	9/14/1998	11.0	NA	ND	ND	8.0	ND	ND
E-18-7'	9/14/1998	3,300.0	NA	ND	ND	ND	ND	ND
E-18-14.5	9/14/1998	12.0	NA	ND	ND	7.0	ND	51.0
E-18-17.5	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-19-5'	9/14/1998	ND	NA	ND	ND	11.0	ND	ND
E-19-10'	9/14/1998	4,200.0	NA	ND	ND	660.0	ND	ND
E-19-13'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-19-16'	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-19-18.5	9/14/1998	ND	NA	ND	ND	ND	ND	ND
E-20-11.75'	9/14/1998	900.0	NA	ND	ND	100.0	ND	4.0
E-26-12'	9/14/1998	190.0	NA	ND	ND	ND	90.0	740.0
E-21-8.5	9/14/1998	5,000.0	NA	ND	ND	ND	ND	36,000.0
GW-1-8'	7/16/1999	<1	<1	<20	<5	<5	<5	<5
GW-1-7'	7/16/1999	<1	<1	<20	<5	<5	<5	<5
GW-4-9'	7/16/1999	<1	<1	<20	<5	<5	<5	<5
GW-5A-9'	7/16/1999	<1	<1	<20	<5	<5	<5	<5
GW-6A-10'	7/16/1999	<1	<1	<20	<5	<5	<5	<5
GW-7-9'	7/15/1999	<1	1.4	<20	<5	<5	<5	<5
GW-7-16'	7/15/1999	<1	<1	<20	<5	<5	<5	<5
GW-7-14'	7/15/1999	<1	<1	<20	<5	<5	<5	<5
GW-7-11'	7/15/1999	<1	<1	<20	<5	<5	<5	<5
GW-8-9'	7/16/1999	<1	<1	<20	<5	<5	<5	<5
GW-8-12'	7/16/1999	4.8	8.2	<20	<5	<5	<5	140.0
SOMA 3-2'	10/11/2001	4.5	7.2	ND	ND	ND	ND	ND
SOMA 3-4'	10/11/2001	ND	ND	ND	ND	ND	ND	ND
SOMA 3-6'	10/11/2001	ND	ND	ND	ND	ND	ND	ND
SOMA 3-8'	10/11/2001	690.0	1,200.0	ND	ND	ND	ND	ND
SOMA 3-10'	10/11/2001	1,900.0	3,200.0	ND	ND	ND	ND	ND
SOMA 3-12'	10/11/2001	250.0	420.0	ND	ND	ND	ND	ND
SOMA 3-14'	10/11/2001	210.0	360.0	ND	ND	ND	ND	ND
SOMA 3-16'	10/11/2001	ND	ND	ND	ND	ND	ND	ND
SOMA 3-18'	10/11/2001	ND	1.7	ND	ND	ND	ND	ND
SOMA 3-20'	10/11/2001	12.0	21.0	ND	ND	ND	ND	ND
SOMA 3-22'	10/12/2001	7.9	14.0	11.0	ND	8.8	6.8	53.0
SOMA 3-24'	10/12/2001	ND	ND	66.0	ND	ND	ND	ND
SOMA 3-26'	10/12/2001	ND	ND	79.0	ND	ND	ND	ND
SOMA 3-28'	10/12/2001	ND	ND	45.0	ND	ND	ND	ND
SOMA 3-30'	10/12/2001	ND	ND	29.0	ND	ND	ND	ND
SOMA 5-2'	10/12/2001	ND	ND	ND	ND	ND	ND	ND
SOMA 5-4'	10/12/2001	8.8	16.0	ND	ND	ND	ND	ND
SOMA 5-6'	10/12/2001	ND	1.7	ND	ND	ND	ND	ND
SOMA 5-8'	10/12/2001	100.0	170.0	ND	ND	ND	ND	ND
SOMA 5-10'	10/12/2001	290.0	490.0	ND	ND	ND	ND	ND
SOMA 5-12'	10/12/2001	4,500.0	7,300.0	ND	ND	ND	ND	ND
SOMA 5-14'	10/12/2001	2.5	4.5	ND	ND	ND	ND	ND
SOMA 5-16'	10/12/2001	4,500.0	7,600.0	ND	ND	ND	ND	ND
SOMA 5-18'	10/12/2001	16.0	28.0	8.7	ND	ND	ND	ND
SOMA 5-20'	10/12/2001	ND	ND	31.0	ND	ND	ND	ND
SOMA 5-22'	10/12/2001	2.0	3.7	ND	ND	ND	ND	ND
SOMA 5-24'	10/12/2001	ND	ND	27.0	ND	ND	ND	ND
SOMA 5-26'	10/12/2001	ND	ND	21.0	ND	ND	ND	ND
Blank	10/19/2001	ND	ND	ND	ND	ND	ND	ND

ND: Not Detected

NA: Not Analyzed

NS: Not Surveyed

Table 6
Analytical Results of Soil Samples Analyzed for Volatile Organic Compounds
Former Glovatorium Site
3820 Manila Avenue, Oakland, California

Sample ID	Date	Acetone (µg/Kg)	Cis-1,2-DCE (µg/Kg)	TCE (µg/Kg)	Propyl-benzene (µg/Kg)	PCE (µg/Kg)	1,2,4-Trimethylbenzene (µg/Kg)	Naphthalene (µg/Kg)
B-10-15.5'	8/22/1997	NA	NA	81,000	NA	1,300,000	NA	NA
B-10-16'	8/22/1997	NA	NA	270,000	NA	5,500,000	NA	NA
E-15-5'	9/14/1998	NA	ND	ND	NA	620	NA	NA
E-15-10'	9/14/1998	NA	340	ND	NA	ND	NA	NA
E-15-14.5'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-15-19'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-16-5'	9/14/1998	NA	7.9	ND	NA	ND	NA	NA
E-16-10'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-16-12.5'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-16-15.5'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-17-3'	9/14/1998	NA	230	7	NA	26	NA	NA
E-17-7'	9/14/1998	NA	390	120	NA	ND	NA	NA
E-17-14.5'	9/14/1998	NA	14	ND	NA	29	NA	NA
E-17-16.5'	9/14/1998	NA	ND	31	NA	850	NA	NA
E-17-19'	9/14/1998	NA	ND	ND	NA	39	NA	NA
E-18-3'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-18-7'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-18-14.5	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-18-17.5	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-19-5'	9/14/1998	NA	78	76	NA	2100	NA	NA
E-19-10'	9/14/1998	NA	ND	ND	NA	ND	NA	NA
E-19-13'	9/14/1998	NA	1800	ND	NA	ND	NA	NA
E-19-16'	9/14/1998	NA	61	ND	NA	39	NA	NA
E-19-18.5'	9/14/1998	NA	7.7	ND	NA	ND	NA	NA
E-20-11.75'	9/14/1998	NA	940	55	NA	ND	NA	NA
E-20-2.5'	9/14/1998	NA	1700	ND	NA	ND	NA	NA
E-20-5'	9/14/1998	NA	3200	ND	NA	ND	NA	NA
GW-1-8'	7/16/1999	NA	<4.8	<4.8	NA	140	NA	NA
GW-1-7'	7/16/1999	NA	<23	<23	NA	710	NA	NA
GW-4-9'	7/16/1999	NA	<4.6	<4.6	NA	<4.6	NA	NA
GW-5A-9'	7/16/1999	NA	<5	<5	NA	<5	NA	NA
GW-6A-10'	7/16/1999	NA	<5.1	<5.1	NA	<5.1	NA	NA
GW-7-9'	7/15/1999	NA	<5.1	<5.1	NA	<5.1	NA	NA
GW-7-16'	7/15/1999	NA	<4.9	<4.9	NA	<4.9	NA	NA
GW-7-14'	7/15/1999	NA	<4.6	<4.6	NA	<4.6	NA	NA
GW-7-11'	7/15/1999	NA	<4.9	<4.9	NA	<4.9	NA	NA
GW-8-9'	7/16/1999	NA	<4.6	<4.6	NA	50	NA	NA
GW-8-12'	7/16/1999	NA	<5	<5	NA	<5	NA	NA
SOMA 3-2'	10/11/01	<20	32.0	7.4	<4.9	50.0	<4.9	<4.9
SOMA 3-4'	10/11/01	130.0	58.0	39.0	<4.7	450 >LR	<4.7	<4.7
SOMA 3-6'	10/11/01	40.0	140.0	46.0	<4.8	210 >LR	<4.8	<4.8
SOMA 3-8'	10/11/01	<2000	<500	720.0	<500	34,000 >LR	<500	<500
SOMA 3-10'	10/11/01	<4000	<1000	1,400	<1000	1,400	<1000	9,300
SOMA 3-12'	10/11/01	<2000	<500	<500	<500	<500	680.0	<500
SOMA 3-14'	10/11/01	<500	<130	<130	210.0	<130	540.0	<130
SOMA 3-16'	10/11/01	24.0	100.0	<5.3	9.5	39.0	35.0	<5.3
SOMA 3-18'	10/11/01	20.0	280 >LR	11.0	<4.6	32.0	8.5	<4.6
SOMA 3-20'	10/11/01	25.0	50.0	<4.8	5.5	21.0	21.0	<4.8
SOMA 3-22'	10/12/01	100.0	180.0	<5.2	48.0	27.0	180.0	<9.7
SOMA 3-24'	10/12/01	<20	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
SOMA 3-26'	10/12/01	<5.1	9.3	<5.1	<5.1	<5.1	<5.1	<5.1
SOMA 3-28'	10/12/01	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
SOMA 3-30'	10/12/01	<20	<5	<5	<5	<5	<5	<5
SOMA 5-2'	10/12/01	<19	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
SOMA 5-4'	10/12/01	35.0	6.3	<4.8	5.8	<4.8	<4.8	<4.8
SOMA 5-6'	10/12/01	99.0	<5	<5	<5	<5	<5	<5
SOMA 5-8'	10/12/01	46.0	5.9	<4.8	<4.8	<4.8	<4.8	ND
SOMA 5-10'	10/12/01	<4000	<1000	<1000	4,600	<1000	4,200	2,900
SOMA 5-12'	10/12/01	57.0	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
SOMA 5-14'	10/12/01	<38	<9.6	<9.6	19.0	<9.6	21.0	<9.6
SOMA 5-16'	10/12/01	<20	<1000	<5	3,400	<5	3,700	2,800
SOMA 5-18'	10/12/01	<4000	<1000	<1000	6.5	<1000	7.4	6.2
SOMA 5-20'	10/12/01	<21	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2
SOMA 5-22'	10/12/01	23.0	<5.2	ND	12.0	ND	14.0	19.0
SOMA 5-24'	10/12/01	<19	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6
SOMA 5-26'	10/12/01	<19	<4.7	<4.7	<42	<4.7	<4.7	<4.7

Table 7
Summary of VOCs Detected in Soil
3820 Manila Avenue, Oakland, California

COPC	Maximum Reported Soil Matrix Concentration (mg/kg)	Sample Location and Depth	Date Sampled
Acetone	0.13	SOMA 3-4'	10/11/2001
cis-1,2-Dichloroethenene (cis, 1,2-DCE)	3.2	E-20-5'	9/14/1998
Trichloroethene (TCE)	1.4	SOMA 3-10'	10/11/2001
Propylbenzene	4.6	SOMA 5-10'	10/12/2001
Tetrachloroethene (PCE)	2.1	E-19-5'	9/14/1998
1,2,4-Trimethylbenzene (1,2,4-TMB)	4.2	SOMA 5-10'	10/12/2001
Naphthalene	9.3	SOMA 3-10'	10/11/2001
Toluene	0.66	E-19-10'	9/14/1998
Ethylbenzene	0.6	E-15-10'	9/14/1998
Xylenes	36	E-21-8.5'	9/14/1998

Table 8
Site Groundwater VOC Summary table
3820 Manila Avenue, Oaklnad, California

