DRAFT
May 8, 1998

RISK MANAGEMENT PLAN

Former Oil Recycling Site
4200 Alameda Avenue
Oakland, California

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- No GW use
- no wells
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1.0 EXECUTIVE SUMMARY

This Risk Management Plan ("Plan") has been prepared to address the environmental conditions at the former Oil Recycling Site ("Site") located at 4200 Alameda Avenue, Oakland, California. Additional work is needed to render the Site suitable for redevelopment for light industrial, retail or commercial uses. This Plan provides a framework under which all the remaining work and the redevelopment of the Site can be managed in a manner that is: (1) satisfactory to the San Francisco Regional Water Quality Control Board ("RWQCB") and all other involved agencies; (2) protective of human health and the environment; and (3) consistent with the Site's planned uses.

Oil recycling operations were conducted on the Site from 1925 until 1981. During that period, the Site was controlled by several different owners and was identified by a number of different names. It last operated under the name of EkoTek Lube, Inc. While in operation, the Site received waste oils from automobiles, railroad locomotives, aircraft, and electrical transformers. It is reported that Stoddard solvent was used at the Site until 1978.

The Site is currently owned by Laurence and Diane Webster. The Websters acquired it with the intention of operating it as an oil recycling facility. However, oil recycling operations never resumed. The cleanup and the development of the Site are now being planned by the Websters.

The Site is a small, triangular-shaped parcel that is less than one acre in size. The former American National Can Company site, now the location of a Super K-Mart, lies along its northern side. The Site is currently fenced and completely covered with asphalt.

Investigatory work requested by the Alameda County Department of Health ("ACDEH") and the RWQCB began in 1995 and included both soil and groundwater sampling. Demolition and excavation work, including the removal of a substantial quantity of contaminated soils and associated materials, took place in August of 1996. Risk assessment activities and further sampling and monitoring work took place from 1996 until the date of this Plan.

The primary contaminants remaining in the soil and above and below the groundwater under the Site are small amounts of heavy metal ions, and volatile organic compounds that may have become commingled with the heavy petroleum hydrocarbons found on-site. These petroleum hydrocarbons exist in free phase form and are highly immobile, highly insoluble, and low in toxicity. The estimated risks associated with these contaminants for future populations who may work at or provide maintenance to a facility on the redeveloped Site are well within the risk ranges determined to be acceptable by the U.S. EPA.

Although no unacceptable risks are associated with the Site, a groundwater remediation program designed to remove as much of the separate phase hydrocarbons as feasible will

be installed and ongoing groundwater monitoring will continue until product removal is no longer producing any product. The removal of any separate phase hydrocarbons should enhance the natural degradation of the small quantities of other chemicals that are present in the soil and groundwater. The criteria to be used in determining the termination schedule for the remediation and the monitoring are presented in this Plan.

A vapor barrier is planned for installation under that portion of the Site that will be used for any enclosed building. Although the contaminants remaining on-site do not pose any unacceptable risks to populations that will use or help maintain such a building, this measure is considered appropriate to provide an additional assurance of safety to the public, the RWQCB and the ACDEH.

In addition to the remediation and monitoring activities, various management controls will be employed to minimize the possibility of exposure to contaminants by individuals who will work on or visit the Site. These management controls will include a deed restriction addressing future use.

A summary of the risk management actions to be taken before, during and after development follows as Table 1

Table 1

SUMMARY OF RISK MANAGEMENT ACTIONS

BEFORE DEVELOPMENT

- Maintain integrity of the existing pavement cover
- Maintain integrity of the existing security fence
- Install seven new monitoring wells, five on-site, two off-site ← wp? ok
- Abandon existing monitoring well, MW-5 why?
- Fit wells for passive hydrocarbon recovery - routinely maintain ← frequency?
- Gauge and sample wells quarterly for one year, annually thereafter ← agree?
- Report activities and new data annually to the RWQCB + ACEH

DURING DEVELOPMENT

- Prepare Site specific Health and Safety Plan for construction workers
- Maintain the integrity of existing Site security
- Minimize dust and wind transport off-site
- Minimize potential for sediment transport by storm runoff
- Monitor for organic vapors and control if necessary
- Decontaminate construction equipment prior to leaving
- Use all soil from excavations on-site as fill on-site under pavement ← regardless of contamination? need to be analyzed?
- Completely pave all areas not under buildings
- Install a vapor barrier under all buildings
- Report activities to the RWQCB in the annual report

AFTER DEVELOPMENT

- Maintain the integrity of the pavement cover ← need inspection schedule - annual
- Maintain protocols, including a Health and Safety Plan for subsurface maintenance activities
- Maintain groundwater remediation and monitoring, as necessary
- Record a deed restriction to ensure compatible future use
- Report environmental activities and data to the RWQCB annually

+ ACEH

2.0 INTRODUCTION

This Plan addresses the environmental conditions for the Site located at 4200 Alameda Avenue in Oakland, California. The Site was used for waste oil recycling until 1981. Although the property is zoned M-40, industrial, current redevelopment planning suggests the Site would be best used for a retail venture that would be compatible with the surrounding land uses.

This Plan has been prepared on behalf of the Websters (current owners) by ARO, LLC. ARO, LLC has entered into a business relationship with the Websters and is assisting them in the remediation and the redevelopment of the Site. The principals of ARO, LLC are experienced environmental consultants and attorneys who provide technical and capital support to projects of this type.

All earlier documents submitted to the RWQCB and the ACDEH regarding the Site were prepared by Erler & Kalinowski, Inc. and were submitted on behalf of both Ekotek Inc. (the previous owner of the Site) and the Websters. The new business relationship between ARO, LLC and the Websters has resulted in a shift of responsibility for the preparation of all additional environmental documents (e.g. this Plan) and the conduct of all future environmental work (including remediation of the Site) to the Websters. Ekotek is supportive of the efforts of the Websters and has provided assistance in the preparation of this Plan, by providing copies of all prior reports and studies that have been completed.

This Plan provides a framework under which all remaining work can be managed in a manner that is: (1) satisfactory to the RWQCB and all other involved agencies; (2) protective of human health and the environment; and (3) consistent with planned uses for the Site. The Plan contains the following:

- Description of Site background, including a history of its prior use, a discussion of investigative and remedial actions performed to date, and a summary of the remaining environmental conditions;
- Brief description of the history of the abutting American National Can Company site;
- Summary of risk assessment activities that have been conducted to evaluate potential environmental and human health impacts;
- Description of the planned groundwater monitoring and remediation systems including a discussion of the feasibility of other system alternatives;
- Presentation of the criteria that will be employed to determine when to terminate both the remediation and the monitoring;
- Description of the management controls that will be employed during all phases of the redevelopment to ensure human health and avoid damage to the environment; and

- Proposed deed restriction that is designed both to properly identify the characteristics of the Site to any future buyers and to ensure that all future uses are appropriate, given the Site's environmental condition.

The monitoring procedures, remediation systems and the management controls that are described are based on current data. If environmental conditions change or are found to be different from those described herein, then the RWQCB will be notified and appropriate adjustments will be made to the contents of this Plan and to the actions being taken.

In the course of preparing this Plan, extensive use has been made of the following documents regarding the Site that were prepared by the consulting firm of Erler & Kalinowski, Inc., 1730 South Amphlett Boulevard, Suite 320, San Mateo, California. All of the documents listed below have been submitted to the RWQCB and other agencies and are in the public domain.

- *Preliminary Investigation Report*, September, 1995.
- *off-site Groundwater Investigation Report*, May 16, 1996.
- *Groundwater Sampling Results for June, 1996,* August 12, 1996.
- *Demolition and Excavation Report,* August 12, 1996.
- *Groundwater Sampling Results for January, 1997,* May 30, 1997.
- *Additional Off-site Groundwater Investigation Report,* November 10, 1997.
- *Groundwater Sampling Results for July, 1997,* November 11, 1997.

3.0 SITE BACKGROUND

3.1 SITE LOCATION

As shown in the map in Figure 1, which was taken from Erler & and Kalinowski's *Demolition and Excavation Report*, August 12, 1996, the Site is located at 4200 Alameda Avenue in Oakland, California. The Site is triangular in shape and about 0.8 acres in size. On the west it is bounded by Alameda Avenue. On the east-southeast it is bounded by East 8th Street. The former American National Can Company site, now the location for a Super K-Mart, lies to the north.

3.2 SITE HISTORY

The Site was used for oil recycling from 1925 to 1981 and operated under the following names:

- Bonus International, Inc.;
- Bayside Oil Company;
- Fabian Oil Refining Company;
- Economy Refining & Service Company;
- Economy Byproducts & Economy Service Company; and
- EkoTek Lube, Inc.

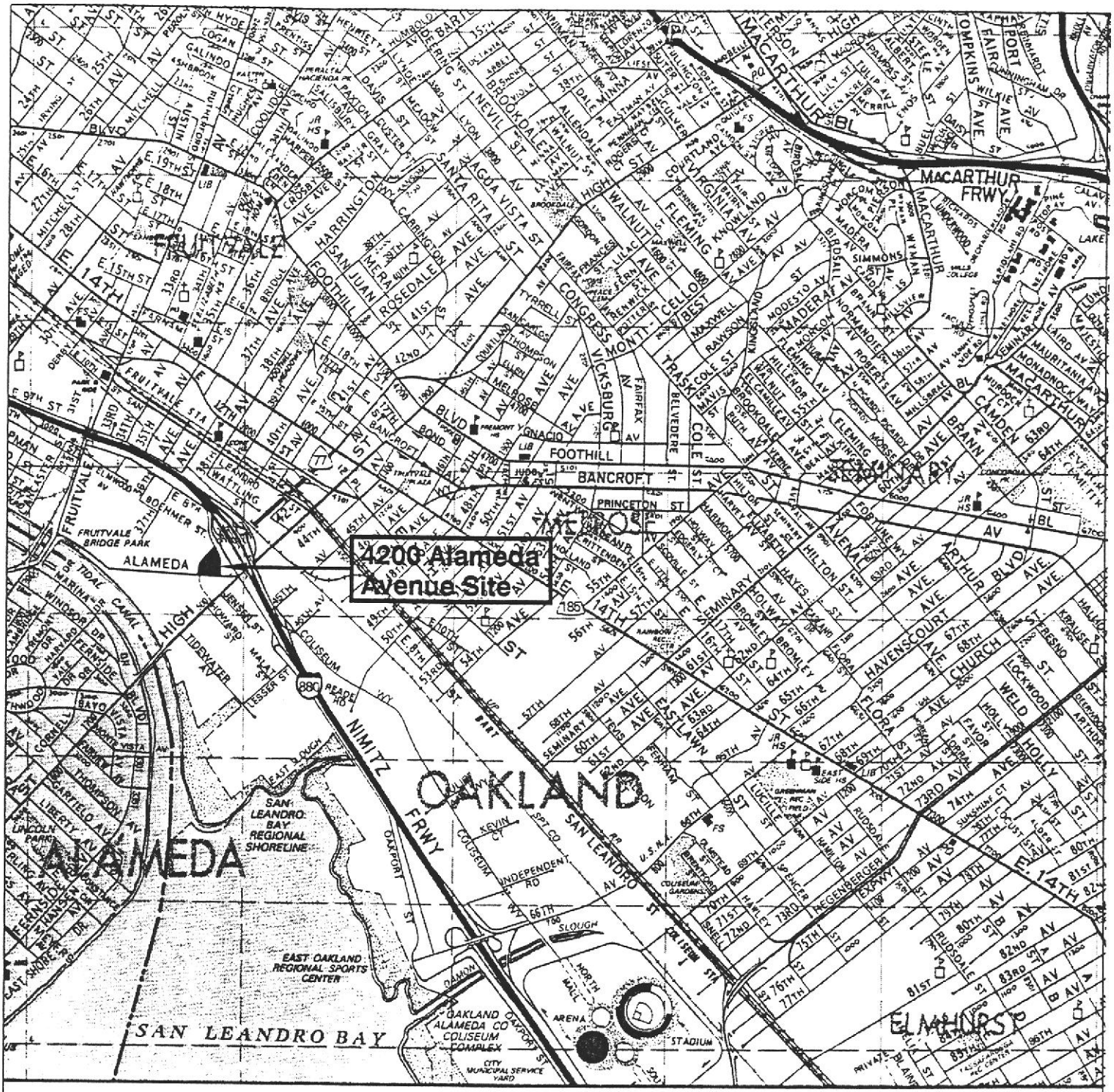
Oil recycling operations were discontinued 1981. Shortly thereafter, Laurence and Diane Webster purchased the Site from Ekotek Inc. with the intention of operating it. However, it was not operated by the Websters.

While in operation, the Site received waste oil that had originated in automobiles, railroad locomotives, aircraft and utility transformers. Stoddard solvent was reportedly recycled until the late 1970s.

3.3 SUMMARY OF SITE INVESTIGATION AND REMEDIAL ACTIONS

3.3.1 Preliminary Investigation

At the request of RWQCB and ACDEH, Erler & Kalinowski performed a preliminary investigation in July of 1995. The results of this investigation are detailed in the previously identified document entitled, *Preliminary Investigation Report,* dated September, 1995.



Base map from: Thomas Guide 1994 Edition.

N

0 1540 3080

(Approximate Scale in Feet)

4200 Alameda Avenue
Oakland, CA
August 1996
EKI 930040.06

Figure 1

The preliminary investigation included 10 soil borings. Groundwater monitoring wells were constructed at the location of 5 of the soil borings. Collected soil and groundwater samples were analyzed for:

- Total Petroleum Hydrocarbons (TPH);
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX);
- Halogenated, volatile organic compounds (VOCs);
- Semivolatile organic compounds (SVOCs);
- Polychlorinated biphenyls (PCBs); and
- Selected heavy metals (arsenic, nickel, total chromium and lead).

Data from the preliminary investigation were used to characterize the nature and extent of chemicals in the soil and the groundwater. Also, the data provided indications of the direction of groundwater flow on-site.

Detailed summaries of data from the preliminary investigation were presented in the previously referenced Erler & Kalinowski report. Insoluble, separate phase hydrocarbons were found below the groundwater table as well as in the soil. PCBs, and metals were only found at low levels. VOCs and BTEX were found below the groundwater in association with the separate phase hydrocarbons.

Based on data collected during the preliminary investigation, groundwater flow was estimated to be toward the south in the direction of San Leandro Bay.

3.3.2 Initial Off-Site Groundwater Investigation

In February of 1996, with the review and concurrence of the ACDEH and the RWQCB, Erler & Kalinowski conducted an off-site groundwater investigation. The results of this investigation are detailed in the document entitled *off-site Groundwater Investigation Report*, dated May 16, 1996. The purpose of this additional sampling program was to assess whether there had been any chemical migration from the Site through groundwater.

Six cone penetrometer tests were performed and grab groundwater samples were collected using PVC piezometers. Soil samples were also collected from the three sample locations closest to the Site. All collected samples were analyzed for TPH, BTEX, VOCs and arsenic.

Waste oil as separate phase hydrocarbons was found in the upper layer of groundwater. TPH was detected in two of the soil samples and most likely represented TPH in the saturated zone that had sorbed to soils. TPH representative of fuel hydrocarbons was not

detected in any of the deeper groundwater samples and the available data indicate that there has not been any downward vertical migration of hydrocarbons.

TPH was detected in the shallow groundwater samples taken from locations approximately 50 feet from the Site. However, the detected TPH was due to high molecular weight compounds which are not likely to be mobile due to their limited solubility. This fact, coupled with the location of other potential sources in the area, makes it unlikely that the TPH detected in the shallow groundwater originated on the Site.

BTEX and VOCs were only detected in one of the soil samples and were likely associated with the TPH in this same sample. BTEX and VOCs were detected in the shallow groundwater samples but only in concentrations below applicable California Maximum Contaminant Levels. The data do not suggest any appreciable lateral migration of BTEX or VOCs from the Site.

Metals were not detected in any of the soil samples obtained at the off-site locations. Dissolved arsenic was present in one shallow groundwater sample, but only at very low levels.

3.3.3 Site Demolition and Excavation

With the concurrence of the ACDEH and the RWQCB, demolition of the above grade and underground structures on the Site took place in two phases in late 1995 and early 1996. Most of the above ground tanks were dismantled and removed from the Site in October and November of 1995. All remaining above ground structures and all underground structures were removed between March and July of 1996. After all removal actions were complete, the Site was graded and covered with two inches of asphalt and sloped to drain to gutters along Alameda Avenue and East 8th Street.

Oily liquids and solids that were stored in the tanks and pipelines on the Site were removed prior to demolition activities. These materials were temporarily stored in the former 4,500 gallon oily water sump. Also stored in this sump were oily debris and materials that were visually distinct from on-site soils. The materials in the sump were eventually tested and determined to be non-RCRA hazardous wastes. At the completion of the work, all of this material was transported to a waste disposal facility in Kettleman Hills, California.

A stockpile of materials was created on-site from soil that became wet from rainfall and Site operations. Testing indicated that the materials in this stockpile were not appreciably different from the other soil on the Site. With the concurrence of the ACDEH, the materials from this stockpile were worked back into the Site as part of the grading process.

Before the completion of the demolition work, an underground survey was conducted to ensure that the removal activities were complete. A small steel tank and various debris were identified through the underground survey and these were removed.

A detailed summary of the demolition and excavation work is contained in the Erler & Kalinowski Report entitled, *Demolition and Excavation Report*, dated August 12, 1996.

3.3.4 Additional Off-Site Groundwater Investigations

Subsequent to the initial phase of off-site monitoring, RWQCB and ACDEH requested that additional sampling be performed to assess immiscible hydrocarbons in groundwater off-site. The results of the additional sampling are described in detail in the Erler & Kalinowski report, *Additional Off-site Groundwater Investigation Report,* November 10, 1997.

All available groundwater data have been used to create a groundwater contour map. The map is presented in Figure 2.

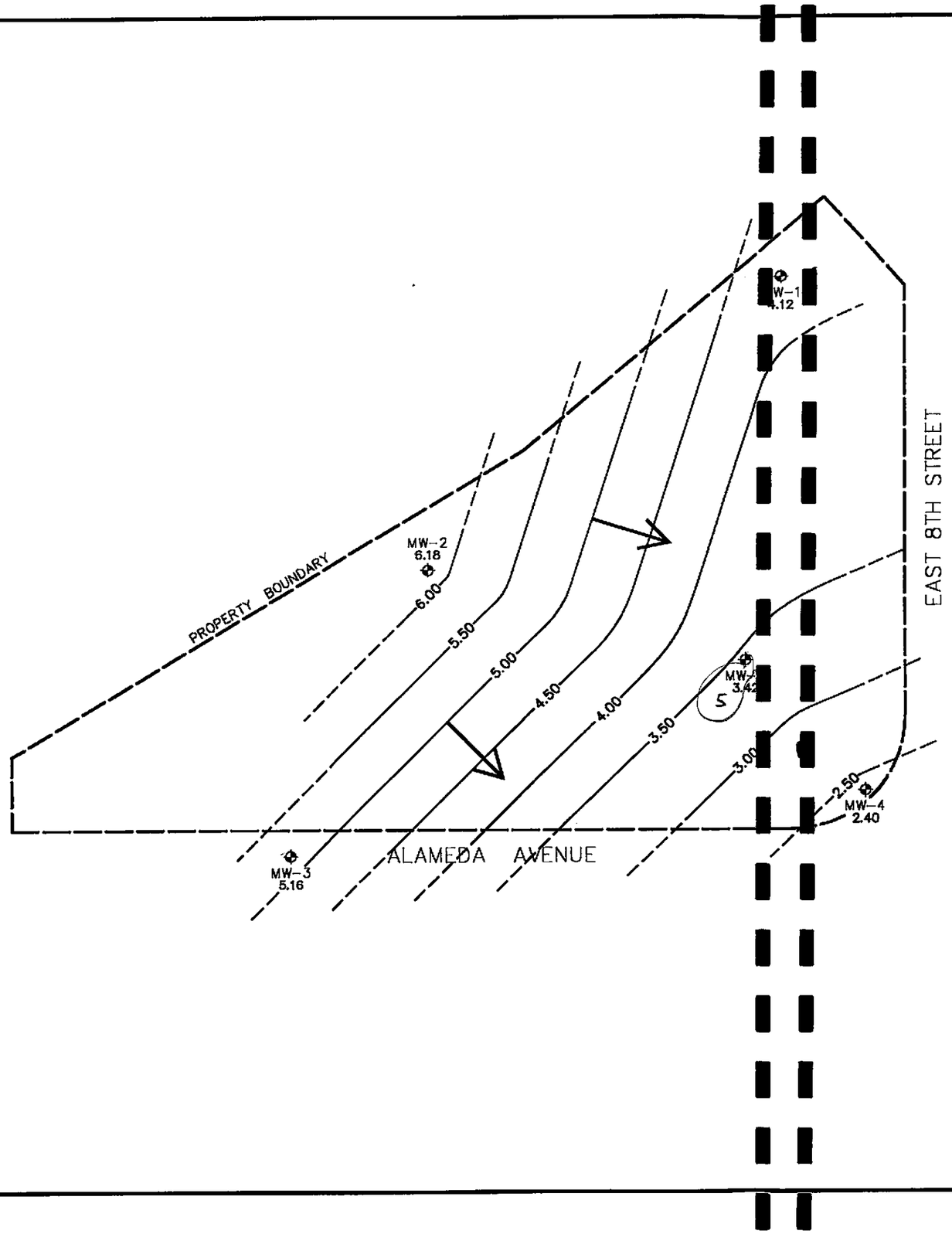
The results of the additional off-site investigations corroborated the previous off-site investigations. TPH attributable to the Site was not detected in any of the groundwater samples that were analyzed. While TPH was detected in samples approximately 50 feet downgradient from the Site, the compounds detected were high in molecular weight, limited in solubility and not very mobile in groundwater. Other likely sources of these TPH compounds would be spills from oil trucks, rail cars, or other properties in the area or leaks from the underground oil pipeline along East 8th Street.

The benzene off-site was reported likely to be preferentially solubilized in the separate phase, heavy hydrocarbons and not in the groundwater.

3.4 REMAINING ENVIRONMENTAL CONDITIONS

Based on all of the on-site and off-site sampling and monitoring that has been performed, the identified environmental conditions that need to be considered during remediation and redevelopment of the Site are the following:

- Low solubility hydrocarbons in separate phase form under the groundwater;
- VOCs and BTEX under the groundwater (with the waste oil) and at low levels in the soil;
- Low levels of metals in the soil; and
- TPH in the soil.



LEGEND

MW-2 6.18 ⊕ GROUNDWATER MONITORING WELL
GROUNDWATER ELEVATION (ug/l)

—6.00— GROUNDWATER CONTOUR LINE
FEET MEAN SEA LEVEL
CONTOUR INTERVAL = 0.50 FEET
DASHED WHERE INFERRED

← ESTIMATED GROUNDWATER FLOW DIRECTION (SEPTEMBER 1997)

N

0 40 80
APPROXIMATE SCALE IN FEET

Source: Erler & Kalinowski, Inc.

FIGURE 2

GROUNDWATER CONTOUR MAP SEPTEMBER 1997

PROJECT LOCATION	DATE	PROJECT NUMBER
EKOTEK SITE 4200 ALAMEDA AVENUE OAKLAND, CALIFORNIA	5-8-98	
	AMERICAN REDEVELOPMENT	

ELAYOUT-A

The contaminants found down gradient during the off-site sampling events may not have originated at the Site. As noted elsewhere in this Plan, ARO LLC anticipates the use of two off-site wells that will be used to monitor off-site groundwater contamination.

3.5 AMERICAN NATIONAL CAN COMPANY SITE HISTORY

The American National Can Company (ANCC) site at 3801 East 8th Street in Oakland is adjacent to the Site. The ANCC site formerly housed a can manufacturing facility.

Soil and groundwater sampling confirmed that there was contamination at the ANCC site. Actions were initiated by ANCC. Deed restrictions preclude the use of groundwater. The ANCC site is now considered "closed" by the RWQCB and a "No Further Action" Letter has been provided to ANCC by the RWQCB (January 5, 1997).

ANCC and K-Mart have formally agreed with Ekotek and the Websters that ANCC shall be responsible for any further investigatory and/or remediation work required on the ANCC site regardless of whether hazardous substances have migrated from or are otherwise attributable to the Site.

4.0 SUMMARY RISK EVALUATION

4.1 HEALTH RISK ASSESSMENT

Appendix A is a *Human Health Risk Assessment Report* ("Report") that was prepared in April of 1998 by Waterstone Environmental, LLC for the Websters and ARO LLC. The Report was prepared under the assumption that it would be submitted to the RWQCB and the ACDEH. The Report utilized the existing Site data collected by Erler & Kalinowski and summarized in several documents that have been submitted to the RWQCB and the ACDEH. The significant assumptions and conclusions that are contained in the Report are summarized in the sections that follow. The chemicals found on the Site, which are discussed in the paragraphs following and in Appendix A, are listed in Table 2.

4.2 EVALUATION OF RISK TO HUMAN HEALTH

4.2.1 Characteristics of Site Impacting Risks

The Site is currently unoccupied, surrounded by a chain link fence and covered with a layer of asphalt. The groundwater under the Site and for a small distance downgradient off-site appears impacted by chemicals from the Site. This water is not used and will not be used in the future for drinking water purposes. The soil contains heavy petroleum hydrocarbons, in some areas to significant concentrations and at depth extending to groundwater and below. Finally, there appears to be a potential for volatile organic vapors in the soil, including vinyl chloride, associated with the heavy hydrocarbons.

During redevelopment, much of the asphalt will be removed, the Site will be graded and compacted as required, foundations will be put in place, a structure will be erected, and the Site will again be covered with a layer of asphalt or other pavement.

During the construction process, the possibility of exposure to contaminants present in the soil or in groundwater will be at the greatest level because the Site will be uncovered and the soil will be disturbed to support construction. However, site construction activities will be limited in time. In addition, significant procedures will be in place to ensure that exposure to contaminants is kept to minimal levels. These construction related procedures are described in a later section of this Plan.

Once construction is complete, the Site will be capped again with an asphalt layer. The contaminant exposure of individuals who regularly work on the Site will be minimal as the covers that are used (i.e. the concrete foundation, the asphalt paving, and an installed vapor barrier) will limit both dermal exposure and the emanation of gases from the soil and the groundwater.

It is envisioned that the Site's use will remain consistent with the presence of a full pavement cover for the foreseeable future. If for any reason the use were to change to one in which less than a full cap was anticipated, then the risk assumptions would need to be

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Table 2

Hazardous Materials Reported on the Site[1]

Chemicals of Significance	Media
Petroleum Hydrocarbons (TPH, BTEX)[2]	Soil, Groundwater
Nickel	Soil
Vinyl Chloride	Groundwater, Vapor

Chemicals Detected but not Requiring Action
Volatile Chlorinated Hydrocarbons
Semi-volatile Hydrocarbons
Semi-volatile Chlorinated Hydrocarbons
PCB[3] Isomers
Heavy Metal Ions (Cadmium, Lead, Zinc)[4]

Notes

1. A detailed summary of the chemicals found on the Site is contained in the Health Risk Assessment, which is included as Appendix A of the Risk Management Plan for the Site that was provided to the San Francisco Regional Water Quality Control Board in May of 1998. Remediation and mitigation strategies for the chemicals of significance are described in Sections 5.0, 6.0, and 7.0 of the Risk Management Plan.

2. TPH = Total Petroleum Hydrocarbons; BTEX = Benzene, Toluene, Ethlybenzene, and Xylene.

3. PCB = Polychlorinated Biphenyls.

4. Measured above reported San Francisco Bay background levels.

reviewed and adjusted, as necessary, to ensure acceptable levels of control. Any changes would be accomplished with review from the appropriate regulatory agencies. This commitment will be assigned to any future owner, if the property changes ownership, until such time as Site data indicate that no threat remains.

Later sections of this Plan indicate the health risks that workers on the Site would experience because of the contaminants in the soil and groundwater. These projected risks are well below any regulatory agency action levels or levels of concern. Future visitors to the Site (i.e. customers) will experience even lower risks because of the infrequency of their visits.

Unlike the workers in the building, future maintenance workers may experience some contact with the soil and vapor emissions. Such contact will be quite infrequent and only occur when an item under the ground requires servicing. Proper maintenance procedures will apply in these cases and should minimize worker exposure risks. A later section of this Plan identifies those risks and indicates their small magnitude.

4.2.2 Carcinogenic Risks

Using criteria and models acceptable to the U.S. EPA and Cal-EPA, in concert with data indicating the presence of low concentrations of TPH, VOCs, BTEX, and some metals in the soil and groundwater, Waterstone calculated the following potential incremental carcinogenic risks for groups exposed to all possible Site contaminant pathways.

- Commercial building occupants: 9.6×10^{-6}, vinyl chloride, inhalation pathway
- Future maintenance personnel: 5.4×10^{-6}, nickel in soil, ingestion pathway

The U.S. EPA considers incremental carcinogenic risks in the 10^{-4} to 10^{-6} range to be acceptable and the results calculated by Waterstone clearly fall within the acceptable category. Waterstone noted the conservatism inherent in the results by explaining that the calculations that were employed, while very consistent with procedures mandated by regulatory agencies, did not differentiate between chemical specific carcinogenic health effects.

ARO LLC has also noted that the commercial building occupant risk calculations are based on the assumption that the same individual will work in a building on the Site for 250 days a year for 25 years. Such a scenario is quite unlikely and further illustrates the degree of conservatism that is present in the calculated risk, which is still within acceptable limits as defined by the U.S. EPA. In spite of this conservatism and as noted elsewhere, a vapor barrier is planned for the area under the planned building thereby all but eliminating any exposure of future populations to any gases or vapors emanating from the soil or groundwater.

Similar conservatism is present in the calculations for maintenance personnel. Again it is assumed that the same maintenance worker would service the Site for 25 years, a very unlikely event for many reasons. Even with that assumption, the calculated carcinogenic risk is within the acceptable range as defined by the U.S. EPA.

With the above assumptions and calculations in mind, specific steps need to be taken in the development of the site to ensure that the risks are managed in ways that maintain the degree of protection that is described in the Report and that is required by government regulations during construction, during use and for as long as necessary in a maintenance mode.

4.2.3 Non-carcinogenic Risks

Using regulatory agency approved procedures, Waterstone also calculated the non-carcinogenic risks associated with the redevelopment of the Site. Non-carcinogenic risks are expressed in terms of a Hazard Index which is the ratio of the estimated dosage of chemicals on a site to the published "safe" dosage level. A Hazard Index value of 1.0 is the point at which non-carcinogenic effects might be experienced. For the Site, the calculated values were as follows.

- Commercial building occupant: Hazard Index of 0.04
- Future maintenance personnel: Hazard Index of 0.06

The methodology used to calculate the Hazard Index values included several conservative assumptions. Even with such assumptions, the results are far below those values at which non-carcinogenic health impacts might be experienced.

The potential impacts of lead are addressed in different fashion in risk management studies because data in the scientific literature correlates lead levels in blood with observed health impacts. The Waterstone Health Risk Assessment in Appendix A addressed this unique aspect of lead risk assessment and performed the appropriate calculations. As with the other contaminants described above, the conclusion drawn from the calculations was that lead will not pose a threat to either workers in a building on the Site or maintenance workers who will service the Site.

4.3 EVALUATION OF RISKS TO THE ENVIRONMENT

The Site is a small piece of land in a much larger historic industrial/commercial area of Oakland. The Site is currently paved and fenced. It is not a habitat for any animal species and vegetation is limited to assorted weeds and grasses that grow around the edges of the asphalt cover. Once redeveloped, it will have similar characteristics except that it will house some type of retail operation. No animals are expected to live on the Site and the new asphalt layer will be well maintained eliminating the limited weeds and grass that

now appear from time to time. No risks to the surface environment will be posed by the planned redevelopment.

As noted elsewhere, the contaminants found in the soils and groundwater are not mobile by their nature. There is no indication of significant off-site transport through groundwater. Paving does and will prevent the off-site transport of chemicals in soil by erosion in surface runoff or release of vapors. During construction activities, care will be taken to minimize potential off-site migration as will be described in more detail later in this Plan.

5.0 RISK MANAGEMENT BEFORE SITE REDEVELOPMENT

This section presents risk management controls to be implemented before Site redevelopment.

5.1 RISK MANAGEMENT CONTROLS TO BE IMPLEMENTED BEFORE SITE REDEVELOPMENT

As described earlier, the Site presently is covered entirely with an asphalt pavement cover that prevents any contact with soil and acts to minimize any potential fugitive emissions of volatile organic compounds or dust which may contain chemicals of concern. The cover also minimizes any infiltration of precipitation to groundwater. The following controls will be continued prior to actual Site redevelopment:

- Maintain the present fencing to minimize unauthorized access to the Site; and
- Maintain the integrity of the pavement cover.

The Site will be inspected at least annually to verify that risk management controls are still in place and effective. Corrective actions will be taken as necessary. Examples of possible actions might include the following.

- Inspect the Site for cracks in the pavement and fill with tar or suitable substance to prevent erosion. Patch any large cracks with "cold patch" asphalt or equivalent.
- Inspect the Site security fence and close any breaks to prevent unauthorized entrance that may compromise the integrity of the Site cover.

The annual inspection results and any corrective actions will be summarized in writing and reported to the Board.

5.2 GROUNDWATER MONITORING AND REMEDIATION

Consistent with the former use of the Site for oil recycling, the soils are reportedly impacted with heavy petroleum hydrocarbons, ranging from none under the former office buildings to approaching saturation in the vicinity of former processing equipment. The nature of these hydrocarbons is such that they are highly viscous, highly adsorbable and would move slowly in the soil, if at all, at ambient temperatures. This material may have been historically spilled at elevated temperatures as a possible mechanism for its migration into the deeper soils.

The Site contains separate phase, heavy hydrocarbons below the present groundwater table. Evidence collected to date suggests that these are highly insoluble and environmentally immobile compounds. Small amounts of lighter end hydrocarbons and chlorinated solvents are commingled, but due to partitioning from differential solubilities

between water and organics, they should be expected to overwhelmingly stay with the hydrocarbon mass. The material may have historically contained larger amounts of lighter end compounds that would have decreased viscosity and allowed vertical migration. Subsequent weathering of the light end compounds would account for current conditions.

The soils underlying the Site in the saturated zone are reported as fine grained with lenses of coarser grained material inner bedded. Groundwater flow direction is generally toward the south (i.e. toward MW-4). As expected, there is little evidence of extensive migration of separate phase hydrocarbons off-site, although there may be some migration south of the south property line. There is speculation that an existing oil pipeline in the street in this area may be contributing to the separate phase hydrocarbons that have been documented off-site, but no direct evidence of this exists.

The separate phase hydrocarbons do not represent a health threat for workers at or future visitors to the Site under any development scenario with the controls envisioned. It is acknowledged that there is a desire on the part of the State Water Resources Control Board to remove separate phase hydrocarbons where they occur in contact with waters of the State when it is reasonable to do so. This policy was aimed at circumstances where hydrocarbons in separate phase form were floating on the groundwater table and able to be transported by groundwater flow. As mentioned earlier, the hydrocarbons on the Site are not mobile and should not flow with the groundwater.

5.3 GROUNDWATER REMEDIATION FEASIBILITY

Four strategies for dealing with the subsurface hydrocarbons were reviewed for economic and environmental feasibility. These were excavation, groundwater pump and treat, bioremediation, and long-term passive recovery. The options were reviewed in light of the limited size of the Site and the characteristics of the hydrocarbon mass discussed in the previous section.

Excavation of the contaminant mass is technically feasible, but not economical. In order to extract the hydrocarbons, a large percentage of the Site would have to be excavated to groundwater and deeper. The locations of the former tank farm and the processing area are very close to the property boundaries and excavations would require costly shoring to prevent undermining of the adjacent road ways. Assuming that 25% of the Site would require removal and that 10% of that also has some soil with hydrocarbons below the water table, the costs are in excess of the market value of the property.

Bioremediation is another common way to deal with hydrocarbons in soil and groundwater. It involves bringing soil microorganisms, trace nutrients and, usually, oxygen together to allow the microbes to use the targeted chemicals as a food source. Under certain circumstances it can be done in place or can be done in specially designed surface facilities known as land farms. Unfortunately, the heavy end hydrocarbons that predominate at this site are not conducive to microbial breakdown except at very slow rates. The Site is a poor candidate for accelerated bioremediation in place. The alternative

would be removing the hydrocarbons to the surface, breaking the soil and oil up into smaller, well mixed pieces and managing the process on the surface. This landfarming option would have to be done at a remote location as there is insufficient space on-site for this approach and none available adjacent. Since the possibility on-site landfarming is not available, all of the cost and excavation considerations of the excavate and disposal option apply. Bioremediation is not viewed as a viable choice.

If the hydrocarbons cannot be feasibly removed from the Site, then the concern is to manage the impact to the groundwater of leaving them in place. The two alternatives are to remove the groundwater and treat it prior to discharge or allow for some form of natural attenuation.

To remove the groundwater would require a pump and treat system of a series of low capacity extraction wells in the vicinity of the potential hydrocarbon sources that would draw the local groundwater to the wells for treatment on the surface. Tight soils like those on-site require a relative large number of small capacity wells to control a site as the effective area controlled by any one well will be small. To attempt this option would require twenty or so wells with associated piping, controls and power source delivering the water to a surface treatment system such as activated carbon which could deal with the dilute nature of the contaminants. The slow mass transfer of these relative insoluble chemicals means that the system would have to be operated and maintained for a very long time at a very substantial cost.

The final alternative considered was to address the Site in terms of the apparent effectiveness of natural attenuation at the Site so far. The hydrocarbons have been in the soil and under the groundwater for quite a while, but the extent of impact is very limited. The realized insolubility of the chemicals and the apparent ability of the surrounding environment to adsorb or degrade the fraction that leaves the main mass of hydrocarbons has effectively contained the release. To ensure that this is in fact the mechanism in operation and that it effectively functions, monitoring of the environment can be designed to validate containment. This can be combined with low cost, passive hydrocarbon removal as additional attenuation for the small amount of hydrocarbons that might solubilize over time. Such an approach should be focused on addressing the known historic release sites. Because it requires no elaborate support system, additional wells can be added if collected data show a need. This approach is the most appropriate for the Site as it meets the needs of environmental protection, provides for some removal of chemicals in the groundwater to augment attenuation, and does not interfere with economic options for the Site.

5.4 SITE GROUNDWATER REMEDIATION APPROACH

Small amounts of separate phase hydrocarbons may be released from the submerged hydrocarbon mass over time. Recovery at the Site will be achieved by using a strategy of continuous recovery from shallow wells. By using this approach downgradient of locations where releases in the soil are documented, separate phase hydrocarbon removal

at these wells will provide two important benefits. First, the wells will capture any separate phase product present. Additionally, removal will encourage the bioattenuation of the dissolved hydrocarbons and the remaining volatile organics.

