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AQUIFER SCIENCES, INC.

MAY 04 2001

REVISED HUMAN HEALTH RISK ASSESSMENT
187 NORTH L STREET
LIVERMORE, CALIFORNIA

Prepared for

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by

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April 30, 2001

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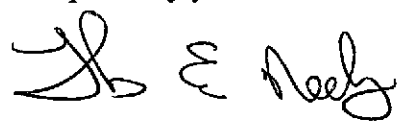
Ms. Rita Sullins
Don-Sul, Inc.
187 North L Street
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Subject: Revised Human Health Risk Assessment
187 North L Street, Livermore, California

Dear Ms. Sullins:

Aquifer Sciences is pleased to present the results of the Revised Human Health Risk Assessment performed for the Arrow Rentals site located at 187 North L Street in Livermore, California. Please call us if you have any questions concerning the report.

Respectfully yours,



Thomas E. Neely, REA
Hydrogeologist



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REVISED HUMAN HEALTH RISK ASSESSMENT

187 North L Street, Livermore, California

April 2001

1.0 INTRODUCTION

This document presents the revised human health risk assessment for the Arrow Rentals site (hereinafter referred to as the "Site") located at 187 North L Street in Livermore, California. The objectives of the human health risk assessment are: 1) to quantify the baseline risk associated with chemicals of concern at the Site and 2) to establish risk-based remediation goals for soil and groundwater at the Site. This report also presents an evaluation of regional and local hydrogeology and a well survey.

2.0 DESCRIPTION OF THE SITE

The Site encompasses approximately 21,000 square feet of land, and is located on the western side of North L Street in northern Livermore (Figure 1). Arrow Rentals, an equipment rental company, occupies the Site. One building covers approximately 1,400 square feet, and is located in the northern portion of the Site (Figure 2). The remainder of the Site is paved with asphalt or concrete. The Site is bounded on the north by railroad tracks, on the east by North L Street, and on the south and west by undeveloped land. Residential housing, commercial businesses, and light industry occupy the vicinity.

3.0 ENVIRONMENTAL HISTORY OF THE SITE

A Mobil service station operated at the Site between approximately 1951 and 1968 (WCC, 1991). Arrow Rentals purchased the Site in 1972. In 1972, three of five underground fuel storage tanks were removed after failing integrity tests. The two remaining tanks were used until 1984, when they were removed. In 1984, one 1,000-gallon underground fuel tank and a vapor monitoring well were installed.

In 1985, a delivery truck operator from Petcock Petroleum accidentally dispensed approximately 600 gallons of fuel into the vapor well. Water was poured into the well from a garden hose some time after the release.

Several soil and groundwater investigations have been conducted at the Site since 1988. The investigations have included drilling soil borings; collecting soil, soil vapor, and groundwater samples; installing groundwater monitoring wells, performing aquifer tests, and conducting periodic groundwater monitoring. The approximate lateral extent of contamination is shown on Figure 2. Based upon analytical data, the contamination at the Site extends less than 60 feet below grade and less than 100 feet offsite (WCC, 1991).

Alameda County has overseen the environmental case for the Site, and has requested that a human health risk assessment be conducted to determine baseline risk and remediation goals.

4.0 TOPOGRAPHY AND HYDROGEOLOGY

The Site is located in the Livermore Valley. The following sections present a discussion of the regional and local topography and hydrogeology. Figure 3 illustrates the topography for the vicinity of the Site.

4.1 REGIONAL TOPOGRAPHY

The Site is located in an east-west trending valley (the Livermore Valley). The valley is bounded by hills on the north reaching elevations of more than 1,200 feet above mean sea level (MSL), and by hills on the south reaching to elevations of more than 900 feet MSL. The elevation of the valley floor ranges from more than 500 feet in the east to approximately 350 feet in the west.

Arroyo Mocho is located approximately 3,800 feet southwest of the Site. Arroyo Las Positas is located approximately 1.1 mile north of the Site. Both streams flow to the west toward the City of Pleasanton. Contamination at the Site likely does not impact either stream, based upon their distances from the Site.

4.2 LOCAL TOPOGRAPHY

The Site is approximately 480 feet MSL. The land surface in the vicinity of the Site slopes to the northwest at approximately 0.9 foot per 100 feet.

4.3 REGIONAL HYDROGEOLOGY

The Site resides on approximately 750 feet of valley-fill deposits, consisting of Quaternary alluvium and the Livermore Formation. The valley-fill deposits are underlain by the Pliocene-age Tassajara Formation (DWR, 1966).

The oldest relevant geologic unit is the Tassajara Formation, which consists of freshwater deposits of moderately indurated sandstone, siltstone, shale, conglomerate, and limestone (DWR, 1974). The Tassajara Formation probably underlies the valley-fill deposits near the Site at a depth of approximately 750 feet.

The Livermore Formation has been divided into two facies: one clay and one gravel (DWR, 1974). The clay facies is believed to underlie the gravel facies and represents a lacustrine phase of deposition. The gravel facies consists of unconsolidated beds of gravel, sand, silt, and clay

(DWR, 1966). The Livermore Formation occurs at a shallow depth in some areas and is difficult to distinguish from the valley-fill deposits.

Quaternary valley-fill alluvium forms the valley floor beneath the Site, thickening to the east. The alluvium consists of lenticular beds of gravel, sand, silt, and clay, representing reworked sediments of the Livermore Formation. The thickness of the alluvium ranges from approximately 20 to 350 feet.

4.4 LOCAL HYDROGEOLOGY

At the Site, silty and clayey gravel and sand extend between the ground surface to depths of approximately 35 to 40 feet below grade (WCC, 1991). The silty and clayey gravel and sand are underlain by silt and clay. In April 2000, the depth to groundwater in monitoring wells at the Site was approximately 25 feet below grade. In October 2000, the depth to groundwater was approximately 31 feet below grade (Aquifer Sciences, 2000). In the early 1990s, the depth to groundwater was greater (approximately 40 feet below grade), due to an extended drought. Groundwater generally flows to the west, with a hydraulic gradient of approximately 0.019 ft/ft (Aquifer Sciences, 2000).

5.0 WELL SURVEY

We conducted a survey of wells in the vicinity of the Site to determine the locations of potential receptors of groundwater contamination. We researched well logs at the California Department of Water Resources (DWR) and Zone 7 of the Alameda County Flood Control and Water Conservation District (Zone 7). Table 1 lists information concerning wells located within approximately 1 mile of the Site.

The depths of monitoring wells located within 1 mile of the site are 85 feet or less. The depths of five cathodic protection wells are approximately 120 feet. The nearest cathodic protection well is 660 feet west-northwest of the Site. Domestic wells in the vicinity are at least 220 feet deep. The nearest domestic well is more than 3,000 feet south-southwest of the Site. Industrial wells in the vicinity are at least 95 feet deep. The nearest industrial well is more than 1,800 feet north-northeast of the Site. Municipal wells in the vicinity are at least 465 feet deep. The nearest municipal well is 2,200 feet north of the Site.

Well location maps were provided by Zone 7. These maps are included in Appendix A. Well 3S/2E8R15 is located approximately 400 feet north of the Site. The nearest downgradient well is 3S/2E8K4, located approximately 1,200 feet north of the Site. No information concerning the use or construction of either well was available.

Based upon information obtained during the well survey, monitoring wells are screened in water-bearing units within 85 feet of ground surface. Water supply wells (domestic, industrial, and

municipal) in the vicinity are typically screened in water-bearing units deeper than 100 feet below grade. The nearest potential water supply well (3S/2E8R15) is approximately 400 feet north of the Site. The contamination at the Site extends less than 60 feet below grade and less than 100 feet offsite to the west (WCC, 1991). Consequently, based upon the distance to nearby wells, contamination at the Site is not impacting any known water supply wells.

6.0 HUMAN HEALTH RISK ASSESSMENT

An assessment of baseline human health risk is performed to evaluate current potential risk at the Site. Baseline human health risk is obtained from the evaluation of different exposure scenarios to representative concentrations of contaminants at the Site. The components needed to evaluate the baseline human health risk include: 1) identification of the chemicals of concern present in soil, 2) identification of potentially exposed receptor populations, 3) identification of relevant exposure pathways, 4) determination of toxicity criteria, 5) determination of physical, chemical, biological, and/or physiological parameters to calculate exposure-point concentrations and dose, and 6) calculation of risk. Remediation goals are then developed that correspond to acceptable risk levels. We utilized the "Risk-Based Corrective Action (RBCA) Tool Kit for Chemical Releases" computer software to assist in performing this assessment (GSI, 2000). The following sections present the known data, assumptions, and equations used to calculate the corresponding baseline risk and remediation goals.

6.1 CHEMICALS OF CONCERN

In developing the risk assessment, the chemicals at the Site must be identified and evaluated.

6.1.1 Identification of Chemicals

Identification of chemicals is done through sampling and laboratory analysis. The analytical data are compared to regulatory standards and limits to identify the potential environmental concerns.

6.1.1.1 Chemicals of Concern in Soil

The chemicals that have been detected in soil are total petroleum hydrocarbons quantified as gasoline (TPH-gasoline); diesel (TPH-diesel); benzene, toluene, ethylbenzene, and xylenes (BTEX); naphthalene; 2-methylnaphthalene; and phenol. A summary of the analytical results for soil samples is presented in Table 2.

6.1.1.2 Chemicals of Concern in Groundwater

The chemicals that have been detected in groundwater are TPH-gasoline, TPH-diesel, BTEX, methyl tertiary butyl ether (MTBE), naphthalene, and 2-methylnaphthalene. A summary of the analytical results for groundwater samples is presented in Table 3.

6.1.2 Representative Chemical Concentrations

A representative concentration is used to perform risk calculations. For soil and groundwater, the representative concentration of each chemical was calculated as the 95% upper confidence limit (UCL) of the mean. Data from soil samples collected within the source area at depths ranging from 15 to 20 feet below grade (in the vadose zone) were utilized in the calculation. The data included soil samples from borings B-1, B-F, and B-G and wells W-A and W-1. For buildings potentially located over the source area, the 95% UCL of the mean for each chemical was calculated for groundwater samples collected from wells W-Bs and W-1s, during the last four sampling events. For buildings potential located at the Site (but not over the source area), the 95% UCL of the mean was calculated for samples collected from wells W-Bs and W-3s, during the last four sampling events. The method detection limit was used in calculating the mean for those groundwater samples that did not contain a chemical of concern. Insufficient data were available for MTBE and naphthalene in soil, and representative concentrations could not be obtained. No toxicological information was available for 2-methyl-naphthalene; therefore, this chemical was not included in the risk assessment. Phenol was detected in only one soil sample (B-1-25 at 0.3 mg/kg). Consequently, phenol was not included in the risk assessment. The representative concentrations for each chemical in soil and groundwater are presented in Table 4.

6.1.2.1 Representative Chemical Concentrations in Soil

The 95% UCLs of the mean for BTEX concentrations in the source area (B-1, B-F, B-G, W-A, and W-1) are presented in Table 4. The concentrations are representative of levels in soil at depths ranging from 15 to 20 feet below grade in the source area. The concentrations of contaminants in soil in Table 4 were selected to be representative of the potential baseline exposure at the Site.

6.1.2.2 Representative Chemical Concentrations in Groundwater

The 95% UCLs of the mean for BTEX, MTBE, and naphthalene concentrations in the source area (W-Bs/W-1s) and the W-Bs/W-3s area over the four most recent sampling events are presented in Table 4. The concentrations of contaminants in groundwater in Table 4 were selected to be representative of the potential baseline exposure at the Site.

6.2 POTENTIALLY EXPOSED RECEPTOR POPULATIONS

An equipment rental facility currently operates at the Site. Retail, light industrial, and residential properties are located in the vicinity of the Site. Railroad tracks pass adjacent to the Site to the north. Future land use could include retail, commercial, or industrial businesses, or residential housing.

Exposure to construction workers would be different than
for tenants at site (dermal, ingestion - inhalation of contaminants
in shallow soil)

Based upon these potential land use scenarios, the potentially exposed receptor populations are: 1) adult tenants, 2) child tenants, 3) adult and child visitors to the Site, 4) maintenance workers (e.g., groundskeepers), 5) office workers, and 6) construction workers during development of the Site. The baseline risks associated with these potentially-exposed populations are addressed in the residential or commercial scenarios. Since the potential exposure for tenants is higher than for visitors, the visitor exposure scenario was not considered in this risk assessment. We are not aware of a particular development plan for the Site. Consequently, we are unable to assess the potential health risk for construction workers. The potential exposure for construction workers depends upon the extent of excavation performed during redevelopment. However, if little soil is excavated or disturbed, the potential health risk to construction workers would be less than to future tenants at the Site.

6.3 RELEVANT EXPOSURE PATHWAYS

Based upon the types of chemicals of concern (petroleum hydrocarbons) and affected media (soil and groundwater), the relevant exposure pathways are through: 1) inhalation of vapors from soil or groundwater, 2) ingestion of soil or groundwater, and 3) dermal contact with soil or groundwater.

Since the contamination is located 15 feet or more below grade, the potential exposure through some of these pathways is limited or insignificant. Ingestion of or dermal contact with contaminated soil is unlikely. Therefore, the relevant exposure pathways examined in this risk assessment are: 1) inhalation of vapors from soil or groundwater, 2) ingestion of groundwater, and 3) dermal contact with groundwater. The risk associated with dermal contact of groundwater is assumed to be the same as the risk associated with ingestion of groundwater. If future development of the site exposes contaminated soil, other exposure pathways would become relevant and the potential risk could change.

6.4 TOXICITY CRITERIA

The results of numerous toxicological studies have been compiled and evaluated by the United States Environmental Protection Agency (USEPA), California EPA, and other regulatory agencies. From these studies, carcinogenic risk slope factors (CSFs) and non-carcinogenic reference doses (RfDs) have been established for many chemicals. The magnitude of the CSF or RfD is an indicator of the toxicity of the chemical in question, and assist in the calculation of carcinogenic and non-carcinogenic risk. Sources of CSFs and RfDs include: 1) the USEPA Integrated Risk Information System (IRIS), 2) the USEPA Health Effects Summary Tables (HEAST), 3) the USEPA National Center for Environmental Assessment (NCEA) Risk Assessment Issue Papers, 4) the California EPA Office of Environmental Health Hazard Assessment (OEHHA) Technical Support Document for the Determination of Non-Cancer Chronic Reference Exposure Levels, and 5) the California EPA Memorandum Concerning Cancer Potency Factors.

6.4.1 Carcinogenic Toxicity Criteria

The toxicity of carcinogenic chemicals is expressed by CSFs, in terms of inverse exposure units (mg/kg-day)⁻¹. The CSF for a particular chemical of concern is multiplied by the corresponding dose to obtain a dimensionless value that represents the risk associated with that chemical and exposure pathway. Chemicals with low CSFs are less carcinogenic than those with high CSFs. CSFs corresponding to each exposure pathway and chemical are listed in Table 5.

6.4.2 Non-Carcinogenic Toxicity Criteria

The toxicity of non-carcinogenic chemicals is expressed by RfDs, in units of milligrams per kilogram of body weight per day. The RfD for a particular chemical of concern is the hypothetical dose that will cause no adverse health effects in human populations. Different RfDs are established for oral (ingestion) and inhalation pathways. RfDs generally represent the maximum safe dosage of a non-carcinogenic chemical. Highly toxic chemicals have low RfDs, indicating a low threshold dose. Less toxic chemicals have high RfDs, indicating a higher threshold dose. RfDs for each exposure pathway and chemical are listed in Table 5.

6.5 EXPOSURE POINT CONCENTRATIONS

An exposure point concentration (EPC) is the concentration of a chemical of concern that a potentially exposed receptor might encounter through a particular exposure pathway. For the cases of soil ingestion and dermal contact, the EPC is identical to the representative concentration.

The inhalation exposure scenario consists of two pathways, vapors migrating from contaminated soil and from contaminated groundwater. Indoor and outdoor inhalation exposure scenarios are considered. For vapors emanating from the subsurface, the EPC for an inhalation exposure scenario is dependent upon the chemical concentration in soil or groundwater, the vapor pressure of the chemical, properties of the soil, the depth of the contamination, and chemical dispersion properties in water and air. The EPC for each chemical in an inhalation exposure scenario was calculated using the equations that are presented in Appendix B.

6.6 CHRONIC DAILY INTAKES

A chronic daily intake is a dose expressed in units of milligrams of chemical per kilogram of body weight per day. The chronic daily intake for a potential receptor depends upon the EPC of a chemical, the characteristics of the receptor, and the exposure pathway. The equations used to calculate the chronic daily intakes and default parameters are provided in the manual "Risk Assessment Guidance for Superfund" (USEPA, 1989b).

7.0 EVALUATION OF BASELINE HUMAN HEALTH RISKS

The carcinogenic and non-carcinogenic risks for each exposure scenario were calculated. The carcinogenic risk was calculated by multiplying the carcinogenic chronic daily intake by the corresponding CSF. The non-carcinogenic risk was calculated by dividing the non-carcinogenic chronic daily intake by the corresponding RfD.

Total carcinogenic risk is expressed as the potential number of excess cancer cases for the exposed population. Under different scenarios, allowable risk ranges from less than one excess cancer case in one million (1×10^{-6}) to one in ten thousand (1×10^{-4}). For this assessment the allowable cumulative carcinogenic risk is 1×10^{-5} . The total non-carcinogenic risk is compared to "1." Non-carcinogenic risk values of less than 1 are considered acceptable.

The following sections describe the potential baseline carcinogenic and non-carcinogenic risks.

7.1 TIER 1 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL SCENARIO

A "Tier 1" approach was utilized with site-specific data and many conservative (default) assumptions to estimate the baseline carcinogenic and non-carcinogenic risks at the Site. Table 6 presents a summary of the risks due to each chemical through each exposure pathway, under a commercial business scenario. Details concerning the risk assessment under this scenario are presented in Appendix C.

The outdoor air inhalation scenario yielded a carcinogenic risk of 2.0×10^{-7} (less than the allowable risk of 1×10^{-5}) and a non-carcinogenic hazard quotient of 0.012 (less than the acceptable limit of 1). The indoor air inhalation scenario yielded a carcinogenic risk of 2.7×10^{-5} (higher than the allowable risk) and a hazard quotient of 1.6 (higher than the acceptable limit). The groundwater ingestion scenario yielded a carcinogenic risk of 5.1×10^{-4} (higher than the allowable risk) and hazard quotient of 17 (higher than the acceptable limit). The elevated carcinogenic risk was attributed to benzene. The elevated non-carcinogenic risk was primarily attributed to benzene.

7.2 TIER 1 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL SCENARIO

A Tier 1 approach was repeated, using a residential scenario for the Site. Table 7 presents a summary of the risks due to each chemical through each exposure pathway. Details concerning the risk assessment under this scenario are presented in Appendix D.

The outdoor air inhalation scenario yielded a carcinogenic risk of 3.2×10^{-7} (less than the allowable risk of 1×10^{-5}) and a non-carcinogenic hazard quotient of 0.016 (less than the acceptable limit of 1). The indoor air inhalation scenario yielded a carcinogenic risk of 5.7×10^{-5} (higher than the allowable risk) and a hazard quotient of 2.8 (higher than the acceptable limit). The groundwater ingestion scenario yielded a carcinogenic risk of 1.7×10^{-3} (higher than the allowable risk) and

hazard quotient of 48 (higher than the acceptable limit). The elevated carcinogenic risk was attributed to benzene. The elevated non-carcinogenic risk associated with the groundwater ingestion scenario was primarily attributed to benzene.

7.3 TIER 2 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL SCENARIO

A Tier 1 risk assessment incorporates many conservative assumptions, and may not represent actual health risks. A "Tier 2" assessment was also performed to evaluate potential risks that are more representative of conditions at the Site. The Tier 2 assessment considers potential offsite, as well as onsite, receptors. We considered a hypothetical case with commercial development located onsite, and residential housing and commercial developments located within 100 feet offsite. These are conservative assumptions, since no residential or commercial developments are currently located within 100 feet of the Site.

Based upon trends in chemical concentrations in groundwater, we used first-order decay models (transient Domenico models) in the Tier 2 assessments. The measured and modeled chemical concentrations of BTEX and MTBE since October 1998 are illustrated in the graphs in Appendix E. The first-order decay model for each chemical is shown on each graph. The corresponding chemical half-lives are: 566 days for benzene, 297 days for toluene, 8.1 years for ethylbenzene, 2.6 years for xylenes, and 339 days for MTBE. Table 8 presents a summary of the risks due to each chemical through each exposure pathway for an onsite commercial scenario. Details concerning the risk assessment under this scenario are presented in Appendix F.

The carcinogenic risk for onsite indoor air inhalation (2.7×10^{-5}) and onsite groundwater ingestion (5.1×10^{-4}) exceeded allowable risk. The non-carcinogenic hazard quotient for onsite indoor air inhalation (1.6) and onsite groundwater ingestion (17) also exceeded acceptable limits. The majority of the risk is attributed to benzene. The risks associated with onsite outdoor air inhalation exposures were within acceptable limits.

The carcinogenic and non-carcinogenic risks for all exposure pathways and potential offsite residential and commercial receptors were within acceptable limits (less than 1×10^{-6} for carcinogenic risk and less than 1.0 for non-carcinogenic risk). The highest total carcinogenic risk was 7.4×10^{-7} , and the highest total non-carcinogenic risk was 0.026 for offsite receptors.

7.4 TIER 2 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL SCENARIO

The Tier 2 assessment described in Section 7.3 was modified to reflect an onsite residential scenario. The remaining input parameters remained the same as in the Tier 2 assessment for the onsite commercial scenario. Table 9 presents a summary of the risks due to each chemical through each exposure pathway. Details concerning the risk assessment under this scenario are presented in Appendix G.

soil vapor below one lx only - can vary depending on time of day,
barometric pressure etc.

The carcinogenic risk for onsite indoor air inhalation (5.6×10^{-5}) and onsite groundwater ingestion (1.7×10^{-3}) exceeded allowable risk. The non-carcinogenic hazard quotient for onsite indoor air inhalation (2.8) and onsite groundwater ingestion (48) also exceeded acceptable limits. The majority of the risk is attributed to benzene. The risks associated with onsite outdoor air inhalation exposures were within acceptable limits.

The carcinogenic and non-carcinogenic risks for all exposure pathways and potential offsite residential and commercial receptors were within acceptable limits. The highest total carcinogenic risk was 7.4×10^{-7} , and the highest total non-carcinogenic risk was 0.026 for offsite receptors.

7.5 SUMMARY OF BASELINE RISK ASSESSMENT

The baseline carcinogenic and non-carcinogenic risks for onsite and offsite scenarios are summarized in the next two sections.

7.5.1 Onsite Commercial and Residential Scenarios

The carcinogenic and non-carcinogenic risks associated with indoor air inhalation and groundwater ingestion exceeded allowable levels, according to the baseline assessment. The risks associated with outdoor air inhalation exposures were within acceptable limits.

In August 1998, Gribi Associates conducted soil vapor sampling at the Site (Gribi Associates, 1998). Soil vapor samples collected at a depth of 3 feet below grade near the former underground tanks contained benzene (up to 4.9 ppbv), toluene (up to 12 ppbv), ethylbenzene (up to 2.2 ppbv), and xylenes (up to 12.8 ppbv). Risk-Based Screening Levels (RBSLs) have been established by the Regional Water Quality Control Board (RWQCB) for BTEX in soil vapor at depths of 3 feet. The RBSLs correspond to a carcinogenic risk of 1×10^{-6} for benzene and a non-carcinogenic hazard quotient of 1.0 for toluene, ethylbenzene, and xylenes for residential receptors. The RBSLs are 11.6 ppbv for benzene, 27,000 ppbv for toluene, 69,000 ppbv for ethylbenzene, and 505,000 ppbv for xylenes. Consequently, the measured concentrations of BTEX in soil vapor at the Site are lower than the RBSLs, and the actual risks associated with indoor air inhalation are within acceptable limits.

The discrepancy between Gribi's findings and results of this risk assessment are likely due to the differences between measured and modeled contaminant concentrations. *Conservative, Conservative* assumptions were used (such as presumably representative soil concentrations in the source area) to calculate vapor concentrations and to model transport and diffusion of contaminants through the subsurface and into the building area. The soil vapor data are likely more reliable indicators of subsurface conditions. Based upon the soil vapor data, no remediation should be necessary to address the indoor air inhalation scenario for onsite commercial or residential developments.

7.5.2 Offsite Commercial and Residential Scenarios

The highest total carcinogenic risk for potential offsite residential and commercial receptors was 7.4×10^{-7} , less than the acceptable limit of 1×10^{-5} . The highest total non-carcinogenic hazard quotient was 0.026, less than the allowable limit of 1.0. Based upon these results, the existing levels of chemicals in soil and groundwater at the Site do not create an excessive human health risk to potential offsite receptors. Based upon existing conditions, no soil or groundwater remediation is necessary for offsite exposure scenarios.

8.0 RISK-BASED REMEDIATION GOALS

Risk-based remediation goals were calculated using the results of the baseline human health risk assessment. Since the baseline risks due to outdoor air inhalation are within acceptable limits, the remediation goals primarily address the risks associated with indoor air inhalation and groundwater ingestion. Remediation goals were developed for existing and possible future redevelopment scenarios. The remediation goals for each scenario are discussed in the following subsection.

8.1 COMMERCIAL DEVELOPMENT

As described in Section 7.0, the majority of carcinogenic and non-carcinogenic baseline risk is due to benzene. Reducing the concentrations of BTEX and MTBE would yield acceptable risk levels. The remediation goals and corresponding risk levels are presented in Table 10 and Appendix H. The remediation goal for benzene in soil is 0.32 mg/kg. None of the other chemicals would require remediation of soil, and the remediation goals can equal the current representative concentrations.

The remediation goals for groundwater are 75 µg/L for benzene, 2,500 µg/L for toluene, and 1,500 µg/L for ethylbenzene. None of the other chemicals would require remediation of groundwater, and the remediation goals can equal the current representative concentrations. Xylenes, MTBE, and naphthalene would not require remediation of soil or groundwater, and the remediation goals can equal the current representative concentrations.

8.2 RESIDENTIAL DEVELOPMENT

Reducing the concentrations of BTEX and MTBE would yield acceptable risk levels. The remediation goals and corresponding risk levels are presented in Table 11 and Appendix I. The remediation goal for benzene in soil is 0.32 mg/kg. None of the other chemicals would require remediation of soil, and the remediation goals can equal the current representative concentrations.

The remediation goals for groundwater are 15 µg/L for benzene, 1,000 µg/L for toluene, 500 µg/L for ethylbenzene, 5,500 µg/L for xylenes, and 75 µg/L for MTBE. Naphthalene would not require remediation, and the remediation goal can equal the current representative concentration.

8.3 DEED RESTRICTION FOR GROUNDWATER USE

Under this scenario, a restriction would be placed on the deed for the Site. The deed restriction would prevent the use of groundwater beneath the Site. The restriction would prevent the extraction of groundwater at the Site for agricultural, domestic, commercial, industrial, or municipal purposes. By implementing a deed restriction, groundwater ingestion would be eliminated as an exposure pathway. Summaries of the remediation goals for onsite commercial and residential developments under this scenario are presented in the following subsections.

8.3.1 Commercial Development

Reducing the concentrations of benzene in soil and groundwater would yield acceptable risk levels. The remediation goals and corresponding risk levels for the commercial development scenario with deed restriction on groundwater usage are presented in Table 12 and Appendix J.

The remediation goal for benzene is 0.5 mg/kg for soil and 2,000 µg/L for groundwater. Toluene, ethylbenzene, xylenes, MTBE, and naphthalene would not require remediation, and the remediation goals can equal the current representative concentrations.

8.3.2 Residential Development

Reducing the concentrations of benzene in soil and groundwater would yield acceptable risk levels. The remediation goals and corresponding risk levels for the residential development scenario with deed restriction on groundwater usage are presented in Table 13 and Appendix K.

The remediation goal for benzene is 0.5 mg/kg for soil and 500 µg/L for groundwater. Toluene, ethylbenzene, xylenes, MTBE, and naphthalene would not require remediation, and the remediation goals can equal the current representative concentrations.

8.4 POST-REMEDATION HUMAN HEALTH RISK

For each of the remediation scenarios presented in Section 8.0, the remaining levels of human health risk following remediation are within acceptable limits. In each case, the cumulative carcinogenic risk is no greater than 1.0×10^{-5} . In each case, the cumulative non-carcinogenic risk does not exceed 1.0.

9.0 CONSERVATIVE ASSUMPTIONS IN PREPARING THE RISK ASSESSMENT

The baseline health risks and risk-based remediation goals presented in this document are upper-bound, conservative estimates for reasonable maximum exposure scenarios. Actual health risks may be lower. The main conservative assumptions include: 1) calculation of representative concentrations of chemicals in soil and groundwater, 2) estimation of exposure frequencies and duration for residents or tenants, and 3) calculation of indoor air concentrations from contaminant volatilization.

The representative concentrations for soil and groundwater were assumed to be 95% UCL of the mean concentrations detected in the source area. Consequently, the actual concentrations at the Site may be lower.

Given the conservative nature of the risk assessment, the actual carcinogenic and non-carcinogenic risks to the potentially exposed populations are likely to be significantly less than the values calculated in this assessment. The conservative assumptions also apply to the development of the remediation goals. The remediation goals are likely more protective of the potentially exposed population than the risk calculated in this assessment indicates.

10.0 SUMMARY AND CONCLUSIONS

We conducted this assessment to evaluate current and potential future human health risk due to contamination in soil and groundwater at the Site. Remediation goals were also calculated for various scenarios. We performed a well survey and reviewed local and regional hydrogeology to assist in the assessment and evaluate potential exposures by offsite receptors.

The well survey indicated that the nearest potential water supply well is located approximately 400 feet north of the Site. In addition, most of the water supply wells in the vicinity are screened at depths greater than 100 feet below grade. The contamination at the Site extends less than 60 feet below grade and less than 100 feet offsite to the west. Consequently, based upon the distance to nearby wells, contamination at the Site is not impacting any known water supply wells.

The baseline risk to potential offsite receptors is within acceptable limits (less than 1×10^{-5} for carcinogenic risk and less than 1.0 for non-carcinogenic risk). Therefore, the remediation goals and institutional controls specifically address potential risks at the Site.

The onsite risks due to outdoor air inhalation are within acceptable levels. The baseline risks associated with indoor air inhalation and groundwater ingestion at the Site exceeded acceptable limits. The risk assessment demonstrated that various remediation scenarios, combined with institutional controls, can yield acceptable limits of potential human health risk. Table 14 presents a summary of the remediation goals for each scenario. Each set of remediation goals yields a total

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carcinogenic risk of no more than 1×10^{-5} and a total non-carcinogenic risk of no more than 1.0 for onsite receptors.

With appropriate institutional controls in place (a restriction on the use of groundwater and a deed notification for possible future development), soil and groundwater remediation may not be necessary. Over time, natural biodegradation and attenuation could reduce concentrations of the contaminants to levels less than remediation goals. Other scenarios incorporate fewer or no institutional controls, but require more stringent remediation levels.

11.0 RECOMMENDATIONS

Base upon the results of this risk assessment and discussions with Tony and Rita Sullins, the current owners of the Site, we recommend the following.

- Place a restriction on the deed that prohibits the use of groundwater beneath the Site for agricultural, domestic, commercial, industrial, or municipal purposes.
- Place a notification on the deed and on file with the Livermore Building Department. The purpose of the notification is to alert City and County personnel if redevelopment of the Site is planned and to illustrate the location of residual contamination. This will enable Alameda County Environmental Health to evaluate a proposed project with respect to potential exposure to residual contamination.
- Collect groundwater samples from monitoring wells W-1s, W-3s, W-Bs, and W-Es annually for laboratory analysis to ensure that contaminant concentrations continue to decrease. Annual monitoring of the four wells should continue until remediation goals have been reached or until the concentrations stabilize. When concentrations reach remediation goals, the case should be closed.

12.0 REFERENCES

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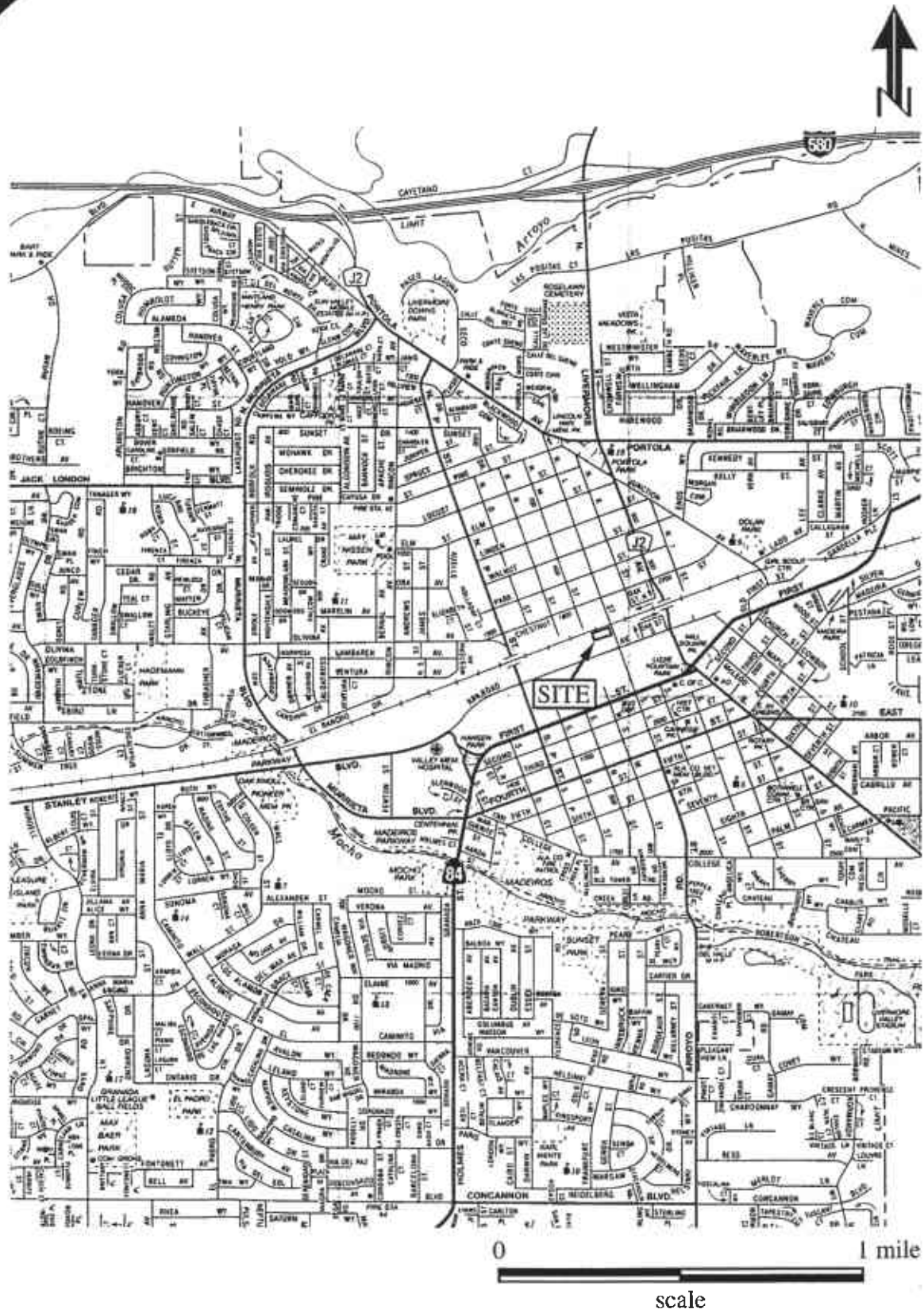


Figure 1. VICINITY MAP
187 North L Street, Livermore, California

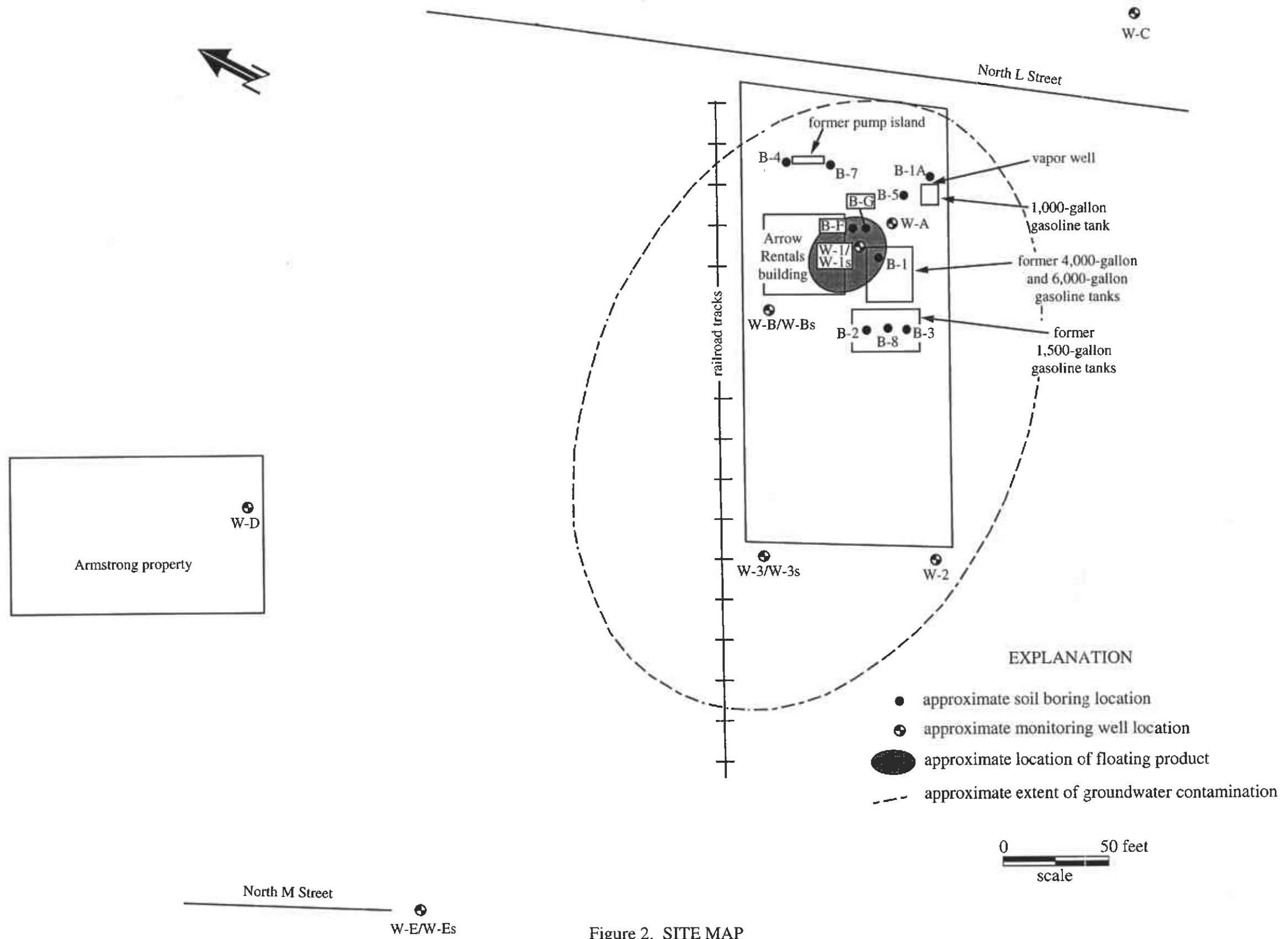


Figure 2. SITE MAP
187 North L Street, Livermore, California



Figure 3. TOPOGRAPHIC MAP
187 North L Street, Livermore, California

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Table 1. WELL SURVEY RESULTS
187 North L Street, Livermore, California

Location	Bearing to Site	Type	Status	Total Depth (feet)	Depth to Groundwater (feet)	Highest Screened Interval (feet)
3S/2E 8R1	805 feet, SSE	mon.	active	77	55.8	27-77
3S/2E 8R2	300 feet, S	mon.	active	61.5	42.74	30-60
3S/2E 8R3	on site	mon.	active	56.5	50	45.5-55.5
3S/2E 8R4	on site	mon.	active	51.5	49	39-49
3S/2E 8R5	on site	mon.	active	51.5	45	38-48
3S/2E 8R6	on site	mon.	active	63	50	42-52
3S/2E 8R7	on site	mon.	active	55	48	40-55
3S/2E 8R8	on site	mon.	active	55	47	45-55
3S/2E 8R9	on site	mon.	active	57.5	46	42-57.5
3S/2E 8R10	on site	mon.	active	61	47	40-60
3S/2E 8R11	795 feet, SSE	mon.	active	60	40	30-60
3S/2E 8R12	865 feet, SSE	mon.	active	60	40	30-60
3S/2E 8R13	895 feet, SSE	mon.	active	60	40	30-60
3S/2E 8P3	2,230 feet, W	mon.	decommissioned	55	53.5	25-55
3S/2E 8Q1	1,830 feet, W	mon.	decommissioned	53	45	25-53
3S/2E 8Q2	1,475 feet, W	mon.	decommissioned	59.5	50	29.5-59.5
3S/2E 8Q3	1,475 feet, SSW	mon.	decommissioned	40	NA	25-40
3S/2E 8K1	660 feet, WNW	cath.	active	120	NA	NA
3S/2E 8K2	1,255 feet, NNW	mon.	active	74	51	64-69
3S/2E 8K4	1,255 feet, NNW	NA	decommissioned	NA	NA	NA
3S/2E 8H1	2,210 feet, N	muni.	active	625	61.9	NA
3S/2E 8H2	2,655 feet, N	mon.	active	47	33	36-41
3S/2E 8G1	2,210 feet, NNW	muni.	active	465	NA	120-455
3S/2E 8G2	2,360 feet, NNW	cath.	active	120	NA	NA
3S/2E 9N1	1,325 feet, ESE	mon.	active	75	NA	55-75
3S/2E 9N2	1,325 feet, ESE	mon.	active	75	NA	55-75
3S/2E 9N3	1,325 feet, ESE	mon.	active	75	NA	55-75
3S/2E 9P1	2,950 feet, E	muni.	active	515	107	192-492
3S/2E 9P4	2,280 feet, ESE	mon.	active	54	45	37-52
3S/2E 9P5	2,340 feet, ESE	mon.	active	53	45	38-53
3S/2E 9P6	2,315 feet, ESE	mon.	active	51.5	45	35-50
3S/2E 9P7	2,210 feet, ESE	mon.	active	55	45	38-53
3S/2E 9P8	2,020 feet, E	cath.	active	120	NA	NA
3S/2E 9Q1	4,720 feet, ESE	muni.	active	576	NA	180-492
3S/2E 9Q3	3,685 feet, ESE	NA	decommissioned	28	8	NA
3S/2E 9Q4	3,540 feet, ESE	mon.	active	80	52	70-75
3S/2E 9Q8	(East Ave.) ESE	dom.	active	252	140	167-170
3S/2E 9M1M	1,845 feet, NNE	irr.	active	95	43	49-89
3S/2E 9M2	2,210 feet, ENE	mon.	active	54	40.3	38-53

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Table 1 (continued). WELL SURVEY RESULTS
187 North L Street, Livermore, California

Location	Bearing to Site	Type	Status	Total Depth (feet)	Depth to Groundwater (feet)	Highest Screened Interval (feet)
3S/2E 9M3	2,200 feet, ENE	mon.	active	53	40	37-52
3S/2E 9M4	2,210 feet, ENE	mon.	active	53	40.4	37-52
3S/2E 9M5	2,210 feet, ENE	mon.	active	46	NA	20-46
3S/2E 9M6	2,210 feet, ENE	mon.	active	40	NA	10-40
3S/2E 9M7	2,210 feet, ENE	mon.	active	45	NA	10-45
3S/2E 9M8	2,210 feet, ENE	mon.	active	45	NA	10-45
3S/2E 9M9	2,210 feet, ENE	mon.	active	60	NA	40-60
3S/2E 9M10	2,210 feet, ENE	mon.	active	60	NA	40-60
3S/2E 9M11	2,210 feet, ENE	mon.	active	65	NA	45-65
3S/2E 9M12	1,475 feet, ENE	mon.	decommissioned	55	NA	NA
3S/2E 9M13	1,475 feet, ENE	mon.	decommissioned	55	NA	NA
3S/2E 9L1	3,095 feet, ENE	muni.	active	529	NA	136-496
3S/2E 9L2	3,095 feet, ENE	mon.	decommissioned	67	46	42-67
3S/2E 9L3	3,095 feet, ENE	mon.	active	61.5	55	46.5-61.5
3S/2E 9L10	3,095 feet, ENE	mon.	active	57	35.5	32-57
3S/2E 16C1	3,390 feet, ESE	muni.	active	584	69	288-298
3S/2E 16C3	3,690 feet, ESE	cath.	active	120	NA	NA
3S/2E 16E1	3,835 feet, SSE	irr.	active	394	NA	NA
3S/2E 16E2	4,130 feet, SSE	irr.	active	540	NA	125-136
3S/2E 16E3	3,690 feet, SSE	irr.	active	377	NA	112-131
3S/2E 16E4	3,540 feet, SSE	mon.	active	50	25	35-40
3S/2E 16E6	3,690 feet, SSE	irr.	active	360	57	300-360
3S/2E 17A	NA	NA	active	77	NA	NA
3S/2E 17B1	3,245 feet, SSW	NA	active	760	67	145-193
3S/2E 17B2	3,230 feet, SSW	dom.	active	442	67	221-224
3S/2E 17B3	2,580 feet, SSW	cath.	active	120	NA	NA
3S/2E 17B4	1,695 feet, SSW	mon.	active	65	40	44.6-59.6
3S/2E 17B5	1,990 feet, SSW	mon.	active	48.5	31.66	28.5-48.5
3S/2E 17B6	1,625 feet, SSW	mon.	active	65	54	44-51
3S/2E 17B7	1,620 feet, WSW	mon.	active	76	70.5	35-75
3S/2E 17B8	1,550 feet, WSW	mon.	active	85	71	35-84.5
3S/2E 17B19	2,210 feet, SSW	mon.	decommissioned	38	NA	23-38
3S/2E 17B72 & 3S/2E 17B73	1,695 feet, SSW	NA	active	65	NA	20-25
3S/2E 17G	3,170 feet, SSW	dom.	active	220	155	NA
3S/2E 17G2	3,170 feet, SSW	mon.	active	35	Dry	18-23
3S/2E 17G3	3,170 feet, SSW	mon.	active	70	31.3	45-70
3S/2E 17J1	NA	dom.	active	531	103	260-270

cath. = cathodic protection
dom. = domestic
irr. = irrigation

mon. = monitoring
muni. = municipal
NA = not available

Table 2. SUMMARY OF ANALYTICAL RESULTS FOR SOIL
187 North L Street, Livermore, California

Well/Boring/ Sample Number	Depth (feet)	TPH- gasoline (mg/kg)	TPH- diesel (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl- benzene (mg/kg)	Total Xylenes (mg/kg)	MTBE (mg/kg)	Naphthalene (mg/kg)	2-Methyl- naphthalene (mg/kg)	Phenol (mg/kg)
B-1A-10	10	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-15	15	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-20	20	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-30	30	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-35	35	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-40	40	350	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-45	45	54	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1A-50	50	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1	2	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-1	5	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-1	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-1	15	ND	2.3	ND	ND	ND	ND	NA	NA	NA	NA
B-1	20	170	NA	2.1	1.4	0.22	1.5	NA	NA	NA	NA
B-1	25	220	NA	0.38	7.1	6.4	52	NA	3.4	3.5	0.3
B-2	2	3.5	NA	ND	ND	ND	0.1	NA	NA	NA	NA
B-2	5	8.2	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-2	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-2	15	ND	2.3	ND	ND	ND	ND	NA	NA	NA	NA
B-2	25	1.7	NA	ND	ND	ND	0.55	NA	NA	NA	NA
B-3	2	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-3	5	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-3	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-3	15	ND	2.6	ND	ND	ND	ND	NA	NA	NA	NA
B-3	20	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-3	25	1.3	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-4	2	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-4	5	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA

Table 2 (continued). SUMMARY OF ANALYTICAL RESULTS FOR SOIL
187 North L Street, Livermore, California

Well/Boring/ Sample Number	Depth (feet)	TPH- gasoline (mg/kg)	TPH- diesel (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl- benzene (mg/kg)	Total Xylenes (mg/kg)	MTBE (mg/kg)	Naphthalene (mg/kg)	2-Methyl- naphthalene (mg/kg)	Phenol (mg/kg)
B-4	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-4	15	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-5	2	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-5	5	1.9	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-5	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-5	15	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-5	20	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
B-5	25	1.7	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-6	5	1.8	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-6	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-6	15	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-6	20	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
B-6	25	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-7	5	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
B-7	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-8	5	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
B-8	10	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
B-F-1,2	15-16	NA	NA	0.002	0.025	0.030	0.034	NA	NA	NA	NA
B-G-5.5	5.5	570	NA	0.550	1.3	< 0.25	2.8	NA	NA	NA	NA
B-G-7	7	< 1.0	NA	< 0.005	< 0.005	< 0.005	< 0.005	NA	NA	NA	NA
B-G-8	8	< 1.0	NA	< 0.005	< 0.005	< 0.005	< 0.005	NA	NA	NA	NA
B-G-9.5	9.5	< 1.0	NA	< 0.005	< 0.005	< 0.005	< 0.005	NA	NA	NA	NA
B-G-11.5	11.5	490	NA	< 0.10	< 0.10	< 0.10	0.53	NA	NA	NA	NA
B-G-13	13	3,100	NA	< 2.0	4.4	38	330	NA	NA	NA	NA
B-G-14	14	750	NA	< 0.5	< 0.5	3.9	38	NA	NA	NA	NA

Table 2 (continued). SUMMARY OF ANALYTICAL RESULTS FOR SOIL
187 North L Street, Livermore, California

Well/Boring/ Sample Number	Depth (feet)	TPH- gasoline (mg/kg)	TPH- diesel (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl- benzene (mg/kg)	Total Xylenes (mg/kg)	MTBE (mg/kg)	Naphthalene (mg/kg)	2-Methyl- naphthalene (mg/kg)	Phenol (mg/kg)
B-G-15	15	1,800	NA	< 0.5	16	31	220	NA	NA	NA	NA
B-G-16	16	6,700	NA	< 20	96	120	790	NA	NA	NA	NA
B-G-17.5	17.5	3,000	NA	< 1.3	2.2	19	220	NA	NA	NA	NA
B-G-19	19	240	NA	< 0.05	0.45	1.3	5.9	NA	NA	NA	NA
B-G-20.5	20.5	2,100	NA	4	75	29	180	NA	NA	NA	NA
B-G-26	26	150	NA	1	3.2	0.9	5.3	NA	NA	NA	NA
B-G-31.5	31.5	40	NA	4	4.4	0.48	2.8	NA	NA	NA	NA
B-G-36	36	1,900	NA	1.8	63	21	120	NA	NA	NA	NA
B-G-41	41	12,000	NA	150	520	130	710	NA	NA	NA	NA
W-A-20	20	< 1	NA	0.41	0.32	0.24	0.21	NA	NA	NA	NA
W-A-30	30	2	NA	0.39	0.13	0.035	1.2	NA	< 1	< 1	< 10
W-A-35	35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
W-A-40	40	1,000	NA	12	37	7.5	27	NA	NA	NA	NA
W-B-25	25	< 1	NA	NA	NA	NA	NA	NA	NA	NA	NA
W-B-30	30	NA	NA	NA	NA	NA	NA	NA	< 1	< 1	< 1
W-B-35	35	< 1	NA	0.69	0.26	0.11	0.07	NA	NA	NA	NA
W-1	5	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-1	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-1	15	1,200	NA	ND	21	20	130	NA	NA	NA	NA
W-1	20	350	380	2.5	14	6.3	30	NA	NA	NA	NA
W-1	25	490	NA	3.5	24	9.4	46	NA	NA	NA	NA
W-1	30	160	NA	1.0	7.9	3.6	18	NA	NA	NA	NA
W-1	35	370	NA	2.4	20	8.2	40	NA	NA	NA	NA
W-1	40	16,000	1,500	220	1,100	340	1,500	NA	NA	NA	NA
W-1	45	1,600	NA	30	120	34	160	NA	NA	NA	NA
W-1	50	2,500	NA	28	200	59	270	NA	NA	NA	NA
W-1	55	120	NA	3.2	10	2.7	13	NA	NA	NA	NA

Table 2 (continued). SUMMARY OF ANALYTICAL RESULTS FOR SOIL
187 North L Street, Livermore, California

Well/Boring/ Sample Number	Depth (feet)	TPH- gasoline (mg/kg)	TPH- diesel (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl- benzene (mg/kg)	Total Xylenes (mg/kg)	MTBE (mg/kg)	Naphthalene (mg/kg)	2-Methyl- naphthalene (mg/kg)	Phenol (mg/kg)
W-2	5	1.2	NA	ND	0.14	ND	ND	NA	NA	NA	NA
W-2	10	ND	NA	ND	0.1	ND	ND	NA	NA	NA	NA
W-2	15	ND	NA	ND	0.1	ND	ND	NA	NA	NA	NA
W-2	20	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-2	25	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-2	30	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-2	35	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-2	40	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-2	45	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
W-2	50	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	5	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	10	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	15	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	20	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	25	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	30	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	35	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	40	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
W-3	45	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA
W-3	50	12	NA	0.06	ND	ND	ND	NA	NA	NA	NA

mg/kg = milligrams per kilograms [parts per million (ppm)]

NA = not analyzed

ND = not detected

MTBE = methyl tertiary butyl ether

TPH-gasoline = total petroleum hydrocarbons quantified as gasoline

TPH-diesel = total petroleum hydrocarbons quantified as diesel

Table 3. SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
187 North L Street, Livermore, California

Well Number	Date Sampled	TPH-gasoline (µg/L)	TPH-diesel (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	2-Methyl-naphthalene (µg/L)
W-1	11/88	210,000	300,000	29,000	30,000	5,400	24,000	NA	NA	NA
W-1 product	11/88	NA	NA	64,000,000	47,000,000	13,000,000	51,000,000	NA	< 1,000,000	200,000
W-1 product (dup)	11/88	NA	NA	66,000,000	47,000,000	13,000,000	51,000,000	NA	< 1,000,000	200,000
W-2	11/88	360	< 50	6.7	2.1	0.47	1.3	NA	NA	NA
W-3	11/88	11,000	2,200	290	120	150	140	NA	NA	NA
W-1s	3/22/96	6,400	NA	580	470	85	1,100	< 500	NA	NA
W-1s	11/22/96	170,000	NA	13,000	18,000	3,500	18,000	< 10,000	NA	NA
W-1s	7/15/97	140,000	38,000	12,000	12,000	2,600	16,000	< 800	NA	NA
W-1s	10/29/97	650,000	180,000	14,000	19,000	7,800	35,000	< 3,000	NA	NA
W-1s	4/27/98	6,700	2,200	410	250	77	870	< 30	NA	NA
W-1s	10/23/98	99,000	18,000	9,800	9,400	1,800	11,000	< 600	NA	NA
W-1s	4/9/99	70,000	24,000	6,500	7,000	1,800	8,900	360	330	NA
W-1s	10/5/99	82,000	60,000	5,500	4,500	2,500	14,000	< 300	510	280
W-1s	4/5/00	47,000	15,000	4,300	2,300	1,500	6,100	170	330	110
W-1s	10/26/00	50,000	1,200	3,800	1,800	1,700	7,600	< 50	350	180
W-3s	3/22/96	100	NA	13	6.9	5.3	14	< 5	NA	NA
W-3s	11/22/96	3,200	NA	270	29.0	63.0	100	< 100	NA	NA
W-3s	7/15/97	2,100	340	230	7	33	51	< 20	NA	NA
W-3s	10/29/97	2,800	750	630	31	71	69	< 30	NA	NA
W-3s	4/27/98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 3	NA	NA
W-3s	10/23/98	3,800	1,000	500	28	90	37	35	NA	NA
W-3s	4/9/99	980	430	240	4	37	3	< 12	NA	NA
W-3s	10/5/99	1,500	1,000	290	9.5	53	9.8	< 6	NA	NA
W-3s	4/5/00	810	320	150	3.0	9.0	5.7	< 3	< 5	< 5
W-3s	10/26/00	310	120	83	3.5	6.4	1.2	< 5	NA	NA

Table 3 (continued). SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
187 North L Street, Livermore, California

Well Number	Date Sampled	TPH-gasoline (µg/L)	TPH-diesel (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	2-Methyl-naphthalene (µg/L)
W-Bs	3/22/96	61,000	NA	9,800	8,000	2,200	11,000	< 5,000	NA	NA
W-Bs	11/22/96	47,000	NA	5,100	3,100	1,400	7,800	< 2,500	NA	NA
W-Bs	7/15/97	66,000	17,000	7,800	4,900	1,900	10,000	< 600	NA	NA
W-Bs	10/29/97	44,000	27,000	6,000	500	1,500	6,400	380	NA	NA
W-Bs	4/27/98	63,000	17,000	6,100	5,400	1,900	9,100	< 600	NA	NA
W-Bs	10/23/98	48,000	9,600	6,700	1,200	1,500	6,200	< 300	NA	NA
W-Bs	4/9/99	39,000	12,000	4,100	1,900	1,400	5,600	< 300	NA	NA
W-Bs	10/5/99	38,000	7,300	3,800	390	1,600	5,900	< 60	NA	NA
W-Bs	4/5/00	34,000	9,600	3,500	1,200	1,400	4,700	< 150	280	68
W-Bs	10/26/00	23,000	650	2,500	210	1,100	2,600	150	260	88
W-Es	3/22/96	< 50	NA	< 0.5	< 0.5	< 0.5	< 0.5	< 5	NA	NA
W-Es	11/22/96	280	NA	24	0.6	1.8	2.2	< 5	NA	NA
W-Es	10/23/98	82	69	< 0.5	0.8	< 0.5	0.8	4	NA	NA
W-Es	10/5/99	68	88	< 0.5	< 0.5	< 0.5	< 0.5	4	NA	NA
W-Es	10/26/00	110	< 50	0.7	< 0.5	< 0.5	< 1.0	< 5	NA	NA
MCL	--	NE	NE	1	150	700	1,750	5	NE	NE

µg/L = micrograms per liter [parts per billion (ppb)]

NA = not analyzed

ND = not detected

NE = none established

MTBE = methyl tertiary butyl ether

TPH-gasoline = total petroleum hydrocarbons quantified as gasoline

TPH-diesel = total petroleum hydrocarbons quantified as diesel

MCL = Maximum Contaminant Level, February 2000

Table 4. REPRESENTATIVE CONCENTRATIONS OF CHEMICALS IN SOIL AND GROUNDWATER
187 North L Street, Livermore, California

Chemical	Source Area Representative Concentration in Soil* (mg/kg)	Source Area Representative Concentration in Groundwater† (µg/L)	W-Bs/W-3s Area Representative Concentration in Groundwater‡ (µg/L)
Benzene	1.4	5,000	770
Toluene	11	4,200	350
Ethylbenzene	12	1,900	790
Total Xylenes	72	9,000	1,700
MTBE	NA	260	96
Naphthalene	NE	350	72

mg/kg = milligrams per kilogram (parts per million or ppm)

µg/L = micrograms per liter (parts per billion or ppb)

NA = not analyzed

NE = no value established, insufficient data were available to obtain a representative concentration.

MTBE = methyl tertiary butyl ether

* 95% upper confidence limit of the mean between 15 and 20 feet at borings B-1, B-F, and B-G and wells W-A and W-1.

† 95% upper confidence limit of the mean at wells W-Bs and W-1s during the four most recent sampling events.

‡ 95% upper confidence limit of the geometric mean of the concentrations at wells W-Bs and W-3s during the four most recent sampling events.

Table 5. REFERENCE DOSES AND CANCER SLOPE FACTORS
 187 North L Street, Livermore, California

Parameter	Units	Benzene	Toluene	Ethyl- benzene	Total Xylenes	MTBE	Naphthalene
Dermal							
RfD	mg/kg-day	0.003	0.16	0.097	1.84	0.008	0.356
CSF	(mg/kg-day) ⁻¹	0.0299	NA	NA	NA	NA	NA
Ingestion							
RfD	mg/kg-day	0.003	0.2	0.1	2	0.01	0.4
CSF	(mg/kg-day) ⁻¹	0.029	NA	NA	NA	NA	NA
Inhalation							
RfD	mg/m ³	0.00595	0.40	1	7	3	1.4
CSF	(µg/m ³) ⁻¹	8.29E-06	NA	NA	NA	NA	NA

NA = not applicable

RfD = reference dose

CSF = cancer slope factor

Reference doses correspond to non-carcinogenic exposures.

Cancer slope factors apply to carcinogenic exposures.

Table 6. TIER 1 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL DEVELOPMENT
 187 North L Street, Livermore, California

Onsite Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	2.0E-07	1.1E-02	2.7E-05	1.5E+00	5.1E-04	1.6E+01
Toluene		6.4E-04		4.5E-02		2.1E-01
Ethylbenzene		1.4E-04		8.3E-03		1.9E-01
Total Xylenes		1.4E-04		7.6E-03		6.1E-02
MTBE		1.2E-07		1.7E-05		2.6E-01
Naphthalene		1.7E-07		2.0E-05		8.5E-03
Total Risk	2.0E-07	1.2E-02	2.7E-05	1.6E+00	5.1E-04	1.7E+01
Total Carcinogenic Risk		5.4E-04	Total Non-Carcinogenic Risk		19	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

MTBE = methyl tertiary butyl ether

Table 7. TIER 1 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL DEVELOPMENT
187 North L Street, Livermore, California

Onsite Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	3.2E-07	1.5E-02	5.7E-05	2.7E+00	1.7E-03	4.6E+01
Toluene		7.6E-04		7.5E-02		5.4E-01
Ethylbenzene		1.9E-04		1.4E-02		5.2E-01
Total Xylenes		2.0E-04		1.3E-02		1.7E-01
MTBE		1.7E-07		3.0E-05		7.4E-01
Naphthalene		2.6E-07		3.7E-05		2.6E-02
Total Risk	3.2E-07	1.6E-02	5.7E-05	2.8E+00	1.7E-03	4.8E+01
Total Carcinogenic Risk		1.8E-03	Total Non-Carcinogenic Risk		51	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

MTBE = methyl tertiary butyl ether

Table 8. TIER 2 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL DEVELOPMENT
 187 North L Street, Livermore, California

Onsite Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	2.0E-07	1.1E-02	2.7E-05	1.5E+00	5.1E-04	1.6E+01
Toluene		6.2E-04		4.4E-02		2.1E-01
Ethylbenzene		1.4E-04		8.2E-03		1.9E-01
Total Xylenes		1.4E-04		7.6E-03		4.4E-02
MTBE		1.2E-07		1.7E-05		2.5E-01
Naphthalene		1.7E-07		2.0E-05		8.6E-03
Total Risk	2.0E-07	1.2E-02	2.7E-05	1.6E+00	5.1E-04	1.7E+01
Total Carcinogenic Risk		5.4E-04		Total Non-Carcinogenic Risk		19
Target Carcinogenic Risk		1.0E-05		Target Non-Carcinogenic Risk		1.0

Table 8 (continued). TIER 2 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL DEVELOPMENT
187 North L Street, Livermore, California

Offsite Commercial Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	9.6E-08	5.4E-03	NA	NA	1.8E-07	5.7E-03
Toluene		2.9E-04		NA		5.6E-09
Ethylbenzene		6.5E-05		NA		7.2E-05
Total Xylenes		6.7E-05		NA		2.3E-07
MTBE		5.5E-08		NA		6.4E-04
Naphthalene		8.3E-08		NA		3.9E-08
Total Risk	9.6E-08	5.9E-03	NA	NA	1.8E-07	6.4E-03
Total Carcinogenic Risk		2.8E-07	Total Non-Carcinogenic Risk		0.013	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

Table 8 (continued). TIER 2 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL DEVELOPMENT
187 North L Street, Livermore, California

Offsite Residential Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	1.5E-07	7.1E-03	NA	NA	5.9E-07	1.6E-02
Toluene		3.5E-04		NA		1.6E-08
Ethylbenzene		9.1E-05		NA		2.0E-04
Total Xylenes		9.4E-05		NA		6.4E-07
MTBE		7.7E-08		NA		1.8E-03
Naphthalene		1.2E-07		NA		1.1E-07
Total Risk	1.5E-07	7.6E-03	NA	NA	5.9E-07	1.8E-02
Total Carcinogenic Risk		7.4E-07	Total Non-Carcinogenic Risk		0.026	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

NA = not applicable

MTBE = methyl tertiary butyl ether

Table 9. TIER 2 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL DEVELOPMENT
 187 North L Street, Livermore, California

Onsite Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	3.1E-07	1.5E-02	5.6E-05	2.7E+00	1.7E-03	4.6E+01
Toluene		7.4E-04		7.5E-02		5.8E-01
Ethylbenzene		1.9E-04		1.4E-02		5.2E-01
Total Xylenes		2.0E-04		1.3E-02		1.2E-01
MTBE		1.6E-07		2.9E-05		7.1E-01
Naphthalene		2.4E-07		3.5E-05		2.4E-02
Total Risk	3.1E-07	1.6E-02	5.6E-05	2.8E+00	1.7E-03	4.8E+01
Total Carcinogenic Risk		1.8E-03	Total Non-Carcinogenic Risk		51	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

Table 9 (continued). TIER 2 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL DEVELOPMENT
187 North L Street, Livermore, California

Offsite Commercial Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	9.6E-08	5.4E-03	NA	NA	1.8E-07	5.7E-03
Toluene		2.9E-04		NA		5.6E-09
Ethylbenzene		6.5E-05		NA		7.2E-05
Total Xylenes		6.7E-05		NA		2.3E-07
MTBE		5.5E-08		NA		6.4E-04
Naphthalene		8.3E-08		NA		3.9E-08
Total Risk	9.6E-08	5.9E-03	NA	NA	1.8E-07	6.4E-03
Total Carcinogenic Risk		2.8E-07	Total Non-Carcinogenic Risk		0.013	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

Table 9 (continued). TIER 2 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL DEVELOPMENT
187 North L Street, Livermore, California

Offsite Residential Receptors

Chemical	Carcinogenic Risk Due To Outdoor Air Exposure	Non-Carcinogenic Risk Due To Outdoor Air Exposure	Carcinogenic Risk Due To Indoor Air Exposure	Non-Carcinogenic Risk Due To Indoor Air Exposure	Carcinogenic Risk Due To Groundwater Exposure	Non-Carcinogenic Risk Due To Groundwater Exposure
Benzene	1.5E-07	7.1E-03	NA	NA	5.9E-07	1.6E-02
Toluene		3.5E-04		NA		1.6E-08
Ethylbenzene		9.1E-05		NA		2.0E-04
Total Xylenes		9.4E-05		NA		6.4E-07
MTBE		7.7E-08		NA		1.8E-03
Naphthalene		1.2E-07		NA		1.1E-07
Total Risk	1.5E-07	7.6E-03	NA	NA	5.9E-07	1.8E-02
Total Carcinogenic Risk		7.4E-07	Total Non-Carcinogenic Risk		0.026	
Target Carcinogenic Risk		1.0E-05	Target Non-Carcinogenic Risk		1.0	

NA = not applicable

MTBE = methyl tertiary butyl ether

Table 10. REMEDIATION GOALS - ONSITE COMMERCIAL DEVELOPMENT
 187 North L Street, Livermore, California

Chemical	Remediation Goal for Soil (mg/kg)	Remediation Goal for Groundwater (µg/L)	Total Carcinogenic Risk (Onsite Receptor)	Total Non-Carcinogenic Risk (Onsite Receptor)
Benzene	0.32	75	1.0E-05	3.7E-01
Toluene	11*	2,500		1.6E-01
Ethylbenzene	12*	1,500		1.6E-01
Total Xylenes	72*	9,000*		5.2E-02
MTBE	NA	260*		2.5E-01
Naphthalene	NA	350*		8.6E-03
Total Risk			1.0E-05	1.0
Target Risk			1.0E-05	1.0

NA = not applicable

MTBE = methyl tertiary butyl ether

* These values represent current representative concentrations.

Table 11. REMEDIATION GOALS - ONSITE RESIDENTIAL DEVELOPMENT
 187 North L Street, Livermore, California

Chemical	Remediation Goal for Soil (mg/kg)	Remediation Goal for Groundwater (µg/L)	Total Carcinogenic Risk (Onsite Receptor)	Total Non-Carcinogenic Risk (Onsite Receptor)
Benzene	0.32	15	9.3E-06	3.4E-01
Toluene	11*	1,000		2.0E-01
Ethylbenzene	12*	500		1.5E-01
Total Xylenes	72*	5,500		8.7E-02
MTBE	NA	75		2.1E-01
Naphthalene	NA	350*		2.4E-02
Total Risk			9.3E-06	1.0
Target Risk			1.0E-05	1.0

NA = not applicable

MTBE = methyl tertiary butyl ether

* These values represent current representative concentrations.

Table 12. REMEDIATION GOALS WITH DEED RESTRICTION ON GROUNDWATER
 ONSITE COMMERCIAL DEVELOPMENT
 187 North L Street, Livermore, California

Chemical	Remediation Goal for Soil (mg/kg)	Remediation Goal for Groundwater (µg/L)	Total Carcinogenic Risk (Onsite Receptor)	Total Non-Carcinogenic Risk (Onsite Receptor)
Benzene	0.5	2,000	1.0E-05	6.0E-01
Toluene	11*	4,200*		4.5E-02
Ethylbenzene	12*	1,900*		8.3E-03
Total Xylenes	72*	9,000*		7.7E-03
MTBE	NA	260*		1.7E-05
Naphthalene	NA	350*		2.0E-05
Total Risk			1.0E-05	6.7E-01
Target Risk			1.0E-05	1.0

NA = not applicable

MTBE = methyl tertiary butyl ether

* These values represent current representative concentrations.

Table 13. REMEDIATION GOALS WITH DEED RESTRICTION ON GROUNDWATER
 ONSITE RESIDENTIAL DEVELOPMENT
 187 North L Street, Livermore, California

Chemical	Remediation Goal for Soil (mg/kg)	Remediation Goal for Groundwater (µg/L)	Total Carcinogenic Risk (Onsite Receptor)	Total Non-Carcinogenic Risk (Onsite Receptor)
Benzene	0.5	500	1.0E-05	4.9E-01
Toluene	11*	4,200*		7.6E-02
Ethylbenzene	12*	1,900*		1.4E-02
Total Xylenes	72*	9,000*		1.3E-02
MTBE	NA	260*		2.9E-05
Naphthalene	NA	350*		3.5E-05
Total Risk			1.0E-05	6.0E-01
Target Risk			1.0E-05	1.0

NA = not applicable

MTBE = methyl tertiary butyl ether

* These values represent current representative concentrations.