Well Identification	Average PCE Groundwater Concentration (µg/L)	Most Recent PCE Groundwater Concentration (µg/L)	Date Sampled	Average TCE Groundwater Concentration (µg/L)	Most Recent TCE Groundwater Concentration (µg/L)	Date Sampled	Average cis-1,2-DCE Groundwater Concentration (µg/L)	Most Recent cis-1,2-DCE Groundwater Concentration (µg/L)	Date Sampled	Most Recent trans-1,2-DCE Groundwater Concentration (µg/L)	Date Sampled	Most Recent Vinyl Chloride Groundwater Concentration (µg/L)	Date Sampled	Most Recebt 1,2-DCP Groundwater Concentration (µg/L)	Date Sampled
B-2	<1.3	<1.3	1/24/2000	<1.3	<1.3	1/24/2000	270	270	1/24/2000	1	1/24/2000	<1.3	1/24/2000	<1.3	1/24/2000
B-3	<2	<2	1/24/2000	<2	<2	1/24/2000	610	610	1/24/2000	<2	1/24/2000	<2	1/24/2000	<2	1/24/2000
B-7	4.7	<3.6	1/24/2000	5.9	<3.6	1/24/2000	928	920	1/24/2000	<3.6	1/24/2000	<3.6	1/24/2000	<3.6	1/24/2000
B-8	<0.5	<0.5	1/24/2000	<0.5	<0.5	1/24/2000	35	35	1/24/2000	<0.5	1/24/2000	<0.5	1/24/2000	<0.5	1/24/2000
B-9	<0.5	<0.5	1/24/2000	0.6	1	1/24/2000	3.2	3	1/24/2000	<0.5	1/24/2000	<0.5	1/24/2000	<0.5	1/24/2000
B-10	1,862	1,200	1/24/2000	1,618	2,400	1/24/2000	8,017	14,000	1/24/2000	90	1/24/2000	<63	1/24/2000	<63	1/24/2000
B-13	20	20	1/24/2000	29	29	1/24/2000	130	130	1/24/2000	5	1/24/2000	<0.5	1/24/2000	<0.5	1/24/2000
GW-2	34	57	1/28/2004	5.8	6.9	1/28/2004	3.6	<5	1/28/2004	<5	1/28/2004	<10	1/28/2004	<5	1/28/2004
GW-3	135	170	1/28/2004	2.8	<5	1/28/2004	5.5	<5	1/28/2004	<5	1/28/2004	<10	1/28/2004	<5	1/28/2004
GW-4	2.5	8.1	1/28/2004	<0.5	<5	1/28/2004	3.8	10	1/28/2004	<5	1/28/2004	<10	1/28/2004	<5	1/28/2004
GW-5	<0.5	<0.5	4/27/2000	<0.5	<0.5	4/27/2000	<0.5	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000
GW-6A	<0.5	<0.5	4/27/2000	<0.5	<0.5	4/27/2000	<0.5	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000
GW-8	111	120	4/28/2000	124	110	4/28/2000	34	29	4/28/2000	5	4/28/2000	2	4/28/2000	<0.5	4/28/2000
LFR-1	797	150	1/29/2004	41	23	1/29/2004	16	7.7	1/29/2004	<6.3	1/29/2004	<13	1/29/2004	<6.3	1/29/2004
LFR-2	2.6	<5	7/30/2003	2.5	<5	7/30/2003	39	11	7/30/2003	<5	7/30/2003	<10	7/30/2003	<5	7/30/2003
LFR-3	2.6	<5	1/29/2004	<0.5	<5	1/29/2004	<0.5	<5	1/29/2004	<5	1/29/2004	<10	1/29/2004	<5	1/29/2004
LFR-4	<0.5	<5	1/29/2004	<0.5	<5	1/29/2004	2.3	<5	1/29/2004	<5	1/29/2004	<10	1/29/2004	<5	1/29/2004
SOMA-1	5.4	19	1/29/2004	<0.5	<5	1/29/2004	11	44	1/29/2004	<5	1/29/2004	<10	1/29/2004	5.9	1/29/2004
SOMA-2	416	36	1/29/2004	154	<17	1/29/2004	2,825	430	1/29/2004	<17	1/29/2004	<33	1/29/2004	<17	1/29/2004
SOMA-3	28	<310	1/29/2004	29	<310	1/29/2004	405	7,700	1/29/2004	<310	1/29/2004	<630	1/29/2004	<310	1/29/2004
SOMA-4	<130	FP	7/29/2003	<130	FP	7/29/2003	2,600	FP	7/29/2003	FP	7/29/2003	FP	7/29/2003	FP	7/29/2003

Well Identification	Most Recent Benzene Groundwater Concentration (µg/L)	Date Sampled	Most Recent Ethylbenzene Groundwater Concentration (µg/L)	Date Sampled	Most Recent Toluene Groundwater Concentration (µg/L)	Date Sampled	Most Recent Xylenes, Total Groundwater Concentration (µg/L)	Date Sampled	Most Recent MtBE Groundwater Concentration (µg/L)	Date Sampled
GW-3	<5	1/28/2004	<5	1/28/2004	<5	1/28/2004	<5	1/28/2004	<5	1/28/2004
GW-4	<5	1/28/2004	<5	1/28/2004	<5	1/28/2004	<5	1/28/2004	<5	1/28/2004
GW-5	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000	<2	4/27/2000
GW-6A	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000	<0.5	4/27/2000	<2	4/27/2000
GW-8	<0.5	4/28/2000	<0.5	4/28/2000	<0.5	4/28/2000	<0.5	4/28/2000	<0.5	4/28/2000
LFR-1	<6.3	1/29/2004	<6.3	1/29/2004	<6.3	1/29/2004	<6.3	1/29/2004	<6.3	1/29/2004
LFR-2	NA	1/29/2004	NA	1/29/2004	NA	1/29/2004	NA	1/29/2004	NA	1/29/2004
LFR-3	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004
LFR-4	11	1/29/2004	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004
SOMA-1	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004	<5	1/29/2004	190	1/29/2004
SOMA-2	<17	1/28/2004	<17	1/28/2004	<17	1/28/2004	<17	1/28/2004	270	1/28/2004
SOMA-3	<310	1/29/2004	<310	1/29/2004	<310	1/29/2004	<310	1/29/2004	<310	1/29/2004
SOMA-4	FP	7/29/2003	FP	7/29/2003	FP	7/29/2003	FP	7/29/2003	FP	7/29/2003

Table 9
Estimated Off-site Groundwater Concentrations of Chlorinated Solvents
3820 Manila Avenue, Oakland, California

Chemicals of Ptential Concern (COPC)	Maximum Estimated Residential Groundwater Concentration (µg/L)	Average Estimated Residential Groundwater Concentration (µg/L)	Time to Reach Non-Detect (years)
Tetrachloroethene (PCE)	394	143	20
Trichloroethene (TCE)	293	85	11
cis-1,2-Dichloroethene (cis-1,2-DCE)	1564	421	12
Vinyl Chloride	31	14	8

Table 10
Default Physical parameters for Silty Clay Vadose Zone Soil
3820 manila Street, Oakland, California

	Water-Filled Porosity ϕ_w (cm^3/cm^3)	Air-Filled Porosity ϕ_a (cm^3/cm^3)	Total Porosity ϕ_t (cm^3/cm^3)	Soil Bulk Density β (g/cm^3)	Vadose Zone Soil Type	Average Soil/ Groundwater Temperature (°C)	Depth to Water Table (cm bgs)
Model Default Values, SC	0.197	0.153	0.35	1.72	SC	18	274.3

SC, Silty Clay

Table 11
Toxicity Criteria sor Soil Matrix VOCs
3820 Manila Avenue, Oakland, California

Chemical of Potential Concern (COPC)	Noncarcinogens		Carcinogens	
	Oral RfD (mg/kg-day)	Source	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Source
Soil Matrix VOCs				
Acetone	1.00E-01	*a*	N/A	
cis-1,2-Dichloroethene (cis, 1,2-DCE)	1.00E-02	*a*	N/A	
Trichloroethene (TCE)	3.00E-04	*a*	1.30E-02	*b*
Propylbenzene	4.00E-02	*a*	N/A	
Tetrachloroethene (PCE)	1.00E-02	*a*	5.40E-01	*b*
1,2,4-Trimethylbenzene (1,2,4-TMB)	5.00E-02	*a*	N/A	
Naphthalene	2.00E-02	*a*	N/A	
Toluene	2.00E-01	*a*	N/A	
Ethylbenzene	1.00E-01	*a*	N/A	
Xylenes	7.00E-01	*a*	N/A	
MTBE	8.60E-01	*a*	1.80E-03	*b*

a USEPA Integrated Risk Information System (IRIS), 2004.
b State of California, Office of Environmental Health Hazard Assessment (OEHHA)

Table 12
Toxicity Criteria, Johnson and Ettinger Vapor Intrusion Model
3820 Manila Avenue, Oakland, California

Chemicals	Inhalation Reference Dose (RfD_{i}) (mg/kg-day)	Reference Concentration (RfC) (mg/m^3)	Source	Inhalation Slope Factor SF_i $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk Factor $(\mu g/m^3)^{-1}$	Source
Benzene	1.7E-02	6.0E-02	*a*	1.0E-01	2.9E-05	*b*
Methy-tert-butyl ether (MTBE)	2.3E+00	8.0E+00	*a*	9.1E-04	2.6E-07	*b*
Tetrachloroethene (PCE)	1.0E-02	3.5E-02	*a*	2.1E-02	5.9E-06	*b*
Trichloroethene (TCE)	1.7E-01	6.0E-01	*a*	7.0E-03	2.0E-06	*b*
cis-1,2-Dichloroethene (cis-1,2-DCE)	1.0E-02	3.5E-02	*c*	N/A	N/A	
trans-1,2-Dihloroethene (trans-1,2-DCE)	2.0E-02	7.0E-02	*c*	N/A	N/A	
Vinyl Chloride	2.9E-02	1.0E-01	*c*	2.7E-01	7.8E-05	*b*
1,2-Dichloropropane (1,2-DCP)	1.1E-03	4.0E-03	*c*	3.6E-02	1.0E-05	*b*

a Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) Chronic RELs (August 2003)
b Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) Cancer Potency Values (June 2, 2004)
c EPA Integrated Risk Information System (IRIS)

Table 13
Summary of Risks and Hazards from Ingestion and Dermal Contact with Soil Matrix
3820 Maila Avenue, Oakland, California

Chemical of Concern	Maximum Soil Conc. (mg/kg)	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Cancer Risk	Oral Reference Dose (mg/kg-day)	Hazard Quotient
Acetone	0.13				1.00E-01	4.83E-06
cis-1,2-Dichloroethene (cis, 1,2-DCE)	3.2				1.00E-02	1.19E-03
Trichloroethene (TCE)	1.4	1.30E-02	7.00E-03	2.41E-08	3.00E-04	1.74E-02
Propylbenzene	4.6				4.00E-02	4.28E-04
Tetrachloroethene (PCE)	2.1	5.40E-01	2.10E-02	1.50E-06	1.00E-02	7.81E-04
1,2,4-Trimethylbenzene (1,2,4-TMB)	4.2				5.00E-02	3.12E-04
Naphthalene	9.3				2.00E-02	1.73E-03
Toluene	0.66				2.00E-01	1.23E-05
Ethylbenzene	0.6				1.00E-01	2.23E-05
Xylenes	36				7.00E-01	1.91E-04
MTBE	0.079	1.80E-03	9.10E-04	1.88E-10	8.60E-01	3.42E-07
			Total Risk	**1.5E-06**	**Total Hazard**	**0.02**

Table 14
Indoor Air Risks and Hazards for Future On-site Workers
3820 Manila Avenue, Oakland, California

Chemicals	Indoor Air Hazard Quotient	Indoor Air Cancer Risk
Benzene	4.8E-04	3.0E-07
MTBE	1.4E-04	4.0E-08
PCE	1.9E-01	1.4E-05
TCE	1.2E-02	5.2E-06
cis-1,2-DCE	1.0E+00	N/A
trans-1,2-DCE	4.3E-03	N/A
Vinyl chloride	1.5E-04	4.3E-07
1,2-DCP	2.8E-03	4.0E-08
Total	1.2	2.0E-05

Table 15
Maximum Off-site Residential Indoor Air Risks
3820 Manila Avenue, Oakland, California

Chemicals	Indoor Air Hazard Quotient	Indoor Air Cancer Risk
PCE	4.1E-02	3.6E-06
TCE	1.5E-03	7.6E-07
cis-1,2-DCE	1.1E-01	N/A
Vinyl chloride	2.4E-03	7.9E-06
Total	0.2	1.2E-05

Table 16
Average Residential Indoor Air Risks
3820 Manila Avenue, Oakland, California

Chemicals	Indoor Air Hazard Quotient	Indoor Air Cancer Risk
PCE	1.5E-02	8.7E-07
TCE	4.3E-04	8.1E-08
cis-1,2-DCE	3.0E-02	N/A
Vinyl chloride	1.1E-03	9.5E-07
Total	0.05	1.9E-06

FIGURES

N

approximate scale in feet

0 250 500

Figure 1: Site vicinity map.

SOMA ENVIRONMENTAL ENGINEERING, INC.