The separate phase hydrocarbons are reported to be in both the coarse soil lenses and the tight, fine grained matrix of the soils under the Site. The oil itself is highly viscous and adsorbable and will flow only very slowly under a gravity gradient (if at all) at ambient temperatures. As such it is not a "free" product source. A recovery system that can handle the low flow rates of high molecular weight hydrocarbons is needed. Additionally, the system must be able to be installed and maintained on a small, crowded site without jeopardizing the integrity of the soil capping pavements that are needed to manage the soil ingestion pathway and to be compatible with the anticipated use of the Site. The use of soil heating techniques to reduce the product viscosity and increase the flow rate was rejected as it would greatly increase the volatilization of the halogenated organics that are in solution in the separate phase hydrocarbons, thereby greatly increasing the Site health risk and the off-site migration potential.

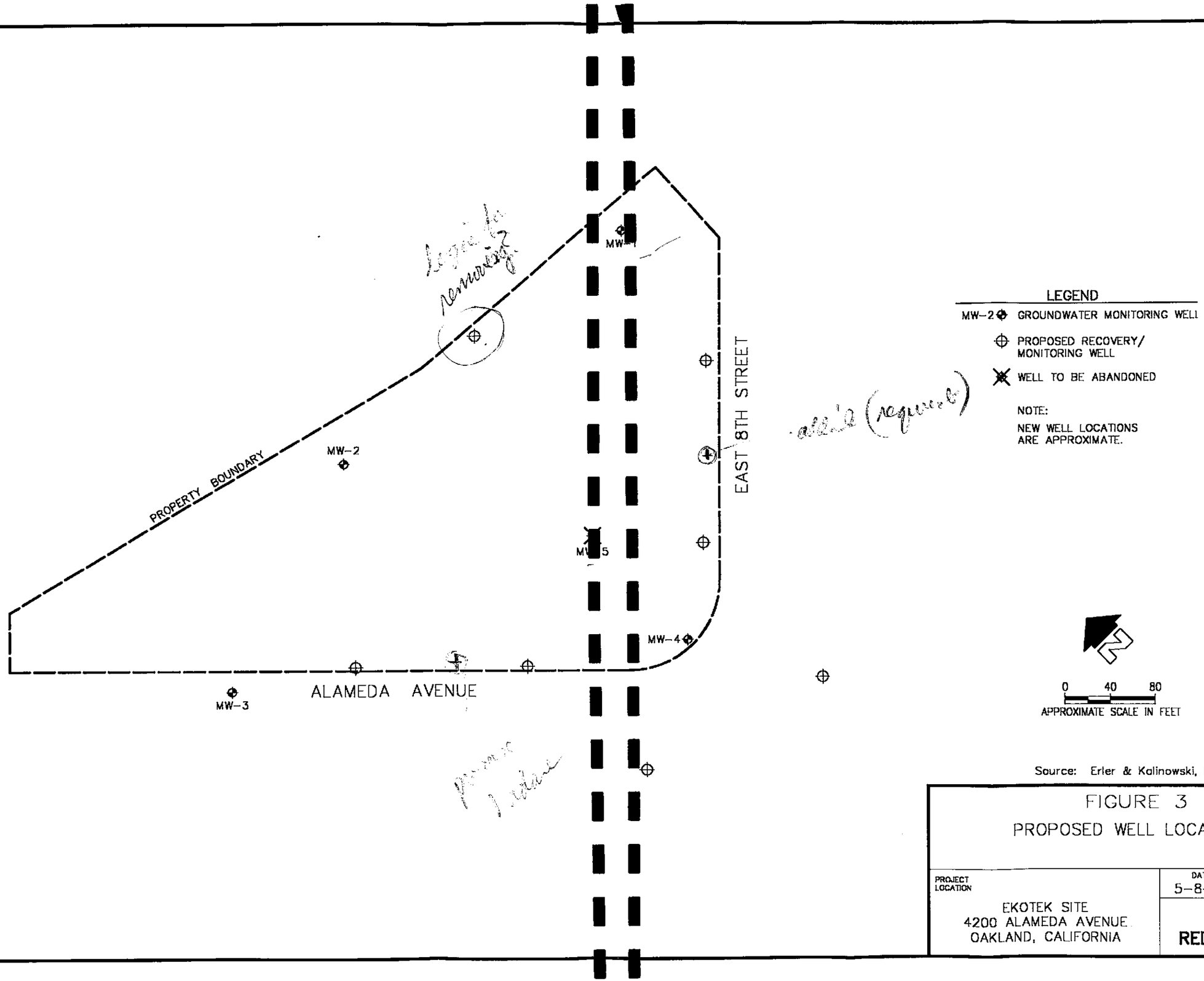
In light of all of the above, the remediation system chosen for the Site will have a series of groundwater monitoring and separate phase hydrocarbons recovery wells spaced around the perimeter. A total of five new wells will be installed, two between wells MW-1 and MW-4 to cover the former processing area, and two more between MW-4 and MW-3 to address the tank farm. One new well will be located between MW-1 and MW-2 to monitor upgradient boundary conditions. Existing well MW-5 will be abandoned in order to avoid conflict with development activities. Well locations are displayed in Figure 3.

This is not what E+K proposed *

To monitor off-site separate phase hydrocarbon conditions, two new wells will be placed near the former data sites CPT-1 and CPT-3 as presented by Erler & Kalinowski, Inc. in the report titled *Additional Off-site Groundwater Investigations Report*, dated November 10, 1997. Final placement of the new wells will be subject to access agreements from the appropriate property owners and safety issues relative to access for maintenance and monitoring.

After installation, the five new perimeter wells will each be fitted with a passive product recovery device consisting of a hydrocarbon absorbent polymer, as supplied by MicroClean of Concord, California, or equivalent, in a specially designed sleeve that is connected by cable to the inside of the locking well cover at the surface. At regular intervals, dictated by the actual recovery rate of the individual wells, the absorbent sleeves will be removed and replaced with fresh absorbent. Spent absorbent will be classified for waste characteristics and disposed of at an approved facility.

Groundwater elevation and product thickness will be monitored in the wells annually to verify the stability of the groundwater gradients and the separate phase hydrocarbons recovery efficiency. For the first year, quarterly groundwater samples will be taken from each well to establish a baseline to evaluate future trends. Each well will be sampled for



Source: Erler & Kalinowski, Inc.

FIGURE 3

PROPOSED WELL LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
EKOTEK SITE 4200 ALAMEDA AVENUE OAKLAND, CALIFORNIA	5-8-98	**AMERICAN REDEVELOPMENT**

ELA\WORK-A2

Total Purgeable Petroleum Hydrocarbons by Modified 8105, and Halogenated Volatile Organics by 8010. For the second and subsequent years, the wells will be sampled annually. These data and a summary of hydrocarbon capture activities will be provided to the RWQCB as part of the annual report.

6.0 RISK MANAGEMENT DURING REDEVELOPMENT

This section of the Plan addresses actions that will be taken to mitigate risks to human health and the environment from the identified chemicals on the Site during any construction activities. Actions will include the following.

- Establishment of health and safety training and worker protection objectives for workers who might directly contact contaminated soils or groundwater in excavations for utility installation or during Site preparation activities including, but not limited to, grading and foundation construction. Samples of the top foot of soil may reveal that remediation efforts to date have already lowered the concentration of contaminants in the surface level of soil to acceptable levels thereby avoiding the need for any special precautions, except in those areas where activities will involve excavation of lower layers of soil.

- Implementation of construction mitigation measures, including control of dust generation, decontamination of equipment and prevention of storm water runoff.

- Establishment of procedures to manage soil during redevelopment.

6.1 SITE SPECIFIC HEALTH AND SAFETY WORKER PLANNING REQUIREMENTS AND SAFETY PLANS

During construction activities, those workers that may directly contact contaminated soil or groundwater will perform their activities in accordance with a hazardous operations site specific health and safety plan (HASP). Preparation of a HASP will be required for site preparation work including pavement removal, grading, buried utility installation, foundation construction, and other activities during which workers might directly contact nickel containing soils. It will be the contractual responsibility of the construction contractor to prepare the HASP and determine the necessary compliance for all state, local and federal requirements.

A HASP will not be required for those workers (e.g. building construction tradesmen) who will be on-site after a cover is in place. When Site improvements are in place (e.g. pavements, foundations, etc.) there will be no exposure pathway.

At a minimum, the HASP will be consistent with applicable Occupational Health and Safety Administration standards for hazardous waste operations (CCR, Title 8, Section 5192 and 29 CFR 1910.120, respectively). Among other items, the HASP will include a description of health and safety training requirements for on-site construction workers, a description of the level of personal protective equipment to the used (if any), air quality monitoring plans, and any applicable precautions to be undertaken to minimize direct contact by the workers with contaminated soil and groundwater.

- list of COCs w/ action levels
- ~~monitoring levels~~
- Contingency plan

6.2 CONSTRUCTION IMPACT MITIGATION MEASURES

This section outlines measures that will be implemented to mitigate potential impacts to human health and the environment during construction at the Site. The primary risks during construction activities will come from exposure to nickel contaminated soils. Groundwater contact is not considered likely. The only risk of concern from soil is due to the ingestion pathway. Neither inhalation nor dermal contact were identified as having significant risks in the Health Risk Assessment. The environmental risk of off-site transport of chemical containing soils by windblown dust, adherence to construction vehicles leaving the Site and erosion need mitigation attention.

The risk assessments that were performed assumed that all soils on the Site could be properly characterized by concentrations of contaminants found in oil samples taken from excavations near former process units and tanks where there had been leaks. This is a conservative assumption as some portion of the Site was covered with structures that did not experience leaks. The underlying soils in these areas should include little, if any, contamination. It is likely that much of the surface soil on the Site has some shallow petroleum contamination. However, for purposes of Site planning, the discovered levels of contamination from the areas around the tanks and process units have been assumed for the entire Site, which is considered to be a worst case scenario.

Measures that will be implemented to mitigate potential impacts during construction will include the following:

- Adequate, temporary fencing and security during those periods when individuals could be exposed through trespass activities;
- Dust control through the use of Site watering and other techniques to avoid the off-site disbursement of soils;
- Runoff controls during the period when soils are exposed to avoid the possibility of off-site transport of soils;
- Monitoring of excavations, such as utility trenches and foundations for organic emissions; and
- Decontamination of all equipment that could come into contact with the existing soils prior to the equipment leaving the Site.

These mitigation measures are described in greater detail below.

6.2.1 Site Security

The Site is presently fenced throughout its entire boundary. Construction equipment access will require the removal of all or some of the existing fence. The construction

contractor will be required to maintain adequate, temporary fencing at all times when Site access is not under direct control so as to maintain security that is at least as effective as the present fence. It is likely that the contractor will take these precautions in any case for the protection of the work site and for control of its conventional liabilities.

6.2.2 Dust Control

Dust controls will be implemented to prevent the off-site dispersal and accumulation of soil and to comply with other applicable regulations as they pertain to air quality and nuisance control. It is expected that the oily nature of the soils on-site will inherently provide substantial mitigation from dust. Dust generation that may need mitigation will include excavation and subsequent stockpile control, replacement of excess excavated soils, on-site construction vehicle traffic, and wind blown soil.

Dust generation will be minimized by all appropriate measures which may include, but not be limited to, the following:

- Wetting of surface soils and spoil piles during excavation and grading;
- Control of excavation techniques to minimize dust generation, such as minimizing drop distances; and
- Covering of stockpiles, if present, with visqueen or other suitable membranes.

Additional measures may be utilized at the discretion of the construction contractor.

6.2.3 Storm Water Runoff Control

Should rainfall events occur after the existing pavement is removed and prior to the replacement of the pavement as part of the redevelopment, storm water runoff controls will be utilized to prevent the off-site migration of ingestible quantities of soil. Storm water runoff control will be based on best management practices such as those described in the *California Storm Water Best Management Practices Handbooks Construction Activity* (Storm Water Quality Task Force, March, 1993). on-site sediment and erosion protection controls will be the primary methods for minimizing the discharges of sediments from the Site. Sediment and erosion protections will include, but not be limited to, the following:

- Covering soil stockpiles, if present, with visqueen or other suitable membranes;
- Placing silt fences or straw bales along the lower boundary of the Site to contain soil laden runoff; and
- Placement of gravel or other suitable material over exposed soil areas.

Specific site practices to be used will be detailed in the construction permitting documents prepared by the construction contractor.

6.2.4 Decontamination

To the extent allowable consistent with geotechnical needs, any clean fill imported to adjust for finish grades will be placed in such a way to provide a buffer for activities relative to the oily soils. Construction equipment that comes in contact with oily soils will be decontaminated prior to leaving the Site to minimize the potential of off-site transport. Decontamination methods will include brushing and/or vacuuming to remove loose dirt on vehicle exteriors and wheels. In the event that these dry decontamination methods are not adequate, steam cleaning, high pressure washing, and cleaning solutions may be employed. Wash waters, if any, will be collected and managed in accordance with applicable laws and regulations.

6.3 MINIMIZING GROUNDWATER CONDUIT CREATION

Residual concentrations of contaminants exist on the Site in separate phase hydrocarbons and dissolved forms, particularly on the south side. The impacted shallow groundwater is at a depth of 9 to 10 feet below existing grade in a zone of interbedded sands and gravels separated by units of fine grained structure.

While it is not presently known exactly what construction foundation techniques will be chosen for the redevelopment of the Site, it is unlikely that they will include pile or caisson foundation systems. If during the design of the redevelopment improvements such penetrations through the shallow groundwater are determined to be necessary, then precautions will be implemented to seal around the piles or caissons to prevent creation of a pathway to lower groundwater units. A description of specific methods cannot be included in this Plan as they will be contingent on the location, nature, and size of the buildings to be constructed on the Site. If foundation activities require penetration below the first groundwater layer, the RWQCB will be provided with construction details for approval.

6.4 SOIL MANAGEMENT PROTOCOLS

During the demolition of the former process units and storage tanks that were on the Site, contaminated soil was encountered. Some of the contaminated soil was retained and mixed with other soil as part of the grading process. It is likely that soils with visual hydrocarbon staining may be present in areas requiring construction activity. Proper handling of these soils will be required. Current development activities suggest that fill will be imported to adjust site grades for runoff control. No excess excavation is presently anticipated.

Soil management protocols will provide guidance for the excavating and handling of soil remaining at the Site. Soil will be categorized in three ways after redevelopment is

complete. These three categories and the possible exposure pathways associated with each are as follows.

- Surface soils are those that are within 18 inches of the surface. Pathways of concern could include direct exposure and ingestion. The Site is expected to be completely covered after redevelopment, and no soil should remain as surface soil.

- Covered soil is soil contained under building materials (e.g. parking areas, walks, etc.) that will prevent the exposure of the underlying soil. This will be the condition of much of the Site once redevelopment activities are complete. Exposure concerns will arise at joints and cracks and as the cover materials age.

- Soil under buildings is the category of soils that will be located under the foundations of buildings that will be constructed on the Site. The primary pathway of concern will be the potential inhalation of volatile chemicals that might invade indoor air spaces.

While the majority of chemicals on the Site are very insoluble and highly adsorbable in soil and therefore highly immobile, it will add to the effectiveness of the remedial measures if as much soil as possible, regardless of chemical concentrations, is kept beneath all pavements and buildings. For this reason, the Site grading plan will accommodate all expected excess excavation from the foundation construction under pavement or building pad areas. If soil is found that has poor structural properties, that soil will be properly manifested and removed to an appropriate disposal site, as necessary.

As a final management approach to deal with soil issues, a vapor barrier will be installed under all buildings intended for occupancy. The vapor barrier will be either a solid sheet membrane or a spray applied, rubberized, reinforced membrane of a composition suitable to resist chemical attack from the known chemicals on the Site.

It should be noted that the groundwater separate phase hydrocarbon control wells at the Site boundary will serve as a backup to the other controls described above and will represent a redundancy in the remediation system.

6.5 SOIL RELOCATION REPORT

After earthwork activities are complete and pavements are in place, a report will be prepared to document the relocation and/or covering of any soil that differs in its contamination characteristics from the general soil at the Site. At a minimum, this report will include a narrative of the observations of the soil excavated for foundations, the placements of soil on the Site, the presence of unsuitable soil, and any disposal methods used. This report will be submitted to the RWQCB.

7.0 RISK MANAGEMENT AFTER REDEVELOPMENT

The post construction portion of this Plan addresses the precautions that will be undertaken to mitigate the long term human health and environmental risks from the Site after all redevelopment activities are complete. Any future reuse of the Site that will involve the disturbance of soil, pavements or building foundations must be accomplished consistent with the objectives of this Plan.

Components of the post construction portion of this Plan include the following:

- Prevention of the exposure of Site occupants or visitors to contaminated soil by maintaining cover materials in good repair;
- Establishment of protocols for on-site workers engaged in subsurface excavation activities such as buried utility repair, work on buried foundations, or pavement requiring the exposure of soil;
- Prevention of the use of groundwater under the Site;
- Establishment of a notification procedure to ensure long term compliance with this Plan;
- Inspection of the Site, at least annually, to verify that the risk management controls + inspection of asphalt cap are being implemented and that they are effective in preventing potential exposure to contaminated soils; and
- Management controls to prevent uses of the Site that would be inconsistent with this Plan and the remediation strategies that will be employed for the Site.

7.1 COVERING OF THE SITE

Soil will be contained under buildings or structural pavements that will be in the form of asphalt or concrete. The Site will be inspected annually to ensure that the cover materials remain in good shape. Damage to the integrity of the cover materials will be promptly repaired. Any actions taken will be part of the annual report described earlier.

7.2 CRITERIA FOR TERMINATING GROUNDWATER CONTROL

It is anticipated that recovery of free phase hydrocarbons will be most effective in the early years of operation and taper off over time in terms of the quantities of chemicals removed per year. The hydrocarbons are high molecular weight, highly to completely insoluble, and highly adsorbable. Mass flow rates into the remediation system will be small in any event. It is the intent of the groundwater remediation system to significantly reduce the potential for the formation of free product in or on the groundwater adjacent to the submerged impacted soil and to capture the small soluble faction possibly present. It

is envisioned that an equilibrium will be reached at some unpredictable point in the future where the mass of hydrocarbons will match the sorptive power of the soil, above and below the groundwater, and the soluble portion will be in balance with the natural degradation potential of the Site.

The recovery efforts associated with the hydrocarbons will continue until no appreciable hydrocarbons are absorbed on the collection media between the servicing periods of that well. As part of the initial normal maintenance of the well system, the technician servicing the absorbent polymer sleeves will note the relative capture weight for each of the wells. Each sleeve has a predetermined capacity for hydrocarbon capture. By leaving the device in place until a sheen coexists with an apparently saturated sleeve, the technician can judge the rate of capture and project replacement cycles and the approximate removal rates. When a sheen no longer coexists with the sleeve in a given well, the technician will note this fact and judge the remaining absorption capacity of the sleeve. On the next subsequent visit, if no sheen has appeared and the sleeve shows no appreciable increase in capture, the sleeve will be removed and replaced with a fresh sleeve. The new sleeve will be left in place for at least three months and then reexamined. If no appreciable separate phase hydrocarbons have been absorbed, the sleeve will be removed and the well will be designated as free of product and will thereafter be used for monitoring only. This process will be repeated for all wells until they all are deemed free of separate phase hydrocarbons or until other evidence exists that suggests the recovery efforts are complete.

need interior wells when most contamination is.

As the wells become free of hydrocarbons, their continued value as monitoring wells will be reexamined. When a well has a neighboring well between it and the remaining separate phase hydrocarbon plume, it will be considered redundant and abandoned to eliminate the small but real potential of it acting as a future conduit for the surface release of anything reaching groundwater without first having to pass through the soil column. Approval of the RWQCB will be sought prior to the abandonment of any well.

ACEH

All groundwater monitoring will be terminated when all of the wells in operation show no evidence of separate phase hydrocarbons for at least six months. Once the operation of all the wells is terminated, the wells will be properly abandoned.

I'm not sure about this.

7.3 PROTOCOLS FOR FUTURE SUBSURFACE DEVELOPMENT

Health and safety procedures will be followed, as described in Section 6, for all individuals engaged in subsurface excavation activities in which covered soil and soil under the building will be exposed. The likely scenarios are buried utility repairs, work on buried foundations, or repair and alterations to pavements. At a minimum, a site specific HASP will be prepared and will be employed in concert with any work of this type.

If minor soil disturbance is undertaken in the future, the work will again follow the guidelines in Section 6. Any excavated soil will be replaced in the excavation or disposed of off-site at an appropriate waste facility.

If future activities at the Site are planned that will involve a significant reduction in the extent or effectiveness of the coverage over the soil, then an addendum to this Plan will be prepared and submitted to the RWQCB.

7.4 USE OF GROUNDWATER

For a variety of reasons, the shallow groundwater under the Site and under the surrounding general area is not used as a source of drinking water or for any other purpose. This shallow groundwater cannot be used for drinking water until a risk assessment is performed that demonstrates the acceptability of this possible use to the satisfaction of the RWQCB and any other involved agencies.

7.5 LONG TERM COMPLIANCE

The RWQCB will issue an Order upon its review and acceptance of this Plan. All future purchasers or users of the Site or a portion of the Site will be bound by the environmental conditions that the RWQCB attaches to its Order.

In addition, EkoTek, the Websters, ARO LLC, and the RWQCB will jointly draft and execute an Environmental Restriction and Covenant that will be recorded with the deed for the Site. The Environmental Restriction and Covenant will limit future uses of the Site and will identify certain restrictions that will apply even to approved uses for the Site. A draft of the Environmental Restriction and Covenant is included as Appendix B to this Plan.

DRAFT
May 8, 1998

APPENDIX A

HUMAN HEALTH RISK ASSESSMENT

WATERSTONE
ENVIRONMENTAL, LLC

HUMAN HEALTH
RISK ASSESSMENT

FORMER OIL RECYCLING SITE
4200 ALAMEDA AVENUE
OAKLAND, CALIFORNIA

APRIL, 1998

HUMAN HEALTH RISK ASSESSMENT
4200 Alameda Avenue, Oakland, California

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1.0 EXECUTIVE SUMMARY

Jill Ryer-Powder, Ph.D. DABT of Waterstone Environmental, LLC. has performed this human health risk assessment ("RA") for the 4200 Alameda Avenue property ("Site"), Oakland, California (Figure 1) to assess the potential human health risks associated with future uses of the Site after it is redeveloped. The objective of this RA is to provide upper-bound, health-conservative estimates of the risks to all future on-site populations.

The Site is fenced and completely covered with asphalt paving. The Site currently presents no significant human health risk because there are no potentially exposed populations. The primary chemicals of concern ("COCs") at the Site are constituents of petroleum hydrocarbon mixtures (e.g., waste oils) and volatile organic compounds that may have become commingled with such mixtures.

This risk assessment assumes that the Site will be redeveloped for commercial uses. Such uses may include but are not limited to restaurants, convenience stores or retail outlets. It is assumed that the entire Site will be covered with buildings, asphalt parking lots, or planter strips with imported soil. The two future potentially exposed populations consist of commercial building occupants and future maintenance personnel.

The estimated risks for these populations are within the risk range determined to be acceptable by U.S. EPA. The total non-carcinogenic hazard index for exposure to COCs in soil and groundwater is 0.04 for future commercial building occupants and 0.06 for future maintenance workers. Both of these values are significantly below the threshold at which non-carcinogenic effects may occur (i.e., one). The total estimated lifetime incremental carcinogenic risk for exposure to COCs is soil and groundwater is 9.6×10^{-6} for future commercial building occupants 5.4×10^{-6} for future maintenance workers, which is within the acceptable range of incremental carcinogenic risks of 10^{-4} to 10^{-6} specified by U.S. EPA.

2.0 INTRODUCTION

Jill Ryer-Powder, Ph.D. DABT of Waterstone Environmental, LLC. has performed this human health risk assessment ("RA") for the 4200 Alameda Avenue property ("Site"), Oakland, California (Figure 1) to assess the potential human health risks associated with future uses of the Site after it is redeveloped. The objective of this RA is to provide upper-bound, health-conservative estimates of the risks to all future on-site populations.

Soil and groundwater investigations have been performed at the Site as well as removal actions consisting of the demolition of above grade building sand tanks and below grade structures (e.g., pipe lines, and oil/water separator, sumps). These investigative and removal actions are discussed in detail in the following reports, which have been previously submitted to the San Francisco Regional Water Quality Control Board and the Alameda County, Department of Health.

- Erler & Kalinowski, Inc., *Demolition and Excavation Report,* Former Oil Recycling Site, 4200 Alameda Avenue, Oakland, California, 12 August 1996.
- Erler & Kalinowski, Inc., *Groundwater Sampling Results for June 1996*, 4200 Alameda Avenue, Oakland, California, 12 August 1996.
- Erler & Kalinowski, Inc., *Preliminary Investigation Report*, Former Oil Recycling Site, 4200 Alameda Avenue, Oakland, California, September 1995.

Presented below are a brief site description and the discussion of the objectives and approach of the RA.

2.1 SITE DESCRIPTION

As shown on Figure 1, the Site is located at 4200 Alameda Avenue in Oakland, California. Oil recycling took place on the Site from approximately 1925 to 1981. It has been known by various names including "Bonus International, Inc.", "Bayside Oil Company", "Fabian Oil Refining Company", "Economy Refining & Service Company", "Economy Byproducts & Economy Service Company", and "Ekotek Lube, Inc." No activities have occurred on the Site since oil recycling was discontinued. Waste oil received by the facility primarily consisted of oils from automobiles, railroad locomotives, aircraft, and electrical transformers. Stoddard solvent was also reportedly recycled at the facility until approximately 1978.

The Site is a small, triangular-shaped property that encompasses less than 35,000 ft^2 or 0.8 ares. The Site is bounded by Alameda Avenue along its western side, East 8th Street along its east-southeastern side, and the former American National Can Company ("ANCC") site along its northern side. The Site is fenced and completely covered with asphalt paving. The Site currently

presents no significant human health risk because there are no potentially exposed populations or complete exposure pathways.

2.2 HUMAN HEALTH RISK ASSESSMENT OBJECTIVES AND APPROACH

The objectives of this human health risk assessment are to provide quantitive estimates of the potential human health impacts attributable to the chemicals detected in soil and groundwater (based upon available site-specific data) and in the air (based upon the results of volatilization from soil or groundwater). The RA utilizes the following risk assessment guidelines published by the State of California Environmental Protection Agency ("Cal-EPA") Department of Toxic Substances and Control ("DTSC"), the United States Environmental Protection Agency ("U.S. EPA"), and the American Society for Testing and Materials ("ASTM"):

- Cal-EPA, DTSC, *Preliminary Endangerment Assessment Guidance Manual.* January 1994.
- U.S. EPA. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A).* December 1989.
- ASTM. *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites ("RBCA").* 1995.

Although all three guidance were relied upon to perform this RA, exposure point concentrations ("EPCs") and attendant potential risks are estimated primarily through the use of transport models and risk equations provided in RBCA. The models (from RBCA) used to calculate air concentrations from chemicals is soil and groundwater are presented in Appendix B. Potential risks posed by lead in soil at the Site were assessed through application of Cal-EPA, DTSC Lead Spreadsheet Version 6.0.

3.0 EVALUATION OF SOIL AND GROUNDWATER ANALYTICAL DATA

This section identifies the chemicals of concern ("COCs") at the Site based on analytical data obtained during previous soil and groundwater investigations at the Site. Soil and groundwater data compiled for the Site are presented in tables included as Appendix A. Soil and groundwater sampling locations at the Site are shown on Figure 2.

Because historical operations consisted of the recycling of waste motor and other lubricating oils, the primary COCs at the Site are constituents of petroleum hydrocarbons mixtures and volatile organic compounds ("VOCs") that may have been commingled with such mixtures. Besides VOCs, polychlorinated biphenyls ("PCBs") and metals such as lead, total chromium, and zinc have been identified in petroleum hydrocarbons released at the Site.

3.1 SUMMARY OF ANALYTICAL DATA

Available data indicate that petroleum hydrocarbons are present in soil and groundwater at the Site. Halogenated VOCs, benzene, toluene, ethyl benzene, total xylenes ("BTEX"), and semivolatile organic compounds ("SOVCs") were detected only at low concentrations in soil. Detected concentrations of halogenated VOCs and BTEX in groundwater are believed to be associated with free-phase petroleum hydrocarbons as opposed to being dissolved in groundwater itself. No appreciable migration of these compounds, and only minimal migration of petroleum hydrocarbons, have been observed in groundwater from the Site.

Petroleum hydrocarbons in soil and groundwater at the Site are characteristic of motor oil and are predominantly high molecular weight (with carbon chain lengths between C_{16} and C_{36}). ASTM (1995) states that petroleum hydrocarbons of this type are "relatively viscous and insoluble in groundwater and relatively immobile in the subsurface." This statement is supported by available data that shows a lack of petroleum hydrocarbon migration in groundwater at the Site.

Metals detected in soil or groundwater at the Site include arsenic, total chromium, lead, cadmium, nickel, and zinc. Representative concentrations ("RCs") of total chromium, lead, nickel, and zinc appear to be above background concentrations reported for soil in the San Francisco Bay Area (Scott, 1995). Arsenic and cadmium were retained in the RA despite the fact that their RCs appear to be within the range of background levels reported for these metals. The following table presents the RCs for metals at Site and their respective background concentrations.

Metal	Site Representative Concentration (mg/kg)	San Francisco Bay Background Level (mg/kg); (a)
Arsenic	5.1	0.2-5.5
Cadmium	1.6	(b)
Total Chromium	75	30.5-72
Lead	89	6.8-16.1
Nickel	110	46.4-101
Zinc	450	47.7-82.8

Notes:

(a) Background metal concentrations obtained from C.M. Scott, 1995. Range is based on the mean plus and minus one standard deviation, or a 68 percent confidence interval.

(b) Statistical data for this metal are not available.

3.2 REPRESENTATIVE CONCENTRATIONS OF CHEMICALS OF CONCERN

Summarized in Tables 1A and 1B are the RCs of COCs in soil and groundwater at the Site. RCs of potential COCs were established as the lesser of the maximum concentration detected of the 95% upper confidence limit ("UCL") of the average concentration, assuming a lognormal distribution (U.S. EPA, 1992; DTSC , 1992). The data were assumed to be lognormally distributed.

The concentrations of petroleum hydrocarbons in some samples caused the laboratory reporting limits for specific compounds (e.g., VOCs) to be raised. Consistent with U.S. EPA guidance (1989), such samples were excluded when estimating RCs if the raised reporting limits were greater than the maximum detected chemical concentrations and the raised reporting limits significantly biased the RCs of chemicals at the Site.

4.0 HUMAN HEALTH RISK ASSESSMENT

This section presents toxicity information for each of the potential COCs, the assumptions used in the risk screening evaluation and the results of the risk screening evaluation. This RA uses a

reasonable maximum exposure ("RME") methodology as recommended by Cal-EPA and U.S. EPA (Cal-EPA, 1992; U.S. EPA, 1989). The RME scenario provides a health-conservative methodology for developing RCs that tends to overestimate environmental concentrations of the detected chemicals for chronic exposures. Using RCs, exposure point concentrations ("EPCs"), chronic daily intakes ("CDIs"), and risk/hazard index estimates are derived for the RME scenarios.

4.1 TOXICITY CRITERIA

The toxicity criteria section provides quantitative estimates of the toxic effects associated with the potential COCs included in the RA. The two broad categories of adverse human health effects recognized in the assessment of health risks are non-carcinogenic and carcinogenic effects. Health criteria for each of these effects are presented separately, where data allow.

The toxicity criteria developed by both the California Environmental Protection Agency ("Cal-EPA") and U.S. EPA are derived primarily for two exposure routes, ingestion and inhalation. Toxicity criteria typically are not derived for dermal absorption exposures. Following U.S. EPA recommendations, the health risk estimates via dermal absorption of soil-bound chemicals are estimated using toxicity criteria developed for the ingestion exposure route (U.S. EPA, 1989), following estimates of the likelihood of absorption.

4.1.1 Non-Carcinogenic Toxicity Criteria

Non-carcinogenic effects encompass adverse, chronic human health effects that do not result in the production of tumors, but which include both developmental and reproductive effects. When the chemical dose levels for non-carcinogens exceed the chemical-specific threshold doses, the potentially exposed populations may exhibit adverse health effects. Dose levels less than the threshold level are assumed not to produce adverse health effects in exposed individuals.

Threshold levels for non-carcinogenic effects are expressed as reference doses ('RfDs"). A RfD, published in units of mg/kg-day, reflects the maximum chemical dose level that must be exceeded before the adverse effects would be expected to occur, but generally incorporates a safety or uncertainty factor of two or more orders of magnitude. A low RfD indicates a low threshold dose level, and therefore a high chemical toxicity. Conversely, a chemical with a higher RfD value is less toxic than chemicals with lower RfDs.

The following hierarchy for selecting RfD values is used in the risk screening evaluation. The preferred source for reference doses is the Integrated Risk Information System ("IRIS") database (U.S. EPA, 1995a). The toxicity values available in IRIS are updated monthly and have undergone agency review and verification by work groups comprising staff from several U.S. EPA program offices. In the absence of toxicity data for IRIS, the FY-1995 edition of U.S. EPA's Health Effects Assessment Summary Tables ("HEAST") is used (U.S. EPA, 1995b). These tables are usually updated annually and contain work group verified or interim toxicity

values based on the toxicological literature. The final source of toxicity information is the U.S. EPA Environmental Criteria Assessment Office ("ECAO") in Cincinnati, Ohio. The values obtained from ECAO are based on a variety of U.S. EPA reports and the toxicological literature, but are not work group verified.

As recommended in agency guidelines, the non-carcinogenic effects of the potential human carcinogenic are also considered in the risk screening evaluation, where data allow (U.S. EPA, 1989; DTSC, 1992, 1994). This strategy provides for a more thorough evaluation of the potential non-carcinogenic effects posed by the potential COCs.

Inhalation and ingestion toxicity information for potential COCs in soil and groundwater is summarized in Tables 2 and 3, respectively.

4.1.2 Carcinogenic Toxicity Criteria

The toxicity criteria that indicate the potential carcinogenicity of chemicals are called slope factors ("SFs"). U.S. EPA defines a SF as the "plausible upper-bound estimates of the probability of a carcinogenic response per unit of chemical intake over a lifetime" (U.S. EPA, 1989). SFs are developed using mathematical models and are expressed in reciprocal units of exposure, $(mg/kg\text{-}day)^{-1}$. Chemicals having a higher SF are believed to be inherently more carcinogenic, i.e., potent, than those with a lower SF.

The International Agency for Research on Carcinogenic ("IARC") and U.S. EPA have also developed systems to categorize chemicals that are potentially carcinogenic according to the strength of the existing experimental evidence (human and animal studies). The U.S. EPA Human Health Assessment Group ranks chemicals from Group A (known human carcinogen) to Group E (evidence on non-carcinogenicity for humans). Group A designation is assigned to those chemicals known to be carcinogenic to humans as substantiated by positive epidemiological evidence. Chemicals not known to be human carcinogens are classified into other categories based on the strength of the available human and animal toxicological data. The U.S. EPA carcinogen ranking classification is presented for each potential human carcinogen included in the risk screening evaluation.

DTSC's recommended hierarchy is used to select health criteria for the carcinogens included in the risk screening evaluation (DTSC, 1994). The preferred source for carcinogenic slope factors is the list of SFs published by the Cal-EPA Standards and Criteria Work Group, dated November, 1994 (Office of Environmental Health Hazard Assessment, 1994). The secondary source of SFs is the IRIS database (U.S. EPA,. 1995a). The third source of SFs is the FY-1995 edition of the U.S. EPA's HEAST (U.S. EPA, 1995b).

Inhalation and ingestion toxicity information for carcinogenic COCs is summarized in Tables 2 and 3, respectively.

4.1.3 Compounds with No Toxicity Criteria

COCs identified at the Site that lack U.S. EPA or DTSC-derived health criteria are petroleum hydrocarbons, n-butylbenzene, sec-butylbenzene, isopropylbenzene, p-isopropyltoluene, n-propylbenzene, 1, 2, 4-trimethylbenzene, 1, 3, 5-trimethylbenzene, and 2-methylnaphthalene. Regarding quantitation of petroleum hydrocarbons, ASTM (1995) states:

> Various chemical analysis methods commonly referred to as total petroleum hydrocarbons (TPHs) are often used in site assessments. These methods usually determine the total amount of hydorcarbons present as a single number and give no information on the types of hydrocarbons present. The TPHs should not be used for risk assessment because the general measure of TPH provides insufficient information about the amounts of individual chemical(s) of concern present.

This RA followed the "individual constituent" approach advocated in RBCA to assess the potential risks associated with petroleum hydrocarbons. In this approach, the toxicity of each individual constituent is separately assessed and the toxicity using a hazard index approach. Individual constituents in petroleum hydrocarbons at the Site were identified by analyzing soil and groundwater samples for VOCs, SVOCs, PCBs, and selected metals.

Toxicity values were assigned to n-butylbenzene, sec-butylbenzene, isopropylbenzene, p-isopropyltoluene, n-propylbenzene, 1 ,2, 4-trimethylbenzene, 1, 3, 5-trimethylbenzene, and 2-methylnaphthalene by assuming their toxicity would be equivalent to compounds with similar chemical structures for which toxicity criteria are available. Toxicity criteria for n-butylbenzene, sec-butylbenze, isopropylbenzene, and n-propylbenzene are assumed to be equivalent to ethylbenzene. Toxicity criteria for p-isopropyltoluene, 1, 2, 4-trimethylbenzene, 1, 3, 5-trimethylbenzene are assumed to be equivalent to total xylenes. Toxicity criteria for 2-methylnaphthalene are assumed to be equivalent to naphthalene.

4.2 EXPOSURE ASSESSMENT

The exposure assessment provides estimates of the levels of chemical exposures in hypothetical on-site populations that may come in contact with the potential COCs. This exposure assessment follows the RBCA Guidance.

4.2.1 Identification of Potentially Exposed Populations

This risk assessment contemplates that the Site will be redeveloped for commercial uses. Such uses may include but are not limited to restaurants, convenience stores, or retail outlets. It is assumed that the entire Site will be covered with buildings, asphalt parking lots, or planter stirps with imported soil. People working at the Site can be divided into two populations:

- Future commercial building occupants
- Future maintenance personnel

Table 4 summarizes the potentially exposed populations and their relevant exposure pathways. Any future customers would have exposures significantly lower than workers because they would spend significantly less time at the Site.

4.2.2 Identification of Relevant Exposure Pathways

Exposure pathways by which future populations may be exposed to COCs are discussed in the following paragraphs.

4.2.2.1 Future Commercial Building Occupants

Since the Site will be covered with buildings, concrete, asphalt, and clean soil upon redevelopment of the Site, the only potential risk for the future commercial building occupants is inhalation of volatilized chemicals from soil or groundwater into indoor air through floor cracks.

4.2.2.2 Future Maintenance Personnel

Future maintenance personnel include populations who may be exposed to contaminated soil and groundwater while installing new utility hookups for tenants or repairing broken utility lines. The potential exposure pathways consist of the following:

- Incidental ingestion of soil
- Dermal contact with soil
- Dermal contact with groundwater
- Inhalation of fugitive dust containing non-volatile COCs
- Inhalation of volatilized VOCs from either groundwater or soil exposed during digging at the Site

4.2.3 Estimation of Exposure Point Concentrations

Exposure point concentrations ("EPCs") are the chemical concentrations at the specific points of potential human contact. The RA provides estimated EPCs for each media that coincide with the RME scenarios.