Table 14. SUMMARY OF REMEDIATION GOALS
187 North L Street, Livermore, California

Chemical	Representative Concentrations		Remediation Goals for Commercial Scenario		Remediation Goals for Residential Scenario		Remediation Goals for Commercial Scenario w/GW deed restriction		Remediation Goals for Residential Scenario w/GW deed restriction	
	Soil (mg/kg)	GW (µg/L)	Soil (mg/kg)	GW (µg/L)	Soil (mg/kg)	GW (µg/L)	Soil (mg/kg)	GW (µg/L)	Soil (mg/kg)	GW (µg/L)
Benzene	1.4	5,000	0.32	75	0.32	15	0.5	2,000	0.5	500
Toluene	11	4,200	11*	2,500	11*	1,000	11*	4,200*	11*	4,200*
Ethylbenzene	12	1,900	12*	1,500	12*	500	12*	1,900*	12*	1,900*
Total Xylenes	72	9,000	72*	9,000*	72*	5,500	72*	9,000*	72*	9,000*
MTBE	NA	260	NA	260*	NA	75	NA	260*	NA	260*
Naphthalene	NA	350	NA	350*	NA	350*	NA	350*	NA	350*

NA = not applicable

MTBE = methyl tertiary butyl ether

GW = groundwater

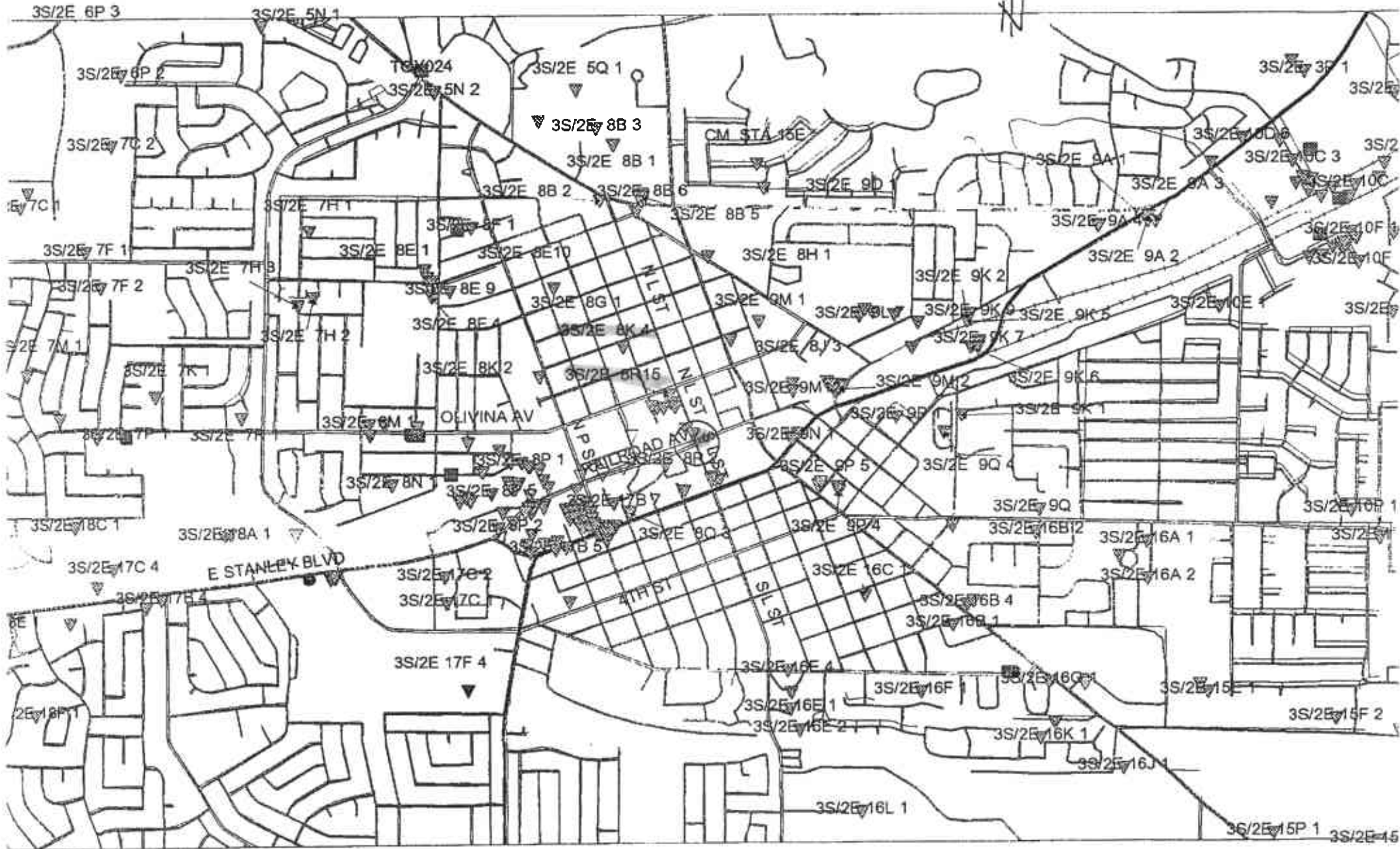
* These values represent current representative concentrations.

APPENDIX A

WELL LOCATION MAPS

APPROX: 1 mile radius

1" ≈ 1500'



APPENDIX B

EQUATIONS FOR INHALATION EXPOSURE SCENARIO

APPENDIX A: RISK-BASED SITE EVALUATION PROCESS

Media Cleanup Values: The RBCA Tool Kit has the ability to i) compare the site data to Tier 1 Risk-Based Screening Levels (RBSLs), computed using the default parameter values as listed in ASTM PS 104, or ii) calculate Tier 2 Site-Specific Target Levels (SSTLs) based on user-supplied site information. For each source medium (i.e., affected soil and groundwater), the software reports target concentrations for all complete pathways and identifies the applicable (i.e., minimum) value for source remediation. The equations used by the RBCA Tool Kit to calculate RBSLs and SSTLs are presented in Table A.2.

TABLE A.2 RBSL AND SSTL EQUATIONS USED IN THE RBCA TOOL KIT

GROUNDWATER EXPOSURE PATHWAY	
Groundwater Ingestion	
<p>Carcinogens: $RBSL_{GW} = \frac{TR \cdot BW \cdot AT_C}{SF_o \cdot EF \cdot ED \cdot IR_w}$</p> <p>Non-Carcinogens: $RBSL_{GW} = \frac{THQ \cdot RfD_o \cdot BW \cdot AT_n}{EF \cdot ED \cdot IR_w}$</p>	$SSTL_{GW} = RBSL_{GW} \cdot DAF$
Soil Leaching to Groundwater → Groundwater Ingestion	
<p>Carcinogens: $RBSL_S = \frac{TR \cdot BW \cdot AT_C}{SF_o \cdot EF \cdot ED \cdot IR_w \cdot LF}$</p> <p>Non-Carc.: $RBSL_S = \frac{THQ \cdot RfD_o \cdot BW \cdot AT_n}{EF \cdot ED \cdot IR_w \cdot LF}$</p>	$SSTL_S = RBSL_S \cdot DAF$
SOIL EXPOSURE PATHWAY	
Surface Soil Ingestion, Inhalation, and Dermal Contact	
<p>Carcinogens: $RBSL_{SS} = \frac{TR \cdot BW \cdot AT_C}{EF \cdot ED \cdot \left[(SF_o \cdot IR_s) + (URF \cdot 1000 \cdot BW \cdot (VF_{ss} + VF_p)) + (SF_d \cdot SA \cdot M \cdot RAF_d) \right]}$</p> <p>Non-Carc.: $RBSL_{SS} = \frac{THQ \cdot BW \cdot AT_n}{EF \cdot ED \cdot \left[\left(\frac{IR_s}{RfD_o} \right) + \left(\frac{BW \cdot (VF_{ss} + VF_p)}{RfC} \right) + \left(\frac{SA \cdot M \cdot RAF_d}{RfD_d} \right) \right]}$</p>	$SSTL_{SS} = RBSL_{SS}$ (No lateral transport; receptor at source.)
OUTDOOR AIR EXPOSURE PATHWAY	
Subsurface Soil Volatilization to Ambient Air	
<p>Carcinogens: $RBSL_S = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{samb}}$</p> <p>Non-Carcinogens: $RBSL_S = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{samb}}$</p>	$SSTL_S = RBSL_S \cdot ADF$
Groundwater Volatilization to Ambient Air	
<p>Carcinogens: $RBSL_{GW} = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{wamb}}$</p> <p>Non-Carcinogens: $RBSL_{GW} = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{wamb}}$</p>	$SSTL_{GW} = RBSL_{GW} \cdot ADF$

Continued

APPENDIX A: RISK-BASED SITE EVALUATION PROCESS

TABLE A.2 RBSL AND SSTL EQUATIONS USED IN THE RBCA TOOL KIT

Continued

INDOOR AIR EXPOSURE PATHWAY	
Subsurface Soil Volatilization to Enclosed Space	
<p>Carcinogens: $RBSL_S = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{seps}}$</p> <p>Non-Carcinogens: $RBSL_S = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{seps}}$</p>	<p>$SSTL_{GW} = RBSL_{GW}$</p> <p><i>(No lateral transport; receptor at source.)</i></p>
Groundwater Volatilization to Enclosed Space	
<p>Carcinogens: $RBSL_{GW} = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{wesp}}$</p> <p>Non-Carcinogens: $RBSL_{GW} = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{wesp}}$</p>	<p>$SSTL_{GW} = RBSL_{GW}$</p> <p><i>(No lateral transport; receptor at source.)</i></p>
SURFACE WATER EXPOSURE PATHWAY	
Groundwater Discharge to Surface Water → Swimming and Fish Consumption	
<p><i>RBSL not applicable.</i></p> <p><i>(Receptor located away from source.)</i></p>	<p>Carcinogens: $SSTL_{GW} = \frac{TR \cdot BW \cdot AT_C \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[(SF_o \cdot EV \cdot ET \cdot IR_{sw}) + (SF_d \cdot EV \cdot SA_{sw} \cdot Z) + (SF_o \cdot IR_{fish} \cdot FI_{fish} \cdot BCF) \right]}$</p> <p>Non-Carc.: $SSTL_{GW} = \frac{THQ \cdot BW \cdot AT_n \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[\left(\frac{EV \cdot ET \cdot IR_{sw}}{RfDo} \right) + \left(\frac{EV \cdot SA_{sw} \cdot Z}{RfDd} \right) + \left(\frac{IR_{fish} \cdot FI_{fish} \cdot BCF}{RfDo} \right) \right]}$</p>
Soil Leaching to Groundwater → Groundwater Discharge to Surface Water → Swimming and Fish Consumption	
<p><i>RBSL not applicable.</i></p> <p><i>(Receptor located away from source.)</i></p>	<p>Carcinogens: $SSTL_S = \frac{TR \cdot BW \cdot AT_C \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[(SF_o \cdot EV \cdot ET \cdot IR_{sw}) + (SF_d \cdot EV \cdot SA_{sw} \cdot Z) + (SF_o \cdot IR_{fish} \cdot FI_{fish} \cdot BCF) \right] \cdot LF}$</p> <p>Non-Carc.: $SSTL_S = \frac{THQ \cdot BW \cdot AT_n \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[\left(\frac{EV \cdot ET \cdot IR_{sw}}{RfDo} \right) + \left(\frac{EV \cdot SA_{sw} \cdot Z}{RfDd} \right) + \left(\frac{IR_{fish} \cdot FI_{fish} \cdot BCF}{RfDo} \right) \right] \cdot LF}$</p>
Groundwater Discharge to Surface Water → Aquatic Life Protection	
<p><i>RBSL not applicable.</i></p> <p><i>(Receptor located away from source.)</i></p>	<p>Carcinogens: $SSTL_{GW} = AQL \cdot DAF \cdot DF_{gw-sw}$</p> <p>Non-Carcinogens: $SSTL_{GW} = AQL \cdot DAF \cdot DF_{gw-sw}$</p>
Soil Leaching to Groundwater → Groundwater Discharge to Surface Water → Aquatic Life Protection	
<p><i>RBSL not applicable.</i></p> <p><i>(Receptor located away from source.)</i></p>	<p>Carcinogens: $SSTL_S = \frac{AQL \cdot DAF \cdot DF_{gw-sw}}{LF}$</p> <p>Non-Carcinogens: $SSTL_S = \frac{AQL \cdot DAF \cdot DF_{gw-sw}}{LF}$</p>

Continued

APPENDIX B: FATE AND TRANSPORT MODELING METHODS

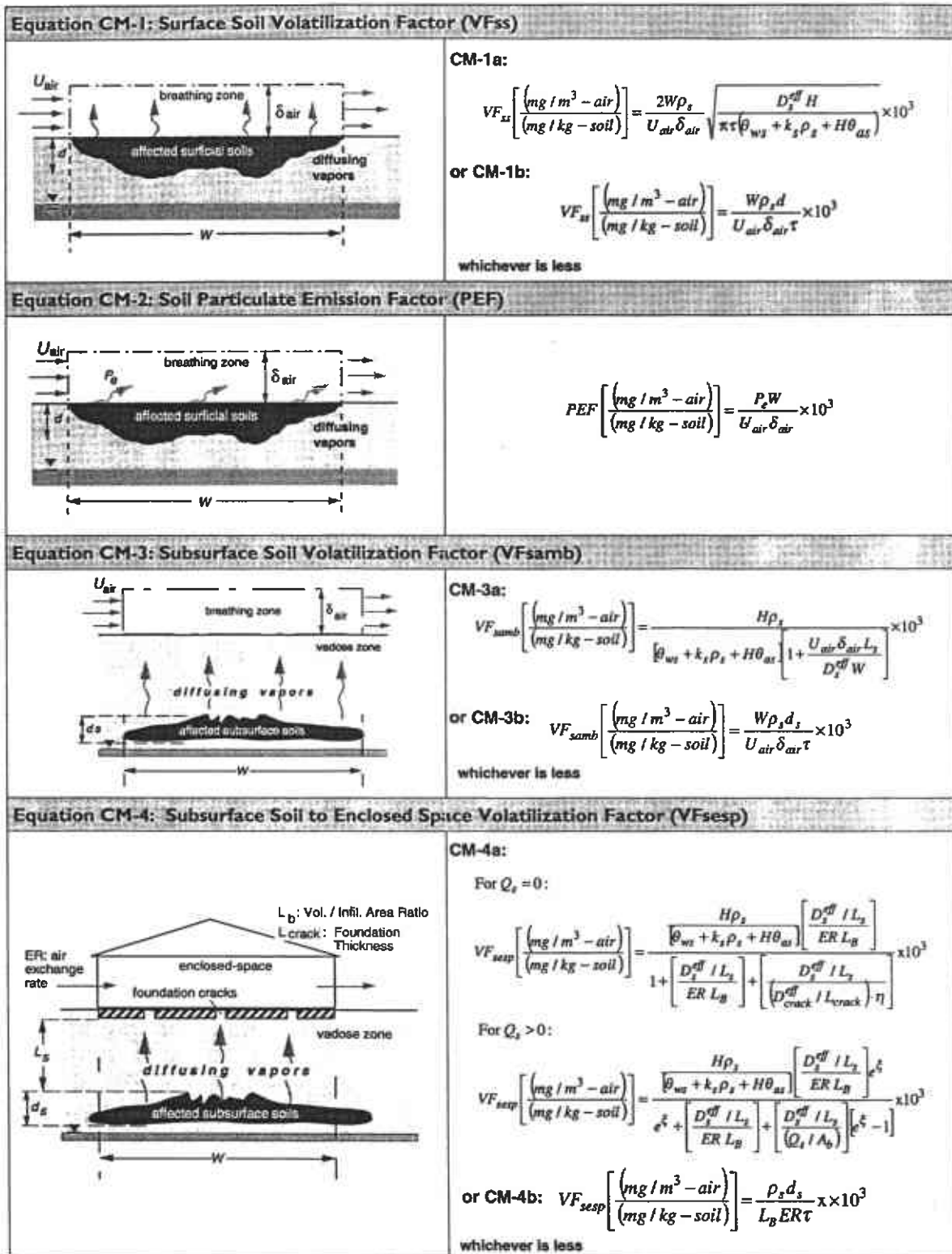
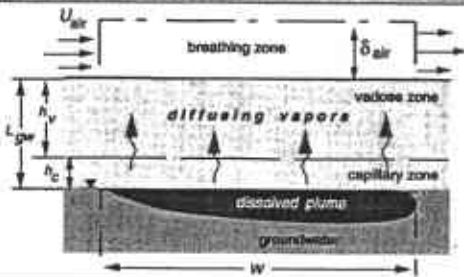


FIGURE B.2. CROSS-MEDIA TRANSFER FACTORS IN THE RBCA TOOL KIT

Continued

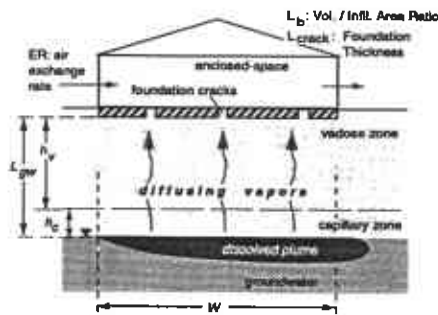
Continued

Equation CM-5: Groundwater Volatilization Factor (VF_{wamb})



$$VF_{wamb} \left[\frac{(mg / m^3 - air)}{(mg/L - H_2O)} \right] = \frac{H}{1 + \left[\frac{U_{air} \delta_{air} L_{GW}}{D_{ws}^{eff} W} \right]} \times 10^3$$

Equation CM-6: Groundwater to Enclosed Space Volatilization Factor (VF_{wesp})



For $Q_s = 0$:

$$VF_{wesp} \left[\frac{(mg / m^3 - air)}{(mg / L - H_2O)} \right] = \frac{H \left[\frac{D_{ws}^{eff} / L_{GW}}{ER L_b} \right]}{1 + \left[\frac{D_{ws}^{eff} / L_{GW}}{ER L_b} \right] + \left[\frac{D_{ws}^{eff} / L_{GW}}{(D_{crack}^{eff} / L_{crack}) \eta} \right]} \times 10^3$$

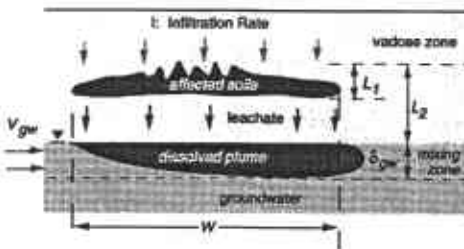
For $Q_s > 0$:

$$VF_{wesp} \left[\frac{(mg / m^3 - air)}{(mg / L - H_2O)} \right] = \frac{H \left[\frac{D_{ws}^{eff} / L_{GW}}{ER L_b} \right] e^{\xi}}{e^{\xi} + \left[\frac{D_{ws}^{eff} / L_{GW}}{ER L_b} \right] + \left[\frac{D_{ws}^{eff} / L_{GW}}{Q_s / \lambda_b} \right] [e^{\xi} - 1]} \times 10^3$$

Equation CM-7: Soil Leachate Partition Factor (K_{sw})

Equation CM-8: Optional Soil Attenuation Model (SAM) Factor

Equation CM-9: Leachate-Groundwater Dilution Factor (LDF)



CM-7: $K_{sw} \left[\frac{(mg / L - H_2O)}{(mg/kg - soil)} \right] = \frac{\rho_s}{\theta_{ws} + k_s \rho_s + H \theta_{as}}$

CM-8: $SAM [dimensionless] = \frac{L_1}{L_2}$

CM-9: $LDF [dimensionless] = 1 + \frac{V_{gw} \delta_{gw}}{I \cdot W}$

Effective Diffusion Coefficients

Effective diffusivity in vadose zone soils:

$$D_s^{eff} \left[\frac{cm^2}{s} \right] = D^{air} \frac{\theta_{as}^{3.33}}{\theta_T^2} + \left[\frac{D^{wat}}{H} \right] \left[\frac{\theta_{ws}^{3.33}}{\theta_T^2} \right]$$

Effective diffusivity above the water table:

$$D_{ws}^{eff} \left[\frac{cm^2}{s} \right] = (h_c + h_v) \left[\frac{h_c}{D_{cap}^{eff}} + \frac{h_v}{D_s^{eff}} \right]^{-1}$$

Effective diffusivity through foundation cracks:

$$D_{crack}^{eff} \left[\frac{cm^2}{s} \right] = D^{air} \frac{\theta_{acrack}^{3.33}}{\theta_T^2} + \left[\frac{D^{wat}}{H} \right] \left[\frac{\theta_{wcrack}^{3.33}}{\theta_T^2} \right]$$

Effective diffusivity in the capillary zone:

$$D_{cap}^{eff} \left[\frac{cm^2}{s} \right] = D^{air} \frac{\theta_{acap}^{3.33}}{\theta_T^2} + \left[\frac{D^{wat}}{H} \right] \left[\frac{\theta_{wcap}^{3.33}}{\theta_T^2} \right]$$

Convective Air Flow Through Foundation Cracks

$$\xi = \frac{Q_s / \lambda_b}{(D_{crack}^{eff} / L_{crack}) \cdot \eta}$$

$$Q_s = \frac{2\pi \Delta p k_v X_{crack}}{\mu_{air} \ln \left[\frac{2 Z_{crack} X_{crack}}{\lambda_b \eta} \right]}$$

FIGURE B.2. CROSS-MEDIA TRANSFER FACTORS IN THE RBCA TOOL KIT

Continued

APPENDIX C

TIER 1 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL SCENARIO

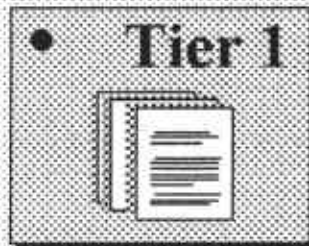
Main Screen

RBCA Tool Kit for Chemical Releases
Version 1.3a © 2000

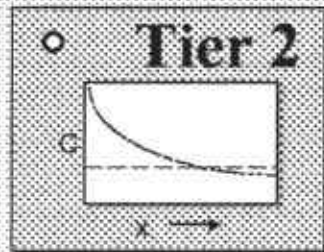
1. Project Information

Site Name:	Arrow Rentals		
Location:	187 North L Street, Livermore, California		
Compl. By:	Aquifer Sciences, Inc.		
Date:	6-Apr-01	Job ID:	971275

2. Which Type of RBCA Analysis?



Tier 1
Generic Values
On-Site
Exposure



Tier 2
Site-Specific Values
On- or Off-Site Exposure

3. Calculation Options

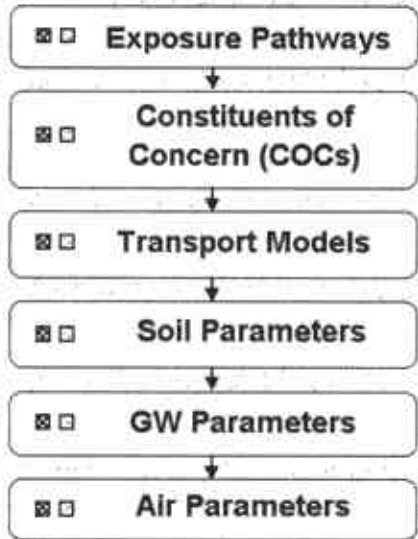
Affects which input data are required

- Baseline Risks (Forward mode)**
- RBCA Cleanup Standards (Backward mode)**

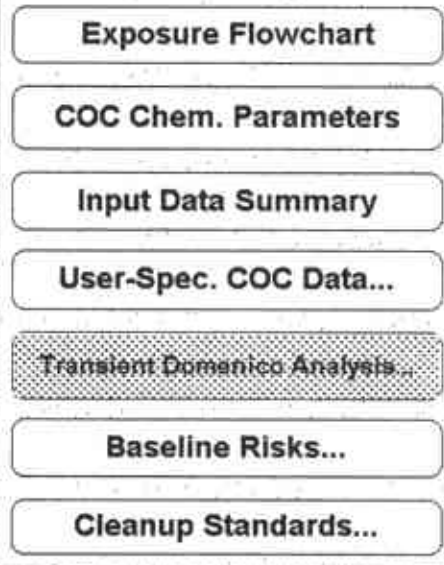
4. RBCA Evaluation Process

Prepare Input Data

Data Complete? (yes, no)



Review Output

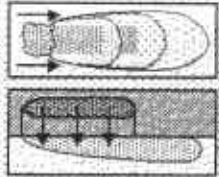


5. Commands and Options

New Site	Load Data...	Save Data As...	Quit
Print Sheet	Set Units	Custom Chem. Data...	Help

Exposure Pathway Identification

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

Receptor Com.

Type On-site Off-site1 Off-site2

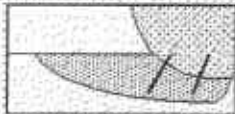
Source Media:

- Affected Groundwater
- Affected Soils Leaching to Groundwater

Distance to GW receptors

0		(ft)
On-site	Off-site1	Off-site2
0		(ft)

GW Discharge to Surface Water Exposure



- Swimming
 - Fish Consumption
 - Aquatic Life Protection
- Enter ALP Criteria

2. Surface Soil Exposure



Direct Ingestion and Dermal Contact

Receptor None No off-site receptors

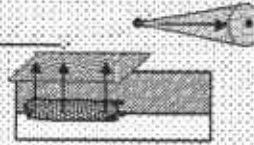
Type On-site

Construction Worker

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl By: Aquifer Sciences, Inc.
 Job ID: 971275
 Date: 6-Apr-01

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation



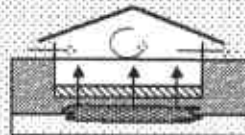
Receptor Com.

Type On-site Off-site1 Off-site2

0 (ft)

Construction worker

- Affected Soils--Volatilization to Ambient Outdoor Air
- Affected Groundwater--Volatilization to Ambient Outdoor Air
- Affected Surface Soils--Particulates to Ambient Outdoor Air



Volatilization to Indoor Air Inhalation

Receptor Com. No off-site receptors

Type On-site

- Affected Soils--Volatilization to Enclosed Space
- Affected Groundwater--Volatilization to Enclosed Space

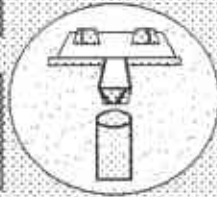
4. Commands and Options

Exposure Factors & Target Risks
 Exposure Flowchart

Exposure Factors and Target Risk Limits

1. Exposure Parameters

Age Adjustment?	Residential		Commercial	
	Adult	(Age 0-6) (Age 0-16)	Chronic	Construc.
Averaging time, carcinogens (yr)	70			
Averaging time, non-carcinogens (yr)	30		25	1
Body weight (kg)	70	15 35	70	
Exposure duration (yr)	30	6 16	25	1
Exposure frequency (days/yr)	350		250	180
Dermal exposure frequency (days/yr)	350		250	
Skin surface area, soil contact (cm ²)	<input type="checkbox"/> 5800	2023	5800	5800
Soil dermal adherence factor (mg/cm ² /day)	1			
Water ingestion rate (L/day)	2		1	
Soil ingestion rate (mg/day)	<input type="checkbox"/> 100	200	50	100
Swimming exposure time (hr/event)	3			
Swimming event frequency (events/yr)	12	12 12		
Swimming water ingestion rate (L/hr)	<input type="checkbox"/> 0.05	0.5		
Skin surface area, swimming (cm ²)	<input type="checkbox"/> 23000	8100		
Fish consumption rate (kg/day)	0.025			
Contaminated fish fraction (unitless)	1			



Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.
 Job ID: 971275 Date: 6-Apr-01

2. Risk Goal Calculation Options

- Individual Constituent Risk Goals Only
- Individual and Cumulative Risk Goals

3. Target Health Risk Limits

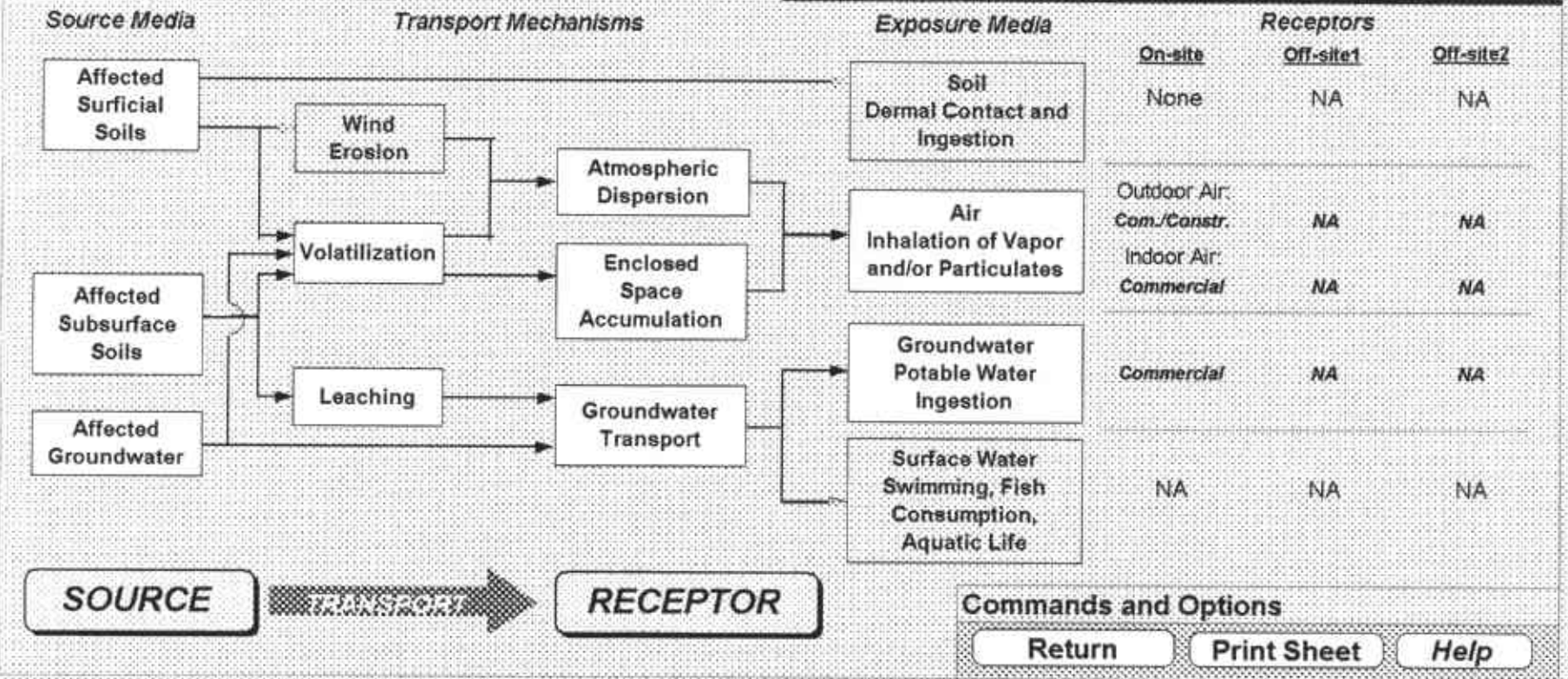
	Individual	Cumulative
Target Risk (Class A/B carcinogens)	1.0E-6	1.0E-5
Target Risk (Class C carcinogens)	1.0E-5	
Target Hazard Quotient	1.0E+0	
Target Hazard Index		1.0E+0

4. Commands and Options

Exposure Pathway Flowchart

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc

Job ID: 971275
 Date: 6-Apr-01



Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.

Job ID: 971275
 Date: 6-Apr-01

Commands and Options

Source Media Constituents of Concern (COCs)

Selected COCs

COC Select: ?

Benzene
Toluene
Ethylbenzene
Xylene (mixed isomers)
Methyl t-Butyl ether
Naphthalene

Representative COC Concentration

Groundwater Source Zone			Soil Source Zone		
<input type="button" value="Enter Directly"/>	<input type="checkbox"/> Enter Site Data		<input type="button" value="Enter Directly"/>	<input type="checkbox"/> Enter Site Data	
(mg/L)	note		(mg/kg)	note	
5.0E+0	95% UCL at W-1s/W-Bs		1.4E+0	95% UCL of mean	
4.2E+0	95% UCL at W-1s/W-Bs		1.1E+1	95% UCL of mean	
1.9E+0	95% UCL at W-1s/W-Bs		1.2E+1	95% UCL of mean	
9.0E+0	95% UCL at W-1s/W-Bs		7.2E+1	95% UCL of mean	
2.6E-1	95% UCL at W-1s/W-Bs		0.0E+0		
3.5E-1	95% UCL at W-1s/W-Bs		0.0E+0		

Apply Raoult's Law ?

Mole Fraction in Source Material

(-)

Transport Modeling Options

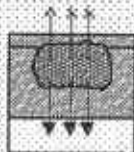
1. Vertical Transport, Surface Soil Column

Outdoor Air Volatilization Factors ?

- Surface soil volatilization model only
- Combination surface soil/Johnson & Ettinger models

Thickness of surface soil zone (ft)

- User-specified VF from other model



Indoor Air Volatilization Factors ?

- Johnson & Ettinger model
- User-specified VF from other model

Soil-to-Groundwater Leaching Factor ?

- ASTM Model
 - Apply Soil Attenuation Model (SAM)
 - Allow first-order biodecay
- User-specified LF from other model

2. Lateral Air Dispersion Factor

wind



- 3-D Gaussian dispersion model
- User-Specified ADF

Off-site 1

Off-site 2

(-)

Site Name Arrow Rentals

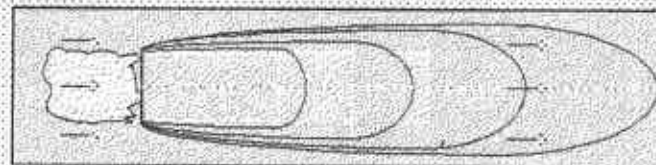
Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 6-Apr-01

Compl. By: Aquifer Sciences, Inc.

3. Groundwater Dilution Attenuation Factor



Calculate DAF using Domenico Model ?

- Domenico equation with dispersion only (no biodegradation)
- Domenico equation first-order decay
- Modified Domenico equation using electron acceptor superposition

Biodegradation Capacity (mg/L)

— or —

User-Specified DAF Values

- DAF values from other model or site data

n

o

4. Commands and Options

Site-Specific Soil Parameters

1. Soil Source Zone Characteristics ?

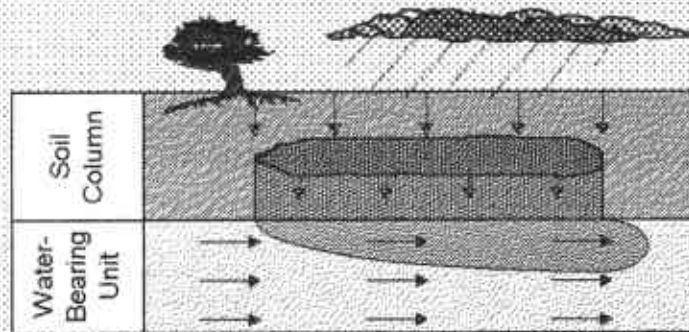
Hydrogeology

Depth to water-bearing unit	25	(ft)
Capillary zone thickness	0.16	(ft)
Soil column thickness	24.84	(ft)

Affected Soil Zone

Depth to top of affected soils	15	(ft)
Depth to base of affected soils	25	(ft)
Affected soil area	1280	1280 (ft ²)
Length of affected soil parallel to assumed wind direction	40	40 (ft)
Length of affected soil parallel to assumed GW flow direction	40	(ft)

General Case Construction



Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 6-Apr-01

Compl. By: Aquifer Sciences, Inc.

2. Surface Soil Column

Vadose Zone: Capillary Fringe

Predominant USCS Soil Type

ults ?

or	Calculate	or
Total porosity	0.3	(-)
Volumetric water content	0.12	0.26 (-)
Volumetric air content	0.18	0.04 (-)
Dry bulk density	2.65	(kg/L)
Vertical hydraulic conductivity	3.3E+2	(ft/yr)
Vapor permeability	1.1E-11	(ft ²)
Capillary zone thickness	1.6E-1	(ft)

Net Rainfall Infiltration

Net infiltration estimate: 11.81102362 (in/yr)

or	Calculate	or
Average annual precipitation	0	(in/yr)

Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

Site-Specific Groundwater Parameters

1. Water-Bearing Unit ?

Hydrogeology

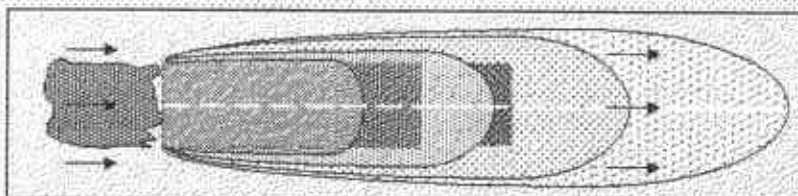
Groundwater Darcy velocity (ft/yr)
 Groundwater seepage velocity (ft/yr)
 or or
 Hydraulic conductivity (ft/yr)
 Hydraulic gradient (-)
 Effective porosity (-)

Sorption

Fraction organic carbon-saturated zone (-)
 Groundwater pH (-)

2. Groundwater Source Zone ?

Groundwater plume width at source (ft)
 Plume (mixing zone) thickness at source (ft)
 or or
 Saturated thickness (ft)
 Length of source zone (ft)



Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 6-Apr-01

Compl By: Aquifer Sciences, Inc

3. Groundwater Dispersion ?

Model: GW Ingestion Soil Leaching to GW
 Distance to GW receptors Off-site 1 Off-site 2 Off-site 1 Off-site 2 (ft)
 or or or
 Longitudinal dispersivity (ft)
 Transverse dispersivity (ft)
 Vertical dispersivity (ft)

4. Groundwater Discharge to Surface Water ?

Distance to GW/SW discharge point Off-site 2 (ft)
 Plume width at GW/SW discharge (ft)
 Plume thickness at GW/SW discharge (ft)
 Surface water flowrate at GW/SW discharge (ft³/s)

5. Commands and Options

Site-Specific Air Parameters

1. Outdoor Air Pathway

Dispersion in Air

Distance to offsite air receptor Off-site 1 Off-site 2 (ft) ?
 or or

Horizontal dispersivity (ft)

Vertical dispersivity (ft)

Air Source Zone

Air mixing zone height (ft)

Ambient air velocity in mixing zone (ft/s)

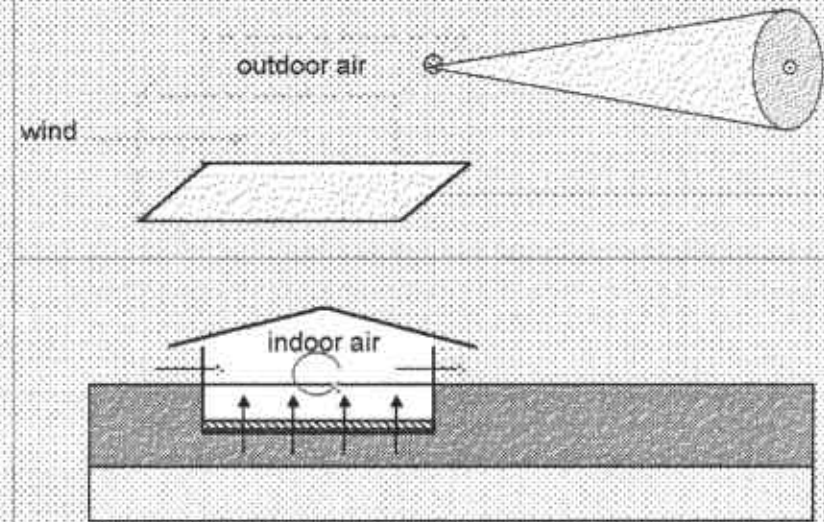
Areal particulate emission flux (g/cm²/s)

2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	8	9.84252	(ft)
Foundation area	20000	20000	(ft ²)
Foundation perimeter	800	800	(ft)
Building air exchange rate	1.4E-4	1.4E-4	(1/s)
Depth to bottom of foundation slab	0.5	0.5	(ft)
Convective air flow through cracks	0.0E+0	0.0E+0	(ft ³ /s)
Foundation thickness	0.5		(ft)
Foundation crack fraction	0.01		(-)
Volumetric water content of cracks	0.28		(-)
Volumetric air content of cracks	0.13		(-)
Indoor/Outdoor differential pressure	0		(Pa)

Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 8-Apr-01
 Compl. By: Aquifer Sciences, Inc.



3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole)		Diffusion Coefficients				log (Koc) or log(Kd) (@ 20 - 25 C)		Henry's Law Constant (@ 20 - 25 C)			Vapor Pressure (@ 20 - 25 C)		Solubility (@ 20 - 25 C)		acid pKa	base pKb	
			MW	ref	In air (cm ² /s) Dair	ref	In water (cm ² /s) Dwat	ref	log(L/kg) partition	ref	(atm-m ³ /mol)	(unitless)	ref	(mm Hg)	ref	(mg/L)	ref			
Benzene	71-43-2	A	78.1	PS	8.60E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.80E-01	A	3.00E+01	4	5.15E+02	29	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.89E+02	PS	-	-
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.96E+02	5	-	-
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	6	9.41E-05	7	1.08	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-
Naphthalene	91-20-3	PAH	128.2	PS	5.90E-02	PS	7.50E-06	PS	3.30	Koc	PS	4.83E-04	1.99E-02	PS	2.30E-01	PS	3.10E+01	PS	-	-

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275



Constituent	ref
Benzene	-
Toluene	-
Ethylbenzene	-
Xylene (mixed isomers)	-
Methyl t-Butyl ether	-
Naphthalene	-

Site Name: Arrow Rentals

Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs **Toxicity Data**

Constituent	Reference Dose (mg/kg/day)				Reference Conc. (mg/m3)				Slope Factors 1/(mg/kg/day)				Unit Risk Factor 1/(µg/m3)		EPA Weight of Evidence	Is Constituent Carcinogenic?
	Oral		Dermal		Inhalation		Oral		Dermal		Inhalation		URF Inhal	ref		
	RfD_oral	ref	RfD_dermal	ref	RfC_inhal	ref	SF_oral	ref	SF_dermal	ref	URF_inhal	ref				
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.90E-02	TX	8.29E-06	PS	A	TRUE		
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	D	FALSE		
Ethylbenzene	1.00E-01	PS	9.70E-02	TX	1.00E+00	PS	-	-	-	-	-	-	D	FALSE		
Xylene (mixed isomers)	2.00E+00	A,R	1.84E+00	TX	7.00E+00	A	-	-	-	-	-	-	D	FALSE		
Methyl t-Butyl ether	1.00E-02	31	8.00E-03	TX	3.00E+00	R	-	-	-	-	-	-	-	FALSE		
Naphthalene	4.00E-01	PS	3.56E-01	TX	1.40E+00	PS	-	-	-	-	-	-	D	FALSE		

Site Name: Arrow Rentals
 Site Location: 187 North L S

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level		Time-Weighted Average Workplace Criteria		Aquatic Life Prot. Criteria		Bioconcentration Factor (L-wat/kg-fish)
	MCL (mg/L)	ref	TWA (mg/m3)	ref	AQL (mg/L)	ref	
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.5
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
Naphthalene	-	-	5.00E+01	PS	-	-	430

Site Name: Arrow Rentals
 Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data						Detection Limits				Half Life (First-Order Decay) (days)		
		Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm ² /vent)	ref	Groundwater (mg/L)		Soil (mg/kg)		Saturated	Unsaturated	ref
								ref	ref	ref	ref			
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Xylene (mixed isomers)	0.5	0.08	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
Naphthalene	0.05	0.069	0.53	2.2	0.2	2.7E-1	D	0.01	32	0.01	32	258	258	H

Site Name: Arrow Rentals
 Site Location: 187 North L S

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 8-Apr-01

Job ID: B71275

1 OF 1

Exposure Parameters		Residential		Commercial/Industrial		
		Adult	(1-99yr)	(1-18yr)	Chronic	Construct.
AT _c	Averaging time for carcinogens (yr)	70				
AT _n	Averaging time for non-carcinogens (yr)	30			25	1
BW	Body weight (kg)	70	15	35	70	
ED	Exposure duration (yr)	30	6	16	25	1
τ	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure frequency (days/yr)	350			250	180
EF _d	Exposure frequency for dermal exposure	350			250	
IR _w	Ingestion rate of water (L/day)	2			1	
IR _s	Ingestion rate of soil (mg/day)	100	200		50	100
SA	Skin surface area (dermal) (cm ²)	5800		2023	5800	5800
M	Soil to skin adherence factor	1				
ET _{swim}	Swimming exposure time (hr/event)	3				
EV _{swim}	Swimming event frequency (events/yr)	12	12			
IR _{swim}	Water ingestion while swimming (L/hr)	0.05	0.5			
SA _{swim}	Skin surface area for swimming (cm ²)	23000		8100		
IR _{fish}	Ingestion rate of fish (kg/yr)	0.025				
F _{fish}	Contaminated fish fraction (unitless)	1				

Surface Parameters		General	Construction	Units
A	Source zone area	1.3E+3	1.3E+3	(ft ²)
W	Length of source-zone area parallel to wind	4.0E+1	4.0E+1	(ft)
W _{gw}	Length of source-zone area parallel to GW flow	4.0E+1		(ft)
U _{air}	Ambient air velocity in mixing zone	7.4E+0		(ft/s)
δ _{air}	Air mixing zone height	6.6E+0		(ft)
P _a	Areal particulate emission rate	NA		(g/cm ² /s)
L _{soil}	Thickness of affected surface soils	1.0E+0		(ft)

Surface Soil Column Parameters		Value	Units
h _{cap}	Capillary zone thickness	1.6E-1	(ft)
h _v	Vadose zone thickness	2.5E+1	(ft)
A _s	Soil bulk density	2.7E+0	(g/cm ³)
f _{oc}	Fraction organic carbon	1.0E-2	(-)
θ _t	Soil total porosity	3.0E-1	(-)
K _{vf}	Vertical hydraulic conductivity	3.3E+2	(ft/yr)
k _v	Vapor permeability	1.1E-11	(ft ²)
L _{gw}	Depth to groundwater	2.5E+1	(ft)
L _s	Depth to top of affected soils	1.5E+1	(ft)
L _{base}	Depth to base of affected soils	2.5E+1	(ft)
L _{soil}	Thickness of affected soils	1.0E+1	(ft)
pH	Soil/groundwater pH	6.8E+0	(-)
θ _v	Volumetric water content	0.26	(-)
θ _a	Volumetric air content	0.04	(-)

Complete Exposure Pathways and Receptors			
	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Commercial	NA	NA
Soil Leaching to Groundwater Ingestion	Commercial	NA	NA
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air:			
Particulates from Surface Soils	None	NA	NA
Volatilization from Soils	Com./Constr.	NA	NA
Volatilization from Groundwater	Commercial	NA	NA
Indoor Air:			
Volatilization from Subsurface Soils	Commercial	NA	NA
Volatilization from Groundwater	Commercial	NA	NA

Building Parameters		Residential	Commercial	Units
L _b	Building volume/area ratio	NA	9.64E+0	(ft)
A _b	Foundation area	NA	2.00E+4	(ft ²)
X _{soil}	Foundation perimeter	NA	6.00E+2	(ft)
ER	Building air exchange rate	NA	1.40E-4	(1/s)
L _{soil}	Foundation thickness	NA	5.00E-1	(ft)
Z _{soil}	Depth to bottom of foundation slab	NA	5.00E-1	(ft)
γ	Foundation crack fraction	NA	1.00E-2	(-)
dP	Indoor/outdoor differential pressure	NA	0.00E+0	(Pa)
Q _c	Convective air flow through slab	NA	0.00E+0	(ft ³ /s)

Receptor Distance from Source Media				
	On-site	Off-site 1	Off-site 2	Units
Groundwater receptor	0	NA	NA	(ft)
Soil leaching to groundwater receptor	0	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)

Groundwater Parameters		Value	Units
δ _{gw}	Groundwater mixing zone depth	6.6E+0	(ft)
I _r	Net groundwater infiltration rate	1.2E+1	(in/yr)
U _{gw}	Groundwater Darcy velocity	8.2E+0	(ft/yr)
V _{gw}	Groundwater seepage velocity	2.1E+1	(ft/yr)
K _s	Saturated hydraulic conductivity	NA	(ft/yr)
i	Groundwater gradient	NA	(-)
S _w	Width of groundwater source zone	NA	(ft)
S _d	Depth of groundwater source zone	NA	(ft)
θ _{eff}	Effective porosity in water-bearing unit	NA	(-)
f _{oc-gw}	Fraction organic carbon in water-bearing unit	NA	(-)
pH _{gw}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	(-)

Target Health Risk Values		
	Individual	Cumulative
TR _h	Target Risk (class A&B carcinogens)	1.0E-6
TR _c	Target Risk (class C carcinogens)	1.0E-5
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	Units
Lateral Groundwater Transport		Groundwater Infiltration		Soil Leaching to GW		
α _l	Longitudinal dispersivity	NA	NA	NA	NA	(ft)
α _t	Transverse dispersivity	NA	NA	NA	NA	(ft)
α _v	Vertical dispersivity	NA	NA	NA	NA	(ft)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ _y	Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
σ _z	Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Modeling Options	
RBCA tier	Tier 1
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	No
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

Surface Water Parameters		Off-site 2	Units
Q _{sw}	Surface water flowrate	NA	(ft ³ /s)
W _{pl}	Width of GW plume at SW discharge	NA	(ft)
δ _{pl}	Thickness of GW plume at SW discharge	NA	(ft)
DF _{sw}	Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (15 - 25 ft)	
	value (mg/L)	note	value (mg/kg)	note
Benzene	5.0E+0	95% UCL at W-1s/W-Bs	1.4E+0	95% UCL of mean
Toluene	4.2E+0	95% UCL at W-1s/W-Bs	1.1E+1	95% UCL of mean
Ethylbenzene	1.9E+0	95% UCL at W-1s/W-Bs	1.2E+1	95% UCL of mean
Xylene (mixed isomers)	9.0E+0	95% UCL at W-1s/W-Bs	7.2E+1	95% UCL of mean
Methyl t-Butyl ether	2.6E-1	95% UCL at W-1s/W-Bs	0.0E+0	
Naphthalene	3.5E-1	95% UCL at W-1s/W-Bs	0.0E+0	

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA Tool Kit for Chemical Releases, Version 1.3a

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Site Location: 187 North L Street, Livermore, Calif Date Completed: 6-Apr-01

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TIER 1 SOIL CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations		
		Typical Detection Limit (mg/kg)	No. of Samples	No. of Detects	Maximum Conc. (mg/kg)	Mean Conc. (mg/kg)	UCL on Mean Conc. (mg/kg)
CAS No.	Name						
71-43-2	Benzene	#N/A	11	11	2.0E+01	2.5E-01	1.4E+00
108-88-3	Toluene	#N/A	11	11	9.6E+01	2.0E+00	1.1E+01
100-41-4	Ethylbenzene	#N/A	11	11	1.2E+02	2.0E+00	1.2E+01
1330-20-7	Xylene (mixed isomers)	#N/A	11	11	7.9E+02	8.0E+00	7.2E+01
1634-04-4	Methyl t-Butyl ether	#N/A	1	0	0.0E+00	0.0E+00	NA
91-20-3	Naphthalene	#N/A	1	0	0.0E+00	0.0E+00	NA

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Site Location: 187 North L Street, Livermore, Calif Date Completed: 6-Apr-01

1 of 1

TIER 1 GROUNDWATER CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method		Detected Concentrations			
		Typical Detection Limit (mg/L)	No. of Samples	No. of Detects	Maximum Conc. (mg/L)	Mean Conc. (mg/L)	UCL on Mean Conc. (mg/L)
CAS No.	Name						
71-43-2	Benzene	5.0E-04	8	8	6.5E+00	3.7E+00	5.0E+00
108-88-3	Toluene	5.0E-04	8	8	7.0E+00	4.8E-01	4.2E+00
100-41-4	Ethylbenzene	5.0E-04	8	8	2.5E+00	1.4E+00	1.9E+00
1330-20-7	Xylene (mixed isomers)	5.0E-04	8	8	1.4E+01	6.2E+00	9.0E+00
1634-04-4	Methyl t-Butyl ether	5.0E-04	8	8	3.6E-01	1.7E-01	2.6E-01
91-20-3	Naphthalene	5.0E-04	8	6	5.1E-01	2.2E-01	3.5E-01

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS:
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³): (1)/(2)			
	Soil Conc. (mg/kg)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Commercial	Construction Worker	NA	NA	Commercial	Construction Worker	NA	NA
Benzene	1.4E+0								
Toluene	1.1E+1								
Ethylbenzene	1.2E+1								
Xylene (mixed isomers)	7.2E+1								
Methyl t-Butyl ether	0.0E+0								
Naphthalene	0.0E+0								

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS:
VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	Construction Worker	NA	NA	Commercial	Construction Worker	NA	NA
Benzene								
Toluene								
Ethylbenzene								
Xylene (mixed isomers)								
Methyl t-Butyl ether								
Naphthalene								

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR×EF×ED)/(BW×AT) (L/kg/day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
	Benzene	3.5E-3			1.8E-2	
Toluene	9.8E-3			4.1E-2		
Ethylbenzene	9.8E-3			1.9E-2		
Xylene (mixed isomers)	9.8E-3			8.8E-2		
Methyl t-Butyl ether	9.8E-3			2.6E-3		
Naphthalene	9.8E-3			3.4E-3		

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

MAXIMUM PATHWAY INTAKE (mg/kg/day)
*(Maximum Intake of active pathways
 soil leaching & groundwater routes.)*

Constituents of Concern	On-site (0 ft)	Off-site 1	Off-site 2
	Commercial	NA	NA
Benzene	1.8E-2		
Toluene	4.1E-2		
Ethylbenzene	1.9E-2		
Xylene (mixed isomers)	1.2E-1		
Methyl t-Butyl ether	2.6E-3		
Naphthalene	3.4E-3		

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Maximum Carcinogenic Intake Rate (mg/kg/day)			(3) Oral Slope Factor (mg/kg-day) ⁻¹	(4) Individual COC Risk (2) x (3)		
		On-site (0 ft) Commercial	Off-site 1 NA	Off-site 2 NA		On-site (0 ft) Commercial	Off-site 1 NA	Off-site 2 NA
Benzene	A	1.8E-2			2.9E-2	5.1E-4		
Toluene	D							
Ethylbenzene	D							
Xylene (mixed isomers)	D							
Methyl t-Butyl ether	-							
Naphthalene	D							

Total Pathway Carcinogenic Risk = 5.1E-4

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Maximum Toxicant Intake Rate (mg/kg/day)			(6) Oral Reference Dose (mg/kg/day)	(7) Individual COC Hazard Quotient (5) / (6)		
	On-site (0 ft) Commercial	Off-site 1 NA	Off-site 2 NA		On-site (0 ft) Commercial	Off-site 1 NA	Off-site 2 NA
Benzene	4.9E-2			3.0E-3	1.6E+1		
Toluene	4.1E-2			2.0E-1	2.1E-1		
Ethylbenzene	1.9E-2			1.0E-1	1.9E-1		
Xylene (mixed isomers)	1.2E-1			2.0E+0	6.1E-2		
Methyl t-Butyl ether	2.6E-3			1.0E-2	2.6E-1		
Naphthalene	3.4E-3			4.0E-1	8.5E-3		

Total Pathway Hazard Index =

1.7E+1

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT	Baseline Risk Summary-All Pathways
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Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

TIER 1 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	2.0E-7	1.0E-6	2.0E-7	1.0E-5	☐	1.1E-2	1.0E+0	1.2E-2	1.0E+0	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	2.7E-5	1.0E-6	2.7E-5	1.0E-5	■	1.5E+0	1.0E+0	1.6E+0	1.0E+0	■
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	5.1E-4	1.0E-6	5.1E-4	1.0E-5	■	1.6E+1	1.0E+0	1.7E+1	1.0E+0	■
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY: (Maximum Values From Complete Pathways)										
	5.1E-4	1.0E-6	5.1E-4	1.0E-5	■	1.6E+1	1.0E+0	1.7E+1	1.0E+0	■
	<i>Groundwater</i>		<i>Groundwater</i>			<i>Groundwater</i>		<i>Groundwater</i>		

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

1 of 7

Constituent: Benzene CAS No.: 71-43-2

Risk-Based Screening Level (RBSL) Concentrations

On-site

Receptor Type / Distance (ft)		Commercial / 0
Groundwater Ingestion		
RBSL _{gw} THQ = 1e+0		3.1E-1
(mg/L) TR = 1e-6		9.9E-3
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s THQ = 1e+0		4.7E-1
(mg/kg) TR = 1e-6		1.5E-2
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} THQ = 1e+0		NA
(mg/kg) TR = 1e-6		NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBEL _{air} THQ = 1e+0		8.7E+0
(µg/m ³) TR = 1e-6		4.9E-1
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Com / Constr / 0
RBSL _s THQ = 1e+0		#DIV/0!
(mg/kg) TR = 1e-6		#DIV/0!
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} THQ = 1e+0		7.3E+2
(mg/L) TR = 1e-6		4.1E+1
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBEL _{air} THQ = 1e+0		8.7E+0
(µg/m ³) TR = 1e-6		4.9E-1
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s THQ = 1e+0		2.8E+0
(mg/kg) TR = 1e-6		1.6E-1
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} THQ = 1e+0		4.8E+0
(mg/L) TR = 1e-6		2.7E-1

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	7.8E+1	PS
Sol	(mg/L)	1.8E+3	PS
P _{vap}	(mmHg)	9.5E+1	PS
H _{labn}	(atm·m ³ /mol)	5.6E-3	PS
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{oc})	(log[L/kg])	1.8E+0	PS
D _{air}	(cm ² /sec)	8.8E-2	PS
D _{soil}	(cm ² /sec)	9.8E-6	PS
Toxicity Data			
Wt of Evd		A	
SF _o	(1/[mg/kg/day])	2.9E-2	PS
SF _d	(1/[mg/kg/day])	3.0E-2	TX
URF _i	(1/[µg/m ³])	8.3E-6	PS
RfD _o	(mg/kg/day)	3.0E-3	R
RfD _d	(mg/kg/day)	-	-
RfC	(mg/m ³)	6.0E-3	R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	2.1E-2	-
tau _u	(hr/event)	2.6E-1	-
t _{cut}	(hr)	6.3E-1	-
B	(-)	1.3E-2	-
Regulatory Standards			
MCL	(mg/L)	5.0E-3	*
TWA	(mg/m ³)	3.3E+0	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	-	H
t _{1/2,ground}	(d)	-	H

* MCL ref = 52 FR 25690

	Units	Residential	Commercial	Construction
Cross-Media Transfer Factors				
VF _{ss}	(kg-soil/m ³ -air)	NA	NC	NC
VF _{samb}	(kg-soil/m ³ -air)	NA	2.8E-5	6.8E-5
VF _{wamb}	(m ³ -wat/m ³ -air)	NA	1.2E-5	1.2E-5
VF _{se}	(kg-soil/m ³ -air)	NA	3.1E-3	NA
VF _{wes}	(m ³ -wat/m ³ -air)	NA	1.8E-3	NA
LF	(kg-soil/L-wat)	All exposures	6.5E-1	NA

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.3E-1
K _{ow}	(L-wat/kg-soil)	1.5E+0
C _{soil}	(mg/kg-soil)	1.1E+3
C _{soil,vap}	(µg/m ³ -air)	4.0E+8
D _{eff,s}	(cm ² /sec)	3.2E-3
D _{eff,soil}	(cm ² /sec)	5.9E-4
D _{eff,cap}	(cm ² /sec)	2.7E-5
D _{eff,wo}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	-
R _{unsat}	(-)	1.4E+1
Z	(cm/event)	7.3E-2

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

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Constituent: Toluene CAS No.: 108-88-3

Risk-Based Screening Level (RBSL) Concentrations

On-site

Receptor Type / Distance (ft)		Commercial / 0
Groundwater Ingestion		
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	2.0E+1 NC
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	6.8E+1 NC
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} (mg/kg)	THQ = 1e+0 TR = 1e-6	NA NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	5.8E+2 NC
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Com./Constr. / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	#DIV/0! NC
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>5.2E+2 NC
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	5.8E+2 NC
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	3.8E+2 NC
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	2.9E+2 NC

Chemical Parameters

Units Value Reference

Physical Properties			
MW	(g/mol)	9.2E+1	5
Sol	(mg/L)	5.2E+2	29
P _{vap}	(mmHg)	3.0E+1	4
H _{atm}	(atm·m ³ /mol)	6.3E-3	A
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{oc})	(log[L/kg])	2.1E+0	A
D _{air}	(cm ² /sec)	8.5E-2	A
D _{soil}	(cm ² /sec)	9.4E-6	A
Toxicity Data			
Wt of Evid.		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RI _{D_o}	(mg/kg/day)	2.0E-1	A,R
RI _{D_i}	(mg/kg/day)	1.6E-1	TX
RI _{C_i}	(mg/m ³)	4.0E-1	A,R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	4.5E-2	
ta _{u_d}	(hr/event)	3.2E-1	
t _{ort}	(hr)	7.7E-1	
B	(-)	5.4E-2	
Regulatory Standards			
MCL	(mg/L)	1.0E+0	*
TWA	(mg/m ³)	1.5E+2	ACGIH
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)		H
t _{1/2,soil}	(d)		H

* MCL ref = 56 FR 3526 (30 Jan 91)

Units Residential Commercial Construction

Cross-Media Transfer Factors				
VF _{ss}	(kg-soil/m ³ -air)	NA	NC	NC
VF _{samb}	(kg-soil/m ³ -air)	NA	2.8E-5	3.4E-5
VF _{wamb}	(m ³ -wat/m ³ -air)	NA	1.3E-5	1.3E-5
VF _{resp}	(kg-soil/m ³ -air)	NA	1.6E-3	NA
VF _{wresp}	(m ³ -wat/m ³ -air)	NA	2.0E-3	NA
LF	(kg-soil/L-wat)	All exposures	3.0E-1	NA

Units Value

Derived Parameters		
H	(L-wat/L-air)	2.6E-1
K _{pw}	(L-wat/kg-soil)	7.1E-1
C _{soil}	(mg/kg-soil)	7.3E+2
C _{soil,vap}	(µg/m ³ -air)	1.5E+8
D _{eff,s}	(cm ² /sec)	3.1E-3
D _{eff,ork}	(cm ² /sec)	5.7E-4
D _{eff,soil}	(cm ² /sec)	2.5E-5
D _{eff,ws}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	
R _{unsat}	(-)	3.1E+1
Z	(cm/event)	1.6E-1

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

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Constituent: Ethylbenzene CAS No.: 100-41-4

Risk-Based Screening Level (RBSL) Concentrations

On-site

Chemical Parameters

Units Value Reference

Groundwater Ingestion		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} THQ = 1e+0		1.0E+1
(mg/L) TR = 1e-6		NC
Soil Leaching to Groundwater Ingestion		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s THQ = 1e+0		8.9E+1
(mg/kg) TR = 1e-6		NC
Surface Soil Ingestion and Dermal Contact		None
Receptor Type / Distance (ft)		None
RBSL _{ss} THQ = 1e+0		NA
(mg/kg) TR = 1e-6		NA
Outdoor Air Inhalation		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{air} THQ = 1e+0		1.5E+3
(µg/m ³) TR = 1e-6		NC
Soil Volatilization to Outdoor Air Inhalation		Com / Constr. / 0
Receptor Type / Distance (ft)		Com / Constr. / 0
RBSL _s THQ = 1e+0		#DIV/0!
(mg/kg) TR = 1e-6		NC
Groundwater Volatilization to Outdoor Air Inhalation		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} THQ = 1e+0		>1.7E+2
(mg/L) TR = 1e-6		NC
Indoor Air Inhalation		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{air} THQ = 1e+0		1.5E+3
(µg/m ³) TR = 1e-6		NC
Soil Volatilization to Indoor Air Inhalation		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s THQ = 1e+0		>6.2E+2
(mg/kg) TR = 1e-6		NC
Groundwater Volatilization to Indoor Air Inhalation		Commercial / 0
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} THQ = 1e+0		>1.7E+2
(mg/L) TR = 1e-6		NC

Physical Properties			
MW	(g/mol)	1.1E+2	PS
Sol	(mg/L)	1.7E+2	PS
P _{vap}	(mmHg)	1.0E+1	PS
H _{vol}	(atm·m ³ /mol)	7.9E-3	PS
pK _a	(log(mol/mol))	-	-
pK _b	(log(mol/mol))	-	-
log(K _{oc})	(log(L/kg))	2.6E+0	PS
D _{air}	(cm ² /sec)	7.5E-2	PS
D _{soil}	(cm ² /sec)	7.8E-6	PS
Toxicity Data			
Wt of Evd		D	
SF _o	(1/(mg/kg/day))	-	-
SF _g	(1/(mg/kg/day))	-	-
URF _i	(1/(µg/m ³))	-	-
RfD _o	(mg/kg/day)	1.0E-1	PS
RfD _g	(mg/kg/day)	9.7E-2	TX
RfC _i	(mg/m ³)	1.0E+0	PS
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	7.4E-2	
t _{au}	(hr/event)	3.9E-1	
t _{ex}	(hr)	1.3E+0	
B	(-)	1.4E-1	
Regulatory Standards			
MCL	(mg/L)	7.0E-1	*
TWA	(mg/m ³)	4.4E+2	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)		H
t _{1/2,ground}	(d)		H

* MCL ref = 56 FR 3526 (30 Jan 91)

		Units	Value
Derived Parameters			
H	(L-wat/L-air)		3.2E-1
K _{ow}	(L-wat/kg-soil)		2.7E-1
C _{soil}	(mg/kg-soil)		6.2E+2
C _{soil,vap}	(µg/m ³ -air)		5.8E+7
D _{eff,s}	(cm ² /sec)		2.8E-3
D _{eff,crk}	(cm ² /sec)		5.0E-4
D _{eff,can}	(cm ² /sec)		2.1E-5
D _{eff,ws}	(cm ² /sec)		1.5E-3
R _{soil}	(-)		
R _{ground}	(-)		8.1E+1
Z	(cm/event)		2.7E-1

		Residential	Commercial	Construction
Cross-Media Transfer Factors				
VF _{ss}	(kg-soil/m ³ -air)	NA	NC	NC
VF _{samb}	(kg-soil/m ³ -air)	NA	1.4E-5	1.4E-5
VF _{wamb}	(m ³ -wat/m ³ -air)	NA	1.4E-5	1.4E-5
VF _{sesp}	(kg-soil/m ³ -air)	NA	6.5E-4	NA
VF _{wesp}	(m ³ -wat/m ³ -air)	NA	2.2E-3	NA
LF	(kg-soil/L-wat)	All exposures 1.1E-1		NA

NA = Not applicable; NC = Not calculated

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

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Constituent: Xylene (mixed isomers) CAS No.: 1330-20-7

Risk-Based Screening Level (RBSL) Concentrations

On-site

Chemical Parameters

Units Value Reference

Receptor Type / Distance (ft)		Commercial / 0
Groundwater Ingestion		
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>2.0E+2 NC
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	>4.9E+2 NC
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} (mg/kg)	THQ = 1e+0 TR = 1e-6	NA NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	1.0E+4 NC
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Com./Constr / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	#DIV/0! NC
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>2.0E+2 NC
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	1.0E+4 NC
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	>4.9E+2 NC
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Commercial / 0
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>2.0E+2 NC

Physical Properties			
MW	(g/mol)	1.1E+2	5
Sol	(mg/L)	2.0E+2	5
P _{vap}	(mmHg)	7.0E+0	4
H _{dm}	(atm·m ³ /mol)	7.0E-3	A
pK _a	(log(mol/mol))	-	-
pK _b	(log(mol/mol))	-	-
log(K _{oc})	(log(L/kg))	2.4E+0	A
D _{air}	(cm ² /sec)	7.2E-2	A
D _{soil}	(cm ² /sec)	8.5E-6	A
Toxicity Data			
Wt of Evd		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RfD _o	(mg/kg/day)	2.0E+0	A,R
RfD _d	(mg/kg/day)	1.8E+0	TX
RfC	(mg/m ³)	7.0E+0	A
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	8.0E-2	
t _{ex}	(hr/event)	3.9E-1	
t _{cont}	(hr)	1.4E+0	
B	(-)	1.6E-1	
Regulatory Standards			
MCL	(mg/L)	1.0E+1	*
TWA	(mg/m ³)	4.3E+2	ACGIH
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	5.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)		H
t _{1/2,soil}	(d)		H

* MCL ref = 56 FR 3526 (30 Jan 91)

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{ss} (kg-soil/m ³ -air)	NA	NC	NC
VF _{samb} (kg-soil/m ³ -air)	NA	1.8E-5	1.8E-5
VF _{wamb} (m ³ -wat/m ³ -air)	NA	1.2E-5	1.2E-5
VF _{sresp} (kg-soil/m ³ -air)	NA	8.4E-4	NA
VF _{wresp} (m ³ -wat/m ³ -air)	NA	1.9E-3	NA
LF (kg-soil/L-wat)	All exposures	1.7E-1	NA

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.9E-1
K _{ow}	(L-wat/kg-soil)	4.1E-1
C _{soil}	(mg/kg-soil)	4.9E+2
C _{soil,vap}	(µg/m ³ -air)	4.0E+7
D _{eff,s}	(cm ² /sec)	2.6E-3
D _{eff,soil}	(cm ² /sec)	4.8E-4
D _{eff,soil}	(cm ² /sec)	2.1E-5
D _{eff,soil}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	
R _{unsoil}	(-)	5.4E+1
Z	(cm/event)	2.9E-1

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

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Constituent: Methyl t-Butyl ether CAS No.: 1634-04-4

Risk-Based Screening Level (RBSL) Concentrations

On-site

Receptor Type / Distance (ft)		Commercial / 0
Groundwater Ingestion		
Receptor Type / Distance (ft)	Commercial / 0	
RBSL _{gw} THQ = 1e+0	1.0E+0	
(mg/L) TR = 1e-6	NC	
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)	Commercial / 0	
RBSL _s THQ = 1e+0	4.0E-1	
(mg/kg) TR = 1e-6	NC	
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)	None	
RBSL _{ss} THQ = 1e+0	NA	
(mg/kg) TR = 1e-6	NA	
Outdoor Air Inhalation		
Receptor Type / Distance (ft)	Commercial / 0	
RBEL _{air} THQ = 1e+0	4.4E+3	
(µg/m ³) TR = 1e-6	NC	
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)	Com / Constr / 0	
RBSL _s THQ = 1e+0	#DIV/0!	
(mg/kg) TR = 1e-6	NC	
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)	Commercial / 0	
RBSL _{gw} THQ = 1e+0	>4.8E+4	
(mg/L) TR = 1e-6	NC	
Indoor Air Inhalation		
Receptor Type / Distance (ft)	Commercial / 0	
RBEL _{air} THQ = 1e+0	4.4E+3	
(µg/m ³) TR = 1e-6	NC	
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)	Commercial / 0	
RBSL _s THQ = 1e+0	2.5E+3	
(mg/kg) TR = 1e-6	NC	
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)	Commercial / 0	
RBSL _{gw} THQ = 1e+0	1.6E+4	
(mg/L) TR = 1e-6	NC	

Chemical Parameters

Units	Value	Reference
Physical Properties		
MW (g/mol)	8.8E+1	5
Sol (mg/L)	4.8E+4	A
P _{vap} (mmHg)	2.5E+2	-
H _{atm} (atm·m ³ /mol)	5.8E-4	-
pK _a (log(mol/mol))	-	-
pK _b (log(mol/mol))	-	-
log(K _{oc}) (log(L/kg))	1.1E+0	A
D _{air} (cm ² /sec)	7.9E-2	6
D _{soil} (cm ² /sec)	9.4E-5	7
Toxicity Data		
WT of Evd	-	-
SF _o (1/(mg/kg/day))	-	-
SF _d (1/(mg/kg/day))	-	-
URF _i (1/(µg/m ³))	-	-
RD _o (mg/kg/day)	1.0E-2	31
RD _d (mg/kg/day)	8.0E-3	TX
RfC _i (mg/m ³)	3.0E+0	R
Dermal Exposure Parameters		
RAF _d (mg/mg)	5.0E-1	-
K _p (cm/hr)	-	-
tau _d (hr/event)	-	-
t _{ore} (hr)	-	-
B (-)	-	-
Regulatory Standards		
MCL (mg/L)	-	-
TWA (mg/m ³)	6.0E+1	NIOSH
AQL (mg/L)	-	-
Miscellaneous Parameters		
ADL _{gw} (mg/L)	-	-
ADL _s (mg/kg)	-	-
t _{1/2,soil} (d)	-	H
t _{1/2,unsoil} (d)	-	H