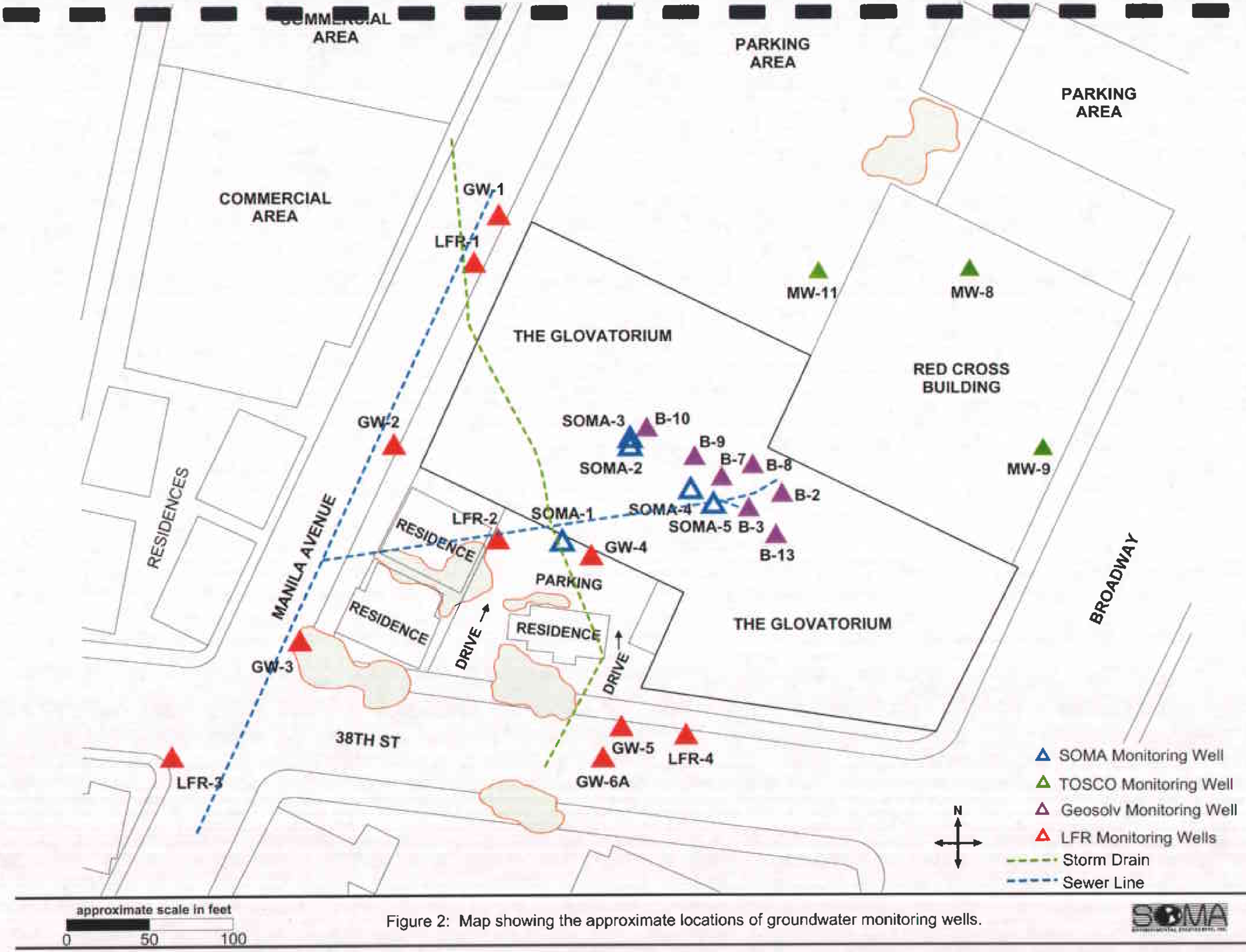
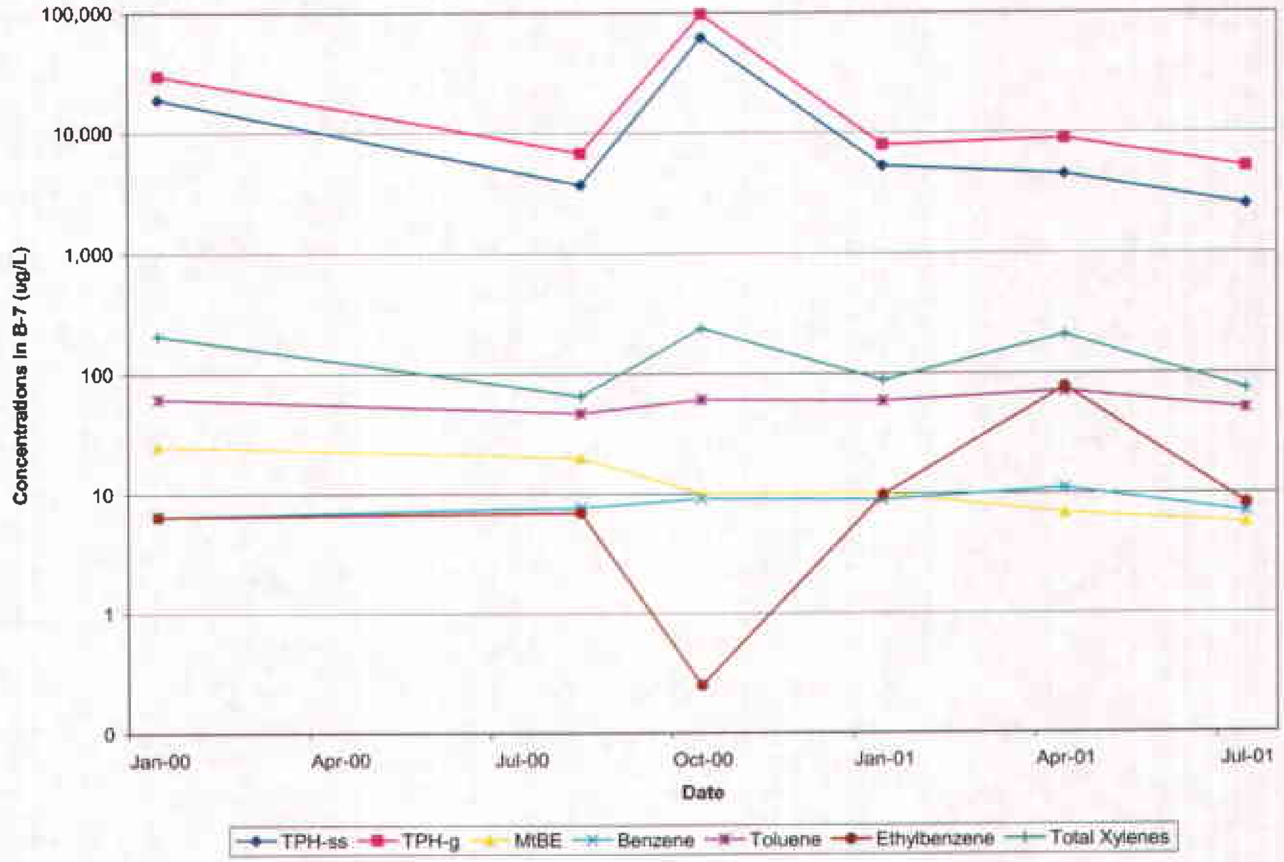


Figure 2: Map showing the approximate locations of groundwater monitoring wells.



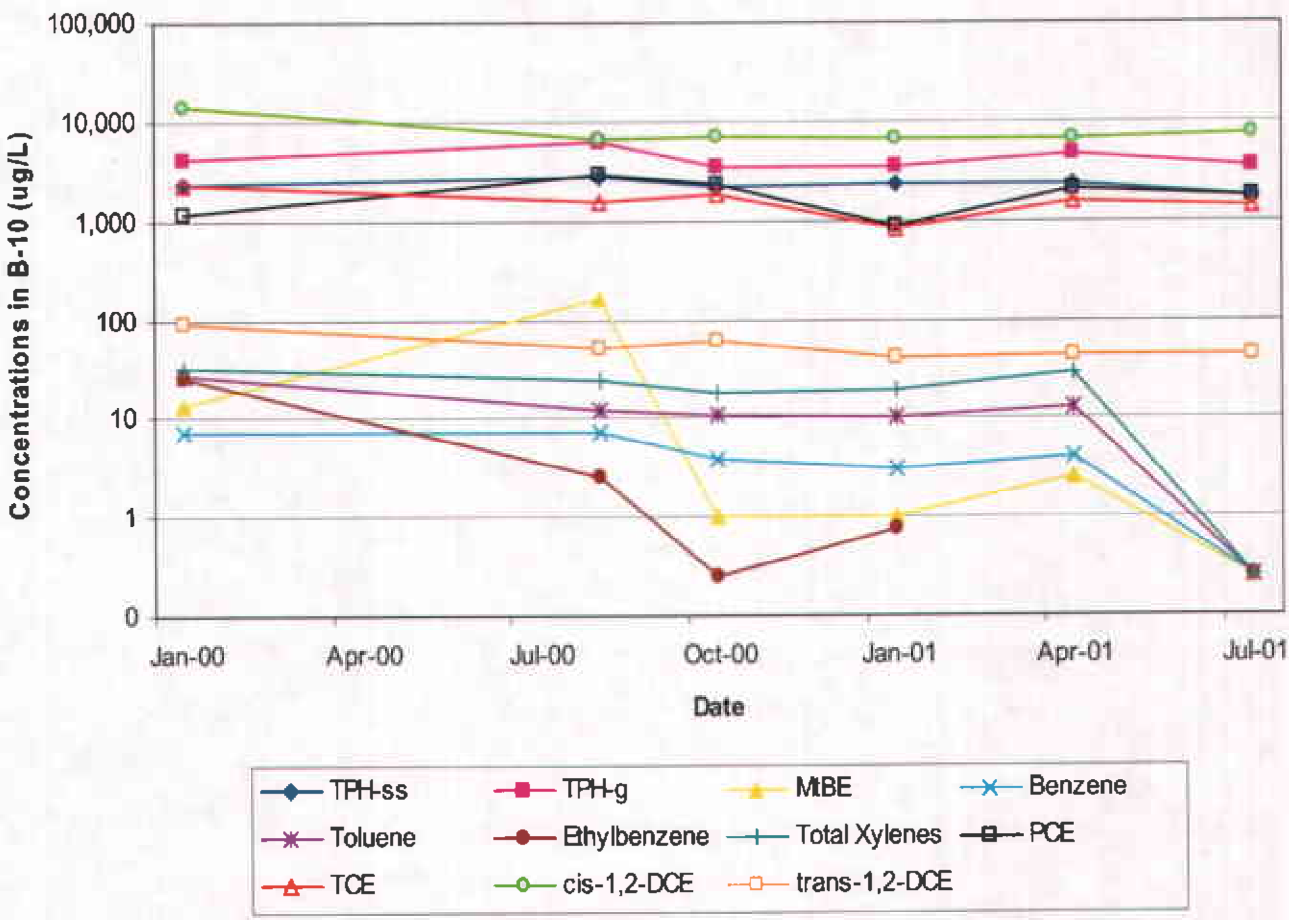
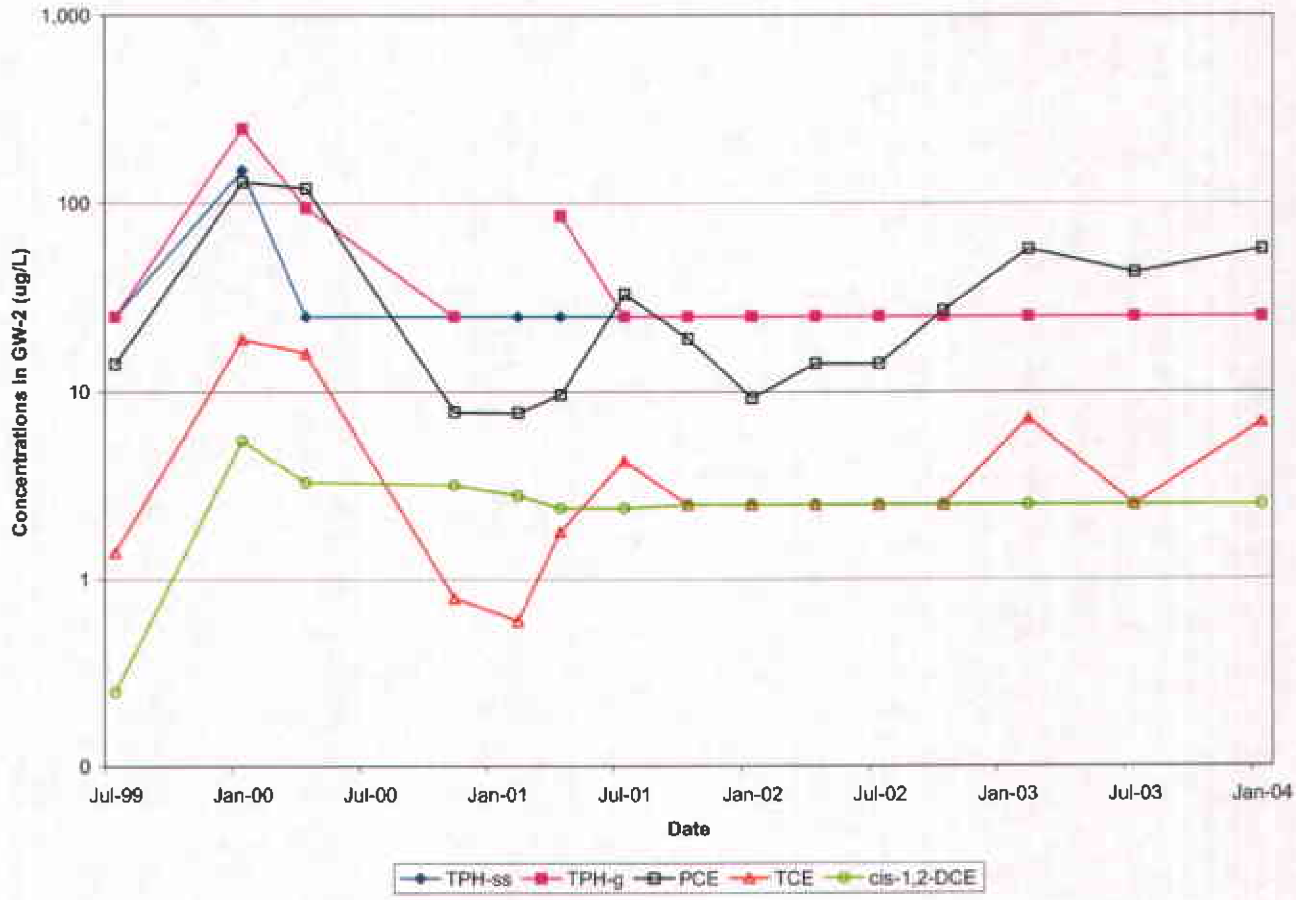


Figure 3: Concentration trends of chemicals detected in B-7 and B-10.