4.2.3.1 Soil EPCs

Analytical results of the soil examples collected on the Site are used to estimate the soil EPCs. Soil EPCs for both commercial building occupants and maintenance personnel are based on the RCs presented in Table 1A.

4.2.3.2 Air EPCs

Exposures to COCs in air are estimated for volatilization of chemicals from both soil and groundwater into the breathing zone. Volatilized chemicals have the potential to move upward through interconnected air-filled soil pores in the unsaturated zone and impact the breathing zone of individuals standing outdoors on paved surfaces or within buildings constructed on top of such soils.

Emission fluxes of chemicals volatilizing from soil and groundwater were estimated from transport models in RBCA calculations and results of these models are presented in Appendix B. Emission fluxes from soil and groundwater were not added because this would result in overestimation of overall emission fluxes into the breathing zone. For example, when considering emission fluxes from groundwater, it is assumed that the unsaturated soil is not contaminated. In actuality, the soil does contain chemicals and emission fluxes from soil would serve to lower emission fluxes from groundwater by reducing the concentration gradient or driving force in the air-filled soil pores.

In conducting the RA, the EPCs for each COC arising from volatilization from soil only and groundwater only were estimated and compared. The greater of these two EPCs was retained for each COC. This approach will provide upper-bound estimates of exposure and potential human health risk for individuals who may occupy the Site in the future.

4.2.3.3 Groundwater EPCs

Analytical results of the groundwater samples collected at the Site are used to estimate the groundwater EPCs. Groundwater EPCs for the maintenance personnel are based on the RCs presented in Table 1B.

4.2.4 Exposure Assumptions

Exposure assumptions are based on (1) default assumptions recommended by the U.S. EPA (U.S. EPA, 1989, 1991, 1992) and the DTSC (DTSC, 1992) and (2) best professional judgment for conditions unique to the Site. Exposure assumptions for each exposure pathway are summarized in Table 5. Soil parameters are based on measured values for the ANCC site (SOMA, 1994). Table 6 lists soil parameters taken from the ANCC site and other assumptions used in RBCA exposure models. Tables 7A and 7B list physical and chemical properties for COCs in soil and groundwater, respectively. Tables 7C and 7D list the results of chemical vapor concentrations due to chemicals in groundwater and soil. Table 7E lists the results of particulate concentrations from chemicals in soil.

4.3 RISK CHARACTERIZATION

For each hypothetical future population, risk estimates for each exposure medium (i.e., soil, groundwater, or air) are calculated for each potential COC and are added to derive the estimated hypothetical risk for each exposure medium. The risk estimates are added to obtain the total estimated lifetime risk for all complete exposure pathways affecting the potentially exposed populations.

Results of the risk screening evaluation are presented in Tables 8 through 10 and are discussed in more detail in the following paragraphs.

4.3.1 Carcinogenic Effects

Risk characterization for carcinogens includes estimating the incremental probability of developing carcinogenic effects over a lifetime of 70 years due to a 25-year exposure to the potential human carcinogens. Except for those chemicals for which scientific information supporting a carcinogenic threshold exists, a carcinogen is considered to be a non-threshold agent, such that any exposure to a carcinogen is expected to increase the probability of developing carcinogenic effects over an individual's lifetime. Incremental carcinogenic risk is calculated as the product of the estimated dose from exposure to the potentials COCs and the carcinogenic slope factor. The PEA Guidance considers risks less than 10^{-6} to be insignificant. California's Proposition 65 considers risks less than 10^{-5} to not require a warning. The U.S. EPA's acceptable range of incremental carcinogenic risk is generally 10^{-4} to 10^{-6} (U.S. EPA, 1989).

The incremental lifetime carcinogenic risk via each complete exposure pathway is calculated by adding the risk estimates from all of the chemicals impacting that partway. Risks across each pathway are then added to derive the total estimated incremental lifetime carcinogenic risk for the potentially exposed population. Such summation is a health-conservative screening step because it does not differentiate between target organs, i.e., chemical-specific carcinogenic health effects are

not all the same.

Estimated incremental lifetime carcinogenic risks for all exposed populations and all applicable exposure pathways are included in Tables 8 through 9. The total lifetime incremental carcinogenic risks for each hypothetically exposed population are summarized in Table 10.

As summarized in Table 10, the total estimated incremental lifetime carcinogenic risks for the potentially exposed populations are as follows:

- 9.6×10^{-6} for future commercial building occupants;
- 5.4×10^{-6} for future maintenance personnel.

These risk values are within U.S. EPA's generally acceptable range of incremental carcinogenic risks of 10^{-4} to 10^{-6}.

4.3.2 Non-Carcinogenic Effects

The non-carcinogenic risk characterization represents the relationship between the chemical doses estimated for the populations of concern and the toxicity of the individual non-carcinogenic COCs.

Calculated HI values for all exposed populations and all applicable exposure pathways are included in Tables 8 through 9. The total non-carcinogenic HI for each hypothetically exposed population is summarized in Table 10.

As summarized in Table 10, the total non-carcinogenic HI values for the potentially exposed populations are as follows:

- .035 for future building occupants;
- .057 for future maintenance personnel.

Both of these values are significantly below the threshold at which non-carcinogenic effects may occur (i.e., 1).

4.3.3 Risks Due to Lead Exposure

Potential health effects due to lead exposure are assessed in terms of the lead concentration in blood,

rather than in terms of non-carcinogenic and carcinogenic risks. Therefore, the risks due to lead exposure are discussed here separately from other COCs.

The concentration of concern for lead in the blood is 10 micrograms per deciliter ("ug/dl") at the 99th percentile (DTSC, 1992). Lead concentration is the blood was calculated using the DTSC Lead Spreadsheet Version 6.0, the equations for which are described in DTSC, 1992. The blood lead concentrations are calculated as the sum of exposure to: (1) background levels of lead in air, (2) background levels of lead in drinking water, (3) background levels of lead in food, and (4) lead in soil at the Site. The representative concentration of lead in soil was 89 mg/kg (Table 1A). Potential risks posed by lead are discussed in the section below for the future populations.

4.3.3.1 Future Commercial Building Occupants

A significant risk has not been identified for future commercial building occupants due to lead-containing soil. The absence of risk results from the fact that a complete exposure pathway to lead-containing soil has not been identified for this population. As discussed earlier, the soil will be capped with buildings, concrete, asphalt, and clean cover upon redevelopment of the Site. Buildings and cover (e.g., asphalt parking lots, planter strips) materials over the Site will render conventional exposure pathways (i.e., ingestion of soil, inhalation of fugitive dust, dermal contact with soil) incomplete.

4.3.3.2 Future Maintenance Personnel

The risk due to exposure to lead-containing soil was evaluated for hypothetical future maintenance personnel and was below the level above which adverse effects due to lead exposure are believed to occur.

The exposure assumptions for the hypothetical future maintenance personnel are based on (1) default assumptions recommended by U.S. EPA (U.S. EPA 1989, 1991, 1992) and the DTSC (DTSC, 1992), and (2) best professional judgment for conditions unique to the Site. The assumptions used are summarized in Table 11. The source of each exposure assumption is referenced in Table 11.

The calculated lead concentration in blood for hypothetical future maintenance personnel is 3.9 ug/dl at the 99th percentile, which is significantly less than the level of concern of 10 ug/dl. Most of the calculated blood lead concentration for the hypothetical future maintenance personnel is due to background levels of led in air, water, and food. Lead in soil as the Site only accounts for 0.1 percent of the blood lead concentration. Therefore, exposure of hypothetical future maintenance personnel to lead-containing soil at the Site should not result in blood lead concentrations in excess of the level of concern.

5.0 UNCERTAINTY ASSOCIATED WITH THE RISK ASSESSMENT

The hypothetical risks calculated and presented in Section 4.3.1 and 4.3.2 are upper bound, health-conservative estimates of risks for RME pathways.

Factors that contribute to the uncertainty or conservatism in this RA include the following:

- Chemical data for soil was retained in the risks screening evaluation, regardless of the soil sampling depth which implies that hypothetical exposure to surface soil is the same as that from depth (e.g., 5 feet below ground surface).

- Risks from COCs is soil and groundwater were estimated without considering the effects of petroleum hydrocarbons on the volatilization of COCs. The volatility of halogenated VOCs and BTEX is likely to be reduced due to the enhanced solubility of these compounds in waste oil. Accordingly, EPCs are likely to be less than those assumed in this RA.

Potential risks may be significantly lower than those presented in Tables 8 through 10 if the RA were to account for the above factors.

6.0 REFERENCES

American Society for Testing and Materials ("ASTM"), *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Site*, 1995

Department of Toxic Substances Control ("DTSC"), January 1994, *Preliminary Endangerment Assessment Guidance Manual*

DTSC, July 1992, *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities*

Erler & Kalinowski, Inc. ("EKI"), September 1995, *Preliminary Investigation Report,* Former Oil Recycling Site, 4200 Alameda Avenue, Oakland, California

EKI, 12 August 1996, *Demolition and Excavation Report,* Former Oil Recycling Site, 4200 Alameda Avenue, Oakland, California

EKI, 12 August 1996, *Groundwater Sampling Results for June 1996,* 4200 Alameda Avenue, Oakland, California

Montgomery, J.H. and L.M. Welkom, 1991, *Groundwater Chemicals Desk Reference,* Lewis Publishers, Chelsea, MI

Office of Environmental Health Hazard Assessment, 1994, *California Carcinogenic Potency Factors: Update,* Standards and Criteria Work Group, Sacramento, CA.

Scott, C.M., May 1995, Background Metal Concentrations in Soils in Northern Santa Clara County, California, in: *Recent Geologic Studies in the San Francisco Bay Area,* E.M. Sangines, D.W. Andersen, and A.V. Buising, Eds., Pacific Section of the Society of Economic Paleontologists and Mineralogists, Vol. 76.

SOMA Environmental Engineering, Inc., *Baseline Health Risk Assessment,* American National Can Company, Oakland, California Facility, 31 January, 1994

U.S. EPA, 1995a, *Integrated Risk Information System (IRIS),* Washington, D.C.

U.S. EPA, 1995b, *Health Effects Assessment Summary Tables, Annual FY 1995*, Office of Emergency and Remedial Response, Washington, D.C., EPA/540/R-95/036

U.S. EPA, January 1992, Dermal Exposure Assessment: *Principles and Applications,* Office of Research and Development, Washington, D.C., EPA/600/8-91/011B

U.S. EPA, 1992, Supplemental Guidance to RAGS: *Calculating the Concentration Term, OSWER*, Washington, D.C., Intermittent Bulletin, Vol. 1, No. 1, Publication 9285.7-081

U.S. EPA, 1989, *Risk Assessment Guidance for Superfund, Vol. 1, Human Health Evaluation Manual (Part A),* Office of Emergency and Remedial Response, Washington, D.C., EPA-540/1-89/002

U.S. EPA, 1988, *Superfund Exposure Assessment Manual,* Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-88/001

Table 1A
Representative Concentrations of Chemicals of Concern Detected in Soil

4200 Alameda Avenue
Oakland, California

Compound	Frequency of Detection		Summary of Detected Concentration (mg/kg)				Representative Concentration (mg/kg) (e)
	Number of Times Detected	Number of Analyses Performed	Minimum (a)	Maximum (b)	Arithmetic Mean (c)	95% Upper Confidence Limit (lognormal); (d)	
TPHg (f)	34	40	2	4,100	600	(i)	4,100
TPHd (g)	40	40	1.5	11,000	1,800	(i)	11,000
TPHm (h)	38	40	21	15,000	3,500	(i)	15,000
Benzene	9	36	0.018	1.5	0.14	1.2	1.2
Chlorobenzene	5	32	0.0072	0.5	0.093	0.37	0.37
2-chlorotoluene	4	10	0.53	22	4.5	(i)	22
1,2-Dichlorobenzene	17	40	0.0058	11	0.66	8.8	8.8
1,1-Dichloroethane	2	17	0.012	0.023	0.0047	(i)	0.023
1,2-Dichloroethane	2	17	0.018	0.028	0.0054	(i)	0.028
cis-1,2-Dichloroethene	5	40	0.014	8.5	0.48	4.2	4.2
trans-1,2-Dichloroethene	1	17	0.033	0.033	0.0047	(i)	0.033
Ethylbenzene	31	40	0.007	34.5	3.5	(i)	34.5
Freon113	1	25	0.83	0.83	0.073	0.61	0.61
n-Butylbenzene	8	10	0.58	19	5.3	(i)	19
sec-Butylbenzene	4	7	0.66	3.4	1.0	(i)	3.4
Isopropylbenzene	3	7	0.53	3.2	0.87	(i)	3.2
p-Isopropyltoluene	8	10	0.5	8.4	2.6	(i)	8.4
n-Propylbenzene	8	10	0.65	19	5.8	(i)	19
Tetrachloroethene	4	40	0.0062	7.6	0.61	7.0	7.0
Toluene	27	40	0.02	91	6.0	55	55
1,2,4-Trimethylbenzene	9	10	1.5	140	47	(i)	140
1,3,5-Trimethylbenzene	10	10	0.56	43	15	(i)	43
Trichloroethene	7	37	0.0063	2.4	0.17	(i)	2.4
Vinyl Chloride	2	17	0.049	0.05	0.011	(i)	0.05
Total Xylenes	36	40	0.007	195	21	(i)	195
2-Methylnaphthalene	4	15	22	76	18	(i)	76

Table 1A
Representative Concentrations of Chemicals of Concern Detected in Soil

4200 Alameda Avenue
Oakland, California

Compound	Frequency of Detection		Summary of Detected Concentration (mg/kg)				Representative Concentration (mg/kg) (e)
	Number of Times Detected	Number of Analyses Performed	Minimum (a)	Maximum (b)	Arithmetic Mean (c)	95% Upper Confidence Limit (lognormal); (d)	
Naphthalene	9	15	0.51	61.5	12	(i)	61.5
1,2,4-Trichlorobenzene	4	10	5.8	9.8	3.3	(i)	9.8
PCB-1242	3	38	0.045	1.1	0.085	0.28	0.28
PCB-1254	5	39	0.021	3.4	0.18	0.41	0.41
PCB-1260	24	40	0.021	27	1.2	4.7	4.7
Arsenic	4	30	6.8	28	4.4	5.1	5.1
Total Chromium	40	40	18	110	65	75	75
Lead	32	40	5.1	660	52	89	89
Cadmium	3	10	0.53	3.7	0.73	1.6	1.6
Nickel	10	10	38	170	85	110	110
Zinc	10	10	31	560	148	450	450

Notes:

(a) Minimum represents the lowest concentration detected.

(b) Maximum represents the highest concentration detected.

(c) The arithmetic mean was calculated assuming that for samples where chemicals were not reported to be present above the analytical method detection limit, the concentration of each of these chemicals is one-half of the reported detection limit. Samples were not included in the dataset to calculate the mean and 95% UCL if the detection limit exceeded the maximum detected concentration.

(d) The 95% upper confidence limit (UCL) was calculated from the arithmetic mean of the transformed lognormal data set. Samples were not included in the dataset to calculate the mean and 95% UCL if the detection limit exceeded the maximum detected concentration.

(e) Representative concentration is the lesser of the maximum detected value or the 95% UCL.

(f) TPHg - total petroleum hydrocarbons as gasoline

(g) TPHd - total petroleum hydrocarbons as diesel

(h) TPHm - total petroleum hydrocarbons as motor oil

(i) Variability in data results in a 95% UCL that is greater than the maximum reported concentration.

Table 1B
Representative Concentrations of Chemicals of Concern Detected in Groundwater

4200 Alameda Avenue
Oakland, California

Compound	Frequency of Detection		Summary of Detected Concentration (ug/L)				Representative Concentration (ug/L); (e)
	Number of Times Detected	Number of Analyses Performed	Minimum (a)	Maximum (b)	Arithmetic Mean (c)	95% Upper Confidence Limit (d)	
TPHg (f)	16	16	57	160,000	15,000	(i)	160,000
TPHd (g)	16	16	4,900	850,000	170,000	(i)	850,000
TPHm (h)	4	4	67,000	800,000	370,000	(i)	800,000
Benzene	16	16	6.2	630	180	(i)	630
Chlorobenzene	5	15	7.3	160	32	(i)	160
Chloroethane	7	15	1	130	37	(i)	130
1,2-Dichlorobenzene	7	16	1.6	300	54	(i)	300
1,3-Dichlorobenzene	4	16	1.5	1,600	130	(i)	1,600
1,4-Dichlorobenzene	5	16	4.4	2,700	200	(i)	2,700
1,1-Dichloroethane	8	15	4.8	160	54	(i)	160
1,2-Dichloroethane	1	7	17	17	3.2	(i)	17
cis-1,2-Dichloroethene	10	16	8.4	6,600	1,600	(i)	6,600
trans-1,2-Dichloroethene	7	15	4.1	170	53	(i)	170
1,2-Dichloropropane	1	6	4.9	4.9	1.3	(i)	4.9
Ethylbenzene	13	16	28	700	120	(i)	700
Toluene	12	16	12	2,500	410	(i)	2,500
Trichloroethene	1	6	3.8	3.8	1.1	(i)	3.8
Vinyl Chloride	10	16	4.1	5,200	2,000	(i)	5,200
Total Xylenes	13	16	49	3,400	550	(i)	3,400
2,4-Dimethylphenol	1	6	3,400	3,400	590	(i)	3,400
2-Methylnaphthalene	1	3	11	11	5.3	(i)	11
2-Methylphenol	1	6	330	330	81	(i)	330
4-Methylphenol	2	6	9.9	550	120	(i)	550
Naphthalene	2	5	63	160	51	(i)	160

Table 1B
Representative Concentrations of Chemicals of Concern Detected in Groundwater

4200 Alameda Avenue
Oakland, California

Compound	Frequency of Detection		Summary of Detected Concentration (ug/L)				Representative Concentration (ug/L); (e)
	Number of Times Detected	Number of Analyses Performed	Minimum (a)	Maximum (b)	Arithmetic Mean (c)	95% Upper Confidence Limit (d)	
Phenol	1	5	230	230	53	(i)	230
PCB-1260	1	6	31	31	7.9	(i)	31
Arsenic	8	8	13	93	40	85	85
Chromium	3	8	21	89	22	70	70
Lead	4	10	5	6,600	920	(i)	6,600

Notes:

(a) Minimum represents the lowest concentration detected.

(b) Maximum represents the highest concentration detected.

(c) The arithmetic mean was calculated assuming that for samples where chemicals were not reported to be present above the analytical method detection limit, the concentration of each of these chemicals is one-half of the reported detection limit. Samples were not included in the dataset to calculate the mean and 95% UCL if the detection limit exceeded the maximum detected concentration.

(d) The 95% upper confidence limit (UCL) was calculated from the arithmetic mean of the transformed lognormal data set. Samples were not included in the dataset to calculate the mean and 95% UCL if the detection limit exceeded the maximum detected concentration.

(e) Representative concentration is the lesser of the maximum detected value or the 95% UCL.

(f) TPHg - total petroleum hydrocarbons as gasoline

(g) TPHd - total petroleum hydrocarbons as diesel

(h) TPHm - total petroleum hydrocarbons as motor oil

(i) Variability in data results in a 95% UCL that is greater than the maximum reported concentration.

Table 2
Summary of Inhalation Toxicity Information for Potential Chemicals of Concern in Soil and Groundwater
4200 Alameda Avenue
Oakland, California

Compound	Non-Carcinogenic Toxicity Information		Carcinogenic Toxicity Information		
	Chronic Reference Dose (RfDi) (mg/kg-day)	Source (a)	Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Source (c)
Benzene	- (d)	-	0.1	A	Cal Potency
Chlorobenzene	0.02 (e)	IRIS	-	D	-
Chloroethane	2.86	IRIS	-	-	-
2-Chlorotoluene	0.02 (e)	IRIS	-	-	-
1,2-Dichlorobenzene	0.09 (e)	IRIS	-	D	-
1,3-Dichlorobenzene	-	-	-	D	-
1,4-Dichlorobenzene	0.23	IRIS	0.04	B2	Cal Potency
1,1-Dichloroethane	0.1	HEAST	0.0057	C	Cal Potency
1,2-Dichloroethane	-	-	0.07	B2	Cal Potency
cis-1,2-Dichloroethene	0.01 (e)	HEAST	-	D	-
trans-1,2-Dichloroethene	0.02 (e)	IRIS	-	D	-
1,2-Dichloropropane	0.0011	IRIS	0.063	B2	Cal Potency
Ethylbenzene	0.29	IRIS	-	D	-
Freon113	30 (e)	IRIS	-	-	-
n-Butylbenzene (f)	0.29	IRIS	-	D	-
sec-Butylbenzene (f)	0.29	IRIS	-	D	-
Isopropylbenzene (f)	0.29	IRIS	-	D	-
p-Isopropyltoluene (g)	2	IRIS	-	D	-
n-Propylbenzene (f)	0.29	IRIS	-	D	-
Tetrachloroethene	0.01 (e)	IRIS	0.021	under review	Cal Potency
Toluene	0.11	IRIS	-	D	-
1,2,4-Trimethylbenzene (g)	2	IRIS	-	D	-
1,3,5-Trimethylbenzene (g)	2	IRIS	-	D	-
Trichloroethene	-	-	0.01	under review	Cal Potency
Vinyl Chloride	-	-	0.27	A	Cal Potency
Total xylenes	2 (e)	IRIS	-	D	-
2,4-Dimethylphenol	0.02 (e)	IRIS	-	-	-
2-Methylnaphthalene (h)	0.04	ECAO	-	D	-

Table 2
Summary of Inhalation Toxicity Information for Potential Chemicals of Concern in Soil and Groundwater
4200 Alameda Avenue
Oakland, California

Compound	Non-Carcinogenic Toxicity Information		Carcinogenic Toxicity Information		
	Chronic Reference Dose (RfDi) (mg/kg-day)	Source (a)	Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Source (c)
2-Methylphenol	0.05 (e)	IRIS	-	C	-
4-Methylphenol	0.005 (e)	HEAST	-	C	-
Naphthalene	0.04	ECAO	-	D	-
Phenol	0.6 (e)	IRIS	-	D	-
1,2,4-Trichlorobenzene	0.01 (e)	IRIS	-	D	-
PCB-1242	0.00002 (i)	IRIS	7.7	B2	Cal Potency
PCB-1254	0.00002 (e)	IRIS	7.7	B2	Cal Potency
PCB-1260	0.00002 (i)	IRIS	7.7	B2	Cal Potency
Arsenic	0.0003 (e)	IRIS	12	A	Cal Potency
Cadmium	0.0005 (e)	IRIS	15	B1	Cal Potency
Total Chromium (j)	1.0	IRIS	-	D	-
Nickel	-	-	0.91	A	Cal Potency
Zinc	0.3 (e)	IRIS	-	D	-

Notes:

(a) Chronic reference doses obtained from U.S. EPA's Integrated Risk Information System (IRIS) or U.S. EPA's Health Effects Assessment Summary Tables (HEAST), dated March 1995, or U.S. EPA's Environmental Criteria and Assessment Office, OH (ECAO), in this order of priority.

(b) U.S. EPA weight-of-evidence classification is as follows:

A = Human Carcinogen

B1 or B2 = Probable Human Carcinogen; B1 indicates that limited human data are available; B2 indicates that there is sufficient evidence in animals and inadequate or no evidence in humans.

C = Possible Human Carcinogen

D = Not Classifiable as to Human Carcinogenicity

E = Evidence of Non-Carcinogenicity for Humans

Weight-of-evidence information obtained from IRIS or HEAST.

Table 5
Exposure Assumptions Used in the Human Health Risk Assessment

4200 Alameda Avenue
Oakland, California

Notes:

(a) Exposure assumptions are compiled from:

- Cal-EPA (State of California, Environmental Protection Agency), January 1994, *Preliminary Endangerment Assessment Guidance Manual,* Department of Toxic Substances Control (DTSC).
- Cal-EPA, July 1992, *Supplemental Guidance for Human Health Multimedia Risk Assessment for Hazardous Waste Sites and Permitted Facilities,* DTSC, The Office of the Science Advisor.
- U.S. EPA (U.S. Environmental Protection Agency), January 1992a, *Dermal Exposure Assessment: Principles and Applications, Interim Report,* Office of Research and Development, EPA/600/8-91/011B.
- U.S. EPA, March 1991, *Risk Assessment Guidance for Superfund - Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors",* Interim Final, OSWER Directive: 9285.6-03.
- U.S. EPA, December 1989a, *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A),* OERR, EPA/540/12-89/002.

(b) The values are based on the following assumptions:

It is assumed that 1 maintenance event in which contaminated soil is exposed occurs every 2 years. Each maintenance event is assumed to take 4 working days. Therefore, the exposure frequency for maintenance personnel is 4 days every 2 years, or 2 days/year. The exposure duration (ED) of 25 years for maintenance personnel assumes that same person performs the work over a 25 year period. It is also assumed that maintenance personnel are immersed in contaminated water for 4 hours out of each day.

(c) Averaging time for non-carcinogenic effects, which equals the exposure duration times 365 is listed first. Averaging time for carcinogenic effects, which equals a 70 year lifetime in units of days, is listed second.

(d) A respirable dust concentration (concentration of dust with particles less than 10 micrometers in diameter) of 1 mg/m^3 corresponds to the presence of visible dust clouds. Because it is unlikely that maintenance personnel will be working in visible dust clouds 8 hours/day, a respirable dust concentration of 1.0 mg/m^3 is conservative. For comparison, the permissible exposure limit (PEL) for respirable dust is 5 mg/m^3 (CCR, Title 8, Section 5155, Table AC-1).

Table 6
Assumptions Used in Risk Based Corrective Action ("RBCA") Transport Models

4200 Alameda Avenue
Oakland, California

Parameter	Definition	Units	Commercial
d	Lower depth of surficial soil zone	cm	100
ER	Enclosed-space air exchange rate	l/s	0.00023
f_{oc}	Fraction of organic carbon	g-C/g-soil	0.00038 (a)
h_{cap}	thickness of capillary fringe	cm	5
h_v	thickness of vadose zone	cm	Lgw - hcap
k_s	Soil-water sorption coefficient	cm3-water/g-C	foc * koc
L_B	Enclosed-space volume/infiltration area ratio	cm	300
L_{crack}	Enclosed-space foundation or wall thickness	cm	15
L_{gw}	Depth to groundwater	cm	300
L_S	Depth to subsurface soil sources	cm	30 (b)
P_e	Particulate emission rate	g/cm^2-s	6.9×10^{-14}
U_{air}	Wind speed above ground surface in ambient mixing zone	cm/s	340 (c)
U_{gw}	Ground water Darcy velocity	cm/year	2500
W	Width of source area parallel to wind, or ground water flow direction	cm	3000 (d)
δ_{air}	Ambient air mixing zone height	cm	200
δ_{gw}	Groundwater mixing zone thickness	cm	200
η	Areal fraction of cracks in foundations/walls	cm^2-cracks/cm^2-total area	0.001 (e)
θ_{acap}	Volumetric air content in capillary fringe soils	cm^3-air/cm^3-soil	0.038
θ_{acrack}	Volumetric air content in foundation/wall cracks	cm^3-air/cm^3-total volume	0.063 (a)
θ_{as}	Volumetric air content in vadose zone soils	cm^3-air/cm^3-soil	0.063 (a)
θ_T	Total soil porosity	cm^3/cm^3-soil	0.39 (a)
θ_{wcap}	Volumetric water content in capillary fringe soils	cm^3-water/cm^3-soil	0.342
θ_{wcrack}	Volumetric water content in foundation/wall cracks	cm^3-water/cm^3-soil	0.327 (a)
θ_{ws}	Volumetric water content in vadose zone soils	cm^3-water/cm^3-soil	0.327 (a)
ρ_s	Soil bulk density	g-soil/cm^3-soil	1.62 (a)
τ	Averaging time for vapor flux	s	7.88×10^8

Notes:

(a) Site-specific soil properties were obtained from vadose zone soils at American National Can Company site locatoed adjacent to 4200 Alameda Avenue.(SOMA Environmental Engineering, Inc. "Baseline Health Risk Assessment *American National Can Company, Oakland, California Facility*", 31 January, 1994).

(b) Depth to subsurface soil sources is assumed to be 1foot (30 cm), which is approximately the depth where the soil was detected of chemicals of concern.

(c) The average wind speed of 340 cm/sec (7.5 mph) was obtained from the wind rose for Oakland Airport (National Weather Service, Redwood City, CA).

(d) Width of source area parallel to wind, or ground water flow direction for the Site is assumed to be approximately 3000 cm (90 feet), which is more appropriate for the Site.

(e) Areal fraction of cracks in foundations/walls for commercial buildings was set to 0.001, which is appropriate for newly constructed commercial buildings (Daugherty, 1991).

Table 7A
Physical and Chemical Properties for Chemicals of Concern in Soil

4200 Alameda Avenue
Oakland, California

Compound	Henry's Law Constant H_c (a) (L-H_2O/L-air)	Diffusivity in Air D_{air} (b) (cm^2/s)	Diffusivity in Water D_{water} (c) (cm^2/s)	Organic Carbon Partition Coeff. K_{oc} (d) (mL/g)
Benzene	2.2E-01	9.3E-02	1.1E-05	3.8E+01
Chlorobenzene	1.5E-01	7.2E-02	7.5E-06	1.6E+02
2-Chlorotoluene	1.3E-02	7.1E-02	7.2E-06	1.9E+02
1,2-Dichlorobenzene	5.0E-02	1.3E-01	7.3E-06	1.1E+03
1,1-Dichloroethane	1.8E-01	9.1E-02	9.2E-06	3.0E+01
1,2-Dichloroethane	4.1E-02	9.1E-02	9.2E-06	1.4E+01
cis-1,2-Dichloroethene	1.7E-01	9.1E-02	9.6E-06	4.9E+01
trans-1,2-Dichloroethene	2.7E-01	7.9E-02	9.6E-06	5.9E+01
Ethylbenzene	3.2E-01	7.6E-02	8.5E-06	9.5E+01
Freon113	1.4E+01	7.2E-02	7.5E-06	3.9E+02
n-Butylbenzene	5.2E-01	6.2E-02	6.1E-06	2.5E+03
sec-Butylbenzene	4.7E-01	6.2E-02	6.1E-06	8.9E+02
Isopropylbenzene	6.1E-01	6.6E-02	6.6E-06	2.8E+03
p-Isopropyltoluene (e)	6.1E-01	6.2E-02	6.1E-06	2.8E+03
n-Propylbenzene	4.2E-01	6.6E-02	6.6E-06	7.4E+02
Tetrachloroethene	6.2E-01	7.2E-02	7.6E-06	6.6E+02
Toluene	2.6E-01	8.5E-02	9.4E-06	1.3E+02
1,2,4-Trimethylbenzene	2.4E-01	6.6E-02	6.6E-06	3.7E+03
1,3,5-Trimethylbenzene	1.6E-01	6.6E-02	6.6E-06	1.6E+03
Trichloroethene	3.8E-01	8.1E-02	8.5E-06	1.3E+02
Vinyl Chloride	1.1E+00	1.1E-01	1.1E-05	5.7E+01
Total xylenes	2.9E-01	7.2E-02	8.5E-06	2.4E+02
2-Methylnaphthalene	4.9E-02 (f)	6.4E-02	6.4E-06	7.9E+03
Naphthalene	4.9E-02	7.2E-02	9.4E-06	1.3E+03
Phenol	1.9E-05	8.4E-02	8.6E-06	1.4E+01
1,2,4-Trichlorobenzene	9.6E-02	6.6E-02	6.7E-06	9.2E+03
PCB-1242	2.4E-02	5.0E-02	4.9E-06	5.1E+03
PCB-1254	1.2E-02	4.8E-02	4.6E-06	4.1E+04
PCB-1260	1.4E-02	4.6E-02	4.5E-06	2.6E+06
Arsenic	NA (g)	NA	NA	NA
Cadmium	NA	NA	NA	NA
Total Chromium	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Zinc	NA	NA	NA	NA

Table 7A
Physical and Chemical Properties for Chemicals of Concern in Soil

4200 Alameda Avenue
Oakland, California

Notes:

(a) Dimensionless Henry's constant at 20 degrees Celcius obtained from Montgomery and Welkom (1991).

(b) Diffusivity in air at 20 degrees Celcius estimated using Fuller's method (Lyman et al., 1990) as directed by U.S. EPA Superfund Exposure Assessment Manual (April 1988).

(c) Diffusivity in water at 20 degrees Celcius calculated using method of Hayduk and Laudie (Lyman et al., 1990).

(d) Organic carbon partition coefficient (Koc) obtained from Montgomery and Welkom (1991). Where multiple values were available, the log values were averaged.

(e) Physical and chemical properties for p-isopropyltoluene assumed to be equivalent to isopropylbenzene, a structurally similar compound.

(f) Because a Henry's constant was not available for 2-methylnaphthalene, the value for napthalene, a structurally similar compound, was used.

(g) "NA" indicates properties not applicable for the compound.

Table 7B
Physical and Chemical Properties for Chemicals of Concern in Groundwater

4200 Alameda Avenue
Oakland, California

Compound	Henry's Law Constant H_c (a) (L-H_2O/L-air)	Diffusivity in Air D_{air} (b) (cm^2/s)	Diffusivity in Water D_{water} (c) (cm^2/s)	Organic Carbon Partition Coeff. K_{oc} (d) (mL/g)	Solubility in Water S (e) (mg/L)
Benzene	2.2E-01	9.3E-02	1.1E-05	3.8E+01	1.8E+03
Chlorobenzene	1.5E-01	7.2E-02	7.5E-06	1.6E+02	4.7E+02
Chloroethane	5.0E-01	1.0E-01	1.1E-05	3.2E+00	4.7E+03
1,2-Dichlorobenzene	5.0E-02	1.3E-01	7.3E-06	1.1E+03	1.6E+02
1,3-Dichlorobenzene	1.5E-01	1.3E-01	7.3E-06	5.4E+02	1.2E+02
1,4-Dichlorobenzene	1.2E-01	1.3E-01	7.3E-06	1.2E+03	8.7E+01
1,1-Dichloroethane	1.8E-01	9.1E-02	9.2E-06	3.0E+01	5.1E+03
1,2-Dichloroethane	4.1E-02	9.1E-02	9.2E-06	1.4E+01	8.5E+03
cis-1,2-Dichloroethene	1.7E-01	9.1E-02	9.6E-06	4.9E+01	3.5E+03
trans-1,2-Dichloroethene	2.7E-01	7.9E-02	9.6E-06	5.9E+01	6.3E+03
1,2-Dichloropropane	9.6E-02	8.0E-02	8.1E-06	3.7E+01	2.7E+03
Ethylbenzene	3.2E-01	7.6E-02	8.5E-06	9.5E+01	1.6E+02
Toluene	2.6E-01	8.5E-02	9.4E-06	1.3E+02	5.3E+02
Trichloroethene	3.8E-01	8.1E-02	8.5E-06	1.3E+02	1.1E+03
Vinyl Chloride	1.1E+00	1.1E-01	1.1E-05	5.7E+01	4.2E+03
Total xylenes	2.9E-01	7.2E-02	8.5E-06	2.4E+02	2.0E+02
2,4-Dimethylphenol	2.7E-04	6.9E-02	6.9E-06	1.2E+02	4.2E+03
2-Methylnaphthalene	4.9E-02 (f)	6.4E-02	6.4E-06	7.9E+03	2.5E+01
2-Methylphenol	5.1E-05	7.5E-02	7.6E-06	2.2E+01	2.5E+04
4-Methylphenol	3.3E-05	7.5E-02	7.6E-06	4.9E+01	2.3E+04
Naphthalene	4.9E-02	7.2E-02	9.4E-06	1.3E+03	3.2E+01
Phenol	1.9E-05	8.4E-02	8.6E-06	1.4E+01	9.3E+04
PCB-1260	1.4E-02	4.6E-02	4.5E-06	2.6E+06	8.0E-02
Arsenic	NA (g)	NA	NA	NA	NA
Total Chromium	NA	NA	NA	NA	NA

Table 7B
Physical and Chemical Properties for Chemicals of Concern in Groundwater

4200 Alameda Avenue
Oakland, California

Notes:

(a) Dimensionless Henry's constant at 20 degrees Celcius obtained from Montgomery and Welkom (1991).

(b) Diffusivity in air at 20 degrees Celcius estimated using Fuller's method (Lyman et al., 1990) as directed by U.S. EPA Superfund Exposure Assessment Manual (April 1988).

(c) Diffusivity in water at 20 degrees Celcius calculated using method of Hayduk and Laudie (Lyman et al., 1990).

(d) Organic carbon partition coefficient (Koc) obtained from Montgomery and Welkom (1991). Where multiple values were available, the log values were averaged.

(e) Solubility in water (S) obtained from Montgomery and Welkom (1991). Where multiple values were available, the values were averaged.

(f) Because a Henry's constant was not available for 2-methylnaphthalene, the value for napthalene, a structurally similar compound, was used.

(g) "NA" indicates properties not applicable for the compound.