* MCL ref = -

Units	Residential	Commercial	Construction
Crust-Media Transfer Factors			
VF _{ss} (kg-soil/m ³ -air)	NA	NC	NC
VF _{samb} (kg-soil/m ³ -air)	NA	2.5E-5	2.5E-5
VF _{wamb} (m ³ -wat/m ³ -air)	NA	1.9E-6	1.9E-6
VF _{seps} (kg-soil/m ³ -air)	NA	1.8E-3	NA
VF _{wesp} (m ³ -wat/m ³ -air)	NA	2.8E-4	NA
LF (kg-soil/L-wat)	All exposures	2.5E+0	NA

Units	Value
Derived Parameters	
H (L-wat/L-air)	2.4E-2
K _{ow} (L-wat/kg-soil)	6.0E+0
C _{soil} (mg/kg-soil)	8.0E+3
C _{soil,vap} (µg/m ³ -air)	1.2E+9
D _{eff,s} (cm ² /sec)	3.0E-3
D _{eff,ork} (cm ² /sec)	8.7E-4
D _{eff,osp} (cm ² /sec)	5.1E-4
D _{eff,ws} (cm ² /sec)	2.9E-3
R _{soil} (-)	-
R _{unsoil} (-)	3.7E+0
Z (cm/event)	-

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

6 of 7

Constituent: Naphthalene CAS No.: 91-20-3

Risk-Based Screening Level (RBSL) Concentrations

Chemical Parameters

		On-site	
Groundwater Ingestion			
Receptor Type / Distance (ft)		Commercial / 0	
RBSL _{gw} THQ = 1e+0 (mg/L)	TR = 1e-6	>3.1E+1	NC
Soil Leaching to Groundwater Ingestion			
Receptor Type / Distance (ft)		Commercial / 0	
RBSL _s THQ = 1e+0 (mg/kg)	TR = 1e-6	>6.2E+2	NC
Surface Soil Ingestion and Dermal Contact			
Receptor Type / Distance (ft)		None	
RBSL _{ss} THQ = 1e+0 (mg/kg)	TR = 1e-6	NA	NA
Outdoor Air Inhalation			
Receptor Type / Distance (ft)		Commercial / 0	
RBEL _{air} THQ = 1e+0 (µg/m ³)	TR = 1e-6	2.0E+3	NC
Soil Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)		Com / Constr / 0	
RBSL _s THQ = 1e+0 (mg/kg)	TR = 1e-6	#DIV/0!	NC
Groundwater Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)		Commercial / 0	
RBSL _{gw} THQ = 1e+0 (mg/L)	TR = 1e-6	>3.1E+1	NC
Indoor Air Inhalation			
Receptor Type / Distance (ft)		Commercial / 0	
RBEL _{air} THQ = 1e+0 (µg/m ³)	TR = 1e-6	2.0E+3	NC
Soil Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)		Commercial / 0	
RBSL _s THQ = 1e+0 (mg/kg)	TR = 1e-6	>6.2E+2	NC
Groundwater Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)		Commercial / 0	
RBSL _{gw} THQ = 1e+0 (mg/L)	TR = 1e-6	>3.1E+1	NC

Units	Value	Reference
Physical Properties		
MW (g/mol)	1.3E+2	PS
Sol (mg/L)	3.1E+1	PS
P _{vap} (mmHg)	2.3E-1	PS
H _{atm} (atm·m ³ /mol)	4.8E-4	PS
pK _a (log(mol/mol))	-	-
pK _b (log(mol/mol))	-	-
log(K _{oc}) (log(L/kg))	3.3E+0	PS
D _{soil} (cm ² /sec)	5.9E-2	PS
D _{soil} (cm ² /sec)	7.5E-6	PS
Toxicity Data		
Wt of Evid	D	
SF _o (1/(mg/kg/day))	-	-
SF _d (1/(mg/kg/day))	-	-
URF _i (1/(µg/m ³))	-	-
RI _{D_o} (mg/kg/day)	4.0E-1	PS
RI _{D_d} (mg/kg/day)	3.6E-1	TX
RI _{C_i} (mg/m ³)	1.4E+0	PS
Dermal Exposure Parameters		
RAF _d (mg/mg)	5.0E-2	D
K _o (cm/hr)	6.9E-2	
ta _{U_d} (hr/event)	5.3E-1	
t _{soil} (hr)	2.2E+0	
B (-)	2.0E-1	
Regulatory Standards		
MCL (mg/L)	-	*
TWA (mg/m ³)	5.0E+1	PS
AQL (mg/L)	-	-
Miscellaneous Parameters		
ADL _{gw} (mg/L)	1.0E-2	32
ADL _s (mg/kg)	1.0E-2	32
t _{1/2,soil} (d)		H
t _{1/2,ground} (d)		H

* MCL ref = -

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{ss} (kg-soil/m ³ -air)	NA	NC	NC
VF _{samb} (kg-soil/m ³ -air)	NA	1.3E-7	1.3E-7
VF _{wamb} (m ³ -wat/m ³ -air)	NA	1.0E-6	1.0E-6
VF _{sresp} (kg-soil/m ³ -air)	NA	6.3E-6	NA
VF _{wesp} (m ³ -wat/m ³ -air)	NA	1.2E-4	NA
LF (kg-soil/L-wat)	All exposures	2.1E-2	NA

Units	Value
Derived Parameters	
H (L-wat/L-air)	2.0E-2
K _{gw} (L-wat/kg-soil)	5.0E-2
C _{soil} (mg/kg-soil)	6.2E+2
C _{soil,vap} (µg/m ³ -air)	1.6E+6
D _{eff,s} (cm ² /sec)	2.2E-3
D _{eff,soil} (cm ² /sec)	4.3E-4
D _{eff,comp} (cm ² /sec)	6.2E-5
D _{eff,ws} (cm ² /sec)	1.8E-3
R _{soil} (-)	
R _{ground} (-)	4.4E+2
Z (cm/event)	2.7E-1

NA = Not applicable; NC = Not calculated
 Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Definitions

Risk-Based Screening Level Concentrations	
RBSL _{gw}	Risk-based screening level for groundwater (mg/L)
RBSL _s	Risk-based screening level for soil (mg/kg)
RBEL _{air}	Risk-based exposure limit for air (µg/m ³)
THQ	Target hazard quotient
TR	Target risk

Cross-Media Transfer Factors	
VF _{so}	Volatilization factor, surface soil to outdoor air (kg-soil/L-air)
VF _{subsoil}	Volatilization factor, subsurface soil to outdoor air (kg-soil/L-air)
VF _{subsoil-gw}	Volatilization factor, groundwater to outdoor air (L-wat/L-air)
VF _{subsoil-air}	Volatilization factor, subsurface soil to indoor air (kg-soil/L-air)
VF _{subsoil-gw-air}	Volatilization factor, groundwater to indoor air (L-wat/L-air)
LF	Leaching factor, soil to groundwater (kg-soil/L-wat)

Cross-Media Transfer Factors	
DAF _{gw}	Dilution-attenuation factor, groundwater (-)
DAF _{gw-soil}	Dilution-attenuation factor, soil leaching to groundwater (-)

Physical Properties	
MW	Molecular weight (g/mol)
Sol	Aqueous solubility limit (mg/L)
P _{vapor}	Vapor pressure (mmHg)
H _{Henry}	Henry's Law constant (atm·m ³ /mol)
pK _a	Acid ionization constant (log(mol/mol))
pK _b	Base ionization constant (log(mol/mol))
K _{oc}	Organic carbon/Water partition coefficient (L/kg)
K _d	Soil/Water distribution coefficient (L/kg)
D _{air}	Molecular diffusion coefficient in air (cm ² /sec)
D _{water}	Molecular diffusion coefficient in water (cm ² /sec)

Toxicity Data	
Wt of Evid	Weight of evidence
SF _o	Oral slope factor for carcinogens (1/(mg/kg/day))
SF _d	Dermal slope factor for carcinogens (1/(mg/kg/day))
URF _i	Inhalation unit risk factor for carcinogens (1/µg/m ³)
RD _o	Oral reference dose (mg/kg/day)
RD _d	Dermal reference dose (mg/kg/day)
RIC _i	Inhalation reference concentration (mg/m ³)

Dermal Exposure Parameters	
RAF _d	Dermal relative absorption factor (mg/mg)
K _p	Dermal permeability coeff. (cm/hr)
tau _d	Lag time for dermal exposure (hr/event)
t _{crit}	Critical exposure time (hr)
B	Relative contribution of permeability coeff. (-)

Regulatory Standards	
MCL	Maximum contaminant level for drinking water protection (mg/L)
TWA	Time-weighted average workplace air criterion (mg/m ³)
AQL	Aquatic life protection criterion (mg/L)

Miscellaneous Parameters	
ADL _{gw}	Analytical detection limit in groundwater (mg/L)
ADL _s	Analytical detection limit in soil (mg/kg)
t _{1/2,sat}	Half life, saturated zone (d)
t _{1/2,unsat}	Half life, unsaturated zone (d)

Derived Parameters	
H	Dimensionless Henry's Law constant (L-wat/L-air)
K _{ow}	Soil to pore-water partitioning factor (L-wat/kg-soil)
C _{sat}	Saturated residual conc. in vadose zone soils (mg/kg-soil)
C _{sat,vapor}	Saturated concentration in vapors (mg/m ³ -air)
D _{eff,v}	Effective diffusion coeff. in vadose zone soils (cm ² /sec)
D _{eff,crack}	Effective diffusion coeff. in foundation cracks (cm ² /sec)
D _{eff,capillary}	Effective diffusion coeff. in capillary zone (cm ² /sec)
D _{eff,water}	Effective diffusion coeff., water table to ground surface (cm ² /sec)
R _{sat}	Retardation factor, saturated zone (-)
R _{unsat}	Retardation factor, unsaturated zone (-)
Z	Water to skin dermal absorption factor (cm ² /event)

Chemical Parameter References

PS	Standard Provisional Guide for Risk-Based Corrective Action, ASTM PS 104-98
A	Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites
D	USEPA, Dermal Exposure Assessment: Principles and Applications, ORD, EPA/600/6-91/011B
H	Howard, Handbook of Environmental Degradation Rates, Lewis Publishers, Chelsea, MI, 1999
R	EPA Region II Risk Based Concentration Table, EPA Region 3, March 7, 1995
S	USEPA, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, OSWER, November 1986
T	TPH Criteria Working Group, 1996
TX	TRRC: Risk-Based Corrective Action for Leaking Storage Tank Sites, January 1994
3	based on Kow from (2) and DiToro, D. M., 1988: "A Particle Interaction Model of Reversible Organic Chemical Sorption", Chemosphere, 14(10), 1505-1536. log(Koc) = 0.00028 + 0.983 log(Kow)
4	USEPA, 1989: Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) - USEPA, OAGPS, Air Emission Models, (EPA-450/3-87-026)
5	Vanclueren, Karel, 1983: Handbook of Environmental data on organic Chemicals, Second Ed., (Van nostrand Reinhold Company Inc., New York), ISBN: 0-442-28802-6
6	Calculated diffusivity using the method of Fuller, Schettler, and Giddings from (9)
7	Calculated diffusivity using the method of Hayduk and Laudie and the reference from (9)
8	Calculated using Kenaga and Gong Kow/solubility regression equation reference (9) and Kow data from (2), log(S, mg/l) = -0.922 log(Kow) + 4.184
9	Handbook of Chemical Property Estimation Methods, 1982, W.J. Lyman, (McGraw-Hill, New York), ISBN: 0-07-039175-0
10	Calculated from (Pw/Patm)/(solubility/mol wt)
11	Back calculated from solubility, Note (9) and (3)
12	Aldrich Chemical Catalog, 1991
13	Calculated using Modified Watson Correlation from (9) and normal boiling point
14	USEPA, 1979: Water Related Environmental Fate of 129 Priority Pollutants, Vol. 1, USEPA, OWDPS (EPA-440/4-79-029a)
15	The Agrochemicals Handbook, (The Royal Society of Chemistry, The University, Nottingham, England), ISBN 0-85186-406-6
16	Vapor pressure specified at elevated temperature, adjustments to 25C using methods presented by (9)
17	Wouchupe, R. D., T. M. Butler, A. G. Homsby, P. W. M. Augustyn-Beckers, and J.P. Bud, 1992: "The SCS/AR/ICES Pesticide Properties Database for Environmental Decision Making", Reviews of Environmental Contamination and Toxicology, vol 123, 1-155.
18	Firm Chemicals Handbook 91, C. Sine, ed., (Meister Publishing Company, Willoughby, Ohio)
19	Structure and Nomenclature Search System, (Version 7.00/7.03) December, 1992
20	From Syracuse Research Corporation Calculated Value from pchem-pcgams, 1988, ref no. 295435 in Enrolite database, Accession no. 105643
23	NIOSH, 1980: Pocket Guide to Chemical Hazards, (U.S. Dept. of Health & Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health)
24	Buchtar, B. et al., 1989: Correlation of Greulich Kd and N retention Parameters with Soils and Elements, Soil Science, 148, 370-379
25	USEPA, 1993: Air/Superfund National Technical Guidance Study series: Estimation of Air Impacts for Thermal Desorption Units Used at Superfund Sites, US Environmental Protection Agency, Office of Air Quality Planning and Standards, EPA-451/R-93-005
26	NTIS Accession No. PB93-215633, April 1993
27	Based on salt solubilities in Table 3-120, R. H. Perry and D. W. Green, "Perry's Chemical Engineering Handbook" Sixth Edition, (McGraw-Hill, New York), 1973
28	Based on salt solubilities in Table of Physical Constants for Inorganic Compounds, Weast, R. C., CRC Handbook of Chemistry and Physics, 67th edition, (CRC Press, Inc., Boca Raton), 1967
29	Montgomery and Wilkom, "Groundwater Chemicals Desk Reference", Lewis Publishers, Chelsea, MI, 1993
30	USEPA, 1996: Soil Screening Guidance, Technical Background Doc., (EPA/600/6-96/26)
31	TRRC Risk Reduction Rule Implementation, July 23, 1996. (update to Reference "D")
32	USEPA, Method 82/DC, Revision 3, "Semi-volatile Organic Compounds by GC/MS", December 1996
33	40 CFR 131.36, July 1, 1987
34	40 CFR 141.23, July 1, 1997
35	USEPA, Manual for the Certification of Laboratories Analyzing Drinking Water, EPA 815-B-97-001, March 1997
36	Calculated using Chou et al. equation reported in (9), S (µmol/L) from (15)
37	Calculated using Chou et al. equation reported in (9), S (µmol/L) from (23)
38	Calculated using Chou et al. equation reported in (9), S (µmol/L) from (4)

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 5-Apr-01

Job ID: 971275

SOIL (15 - 25 ft) RBSL VALUES

Target Risk (Class A & B) 1.0E-6
 Target Risk (Class C) 1.0E-5
 Target Hazard Quotient 1.0E+0

RBSL Results for Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN	Representative Concentration (mg/kg)	RBSL Results for Complete Exposure Pathways ("X" if Complete)											Applicable RBSL (mg/kg)	RBSL Exceeded? "X" if yes	Required CRF Only if "yes" list
		Soil Leaching to Groundwater Ingestion			Soil Vol. to Indoor Air		Soil Volatilization to Outdoor Air				Surface Soil Inhalation, Ingestion, Dermal Contact				
		On-site (0 ft)	NA	NA	On-site (0 ft)	On-site (0 ft)	Construction Worker	NA	NA	On-site (0 ft)	Construction Worker				
CAS No.	Name	(mg/kg)	Commercial	NA	NA	Commercial	Commercial	Construction Worker	NA	NA	None	Construction Worker	(mg/kg)		
71-43-2	Benzene	1.4E+0	1.5E-2	NA	NA	1.6E-1	1.8E+1	NA	NA	NA	NA	NA	1.5E-2	■	9.1E+1
108-88-3	Toluene	1.1E+1	6.8E+1	NA	NA	3.8E+2	>7.3E+2	NA	NA	NA	NA	NA	6.8E+1	□	<1
100-41-4	Ethylbenzene	1.2E+1	8.8E+1	NA	NA	>6.2E+2	>6.2E+2	NA	NA	NA	NA	NA	8.9E+1	□	<1
1330-20-7	Xylene (mixed isomers)	7.2E+1	>4.9E+2	NA	NA	>4.9E+2	>4.9E+2	NA	NA	NA	NA	NA	>4.9E+2	□	NA
1634-04-4	Methyl t-Butyl ether	0.0E+0	4.0E-1	NA	NA	2.5E+3	>8.0E+3	NA	NA	NA	NA	NA	4.0E-1	□	<1
91-20-3	Naphthalene	0.0E+0	>6.2E+2	NA	NA	>6.2E+2	>6.2E+2	NA	NA	NA	NA	NA	>6.2E+2	□	NA

">" indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

use 1.6E-1 for appl. RBSL

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

GROUNDWATER RBSL VALUES

Target Risk (Class A & B) 1.0E-6

Target Risk (Class C) 1.0E-5

Target Hazard Quotient 1.0E+0

RBSL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration (mg/L)	X Groundwater Ingestion			X GW Vol. to Indoor Air	X Groundwater Volatilization to Outdoor Air			Applicable RBSL (mg/L)	RBSL Exceeded ?
			On-site (0 ft) Commercial	NA	NA	On-site (0 ft) Commercial	On-site (0 ft) Commercial	NA	NA		
71-43-2	Benzene	5.0E+0	9.9E-3	NA	NA	2.7E-1	4.1E+1	NA	NA	9.9E-3	■
108-88-3	Toluene	4.2E+0	2.0E+1	NA	NA	2.9E+2	>5.2E+2	NA	NA	2.0E+1	□
100-41-4	Ethylbenzene	1.9E+0	1.0E+1	NA	NA	>1.7E+2	>1.7E+2	NA	NA	1.0E+1	□
1330-20-7	Xylene (mixed isomers)	9.0E+0	>2.0E+2	NA	NA	>2.0E+2	>2.0E+2	NA	NA	>2.0E+2	□
1634-04-4	Methyl t-Butyl ether	2.6E-1	1.0E+0	NA	NA	1.6E+4	>4.8E+4	NA	NA	1.0E+0	□
91-20-3	Naphthalene	3.5E-1	>3.1E+1	NA	NA	>3.1E+1	>3.1E+1	NA	NA	>3.1E+1	□

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

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1 OF 1

Required CRF
Only if "yes" left
5.1E+2
<1
<1
NA
<1
NA

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 8-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
		Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	1.0E+0	1.0E+0	1.4E+0	5.0E+0
108-88-3	Toluene	1.1E+1	4.2E+0	1.0E+0	1.0E+0	1.1E+1	4.2E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	1.0E+0	1.0E+0	1.2E+1	1.9E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	1.0E+0	1.0E+0	7.2E+1	9.0E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	1.0E+0	1.0E+0	0.0E+0	2.6E-1
91-20-3	Naphthalene	0.0E+0	3.5E-1	1.0E+0	1.0E+0	0.0E+0	3.5E-1

Cumulative Values:

RBCA Tool Kit for Chemical Releases, Version 1.3a

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

2 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Commercial		Commercial		None		Commercial	
		Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	2.0E-7	1.1E-2	2.7E-5	1.5E+0			5.1E-4	1.6E+1
108-88-3	Toluene		6.4E-4		4.5E-2				2.1E-1
100-41-4	Ethylbenzene		1.4E-4		8.3E-3				1.9E-1
1330-20-7	Xylene (mixed isomers)		1.4E-4		7.6E-3				6.1E-2
1634-04-4	Methyl t-Butyl ether		1.2E-7		1.7E-5				2.6E-1
91-20-3	Naphthalene		1.7E-7		2.0E-5				8.5E-3
Cumulative Values:		2.0E-7	1.2E-2	2.7E-5	1.6E+0	0.0E+0	0.0E+0	5.1E-4	1.7E+1

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: FALSE

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		None		None		None		None	
CAS No.	Name	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0	Target Risk 1.0E-6 / 1.0E-5	Target HQ 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene								
108-88-3	Toluene								
100-41-4	Ethylbenzene								
1330-20-7	Xylene (mixed isomers)								
1634-04-4	Methyl t-Butyl ether								
91-20-3	Naphthalene								
Cumulative Values:		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

■ Indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS (16 - 26 ft):
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³) (1)/(2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	1.4E+0	3.6E+4			3.9E-5		
Toluene	1.1E+1	3.6E+4			3.2E-4		
Ethylbenzene	1.2E+1	7.0E+4			1.7E-4		
Xylene (mixed isomers)	7.2E+1	5.4E+4			1.3E-3		
Methyl t-Butyl ether	0.0E+0	4.0E+4			0.0E+0		
Naphthalene	0.0E+0	7.8E+6			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (16 - 25 ft):
 VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	NA	NA	Commercial	NA	NA
Benzene	2.4E-1			9.4E-6		
Toluene	6.8E-1			2.2E-4		
Ethylbenzene	6.8E-1			1.2E-4		
Xylene (mixed isomers)	6.8E-1			9.2E-4		
Methyl t-Butyl ether	6.8E-1			0.0E+0		
Naphthalene	6.8E-1			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR
INHALATION

Constituents of Concern	Exposure Concentration						
	1) Source Medium	2) NAF Value (m ³ L)			3) Exposure Medium		
	Groundwater Conc. (mg/L)	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	Outdoor Air: POE Conc. (mg/m ³) (1)/(2)		
					On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	5.0E+0	8.4E+4			6.0E-5		
Toluene	4.2E+0	7.7E+4			5.5E-5		
Ethylbenzene	1.9E+0	7.1E+4			2.7E-5		
Xylene (mixed isomers)	9.0E+0	8.2E+4			1.1E-4		
Methyl t-Butyl ether	2.6E-1	5.2E+5			5.1E-7		
Naphthalene	3.5E-1	9.9E+5			3.5E-7		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR
 INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EF×ED)(AT×365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	NA	NA	Commercial	NA	NA
Benzene	2.4E-1			1.5E-5		
Toluene	6.8E-1			3.8E-5		
Ethylbenzene	6.8E-1			1.8E-5		
Xylene (mixed isomers)	6.8E-1			7.5E-5		
Methyl t-Butyl ether	6.8E-1			3.5E-7		
Naphthalene	6.8E-1			2.4E-7		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

7 OF 7

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)

(Sum average exposure concentrations from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	Construction Worker	NA	NA
Benzene	2.4E-5			
Toluene	2.5E-4			
Ethylbenzene	1.4E-4			
Xylene (mixed isomers)	9.9E-4			
Methyl t-Butyl ether	3.5E-7			
Naphthalene	2.4E-7			

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³)						(3) Inhalation Unit Risk Factor (ugm ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000		
		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)			Off-site 1 (0 ft)		
		Commercial	Construction Worker	NA	NA	Commercial	Construction Worker		NA		
Benzene	A	2.4E-5					8.3E-6	2.0E-7			
Toluene	D										
Ethylbenzene	D										
Xylene (mixed isomers)	D										
Methyl t-Butyl ether	-										
Naphthalene	D										

Total Pathway Carcinogenic Risk = 2.0E-7

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

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Off-site 2
(0 ft)
NA

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)				(6) Inhalation Reference Conc. (mg/m ³)	(7) Individual COC Hazard Quotient (5)/(6)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	Construction Worker	NA	NA		Commercial	Construction Worker	NA	NA
Benzene	6.7E-5				6.0E-3	1.1E-2			
Toluene	2.5E-4				4.0E-1	6.4E-4			
Ethylbenzene	1.4E-4				1.0E+0	1.4E-4			
Xylene (mixed isomers)	9.9E-4				7.0E+0	1.4E-4			
Methyl t-Butyl ether	3.5E-7				3.0E+0	1.2E-7			
Naphthalene	2.4E-7				1.4E+0	1.7E-7			

Total Pathway Hazard Index = 1.2E-2

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS (16 - 26 ft): VAPOR

INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor	3) Exposure Medium	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)	5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)
	Soil Conc. (mg/kg)	Commercial	Indoor Air POE Conc. (mg/m ³) (1) / (2) Commercial	Commercial	Commercial
Benzene	1.4E+0	3.2E+2	4.3E-3	2.4E-1	1.0E-3
Toluene	1.1E+1	6.4E+2	1.8E-2	6.8E-1	1.2E-2
Ethylbenzene	1.2E+1	1.5E+3	7.9E-3	6.8E-1	5.4E-3
Xylene (mixed isomers)	7.2E+1	1.2E+3	6.1E-2	6.8E-1	4.2E-2
Methyl t-Butyl ether	0.0E+0	5.6E+2	0.0E+0	6.8E-1	0.0E+0
Naphthalene	0.0E+0	1.6E+5	0.0E+0	6.8E-1	0.0E+0

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

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RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

**GROUNDWATER: VAPOR INTRUSION
INTO ON-SITE BUILDINGS**

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /L) Receptor	3) Exposure Medium Indoor Air: POE Conc. (mg/m ³) (1) / (2)	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)
	Groundwater Conc. (mg/L)	Commercial	Commercial	Commercial
Benzene	5.0E+0	5.5E+2	9.1E-3	2.4E-1
Toluene	4.2E+0	5.0E+2	8.4E-3	6.8E-1
Ethylbenzene	1.9E+0	4.6E+2	4.2E-3	6.8E-1
Xylene (mixed isomers)	9.0E+0	5.3E+2	1.7E-2	6.8E-1
Methyl t-Butyl ether	2.6E-1	3.6E+3	7.3E-5	6.8E-1
Naphthalene	3.5E-1	8.5E+3	4.1E-5	6.8E-1

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

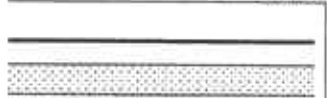
Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275



5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)
Commercial
2.2E-3
5.8E-3
2.9E-3
1.2E-2
5.0E-5
2.8E-5



RBCA SITE ASSESSMENT

3 OF 3

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)
*(Sum average exposure concentrations
 from soil and groundwater routes.)*

Constituents of Concern	Commercial
Benzene	3.3E-3
Toluene	1.8E-2
Ethylbenzene	8.3E-3
Xylene (mixed isomers)	5.3E-2
Methyl t-Butyl ether	5.0E-5
Naphthalene	2.8E-5

Site Name: Arrow Rentals Date Completed: 6-Apr-01
 Site Location: 187 North L Street, Livermore, Call Job ID: 971275
 Completed By: Aquifer Sciences, Inc.

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³ s)	(3) Inhalation Unit Risk Factor (µg/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000
		Commercial		Commercial
Benzene	A	3.3E-3	8.3E-6	2.7E-5
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			
Methyl t-Butyl ether	-			
Naphthalene	D			

Total Pathway Carcinogenic Risk = 2.7E-5

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

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TIER 1 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS **(CHECKED IF PATHWAYS ARE ACTIVE)**

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)	(6) Inhalation Reference Concentration (mg/m ³)	(7) Individual COC Hazard Quotient (5) / (6)
	Commercial		Commercial
Benzene	9.2E-3	6.0E-3	1.5E+0
Toluene	1.8E-2	4.0E-1	4.5E-2
Ethylbenzene	8.3E-3	1.0E+0	8.3E-3
Xylene (mixed isomers)	5.3E-2	7.0E+0	7.6E-3
Methyl t-Butyl ether	5.0E-5	3.0E+0	1.7E-5
Naphthalene	2.8E-5	1.4E+0	2.0E-5

Total Pathway Hazard Index = 1.6E+0

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (L/ig) Receptor			3) Exposure Medium Groundwater POE Conc. (mg/L) (1)/(2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	1.4E+0	1.5E+0			9.0E-1		
Toluene	1.1E+1	3.3E+0			3.4E+0		
Ethylbenzene	1.2E+1	8.8E+0			1.4E+0		
Xylene (mixed isomers)	7.2E+1	5.8E+0			1.2E+1		
Methyl t-Butyl ether	0.0E+0	4.0E-1			0.0E+0		
Naphthalene	0.0E+0	4.7E+1			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR x EF x ED) / (BW x AT) (L/kg-day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	NA	NA	Commercial	NA	NA
Benzene	3.5E-3			3.2E-3		
Toluene	9.8E-3			3.3E-2		
Ethylbenzene	9.8E-3			1.4E-2		
Xylene (mixed isomers)	9.8E-3			1.2E-1		
Methyl t-Butyl ether	9.8E-3			0.0E+0		
Naphthalene	9.8E-3			0.0E+0		

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (unitless) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	5.0E+0	1.0E+0			5.0E+0		
Toluene	4.2E+0	1.0E+0			4.2E+0		
Ethylbenzene	1.9E+0	1.0E+0			1.9E+0		
Xylene (mixed isomers)	9.0E+0	1.0E+0			9.0E+0		
Methyl t-Butyl ether	2.6E-1	1.0E+0			2.6E-1		
Naphthalene	3.5E-1	1.0E+0			3.5E-1		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

APPENDIX D

TIER 1 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL SCENARIO

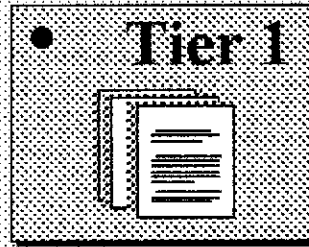
Main Screen

RBCA Tool Kit for Chemical Releases
Version 1.3a © 2000

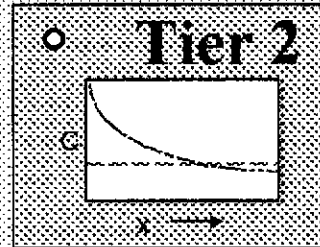
1. Project Information

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.
 Date: 6-Apr-01 Job ID: 971275

2. Which Type of RBCA Analysis?



Tier 1
 Generic Values
 On-Site
 Exposure



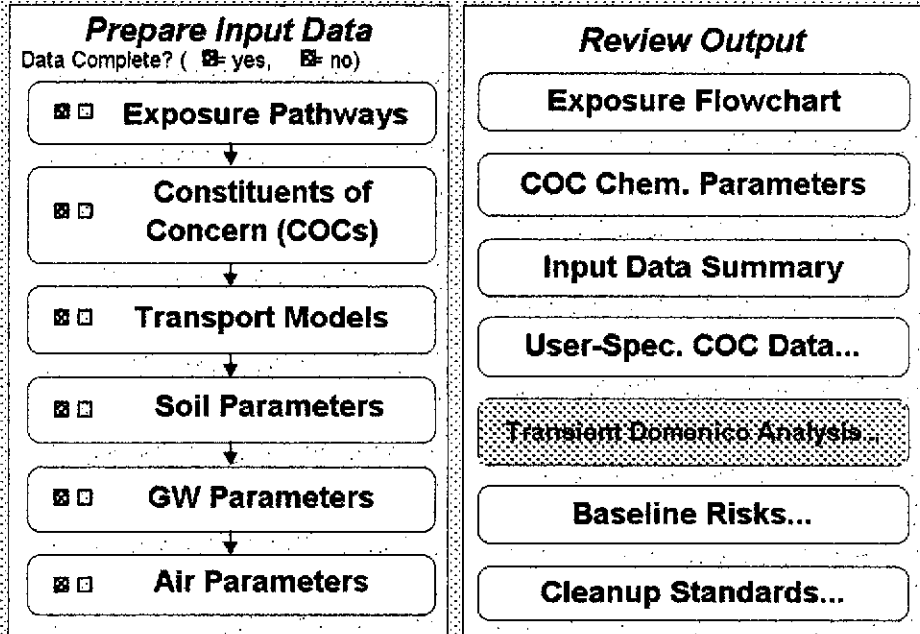
Tier 2
 Site-Specific Values
 On- or Off-Site Exposure

3. Calculation Options

Affects which input data are required

- Baseline Risks (Forward mode)**
- RBCA Cleanup Standards (Backward mode)**

4. RBCA Evaluation Process



5. Commands and Options

Exposure Pathway Identification

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

Receptor Res.

Type: On-site Off-site1 Off-site2

Source Media:

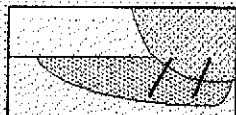
Affected Groundwater

Affected Soils Leaching to Groundwater

Distance to GW receptors

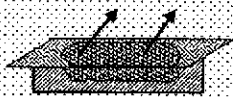
On-site	Off-site1	Off-site2	(ft)
0			
On-site	Off-site1	Off-site2	(ft)
0			

GW Discharge to Surface Water Exposure



- Swimming
- Fish Consumption
- Aquatic Life Protection
-

2. Surface Soil Exposure



Direct Ingestion and Dermal Contact

Receptor None

Type: On-site No off-site receptors

Construction Worker

Site Name: Arrow Rentals

Location: 187 North L Street, Livermore, California

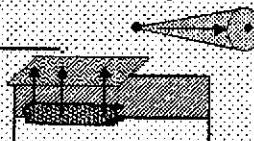
Compl. By: Aquifer Sciences, Inc.

Job ID: 971275

Date: 6-Apr-01

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation



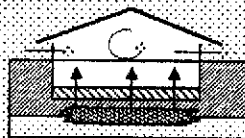
Receptor Res.

Type: On-site Off-site1 Off-site2

0 (ft)

Construction worker

- Affected Soils--Volatilization to Ambient Outdoor Air
- Affected Groundwater--Volatilization to Ambient Outdoor Air
- Affected Surface Soils--Particulates to Ambient Outdoor Air



Volatilization to Indoor Air Inhalation

Receptor Res.

Type: On-site No off-site receptors

- Affected Soils--Volatilization to Enclosed Space
- Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options

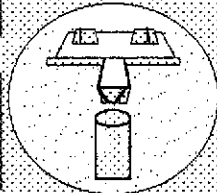
-
- Exposure Factors & Target Risks

Exposure Factors and Target Risk Limits

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc
 Job ID: 971275 Date: 6-Apr-01

1. Exposure Parameters

Age Adjustment?	Residential		Commercial	
	Adult	(Age 0-6) (Age 0-16)	Chronic	Construc
Averaging time, carcinogens (yr)	70			
Averaging time, non-carcinogens (yr)	30		25	1
Body weight (kg)	70	15 35	70	
Exposure duration (yr)	30	6 16	25	1
Exposure frequency (days/yr)	350		250	180
Dermal exposure frequency (days/yr)	350		250	
Skin surface area, soil contact (cm ²)	<input type="checkbox"/> 5800	2023	5800	5800
Soil dermal adherence factor (mg/cm ² /day)	1			
Water ingestion rate (L/day)	2		1	
Soil ingestion rate (mg/day)	<input type="checkbox"/> 100	200	50	100
Swimming exposure time (hr/event)	3			
Swimming event frequency (events/yr)	12	12 12		
Swimming water ingestion rate (L/hr)	<input type="checkbox"/> 0.05	0.5		
Skin surface area, swimming (cm ²)	<input type="checkbox"/> 23000	8100		
Fish consumption rate (kg/day)	0.025			
Contaminated fish fraction (unitless)	1			



2. Risk Goal Calculation Options

- Individual Constituent Risk Goals Only
- Individual and Cumulative Risk Goals

3. Target Health Risk Limits

	Individual	Cumulative
Target Risk (Class A/B carcin.)	1.0E-6	1.0E-5
Target Risk (Class C carcinogens)	1.0E-5	
Target Hazard Quotient	1.0E+0	
Target Hazard Index		1.0E+0

4. Commands and Options

Return to Exposure Pathways

Use Default Values

Print Sheet

Help

Exposure Pathway Flowchart

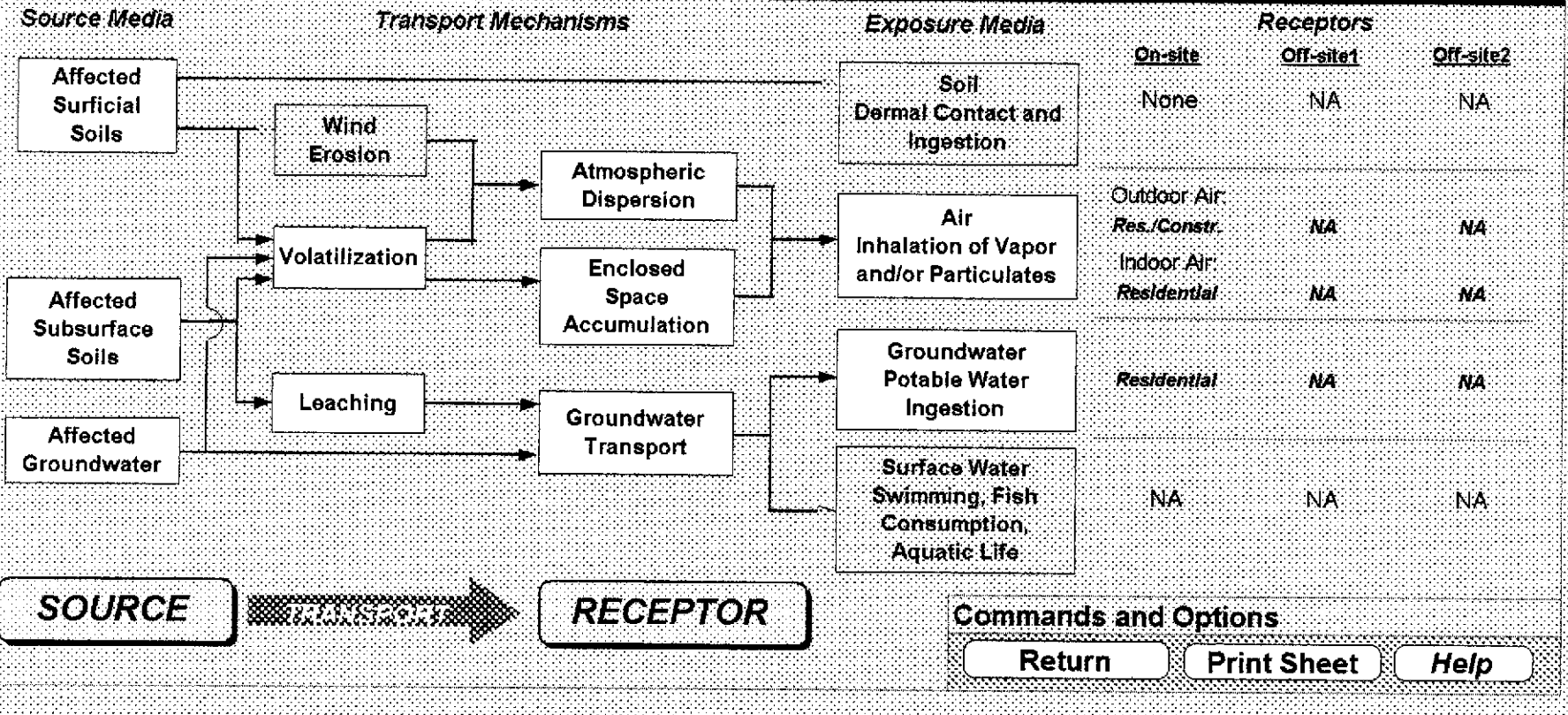
Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 6-Apr-01

Compl. By: Aquifer Sciences, Inc.



Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.

Job ID: 971275
 Date: 6-Apr-01

Commands and Options

Main Screen

Print Sheet

Help

Source Media Constituents of Concern (COCs)

Selected COCs

COC Select: Sort List:

Benzene
Toluene
Ethylbenzene
Xylene (mixed isomers)
Methyl t-Butyl ether
Naphthalene

Representative COC Concentration

Groundwater Source Zone

Enter Site Data

(mg/L)	note
5.1E+0	95% UCL at W-1s/W-Bs
3.9E+0	95% UCL at W-1s/W-Bs
1.9E+0	95% UCL at W-1s/W-Bs
9.2E+0	95% UCL at W-1s/W-Bs
2.7E-1	95% UCL at W-1s/W-Bs
3.8E-1	95% UCL at W-1s/W-Bs

Soil Source Zone

Enter Site Data

(mg/kg)	note
1.4E+0	95% UCL of mean
1.1E+1	95% UCL of mean
1.2E+1	95% UCL of mean
7.2E+1	95% UCL of mean
0.0E+0	
0.0E+0	

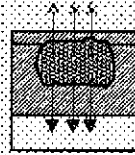
Apply Raoult's Law
 Mole Fraction in Source Material
 (-)

Transport Modeling Options

1. Vertical Transport, Surface Soil Column

Outdoor Air Volatilization Factors ?

- Surface soil volatilization model only
 - Combination surface soil/Johnson & Ettinger models
- Thickness of surface soil zone (ft)
- User-specified VF from other model



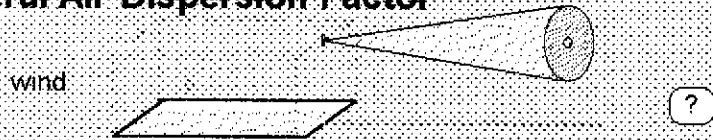
Indoor Air Volatilization Factors ?

- Johnson & Ettinger model
- User-specified VF from other model

Soil-to-Groundwater Leaching Factor ?

- ASTM Model
 - Apply Soil Attenuation Model (SAM)
 - Allow first-order biodecay
- User-specified LF from other model

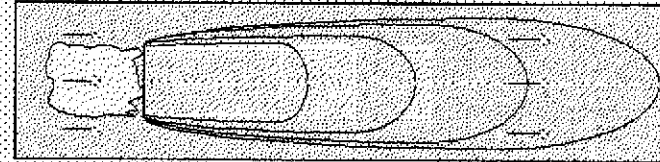
2. Lateral Air Dispersion Factor



- 3-D Gaussian dispersion model
- User-Specified ADF (-)

Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 6-Apr-01
 Compl. By: Aquifer Sciences, Inc

3. Groundwater Dilution Attenuation Factor



Calculate DAF using Domenico Model ?

- Domenico equation with dispersion only (no biodegradation)
- Domenico equation first-order decay
- Modified Domenico equation using electron acceptor superposition
- Biodegradation Capacity (mg/L)

— or —

User-Specified DAF Values

- DAF values from other model or site data
- n* *o*

4. Commands and Options

Site-Specific Groundwater Parameters

1. Water-Bearing Unit ?

Hydrogeology

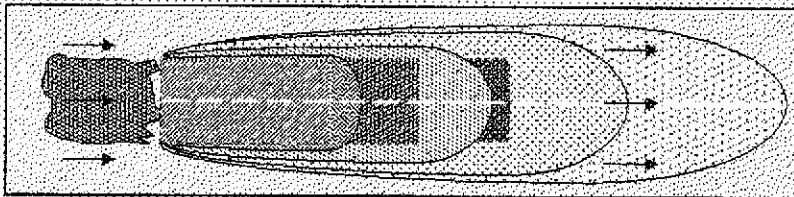
Groundwater Darcy velocity	8.2E+0	(ft/yr)
Groundwater seepage velocity	2.1E+1	(ft/yr)
or	Enter Directly	
Hydraulic conductivity	4.1E+2	(ft/yr)
Hydraulic gradient	2.0E-2	(-)
Effective porosity	0.40	(-)

Sorption

Fraction organic carbon-saturated zone		(-)
Groundwater pH		(-)

2. Groundwater Source Zone ?

Groundwater plume width at source	32	(ft)
Plume (mixing zone) thickness at source	6.56167979	(ft)
or	Calculate	
Saturated thickness	10	(ft)
Length of source zone		(ft)



Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 6-Apr-01
 Compl. By: Aquifer Sciences, Inc.

3. Groundwater Dispersion ?

Model:	<div style="display: flex; justify-content: space-between;"> GW Ingestion Soil Leaching to GW </div>			
	Off-site 1	Off-site 2	Off-site 1	Off-site 2
Distance to GW receptors	0	0	0	0 (ft)
or	NA			
Longitudinal dispersivity				(ft)
Transverse dispersivity				(ft)
Vertical dispersivity				(ft)

4. Groundwater Discharge to Surface Water ?

	Off-site 2
Distance to GW/SW discharge point	NA (ft)
Plume width at GW/SW discharge	0 (ft)
Plume thickness at GW/SW discharge	0 (ft)
Surface water flowrate at GW/SW discharge	0.0E+0 (ft ³ /s)

5. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

Site-Specific Air Parameters

1. Outdoor Air Pathway

Dispersion in Air

Distance to offsite air receptor

Off-site 1	Off-site 2

 (ft) ?

or

NA

or

Horizontal dispersivity

Off-site 1	Off-site 2

 (ft)

Vertical dispersivity

Off-site 1	Off-site 2

 (ft)

Air Source Zone

Air mixing zone height

6.56167979

 (ft)

Ambient air velocity in mixing zone

7.381889764

 (ft/s)

Areal particulate emission flux

6.9E-14

 (g/cm²/s)

2. Indoor Air Pathway

Building Parameters

Building volume/area ratio

Residential	Commercial
8	9.84252

 (ft) ?

Foundation area

Residential	Commercial
1000	20000

 (ft²)

Foundation perimeter

Residential	Commercial
130	600

 (ft)

Building air exchange rate

Residential	Commercial
1.4E-4	1.4E-4

 (1/s)

Depth to bottom of foundation slab

Residential	Commercial
0.5	0.5

 (ft)

Convective air flow through cracks

Residential	Commercial
0.0E+0	0.0E+0

 (ft³/s)

Foundation thickness

0.5

 (ft)

Foundation crack fraction

0.01

 (-)

Volumetric water content of cracks

0.28

 (-)

Volumetric air content of cracks

0.13

 (-)

Indoor/Outdoor differential pressure

0

 (Pa)

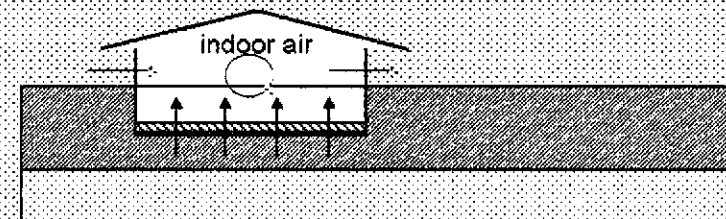
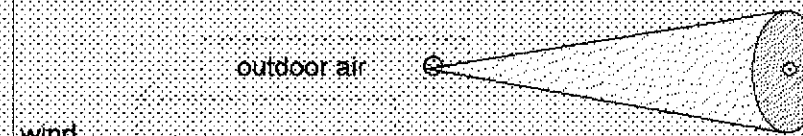
Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 8-Apr-01

Compl. By: Aquifer Sciences, Inc.



3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole)		Diffusion Coefficients				log (Koc) or log(Kd) (@ 20 - 25 C)			Henry's Law Constant (@ 20 - 25 C)			Vapor Pressure (@ 20 - 25 C)		Solubility (@ 20 - 25 C)		acid pKa	base pKb
			MW	ref	In air (cm ² /s)	ref	In water (cm ² /s)	ref	log(L/kg) partition	ref	mol	(unitless)	ref	ref	ref	ref	ref			
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5	-	-
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	6	9.41E-06	7	1.08	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-
Naphthalene	91-20-3	PAH	128.2	PS	5.90E-02	PS	7.50E-06	PS	3.30	Koc	PS	4.83E-04	1.99E-02	PS	2.30E-01	PS	3.10E+01	PS	-	-

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01



Constituent	ref
Benzene	-
Toluene	-
Ethylbenzene	-
Xylene (mixed isomers)	-
Methyl t-Butyl ether	-
Naphthalene	-

Site Name: Arrow Rentals

Site Location: 167 North L S

CHEMICAL DATA FOR SELECTED COCs **Toxicity Data**

Constituent	Reference Dose (mg/kg/day)				Reference Conc. (mg/m3)			Slope Factors 1/(mg/kg/day)						Unit Risk Factor 1/(µg/m3)		EPA Weight of Evidence	Is Constituent Carcinogenic ?		
	Oral		Dermal		Inhalation			Oral		Dermal		Inhalation							
	RfD	oral	ref	RfD	dermal	ref	RfC	Inhal	ref	SF	oral	ref	SF	dermal	ref			URF	Inhal
Benzene	3.00E-03		R	-			5.95E-03	R	2.90E-02	PS		2.99E-02	TX		8.29E-06	PS		A	TRUE
Toluene	2.00E-01	A,R		1.60E-01	TX		4.00E-01	A,R	-			-			-			D	FALSE
Ethylbenzene	1.00E-01	PS		9.70E-02	TX		1.00E+00	PS	-			-			-			D	FALSE
Xylene (mixed isomers)	2.00E+00	A,R		1.84E+00	TX		7.00E+00	A	-			-			-			D	FALSE
Methyl t-Butyl ether	1.00E-02	31		8.00E-03	TX		3.00E+00	R	-			-			-			-	FALSE
Naphthalene	4.00E-01	PS		3.56E-01	TX		1.40E+00	PS	-			-			-			D	FALSE

Site Name: Arrow Rentals
 Site Location: 187 North L S

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level		Time-Weighted Average Workplace Criteria		Aquatic Life Prot. Criteria		Bioconcentration Factor (L-wat/kg-fish)
	MCL (mg/L)	ref	TWA (mg/m3)	ref	AQL (mg/L)	ref	
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
Naphthalene	-	-	5.00E+01	PS	-	-	430

Site Name: Arrow Rentals

Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs **Miscellaneous Chemical Data**

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data						Detection Limits				Half Life (First-Order Decay) (days)		
		Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Groundwater (mg/L)		Soil (mg/kg)		Saturated	Unsaturated	ref
								ref	ref	ref	ref			
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Xylene (mixed isomers)	0.5	0.08	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
Naphthalene	0.05	0.069	0.53	2.2	0.2	2.7E-1	D	0.01	32	0.01	32	258	258	H

Site Name: Arrow Rentals
 Site Location: 187 North L S

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 8-Apr-01

Job ID: 871275

1 OF 1

Exposure Parameters	Residential			Commercial/Industrial	
	Adult	(1-9yrs)	(1-16 yrs)	Chronic	Construc.
AT _c	Averaging time for carcinogens (yr)				
AT _n	Averaging time for non-carcinogens (yr)				
BW	70	15	35	70	1
ED	30	6	16	25	1
τ	Averaging time for vapor flux (yr)				
EF	Exposure frequency (days/yr)				
EF _d	Exposure frequency for dermal exposure				
IR _w	Ingestion rate of water (L/day)				
IR _s	100	200		50	100
SA	Skin surface area (dermal) (cm ²)				
M	Soil to skin adherence factor				
ET _{swim}	Swimming exposure time (hr/event)				
EV _{swim}	Swimming event frequency (events/yr)				
IR _{swim}	0.05	0.5			
SA _{swim}	Skin surface area for swimming (cm ²)				
IR _{fish}	Ingestion rate of fish (kg/yr)				
F _{fish}	Contaminated fish fraction (unitless)				

Surface Parameters	General	Construction	Units
			(Units)
A	1.3E+3	1.3E+3	(ft ²)
W	4.0E+1	4.0E+1	(ft)
W _{gw}	4.0E+1		(ft)
U _{air}	7.4E+0		(ft/s)
H _{air}	6.6E+0		(ft)
P _a	NA		(g/cm ² /s)
L _{ss}	1.0E+0		(ft)

Surface Soil Column Parameters	Value	Units	
r _{cap}	1.5E-1	(ft)	
h _v	2.5E+1	(ft)	
ρ _s	2.7E+0	(g/cm ³)	
f _{oc}	1.0E-2	(-)	
φ _t	3.0E-1	(-)	
K _{vs}	3.3E+2	(ft/yr)	
k _v	1.1E-11	(ft ²)	
L _{gw}	2.5E+1	(ft)	
L _t	1.5E+1	(ft)	
L _{base}	2.5E+1	(ft)	
L _{subr}	1.0E+1	(ft)	
pH	6.6E+0	(-)	
θ _v	capillary 0.26	vadose 0.12	foundation 0.28
θ _a	0.04	0.18	0.13

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Residential	NA	NA
Soil Leaching to Groundwater Ingestion	Residential	NA	NA
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air:			
Particulates from Surface Soils	None	NA	NA
Volatilization from Soils	Res./Constr.	NA	NA
Volatilization from Groundwater	Residential	NA	NA
Indoor Air:			
Volatilization from Subsurface Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	NA	NA

Building Parameters	Residential	Commercial	Units
L _b	8.00E+0	NA	(ft)
A _b	1.00E+3	NA	(ft ²)
X _{con}	1.30E+2	NA	(ft)
ER	1.40E-4	NA	(1/s)
L _{con}	5.00E-1	NA	(ft)
Z _{con}	5.00E-1	NA	(ft)
γ	1.00E-2	NA	(-)
dP	0.00E+0	NA	(Pa)
D _a	0.00E+0	NA	(ft ² /s)

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	Units
Groundwater receptor	0	NA	NA	(ft)
Soil leaching to groundwater receptor	0	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)

Groundwater Parameters	Value	Units
δ _{gw}	5.6E+0	(ft)
i	1.2E+1	(m/yr)
U _{gw}	6.2E+0	(ft/yr)
V _{gw}	2.1E+1	(ft/yr)
K _s	NA	(ft/yr)
i	NA	(-)
S _w	NA	(ft)
S _d	NA	(ft)
θ _{eff}	NA	(-)
f _{oc-gw}	NA	(-)
pH _{gw}	NA	(-)
Biodegradation considered?	NA	(-)

Target Health Risk Values	Individual	Cumulative
TR ₁₀₀ Target Risk (class A&B carcinogens)	1.0E-6	1.0E-5
TR ₁₀ Target Risk (class C carcinogens)	1.0E-5	
THQ Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	Tier 1
RBCA tier	Tier 1
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	No
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	Units
Lateral Groundwater Transport					
α _x Longitudinal dispersivity	NA	NA	NA	NA	(ft)
α _y Transverse dispersivity	NA	NA	NA	NA	(ft)
α _z Vertical dispersivity	NA	NA	NA	NA	(ft)
Lateral Outdoor Air Transport					
σ _y Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
σ _z Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters	Off-site 2	Units
Q _{sw} Surface water flowrate	NA	(ft ³ /s)
W _{pl} Width of GW plume at SW discharge	NA	(ft)
δ _{pl} Thickness of GW plume at SW discharge	NA	(ft)
DF _{sw} Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (15 - 25 ft)	
	value (mg/L)	note	value (mg/kg)	note
Benzene	5.1E+0	95% UCL at W-1s/W-Bs	1.4E+0	95% UCL of mean
Toluene	3.9E+0	95% UCL at W-1s/W-Bs	1.1E+1	95% UCL of mean
Ethylbenzene	1.9E+0	95% UCL at W-1s/W-Bs	1.2E+1	95% UCL of mean
Xylene (mixed isomers)	9.2E+0	95% UCL at W-1s/W-Bs	7.2E+1	95% UCL of mean
Methyl t-Butyl ether	2.7E-1	95% UCL at W-1s/W-Bs	0.0E+0	
Naphthalene	3.8E-1	95% UCL at W-1s/W-Bs	0.0E+0	

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Site Location: 187 North L Street, Livermore, Calif Date Completed: 6-Apr-01

1 of 1

TIER 1 SOIL CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method	Detected Concentrations				
			Typical Detection Limit (mg/kg)	No. of Samples	No. of Detects	Maximum Conc. (mg/kg)	Mean Conc. (mg/kg)
CAS No.	Name						
71-43-2	Benzene	#N/A	11	11	2.0E+01	2.5E-01	1.4E+00
108-88-3	Toluene	#N/A	11	11	9.6E+01	2.0E+00	1.1E+01
100-41-4	Ethylbenzene	#N/A	11	11	1.2E+02	2.0E+00	1.2E+01
1330-20-7	Xylene (mixed isomers)	#N/A	11	11	7.9E+02	8.0E+00	7.2E+01
1634-04-4	Methyl t-Butyl ether	#N/A	1	0	0.0E+00	0.0E+00	NA
91-20-3	Naphthalene	#N/A	1	0	0.0E+00	0.0E+00	NA

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Site Location: 187 North L Street, Livermore, Calif Date Completed: 6-Apr-01

1 of 1

TIER 1 GROUNDWATER CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method Typical Detection Limit (mg/L)	Detected Concentrations				
			No. of Samples	No. of Detects	Maximum Conc. (mg/L)	Mean Conc. (mg/L)	UCL on Mean Conc. (mg/L)
CAS No.	Name						
71-43-2	Benzene	5.0E-04	8	8	6.5E+00	4.3E+00	5.1E+00
108-88-3	Toluene	5.0E-04	8	8	7.0E+00	2.4E+00	3.9E+00
100-41-4	Ethylbenzene	5.0E-04	8	8	2.5E+00	1.6E+00	1.9E+00
1330-20-7	Xylene (mixed isomers)	5.0E-04	8	8	1.4E+01	6.9E+00	9.2E+00
1634-04-4	Methyl t-Butyl ether	5.0E-04	8	8	3.6E-01	1.9E-01	2.7E-01
91-20-3	Naphthalene	5.0E-04	8	6	5.1E-01	2.6E-01	3.8E-01

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS:
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor				3) Exposure Medium Outdoor Air. POE Conc. (mg/m ³) (1) / (2)			
	Soil Conc. (mg/kg)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	Construction Worker	NA	NA	Residential	Construction Worker	NA	NA
Benzene	1.4E+0								
Toluene	1.1E+1								
Ethylbenzene	1.2E+1								
Xylene (mixed isomers)	7.2E+1								
Methyl t-Butyl ether	0.0E+0								
Naphthalene	0.0E+0								

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS:

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)				
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	NA	NA	Residential	Construction Worker	NA	NA
Benzene								
Toluene								
Ethylbenzene								
Xylene (mixed isomers)								
Methyl t-Butyl ether								
Naphthalene								

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS (15 - 26 ft):
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/kg)			3) Exposure Medium		
	Soil Conc. (mg/kg)	Receptor			Outdoor Air. POE Conc. (mg/m ³) (1) / (2)		
		On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	1.4E+0	4.3E+4			3.2E-5		
Toluene	1.1E+1	4.3E+4			2.6E-4		
Ethylbenzene	1.2E+1	7.0E+4			1.7E-4		
Xylene (mixed isomers)	7.2E+1	5.4E+4			1.3E-3		
Methyl t-Butyl ether	0.0E+0	4.3E+4			0.0E+0		
Naphthalene	0.0E+0	7.8E+6			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (16 - 25 ft):
 VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	NA	NA	Residential	NA	NA
Benzene	4.1E-1			1.3E-5		
Toluene	9.6E-1			2.5E-4		
Ethylbenzene	9.6E-1			1.7E-4		
Xylene (mixed isomers)	9.6E-1			1.3E-3		
Methyl t-Butyl ether	9.6E-1			0.0E+0		
Naphthalene	9.6E-1			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR
INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³) (1)/(2)		
	Groundwater Conc. (mg/L)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	NA	NA	Residential	NA	NA
Benzene	5.1E+0	8.4E+4			6.1E-5		
Toluene	3.9E+0	7.7E+4			5.1E-5		
Ethylbenzene	1.9E+0	7.1E+4			2.7E-5		
Xylene (mixed isomers)	9.2E+0	8.2E+4			1.1E-4		
Methyl t-Butyl ether	2.7E-1	5.2E+5			5.2E-7		
Naphthalene	3.8E-1	9.9E+5			3.8E-7		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR
 INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) × (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	NA	NA	Residential	NA	NA
Benzene	4.1E-1			2.5E-5		
Toluene	9.6E-1			4.9E-5		
Ethylbenzene	9.6E-1			2.6E-5		
Xylene (mixed isomers)	9.6E-1			1.1E-4		
Methyl t-Butyl ether	9.6E-1			5.0E-7		
Naphthalene	9.6E-1			3.6E-7		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

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TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)
 (Sum average exposure concentrations
 from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	NA	NA
Benzene	3.8E-5			
Toluene	3.0E-4			
Ethylbenzene	1.9E-4			
Xylene (mixed isomers)	1.4E-3			
Methyl t-Butyl ether	5.0E-7			
Naphthalene	3.6E-7			

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³)				(3) Inhalation Unit Risk (μg/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000		
		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)
		Residential	Construction Worker	NA	NA		Residential	Construction Worker	NA
Benzene	A	3.8E-5				8.3E-6	3.2E-7		
Toluene	D								
Ethylbenzene	D								
Xylene (mixed isomers)	D								
Methyl t-Butyl ether	-								
Naphthalene	D								

Total Pathway Carcinogenic Risk = **3.2E-7**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)				(6) Inhalation Reference Conc. (mg/m ³)	(7) Individual COC Hazard Quotient (5)/(6)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	NA	NA		Residential	Construction Worker	NA	NA
Benzene	8.9E-5				6.0E-3	1.5E-2			
Toluene	3.0E-4				4.0E-1	7.6E-4			
Ethylbenzene	1.9E-4				1.0E+0	1.9E-4			
Xylene (mixed isomers)	1.4E-3				7.0E+0	2.0E-4			
Methyl t-Butyl ether	5.0E-7				3.0E+0	1.7E-7			
Naphthalene	3.6E-7				1.4E+0	2.6E-7			

Total Pathway Hazard Index =

1.6E-2

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS (15 - 25 ft): VAPOR
INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor	3) Exposure Medium Indoor Air: POE Conc. (mg/m ³) (1) / (2)	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)	5) Average Inhalation Exposure Concentration (mg/m ³) (3) × (4)
	Soil Conc. (mg/kg)	Residential	Residential	Residential	Residential
Benzene	1.4E+0	2.6E+2	5.3E-3	4.1E-1	2.2E-3
Toluene	1.1E+1	5.2E+2	2.2E-2	9.6E-1	2.1E-2
Ethylbenzene	1.2E+1	1.2E+3	9.8E-3	9.6E-1	9.4E-3
Xylene (mixed isomers)	7.2E+1	9.7E+2	7.5E-2	9.6E-1	7.2E-2
Methyl t-Butyl ether	0.0E+0	4.6E+2	0.0E+0	9.6E-1	0.0E+0
Naphthalene	0.0E+0	1.3E+5	0.0E+0	9.6E-1	0.0E+0

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 197 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA Tool Kit for Chemical Releases, Version 1.3a



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RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INTRUSION
INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /L) Receptor	3) Exposure Medium Indoor Air, POE Conc. (mg/m ³) (1) / (2)	4) Exposure Multiplier (EF*ED)/(AT*365) (unitless)
	Groundwater Conc. (mg/L)	Residential	Residential	Residential
Benzene	5.1E+0	4.5E+2	1.1E-2	4.1E-1
Toluene	3.9E+0	4.1E+2	9.7E-3	9.6E-1
Ethylbenzene	1.9E+0	3.7E+2	5.1E-3	9.6E-1
Xylene (mixed isomers)	9.2E+0	4.3E+2	2.1E-2	9.6E-1
Methyl t-Butyl ether	2.7E-1	2.9E+3	9.3E-5	9.6E-1
Naphthalene	3.8E-1	6.9E+3	5.5E-5	9.6E-1

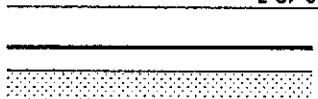
NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

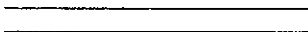
Date Completed: 6-Apr-01
Job ID: 971275



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5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)	
Residential	
	4.7E-3
	9.3E-3
	4.9E-3
	2.0E-2
	8.9E-5
	5.2E-5



RBCA SITE ASSESSMENT

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TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)
 (Sum average exposure concentrations
 from soil and groundwater routes.)

Constituents of Concern	Residential
Benzene	6.8E-3
Toluene	3.0E-2
Ethylbenzene	1.4E-2
Xylene (mixed isomers)	9.2E-2
Methyl t-Butyl ether	8.9E-5
Naphthalene	5.2E-5

Site Name: Arrow Rentals Date Completed: 6-Apr-01
 Site Location: 187 North L Street, Livermore, Call Job ID: 971275
 Completed By: Aquifer Sciences, Inc.