SOMA



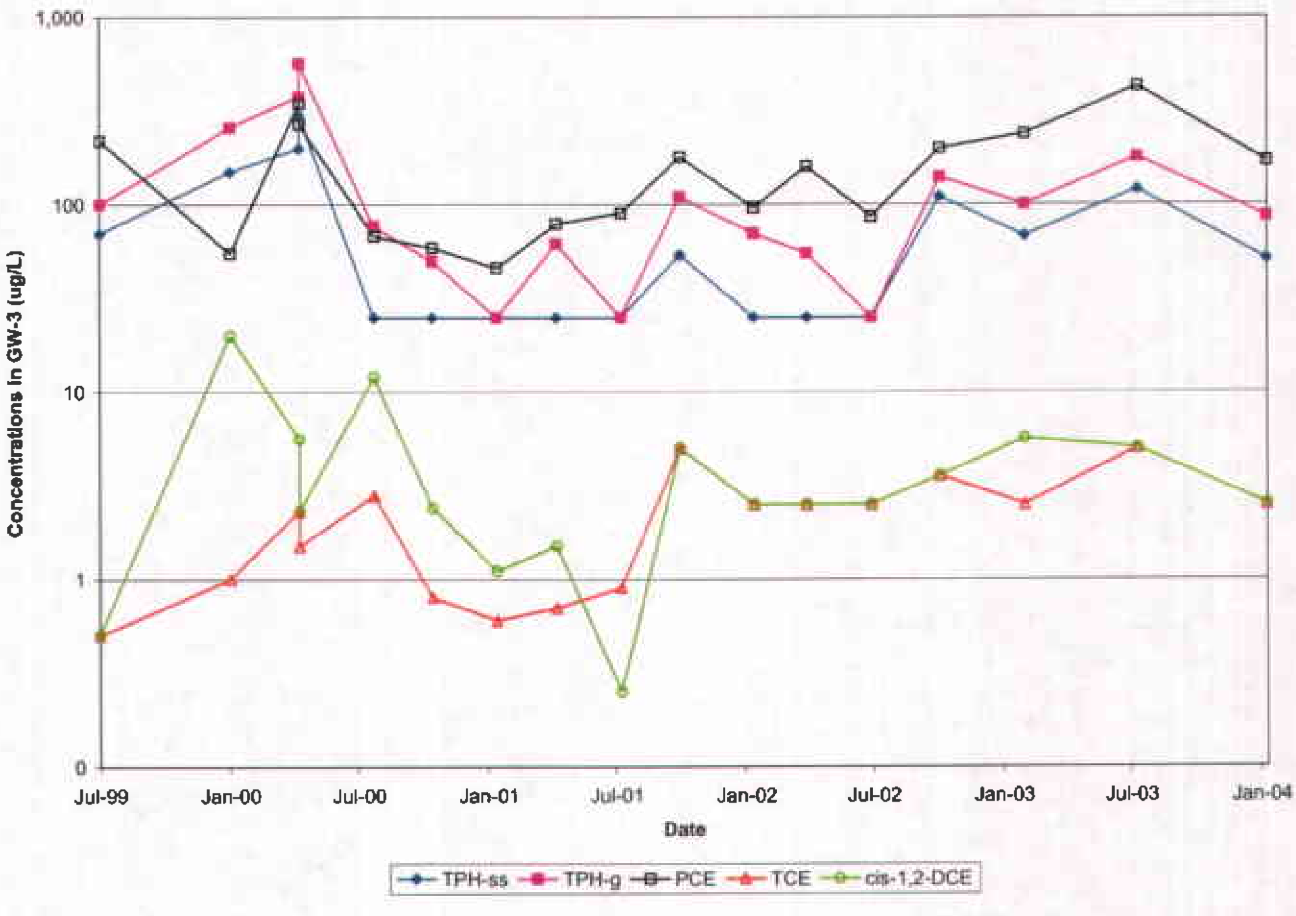


Figure 4: Concentration trends of chemicals detected in GW-2 and GW-3.

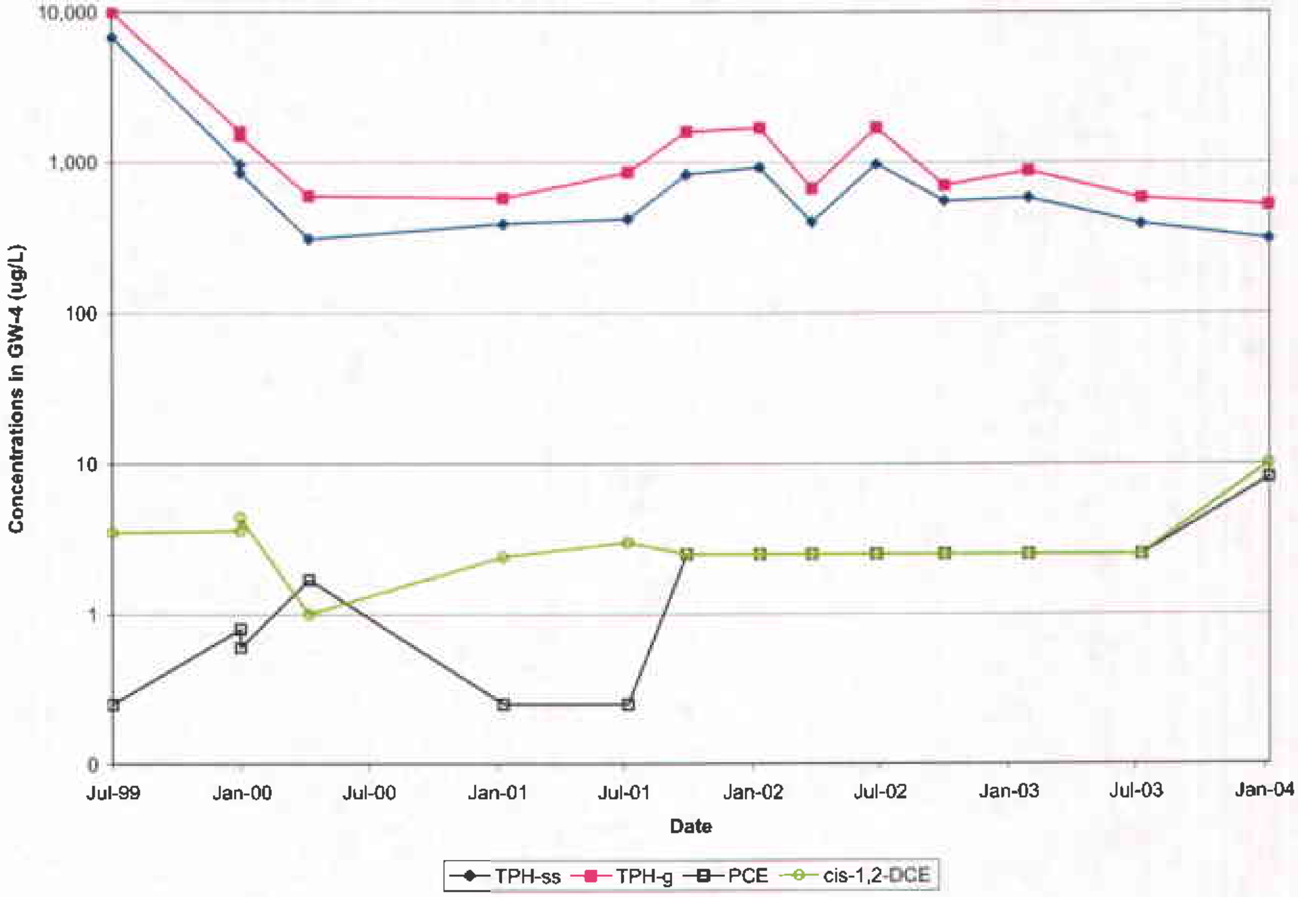
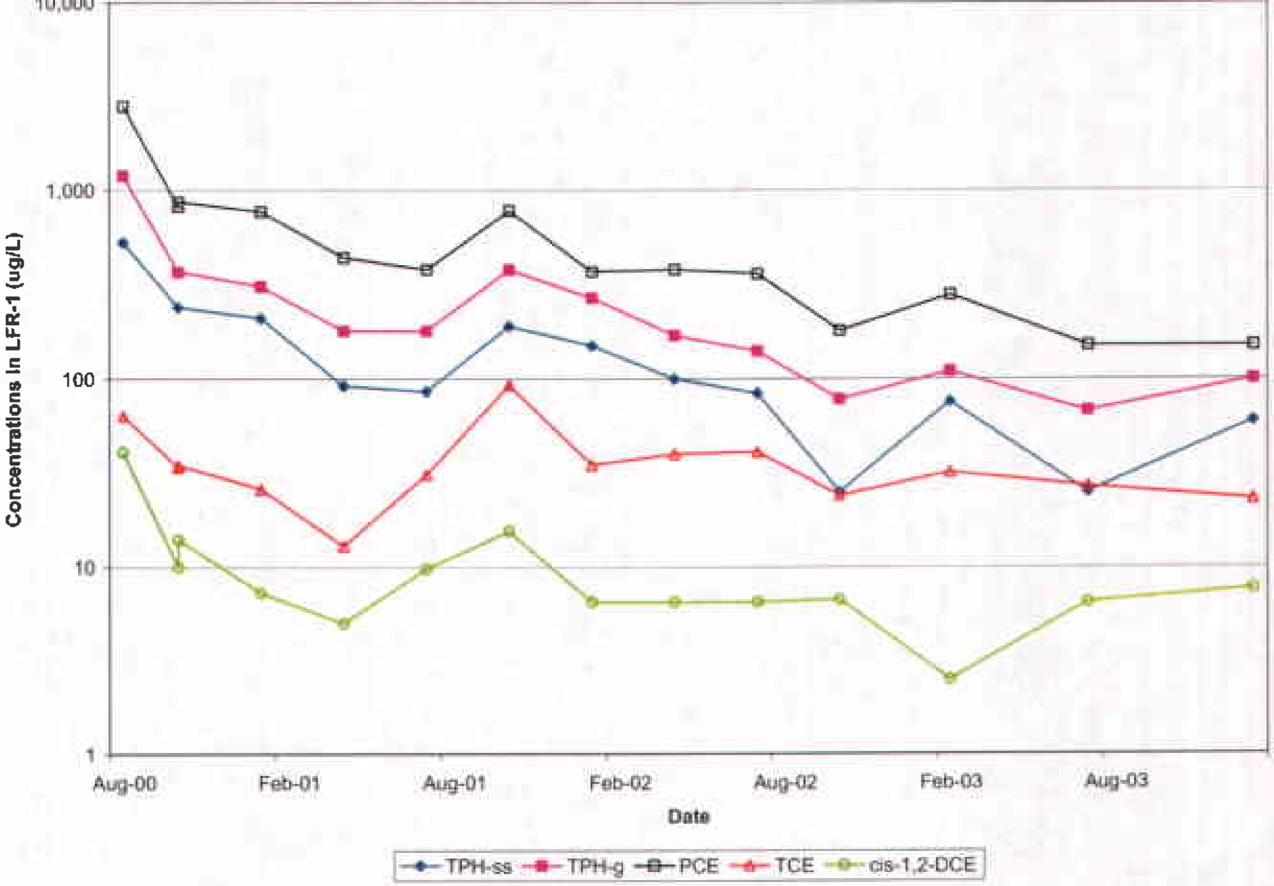


Figure 5: Concentration trends of chemicals detected in GW-4 and GW-5.