Table 7C
Concentrations of Chemicals in Air due to Chemicals in Groundwater

Chemical	Indoor Air Concentration from Groundwater (mg/m3)	Outdoor Air Concentration from Groundwater (mg/m3)
Benzene	9.10E-06	2.20E-07
Chlorobenzene	1.26E-06	3.05E-08
Chloroethane	4.28E-06	1.03E-07
1,2-Dichlorobenzene	1.55E-06	3.74E-08
1,3-Dichlorobenzene	2.13E-05	5.14E-07
1,4-Dichlorobenzene	2.93E-05	7.08E-07
1,1-Dichloroethane	1.86E-06	4.50E-08
1,2-Dichloroethane	6.32E-08	1.53E-09
cis-1,2-Dichloroethene	7.33E-05	1.77E-06
trans-1,2-Dichloroethene	2.51E-06	6.07E-08
1,2-Dichloropropane	2.95E-08	7.13E-10
Ethylbenzene	1.15E-05	2.79E-07
Toluene	3.81E-05	9.20E-07
Trichloroethene	7.79E-08	1.88E-09
Vinyl Chloride	4.02E-04	9.71E-06
Total Xylenes	4.87E-05	1.18E-06
2,4-Dimethylphenol	3.57E-06	8.64E-08
2-Methylnaphthalene	3.22E-08	7.78E-10
2-Methylphenol	3.78E-07	9.15E-09
4-Methylphenol	6.30E-07	1.52E-08
Naphthalene	5.79E-07	1.40E-08
Phenol	2.98E-07	7.21E-09
PCB-1260	3.35E-08	8.10E-10

Table 7D
Concentrations of Chemicals in Air due to Chemicals in Soil

Chemical	Indoor Air Concentration from Soil (mg/m3)	Outdoor Air Concentration from Soil (mg/m3)
Benzene	7.85E-05	1.20E-04
Chlorobenzene	1.11E-05	1.69E-05
2-chlorotoluene	6.97E-05	2.07E-04
1,2-Dichlorobenzene	4.73E-05	1.13E-04
1,1-Dichloroethane	1.26E-06	1.89E-06
1,2-Dichloroethane	3.68E-07	7.74E-07
cis-1,2-Dichloroethene	2.10E-04	3.19E-04
trans-1,2-Dichloroethene	2.54E-06	3.23E-06
Ethylbenzene	2.94E-03	3.53E-03
Freon 113	1.60E-05	1.98E-05
n-Butylbenzene	5.63E-04	5.31E-04
sec-Butylbenzene	1.91E-04	1.81E-04
Isopropylbenzene	1.01E-04	1.01E-04
p-Isopropyltoluene	2.65E-04	2.48E-04
n-Propylbenzene	1.07E-03	1.08E-03
Tetrachloroethene	6.08E-04	6.62E-04
Toluene	3.66E-03	4.98E-03
1,2,4-Trimethylbenzene	1.39E-03	1.46E-03
1,3,5-Trimethylbenzene	5.63E-04	6.22E-04
Trichloroethene	2.29E-04	2.88E-04
Vinyl Chloride	1.38E-05	2.25E-05
Total Xylenes	1.24E-02	1.43E-02
2-Methylnaphthalene	7.76E-05	1.08E-04
Naphthalene	2.89E-04	4.96E-04
Phenol	6.02E-08	9.52E-05
1,2,4-Trichlorobenzene	4.85E-07	5.84E-07
PCB-1242	3.07E-07	4.43E-07
PCB-1254	2.39E-07	4.87E-07
PCB-1260	4.83E-09	8.66E-09

Table 7E
Concentrations of Non-Volatile Chemicals in Air From Chemicals in Soil

		RDC	CF	Cair
Chemical	Representative Concentration (mg/kg)	Respirable dust concentration (mg/m3)	Conversion Factor (kg/mg)	Concentration in air for non-volatiles (mg/m3)
Arsenic	5.1	1	1.00E-06	5.10E-06
Total Chromium	75	1	1.00E-06	7.50E-05
Lead	89	1	1.00E-06	8.90E-05
Cadmium	1.6	1	1.00E-06	1.60E-06
Nickel	110	1	1.00E-06	1.10E-04
Zinc	450	1	1.00E-06	4.50E-04

Table 8A

Exposure Scenario: Commercial Worker / Inhalation / Risk

(	Ca	*	IR	*	EF	*	ED	)/(	BW	*	AT	)=	Intake factor	*	CSF		
Chemical	(mg/m3)		(m^3/day)		(days/year)		(yrs)		(kg)		(days)		(mg/kg/day)		(mg/kg-day)$^{-1}$	=	Risk
Benzene	7.85E-05		20		250		25		70		25550		5.49E-06		0.1		5.49E-07
Chlorobenzene	1.10E-05		20		250		25		70		25550		7.69E-07		na		
Chloroethane	4.28E-06		20		250		25		70		25550		2.99E-07		na		
2-chlorotoluene	6.97E-05		20		250		25		70		25550		4.87E-06		na		
1,2-Dichlorobenzene	4.73E-05		20		250		25		70		25550		3.31E-06		na		
1,3-Dichlorobenzene	2.13E-05		20		250		25		70		25550		1.49E-06		na		
1,4-Dichlorobenzene	2.93E-05		20		250		25		70		25550		2.05E-06		0.04		8.19E-08
1,1-Dichloroethane	1.86E-06		20		250		25		70		25550		1.30E-07		0.0057		7.41E-10
1,2-Dichloroethane	3.68E-07		20		250		25		70		25550		2.57E-08		0.07		1.80E-09
cis-1,2-Dichloroethene	2.10E-04		20		250		25		70		25550		1.47E-05		na		
trans-1,2-Dichloroethene	2.54E-06		20		250		25		70		25550		1.78E-07		na		
1,2-Dichloropropane	2.95E-08		20		250		25		70		25550		2.06E-09		0.063		1.30E-10
Ethylbenzene	2.94E-03		20		250		25		70		25550		2.05E-04		na		
Freon 113	1.60E-05		20		250		25		70		25550		1.12E-06		na		
n-Butylbenzene	5.63E-04		20		250		25		70		25550		3.93E-05		na		
sec-Butylbenzene	1.91E-04		20		250		25		70		25550		1.33E-05		na		
Isopropylbenzene	1.01E-04		20		250		25		70		25550		7.06E-06		na		
p-Isopropyltoluene	2.65E-04		20		250		25		70		25550		1.85E-05		na		
n-Propylbenzene	1.07E-03		20		250		25		70		25550		7.48E-05		na		
Tetrachloroethene	6.08E-04		20		250		25		70		25550		4.25E-05		0.021		8.92E-07
Toluene	3.66E-03		20		250		25		70		25550		2.56E-04		na		
1,2,4-Trimethylbenzene	1.39E-03		20		250		25		70		25550		9.71E-05		na		
1,3,5-Trimethylbenzene	5.63E-04		20		250		25		70		25550		3.93E-05		na		
Trichloroethene	2.29E-04		20		250		25		70		25550		1.60E-05		0.01		1.60E-07
Vinyl Chloride	4.02E-04		20		250		25		70		25550		2.81E-05		0.27		7.59E-06
Total Xylenes	1.24E-02		20		250		25		70		25550		8.67E-04		na		
2,4-Dimethylphenol	3.57E-06		20		250		25		70		25550		2.50E-07		na		
2-Methylnaphthalene	7.76E-05		20		250		25		70		25550		5.42E-06		na		
2-Methylphenol	3.78E-07		20		250		25		70		25550		2.64E-08		na		
4-Methylphenol	6.30E-07		20		250		25		70		25550		4.40E-08		na		
Naphthalene	2.89E-04		20		250		25		70		25550		2.02E-05		na		
Phenol	2.98E-07		20		250		25		70		25550		2.08E-08		na		
1,2,4-Trichlorobenzene	4.85E-07		20		250		25		70		25550		3.39E-08		na		
PCB-1242	3.06E-07		20		250		25		70		25550		2.14E-08		7.7		1.65E-07
PCB-1254	2.39E-07		20		250		25		70		25550		1.67E-08		7.7		1.29E-07
PCB-1260	3.35E-08		20		250		25		70		25550		2.34E-09		7.7		1.80E-08
																Risk	**9.58E-06**

Ca = concentration in air
IR = inhalation rate
EF = exposure frequency
ED = exposure duration
BW = body weight
AT = averaging time
CSF = cancer slope factor
mg/m3 = milligrams per cubic meter
m3/day = cubic meters per day
yrs = years
kg = kilograms

Table 8B
Exposure Scenario: Commercial Worker / Inhalation / Hazard

(Chemical	Ca (mg/m3)	* IR (m³/day)	* EF (days/year)	* ED (yrs)	)(BW (kg)	* AT (days)	) = Intake factor (mg/kg/day)	/ RfD (mg/kg-day)	= Hazard Index
Benzene	7.85E-05	20	250	25	70	9125	1.54E-05	na	
Chlorobenzene	1.10E-05	20	250	25	70	9125	2.15E-06	0.02	1.08E-04
Chloroethane	4.28E-06	20	250	25	70	9125	8.38E-07	2.86	2.93E-07
2-chlorotoluene	6.97E-05	20	250	25	70	9125	1.36E-05	0.02	6.82E-04
1,2-Dichlorobenzene	4.73E-05	20	250	25	70	9125	9.26E-06	0.09	1.03E-04
1,3-Dichlorobenzene	2.13E-05	20	250	25	70	9125	4.17E-06	na	
1,4-Dichlorobenzene	2.93E-05	20	250	25	70	9125	5.73E-06	0.23	2.49E-05
1,1-Dichloroethane	1.86E-06	20	250	25	70	9125	3.64E-07	0.1	3.64E-06
1,2-Dichloroethane	3.68E-07	20	250	25	70	9125	7.20E-08	na	
cis-1,2-Dichloroethene	2.10E-04	20	250	25	70	9125	4.11E-05	0.01	4.11E-03
trans-1,2-Dichloroethene	2.54E-06	20	250	25	70	9125	4.97E-07	0.02	2.49E-05
1,2-Dichloropropane	2.95E-08	20	250	25	70	9125	5.77E-09	0.0011	5.25E-06
Ethylbenzene	2.94E-03	20	250	25	70	9125	5.75E-04	0.29	1.98E-03
Freon 113	1.60E-05	20	250	25	70	9125	3.13E-06	30	1.04E-07
n-Butylbenzene	5.63E-04	20	250	25	70	9125	1.10E-04	0.29	3.80E-04
sec-Butylbenzene	1.91E-04	20	250	25	70	9125	3.74E-05	0.29	1.29E-04
Isopropylbenzene	1.01E-04	20	250	25	70	9125	1.98E-05	0.29	6.82E-05
p-Isopropyltoluene	2.65E-04	20	250	25	70	9125	5.19E-05	2	2.59E-05
n-Propylbenzene	1.07E-03	20	250	25	70	9125	2.09E-04	0.29	7.22E-04
Tetrachloroethene	6.08E-04	20	250	25	70	9125	1.19E-04	0.01	1.19E-02
Toluene	3.66E-03	20	250	25	70	9125	7.16E-04	0.11	6.51E-03
1,2,4-Trimethylbenzene	1.39E-03	20	250	25	70	9125	2.72E-04	2	1.36E-04
1,3,5-Trimethylbenzene	5.63E-04	20	250	25	70	9125	1.10E-04	2	5.51E-05
Trichloroethene	2.29E-04	20	250	25	70	9125	4.48E-05	na	
Vinyl Chloride	4.02E-04	20	250	25	70	9125	7.87E-05	na	
Total Xylenes	1.24E-02	20	250	25	70	9125	2.43E-03	2	1.21E-03
2,4-Dimethylphenol	3.57E-06	20	250	25	70	9125	6.99E-07	0.02	3.49E-05
2-Methylnaphthalene	7.76E-05	20	250	25	70	9125	1.52E-05	0.04	3.80E-04
2-Methylphenol	3.78E-07	20	250	25	70	9125	7.40E-08	0.05	1.48E-06
4-Methylphenol	6.30E-07	20	250	25	70	9125	1.23E-07	0.005	2.47E-05
Naphthalene	2.89E-04	20	250	25	70	9125	5.66E-05	0.04	1.41E-03
Phenol	2.98E-07	20	250	25	70	9125	5.83E-08	0.6	9.72E-08
1,2,4-Trichlorobenzene	4.85E-07	20	250	25	70	9125	9.49E-08	0.01	9.49E-06
PCB-1242	3.06E-07	20	250	25	70	9125	5.99E-08	0.00002	2.99E-03
PCB-1254	2.39E-07	20	250	25	70	9125	4.68E-08	0.00002	2.34E-03
PCB-1260	3.35E-08	20	250	25	70	9125	6.56E-09	0.00002	3.28E-04
								HI	3.57E-02

Ca = concentration in air
IR = inhalation rate
EF = exposure frequency
ED = exposure duration
BW = body weight
AT = averaging time
RfD = reference dose
mg/m3 = milligrams per cubic meter
m3/day = cubic meters per day
yrs = years
kg = kilograms

Table 8C
Notes Regarding Characterization of Human Health Risks Due to Inhalation of Vapors Containing Chemicals of Concern of Future Commercial Building Occupants

4200 Alameda Avenue
Oakland, California

Notes:

(a) The exposure point concentration ("EPC") was calculated based on the volatilization models in the RBCA model (ASTM, 1995).

(b) The assumed indoor EPC for each compound is the greater of EPC from groundwater or from soil.

(c) Chronic Daily Intakes ("CDIs") were estimated using methodologies recommended by U.S. EPA or Cal-EPA. Refer to Table 5 for assumptions to calculate CDIs.

(d) Chronic reference doses ("RfDs") for non-carcinogenic effects were obtained from IRIS or HEAST, in this order of priority. Origin of respective RfDs is included in Tables 2 and 3. Hyphen indicates that RfD is not available for the compound.

(e) Slope factors ("SFs)") for carcinogenic effects were obtained from Cal-EPA's California Cancer Potency Factor Memorandum (November 1994) or IRIS, in this order of priority. Origin of respective SFs is included in Tables 2 and 3. Hyphen indicates that SF is not available for the compound.

(f) Non-carcinogenic hazard index ("HI") for compound i is defined as the CDIi/RfDi. The non-carcinogenic HI, summed for all compounds and exposure pathways, assumes that there is a level of exposure (i.e., RfD) below which it is unlikely even for sensitive populations to experience adverse health effects (U.S. EPA, 1989a). If the CDI exceeds this RfD threshold (i.e., HI greater than 1), there may be concern for potential non-carcinogenic effects.

(g) Estimated lifetime incremental cancer risk for chemical i is defined as CDIi * SFi. The estimated incremental lifetime cancer risks to an individual developing cancer due to COCs is given by the sum of incremental cancer risks for all chemicals and exposure pathways.

Table 9A
Exposure Scenario: Maintenance Worker / Inhalation / Risk

(Chemical	Ca (mg/m3)	* IR (m³/day)	* EF (days/year)	* ED (yrs)	)/(BW (kg)	* AT (days)	)= Intake factor (mg/kg/day)	* CSF (mg/kg-day)⁻¹	= Risk	
Benzene	1.20E-04	20	2	25	70	25550	6.71E-08	0.1	6.71E-09	
Chlorobenzene	1.69E-05	20	2	25	70	25550	9.45E-09	na		
Chloroethane	6.30E-07	20	2	25	70	25550	3.52E-10	na		
2-chlorotoluene	2.07E-04	20	2	25	70	25550	1.16E-07	na		
1,2-Dichlorobenzene	1.13E-04	20	2	25	70	25550	6.32E-08	na		
1,3-Dichlorobenzene	3.16E-06	20	2	25	70	25550	1.77E-09	na		
1,4-Dichlorobenzene	4.37E-06	20	2	25	70	25550	2.44E-09	0.04	9.77E-11	
1,1-Dichloroethane	1.89E-06	20	2	25	70	25550	1.06E-09	0.0057	6.02E-12	
1,2-Dichloroethane	7.74E-07	20	2	25	70	25550	4.33E-10	0.07	3.03E-11	
cis-1,2-Dichloroethene	3.19E-04	20	2	25	70	25550	1.78E-07	na		
trans-1,2-Dichloroethene	3.23E-06	20	2	25	70	25550	1.81E-09	na		
1,2-Dichloropropane	4.46E-09	20	2	25	70	25550	2.49E-12	0.063	1.57E-13	
Ethylbenzene	3.53E-03	20	2	25	70	25550	1.97E-06	na		
Freon 113	1.98E-05	20	2	25	70	25550	1.11E-08	na		
n-Butylbenzene	5.31E-04	20	2	25	70	25550	2.97E-07	na		
sec-Butylbenzene	1.81E-04	20	2	25	70	25550	1.01E-07	na		
Isopropylbenzene	1.01E-04	20	2	25	70	25550	5.65E-08	na		
p-Isopropyltoluene	2.48E-04	20	2	25	70	25550	1.39E-07	na		
n-Propylbenzene	1.08E-03	20	2	25	70	25550	6.04E-07	na		
Tetrachloroethene	6.62E-04	20	2	25	70	25550	3.70E-07	0.021	7.77E-09	
Toluene	4.98E-03	20	2	25	70	25550	2.78E-06	na		
1,2,4-Trimethylbenzene	1.46E-03	20	2	25	70	25550	8.16E-07	na		
1,3,5-Trimethylbenzene	6.22E-04	20	2	25	70	25550	3.48E-07	na		
Trichloroethene	2.88E-04	20	2	25	70	25550	1.61E-07	0.01	1.61E-09	
Vinyl Chloride	5.87E-05	20	2	25	70	25550	3.28E-08	0.27	8.86E-09	
Total Xylenes	1.43E-02	20	2	25	70	25550	8.00E-06	na		
2,4-Dimethylphenol	5.56E-07	20	2	25	70	25550	3.11E-10	na		
2-Methylnaphthalene	1.08E-04	20	2	25	70	25550	6.04E-08	na		
2-Methylphenol	5.89E-08	20	2	25	70	25550	3.29E-11	na		
4-Methylphenol	9.81E-08	20	2	25	70	25550	5.49E-11	na		
Naphthalene	4.96E-04	20	2	25	70	25550	2.77E-07	na		
Phenol	9.52E-05	20	2	25	70	25550	5.32E-08	na		
1,2,4-Trichlorobenzene	5.84E-07	20	2	25	70	25550	3.27E-10	na		
PCB-1242	4.43E-07	20	2	25	70	25550	2.48E-10	7.7	1.91E-09	
PCB-1254	4.87E-07	20	2	25	70	25550	2.72E-10	7.7	2.10E-09	
PCB-1260	8.66E-09	20	2	25	70	25550	4.84E-12	7.7	3.73E-11	2.91E-08
Arsenic	5.10E-06	20	2	25	70	25550	2.85E-09	12	3.42E-08	
Cadmium	1.60E-06	20	2	25	70	25550	8.95E-10	15	1.34E-08	
Total chromium	7.50E-05	20	2	25	70	25550	4.19E-08	na		
Nickel	1.10E-04	20	2	25	70	25550	6.15E-08	0.91	5.60E-08	
Zinc	4.50E-04	20	2	25	70	25550	2.52E-07	na		1.04E-07
									Risk	**1.33E-07**

Ca = concentration in air
IR = inhalation rate
EF = exposure frequency
ED = exposure duration
BW = body weight
AT = averaging time
CSF = cancer slope factor
mg/m3 = milligrams per cubic meter
m3/day = cubic meters per day
yrs = years
kg = kilograms

Table 9B

Exposure Scenario: Maintenance Worker / Inhalation / Hazard

(Chemical	Ca (mg/m3)	* IR (m^3/day)	* EF (days/year)	* ED (yrs)	)/(BW (kg)	* AT (days)	)= Intake factor (mg/kg/day)	/ RfD (mg/kg-day)	= Hazard Index	
Benzene	1.20E-04	20	2	25	70	9125	1.88E-07	na		
Chlorobenzene	1.69E-05	20	2	25	70	9125	2.65E-08	0.02	1.32E-06	
Chloroethane	6.30E-07	20	2	25	70	9125	9.86E-10	2.86	3.45E-10	
2-chlorotoluene	2.07E-04	20	2	25	70	9125	3.24E-07	0.02	1.62E-05	
1,2-Dichlorobenzene	1.13E-04	20	2	25	70	9125	1.77E-07	0.09	1.97E-06	
1,3-Dichlorobenzene	3.16E-06	20	2	25	70	9125	4.95E-09	na		
1,4-Dichlorobenzene	4.37E-06	20	2	25	70	9125	6.84E-09	0.23	2.97E-08	
1,1-Dichloroethane	1.89E-06	20	2	25	70	9125	2.96E-09	0.1	2.96E-08	
1,2-Dichloroethene	7.74E-07	20	2	25	70	9125	1.21E-09	na		
cis-1,2-Dichloroethene	3.19E-04	20	2	25	70	9125	4.99E-07	0.01	4.99E-05	
trans-1,2-Dichloroethene	3.23E-06	20	2	25	70	9125	5.06E-09	0.02	2.53E-07	
1,2-Dichloropropane	4.46E-09	20	2	25	70	9125	6.98E-12	0.0011	6.35E-09	
Ethylbenzene	3.53E-03	20	2	25	70	9125	5.53E-06	0.29	1.91E-05	
Freon 113	1.98E-05	20	2	25	70	9125	3.10E-08	30	1.03E-09	
n-Butylbenzene	5.31E-04	20	2	25	70	9125	8.31E-07	0.29	2.87E-06	
sec-Butylbenzene	1.81E-04	20	2	25	70	9125	2.83E-07	0.29	9.77E-07	
Isopropylbenzene	1.01E-04	20	2	25	70	9125	1.58E-07	0.29	5.45E-07	
p-Isopropyltoluene	2.48E-04	20	2	25	70	9125	3.88E-07	2	1.94E-07	
n-Propylbenzene	1.08E-03	20	2	25	70	9125	1.69E-06	0.29	5.83E-06	
Tetrachloroethene	6.62E-04	20	2	25	70	9125	1.04E-06	0.01	1.04E-04	
Toluene	4.98E-03	20	2	25	70	9125	7.80E-06	0.11	7.09E-05	
1,2,4-Trimethylbenzene	1.46E-03	20	2	25	70	9125	2.29E-06	2	1.14E-06	
1,3,5-Trimethylbenzene	6.22E-04	20	2	25	70	9125	9.74E-07	2	4.87E-07	
Trichloroethene	2.88E-04	20	2	25	70	9125	4.51E-07	na		
Vinyl Chloride	5.87E-05	20	2	25	70	9125	9.19E-08	na		
Total Xylenes	1.43E-02	20	2	25	70	9125	2.24E-05	2	1.12E-05	
2,4-Dimethylphenol	5.56E-07	20	2	25	70	9125	8.70E-10	0.02	4.35E-08	
2-Methylnaphthalene	1.08E-04	20	2	25	70	9125	1.69E-07	0.04	4.23E-06	
2-Methylphenol	5.89E-08	20	2	25	70	9125	9.22E-11	0.05	1.84E-09	
4-Methylphenol	9.81E-08	20	2	25	70	9125	1.54E-10	0.005	3.07E-08	
Naphthalene	4.96E-04	20	2	25	70	9125	7.77E-07	0.04	1.94E-05	
Phenol	9.52E-05	20	2	25	70	9125	1.49E-07	0.6	2.48E-07	
1,2,4-Trichlorobenzene	5.84E-07	20	2	25	70	9125	9.14E-10	0.01	9.14E-08	
PCB-1242	4.43E-07	20	2	25	70	9125	6.94E-10	0.00002	3.47E-05	
PCB-1254	4.87E-07	20	2	25	70	9125	7.62E-10	0.00002	3.81E-05	
PCB-1260	8.66E-09	20	2	25	70	9125	1.36E-11	0.00002	6.78E-07	3.84E-04
Arsenic	5.10E-06	20	2	25	70	9125	7.98E-09	0.0003	2.66E-05	
Cadmium	1.60E-06	20	2	25	70	9125	2.50E-09	0.0005	5.01E-06	
Total chromium	7.50E-05	20	2	25	70	9125	1.17E-07	1	1.17E-07	
Nickel	1.10E-04	20	2	25	70	9125	1.72E-07	na		
Zinc	4.50E-04	20	2	25	70	9125	7.05E-07	0.3	2.35E-06	3.41E-05
								HI	**4.18E-04**	

Ca = concentration in air
IR = inhalation rate
EF = exposure frequency
ED = exposure duration
BW = body weight
AT = averaging time
RfD = reference dose
mg/m3 = milligrams per cubic meter
m3/day = cubic meters per day
yrs = years
kg = kilograms

Table 9B1
Notes Regarding Characterization of Human Health Risks Due to Inhalation of Fugitive Dust Containing Non-Volatile Chemicals of Concern for Future Maintenance Personnel

4200 Alameda Avenue
Oakland, California

Notes:

(a) Refer to Table 1A for compilation of representative concentrations ("RCs").

(b) The concentration in air (Ca) is calculated using the following equation:

$Ca = Cs * RDC * (10^{-6}\ kg/mg)$

where Cs is the representative concentration of compound in soil, RDC is the respirable dust concentration, see Table 5 for the assumption of RDC value.

(c) Chronic Daily Intakes ("CDIs") were estimated using methodologies recommended by U.S. EPA or Cal-EPA. Refer to Table 5 for assumptions to calculate CDIs.

(d) Chronic reference doses ("RfDs") for non-carcinogenic effects were obtained from IRIS or HEAST, in this order of priority. Origin of respective RfDs is included in Tables 2 and 3. Hyphen indicates that RfD is not available for the compound.

(e) Slope factors ("SFs)") for carcinogenic effects were obtained from Cal-EPA's California Cancer Potency Factor Memorandum (November 1994) or IRIS, in this order of priority. Origin of respective SFs is included in Tables 2 and 3. Hyphen indicates that SF is not available for the compound.

(f) Non-carcinogenic hazard index ("HI") for compound i is defined as the CDIi/ fDi. The non-carcinogenic HI, summed for all compounds and exposure pathways, assumes that there is a level of exposure (i.e., RfD) below which it is unlikely even for sensitive populations to experience adverse health effects (U.S. EPA, 1989a). If the CDI exceeds this RfD threshold (i.e., HI greater than 1), there may be concern for potential non-carcinogenic effects.

(g) Estimated lifetime incremental cancer risk for chemical i is defined as CDIi * SFi. The estimated incremental lifetime cancer risks to an individual developing cancer due to COCs is given by the sum of incremental cancer risks for all chemicals and exposure pathways.

Table 9B2
Notes Regarding Characterization of Human Health Risks Due to Inhalation of Vapors Containing Chemicals of Concern
for Future Maintenance Personnel

4200 Alameda Avenue
Oakland, California

Notes:

(a) The exposure point concentration ("EPC") was calculated based on the volatilization models in the RBCA model (ASTM, 1995).

(b) The assumed indoor EPC for each compound is the greater of EPC from groundwater or from soil.

(c) Chronic Daily Intakes ("CDIs") were estimated using methodologies recommended by U.S. EPA or Cal-EPA. Refer to Table 5 for assumptions to calculate CDIs.

(d) Chronic reference doses ("RfDs") for non-carcinogenic effects were obtained from IRIS or HEAST, in this order of priority. Origin of respective RfDs is included in Tables 2 and 3. Hyphen indicates that RfD is not available for the compound.

(e) Slope factors ("SFs)") for carcinogenic effects were obtained from Cal-EPA's California Cancer Potency Factor Memorandum (November 1994) or IRIS, in this order of priority. Origin of respective SFs is included in Tables 2 and 3. Hyphen indicates hat SF is not available for the compound.

(f) Non-carcinogenic hazard index ("HI") for compound i is defined as the CDIi/RfDi. The non-carcinogenic HI, summed for all compounds and exposure pathways, assumes that there is a level of exposure (i.e., RfD) below which it is unlikely even for sensitive populations to experience adverse health effects (U.S. EPA, 1989a). If the CDI exceeds this RfD threshold (i.e., HI greater than 1), there may be concern for potential non-carcinogenic effects.

(g) Estimated lifetime incremental cancer risk for chemical i is defined as CDIi * SFi. The estimated incremental lifetime cancer risks to an individual developing cancer due to COCs is given by the sum of incremental cancer risks for all chemicals and exposure pathways.

Table 9C
Exposure Scenario: Maintenance Worker / Soil / Dermal Exposure / Risk

	((	C	*	SA	*	AF	*	EF	*	ED	*	ABS	*	CF	)/(	BW	*	AT	) =	Intake Factor	*	CSF		
Chemical		Representative Concentration (mg/kg)		cm2/day		mg/cm2		days/year		year		unitless		kg/mg		(kg)		(days)		(mg/kg/day)		(mg/kg-day)	=	Risk
Benzene		1.2		3160		0.2		2		25		0.1		1.00E-06		70		25550		2.12E-09		1.00E-01		2.12E-10
Chlorobenzene		0.37		3160		0.2		2		25		0.1		1.00E-06		70		25550		6.54E-10		na		
2-chlorotoluene		22		3160		0.2		2		25		0.1		1.00E-06		70		25550		3.89E-08		na		
1,2-Dichlorobenzene		8.8		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.55E-08		na		
1,1-Dichloroethane		0.023		3160		0.2		2		25		0.1		1.00E-06		70		25550		4.06E-11		5.7E-03		2.32E-13
1,2-Dichloroethane		0.028		3160		0.2		2		25		0.1		1.00E-06		70		25550		4.95E-11		7.0E-02		3.46E-12
cis-1,2-Dichloroethene		4.2		3160		0.2		2		25		0.1		1.00E-06		70		25550		7.42E-09		na		
trans-1,2-Dichloroethene		0.033		3160		0.2		2		25		0.1		1.00E-06		70		25550		5.83E-11		na		
Ethylbenzene		34.5		3160		0.2		2		25		0.1		1.00E-06		70		25550		6.10E-08		na		
Freon 113		0.61		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.08E-09		na		
n-Butylbenzene		19		3160		0.2		2		25		0.1		1.00E-06		70		25550		3.36E-08		na		
sec-Butylbenzene		3.4		3160		0.2		2		25		0.1		1.00E-06		70		25550		6.01E-09		na		
Isopropylbenzene		3.2		3160		0.2		2		25		0.1		1.00E-06		70		25550		5.65E-09		na		
p-Isopropyltoluene		8.4		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.48E-08		na		
n-Propylbenzene		19		3160		0.2		2		25		0.1		1.00E-06		70		25550		3.36E-08		na		
Tetrachloroethene		7		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.24E-08		0.051		6.31E-10
Toluene		55		3160		0.2		2		25		0.1		1.00E-06		70		25550		9.72E-08		na		
1,2,4-Trimethylbenzene		140		3160		0.2		2		25		0.1		1.00E-06		70		25550		2.47E-07		na		
1,3,5-Trimethylbenzene		43		3160		0.2		2		25		0.1		1.00E-06		70		25550		7.60E-08		na		
Trichloroethene		2.4		3160		0.2		2		25		0.1		1.00E-06		70		25550		4.24E-09		0.015		6.36E-11
Vinyl Chloride		0.05		3160		0.2		2		25		0.1		1.00E-06		70		25550		8.83E-11		0.27		2.39E-11
Total Xylenes		195		3160		0.2		2		25		0.1		1.00E-06		70		25550		3.45E-07		na		
2-Methylnaphthalene		76		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.34E-07		na		
Naphthalene		61.5		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.09E-07		na		
1,2,4-Trichlorobenzene		9.8		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.73E-08		na		
PCB-1242		0.28		3160		0.2		2		25		0.1		1.00E-06		70		25550		4.95E-10		7.7		3.81E-09
PCB-1254		0.41		3160		0.2		2		25		0.1		1.00E-06		70		25550		7.24E-10		7.7		5.58E-09
PCB-1260		4.7		3160		0.2		2		25		0.1		1.00E-06		70		25550		8.30E-09		7.7		6.39E-08
Arsenic		5.1		3160		0.2		2		25		0.1		1.00E-06		70		25550		9.01E-09		1.75		1.58E-08
Total Chromium		75		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.33E-07		na		
Cadmium		1.6		3160		0.2		2		25		0.1		1.00E-06		70		25550		2.83E-09		15		4.24E-08
Nickel		110		3160		0.2		2		25		0.1		1.00E-06		70		25550		1.94E-07		0.91		1.77E-07
Zinc		450		3160		0.2		2		25		0.1		1.00E-06		70		25550		7.95E-07		na		
																							RISK	3.09E-07

C = concentration of chemical in soil
SA = surface area of skin
AF = adherence factor
EF = exposure frequency
ED = exposure duration
ABS = absorption
CF = conversion factor
BW = body weight
AT = averaging time
CSF = cancer slope factor

Table 9D
Exposure Scenario: Maintenance Worker / Soil / Dermal Exposure / Hazard

	((	C	*	SA	*	AF	*	EF	*	ED	*	ABS	*	CF	)/(	BW	*	AT	) =	Intake factor	/	RfD		
Chemical		Representative Concentration (mg/kg)		cm2/day		mg/cm2		days/year		year		unitless		kg/mg		(kg)		(days)		(mg/kg/day)		(mg/kg-day)	=	Hazard
Benzene		1.2		3160		0.2		2		25		0.1		1.00E-06		70		9125		5.94E-09		ns		
Chlorobenzene		0.37		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.83E-09		2.00E-02		9.15E-08
2-chlorotoluene		22		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.09E-07		2.00E-02		5.44E-06
1,2-Dichlorobenzene		8.8		3160		0.2		2		25		0.1		1.00E-06		70		9125		4.35E-08		9.00E-02		4.84E-07
1,1-Dichloroethane		0.023		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.14E-10		1.0E-01		1.14E-09
1,2-Dichloroethene		0.028		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.39E-10		1.0E-01		1.39E-09
cis-1,2-Dichloroethene		4.2		3160		0.2		2		25		0.1		1.00E-06		70		9125		2.08E-08		0.01		2.08E-06
trans-1,2-Dichloroethene		0.033		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.63E-10		0.02		8.16E-09
Ethylbenzene		34.5		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.71E-07		0.1		1.71E-06
Freon 113		0.61		3160		0.2		2		25		0.1		1.00E-06		70		9125		3.02E-09		30		1.01E-10
n-Butylbenzene		19		3160		0.2		2		25		0.1		1.00E-06		70		9125		9.40E-08		0.1		9.40E-07
sec-Butylbenzene		3.4		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.68E-08		0.1		1.68E-07
Isopropylbenzene		3.2		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.58E-08		0.1		1.58E-07
p-Isopropyltoluene		8.4		3160		0.2		2		25		0.1		1.00E-06		70		9125		4.16E-08		2		2.08E-08
n-Propylbenzene		19		3160		0.2		2		25		0.1		1.00E-06		70		9125		9.40E-08		0.1		9.40E-07
Tetrachloroethene		7		3160		0.2		2		25		0.1		1.00E-06		70		9125		3.46E-08		0.01		3.46E-06
Toluene		55		3160		0.2		2		25		0.1		1.00E-06		70		9125		2.72E-07		0.2		1.36E-06
1,2,4-Trimethylbenzene		140		3160		0.2		2		25		0.1		1.00E-06		70		9125		6.93E-07		2		3.46E-07
1,3,5-Trimethylbenzene		43		3160		0.2		2		25		0.1		1.00E-06		70		9125		2.13E-07		2		1.06E-07
Trichloroethene		2.4		3160		0.2		2		25		0.1		1.00E-06		70		9125		1.19E-08		ns		
Vinyl Chloride		0.05		3160		0.2		2		25		0.1		1.00E-06		70		9125		2.47E-10		ns		
Total Xylenes		195		3160		0.2		2		25		0.1		1.00E-06		70		9125		9.63E-07		2		4.82E-07
2-Methylnaphthalene		76		3160		0.2		2		25		0.15		1.00E-06		70		9125		5.64E-07		0.04		1.41E-05
Naphthalene		61.5		3160		0.2		2		25		0.15		1.00E-06		70		9125		4.56E-07		0.04		1.14E-05
1,2,4-Trichlorobenzene		9.8		3160		0.2		2		25		0.1		1.00E-06		70		9125		4.85E-08		0.01		4.85E-06
PCB-1242		0.28		3160		0.2		2		25		0.15		1.00E-06		70		9125		2.08E-09		0.00002		1.04E-04
PCB-1254		0.41		3160		0.2		2		25		0.15		1.00E-06		70		9125		3.04E-09		0.00002		1.52E-04
PCB-1260		4.7		3160		0.2		2		25		0.15		1.00E-06		70		9125		3.49E-08		0.00002		1.74E-03
Arsenic		5.1		3160		0.2		2		25		0.03		1.00E-06		70		9125		7.57E-09		0.0003		2.52E-05
Total Chromium		75		3160		0.2		2		25		0.01		1.00E-06		70		9125		3.71E-08		1		3.71E-08
Cadmium		1.6		3160		0.2		2		25		0.001		1.00E-06		70		9125		7.92E-11		0.0005		1.58E-07
Nickel		110		3160		0.2		2		25		0.01		1.00E-06		70		9125		5.44E-08		ns		
Zinc		450		3160		0.2		2		25		0.01		1.00E-06		70		9125		2.23E-07		0.3		7.42E-07
																							HI	2.07E-03

C = concentration of chemical in soil
SA = surface area of skin
AF = adherence factor
EF = exposure frequency
ED = exposure duration
ABS = absorption
CF = conversion factor
BW = body weight
AT = averaging time
RfD = reference dose

Table 9E

Exposure Scenario: Maintenance Worker / Groundwater / Dermal / Risk

Chemical	((C	* SA	* PC	* EF	* ED	* F	* CF	)/(BW	* AT	)= Intake factor	* CSF	– Risk
	(mg/l)	cm2/day	cm/hour	days/year	year	Fraction of the day	L/1000cm^3	(kg)	(days)	(mg/kg/day)	(mg/kg-day)$^{-1}$	
Benzene	0.63	3160	2.10E-02	2	25	0.16	1.00E-03	70	25550	1.87E-07	0.1	1.87E-08
Chlorobenzene	0.16	3160	4.10E-02	2	25	0.16	1.00E-03	70	25550	9.27E-08	na	
Chloroethane	0.13	3160	8.00E-03	2	25	0.16	1.00E-03	70	25550	1.47E-08	na	
1,2-Dichlorobenzene	0.1	3160	6.10E-02	2	25	0.16	1.00E-03	70	25550	2.59E-07	na	
1,3-Dichlorobenzene	1.6	3160	8.70E-02	2	25	0.16	1.00E-03	70	25550	1.97E-06	na	
1,4-Dichlorobenzene	2.7	3160	6.20E-02	2	25	0.16	1.00E-03	70	25550	2.37E-06	0.04	9.46E-08
1,1-Dichloroethane	0.16	3160	8.90E-03	2	25	0.16	1.00E-03	70	25550	2.01E-08	0.0057	1.15E-10
1,2-Dichloroethane	0.017	3160	5.30E-03	2	25	0.16	1.00E-03	70	25550	1.27E-09	0.07	8.91E-11
cis-1,2-Dichloroethene	6.6	3160	1.00E-02	2	25	0.16	1.00E-03	70	25550	9.33E-07	na	
trans-1,2-Dichloroethene	0.37	3160	1.00E-02	2	25	0.16	1.00E-03	70	25550	2.40E-08	na	
1,2-Dichloropropane	0.0049	3160	1.00E-02	2	25	0.16	1.00E-03	70	25550	6.93E-10	0.063	4.36E-11
Ethylbenzene	0.7	3160	7.40E-02	2	25	0.16	1.00E-03	70	25550	7.12E-07	na	
Toluene	2.5	3160	4.50E-02	2	25	0.16	1.00E-03	70	25550	1.59E-06	na	
Trichloroethene	0.0038	3160	1.60E-02	2	25	0.16	1.00E-03	70	25550	8.59E-10	0.013	1.29E-11
Vinyl Chloride	5.2	3160	7.30E-03	2	25	0.16	1.00E-03	70	25550	5.37E-07	0.27	1.45E-07
Total Xylenes	3.4	3160	8.00E-02	2	25	0.16	1.00E-03	70	25550	3.84E-06	na	
2,4-Dimethylphenol	1.4	3160	1.50E-02	2	25	0.16	1.00E-03	70	25550	7.21E-07	na	
2-Methylnaphthalene	0.011	3160	6.90E-02	2	25	0.16	1.00E-03	70	25550	1.07E-08	na	
2-Methylphenol	0.33	3160	5.50E-03	2	25	0.16	1.00E-03	70	25550	2.57E-08	na	
4-Methylphenol	0.53	3160	5.50E-03	2	25	0.16	1.00E-03	70	25550	4.28E-08	na	
Naphthalene	0.16	3160	6.90E-02	2	25	0.16	1.00E-03	70	25550	1.56E-07	na	
Phenol	0.23	3160	3.50E-03	2	25	0.16	1.00E-03	70	25550	1.79E-08	na	
PCB-1260	0.031	3160	7.00E-01	2	25	0.16	1.00E-03	70	25550	3.07E-07	7.7	2.36E-06
Arsenic	0.085	3160	1.00E-03	2	25	0.16	1.00E-03	70	25550	1.20E-09	1.75	2.10E-09
Chromium	0.07	3160	1.00E-03	2	25	0.16	1.00E-03	70	25550	9.89E-10	na	
											Risk	2.62E-06