RBCA SITE ASSESSMENT

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TIER 1 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³ s)	(3) Inhalation Unit Risk Factor (µg/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000
		Residential		Residential
Benzene	A	6.8E-3	8.3E-6	5.7E-5
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			
Methyl t-Butyl ether	-			
Naphthalene	D			

Total Pathway Carcinogenic Risk = 5.7E-5

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

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TIER 1 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)	(6) Inhalation Reference Concentration (mg/m ³)	(7) Individual COC Hazard Quotient (5) / (6)
	Residential		Residential
Benzene	1.6E-2	6.0E-3	2.7E+0
Toluene	3.0E-2	4.0E-1	7.5E-2
Ethylbenzene	1.4E-2	1.0E+0	1.4E-2
Xylene (mixed isomers)	9.2E-2	7.0E+0	1.3E-2
Methyl t-Butyl ether	8.9E-5	3.0E+0	3.0E-5
Naphthalene	5.2E-5	1.4E+0	3.7E-5

Total Pathway Hazard Index = **2.8E+0**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (L/kg) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	1.4E+0	1.5E+0			9.0E-1		
Toluene	1.1E+1	3.3E+0			3.4E+0		
Ethylbenzene	1.2E+1	8.8E+0			1.4E+0		
Xylene (mixed isomers)	7.2E+1	5.8E+0			1.2E+1		
Methyl t-Butyl ether	0.0E+0	4.0E-1			0.0E+0		
Naphthalene	0.0E+0	4.7E+1			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR×EF×ED)/(BW×AT) (L/kg-day)			5) Average Daily Intake Rate (mg/kg/day) (3) × (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
	Benzene	1.2E-2			1.1E-2	
Toluene	2.7E-2			9.4E-2		
Ethylbenzene	2.7E-2			3.8E-2		
Xylene (mixed isomers)	2.7E-2			3.4E-1		
Methyl t-Butyl ether	2.7E-2			0.0E+0		
Naphthalene	2.7E-2			0.0E+0		

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (unitless) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA	On-site (0 ft) Residential	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	5.1E+0	1.0E+0			5.1E+0		
Toluene	3.9E+0	1.0E+0			3.9E+0		
Ethylbenzene	1.9E+0	1.0E+0			1.9E+0		
Xylene (mixed isomers)	9.2E+0	1.0E+0			9.2E+0		
Methyl t-Butyl ether	2.7E-1	1.0E+0			2.7E-1		
Naphthalene	3.8E-1	1.0E+0			3.8E-1		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR×EF×ED)/(BW×AT) (L/kg/day)			5) Average Daily Intake Rate (mg/kg/day) (3) × (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	NA	NA	Residential	NA	NA
Benzene	1.2E-2			6.0E-2		
Toluene	2.7E-2			1.1E-1		
Ethylbenzene	2.7E-2			5.2E-2		
Xylene (mixed isomers)	2.7E-2			2.5E-1		
Methyl t-Butyl ether	2.7E-2			7.4E-3		
Naphthalene	2.7E-2			1.0E-2		

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
Date Completed: 6-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

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TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

MAXIMUM PATHWAY INTAKE (mg/kg/day)

*(Maximum intake of active pathways
soil leaching & groundwater routes.)*

Constituents of Concern	On-site (0 ft)	Off-site 1	Off-site 2
	Residential	NA	NA
Benzene	6.0E-2		
Toluene	1.1E-1		
Ethylbenzene	5.2E-2		
Xylene (mixed isomers)	3.4E-1		
Methyl t-Butyl ether	7.4E-3		
Naphthalene	1.0E-2		

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Maximum Carcinogenic Intake Rate (mg/kg/day)			(3) Oral Slope Factor (mg/kg-day) ⁻¹	(4) Individual COC Risk (2) x (3)		
		On-site (0 ft) Residential	Off-site 1	Off-site 2		On-site (0 ft) Residential	Off-site 1	Off-site 2
Benzene	A	6.0E-2	NA	NA	2.9E-2	1.7E-3		
Toluene	D							
Ethylbenzene	D							
Xylene (mixed isomers)	D							
Methyl t-Butyl ether	-							
Naphthalene	D							

Total Pathway Carcinogenic Risk = 1.7E-3

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Maximum Toxicant Intake Rate (mg/kg/day)			(6) Oral Reference Dose (mg/kg/day)	(7) Individual COC Hazard Quotient (5) / (6)		
	On-site (0 ft) Residential	Off-site 1 NA	Off-site 2 NA		On-site (0 ft) Residential	Off-site 1 NA	Off-site 2 NA
Benzene	1.4E-1			3.0E-3	4.6E+1		
Toluene	1.1E-1			2.0E-1	5.4E-1		
Ethylbenzene	5.2E-2			1.0E-1	5.2E-1		
Xylene (mixed isomers)	3.4E-1			2.0E+0	1.7E-1		
Methyl t-Butyl ether	7.4E-3			1.0E-2	7.4E-1		
Naphthalene	1.0E-2			4.0E-1	2.6E-2		

Total Pathway Hazard Index = **4.8E+1**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 6-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT	Baseline Risk Summary-All Pathways
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Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

TIER 1 BASELINE RISK SUMMARY TABLE										
EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.2E-7	1.0E-6	3.2E-7	1.0E-5	<input type="checkbox"/>	1.5E-2	1.0E+0	1.6E-2	1.0E+0	<input type="checkbox"/>
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	5.7E-5	1.0E-6	5.7E-5	1.0E-5	<input checked="" type="checkbox"/>	2.7E+0	1.0E+0	2.8E+0	1.0E+0	<input checked="" type="checkbox"/>
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	1.7E-3	1.0E-6	1.7E-3	1.0E-5	<input checked="" type="checkbox"/>	4.6E+1	1.0E+0	4.8E+1	1.0E+0	<input checked="" type="checkbox"/>
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	1.7E-3	1.0E-6	1.7E-3	1.0E-5	<input checked="" type="checkbox"/>	4.6E+1	1.0E+0	4.8E+1	1.0E+0	<input checked="" type="checkbox"/>
	Groundwater		Groundwater			Groundwater		Groundwater		

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

1 of 7

Constituent: Benzene CAS No.: 71-43-2

Risk-Based Screening Level (RBSL) Concentrations

On-site

Chemical Parameters

Units Value Reference

Receptor Type / Distance (ft)		Residential / 0
Groundwater Ingestion		
RBSL _{gw}	THQ = 1e+0	1.1E-1
(mg/L)	TR = 1e-6	2.9E-3
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s	THQ = 1e+0	1.7E-1
(mg/kg)	TR = 1e-6	4.5E-3
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss}	THQ = 1e+0	NA
(mg/kg)	TR = 1e-6	NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air}	THQ = 1e+0	6.2E+0
(µg/m ³)	TR = 1e-6	2.9E-1
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Res./Constr. / 0
RBSL _s	THQ = 1e+0	#DIV/0!
(mg/kg)	TR = 1e-6	#DIV/0!
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw}	THQ = 1e+0	5.2E+2
(mg/L)	TR = 1e-6	2.5E+1
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air}	THQ = 1e+0	6.2E+0
(µg/m ³)	TR = 1e-6	2.9E-1
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s	THQ = 1e+0	1.6E+0
(mg/kg)	TR = 1e-6	7.7E-2
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw}	THQ = 1e+0	2.8E+0
(mg/L)	TR = 1e-6	1.3E-1

Physical Properties			
MW	(g/mol)	7.8E+1	PS
Sol	(mg/L)	1.8E+3	PS
P _{vap}	(mmHg)	9.5E+1	PS
H _{ben}	(atm·m ³ /mol)	5.6E-3	PS
pK _a	(log(mol/mol))	-	-
pK _b	(log(mol/mol))	-	-
log(K _{oc})	(log(L/kg))	1.8E+0	PS
D _{air}	(cm ² /sec)	8.8E-2	PS
D _{soil}	(cm ² /sec)	9.8E-6	PS
Toxicity Data			
Wt of Evid.		A	
SF _o	(1/[mg/kg/day])	2.9E-2	PS
SF _d	(1/[mg/kg/day])	3.0E-2	TX
URF _i	(1/[µg/m ³])	8.3E-6	PS
RF _{D_o}	(mg/kg/day)	3.0E-3	R
RF _{D_d}	(mg/kg/day)	-	-
RF _{C_i}	(mg/m ³)	6.0E-3	R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	2.1E-2	
tau _u	(hr/event)	2.6E-1	
t _{ex}	(hr)	6.3E-1	
B	(-)	1.3E-2	
Regulatory Standards			
MCL	(mg/L)	5.0E-3	*
TWA	(mg/m ³)	3.3E+0	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)		H
t _{1/2,ground}	(d)		H

* MCL ref = 52 FR 25690

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{ss}	(kg-soil/m ³ -air)	NC	NA
VF _{samb}	(kg-soil/m ³ -air)	2.3E-5	NA
VF _{wamb}	(m ³ -wat/m ³ -air)	1.2E-5	NA
VF _{resp}	(kg-soil/m ³ -air)	3.8E-3	NA
VF _{wesp}	(m ³ -wat/m ³ -air)	2.2E-3	NA
LF	(kg-soil/L-wat)	All exposures: 6.5E-1	

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.3E-1
K _{sw}	(L-wat/kg-soil)	1.5E+0
C _{soil}	(mg/kg-soil)	1.1E+3
C _{soil,vap}	(µg/m ³ -air)	4.0E+8
D _{eff,s}	(cm ² /sec)	3.2E-3
D _{eff,soil}	(cm ² /sec)	5.9E-4
D _{eff,soil}	(cm ² /sec)	2.7E-5
D _{eff,ws}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	
R _{unsoil}	(-)	1.4E+1
Z	(cm/event)	7.3E-2

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

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Constituent: Toluene CAS No.: 108-88-3

Risk-Based Screening Level (RBSL) Concentrations

On-site

Receptor Type / Distance (ft)		Residential / 0
Groundwater Ingestion		
RBSL _{gw} THQ = 1e+0		7.3E+0
(mg/L) TR = 1e-6		NC
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s THQ = 1e+0		2.4E+1
(mg/kg) TR = 1e-6		NC
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} THQ = 1e+0		NA
(mg/kg) TR = 1e-6		NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} THQ = 1e+0		4.2E+2
(µg/m ³) TR = 1e-6		NC
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Res / Constr. / 0
RBSL _s THQ = 1e+0		#DIV/0!
(mg/kg) TR = 1e-6		NC
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0		>5.2E+2
(mg/L) TR = 1e-6		NC
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} THQ = 1e+0		4.2E+2
(µg/m ³) TR = 1e-6		NC
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s THQ = 1e+0		2.2E+2
(mg/kg) TR = 1e-6		NC
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0		1.7E+2
(mg/L) TR = 1e-6		NC

Chemical Parameters

Units	Value	Reference
Physical Properties		
MW (g/mol)	9.2E+1	5
Sol (mg/L)	5.2E+2	29
P _{vap} (mmHg)	3.0E+1	4
H _{air} (atm-m ³ /mol)	6.3E-3	A
pK _a (log[mol/mol])	-	-
pK _b (log[mol/mol])	-	-
log(K _{oc}) (log[L/kg])	2.1E+0	A
D _{air} (cm ² /sec)	8.5E-2	A
D _{soil} (cm ² /sec)	9.4E-6	A
Toxicity Data		
Wt of Evid.	D	-
SF _o (1/[mg/kg/day])	-	-
SF _d (1/[mg/kg/day])	-	-
URF _i (1/[µg/m ³])	-	-
RTD _o (mg/kg/day)	2.0E-1	A,R
RTD _d (mg/kg/day)	1.6E-1	TX
RTC _i (mg/m ³)	4.0E-1	A,R
Dermal Exposure Parameters		
RAF _d (mg/mg)	5.0E-1	D
K _p (cm/hr)	4.5E-2	-
fa _{u,d} (hr/event)	3.2E-1	-
t _{ora} (hr)	7.7E-1	-
B (-)	5.4E-2	-
Regulatory Standards		
MCL (mg/L)	1.0E+0	*
TWA (mg/m ³)	1.5E+2	ACGIH
AGL (mg/L)	-	-
Miscellaneous Parameters		
ADL _{ow} (mg/L)	2.0E-3	S
ADL _s (mg/kg)	5.0E-3	S
t _{1/2,soil} (d)	-	H
t _{1/2,ground} (d)	-	H

* MCL ref = 56 FR 3526 (30 Jan 91)

Units Residential Commercial Construction

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{ss} (kg-soil/m ³ -air)	NC	NA	NC
VF _{samb} (kg-soil/m ³ -air)	2.3E-5	NA	3.4E-5
VF _{wamb} (m ³ -wat/m ³ -air)	1.3E-5	NA	1.3E-5
VF _{seps} (kg-soil/m ³ -air)	1.9E-3	NA	NA
VF _{wesp} (m ³ -wat/m ³ -air)	2.4E-3	NA	NA
LF (kg-soil/L-wat)	All exposures: 3.0E-1		NA

Units Value

Units	Value
Derived Parameters	
H (L-wat/L-air)	2.6E-1
K _{sw} (L-wat/kg-soil)	7.1E-1
C _{soil} (mg/kg-soil)	7.3E+2
C _{soil,vap} (µg/m ³ -air)	1.5E+8
D _{eff,s} (cm ² /sec)	3.1E-3
D _{eff,crk} (cm ² /sec)	5.7E-4
D _{eff,can} (cm ² /sec)	2.5E-5
D _{eff,ws} (cm ² /sec)	1.8E-3
R _{soil} (-)	-
R _{unsoil} (-)	3.1E+1
Z (cm/event)	1.6E-1

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

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Constituent: Ethylbenzene CAS No.: 100-41-4

Risk-Based Screening Level (RBSL) Concentrations

On-site

Receptor Type / Distance (ft)		Residential / 0
Groundwater Ingestion		
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	3.7E+0 NC
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	3.2E+1 NC
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} (mg/kg)	THQ = 1e+0 TR = 1e-6	NA NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	1.0E+3 NC
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Res./Constr. / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	#DIV/0! NC
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>1.7E+2 NC
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	1.0E+3 NC
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	>6.2E+2 NC
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>1.7E+2 NC

Chemical Parameters

Units Value Reference

Physical Properties			
MW	(g/mol)	1.1E+2	PS
Sol	(mg/L)	1.7E+2	PS
P _{vap}	(mmHg)	1.0E+1	PS
H _{atm}	(atm-m ³ /mol)	7.9E-3	PS
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{oc})	(log[L/kg])	2.6E+0	PS
D _{air}	(cm ² /sec)	7.5E-2	PS
D _{soil}	(cm ² /sec)	7.8E-6	PS
Toxicity Data			
Wt of Evid.		D	
SF _o	{1/[mg/kg/day]}	-	-
SF _d	{1/[mg/kg/day]}	-	-
URF _i	{1/[µg/m ³]}	-	-
RF _o	(mg/kg/day)	1.0E-1	PS
RF _d	(mg/kg/day)	9.7E-2	TX
RF _i	(mg/m ³)	1.0E+0	PS
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	7.4E-2	
tau _d	(hr/event)	3.9E-1	
t _{cr}	(hr)	1.3E+0	
B	(-)	1.4E-1	
Regulatory Standards			
MCL	(mg/L)	7.0E-1	*
TWA	(mg/m ³)	4.4E+2	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)		H
t _{1/2,unsoil}	(d)		H

* MCL ref = 56 FR 3526 (30 Jan 91)

Units Residential Commercial Construction

Cross-Media Transfer Factors				
VF _{ss}	{kg-soil/m ³ -air}	NC	NA	NC
VF _{samb}	{kg-soil/m ³ -air}	1.4E-5	NA	1.4E-5
VF _{wamb}	{m ³ -wat/m ³ -air}	1.4E-5	NA	1.4E-5
VF _{sesp}	{kg-soil/m ³ -air}	8.0E-4	NA	NA
VF _{wesp}	{m ³ -wat/m ³ -air}	2.7E-3	NA	NA
LF	{kg-soil/L-wat}	All exposures: 1.1E-1		NA

Units Value

Derived Parameters		
H	(L-wat/L-air)	3.2E-1
K _{gw}	(L-wat/kg-soil)	2.7E-1
C _{soil}	(mg/kg-soil)	6.2E+2
C _{soil,vap}	(µg/m ³ -air)	5.8E+7
D _{eff,so}	(cm ² /sec)	2.8E-3
D _{eff,crk}	(cm ² /sec)	5.0E-4
D _{eff,cap}	(cm ² /sec)	2.1E-5
D _{eff,ws}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	
R _{unsoil}	(-)	8.1E+1
Z	(cm/event)	2.7E-1

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

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Constituent: Xylene (mixed isomers) CAS No.: 1330-20-7

Risk-Based Screening Level (RBSL) Concentrations		On-site
Groundwater Ingestion		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0		7.3E+1
(mg/L) TR = 1e-6		NC
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Residential / 0
RBSLs THQ = 1e+0		4.3E+2
(mg/kg) TR = 1e-6		NC
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} THQ = 1e+0		NA
(mg/kg) TR = 1e-6		NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} THQ = 1e+0		7.3E+3
(µg/m ³) TR = 1e-6		NC
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Res./Constr. / 0
RBSLs THQ = 1e+0		#DIV/0!
(mg/kg) TR = 1e-6		NC
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0		>2.0E+2
(mg/L) TR = 1e-6		NC
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} THQ = 1e+0		7.3E+3
(µg/m ³) TR = 1e-6		NC
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSLs THQ = 1e+0		>4.9E+2
(mg/kg) TR = 1e-6		NC
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0		>2.0E+2
(mg/L) TR = 1e-6		NC

Units	Residential	Commercial	Construction
Grass-Media Transfer Factors			
VF _{ss} (kg-soil/m ³ -air)	NC	NA	NC
VF _{samb} (kg-soil/m ³ -air)	1.8E-5	NA	1.8E-5
VF _{wamb} (m ³ -wat/m ³ -air)	1.2E-5	NA	1.2E-5
VF _{sest} (kg-soil/m ³ -air)	1.0E-3	NA	NA
VF _{wesp} (m ³ -wat/m ³ -air)	2.3E-3	NA	NA
LF (kg-soil/L-wat)	All exposures: 1.7E-1		

Chemical Parameters			
	Units	Value	Reference
Physical Properties			
MW	(g/mol)	1.1E+2	5
Sol	(mg/L)	2.0E+2	5
P _{vap}	(mmHg)	7.0E+0	4
H _{tan}	(atm-m ³ /mol)	7.0E-3	A
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{oc})	(log[L/kg])	2.4E+0	A
D _{air}	(cm ² /sec)	7.2E-2	A
D _{wat}	(cm ² /sec)	8.5E-6	A
Toxicity Data			
Wt of Evd.		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RfD _o	(mg/kg/day)	2.0E+0	A,R
RfD _d	(mg/kg/day)	1.8E+0	TX
RfC _i	(mg/m ³)	7.0E+0	A
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	8.0E-2	
tau _d	(hr/event)	3.9E-1	
t _{ext}	(hr)	1.4E+0	
B	(-)	1.6E-1	
Regulatory Standards			
MCL	(mg/L)	1.0E+1	*
TWA	(mg/m ³)	4.3E+2	ACGIH
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	5.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)		H
t _{1/2,unsoil}	(d)		H

* MCL ref = 56 FR 3526 (30 Jan 91)

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.9E-1
K _{ow}	(L-wat/kg-soil)	4.1E-1
C _{soil}	(mg/kg-soil)	4.9E+2
C _{soil,wat}	(µg/m ³ -air)	4.0E+7
D _{eff,s}	(cm ² /sec)	2.6E-3
D _{eff,crk}	(cm ² /sec)	4.8E-4
D _{eff,can}	(cm ² /sec)	2.1E-5
D _{eff,wat}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	
R _{unsoil}	(-)	5.4E+1
Z	(cm/event)	2.9E-1

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

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Constituent: Methyl t-Butyl ether CAS No.: 1634-04-4

Risk-Based Screening Level (RBSL) Concentrations

On-site

Receptor Type / Distance (ft)		Residential / 0
Groundwater Ingestion		
RBSL _{gw} THQ = 1e+0	(mg/L) TR = 1e-6	3.7E-1 NC
Soil Leaching to Groundwater Ingestion		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s THQ = 1e+0	(mg/kg) TR = 1e-6	1.4E-1 NC
Surface Soil Ingestion and Dermal Contact		
Receptor Type / Distance (ft)		None
RBSL _{ss} THQ = 1e+0	(mg/kg) TR = 1e-6	NA NA
Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} THQ = 1e+0	(µg/m ³) TR = 1e-6	3.1E+3 NC
Soil Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Res./Constr. / 0
RBSL _s THQ = 1e+0	(mg/kg) TR = 1e-6	#DIV/0! NC
Groundwater Volatilization to Outdoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0	(mg/L) TR = 1e-6	>4.8E+4 NC
Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBEL _{air} THQ = 1e+0	(µg/m ³) TR = 1e-6	3.1E+3 NC
Soil Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _s THQ = 1e+0	(mg/kg) TR = 1e-6	1.4E+3 NC
Groundwater Volatilization to Indoor Air Inhalation		
Receptor Type / Distance (ft)		Residential / 0
RBSL _{gw} THQ = 1e+0	(mg/L) TR = 1e-6	9.1E+3 NC

Chemical Parameters

Units Value Reference

Physical Properties			
MW	(g/mol)	8.8E+1	5
Sol	(mg/L)	4.8E+4	A
P _{vac}	(mmHg)	2.5E+2	-
H _{abn}	(atm-m ³ /mol)	5.8E-4	-
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{oc})	(log[L/kg])	1.1E+0	A
D _{air}	(cm ² /sec)	7.9E-2	6
D _{soil}	(cm ² /sec)	9.4E-5	7
Toxicity Data			
Wt of Evid.		-	-
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RfD _o	(mg/kg/day)	1.0E-2	31
RfD _d	(mg/kg/day)	8.0E-3	TX
RfC _i	(mg/m ³)	3.0E+0	R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	-
K _p	(cm/hr)	-	-
tau _d	(hr/event)	-	-
t _{cont}	(hr)	-	-
B	(-)	-	-
Regulatory Standards			
MCL	(mg/L)	-	*
TWA	(mg/m ³)	6.0E+1	NIOSH
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	-	-
ADL _s	(mg/kg)	-	-
t _{1/2,soil}	(d)	-	H
t _{1/2,unsoil}	(d)	-	H

* MCL ref = -

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{ss} (kg-soil/m ³ -air)	NC	NA	NC
VF _{samb} (kg-soil/m ³ -air)	2.3E-5	NA	2.5E-5
VF _{wamb} (m ³ -wat/m ³ -air)	1.9E-6	NA	1.9E-6
VF _{sesp} (kg-soil/m ³ -air)	2.2E-3	NA	NA
VF _{wesp} (m ³ -wat/m ³ -air)	3.4E-4	NA	NA
LF (kg-soil/L-wat)	All exposures: 2.5E+0		NA

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.4E-2
K _{sw}	(L-wat/kg-soil)	6.0E+0
C _{sat}	(mg/kg-soil)	8.0E+3
C _{sat,vap}	(µg/m ³ -air)	1.2E+9
D _{eff,s}	(cm ² /sec)	3.0E-3
D _{eff,ork}	(cm ² /sec)	8.7E-4
D _{eff,cao}	(cm ² /sec)	5.1E-4
D _{eff,ws}	(cm ² /sec)	2.9E-3
R _{sat}	(-)	-
R _{unsoil}	(-)	3.7E+0
Z	(cm/event)	-

NA = Not applicable; NC = Not calculated.

Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

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Constituent: Naphthalene CAS No.: 91-20-3

Risk-Based Screening Level (RBSL) Concentrations

Chemical Parameters

		On-site	
Groundwater Ingestion			
Receptor Type / Distance (ft)		Residential / 0	
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	1.5E+1	NC
Soil Leaching to Groundwater Ingestion			
Receptor Type / Distance (ft)		Residential / 0	
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	>6.2E+2	NC
Surface Soil Ingestion and Dermal Contact			
Receptor Type / Distance (ft)		None	
RBSL _{ss} (mg/kg)	THQ = 1e+0 TR = 1e-6	NA	NA
Outdoor Air Inhalation			
Receptor Type / Distance (ft)		Residential / 0	
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	1.5E+3	NC
Soil Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)		Res./Constr. / 0	
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	#DIV/0!	NC
Groundwater Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)		Residential / 0	
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>3.1E+1	NC
Indoor Air Inhalation			
Receptor Type / Distance (ft)		Residential / 0	
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	1.5E+3	NC
Soil Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)		Residential / 0	
RBSL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	>6.2E+2	NC
Groundwater Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)		Residential / 0	
RBSL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>3.1E+1	NC

Physical Properties			
	Units	Value	Reference
MW	(g/mol)	1.3E+2	PS
Sol	(mg/L)	3.1E+1	PS
P _{vap}	(mmHg)	2.3E-1	PS
H _{atm}	(atm·m ³ /mol)	4.8E-4	PS
pK _a	(log(mol/mol))	-	-
pK _b	(log(mol/mol))	-	-
log(K _{oc})	(log(L/kg))	3.3E+0	PS
D _{air}	(cm ² /sec)	5.9E-2	PS
D _{wat}	(cm ² /sec)	7.5E-6	PS

Toxicity Data			
	Units	Value	Reference
Wt of Evid.		D	
SF _o	(1/(mg/kg/day))	-	-
SF _d	(1/(mg/kg/day))	-	-
URF _i	(1/(µg/m ³))	-	-
RfD _o	(mg/kg/day)	4.0E-1	PS
RfD _d	(mg/kg/day)	3.6E-1	TX
RfC _i	(mg/m ³)	1.4E+0	PS

Dermal Exposure Parameters			
	Units	Value	Reference
RAF _d	(mg/mg)	5.0E-2	D
K _o	(cm/hr)	6.9E-2	
tau _d	(hr/event)	5.3E-1	
t _{cont}	(hr)	2.2E+0	
B	(-)	2.0E-1	

Regulatory Standards			
	Units	Value	Reference
MCL	(mg/L)	-	*
TWA	(mg/m ³)	5.0E+1	PS
AQL	(mg/L)	-	-

Miscellaneous Parameters			
	Units	Value	Reference
ADL _{gw}	(mg/L)	1.0E-2	32
ADL _s	(mg/kg)	1.0E-2	32
t _{1/2,soil}	(d)		H
t _{1/2,unsoil}	(d)		H

* MCL ref = -

Units	Residential			Commercial		Construction	
Gross Media Transfer Factors							
VF _{ss} (kg-soil/m ³ -air)		NC		NA		NC	
VF _{samb} (kg-soil/m ³ -air)		1.3E-7		NA		1.3E-7	
VF _{wamb} (m ³ -wat/m ³ -air)		1.0E-6		NA		1.0E-6	
VF _{seps} (kg-soil/m ³ -air)		7.7E-6		NA		NA	
VF _{wesp} (m ³ -wat/m ³ -air)		1.5E-4		NA		NA	
LF (kg-soil/L-wat)		All exposures: 2.1E-2				NA	

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.0E-2
K _{ow}	(L-wat/kg-soil)	5.0E-2
C _{soil}	(mg/kg-soil)	6.2E+2
C _{soil,vap}	(µg/m ³ -air)	1.6E+6
D _{eff,s}	(cm ² /sec)	2.2E-3
D _{eff,crk}	(cm ² /sec)	4.3E-4
D _{eff,pap}	(cm ² /sec)	6.2E-5
D _{eff,ws}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	
R _{unsoil}	(-)	4.4E+2
Z	(cm/event)	2.7E-1

NA = Not applicable; NC = Not calculated.
 Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 1 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Definitions

Risk-Based Screening Level Concentrations	
RBSL _{gw}	Risk-based screening level for groundwater (mg/L)
RBSL _s	Risk-based screening level for soil (mg/kg)
RBEL _{air}	Risk-based exposure limit for air (µg/m ³)
THQ	Target hazard quotient
TR	Target risk

Cross-Media Transfer Factors	
VF _{so}	Volatilization factor, surface soil to outdoor air (kg-soil/L-air)
VF _{subsoil}	Volatilization factor, subsurface soil to outdoor air (kg-soil/L-air)
VF _{subsoil}	Volatilization factor, groundwater to outdoor air (L-wat/L-air)
VF _{subsoil}	Volatilization factor, subsurface soil to indoor air (kg-soil/L-air)
VF _{subsoil}	Volatilization factor, groundwater to indoor air (L-wat/L-air)
LF	Leaching factor, soil to groundwater (kg-soil/L-wat)

Cross-Media Transfer Factors	
DAF _{gw}	Dilution-attenuation factor, groundwater (-)
DAF _{soil}	Dilution-attenuation factor, soil leaching to groundwater (-)

Physical Properties	
MW	Molecular weight (g/mol)
Sol	Aqueous solubility limit (mg/L)
P _{vap}	Vapor pressure (mmHg)
H _{lim}	Henry's Law constant (atm-m ³ /mol)
pK _a	Acid ionization constant (log[mol/mol])
pK _b	Base ionization constant (log[mol/mol])
K _{oc}	Organic carbon/Water partition coefficient (L/kg)
K _d	Soil/Water distribution coefficient (L/kg)
D _{air}	Molecular diffusion coefficient in air (cm ² /sec)
D _{wat}	Molecular diffusion coefficient in water (cm ² /sec)

Toxicity Data	
Wt of Evid.	Weight of evidence
SF _o	Oral slope factor for carcinogens (1/(mg/kg/day))
SF _d	Dermal slope factor for carcinogens (1/(mg/kg/day))
URF _i	Inhalation unit risk factor for carcinogens (1/µg/m ³)
RfD _o	Oral reference dose (mg/kg/day)
RfD _d	Dermal reference dose (mg/kg/day)
RfC _i	Inhalation reference concentration (mg/m ³)

Dermal Exposure Parameters	
RAF _d	Dermal relative absorption factor (mg/mg)
K _p	Dermal permeability coeff. (cm/hr)
tau _d	Lag time for dermal exposure (hr/event)
t _{crit}	Critical exposure time (hr)
B	Relative contribution of permeability coeff. (-)

Regulatory Standards	
MCL	Maximum contaminant level for drinking water protection (mg/L)
TWA	Time-weighted average workplace air criterion (mg/m ³)
AQL	Aquatic life protection criterion (mg/L)

Miscellaneous Parameters	
ADL _{gw}	Analytical detection limit in groundwater (mg/L)
ADL _s	Analytical detection limit in soil (mg/kg)
t _{1/2,sat}	Half life, saturated zone (d)
t _{1/2,unsat}	Half life, unsaturated zone (d)

Derived Parameters	
H	Dimensionless Henry's Law constant (L-wat/L-air)
K _{ow}	Soil to pore-water partitioning factor (L-wat/kg-soil)
C _{sat}	Saturated residual conc. in vadose zone soils (mg/kg-soil)
C _{sat,vad}	Saturated concentration in vapors (mg/m ³ -air)
D _{eff,s}	Effective diffusion coeff. in vadose zone soils (cm ² /sec)
D _{eff,crack}	Effective diffusion coeff. in foundation cracks (cm ² /sec)
D _{eff,cap}	Effective diffusion coeff. in capillary zone (cm ² /sec)
D _{eff,wb}	Effective diffusion coeff., water table to ground surface (cm ² /sec)
R _{sat}	Retardation factor, saturated zone (-)
R _{unsat}	Retardation factor, unsaturated zone (-)
Z	Water to skin dermal absorption factor (cm/event)

Chemical Parameter References

PS	Standard Provisional Guide for Risk-Based Corrective Action, ASTM PS 104-98.
A	Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites.
D	USEPA, Dermal Exposure Assessment: Principles and Applications, ORD, EPA/600/8-91/011B
H	Howard, Handbook of Environmental Degradation Rates, Lewis Publishers, Chelsea, MI, 1989
R	EPA Region III Risk Based Concentration Table, EPA Region 3, March 7, 1995.
S	USEPA, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, OSWER, November 1986.
T	TPH Criteria Working Group, 1996.
TX	TNRCC Risk-Based Corrective Action for Leaking Storage Tank Sites, January 1994.
3	based on Kow from (2) and DiToro, D. M., 1985, "A Particle Interaction Model of Reversible Organic Chemical Sorption", Chemosphere, 14(10), 1505-1538. log(Koc) = 0.00028 + 0.983 log(Kow)
4	USEPA, 1989: Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) - USEPA, OAQPS, Air Emission Models, (EPA 450/3-87-026)
5	Verschueren, Karel, 1983: Handbook of Environmental Data on organic Chemicals, Second Ed., (Van Nostrand Reinhold Company Inc., New York), ISBN: 0-442-28902-6.
6	Calculated diffusivity using the method of Fuller, Schettler, and Giddings from (9).
7	Calculated diffusivity using the method of Hayduk and Laudie and the reference from (9).
8	Calculated using Kanaga and Gong Kow/solubility regression equation reference (9) and Kow data from (2), log(S, mg/l) = -0.922 log(Kow) + 4.184
9	Handbook of Chemical Property Estimation Methods, 1982, W.J. Lyman, (McGraw-Hill, New York), ISBN 0-07-039175-0.
10	Calculated from (FwPatm)/(solubility/mol wt)
11	Back calculated from solubility, Note (9) and (3).
12	Aldrich Chemical Catalog, 1991.
13	Calculated using Modified Watson Correlation from (9) and normal boiling point.
14	USEPA, 1979: Water Related Environmental Fate of 129 Priority Pollutants, Vol. 1, USEPA, OAQPS, (EPA-440/4-79-029a).
15	The Agrochemicals Handbook, (The Royal Society of Chemistry, The University, Nottingham, England), ISBN 0-85186-406-6.
16	Vapor pressure specified at elevated temperature, adjustments to 25C using methods presented by (9).
17	Wauchope, R. D., J. M. Butler, A. G. Homsby, P. W. M. Augustijn-Beckers, and J.P. Burd, 1992: "The SCS/ARS/CSES Pesticide Properties Database for Environmental Decision Making", Reviews of Environmental Contamination and Toxicology, vol 123, 1-155.
18	Farm Chemicals Handbook 91, C. Sine, ed., (Meister Publishing Company, Waukegan, Ohio).
19	Structure and Nomenclature Search System, (Version 7.00/7.03) December, 1992
20	From Syracuse Research Corporation Calculated Value from pchem-pcgems, 1988, ref no. 256436 in Enirofate database, Accession no. 105543.
23	NIOSH, 1990: Pocket Guide to Chemical Hazards, (U. S. Dept. of Health & Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health).
24	Buchter, B. et al., 1989: Correlation of Groundwater Kd and N retention Parameters with Soils and Elements, Soil Science, 148, 370-379.
25	USEPA, 1993: Air/Superfund National Technical Guidance Study series: Estimation of Air Impacts for Thermal Desorption Units Used at Superfund Sites, US Environmental Protection Agency, Office of Air Quality Planning and Standards, EPA-451/R-93-005.
26	NTIS Accession No. PB93-215630, April 1993.
27	Based on salt solubilities in Table 3-120, R. H. Perry and D. W. Green, "Perry's Chemical Engineering Handbook" Sixth Edition, (McGraw-Hill, New York), 1973.
28	Based on salt solubilities in Table of Physical Constants for Inorganic Compounds, Weast, R. C., CRC Handbook of Chemistry and Physics, 67th edition, (CRC Press, Inc., Boca Raton), 1967.
29	Montgomery and Welton, "Groundwater Chemicals Desk Reference", Lewis Publishers, Chelsea, MI, 1990.
30	USEPA, 1996: Soil Screening Guidance: Technical Background Doc., (EPA/540/R-96/128)
31	TNRCC Risk Reduction Rule Implementation, July 25, 1996. (update to Reference "TX")
32	USEPA, Method 8270C, Revision 3, "Semi-volatile Organic Compounds by GC/MS", December 1996.
33	40 CFR 151.36, July 1, 1997
34	40 CFR 141.23, July 1, 1997
35	USEPA, Manual for the Certification of Laboratories Analyzing Drinking Water, EPA 615-B-97-001, March 1997
36	Calculated using Chiu et al. equation reported in (9); S (µmol/L) from (15).
37	Calculated using Chiu et al. equation reported in (9); S (µmol/L) from (23).
38	Calculated using Chiu et al. equation reported in (9); S (µmol/L) from (4).

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 6-Apr-01

Job ID: 971275

SOIL (15 - 25 ft) RBSL VALUES

Target Risk (Class A & B) 1.0E-6
 Target Risk (Class C) 1.0E-5
 Target Hazard Quotient 1.0E+0

RBSL Results For Complete Exposure Pathways ("N" if Complete)

CAS No.	Name	Representative Concentration (mg/kg)	RBSL Results For Complete Exposure Pathways ("N" if Complete)										Applicable RBSL (mg/kg)	RBSL Exceeded? "■" if yes	Required CRF Only if "yes" left
			Soil Leaching to Groundwater Ingestion			Soil Vol. to Indoor Air		Soil Volatilization to Outdoor Air			Surface Soil Inhalation, Ingestion, Dermal Contact				
			On-site (0 ft)	NA	NA	On-site (0 ft)	Residential	Construction Worker	NA	NA	On-site (0 ft)	Construction Worker			
71-43-2	Benzene	1.4E+0	4.5E-3	NA	NA	7.7E-2	1.3E+1	NA	NA	NA	NA	4.5E-3	■	3.1E+2	
108-88-3	Toluene	1.1E+1	2.4E+1	NA	NA	2.2E+2	>7.3E+2	NA	NA	NA	NA	2.4E+1	□	<1	
100-41-4	Ethylbenzene	1.2E+1	3.2E+1	NA	NA	>6.2E+2	>6.2E+2	NA	NA	NA	NA	3.2E+1	□	<1	
1330-20-7	Xylene (mixed isomers)	7.2E+1	4.3E+2	NA	NA	>4.9E+2	>4.9E+2	NA	NA	NA	NA	4.3E+2	□	<1	
1634-04-4	Methyl t-Butyl ether	0.0E+0	1.4E-1	NA	NA	1.4E+3	>8.0E+3	NA	NA	NA	NA	1.4E-1	□	<1	
91-20-3	Naphthalene	0.0E+0	>6.2E+2	NA	NA	>6.2E+2	>6.2E+2	NA	NA	NA	NA	>6.2E+2	□	NA	

S indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

GROUNDWATER RBSL VALUES

Target Risk (Class A & B) 1.0E-6

Target Risk (Class C) 1.0E-5

Target Hazard Quotient 1.0E+0

RBSL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration (mg/L)	RBSL Results For Complete Exposure Pathways ("X" If Complete)							Applicable RBSL (mg/L)	RBSL Exceeded ? "■" if yes		
			X	Groundwater Ingestion			X	GW Vol. to Indoor Air	X			Groundwater Volatilization to Outdoor Air	
			On-site (0 ft) Residential	NA	NA	On-site (0 ft) Residential	On-site (0 ft) Residential	NA	NA				
71-43-2	Benzene	5.1E+0	2.9E-3	NA	NA	1.3E-1	2.5E+1	NA	NA	2.9E-3	■		
108-88-3	Toluene	3.9E+0	7.3E+0	NA	NA	1.7E+2	>5.2E+2	NA	NA	7.3E+0	□		
100-41-4	Ethylbenzene	1.9E+0	3.7E+0	NA	NA	>1.7E+2	>1.7E+2	NA	NA	3.7E+0	□		
1330-20-7	Xylene (mixed isomers)	9.2E+0	7.3E+1	NA	NA	>2.0E+2	>2.0E+2	NA	NA	7.3E+1	□		
1634-04-4	Methyl t-Butyl ether	2.7E-1	3.7E-1	NA	NA	9.1E+3	>4.8E+4	NA	NA	3.7E-1	□		
91-20-3	Naphthalene	3.6E-1	1.5E+1	NA	NA	>3.1E+1	>3.1E+1	NA	NA	1.5E+1	□		

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

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1 OF 1

Required CRF
Only if "yes" left
1.7E+3
<1
<1
<1
<1
<1

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.1E+0	1.0E+0	1.0E+0	1.4E+0	5.1E+0
108-88-3	Toluene	1.1E+1	3.9E+0	1.0E+0	1.0E+0	1.1E+1	3.9E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	1.0E+0	1.0E+0	1.2E+1	1.9E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.2E+0	1.0E+0	1.0E+0	7.2E+1	9.2E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.7E-1	1.0E+0	1.0E+0	0.0E+0	2.7E-1
91-20-3	Naphthalene	0.0E+0	3.8E-1	1.0E+0	1.0E+0	0.0E+0	3.8E-1

Cumulative Values:

RBCA Tool Kit for Chemical Releases, Version 1.3a

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 6-Apr-01

2 OF 3

Cumulative Target Risk: 1.0E-5

Target Hazard Index: 1.0E+0

CUMULATIVE RISK WORKSHEET

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Residential		Residential		None		Residential	
CAS No.	Name	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	3.2E-7	1.5E-2	5.7E-5	2.7E+0			1.7E-3	4.6E+1
108-88-3	Toluene		7.6E-4		7.5E-2				5.4E-1
100-41-4	Ethylbenzene		1.9E-4		1.4E-2				5.2E-1
1330-20-7	Xylene (mixed isomers)		2.0E-4		1.3E-2				1.7E-1
1634-04-4	Methyl t-Butyl ether		1.7E-7		3.0E-5				7.4E-1
91-20-3	Naphthalene		2.6E-7		3.7E-5				2.6E-2
Cumulative Values:		3.2E-7	1.6E-2	5.7E-5 ■	2.8E+0 ■	0.0E+0	0.0E+0	1.7E-3 ■	4.8E+1 ■

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California Site Location: 187 North L Street, Livermore, California Date Completed: 6-Apr-01

3 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: FALSE

OFF-SITE RECEPTORS

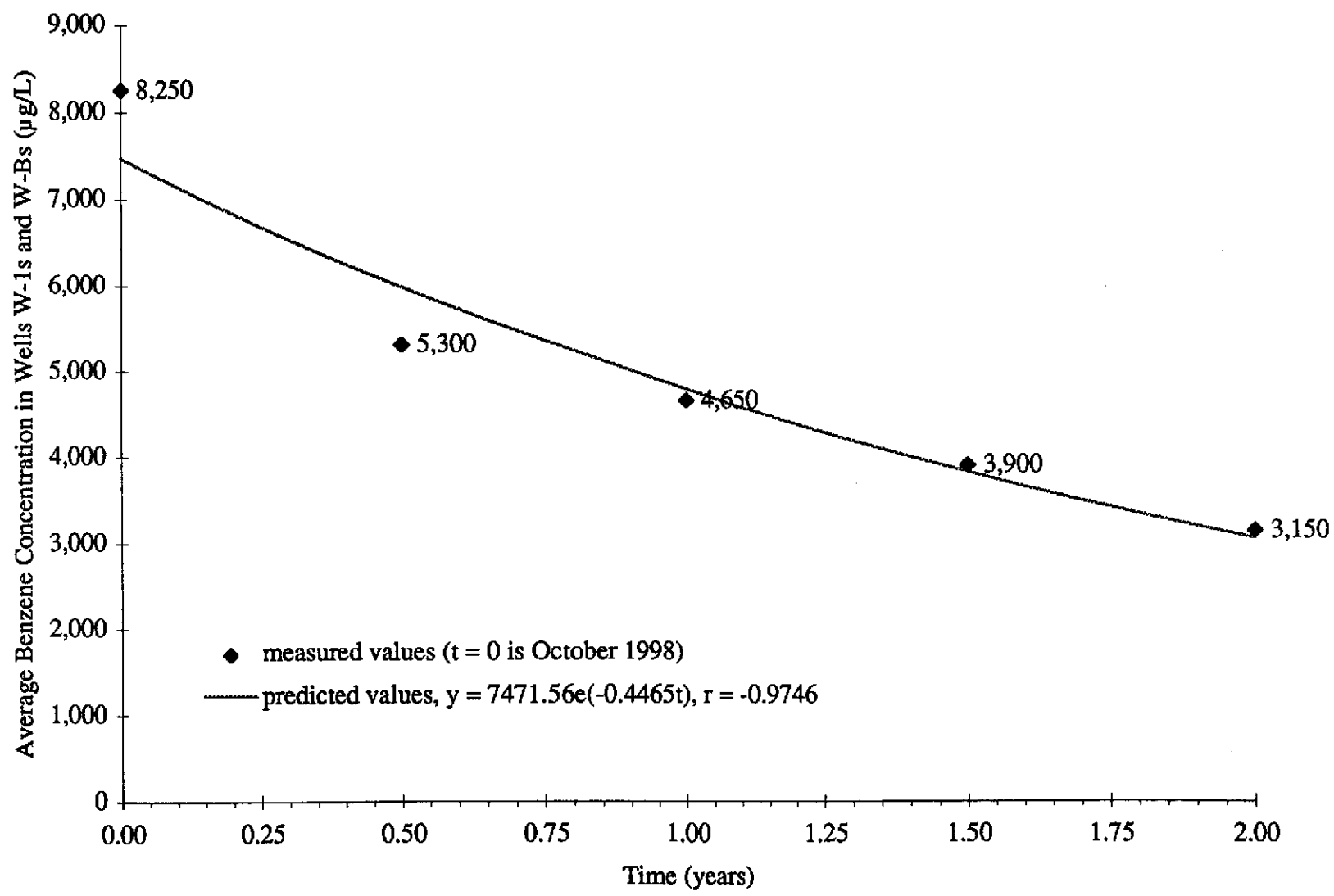
CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		None		None		None		None	
CAS No.	Name	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene								
108-88-3	Toluene								
100-41-4	Ethylbenzene								
1330-20-7	Xylene (mixed isomers)								
1634-04-4	Methyl t-Butyl ether								
91-20-3	Naphthalene								
Cumulative Values:		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

■ indicates risk level exceeding target risk

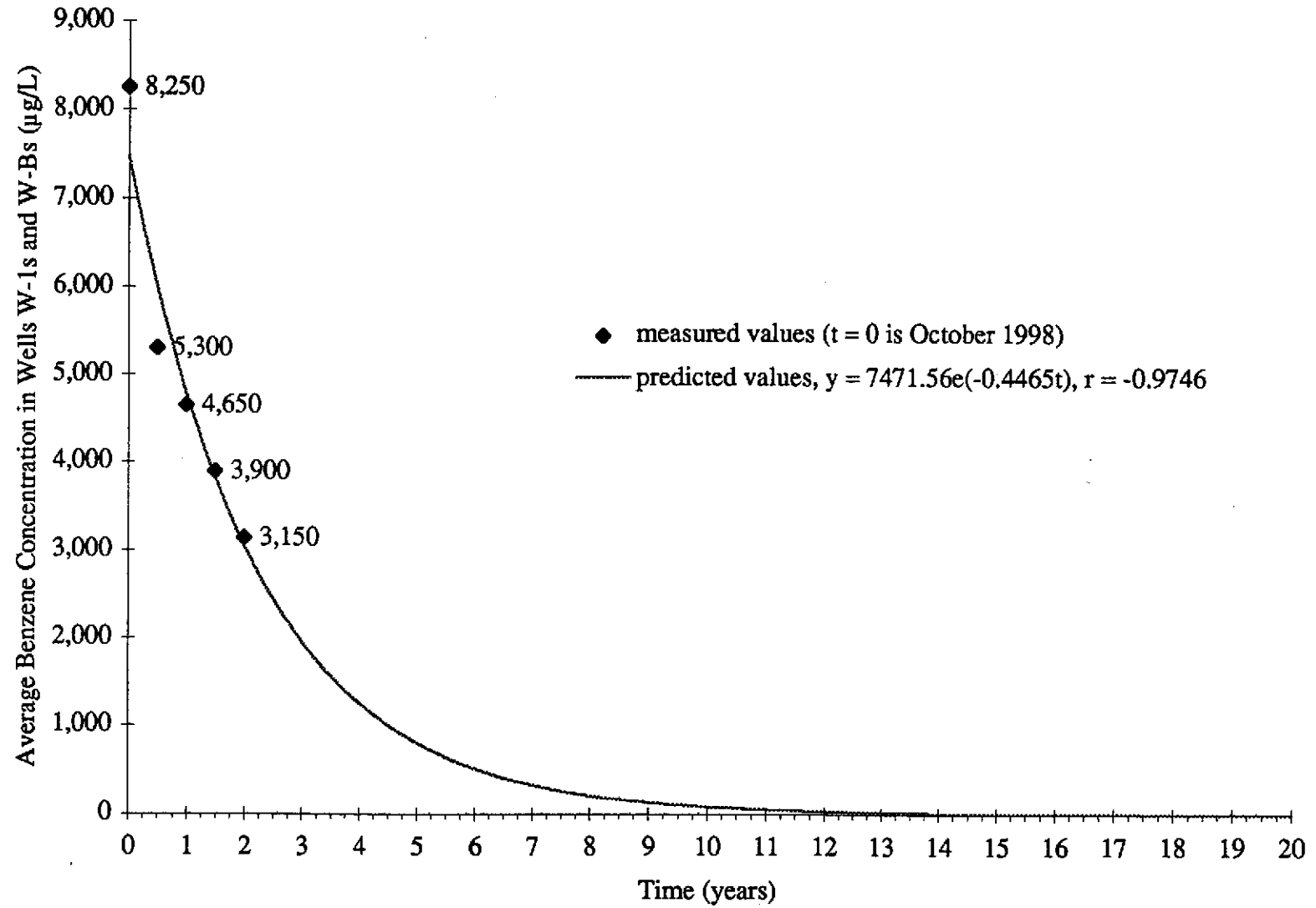
APPENDIX E

GRAPHS OF CHEMICAL CONCENTRATIONS VERSUS TIME

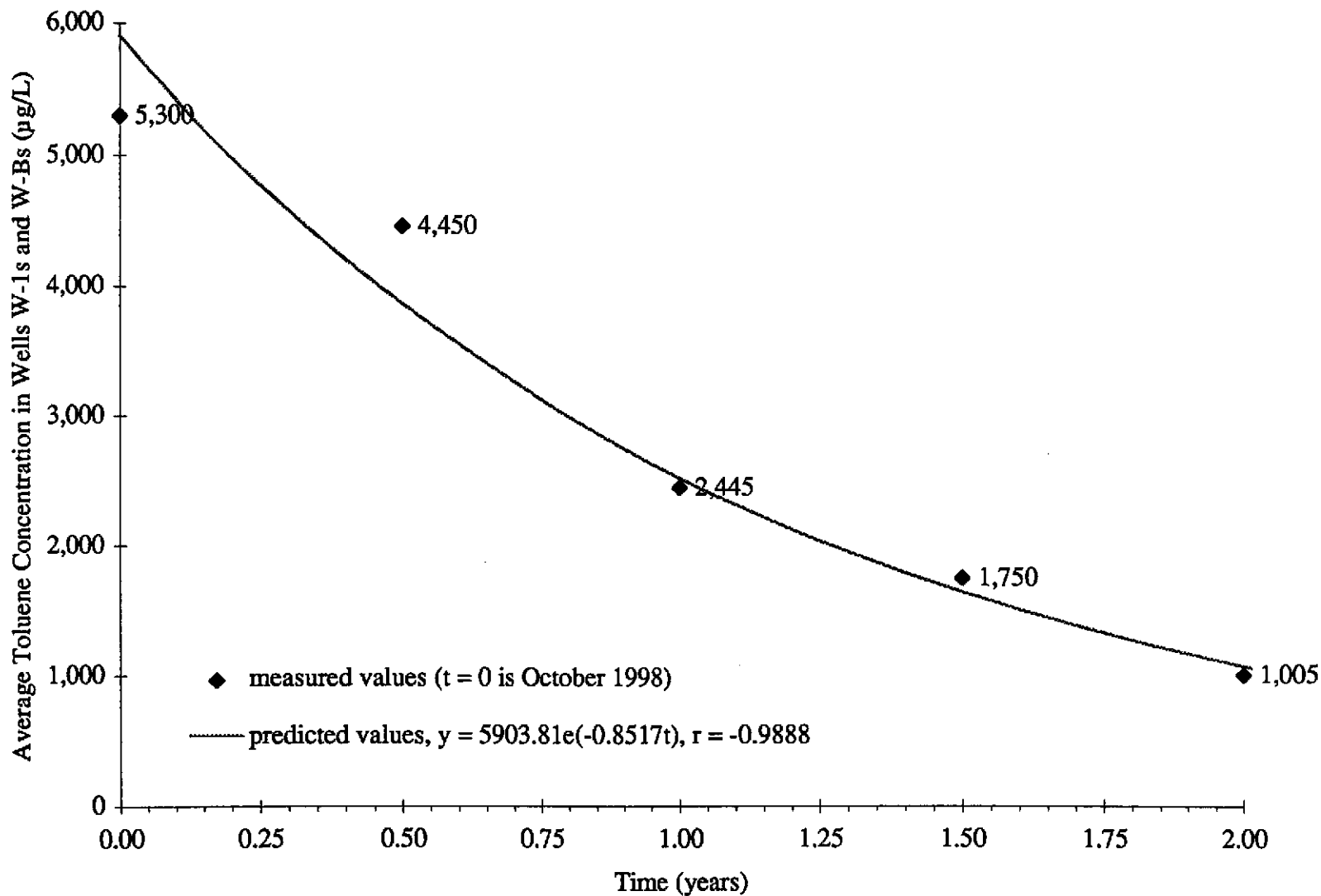
Measured and Predicted Benzene Concentrations Versus Time



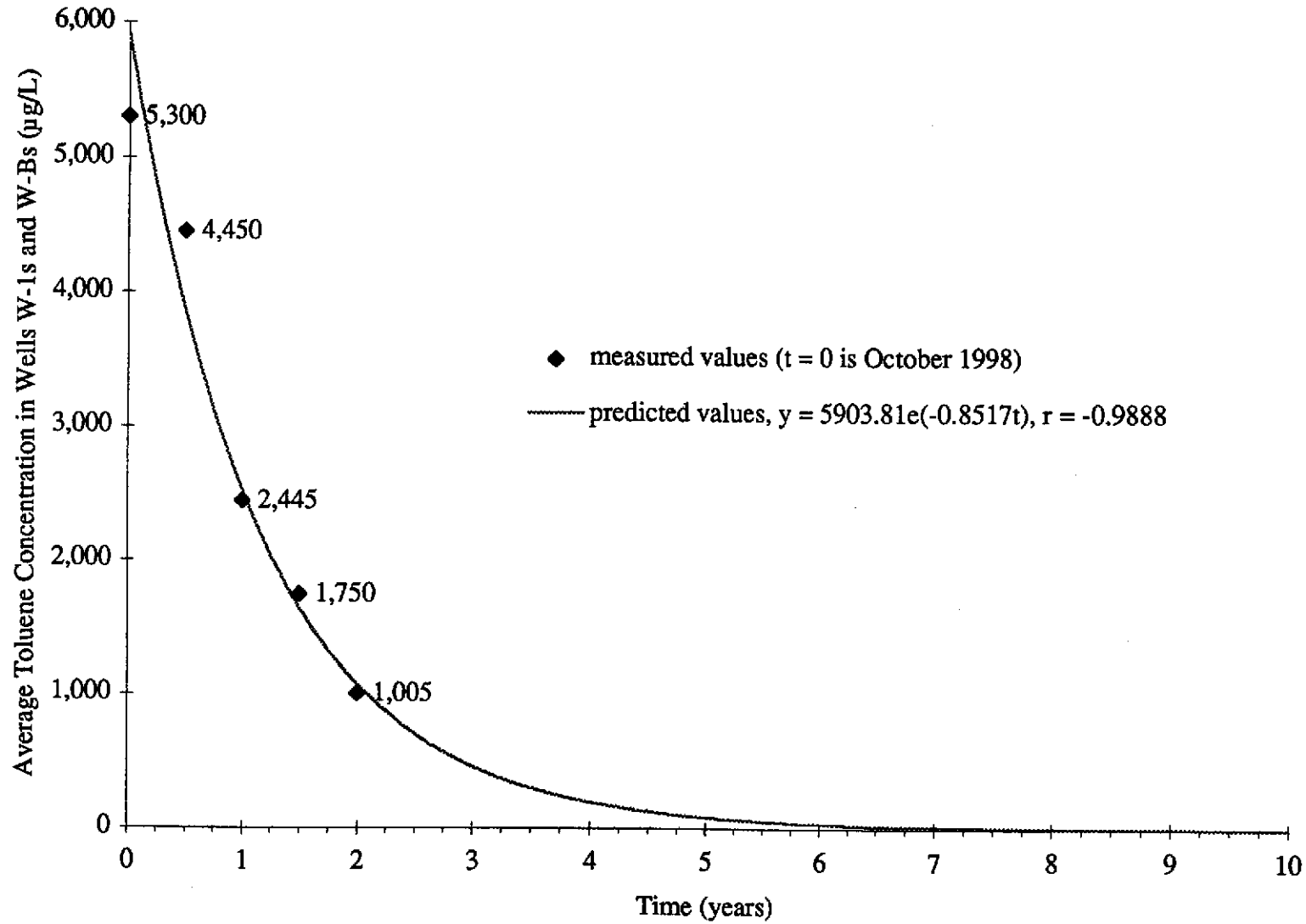
Measured and Predicted Benzene Concentrations Versus Time



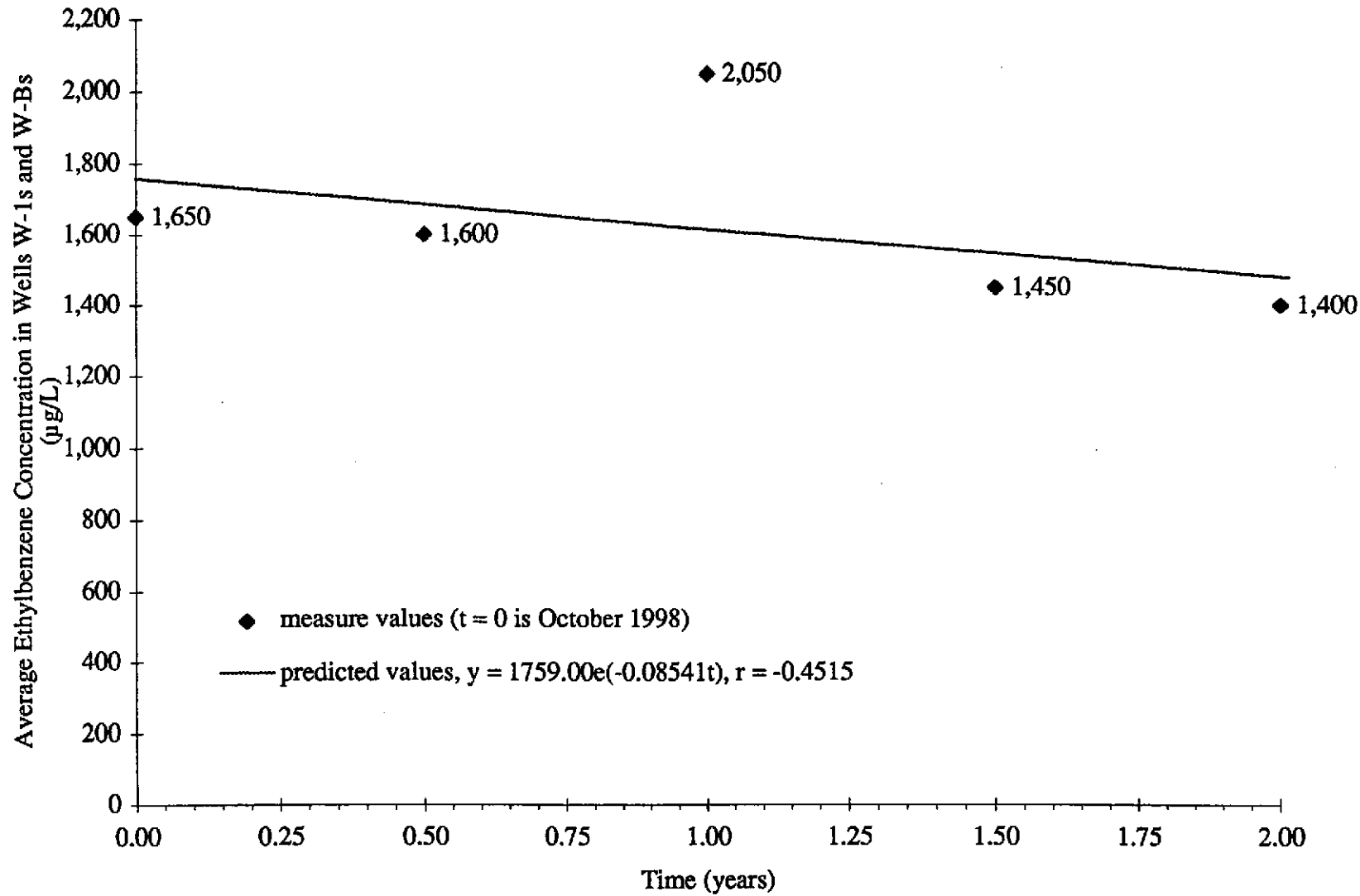
Measured and Predicted Toluene Concentrations Versus Time



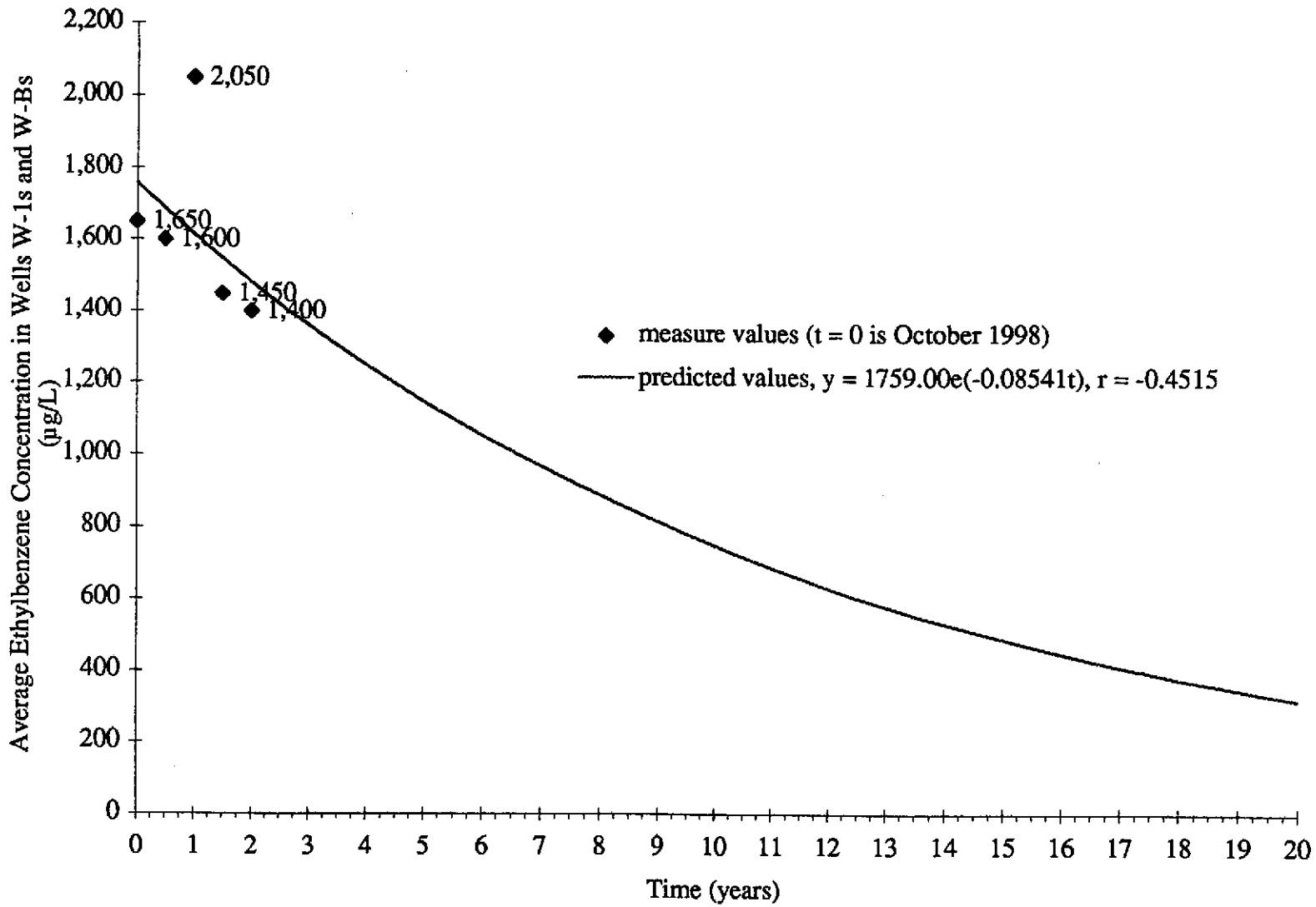
Measured and Predicted Toluene Concentrations Versus Time



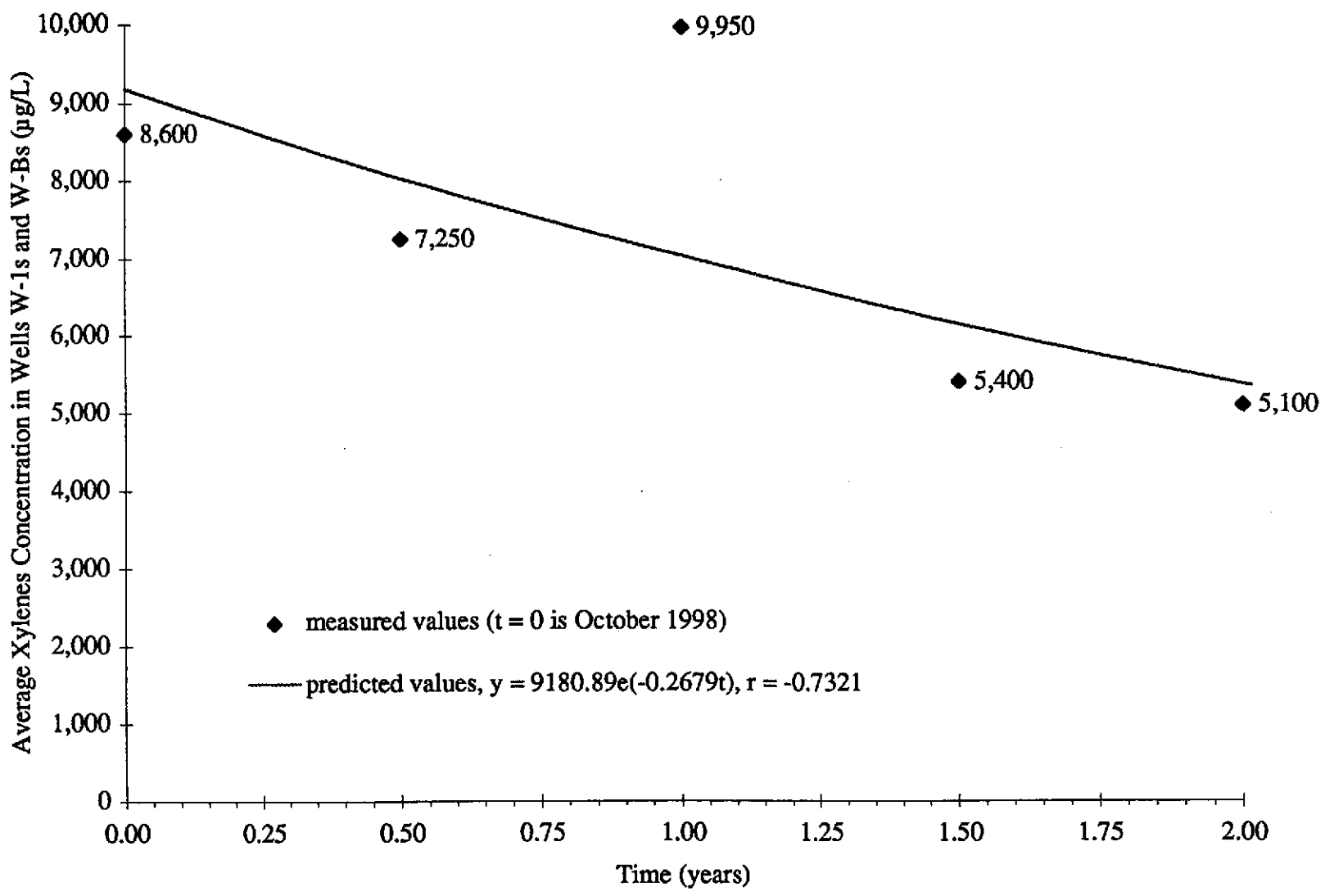
Measured and Predicted Ethylbenzene Concentrations Versus Time



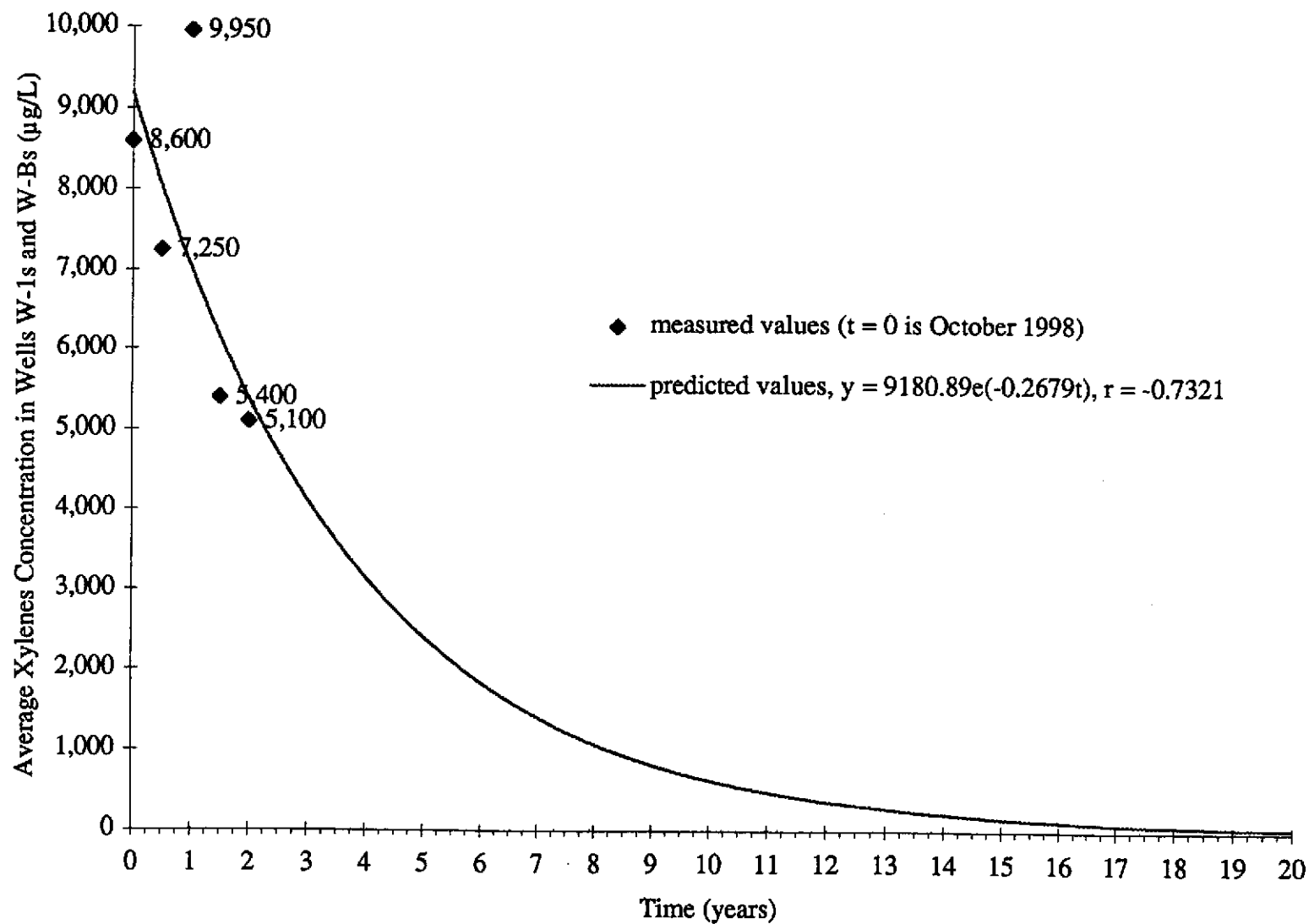
Measured and Predicted Ethylbenzene Concentrations Versus Time



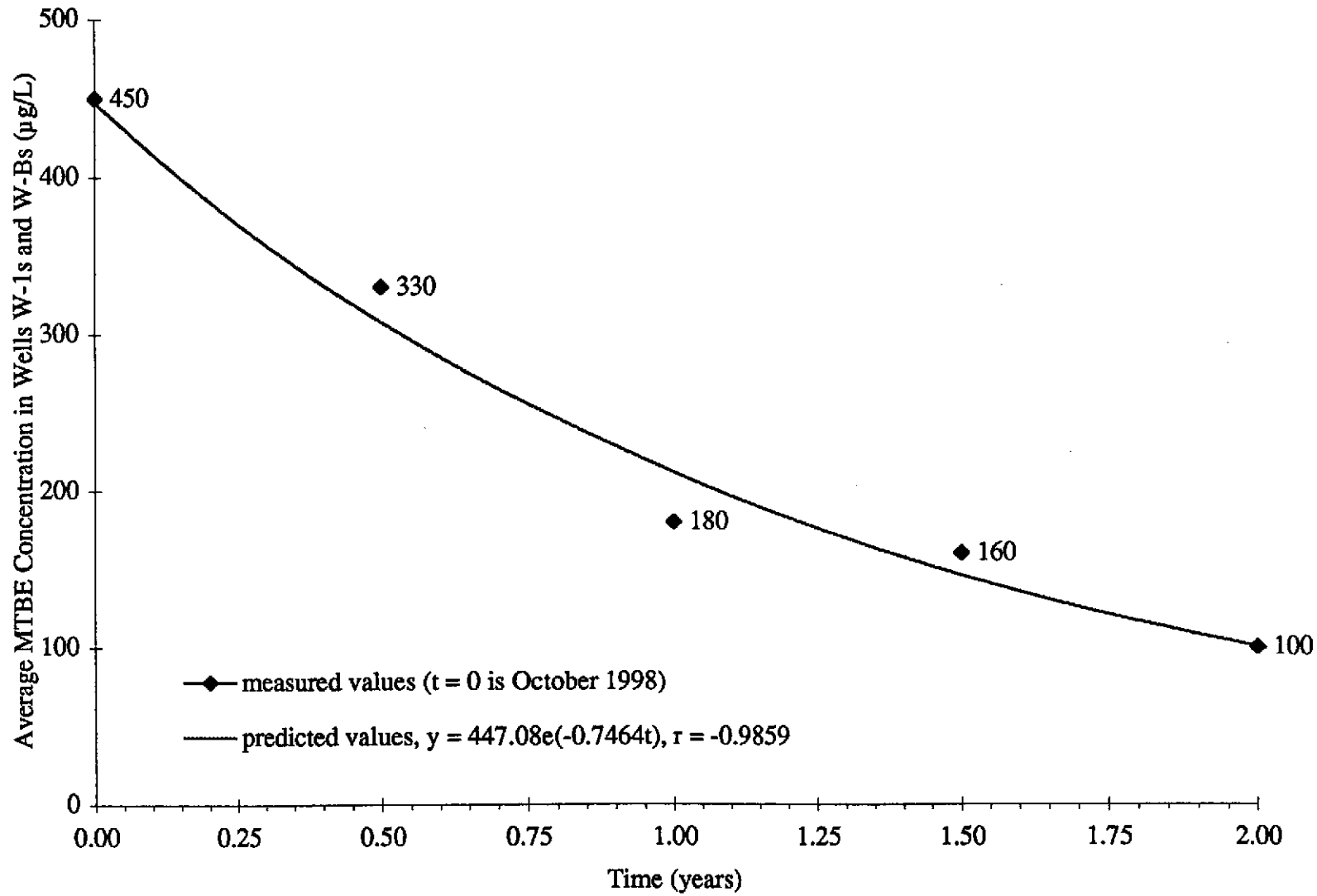
Measured and Predicted Xylenes Concentrations Versus Time



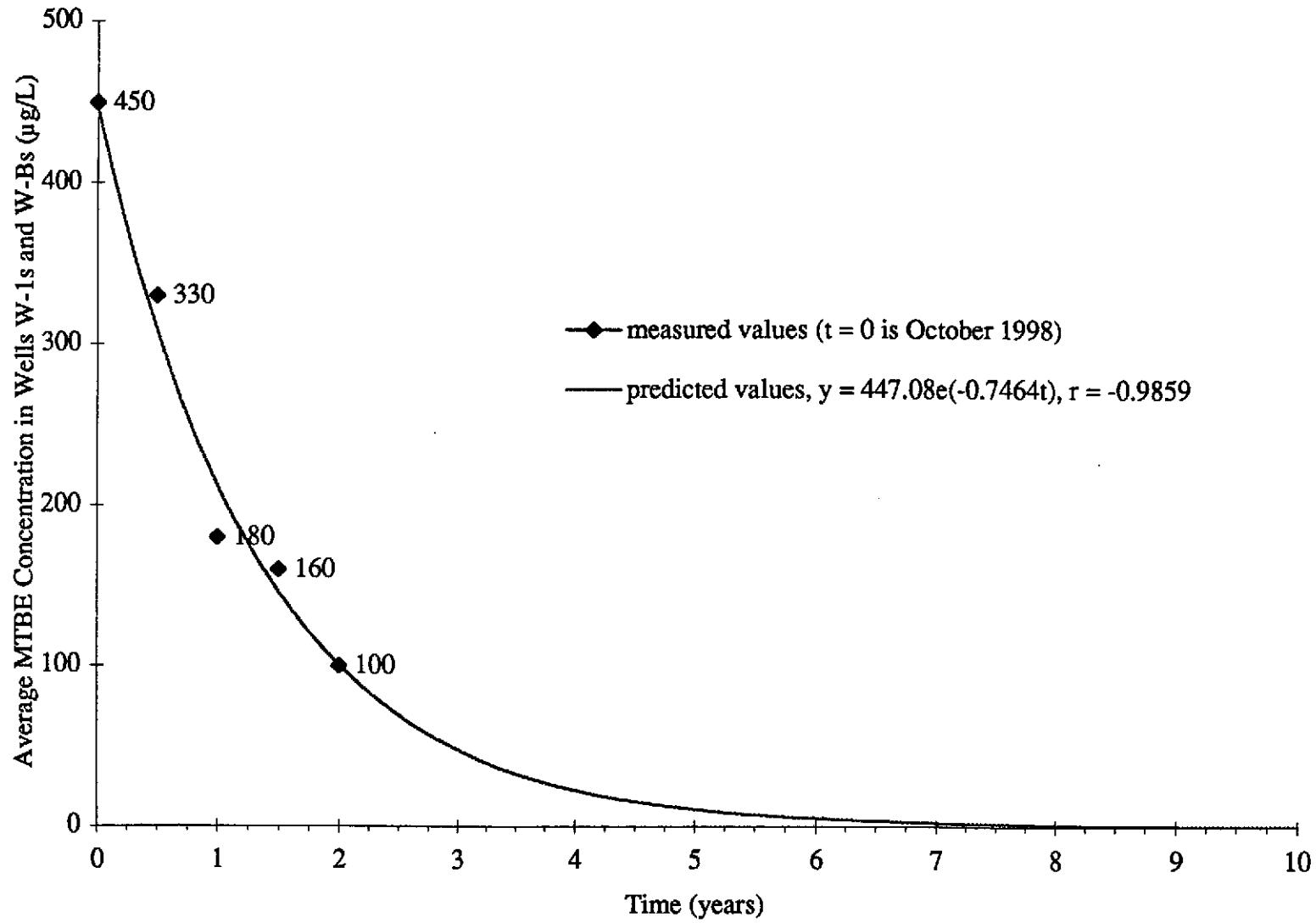
Measured and Predicted Xylenes Concentrations Versus Time



Measured and Predicted MTBE Concentrations Versus Time



Measured and Predicted MTBE Concentrations Versus Time



APPENDIX F

TIER 2 BASELINE RISK ASSESSMENT - ONSITE COMMERCIAL SCENARIO

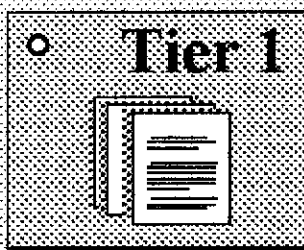
Main Screen

RBCA Tool Kit for Chemical Releases
Version 1.3a © 2000

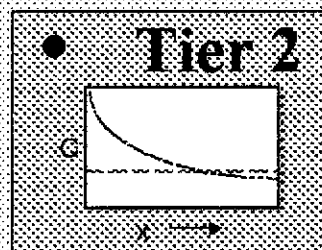
1. Project Information

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.
 Date: 17-Apr-01 Job ID: 971275

2. Which Type of RBCA Analysis?



Generic Values
On-Site
Exposure



Site-Specific Values
On- or Off-Site Exposure

3. Calculation Options

Affects which input data are required

- Baseline Risks (Forward mode)**
- RBCA Cleanup Standards (Backward mode)**

4. RBCA Evaluation Process

Prepare Input Data

Data Complete? (yes, no)

Exposure Pathways

Constituents of Concern (COCs)

Transport Models

Soil Parameters

GW Parameters

Air Parameters

Review Output

Exposure Flowchart

COC Chem. Parameters

Input Data Summary

User-Spec. COC Data...