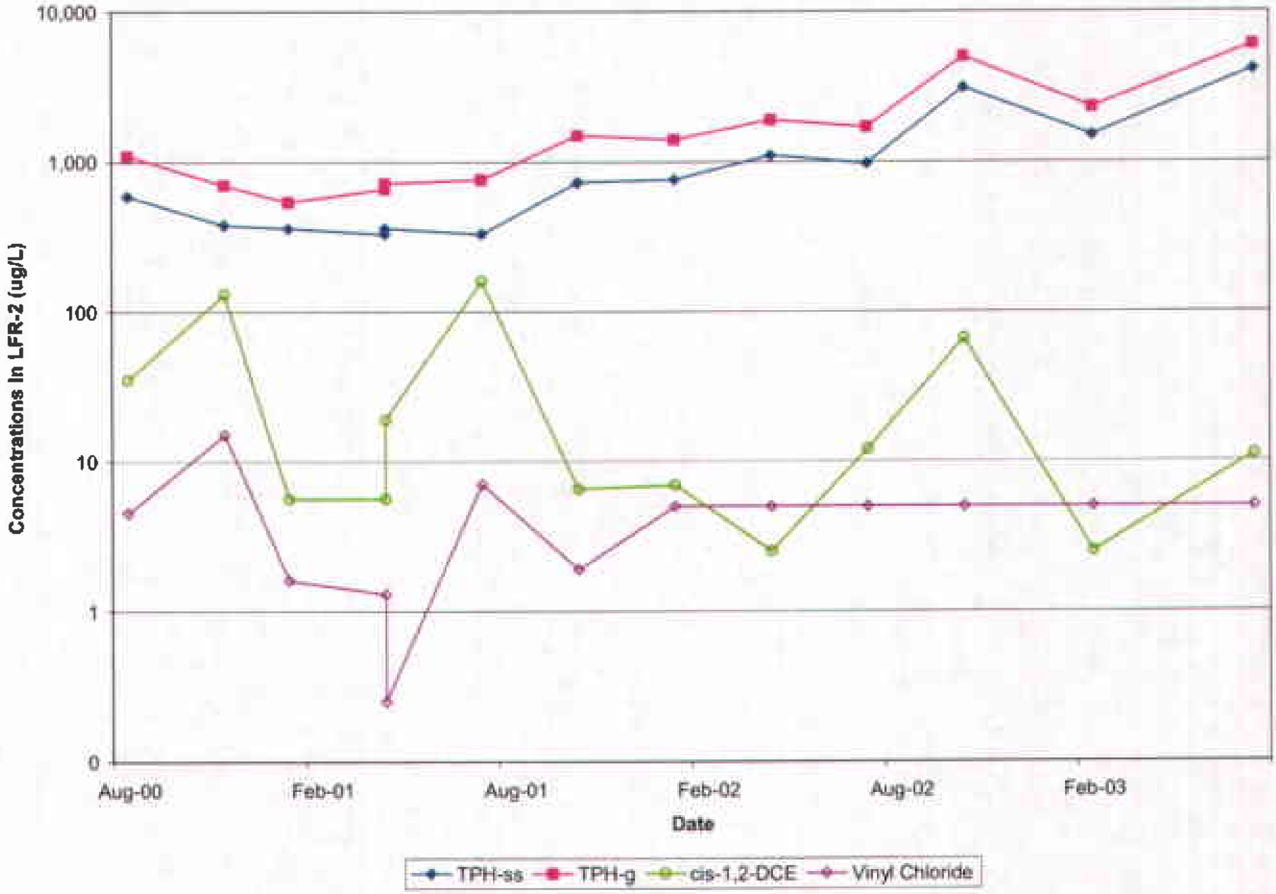
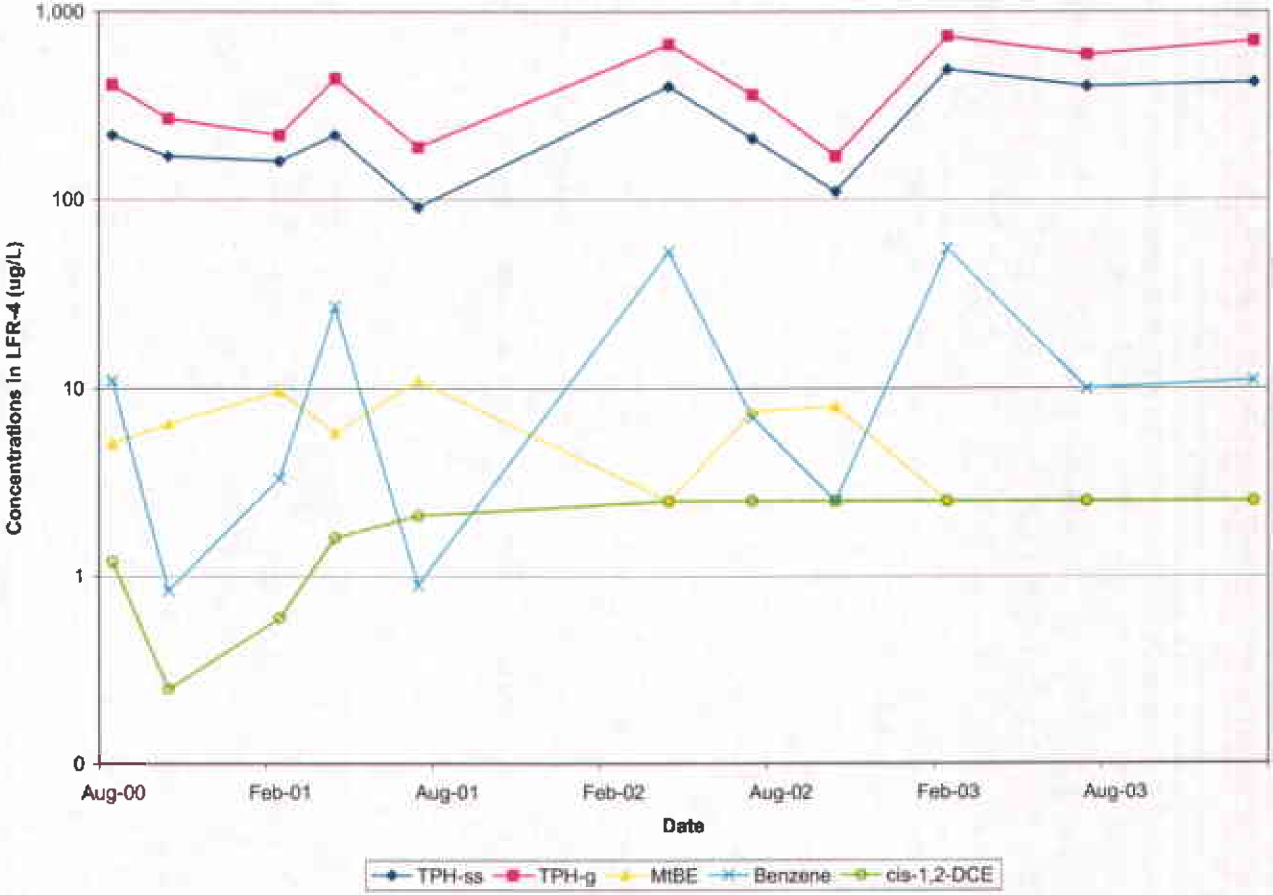


Figure 6: Concentration trends of chemicals detected in LFR-1 and LFR-2.



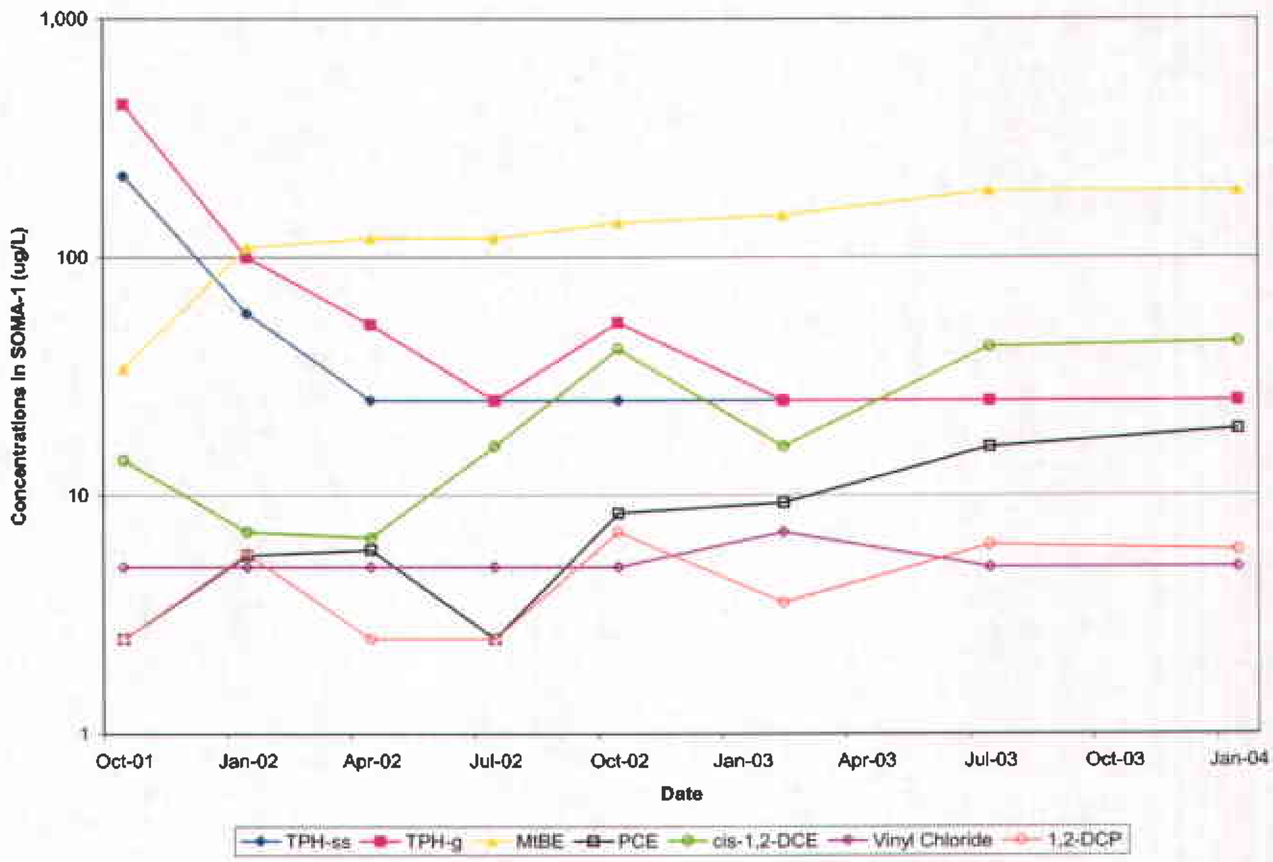
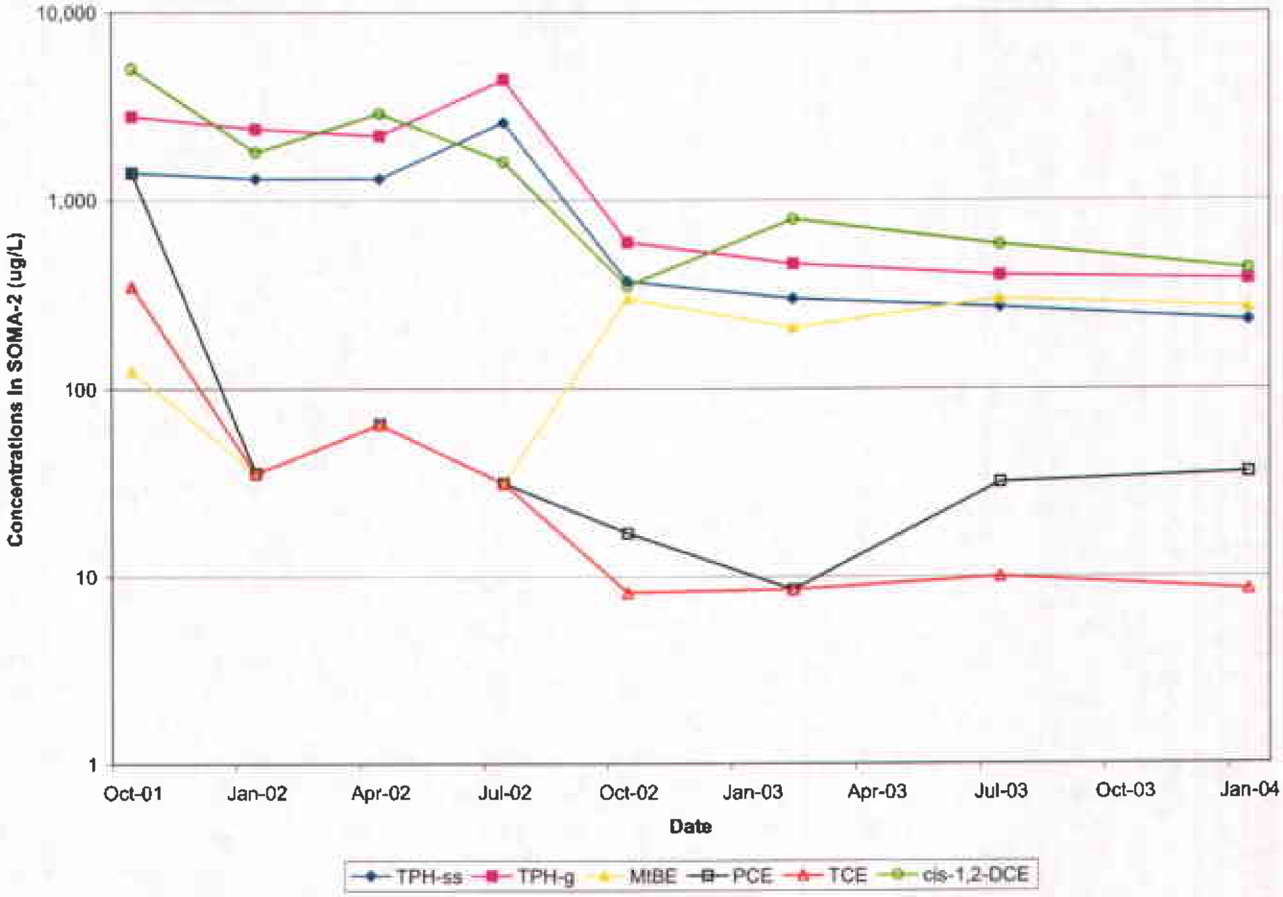


Figure 7: Concentration trends of chemicals detected in LFR-4 and SOMA-1.