C = concentration in groundwater
SA = surface area
PC = permeability constant
EF = exposure frequency
ED = exposure duration
F = fraction of the day immersed in groundwater
CF = conversion factor
BW = body weight
AT = averaging time
CSF = cancer slope factor

Table 9F

Exposure Scenario: Maintenance Worker / Groundwater / Dermal / Hazard

Chemical	((C (mg/l)	* SA cm2/day	* PC cm/hour	* EF days/year	* ED year	* F fraction of the day	CF L/1000cm3	)/(BW (kg)	* AT (days)	)= Intake factor (mg/kg/day)	/ RfD (mg/kg-day)	= Hazard	
Benzene	0.63	3160	2.10E-02	2	25	0.16	1.00E-03	70	9125	5.24E-07	na		
Chlorobenzene	0.16	3160	4.10E-02	2	25	0.16	1.00E-03	70	9125	2.60E-07	0.02		1.30E-05
Chloroethane	0.13	3160	8.00E-03	2	25	0.16	1.00E-03	70	9125	4.12E-08	2.86		1.44E-08
1,2-Dichlorobenzene	0.3	3160	6.10E-01	2	25	0.16	1.00E-03	70	9125	7.24E-07	0.09		8.05E-06
1,3-Dichlorobenzene	1.6	3160	8.70E-02	2	25	0.16	1.00E-03	70	9125	5.31E-06	0.23		2.40E-05
1,4-Dichlorobenzene	2.7	3160	6.20E-02	2	25	0.16	1.00E-03	70	9125	6.63E-06	0.23		2.88E-05
1,1-Dichloroethane	0.16	3160	8.90E-03	2	25	0.16	1.00E-03	70	9125	5.64E-08	0.1		5.64E-07
1,2-Dichloroethane	0.017	3160	5.30E-03	2	25	0.16	1.00E-03	70	9125	3.57E-09	0.1		3.57E-08
cis-1,2-Dichloroethene	6.6	3160	1.00E-02	2	25	0.16	1.00E-03	70	9125	2.61E-06	0.01		2.61E-04
trans-1,2-Dichloroethene	0.17	3160	1.00E-02	2	25	0.16	1.00E-03	70	9125	6.73E-08	0.02		3.36E-06
1,2-Dichloropropane	0.0049	3160	1.00E-02	2	25	0.16	1.00E-03	70	9125	1.94E-09	0.0011		1.76E-06
Ethylbenzene	0.7	3160	7.40E-02	2	25	0.16	1.00E-03	70	9125	2.05E-06	0.1		2.05E-05
Toluene	2.5	3160	4.50E-02	2	25	0.16	1.00E-03	70	9125	4.45E-06	0.2		2.23E-05
Trichloroethene	0.0038	3160	1.60E-02	2	25	0.16	1.00E-03	70	9125	2.41E-09	na		
Vinyl Chloride	5.2	3160	7.30E-03	2	25	0.16	1.00E-03	70	9125	1.50E-06	na		
Total Xylenes	3.4	3160	8.00E-02	2	25	0.16	1.00E-03	70	9125	1.08E-05	2		5.38E-06
2,4-Dimethylphenol	3.4	3160	1.50E-02	2	25	0.16	1.00E-03	70	9125	2.02E-06	0.02		1.01E-04
2-Methylnaphthalene	0.011	3160	6.90E-02	2	25	0.16	1.00E-03	70	9125	3.00E-08	0.04		7.51E-07
2-Methylphenol	0.33	3160	5.50E-03	2	25	0.16	1.00E-03	70	9125	7.18E-08	0.05		1.44E-06
4-Methylphenol	0.53	3160	5.50E-03	2	25	0.16	1.00E-03	70	9125	1.20E-07	0.005		2.39E-05
Naphthalene	0.16	3160	6.90E-02	2	25	0.16	1.00E-03	70	9125	4.37E-07	0.04		1.09E-05
Phenol	0.23	3160	5.50E-03	2	25	0.16	1.00E-03	70	9125	5.01E-08	0.6		8.34E-08
PCB-1260	0.031	3160	7.00E-01	2	25	0.16	1.00E-03	70	9125	8.59E-07	0.00002		4.29E-02
Arsenic	0.085	3160	1.00E-03	2	25	0.16	1.00E-03	70	9125	3.36E-09	0.0003		1.12E-05
Chromium	0.07	3160	1.00E-03	2	25	0.16	1.00E-03	70	9125	2.77E-09	1		2.77E-09
												HI	4.55E-02

C = concentration in groundwater
SA = surface area
PC = permeability constant
EF = exposure frequency
ED = exposure duration
F = fraction of the day immersed in groundwater
CF = conversion factor
BW = body weight
AT = averaging time
RfD = reference dose

Table 9G
Exposure Scenario: Maintenance Worker / Soil / Ingestion Exposure / Risk

	((	C	*	IR	*	EF	*	ED	*	CF	)/(	BW	*	AT	)=	Intake factor	*	CSF		
Chemical		Representative Concentration (mg/kg)		mg/day		days/year		year		kg/mg		(kg)		(days)		(mg/kg/day)		(mg/kg-day)$^{-1}$	=	Risk
Benzene		1.2		480		2		25		1.00E-06		70		25550		1.61E-08		1.00E-01		1.61E-09
Chlorobenzene		0.37		480		2		25		1.00E-06		70		25550		4.97E-09		na		
2-chlorotoluene		22		480		2		25		1.00E-06		70		25550		2.95E-07		na		
1,2-Dichlorobenzene		8.8		480		2		25		1.00E-06		70		25550		1.18E-07		na		
1,1-Dichloroethane		0.023		480		2		25		1.00E-06		70		25550		3.09E-10		5.7E-03		1.76E-12
1,2-Dichloroethane		0.028		480		2		25		1.00E-06		70		25550		3.76E-10		7.0E-02		2.63E-11
cis-1,2-Dichloroethene		4.2		480		2		25		1.00E-06		70		25550		5.64E-08		na		
trans-1,2-Dichloroethene		0.033		480		2		25		1.00E-06		70		25550		4.43E-10		na		
Ethylbenzene		34.5		480		2		25		1.00E-06		70		25550		4.63E-07		na		
Freon 113		0.61		480		2		25		1.00E-06		70		25550		8.19E-09		na		
n-Butylbenzene		19		480		2		25		1.00E-06		70		25550		2.55E-07		na		
sec-Butylbenzene		3.4		480		2		25		1.00E-06		70		25550		4.56E-08		na		
Isopropylbenzene		3.2		480		2		25		1.00E-06		70		25550		4.29E-08		na		
p-Isopropyltoluene		8.4		480		2		25		1.00E-06		70		25550		1.13E-07		na		
n-Propylbenzene		19		480		2		25		1.00E-06		70		25550		2.55E-07		na		
Tetrachloroethene		7		480		2		25		1.00E-06		70		25550		9.39E-08		0.051		4.79E-09
Toluene		55		480		2		25		1.00E-06		70		25550		7.38E-07		na		
1,2,4-Trimethylbenzene		140		480		2		25		1.00E-06		70		25550		1.88E-06		na		
1,3,5-Trimethylbenzene		43		480		2		25		1.00E-06		70		25550		5.77E-07		na		
Trichloroethene		2.4		480		2		25		1.00E-06		70		25550		3.22E-08		0.015		4.83E-10
Vinyl Chloride		0.05		480		2		25		1.00E-06		70		25550		6.71E-10		0.27		1.81E-10
Total Xylenes		195		480		2		25		1.00E-06		70		25550		2.62E-06		na		
2-Methylnaphthalene		76		480		2		25		1.00E-06		70		25550		1.02E-06		na		
Naphthalene		61.5		480		2		25		1.00E-06		70		25550		8.25E-07		na		
1,2,4-Trichlorobenzene		9.8		480		2		25		1.00E-06		70		25550		1.32E-07		na		
PCB-1242		0.28		480		2		25		1.00E-06		70		25550		3.76E-09		7.7		2.89E-08
PCB-1254		0.41		480		2		25		1.00E-06		70		25550		5.50E-09		7.7		4.24E-08
PCB-1260		4.7		480		2		25		1.00E-06		70		25550		6.31E-08		7.7		4.86E-07
Arsenic		5.1		480		2		25		1.00E-06		70		25550		6.84E-08		1.75		1.20E-07
Total Chromium		75		480		2		25		1.00E-06		70		25550		1.01E-06		na		
Cadmium		1.6		480		2		25		1.00E-06		70		25550		2.15E-08		15		3.22E-07
Nickel		110		480		2		25		1.00E-06		70		25550		1.48E-06		0.91		1.34E-06
Zinc		450		480		2		25		1.00E-06		70		25550		6.04E-06		na		
																			RISK	**2.35E-06**

C = concentration of chemical in soil
IR = ingestion rate
EF = exposure frequency
ED = exposure duration
CF = conversion factor
BW = body weight
AT = averaging time
CSF = cancer slope factor

Table 9H
Exposure Scenario: Maintenance Worker / Soil / Ingestion Exposure / Hazard

	((	C	*	IR	*	EF	*	ED	*	CF	)(	BW	*	AT	) =	Intake factor	/	RfD		
Chemical		Representative Concentration (mg/kg)		mg/day		days/year		year		kg/mg		(kg)		(days)		(mg/kg/day)		(mg/kg-day)	=	Hazard
Benzene		1.2		480		2		25		1.00E-06		70		9125		4.51E-08		na		
Chlorobenzene		0.37		480		2		25		1.00E-06		70		9125		1.39E-08		2.00E-02		6.95E-07
2-chlorotoluene		22		480		2		25		1.00E-06		70		9125		8.27E-07		2.00E-02		4.13E-05
1,2-Dichlorobenzene		8.8		480		2		25		1.00E-06		70		9125		3.31E-07		9.00E-02		3.67E-06
1,1-Dichloroethane		0.023		480		2		25		1.00E-06		70		9125		8.64E-10		1.00E-01		8.64E-09
1,2-Dichloroethane		0.028		480		2		25		1.00E-06		70		9125		1.05E-09		1.00E-01		1.05E-08
cis-1,2-Dichloroethene		4.2		480		2		25		1.00E-06		70		9125		1.58E-07		1.00E-02		1.58E-05
trans-1,2-Dichloroethene		0.033		480		2		25		1.00E-06		70		9125		1.24E-09		2.00E-02		6.20E-08
Ethylbenzene		34.5		480		2		25		1.00E-06		70		9125		1.30E-06		1.00E-01		1.30E-05
Freon 113		0.61		480		2		25		1.00E-06		70		9125		2.29E-08		3.00E+01		7.64E-10
n-Butylbenzene		19		480		2		25		1.00E-06		70		9125		7.14E-07		1.00E-01		7.14E-06
sec-Butylbenzene		3.4		480		2		25		1.00E-06		70		9125		1.28E-07		1.00E-01		1.28E-06
Isopropylbenzene		3.2		480		2		25		1.00E-06		70		9125		1.20E-07		1.00E-01		1.20E-06
p-Isopropyltoluene		8.4		480		2		25		1.00E-06		70		9125		3.16E-07		2.00E+00		1.58E-07
n-Propylbenzene		19		480		2		25		1.00E-06		70		9125		7.14E-07		1.00E-01		7.14E-06
Tetrachloroethene		7		480		2		25		1.00E-06		70		9125		2.63E-07		1.00E-02		2.63E-05
Toluene		55		480		2		25		1.00E-06		70		9125		2.07E-06		2.00E-01		1.03E-05
1,2,4-Trimethylbenzene		140		480		2		25		1.00E-06		70		9125		5.26E-06		2.00E+00		2.63E-06
1,3,5-Trimethylbenzene		43		480		2		25		1.00E-06		70		9125		1.62E-06		2.00E+00		8.08E-07
Trichloroethene		2.4		480		2		25		1.00E-06		70		9125		9.02E-08		na		
Vinyl Chloride		0.05		480		2		25		1.00E-06		70		9125		1.88E-09		na		
Total Xylenes		195		480		2		25		1.00E-06		70		9125		7.33E-06		2.00E+00		3.66E-06
2-Methylnaphthalene		76		480		2		25		1.00E-06		70		9125		2.86E-06		4.00E-02		7.14E-05
Naphthalene		61.5		480		2		25		1.00E-06		70		9125		2.31E-06		4.00E-02		5.78E-05
1,2,4-Trichlorobenzene		9.8		480		2		25		1.00E-06		70		9125		3.68E-07		1.00E-02		3.68E-05
PCB-1242		0.28		480		2		25		1.00E-06		70		9125		1.05E-08		2.00E-05		5.26E-04
PCB-1254		0.41		480		2		25		1.00E-06		70		9125		1.54E-08		2.00E-05		7.70E-04
PCB-1260		4.7		480		2		25		1.00E-06		70		9125		1.77E-07		2.00E-05		8.83E-03
Arsenic		5.1		480		2		25		1.00E-06		70		9125		1.92E-07		3.00E-04		6.39E-04
Total Chromium		75		480		2		25		1.00E-06		70		9125		2.82E-06		1.00E+00		2.82E-06
Cadmium		1.6		480		2		25		1.00E-06		70		9125		6.01E-08		5.00E-04		1.20E-04
Nickel		110		480		2		25		1.00E-06		70		9125		4.13E-06		na		
Zinc		450		480		2		25		1.00E-06		70		9125		1.69E-05		3.00E-01		5.64E-05
																			HI	**1.12E-02**

C = concentration of chemical in soil
IR = ingestion rate
EF = exposure frequency
ED = exposure duration
CF = conversion factor
BW = body weight
AT = averaging time
RfD = reference dose

Table 9H1
Notes Regarding Characterization of Human Health Risks Due to Ingestion o f Soils Containing Chemicals of Concern
for Future Maintenance Personnel

4200 Alameda Avenue
Oakland, California

Notes:

(a) Refer to Table 1A for compilation of representative concentrations ("RCs").

(b) Chronic Daily Intakes ("CDIs") were estimated using methodologies recommended by U.S. EPA or Cal-EPA. Refer to Table 5 for assumptions to calculate CDIs.

(c) Chronic reference doses ("RfDs") for non-carcinogenic effects were obtained from IRIS or HEAST, in this order of priority. Origin of respective RfDs is included in Tables 2 and 3. Hyphen indicates that RfD is not available for the compound.

(d) Slope factors ("SFs)") for carcinogenic effects were obtained from Cal-EPA's California Cancer Potency Factor Memorandum (November 1994) or IRIS, in this order of priority. Origin of respective SFs is included in Tables 2 and 3. Hyphen indicates that SF is not available for the compound.

(e) Non-carcinogenic hazard index ("HI") for compound i is defined as the CDIi/RfDi. The non-carcinogenic HI, summed for all compounds and exposure pathways, assumes that there is a level of exposure (i.e., RfD) below which it is unlikely even for sensitive populations to experience adverse health effects (U.S. EPA, 1989a). If the CDI exceeds this RfD threshold (i.e., HI greater than 1), there may be concern for potential non-carcinogenic effects.

(f) Estimated lifetime incremental cancer risk for chemical i is defined as CDIi * SFi. The estimated incremental lifetime cancer risks to an individual developing cancer due to COCs is given by the sum of incremental cancer risks for all chemicals and exposure pathways.

Table 10
Summary of Estimated Hypothetical Human Health Risks

Future On-site Population	Exposure Pathway	Estimated Non-Carcinogenic Hazard Index	Estimated Incremental Lifetime Carcinogenic Risk	
Commercial Building Occupants	Inhalation of vapors from soil or groundwater to indoor air	0.03500	9.58E-06	*
Total Estimated Risk for Commercial Building Occupants		**0.03570**	**9.58E-06**	
Maintenance Personnel	Soil Ingestion	0.01120	2.35E-06	
	Dermal contact with soil	0.00207	3.09E-07	
	Dust inhalation of non-volatiles from soil	0.00003	1.04E-07	
	Dermal contact with groundwater	0.04350	2.62E-06	
	Inhalation of vapors from soil or groundwater to outdoor air	0.00038	2.91E-08	
Total Estimated Risk for Maintenance Personnel		**0.05719**	**5.41E-06**	

Table 11
Exposure Assumptions Used to Characterize Risks
to Future Maintenance Personnel from Lead-Containing Soil

4200 Alameda Avenue
Oakland, California

Parameter	Parameter Assumption (a)	Reference
Exposure Frequency	2 days/year	Best Professional Judgment (b)
Exposure Duration	25 years	EPA (1991); DTSC (1992)
Body Weight	70 kg	EPA (1989, 1991); DTSC (1992)
Exposed Skin Surface	3,160 cm^2 (c)	EPA (1992)
Ingestion Rate	240 mg/day	EPA (1991)
Inhalation Rate	20m^3/day	EPA (1989, 1991); DTSC (1992)
Dust Concentration	1mg/m^3	Best Professional Judgment (b)

Notes:

(a) Exposure assumptions are compiled from:

DTSC, July, 1992, *Supplemental Guidance for Human Health Multimedia Risk Assessments for Hazardous Waste Sites and Permitted Facilities*, Cal-EPA, the Office of the Science Advisor.

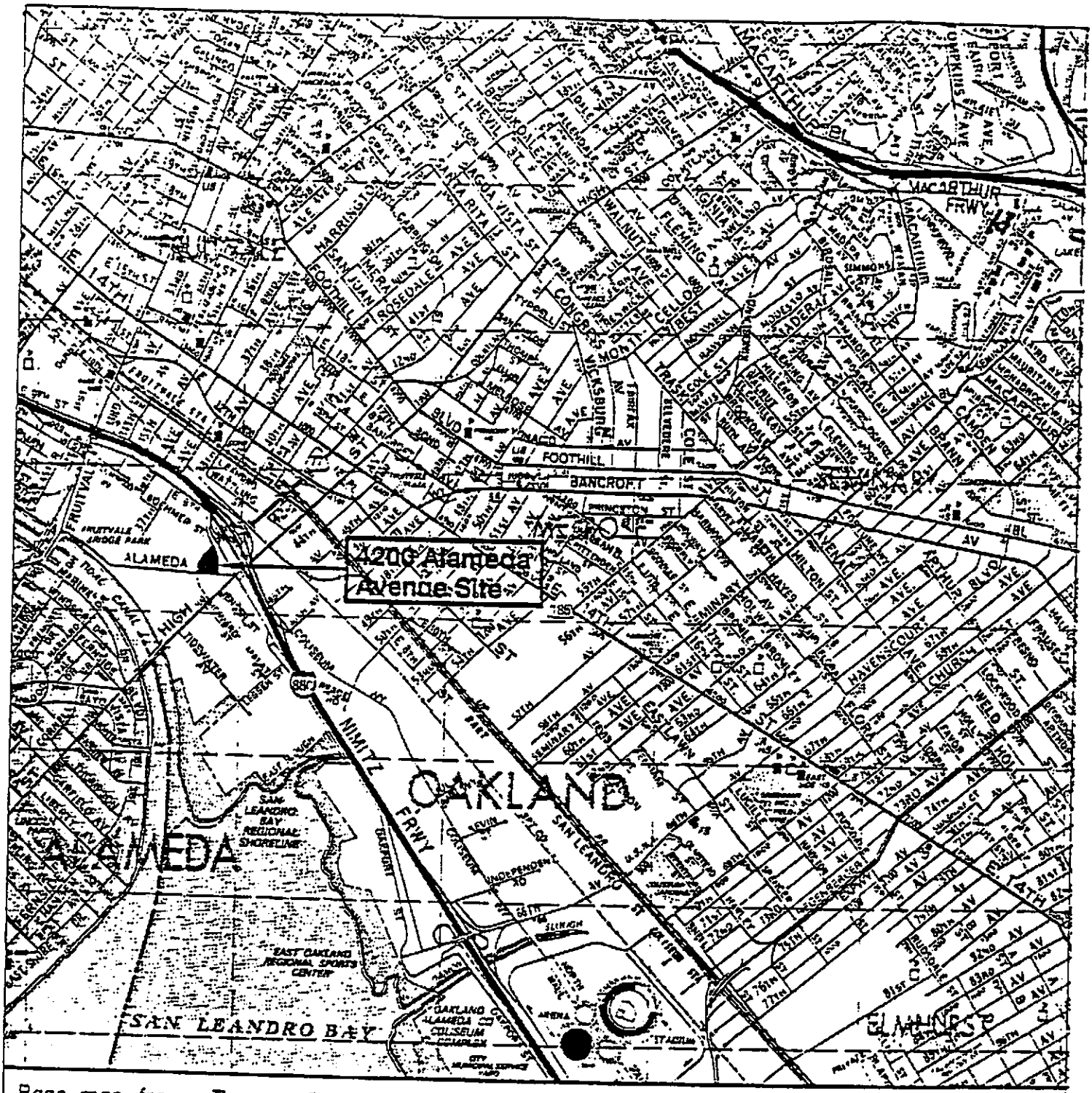
EPA, January 1992, *Dermal Exposure Assessment: Priciniples and Applications*, Interim Report, Office of Research and Development, EPA/600/8-91/011B.

EPA, March 1991, *Risk Assessment Guidance for Superfund - Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors"*, Interim Final, OSWER Directive: 9285.6-03.

EPA, December 1989, *Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part A)*, OERR, EPA/540/12-89/002.

(b) Refer to Table 5 for exposure assumptions for maintenance personnel.

(c) Exposed skin area assumes that future maintenance personnel wear short-sleeved shirts and long pants, and thus, can dermally absorb soil-bound chemicals by direct contact with hands, forearms, and head only.



Base map from: Thomas Guide 1994 Edition.

N

0 1540 3080

(Approximate Scale in Feet)

Vicinity Map

4200 Alameda Avenue
Oakland, CA

Figure 1

Table 5
Exposure Assumptions Used in the Health Risk Assessment
4200 Alameda Avenue
Oakland, California

Future On Site Population	Exposure Parameter (a)		Reference
• **Commercial Building Occupants**			
	EF Exposure Frequency	250 days/year	U.S. EPA (1989a, 1991); cAL-epa (1992)
	ED Exposure Duration	25 years	U.S. EPA (1989a, 1991); Cal-EPA (1992)
	BW Body Weight	70kg	U.S. EPA (1989a, 1991); Cal-EPA (1992)
	AT Averaging Time	9125 days; 25,550 days	Cal-EPA (1992)
	Air		
	IRa Inhalation Rate of Air	$20m^3$/day	U.S. EPA (1989a, 1991); Cal-EPA (1992)
• **Maintenance Personnel**			
	EF Exposure Frequency	2 days/year (b)	Best Professional Judgment
	ED Exposure Duration	25 years	U.S. EPA (1989a, 1991); Cal-EPA (1992)
	BW Body Weight	9125 days; 25,550 days (c)	U.S. EPA (1989a, 1991); Cal-EPA (1992)
	AT Averaging Time	9125 days; 25,550 days	U.S. EPA (1989a, 1991); Cal-EPA (1992)
	Soil		
	SAs Skin Surface Area Available for Contact with Soil	$3,160cm^2$	U.S. EPA (1992a)
	IRs Incidental Soil Ingestion Rate	480mg/day	U.S. EPA (1991)
	AF Soil to Skin Adherence Factor	$.2mg/cm^2$	U.S. EPA (1992a); Cal-EPA (1992)
	Air		
	IRa Inhalation Rate of Air	$20m^3$/day	U.S. EPA (1989a, 1991); Cal-EPA (1992)
	RDC Respirable Dust Concentration	1 mg/m^3 (d)	Best Professional Judgment
	Groundwater		
	PC Permeability Constant	cm/hour Chemical-specific	U.S. EPA (1992a)
	F Fraction of the day Immersed in contaminated water	.16 (4 hours out of each day)	Best Professional Judgment

Table 2
Summary of Inhalation Toxicity Information for Potential Chemicals of Concern in Soil and Groundwater
4200 Alameda Avenue
Oakland, California

Notes:

(c) Cancer slope factors obtained from California Cancer Potency Factors Updated Memorandum for the Office of Environmental Health Hazard Assessment (1 November 1994) or IRIS, in this order of priority.

(d) Hyphen ("-") symbol indicates a respective reference dose or cancer slope factor is not available for this compound.

(e) In the absence of an inhalation chronic reference dose or an inhalation carcinogenic slope factor, the respective oral value was used.

(f) Health criteria for n-butylbenzene, sec-butylbenzene, isopropylbenzene, and n-propylbenzene assumed to be equilvalent to ethylbenzene.

(g) Health criteria for p-isopropyltoluene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene assumed to be equilvalent to total xylenes.

(h) Health criteria for 2-methylnaphthalene assumed to be equilvalent to naphthalene.

(i) The chronic reference dose for PCB-1242 and PCB-1260 assumed to be the same as that for PCB-1254.

(j) The toxicity information for total chromium is assumed to be the same as that for chromium(III).

Table 3
Summary of Ingestion Toxicity Information for Potential Chemicals of Concern in Soil and Groundwater

4200 Alameda Avenue
Oakland, California

Compound	Non-Carcinogenic Toxicity Information		Carcinogenic Toxicity Information		
	Chronic Reference Dose (RfDo) (mg/kg-day)	Source (a)	Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Source (c)
Benzene	- (d)	-	0.1	A	Cal Potency
Chlorobenzene	0.02	IRIS	-	D	-
Chloroethane	2.86 (e)	IRIS	-	-	-
2-Chlorotoluene	0.02	IRIS	-	-	-
1,2-Dichlorobenzene	0.09	IRIS	-	D	-
1,3-Dichlorobenzene	under review	IRIS	-	D	-
1,4-Dichlorobenzene	0.23 (e)	IRIS	0.04	B2	Cal Potency
1,1-Dichloroethane	0.1 (e)	HEAST	0.0057	C	Cal Potency
1,2-Dichloroethane	-	-	0.07	B2	Cal Potency
cis-1,2-Dichloroethene	0.01	HEAST	-	D	-
trans-1,2-Dichloroethene	0.02	IRIS	-	D	-
1,2-Dichloropropane	0.0011 (e)	IRIS	0.063	B2	Cal Potency
Ethylbenzene	0.1	IRIS	-	D	-
Freon113	30	IRIS	-	-	-
n-Butylbenzene (f)	0.1	IRIS	-	D	-
sec-Butylbenzene (f)	0.1	IRIS	-	D	-
Isopropylbenzene (f)	0.1	IRIS	-	D	-
p-Isopropyltoluene (g)	2	IRIS	-	D	-
n-Propylbenzene (f)	0.1	IRIS	-	D	-
Tetrachloroethene	0.01	IRIS	0.051	under review	Cal Potency
Toluene	0.2	IRIS	-	D	-
1,2,4-Trimethylbenzene (g)	2	IRIS	-	D	-
1,3,5-Trimethylbenzene (g)	2	IRIS	-	D	-
Trichloroethene	-	-	0.015	under review	Cal Potency
Vinyl Chloride	-	-	0.27	A	Cal Potency
Total xylenes	2	IRIS	-	D	-
2,4-Dimethylphenol	0.02	IRIS	-	-	-
2-Methylnaphthalene	0.04 (h)	ECAO	-	D	-

Table 3
Summary of Ingestion Toxicity Information for Potential Chemicals of Concern in Soil and Groundwater

4200 Alameda Avenue
Oakland, California

Compound	Non-Carcinogenic Toxicity Information		Carcinogenic Toxicity Information		
	Chronic Reference Dose (RfDo) (mg/kg-day)	Source (a)	Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Source (c)
2-Methylphenol	0.05	IRIS	-	C	-
4-Methylphenol	0.005	HEAST	-	C	-
Naphthalene	0.04	ECAO	-	D	-
Phenol	0.6	IRIS	-	D	-
1,2,4-Trichlorobenzene	0.01	IRIS	-	D	-
PCB-1242	0.00002 (i)	IRIS	7.7	B2	Cal Potency
PCB-1254	0.00002	IRIS	7.7	B2	Cal Potency
PCB-1260	0.00002 (i)	IRIS	7.7	B2	Cal Potency
Arsenic	0.0003	IRIS	1.75	A	Cal Potency
Cadmium	0.0005	IRIS	15 (e)	B1	Cal Potency
Total Chromium (j)	1.0	IRIS	-	D	-
Nickel	-	-	0.91(e)	A	Cal Potency
Zinc	0.3	IRIS	-	D	-

Notes:

(a) Chronic reference doses obtained from U.S. EPA's Integrated Risk Information System (IRIS), U.S. EPA's Health Effects Assessment Summary Tables (HEAST), dated March 1995, or U.S. EPA's Environmental Criteria and Assessment Office, OH (ECAO), in this order of priority.

(b) U.S. EPA weight-of-evidence classification is as follows:

A = Human Carcinogen

B1 or B2 = Probable Human Carcinogen; B1 indicates that limited human data are available; B2 indicates that there is sufficient evidence in animals and inadequate or no evidence in humans.

C = Possible Human Carcinogen

D = Not Classifiable as to Human Carcinogenicity

E = Evidence of Non-Carcinogenicity for Humans

Weight-of-evidence information obtained from IRIS or HEAST.

Table 3
Summary of Ingestion Toxicity Information for Potential Chemicals of Concern in Soil and Groundwater

4200 Alameda Avenue
Oakland, California

Notes:

(c) Cancer slope factors obtained from California Cancer Potency Factors Updated Memorandum for the Office of Environmental Health Hazard Assessment (1 November 1994) or IRIS, in this order of priority.

(d) Hyphen ("-") symbol indicates a respective reference dose or cancer slope factor is not available for this compound.

(e) In the absence of an ingestion chronic reference dose or an ingestion carcinogenic slope factor, the respective inhalation value was used.

(f) Health criteria for n-butylbenzene, sec-butylbenzene, isopropylbenzene, and n-propylbenzene assumed to be equilvalent to ethylbenzene.

(g) Health criteria for p-isopropyltoluene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene assumed to be equilvalent to total xylenes.

(h) Health criteria for 2-methylnaphthalene assumed to be equilvalent to naphthalene.

(i) The chronic reference dose for PCB-1242 and PCB-1260 assumed to be the same as that for PCB-1254.

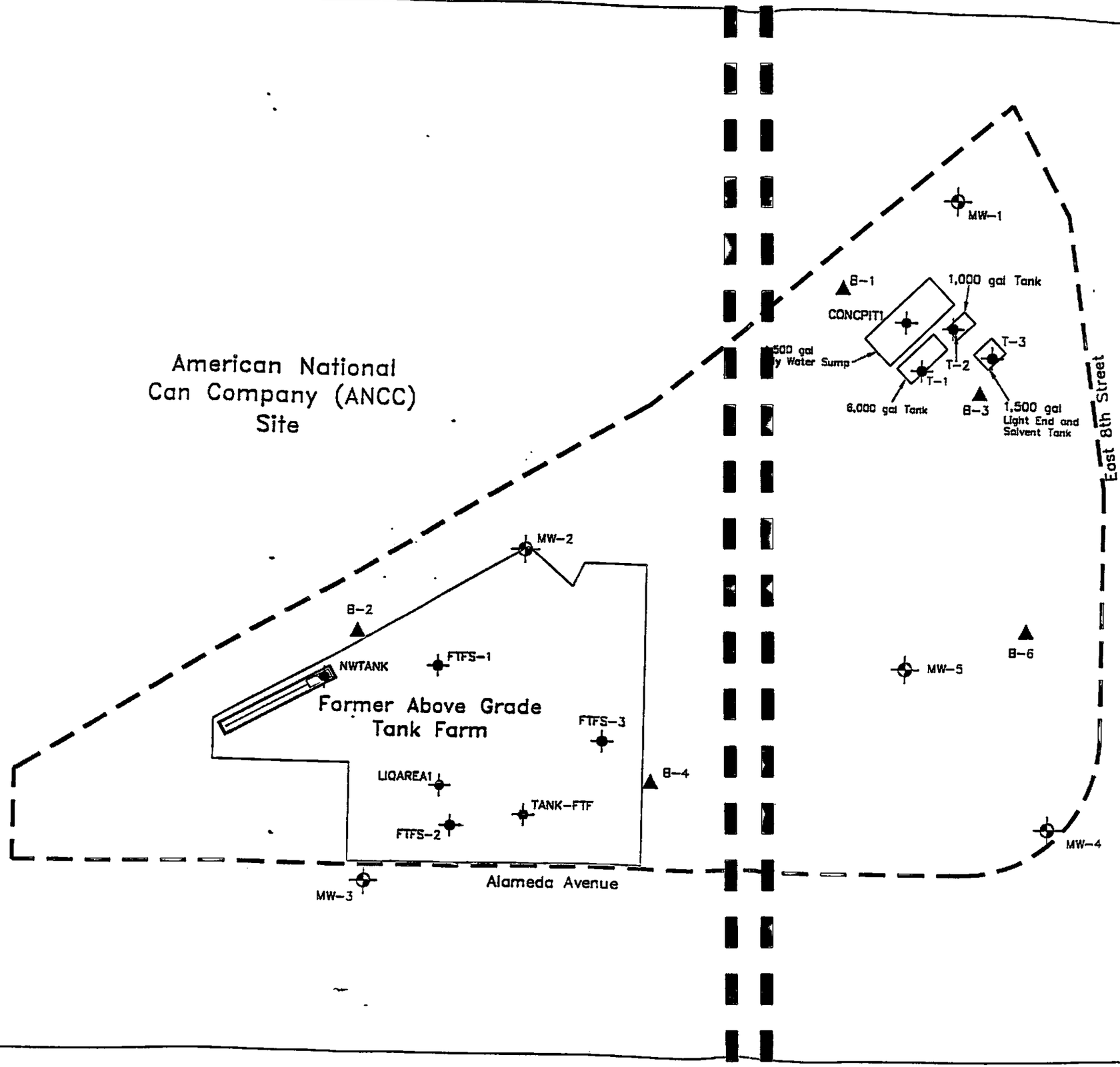
(j) The toxicity information for total chromium is assumed to be the same as that for chromium(III).