Transient Domenico Analysis...

Baseline Risks...

Cleanup Standards...

5. Commands and Options

New Site

Load Data...

Save Data As...

Quit

Print Sheet

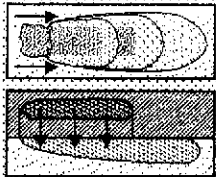
Set Units

Custom Chem. Data...

Help

Exposure Pathway Identification

1. Groundwater Exposure



**Groundwater Ingestion/
Surface Water Impact**

Receptor: Com. [v] Res. [v] Com. [v]
 Type: On-site Off-site1 Off-site2

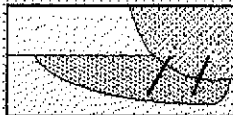
Source Media:

- Affected Groundwater
- Affected Soils Leaching to Groundwater

Distance to GW receptors:

0	100	100	(ft)
On-site	Off-site1	Off-site2	
0	100	100	(ft)

GW Discharge to Surface Water Exposure

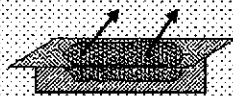


- Swimming
- Fish Consumption
- Aquatic Life Protection

Enter ALP Criteria

2. Surface Soil Exposure

**Direct Ingestion
and Dermal Contact**



Receptor: None [v]
 Type: On-site No off-site receptors

Construction Worker

Site Name: Arrow Rentals

Location: 187 North L Street, Livermore, California

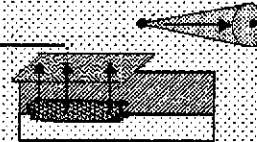
Compl. By: Aquifer Sciences, Inc.

Job ID: 971275

Date: 17-Apr-01

3. Air Exposure

**Volatilization and Particulates
to Outdoor Air Inhalation**



Receptor: Com. [v] Res. [v] Com. [v]
 Type: On-site Off-site1 Off-site2
 0 100 100 (ft)

Construction worker

- Affected Soils--Volatilization to Ambient Outdoor Air
- Affected Groundwater--Volatilization to Ambient Outdoor Air
- Affected Surface Soils--Particulates to Ambient Outdoor Air



**Volatilization to
Indoor Air Inhalation**

Receptor: Com. [v]
 Type: On-site No off-site receptors

- Affected Soils--Volatilization to Enclosed Space
- Affected Groundwater--Volatilization to Enclosed Space

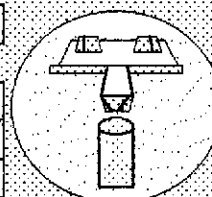
4. Commands and Options

Exposure Factors & Target Risks
 Exposure Flowchart

Exposure Factors and Target Risk Limits

1. Exposure Parameters

	Age Adjustment?			Residential		Commercial	
	Adult	(Age 0-6)	(Age 0-16)	Chronic	Construc.	Chronic	Construc.
Averaging time, carcinogens (yr)	70						
Averaging time, non-carcinogens (yr)	30			25		1	
Body weight (kg)	70	15	35	70			
Exposure duration (yr)	30	6	16	25		1	
Exposure frequency (days/yr)	350			250		180	
Dermal exposure frequency (days/yr)	350			250			
Skin surface area, soil contact (cm ²)	<input type="checkbox"/> 5800			2023	5800	5800	
Soil dermal adherence factor (mg/cm ² /day)	1						
Water ingestion rate (L/day)	2			1			
Soil ingestion rate (mg/day)	<input type="checkbox"/> 100	200		50	100		
Swimming exposure time (hr/event)	3						
Swimming event frequency (events/yr)	12			12	12		
Swimming water ingestion rate (L/hr)	<input type="checkbox"/> 0.05	0.5					
Skin surface area, swimming (cm ²)	<input type="checkbox"/> 23000	8100					
Fish consumption rate (kg/day)	0.025						
Contaminated fish fraction (unitless)	1						



Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.
 Job ID: 971275 Date: 17-Apr-01

2. Risk Goal Calculation Options

- Individual Constituent Risk Goals Only
- Individual and Cumulative Risk Goals

3. Target Health Risk Limits

	Individual	Cumulative
Target Risk (Class A/B carcin.)	1.0E-6	1.0E-5
Target Risk (Class C carcinogens)	1.0E-5	
Target Hazard Quotient	1.0E+0	
Target Hazard Index		1.0E+0

4. Commands and Options

Return to Exposure Pathways

Use Default Values

Print Sheet

Help

Exposure Pathway Flowchart

Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 17-Apr-01
 Compl. By: Aquifer Sciences, Inc.

Source Media

Transport Mechanisms

Exposure Media

Receptors

Affected Surficial Soils

Wind Erosion

Atmospheric Dispersion

Soil Dermal Contact and Ingestion

On-site

Off-site1

Off-site2

None

NA

NA

Affected Subsurface Soils

Volatilization

Enclosed Space Accumulation

Air Inhalation of Vapor and/or Particulates

Outdoor Air

Residential

Commercial

Commercial

Indoor Air

Commercial

NA

NA

Affected Groundwater

Leaching

Groundwater Transport

Groundwater Potable Water Ingestion

Commercial

Residential

Commercial

Surface Water Swimming, Fish Consumption, Aquatic Life

NA

NA

NA



Commands and Options

Return

Print Sheet

Help

Site Name: Arrow Rentals

Job ID: 971275

Commands and Options

Location: 187 North L Street, Livermore, California

Date: 17-Apr-01

Compl. By: Aquifer Sciences, Inc.

Main Screen

Print Sheet

Help

Source Media Constituents of Concern (COCs)

Selected COCs

COC Select:

Sort List:

?

Add/Insert

Top

MoveUp

Delete

Bottom

MoveDown

Benzene

Toluene

Ethylbenzene

Xylene (mixed isomers)

Methyl t-Butyl ether

Naphthalene

Representative COC Concentration

?

Groundwater Source Zone

Calculate

Enter Site Data

(mg/L)

note

5.0E+0

95% UCL at W-1s/W-Bs

4.2E+0

95% UCL at W-1s/W-Bs

1.9E+0

95% UCL at W-1s/W-Bs

9.0E+0

95% UCL at W-1s/W-Bs

2.6E-1

95% UCL at W-1s/W-Bs

3.5E-1

95% UCL at W-1s/W-Bs

Soil Source Zone

Calculate

Enter Site Data

(mg/kg)

note

1.4E+0

95% UCL of mean

1.1E+1

95% UCL of mean

1.2E+1

95% UCL of mean

7.2E+1

95% UCL of mean

0.0E+0

0.0E+0

Apply Raoult's Law ?

Mole Fraction in Source Material

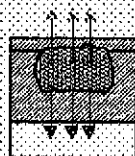
(-)

Transport Modeling Options

1. Vertical Transport, Surface Soil Column

Outdoor Air Volatilization Factors ?

- Surface soil volatilization model only
 - Combination surface soil/Johnson & Ettinger models
- Thickness of surface soil zone (ft)
- User-specified VF from other model



Indoor Air Volatilization Factors ?

- Johnson & Ettinger model
- User-specified VF from other model

Soil-to-Groundwater Leaching Factor ?

- ASTM Model
- Apply Soil Attenuation Model (SAM)
- Allow first-order biodecay
- User-specified LF from other model

Enter Decay Rates

2. Lateral Air Dispersion Factor

wind



- 3-D Gaussian dispersion model
 - User-Specified ADF
- Off-site 1 Off-site 2 (-)

Site Name: Arrow Rentals

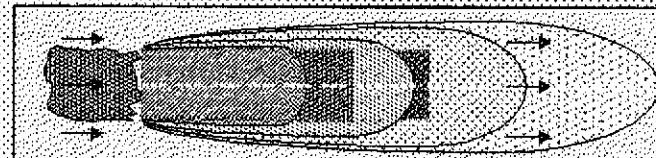
Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 17-Apr-01

Compl. By: Aquifer Sciences, Inc

3. Groundwater Dilution Attenuation Factor



Calculate DAF using Domenico Model ?

- Domenico equation with dispersion only (no biodegradation)
- Domenico equation first-order decay Enter Decay Rates
- Modified Domenico equation using electron acceptor superposition
- Enter Directly Biodegradation Capacity (mg/L)

— or —

User-Specified DAF Values

- DAF values from other model or site data
- n o

4. Commands and Options

Main Screen

Print Sheet

Help

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.

Job ID: 971275
 Date: 17-Apr-01

Commands and Options

Return Print Sheet
 Paste Default Values Help

Constituent Half-Life Values

<i>Constituent</i>	Saturated Zone		Unsaturated Zone	
	First-Order Decay		First-Order Decay	
	Half-Life (day)	Coefficient (1/day)	Half-Life (day)	Coefficient (1/day)
Benzene	5.7E+2	1.2E-3	5.7E+2	1.2E-3
Toluene	3.0E+2	2.3E-3	3.0E+2	2.3E-3
Ethylbenzene	3.0E+3	2.3E-4	3.0E+3	2.3E-4
Xylene (mixed isomers)	9.4E+2	7.3E-4	9.4E+2	7.3E-4
Methyl t-Butyl ether	3.4E+2	2.0E-3	3.4E+2	2.0E-3
Naphthalene	7.3E+3	9.5E-5	7.3E+3	9.5E-5

Site-Specific Soil Parameters

1. Soil Source Zone Characteristics

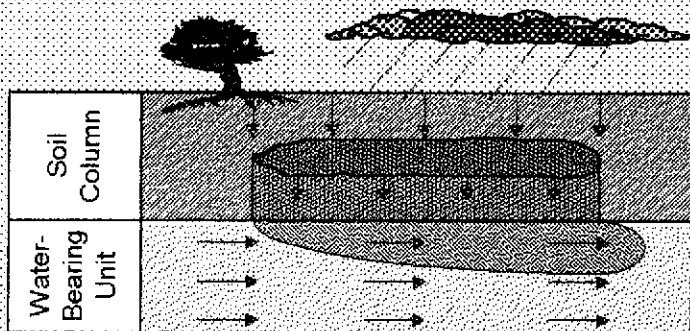
Hydrogeology

General Case Construction

Depth to water-bearing unit	25	(ft)
Capillary zone thickness	0.16	(ft)
Soil column thickness	24.84	(ft)

Affected Soil Zone

Depth to top of affected soils	15	(ft)
Depth to base of affected soils	25	(ft)
Affected soil area	1280	1280 (ft ²)
Length of affected soil parallel to assumed wind direction	40	40 (ft)
Length of affected soil parallel to assumed GW flow direction	40	(ft)



Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 17-Apr-01

Compl. By: Aquifer Sciences, Inc.

2. Surface Soil Column

Vadose Zone: Capillary Fringe

Predominant USCS Soil Type

Units ?

or	Calculate	or	
Total porosity		0.3	(-)
Volumetric water content	0.12	0.26	(-)
Volumetric air content	0.18	0.04	(-)
Dry bulk density		2.65	(kg/L)
Vertical hydraulic conductivity		3.3E+2	(ft/yr)
Vapor permeability		1.1E-11	(ft ²)
Capillary zone thickness		1.6E-1	(ft)

Net Rainfall Infiltration

Net infiltration estimate (in/yr)

or (in/yr)

Average annual precipitation

Partitioning Parameters

Fraction organic carbon (-)

Soil/water pH (-)

3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

Site-Specific Groundwater Parameters

1. Water-Bearing Unit ?

Hydrogeology

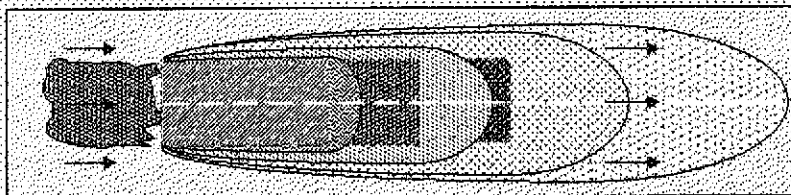
Groundwater Darcy velocity	8.2E+0	(ft/yr)
Groundwater seepage velocity	2.1E+1	(ft/yr)
or <input type="button" value="Enter Directly"/>		
Hydraulic conductivity	4.1E+2	(ft/yr)
Hydraulic gradient	2.0E-2	(-)
Effective porosity	0.40	(-)

Sorption

Fraction organic carbon--saturated zone	0.01	(-)
Groundwater pH	6.90	(-)

2. Groundwater Source Zone ?

Groundwater plume width at source	32	(ft)
Plume (mixing zone) thickness at source	6.56167979	(ft)
or <input type="button" value="Calculate"/>		
Saturated thickness	10	(ft)
Length of source zone		(ft)



Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 17-Apr-01
 Compl. By: Aquifer Sciences, Inc.

3. Groundwater Dispersion ?

Model: <input type="text" value="ASTM Default"/>	GW Ingestion		Soil Leaching to GW	
	Off-site 1	Off-site 2	Off-site 1	Off-site 2
Distance to GW receptors	100	100	100	100 (ft)
or <input type="button" value="Enter Directly"/>				
Longitudinal dispersivity	10	10	10	10 (ft)
Transverse dispersivity	3.3	3.3	3.3	3.3 (ft)
Vertical dispersivity	0.5	0.5	0.5	0.5 (ft)

4. Groundwater Discharge to Surface Water ?

Distance to GW/SW discharge point	Off-site 2	
	NA	(ft)
Plume width at GW/SW discharge	0	(ft)
Plume thickness at GW/SW discharge	0	(ft)
Surface water flowrate at GW/SW discharge	0.0E+0	(ft ³ /s)

5. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

Site-Specific Air Parameters

1. Outdoor Air Pathway

Dispersion in Air

Distance to offsite air receptor

Off-site 1	Off-site 2	
100	100	(ft)

or

Enter Directly

Horizontal dispersivity

11.26	11.26	(ft)
-------	-------	------

Vertical dispersivity

7.61	7.61	(ft)
------	------	------

Air Source Zone

Air mixing zone height

6.56167979	(ft)
------------	------

Ambient air velocity in mixing zone

7.381889764	(ft/s)
-------------	--------

Areal particulate emission flux

6.9E-14	(g/cm ² /s)
---------	------------------------

2. Indoor Air Pathway

Building Parameters

Building volume/area ratio

Residential	Commercial	
8	9.84252	(ft)

Foundation area

1000	20000	(ft ²)
------	-------	--------------------

Foundation perimeter

130	600	(ft)
-----	-----	------

Building air exchange rate

1.4E-4	1.4E-4	(1/s)
--------	--------	-------

Depth to bottom of foundation slab

0.5	0.5	(ft)
-----	-----	------

Convective air flow through cracks

0.0E+0	0.0E+0	(ft ³ /s)
--------	--------	----------------------

Foundation thickness

0.5	(ft)
-----	------

Foundation crack fraction

0.01	(-)
------	-----

Volumetric water content of cracks

0.28	(-)
------	-----

Volumetric air content of cracks

0.13	(-)
------	-----

Indoor/Outdoor differential pressure

0	(Pa)
---	------

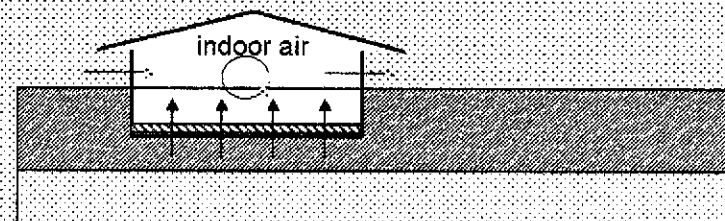
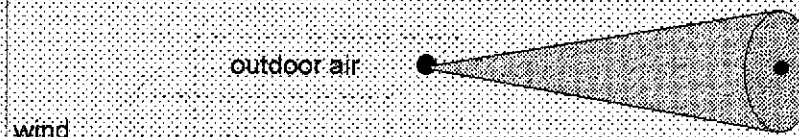
Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 17-Apr-01

Compl. By: Aquifer Sciences, Inc.



3. Commands and Options

Main Screen

Use Default Values

Print Sheet

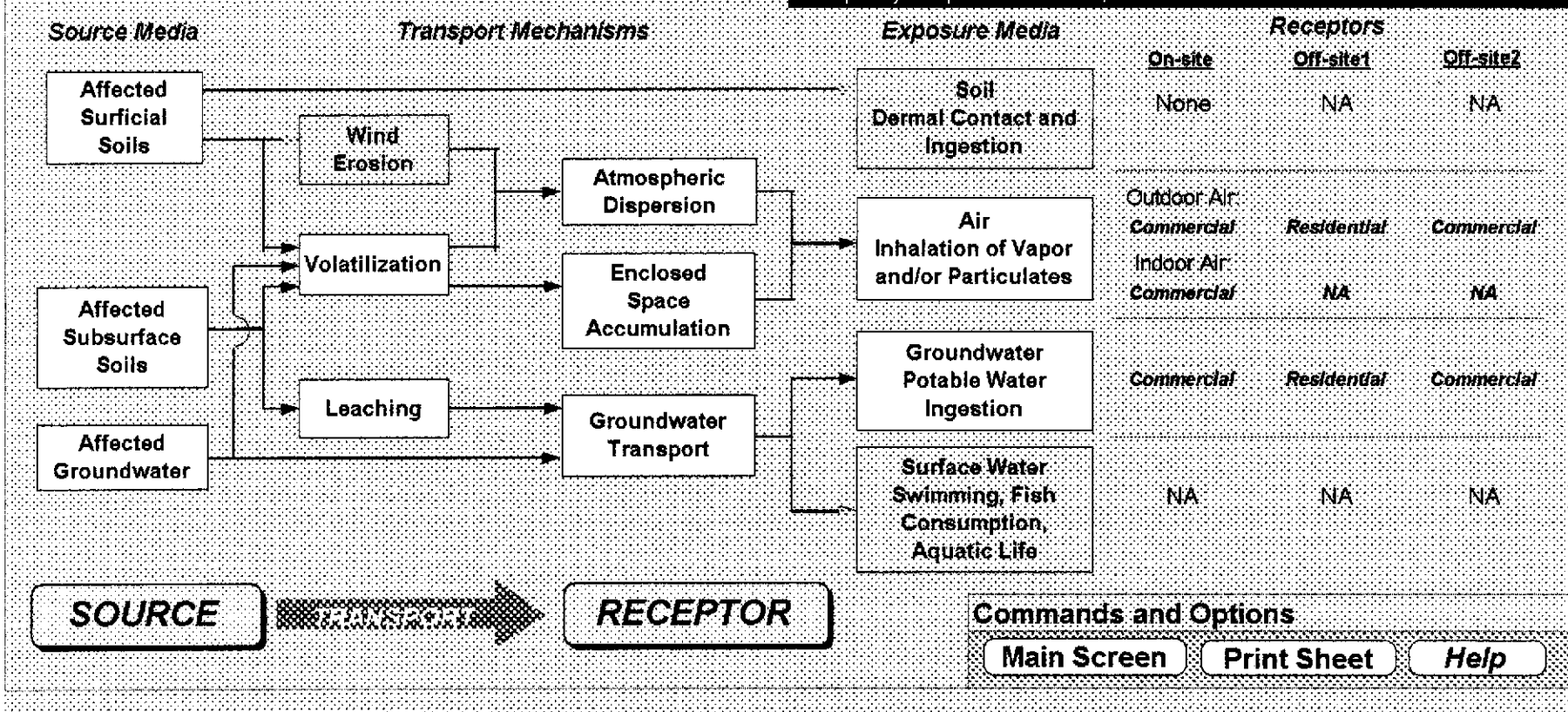
Set Units

Help

Exposure Pathway Flowchart

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc

Job ID: 971275
 Date: 17-Apr-01



CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS		Molecular Weight		Diffusion Coefficients				log (Koc) or log(Kd)		Henry's Law Constant		Vapor Pressure		Solubility		acid pKa	base pKb		
	Number	type	MW	ref	in air (cm ² /s)		in water (cm ² /s)		(@ 20 - 25 C)		(@ 20 - 25 C)		(@ 20 - 25 C)		(@ 20 - 25 C)					
					Dair	ref	Dwat	ref	log(L/kg) partition	ref	(atm-mg/mol)	(unitless)	ref	(mm Hg)	ref	(mg/L)	ref			
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.90E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5	-	-
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	6	9.41E-05	7	1.08	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-
Naphthalene	91-20-3	PAH	128.2	PS	5.90E-02	PS	7.50E-06	PS	3.30	Koc	PS	4.83E-04	1.99E-02	PS	2.30E-01	PS	3.10E+01	PS	-	-

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01



Constituent	ref
Benzene	-
Toluene	-
Ethylbenzene	-
Xylene (mixed isomers)	-
Methyl t-Butyl ether	-
Naphthalene	-

Site Name: Arrow Rentals

Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs **Toxicity Data**

Constituent	Reference Dose (mg/kg/day)				Reference Conc. (mg/m3)				Slope Factors 1/(mg/kg/day)				Unit Risk Factor 1/(µg/m3)		EPA Weight of Evidence	is Constituent Carcinogenic ?
	Oral		Dermal		Inhalation		Oral		Dermal		Inhalation		URF_inhal	ref		
	RFD_oral	ref	RFD_dermal	ref	RFC_inhal	ref	SF_oral	ref	SF_dermal	ref	URF_inhal	ref				
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE		
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	D	FALSE		
Ethylbenzene	1.00E-01	PS	9.70E-02	TX	1.00E+00	PS	-	-	-	-	-	-	D	FALSE		
Xylene (mixed isomers)	2.00E+00	A,R	1.84E+00	TX	7.00E+00	A	-	-	-	-	-	-	D	FALSE		
Methyl t-Butyl ether	1.00E-02	31	8.00E-03	TX	3.00E+00	R	-	-	-	-	-	-	-	FALSE		
Naphthalene	4.00E-01	PS	3.56E-01	TX	1.40E+00	PS	-	-	-	-	-	-	D	FALSE		

Site Name: Arrow Rentals
 Site Location: 187 North L S

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level		Time-Weighted Average Workplace Criteria		Aquatic Life Prot. Criteria		Bioconcentration Factor (L-wat/kg-flesh)
	MCL (mg/L)	ref	TWA (mg/m3)	ref	AQL (mg/L)	ref	
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6
Toluene	1.00E+00	56 FR 3528 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3528 (30 Jan 91)	4.35E+02	PS	-	-	1
Xylene (mixed isomers)	1.00E+01	56 FR 3528 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
Naphthalene	-	-	5.00E+01	PS	-	-	430

Site Name: Arrow Rentals

Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data						Detection Limits				Half Life (First-Order Decay) (days)		
		Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Saturated	Unsaturated	ref
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Xylene (mixed isomers)	0.5	0.08	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
Naphthalene	0.05	0.069	0.53	2.2	0.2	2.7E-1	D	0.01	32	0.01	32	258	258	H

Site Name: Arrow Rentals

Site Location: 187 North L S

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Arrow Rentals
 Site Location: 167 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971276

1 OF 1

Exposure Parameters	Residential			Commercial/Industrial	
	Adult	(1-6yrs)	(1-18 yrs)	Chronic	Construct.
AT _c	70				
AT _n	30			25	1
BW	70	15	35	70	
ED	30	6	16	25	1
τ	30			25	1
EF	350			250	180
EF _D	350			250	
IR _w	2			1	
IR _s	100	200		50	100
SA	5800		2023	5800	5800
M	1				
ET _{swim}	3				
EV _{swim}	12	12			
IR _{swim}	0.05	0.5			
SA _{swim}	23000		8100		
IR _{fish}	0.025				
F _{fish}	1				

Surface Parameters	General	Construction	Units
			(Units)
A	1.3E+3	NA	(ft ²)
W	4.0E+1	NA	(ft)
W _{gw}	4.0E+1		(ft)
U _{air}	7.4E+0		(ft/s)
h _{air}	6.6E+0		(ft)
P _a	NA		(g/cm ² /s)
L _{ss}	1.0E+0		(ft)

Surface Soil Coefficients Parameters	Value	Units
h _{cap}	1.6E-1	(ft)
h _v	2.5E+1	(ft)
A _s	2.7E+0	(g/cm ³)
f _{oc}	1.0E-2	(-)
θ _t	3.0E-1	(-)
K _{vs}	3.3E+2	(ft/yr)
K _v	1.1E-11	(ft ²)
L _{gw}	2.5E+1	(ft)
L _s	1.5E+1	(ft)
L _{base}	2.5E+1	(ft)
L _{subs}	1.0E+1	(ft)
pH	6.9E+0	(-)
θ _v	0.25	(-)
θ _a	0.04	(-)

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Commercial	Residential	Commercial
Soil Leaching to Groundwater Ingestion	Commercial	Residential	Commercial
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Commercial	Residential	Commercial
Volatilization from Groundwater	Commercial	Residential	Commercial
Indoor Air:			
Volatilization from Subsurface Soils	Commercial	NA	NA
Volatilization from Groundwater	Commercial	NA	NA

Building Parameters	Residential	Commercial	Units
L _b	NA	9.84E+0	(ft)
A _b	NA	2.00E+4	(ft ²)
X _{crk}	NA	6.00E+2	(ft)
ER	NA	1.40E-4	(1/s)
L _{crk}	NA	5.00E-1	(ft)
Z _{crk}	NA	5.00E-1	(ft)
γ	NA	1.00E-2	(-)
ΔP	NA	0.00E+0	(Pa)
C _a	NA	0.00E+0	(ft ³ /s)

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	Units
Groundwater receptor	0	100	100	(ft)
Soil leaching to groundwater receptor	0	100	100	(ft)
Outdoor air inhalation receptor	0	100	100	(ft)

Groundwater Parameters	Value	Units
h _{gw}	6.6E+0	(ft)
i	1.2E-1	(m/yr)
U _{gw}	6.7E+0	(ft/yr)
V _{gw}	2.1E+1	(ft/yr)
K _s	4.1E+2	(ft/yr)
i	2.0E-2	(-)
S _w	3.2E+1	(ft)
S _s	6.6E+0	(ft)
θ _{eff}	4.0E-1	(-)
f _{oc-gw}	1.0E-2	(-)
pH _{gw}	6.9E+0	(-)
Biodegradation considered?	1st Order	(-)

Target Health Risk Values	Individual	Cumulative
TR ₅₀ Target Risk (class A&B carcinogens)	1.0E-5	1.0E-5
TR _c Target Risk (class C carcinogens)	1.0E-6	
THQ Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	Units
	Groundwater Ingestion		Soil Leaching to GW		
α _x Longitudinal dispersivity	1.0E+1	1.0E+1	1.0E+1	1.0E+1	(ft)
α _y Transverse dispersivity	3.3E+0	3.3E+0	3.3E+0	3.3E+0	(ft)
α _v Vertical dispersivity	5.0E-1	5.0E-1	5.0E-1	5.0E-1	(ft)
Lateral Outdoor Air Transport			Soil to Outdoor Air Inhal.	GW to Outdoor Air Inhal.	
α _y Transverse dispersion coefficient	1.1E+1	1.1E+1	1.1E+1	1.1E+1	(ft)
α _v Vertical dispersion coefficient	7.6E+0	7.6E+0	7.6E+0	7.6E+0	(ft)
ADF Air dispersion factor	2.1E+0	2.1E+0	2.1E+0	2.1E+0	(-)

Mitigation Options	Tier 2
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	Yes
Air dilution factor	3-D Gaussian dispersion
Groundwater dilution-attenuation factor	Domenico model w/ biodeg.

Surface Water Parameters	Off-site 2	Units
Q _{sw} Surface water flowrate	NA	(ft ³ /s)
W _{pl} Width of GW plume at SW discharge	NA	(ft)
h _{pl} Thickness of GW plume at SW discharge	NA	(ft)
DF _{sw} Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (15 - 25 ft)	
	value (mg/L)	note	value (mg/kg)	note
Benzene	5.0E+0	95% UCL at W-1s/W-Bs	1.4E+0	95% UCL of mean
Toluene	4.2E+0	95% UCL at W-1s/W-Bs	1.1E+1	95% UCL of mean
Ethylbenzene	1.9E+0	95% UCL at W-1s/W-Bs	1.2E+1	95% UCL of mean
Xylene (mixed isomers)	9.0E+0	95% UCL at W-1s/W-Bs	7.2E+1	95% UCL of mean
Methyl t-Butyl ether	2.6E-1	95% UCL at W-1s/W-Bs	0.0E+0	
Naphthalene	3.5E-1	95% UCL at W-1s/W-Bs	0.0E+0	

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT**User-Specified COC Data****CONSTITUENT HALF-LIFE VALUES**

CONSTITUENT	Saturated Zone Half-Life (days)	Unsaturated Zone Half-Life (days)
Benzene	567	567
Toluene	297	297
Ethylbenzene	2962	2962
Xylene (mixed isomers)	944	944
Methyl t-Butyl ether	339	339
Naphthalene	7300	7300

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

Tier 2 Domenico Groundwater Modeling Summary

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, CA

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

1 OF 2

DOMENICO GROUNDWATER MODELING SUMMARY

OFF-SITE GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS LEACHING TO GROUNDWATER:

INGESTION

Constituents of Concern	1) Source Medium	2) Steady-state Exposure Concentration Groundwater: POE Conc. (mg/L)		3) POE Concentration Limit Groundwater: POE Conc. (mg/L)		4) Time to Reach POE Conc. Limit Conc. limit reached? ("X" if yes); Time (yr)	
	Soil Conc. (mg/kg)	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	1.4E+0	1.3E-7	1.3E-7	2.9E-3	9.9E-3
Toluene	1.1E+1	7.7E-22	7.7E-22	7.3E+0	2.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Ethylbenzene	1.2E+1	1.1E-7	1.1E-7	3.7E+0	1.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Xylene (mixed isomers)	7.2E+1	1.2E-12	1.2E-12	7.3E+1	2.0E+2	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Methyl t-Butyl ether	0.0E+0	0.0E+0	0.0E+0	3.7E-1	1.0E+0	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Naphthalene	0.0E+0	0.0E+0	0.0E+0	1.5E+1	4.1E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA

NOTE: POE = Point of exposure

RBCA SITE ASSESSMENT

Tier 2 Domenico Groundwater Modeling Summary

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, CA

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

2 OF 2

DOMENICO GROUNDWATER MODELING SUMMARY

OFF-SITE GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER:

INGESTION

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) Steady-state Exposure Concentration Groundwater: POE Conc. (mg/L)		3) POE Concentration Limit Groundwater: POE Conc. (mg/L)		4) Time to Reach POE Conc. Limit Conc reaches limit? (* if yes); Time (yr)	
		Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	5.0E+0	1.7E-3	1.7E-3	2.9E-3	9.9E-3
Toluene	4.2E+0	1.2E-7	1.2E-7	7.3E+0	2.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Ethylbenzene	1.9E+0	7.4E-4	7.4E-4	3.7E+0	1.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Xylene (mixed isomers)	9.0E+0	4.7E-5	4.7E-5	7.3E+1	2.0E+2	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Methyl t-Butyl ether	2.6E-1	6.5E-4	6.5E-4	3.7E-1	1.0E+0	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Naphthalene	3.5E-1	1.6E-6	1.6E-6	1.5E+1	4.1E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA

NOTE: POE = Point of exposure

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

Constituent: Benzene
Source Medium: Affected Groundwater
Biodegradation: 1st Order

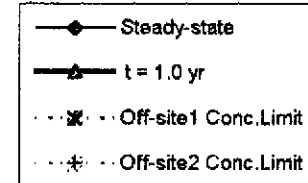
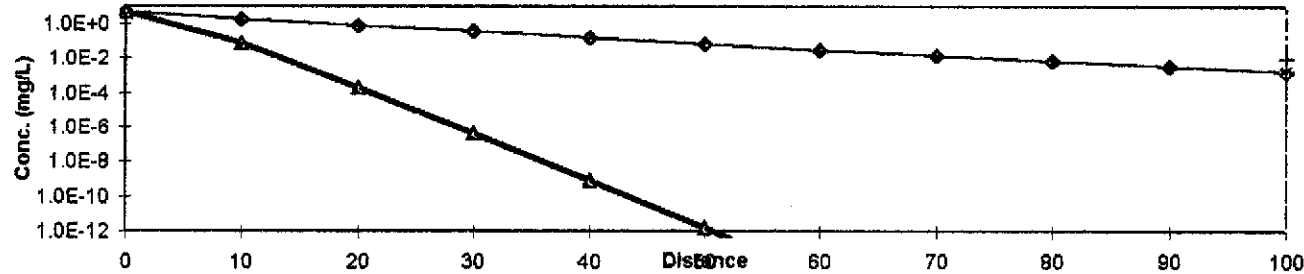
**Concentration vs. Distance from Source
 (for given time)**

Time (yr) **1.0**

Distance (ft)	0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	5.0E+0	7.9E-2	1.9E-4	4.1E-7	8.1E-10	1.5E-12	2.9E-15	5.4E-18	0.0E+0	0.0E+0	0.0E+0
Steady-state	5.0E+0	1.9E+0	8.2E-1	3.6E-1	1.6E-1	6.8E-2	3.0E-2	1.4E-2	6.7E-3	3.4E-3	1.7E-3

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.7E-3	1.7E-3
2.9E-3	9.9E-3

POE Concentration Limit (mg/L)



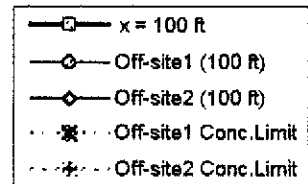
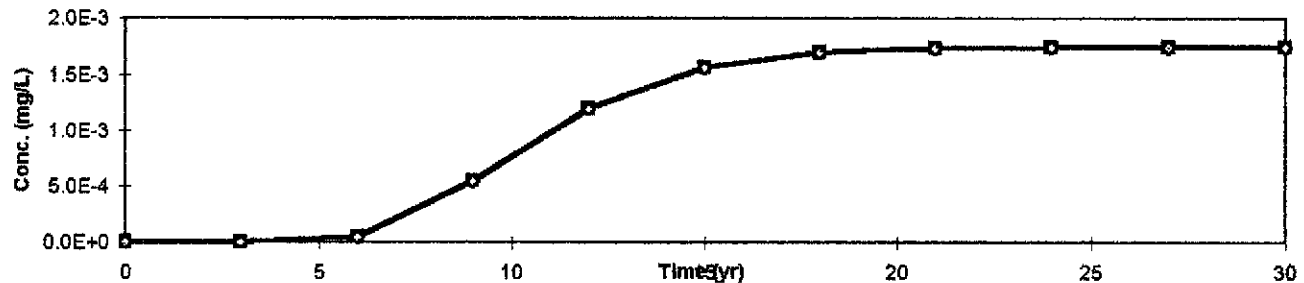
**Concentration vs. Time
 (for given distance from source)**

Distance (ft) **100**

Time (yr)	0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	0.0E+0	6.1E-9	5.1E-5	5.4E-4	1.2E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3
Off-site1 (100 ft)	0.0E+0	6.1E-9	5.1E-5	5.4E-4	1.2E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3
Off-site2 (100 ft)	0.0E+0	6.1E-9	5.1E-5	5.4E-4	1.2E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3

**Time to Reach
 Conc. Limit (yr)**

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

Constituent: Toluene
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

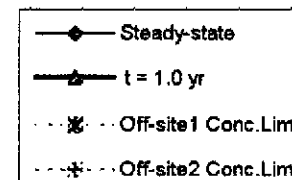
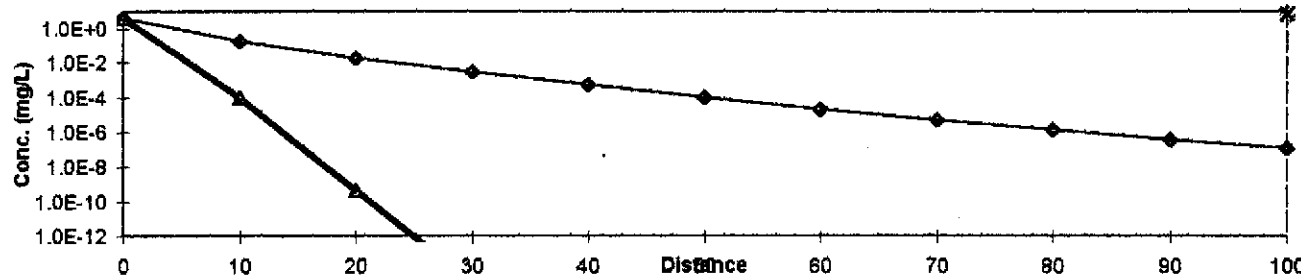
Concentration vs. Distance from Source
 (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	4.2E+0	9.8E-5	4.3E-10	1.9E-15	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	4.2E+0	1.8E-1	1.9E-2	2.9E-3	5.0E-4	9.8E-5	2.1E-5	5.1E-6	1.3E-6	3.8E-7	1.2E-7

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.2E-7	1.2E-7
7.3E+0	2.0E+1

POE Concentration Limit (mg/L)



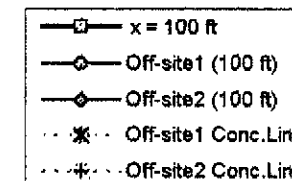
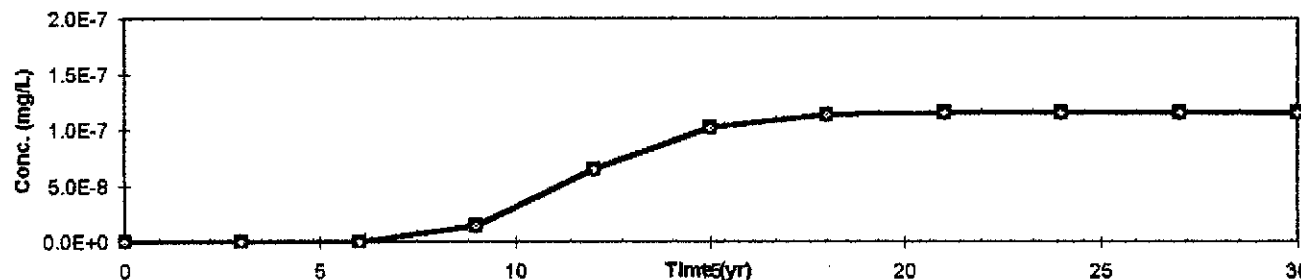
Concentration vs. Time
 (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	1.6E-18	1.3E-10	1.4E-8	6.5E-8	1.0E-7	1.1E-7	1.1E-7	1.2E-7	1.2E-7	1.2E-7
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	1.6E-18	1.3E-10	1.4E-8	6.5E-8	1.0E-7	1.1E-7	1.1E-7	1.2E-7	1.2E-7	1.2E-7
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	1.6E-18	1.3E-10	1.4E-8	6.5E-8	1.0E-7	1.1E-7	1.1E-7	1.2E-7	1.2E-7	1.2E-7

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

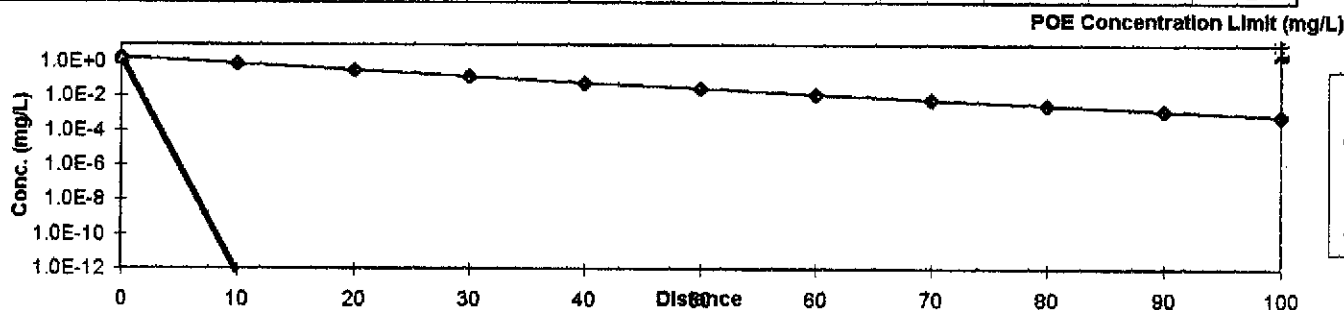
Constituent: Ethylbenzene
Source Medium: Affected Groundwater
Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)	0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	1.9E+0	6.3E-13	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	1.9E+0	7.3E-1	3.2E-1	1.4E-1	6.3E-2	2.7E-2	1.2E-2	5.7E-3	2.8E-3	1.4E-3	7.4E-4

Off-site1 Residential	Off-site2 Commercial
100	100
0.0E+0	0.0E+0
7.4E-4	7.4E-4
3.7E+0	1.0E+1



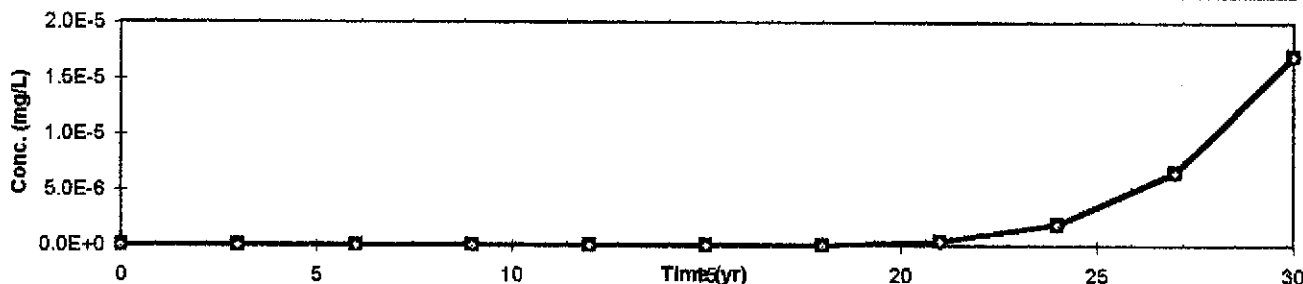
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)	0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	0.0E+0	0.0E+0	0.0E+0	2.5E-15	1.1E-11	1.6E-9	3.9E-8	3.7E-7	1.9E-6	6.6E-6	1.7E-5
Off-site1 (100 ft)	0.0E+0	0.0E+0	0.0E+0	2.5E-15	1.1E-11	1.6E-9	3.9E-8	3.7E-7	1.9E-6	6.6E-6	1.7E-5
Off-site2 (100 ft)	0.0E+0	0.0E+0	0.0E+0	2.5E-15	1.1E-11	1.6E-9	3.9E-8	3.7E-7	1.9E-6	6.6E-6	1.7E-5

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

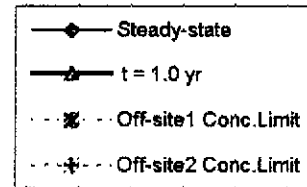
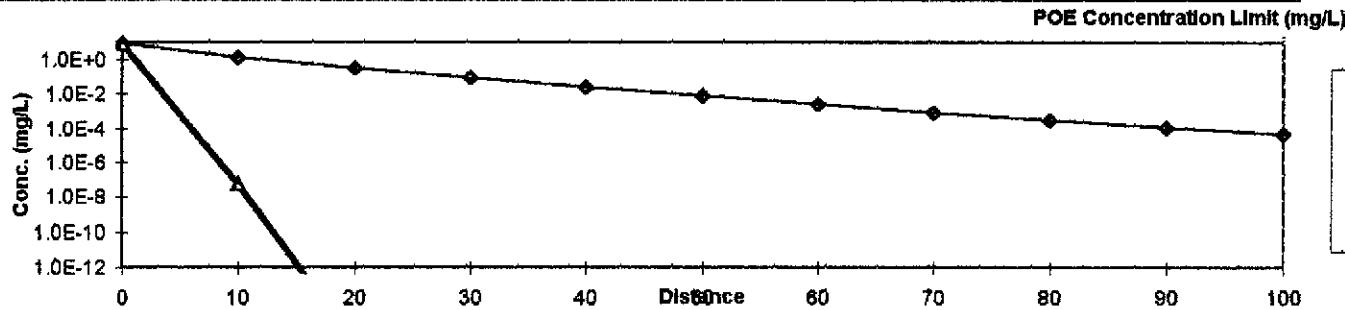
Constituent: Xylene (mixed isomers)
Source Medium: Affected Groundwater
Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	9.0E+0	6.2E-8	5.4E-17	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	9.0E+0	1.4E+0	3.3E-1	8.9E-2	2.5E-2	7.5E-3	2.4E-3	8.2E-4	3.0E-4	1.2E-4	4.7E-5

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
4.7E-5	4.7E-5
7.3E+1	2.0E+2



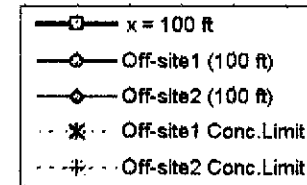
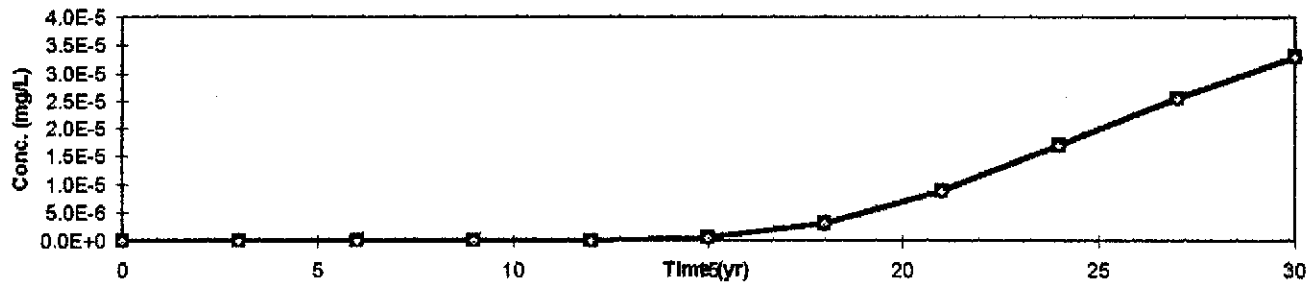
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	3.8E-15	2.0E-10	3.4E-8	5.8E-7	3.1E-6	8.8E-6	1.7E-5	2.6E-5	3.3E-5
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	3.8E-15	2.0E-10	3.4E-8	5.8E-7	3.1E-6	8.8E-6	1.7E-5	2.6E-5	3.3E-5
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	3.8E-15	2.0E-10	3.4E-8	5.8E-7	3.1E-6	8.8E-6	1.7E-5	2.6E-5	3.3E-5

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

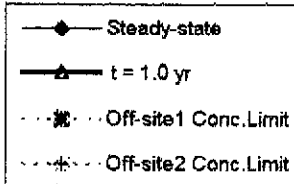
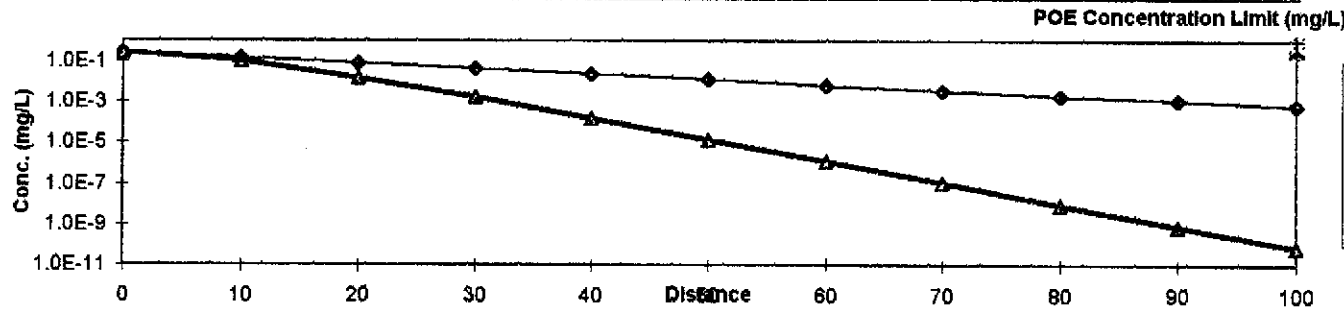
Constituent: Methyl t-Butyl ether
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.6E-1	1.0E-1	1.5E-2	1.7E-3	1.6E-4	1.4E-5	1.2E-6	1.0E-7	8.9E-9	7.9E-10	7.1E-11
Steady-state	Conc. (mg/L)	2.6E-1	1.4E-1	8.0E-2	4.5E-2	2.4E-2	1.2E-2	6.5E-3	3.8E-3	1.9E-3	1.1E-3	6.5E-4

Off-site1 Residential	Off-site2 Commercial
100	100
7.1E-11	7.1E-11
6.5E-4	6.5E-4
3.7E-1	1.0E+0



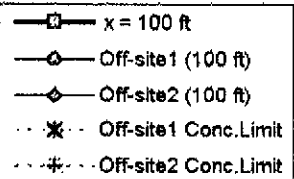
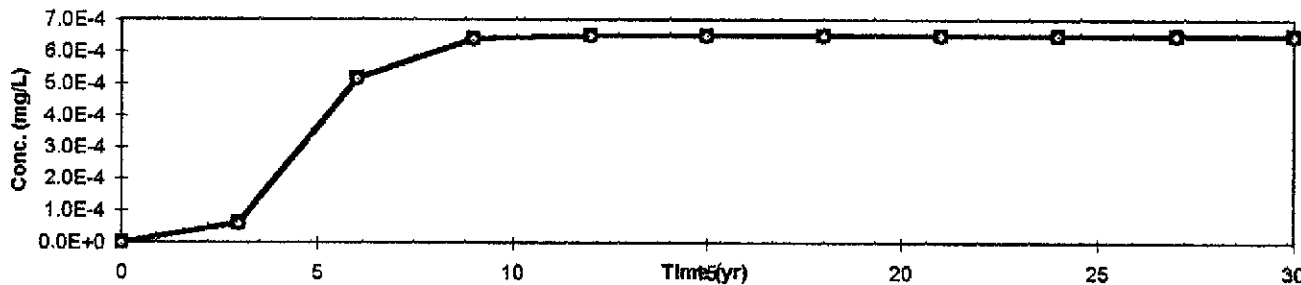
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	5.9E-5	5.2E-4	6.4E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	5.9E-5	5.2E-4	6.4E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	5.9E-5	5.2E-4	6.4E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

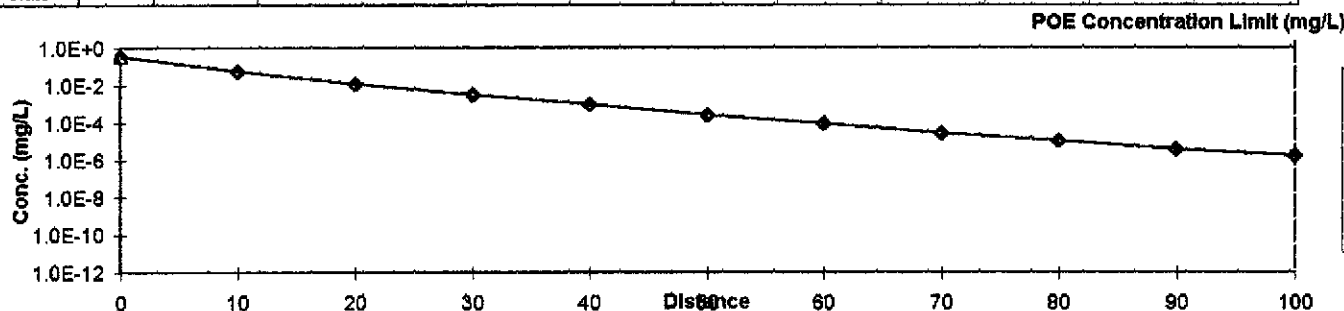
Constituent: Naphthalene
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

Concentration vs. Distance from Source
 (for given time)

Time (yr) 1.0

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	3.5E-1	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	3.5E-1	5.3E-2	1.2E-2	3.2E-3	9.0E-4	2.7E-4	8.4E-5	2.9E-5	1.0E-5	4.0E-6	1.6E-6

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.6E-6	1.6E-6
1.5E+1	4.1E+1



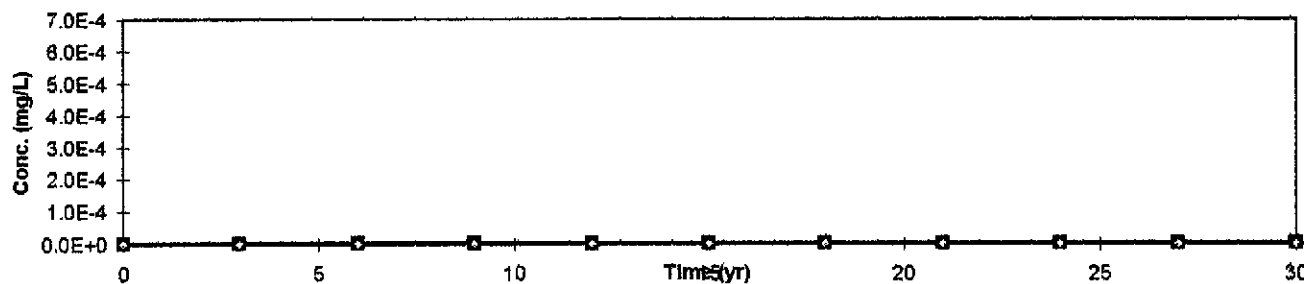
Concentration vs. Time
 (for given distance from source)

Distance (ft) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

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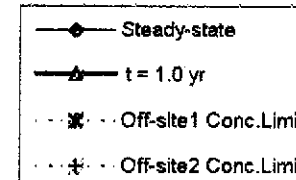
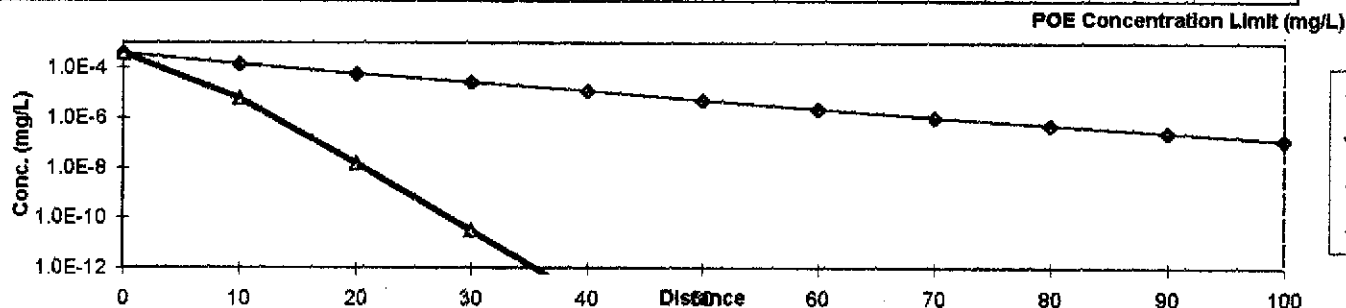
Constituent: Benzene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

**Concentration vs. Distance from Source
(for given time)**

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	3.7E-4	5.8E-6	1.4E-8	3.0E-11	6.0E-14	1.1E-16	2.1E-19	4.0E-22	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	3.7E-4	1.4E-4	6.0E-5	2.7E-5	1.2E-5	5.0E-6	2.2E-6	1.0E-6	4.9E-7	2.5E-7	1.3E-7

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.3E-7	1.3E-7
2.9E-3	9.9E-3



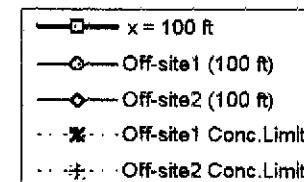
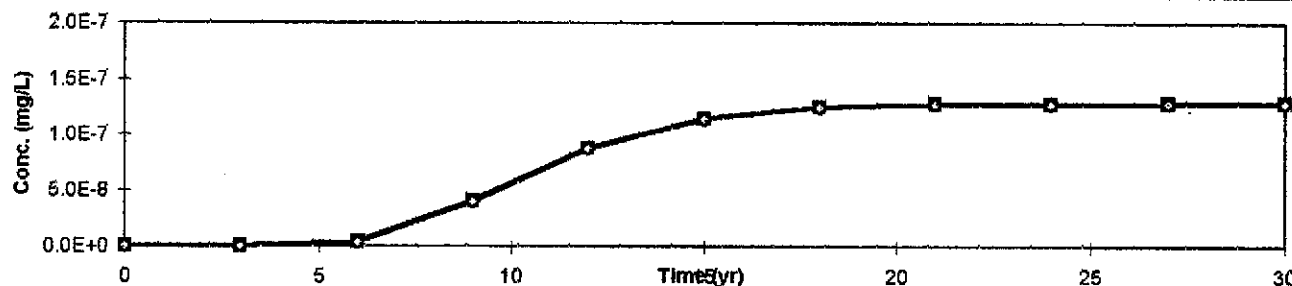
**Concentration vs. Time
(for given distance from source)**

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	4.5E-13	3.8E-9	4.0E-8	8.8E-8	1.1E-7	1.2E-7	1.3E-7	1.3E-7	1.3E-7	1.3E-7
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	4.5E-13	3.8E-9	4.0E-8	8.8E-8	1.1E-7	1.2E-7	1.3E-7	1.3E-7	1.3E-7	1.3E-7
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	4.5E-13	3.8E-9	4.0E-8	8.8E-8	1.1E-7	1.2E-7	1.3E-7	1.3E-7	1.3E-7	1.3E-7

**Time to Reach
Conc. Limit (yr)**

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

2 of 6

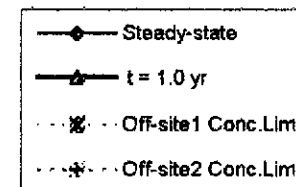
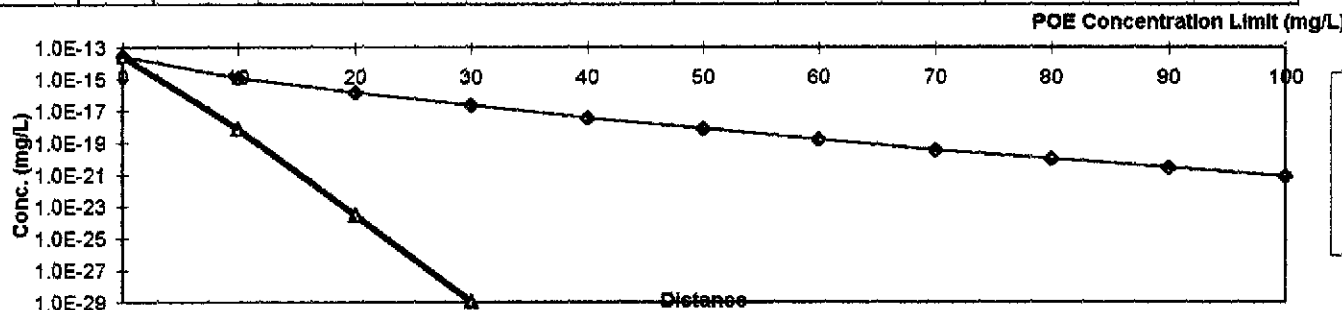
Constituent: Toluene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.8E-14	6.5E-19	2.9E-24	1.2E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	2.8E-14	1.2E-15	1.3E-16	1.9E-17	3.4E-18	6.5E-19	1.4E-19	3.4E-20	8.9E-21	2.5E-21	7.7E-22

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
7.7E-22	7.7E-22
7.3E+0	2.0E+1



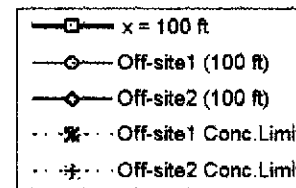
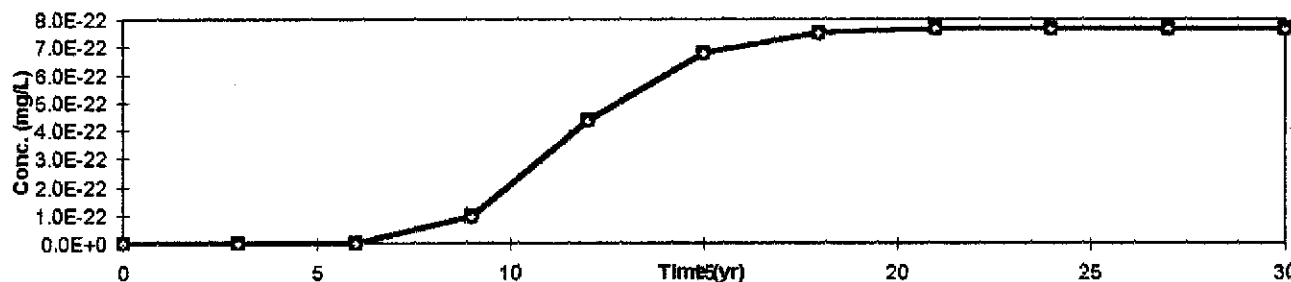
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	1.1E-32	8.4E-25	9.5E-23	4.3E-22	6.8E-22	7.5E-22	7.6E-22	7.7E-22	7.7E-22	7.7E-22
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	1.1E-32	8.4E-25	9.5E-23	4.3E-22	6.8E-22	7.5E-22	7.6E-22	7.7E-22	7.7E-22	7.7E-22
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	1.1E-32	8.4E-25	9.5E-23	4.3E-22	6.8E-22	7.5E-22	7.6E-22	7.7E-22	7.7E-22	7.7E-22

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

Constituent: Ethylbenzene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

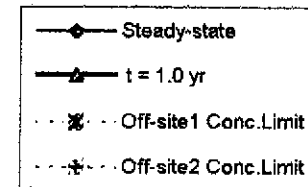
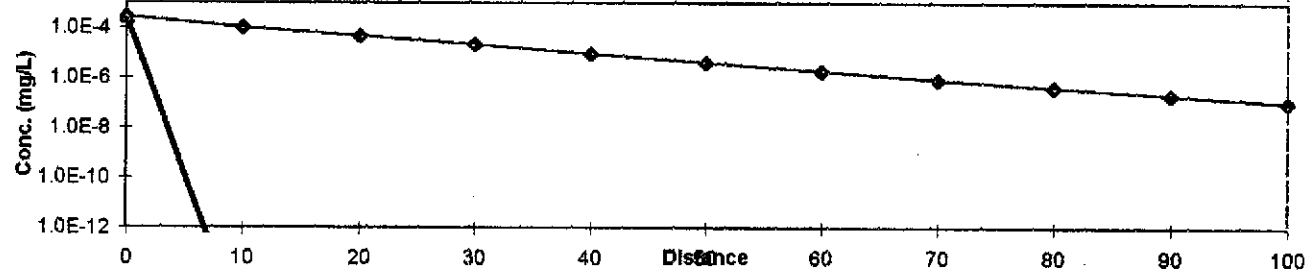
**Concentration vs. Distance from Source
(for given time)**

Time (yr)

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.8E-4	9.2E-17	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	2.8E-4	1.1E-4	4.7E-5	2.1E-5	9.2E-6	4.0E-6	1.8E-6	8.3E-7	4.1E-7	2.0E-7	1.1E-7

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.1E-7	1.1E-7
3.7E+0	1.0E+1

POE Concentration Limit (mg/L)



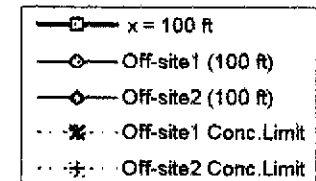
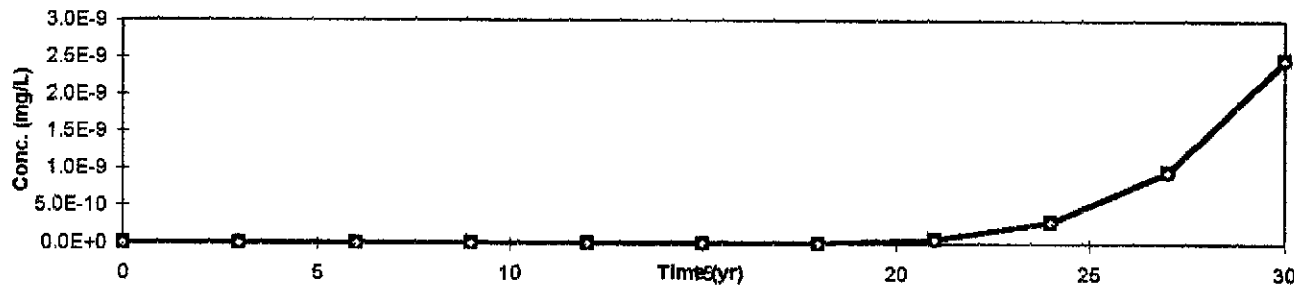
**Concentration vs. Time
(for given distance from source)**

Distance (ft)

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	3.7E-19	1.6E-15	2.3E-13	5.7E-12	5.4E-11	2.8E-10	9.6E-10	2.5E-9
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	3.7E-19	1.6E-15	2.3E-13	5.7E-12	5.4E-11	2.8E-10	9.6E-10	2.5E-9
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	3.7E-19	1.6E-15	2.3E-13	5.7E-12	5.4E-11	2.8E-10	9.6E-10	2.5E-9

Time to Reach
Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

Constituent: Xylene (mixed isomers)
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

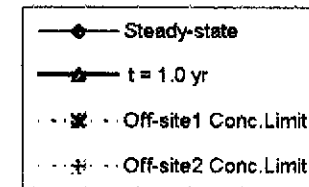
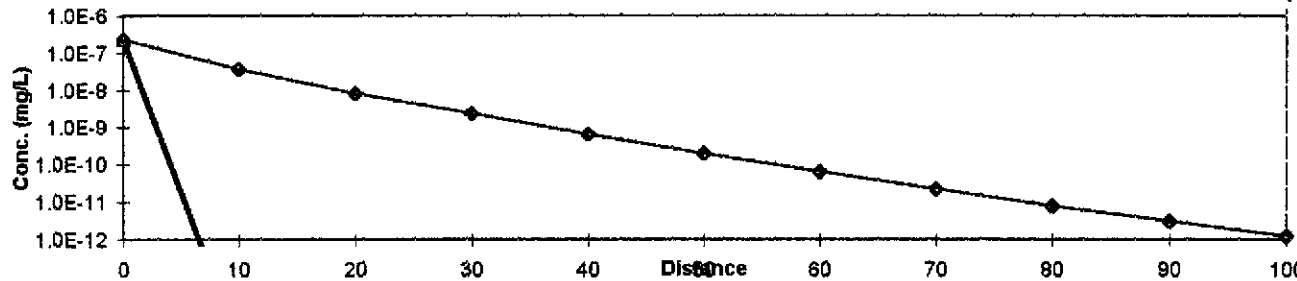
Concentration vs. Distance from Source
 (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.3E-7	1.6E-15	1.4E-24	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	2.3E-7	3.6E-8	8.4E-9	2.3E-9	6.5E-10	1.9E-10	6.2E-11	2.1E-11	7.8E-12	3.0E-12	1.2E-12

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.2E-12	1.2E-12
7.3E+1	2.0E+2

POE Concentration Limit (mg/L)



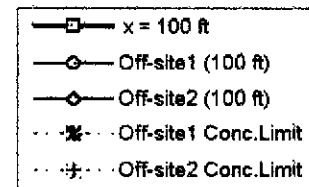
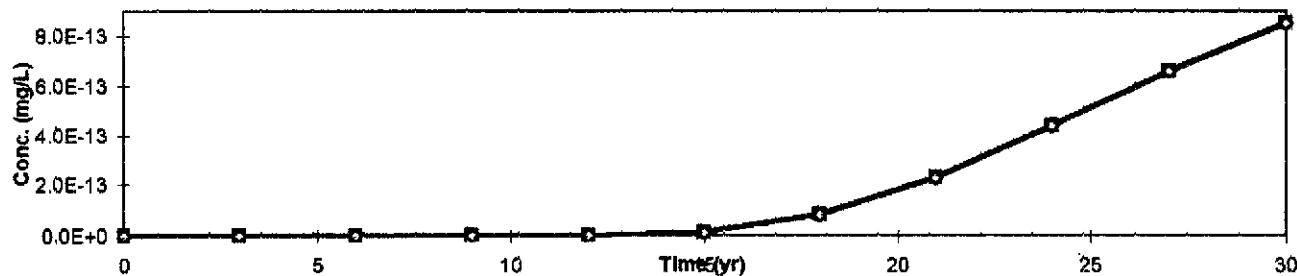
Concentration vs. Time
 (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	9.8E-23	5.3E-18	8.9E-16	1.5E-14	8.0E-14	2.3E-13	4.4E-13	6.6E-13	8.5E-13
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	9.8E-23	5.3E-18	8.9E-16	1.5E-14	8.0E-14	2.3E-13	4.4E-13	6.6E-13	8.5E-13
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	9.8E-23	5.3E-18	8.9E-16	1.5E-14	8.0E-14	2.3E-13	4.4E-13	6.6E-13	8.5E-13

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

Constituent: Methyl t-Butyl ether
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