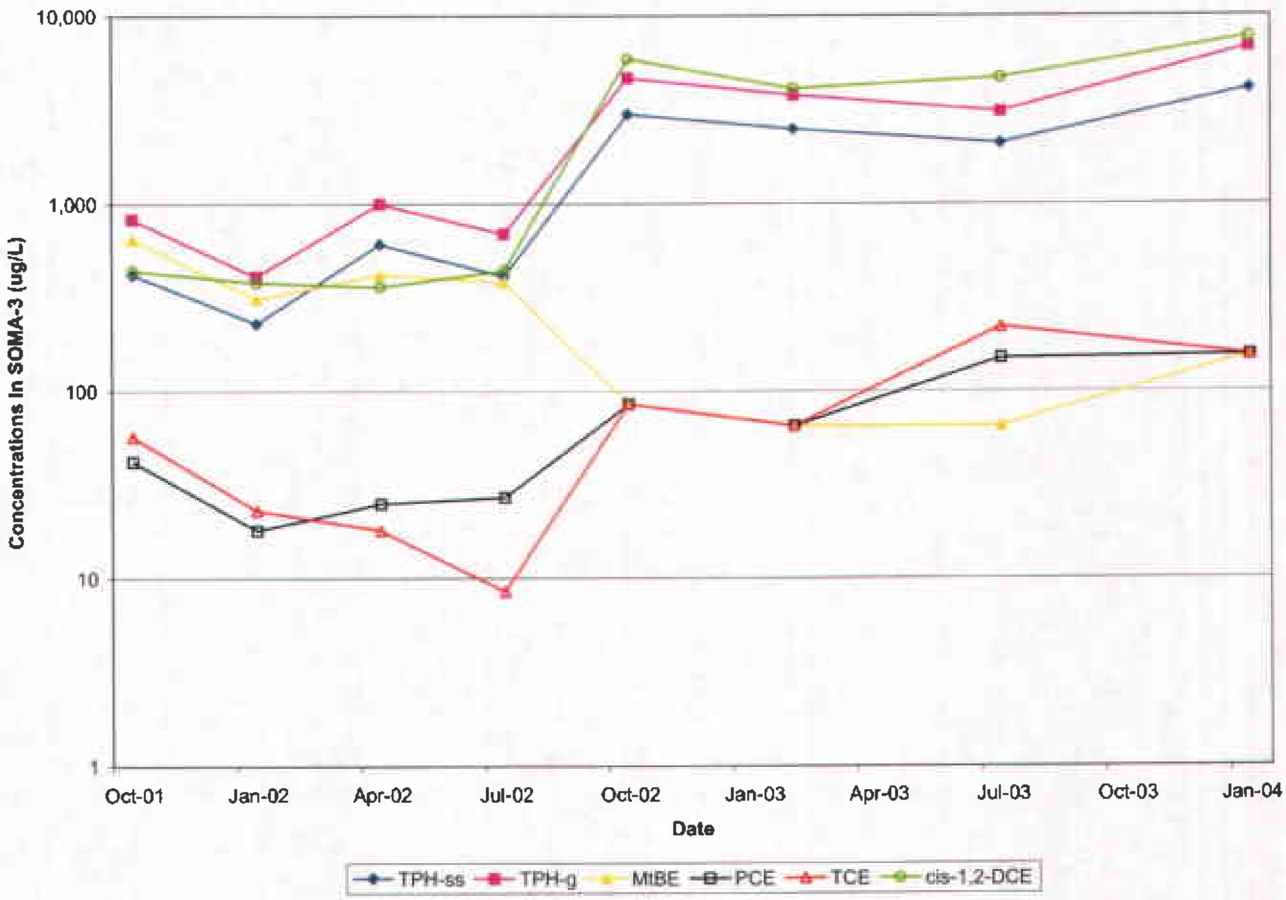
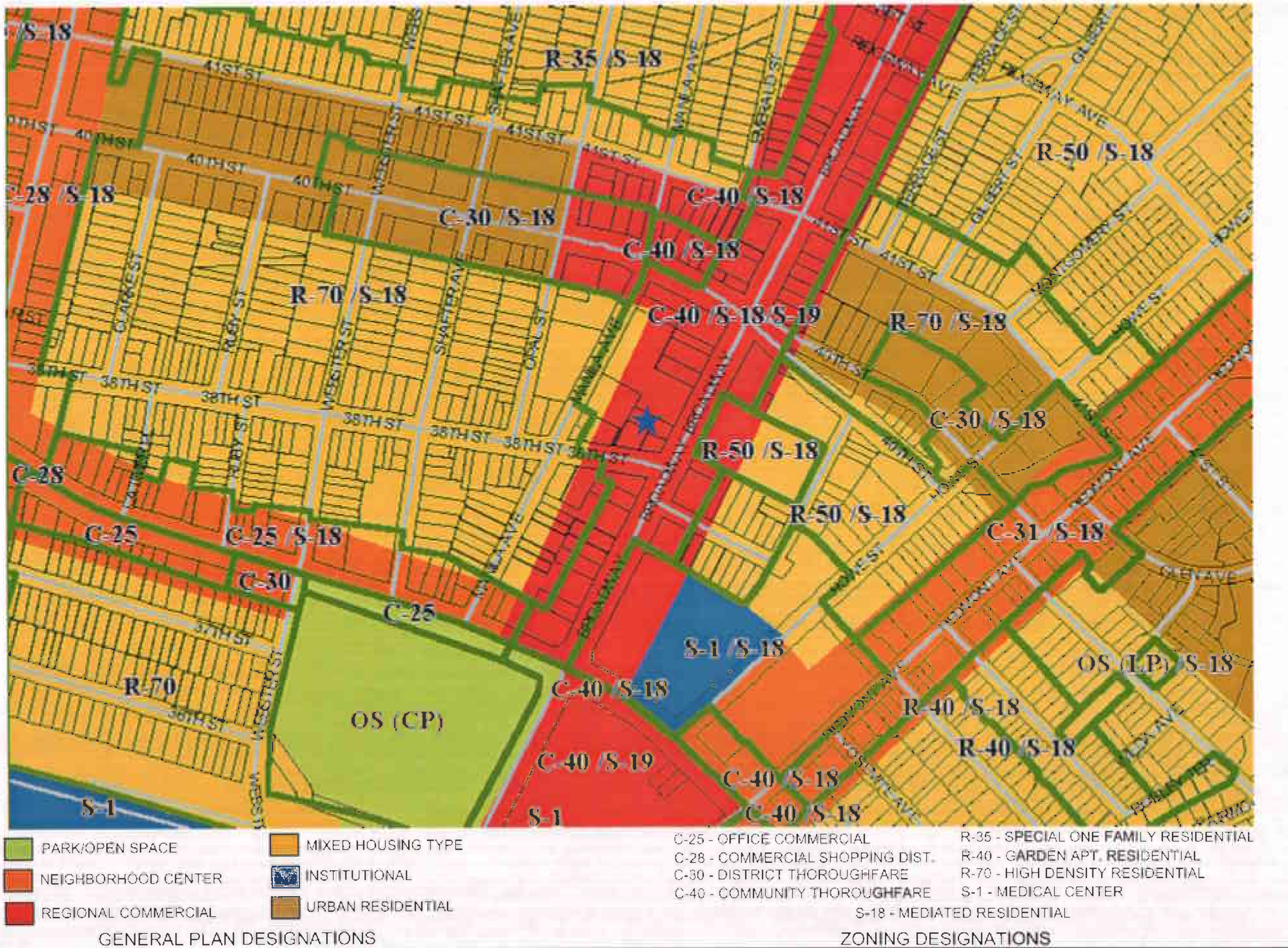


Figure 8: Concentration trends of chemicals detected in SOMA-2 and SOMA-3.



approximate scale in feet
0 500

Figure 9: Generalized zoning map of areas in the vicinity of 3820 Manila Ave, Oakland, CA.

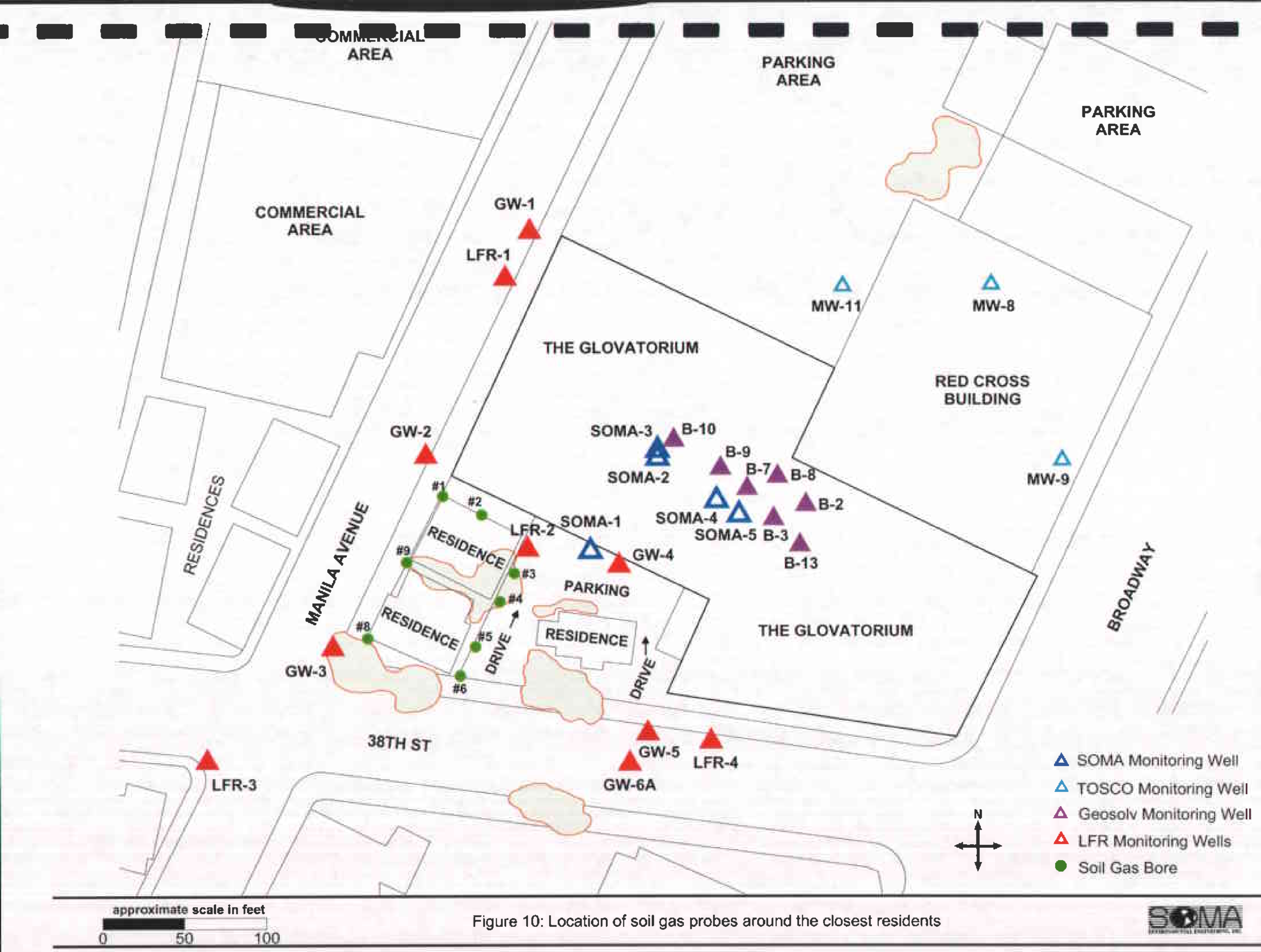


Figure 10: Location of soil gas probes around the closest residents

Appendix A

State Water Board Resolution 88-63

STATE WATER RESOURCES CONTROL BOARD

RESOLUTION NO. 88-63

ADOPTION OF POLICY ENTITLED

"SOURCES OF DRINKING WATER"

WHEREAS

1. California Water Code Section 13140 provides that the State Board shall formulate and adopt State Policy for Water Quality Control; and,

2. California Water Code Section 13240 provides that Water Quality Plans "shall conform" to any State Policy for Water Quality Control; and,

3. The Regional Boards can conform the Water Quality Control Plans to this policy by amending the plans to incorporate the policy; and,

4. The State Board must approve any conforming amendments pursuant to Water Code Section 13245; and,

5. "Sources of drinking water" shall be defined in the Water Quality Control Plans as those water bodies with beneficial uses designated as suitable, or potentially suitable, for municipal or domestic water supply (MUN); and,

6. The Water Quality Control Plans do not provide sufficient detail in the description of water bodies designated MUN to judge clearly what is, or is not, a source of drinking water for various purposes.

THEREFORE BE IT RESOLVED:

All surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards[1] with the exception of:

1. Surface and ground waters where:

a. The total dissolved solids (TDS) exceed 3,000 mg/L (5,000 uS/cm, electrical conductivity) and it is not reasonably expected by Regional Boards to supply a public water system, or

b. There is contamination, either by natural processes or by human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices, or

c. The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

2. Surface Waters Where:

a. The water is in systems designed or modified to collect or treat municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards; or,

b. The water is in systems designed or modified for the primary purpose of conveying or holding agricultural drainage waters, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards.

3. Ground water where:

The aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations, Section 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR, Section 261.3.

4. Regional Board Authority to Amend Use Designations:

Any body of water which has a current specific designation previously assigned to it by a Regional Board in Water Quality Control Plans may retain that designation at the Regional Board's discretion. Where a body of water is not currently designated as MUN but, in the opinion of a Regional Board, is presently or potentially suitable for MUN, the Regional Board shall include MUN in the beneficial use designation.

The Regional Boards shall also assure that the beneficial uses of municipal and domestic supply are designated for protection wherever those uses are presently being attained, and assure that any changes in beneficial use designations for waters of the State are consistent with all applicable regulations adopted by the Environmental Protection Agency.

The Regional Boards shall review and revise the Water Quality Control Plans to incorporate this policy.

---

1 This policy does not affect any determination of what is a potential source of drinking water for the limited purposes of maintaining a surface impoundment after June 30, 1988, pursuant to Section 25208.4 of the Health and Safety Code.

CERTIFICATION

The undersigned, Administrative assistant to the Board, does hereby certify that the foregoing is a full, true, and correct copy of a policy duly and regularly adopted at a meeting of the State Water Resources Control Board held on May 19, 1988.