Table 4

Summary of Potential Exposure Pathways for Future On-site Populations

4200 Alameda Avenue
Oakland, California

Future On-site Population	Exposure Pathway
• Commercial Building Occupants	• Inhalation of vapors from soil or groundwater to indoor air
• Maintenance Personnel	• Soil Ingestion • Dermal contact with soil • Dermal contact with groundwater • Dust inhalation of non-volatiles from soil • Inhalation of vapors from soil or groundwater to outdoor air



N

0 30 60

(Approximate Scale in Feet)

LEGEND

- Site Boundary
- Monitoring Well
- Shallow Soil Sample
- Soil Boring
- Approximate Limits of Underground Tank and Sump Excavations

Notes:

1. All locations are approximate.

Soil and Groundwater
Sampling Locations

4200 Alameda Avenue
Oakland, CA

Figure 2

APPENDIX A

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Depth (ft, bgs)	Sample Date	TPH (as gasoline) Concentration		TPH (as diesel) Concentration		TPH (as motor oil) Concentration	
			(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern
B-1	5.5-6.0	7/12/95	60	Pattern characteristic of weathered gasoline (C_8-C_{10}) and unidentified hydrocarbons greater than C_{10}	330	Pattern characteristic of diesel	540	Pattern characteristic of motor oil
B-1	7.0-7.5	7/12/95	1,200	Pattern characteristic of weathered gasoline (C_8-C_{12})	3,100	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	4,600	Pattern characteristic of motor oil
B-1	9.5-10.0	7/12/95	890	Pattern characteristic of weathered gasoline (C_8-C_{10}) and unidentified hydrocarbons greater than C_{10}	2,200	Pattern characteristic of diesel	2,700	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-2	1.0-1.5	7/12/95	<1.0 (a)	-	5.8	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	33	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-2	4.5-5.0	7/12/95	140	Unidentifiable pattern of hydrocarbons in C_8-C_{12} range	1,200	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	2,300	Pattern characteristic of motor oil
B-2	7.5-8.0	7/12/95	28	Pattern characteristic of weathered gasoline (C_8-C_{10}) and unidentified hydrocarbons greater than C_{10}	90	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	180	Pattern characteristic of motor oil
B-3	1.5-2.0	7/14/95	4,100	Pattern characteristic of weathered gasoline (C_8-C_{12})	1,100	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	1,600	Pattern characteristic of motor oil
B-3	3.0-3.5	7/14/95	950	Pattern characteristic of weathered gasoline (C_7-C_{12})	140	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	230	Pattern characteristic of motor oil
B-3	8.5-9.0	7/14/95	22	Pattern characteristic of weathered gasoline (C_7-C_{12})	4,400	Pattern characteristic of diesel	4,800	Pattern characteristic of motor oil

APPENDIX A

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Depth (ft, bgs)	Sample Date	TPH (as gasoline) Concentration		TPH (as diesel) Concentration		TPH (as motor oil) Concentration	
			(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern
B-4	1.0-1.5	7/13/95	**490**	Unidentifiable pattern of hydrocarbons in C_8-C_{12} range	**2,000**	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	**5,400**	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-4	3.5-4.0	7/13/95	**1,100**	Unidentifiable pattern of hydrocarbons in C_8-C_{12} range	**3,500**	Pattern characteristic of diesel	**9,000**	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-4	7.5-8.0	7/13/95	**58**	Pattern characteristic of weathered gasoline (C_8-C_{12})	**200**	Pattern characteristic of diesel	**1,000**	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-6	1.0-1.5	7/13/95	**49**	Unidentified hydrocarbons less than C_7	**500**	Pattern characteristic of diesel	**870**	Pattern characteristic of motor oil
B-6	3.0-3.5	7/13/95	**14**	Unidentifiable pattern of hydrocarbons in C_6-C_{12} range	**730**	Unidentifiable pattern of hydrocarbons in C12-C24 range	**3,900**	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-6	7.5-8.0	7/13/95	**530**	Unidentifiable pattern of hydrocarbons in C_8-C_{12} range	**770**	Pattern characteristic of diesel	**1,200**	Pattern characteristic of motor oil
MW-1	4.0-4.5	7/12/95	**92**	Pattern characteristic of weathered gasoline (C_8-C_{12})	**200**	Pattern characteristic of diesel	**300**	Pattern characteristic of motor oil
MW-1	4.5-5.0	7/12/95	**32**	Unidentified hydrocarbons greater than C_8	**310**	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	**460**	Pattern characteristic of motor oil
MW-1	6.5-7.0	7/12/95	**51**	Unidentifiable pattern of hydrocarbons in C_8-C_{12} range	**120**	Pattern characteristic of diesel	**200**	Pattern characteristic of motor oil

APPENDIX A

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Depth (ft, bgs)	Sample Date	TPH (as gasoline) Concentration		TPH (as diesel) Concentration		TPH (as motor oil) Concentration	
			(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern
MW-2	1.5-2.0	7/13/95	<1.0	-	10	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	53	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-2	3.0-3.5	7/13/95	290	Unidentifiable pattern of hydrocarbons in C_8-C_{12} range	1100	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	2,400	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-2	6.0-6.5	7/13/95	260	Pattern characteristic of weathered gasoline (C_8-C_{12})	490	Pattern characteristic of diesel	920	Pattern characteristic of motor oil
MW-3	2.0-2.5	7/13/95	<1.0	-	5.9	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	21	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-3	4.0-4.5	7/13/95	<1.0	-	2.1	Unidentifiable pattern of hydrocarbons in C_{14}-C_{24} range	<10	-
MW-3	8.0-8.5	7/13/95	<1.0	-	1.5	Unidentifiable pattern of hydrocarbons in C_{14}-C_{24} range	<10	-
MW-4	2.0-2.5	7/13/95	<1.0	-	1,300	Unidentifiable pattern of hydrocarbons in C_{18}-C_{24} range	8,600	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-4	3.0-3.5	7/13/95	2	Pattern characteristic of gasoline	540	Unidentifiable pattern of hydrocarbons in C_{12}-C_{24} range	3,000	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-4	8.0-8.5	7/13/95	270	Pattern characteristic of weathered gasoline (C_8-C_{12})	110	Pattern characteristic of diesel	210	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-5	2.0-2.5	7/13/95	1,600	Pattern characteristic of weathered gasoline (C_8-C_{12})	2,300	Pattern characteristic of diesel	5,400	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-5	3.0-3.5	7/13/95	50	Unidentified hydrocarbons greater than C_8	480	Unidentifiable pattern of hydrocarbons in C_8-C_{24} range	1,000	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-5	8.0-8.5	7/13/95	100	Unidentified hydrocarbons greater than C_7	2,500	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	4,800	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range

APPENDIX A

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Depth (ft, bgs)	Sample Date	TPH (as gasoline) Concentration		TPH (as diesel) Concentration		TPH (as motor oil) Concentration	
			(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern	(mg/kg)	Description of Chromatogram Pattern
T-1	4 - 4.5	4/3/96	4,000	Pattern characteristic of weathered gasoline less than C_8	7,000	Pattern characteristic of weathered diesel and unidentified hydrocarbons in C_9-C_{14} range	6,100	Pattern characteristic of motor oil
T-2	5.5 - 6	4/3/96	2,700	Pattern characteristic of weathered gasoline less than C_8	11,000	Pattern characteristic of diesel and unidentified hydrocarbons in C_9-C_{14} range	9,800	Pattern characteristic of motor oil
T-3	5.5 - 6	4/3/96	1,700	Pattern characteristic of weathered gasoline less than C_8	2,400	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	2,600	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
NWTANK	4 - 5	5/3/96	480	Unidentifiable pattern of hydrocarbons in C_6-C_{12} range	1,800	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	5,000	Pattern characteristic of motor oil
CONCPIT1	4 - 5	6/4/96	1,300	Pattern characteristic of gasoline with hydrocarbons greater than C_7	3,600	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	3,100	Pattern characteristic of motor oil
FTFS-1	2 - 3	4/18/96	600	Pattern characteristic of weathered gasoline	1,300	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	2,600	Pattern characteristic of motor oil
FTFS-2	2 - 3	4/18/96	89	Pattern characteristic of weathered gasoline	2,700	Pattern characteristic of weathered diesel in C_{16}-C_{24} range	7,000	Pattern characteristic of weathered diesel in C_{16}-C_{40} range
FTFS-3	2 - 3	4/18/96	330	Pattern characteristic of weathered gasoline less than C_8	3,200	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	12,000	Pattern characteristic of motor oil
Tank-FTF	2 - 3	5/1/96	190	Unidentifiable pattern of hydrocarbons in C_6-C_{12} range	3,700	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	15,000	Pattern characteristic of motor oil
LiqArea1	2 - 3	5/1/96	150	Pattern characteristic of weathered gasoline in C_8-C_{12} range	3,800	Pattern characteristic of weathered diesel	9,400	Pattern characteristic of motor oil

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

TABLE A-2
BENZENE, TOLUENE, ETHYL BENZENE, TOTAL XYLENES (BTEX)
ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	BTEX Concentration (mg/kg)			
			Benzene	Toluene	Ethyl Benzene	Total Xylenes
B-1	5.5-6.0	7/12/95	<0.05 (a)	0.16	0.32	1.9
B-1	7.0-7.5	7/12/95	<0.5	0.77	5.2	31
B-1	9.5-10.0	7/12/95	<0.5	0.99	2.7	21
B-2	1.0-1.5	7/12/95	<0.005	<0.005	<0.005	0.007
B-2	4.5-5.0	7/12/95	<0.10	0.26	0.11	0.54
B-2	7.5-8.0	7/12/95	<0.05	0.16	0.11	0.39
B-3	1.5-2.0	7/14/95	<6	<6	16	130
B-3	3.0-3.5	7/14/95	<0.5	11	4.6	33
B-3	8.5-9.0	7/14/95	0.073	0.29	0.22	1.7
B-4	1.0-1.5	7/13/95	<0.25	0.45	1.6	7.8
B-4	3.5-4.0	7/13/95	<0.5	<0.5	5.7	11
B-4	7.5-8.0	7/13/95	<0.050	<0.050	0.16	0.75
B-6	1.0-1.5	7/13/95	<0.025	0.049	0.17	0.32
B-6	3.0-3.5	7/13/95	0.14	0.29	0.1	0.42
B-6	7.5-8.0	7/13/95	<0.25	0.28	0.8	3.8
MW-1	4.0-4.5	7/12/95	<0.10	<0.10	<0.10	0.21
MW-1	4.5-5.0	7/12/95	<0.05	<0.05	<0.05	0.21
MW-1	6.5-7.0	7/12/95	<0.10	<0.10	<0.10	0.26
MW-2	1.5-2.0	7/13/95	<0.005	<0.005	<0.005	<0.005
MW-2	3.0-3.5	7/13/95	<0.25	<0.25	<0.25	0.94
MW-2	6.0-6.5	7/13/95	<0.12	<0.12	1.7	12
MW-3	2.0-2.5	7/13/95	<0.005	<0.005	<0.005	<0.005
MW-3	4.0-4.5	7/13/95	<0.005	<0.005	<0.005	<0.005
MW-3	8.0-8.5	7/13/95	<0.005	<0.005	<0.005	<0.005
MW-4	2.0-2.5	7/13/95	0.018	0.02	0.0078	0.039
MW-4	3.0-3.5	7/13/95	0.058	0.04	0.007	0.062
MW-4	8.0-8.5	7/13/95	<0.12	0.17	0.65	1.9
MW-5	2.0-2.5	7/13/95	<0.5	1.3	5	42
MW-5	3.0-3.5	7/13/95	<0.05	0.13	0.11	0.45
MW-5	8.0-8.5	7/13/95	0.058	0.12	0.29	1.4
T-1	4 - 4.5	4/3/96	<10	86	30	190
T-2	5.5 - 6	4/3/96	<8.0	84	33	190

TABLE A-2
BENZENE, TOLUENE, ETHYL BENZENE, TOTAL XYLENES (BTEX)
ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	BTEX Concentration (mg/kg)			
			Benzene	Toluene	Ethyl Benzene	Total Xylenes
T-3	5.5 - 6	4/3/96	<2.5	14	5.6	58
NWTANK	4 - 5	5/3/96	<0.50	2.0	3.0	5.3
CONCPIT1	4 - 5	6/4/96	1.5	31	12	65
FTFS-1	2 - 3	4/18/96	<0.50	0.8	2.1	11
FTFS-2	2 - 3	4/18/96	<0.12	0.31	0.3	1.4
FTFS-3	2 - 3	4/18/96	0.22	0.46	1.8	7.7
Tank-FTF	2 - 3	5/1/96	0.26	0.52	0.92	4.8
LiqArea1	2 - 3	5/1/96	0.24	0.25	0.85	2.9

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

TABLE A-3

HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Halogenated Volatile Organic Compound Concentration (mg/kg)														
			Freon 113	1,2-dichloroethane	1,2-dichloropropane	Chlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	1,1,1-trichloroethane	1,1-dichloroethane	Chloroethane	Tetrachloroethene	Trichloroethene	cis-1,2-dichloroethene	trans-1,2-dichloroethene	p-Isopropyltoluene
B-1	5.5-6.0	7/12/95	<0.01 (a)	<0.005	<0.005	**0.0072**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	**0.0062**	<0.005	<0.005	<0.005	NA (b)
B-1	7.0-7.5	7/12/95	<2	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	NA
B-1	9.5-10.0	7/12/95	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	NA
B-2	1.0-1.5	7/12/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
B-2	4.5-5.0	7/12/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.012**	<0.01	<0.005	<0.005	<0.005	<0.005	NA
B-2	7.5-8.0	7/12/95	<0.01	<0.005	<0.005	<0.005	**0.0058**	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
B-3	1.5-2.0	7/14/95	<1	<0.5	<0.5	**0.5**	**1.6**	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	NA
B-3	3.0-3.5	7/14/95	<0.01	**0.018**	<0.005	**0.014**	**0.13**	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
B-3	8.5-9.0	7/14/95	**0.83**	<0.2	<0.2	**0.34**	**0.38**	<0.2	<0.2	<0.2	<0.2	<0.4	**0.95**	**0.42**	**0.4**	<0.2	NA
B-4	1.0-1.5	7/13/95	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	NA
B-4	3.5-4.0	7/13/95	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	NA
B-4	7.5-8.0	7/13/95	<0.1	<0.05	<0.05	<0.05	**0.064**	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	NA
B-6	1.0-1.5	7/13/95	<0.02	**0.028**	<0.01	<0.01	**0.021**	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	**0.12**	<0.01	<0.01	NA
B-6	3.0-3.5	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	**0.0067**	**0.014**	<0.005	NA
B-6	7.5-8.0	7/13/95	<0.4	<0.2	<0.2	<0.2	**0.25**	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	NA
MW-1	4.0-4.5	7/12/95	<0.02	<0.01	<0.01	<0.01	**0.019**	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	NA
MW-1	4.5-5.0	7/12/95	<0.02	<0.01	<0.01	<0.01	**0.011**	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	NA
MW-1	6.5-7.0	7/12/95	<0.01	<0.005	<0.005	<0.005	**0.0065**	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA

TABLE A-3

HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Halogenated Volatile Organic Compound Concentration (mg/kg)												
			Naphthalene	n-Propylbenzene	Toluene	1,2,4-Trichlororbenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Total Xylenes	n-Butylbenzene	sec-Butylbenzene	2-Chlorotoluene	Ethylbenzene	Isopropylbenzene	Vinyl Chloride
B-1	5.5-6.0	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
B-1	7.0-7.5	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2
B-1	9.5-10.0	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1
B-2	1.0-1.5	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
B-2	4.5-5.0	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
B-2	7.5-8.0	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
B-3	1.5-2.0	7/14/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1
B-3	3.0-3.5	7/14/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
B-3	8.5-9.0	7/14/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4
B-4	1.0-1.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4
B-4	3.5-4.0	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1
B-4	7.5-8.0	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1
B-6	1.0-1.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.02
B-6	3.0-3.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
B-6	7.5-8.0	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4
MW-1	4.0-4.5	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.02
MW-1	4.5-5.0	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.02
MW-1	6.5-7.0	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01

TABLE A-3

HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue

Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Halogenated Volatile Organic Compound Concentration (mg/kg)														
			Freon 113	1,2-dichloroethane	1,2-dichloropropane	Chlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	1,1,1-trichloroethane	1,1-dichloroethane	Chloroethane	Tetrachloroethene	Trichloroethene	cis-1,2-dichloroethene	trans-1,2-dichloroethene	p-Isopropyltoluene
MW-2	1.5-2.0	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
MW-2	3.0-3.5	7/13/95	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	NA
MW-2	6.0-6.5	7/13/95	<0.2	<0.1	<0.1	<0.1	**0.12**	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	NA
MW-3	2.0-2.5	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
MW-3	4.0-4.5	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
MW-3	8.0-8.5	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
MW-4	2.0-2.5	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	NA
MW-4	3.0-3.5	7/13/95	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	**0.0063**	**0.036**	<0.005	NA
MW-4	8.0-8.5	7/13/95	<0.2	<0.1	<0.1	<0.1	**0.11**	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	NA
MW-5	2.0-2.5	7/13/95	<1.0	<0.5	<0.5	<0.5	**1.1**	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<0.5	NA
MW-5	3.0-3.5	7/13/95	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.023**	<0.02	<0.01	**0.091**	**0.22**	**0.033**	NA
MW-5	8.0-8.5	7/13/95	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	NA
T-1	4 - 4.5	4/3/96	NA	<6.67	<6.67	NA	<6.67	<6.67	<6.67	<6.67	<6.67	<6.67	<6.67	<6.67	<6.67	<6.67	**8.4**
T-2	5.5 - 6	4/3/96	NA	<6.67	<6.67	NA	**11**	<6.67	<6.67	<6.67	<6.67	<6.67	**7.6**	<6.67	**8.5**	<6.67	**6.8**
T-3	5.5 - 6	4/3/96	NA	<4	<4	NA	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
FTFS-1	2 - 3	4/18/96	<0.4	<0.667	<0.667	**0.26**	**0.7**	<0.667	<0.667	<0.667	<0.667	<0.667	<0.667	<0.667	<0.667	<0.667	**1**
FTFS-2	2 - 3	4/18/96	<0.1	<0.5	<0.5	<0.05	<0.5	**0.058**	<0.5	<0.5	<0.5	<0.5	<0.5	**0.062**	<0.5	<0.5	**0.5**
FTFS-3	2 - 3	4/18/96	<0.4	<0.5	<0.5	<0.2	**0.34;0.6**	**0.68**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.87**

TABLE A-3

HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Halogenated Volatile Organic Compound Concentration (mg/kg)												
			Naphthalene	n-Propylbenzene	Toluene	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Total Xylenes	n-Butylbenzene	sec-Butylbenzene	2-Chlorotoluene	Ethylbenzene	Isopropylbenzene	Vinyl Chloride
MW-2	1.5-2.0	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
MW-2	3.0-3.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4
MW-2	6.0-6.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2
MW-3	2.0-2.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
MW-3	4.0-4.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
MW-3	8.0-8.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01
MW-4	2.0-2.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05
MW-4	3.0-3.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.049
MW-4	8.0-8.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2
MW-5	2.0-2.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0
MW-5	3.0-3.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.02
MW-5	8.0-8.5	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1
T-1	4 - 4.5	4/3/96	67	17	61	9.6	130	42	160	18	<6.67	<6.67	27	<6.67	<6.67
T-2	5.5 - 6	4/3/96	66	19	98	9.8	140	43	200	19	<6.67	22	36	<6.67	<6.67
T-3	5.5 - 6	4/3/96	29	<4	10	5.8	68	23	56	<4	<4	10	4	<4	<4
FTFS-1	2 - 3	4/18/96	6	1.9	<0.667	<0.667	14	4.7	8.1	1.4	0.96	<0.667	1.6	<0.667	<0.667
FTFS-2	2 - 3	4/18/96	1.1	0.65	<0.5	<0.5	3.4	0.69	2.1	0.58	<0.5	<0.5	0.58	<0.5	<0.5
FTFS-3	2 - 3	4/18/96	4.3	1.6	<0.5	<0.5	9.2	2.5	7.3	1.1	0.66	530	<0.5	<0.5	<0.5

TABLE A-3

HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue

Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Halogenated Volatile Organic Compound Concentration (mg/kg)														
			Freon 113	1,2-dichloroethane	1,2-dichloropropane	Chlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	1,1,1-trichloroethane	1,1-dichloroethane	Chloroethane	Tetrachloroethene	Trichloroethene	cis-1,2-dichloroethene	trans-1,2-dichloroethene	p-Isopropyltoluene
Tank-FTF	2 - 3	5/1/96	NA	<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
LiqAreal	2 - 3	5/1/96	NA	<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.622
NWTANK	4 - 5	5/3/96	NA	<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.9
CONCPIT1	4 - 5	6/4/96	NA	<2	<2	NA	3	<2	<2	<2	<2	<2	6.9	2.4	<2	<2	3.8

TABLE A-3

HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Halogenated Volatile Organic Compound Concentration (mg/kg)												
			Naphthalene	n-Propylbenzene	Toluene	1,2,4-Trichlororbenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Toual Xylenes	n-Butylbenzene	sec-Butylbenzene	2-Chlorotoluene	Ethylbenzene	Isopropylbenzene	Vinyl Chloride
Tank-FTF	2 - 3	5/1/96	**0.51**	<0.5	<0.5	<0.5	<0.5	**1.4**	**0.92**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
LiqArea1	2 - 3	5/1/96	**0.67**	<0.5	<0.5	<0.5	**4.5**	**0.56**	**1.8**	**0.64**	<0.5	<0.5	<0.5	<0.5	<0.5
NWTANK	4 - 5	5/3/96	**1**	**3.3**	**0.87**	<0.5	**1.5**	**1.2**	**2**	**1.8**	**1.2**	**530**	**4.1**	**1.3**	<0.5
CONCPIT1	4 - 5	6/4/96	**33**	**12**	**45**	<2	**95**	**29**	**110**	**8.7**	**3.4**	**8300**	**18**	**3.2**	<2

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(b) "NA" indicates that compound was not analyzed.

TABLE A-4
SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Semivolatile Organic Compound Concentration (mg/kg)								
			1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2,4-dimethylphenol	2-methylnaphthalene	2-methylphenol	4-methylphenol	Naphthalene	Phenol
B-1	-	-	-	-	-	-	-	-	-	-	-
B-2	-	-	-	-	-	-	-	-	-	-	-
B-3	-	-	-	-	-	-	-	-	-	-	-
B-4	-	-	-	-	-	-	-	-	-	-	-
B-6	-	-	-	-	-	-	-	-	-	-	-
MW-1	6.5-7.0	7/12/95	<0.25 (a)	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
MW-2	6.0-6.5	7/13/95	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25
MW-3	8.0-8.5	7/13/95	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
MW-4	2.0-2.5	7/13/95	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5
MW-5	8.0-8.5	7/13/95	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
T-1	4 - 4.5	4/3/96	<50	<50	<50	<50	76	<50	<50	56	<50
T-2	5.5 - 6	4/3/96	<12.5	<12.5	<12.5	<12.5	22	<12.5	<12.5	18	<12.5
T-3	5.5 - 6	4/3/96	<25	<25	<25	<25	51	<25	<25	<25	<25

TABLE A-4
SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Semivolatile Organic Compound Concentration (mg/kg)								
			1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2,4-dimethylphenol	2-methylnaphthalene	2-methylphenol	4-methylphenol	Naphthalene	Phenol
NWTANK	4 - 5	5/3/96	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5
CONCPIT1	4 - 5	6/4/96	<12.5	<12.5	<12.5	<12.5	27	<12.5	<12.5	17	<12.5
FTFS-1	2 - 3	4/18/96	<25	<25	<25	<25	<25	<25	<25	<25	<25
FTFS-2	2 - 3	4/18/96	<25	<25	<25	<25	<25	<25	<25	<25	<25
FTFS-3	2 - 3	4/18/96	<25	<25	<25	<25	<25	<25	<25	<25	<25
Tank-FTF	2 - 3	5/1/96	<20	<20	<20	<20	<20	<20	<20	<20	<20
LiqArea1	2 - 3	5/1/96	<50	<50	<50	<50	<50	<50	<50	<50	<50

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

TABLE A-5
POLYCHLORINATED BIPHENYL (PCB) ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	PCB Arochlor Concentration (mg/kg)		
			PCB-1242	PCB-1254	PCB-1260
B-1	5.5-6.0	7/12/95	<0.02 (a)	<0.02	<0.02
B-1	7.0-7.5	7/12/95	<2.0	<2.0	**6.6**
B-1	9.5-10.0	7/12/95	<20	<20	**27**
B-2	1.0-1.5	7/12/95	<0.02	<0.02	<0.02
B-2	4.5-5.0	7/12/95	<0.02	<0.02	<0.02
B-2	7.5-8.0	7/12/95	<0.02	<0.02	**0.085**
B-3	1.5-2.0	7/14/95	<0.2	<0.2	**0.7**
B-3	3.0-3.5	7/14/95	<0.02	<0.02	**0.021**
B-3	8.5-9.0	7/14/95	<0.4	<0.4	**2.7**
B-4	1.0-1.5	7/13/95	<0.02	<0.02	<0.02
B-4	3.5-4.0	7/13/95	<0.1	<0.1	<0.1
B-4	7.5-8.0	7/13/95	**0.045**	<0.02	**0.058**
B-6	1.0-1.5	7/13/95	<0.1	**0.36**	**0.52**
B-6	3.0-3.5	7/13/95	<0.02	**0.021**	**0.024**
B-6	7.5-8.0	7/13/95	<0.1	<0.1	**0.48**
MW-1	4.0-4.5	7/12/95	<0.02	<0.02	**0.022**
MW-1	4.5-5.0	7/12/95	<0.02	<0.02	<0.02
MW-1	6.5-7.0	7/12/95	<0.02	<0.02	<0.02
MW-2	1.5-2.0	7/13/95	<0.02	<0.02	<0.02
MW-2	3.0-3.5	7/13/95	<0.2	<0.2	**0.89**
MW-2	6.0-6.5	7/13/95	<0.02	<0.02	**0.039**
MW-3	2.0-2.5	7/13/95	<0.02	<0.02	**0.062**
MW-3	4.0-4.5	7/13/95	<0.02	<0.02	<0.02
MW-3	8.0-8.5	7/13/95	<0.02	<0.02	<0.02
MW-4	2.0-2.5	7/13/95	<0.02	<0.02	<0.02
MW-4	3.0-3.5	7/13/95	<0.02	<0.02	<0.02
MW-4	8.0-8.5	7/13/95	<0.02	<0.02	<0.02
MW-5	2.0-2.5	7/13/95	<1.0	**3.4**	<1.0
MW-5	3.0-3.5	7/13/95	<0.02	**0.033**	<0.02
MW-5	8.0-8.5	7/13/95	<0.1	**0.58**	<0.1
T-1	4 - 4.5	4/3/96	<100	<100	**1,300**
T-2	5.5 - 6	4/3/96	<100	<100	**740**
T-3	5.5 - 6	4/3/96	<100	<100	**390**

TABLE A-5
POLYCHLORINATED BIPHENYL (PCB) ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	PCB Arochlor Concentration (mg/kg)		
			PCB-1242	PCB-1254	PCB-1260
NWTANK	4 - 5	5/3/96	**150**	<100	**110**
CONCPIT1	4 - 5	6/4/96	<500	<500	**2,400**
FTFS-1	2 - 3	4/18/96	<100	<100	**280**
FTFS-2	2 - 3	4/18/96	<100	<100	**260**
FTFS-3	2 - 3	4/18/96	<100	<100	**620**
Tank-FTF	2 - 3	5/1/96	**1,100**	<200	**980**
LiqArea1	2 - 3	5/1/96	<200	<200	**510**

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

TABLE A-6
METAL ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Metal Concentration (mg/kg)					
			Arsenic	Cadmium	Total Chromium	Lead	Nickel	Zinc
B-1	5.5-6.0	7/12/95	<10 (a)	NA (b)	95	<10	NA	NA
B-1	7.0-7.5	7/12/95	<5	NA	75	5.1	NA	NA
B-1	9.5-10.0	7/12/95	10	NA	55	7.2	NA	NA
B-2	1.0-1.5	7/12/95	<5	NA	20	14	NA	NA
B-2	4.5-5.0	7/12/95	<10	NA	64	<10	NA	NA
B-2	7.5-8.0	7/12/95	<5	NA	50	5.7	NA	NA
B-3	1.5-2.0	7/14/95	13	NA	58	97	NA	NA
B-3	3.0-3.5	7/14/95	<5	NA	84	15	NA	NA
B-3	8.5-9.0	7/14/95	<5	NA	110	6.5	NA	NA
B-4	1.0-1.5	7/13/95	<5	NA	23	<5	NA	NA
B-4	3.5-4.0	7/13/95	<5	NA	54	19	NA	NA
B-4	7.5-8.0	7/13/95	<5	NA	63	<5	NA	NA
B-6	1.0-1.5	7/13/95	<5	NA	61	49	NA	NA
B-6	3.0-3.5	7/13/95	<5	NA	90	24	NA	NA
B-6	7.5-8.0	7/13/95	<5	NA	91	5.3	NA	NA
MW-1	4.0-4.5	7/12/95	<10	NA	94	<10	NA	NA
MW-1	4.5-5.0	7/12/95	<10	NA	82	<10	NA	NA
MW-1	6.5-7.0	7/12/95	<5	NA	77	6.5	NA	NA
MW-2	1.5-2.0	7/13/95	6.8	NA	18	18	NA	NA
MW-2	3.0-3.5	7/13/95	<5	NA	66	38	NA	NA
MW-2	6.0-6.5	7/13/95	<5	NA	76	5.2	NA	NA
MW-3	2.0-2.5	7/13/95	<5	NA	51	31	NA	NA
MW-3	4.0-4.5	7/13/95	<5	NA	56	5.2	NA	NA
MW-3	8.0-8.5	7/13/95	<5	NA	52	<5	NA	NA
MW-4	2.0-2.5	7/13/95	28	NA	25	54	NA	NA
MW-4	3.0-3.5	7/13/95	<5	NA	61	97	NA	NA
MW-4	8.0-8.5	7/13/95	<5	NA	83	5.5	NA	NA
MW-5	2.0-2.5	7/13/95	<5	NA	53	150	NA	NA
MW-5	3.0-3.5	7/13/95	<5	NA	71	<5	NA	NA
MW-5	8.0-8.5	7/13/95	<5	NA	81	26	NA	NA
T-1	4 - 4.5	4/3/96	NA	<0.50	80	90	130	100

TABLE A-6
METAL ANALYTICAL RESULTS OF SOIL SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Depth (ft, bgs)	Sample Date	Metal Concentration (mg/kg)					
			Arsenic	Cadmium	Total Chromium	Lead	Nickel	Zinc
T-2	5.5 - 6	4/3/96	NA	1.3	110	230	83	560
T-3	5.5 - 6	4/3/96	NA	0.53	48	100	61	95
NWTANK	4 - 5	5/3/96	NA	<0.50	31	190	38	130
CONCPIT1	4 - 5	6/4/96	NA	<0.50	<0.50	<5.0	<2.5	2.2
FTFS-1	2 - 3	4/18/96	NA	<0.50	57	11	74	31
FTFS-2	2 - 3	4/18/96	NA	<0.50	54	40	74	44
FTFS-3	2 - 3	4/18/96	NA	<0.50	56	18	78	43
Tank-FTF	2 - 3	5/1/96	NA	3.7	60	660	74	410
LiqArea1	2 - 3	5/1/96	NA	<0.50	57	7.8	68	31

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(b) "NA" indicates that compound was not analyzed.

TABLE A-7

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue

Oakland, California

Sample ID	Sample Date	TPH (as gasoline) Concentration (a)		TPH (as diesel) Concentration (a)		TPH (as motor oil) Concentration (a)	
		(ug/L)	Description of Chromatogram Pattern	(ug/L)	Description of Chromatogram Pattern	(ug/L)	Description of Chromatogram Pattern
B-1	7/12/95	24,000	Pattern characteristic of gasoline	150,000	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	160,000	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-2	7/12/95	7,000	Pattern characteristic of gasoline	30,000	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	67,000	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-4	7/13/95	160,000	Pattern characteristic of gasoline	400,000	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	800,000	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
B-6	7/13/95	3,100	Pattern characteristic of gasoline	330,000	Unidentifiable pattern of hydrocarbons in C_9-C_{24} range	450,000	Unidentifiable pattern of hydrocarbons in C_{16}-C_{36} range
MW-1	7/26/95	11,000	Pattern characteristic of gasoline	29,000	Unidentifiable pattern of hydrocarbons in C_9-C_{30} range	-	-
	6/24/96	7,800	Pattern characteristic of gasoline	39,000	Pattern characteristic of diesel in the C_9-C_{14} range	-	-
MW-2	7/26/95	3,600	Pattern characteristic of gasoline	22,000	Unidentifiable pattern of hydrocarbons in C_9-C_{39} range	-	-
	6/24/96	2,700	Pattern characteristic of gasoline	12,000	Unidentifiable pattern of hydrocarbons in C_9-C_{36} range	-	-
MW-3	7/25/95	200	Pattern characteristic of gasoline and unidentified hydrocarbons greater than C_8	5,600	Unidentifiable pattern of hydrocarbons in C_9-C_{38} range	-	-
	7/25/95 dup	180	Pattern characteristic of gasoline and unidentified hydrocarbons greater than C_{10}	7,000	Unidentifiable pattern of hydrocarbons in C_9-C_{38} range	-	-
	6/24/96	57	Pattern characteristic of gasoline	4,900	Unidentifiable pattern of hydrocarbons in C_9-C_{38} range	-	-

TABLE A-7

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Date	TPH (as gasoline) Concentration (a)		TPH (as diesel) Concentration (a)		TPH (as motor oil) Concentration (a)	
		(ug/L)	Description of Chromatogram Pattern	(ug/L)	Description of Chromatogram Pattern	(ug/L)	Description of Chromatogram Pattern
MW-4	7/25/95	1,400	Pattern characteristic of gasoline	24,000	Pattern characteristic of crude oil	-	-
	6/24/96	5,500	Pattern characteristic of gasoline and unidentified hydrocarbons greater than C_{11}	850,000	Unidentifiable pattern of hydrocarbons in C_9-C_{40} range	-	-
MW-5	7/26/95	4,800	Pattern characteristic of gasoline and unidentified hydrocarbons greater than C_{10}	7,500	Unidentifiable pattern of hydrocarbons in C_9-C_{34} range	-	-
	6/24/96	2,000	Pattern characteristic of gasoline	520,000	Unidentifiable pattern of hydrocarbons in C_9-C_{40} range	-	-
	6/24/96 dup	2,200	Pattern characteristic of gasoline	360,000	Unidentifiable pattern of hydrocarbons in C_9-C_{40} range	-	-

Notes:

(a) Immiscible hydrocarbons present in groundwater samples. Measured constituents likely include quantitation of constituents in both immiscible and soluble phases.

TABLE A-8
BENZENE, TOLUENE, ETHYL BENZENE, TOTAL XYLENES (BTEX)
ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Date	BTEX Concentration (ug/L); (b)			
		Benzene	Toluene	Ethyl Benzene	Total Xylenes
B-1	7/12/95	320	670	260	1,400
B-2	7/12/95	350	610	110	370
B-4	7/13/95	180	2,500	700	3,400
B-6	7/13/95	380	19	61	130
MW-1	7/26/95	630	1,300	140	870
	6/24/96	530	1,000	130	860
MW-2	7/26/95	36	37	130	660
	6/24/96	19	<10 (a)	170	340
MW-3	7/25/95	6.2	<0.5	<0.5	<0.5
	7/25/95 dup	6.2	<0.5	<0.5	<0.5
	6/24/96	6.3	<0.5	<0.5	<0.5
MW-4	7/25/95	64	12	28	49
	6/24/96	140	13	87	150
MW-5	7/26/95	78	160	56	190
	6/24/96	97	160	48	150
	6/24/96 dup	95	150	50	160

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(b) Immiscible hydrocarbons present in groundwater samples. Measured constituents likely include quantitation of constituents in both immiscible and soluble phases.

TABLE A-9
HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Date	Halogenated Volatile Organic Compound Concentration (ug/L); (b)														
		Freon 113	1,2 -dichloroethane	1,2-dichloropropane	Chlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	1,1,1-trichloroethane	1,1-dichloroethane	Chloroethane	Tetrachloroethane	Trichloroethene	cis-1,2-dichloroethene	trans-1,2-dichloroethene	Vinyl Chloride
B-1	7/12/95	<100 (a)	<50	<50	160	300	1,600	2,700	<50	<50	<50; (d)	<50	<50	<50	<50	<100
B-2	7/12/95	<5.0	17	4.9	21	24	<2.5	4.4	<2.5	26	2.5	<2.5	<2.5	8.4	4.1	4.2
B-4	7/13/95	<500	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	6,600	<250	4,800
B-6	7/13/95	<10	<5	<5	10	15	5.6	13	<5.0	<5	130	<5.0	<5.0	<5.0	<5.0	<10
MW-1	7/26/95	<100	<50	<50	<50	<50	<50	<50	<50	130	<100	<50	<50	2,300	91	3,100
	6/24/96	<50	<50	<50	<50	<50	<50	<50	<50	88	<100	<50	<50	2,800	110	3,100
MW-2	7/26/95	<2.5	<1.3	<1.3	7.3	48	1.5	8	<1.3	4.8	5.8	<1.3	<1.3	<1.3	<1.3	<2.5
	6/24/96	<2.5	<2.5	<2.5	7.4	88	4.0	18	<2.5	15	6.2	<2.5	3.8	20	<2.5	4.1
MW-3	7/25/95	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5
	/25/95 du	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5
	6/24/96	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	<0.5	<0.5
MW-4	7/25/95	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	2,000	50	3,500
	6/24/96	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	3,100	<100	4,200
MW-5	7/26/95	<200	<100	<100	<100	<100	<100	<100	<100	160	<200	<100	<100	3,700	130	5,200
	6/24/96	<100	<100	<100	<100	<100	<100	<100	<100	150	<100	<100	<100	2,800	160	4,200
	6/24/96 du	<100	<100	<100	<100	<100	<100	<100	<100	140	<100	<100	<100	2,800	170	4,100

TABLE A-9
HALOGENATED VOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(b) Immiscible hydrocarbons present in groundwater samples. Measured constituents likely include quantitation of constituents in both immiscible and soluble phases.

TABLE A-10
SEMIVOLATILE ORGANIC COMPOUND ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Date	Semivolatile Organic Compound Concentration (ug/L); (c)								
		1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2,4-dimethylphenol	2-methylnaphthalene	2-methylphenol	4-methylphenol	Naphthalene	Phenol
B-1	7/12/95	NA (a)	NA	NA	NA	NA	NA	NA	NA	NA
B-2	7/12/95	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	7/13/95	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-1	7/26/95	<100 (b)	<100	<100	**3,400**	<100	**330**	**550**	**160**	**230**
	6/24/96	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2	7/26/95	**30**	<5	**5.4**	<5	**11**	<5	**9.9**	**63**	<5
	6/24/96	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3	7/25/95	<5	<5	<5	<5	<5	<5	<5	<5	<5
	7/25/95 dup	<5	<5	<5	<5	<5	<5	<5	<5	<5
	6/24/96	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4	7/25/95	<50	<50	<50	<50	<50	<50	<50	<50	<50
	6/24/96	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	7/26/95	<250	<250	<250	<250	<250	<250	<250	<250	<250
	6/24/96	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/24/96 dup	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

(a) "NA" indicates that compound was not analyzed.

(b) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(c) Immiscible hydrocarbons present in groundwater samples. Measured constituents likely include quantitation of constituents in both immiscible and soluble phases.

TABLE A-11
POLYCHLORINATED BIPHENYL (PCB) ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Date	PCB Arochlor Concentration (ug/L); (c)		
		PCB-1242	PCB-1254	PCB-1260
B-1	7/12/95	NA (a)	NA	NA
B-2	7/12/95	NA	NA	NA
B-4	7/13/95	NA	NA	NA
B-6	7/13/95	NA	NA	NA
MW-1	7/26/95	<25 (b)	<25	<25
MW-2	7/26/95	<2.5	<2.5	<2.5
MW-3	7/25/95	<2.5	<2.5	<2.5
MW3 DUP	7/25/95	<0.5	<0.5	<0.5
MW-4	7/25/95	<2.5	<2.5	<2.5
MW-5	7/26/95	<50	<10	31

Notes:

(a) "NA" indicates that compound was not analyzed.

(b) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(c) Immiscible hydrocarbons present in groundwater samples. Measured constituents likely include quantitation of constituents in both immiscible and soluble phases. both immiscible and soluble phases.

TABLE A-12
DISSOLVED ARSENIC, TOTAL CHROMIUM, AND LEAD
ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

4200 Alameda Avenue
Oakland, California

Sample ID	Sample Date	Dissolved Metal Concentration (mg/L); (c)		
		Arsenic	Total Chromium	Lead
B-1	7/12/95	**0.088**	**0.089**	**0.008**
B-2	7/12/95	**0.026**	<0.020	<0.0050
B-4	7/13/95	<5.0 (a)	<5.0	<5.0
B-6	7/13/95	<5.0	<0.5	**6.6**
MW-1	7/26/95	**0.093**	<0.020	<0.0050
	6/24/96	NA (b)	NA	NA
MW-2	7/26/95	**0.025**	<0.010	<0.0050
	6/24/96	NA	NA	NA
MW-3	7/25/95	**0.017**	**0.021**	<0.0050
	7/25/95 dup	**0.013**	**0.024**	**0.005**
	6/24/96	NA	NA	NA
MW-4	7/25/95	**0.028**	<0.010	<0.0050
	6/24/96	NA	NA	NA
MW-5	7/26/95	**0.032**	<0.020	**0.12**
	6/24/96	NA	NA	NA
	6/24/96 dup	NA	NA	NA

Notes:

(a) Less than symbol ("<") denotes that compound was not present above the detection limit shown.

(b) "NA" indicates that compound was not analyzed.

(c) Analyses were performed on groundwater samples filtered in the field.