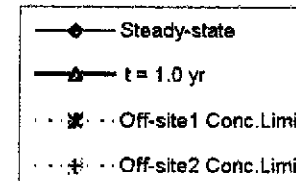
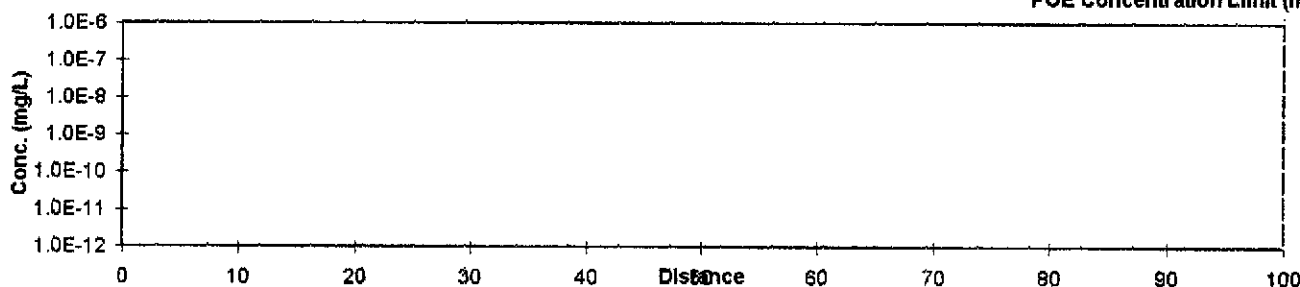
Concentration vs. Distance from Source
(for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
0.0E+0	0.0E+0
3.7E-1	1.0E+0

POE Concentration Limit (mg/L)



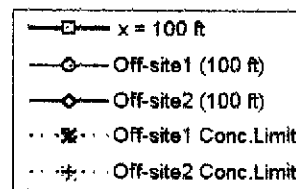
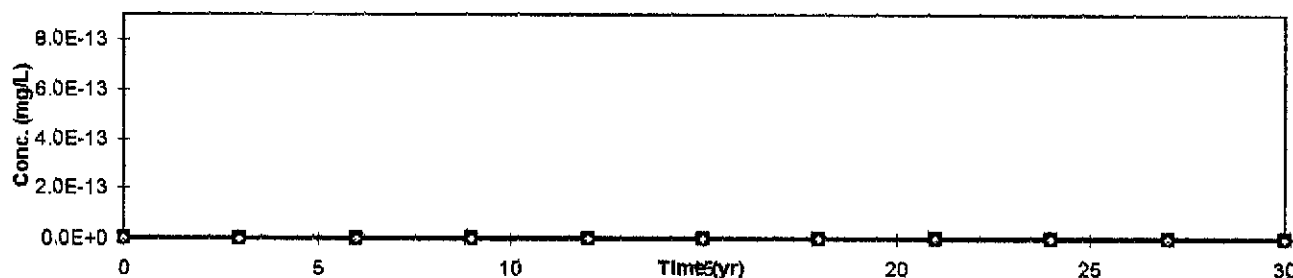
Concentration vs. Time
(for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

Constituent: Naphthalene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

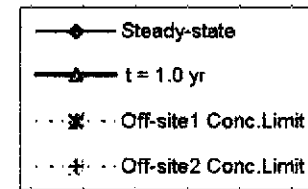
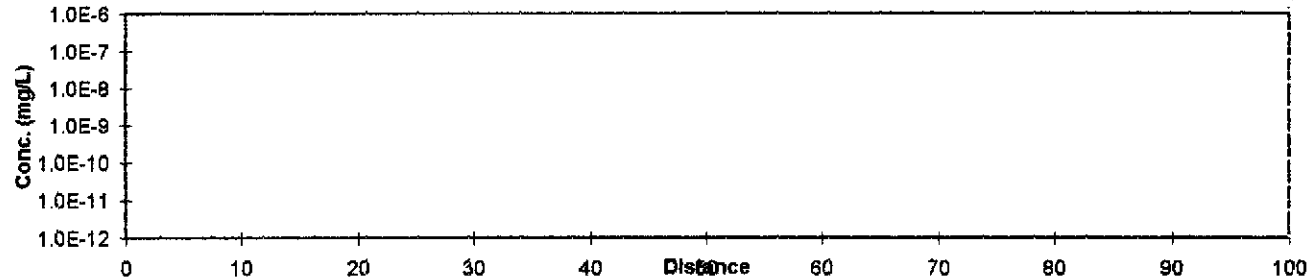
Concentration vs. Distance from Source
 (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
0.0E+0	0.0E+0
1.5E+1	4.1E+1

POE Concentration Limit (mg/L)



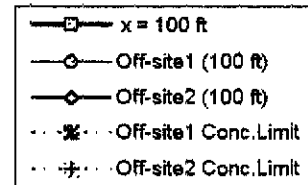
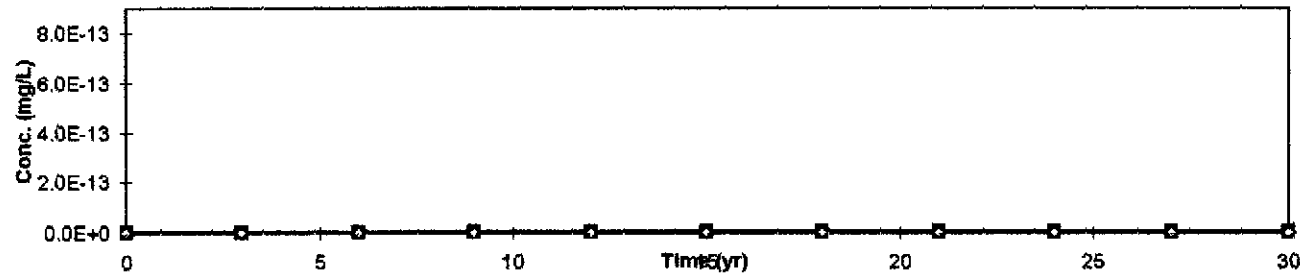
Concentration vs. Time
 (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS:
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³) (1)/(2)			
	Soil Conc. (mg/kg)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
		Commercial	Construction Worker	Residential	Commercial	Commercial	Construction Worker	Residential	Commercial
Benzene	1.4E+0								
Toluene	1.1E+1								
Ethylbenzene	1.2E+1								
Xylene (mixed isomers)	7.2E+1								
Methyl t-Butyl ether	0.0E+0								
Naphthalene	0.0E+0								

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS:
VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m ³) (3) × (4)			
	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Construction Worker	Residential	Commercial	Commercial	Construction Worker	Residential	Commercial
Benzene								
Toluene								
Ethylbenzene								
Xylene (mixed isomers)								
Methyl t-Butyl ether								
Naphthalene								

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS (16 - 25 ft):
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg)			3) Exposure Medium		
	Soil Conc. (mg/kg)	Receptor			Outdoor Air: POE Conc. (mg/m ³) (1)/(2)		
		On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
Benzene	1.4E+0	3.6E+4	9.0E+4	7.5E+4	3.9E-5	1.5E-5	1.9E-5
Toluene	1.1E+1	3.6E+4	9.0E+4	7.5E+4	3.1E-4	1.2E-4	1.5E-4
Ethylbenzene	1.2E+1	7.0E+4	1.5E+5	1.5E+5	1.7E-4	8.2E-5	8.2E-5
Xylene (mixed isomers)	7.2E+1	5.4E+4	1.1E+5	1.1E+5	1.3E-3	6.4E-4	6.4E-4
Methyl t-Butyl ether	0.0E+0	4.0E+4	9.0E+4	8.4E+4	0.0E+0	0.0E+0	0.0E+0
Naphthalene	0.0E+0	7.8E+6	1.6E+7	1.6E+7	0.0E+0	0.0E+0	0.0E+0

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 871275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (16 - 25 ft):
 VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)			5) Average Inhalation Exposure Concentration (ng/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Residential	Commercial	Commercial	Residential	Commercial
Benzene	2.4E-1	4.1E-1	2.4E-1	9.5E-6	6.4E-6	4.5E-6
Toluene	6.8E-1	9.6E-1	6.8E-1	2.1E-4	1.2E-4	1.0E-4
Ethylbenzene	6.8E-1	9.6E-1	6.8E-1	1.2E-4	7.9E-5	5.6E-5
Xylene (mixed isomers)	6.8E-1	9.6E-1	6.8E-1	9.1E-4	6.1E-4	4.4E-4
Methyl t-Butyl ether	6.8E-1	9.6E-1	6.8E-1	0.0E+0	0.0E+0	0.0E+0
Naphthalene	6.8E-1	9.6E-1	6.8E-1	0.0E+0	0.0E+0	0.0E+0

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR
INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³) (1)/(2)		
	Groundwater Conc. (mg/L)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
		Commercial	Residential	Commercial	Commercial	Residential	Commercial
Benzene	5.0E+0	8.4E+4	1.7E+5	1.7E+5	6.0E-5	2.9E-5	2.9E-5
Toluene	4.2E+0	7.7E+4	1.6E+5	1.6E+5	5.5E-5	2.6E-5	2.6E-5
Ethylbenzene	1.9E+0	7.1E+4	1.5E+5	1.5E+5	2.7E-5	1.3E-5	1.3E-5
Xylene (mixed isomers)	9.0E+0	8.2E+4	1.7E+5	1.7E+5	1.1E-4	5.3E-5	5.3E-5
Methyl t-Butyl ether	2.6E-1	5.2E+5	1.1E+6	1.1E+6	5.0E-7	2.4E-7	2.4E-7
Naphthalene	3.5E-1	9.9E+5	2.1E+6	2.1E+6	3.5E-7	1.7E-7	1.7E-7

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR
 INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Residential	Commercial	Commercial	Residential	Commercial
Benzene	2.4E-1	4.1E-1	2.4E-1	1.5E-5	1.2E-5	7.0E-6
Toluene	6.8E-1	9.6E-1	6.8E-1	3.7E-5	2.5E-5	1.8E-5
Ethylbenzene	6.8E-1	9.6E-1	6.8E-1	1.8E-5	1.2E-5	8.7E-6
Xylene (mixed isomers)	6.8E-1	9.6E-1	6.8E-1	7.5E-5	5.0E-5	3.6E-5
Methyl t-Butyl ether	6.8E-1	9.6E-1	6.8E-1	3.5E-7	2.3E-7	1.7E-7
Naphthalene	6.8E-1	9.6E-1	6.8E-1	2.4E-7	1.6E-7	1.2E-7

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aqualfer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)

(Sum average exposure concentrations
from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Construction Worker	Residential	Commercial
Benzene	2.4E-5		1.8E-5	1.2E-5
Toluene	2.5E-4		1.4E-4	1.2E-4
Ethylbenzene	1.4E-4		9.1E-5	6.5E-5
Xylene (mixed isomers)	9.9E-4		6.6E-4	4.7E-4
Methyl t-Butyl ether	3.5E-7		2.3E-7	1.7E-7
Naphthalene	2.4E-7		1.6E-7	1.2E-7

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³)				(3) Inhalation Unit Risk (μg/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000		
		On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)		On-site (0 ft)		Off-site 1 (100 ft)
		Commercial	Construction Worker	Residential	Commercial		Commercial	Construction Worker	Residential
Benzene	A	2.4E-5		1.8E-5	1.2E-5	8.3E-6	2.0E-7		1.5E-7
Toluene	D								
Ethylbenzene	D								
Xylene (mixed isomers)	D								
Methyl t-Butyl ether	-								
Naphthalene	D								

Total Pathway Carcinogenic Risk =

2.0E-7

1.5E-7

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

1 OF 10
Off-site 2 (100 ft) Commercial
9.6E-8

9.6E-8

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)				(6) Inhalation Reference Conc. (mg/m ³)	(7) Individual COC Hazard Quotient (5)/(6)			
	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)		On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Construction Worker	Residential	Commercial		Commercial	Construction Worker	Residential	Commercial
Benzene	6.8E-5		4.2E-5	3.2E-5	6.0E-3	1.1E-2		7.1E-3	5.4E-3
Toluene	2.5E-4		1.4E-4	1.2E-4	4.0E-1	6.2E-4		3.5E-4	2.9E-4
Ethylbenzene	1.4E-4		9.1E-5	6.5E-5	1.0E+0	1.4E-4		9.1E-5	6.5E-5
Xylene (mixed isomers)	9.9E-4		6.6E-4	4.7E-4	7.0E+0	1.4E-4		9.4E-5	6.7E-5
Methyl t-Butyl ether	3.5E-7		2.3E-7	1.7E-7	3.0E+0	1.2E-7		7.7E-8	5.5E-8
Naphthalene	2.4E-7		1.6E-7	1.2E-7	1.4E+0	1.7E-7		1.2E-7	8.3E-8

Total Pathway Hazard Index = **1.2E-2** **7.8E-3** **5.9E-3**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

1 OF 3

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

 (CHECKED IF PATHWAY IS ACTIVE)

SOILS (16 - 25 ft): VAPOR

INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor	3) Exposure Medium Indoor Air: POE Conc. (mg/m ³) (1) / (2)	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)	5) Average Inhalation Exposure Concentration (mg/m ³) (3) × (4)
	Soil Conc. (mg/kg)	Commercial	Commercial	Commercial	Commercial
Benzene	1.4E+0	3.2E+2	4.3E-3	2.4E-1	1.1E-3
Toluene	1.1E+1	6.4E+2	1.7E-2	6.8E-1	1.2E-2
Ethylbenzene	1.2E+1	1.5E+3	7.8E-3	6.8E-1	5.4E-3
Xylene (mixed isomers)	7.2E+1	1.2E+3	6.1E-2	6.8E-1	4.1E-2
Methyl t-Butyl ether	0.0E+0	5.6E+2	0.0E+0	6.8E-1	0.0E+0
Naphthalene	0.0E+0	1.6E+5	0.0E+0	6.8E-1	0.0E+0

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA Tool Kit for Chemical Releases, Version 1.3a



3



RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INTRUSION
INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /L) Receptor	3) Exposure Medium Indoor Air: POE Conc. (mg/m ³) (1) / (2)	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)
	Groundwater Conc. (mg/L)	Commercial	Commercial	Commercial
Benzene	5.0E+0	5.5E+2	9.1E-3	2.4E-1
Toluene	4.2E+0	5.0E+2	8.4E-3	6.8E-1
Ethylbenzene	1.9E+0	4.6E+2	4.2E-3	6.8E-1
Xylene (mixed isomers)	9.0E+0	5.3E+2	1.7E-2	6.8E-1
Methyl t-Butyl ether	2.6E-1	3.6E+3	7.3E-5	6.8E-1
Naphthalene	3.5E-1	8.5E+3	4.1E-5	6.8E-1

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 167 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275



2 OF 3

5) Average Inhalation Exposure Concentration (mg/m ³) (S) X (4)
Commercial
2.2E-3
5.7E-3
2.8E-3
1.2E-2
5.0E-5
2.8E-5

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RBCA SITE ASSESSMENT

3 OF 10

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³)	(3) Inhalation Unit Risk Factor (µg/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000
		Commercial		Commercial
Benzene	A	3.3E-3	8.3E-6	2.7E-5
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			
Methyl t-Butyl ether	-			
Naphthalene	D			

Total Pathway Carcinogenic Risk = 2.7E-5

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

4 OF 10

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

Constituents of Concern	TOXIC EFFECTS		
	(5) Total Toxicant Exposure (mg/m ³) Commercial	(6) Inhalation Reference Concentration (mg/m ³)	(7) Individual COC Hazard Quotient (5) / (6) Commercial
Benzene	9.2E-3	6.0E-3	1.5E+0
Toluene	1.7E-2	4.0E-1	4.4E-2
Ethylbenzene	8.2E-3	1.0E+0	8.2E-3
Xylene (mixed isomers)	5.3E-2	7.0E+0	7.6E-3
Methyl t-Butyl ether	5.0E-5	3.0E+0	1.7E-5
Naphthalene	2.8E-5	1.4E+0	2.0E-5

Total Pathway Hazard Index = 1.6E+0

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (L/kg) Receptor			3) Exposure Medium Groundwater POE Conc. (mg/L) (1)/(2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	1.4E+0	3.8E+3	1.1E+7	1.1E+7	3.7E-4
Toluene	1.1E+1	3.9E+14	1.4E+22	1.4E+22	2.8E-14	7.7E-22	7.7E-22
Ethylbenzene	1.2E+1	4.3E+4	1.1E+8	1.1E+8	2.8E-4	1.1E-7	1.1E-7
Xylene (mixed isomers)	7.2E+1	3.1E+8	5.9E+13	5.9E+13	2.3E-7	1.2E-12	1.2E-12
Methyl t-Butyl ether	0.0E+0	1.1E+1	4.6E+3	4.6E+3	0.0E+0	0.0E+0	0.0E+0
Naphthalene	0.0E+0	6.1E+9	1.3E+15	1.3E+15	0.0E+0	0.0E+0	0.0E+0

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR×EF×ED)/(BW×AT) (L/kg-day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Residential	Commercial	Commercial	Residential	Commercial
Benzene	3.5E-3	1.2E-2	3.5E-3	1.3E-6	1.5E-9	4.5E-10
Toluene	9.8E-3	2.7E-2	9.8E-3	2.7E-16	2.1E-23	7.5E-24
Ethylbenzene	9.8E-3	2.7E-2	9.8E-3	2.7E-6	2.9E-9	1.0E-9
Xylene (mixed isomers)	9.8E-3	2.7E-2	9.8E-3	2.3E-9	3.3E-14	1.2E-14
Methyl t-Butyl ether	9.8E-3	2.7E-2	9.8E-3	0.0E+0	0.0E+0	0.0E+0
Naphthalene	9.8E-3	2.7E-2	9.8E-3	0.0E+0	0.0E+0	0.0E+0

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (unitless) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
Benzene	5.0E+0	1.0E+0	2.9E+3	2.9E+3	5.0E+0	1.7E-3	1.7E-3
Toluene	4.2E+0	1.0E+0	3.6E+7	3.6E+7	4.2E+0	1.2E-7	1.2E-7
Ethylbenzene	1.9E+0	1.0E+0	2.6E+3	2.6E+3	1.9E+0	7.4E-4	7.4E-4
Xylene (mixed isomers)	9.0E+0	1.0E+0	1.9E+5	1.9E+5	9.0E+0	4.7E-5	4.7E-5
Methyl t-Butyl ether	2.6E-1	1.0E+0	4.0E+2	4.0E+2	2.6E-1	6.5E-4	6.5E-4
Napthalene	3.5E-1	1.0E+0	2.2E+5	2.2E+5	3.5E-1	1.6E-6	1.6E-6

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR×EF×ED)/(BW×AT) (L/kg/day)			5) Average Daily Intake Rate (mg/kg/day) (3) × (4)		
	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Commercial	Residential	Commercial	Commercial	Residential	Commercial
Benzene	3.5E-3	1.2E-2	3.5E-3	1.7E-2	2.0E-5	6.1E-6
Toluene	9.8E-3	2.7E-2	9.8E-3	4.1E-2	3.2E-9	1.1E-9
Ethylbenzene	9.8E-3	2.7E-2	9.8E-3	1.9E-2	2.0E-5	7.2E-6
Xylene (mixed isomers)	9.8E-3	2.7E-2	9.8E-3	8.8E-2	1.3E-6	4.6E-7
Methyl t-Butyl ether	9.8E-3	2.7E-2	9.8E-3	2.5E-3	1.8E-5	6.4E-6
Naphthalene	9.8E-3	2.7E-2	9.8E-3	3.4E-3	4.4E-8	1.6E-8

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971276

RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

MAXIMUM PATHWAY INTAKE (mg/kg/day)
 (Maximum Intake of active pathways
 soil leaching & groundwater routes.)

Constituents of Concern	On-site (0 ft)	Off-site 1	Off-site 2
	Commercial	Residential	Commercial
Benzene	1.7E-2	2.0E-5	6.1E-6
Toluene	4.1E-2	3.2E-9	1.1E-9
Ethylbenzene	1.9E-2	2.0E-5	7.2E-6
Xylene (mixed isomers)	8.8E-2	1.3E-6	4.6E-7
Methyl t-Butyl ether	2.5E-3	1.8E-5	6.4E-6
Naphthalene	3.4E-3	4.4E-8	1.6E-8

Site Name: Arrow Rentals
 Site Location: 197 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

Baseline Risk Summary-All Pathways

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

TIER 2 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	2.0E-7	1.0E-6	2.0E-7	1.0E-5	<input type="checkbox"/>	1.1E-2	1.0E+0	1.2E-2	1.0E+0	<input type="checkbox"/>
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	2.7E-5	1.0E-6	2.7E-5	1.0E-5	<input checked="" type="checkbox"/>	1.5E+0	1.0E+0	1.6E+0	1.0E+0	<input checked="" type="checkbox"/>
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	5.1E-4	1.0E-6	5.1E-4	1.0E-5	<input checked="" type="checkbox"/>	1.6E+1	1.0E+0	1.7E+1	1.0E+0	<input checked="" type="checkbox"/>
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	5.1E-4	1.0E-6	5.1E-4	1.0E-5	<input checked="" type="checkbox"/>	1.6E+1	1.0E+0	1.7E+1	1.0E+0	<input checked="" type="checkbox"/>
	Groundwater		Groundwater			Groundwater		Groundwater		

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 071275

Sandy silt 10F1

Exposure Parameters	Residential		Commercial/Industrial	
	Adult (1.9yrs)	(1-16 yrs)	Chronic	Construc.
AT _c Averaging time for carcinogens (yr)	70 ✓			
AT _n Averaging time for non-carcinogens (yr)	30 <i>24</i>		25 ✓	1
BW Eddy weight (kg)	70 ✓	15 ✓	70 ✓	
ED Exposure duration (yr)	30 <i>24</i>	6 ✓	25 ✓	1
τ Averaging time for vapor flux (yr)	30 <i>24</i>		25 ✓	1
EF Exposure frequency (days/yr)	350 ✓		250 ✓	160
EF _d Exposure frequency for dermal exposure	350		250	
IR _w Ingestion rate of water (L/day)	2 ✓		1 ✓	
IR _s Ingestion rate of soil (mg/day)	100 ✓	200 ✓	50 ✓	100
SA Skin surface area (dermal) (cm ²)	5800 <i>5000</i>	2000	5800 <i>5000</i>	5800
M Soil to skin adherence factor	1			
ET _{swim} Swimming exposure time (hr/event)	3			
EV _{swim} Swimming event frequency (events/yr)	12	12	12	
IR _{swim} Water ingestion while swimming (L/hr)	0.05	0.5		
SA _{swim} Skin surface area for swimming (cm ²)	✓ 23000	<i>20,000</i>	8100 ✓	
IR _{fish} Ingestion rate of fish (kg/yr)	0.025			
F _{fish} Contaminated fish fraction (unitless)	1			

Surface Parameters	General	Construction	Units
	A Source zone area	1.3E+3	NA
W Length of source-zone area parallel to wind	4.0E+1 ✓	NA	(ft)
W _{gw} Length of source-zone area parallel to GW flow	4.0E+1 ✓		(ft)
U _{air} Ambient air velocity in mixing zone	7.4E+0		(ft/s)
h _{air} Air mixing zone height	6.6E+0 = <i>200 cm</i> ✓		(ft)
P _a Areal particulate emission rate	NA		(g/cm ² /s)
L _{so} Thickness of affected surface soils	1.0E+0		(ft)

Surface Soil Column Parameters	Value	Units	
h _{cap} Capillary zone thickness	1.8E-1 = <i>4.9 cm</i>	(ft)	
h _v Vadose zone thickness	2.5E+1	(ft)	
ρ _s Soil bulk density	2.7E+0	(g/cm ³)	
f _{oc} Fraction organic carbon	1.0E-2	(-)	
φ _t Soil total porosity	3.0E-1	(-)	
K _{vf} Vertical hydraulic conductivity	3.3E+2	(ft/yr)	
k _v Vapor permeability	1.1E-11	(ft ²)	
L _{gd} Depth to groundwater	2.5E+1	(ft)	
L _t Depth to top of affected soils	1.5E+1	(ft)	
L _{base} Depth to base of affected soils	2.5E+1	(ft)	
L _{sub} Thickness of affected soils	1.0E+1	(ft)	
pH Soil/groundwater pH	6.9E+0	(-)	
θ _v Volumetric water content	<i>caillary</i> 0.26	<i>vadose</i> 0.12 ✓	<i>foundation</i> 0.28
θ _a Volumetric air content	0.04	0.18 ✓	0.13

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Residential	Residential	Commercial
Soil Leaching to Groundwater Ingestion	Residential	Residential	Commercial
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Residential	Residential	Commercial
Volatilization from Groundwater	Residential	Residential	Commercial
Indoor Air:			
Volatilization from Subsurface Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	NA	NA

Building Parameters	Residential	Commercial	Units
L _b Building volume/area ratio	8.00E+0	NA	(ft)
A _b Foundation area	1.00E+3	NA	(ft ²)
X _{crk} Foundation perimeter	1.30E+2	NA	(ft)
ER Building air exchange rate	1.40E-4	NA	(1/hr)
L _{crk} Foundation thickness	5.00E-1	NA	(ft)
Z _{crk} Depth to bottom of foundation slab	5.00E-1	NA	(ft)
γ Foundation crack fraction	1.00E-2 ✓	NA	(-)
dP Indoor/outdoor differential pressure	0.00E+0	NA	(Pa)
Q _c Convective air flow through slab	0.00E+0	NA	(ft ³ /s)

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	Units
Groundwater receptor	0	100	100	(ft)
Soil leaching to groundwater receptor	0	100	100	(ft)
Outdoor air inhalation receptor	0	100	100	(ft)

Groundwater Parameters	Value	Units
h _{gw} Groundwater mixing zone depth	8.8E+0 ✓ <i>150m</i>	(ft)
I _g Net groundwater infiltration rate	1.2E+1	(in/yr)
U _{gw} Groundwater Darcy velocity	8.2E+0 ✓ <i>1110m</i>	(ft/yr)
V _{gw} Groundwater seepage velocity	2.1E+1	(ft/yr)
K _s Saturated hydraulic conductivity	4.1E+2 ✓ <i>acceptable</i>	(ft/yr)
i Groundwater gradient	2.0E-2	(-)
S _w Width of groundwater source zone	3.2E+1	(ft)
S _d Depth of groundwater source zone	6.8E+0	(ft)
φ _{eff} Effective porosity in water-bearing unit	4.0E-1	(-)
f _{oc-gw} Fraction organic carbon in water-bearing unit	1.0E-2	(-)
pH _{gw} Groundwater pH	6.9E+0	(-)
Biodegradation considered?	1st Order	(-)

Target Health Risk Values	Individual	Cumulative
TR ₁₀₀ Target Risk (class A&B carcinogens)	1.0E-6	1.0E-5
TR ₁ Target Risk (class C carcinogens)	1.0E-5	
THQ Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	Units
	Lateral Groundwater Transport	Groundwater Ingestion		Soil Leaching to GW	
α _x Longitudinal dispersivity	1.0E+1	1.0E+1	1.0E+1	1.0E+1	(ft)
α _y Transverse dispersivity	3.3E+0	3.3E+0	3.3E+0	3.3E+0	(ft)
α _z Vertical dispersivity	5.0E-1	5.0E-1	5.0E-1	5.0E-1	(ft)
Lateral Outdoor Air Transport	Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ _y Transverse dispersion coefficient	1.1E+1	1.1E+1	1.1E+1	1.1E+1	(ft)
σ _z Vertical dispersion coefficient	7.6E+0	7.6E+0	7.6E+0	7.6E+0	(ft)
ADF Air dispersion factor	2.1E+0	2.1E+0	2.1E+0	2.1E+0	(-)

Modeling Options	Tier 2
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	Yes
Air dilution factor	3-D Gaussian dispersion
Groundwater dilution-attenuation factor	Domenico model w/ biodeg.

Surface Water Parameters	Off-site 2	Units
Q _{sw} Surface water flowrate	NA	(ft ³ /s)
W _{pl} Width of GW plume at SW discharge	NA	(ft)
θ _{pl} Thickness of GW plume at SW discharge	NA	(ft)
DF _{sw} Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

Arrow Rentals

RBCA Site Assessment - Input Parameter Summary

Surface soil column parameters:

- capillary zone thickness: 1.6E-1 feet or 4.9cm cf 60.1cm (Oak RBCA for sandy silt)
- vadose zone thickness: 2.5E1 feet. DTW ranged from ___ feet to ___ feet bgs. **Need to select appropriate vadose zone thickness, it's not 25 feet**
- soil bulk density: 2.7 g/cm³ cf 1.59 for Oak RBCA sandy silt
- fraction organic carbon: 1.0E-2 cf .015
- soil total porosity: 3.0E-1 cf 0.4
- vertical hydraulic conductivity: 3.3E+2 ft/yr or 10,000cm/yr cf 6.0 cm/yr Oaklands
Infiltration rate of water through the vadose zone
-

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Maximum Carcinogenic Intake Rate (mg/kg/day)			(3) Oral Slope Factor (mg/kg-day) ⁻¹	(4) Individual COC Risk (2) x (3)		
		On-site (0 ft) Commercial	Off-site 1 Residential	Off-site 2 Commercial		On-site (0 ft) Commercial	Off-site 1 Residential	Off-site 2 Commercial
Benzene	A	1.7E-2	2.0E-5	6.1E-6	2.9E-2	5.1E-4	5.9E-7	1.8E-7
Toluene	D							
Ethylbenzene	D							
Xylene (mixed isomers)	D							
Methyl t-Butyl ether	-							
Naphthalene	D							

Total Pathway Carcinogenic Risk = **5.1E-4** **5.9E-7** **1.8E-7**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Maximum Toxicant Intake Rate (mg/kg/day)			(6) Oral Reference Dose (mg/kg/day)	(7) Individual COC Hazard Quotient (5) / (6)		
	On-site (0 ft)	Off-site 1	Off-site 2		On-site (0 ft)	Off-site 1	Off-site 2
	Commercial	Residential	Commercial		Commercial	Residential	Commercial
Benzene	4.9E-2	4.8E-5	1.7E-5	3.0E-3	1.6E+1	1.6E-2	5.7E-3
Toluene	4.1E-2	3.2E-9	1.1E-9	2.0E-1	2.1E-1	1.6E-8	5.6E-9
Ethylbenzene	1.9E-2	2.0E-5	7.2E-6	1.0E-1	1.9E-1	2.0E-4	7.2E-5
Xylene (mixed isomers)	8.8E-2	1.3E-6	4.6E-7	2.0E+0	4.4E-2	6.4E-7	2.3E-7
Methyl t-Butyl ether	2.5E-3	1.8E-5	6.4E-6	1.0E-2	2.5E-1	1.8E-3	6.4E-4
Naphthalene	3.4E-3	4.4E-8	1.6E-8	4.0E-1	8.6E-3	1.1E-7	3.9E-8

Total Pathway Hazard Index = **1.7E+1** **1.8E-2** **6.4E-3**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBGA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 of 7

Constituent: Benzene CAS No.: 71-43-2

Site-Specific Target Level (SSTL) Concentrations

	On-site	Off-site1	Off-site2
Groundwater Ingestion			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6	3.1E-1 9.9E-3	3.1E+2 8.4E+0	8.8E+2 2.8E+1
Soil Leaching to Groundwater Ingestion			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6	>1.1E+3 3.8E+1	>1.1E+3 >1.1E+3	>1.1E+3 >1.1E+3
Surface Soil Ingestion and Dermal Contact			
Receptor Type / Distance (ft)	None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0 (mg/kg) TR = 1e-6	NA NA		
Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
RBEL _{aw} THQ = 1e+0 (µg/m ³) TR = 1e-6	8.7E+0 4.9E-1	6.2E+0 2.9E-1	8.7E+0 4.9E-1
Soil Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6	3.1E+2 1.8E+1	5.6E+2 2.7E+1	6.5E+2 3.7E+1
Groundwater Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6	7.3E+2 4.1E+1	1.1E+3 5.1E+1	1.5E+3 8.6E+1
Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
RBEL _{aw} THQ = 1e+0 (µg/m ³) TR = 1e-6	8.7E+0 4.9E-1		
Soil Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6	2.8E+0 1.6E-1		
Groundwater Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6	4.8E+0 2.7E-1		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	7.8E+1	PS
Soi	(mg/L)	1.8E+3	PS
P _{vap}	(mmHg)	9.5E+1	PS
H _{abn}	(atm·m ² /mol)	5.6E-3	PS
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{ow})	(log[L/kg])	1.8E+0	PS
D _{air}	(cm ² /sec)	8.8E-2	PS
D _{soil}	(cm ² /sec)	9.8E-6	PS
Toxicity Data			
WL of Evid.		A	
SF _o	(1/[mg/kg/day])	2.9E-2	PS
SF _d	(1/[mg/kg/day])	3.0E-2	TX
URF _i	(1/[µg/m ³])	8.3E-6	PS
RD _o	(mg/kg/day)	3.0E-3	R
RD _s	(mg/kg/day)	-	-
RF _i	(mg/m ³)	6.0E-3	R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	2.1E-2	
tau _d	(hr/event)	2.6E-1	
t _{ra}	(hr)	6.3E-1	
B	(-)	1.3E-2	
Regulatory Standards			
MCL	(mg/L)	5.0E-3	*
TWA	(mg/m ³)	3.3E+0	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	7.2E+2	H
t _{1/2,ground}	(d)	7.2E+2	H

* MCL ref = 52 FR 25690

	Units	Residential	Commercial	Construction
Cross-Media Transfer Factors				
VF _{ss}	(kg-soil/m ³ -air)	NC	NC	NA
VF _{soil}	(kg-soil/m ³ -air)	2.3E-5	2.8E-5	NA
VF _{wat}	(m ³ -wat/m ³ -air)	1.2E-5	1.2E-5	NA
VF _{soil}	(kg-soil/m ³ -air)	NA	3.1E-3	NA
VF _{wat}	(m ³ -wat/m ³ -air)	NA	1.8E-3	NA
LF	(kg-soil/L-wat)	All exposures: 2.6E-4		NA

	Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors				
DAF _{gw}	(-)	1.0E+0	2.9E+3	2.9E+3
DAF _{s/gw}	(-)	1.0E+0	2.9E+3	2.9E+3

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.3E-1
K _{sw}	(L-wat/kg-soil)	1.5E+0
C _{soil}	(mg/kg-soil)	1.1E+3
C _{soil,soil}	(µg/m ³ -air)	4.0E+8
D _{eff,s}	(cm ² /sec)	3.2E-3
D _{eff,soil}	(cm ² /sec)	5.9E-4
D _{eff,soil}	(cm ² /sec)	2.7E-5
D _{eff,soil}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	4.9E+0
R _{unsoil}	(-)	1.4E+1
Z	(cm/event)	7.3E-2

Notes: 1) NA = Not applicable; NC = Not calculated.
2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

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Constituent: Toluene CAS No.: 108-88-3

Site-Specific Target Level (SSTL) Concentrations

Chemical Parameters

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6		2.0E+1 NC	>5.2E+2 NC	>5.2E+2 NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6		>7.3E+2 NC	>7.3E+2 NC	>7.3E+2 NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0 (mg/kg) TR = 1e-6		NA NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0 (µg/m³) TR = 1e-6		5.8E+2 NC	4.2E+2 NC	5.8E+2 NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6		>7.3E+2 NC	>7.3E+2 NC	>7.3E+2 NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6		>5.2E+2 NC	>5.2E+2 NC	>5.2E+2 NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0 (µg/m³) TR = 1e-6		5.8E+2 NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6		3.8E+2 NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6		2.9E+2 NC		

		Units	Value	Reference
Physical Properties				
MW	(g/mol)		9.2E+1	5
Sol	(mg/L)		5.2E+2	29
P _{vap}	(mmHg)		3.0E+1	4
H _{abn}	(atm·m³/mol)		6.3E-3	A
pK _a	(log[mol/mol])		-	-
pK _b	(log[mol/mol])		-	-
log(K _{ow})	(log[L/kg])		2.1E+0	A
D _{air}	(cm²/sec)		8.5E-2	A
D _{wt}	(cm²/sec)		9.4E-6	A
Toxicity Data				
Wt of Evid.			D	
SF _o	(1/[mg/kg/day])		-	-
SF _d	(1/[mg/kg/day])		-	-
URF _i	(1/[µg/m³])		-	-
RfD _o	(mg/kg/day)		2.0E-1	A,R
RfD _v	(mg/kg/day)		1.6E-1	TX
RfC _i	(mg/m³)		4.0E-1	A,R
Dermal Exposure Parameters				
RAF _d	(mg/mg)		5.0E-1	D
K _p	(cm/hr)		4.5E-2	
tau _d	(hr/event)		3.2E-1	
t _{crit}	(hr)		7.7E-1	
B	(-)		5.4E-2	
Regulatory Standards				
MCL	(mg/L)		1.0E+0	*
TWA	(mg/m³)		1.5E+2	ACGIH
AGL	(mg/L)		-	-
Miscellaneous Parameters				
ADL _{gw}	(mg/L)		2.0E-3	S
ADL _s	(mg/kg)		5.0E-3	S
t _{1/2,soil}	(d)		2.8E+1	H
t _{1/2,unsoil}	(d)		2.8E+1	H

* MCL ref = 56 FR 3526 (30 Jan 91)

		Units	Value
Derived Parameters			
H	(L-wat/L-air)		2.6E-1
K _{gw}	(L-wat/kg-soil)		7.1E-1
C _{soil}	(mg/kg-soil)		7.3E+2
C _{soil,vap}	(µg/m³-air)		1.5E+8
D _{eff,s}	(cm²/sec)		3.1E-3
D _{eff,crk}	(cm²/sec)		5.7E-4
D _{eff,can}	(cm²/sec)		2.5E-5
D _{eff,ws}	(cm²/sec)		1.8E-3
R _{soil}	(-)		9.9E+0
R _{unsoil}	(-)		3.1E+1
Z	(cm/event)		1.6E-1

		Units	Residential	Commercial	Construction
Grass-Media Transfer Factors					
VF _{oc}	(kg-soil/m³-air)		NC	NC	NA
VF _{sand}	(kg-soil/m³-air)		2.3E-5	2.8E-5	NA
VF _{wand}	(m³-wat/m³-air)		1.3E-5	1.3E-5	NA
VF _{resd}	(kg-soil/m³-air)		NA	1.6E-3	NA
VF _{wesp}	(m³-wat/m³-air)		NA	2.0E-3	NA
LF	(kg-soil/L-wat)		All exposures: 2.5E-15		NA

		Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors					
DAF _{gw}	(-)		1.0E+0	3.6E+7	3.6E+7
DAFs _{gw}	(-)		1.0E+0	3.6E+7	3.6E+7

Notes: 1) NA = Not applicable; NC = Not calculated.
2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: Ethylbenzene CAS No.: 100-41-4

Site-Specific Target Level (SSTL) Concentrations

Chemical Parameters

	On-site	Off-site1	Off-site2
Groundwater Ingestion			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6	1.0E+1 NC	>1.7E+2 NC	>1.7E+2 NC
Soil Leaching to Groundwater Ingestion			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6	>6.2E+2 NC	>6.2E+2 NC	>6.2E+2 NC
Surface Soil Ingestion and Dermal Contact			
Receptor Type / Distance (ft)	None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0 (mg/kg) TR = 1e-6	NA NA		
Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0 (µg/m ³) TR = 1e-6	1.5E+3 NC	1.0E+3 NC	1.5E+3 NC
Soil Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6	>6.2E+2 NC	>6.2E+2 NC	>6.2E+2 NC
Groundwater Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6	>1.7E+2 NC	>1.7E+2 NC	>1.7E+2 NC
Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0 (µg/m ³) TR = 1e-6	1.5E+3 NC		
Soil Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0 (mg/kg) TR = 1e-6	>6.2E+2 NC		
Groundwater Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0 (mg/L) TR = 1e-6	>1.7E+2 NC		

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	1.1E+2	PS
Soi	(mg/L)	1.7E+2	PS
P _{vap}	(mmHg)	1.0E+1	PS
H _{dim}	(atm-m ³ /mol)	7.9E-3	PS
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log{K _{ow} }	(log[L/kg])	2.6E+0	PS
D _{air}	(cm ² /sec)	7.5E-2	PS
D _{soil}	(cm ² /sec)	7.8E-6	PS
Toxicity Data			
Wt of Evid.		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RF _{D_o}	(mg/kg/day)	1.0E-1	PS
RF _{D_s}	(mg/kg/day)	9.7E-2	TX
RF _i	(mg/m ³)	1.0E+0	PS
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	7.4E-2	
ta _{0.5}	(hr/event)	3.9E-1	
t _{ex}	(hr)	1.3E+0	
B	(-)	1.4E-1	
Regulatory Standards			
MCL	(mg/L)	7.0E-1	*
TWA	(mg/m ³)	4.4E+2	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	2.3E+2	H
t _{1/2,soil}	(d)	2.3E+2	H

* MCL ref = 56 FR 3526 (30 Jan 91)

	Units	Residential	Commercial	Construction
Crass-Media Transfer Factors				
VF _{ss}	(kg-soil/m ³ -air)	NC	NC	NA
VF _{samb}	(kg-soil/m ³ -air)	1.4E-5	1.4E-5	NA
VF _{wamb}	(m ³ -wat/m ³ -air)	1.4E-5	1.4E-5	NA
VF _{soil}	(kg-soil/m ³ -air)	NA	6.5E-4	NA
VF _{wsoil}	(m ³ -wat/m ³ -air)	NA	2.2E-3	NA
LF	(kg-soil/L-wat)	All exposures: 2.3E-5		NA

	Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors				
DAF _{gw}	(-)	1.0E+0	2.6E+3	2.6E+3
DAF _{s/gw}	(-)	1.0E+0	2.6E+3	2.6E+3

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	3.2E-1
K _{sw}	(L-wat/kg-soil)	2.7E-1
C _{soil}	(mg/kg-soil)	6.2E+2
C _{soil,vap}	(µg/m ³ -air)	5.8E+7
D _{eff,s}	(cm ² /sec)	2.8E-3
D _{eff,soil}	(cm ² /sec)	5.0E-4
D _{eff,soil}	(cm ² /sec)	2.1E-5
D _{eff,soil}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	2.5E+1
R _{soil}	(-)	8.1E+1
Z	(cm/event)	2.7E-1

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

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Constituent: Xylene (mixed isomers) CAS No.: 1330-20-7

Site-Specific Target Level (SSTL) Concentrations

	On-site	Off-site1	Off-site2
Groundwater Ingestion			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0	>2.0E+2	>2.0E+2	>2.0E+2
(mg/L) TR = 1e-6	NC	NC	NC
Soil Leaching to Groundwater Ingestion			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0	>4.9E+2	>4.9E+2	>4.9E+2
(mg/kg) TR = 1e-6	NC	NC	NC
Surface Soil Ingestion and Dermal Contact			
Receptor Type / Distance (ft)	None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0	NA		
(mg/kg) TR = 1e-6	NA		
Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0	1.0E+4	7.3E+3	1.0E+4
(µg/m ³) TR = 1e-6	NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0	>4.9E+2	>4.9E+2	>4.9E+2
(mg/kg) TR = 1e-6	NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0	>2.0E+2	>2.0E+2	>2.0E+2
(mg/L) TR = 1e-6	NC	NC	NC
Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0	1.0E+4		
(µg/m ³) TR = 1e-6	NC		
Soil Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0	>4.9E+2		
(mg/kg) TR = 1e-6	NC		
Groundwater Volatilization to Indoor Air Inhalation			
Receptor Type / Distance (ft)	Commercial / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0	>2.0E+2		
(mg/L) TR = 1e-6	NC		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	1.1E+2	5
Soi	(mg/L)	2.0E+2	5
P _{vap}	(mmHg)	7.0E+0	4
H _{sat}	(atm-m ³ /mol)	7.0E-3	A
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{ow})	(log[L/kg])	2.4E+0	A
D _{air}	(cm ² /sec)	7.2E-2	A
D _{wat}	(cm ² /sec)	8.5E-6	A
Toxicity Data			
Wt of Evid.		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RD _o	(mg/kg/day)	2.0E+0	A,R
RD _d	(mg/kg/day)	1.8E+0	TX
RF _i	(mg/m ³)	7.0E+0	A
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	8.0E-2	
tau _d	(hr/event)	3.9E-1	
t _{crit}	(hr)	1.4E+0	
B	(-)	1.6E-1	
Regulatory Standards			
MCL	(mg/L)	1.0E+1	*
TWA	(mg/m ³)	4.3E+2	ACGIH
AOL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	5.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	3.6E+2	H
t _{1/2,soil}	(d)	3.6E+2	H

* MCL ref = 56 FR 3526 (30 Jan 91)

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{so} (kg-soil/m ³ -air)	NC	NC	NA
VF _{soil} (kg-soil/m ³ -air)	1.8E-5	1.8E-5	NA
VF _{wat} (m ³ -wat/m ³ -air)	1.2E-5	1.2E-5	NA
VF _{soil} (kg-soil/m ³ -air)	NA	8.4E-4	NA
VF _{wat} (m ³ -wat/m ³ -air)	NA	1.9E-3	NA
LF (kg-soil/L-wat)	All exposures: 3.2E-9		

Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors			
DAF _{gw} (-)	1.0E+0	1.9E+5	1.9E+5
DAF _{s/gw} (-)	1.0E+0	1.8E+5	1.9E+5

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.9E-1
K _{ow}	(L-wat/kg-soil)	4.1E-1
C _{soil}	(mg/kg-soil)	4.9E+2
C _{soil,vap}	(µg/m ³ -air)	4.0E+7
D _{eff,a}	(cm ² /sec)	2.6E-3
D _{eff,ptk}	(cm ² /sec)	4.8E-4
D _{eff,vap}	(cm ² /sec)	2.1E-5
D _{eff,ws}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	1.7E+1
R _{unsoil}	(-)	5.4E+1
Z	(cm/event)	2.9E-1

Notes: 1) NA = Not applicable; NC = Not calculated.

2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: Methyl t-Butyl ether CAS No.: 1634-04-4

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion:				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	1.0E+0 NC	1.5E+2 NC	4.1E+2 NC
Soil Leaching to Groundwater Ingestion:				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	1.2E+1 NC	1.7E+3 NC	4.7E+3 NC
Surface Soil Ingestion and Dermal Contact:				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} (mg/kg)	THQ = 1e+0 TR = 1e-6	NA NA		
Outdoor Air Inhalation:				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	4.4E+3 NC	3.1E+3 NC	4.4E+3 NC
Soil Volatilization to Outdoor Air Inhalation:				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	>8.0E+3 NC	>8.0E+3 NC	>8.0E+3 NC
Groundwater Volatilization to Outdoor Air Inhalation:				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	>4.8E+4 NC	>4.8E+4 NC	>4.8E+4 NC
Indoor Air Inhalation:				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
RBEL _{air} (µg/m ³)	THQ = 1e+0 TR = 1e-6	4.4E+3 NC		
Soil Volatilization to Indoor Air Inhalation:				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
SSTL _s (mg/kg)	THQ = 1e+0 TR = 1e-6	2.5E+3 NC		
Groundwater Volatilization to Indoor Air Inhalation:				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
SSTL _{gw} (mg/L)	THQ = 1e+0 TR = 1e-6	1.8E+4 NC		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	8.8E+1	5
Sol	(mg/L)	4.8E+4	A
P _{vap}	(mmHg)	2.5E+2	-
H _{vol}	(atm-m ³ /mol)	5.8E-4	-
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{ow})	(log[L/kg])	1.1E+0	A
D _{air}	(cm ² /sec)	7.9E-2	6
D _{soil}	(cm ² /sec)	9.4E-5	7
Toxicity Data			
Wt of Evid.		-	-
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RfD _o	(mg/kg/day)	1.0E-2	31
RfD _s	(mg/kg/day)	8.0E-3	TX
RfC _i	(mg/m ³)	3.0E+0	R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	-
K _p	(cm/hr)	-	-
tau _d	(hr/event)	-	-
t _{crit}	(hr)	-	-
B	(-)	-	-
Regulatory Standards			
MCL	(mg/L)	-	*
TWA	(mg/m ³)	6.0E+1	NIOSH
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	-	-
ADL _s	(mg/kg)	-	-
t _{1/2,soil}	(d)	3.6E+2	H
t _{1/2,soil}	(d)	1.8E+2	H

* MCL ref = -

Units	Residential	Commercial	Construction
Grass-Media Transfer Factors			
VF _{so} (kg-soil/m ³ -air)	NC	NC	NA
VF _{soil} (kg-soil/m ³ -air)	2.3E-5	2.5E-5	NA
VF _{wat} (m ³ -wat/m ³ -air)	1.9E-6	1.9E-6	NA
VF _{soil} (kg-soil/m ³ -air)	NA	1.8E-3	NA
VF _{wat} (m ³ -wat/m ³ -air)	NA	2.8E-4	NA
LF (kg-soil/L-wat)	All exposures: 8.8E-2		NA

Units	On-Site	Off-Site1	Off-Site2
Latent Transport Factors			
DAF _{gw} (-)	1.0E+0	4.0E+2	4.0E+2
DAF _{s/gw} (-)	1.0E+0	4.0E+2	4.0E+2

Units Value

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.4E-2
K _{ow}	(L-wat/kg-soil)	6.0E+0
C _{soil}	(mg/kg-soil)	8.0E+3
C _{soil,vap}	(µg/m ³ -air)	1.2E+9
D _{eff,s}	(cm ² /sec)	3.0E-3
D _{eff,ork}	(cm ² /sec)	8.7E-4
D _{eff,soil}	(cm ² /sec)	5.1E-4
D _{eff,ws}	(cm ² /sec)	2.9E-3
R _{soil}	(-)	1.8E+0
R _{unsoil}	(-)	3.7E+0
Z	(cm/event)	-

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: Naphthalene CAS No.: 91-20-3

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>3.1E+1	>3.1E+1	>3.1E+1
(mg/L) TR = 1e-6		NC	NC	NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>6.2E+2	>6.2E+2	>6.2E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0		2.0E+3	1.5E+3	2.0E+3
(µg/m ³) TR = 1e-6		NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>6.2E+2	>6.2E+2	>6.2E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>3.1E+1	>3.1E+1	>3.1E+1
(mg/L) TR = 1e-6		NC	NC	NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0		2.0E+3		
(µg/m ³) TR = 1e-6		NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		>6.2E+2		
(mg/kg) TR = 1e-6		NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Commercial / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		>3.1E+1		
(mg/L) TR = 1e-6		NC		

Chemical Parameters

		Units	Value	Reference
Physical Properties				
MW	(g/mol)		1.3E+2	PS
Sol	(mg/ft)		3.1E+1	PS
P _{vap}	(mmHg)		2.3E-1	PS
H _{atm}	(atm-m ³ /mol)		4.8E-4	PS
pK _a	(log[mol/mol])		-	-
pK _b	(log[mol/mol])		-	-
log(K _{ow})	(log[L/kg])		3.3E+0	PS
D _{air}	(cm ² /sec)		5.9E-2	PS
D _{soil}	(cm ² /sec)		7.5E-6	PS
Toxicity Data				
Wt of Evid.			D	
SF _o	(1/[mg/kg/day])		-	-
SF _d	(1/[mg/kg/day])		-	-
URF _i	(1/[µg/m ³])		-	-
RfD _o	(mg/kg/day)		4.0E-1	PS
RfD _d	(mg/kg/day)		3.6E-1	TX
RfC _i	(mg/m ³)		1.4E+0	PS
Dermal Exposure Parameters				
RAF _d	(mg/mg)		5.0E-2	D
K _p	(cm/hr)		6.9E-2	
tau _d	(hr/event)		5.3E-1	
t _{ex}	(hr)		2.2E+0	
B	(-)		2.0E-1	
Regulatory Standards				
MCL	(mg/L)		-	*
TWA	(mg/m ³)		5.0E+1	PS
AQL	(mg/L)		-	-
Miscellaneous Parameters				
ADL _{gw}	(mg/L)		1.0E-2	32
ADL _s	(mg/kg)		1.0E-2	32
t _{1/2,soil}	(d)		2.6E+2	H
t _{1/2,unsoil}	(d)		2.6E+2	H

* MCL ref = -

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{so} (kg-soil/m ³ -air)	NC	NC	NA
VF _{samb} (kg-soil/m ³ -air)	1.3E-7	1.3E-7	NA
VF _{wamb} (m ³ -wat/m ³ -air)	1.0E-6	1.0E-6	NA
VF _{seep} (kg-soil/m ³ -air)	NA	6.3E-6	NA
VF _{wesp} (m ³ -wat/m ³ -air)	NA	1.2E-4	NA
LF (kg-soil/L-wat)	All exposures: 1.6E-10		NA

Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors			
DAF _{gw} (-)	1.0E+0	2.2E+5	2.2E+5
DAF _{s/gw} (-)	1.0E+0	2.2E+5	2.2E+5

		Units	Value
Derived Parameters			
H	(L-wat/L-air)		2.0E-2
K _{sw}	(L-wat/kg-soil)		5.0E-2
C _{soil}	(mg/kg-soil)		6.2E+2
C _{sat, vap}	(µg/m ³ -air)		1.6E+6
D _{eff, s}	(cm ² /sec)		2.2E-3
D _{eff, soil}	(cm ² /sec)		4.3E-4
D _{eff, cap}	(cm ² /sec)		6.2E-5
D _{eff, ws}	(cm ² /sec)		1.8E-3
R _{sat}	(-)		1.3E+2
R _{unsoil}	(-)		4.4E+2
Z	(cm/event)		2.7E-1

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Definitions

Site-Specific Target Level Concentrations	
SSTL _{gw}	Site-specific target level for groundwater (mg/L)
SSTL _s	Site-specific target level for soil (mg/kg)
REEL _{air}	Risk-based exposure limit for air (µg/m ³)
THQ	Target hazard quotient
TR	Target risk

Cross-Media Transfer Factors	
VF _{ss}	Volatilization factor, surface soil to outdoor air (kg-soil/L-air)
VF _{sub}	Volatilization factor, subsurface soil to outdoor air (kg-soil/L-air)
VF _{wat}	Volatilization factor, groundwater to outdoor air (L-wat/L-air)
VF _{soil}	Volatilization factor, subsurface soil to indoor air (kg-soil/L-air)
VF _{wat}	Volatilization factor, groundwater to indoor air (L-wat/L-air)
LF	Leaching factor, soil to groundwater (kg-soil/L-wat)

Cross-Media Transfer Factors	
DAF _{gw}	Dilution-attenuation factor, groundwater (-)
DAF _{soil}	Dilution-attenuation factor, soil leaching to groundwater (-)

Physical Properties	
MW	Molecular weight (g/mol)
Sol	Aqueous solubility limit (mg/L)
P _{vap}	Vapor pressure (mmHg)
H _{ps}	Henry's Law constant (atm·m ³ /mol)
pK _a	Acid ionization constant (log[mol/mol])
pK _b	Base ionization constant (log[mol/mol])
K _{oc}	Organic carbon/Water partition coefficient (L/kg)
K _d	Soil/Water distribution coefficient (L/kg)
D _{air}	Molecular diffusion coefficient in air (cm ² /sec)
D _{wat}	Molecular diffusion coefficient in water (cm ² /sec)

Toxicity Data	
Wt of Evid.	Weight of evidence
SF _o	Oral slope factor for carcinogens (1/[mg/kg/day])
SF _d	Dermal slope factor for carcinogens (1/[mg/kg/day])
URF _i	Inhalation unit risk factor for carcinogens (1/[µg/m ³])
RfD _o	Oral reference dose (mg/kg/day)
RfD _d	Dermal reference dose (mg/kg/day)
RfC _i	Inhalation reference concentration (mg/m ³)

Dermal Exposure Parameters	
RAF _d	Dermal relative absorption factor (mg/mg)
K _p	Dermal permeability coeff. (cm/hr)
tau _d	Lag time for dermal exposure (hr/event)
t _{crit}	Critical exposure time (hr)
B	Relative contribution of permeability coeff. (-)

Regulatory Standards	
MCL	Maximum contaminant level for drinking water protection (mg/L)
TWA	Time-weighted average workplace air criterion (mg/m ³)
AQL	Aquatic life protection criterion (mg/L)

Miscellaneous Parameters	
ADL _{gw}	Analytical detection limit in groundwater (mg/L)
ADL _s	Analytical detection limit in soil (mg/kg)
t _{1/2,sat}	Half life, saturated zone (d)
t _{1/2,unsat}	Half life, unsaturated zone (d)

Derived Parameters	
H	Dimensionless Henry's Law constant (L-wat/L-air)
K _{ow}	Soil to pore-water partitioning factor (L-wat/kg-soil)
C _{sat}	Saturated residual conc. in vadose zone soils (mg/kg-soil)
C _{sat,vap}	Saturated concentration in vapors (mg/m ³ -air)
D _{eff,s}	Effective diffusion coeff. in vadose zone soils (cm ² /sec)
D _{eff,cr}	Effective diffusion coeff. in foundation cracks (cm ² /sec)
D _{eff,ca}	Effective diffusion coeff. in capillary zone (cm ² /sec)
D _{eff,gs}	Effective diffusion coeff., water table to ground surface (cm ² /sec)
R _{sat}	Retardation factor, saturated zone (-)
R _{unsat}	Retardation factor, unsaturated zone (-)
Z	Water to skin dermal absorption factor (cm/event)

Chemical Parameter References

PS	Standard Provisional Guide for Risk-Based Corrective Action, ASTM PS 104-98.
A	Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites.
D	USEPA, Dermal Exposure Assessment: Principles and Applications, ORD, EPA/600/R-97/011B.
H	Howard, Handbook of Environmental Degradation Rates, Lewis Publishers, Chelsea, MI, 1989.
R	EPA Region III Risk Based Concentration Table, EPA Region 3, March 7, 1995.
S	USEPA, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, OSWER, November 1986.
T	TPH Criteria Working Group, 1986.
TX	TNRCC Risk-Based Corrective Action for Leaking Storage Tank Sites, January 1994.
3	Based on Kow from (2) and DiToro, D. M., 1986: "A Particle Interaction Model of Reversible Organic Chemical Sorption", Chemosphere, 14(10), 1505-1538. log(Koc) = 0.00028 + 0.983 log(Kow)
4	USEPA, 1989: Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) - USEPA, OAQPS, Air Emission Models, (EPA-450/3-87-026).
5	Verschuieren, Karel, 1983: Handbook of Environmental data on organic Chemicals, Second Ed., (Van nostrand Reinhold Company Inc., New York), ISBN: 0-442-26802-6.
6	Calculated diffusivity using the method of Fuller, Schettler, and Giddings from (9).
7	Calculated diffusivity using the method of Hayduk and Laudie and the reference from (9).
8	Calculated using Kow and Goring Kow/solubility regression equation reference (9) and Kow data from (2), log(S, mg/l) = -0.922 log(Kow) + 4.164
9	Handbook of Chemical Property Estimation Methods, 1982, W.J. Lyman, (McGraw-Hill, New York), ISBN 0-07-039175-0.
10	Calculated from (Pw/Patm)/(solubility/mol wt).
11	Back calculated from solubility, Note (6) and (3).
12	Aldrich Chemical Catalog, 1991.
13	Calculated using Modified Watson Correlation from (9) and normal boiling point.
14	USEPA, 1979: Water Related Environmental Fate of 129 Priority Pollutants, Vol. 1, USEPA, OWAQPS (EPA-440/4-79-023a).
15	The Agrochemicals Handbook, (The Royal Society of Chemistry, The University, Nottingham, England), ISBN 0-85186-406-6.
16	Vapor pressure specified at elevated temperature, adjustments to 25C using methods presented by (9).
17	Wauchope, R. D., T. M. Butler, A. G. Homsby, P. W. M. Augustijn-Beckers, and J.P. Burt, 1992: "The SCS/ARS/CS CES Pesticide Properties Database for Environmental Decision Making", Reviews of Environmental Contamination and Toxicology, vol 123, 1-156.
18	Farm Chemicals Handbook 91, C. Sine, ed., (Meister Publishing Company, Wadsworth, Ohio).
19	Structure and Nomenclature Search System, (Version 7.0/7.1/3) December, 1992.
20	From Syracuse Research Corporation Calculated Value from pchem-pchems, 1986, ref no. 255435 in Eninfo database, Accession no. 106543.
23	NIOSH, 1990: Pocket Guide to Chemical Hazards, (U. S. Dept. of Health & Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health).
24	Buchter, B. et al., 1989: Correlation of Groundwater Kd and N retention Parameters with Soils and Elements, Soil Science, 148, 370-379.
25	USEPA, 1993: Air/Superfund National Technical Guidance Study series: Estimation of Air Impacts for Thermal Desorption Units Used at Superfund Sites, US Environmental Protection Agency, Office of Air Quality Planning and Standards, EPA-451/R-93-005.
26	NRS Accession No. PB93-215630, April 1993.
27	Based on salt solubilities in Table 3-120, R. H. Perry and D. W. Green, "Perry's Chemical Engineering Handbook" Sixth Edition, (McGraw-Hill, New York), 1973.
28	Based on salt solubilities in Table of Physical Constants for Inorganic Compounds, Weast, R. C., CRC Handbook of Chemistry and Physics, 67th edition, (CRC Press, Inc., Boca Raton), 1987.
29	Montgomery and Welkom, "Groundwater Chemicals Desk Reference", Lewis Publishers, Chelsea, MI, 1990.
30	USEPA, 1966. Soil Screening Guidance: Technical Background Doc., (EPA/540/R-95/126)
31	TNRCC Risk Reduction Rule Implementation, July 23, 1998. (update to Reference "TX")
32	USEPA, Method 8270C, Revision 3, "Semi-volatile Organic Compounds by GC/MS", December 1996.
33	40 CFR 131.36, July 1, 1997
34	40 CFR 141.23, July 1, 1997
35	USEPA, Manual for the Certification of Laboratories Analyzing Drinking Water, EPA 815-B-97-001, March 1997
36	Calculated using Chiou et al. equation reported in (9); S (µmol/L) from (15).
37	Calculated using Chiou et al. equation reported in (9); S (µmol/L) from (23).
38	Calculated using Chiou et al. equation reported in (9); S (µmol/L) from (4).

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

1 OF 1

SOIL (15 - 25 ft) SSTL VALUES

Target Risk (Class A & B) 1.0E-6
 Target Risk (Class C) 1.0E-5
 Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domenico - First Order
 (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CAS No.	Name	Representative Concentration (mg/kg)	Soil Leaching to Groundwater Ingestion			Soil Vol. to Indoor Air			Soil Volatilization to Outdoor Air			Surface Soil Inhalation, Ingestion, Dermal Contact		Applicable SSTL (mg/kg)	SSTL Exceeded? ("X" if yes)	Required CRF Only if "yes" left
			X			X	X			On-site (0 ft)						
			On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Commercial	Construction Worker	Residential	Commercial	None	Construction Worker				
71-43-2	Benzene	1.4E+0	3.8E+1	>1.1E+3	>1.1E+3	1.8E-1	1.8E+1	NA	2.7E+1	3.7E+1	NA	NA	1.6E-1	<input checked="" type="checkbox"/>	8.7E+0	
108-88-3	Toluene	1.1E+1	>7.3E+2	>7.3E+2	>7.3E+2	3.8E+2	>7.3E+2	NA	>7.3E+2	>7.3E+2	NA	NA	3.8E+2	<input type="checkbox"/>	<1	
100-41-4	Ethylbenzene	1.2E+1	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	NA	>6.2E+2	>6.2E+2	NA	NA	>6.2E+2	<input type="checkbox"/>	NA	
1330-20-7	Xylene (mixed isomers)	7.2E+1	>4.9E+2	>4.9E+2	>4.9E+2	>4.9E+2	>4.9E+2	NA	>4.9E+2	>4.9E+2	NA	NA	>4.9E+2	<input type="checkbox"/>	NA	
1634-04-4	Methyl t-Butyl ether	0.0E+0	1.2E+1	1.7E+3	4.7E+3	2.5E+3	>8.0E+3	NA	>8.0E+3	>8.0E+3	NA	NA	1.2E+1	<input type="checkbox"/>	<1	
91-20-3	Naphthalene	0.0E+0	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	NA	>6.2E+2	>6.2E+2	NA	NA	>6.2E+2	<input type="checkbox"/>	NA	

> indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
 Target Risk (Class C) 1.0E-5
 Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domenico - Fir
 (One-directional)

SSTL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration (mg/L)	Groundwater Ingestion			X	GW Vol. to Indoor Air	Groundwater Volatilization to Outdoor Air			Applicable SSTL (mg/L)	SSTL Exceeded? "X" if yes
			On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial			On-site (0 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial		
71-43-2	Benzene	5.0E+0	9.9E-3	8.4E+0	2.8E+1	X	2.7E-1	4.1E+1	5.1E+1	8.6E+1	9.9E-3	X
108-88-3	Toluene	4.2E+0	2.0E+1	>5.2E+2	>5.2E+2		2.9E+2	>5.2E+2	>5.2E+2	>5.2E+2	2.0E+1	<input type="checkbox"/>
100-41-4	Ethylbenzene	1.9E+0	1.0E+1	>1.7E+2	>1.7E+2		>1.7E+2	>1.7E+2	>1.7E+2	>1.7E+2	1.0E+1	<input type="checkbox"/>
1330-20-7	Xylene (mixed isomers)	9.0E+0	>2.0E+2	>2.0E+2	>2.0E+2		>2.0E+2	>2.0E+2	>2.0E+2	>2.0E+2	>2.0E+2	<input type="checkbox"/>
1634-04-4	Methyl t-Butyl ether	2.6E-1	1.0E+0	1.5E+2	4.1E+2		1.6E+4	>4.8E+4	>4.8E+4	>4.8E+4	1.0E+0	<input type="checkbox"/>
91-20-3	Naphthalene	3.5E-1	>3.1E+1	>3.1E+1	>3.1E+1		>3.1E+1	>3.1E+1	>3.1E+1	>3.1E+1	>3.1E+1	<input type="checkbox"/>

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

--

1 OF 1

1st Order
(al vert. dispersion)

Required CRF
Only if "yes" left
5.1E+2
<1
<1
NA
<1
NA

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
-----------------------------	----------------------------------

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	<1	<1	1.4E+0	5.0E+0
108-88-3	Toluene	1.1E+1	4.2E+0	<1	<1	1.1E+1	4.2E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	<1	<1	1.2E+1	1.9E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	NA	NA	7.2E+1	9.0E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	<1	<1	0.0E+0	2.6E-1
91-20-3	Naphthalene	0.0E+0	3.5E-1	NA	NA	0.0E+0	3.5E-1

Cumulative Values:

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

2 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Commercial		Commercial		None		Commercial	
CAS No.	Name	Target Risk: 1.0E-5 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	2.0E-7	1.1E-2	2.7E-5	1.5E+0			5.1E-4	1.6E+1
108-88-3	Toluene		6.2E-4		4.4E-2				2.1E-1
100-41-4	Ethylbenzene		1.4E-4		8.2E-3				1.9E-1
1330-20-7	Xylene (mixed isomers)		1.4E-4		7.6E-3				4.4E-2
1634-04-4	Methyl t-Butyl ether		1.2E-7		1.7E-5				2.5E-1
91-20-3	Naphthalene		1.7E-7		2.0E-5				8.6E-3
Cumulative Values:		2.0E-7	1.2E-2	2.7E-5 ■	1.6E+0 ■	0.0E+0	0.0E+0	5.1E-4 ■	1.7E+1 ■

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT Cumulative Risk Worksheet

Site Name: Arrow Rentals Site Name: Arrow Rentals Completed By: Aquifer Sciences, Inc. Job ID: 971275
 Site Location: 187 North L Street, Livermore, California Site Location: 187 North L Street, Livermore, California Date Completed: 17-Apr-01 3 OF 3

CUMULATIVE RISK WORKSHEET Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0
Groundwater DAF Option: Domenico - First Order

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		Residential (100 ft)		Commercial (100 ft)		Residential (100 ft)		Commercial (100 ft)	
		Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	1.5E-7	7.1E-3	9.6E-8	5.4E-3	5.9E-7	1.6E-2	1.8E-7	5.7E-3
108-88-3	Toluene		3.5E-4		2.9E-4		1.6E-8		5.6E-9
100-41-4	Ethylbenzene		9.1E-5		6.5E-5		2.0E-4		7.2E-5
1330-20-7	Xylene (mixed isomers)		9.4E-5		6.7E-5		6.4E-7		2.3E-7
1634-04-4	Methyl t-Butyl ether		7.7E-8		5.5E-8		1.8E-3		6.4E-4
91-20-3	Naphthalene		1.2E-7		8.3E-8		1.1E-7		3.9E-8
Cumulative Values:		1.5E-7	7.6E-3	9.6E-8	5.9E-3	5.9E-7	1.8E-2	1.8E-7	6.4E-3

■ Indicates risk level exceeding target risk

APPENDIX G

TIER 2 BASELINE RISK ASSESSMENT - ONSITE RESIDENTIAL SCENARIO

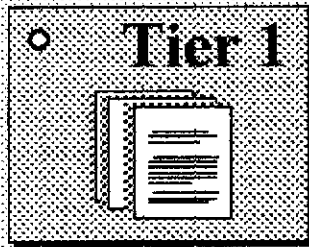
Main Screen

RBCA Tool Kit for Chemical Releases
Version 1.3a © 2000

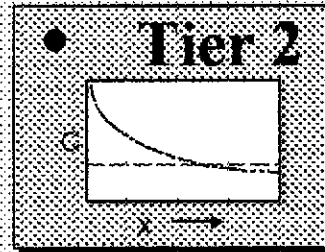
1. Project Information

Site Name:	Arrow Rentals		
Location:	187 North L Street, Livermore, California		
Compl. By:	Aquifer Sciences, Inc.		
Date:	17-Apr-01	Job ID:	971275

2. Which Type of RBCA Analysis? ?



Tier 1
Generic Values
On-Site
Exposure



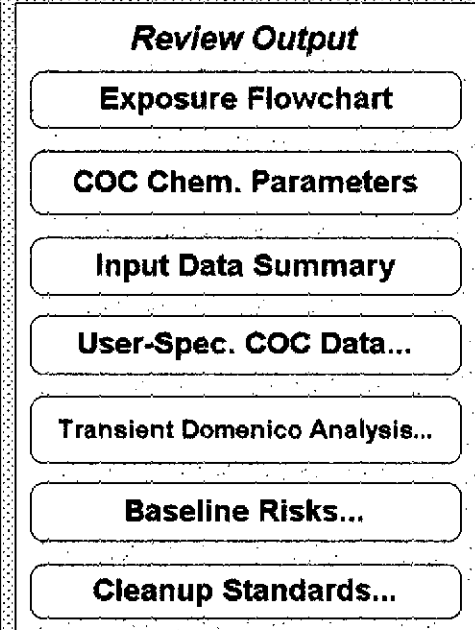
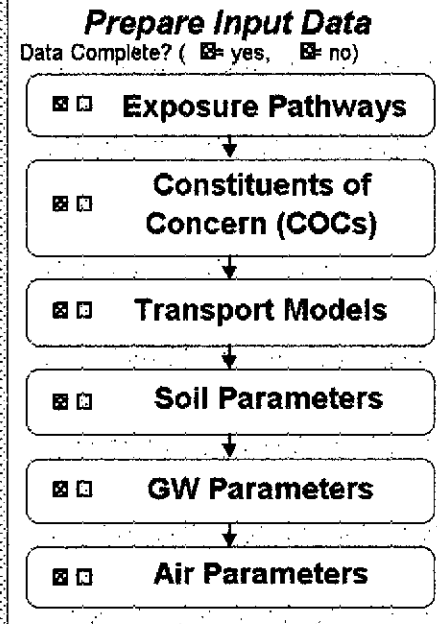
Tier 2
Site-Specific Values
On- or Off-Site Exposure

3. Calculation Options ?

Affects which input data are required

- Baseline Risks (Forward mode)**
- RBCA Cleanup Standards (Backward mode)**

4. RBCA Evaluation Process

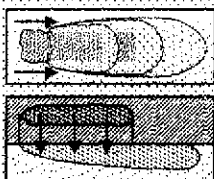


5. Commands and Options

New Site	Load Data...	Save Data As...	Quit
Print Sheet	Set Units	Custom Chem. Data...	Help

Exposure Pathway Identification

1. Groundwater Exposure



**Groundwater Ingestion/
Surface Water Impact**

Receptor: Res. [v] Res. [v] Com. [v]
 Type: On-site Off-site1 Off-site2

Source Media:

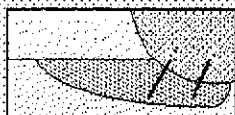
Affected Groundwater

Affected Soils Leaching to Groundwater

Distance to GW receptors:

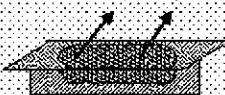
0	100	100	(ft)
On-site	Off-site1	Off-site2	
0	100	100	(ft)
On-site	Off-site1	Off-site2	

GW Discharge to Surface Water Exposure



- Swimming
- Fish Consumption
- Aquatic Life Protection
- Enter ALP Criteria

2. Surface Soil Exposure



**Direct Ingestion
and Dermal Contact**

Receptor: None [v]
 Type: On-site No off-site receptors

Construction Worker

Site Name: Arrow Rentals

Location: 187 North L Street, Livermore, California

Compl. By: Aquifer Sciences, Inc.