/s/

Maureen Marché

Administrative Assistant to the Board

Appendix B

Laboratory Analysis and Chain of Custody Forms

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L   R E P O R T

Prepared for:

SOMA Environmental Engineering Inc.
2680 Bishop Dr.
Suite 203
San Ramon, CA 94583

Date: 27-AUG-04
Lab Job Number: 174018
Project ID: 2512
Location: Fmr Glovatorium-Oakland

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signatures. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis.

Reviewed by: ______________________
Project Manager

Reviewed by: ______________________
Operations Manager

NELAP # 01107CA

Curtis & Tompkins, Ltd.
Analytical Laboratory Since 1878
2323 Fifth Street
Berkeley, CA 94710
(510) 486-0900 Phone
(510) 486-0532 Fax

CHAIN OF CUSTODY

C & T LOGIN #: 174018

Sampler: ERIC JENNINGS

Project No.: 2512

Report To: JOYCE BOBEK

Project Name: FORMER GLOVATORIUM; 5820 MANILLA AVE; OAKLAND

Company: SOMA ENV ENG

Project P.O.: ——

Telephone: 925 244-6600

Turnaround Time: STANDARD

Fax: 925 244-6601

Lab No.	Sample ID.	Sampling Date Time	Matrix: Soil	Matrix: Water	Matrix: Waste		# of Containers	Preservative: HCL	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: ICE		Analysis: BULK DENSITY	Analysis: TOC	Analysis: TOTAL LEAD
-1	SGB-NO5-5.5'	AUG,16,2004 12^15	X				1							X	X
-2	SGB-NO5.5-6'	12^00	X				1						X		
-3	SGB-SO5-5.5'	11^30	X				1							X	X
-4	SGB-SO5.5-6'	11^20	X				1						X		

Received ☐ On Ice ☒ Cold ☐ Ambient ☒ Intact

Notes: EDF REQUIRED

SAMPLE RECEIPT
☐ Intact ☐ Cold
☐ On Ice ☐ Ambient
Preservative Correct?
☐ Yes ☐ No ☐ N/A

RELINQUISHED BY:	DATE / TIME	RECEIVED BY:	DATE / TIME
E [signature]	AUG,16,2004/ 2:15	[signature]	8/16/04 14:45

SIGNATURE

Curtis & Tompkins, Ltd.

Lead

Lab #:	174018	Location:	Fmr Glovatorium-Oakland
Client:	SOMA Environmental Engineering Inc.	Prep:	EPA 3050
Project#:	2512	Analysis:	EPA 6010B
Analyte:	Lead	Batch#:	93797
Matrix:	Soil	Sampled:	08/16/04
Units:	mg/Kg	Received:	08/16/04
Basis:	as received	Prepared:	08/16/04
Diln Fac:	1.000	Analyzed:	08/17/04

Field ID	Type	Lab ID	Result	RL
SGB-N@5-5.5'	SAMPLE	174018-001	5.7	0.11
SGB-S@5-5.5'	SAMPLE	174018-003	5.0	0.098
	BLANK	QC261393	ND	0.15

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Lead

Lab #:	174018	Location:	Fmr Glovatorium-Oakland
Client:	SOMA Environmental Engineering Inc.	Prep:	EPA 3050
Project#:	2512	Analysis:	EPA 6010B
Analyte:	Lead	Diln Fac:	1.000
Matrix:	Soil	Batch#:	93797
Units:	mg/Kg	Prepared:	08/16/04
Basis:	as received	Analyzed:	08/17/04

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC261394	100.0	91.50	92	80-120		
BSD	QC261395	100.0	97.50	98	80-120	6	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Lead

Lab #:	174018	Location:	Fmr Glovatorium-Oakland
Client:	SOMA Environmental Engineering Inc.	Prep:	EPA 3050
Project#:	2512	Analysis:	EPA 6010B
Analyte:	Lead	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	93797
MSS Lab ID:	174026-003	Sampled:	08/11/04
Matrix:	Soil	Received:	08/11/04
Units:	mg/Kg	Prepared:	08/16/04
Basis:	as received	Analyzed:	08/17/04

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC261396	32.69	71.43	101.4	96	47-126		
MSD	QC261397		105.3	137.4	99	47-126	2	28

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Total Organic Carbon (TOC)

Lab #:	174018	Location:	Fmr Glovatorium-Oakland
Client:	SOMA Environmental Engineering Inc.	Prep:	METHOD
Project#:	2512	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Batch#:	93819
Matrix:	Soil	Sampled:	08/16/04
Units:	%	Received:	08/16/04
Basis:	as received	Analyzed:	08/17/04
Diln Fac:	1.000		

Field ID	Type	Lab ID	Result	RL
SGB-N@5-5.5'	SAMPLE	174018-001	0.05	0.01
SGB-S@5-5.5'	SAMPLE	174018-003	0.23	0.01
	BLANK	QC261485	ND	0.01

ND= Not Detected
RL= Reporting Limit

DRY BULK DENSITY OF IN-PLACE SOIL

(METHODOLOGY: ASTM D2937)

PROJECT NAME: N/A
PROJECT NO: 174018

		METHODOLOGY:	MEASURED
SAMPLE ID.	DEPTH, ft.	TOTAL SAMPLE VOLUME cc	DRY BULK DENSITY, g/cc
SGB-N@5.5-6	N/A	24.62	1.72
SGB-S@5.5-6	N/A	25.58	1.84

APPENDIX C

On-Site Johnson and Ettinger Model Outputs

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (μg/L)	Chemical
127184	1.86E+03	Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vandose zone soil vapor permeability, k_v (cm²)	**ENTER** Vadose zone SCS soil type (Lookup Soil Parameters)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	**ENTER** Vadose zone soil total porosity, n^V (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**ENTER** Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.4E-05	1.9E-01

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	2.40E+03	Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
5.2E-06	1.2E-02

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
156592	1.40E+04	cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	3.50E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.0E+00

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156605	9.00E+01	trans-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm²)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	6.30E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	4.3E-03

MESSAGE SUMMARY BELOW:

END

]

Appendix D

Maximum Off-Site Johnson and Ettinger Model Outputs

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
75014	2.00E+00	Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	8.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.3E-07	1.5E-04

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
78875	5.90E+00	1,2-Dichloropropane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.0E-08	2.8E-03

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71432	1.10E+01	Benzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm²)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.79E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.0E-07	4.8E-04

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (μg/L)	Chemical
1634044	2.70E+02	MTBE

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vandose zone soil vapor permeability, k_v (cm²)	**ENTER** Vadose zone SCS soil type (Lookup Soil Parameters)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	**ENTER** Vadose zone soil total porosity, n^V (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**ENTER** Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)
1.0E-06	1	70	25	25	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	5.10E+07	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.0E-08	1.4E-04

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	3.94E+02	Tetrachloroethylene

Max. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.6E-06	4.1E-02

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
79016	2.93E+02	Trichloroethylene

Max. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm²)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
7.6E-07	1.5E-03

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
156592	1.56E+03	cis-1,2-Dichloroethylene

Max. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm²)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	3.50E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.1E-01

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
75014	3.10E+01	Vinyl chloride (chloroethene)

Max. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
7.9E-06	2.4E-03

MESSAGE SUMMARY BELOW:

END

Appendix E

Average Off-Site Johnson and Ettinger Model Outputs

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical	
127184	1.43E+02	Tetrachloroethylene	Avg. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	274.3	SC	18	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm²)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm³/cm³)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	20	20	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.7E-07	1.5E-02

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	8.50E+01	Trichloroethylene

Avg. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

Lookup Soil Parameters

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	11	11	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.1E-08	4.3E-04

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156592	4.21E+02	cis-1,2-Dichloroethylene

Avg. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	12	12	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	3.50E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	3.0E-02

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
ersion 3.0; 04/0

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC / HERD
Version 3.0-mod2;11/1/03
Default for Fine Soil

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75014	1.40E+01	Vinyl chloride (chloroethene)

Avg. Off-Site Groundwater Conc.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	274.3	SC	18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SC			SC	1.63	0.385	0.197

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	8	8	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
9.5E-07	1.1E-03

MESSAGE SUMMARY BELOW:

END

1

APPENDIX F

Sensitive Receptor Survey

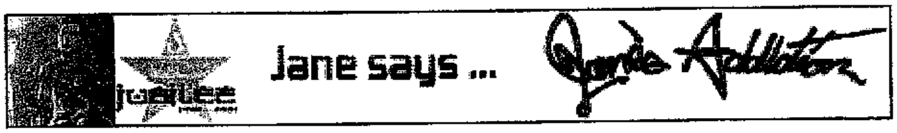
Classifieds | Shopping | Travel | Health | Yellow Pages | Maps & Directions | Silicon\

» White Pages » Em

BayArea•com Yellow Pages

powered by S

Local Guide | News | Entertainment | Sports | Cars | Real Estate |



Home → Find a Business → Schools

Schools near Oakland, CA (View Related Categories)

shown17-20

Services

- Yellow Pages
- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

Modify Search | New Search | Help

PREVIOUS PAGE NEXT PAGE

Midrasha Oakland
2808 Summit St — 0.78 mi.
Oakland, CA ZipCode
Phone: (510)444-6744
Map | Directions | What's Nearby[SM]

Westlake Middle School
2629 Harrison St — 0.81 mi.
Oakland, CA ZipCode
Phone: (510)879-2130
Map | Directions | What's Nearby[SM]

Longfellow Elementary School
3877 Lusk St — 0.84 mi.
Oakland, CA ZipCode
Phone: (510)879-1350
Map | Directions | What's Nearby[SM]

Far West Alternative School
5263 Broadway Ter — 0.87 mi.
Oakland, CA ZipCode
Phone: (510)879-1580
Map | Directions | What's Nearby[SM]

PREVIOUS PAGE NEXT PAGE

Modify Search | New Search | Help

Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Home → Find a Business → Schools

Schools near Oakland, CA (View Related Categories)

shown25-28

Services

- Yellow Pages
- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

Modify Search | New Search | Help

PREVIOUS PAGE NEXT PAGE

St Paul's Episcopal School
116 Montecito Ave — 1.03 mi.
Oakland, CA ZipCode
Phone: (510)287-9600
Map | Directions | What's Nearby[SM]

Foster Elementary School
2850 West St — 1.06 mi.
Emeryville, CA ZipCode
Phone: (510)879-2080
Map | Directions | What's Nearby[SM]

St Andrews Missionary Baptist
2624 West St — 1.12 mi.
Oakland, CA ZipCode
Phone: (510)465-8023
Map | Directions | What's Nearby[SM]

Lakeview Early Childhood Ctr
746 Grand Ave — 1.18 mi.
Oakland, CA ZipCode
Phone: (510)879-0857
Map | Directions | What's Nearby[SM]

PREVIOUS PAGE NEXT PAGE

Modify Search | New Search | Help

Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

BayArea.com Yellow Pages

Schools near Oakland, CA (View Related Categories)

shown 21-24

Modify Search | New Search | Help

PREVIOUS PAGE NEXT PAGE

Longfellow Early Childhood Ctr
880 39th St — 0.92 mi.
Oakland, CA ZipCode
Phone: (510)879-0826
Map | Directions | What's Nearby℠

Alhambra Academy
666 Bellevue Ave — 0.95 mi.
Oakland, CA ZipCode
Phone: (510)530-9406
Map | Directions | What's Nearby℠

Harriet R Tubman Childhood Ctr
880 33rd St — 0.98 mi.
Oakland, CA ZipCode
Phone: (510)879-0825
Map | Directions | What's Nearby℠

Hoover Elementary School
890 Brockhurst St — 1.01 mi.
Oakland, CA ZipCode
Phone: (510)879-1700
Map | Directions | What's Nearby℠

PREVIOUS PAGE NEXT PAGE

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Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Click here to visit other REAL Cities sites

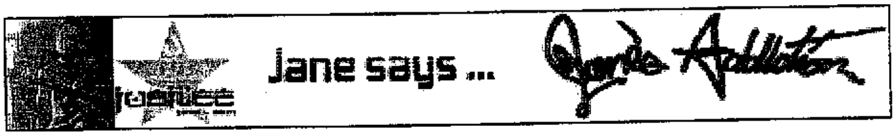
Classifieds | Shopping | Travel | Health | Yellow Pages | Maps & Directions | Silicon\

» White Pages » Em

BayArea•com Yellow Pages

powered by S

Local Guide | News | Entertainment | Sports | Cars | Real Estate |



Home → Find a Business → Hospitals

Hospitals near Oakland, CA (View Related Categories)

shown1-4

Services

- Yellow Pages
- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

Modify Search | New Search | Help

NEXT PAGE

Kaiser Foundation Hospital
280 W Macarthur Blvd — 0.14 mi.
Oakland, CA 94611-5642
Phone: (510)596-1000
Map | Directions | What's Nearby[SM]

Thunder Road Community Day Sc
390 40th St — 0.18 mi.
Oakland, CA 94609-2633
Phone: (510)653-5040
Map | Directions | What's Nearby[SM]

Surgery Center
3875 Telegraph Ave — 0.42 mi.
Oakland, CA 94609-2428
Phone: (510)547-2244
Map | Directions | What's Nearby[SM]

Summit Medical Ctr
350 Hawthorne Ave — 0.48 mi.
Oakland, CA 94609-3100
Phone: (510)655-4000
Map | Directions | What's Nearby[SM]

NEXT PAGE

Modify Search | New Search | Help

Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Hospitals near Oakland, CA (View Related Categories)

shown5-8

Mc Clure Rehabilitation Hosp
2910 Mcclure St — 0.74 mi.
Oakland, CA ZipCode
Phone: (510)836-3677
Map | Directions | What's Nearby(SM)