APPENDIX B

Appendix B
Environmental Fate and Transport Model - Outdoor Concentrations from Soil Vapors

Chemical	Concentration in soil (mg/kg)	Dair	Dwat	W	Ps	Ustr	gammastr	Thetaas	Thetaws	Thetacs^2	Deffs	H	PIE	Thetaws^3.33	Ks		T	d	tscrcrk^3.33	fwcrck^3.33					
		Diffusivity in Air Dat (cm2/s)	Diffusivity in Water Dwater (cm2/s)	Width of source area (cm)	Soil Bulk Density (gm/cm3 soil)	Wind speed (cm/sec)	Ambient air mixing zone height (cm)	vol air content - vadose zone soils (cm3/cm3soil)	volumetric water content - vadose zone soils	total soil porosity (cm3/cm3-soil)	effective diffusion coeff in soil based on vapor-phase data(cm2/s ec)	Henry's Law Constant Hc (L-H2Ok-atm/ mol)		volumetric water content in vadose zone soils (cm3watercm3 soil)	Soil-water partition coefficient (cm3/watergr C)	Organic Carbon Partition Coeff Koc (ml/g)	Averaging time for vapor flux (s)	Lower depth of enrthtal soil zone (cm)	Volumetric air content in foundation crack(cm3/cm3 other vol	Volumetric H2O content in foundation crack(cm3/cm3)/(cm3/cm3 air		Effective Diffusion Coeff thru Found Cracks	Vtemp	Outdoor Air (mg/m3 air / mg/kgsoil)	Outdoor Air (mg/m3 air)
Benzene	1.2	9.30E-02	1.10E-05	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.83E-06	2.20E-01	3.14	0.02417932	1.44E-02	3.00E+01	7.88E+08	100	1.00E-04	2.42E-02	30	6.93E-06	6.64E-06	9.96E-06	1.20E-04
Chlorobenzene	0.37	7.20E-02	7.50E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.66E-06	1.50E-01	3.14	0.02417932	6.08E-02	1.50E+02	7.88E+08	100	1.00E-04	2.42E-02	30	5.56E-06	2.99E-06	4.96E-06	1.59E-06
3-chlorotoluene	23	7.10E-02	7.20E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	1.35E-04	1.30E-02	3.14	0.02417932	7.22E-02	1.90E+02	7.88E+08	100	1.00E-04	2.42E-02	30	1.36E-04	3.17E-06	9.39E-06	2.07E-04
1,2-Dichlorobenzene	0.8	1.30E-01	7.30E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	1.08E-04	8.00E-02	3.14	0.02417932	4.18E-01	1.10E+03	7.88E+08	100	1.00E-04	2.42E-02	30	1.69E-04	5.34E-06	1.29E-05	1.15E-04
1,1-Dichloroethane	0.023	9.10E-02	9.20E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.97E-06	1.80E-01	3.14	0.02417932	1.14E-02	3.00E+01	7.88E+08	100	1.00E-04	2.42E-02	30	6.82E-06	5.46E-06	8.20E-06	1.89E-06
1,2-Dichloroethane	0.028	9.10E-02	9.20E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.97E-06	4.10E-02	3.14	0.02417932	6.32E-03	1.40E+01	7.88E+08	180	1.00E-04	2.42E-02	30	9.57E-06	1.31E-06	2.77E-06	7.74E-07
cis-1,2-Dichloroethene	4.2	9.10E-02	9.80E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.91E-06	1.70E-01	3.14	0.02417932	1.08E-02	4.90E+01	7.88E+08	100	1.00E-04	2.42E-02	30	6.91E-06	8.00E-06	7.80E-06	3.19E-04
trans-1,2-Dichloroethene	0.033	7.90E-02	9.80E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.78E-06	2.70E-01	3.14	0.02417932	2.24E-02	6.90E+01	7.88E+08	100	1.00E-04	2.42E-02	30	5.78E-06	7.68E-06	9.78E-06	3.23E-05
Ethylbenzene	34.5	7.60E-02	8.00E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.44E-06	3.20E-01	3.14	0.02417932	3.81E-02	9.50E+01	7.88E+08	100	1.00E-04	2.42E-02	30	5.44E-06	8.64E-06	1.02E-04	3.63E-03
Freon 113	6.81	7.20E-02	7.50E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.61E-06	1.40E-01	3.14	0.02417932	1.48E-01	3.90E+02	7.88E+08	100	1.00E-04	2.42E-02	30	5.61E-06	2.63E-06	3.20E-06	1.98E-06
n-Butylbenzene	19	6.20E-02	6.10E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.38E-06	9.20E-01	3.14	0.02417932	9.50E-01	2.60E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.28E-06	2.98E-06	2.78E-06	8.31E-04
sec-Butylbenzene	3.4	6.20E-02	6.10E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.30E-06	4.70E-01	3.14	0.02417932	3.36E-01	8.90E+02	7.88E+08	100	1.00E-04	2.42E-02	30	4.30E-06	6.82E-06	6.32E-06	1.81E-04
Isopropylbenzene	3.2	6.60E-02	6.60E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.53E-06	8.10E-01	3.14	0.02417932	1.06E+00	2.80E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.53E-06	3.16E-06	3.15E-06	1.01E-04
p-Isopropyltoluene	8.4	6.20E-02	6.10E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.76E-06	8.10E-01	3.14	0.02417932	1.06E+00	2.80E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.29E-06	3.16E-06	2.96E-06	2.49E-04
n-Propylbenzene	19	6.60E-02	6.60E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.61E-06	4.20E-01	3.14	0.02417932	2.81E-01	7.40E+02	7.88E+08	100	1.00E-04	2.42E-02	30	4.61E-06	6.61E-06	6.70E-06	1.06E-03
Tetrachloroethene	7	7.20E-02	7.60E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.95E-06	6.20E-01	3.14	0.02417932	2.81E-01	6.60E+02	7.88E+08	100	1.00E-04	2.42E-02	30	4.95E-06	8.58E-06	9.46E-06	6.82E-04
Toluene	68	8.60E-02	9.40E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.18E-06	2.60E-01	3.14	0.02417932	4.94E-02	1.30E+02	7.88E+08	100	1.00E-04	2.42E-02	30	8.18E-06	6.66E-06	9.06E-06	4.96E-03
1,2,4-Trimethylbenzene	140	6.60E-02	6.60E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	4.78E-06	2.40E-01	3.14	0.02417932	1.41E+00	3.70E+03	7.88E+08	180	1.00E-04	2.42E-02	30	4.78E-06	9.91E-06	1.05E-05	1.46E-03
1,3,5-Trimethylbenzene	43	6.60E-02	6.60E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.01E-06	1.80E-01	3.14	0.02417932	8.08E-01	1.80E+03	7.88E+08	100	1.00E-04	2.42E-02	30	5.01E-06	1.31E-06	1.45E-06	8.22E-04
Trichloroethene	2.4	9.10E-02	9.80E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.70E-06	3.90E-01	3.14	0.02417932	4.94E-02	1.30E+02	7.88E+08	100	1.00E-04	2.42E-02	30	6.70E-06	9.64E-06	1.20E-04	2.86E-04
Vinyl Chloride	0.08	1.10E-01	1.10E-05	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	7.42E-06	1.1	3.14	0.02417932	2.17E-02	5.70E+01	7.88E+08	100	1.00E-04	2.42E-02	30	7.42E-06	2.76E-04	4.51E-04	2.25E-06
Total Xylenes	195	7.20E-02	8.50E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.22E-06	2.90E-01	3.14	0.02417932	9.12E-02	2.40E+02	7.88E+08	100	1.00E-04	2.42E-02	30	5.22E-06	6.36E-06	7.31E-06	1.43E-02
2-Methylnaphthalene	76	6.40E-02	6.40E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.30E-06	4.90E-02	3.14	0.02417932	3.00E+00	7.90E+03	7.88E+08	100	1.00E-04	2.42E-02	30	6.30E-06	1.02E-06	1.42E-06	1.08E-04
Naphthalene	61.5	7.20E-02	9.40E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	7.60E-06	4.90E-02	3.14	0.02417932	4.94E-01	1.30E+03	7.88E+08	100	1.00E-04	2.42E-02	30	7.90E-06	4.89E-06	8.08E-06	4.98E-04
Phenol	9.9	8.40E-02	8.60E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	7.20E-02	1.90E-06	3.14	0.02417932	5.32E-03	1.40E+01	7.88E+08	100	1.00E-04	2.42E-02	30	7.20E-02	6.14E-09	9.71E-08	9.62E-06
1,2,4-Trichlorobenzene	0.29	6.60E-02	6.70E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	5.47E-06	9.80E-02	3.14	0.02417932	3.80E+00	8.20E+03	7.88E+08	100	1.00E-04	2.42E-02	30	5.47E-06	1.73E-08	3.09E-08	8.84E-07
PCB-1242	0.41	5.00E-02	4.90E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	6.54E-06	2.40E-02	3.14	0.02417932	1.94E+00	5.10E+03	7.88E+08	100	1.00E-04	2.42E-02	30	6.56E-06	7.49E-07	1.06E-06	4.43E-07
PCB-1254	4.7	4.60E-02	4.80E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	6.28E-06	1.20E-02	3.14	0.02417932	1.86E+01	4.10E+04	7.88E+08	100	1.00E-04	2.42E-02	30	9.26E-06	5.09E-08	1.04E-07	4.87E-07
PCB-1260	5.1	4.60E-02	4.80E-06	3000	1.82	340	200	6.30E-02	3.27E-01	1.62E-01	8.15E-06	1.40E-02	3.14	0.02417932	9.86E+02	2.60E+06	7.88E+08	100	1.00E-04	2.42E-02	30	8.15E-06	9.47E-10	1.70E-09	8.66E-09

Appendix B
Environmental Fate and Transport Model - Indoor Air Concentrations from Soil Vapors

Chemical	Concentration in soil (mg/kg)	Dair Diffusivity in Air Dair (cm2/s)	Dwat Diffusivity in Water Dwater (cm2/s)	W Width of source area (cm)	Ps Soil Bulk Density (gm/cm3soil)	Uair Wind speed (cm/sec)	gammair Ambient air mixing zone height (cm)	Thetaas soil air content - vadose zone soils (cm3air/cm3 soil	Thetaws volumetric water content - vadose zone soils	Thetat^2 total soil porosity (cm3void-cm3 soil	Deffs effective diffusion coeff in soil based on vapor-phase conc(cm2/sec)	H Henry's Law Constant Hc (L-H2O/L-air)	PIE	Thetawv^3 volumetric water content in vadose zone soils (cm3water/cm3 soil)	Ka Soil-water sorption coefficient (cm3water/g-C)	Koc Organic Carbon Partition Coeff Koc (cm3/g)	T Averaging time for vapor flux (y)	d Lower depth of confined soil zone (cm)	thetacrit^3.33 Volumetric air content in foundation cracks(cm3air/cm3tot vol	thetacrit^3.33 Volumetric H2O content in foundation cracks(cm3H2O/cm3	Eb	Effective Diffusion Coeff thru Pound Cracks	Vbsoil	Air Concentration in (mg/m3)	Air Concentration in (ug/m3)
Benzene	1.2	9.90E-02	1.10E-05	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.93E-06	2.20E-01	3.14	0.024179	1.44E-02	3.90E+01	7.88E+08	100	1.00E-04	2.42E-02	30	6.93E-05	8.54E-06	7.85E-06	7.85E-02
Chlorobenzene	0.37	7.20E-02	7.50E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.66E-06	1.60E-01	3.14	0.024179	6.08E-02	1.60E+02	7.88E+08	100	1.00E-04	2.42E-02	30	6.66E-05	2.99E-05	1.11E-05	1.11E-02
2-chlorotoluene	22	7.10E-02	7.20E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	1.35E-04	1.30E-02	3.14	0.024179	7.22E-02	1.90E+02	7.88E+08	100	1.00E-04	2.42E-02	30	1.35E-04	3.17E-06	8.97E-06	8.97E-02
1,2-Dichlorobenzene	8.8	1.30E-01	7.30E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	1.09E-04	5.00E-02	3.14	0.024179	4.18E-01	1.10E+03	7.88E+08	100	1.00E-04	2.42E-02	30	1.09E-04	5.38E-06	4.73E-06	4.73E-02
1,1-Dichloroethene	0.023	9.10E-02	8.20E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.82E-06	1.60E-01	3.14	0.024179	1.14E-02	3.00E+01	7.88E+08	100	1.00E-04	2.42E-02	30	6.82E-05	6.46E-06	1.26E-06	1.26E-03
1,2-Dichloroethane	0.028	9.10E-02	9.20E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	9.57E-06	4.10E-02	3.14	0.024179	5.32E-03	1.40E+01	7.88E+08	100	1.00E-04	2.42E-02	30	9.57E-05	1.31E-05	3.88E-07	3.88E-04
cis-1,2-Dichloroethene	4.2	9.10E-02	9.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	8.91E-06	1.70E-01	3.14	0.024179	1.88E-02	4.90E+01	7.88E+08	100	1.00E-04	2.42E-02	30	8.91E-05	6.00E-06	2.10E-04	2.10E-01
trans-1,2-Dichloroethe	0.033	7.90E-02	8.80E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	5.78E-06	2.70E-01	3.14	0.024179	2.24E-02	5.80E+01	7.88E+08	100	1.00E-04	2.42E-02	30	5.78E-05	7.68E-06	2.54E-06	2.54E-03
Ethylbenzene	34.5	7.80E-02	8.50E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	5.44E-06	3.20E-01	3.14	0.024179	3.81E-02	9.50E+01	7.88E+08	100	1.00E-04	2.42E-02	30	5.44E-06	8.54E-06	2.94E-03	2.94E+00
Freon 113	0.61	7.20E-02	7.50E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	5.61E-06	1.40E-01	3.14	0.024179	1.48E-01	3.90E+02	7.88E+08	100	1.00E-04	2.42E-02	30	5.61E-06	2.83E-06	1.60E-06	1.60E-02
n-Butylbenzene	18	8.20E-02	8.10E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.28E-06	5.20E-01	3.14	0.024179	9.50E-01	2.50E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.28E-06	2.96E-06	6.63E-04	6.63E-01
sec-Butylbenzene	3.4	8.20E-02	8.10E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.30E-06	4.70E-01	3.14	0.024179	3.38E-01	8.90E+02	7.88E+08	100	1.00E-04	2.42E-02	30	4.30E-06	5.62E-06	1.91E-04	1.91E-01
Isopropylbenzene	3.2	8.80E-02	8.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.53E-06	8.10E-01	3.14	0.024179	1.08E+00	2.80E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.53E-06	3.16E-06	1.01E-04	1.01E-01
p-Isopropyltoluene	8.4	8.20E-02	8.10E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.25E-06	8.10E-01	3.14	0.024179	1.08E+00	2.80E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.25E-06	3.16E-06	2.66E-04	2.66E-01
n-Propylbenzene	18	8.80E-02	8.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.81E-06	4.20E-01	3.14	0.024179	2.81E-01	7.40E+02	7.88E+08	100	1.00E-04	2.42E-02	30	4.81E-06	5.81E-06	1.07E-03	1.07E+00
Tetrachloroethene	7	7.20E-02	7.80E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.96E-06	6.20E-01	3.14	0.024179	2.51E-01	6.60E+02	7.88E+08	100	1.00E-04	2.42E-02	30	4.96E-06	8.68E-06	6.08E-04	6.08E-01
Toluene	66	8.50E-02	9.40E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.19E-06	2.60E-01	3.14	0.024179	4.84E-02	1.30E+02	7.88E+08	100	1.00E-04	2.42E-02	30	6.19E-06	6.65E-06	3.66E-03	3.66E+00
1,2,4-Trimethylbenzen	140	8.80E-02	8.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	4.79E-06	2.40E-01	3.14	0.024179	1.41E+00	3.70E+03	7.88E+08	100	1.00E-04	2.42E-02	30	4.79E-06	9.91E-06	1.39E-03	1.39E+00
1,3,5-Trimethylbenzen	43	8.80E-02	8.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.01E-06	1.80E-01	3.14	0.024179	6.08E-01	1.60E+03	7.88E+08	100	1.00E-04	2.42E-02	30	6.01E-06	1.31E-05	6.63E-04	6.63E-01
Trichloroethene	2.4	9.10E-02	9.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.70E-06	3.80E-01	3.14	0.024179	4.94E-02	1.30E+02	7.88E+08	100	1.00E-04	2.42E-02	30	6.70E-06	9.54E-06	2.29E-04	2.29E-01
Vinyl Chloride	0.05	1.10E-01	1.10E-05	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	7.42E-06	1.1	3.14	0.024179	2.17E-02	5.70E+01	7.88E+08	100	1.00E-04	2.42E-02	30	7.42E-06	2.76E-04	1.38E-06	1.38E-02
Total Xylenes	195	7.20E-02	8.50E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	5.22E-06	2.90E-01	3.14	0.024179	9.12E-02	2.40E+02	7.88E+08	100	1.00E-04	2.42E-02	30	5.22E-06	9.36E-06	1.24E-02	1.24E+01
2-Methylnaphthalene	76	6.40E-02	6.40E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.30E-06	4.80E-02	3.14	0.024179	3.00E+00	7.90E+03	7.88E+08	100	1.00E-04	2.42E-02	30	6.30E-06	1.02E-06	7.78E-06	7.78E-02
Naphthalene	61.5	7.20E-02	9.40E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	7.80E-06	4.80E-02	3.14	0.024179	4.94E-01	1.30E+03	7.88E+08	100	1.00E-04	2.42E-02	30	7.80E-06	4.69E-06	2.89E-04	2.89E-01
Phenol	9.8	8.40E-02	8.60E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	7.20E-02	1.90E-05	3.14	0.024179	6.32E-03	1.40E+01	7.88E+08	100	1.00E-04	2.42E-02	30	7.20E-02	6.14E-09	6.02E-08	6.02E-05
1,2,4-Trichlorobenzen	0.28	8.60E-02	8.70E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.47E-06	9.60E-02	3.14	0.024179	3.50E+00	9.20E+03	7.88E+08	100	1.00E-04	2.42E-02	30	6.47E-06	1.73E-08	4.85E-07	4.85E-04
PCB-1242	0.41	5.00E-02	4.90E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	6.55E-06	2.40E-02	3.14	0.024179	1.94E+00	5.10E+03	7.88E+08	100	1.00E-04	2.42E-02	30	6.55E-06	7.49E-07	3.07E-07	3.07E-04
PCB-1254	4.7	4.80E-02	4.80E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	9.26E-06	1.20E-02	3.14	0.024179	1.58E+01	4.10E+04	7.88E+08	100	1.00E-04	2.42E-02	30	9.26E-06	6.08E-08	2.39E-07	2.39E-04
PCB-1260	5.1	4.60E-02	4.50E-06	3000	1.62	340	200	0.30E-02	3.27E-01	1.52E-01	9.15E-06	1.40E-02	3.14	0.024179	9.89E+02	2.60E+06	7.88E+08	100	1.00E-04	2.42E-02	30	9.15E-06	8.47E-10	4.83E-08	4.83E-05

Appendix B
Environmental Fate and Transport Model - Indoor Air Concentrations from Groundwater

Chemical	Dair Diffusivity in Air Dair (cm2/s)	Thetaas vol air content - vadose zone soils (cm3air/cm3soil)	Thetat^2 total soil porosity (cm3/cm3-soil	Dwet Diffusivity in Water Dwater (cm2/s)	H Henry's Law Constant Hc (L-H20/L-air)	Thetaws volumetric water content - vadose zone soils	Deffs effective diffusion coeff in soil based on vapor-phase conc	Thetaacap volumetric air content in cap fringe soils (cm3air/cm3soil)	Thetawcap volumetric water content in cap fringe soils (cm3water/cm3soil)	Deffcap effective diffusion coeff in capillary fringe (cm2/sec)	Deffws effective diffusion coeff between groundwater and soil surface(cm2/sec)	Vfwsap (mg/m3air/mg/lH2O) - numerator	Vfwsap (mg/m3air/mg/lH2O) - denominator	ϕacrack volumetric air content in foundation/wall cracks(cm3air/cm3total volume)	ϕwcrack volumetric water content in foundation/wall cracks(cm3water/cm3soil)	Deffcrack effective diffusion coeff between foundation cracks(cm2/sec)	Vfwsap (mg/m3air/mg/lH2O) - RESULT	Groundwater Concentration (mg/l)	GW Conc x VF = mg/m3
Benzene	9.30E-02	1.00E-04	1.52E-01	1.10E-05	2.20E-01	2.42E-02	6.93E-05	1.87E-05	2.81E-02	2.06E-05	6.67E-05	7.09E-04	4.91E+01	1.00E-04	2.42E-02	6.93E-05	**1.44E-05**	0.63	9.10E-06
Chlorobenzene	7.20E-02	1.00E-04	1.52E-01	7.50E-06	1.50E-01	2.42E-02	5.55E-05	1.87E-05	2.81E-02	1.81E-05	5.36E-05	3.69E-04	4.93E+01	1.00E-04	2.42E-02	5.55E-05	**7.88E-06**	0.16	1.26E-06
Chloroethane	1.00E-01	1.00E-04	1.52E-01	1.10E-05	5.00E-01	2.42E-02	6.95E-05	1.87E-05	2.81E-02	1.63E-05	6.59E-05	1.59E-03	4.84E+01	1.00E-04	2.42E-02	6.95E-05	**3.29E-05**	0.13	4.28E-06
1,2-Dichlorobenzene	1.30E-01	1.00E-04	1.52E-01	7.30E-06	5.00E-02	2.42E-02	1.09E-04	1.87E-05	2.81E-02	4.29E-05	1.06E-04	2.57E-04	4.97E+01	1.00E-04	2.42E-02	1.09E-04	**5.16E-06**	0.3	1.55E-06
1,3-Dichlorobenzene	1.30E-01	1.00E-04	1.52E-01	7.30E-06	1.50E-01	2.42E-02	9.36E-05	1.87E-05	2.81E-02	2.49E-05	8.95E-05	6.48E-04	4.88E+01	1.00E-04	2.42E-02	9.36E-05	**1.33E-05**	1.6	2.13E-05
1,4-Dichlorobenzene	1.30E-01	1.00E-04	1.52E-01	7.30E-06	1.20E-01	2.42E-02	9.55E-05	1.87E-05	2.81E-02	2.72E-05	9.17E-05	5.31E-04	4.90E+01	1.00E-04	2.42E-02	9.55E-05	**1.08E-05**	2.7	2.93E-05
1,1-Dichloroethane	9.10E-02	1.00E-04	1.52E-01	9.20E-06	1.60E-01	2.42E-02	6.82E-05	1.87E-05	2.81E-02	2.06E-05	6.57E-05	5.71E-04	4.91E+01	1.00E-04	2.42E-02	6.82E-05	**1.16E-05**	0.16	1.86E-06
1,2-Dichloroethane	9.10E-02	1.00E-04	1.52E-01	9.20E-06	4.10E-02	2.42E-02	9.57E-05	1.87E-05	2.81E-02	5.26E-05	9.45E-05	1.87E-04	5.03E+01	1.00E-04	2.42E-02	9.57E-05	**3.72E-06**	0.017	6.32E-08
cis-1,2-Dichloroethene	9.10E-02	1.00E-04	1.52E-01	9.60E-06	1.70E-01	2.42E-02	6.91E-05	1.87E-05	2.81E-02	2.16E-05	6.66E-05	5.47E-04	4.92E+01	1.00E-04	2.42E-02	6.91E-05	**1.11E-05**	6.6	7.33E-05
trans-1,2-Dichloroethene	7.90E-02	1.00E-04	1.52E-01	9.60E-06	2.70E-01	2.42E-02	5.78E-05	1.87E-05	2.81E-02	1.62E-05	5.54E-05	7.23E-04	4.90E+01	1.00E-04	2.42E-02	5.78E-05	**1.48E-05**	0.17	2.51E-06
1,2-Dichloropropane	8.00E-02	1.00E-04	1.52E-01	8.10E-06	9.60E-02	2.42E-02	6.62E-05	1.87E-05	2.81E-02	2.54E-05	6.45E-05	2.99E-04	4.97E+01	1.00E-04	2.42E-02	6.62E-05	**6.02E-06**	0.0049	2.95E-08
Ethylbenzene	7.60E-02	1.00E-04	1.52E-01	8.50E-06	3.20E-01	2.42E-02	5.44E-05	1.87E-05	2.81E-02	1.42E-05	5.20E-05	8.03E-04	4.88E+01	1.00E-04	2.42E-02	5.44E-05	**1.65E-05**	0.7	1.15E-05
Toluene	8.50E-02	1.00E-04	1.52E-01	9.40E-06	2.60E-01	2.42E-02	6.19E-05	1.87E-05	2.81E-02	1.71E-05	5.93E-05	7.45E-04	4.89E+01	1.00E-04	2.42E-02	6.19E-05	**1.52E-05**	2.5	3.61E-05
Trichloroethene	8.10E-02	1.00E-04	1.52E-01	8.50E-06	3.80E-01	2.42E-02	5.70E-05	1.87E-05	2.81E-02	1.41E-05	5.43E-05	9.96E-04	4.86E+01	1.00E-04	2.42E-02	5.70E-05	**2.05E-05**	0.0038	7.79E-08
Vinyl Chloride	1.10E-01	1.00E-04	1.52E-01	1.10E-05	1.1	2.42E-02	7.42E-05	1.87E-05	2.81E-02	1.53E-05	6.97E-05	3.71E-03	4.80E+01	1.00E-04	2.42E-02	7.42E-05	**7.72E-05**	5.2	4.02E-04
Total Xylenes	7.20E-02	1.00E-04	1.52E-01	8.50E-06	2.90E-01	2.42E-02	5.22E-05	1.87E-05	2.81E-02	1.42E-05	5.00E-05	7.00E-04	4.89E+01	1.00E-04	2.42E-02	5.22E-05	**1.43E-05**	3.4	4.87E-05
2,4-Dimethylphenol	6.90E-02	1.00E-04	1.52E-01	6.90E-06	2.70E-04	2.42E-02	4.11E-03	1.87E-05	2.81E-02	4.73E-03	4.12E-03	5.37E-05	5.11E+01	1.00E-04	2.42E-02	4.11E-03	**1.05E-06**	3.4	3.57E-06
2-Methylnaphthalene	6.40E-02	1.00E-04	1.52E-01	6.40E-06	4.90E-02	2.42E-02	6.30E-05	1.87E-05	2.81E-02	3.20E-05	6.20E-05	1.47E-04	5.02E+01	1.00E-04	2.42E-02	6.30E-05	**2.92E-06**	0.011	3.22E-08
2-Methylphenol	7.50E-02	1.00E-04	1.52E-01	7.60E-06	5.10E-05	2.42E-02	2.37E-02	1.87E-05	2.81E-02	2.75E-02	2.38E-02	5.86E-05	5.11E+01	1.00E-04	2.42E-02	2.37E-02	**1.15E-06**	0.33	3.78E-07
4-Methylphenol	7.50E-02	1.00E-04	1.52E-01	7.60E-06	3.30E-05	2.42E-02	3.67E-02	1.87E-05	2.81E-02	4.25E-02	3.67E-02	5.86E-05	5.11E+01	1.00E-04	2.42E-02	3.67E-02	**1.15E-06**	0.55	6.30E-07
Naphthalene	7.20E-02	1.00E-04	1.52E-01	9.40E-06	4.90E-02	2.42E-02	7.80E-05	1.87E-05	2.81E-02	4.42E-05	7.70E-05	1.82E-04	5.04E+01	1.00E-04	2.42E-02	7.80E-05	**3.62E-06**	0.16	5.79E-07
Phenol	8.40E-02	1.00E-04	1.52E-01	8.60E-06	1.90E-05	2.42E-02	7.20E-02	1.87E-05	2.81E-02	8.36E-02	7.22E-02	6.62E-05	5.11E+01	1.00E-04	2.42E-02	7.20E-02	**1.30E-06**	0.23	2.98E-07
PCB-1260	4.60E-02	1.00E-04	1.52E-01	4.50E-06	1.40E-02	2.42E-02	8.15E-05	1.87E-05	2.81E-02	6.50E-05	8.11E-05	5.49E-05	5.08E+01	1.00E-04	2.42E-02	8.15E-05	**1.08E-06**	0.031	3.35E-08

Appendix B
Environmental Fate and Transport Model - Outdoor Air Concentrations from Groundwater

Chemical	Dair Diffusivity in Air Dair (cm2/s)	Uair Wind speed above ground surface in ambient mixing zone (cm/s)	gamma air Ambient air mixing zone height (cm)	Lgw Depth to groundwater (cm)	W Width of source area parallel to wind or GW flow direction (cm)	Thetaas vol air content - vadose zone soils (cm3air/cm3soil	Thetat^2 total soil porosity (cm3/cm3-soil	Dwat Diffusivity in Water Dwater (cm2/s)	H Henry's Law Constant Hs (L-H2O/L-air)	Thetaws volumetric water content - vadose zone soils	Deffs effective diffusion coeff in soil based on vapor-phase cons	Thetaacap volumetric air content in cap fringe soils (cm3air/cm3soil)	Thetawcap volumetric water content in cap fringe soils (cm3water/cm3soil)	Deffcap effective diffusion coeff in capillary fringe (cm2/sec)	Deffws effective diffusion coeff between groundwater and soil surface(cm2/sec)	Groundwater Concentration (mg/l)	Organic Carbon Partition Coeff Koc (ml/g)	Solubility in Water S (mg/l)	Groundwater to ambient vapors (mg/m3air / mg/LH2O)	Air conc from groundwater chemicals(mg/m3air)
Benzene	9.30E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	1.10E-05	2.20E-01	2.42E-02	6.93E-05	1.87E-05	2.81E-02	2.08E-05	6.67E-05	0.63	3.80E+01	1.80E+03	2.16E-06	1.36E-06
Chlorobenzene	7.20E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	7.50E-06	1.50E-01	2.42E-02	5.55E-05	1.87E-05	2.81E-02	1.61E-05	5.36E-05	0.16	1.60E+02	4.70E+02	1.18E-06	1.89E-07
Chloroethane	1.00E-01	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	1.10E-05	5.00E-01	2.42E-02	8.95E-05	1.87E-05	2.81E-02	1.83E-05	6.59E-05	0.13	3.20E+00	4.70E+03	4.85E-06	6.30E-07
1,2-Dichlorobenzene	1.30E-01	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	7.30E-06	5.00E-02	2.42E-02	1.09E-04	1.87E-05	2.81E-02	4.29E-05	1.08E-04	0.3	1.10E+03	1.80E+02	7.82E-07	2.34E-07
1,3-Dichlorobenzene	1.30E-01	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	7.30E-06	1.50E-01	2.42E-02	9.36E-05	1.87E-05	2.81E-02	2.49E-05	8.95E-05	1.6	5.40E+02	1.20E+02	1.97E-06	3.16E-06
1,4-Dichlorobenzene	1.30E-01	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	7.30E-06	1.20E-01	2.42E-02	9.55E-05	1.87E-05	2.81E-02	2.72E-05	9.17E-05	2.7	1.20E+03	8.70E+01	1.62E-06	4.37E-06
1,1-Dichloroethane	9.10E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	9.20E-06	1.80E-01	2.42E-02	6.82E-05	1.87E-05	2.81E-02	2.06E-05	8.57E-05	0.16	3.00E+01	5.10E+03	1.74E-06	2.78E-07
1,2-Dichloroethane	9.10E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	9.20E-06	4.10E-02	2.42E-02	9.57E-05	1.87E-05	2.81E-02	5.26E-05	9.45E-05	0.017	1.40E+01	8.50E+03	5.70E-07	9.68E-09
cis-1,2-Dichloroethene	9.10E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	9.60E-06	1.70E-01	2.42E-02	6.91E-05	1.87E-05	2.81E-02	2.16E-05	8.66E-05	6.8	4.90E+01	3.50E+03	1.67E-06	1.10E-05
trans-1,2-Dichloroethene	7.90E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	9.60E-06	2.70E-01	2.42E-02	5.78E-05	1.87E-05	2.81E-02	1.62E-05	5.54E-05	0.17	5.90E+01	6.30E+03	2.20E-06	3.74E-07
1,2-Dichloropropane	8.00E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	8.10E-06	9.60E-02	2.42E-02	6.62E-05	1.87E-05	2.81E-02	2.54E-05	8.45E-05	0.0049	3.70E+01	2.70E+03	9.11E-07	4.46E-09
Ethylbenzene	7.60E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	8.50E-06	3.20E-01	2.42E-02	5.44E-05	1.87E-05	2.81E-02	1.42E-05	5.20E-05	0.7	9.50E+01	1.60E+02	2.44E-06	1.71E-06
Toluene	8.50E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	9.40E-06	2.60E-01	2.42E-02	6.19E-05	1.87E-05	2.81E-02	1.71E-05	5.83E-05	2.5	1.30E+02	5.30E+02	2.27E-06	5.67E-06
Trichloroethene	8.10E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	8.50E-06	3.80E-01	2.42E-02	5.70E-05	1.87E-05	2.81E-02	1.41E-05	5.43E-05	0.0038	1.30E+02	1.10E+03	3.03E-06	1.15E-06
Vinyl Chloride	1.10E-01	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	1.10E-05	1.1	2.42E-02	7.42E-05	1.87E-05	2.81E-02	1.53E-05	6.97E-05	5.2	5.70E+01	4.20E+03	1.13E-05	5.87E-05
Total Xylenes	7.20E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	8.50E-06	2.90E-01	2.42E-02	5.22E-05	1.87E-05	2.81E-02	1.42E-05	5.00E-05	3.4	2.40E+02	2.00E+02	2.13E-06	7.25E-06
2,4-Dimethylphenol	8.90E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	6.90E-06	2.70E-04	2.42E-02	4.11E-03	1.87E-05	2.81E-02	4.73E-03	4.12E-03	3.4	1.20E+02	4.20E+03	1.63E-07	5.56E-07
2-Methylnaphthalene	6.40E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	6.40E-06	4.90E-02	2.42E-02	6.30E-05	1.87E-05	2.81E-02	3.20E-05	6.20E-05	0.011	7.90E+03	2.50E+01	4.47E-07	4.92E-09
2-Methylphenol	7.50E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	7.60E-06	5.10E-05	2.42E-02	2.37E-02	1.87E-05	2.81E-02	2.75E-02	2.36E-02	0.33	2.20E+01	2.50E+04	1.78E-07	5.89E-08
4-Methylphenol	7.50E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	7.60E-06	3.30E-05	2.42E-02	3.67E-02	1.87E-05	2.81E-02	4.25E-02	3.67E-02	0.55	4.90E+01	2.30E+04	1.78E-07	9.81E-08
Naphthalene	7.20E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	9.40E-06	4.90E-02	2.42E-02	7.80E-05	1.87E-05	2.81E-02	4.42E-05	7.70E-05	0.16	1.30E+03	3.20E+01	5.55E-07	8.85E-08
Phenol	8.40E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	8.60E-06	1.90E-05	2.42E-02	7.20E-02	1.87E-05	2.81E-02	6.38E-02	7.22E-02	0.23	1.40E+01	9.30E+04	2.02E-07	4.64E-08
PCB-1260	4.60E-02	3.40E+02	2.00E+02	3.00E+02	3.00E+03	1.00E-04	1.52E-01	4.50E-06	1.40E-02	2.42E-02	8.15E-05	1.87E-05	2.81E-02	8.50E-05	8.11E-05	0.031	2.60E+06	8.20E-02	1.67E-07	5.16E-09

DRAFT
May 8, 1998

APPENDIX B

PROPOSED ENVIRONMENTAL RESTRICTION AND COVENANT

RECORDING REQUESTED BY:

WHEN RECORDED MAIL TO:
Crosby, Heafey, Roach & May
Professional Corporation
P. O. Box 7936
San Francisco, California 94120-7936
Attn: Timothy N. Brown, Esq.

ENVIRONMENTAL RESTRICTION AND COVENANT

(Civil Code § 1471)

THIS ENVIRONMENTAL RESTRICTION AND COVENANT ("Covenant") is made as of _____, 1998 by Laurence C. and Diane M. Webster, husband and wife (the "Websters") and the California Regional Water Quality Control Board, San Francisco Bay Region (the "Regional Board") for the benefit of the Websters, the Regional Board, AR-Oakland LLC, a California limited liability company ("ARO"), Ekotek, Inc., a Delaware corporation ("Ekotek") and all Owners and Occupants of the Property, as defined below.

RECITALS

A. The Websters own that real property located in the City of Oakland, County of Alameda, State of California, as described on Exhibit A attached hereto (the "Property"). Ekotek owned the Property from 1978 until December 31, 1983, when it sold the Property to the Websters.

B. The Property was used for a waste oil and waste solvent recycling facility from before 1940 until 1981. The facility was demolished in 1995.

C. ARO has entered into an agreement with the Websters to be the development manager for the Property. **[revise as necessary]**

D. By its Order No. 98-_____, dated April _____, 1998, entitled "_____" ("Order"), the Regional Board ordered _____ and future Owners and Occupants of the Property to implement the Risk Management Plan dated February ___,

1998 submitted to the Regional Board by_____ (as it may be amended from time to time with the approval of the Regional Board, referred to herein as the "Plan,"), prohibited use of groundwater at the Property without the consent of the Regional Board and required recordation of institutional constraints in the form of an Environmental Restriction under California Civil Code § 1471 against the Property prohibiting groundwater use, limiting uses of the Property and requiring implementation of the Plan.

E. The Regional Board has determined that the requirements of this Covenant are reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the Property of residual levels of certain hazardous materials identified in Exhibit B hereto.

NOW, THEREFORE, the Websters, ARO, Ekotek and the Regional Board agree as follows:

1. Definitions

1.1 ARO. "ARO" shall mean AR-Oakland LLC, a California limited liability company, and shall include any successor business organization (whether by name change, merger or other action) of ARO.

1.2 Covenant. "Covenant" shall mean this Environmental Restriction and Covenant.

1.3 Effective Date. "Effective Date" shall mean the date this Agreement is recorded in the Official Records of Alameda County, California.

1.4 Ekotek. "Ekotek" shall mean Ekotek, Inc., a Delaware corporation, which is the beneficiary of a Deed of Trust encumbering the Property and shall include any corporate successor (by corporate name change, merger or other corporate action) of Ekotek.

1.5 Occupants. "Occupants" shall mean those persons (whether individuals, corporations or any other legal entities), who, from and after the Effective Date, from time to time become entitled by leasehold, subleasehold or other legal relationship with an Owner or Occupant to occupy any portion of the Property and to engage in activities thereon that are subject to one or more Requirements set forth herein.

1.6 Order. "Order" shall mean the Regional Board's Order No. 98-_____, dated April ___, 1998, as described in Recital D.

1.7 Owners. "Owners" shall mean those persons (whether individuals, corporations or other legal entities) who hold title (whether legal or equitable) from time to time to all or any portion of the Property.

1.8 Plan. "Plan" shall mean the Risk Management Plan described in Recital D above, and all documents incorporated therein by reference, as it may be amended from time to time with the approval of the Regional Board.

1.9 Property. "Property" means the real property described in Exhibit A.

1.10 Regional Board. "Regional Board" shall mean the California Regional Water Quality Control Board, San Francisco Bay Region, and shall include its successor agencies, if any.

1.11 Requirements. "Requirements" shall have the meaning set forth in Section 2.2 hereof.

1.12 Websters. The "Websters" shall mean Laurence C. Webster and Diane M. Webster, husband and wife, and their respective heirs, administrators, executors, successors and assigns.

2. Environmental Restriction.

2.1 Land Affected. The land that is to be affected by this Covenant is the Property.

2.2 Covenants to Run with the Land. This Covenant (including the Plan and all exhibits, attachments, or appendices thereto, all documents incorporated herein by reference and all exhibits attached hereto) sets forth protective provisions, covenants, restrictions and conditions (collectively referred to as "Requirements"), upon and subject to which the Property and every portion thereof shall be improved, held, used, occupied, leased, sold, hypothecated, encumbered, and/or conveyed. Each and all of the Requirements shall also inure to the benefit of and pass with each and every portion of the Property, and shall apply to, benefit and bind the respective successors in interest to the Property. Each and all of the Requirements shall be for the benefit of, and enforceable by the Regional Board, Owners, Occupants, the Websters, ABC and Ekotek, as their interests may appear. Each and all of the Requirements are imposed upon the entire Property unless expressly stated as applicable to a specific portion of the Property. This Covenant and each and all of the Requirements shall run with the land and pass with each and every portion of the Property, pursuant to California Civil Code Section 1471.

2.3 Necessity. Each and all of the Requirements relates to the use of the Property and each of the Requirements is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the Property of the hazardous materials listed in Exhibit B attached hereto, which are all hazardous materials as defined in Section 25260 of the California Health and Safety Code. This is not a statement that a hazard exists.

2.4 Concurrence of the Websters, Owners and Occupants Presumed. The Websters and ARO acting for the Websters, by their execution of this Covenant, and all other Owners and

Occupants of all or any portion of the Property, by their purchase, leasing, or possession of all or any portion of the Property, shall be deemed to consent to and ratify the provisions hereof, including (without limitation) Section 2.2 hereof and to agree for and among themselves, their heirs, administrators, executors, successors and assigns, and the lessees of such Owners, heirs, administrators, executors, successors and assigns, that this Covenant and the Requirements as herein established must be adhered to for the benefit of present and future Owners and Occupants and that their interest in the Property shall be subject to this Covenant and the Requirements contained herein.