Job ID: 971275

Date: 17-Apr-01

3. Air Exposure

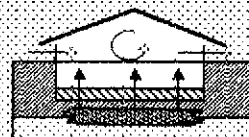
**Volatilization and Particulates
to Outdoor Air Inhalation**



Receptor: Res. [v] Res. [v] Com. [v]
 Type: On-site Off-site1 Off-site2
 0 100 100 (ft)

Construction worker

- Affected Soils--Volatilization to Ambient Outdoor Air
- Affected Groundwater--Volatilization to Ambient Outdoor Air
- Affected Surface Soils--Particulates to Ambient Outdoor Air



**Volatilization to
Indoor Air Inhalation**

Receptor: Res. [v]
 Type: On-site No off-site receptors

- Affected Soils--Volatilization to Enclosed Space
- Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options

Main Screen

Print Sheet

Set Units

Help

Exposure Factors & Target Risks

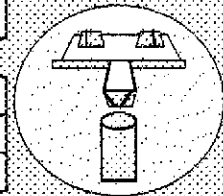
Exposure Flowchart

Exposure Factors and Target Risk Limits

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl By: Aquifer Sciences, Inc.
 Job ID: 971275 Date: 17-Apr-01

1. Exposure Parameters

Age Adjustment?	Residential		Commercial	
	Adult	(Age 0-6) (Age 0-16)	Chronic	Construc.
Averaging time, carcinogens (yr)	70			
Averaging time, non-carcinogens (yr)	30		25	1
Body weight (kg)	70	15 35	70	
Exposure duration (yr)	30	6 16	25	1
Exposure frequency (days/yr)	350		250	180
Dermal exposure frequency (days/yr)	350		250	
Skin surface area, soil contact (cm ²)	<input type="checkbox"/> 5800	2023	5800	5800
Soil dermal adherence factor (mg/cm ² /day)	1			
Water ingestion rate (L/day)	2		1	
Soil ingestion rate (mg/day)	<input type="checkbox"/> 100	200	50	100
Swimming exposure time (hr/event)	3			
Swimming event frequency (events/yr)	12	12 12		
Swimming water ingestion rate (L/hr)	<input type="checkbox"/> 0.05	0.5		
Skin surface area, swimming (cm ²)	<input type="checkbox"/> 23000	8100		
Fish consumption rate (kg/day)	0.025			
Contaminated fish fraction (unitless)	1			



2. Risk Goal Calculation Options

- Individual Constituent Risk Goals Only
- Individual and Cumulative Risk Goals

3. Target Health Risk Limits

	Individual	Cumulative
Target Risk (Class A/B carcins.)	1.0E-6	1.0E-5
Target Risk (Class C carcinogens)	1.0E-5	
Target Hazard Quotient	1.0E+0	
Target Hazard Index		1.0E+0

4. Commands and Options

Return to Exposure Pathways

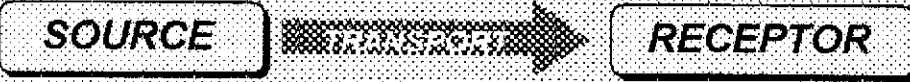
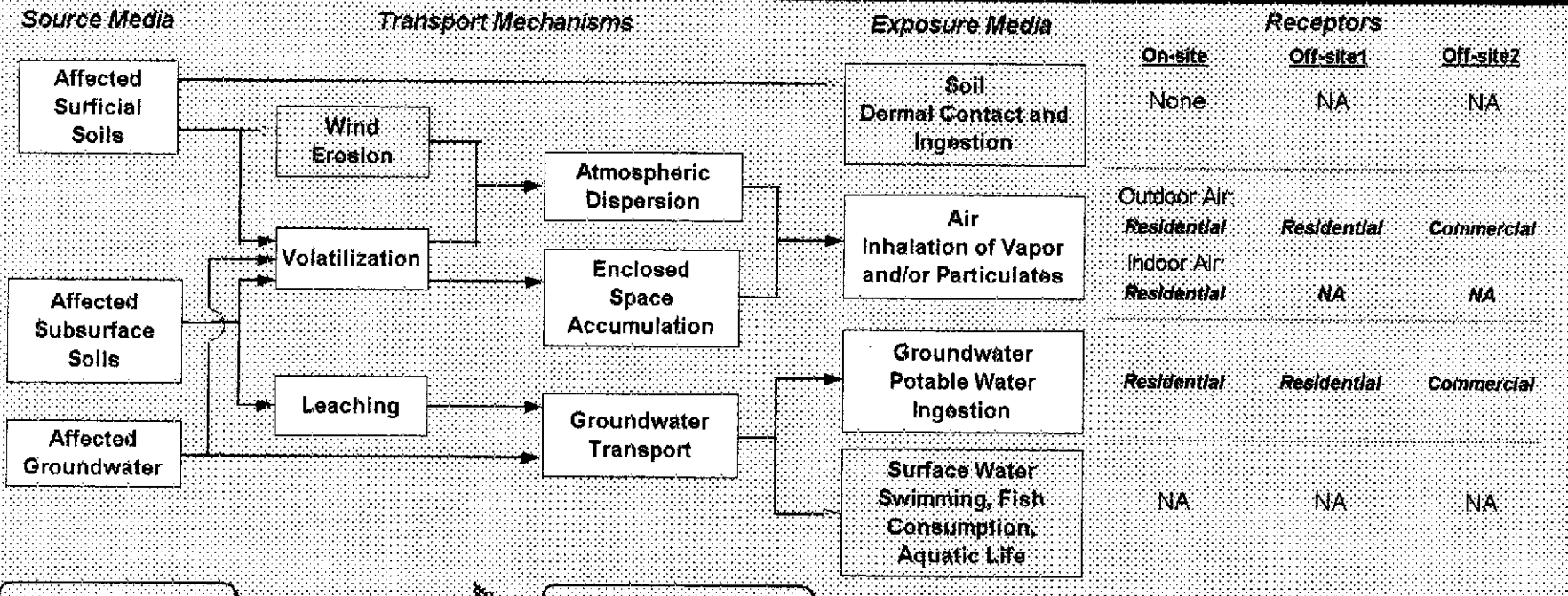
Print Sheet

Use Default Values

Help

Exposure Pathway Flowchart

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.
 Job ID: 971275
 Date: 17-Apr-01



Commands and Options

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.

Job ID: 971275
 Date: 17-Apr-01

Commands and Options

Main Screen

Print Sheet

Help

Source Media Constituents of Concern (COCs)

Selected COCs

COC Select: Sort List:

Benzene
Toluene
Ethylbenzene
Xylene (mixed isomers)
Methyl t-Butyl ether
Naphthalene

Representative COC Concentration

Groundwater Source Zone

Calculate

(mg/L)	note
5.0E+0	95% UCL at W-1s/W-Bs
4.2E+0	95% UCL at W-1s/W-Bs
1.9E+0	95% UCL at W-1s/W-Bs
9.0E+0	95% UCL at W-1s/W-Bs
2.6E-1	95% UCL at W-1s/W-Bs
3.5E-1	95% UCL at W-1s/W-Bs

Soil Source Zone

Calculate

(mg/kg)	note
1.4E+0	95% UCL of mean
1.1E+1	95% UCL of mean
1.2E+1	95% UCL of mean
7.2E+1	95% UCL of mean
0.0E+0	
0.0E+0	

Apply Raoult's Law

Mole Fraction in Source Material

(-)

Transport Modeling Options

1. Vertical Transport, Surface Soil Column

Outdoor Air Volatilization Factors ?

- Surface soil volatilization model only
- Combination surface soil/Johnson & Ettinger models

Thickness of surface soil zone (ft)

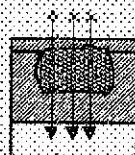
- User-specified VF from other model

Indoor Air Volatilization Factors ?

- Johnson & Ettinger model
- User-specified VF from other model

Soil-to-Groundwater Leaching Factor ?

- ASTM Model
 - Apply Soil Attenuation Model (SAM)
 - Allow first-order biodecay
- User-specified LF from other model



2. Lateral Air Dispersion Factor

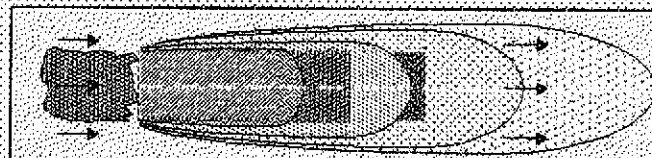


- 3-D Gaussian dispersion model

Off-site 1	Off-site 2
1.00E+0	1.00E+0 (-)
- User-Specified ADF

Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 17-Apr-01
 Compl. By: Aquifer Sciences, Inc.

3. Groundwater Dilution Attenuation Factor



Calculate DAF using Domenico Model ?

- Domenico equation with dispersion only (no biodegradation)
- Domenico equation first-order decay Enter Decay Rates
- Modified Domenico equation using electron acceptor superposition
- Biodegradation Capacity (mg/L)

— or —

User-Specified DAF Values

- DAF values from other model or site data

4. Commands and Options

Site-Specific Soil Parameters

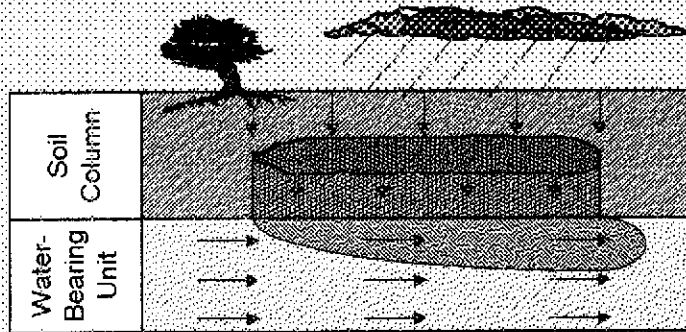
1. Soil Source Zone Characteristics

Hydrogeology

Depth to water-bearing unit	25	(ft)
Capillary zone thickness	0.16	(ft)
Soil column thickness	24.84	(ft)

Affected Soil Zone

Depth to top of affected soils	15	(ft)
Depth to base of affected soils	25	(ft)
Affected soil area	1280	1280 (ft ²)
Length of affected soil parallel to assumed wind direction	40	40 (ft)
Length of affected soil parallel to assumed GW flow direction	40	(ft)



Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 17-Apr-01
 Compl. By: Aquifer Sciences, Inc.

2. Surface Soil Column

Predominant USCS Soil Type

or

Total porosity	0.3	(-)
Volumetric water content	0.12	0.26 (-)
Volumetric air content	0.18	0.04 (-)
Dry bulk density	2.65	(kg/L)
Vertical hydraulic conductivity	3.3E+2	(ft/yr)
Vapor permeability	1.1E-11	(ft ²)
Capillary zone thickness	1.6E-1	(ft)

Net Rainfall Infiltration

Net infiltration estimate (in/yr)
 or

Average annual precipitation (in/yr)

Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	6.9	(-)

3. Commands and Options

Site-Specific Groundwater Parameters

1. Water-Bearing Unit ?

Hydrogeology

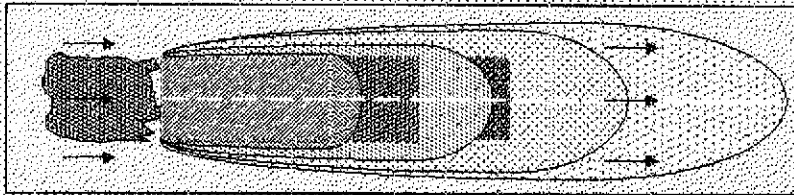
Groundwater Darcy velocity	8.2E+0	(ft/yr)
Groundwater seepage velocity	2.1E+1	(ft/yr)
or	Enter Directly	1. or
Hydraulic conductivity	4.1E+2	(ft/yr)
Hydraulic gradient	2.0E-2	(-)
Effective porosity	0.40	(-)

Sorption

Fraction organic carbon-saturated zone	0.01	(-)
Groundwater pH	6.90	(-)

2. Groundwater Source Zone ?

Groundwater plume width at source	32	(ft)
Plume (mixing zone) thickness at source	6.56167979	(ft)
or	Calculate	or
Saturated thickness	10	(ft)
Length of source zone		(ft)



Site Name: Arrow Rentals Job ID: 971275
 Location: 187 North L Street, Livermore, California Date: 17-Apr-01
 Compl. By: Aquifer Sciences, Inc

3. Groundwater Dispersion ?

Model:	ASTM Default	GW Ingestion	Soil Leaching to GW
Distance to GW receptors	100	Off-site 1	Off-site 2
or	Enter Directly	100	100
Longitudinal dispersivity	10	10	10
Transverse dispersivity	3.3	3.3	3.3
Vertical dispersivity	0.5	0.5	0.5

4. Groundwater Discharge to Surface Water ?

Distance to GW/SW discharge point	Off-site 2
	NA (ft)
Plume width at GW/SW discharge	0 (ft)
Plume thickness at GW/SW discharge	0 (ft)
Surface water flowrate at GW/SW discharge	0.0E+0 (ft ³ /s)

5. Commands and Options

Site-Specific Air Parameters

1. Outdoor Air Pathway

Dispersion in Air

Distance to offsite air receptor

Off-site 1	Off-site 2	
100	100	(ft)

or

Enter Directly

Horizontal dispersivity

11.26	11.26	(ft)
-------	-------	------

Vertical dispersivity

7.81	7.61	(ft)
------	------	------

Air Source Zone

Air mixing zone height

6.56167979	(ft)
------------	------

Ambient air velocity in mixing zone

7.381889764	(ft/s)
-------------	--------

Areal particulate emission flux

6.9E-14	(g/cm ² /s)
---------	------------------------

?

2. Indoor Air Pathway

Building Parameters

Building volume/area ratio

Residential	Commercial	
8	9.84252	(ft)

Foundation area

1000	20000	(ft ²)
------	-------	--------------------

Foundation perimeter

130	600	(ft)
-----	-----	------

Building air exchange rate

1.4E-4	1.4E-4	(1/s)
--------	--------	-------

Depth to bottom of foundation slab

0.5	0.5	(ft)
-----	-----	------

Convective air flow through cracks

0.0E+0	0.0E+0	(ft ³ /s)
--------	--------	----------------------

Foundation thickness

0.5	(ft)
-----	------

Foundation crack fraction

0.01	(-)
------	-----

Volumetric water content of cracks

0.28	(-)
------	-----

Volumetric air content of cracks

0.13	(-)
------	-----

Indoor/Outdoor differential pressure

0	(Pa)
---	------

?

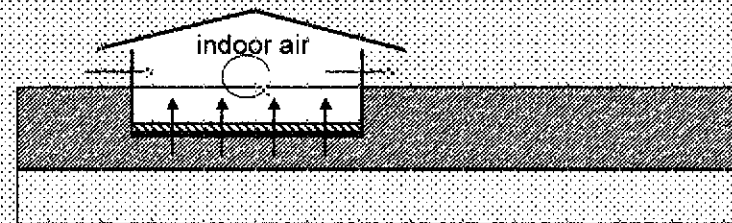
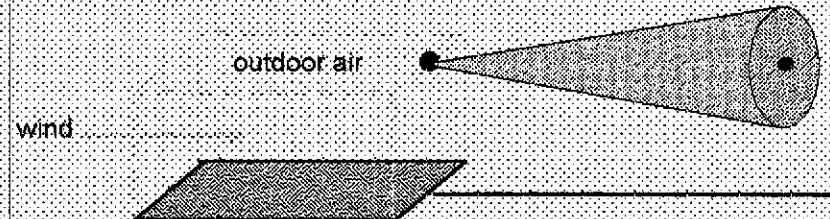
Site Name: Arrow Rentals

Job ID: 971275

Location: 187 North L Street, Livermore, California

Date: 17-Apr-01

Compl. By: Aquifer Sciences, Inc.



3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

Exposure Pathway Flowchart

Site Name: Arrow Rentals
 Location: 187 North L Street, Livermore, California
 Compl. By: Aquifer Sciences, Inc.

Job ID: 971275
 Date: 17-Apr-01

Source Media

Transport Mechanisms

Exposure Media

Receptors

Affected Surficial Soils

Wind Erosion

Atmospheric Dispersion

Soil Dermal Contact and Ingestion

On-site

Off-site1

Off-site2

None

NA

NA

Affected Subsurface Soils

Volatilization

Enclosed Space Accumulation

Air Inhalation of Vapor and/or Particulates

Outdoor Air:

Residential

Residential

Commercial

Indoor Air:

Residential

NA

NA

Affected Groundwater

Leaching

Groundwater Transport

Groundwater Potable Water Ingestion

Residential

Residential

Commercial

Surface Water Swimming, Fish Consumption, Aquatic Life

NA

NA

NA



SOURCE → **RECEPTOR**

Commands and Options

Return

Print Sheet

Help

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight		Diffusion Coefficients				log (Koc) or log(Kd)			Henry's Law Constant			Vapor Pressure		Solubility		acid pKa	base pKb
			(g/mole)	ref	in air (cm ² /s)	ref	in water (cm ² /s)	ref	log(L/kg) partition	ref	(atm-m ³ /mol)	(unitless)	ref	(@ 20 - 25 C) (mm Hg)	ref	(@ 20 - 25 C) (mg/L)	ref			
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5	-	-
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	5	9.41E-05	7	1.08	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-
Naphthalene	81-20-3	FAH	128.2	PS	5.90E-02	PS	7.50E-06	PS	3.30	Koc	PS	4.83E-04	1.99E-02	PS	2.30E-01	PS	3.10E+01	PS	-	-

Site Name: Arrow Rentals

Completed by: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01



Constituent	ref
Benzene	-
Toluene	-
Ethylbenzene	-
Xylene (mixed isomers)	-
Methyl t-Butyl ether	-
Naphthalene	-

Site Name: Arrow Rentals

Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs **Toxicity Data**

Constituent	Reference Dose (mg/kg/day)				Reference Conc. (mg/m ³)				Slope Factors 1/(mg/kg/day)				Unit Risk Factor 1/(µg/m ³)		EPA Weight of Evidence	Is Constituent Carcinogenic ?
	Oral		Dermal		Inhalation		Oral		Dermal		Inhalation		URF Inhal	ref		
	RfD oral	ref	RfD dermal	ref	RfC Inhal	ref	SF oral	ref	SF dermal	ref	SF dermal	ref				
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE		
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	D	FALSE		
Ethylbenzene	1.00E-01	PS	9.76E-02	TX	1.00E+00	PS	-	-	-	-	-	-	D	FALSE		
Xylene (mixed isomers)	2.00E+00	A,R	1.84E+00	TX	7.00E+00	A	-	-	-	-	-	-	D	FALSE		
Methyl t-Butyl ether	1.00E-02	31	3.00E-03	TX	3.00E+00	R	-	-	-	-	-	-	-	FALSE		
Naphthalene	4.00E-01	PS	3.56E-01	TX	1.40E+00	PS	-	-	-	-	-	-	D	FALSE		

Site Name: Arrow Rentals
 Site Location: 187 North L S

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level		Time-Weighted Average Workplace Criteria		Aquatic Life Prot. Criteria		Bioconcentration Factor (L-wat/kg-fish)
	MCL (mg/L)	ref	TWA (mg/m ³)	ref	AQL (mg/L)	ref	
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
Naphthalene	-	-	5.00E+01	PS	-	-	430

Site Name: Arrow Rentals

Site Location: 187 North L S

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data						Detection Limits				Half Life (First-Order Decay)		
		Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm ³ /event)	ref	Groundwater		Soil		(days)		ref
								(mg/L)	ref	(mg/kg)	ref	Saturated	Unsaturated	
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.032	S	0.005	S	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.032	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.032	S	0.005	S	228	228	H
Xylene (mixed isomers)	0.5	0.08	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
Naphthalene	0.05	0.069	0.53	2.2	0.2	2.7E-1	D	0.01	32	0.01	32	258	258	H

Site Name: Arrow Rentals
 Site Location: 187 North L S

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

1 OF 1

Exposure Parameters	Residential		Commercial/Industrial		
	Actual	(1.6yrs)	(1.6yrs)	Chronic	Construc.
AT _c	70				
AT _n	30			25	1
BW	70	15	35	70	
ED	30	6	16	25	1
τ	30			25	1
EF	350			250	160
EF _d	350			250	
IR _w	2			1	
IR _s	100	200		50	100
SA	5800		2023	5800	5800
M	1				
ET _{swim}	3				
EV _{swim}	12	12	12		
IR _{swim}	0.05	0.5			
SA _{swim}	23000		9100		
IR _{fish}	0.025				
F _{fish}	1				

Surface Parameters	General	Construction	Units
A	1.3E+3	NA	(ft ²)
W	4.0E+1	NA	(ft)
W _{GW}	4.0E+1		(ft)
U _{air}	7.4E+0		(ft/s)
δ _{air}	6.6E+0		(ft)
P _a	NA		(g/cm ² /s)
L _{so}	1.0E+0		(ft)

Surface Soil Column Parameters	Value	Units
h _{cap}	1.6E-1	(ft)
h _v	2.6E+1	(ft)
A _s	2.7E+0	(g/cm ³)
f _o	1.0E-2	(-)
θ _T	3.0E-1	(-)
K _{vs}	3.9E+2	(ft/yr)
k _v	1.1E-11	(ft ²)
L _{gw}	2.6E+1	(ft)
L _s	1.5E+1	(ft)
L _{base}	2.5E+1	(ft)
L _{subs}	1.0E+1	(ft)
pH	6.9E+0	(-)
δ _v	0.26	(-)
δ _a	0.04	(-)

Building Parameters	Residential	Commercial	Units
L _v	8.00E+0	NA	(ft)
A _b	1.00E+3	NA	(ft ²)
X _{tot}	1.30E+2	NA	(ft)
ER	1.40E-4	NA	(1/s)
L _{blk}	5.00E-1	NA	(ft)
Z _{blk}	5.00E-1	NA	(ft)
γ	1.00E-2	NA	(-)
dP	0.00E+0	NA	(Pa)
Q _c	0.00E+0	NA	(ft ³ /s)

Groundwater Parameters	Value	Units
δ _{gw}	6.6E+0	(ft)
I _r	1.2E+1	(in/yr)
U _{gw}	6.2E+0	(ft/yr)
V _{gw}	2.1E+1	(ft/yr)
K _s	4.1E+2	(ft/yr)
i	2.0E-2	(-)
S _b	3.2E+1	(ft)
S _d	6.6E+0	(ft)
θ _{eff}	4.0E-1	(-)
f _{o,sw}	1.0E-2	(-)
pH _{sw}	6.9E+0	(-)
	1st Order	(-)

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	Units
Lateral Groundwater Transport					
α _x	1.0E+1	1.0E+1	1.0E+1	1.0E+1	(ft)
α _y	3.3E+0	3.3E+0	3.3E+0	3.3E+0	(ft)
α _z	5.0E-1	5.0E-1	5.0E-1	5.0E-1	(ft)
Lateral Outdoor Air Transport					
α _x	1.1E+1	1.1E+1	1.1E+1	1.1E+1	(ft)
α _y	7.6E+0	7.6E+0	7.6E+0	7.6E+0	(ft)
ADF	2.1E+0	2.1E+0	2.1E+0	2.1E+0	(-)

Surface Water Parameters	Off-site 2	Units
Q _{sw}	NA	(ft ³ /s)
W _{pl}	NA	(ft)
S _d	NA	(ft)
DF _{sw}	NA	(-)

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Residential	Residential	Commercial
Soil Leaching to Groundwater Ingestion	Residential	Residential	Commercial
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Residential	Residential	Commercial
Volatilization from Groundwater	Residential		
Indoor Air:			
Volatilization from Subsurface Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	NA	NA

Receptor Distance from Source (ft)	On-site	Off-site 1	Off-site 2	Units
Groundwater receptor	0	100	100	(ft)
Soil leaching to groundwater receptor	0	100	100	(ft)
Outdoor air inhalation receptor	0	100	100	(ft)

Target Health Risk Values	Individual	Cumulative
TR ₁₀₀ Target Risk (class A&B carcinogens)	1.0E-5	1.0E-5
TR ₁₀ Target Risk (class C carcinogens)	1.0E-6	
THQ Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	Model
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	Yes
Air dilution factor	3-D Gaussian dispersion
Groundwater dilution/attenuation factor	Domenico model w/ biodeg.

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (15 - 25 ft)	
	value (mg/L)	note	value (mg/kg)	note
Benzene	5.0E+0	95% UCL at W-1s/W-Bs	1.4E+0	95% UCL of mean
Toluene	4.2E+0	95% UCL at W-1s/W-Bs	1.1E+1	95% UCL of mean
Ethylbenzene	1.9E+0	95% UCL at W-1s/W-Bs	1.2E+1	95% UCL of mean
Xylene (mixed isomers)	9.0E+0	95% UCL at W-1s/W-Bs	7.2E+1	95% UCL of mean
Methyl t-Butyl ether	2.6E-1	95% UCL at W-1s/W-Bs	0.0E+0	
Naphthalene	3.5E-1	95% UCL at W-1s/W-Bs	0.0E+0	

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

User-Specified COC Data

CONSTITUENT HALF-LIFE VALUES

CONSTITUENT	Saturated Zone Half-Life (days)	Unsaturated Zone Half-Life (days)
Benzene	567	567
Toluene	297	297
Ethylbenzene	2962	2962
Xylene (mixed isomers)	944	944
Methyl t-Butyl ether	339	339
Naphthalene	7300	7300

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

Tier 2 Domenico Groundwater Modeling Summary

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, CA

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

1 OF 2

DOMENICO GROUNDWATER MODELING SUMMARY

OFF-SITE GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

SOILS LEACHING TO GROUNDWATER:

INGESTION

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) Steady-state Exposure Concentration Groundwater POE Conc. (mg/L)		3) POE Concentration Limit Groundwater POE Conc. (mg/L)		4) Time to Reach POE Conc. Limit Conc. limit reached? ("■" if yes); Time (yr)	
		Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	1.4E+0	1.3E-7	1.3E-7	2.9E-3	9.9E-3
Toluene	1.1E+1	7.7E-22	7.7E-22	7.3E+0	2.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Ethylbenzene	1.2E+1	1.1E-7	1.1E-7	3.7E+0	1.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Xylene (mixed isomers)	7.2E+1	1.2E-12	1.2E-12	7.3E+1	2.0E+2	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Methyl t-Butyl ether	0.0E+0	0.0E+0	0.0E+0	3.7E-1	1.0E+0	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Naphthalene	0.0E+0	0.0E+0	0.0E+0	1.5E+1	4.1E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA

NOTE: POE = Point of exposure

RBCA SITE ASSESSMENT

Tier 2 Domenico Groundwater Modeling Summary

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, (Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

2 OF 2

DOMENICO GROUNDWATER MODELING SUMMARY

OFF-SITE GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER:

INGESTION

Constituents of Concern	1) Source Medium	2) Steady-state Exposure Concentration Groundwater: POE Conc. (mg/L)		3) POE Concentration Limit Groundwater: POE Conc. (mg/L)		4) Time to Reach POE Conc. Limit Conc. reaches limit? ("■" if yes); Time (yr)	
	Groundwater Conc. (mg/L)	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	5.0E+0	1.7E-3	1.7E-3	2.9E-3	9.9E-3
Toluene	4.2E+0	1.2E-7	1.2E-7	7.3E+0	2.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Ethylbenzene	1.9E+0	7.4E-4	7.4E-4	3.7E+0	1.0E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Xylene (mixed isomers)	9.0E+0	4.7E-5	4.7E-5	7.3E+1	2.0E+2	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Methyl t-Butyl ether	2.6E-1	6.5E-4	6.5E-4	3.7E-1	1.0E+0	<input type="checkbox"/> NA	<input type="checkbox"/> NA
Naphthalene	3.5E-1	1.6E-6	1.6E-6	1.5E+1	4.1E+1	<input type="checkbox"/> NA	<input type="checkbox"/> NA

NOTE: POE = Point of exposure

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

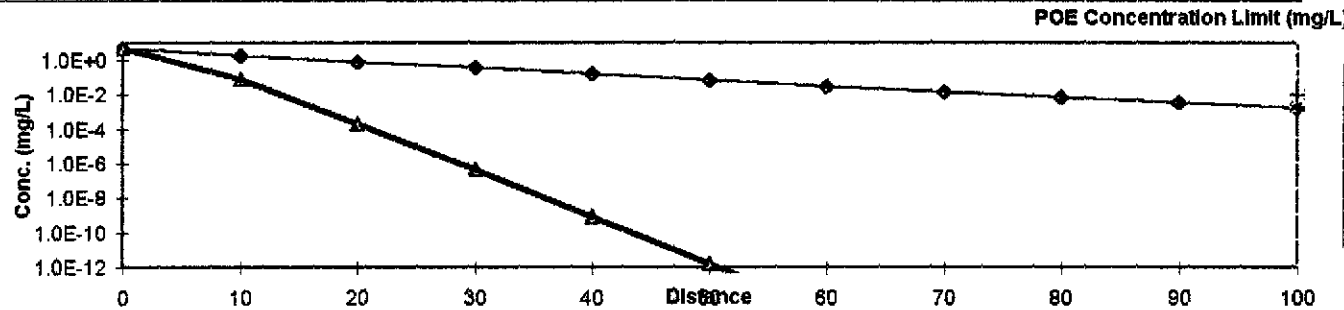
Constituent: Benzene
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

Concentration vs. Distance from Source
 (for given time)

Time (yr) 1.0

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	5.0E+0	7.9E-2	1.9E-4	4.1E-7	8.1E-10	1.6E-12	2.9E-15	5.4E-18	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	5.0E+0	1.9E+0	8.2E-1	3.6E-1	1.8E-1	6.8E-2	3.0E-2	1.4E-2	6.7E-3	3.4E-3	1.7E-3

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.7E-3	1.7E-3
2.9E-3	9.9E-3



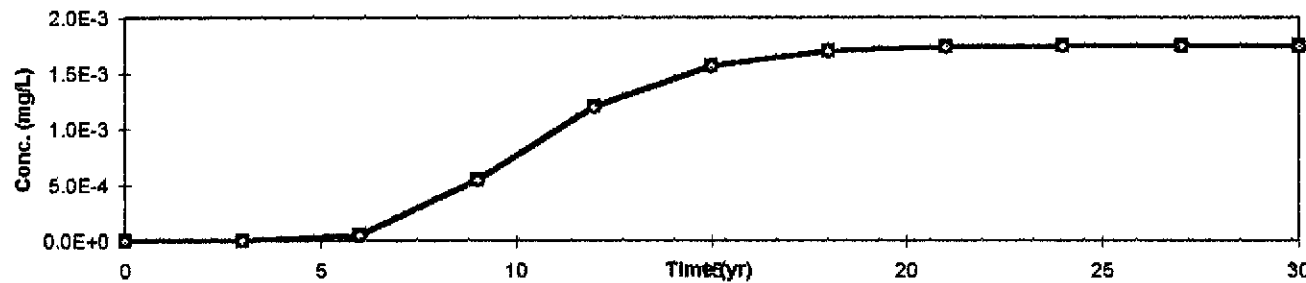
Concentration vs. Time
 (for given distance from source)

Distance (ft) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	6.1E-9	5.1E-6	5.4E-4	1.2E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	6.1E-9	5.1E-6	5.4E-4	1.2E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	6.1E-9	5.1E-6	5.4E-4	1.2E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3	1.7E-3

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

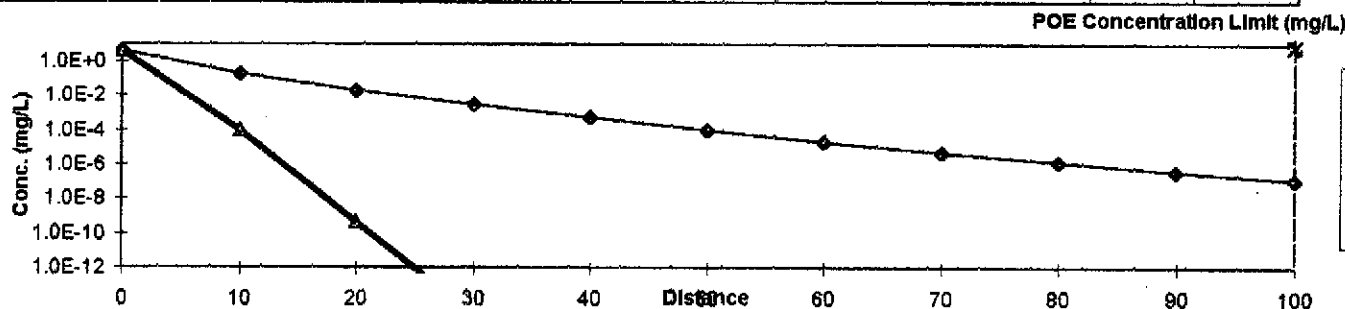
Constituent: Toluene
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

**Concentration vs. Distance from Source
 (for given time)**

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	4.2E+0	9.8E-5	4.3E-10	1.9E-15	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	4.2E+0	1.8E-1	1.9E-2	2.9E-3	5.0E-4	9.8E-5	2.1E-5	5.1E-6	1.3E-6	3.8E-7	1.2E-7

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.2E-7	1.2E-7
7.3E+0	2.0E+1



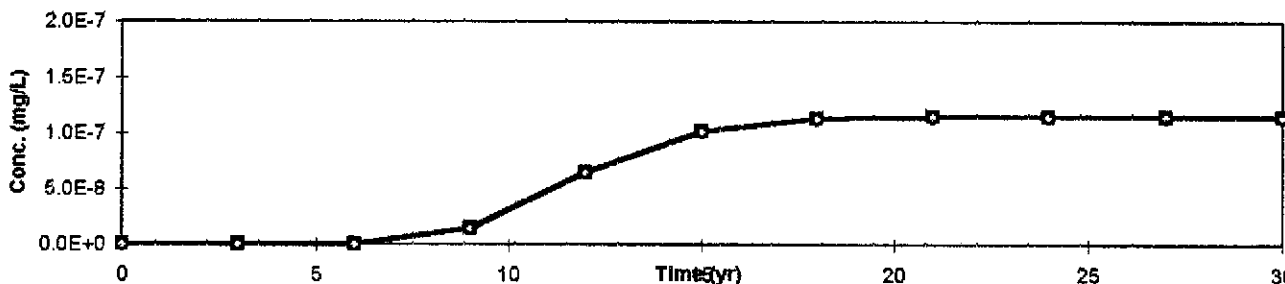
**Concentration vs. Time
 (for given distance from source)**

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	1.6E-18	1.3E-10	1.4E-8	6.5E-8	1.0E-7	1.1E-7	1.1E-7	1.2E-7	1.2E-7	1.2E-7
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	1.6E-18	1.3E-10	1.4E-8	6.5E-8	1.0E-7	1.1E-7	1.1E-7	1.2E-7	1.2E-7	1.2E-7
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	1.6E-18	1.3E-10	1.4E-8	6.5E-8	1.0E-7	1.1E-7	1.1E-7	1.2E-7	1.2E-7	1.2E-7

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

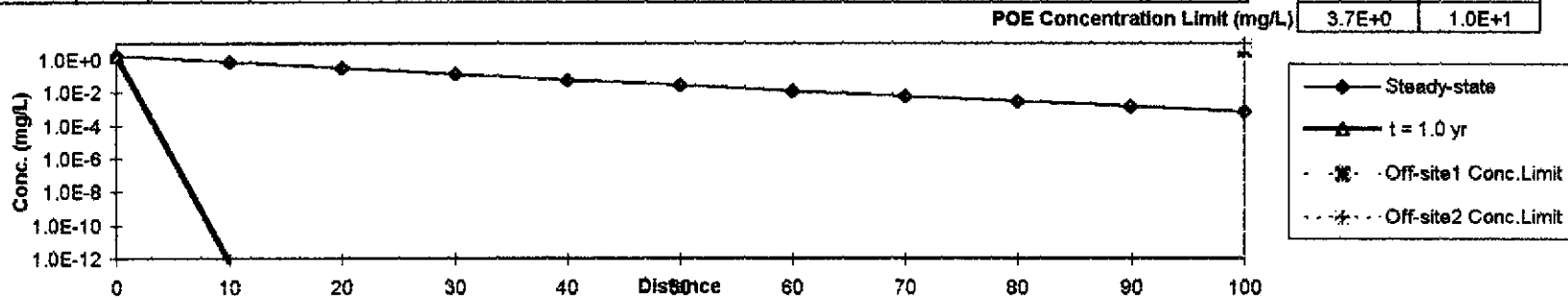
Constituent: Ethylbenzene
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

Concentration vs. Distance from Source
 (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	1.9E+0	6.3E-13	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	1.9E+0	7.3E-1	3.2E-1	1.4E-1	6.3E-2	2.7E-2	1.2E-2	5.7E-3	2.8E-3	1.4E-3	7.4E-4

Off-site1 Residential	Off-site2 Commercial
100	100
0.0E+0	0.0E+0
7.4E-4	7.4E-4
3.7E+0	1.0E+1



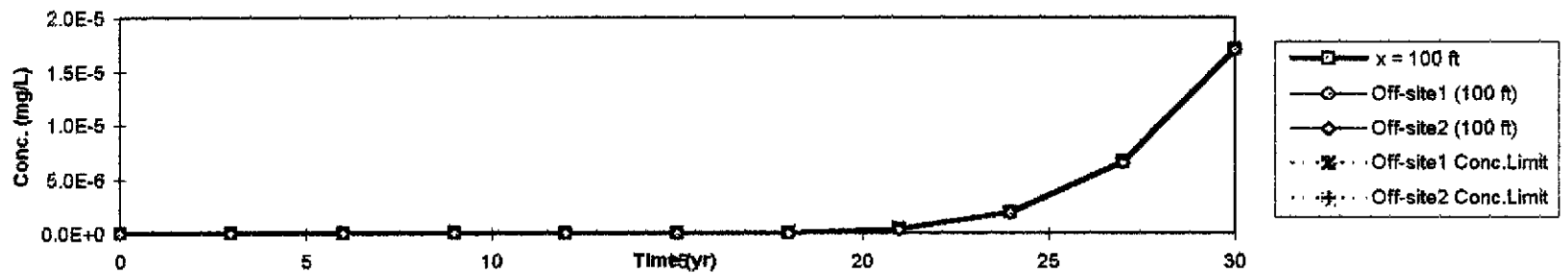
Concentration vs. Time
 (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	2.5E-15	1.1E-11	1.6E-9	3.9E-8	3.7E-7	1.9E-6	6.6E-6	1.7E-5
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	2.5E-15	1.1E-11	1.6E-9	3.9E-8	3.7E-7	1.9E-6	6.6E-6	1.7E-5
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	2.5E-15	1.1E-11	1.6E-9	3.9E-8	3.7E-7	1.9E-6	6.6E-6	1.7E-5

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

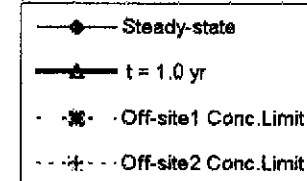
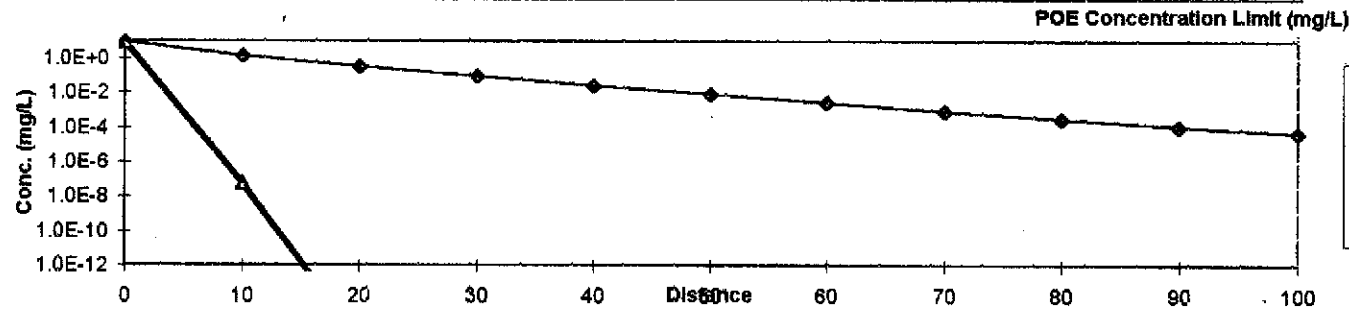
Constituent: Xylene (mixed isomers)
Source Medium: Affected Groundwater
Biodegradation: 1st Order

**Concentration vs. Distance from Source
 (for given time)**

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	9.0E+0	6.2E-8	5.4E-17	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	9.0E+0	1.4E+0	3.3E-1	8.9E-2	2.6E-2	7.5E-3	2.4E-3	8.2E-4	3.0E-4	1.2E-4	4.7E-5

Off-site1 Residential	Off-site2 Commercial
100	100
0.0E+0	0.0E+0
4.7E-5	4.7E-5
7.3E+1	2.0E+2



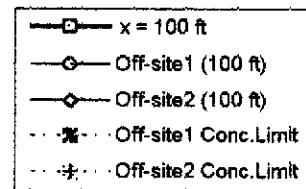
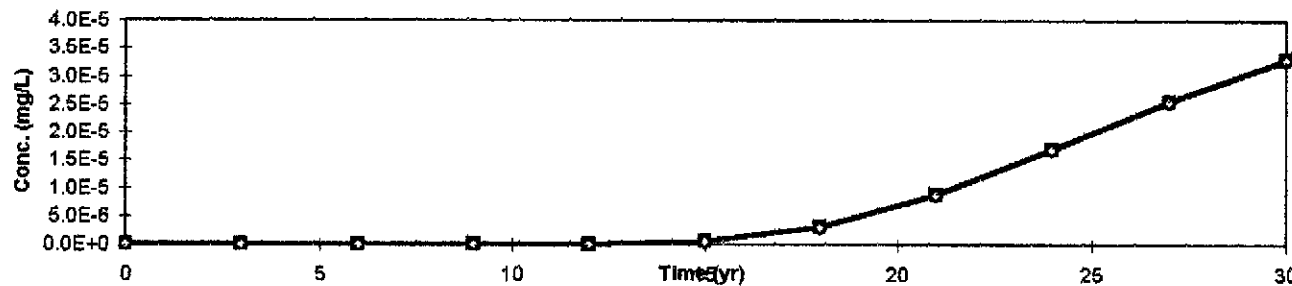
**Concentration vs. Time
 (for given distance from source)**

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	3.8E-15	2.0E-10	3.4E-8	5.8E-7	3.1E-6	8.8E-6	1.7E-5	2.6E-5	3.3E-5
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	3.8E-15	2.0E-10	3.4E-8	5.8E-7	3.1E-6	8.8E-6	1.7E-5	2.6E-5	3.3E-5
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	3.8E-15	2.0E-10	3.4E-8	5.8E-7	3.1E-6	8.8E-6	1.7E-5	2.6E-5	3.3E-5

**Time to Reach
 Conc. Limit (yr)**

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

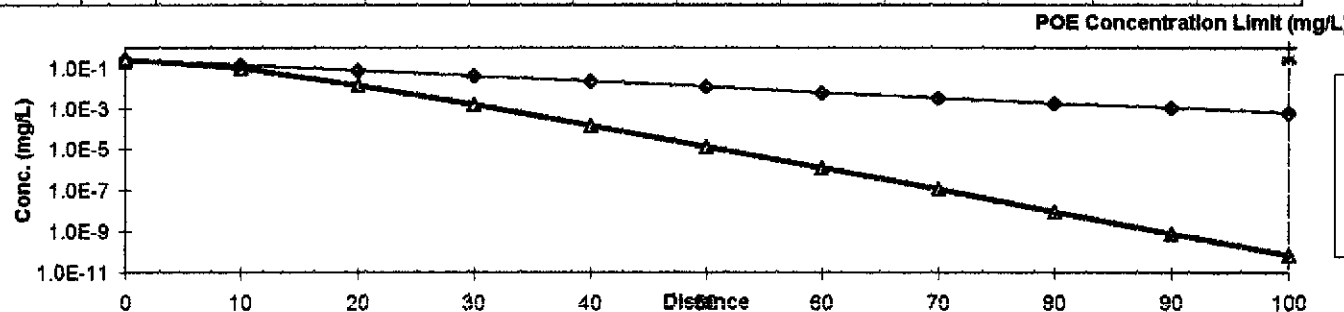
Constituent: Methyl t-Butyl ether
 Source Medium: Affected Groundwater
 Biodegradation: 1st Order

**Concentration vs. Distance from Source
 (for given time)**

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.6E-1	1.0E-1	1.5E-2	1.7E-3	1.8E-4	1.4E-5	1.2E-6	1.0E-7	8.9E-9	7.9E-10	7.1E-11
Steady-state	Conc. (mg/L)	2.6E-1	1.4E-1	8.0E-2	4.5E-2	2.4E-2	1.2E-2	6.5E-3	3.5E-3	1.9E-3	1.1E-3	6.5E-4

Off-site1	Off-site2
Residential	Commercial
100	100
7.1E-11	7.1E-11
6.5E-4	6.5E-4
3.7E-1	1.0E+0

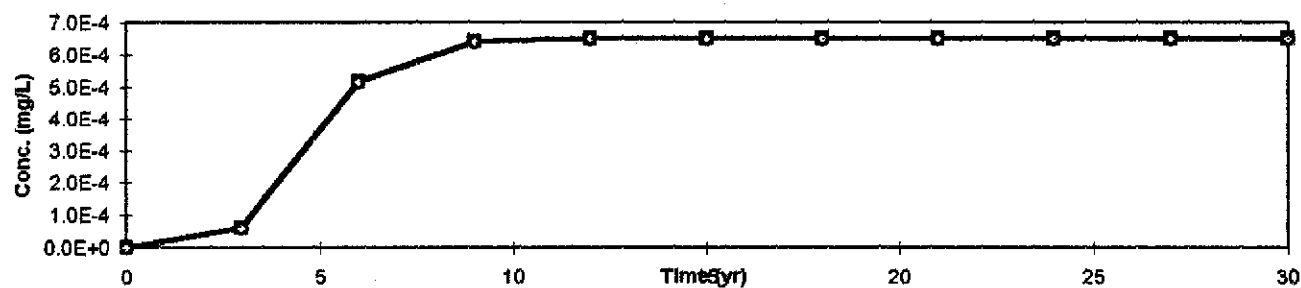


**Concentration vs. Time
 (for given distance from source)**

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	5.9E-5	5.2E-4	6.4E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	5.9E-5	5.2E-4	6.4E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	5.9E-5	5.2E-4	6.4E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4	6.5E-4

Time to Reach Conc. Limit (yr)	
Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

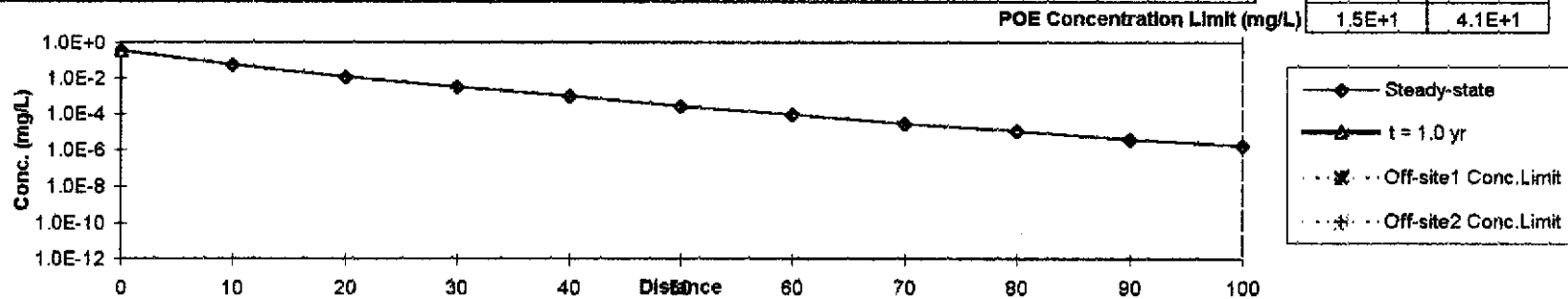
Constituent: Naphthalene
Source Medium: Affected Groundwater
Biodegradation: 1st Order

**Concentration vs. Distance from Source
 (for given time)**

Time (yr) **1.0**

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.6E-6	1.6E-6
1.5E+1	4.1E+1

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	3.5E-1	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	3.5E-1	5.3E-2	1.2E-2	3.2E-3	9.0E-4	2.7E-4	8.4E-5	2.9E-5	1.0E-5	4.0E-6	1.6E-6

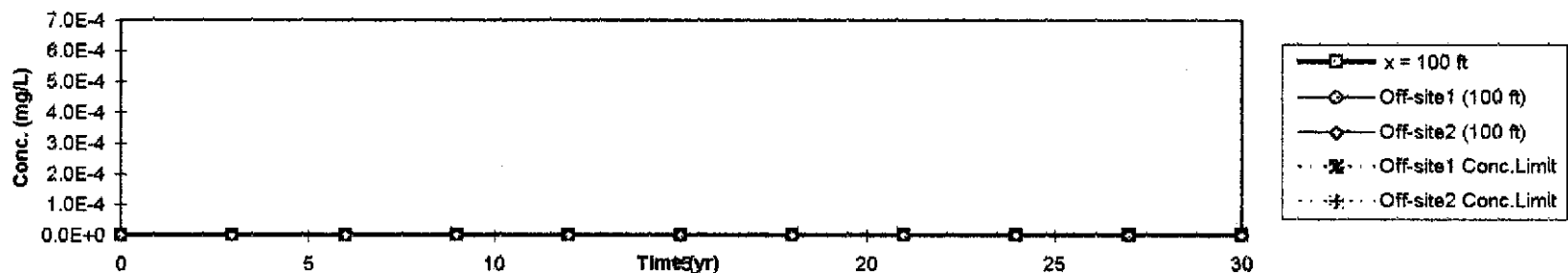


**Concentration vs. Time
 (for given distance from source)**

Distance (ft) **100**

Time to Reach Conc. Limit (yr)	
Off-site1	NA
Off-site2	NA

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

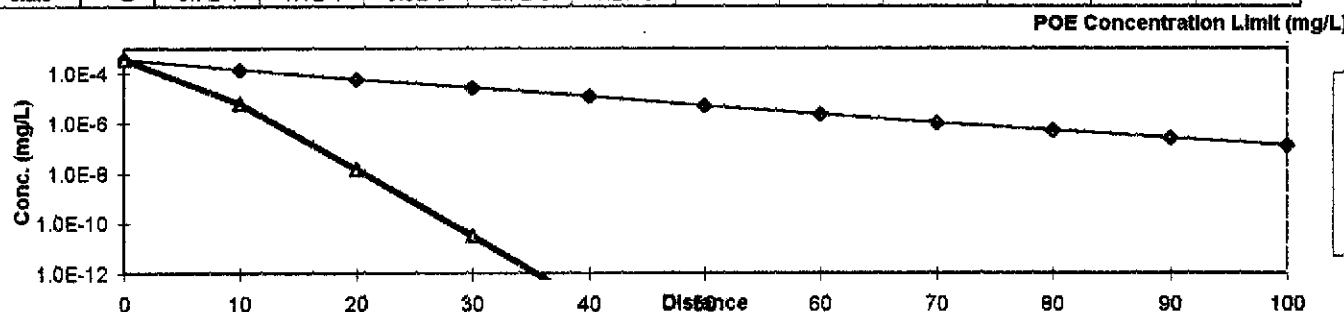
Constituent: Benzene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	3.7E-4	5.8E-6	1.4E-8	3.0E-11	6.0E-14	1.1E-16	2.1E-19	4.0E-22	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	3.7E-4	1.4E-4	6.0E-5	2.7E-5	1.2E-5	5.0E-6	2.2E-6	1.0E-6	4.9E-7	2.5E-7	1.3E-7

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.3E-7	1.3E-7
2.9E-3	9.9E-3



Legend:
 -◆- Steady-state
 -▲- t = 1.0 yr
 - - - Off-site1 Conc. Limit
 - - - Off-site2 Conc. Limit

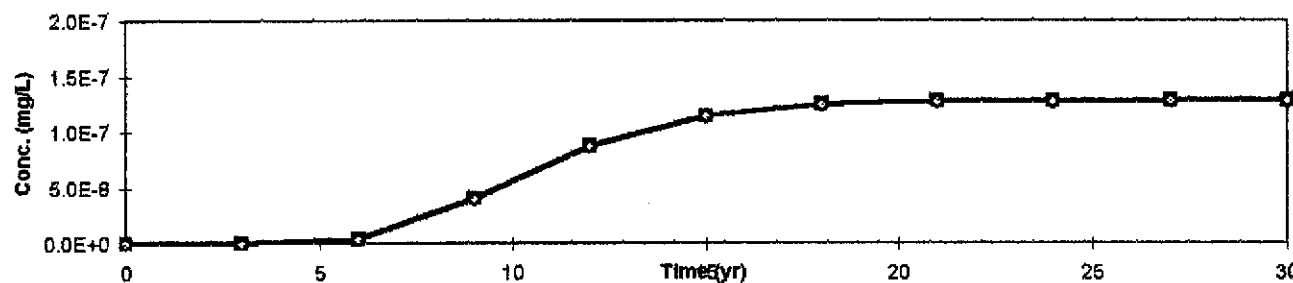
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	4.5E-13	3.8E-9	4.0E-8	8.8E-8	1.1E-7	1.2E-7	1.3E-7	1.3E-7	1.3E-7	1.3E-7
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	4.5E-13	3.8E-9	4.0E-8	8.8E-8	1.1E-7	1.2E-7	1.3E-7	1.3E-7	1.3E-7	1.3E-7
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	4.5E-13	3.8E-9	4.0E-8	8.8E-8	1.1E-7	1.2E-7	1.3E-7	1.3E-7	1.3E-7	1.3E-7

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



Legend:
 -□- x = 100 ft
 -○- Off-site1 (100 ft)
 -◇- Off-site2 (100 ft)
 - - - Off-site1 Conc. Limit
 - - - Off-site2 Conc. Limit

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

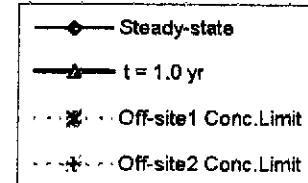
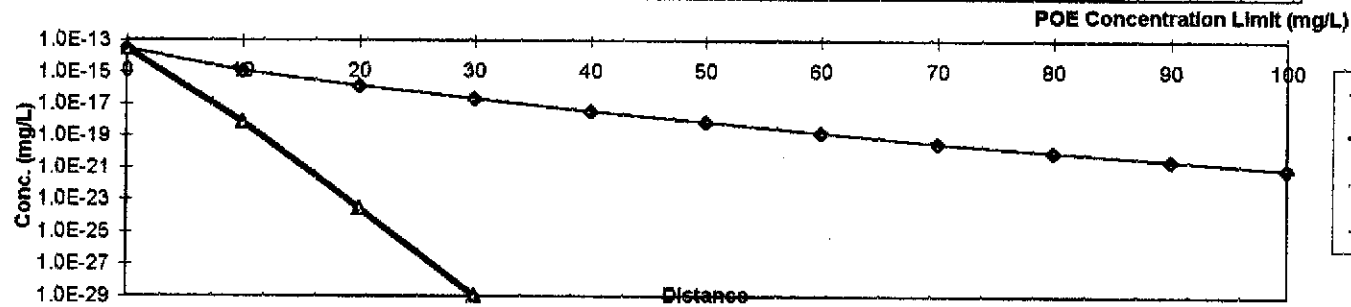
Constituent: Toluene
 Source Medium: Affected Soils Leaching to Groundwater
 Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.8E-14	6.5E-19	2.9E-24	1.2E-29	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	2.8E-14	1.2E-15	1.3E-16	1.9E-17	3.4E-18	6.5E-19	1.4E-19	3.4E-20	8.9E-21	2.5E-21	7.7E-22

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
7.7E-22	7.7E-22
7.3E+0	2.0E+1



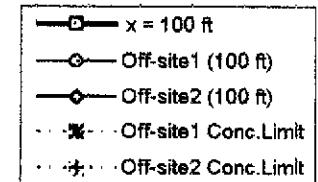
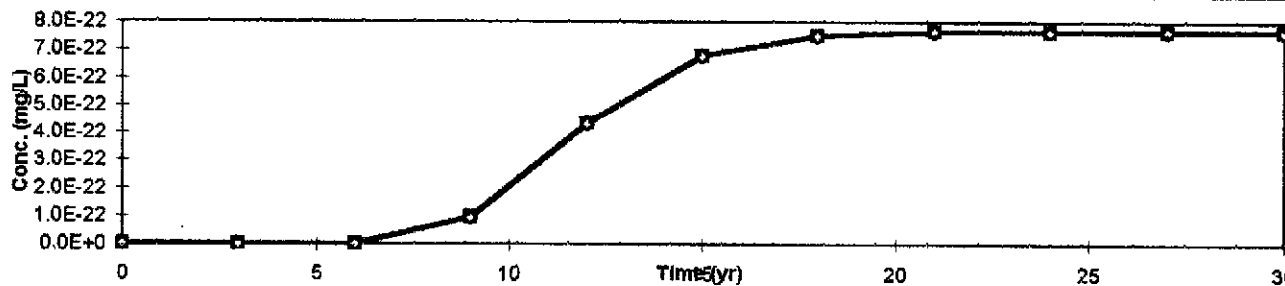
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	1.1E-32	8.4E-25	9.5E-23	4.3E-22	6.8E-22	7.5E-22	7.6E-22	7.7E-22	7.7E-22	7.7E-22
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	1.1E-32	8.4E-25	9.5E-23	4.3E-22	6.8E-22	7.5E-22	7.6E-22	7.7E-22	7.7E-22	7.7E-22
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	1.1E-32	8.4E-25	9.5E-23	4.3E-22	6.8E-22	7.5E-22	7.6E-22	7.7E-22	7.7E-22	7.7E-22

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

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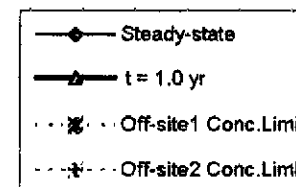
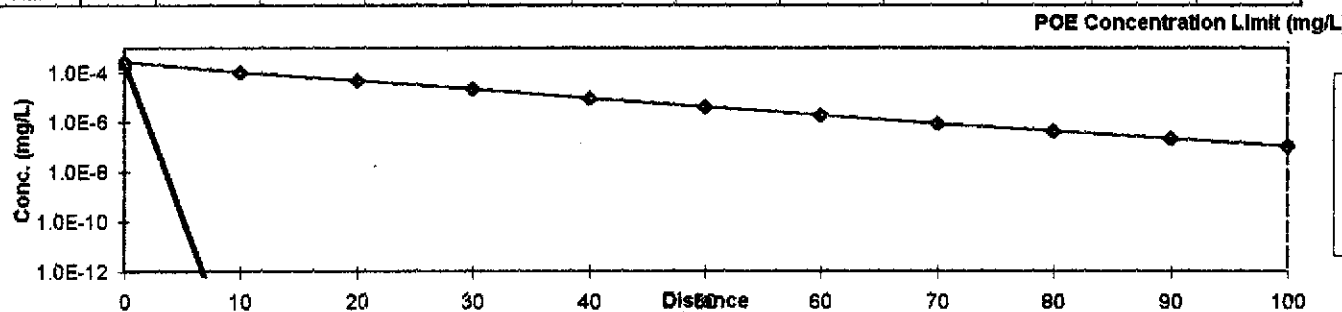
Constituent: Ethylbenzene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.8E-4	9.2E-17	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	2.8E-4	1.1E-4	4.7E-5	2.1E-5	9.2E-6	4.0E-6	1.8E-6	8.3E-7	4.1E-7	2.0E-7	1.1E-7

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.1E-7	1.1E-7
3.7E+0	1.0E+1



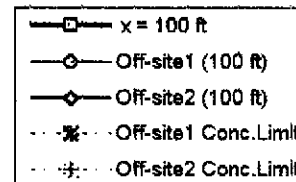
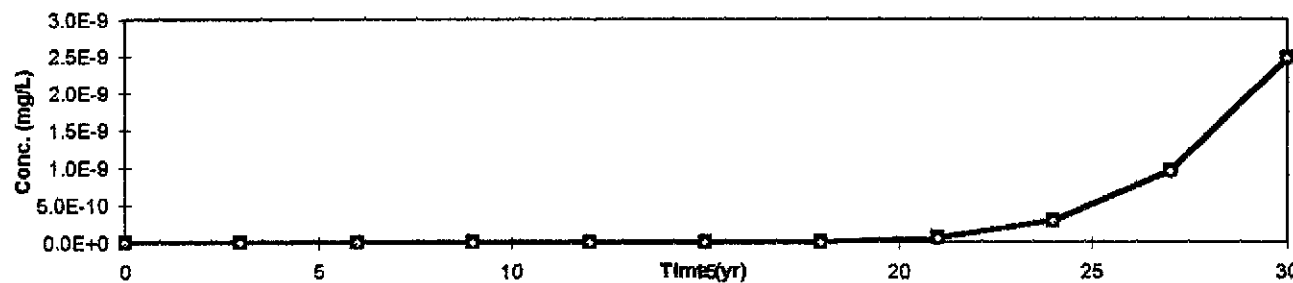
Concentration vs. Time (for given distance from source)

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	3.7E-19	1.6E-15	2.3E-13	5.7E-12	5.4E-11	2.8E-10	9.6E-10	2.5E-9
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	3.7E-19	1.6E-15	2.3E-13	5.7E-12	5.4E-11	2.8E-10	9.6E-10	2.5E-9
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	3.7E-19	1.6E-15	2.3E-13	5.7E-12	5.4E-11	2.8E-10	9.6E-10	2.5E-9

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

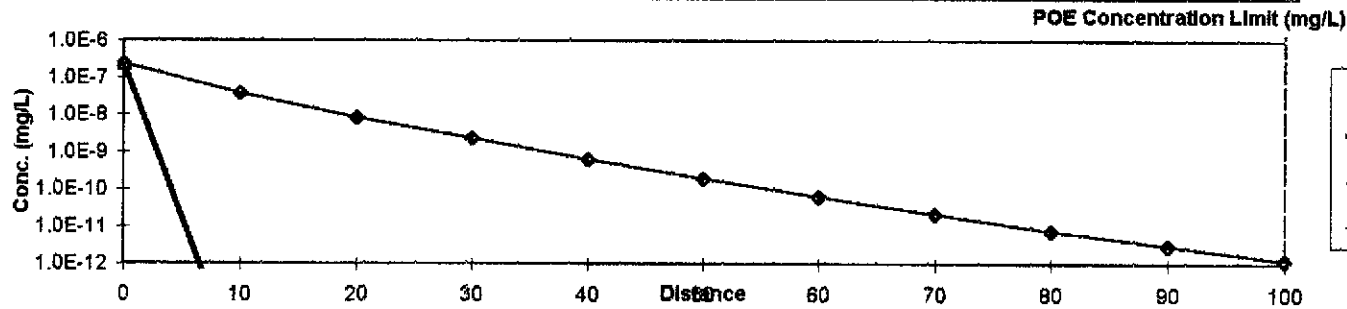
Constituent: Xylene (mixed isomers)
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

**Concentration vs. Distance from Source
 (for given time)**

Time (yr) **1.0**

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.3E-7	1.6E-15	1.4E-24	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	2.3E-7	3.6E-8	8.4E-9	2.3E-9	6.5E-10	1.9E-10	6.2E-11	2.1E-11	7.8E-12	3.0E-12	1.2E-12

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
1.2E-12	1.2E-12
7.3E+1	2.0E+2



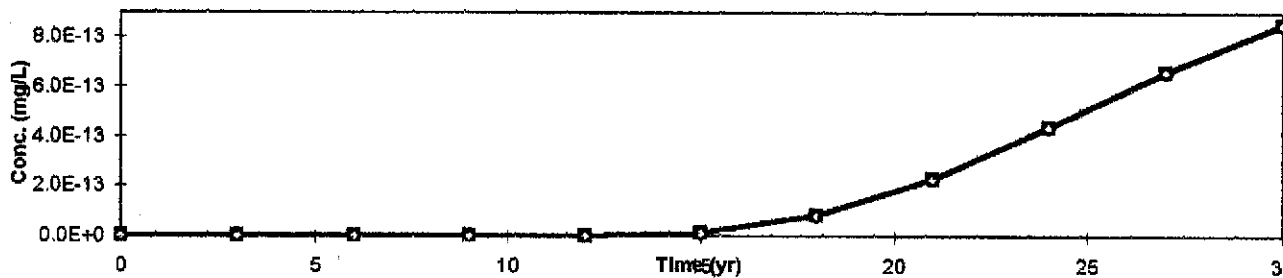
**Concentration vs. Time
 (for given distance from source)**

Distance (ft) **100**

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	9.8E-23	5.3E-18	8.9E-16	1.5E-14	8.0E-14	2.3E-13	4.4E-13	6.6E-13	8.5E-13
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	9.8E-23	5.3E-18	8.9E-16	1.5E-14	8.0E-14	2.3E-13	4.4E-13	6.6E-13	8.5E-13
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	9.8E-23	5.3E-18	8.9E-16	1.5E-14	8.0E-14	2.3E-13	4.4E-13	6.6E-13	8.5E-13

**Time to Reach
 Conc. Limit (yr)**

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

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Constituent: Methyl t-Butyl ether
 Source Medium: Affected Soils Leaching to Groundwater
 Biodegradation: 1st Order

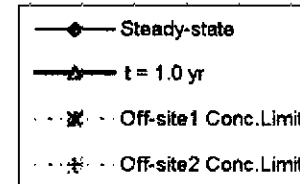
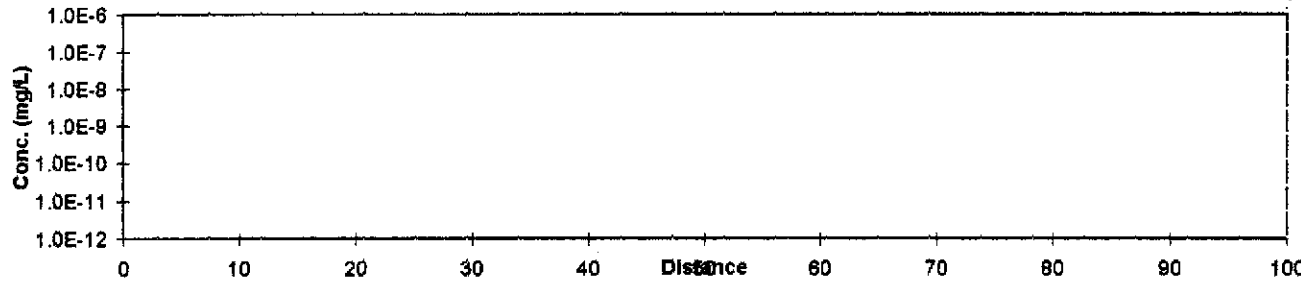
**Concentration vs. Distance from Source
 (for given time)**

Time (yr) 1.0

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

POE Concentration Limit (mg/L)

Off-site1 Residential	Off-site2 Commercial
100	100
0.0E+0	0.0E+0
0.0E+0	0.0E+0
3.7E-1	1.0E+0



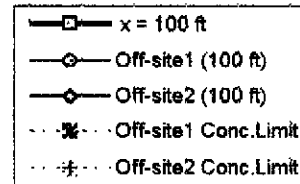
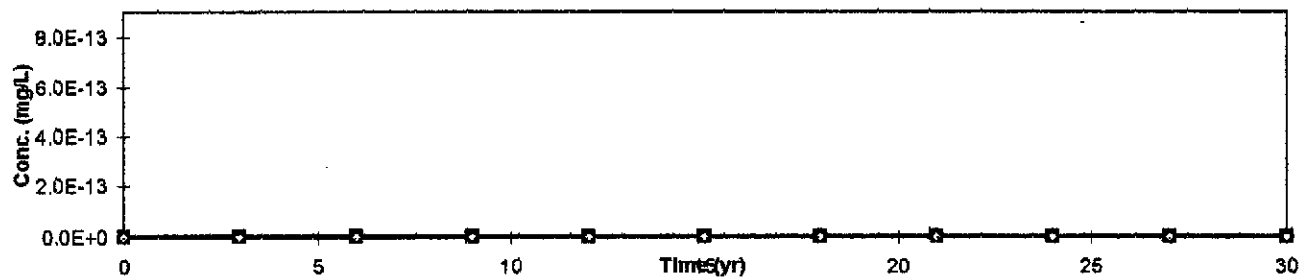
**Concentration vs. Time
 (for given distance from source)**

Distance (ft) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site1 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (100 ft)	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach
 Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

6 of 6

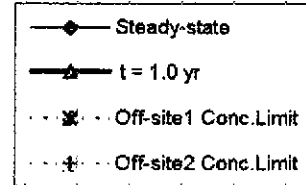
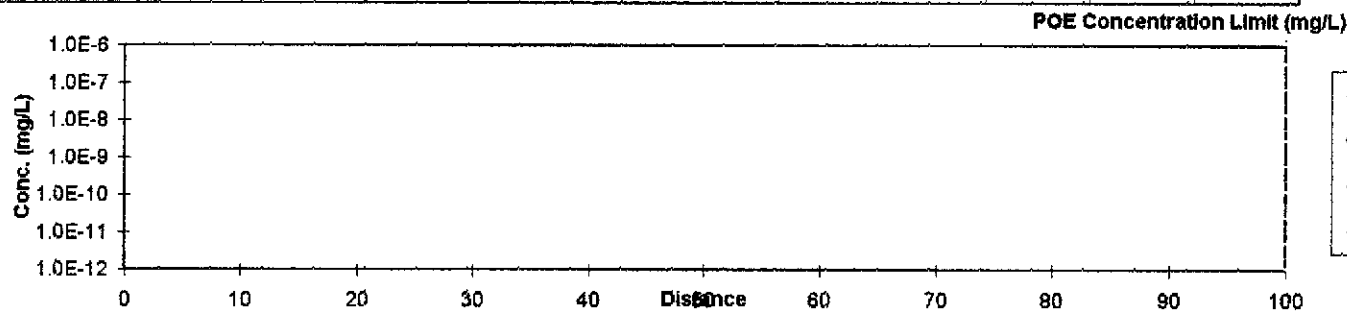
Constituent: Naphthalene
Source Medium: Affected Soils Leaching to Groundwater
Biodegradation: 1st Order

**Concentration vs. Distance from Source
(for given time)**

Time (yr)

Off-site1	Off-site2
Residential	Commercial
100	100
0.0E+0	0.0E+0
0.0E+0	0.0E+0
1.5E+1	4.1E+1

Distance (ft)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
	Steady-state	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0



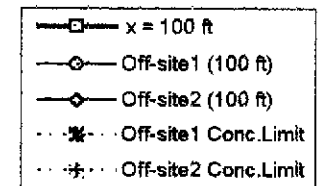
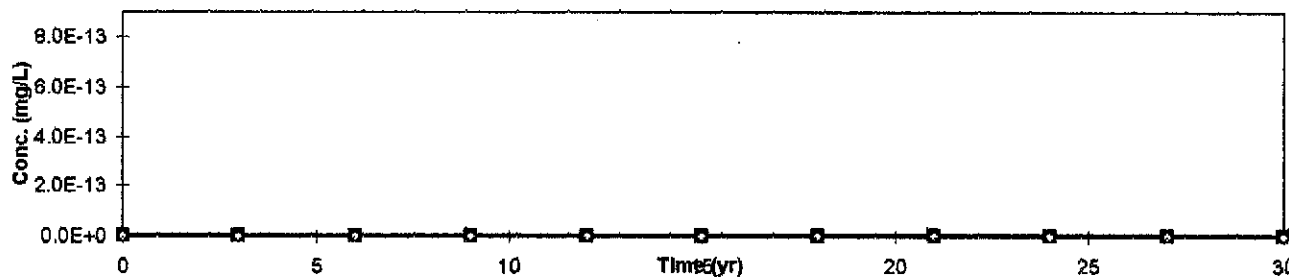
**Concentration vs. Time
(for given distance from source)**

Distance (ft)

**Time to Reach
Conc. Limit (yr)**

Off-site1	NA
Off-site2	NA

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 ft	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
	Off-site1 (100 ft)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
	Off-site2 (100 ft)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0



RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS:
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³) (1) / (2)			
	Soil Conc. (mg/kg)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
		Residential	Construction Worker	Residential	Commercial	Residential	Construction Worker	Residential	Commercial
Benzene	1.4E+0								
Toluene	1.1E+1								
Ethylbenzene	1.2E+1								
Xylene (mixed isomers)	7.2E+1								
Methyl t-Butyl ether	0.0E+0								
Naphthalene	0.0E+0								

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS:
VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)			
	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Residential	Construction Worker	Residential	Commercial	Residential	Construction Worker	Residential	Commercial
Benzene								
Toluene								
Ethylbenzene								
Xylene (mixed isomers)								
Methyl t-Butyl ether								
Naphthalene								

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS (15 - 25 ft):
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /kg)			3) Exposure Medium		
	Soil Conc. (mg/kg)	Receptor			Outdoor Air POE Conc. (mg/m ³) (1)/(2)		
		On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
Benzene	1.4E+0	4.3E+4	9.0E+4	7.5E+4	3.2E-5	1.5E-5	1.9E-5
Toluene	1.1E+1	4.3E+4	9.0E+4	7.5E+4	2.5E-4	1.2E-4	1.5E-4
Ethylbenzene	1.2E+1	7.0E+4	1.5E+5	1.5E+5	1.7E-4	8.2E-5	8.2E-5
Xylene (mixed isomers)	7.2E+1	5.4E+4	1.1E+5	1.1E+5	1.3E-3	6.4E-4	6.4E-4
Methyl t-Butyl ether	0.0E+0	4.3E+4	9.0E+4	8.4E+4	0.0E+0	0.0E+0	0.0E+0
Naphthalene	0.0E+0	7.8E+6	1.6E+7	1.6E+7	0.0E+0	0.0E+0	0.0E+0

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (15 - 25 ft):
VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Residential	Residential	Commercial	Residential	Residential	Commercial
Benzene	4.1E-1	4.1E-1	2.4E-1	1.3E-5	6.4E-6	4.5E-6
Toluene	9.6E-1	9.6E-1	6.8E-1	2.4E-4	1.2E-4	1.0E-4
Ethylbenzene	9.6E-1	9.6E-1	6.8E-1	1.7E-4	7.9E-5	5.6E-5
Xylene (mixed isomers)	9.6E-1	9.6E-1	6.8E-1	1.3E-3	6.1E-4	4.4E-4
Methyl t-Butyl ether	9.6E-1	9.6E-1	6.8E-1	0.0E+0	0.0E+0	0.0E+0
Naphthalene	9.6E-1	9.6E-1	6.8E-1	0.0E+0	0.0E+0	0.0E+0

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR
INHALATION

Exposure Concentration

Constituents of Concern	Exposure Concentration						
	1) Source Medium	2) NAF Value (m ³ /L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m ³) (1) / (2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
Benzene	5.0E+0	8.4E+4	1.7E+5	1.7E+5	6.0E-5	2.9E-5	2.9E-5
Toluene	4.2E+0	7.7E+4	1.6E+5	1.6E+5	5.5E-5	2.6E-5	2.6E-5
Ethylbenzene	1.9E+0	7.1E+4	1.5E+5	1.5E+5	2.7E-5	1.3E-5	1.3E-5
Xylene (mixed isomers)	9.0E+0	8.2E+4	1.7E+5	1.7E+5	1.1E-4	5.3E-5	5.3E-5
Methyl t-Butyl ether	2.6E-1	5.2E+5	1.1E+6	1.1E+6	5.0E-7	2.4E-7	2.4E-7
Naphthalene	3.5E-1	9.9E+5	2.1E+6	2.1E+6	3.5E-7	1.7E-7	1.7E-7

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR
 INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)		
	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Residential	Residential	Commercial	Residential	Residential	Commercial
Benzene	4.1E-1	4.1E-1	2.4E-1	2.5E-5	1.2E-5	7.0E-6
Toluene	9.6E-1	9.6E-1	6.8E-1	5.2E-5	2.5E-5	1.8E-5
Ethylbenzene	9.6E-1	9.6E-1	6.8E-1	2.6E-5	1.2E-5	8.7E-6
Xylene (mixed isomers)	9.6E-1	9.6E-1	6.8E-1	1.1E-4	5.0E-5	3.6E-5
Methyl t-Butyl ether	9.6E-1	9.6E-1	6.8E-1	4.8E-7	2.3E-7	1.7E-7
Naphthalene	9.6E-1	9.6E-1	6.8E-1	3.4E-7	1.6E-7	1.2E-7

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)
(Sum average exposure concentrations from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Residential	Construction Worker	Residential	Commercial
Benzene	3.8E-5		1.8E-5	1.2E-5
Toluene	3.0E-4		1.4E-4	1.2E-4
Ethylbenzene	1.9E-4		9.1E-5	6.5E-5
Xylene (mixed isomers)	1.4E-3		6.6E-4	4.7E-4
Methyl t-Butyl ether	4.8E-7		2.3E-7	1.7E-7
Naphthalene	3.4E-7		1.6E-7	1.2E-7

Site Name: Arrow Rentals	Date Completed: 17-Apr-01
Site Location: 187 North L Street, Livermore, California	Job ID: 971275
Completed By: Aquifer Sciences, Inc.	