Dowling Convalescent Hospital
451 28th St — 0.82 mi.
Oakland, CA ZipCode
Phone: (510)893-4066
Map | Directions | What's Nearby(SM)

Children's Hospital Oakland
747 52nd St — 0.96 mi.
Oakland, CA ZipCode
Phone: (510)428-3000
Map | Directions | What's Nearby(SM)

Alta Bates Medical Group
2201 Broadway Fl 6 — 1.18 mi.
Oakland, CA ZipCode
Phone: (510)627-4715
Map | Directions | What's Nearby(SM)

Home → Find a Business → Nursing & Convalescent Homes

Nursing & Convalescent Homes near Oakland, CA (View Related Categories)

shown1-4

Modify Search | New Search | Help

NEXT PAGE

Rounseville Rehabilitation Ctr
210 40th Street Way — 0.14 mi.
Oakland, CA 94611-5612
Phone: (510)658-2041
Map | Directions | What's Nearby[SM]

Grand Lake Gardens
110 41st St — 0.30 mi.
Oakland, CA 94611-5250
Phone: (510)596-2600
Map | Directions | What's Nearby[SM]

Gatewood Manor
524 41st St — 0.47 mi.
Oakland, CA 94609-2412
Phone: (510)654-9612
Map | Directions | What's Nearby[SM]

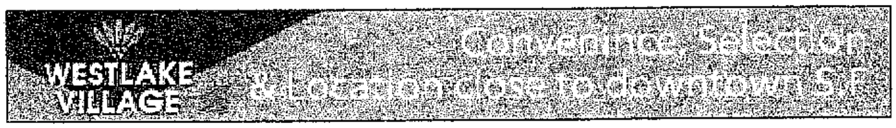
Oakland Nursing & Rehab Ctr
3030 Webster St — 0.59 mi.
Oakland, CA 94609-3411
Phone: (510)451-3856
Map | Directions | What's Nearby[SM]

NEXT PAGE

Modify Search | New Search | Help

Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

BayArea.com Yellow Pages



Home ➔ Find a Business ➔ Nursing & Convalescent Homes

Nursing & Convalescent Homes near Oakland, CA (View Related Categories)

shown5-8

Services

- Yellow Pages
- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

Modify Search | New Search | Help

PREVIOUS PAGE   NEXT PAGE

Mc Clure Rehabilitation Hosp
2910 Mcclure St — **0.74 mi.**
Oakland, CA ZipCode
Phone: (510)836-3677
Map | Directions | What's Nearby℠

Guardian Medical Hill Nursing
475 29th St — **0.75 mi.**
Oakland, CA ZipCode
Phone: (510)832-3222
Map | Directions | What's Nearby℠

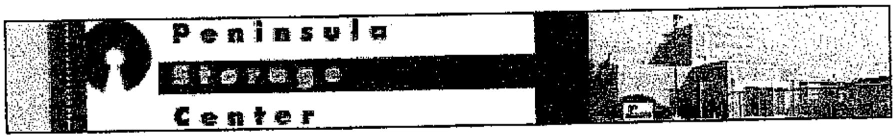
Dowling Convalescent Hospital
451 28th St — **0.82 mi.**
Oakland, CA ZipCode
Phone: (510)893-4066
Map | Directions | What's Nearby℠

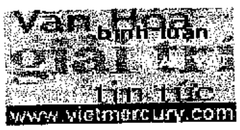
Mac Arthur Nursing Ctr
309 Macarthur Blvd — **0.88 mi.**
Oakland, CA ZipCode
Phone: (510)836-3777
Map | Directions | What's Nearby℠

PREVIOUS PAGE   NEXT PAGE

Modify Search | New Search | Help

Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z





Nursing & Convalescent Homes near Oakland, CA (View Related Categories)

shown9-12

Modify Search | New Search | Help

PREVIOUS PAGE NEXT PAGE

St Paul's Towers
100 Bay Pl — 1.01 mi.
Oakland, CA ZipCode
Phone: (510)835-4700
Map | Directions | What's Nearby[SM]

Burns Improvement Care
939 W Macarthur Blvd — 1.02 mi.
Oakland, CA ZipCode
Phone: (510)652-7290
Map | Directions | What's Nearby[SM]

Park View Lodge
616 59th St — 1.33 mi.
Oakland, CA ZipCode
Phone: (510)655-9110
Map | Directions | What's Nearby[SM]

Lake Park Retirement Residence
1850 Alice St — 1.46 mi.
Oakland, CA ZipCode
Phone: (510)835-5511
Map | Directions | What's Nearby[SM]

PREVIOUS PAGE NEXT PAGE

Modify Search | New Search | Help

Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Day Care Centers-Adult near Oakland, CA (View Related Categories)

shown1-4

Bay Area Community Svc
459 22nd St
Oakland, CA 94612
Phone: (510)986-8910
Map | Directions | What's Nearby[SM]
1.19 mi.

Citi Cerebral Palsy
1775 Broadway
Oakland, CA 94612-2105
Phone: (510)465-4430
Map | Directions | What's Nearby[SM]
1.47 mi.

Berkeley Adult Day Health Ctr
1890 Alcatraz Ave
Berkeley, CA 94703-2715
Phone: (510)601-0167
Map | Directions | What's Nearby[SM]
1.70 mi.

Hong Fook Ctr Harrison
1388 Harrison St
Oakland, CA 94612-2715
Phone: (510)302-0460
Map | Directions | What's Nearby[SM]
1.70 mi.

Home ➡ Find a Business ➡ Child Care Service

Child Care Service near Oakland, CA (View Related Categories)

shown5-8

Services

- Yellow Pages
- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

Modify Search | New Search | Help

PREVIOUS PAGE NEXT PAGE

First Step Children's Ctr
111 Fairmount Ave — 0.69 mi.
Oakland, CA ZipCode
Phone: (510)238-0880
Map | Directions | What's Nearby^SM

First Presbyterian Child Dev
2619 Broadway — 0.86 mi.
Oakland, CA ZipCode
Phone: (510)444-4456
Map | Directions | What's Nearby^SM

Parent Child Development Ctr
2619 Broadway # 201 — 0.86 mi.
Oakland, CA ZipCode
Phone: (510)452-0492
Map | Directions | What's Nearby^SM

Duck Soup Family Day Care
5304 Bryant Ave — 0.88 mi.
Oakland, CA ZipCode
Phone: (510)653-7430
Map | Directions | What's Nearby^SM

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Show businesses that start with letter:
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BayArea•com Yellow Pages


Child Care Service near Oakland, CA (View Related Categories)

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YWCA
4351 Broadway — **0.39 mi.**
Oakland, CA 94611-4612
Phone: (510)428-1373
Map | Directions | What's Nearby[SM]

Circle Pre-School
9 Lake Ave — **0.54 mi.**
Oakland, CA 94611-4425
Phone: (510)547-6447
Map | Directions | What's Nearby[SM]

Home Day Pre-School
363 Oakland Ave — **0.62 mi.**
Oakland, CA 94611-5530
Phone: (510)763-5155
Map | Directions | What's Nearby[SM]

Temescal Preschool
4827 Clarke St — **0.63 mi.**
Oakland, CA 94609-2107
Phone: (510)658-6197
Map | Directions | What's Nearby[SM]

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Services

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- White Pages
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- Email Directory
- Maps / Directions

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PCDCI 31st Child Devlp Ctr
836 31st St 0.99 mi.
Oakland, CA ZipCode
Phone: (510)595-7808
Map | Directions | What's Nearby[SM]

Supporting Future Growth Child
860 30th St 1.06 mi.
Emeryville, CA ZipCode
Phone: (510)465-8810
Map | Directions | What's Nearby[SM]

Starlite Child Development Ctr
2354 Telegraph Ave 1.06 mi.
Oakland, CA ZipCode
Phone: (510)839-0608
Map | Directions | What's Nearby[SM]

Excellent Beginnings
4715 Market St 1.09 mi.
Oakland, CA ZipCode
Phone: (510)601-1885
Map | Directions | What's Nearby[SM]

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Services

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- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

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Blossom Day School
4701 Market St **1.09 mi.**
Emeryville, CA ZipCode
Phone: (510)658-5892
Map | Directions | What's Nearby℠

Smalltrans Depot
111 Grand Ave **1.11 mi.**
Oakland, CA ZipCode
Phone: (510)286-5130
Map | Directions | What's Nearby℠

New Day Pre School & Lrng Ctr
460 W Grand Ave **1.15 mi.**
Oakland, CA ZipCode
Phone: (510)465-8591
Map | Directions | What's Nearby℠

Lakeview Preschool
515 Glenview Ave **1.17 mi.**
Oakland, CA ZipCode
Phone: (510)444-1725
Map | Directions | What's Nearby℠

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BayArea•com Yellow Pages

Schools near Oakland, CA (View Related Categories)

shown1-4

VIP Nursing School
376 40th St — **0.16 mi.**
Oakland, CA 94609-2634
Phone: (510)481-0240
Map | Directions | What's Nearby[SM]

} Adult School

Thunder Road Community Day Sc
390 40th St — **0.18 mi.**
Oakland, CA 94609-2633
Phone: (510)653-5040
Map | Directions | What's Nearby[SM]

Archway School
250 41st St — **0.18 mi.**
Oakland, CA 94611-5644
Phone: (510)547-4747
Map | Directions | What's Nearby[SM]

Oakland Hebrew Day School
215 Ridgeway Ave — **0.32 mi.**
Oakland, CA 94611-5123
Phone: (510)652-4324
Map | Directions | What's Nearby[SM]

Schools near Oakland, CA (View Related Categories)

shown5-8

St Leo's School
4238 Howe St 0.39 mi.
Oakland, CA ZipCode
Phone: (510)654-7828
Map | Directions | What's Nearby℠

Oakland Technical High School
4351 Broadway 0.39 mi.
Oakland, CA ZipCode
Phone: (510)879-3050
Map | Directions | What's Nearby℠

Park Day School
370 43rd St 0.40 mi.
Oakland, CA ZipCode
Phone: (510)653-0317
Map | Directions | What's Nearby℠

Piedmont Avenue Elementary
4314 Piedmont Ave 0.48 mi.
Oakland, CA ZipCode
Phone: (510)879-1460
Map | Directions | What's Nearby℠

BayArea.com Yellow Pages

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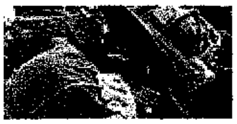

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Schools near Oakland, CA (View Related Categories)

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Services

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- White Pages
- Search By Phone #
- Email Directory
- Maps / Directions

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Piedmont Avenue Early Chldhd
86 Echo Ave — 0.50 mi.
Oakland, CA ZipCode
Phone: (510)879-0832
Map | Directions | What's Nearby[SM]

Carter Middle School
4521 Webster St — 0.51 mi.
Oakland, CA ZipCode
Phone: (510)879-2140
Map | Directions | What's Nearby[SM]

Emerson Early Childhood Ctr
4801 Lawton Ave — 0.57 mi.
Oakland, CA ZipCode
Phone: (510)879-0811
Map | Directions | What's Nearby[SM]

Emerson Elementary School
4803 Lawton Ave — 0.58 mi.
Oakland, CA ZipCode
Phone: (510)879-1150
Map | Directions | What's Nearby[SM]

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Egbert W Beach Elementary Schl
100 Lake Ave — 0.58 mi.
Piedmont, CA ZipCode
Phone: (510)594-2686
Map | Directions | What's Nearby℠

St Martin De Porres School
675 41st St — 0.68 mi.
Oakland, CA ZipCode
Phone: (510)652-2220
Map | Directions | What's Nearby℠

Oakland Emiliano Zapata Acad
417 29th St — 0.72 mi.
Oakland, CA ZipCode
Phone: (510)879-3130
Map | Directions | What's Nearby℠

Montessori Casa Dei Bambini
281 Santa Clara Ave — 0.78 mi.
Oakland, CA ZipCode
Phone: (510)836-4313
Map | Directions | What's Nearby℠

PREVIOUS PAGE NEXT PAGE

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Show businesses that start with letter:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Subject: Well Survey Results
Date: Wed, 14 Nov 2001 21:37:42 -0800
From: "Bob Solotar" <bob_solotar@hotmail.com>
To: "Mansour Sepehr" <msepehr@somaenv.com>

Hi, Mansour!

I thought it would be just as easy, and easier for you to read, if I just e-mailed you the results of the well survey rather than to fax you my notes. So here are the results:

There were no domestic, industrial, irrigation, or other water supply wells within 2000 feet of the Glovatorium site at 3815 Broadway. The only wells in the vicinity of the Site were monitoring wells.

The following downgradient locations had monitoring wells:

Kaiser Foundation Hospital
280 W. MacArthur Boulevard
6 monitoring wells, of which at least two were inside the building.

Chevron
3701 Broadway (NW corner of Broadway and W. MacArthur)
Approximately 11 monitoring wells

Shell
230 MacArthur Blvd. (at Piedmont Avenue)
3 monitoring wells

Firestone Tire and Rubber
2785 Broadway
1 monitoring well

Unocal
411 W. MacArthur Blvd. (at Webster)
6 monitoring wells

Kaiser Health Plan
3505 Broadway
3 monitoring wells

The following cross- or upgradient locations also had monitoring wells:

Unocal
3943 Broadway (at 40th St.)
10 monitoring wells and 1 recovery well

Freidkin-Becker
3810 Broadway
2 monitoring wells

Piedmont Plaza
175 41st St.
3 monitoring wells

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