3. Provisions.

3.1 Implementation of Plan. The Websters, ARO acting for the Websters and each and every Owner and Occupant shall comply with and implement the Plan, as the Plan may be amended from time to time in accordance with applicable law and the rules and regulations of the Regional Board, during the period of time that the Websters and such Owner and/or Occupant owns and/or holds an interest in the Property. Each Owner shall be responsible for insuring compliance with the Plan and this Covenant by all Occupants of, and all other persons holding or claiming any interest in, that portion of the Property owned by such Owner.

3.2 Engineering Controls. Without limiting the generality of the requirements of Section 3.1, the Websters, ARO acting for the Websters and each and every Owner and Occupant during the time that they own and/or hold an interest in the Property shall implement engineering controls set forth in the Plan, including without limitation maintenance of a cover or cap over the Property, installation of vapor barriers in the foundations of all improvements constructed on the Property and such other measures as may be specified in the Plan, as it may be amended from time to time.

3.3 Restriction on Use. The Websters, ARO acting for the Websters and each and every Owner and Occupant, separately and independently, covenant not to use the Property for any of the following during the period of time that the Websters or any other Owner and/or Occupant owns and/or holds an interest in the Property, without first obtaining the prior written consent of the Regional Board:

a. Use as a residence, including any mobile home or factory built housing, apartment building, single-family home, or other structure constructed or installed for use as permanently occupied human habitation;

b. Use as a hospital for humans; or

c. Use as a school for persons under 21 years of age or a day care center for children.

3.4 Groundwater Use. Groundwater at the Property shall not be used as a source of drinking water, irrigation water, industrial water or for any other purpose without the prior written consent of the Regional Board.

3.5 Notice. Each Owner and Occupant (including the Websters) shall provide each new Owner, tenant, licensee or any person acquiring an interest in the Property from such Owner or Occupant with notice of this Covenant, the Plan and the Order and include the following provision in each deed, lease, license or other agreement to or with such person:

> The land described herein is subject to that certain Environmental Restriction and Covenant dated as of _____, 1998 and recorded on _____, 1998 in the Official Records of Alameda County, California as Document No. _____, which imposes certain covenants, conditions and restrictions on usage of the property described herein. The provisions of the Environmental Restriction and Covenant are incorporated herein by reference and made a part hereof as if set forth in full.

3.6 Waiver of Claims. Each and every Owner and Occupant hereby waive release acquit and forever discharge the Websters, ARO, Ekotek and their respective agents, directors, officers, employees, parent corporations, affiliated corporations, affiliated business entities, heirs, administrators, executives and successors, to the maximum extent permitted by law, of and from any and all claims, actions, causes of action, demands, rights, liabilities, damages, losses, cost expenses, or compensation, whatsoever, direct or indirect, known or unknown, foreseen or unforeseen, that they or any of them may now have or which may arise in the future on account of or in any way growing out of or connected with this Covenant, the Plan and the hazardous materials listed on Exhibit B attached hereto, except to the extent that the Websters, ARO or Ekotek are an Owner or Occupant of the Property and failed to comply with this Covenant or the Plan.

> EACH OWNER AND OCCUPANT EXPRESSLY WAIVE ANY OF THEIR RIGHTS GRANTED UNDER CALIFORNIA CIVIL CODE SECTION 1542, WHICH PROVIDES AS FOLLOWS: "A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM MUST HAVE MATERIALLY AFFECTED HIS SETTLEMENT WITH THE DEBTOR."

4. General Provisions

4.1 Term. This Agreement shall continue in effect perpetually, unless properly terminated in accordance with applicable law. The termination of this Agreement shall be considered a form of "Amendment" for which the provisions of Section 4.2 shall apply.

4.2 Amendment. Any Owner or, with the Owner's consent any Occupant of the Property or any portion thereof, may apply to the Regional Board for a written amendment to the provisions of the Plan or any provision of this Covenant as they apply to all or any portion of the Property. Any amendment to the Covenant which results from any such application shall apply only to that Owner or Occupant who made application for the same, unless explicitly stated to bind future Owners and Occupants. The Regional Board may also propose to Owners and (with the Owner's consent) to Occupants, written amendments to the Covenant relating to the Order and/or the Plan and the approval of the particular Owners and/or Occupants shall not be unreasonably withheld. Any amendment, termination or variance pursuant to this Section 4.2 must be in writing and signed by the Executive Officer of the Regional Board and such Owners and/or Occupants affected thereby. Notwithstanding the foregoing, no amendment to this Covenant or to the Plan shall be effective without the prior written consent of each of the Websters, ARO and Ekotek.

4.3 No Dedication Intended. Nothing set forth herein shall be constructed to be a gift or dedication, or offer of a gift or dedication, of the Property or any portion thereof to the general public or for any purposes whatsoever.

4.4 Notices. Whenever any person gives or serves any notice demand or other communication with respect to this Covenant, each such notice, demand or other communication shall be in writing and shall be deemed effective (i) when delivered, if personally delivered to the person being served or to an officer of a corporate party being served, (ii) on delivery after deposit in the mail if mailed by United States mail, postage paid certified, return receipt requested, (iii) delivered by Federal Express or another recognized courier service, or (iv) one business day after delivery by facsimile or other electronic transmission, with confirmation of successful delivery to the facsimile number provided below:

To the Websters:

Mr. Laurence C. Webster
Mrs. Diane M. Webster
16371 Ardsley Circle
Huntington Beach, CA 92649
Telephone:
Facsimile:

To ARO:

AR-Oakland LLC
c/o American Redevelopment
27525 Puerta Real, Suite 100-606
Mission Viejo, CA 92691
Telephone: (714) 457-2176
Facsimile: (714) 582-3042

To Ekotek:	Ekotek Inc. 300 Atlantic Street Stamford, CT 06901 Attention: General Counsel Telephone: (203) 326-5225 Facsimile: (203) 326-5029
To the Regional Board:	California Regional Water Quality Control Board San Francisco Bay Region 2101 Webster Street Oakland, CA 94612 Attention: Executive Officer Telephone: (510) 286-1255 Facsimile: (510) 286-1380
To Owners:	At the address shown on the Alameda County property tax records.
To Occupants:	At the Property.

4.5 Partial Invalidity. If any portion of this Covenant is determined to be invalid for any reason, the remaining portions shall remain in full force and effect as if such portion had not been included herein.

4.6 Headings. Headings at the beginning of each numbered section of this Covenant are solely for the convenience of the parties and are not a part of the Covenant.

4.7 Recordation. This instrument shall be executed by the Websters, ARO, Ekotek and the Regional Board. This instrument shall be recorded by the Websters in the County of Alameda prior to the recordation of any conveyance of, or execution of any lease for, any portion of the Property by the Websters in favor of any Owner or Occupant.

4.8 Authority. The execution of this Covenant has been duly authorized on behalf of the parties hereto and constitutes the binding obligation of each such entity and agency.

4.9 Counterparts. This Covenant may be executed in one or more counterparts and shall become effective when one or more counterparts have been signed by all of the parties and filed in the Official Records of Alameda County, California; each such counterpart being deemed an original but all counterparts constituting a single instrument.

4.10 Parties Bound. This Covenant applies to and is binding upon and is for the benefit of (a) the Websters, Owners, Occupants and their respective heirs, administrators, executors, successors and assigns and (b) the Regional Board and any successor agency of the

State of California that may have responsibility for and jurisdiction over the subject matter of this Covenant, and is also for the benefit of ARO and Ekotek and their successors and assigns.

4.11 Governing Law. This Covenant shall be construed and governed in accordance with the laws of the State of California.

IN WITNESS WHEREOF, the Parties have executed this Covenant as of the date set forth above.

CALIFORNIA REGIONAL WATER
QUALITY CONTROL BOARD
San Francisco Bay Region

By: _____
LORETTA K. BARSAMIAN
Executive Officer

_____
LAURENCE C. WEBSTER

_____
DIANE M. WEBSTER

AR-Oakland LLC,
a California limited liability company

By: _____
Name:
Title:

EKOTEK, INC.,
a Delaware corporation

By: _____
Name:
Title:

[add acknowledgments]

TABLE OF EXHIBITS

Exhibit		Introduced in
A	Legal Description of the Property	Recital A
B	Hazardous Materials on the Property	Recital E

Exhibit B

Hazardous Materials Reported on the Site[1]

Chemicals of Significance	Media
Petroleum Hydrocarbons (TPH, BTEX)[2]	Soil, Groundwater
Nickel	Soil
Vinyl Chloride	Groundwater, Vapor

Chemicals Detected but not Requiring Action

Volatile Chlorinated Hydrocarbons
Semi-volatile Hydrocarbons
Semi-volatile Chlorinated Hydrocarbons
PCB[3] Isomers
Heavy Metal Ions (Cadmium, Lead, Zinc)[4]

Notes

1. A detailed summary of the chemicals found on the Site is contained in the Health Risk Assessment, which is included as Appendix A of the Risk Management Plan for the Site that was provided to the San Francisco Regional Water Quality Control Board in May of 1998. Remediation and mitigation strategies for the chemicals of significance are described in Sections 5.0, 6.0, and 7.0 of the Risk Management Plan.

2. TPH = Total Petroleum Hydrocarbons; BTEX = Benzene, Toluene, Ethlybenzene, and Xylene.

3. PCB = Polychlorinated Biphenyls.

4. Measured above reported San Francisco Bay background levels.

Cal/EPA

San Francisco
Bay Regional
Water Quality
Control Board

1515 Clay Street
Suite 1400
Oakland, CA 94612
(510) 622-2300
FAX (510) 622-2460

SLIC 4808

Pete Wilson
Governor

August 12, 1998
File No. 2223.09 (DCL)
SLIC No. 01S0132

CERTIFIED MAIL NO.
RETURN RECEIPT REQUESTED

Laurence and Diane Webster
c/o Mike Webster
P.O. Box 92918
Long Beach, CA 90805

Ekotek, Inc.
c/o William Wick
Crosby, Heafey, Roach & May
1999 Harrison Street
Oakland, CA 94612-3573

Subject: Adoption of Site Cleanup Requirements for the Former Ekotek Lube Site, 4200 Alameda Avenue, Oakland, Alameda County

Dear Lady and Gentlemen:

Enclosed is a copy of a tentative order of Site Cleanup Requirements for the subject site. This matter will be considered by the Board at its meeting of September 16, 1998. The meeting starts at 9:30 AM and will be held at the BART Headquarters Building, Hearing Room, 800 Madison Street, Oakland. Please submit any comments you have no later than 5 p.m. on August 31, 1998.

Please contact Derek Lee of my staff at (510) 622-2374 if you have any questions.

Sincerely,

Stephen I. Morse, Chief
Toxics Cleanup Division

Enclosure: Tentative Order
cc w/ enc: Mailing List

MAILING LIST

Barney Chan
Hazardous Materials Program
ACDEH
1131 Harbor Bay Parkway, 2nd Floor
Alameda, CA 94502-6577

Joseph F. Silvey
American Redevelopment, L.L.C.
27525 Puerta Real, Suite 100-606
Mission Viejo, CA 92691

Rohinton M. Rivetna
American National Can Company
Mail Suite 04D
8770 West Bryn Mawr Avenue
Chicago, IL 60631-3504

Barbara J. Cook
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2737

LeRoy Griffin
Hazardous Materials Supervisor
City of Oakland
505 14th Street, 7th Floor
Oakland, CA 94612

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

TENTATIVE ORDER

ADOPTION OF FINAL SITE CLEANUP REQUIREMENTS FOR:

LAURENCE AND DIANE WEBSTER AND
EKOTEK, INC.

for the property located at

4200 ALAMEDA AVENUE
OAKLAND
ALAMEDA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter Board), finds that:

1. **Site Location:** The former Ekotek Lube site (the "Site") is located at 4200 Alameda Avenue in Oakland, Alameda County. The Site is about 0.8 acres in size. It is bordered on the west by Alameda Avenue, on the east-southeast by East 8th Street. The former American National Can Company site, now the location for a Super K-Mart, lies to the north. The distance to the Bay is more than 1500 feet.

2. **Site History:** The Site was used for oil recycling from 1925 to 1981. It has been known by various names including "Bonus International, Inc.", "Bayside Oil Company", "Fabian Oil Refining Company", "Economy Refining & Service Company", "Economy Byproducts & Economy Service Company", and "Ekotek Lube, Inc." Waste oil received by the facility primarily consisted of oils from automobiles, railroad locomotives, aircraft, and electrical transformers. Stoddard solvent was also reportedly recycled at the facility until approximately 1978.

   Ekotek bears no relationship to any of the previous operators/owners of the Site. At this time, none of the parties previously associated with the Site could be located.

   Laurence and Diane Webster purchased the Site from Ekotek, Inc. in 1983 but have never operated on-site.

3. **Named Dischargers:** Laurence and Diane Webster are named as dischargers because they have owned the Site since 1983 and intend to develop it and implement the necessary actions specified in this Order. Ekotek, Inc., formerly known as Ekotek Lube, Inc., is named as a discharger because it owned the Site from 1978 to 1983 and operated an oil-recycling facility on-site for three years.

Ekotek, Inc. will be responsible for compliance only if the Board or Executive Officer finds that other named dischargers have failed to comply with the requirements of this order.

If additional information is submitted indicating that other parties caused or permitted any waste to be discharged on the Site where it entered or could have entered waters of the state, the Board will consider adding that party's name to this order.

4. **Regulatory Status:** This site is currently not subject to Board order.

5. **Site Hydrogeology:** The Site is located in the East Bay Plain Basin. Soils immediately underlying pavement on- and off-site consist of artificial fill extending to approximately 1.5 to 4 feet below ground surface (bgs). This artificial fill overlays a silty clay that extends to a depth of 6 to 15 feet bgs. Contained within this silty clay are 1 to 2 feet thick discontinuous lenses of clayey gravel and silty sand.

Located beneath the silty clay is the first water-bearing unit. This first water-bearing unit ranges in thickness from approximately 1 to 5 feet and consists of clayey sands, sandy gravel, and gravely sand. Below this first water-bearing unit are clays and silty clays that extend to the maximum depth explored (i.e. 50 feet bgs). Interbedded in these clays and silts are thin discontinuous sand lenses. The thickest of these discontinuous sand lenses was encountered between 38 and 40 feet bgs and are 1 to 1.5 feet thick. These discontinuous sand lenses are considered the next deeper permeable unit.

Local groundwater flow direction is to the south, towards the San Leandro Bay. The depth to groundwater on-site has generally been between 7 and 12 feet bgs.

6. **Remedial Investigation:** The former processing area was located on the eastern part of the Site. It consisted of an oily water sump and some underground storage tanks. There was also an above-grade tank farm on the western part of the Site.

The preliminary investigation conducted in July 1995 consisted of 10 soil borings. Five of the borings were converted into groundwater monitoring wells, MW-1 to MW-5. The main pollutants discovered were petroleum hydrocarbons and associated VOCs, chlorinated solvents, and PCBs. TPH-gasoline up to 4100 ppm, TPH-diesel up to 11,000 ppm, TPH-motor oil up to 15,000 ppm, and PCBs up to 27 ppm have been detected in the soil. The historic maximum concentrations detected in groundwater are 160,000 ppb of TPH-gasoline, 850,000 ppb of TPH-diesel, 800,000 ppb of TPH-motor oil, 630 ppb of benzene, and 5200 ppb of vinyl chloride.

Off-site soil and groundwater investigations were conducted in February 1996 and June 1997. Waste oil as separate phase hydrocarbons was found in the upper

layer of groundwater as far as 50 feet from the Site. The petroleum hydrocarbons discovered were predominantly high molecular weight, with carbon chain lengths between C_{16} and C_{36}, and should therefore be rather immobile. TPH was detected in two of the soil samples taken and most likely represented TPH in the saturated zone that had sorbed to soils. BTEX, other VOCs, and metals were either not detected or below applicable California Maximum Contaminant Levels.

In the absence of any identified source for the off-site pollution and in light of its proximity to the Site, the off-site pollution is subject to the same cleanup plans as specified in this Order for the on-site pollution.

7. **Interim Remedial Measures:** Demolition of the majority of the aboveground tanks was performed in October and November 1995. Demolition of the remaining above-grade structures and removal of underground tanks and appurtenances (e.g., pipelines, sumps, catch basin, utilities) were conducted between March and July 1996. The Site was then graded and covered with two inches of asphalt and sloped to drain to gutters along Alameda Avenue and East 8th Street.

   Oil liquids, debris, and other materials which were visually distinct from on-site soils were tested and determined to be non-RCRA hazardous wastes, prior to disposal at an approved facility. Some of the soils excavated were allowed to be worked back into the Site as part of the grading process.

   Shallow soil samples were taken in the areas of the former under- and above-ground tanks. The results contribute to some of the historic maximum pollutant concentrations found on-site, as shown above.

8. **Adjacent Sites:** The American National Can Company (ANCC) site at 3801 East 8th Street in Oakland is adjacent to the Site. The ANCC site formerly housed a can manufacturing facility and is now the location of a K-Mart store. Residual VOCs, SVOCs, and floating product remain on this site after completion of extensive remediation. "No Further Action" letters were issued by the Board on January 5 and December 23, 1997.

   ANCC and K-Mart have formally agreed with Ekotek and the Websters that ANCC/K-Mart and Websters/Ekotek should each be responsible for any further investigatory and/or remediation work required on their respective sites, regardless of any possible off-site migration complications. However, the Board is not bound by this private agreement.

9. **Feasibility Study:** Four remediation strategies for the subsurface hydrocarbons were examined for environmental and economic feasibility in the "Risk Management Plan" (RMP) of July 2, 1998, submitted by ARO, L.L.C., for the Websters. They included excavation, groundwater pump and treat, enhanced bioremediation, and long-term passive recovery.

Excavation was shown to be an economically infeasible means of remediation. According to the study, a large percentage of the Site would need to be excavated to address the full scope of the problem. In addition, due to the proximity of the former tank farm and processing area to the adjacent road ways, extensive shoring would be required. ARO estimated that the entire project, including excavation, shoring, and waste disposal, would cost in the range of $1,800,000. Such costs are substantially in excess of the market value of the property.

A pump-and-treat system is not cost-effective either. The tight soils on-site would require an extensive network of low capacity extraction wells. The slow mass transfer of these relatively insoluble chemicals means that the system would have to be operated and maintained for a lengthy period of time at a substantial cost.

Enhanced in-situ bioremediation would require the introduction of microorganism, trace nutrients, and, usually, oxygen to the subsurface. Unfortunately, due to the tight soils and magnitude of the pollution, this option would prove to be just as inefficient as pump-and-treat. Due to the limited space on-site, ex-situ bioremediation would not be a viable remediation option either.

The feasibility study showed that passive hydrocarbon removal, combined with natural attenuation, is the most cost-effective means of reducing and containing the subsurface pollution. With placement of passive recovery wells on the property boundary and in the former release areas, on-site pollution is expected to stay put and abate in time.

The subsurface of the Site is mostly impacted by heavy-end petroleum hydrocarbons. With their tendency to adsorb to the tight soils such as those present at the Site, extensive migration off-site, if at all, is not expected. The installation of recovery wells on the perimeters should effectively reduce the presence of floating product on the property boundary and minimize spread of the pollution. Moreover, reduction of floating product renders the portion that remains more susceptible to biodegradation, and, in turn, accelerates the entire process of remediation.

The feasibility study did not examine remediation strategies for chlorinated solvents in the groundwater. One particular contaminant of concern is vinyl chloride due to its relatively mobile characteristic.

10. **Remediation and Risk Management Plan:** The July 2, 1998, RMP describes a passive hydrocarbon recovery system, coupled by risk management for the Site before, during, and after redevelopment. It also proposes the recordation of an Environmental Restriction and Covenant (ERC) with the deed of the Site. The ERC will limit future use of the Site and identify certain restrictions that will apply even to approved uses for the Site.

a. **Proposed Groundwater Remediation Approach:** The proposed remediation approach consists of a series of dual purpose groundwater monitoring/separate phase hydrocarbons recovery wells spaced around the perimeter. Seven on-site and two off-site wells will be constructed. Three of them will be between existing wells MW-1 and MW-4 to cover the former processing area, and three more between MW-4 and MW-3 to address the tank farm area. One new well will be located between MW-1 and MW-2 to monitor upgradient conditions. All five existing wells will be retrofitted for product recovery as well. Nonetheless, if MW-5 is in the way of site improvements, it will be abandoned and replaced with a new well as close to the former location as practical. This well is important because it has historically shown the greatest depth of product on the groundwater table.

Two off-site wells on the corner of East 8th Street and Alameda Avenue will also be installed. These wells are intended to remediate and monitor the off-site subsurface conditions.

All wells will be fitted with a passive product recovery device consisting of a hydrocarbon absorbent polymer. The spent absorbents will be replaced with fresh ones periodically. Groundwater samples will also be taken and monitored on a regular schedule as specified in the Self Monitoring Program. Closure of these wells will be contingent upon a consistent absence of floating product, favorable results from a sound fate and transport study of the Site's pollutants, and confirmation of these results with additional sampling. For the purposes of the Self Monitoring Program, the word "consistent" shall mean two or more consecutive sampling events not less than one year apart. The words "absence of floating product" shall refer to the lack of a visible sheen and no evidence of capture on the passive product recovery device. The premise is that a stable or diminishing plume of dissolved hydrocarbons will be achieved at the point when there is no longer any evidence of free product in the monitoring wells and water quality parameters show evidence of natural attenuation. The existence of a sufficient amount of dissolved oxygen and other inorganic indicators in the groundwater could be used as such evidential support.

b. **Proposed Risk Management Plan:** Pre-redevelopment risk management plan calls for maintaining the integrity of the pavement cover and present fencing to minimize unauthorized access to the Site.

Risk management during redevelopment includes implementation of site specific health and safety worker planning requirements and safety plans (HASP), construction impact mitigation measures, minimization of groundwater conduit creation, and soil management protocols.

The HASPs will be submitted to Alameda County Environmental Health Department prior to commencement of work. The construction impact mitigation measures consist of site security, dust control, storm water runoff control, and decontamination procedures. The RMP also lists precautions to be taken during construction to prevent the creation of groundwater conduits. Lastly, soil management protocols provide guidance for the excavating and handling of soil remaining at the Site.

Risk management after redevelopment includes maintaining a cap on the Site, establishing protocols for future subsurface development, preventing the use of groundwater under the Site, and establishing a notification procedure to ensure long term compliance with the RMP.

c. **Proposed Environmental Restriction and Covenant:** The proposed engineering controls include maintenance of a cover or cap over the Site, installation of vapor barriers in the foundations of all improvements constructed on the Site, and such other measures as may be specified in the RMP, as it may be amended from time to time.

The proposed institutional restrictions would preclude use of the Site as a residence, hospital for humans, and school for persons under 21 years of age or a day care center for children. Use of the groundwater for drinking, irrigation, industrial water supply, or any other purpose without the prior written consent of the Regional Board is prohibited.

11. **Risk Assessment:** Waterstone Environmental, L.L.C. prepared a Human Health Risk Assessment Report (HHRA) in April 1998 for the Site. The Site is currently fenced and completely covered with asphalt paving. It is assumed that the Site will be redeveloped for commercial uses. Such uses may include but are not limited to restaurants, convenience stores or retail outlets. It is further assumed that the entire Site will be covered with buildings, asphalt parking lots, or planter strips with imported soil.

The two future potential receptors considered are commercial building occupants and maintenance personnel. The exposure pathways evaluated include inhalation of vapors from soil or groundwater to indoor air for commercial building occupants, and soil ingestion, dermal contact with soil and groundwater, dust inhalation of non-volatiles from soil, and inhalation of vapors from soil or groundwater to outdoor air for maintenance personnel.

The estimated risks for these populations are within the acceptable risk range. The total non-carcinogenic hazard index for exposure to COCs in soil and groundwater is 0.04 for future commercial building occupants and 0.06 for future maintenance workers. The total estimated lifetime incremental carcinogenic risk for exposure to COCs is 9.6×10^{-6} for future commercial building occupants and 5.4×10^{-6} for future maintenance workers.

For comparison, the Board considers the following risks to be acceptable at remediation sites: a hazard index of 1.0 or less for non-carcinogens, and an excess cancer risk of 10^{-4} or less for carcinogens.
The implementation of institutional and engineering controls such as those listed in the proposed ERC would further minimize the potential of exposure through pathways not considered in the assessment.

Risk management prior to, during, and after redevelopment is necessary in order to ensure the health and safety for construction workers, maintenance personnel, and others that might come into contact with the Site. Appropriate risk management would also prevent the further deterioration of both above- and sub-surface environmental conditions.

12. **Basis for Cleanup Standards**

a. **General:** State Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," applies to this discharge and requires attainment of background levels of water quality, or the highest level of water quality which is reasonable if background levels of water quality cannot be restored. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in exceedance of applicable water quality objectives.

State Board Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304," applies to this discharge. This order and its requirements are consistent with the provisions of Resolution No. 92-49, as amended.

b. **Beneficial Uses:** The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on June 21, 1995. This updated and consolidated plan represents the Board's master water quality control planning document. The revised Basin Plan was approved by the State Water Resources Control Board and the Office of Administrative Law on July 20, 1995, and November 13, 1995, respectively. A summary of regulatory provisions is contained in 23 CCR 3912. The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface waters and groundwaters.

Board Resolution No. 89-39, "Sources of Drinking Water," defines potential sources of drinking water to include all groundwater in the region, with limited exceptions for areas of high TDS, low yield, or

naturally-high contaminant levels. Groundwater underlying and adjacent to the site qualifies as a potential source of drinking water.

The Basin Plan designates the following potential beneficial uses of groundwater underlying and adjacent to the Site:

o Municipal and domestic water supply
o Industrial process water supply
o Industrial service water supply
o Agricultural water supply

At present, there is no known use of groundwater underlying the Site for the above purposes.

c. **Basis for Groundwater Cleanup Standards:** The groundwater cleanup standards for the Site are based on applicable water quality objectives and are the more stringent of EPA and California primary maximum contaminant levels (MCLs). Cleanup to this level will result in acceptable residual risk to humans.

13. **Reuse or Disposal of Extracted Groundwater:** Board Resolution No. 88-160 allows discharges of extracted, treated groundwater from site cleanups to surface waters only if it has been demonstrated that neither reclamation nor discharge to the sanitary sewer is technically and economically feasible.

14. **Basis for 13304 Order:** The dischargers have caused or permitted waste to be discharged or deposited where it is or probably will be discharged into waters of the State and creates or threatens to create a condition of pollution or nuisance.

15. **Cost Recovery:** Pursuant to California Water Code Section 13304, the dischargers are hereby notified that the Board is entitled to, and may seek reimbursement for, all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this order.

16. **CEQA:** This action is an order to enforce the laws and regulations administered by the Board. As such, this action is categorically exempt from the provisions of the California Environmental Quality Act (CEQA) pursuant to Section 15321 of the Resources Agency Guidelines.

17. **Notification:** The Board has notified the dischargers and all interested agencies and persons of its intent under California Water Code Section 13304 to prescribe site cleanup requirements for the discharge, and has provided them with an opportunity to submit their written comments.

18. **Public Hearing:** The Board, at a public meeting, heard and considered all comments pertaining to this discharge.

IT IS HEREBY ORDERED, pursuant to Section 13304 of the California Water Code, that the dischargers (or their agents, successors, or assigns) shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous substances in a manner which will degrade water quality or adversely affect beneficial uses of waters of the State is prohibited.

2. Further significant migration of wastes or hazardous substances through subsurface transport to waters of the State is prohibited.

3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of wastes or hazardous substances are prohibited.

B. CLEANUP PLAN AND CLEANUP STANDARDS

1. **Implement Remediation and Risk Management Plan**: The dischargers shall implement the Remediation and Risk Management Plan described in finding 10, as augmented by Tasks C.3 through C.4.

2. **Groundwater Cleanup Standards**: The following groundwater cleanup standards shall be met in all wells identified in the Self-Monitoring Program:

Constituent	Cleanup Standard (ug/l)	Basis
Benzene	1	California MCL
Toluene	150	California MCL
Ethylbenzene	700	California MCL
Xylene	1,750	California MCL
Vinyl Chloride	0.5	California MCL

C. TASKS

1. SUBMITTAL OF A FEASIBILITY STUDY ADDENDUM

COMPLIANCE DATE: October 15, 1998

Submit an addendum examining available remediation strategies for chlorinated solvents in the groundwater on-site. A detailed explanation supported by sufficient evidence shall be provided if remedial actions for the existing contaminants are concluded to be inappropriate.

2. **IMPLEMENTATION OF INSTITUTIONAL CONSTRAINTS**

COMPLIANCE DATE: 60 days after Executive Officer approval but no sooner than November 15, 1998

Submit a technical report acceptable to the Executive Officer documenting that the July 2, 1998 proposed Environmental Restriction and Covenant has been implemented.

3. **IMPLEMENTATION OF PASSIVE HYDROCARBON RECOVERY**

COMPLIANCE DATE: Within 120 days of completion of site construction but no later than September 15, 1999

Submit a technical report acceptable to the Executive Officer documenting installation of the hydrocarbons recovery wells. This report should also present results of groundwater elevation, floating product recovery, and groundwater analyses for the first quarter.

4. **WORKPLAN FOR SOIL SAMPLING**

COMPLIANCE DATE: 45 days prior to proposed site improvements/construction

Submit a workplan acceptable to the Executive Officer for sampling of soils intended for excavation during site improvements. The workplan should delineate the soil to be excavated. Sampling method(s) and frequency should be described and justified. The plan should also specify any expected treatment, reuse, and/or disposal of the soils to be removed.

5. **COMPLETION OF SOIL SAMPLING AND SITE IMPROVEMENTS**

COMPLIANCE DATE: 45 days after the completion of soil sampling/site improvements

Submit a technical report acceptable to the Executive Officer documenting completion of tasks identified in Task 4.

6. **PROPOSED CURTAILMENT**

COMPLIANCE DATE: 60 days prior to proposed curtailment

Submit a technical report acceptable to the Executive Officer containing a proposal to curtail remediation. Curtailment includes system closure (e.g. well abandonment), system suspension (e.g. cease passive recovery but wells retained for monitoring only), and significant system modification (e.g. closure of individual recovery wells within the network). The report should include the rationale for curtailment.

7. **IMPLEMENTATION OF CURTAILMENT**

COMPLIANCE DATE: 60 days after Executive Officer approval

Submit a technical report acceptable to the Executive Officer documenting completion of the tasks identified in Task 6.

8. **EVALUATION OF NEW HEALTH CRITERIA**

COMPLIANCE DATE: 90 days after requested by Executive Officer

Submit a technical report acceptable to the Executive Officer evaluating the effect on the approved cleanup plan of revising one or more cleanup standards in response to revision of drinking water standards, maximum contaminant levels, or other health-based criteria.

9. **EVALUATION OF NEW TECHNICAL INFORMATION**

COMPLIANCE DATE: 90 days after requested by Executive Officer

Submit a technical report acceptable to the Executive Officer evaluating new technical information which bears on the approved cleanup plan and cleanup standards for this site. In the case of a new cleanup technology, the report should evaluate the technology using the same criteria used in the feasibility study. Such technical reports shall not be requested unless the Executive Officer determines that the new information is reasonably likely to warrant a revision in the approved cleanup plan or cleanup standards.

10. **Delayed Compliance:** If the dischargers are delayed, interrupted, or prevented from meting one or more of the completion dates specified for the above tasks, the dischargers shall promptly notify the Executive Officer and the Board may consider revision to this Order.

D. PROVISIONS

1. **No Nuisance**: The storage, handling, treatment, or disposal of polluted soil or groundwater shall not create a nuisance as defined in California Water Code Section 13050(m).

2. **Good O&M**: The dischargers shall maintain in good working order and operate as efficiently as possible any facility or control system installed to achieve compliance with the requirements of this Order.

3. **Cost Recovery**: The dischargers shall be liable, pursuant to California Water Code Section 13304, to the Board for all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order. If the site addressed by this Order is enrolled in a State Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program. Any disputes raised by the discharger over reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures for that program.

4. **Access to Site and Records**: In accordance with California Water Code Section 13267(c), the dischargers shall permit the Board or its authorized representative:

   a. Entry upon premises in which any pollution source exists, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

   b. Access to copy any records required to be kept under the requirements of this Order.

   c. Inspection of any monitoring or remediation facilities installed in response to this Order.

   d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.

5. **Self-Monitoring Program**: The dischargers shall comply with the Self-Monitoring Program as attached to this Order and as may be amended by the Executive Officer.

6. **Contractor / Consultant Qualifications**: All technical documents shall be signed by and stamped with the seal of a California registered

geologist, a California certified engineering geologist, or a California registered civil engineer.

7. **Lab Qualifications**: All samples shall be analyzed by State-certified laboratories or laboratories accepted by the Board using approved EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control (QA/QC) records for Board review. This provision does not apply to analyses that can only reasonably be performed on-site (e.g. temperature).

8. **Document Distribution**: Copies of all correspondence, technical reports, and other documents pertaining to compliance with this Order shall be provided to the following agency:

   a. Alameda County Environmental Health Department

   The Executive Officer may modify this distribution list as needed.

9. **Reporting of Changed Owner or Operator**: Laurence and Diane Webster shall file a technical report on any changes in site occupancy or ownership associated with the property described in this Order.

10. **Reporting of Hazardous Substance Release**: If any hazardous substance is discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, the dischargers shall report such discharge to the Regional Board by calling (510) 286-1255 during regular office hours (Monday through Friday, 8:00 to 5:00).

    A written report shall be filed with the Board within five working days. The report shall describe: the nature of the hazardous substance, estimated quantity involved, duration of incident, cause of release, estimated size of affected area, nature of effect, corrective actions taken or planned, schedule of corrective actions planned, and persons/agencies notified.

    This reporting is in addition to reporting to the Office of Emergency Services required pursuant to the Health and Safety Code.

11. **Secondarily-Responsible Discharger**: Within 60 days after being notified by the Executive Officer that other named dischargers have failed to comply with this order, Ekotek, Inc., as the secondarily-responsible discharger, shall then be responsible for complying with this order.

12. **Periodic SCR Review**: The Board will review this Order periodically and may revise it when necessary.

I, Loretta K. Barsamian, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on _____.

_____
Loretta K. Barsamian
Executive Officer

FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO: IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL OR CRIMINAL LIABILITY

Attachments: Site Map
Self-Monitoring Program

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

SELF-MONITORING PROGRAM FOR:

LAURENCE AND DIANE WEBSTER AND
EKOTEK, INC.

for the property located at

4200 ALAMEDA AVENUE
OAKLAND
ALAMEDA COUNTY

1. **Authority and Purpose**: The Board requests the technical reports required in this Self-Monitoring Program pursuant to Water Code Sections 13267 and 13304. This Self-Monitoring Program is intended to document compliance with Board Order No. 98-XXX (site cleanup requirements).

2. **Monitoring**: The dischargers shall measure groundwater elevations in all monitoring wells and collect and analyze representative samples of groundwater according to the following table:

Well #	Sampling Frequency	Analyses	Well #	Sampling Frequency	Analyses
MW-1	Q*	8015/8240	MW-8**	Q*	8015/8240
MW-2	Q*	8015/8240	MW-9**	Q*	8015/8240
MW-3	Q*	8015/8240	MW-10**	Q*	8015/8240
MW-4	Q*	8015/8240	MW-11**	Q*	8015/8240
MW-5	Q*	8015/8240	MW-12**	Q*	8015/8240
MW-6**	Q*	8015/8240	MW-13***	Q*	8015/8240
MW-7**	Q*	8015/8240	MW-14***	Q*	8015/8240

Key: Q = Quarterly 8015/8240 = Modified EPA Method 8015 or equivalent and EPA Method 8240

* The sampling frequency will be quarterly for the first year and semi-annually (March and October) for the second and third years. The dischargers may propose a further reduction to annual monitoring for the fourth and following years, assuming that the data remain stable. Any proposed changes, however, are subject to Executive Officer approval.
** New on-site recovery/monitoring wells.
*** New off-site recovery/monitoring wells.

3. **Quarterly Monitoring Reports**: The dischargers shall submit quarterly monitoring reports to the Board no later than 30 days following the end of the quarter (e.g. report for first quarter of the year due April 30). The due date of the first quarterly monitoring report, however, shall be the time specified in Task C.3 of this Order. The reports shall include:

   a. Transmittal Letter: The transmittal letter shall discuss any violations during the reporting period and actions taken or planned to correct the problem. The letter shall be signed by the dischargers' principal executive officer or their duly authorized representative, and shall include a statement by the official, under penalty of perjury, that the report is true and correct to the best of the official's knowledge.

   b. Groundwater Elevations: Groundwater elevation data shall be presented in tabular form, and a groundwater elevation map should be prepared for each monitored water-bearing zone. Historical groundwater elevations shall be included in the fourth quarterly report each year.

   c. Groundwater Analyses: Groundwater sampling data shall be presented in tabular form, and an isoconcentration map should be prepared for one or more key contaminants for each monitored water-bearing zone, as appropriate. The report shall indicate the analytical method used, detection limits obtained for each reported constituent, and a summary of QA/QC data. Historical groundwater sampling results shall be included in the fourth quarterly report each year as well as free product thickness and historical and annual mass removal. The report shall describe any significant increases in contaminant concentrations since the last report, and any measures proposed to address the increases. Supporting data, such as lab data sheets, need not be included (however, see record keeping - below).

   d. Status Report: The quarterly report shall describe relevant work completed during the reporting period (e.g. free product recovery) and work planned for the following quarter.

4. **Semi-Annual Monitoring Reports**: The dischargers shall submit semi-annual monitoring reports to the Board no later than April 30 for the first report and November 30 for the second. These reports should follow the same requirements

specified for the quarterly reports. Moreover, the second semi-annual report is equivalent to the fourth quarterly report in terms of additional conditions to be fulfilled.

5. **Violation Reports**: If the dischargers violate requirements in the Site Cleanup Requirements, then the dischargers shall notify the Board office by telephone as soon as practicable once the dischargers have knowledge of the violation. Board staff may, depending on violation severity, require the dischargers to submit a separate technical report on the violation within five working days of telephone notification.

6. **Other Reports**: The dischargers shall notify the Board in writing prior to any site activities, such as construction or underground tank removal, which have the potential to cause further migration of contaminants or which would provide new opportunities for site investigation. Please see Tasks 3 and 4 of the Site Cleanup Requirements for additional information.

7. **Record Keeping**: The dischargers or their agent shall retain data generated for the above reports, including lab results and QA/QC data, for a minimum of six years after origination and shall make them available to the Board upon request.

8. **SMP Revisions**: Revisions to the Self-Monitoring Program may be ordered by the Executive Officer, either on his/her own initiative or at the request of the dischargers. Prior to making SMP revisions, the Executive Officer will consider the burden, including costs, of associated self-monitoring reports relative to the benefits to be obtained from these reports.

I, Loretta K. Barsamian, Executive Officer, hereby certify that this Self-Monitoring Program was adopted by the Board on _____.

_____
Loretta K. Barsamian
Executive Officer

Base map from: Thomas Guide 1994 Edition.

N

0 1540 3080

(Approximate Scale in Feet)

Vicinity Map

4200 Alameda Avenue
Oakland, CA

Figure 1