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

Constituents of Concern	(1) EPA Carcinogenic Classification	CARCINOGENIC RISK							
		(2) Total Carcinogenic Exposure (mg/m ³)			(3) Inhalation Unit Risk Factor (ug/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 ft)		Off-site 1 (100 ft)		Off-site 2 (100 ft)	On-site (0 ft)		Off-site 1 (100 ft)
Residential	Construction Worker	Residential	Commercial	Residential	Construction Worker	Residential			
Benzene	A	3.8E-5		1.8E-5	1.2E-5	8.3E-6	3.1E-7		1.5E-7
Toluene	D								
Ethylbenzene	D								
Xylene (mixed isomers)	D								
Methyl t-Butyl ether	-								
Naphthalene	D								

Total Pathway Carcinogenic Risk = 3.1E-7 1.5E-7

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

RBCA Tool Kit for Chemical Releases, Version 1.3a

1 OF 10
Off-site 2 (100 ft) Commercial
9.6E-8
9.6E-8

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)				(6) Inhalation Reference Conc. (mg/m ³)	(7) Individual COC Hazard Quotient (5)/(6)			
	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)		On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)
	Residential	Construction Worker	Residential	Commercial		Residential	Construction Worker	Residential	Commercial
Benzene	8.8E-5		4.2E-5	3.2E-5	6.0E-3	1.5E-2		7.1E-3	5.4E-3
Toluene	3.0E-4		1.4E-4	1.2E-4	4.0E-1	7.4E-4		3.5E-4	2.9E-4
Ethylbenzene	1.9E-4		9.1E-5	6.5E-5	1.0E+0	1.9E-4		9.1E-5	6.5E-5
Xylene (mixed isomers)	1.4E-3		6.6E-4	4.7E-4	7.0E+0	2.0E-4		9.4E-5	6.7E-5
Methyl t-Butyl ether	4.8E-7		2.3E-7	1.7E-7	3.0E+0	1.6E-7		7.7E-8	5.6E-8
Naphthalene	3.4E-7		1.6E-7	1.2E-7	1.4E+0	2.4E-7		1.2E-7	8.3E-8

Total Pathway Hazard Index = **1.6E-2** **7.6E-3** **5.9E-3**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS (15 - 25 ft): VAPOR
INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium	2) NAF Value (m ² /kg)	3) Exposure Medium	4) Exposure Multiplier	5) Average Inhalation Exposure
	Soil Conc. (mg/kg)	Receptor	Indoor Air: POE Conc. (mg/m ³) (1) / (2)	(EF×ED)/(AT×365) (unitless)	Concentration (mg/m ³) (3) X (4)
Benzene	1.4E+0	Residential 2.6E+2	Residential 5.3E-3	Residential 4.1E-1	Residential 2.2E-3
Toluene	1.1E+1	5.2E+2	2.1E-2	9.6E-1	2.0E-2
Ethylbenzene	1.2E+1	1.2E+3	9.6E-3	9.6E-1	9.3E-3
Xylene (mixed isomers)	7.2E+1	9.7E+2	7.5E-2	9.6E-1	7.1E-2
Methyl t-Butyl ether	0.0E+0	4.6E+2	0.0E+0	9.6E-1	0.0E+0
Naphthalene	0.0E+0	1.3E+5	0.0E+0	9.6E-1	0.0E+0

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA Tool Kit for Chemical Releases, Version 1.3a



3



RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

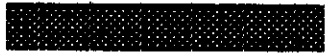
GROUNDWATER: VAPOR INTRUSION
INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m ³ /L) Receptor	3) Exposure Medium Indoor Air, POE Conc. (mg/m ³) (1) / (2)	4) Exposure Multiplier (EF×ED)/(AT×365) (unitless)
	Groundwater Conc. (mg/L)	Residential	Residential	Residential
Benzene	5.0E+0	4.5E+2	1.1E-2	4.1E-1
Toluene	4.2E+0	4.1E+2	1.0E-2	9.6E-1
Ethylbenzene	1.9E+0	3.7E+2	5.1E-3	9.6E-1
Xylene (mixed isomers)	9.0E+0	4.3E+2	2.1E-2	9.6E-1
Methyl t-Butyl ether	2.6E-1	2.9E+3	9.0E-5	9.6E-1
Naphthalene	3.5E-1	6.9E+3	5.1E-5	9.6E-1

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

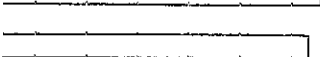
Site Name: Arrow Rentals Date Completed: 17-Apr-01
 Site Location: 167 North L Street, Livermore, California Job ID: 971275
 Completed By: Aquifer Sciences, Inc.



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5) Average Inhalation Exposure Concentration (mg/m ³) (3) X (4)
Residential
4.6E-3
9.9E-3
4.9E-3
2.0E-2
8.6E-5
4.9E-5



RBCA SITE ASSESSMENT

3 OF 3

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m³)
 (Sum average exposure concentrations
 from soil and groundwater routes.)

Constituents of Concern	Residential
Benzene	6.8E-3
Toluene	3.0E-2
Ethylbenzene	1.4E-2
Xylene (mixed isomers)	9.1E-2
Methyl t-Butyl ether	8.6E-5
Naphthalene	4.9E-5

Site Name: Arrow Rentals Date Completed: 17-Apr-01
 Site Location: 187 North L Street, Livermore, Call Job ID: 971275
 Completed By: Aquifer Sciences, Inc.

RBCA SITE ASSESSMENT

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TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS **(CHECKED IF PATHWAYS ARE ACTIVE)**

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m ³)	(3) Inhalation Unit Risk Factor (µg/m ³) ⁻¹	(4) Individual COC Risk (2) x (3) x 1000
		Residential		Residential
Benzene	A	6.8E-3	8.3E-6	5.6E-5
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			
Methyl t-Butyl ether	-			
Naphthalene	D			

Total Pathway Carcinogenic Risk = 5.6E-5

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

4 OF 10

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m ³)	(6) Inhalation Reference Concentration (mg/m ³)	(7) Individual COC Hazard Quotient (5) / (6)
	Residential		Residential
Benzene	1.8E-2	6.0E-3	2.7E+0
Toluene	3.0E-2	4.0E-1	7.5E-2
Ethylbenzene	1.4E-2	1.0E+0	1.4E-2
Xylene (mixed isomers)	9.1E-2	7.0E+0	1.3E-2
Methyl t-Butyl ether	8.6E-5	3.0E+0	2.9E-5
Naphthalene	4.9E-5	1.4E+0	3.5E-5

Total Pathway Hazard Index = 2.8E+0

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (L/kg) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	1.4E+0	3.8E+3	1.1E+7	1.1E+7	3.7E-4
Toluene	1.1E+1	3.9E+14	1.4E+22	1.4E+22	2.8E-14	7.7E-22	7.7E-22
Ethylbenzene	1.2E+1	4.3E+4	1.1E+8	1.1E+8	2.8E-4	1.1E-7	1.1E-7
Xylene (mixed isomers)	7.2E+1	3.1E+8	5.9E+13	5.9E+13	2.3E-7	1.2E-12	1.2E-12
Methyl t-Butyl ether	0.0E+0	1.1E+1	4.6E+3	4.6E+3	0.0E+0	0.0E+0	0.0E+0
Naphthalene	0.0E+0	6.1E+9	1.3E+15	1.3E+15	0.0E+0	0.0E+0	0.0E+0

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California
Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

SOILS (15 - 25 ft): LEACHING TO
GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR×EF×ED)/(BW×AT) (L/kg-day)			5) Average Daily Intake Rate (mg/kg/day) (3) × (4)		
	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
	Benzene	1.2E-2	1.2E-2	3.5E-3	4.3E-6	1.5E-9
Toluene	2.7E-2	2.7E-2	9.8E-3	7.7E-16	2.1E-23	7.5E-24
Ethylbenzene	2.7E-2	2.7E-2	9.8E-3	7.6E-6	2.9E-9	1.0E-9
Xylene (mixed isomers)	2.7E-2	2.7E-2	9.8E-3	6.4E-9	3.3E-14	1.2E-14
Methyl t-Butyl ether	2.7E-2	2.7E-2	9.8E-3	0.0E+0	0.0E+0	0.0E+0
Naphthalene	2.7E-2	2.7E-2	9.8E-3	0.0E+0	0.0E+0	0.0E+0

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (unitless) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
		Benzene	5.0E+0	1.0E+0	2.9E+3	2.9E+3	5.0E+0
Toluene	4.2E+0	1.0E+0	3.6E+7	3.6E+7	4.2E+0	1.2E-7	1.2E-7
Ethylbenzene	1.9E+0	1.0E+0	2.6E+3	2.6E+3	1.9E+0	7.4E-4	7.4E-4
Xylene (mixed isomers)	9.0E+0	1.0E+0	1.9E+5	1.9E+5	9.0E+0	4.7E-5	4.7E-5
Methyl t-Butyl ether	2.6E-1	1.0E+0	4.0E+2	4.0E+2	2.6E-1	6.5E-4	6.5E-4
Naphthalene	3.5E-1	1.0E+0	2.2E+5	2.2E+5	3.5E-1	1.6E-6	1.6E-6

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Arrow Rentals

Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IR x EF x ED) / (BW x AT) (L/kg/day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial	On-site (0 ft) Residential	Off-site 1 (100 ft) Residential	Off-site 2 (100 ft) Commercial
	Benzene	1.2E-2	1.2E-2	3.5E-3	5.9E-2	2.0E-5
Toluene	2.7E-2	2.7E-2	9.8E-3	1.2E-1	3.2E-9	1.1E-9
Ethylbenzene	2.7E-2	2.7E-2	9.8E-3	5.2E-2	2.0E-5	7.2E-6
Xylene (mixed isomers)	2.7E-2	2.7E-2	9.8E-3	2.5E-1	1.3E-6	4.6E-7
Methyl t-Butyl ether	2.7E-2	2.7E-2	9.8E-3	7.1E-3	1.8E-5	6.4E-6
Naphthalene	2.7E-2	2.7E-2	9.8E-3	9.6E-3	4.4E-8	1.6E-8

NOTE: AT = Averaging time (days)
BW = Body weight (kg)

ED = Exposure duration (yr)
EF = Exposure frequency (days/yr)

IR = Ingestion rate (mg/day)

Site Name: Arrow Rentals
Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
Date Completed: 17-Apr-01

Job ID: 971275

RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

MAXIMUM PATHWAY INTAKE (mg/kg/day)
*(Maximum intake of active pathways
 soil leaching & groundwater routes.)*

Constituents of Concern	On-site (0 ft)	Off-site 1	Off-site 2
	Residential	Residential	Commercial
Benzene	5.9E-2	2.0E-5	6.1E-6
Toluene	1.2E-1	3.2E-9	1.1E-9
Ethylbenzene	5.2E-2	2.0E-5	7.2E-6
Xylene (mixed isomers)	2.5E-1	1.3E-6	4.6E-7
Methyl t-Butyl ether	7.1E-3	1.8E-5	6.4E-6
Naphthalene	9.6E-3	4.4E-8	1.6E-8

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971275

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

(CHECKED IF PATHWAYS ARE ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Maximum Carcinogenic Intake Rate (mg/kg/day)			(3) Oral Slope Factor (mg/kg-day) ⁻¹	(4) Individual COC Risk (2) x (3)		
		On-site (0 ft) Residential	Off-site 1 Residential	Off-site 2 Commercial		On-site (0 ft) Residential	Off-site 1 Residential	Off-site 2 Commercial
Benzene	A	5.9E-2	2.0E-5	6.1E-6	2.9E-2	1.7E-3	5.9E-7	1.8E-7
Toluene	D							
Ethylbenzene	D							
Xylene (mixed isomers)	D							
Methyl t-Butyl ether	-							
Naphthalene	D							

Total Pathway Carcinogenic Risk = 1.7E-3 5.9E-7 1.8E-7

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 871275

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS (CHECKED IF PATHWAYS ARE ACTIVE)

TOXIC EFFECTS

Constituents of Concern	(5) Maximum Toxicant Intake Rate (mg/kg/day)			(6) Oral Reference Dose (mg/kg/day)	(7) Individual COC Hazard Quotient (5) / (6)		
	On-site (0 ft)	Off-site 1	Off-site 2		On-site (0 ft)	Off-site 1	Off-site 2
	Residential	Residential	Commercial		Residential	Residential	Commercial
Benzene	1.4E-1	4.8E-5	1.7E-5	3.0E-3	4.6E+1	1.6E-2	5.7E-3
Toluene	1.2E-1	3.2E-9	1.1E-9	2.0E-1	5.8E-1	1.6E-8	5.6E-9
Ethylbenzene	5.2E-2	2.0E-5	7.2E-6	1.0E-1	5.2E-1	2.0E-4	7.2E-5
Xylene (mixed isomers)	2.5E-1	1.3E-6	4.6E-7	2.0E+0	1.2E-1	6.4E-7	2.3E-7
Methyl t-Butyl ether	7.1E-3	1.8E-5	6.4E-6	1.0E-2	7.1E-1	1.8E-3	6.4E-4
Naphthalene	9.6E-3	4.4E-8	1.6E-8	4.0E-1	2.4E-2	1.1E-7	3.9E-8

Total Pathway Hazard Index = **4.8E+1** **1.8E-2** **6.4E-3**

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California
 Completed By: Aquifer Sciences, Inc.

Date Completed: 17-Apr-01
 Job ID: 971276

RBCA SITE ASSESSMENT	Baseline Risk Summary-All Pathways
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

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TIER 2 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.1E-7	1.0E-6	3.1E-7	1.0E-5	<input type="checkbox"/>	1.5E-2	1.0E+0	1.6E-2	1.0E+0	<input type="checkbox"/>
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	5.6E-5	1.0E-6	5.6E-5	1.0E-5	<input checked="" type="checkbox"/>	2.7E+0	1.0E+0	2.8E+0	1.0E+0	<input checked="" type="checkbox"/>
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	1.7E-3	1.0E-6	1.7E-3	1.0E-5	<input checked="" type="checkbox"/>	4.6E+1	1.0E+0	4.8E+1	1.0E+0	<input checked="" type="checkbox"/>
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	1.7E-3	1.0E-6	1.7E-3	1.0E-5	<input checked="" type="checkbox"/>	4.6E+1	1.0E+0	4.8E+1	1.0E+0	<input checked="" type="checkbox"/>
	Groundwater		Groundwater			Groundwater		Groundwater		

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: Benzene CAS No.: 71-43-2

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		1.1E-1	3.1E+2	8.8E+2
(mg/L) TR = 1e-6		2.9E-3	8.4E+0	2.8E+1
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		4.2E+2	>1.1E+3	>1.1E+3
(mg/kg) TR = 1e-6		1.1E+1	>1.1E+3	>1.1E+3
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0		6.2E+0	6.2E+0	8.7E+0
(µg/m ³) TR = 1e-6		2.9E-1	2.9E-1	4.9E-1
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		2.7E+2	5.6E+2	6.5E+2
(mg/kg) TR = 1e-6		1.3E+1	2.7E+1	3.7E+1
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		5.2E+2	1.1E+3	1.5E+3
(mg/L) TR = 1e-6		2.5E+1	5.1E+1	8.6E+1
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0		6.2E+0		
(µg/m ³) TR = 1e-6		2.9E-1		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		1.6E+0		
(mg/kg) TR = 1e-6		7.7E-2		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		2.8E+0		
(mg/L) TR = 1e-6		1.3E-1		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	7.8E+1	PS
Sol	(mg/L)	1.8E+3	PS
P _{vap}	(mmHg)	9.5E+1	PS
H _{air}	(atm-m ³ /mol)	5.6E-3	PS
pK _a	(log(mol/mol))	-	-
pK _b	(log(mol/mol))	-	-
log(K _{ow})	(log[L/kg])	1.8E+0	PS
D _{air}	(cm ² /sec)	8.8E-2	PS
D _{soil}	(cm ² /sec)	9.8E-6	PS
Toxicity Data			
Wt of Evid.		A	
SF _o	(1/(mg/kg/day))	2.9E-2	PS
SF _a	(1/(mg/kg/day))	3.0E-2	TX
URF _i	(1/(µg/m ³))	8.3E-6	PS
RfD _o	(mg/kg/day)	3.0E-3	R
RfD _i	(mg/kg/day)	-	-
RfC _i	(mg/m ³)	6.0E-3	R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _o	(cm/hr)	2.1E-2	
tau _{sk}	(hr/event)	2.6E-1	
t _{ex}	(hr)	6.3E-1	
B	(-)	1.3E-2	
Regulatory Standards			
MCL	(mg/L)	5.0E-3	*
TWA	(mg/m ³)	3.3E+0	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	7.2E+2	H
t _{1/2,ground}	(d)	7.2E+2	H

* MCL ref = 52 FR 25690

		Residential	Commercial	Construction
Cross-Media Transfer Factors				
VF _{so}	(kg-soil/m ³ -air)	NC	NC	NA
VF _{samb}	(kg-soil/m ³ -air)	2.3E-5	2.8E-5	NA
VF _{womb}	(m ³ -wat/m ³ -air)	1.2E-5	1.2E-5	NA
VF _{soa}	(kg-soil/m ³ -air)	3.8E-3	NA	NA
VF _{wosa}	(m ³ -wat/m ³ -air)	2.2E-3	NA	NA
LF	(kg-soil/L-wat)	All exposures: 2.6E-4		NA

		On-Site	Off-Site1	Off-Site2
Lateral Transport Factors				
DAF _{gw}	(-)	1.0E+0	2.9E+3	2.9E+3
DAF _{s/gw}	(-)	1.0E+0	2.9E+3	2.9E+3

Units Value

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.3E-1
K _{ow}	(L-wat/kg-soil)	1.5E+0
C _{soil}	(mg/kg-soil)	1.1E+3
C _{soil,vap}	(µg/m ³ -air)	4.0E+8
D _{eff,s}	(cm ² /sec)	3.2E-3
D _{eff,sk}	(cm ² /sec)	5.9E-4
D _{eff,cap}	(cm ² /sec)	2.7E-5
D _{eff,ws}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	4.9E+0
R _{unsoil}	(-)	1.4E+1
Z	(cm/event)	7.3E-2

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

Constituent: Toluene CAS No.: 108-88-3

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		7.3E+0	>5.2E+2	>5.2E+2
(mg/L) TR = 1e-6		NC	NC	NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>7.3E+2	>7.3E+2	>7.3E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0		4.2E+2	4.2E+2	5.8E+2
(µg/m ³) TR = 1e-6		NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>7.3E+2	>7.3E+2	>7.3E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>5.2E+2	>5.2E+2	>5.2E+2
(mg/L) TR = 1e-6		NC	NC	NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0		4.2E+2		
(µg/m ³) TR = 1e-6		NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		2.2E+2		
(mg/kg) TR = 1e-6		NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		1.7E+2		
(mg/L) TR = 1e-6		NC		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	9.2E+1	5
Sol	(mg/L)	5.2E+2	28
P _{vap}	(mmHg)	3.0E+1	4
H _{sat}	(atm-m ³ /mol)	6.3E-3	A
pK _a	(log(mol/mol))	-	-
pK _b	(log(mol/mol))	-	-
log(K _{ow})	(log[L/kg])	2.1E+0	A
D _{air}	(cm ² /sec)	8.5E-2	A
D _{soil}	(cm ² /sec)	9.4E-6	A
Toxicity Data			
Wt of Evid.		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RfD _o	(mg/kg/day)	2.0E-1	A,R
RfD _i	(mg/kg/day)	1.8E-1	TX
RfC _i	(mg/m ³)	4.0E-1	A,R
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	4.5E-2	
tau _d	(hr/event)	3.2E-1	
t _{crit}	(hr)	7.7E-1	
B	(-)	5.4E-2	
Regulatory Standards			
MCL	(mg/L)	1.0E+0	*
TWA	(mg/m ³)	1.5E+2	ACGIH
ACL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	2.8E+1	H
t _{1/2,soil}	(d)	2.8E+1	H

* MCL ref = 56 FR 3526 (30 Jan 91)

	Units	Residential	Commercial	Construction
Grass-Media Transfer Factors				
VF _{so}	(kg-soil/m ³ -air)	NC	NC	NA
VF _{wamb}	(kg-soil/m ³ -air)	2.3E-5	2.8E-5	NA
VF _{wamb}	(m ³ -wat/m ³ -air)	1.3E-5	1.3E-5	NA
VF _{seep}	(kg-soil/m ³ -air)	1.0E-3	NA	NA
VF _{wseep}	(m ³ -wat/m ³ -air)	2.4E-3	NA	NA
LF	(kg-soil/L-wat)	All exposures: 2.5E-15		NA

	Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors				
DAF _{gw}	(-)	1.0E+0	3.8E+7	3.8E+7
DAFs/gw	(-)	1.0E+0	3.8E+7	3.8E+7

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.6E-1
K _{sw}	(L-wat/kg-soil)	7.1E-1
C _{soil}	(mg/kg-soil)	7.3E+2
C _{soil,vol}	(µg/m ³ -air)	1.5E+8
D _{eff,s}	(cm ² /sec)	3.1E-3
D _{eff,crk}	(cm ² /sec)	5.7E-4
D _{eff,cap}	(cm ² /sec)	2.5E-5
D _{eff,ws}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	9.9E+0
R _{unsat}	(-)	3.1E+1
Z	(cm/event)	1.6E-1

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: Ethylbenzene CAS No.: 100-41-4

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		3.7E+0	>1.7E+2	>1.7E+2
(mg/L) TR = 1e-6		NC	NC	NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>6.2E+2	>6.2E+2	>6.2E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0		1.0E+3	1.0E+3	1.5E+3
(µg/m ³) TR = 1e-6		NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>6.2E+2	>6.2E+2	>6.2E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>1.7E+2	>1.7E+2	>1.7E+2
(mg/L) TR = 1e-6		NC	NC	NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0		1.0E+3		
(µg/m ³) TR = 1e-6		NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		>6.2E+2		
(mg/kg) TR = 1e-6		NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		>1.7E+2		
(mg/L) TR = 1e-6		NC		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	1.1E+2	PS
Sol	(mg/L)	1.7E+2	PS
P _{vap}	(mmHg)	1.0E+1	PS
H _{am}	(atm-m ³ /mol)	7.9E-3	PS
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{ow})	(log[L/kg])	2.8E+0	PS
D _{air}	(cm ² /sec)	7.5E-2	PS
D _{soil}	(cm ² /sec)	7.8E-6	PS
Toxicity Data			
Wt of Evid.		D	
SF _o	(1/(mg/kg/day))	-	-
SF _d	(1/(mg/kg/day))	-	-
URF _i	(1/(µg/m ³))	-	-
RI _{D_o}	(mg/kg/day)	1.0E-1	PS
RI _{D_f}	(mg/kg/day)	9.7E-2	TX
RI _{C_i}	(mg/m ³)	1.0E+0	PS
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	7.4E-2	
tau _{sk}	(hr/event)	3.9E-1	
t _{crit}	(hr)	1.3E+0	
B	(-)	1.4E-1	
Regulatory Standards			
MCL	(mg/L)	7.0E-1	*
TWA	(mg/m ³)	4.4E+2	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	2.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2, soil}	(d)	2.3E+2	H
t _{1/2, ground}	(d)	2.3E+2	H

* MCL ref = 56 FR 3526 (30 Jan 91)

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{so} (kg-soil/m ³ -air)	NC	NC	NA
VF _{soil} (kg-soil/m ³ -air)	1.4E-5	1.4E-5	NA
VF _{wat} (m ³ -wat/m ³ -air)	1.4E-5	1.4E-5	NA
VF _{soil} (kg-soil/m ³ -air)	8.0E-4	NA	NA
VF _{wat} (m ³ -wat/m ³ -air)	2.7E-3	NA	NA
LF (kg-soil/L-wat)	All exposures: 2.3E-5		

Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors			
DAF _{gw} (-)	1.0E+0	2.6E+3	2.6E+3
DAF _{s/gw} (-)	1.0E+0	2.6E+3	2.6E+3

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	3.2E-1
K _{sw}	(L-wat/kg-soil)	2.7E-1
C _{soil}	(mg/kg-soil)	6.2E+2
C _{sat, soil}	(µg/m ³ -air)	5.8E+7
D _{eff, s}	(cm ² /sec)	2.8E-3
D _{eff, soil}	(cm ² /sec)	5.0E-4
D _{eff, soil}	(cm ² /sec)	2.1E-5
D _{eff, soil}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	2.5E+1
R _{unsoil}	(-)	8.1E+1
Z	(cm/event)	2.7E-1

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

Constituent: Xylene (mixed isomers) CAS No.: 1330-20-7

Site-Specific Target Level (SSTL) Concentrations				
		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		7.3E+1	>2.0E+2	>2.0E+2
(mg/L) TR = 1e-6		NC	NC	NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>4.9E+2	>4.9E+2	>4.9E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
RBEL _{ar} THQ = 1e+0		7.3E+3	7.3E+3	1.0E+4
(µg/m ³) TR = 1e-6		NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>4.9E+2	>4.9E+2	>4.9E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>2.0E+2	>2.0E+2	>2.0E+2
(mg/L) TR = 1e-6		NC	NC	NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
RBEL _{ar} THQ = 1e+0		7.3E+3		
(µg/m ³) TR = 1e-6		NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		>4.9E+2		
(mg/kg) TR = 1e-6		NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		>2.0E+2		
(mg/L) TR = 1e-6		NC		

Units	Residential	Commercial	Construction
Cross-Media Transfer Factors			
VF _{so} (kg-soil/m ³ -air)	NC	NC	NA
VF _{soil} (kg-soil/m ³ -air)	1.8E-5	1.8E-5	NA
VF _{wat} (m ³ -wat/m ³ -air)	1.2E-5	1.2E-5	NA
VF _{susp} (kg-soil/m ³ -air)	1.0E-3	NA	NA
VF _{wat} (m ³ -wat/m ³ -air)	2.3E-3	NA	NA
LF (kg-soil/L-wat)	All exposures: 3.2E-9		NA

Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors			
DAF _{gw} (-)	1.0E+0	1.9E+5	1.9E+5
DAF _{s/gw} (-)	1.0E+0	1.9E+5	1.9E+5

Chemical Parameters			
	Units	Value	Reference
Physical Properties			
MW	(g/mol)	1.1E+2	5
Soi	(mg/L)	2.0E+2	5
P _{vap}	(mmHg)	7.0E+0	4
H _{vol}	(atm-m ³ /mol)	7.0E-3	A
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{ow})	(log[L/kg])	2.4E+0	A
D _{air}	(cm ² /sec)	7.2E-2	A
D _{soil}	(cm ² /sec)	8.5E-6	A
Toxicity Data			
Wt of Evid		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RD _o	(mg/kg/day)	2.0E+0	A,R
RD _i	(mg/kg/day)	1.8E+0	TX
RF _i	(mg/m ³)	7.0E+0	A
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-1	D
K _p	(cm/hr)	8.0E-2	
tax _d	(hr/event)	3.9E-1	
t _{int}	(hr)	1.4E+0	
B	(-)	1.6E-1	
Regulatory Standards			
MCL	(mg/L)	1.0E+1	*
TWA	(mg/m ³)	4.3E+2	ACGIH
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	5.0E-3	S
ADL _s	(mg/kg)	5.0E-3	S
t _{1/2,soil}	(d)	3.6E+2	H
t _{1/2,ground}	(d)	3.6E+2	H

* MCL ref = 56 FR 3526 (30 Jan 91)

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.9E-1
K _{oc}	(L-wat/kg-soil)	4.1E-1
C _{soil}	(mg/kg-soil)	4.9E+2
C _{soil,vap}	(µg/m ³ -air)	4.0E+7
D _{eff,so}	(cm ² /sec)	2.6E-3
D _{eff,soil}	(cm ² /sec)	4.8E-4
D _{eff,soil}	(cm ² /sec)	2.1E-5
D _{eff,wat}	(cm ² /sec)	1.5E-3
R _{soil}	(-)	1.7E+1
R _{unsoil}	(-)	5.4E+1
Z	(cm/event)	2.9E-1

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: **Methyl t-Butyl ether** CAS No.: 1634-04-4

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		3.7E-1	1.5E+2	4.1E+2
(mg/L) TR = 1e-6		NC	NC	NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		4.2E+0	1.7E+3	4.7E+3
(mg/kg) TR = 1e-6		NC	NC	NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
RBEL _{aw} THQ = 1e+0		3.1E+3	3.1E+3	4.4E+3
(µg/m ³) TR = 1e-6		NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>8.0E+3	>8.0E+3	>8.0E+3
(mg/kg) TR = 1e-6		NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>4.8E+4	>4.8E+4	>4.8E+4
(mg/L) TR = 1e-6		NC	NC	NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0		3.1E+3		
(µg/m ³) TR = 1e-6		NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		1.4E+3		
(mg/kg) TR = 1e-6		NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		9.1E+3		
(mg/L) TR = 1e-6		NC		

Chemical Parameters

		Units	Value	Reference
Physical Properties				
MW	(g/mol)		8.8E+1	5
Sol	(mg/L)		4.8E+4	A
P _{vap}	(mmHg)		2.5E+2	-
H _{atm}	(atm-m ² /mol)		5.8E-4	-
pK _a	(log[mol/mol])		-	-
pK _b	(log[mol/mol])		-	-
log(K _{ow})	(log[L/kg])		1.1E+0	A
D _{air}	(cm ² /sec)		7.9E-2	6
D _{soil}	(cm ² /sec)		9.4E-5	7
Toxicity Data				
WT of Evid.			-	-
SF _o	(1/(mg/kg/day))		-	-
SF _d	(1/(mg/kg/day))		-	-
URF _i	(1/(µg/m ³))		-	-
RfD _o	(mg/kg/day)		1.0E-2	31
RfD _u	(mg/kg/day)		8.0E-3	TX
RfC _i	(mg/m ³)		3.0E+0	R
Dermal Exposure Parameters				
RAF _d	(mg/mg)		5.0E-1	-
K _p	(cm/hr)		-	-
tau _d	(hr/event)		-	-
t _{ex}	(hr)		-	-
B	(-)		-	-
Regulatory Standards				
MCL	(mg/L)		-	*
TWA	(mg/m ³)		6.0E+1	NIOSH
AQL	(mg/L)		-	-
Miscellaneous Parameters				
ADL _{gw}	(mg/L)		-	-
ADL _s	(mg/kg)		-	-
t _{1/2,soil}	(d)		3.6E+2	H
t _{1/2,ground}	(d)		1.8E+2	H

* MCL ref = -

		Units	Value
Derived Parameters			
H	(L-wat/L-air)		2.4E-2
K _{sw}	(L-wat/kg-soil)		6.0E+0
C _{soil}	(mg/kg-soil)		8.0E+3
C _{soil,vap}	(µg/m ³ -air)		1.2E+9
D _{eff,s}	(cm ² /sec)		3.9E-3
D _{eff,soil}	(cm ² /sec)		8.7E-4
D _{eff,soil}	(cm ² /sec)		5.1E-4
D _{eff,soil}	(cm ² /sec)		2.9E-3
R _{soil}	(-)		1.8E+0
R _{unsoil}	(-)		3.7E+0
Z	(cm/event)		-

		Residential	Commercial	Construction
Cross-Media Transfer Factors				
VF _{so}	(kg-soil/m ³ -air)	NC	NC	NA
VF _{soil}	(kg-soil/m ³ -air)	2.3E-5	2.5E-5	NA
VF _{wat}	(m ³ -wat/m ³ -air)	1.9E-6	1.9E-6	NA
VF _{soil}	(kg-soil/m ³ -air)	2.2E-3	NA	NA
VF _{wat}	(m ³ -wat/m ³ -air)	3.4E-4	NA	NA
LF	(kg-soil/L-wat)	All exposures: 8.8E-2		NA

		On-Site	Off-Site1	Off-Site2
Lateral Transport Factors				
DAF _{gw}	(-)	1.0E+0	4.0E+2	4.0E+2
DAF _{sgw}	(-)	1.0E+0	4.0E+2	4.0E+2

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Job ID: 971275

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Constituent: Naphthalene CAS No.: 91-20-3

Site-Specific Target Level (SSTL) Concentrations

		On-site	Off-site1	Off-site2
Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		1.5E+1	>3.1E+1	>3.1E+1
(mg/L) TR = 1e-6		NC	NC	NC
Soil Leaching to Groundwater Ingestion				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>6.2E+2	>6.2E+2	>6.2E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Surface Soil Ingestion and Dermal Contact				
Receptor Type / Distance (ft)		None	No Off-site Receptors	
SSTL _{ss} THQ = 1e+0		NA		
(mg/kg) TR = 1e-6		NA		
Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
RBEL _{air} THQ = 1e+0		1.5E+3	1.5E+3	2.0E+3
(µg/m ³) TR = 1e-6		NC	NC	NC
Soil Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _s THQ = 1e+0		>6.2E+2	>6.2E+2	>6.2E+2
(mg/kg) TR = 1e-6		NC	NC	NC
Groundwater Volatilization to Outdoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	Residential / 100	Commercial / 100
SSTL _{gw} THQ = 1e+0		>3.1E+1	>3.1E+1	>3.1E+1
(mg/L) TR = 1e-6		NC	NC	NC
Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
RBEL _{air} THQ = 1e+0		1.5E+3		
(µg/m ³) TR = 1e-6		NC		
Soil Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _s THQ = 1e+0		>6.2E+2		
(mg/kg) TR = 1e-6		NC		
Groundwater Volatilization to Indoor Air Inhalation				
Receptor Type / Distance (ft)		Residential / 0	No Off-site Receptors	
SSTL _{gw} THQ = 1e+0		>3.1E+1		
(mg/L) TR = 1e-6		NC		

Chemical Parameters

	Units	Value	Reference
Physical Properties			
MW	(g/mol)	1.3E+2	PS
Sol	(mg/L)	3.1E+1	PS
P _{vap}	(mmHg)	2.3E-1	PS
H _{ow}	(atm-m ³ /mol)	4.8E-4	PS
pK _a	(log[mol/mol])	-	-
pK _b	(log[mol/mol])	-	-
log(K _{ow})	(log[L/kg])	3.3E+0	PS
D _{air}	(cm ² /sec)	5.9E-2	PS
D _{soil}	(cm ² /sec)	7.5E-6	PS
Toxicity Data			
Wt of Evd.		D	
SF _o	(1/[mg/kg/day])	-	-
SF _d	(1/[mg/kg/day])	-	-
URF _i	(1/[µg/m ³])	-	-
RfD _o	(mg/kg/day)	4.0E-1	PS
RfD _i	(mg/kg/day)	3.6E-1	TX
RfC _i	(mg/m ³)	1.4E+0	PS
Dermal Exposure Parameters			
RAF _d	(mg/mg)	5.0E-2	D
K _p	(cm/hr)	6.9E-2	
tau _d	(hr/event)	5.3E-1	
t _{crit}	(hr)	2.2E+0	
B	(-)	2.0E-1	
Regulatory Standards			
MCL	(mg/L)	-	*
TWA	(mg/m ³)	5.0E+1	PS
AQL	(mg/L)	-	-
Miscellaneous Parameters			
ADL _{gw}	(mg/L)	1.0E-2	32
ADL _s	(mg/kg)	1.0E-2	32
t _{1/2,soil}	(d)	2.6E+2	H
t _{1/2,ground}	(d)	2.6E+2	H

* MCL ref = -

	Units	Residential	Commercial	Construction
Cross-Media Transfer Factors				
VF _{so}	(kg-soil/m ³ -air)	NC	NC	NA
VF _{samb}	(kg-soil/m ³ -air)	1.3E-7	1.3E-7	NA
VF _{watb}	(m ³ -wat/m ³ -air)	1.0E-6	1.0E-6	NA
VF _{soa}	(kg-soil/m ³ -air)	7.7E-6	NA	NA
VF _{wasa}	(m ³ -wat/m ³ -air)	1.5E-4	NA	NA
LF	(kg-soil/L-wat)	All exposures: 1.6E-10		NA

	Units	On-Site	Off-Site1	Off-Site2
Lateral Transport Factors				
DAF _{gw}	(-)	1.0E+0	2.2E+5	2.2E+5
DAF _{s/gw}	(-)	1.0E+0	2.2E+5	2.2E+5

	Units	Value
Derived Parameters		
H	(L-wat/L-air)	2.0E-2
K _{sw}	(L-wat/kg-soil)	5.0E-2
C _{soil}	(mg/kg-soil)	6.2E+2
C _{soil,vap}	(µg/m ³ -air)	1.6E+6
D _{eff,s}	(cm ² /sec)	2.2E-3
D _{eff,ork}	(cm ² /sec)	4.3E-4
D _{eff,cap}	(cm ² /sec)	6.2E-5
D _{eff,ws}	(cm ² /sec)	1.8E-3
R _{soil}	(-)	1.3E+2
R _{unsoil}	(-)	4.4E+2
Z	(cm/event)	2.7E-1

Notes: 1) NA = Not applicable; NC = Not calculated.
 2) Definitions and references presented on page 7 of 7.

RBCA SITE ASSESSMENT

Chemical-Specific Tier 2 Cleanup Summary

Site Name: Arrow Rentals
 Site Location: 187 North L Street, Livermore, California

Completed By: Aquifer Sciences, Inc.
 Date Completed: 17-Apr-01

Definitions

Site-Specific Target Level Concentrations

SSTL _{gw}	Site-specific target level for groundwater (mg/L)
SSTL _s	Site-specific target level for soil (mg/kg)
RBEL _{air}	Risk-based exposure limit for air (µg/m ³)
THQ	Target hazard quotient
TR	Target risk

Cross-Media Transfer Factors

VF _{ss}	Volatilization factor, surface soil to outdoor air (kg-soil/L-air)
VF _{samb}	Volatilization factor, subsurface soil to outdoor air (kg-soil/L-air)
VF _{wamb}	Volatilization factor, groundwater to outdoor air (L-wat/L-air)
VF _{sind}	Volatilization factor, subsurface soil to indoor air (kg-soil/L-air)
VF _{wind}	Volatilization factor, groundwater to indoor air (L-wat/L-air)
LF	Leaching factor, soil to groundwater (kg-soil/L-wat)

Cross-Media Transfer Factors

DAF _{gw}	Dilution-attenuation factor, groundwater (-)
DAF _{sgw}	Dilution-attenuation factor, soil leaching to groundwater (-)

Physical Properties

MW	Molecular weight (g/mol)
Sol	Aqueous solubility limit (mg/L)
P _{vap}	Vapor pressure (mmHg)
H _{atm}	Henry's Law constant (atm·m ³ /mol)
pK _a	Acid ionization constant (log(mol/mol))
pK _b	Base ionization constant (log(mol/mol))
K _{ow}	Organic carbon/Water partition coefficient (L/kg)
K _d	Soil/Water distribution coefficient (L/kg)
D _{air}	Molecular diffusion coefficient in air (cm ² /sec)
D _{wat}	Molecular diffusion coefficient in water (cm ² /sec)

Toxicity Data

Wt of Evid.	Weight of evidence
SF _o	Oral slope factor for carcinogens (1/(mg/kg/day))
SF _d	Dermal slope factor for carcinogens (1/(mg/kg/day))
URF _i	Inhalation unit risk factor for carcinogens (1/(µg/m ³))
RF _o	Oral reference dose (mg/kg/day)
RF _d	Dermal reference dose (mg/kg/day)
RF _i	Inhalation reference concentration (mg/m ³)

Dermal Exposure Parameters

RAF _d	Dermal relative absorption factor (mg/mg)
K _p	Dermal permeability coeff. (cm/hr)
tau _d	Lag time for dermal exposure (hr/event)
t _{crit}	Critical exposure time (hr)
B	Relative contribution of permeability coeff. (-)

Regulatory Standards

MCL	Maximum contaminant level for drinking water protection (mg/L)
TWA	Time-weighted average workplace air exterior (mg/m ³)
AQL	Aquatic life protection criterion (mg/L)

Miscellaneous Parameters

ADL _{gw}	Analytical detection limit in groundwater (mg/L)
ADL _s	Analytical detection limit in soil (mg/kg)
t _{1/2,sat}	Half life, saturated zone (d)
t _{1/2,unsat}	Half life, unsaturated zone (d)

Derived Parameters

H	Dimensionless Henry's Law constant (L-wat/L-air)
K _{ow}	Soil to pore-water partitioning factor (L-wat/kg-soil)
C _{sat}	Saturated residual conc. in vadose zone soils (mg/kg-soil)
C _{sat,vap}	Saturated concentration in vapors (mg/m ³ -air)
D _{eff,s}	Effective diffusion coeff. in vadose zone soils (cm ² /sec)
D _{eff,cd}	Effective diffusion coeff. in foundation cracks (cm ² /sec)
D _{eff,ca}	Effective diffusion coeff. in capillary zone (cm ² /sec)
D _{eff,ms}	Effective diffusion coeff., water table to ground surface (cm ² /sec)
R _{sat}	Retardation factor, saturated zone (-)
R _{unsat}	Retardation factor, unsaturated zone (-)
Z	Water to skin dermal absorption factor (cm/event)

Chemical Parameter References

PS	Standard Provisional Guide for Risk-Based Corrective Action, ASTM PS 104-98.
A	Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites.
D	USEPA, Dermal Exposure Assessment: Principles and Applications, ORD, EPA/600/8-91/011B.
H	Howard, Handbook of Environmental Degradation Rates, Lewis Publishers, Chelsea, MI, 1989.
R	EPA Region III Risk Based Concentration Table, EPA Region 3, March 7, 1995.
S	USEPA, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, OSWER, November 1986.
T	TPH Criteria Working Group, 1996.
TX	TNRCC Risk-Based Corrective Action for Leaking Storage Tank Sites, January 1994.
3	based on Kow from (2) and DiFano, G. M., 1985: "A Particle Interaction Model of Reversible Organic Chemical Sorption", Chemosphere, 14(10), 1505-1536. log(Koc) = 0.00028 + 0.963 log(Kow)
4	USEPA, 1989: Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) - USEPA, OAQPS, Air Emission Models, (EPA-450/G-87-026).
5	Verschueren, Karel, 1983: Handbook of Environmental data on organic Chemicals, Second Ed., (Van Nostrand Reinhold Company Inc., New York), ISBN: 0-442-26802-6.
8	Calculated diffusivity using the method of Fuller, Schettler, and Giddings from (9).
7	Calculated diffusivity using the method of Hayduk and Laudie and the reference from (9).
8	Calculated using Kanaga and Gong Kow/solubility regression equation reference (9) and Kow data from (2), log(S, mg/l) = -0.922 log(Kow) + 4.184
9	Handbook of Chemical Property Estimation Methods, 1982, W.J. Lyman, (McGraw-Hill, New York), ISBN 0-07-039175-0.
10	Calculated from (P*P _{atm})/solubility(mol wd).
11	Back calculated from solubility, Note (8) and (3).
12	Aldrich Chemical Catalog, 1991.
13	Calculated using Modified Watson Correlation from (9) and normal boiling point.
14	USEPA, 1979: Water Related Environmental Fate of 129 Priority Pollutants, Vol.1, USEPA, OWQPS, (EPA-440/4-79/029a).
15	The Agrochemicals Handbook, (The Royal Society of Chemistry, The University, Nottingham, England), ISBN 0 86188 406 6.
16	Vapor pressure specified at elevated temperature, adjustments to 25C using methods presented by (9).
17	Wauchope, R. D., T. M. Butler, A. G. Homsby, P. W. M. Augustijn-Beckers, and J.P. Butt, 1992: "The SC\$ARS/CES Pesticide Properties Database for Environmental Decision Making", Reviews of Environmental Contamination and Toxicology, vol 123, 1-156.
18	Farm Chemicals Handbook 91, C. Sine, ed., (Meister Publishing Company, Willoughby, Ohio).
19	Structure and Nomenclature Search System, (Version 7.00/7.03) December, 1992.
20	From Syracuse Research Corporation Calculated Value from pchem-pcgems, 1988, ref no. 265435 in Enriofate database, Accession no. 105543.
23	NIOSH, 1990: Pocket Guide to Chemical Hazards, (U. S. Dept. of Health & Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health).
24	Buchter, B. et al., 1988: Correlation of Groundwater K _d and N retention Parameters with Soils and Elements, Soil Science, 148, 370-379.
25	USEPA, 1993: Air/Superfund National Technical Guidance Study Series: Estimation of Air Impacts for Thermal Desorption Units Used at Superfund Sites, US Environmental Protection Agency, Office of Air Quality Planning and Standards, EPA-451/R-93-005.
26	NTIS Accession No. PB93-215630, April 1993.
27	Based on salt solubilities in Table 3-120, R. H. Perry and D. W. Green, "Perry's Chemical Engineering Handbook" Sixth Edition, (McGraw-Hill, New York), 1973.
28	Based on salt solubilities in Table of Physical Constants for Inorganic Compounds, Weast, R. C., CRC Handbook of Chemistry and Physics, 67th edition, (CRC Press, Inc., Boca Raton), 1987.
28	Montgomery and Welton, "Groundwater Chemicals Desk Reference", Lewis Publishers, Chelsea, MI, 1990.
30	USEPA, 1996: Soil Screening Guidance: Technical Background Doc., (EPA/540/R-96/126)
31	TNRCC Risk Reduction Rule Implementation, July 23, 1996. (update to Reference "TX").
32	USEPA, Method 6270C, Revision 3, "Semi-volatile Organic Compounds by GC/MS", December 1996.
33	40 CFR 131.36, July 1, 1997
34	40 CFR 141.23, July 1, 1997
35	USEPA, Manual for the Certification of Laboratories Analyzing Drinking Water, EPA 815-B-97-001, March 1997
36	Calculated using Chiou et al. equation reported in (9); S (µmol/L) from (15).
37	Calculated using Chiou et al. equation reported in (9); S (µmol/L) from (23).
38	Calculated using Chiou et al. equation reported in (9); S (µmol/L) from (4).

RECA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 167 North L Street, Livermore, California

Date Completed: 17-Apr-03

1 OF 1

SOIL (15 - 25 ft) SSTL VALUES

Target Risk (Class A & B) 1.0E-8
 Target Risk (Class C) 1.0E-5
 Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domenico - First Order
 (One-directional var. dispersion)

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN	Representative Concentration (mg/kg)	SSTL Results For Complete Exposure Pathways ("X" if Complete)											Applicable SSTL (mg/kg)	SSTL Exceeded?	Required CRF
		Soil Leaching to Groundwater Ingestion			Soil Vol. to Indoor Air	Soil Volatilization to Outdoor Air			Surface Soil Inhalation, Ingestion, Dermal Contact						
		On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)	On-site (0 ft)		Off-site 1 (100 ft)	Off-site 2 (100 ft)	On-site (0 ft)					
CAS No.	Name		Residential	Residential	Commercial	Residential	Residential	Construction Worker	Residential	Commercial	None	Construction Worker		"X" if yes	Only if "yes" left
71-43-2	Benzene	1.4E+0	1.1E+1	>1.1E+3	>1.1E+3	7.7E-2	1.3E+1	NA	2.7E+1	3.7E+1	NA	NA	7.7E-2	<input checked="" type="checkbox"/>	1.8E+1
108-88-3	Toluene	1.1E+1	>7.3E+2	>7.3E+2	>7.3E+2	2.2E+2	>7.3E+2	NA	>7.3E+2	>7.3E+2	NA	NA	2.2E+2	<input type="checkbox"/>	<1
100-41-4	Ethylbenzene	1.2E+1	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	NA	>6.2E+2	>6.2E+2	NA	NA	>6.2E+2	<input type="checkbox"/>	NA
1330-20-7	Xylene (mixed isomers)	7.2E+1	>4.9E+2	>4.9E+2	>4.9E+2	>4.9E+2	>4.9E+2	NA	>4.9E+2	>4.9E+2	NA	NA	>4.9E+2	<input type="checkbox"/>	NA
1634-04-4	Methyl t-Butyl ether	0.0E+0	4.2E+0	1.7E+3	4.7E+3	1.4E+3	>8.0E+3	NA	>8.0E+3	>8.0E+3	NA	NA	4.2E+0	<input type="checkbox"/>	<1
91-20-3	Naphthalene	0.0E+0	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	>6.2E+2	NA	>6.2E+2	>6.2E+2	NA	NA	>6.2E+2	<input type="checkbox"/>	NA

*> indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6

Target Risk (Class C) 1.0E-5

Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domenico - First
(One-directional)

SSTL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN CAS No.	Name	Representative Concentration (mg/L)	Groundwater Ingestion			GW Vol. to Indoor Air	Groundwater Volatilization to Outdoor Air			Applicable SSTL (mg/L)	SSTL Exceeded? "■" if yes		
			X	On-site (0 ft)	Off-site 1 (100 ft)	Off-site 2 (100 ft)	X	On-site (0 ft)	Off-site 1 (100 ft)			Off-site 2 (100 ft)	
			Residential	Residential	Commercial	Residential	Residential	Residential	Commercial				
71-43-2	Benzene	5.0E+0	X	2.9E-3	8.4E+0	2.8E+1	X	1.3E-1	2.5E+1	5.1E+1	8.6E+1	2.9E-3	■
108-88-3	Toluene	4.2E+0		7.3E+0	>5.2E+2	>5.2E+2		1.7E+2	>5.2E+2	>5.2E+2	>5.2E+2	7.3E+0	□
100-41-4	Ethylbenzene	1.9E+0		3.7E+0	>1.7E+2	>1.7E+2		>1.7E+2	>1.7E+2	>1.7E+2	>1.7E+2	3.7E+0	□
1330-20-7	Xylene (mixed isomers)	9.0E+0		7.3E+1	>2.0E+2	>2.0E+2		>2.0E+2	>2.0E+2	>2.0E+2	>2.0E+2	7.3E+1	□
1634-04-4	Methyl t-Butyl ether	2.6E-1		3.7E-1	1.5E+2	4.1E+2		9.1E+3	>4.8E+4	>4.8E+4	>4.8E+4	3.7E-1	□
91-20-3	Naphthalene	3.5E-1		1.5E+1	>3.1E+1	>3.1E+1		>3.1E+1	>3.1E+1	>3.1E+1	>3.1E+1	1.5E+1	□

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

--

1 OF 1

1st Order
(at vert. dispersion)

Required CRF
Only if "yes" left
1.7E+3
<1
<1
<1
<1
<1

RBCA SITE ASSESSMENT **Cumulative Risk Worksheet**

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	<1	<1	1.4E+0	5.0E+0
108-88-3	Toluene	1.1E+1	4.2E+0	<1	<1	1.1E+1	4.2E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	NA	<1	1.2E+1	1.9E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	NA	<1	7.2E+1	9.0E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	<1	<1	0.0E+0	2.6E-1
91-20-3	Naphthalene	0.0E+0	3.5E-1	NA	<1	0.0E+0	3.5E-1

Cumulative Values:

RBCA SITE ASSESSMENT Cumulative Risk Worksheet

Site Name: Arrow Rentals Site Name: Arrow Rentals Completed By: Aquifer Sciences, Inc. Job ID: 971275
 Site Location: 187 North L Street, Livermore, California Site Location: 187 North L Street, Livermore, California Date Completed: 17-Apr-01 2 OF 3

CUMULATIVE RISK WORKSHEET Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Residential		Residential		None		Residential	
CAS No.	Name	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	3.1E-7	1.5E-2	5.6E-5	2.7E+0			1.7E-3	4.6E+1
108-88-3	Toluene		7.4E-4		7.5E-2				5.8E-1
100-41-4	Ethylbenzene		1.9E-4		1.4E-2				5.2E-1
1330-20-7	Xylene (mixed isomers)		2.0E-4		1.3E-2				1.2E-1
1634-04-4	Methyl t-Butyl ether		1.6E-7		2.9E-5				7.1E-1
91-20-3	Naphthalene		2.4E-7		3.5E-5				2.4E-2
Cumulative Values:		3.1E-7	1.6E-2	5.6E-5 ■	2.8E+0 ■	0.0E+0	0.0E+0	1.7E-3 ■	4.8E+1 ■

■ Indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

3 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: Domenico - First Order

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		Residential (100 ft)		Commercial (100 ft)		Residential (100 ft)		Commercial (100 ft)	
		Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	1.5E-7	7.1E-3	9.6E-8	5.4E-3	5.9E-7	1.6E-2	1.8E-7	5.7E-3
108-88-3	Toluene		3.5E-4		2.9E-4		1.6E-8		5.6E-9
100-41-4	Ethylbenzene		9.1E-5		6.5E-5		2.0E-4		7.2E-5
1330-20-7	Xylene (mixed isomers)		9.4E-5		6.7E-5		6.4E-7		2.3E-7
1634-04-4	Methyl t-Butyl ether		7.7E-8		5.5E-8		1.8E-3		6.4E-4
91-20-3	Naphthalene		1.2E-7		8.3E-8		1.1E-7		3.9E-8
Cumulative Values:		1.5E-7	7.6E-3	9.6E-8	5.9E-3	5.9E-7	1.9E-2	1.8E-7	6.4E-3

■ indicates risk level exceeding target risk

APPENDIX H

REMEDATION GOALS - ONSITE COMMERCIAL SCENARIO

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 197 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	4.4E+0	8.7E+1	3.2E-1	7.5E-2
108-88-3	Toluene	1.1E+1	4.2E+0	<1	1.7E+0	1.1E+1	2.5E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	<1	1.3E+0	1.2E+1	1.5E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	NA	NA	7.2E+1	9.0E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	<1	<1	0.0E+0	2.6E-1
91-20-3	Naphthalene	0.0E+0	3.5E-1	NA	NA	0.0E+0	3.5E-1

Cumulative Values:

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

2 OF 3

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

CUMULATIVE RISK WORKSHEET

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Commercial		Commercial		None		Commercial	
CAS No.	Name	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	2.0E-8	1.1E-3	2.3E-6	1.3E-1			7.6E-6	2.4E-1
108-88-3	Toluene		5.8E-4		3.8E-2				1.2E-1
100-41-4	Ethylbenzene		1.3E-4		7.6E-3				1.5E-1
1330-20-7	Xylene (mixed isomers)		1.4E-4		7.6E-3				4.4E-2
1634-04-4	Methyl t-Butyl ether		1.2E-7		1.7E-5				2.5E-1
91-20-3	Naphthalene		1.7E-7		2.0E-5				8.6E-3
Cumulative Values:		2.0E-8	2.0E-3	2.3E-6	1.8E-1	0.0E+0	0.0E+0	7.6E-6	8.2E-1

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

3 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: Domenico - First Order

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		Residential (100 ft)		Commercial (100 ft)		Residential (100 ft)		Commercial (100 ft)	
		Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	1.4E-8	6.4E-4	9.5E-9	5.4E-4	8.9E-9	2.4E-4	2.7E-9	8.5E-5
108-88-3	Toluene		3.3E-4		2.8E-4		9.4E-9		3.4E-9
100-41-4	Ethylbenzene		8.9E-5		6.3E-5		1.6E-4		5.7E-5
1330-20-7	Xylene (mixed isomers)		9.4E-5		6.7E-5		6.4E-7		2.3E-7
1634-04-4	Methyl t-Butyl ether		7.7E-8		5.5E-8		1.8E-3		6.4E-4
91-20-3	Naphthalene		1.2E-7		8.3E-8		1.1E-7		3.9E-8
Cumulative Values:		1.4E-8	1.2E-3	9.5E-9	9.5E-4	8.9E-9	2.2E-3	2.7E-9	7.8E-4

■ indicates risk level exceeding target risk

APPENDIX I

REMEDATION GOALS - ONSITE RESIDENTIAL SCENARIO

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 197 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	4.4E+0	3.3E+2	3.2E-1	1.5E-2
108-88-3	Toluene	1.1E+1	4.2E+0	<1	4.2E+0	1.1E+1	1.0E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	NA	3.8E+0	1.2E+1	5.0E-1
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	NA	1.6E+0	7.2E+1	5.5E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	<1	3.5E+0	0.0E+0	7.5E-2
91-20-3	Naphthalene	0.0E+0	3.5E-1	NA	<1	0.0E+0	3.5E-1

Cumulative Values:

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

2 OF 3

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

CUMULATIVE RISK WORKSHEET

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Residential		Residential		None		Residential	
CAS No.	Name	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	2.6E-8	1.2E-3	4.2E-6	2.0E-1			5.1E-6	1.4E-1
108-88-3	Toluene		6.4E-4		5.6E-2				1.4E-1
100-41-4	Ethylbenzene		1.7E-4		1.1E-2				1.4E-1
1330-20-7	Xylene (mixed isomers)		1.9E-4		1.2E-2				7.5E-2
1634-04-4	Methyl t-Butyl ether		4.6E-8		8.3E-6				2.1E-1
91-20-3	Naphthalene		2.4E-7		3.5E-5				2.4E-2
Cumulative Values:		2.6E-8	2.2E-3	4.2E-6	2.9E-1	0.0E+0	0.0E+0	5.1E-6	7.2E-1

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

3 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: Domenico - First Order

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		Residential (100 ft)		Commercial (100 ft)		Residential (100 ft)		Commercial (100 ft)	
		Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	1.2E-8	5.8E-4	8.8E-9	5.0E-4	1.8E-9	4.8E-5	5.3E-10	1.7E-5
108-88-3	Toluene		3.1E-4		2.6E-4		3.8E-9		1.3E-9
100-41-4	Ethylbenzene		8.2E-5		5.9E-5		5.3E-5		1.9E-5
1330-20-7	Xylene (mixed isomers)		9.2E-5		6.5E-5		3.9E-7		1.4E-7
1634-04-4	Methyl t-Butyl ether		2.2E-8		1.6E-8		5.1E-4		1.8E-4
91-20-3	Naphthalene		1.2E-7		8.3E-8		1.1E-7		3.9E-8
Cumulative Values:		1.2E-8	1.1E-3	8.8E-9	8.8E-4	1.8E-9	6.2E-4	5.3E-10	2.2E-4

■ Indicates risk level exceeding target risk

APPENDIX J

REMEDATION GOALS WITH DEED RESTRICTION ON GROUNDWATER -
ONSITE COMMERCIAL SCENARIO

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 OF 3

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	2.8E+0	2.5E+0	5.0E-1	2.0E+0
108-88-3	Toluene	1.1E+1	4.2E+0	<1	<1	1.1E+1	4.2E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	<1	<1	1.2E+1	1.9E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	NA	NA	7.2E+1	9.0E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	<1	<1	0.0E+0	2.6E-1
91-20-3	Naphthalene	0.0E+0	3.5E-1	NA	NA	0.0E+0	3.5E-1

Cumulative Values:

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California Site Location: 187 North L Street, Livermore, California Date Completed: 17-Apr-01

2 OF 3

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

CUMULATIVE RISK WORKSHEET

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Commercial		Commercial		None		Commercial	
CAS No.	Name	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	7.7E-8	4.4E-3	1.0E-5	6.0E-1			2.0E-4	6.5E+0
108-88-3	Toluene		6.2E-4		4.4E-2				2.1E-1
100-41-4	Ethylbenzene		1.4E-4		8.2E-3				1.9E-1
1330-20-7	Xylene (mixed isomers)		1.4E-4		7.6E-3				4.4E-2
1634-04-4	Methyl t-Butyl ether		1.2E-7		1.7E-5				2.5E-1
91-20-3	Naphthalene		1.7E-7		2.0E-5				8.6E-3
Cumulative Values:		7.7E-8	5.2E-3	1.0E-5 ■	6.6E-1	0.0E+0	0.0E+0	2.0E-4 ■	7.2E+0 ■

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

3 OF 3

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: Domenico - First Order

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		Residential (100 ft)		Commercial (100 ft)		Residential (100 ft)		Commercial (100 ft)	
		Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	5.8E-8	2.7E-3	3.7E-8	2.1E-3	2.4E-7	6.4E-3	7.1E-8	2.3E-3
108-88-3	Toluene		3.5E-4		2.9E-4		1.6E-8		5.6E-9
100-41-4	Ethylbenzene		9.1E-5		6.5E-5		2.0E-4		7.2E-5
1330-20-7	Xylene (mixed isomers)		9.4E-5		6.7E-5		6.4E-7		2.3E-7
1634-04-4	Methyl t-Butyl ether		7.7E-8		5.5E-8		1.8E-3		6.4E-4
91-20-3	Naphthalene		1.2E-7		8.3E-8		1.1E-7		3.9E-8
Cumulative Values:		5.8E-8	3.3E-3	3.7E-8	2.5E-3	2.4E-7	8.4E-3	7.1E-8	3.0E-3

■ indicates risk level exceeding target risk

APPENDIX K

REMEDATION GOALS WITH DEED RESTRICTION ON GROUNDWATER -
ONSITE RESIDENTIAL SCENARIO

RBCA SITE ASSESSMENT	Cumulative Risk Worksheet
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Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

1 OF 3

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene	1.4E+0	5.0E+0	2.8E+0	1.0E+1	5.0E-1	5.0E-1
108-88-3	Toluene	1.1E+1	4.2E+0	<1	<1	1.1E+1	4.2E+0
100-41-4	Ethylbenzene	1.2E+1	1.9E+0	NA	<1	1.2E+1	1.9E+0
1330-20-7	Xylene (mixed isomers)	7.2E+1	9.0E+0	NA	<1	7.2E+1	9.0E+0
1634-04-4	Methyl t-Butyl ether	0.0E+0	2.6E-1	<1	<1	0.0E+0	2.6E-1
91-20-3	Naphthalene	0.0E+0	3.5E-1	NA	<1	0.0E+0	3.5E-1

Cumulative Values:

RBCA SITE ASSESSMENT

Cumulative Risk Worksheet

Site Name: Arrow Rentals

Site Name: Arrow Rentals

Completed By: Aquifer Sciences, Inc.

Job ID: 971275

Site Location: 187 North L Street, Livermore, California

Site Location: 187 North L Street, Livermore, California

Date Completed: 17-Apr-01

2 OF 3

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

CUMULATIVE RISK WORKSHEET

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:		Indoor Air Exposure:		Soil Exposure:		Groundwater Exposure:	
		Residential		Residential		None		Residential	
CAS No.	Name	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0
		Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	6.0E-8	2.8E-3	1.0E-5	4.9E-1			1.7E-4	4.6E+0
108-88-3	Toluene		7.4E-4		7.5E-2				5.8E-1
100-41-4	Ethylbenzene		1.9E-4		1.4E-2				5.2E-1
1330-20-7	Xylene (mixed isomers)		2.0E-4		1.3E-2				1.2E-1
1634-04-4	Methyl t-Butyl ether		1.6E-7		2.9E-5				7.1E-1
91-20-3	Naphthalene		2.4E-7		3.5E-5				2.4E-2
Cumulative Values:		6.0E-8	4.0E-3	1.0E-5 ■	5.9E-1	0.0E+0	0.0E+0	1.7E-4 ■	6.5E+0 ■

■ Indicates risk level exceeding target risk

RBCA Tool Kit for Chemical Releases, Version 1.3a

RBCA SITE ASSESSMENT **Cumulative Risk Worksheet**

Site Name: Arrow Rentals Site Name: Arrow Rentals Completed By: Aquifer Sciences, Inc. Job ID: 971275
 Site Location: 187 North L Street, Livermore, California Site Location: 187 North L Street, Livermore, California Date Completed: 17-Apr-01 3 OF 3

CUMULATIVE RISK WORKSHEET		OFF-SITE RECEPTORS							
		Outdoor Air Exposure:				Groundwater Exposure:			
CONSTITUENTS OF CONCERN		Residential (100 ft)		Commercial (100 ft)		Residential (100 ft)		Commercial (100 ft)	
		Target Risk: 1.0E-8 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene	2.9E-8	1.4E-3	1.9E-8	1.1E-3	5.9E-8	1.6E-3	1.8E-8	5.7E-4
108-88-3	Toluene		3.5E-4		2.9E-4		1.6E-8		5.6E-9
100-41-4	Ethylbenzene		9.1E-5		6.5E-5		2.0E-4		7.2E-5
1330-20-7	Xylene (mixed isomers)		9.4E-5		6.7E-5		6.4E-7		2.3E-7
1634-04-4	Methyl t-Butyl ether		7.7E-8		5.5E-8		1.8E-3		6.4E-4
91-20-3	Naphthalene		1.2E-7		8.3E-8		1.1E-7		3.9E-8
Cumulative Values:		2.9E-8	1.9E-3	1.9E-8	1.5E-3	5.9E-8	3.6E-3	1.8E-8	1.3E-3

■ indicates risk level exceeding target risk