APPENDIX F2:

F.2 Enviro-Tox Services, Inc.,
Human Health Risk Assessment Report
2750 and 2800 Casitas Avenue and 2800 Kerr Street, Los Angeles, California,
January 28, 2016.

ENVIRO-TOX
services, inc.

Human Health Risk Assessment Report
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Prepared for

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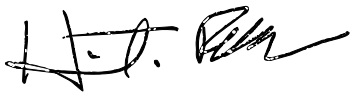
January 28, 2016

This report has been prepared for the exclusive use of Leighton and Associates, Inc. and Casitas Investment Company II, LLC as it pertains to the real estate property located at 2750 and 2800 Casitas Avenue and 2800 Kerr Street in Los Angeles, California. Our professional services have been performed using that degree of care and skill ordinarily exercised under similar circumstances by other scientists, geologists and engineers practicing in this field. No other warranty, express or implied, is made as to the professional advice presented in this report.



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January 28, 2016

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EXECUTIVE SUMMARY

At the request of Leighton and Associates, Inc. (Leighton), Enviro-Tox Services, Inc. (ETSI) conducted a Human Health Risk Assessment (HHRA) for the property located at 2750 and 2800 Casitas Avenue and 2800 Kerr Street in Los Angeles, California (the Subject Property). The objective of the HHRA was to determine whether trace concentrations of metals and petroleum hydrocarbons detected in soil and volatile organic compounds (VOCs) detected in soil gas at the Subject Property represent a health threat to future onsite residents.

The Subject Property covers approximately 5.61 acres and is located at the addresses of 2750 and 2800 Casitas Avenue and 2800 Kerr Street, Los Angeles, California. The Subject Property is surrounded by Extra Space Storage to the north; the Los Angeles River to the south; the Glendale Freeway (2 Freeway) to the west; and Casitas Avenue, the former Union Pacific Railroad Taylor Yard Parcel G-1, and the current Metrolink railroad tracks to the east.

The Subject Property is developed with one, approximately 117,000 square-foot concrete tilt-up, slab-on-grade foundation, structure. The Subject Property is occupied by Greco Décor, Inc., a furniture and prop assembly/storage business, and Nelson Miller, Inc., a light industrial/manufacturing business.

Greco Décor, Inc. occupies the northwest half of the onsite structure and primarily utilizes the space for the assembly and storage of props and furniture. Nelson-Miller, Inc. occupies the southeast half of the onsite structure and manufactures metal and plastic nameplates, graphic overlays, domed labels, membrane switches, keypads, light guides, and touchscreens, in addition to several other products. A majority of the structure is single story with a partial second story located within the portion of the structure occupied by Nelson-Miller, Inc. The remainder of the Subject Property is asphalt-paved with parking located to the north, east, and southeast of the structure. Minimal landscaping is located within the asphalt-paved areas. The immediate Subject Property vicinity consists primarily of commercial and light industrial properties, with some residential properties.

Environmental investigations previously completed at the Subject Property revealed the presence of trace quantities of man-made chemicals in soil and soil gas under the property. The only chemicals detected in soil were a few metals (primarily lead) and total petroleum hydrocarbons (TPH). Chemicals detected in soil gas included traces of petroleum-derived hydrocarbons and chlorinated solvents. There is no indication that site-related chemicals have impacted groundwater resources under the Subject Property. Groundwater is estimated to be found at depths greater than 40 feet below ground surface.

In accordance with U.S. Environmental Protection Agency (USEPA) and California Department of Toxic Substances Control (DTSC) risk assessment guidance, metals found at a Subject Property at concentrations similar to or equal to ambient, background concentrations should not be included in a risk assessment. The natural, background soil metal concentrations at the Subject Property are unknown, therefore detected metals were included in the evaluation. However, for simplification, metal concentrations detected at the Subject Property were not

carried through the risk evaluation but were only compared to concentrations deemed safe for residential sites by the USEPA and the DTSC. Only those metals whose maximum detected concentrations exceeded the regulatory agencies' soil screening levels were included in the quantitative evaluation of health risks. The only metal detected at the Subject Property that had a maximum detected concentration higher than its corresponding soil screening level was lead. Therefore, lead was included in this risk assessment as a chemical of potential concern (COPC). All organic chemicals detected at the Subject Property at concentrations deemed to be the result of human activity were also included as COPCs in this HHRA.

The current development plan for the Subject Property involves the construction of a multilevel residential complex, in which case future onsite residents will not be in contact with soils while at the Subject Property. However, it is conceivable that the residential complex could be surrounded by landscaped areas. Therefore, the incidental ingestion and dermal contact with impacted soil was considered to be an extremely unlikely but complete exposure pathway and was evaluated in this HHRA.

The potential vapor emissions that could result in exposure from VOCs detected in soil gas under the Subject Property were evaluated in this HHRA. The estimated vapor emissions were used to obtain potential indoor air chemical concentrations that could result from subsurface vapor intrusion. The potential health risk associated with VOC vapor intrusion and subsequent residential exposure was evaluated in this HHRA.

Screening-level emission estimation methods were used to predict potential chemical emissions and resulting residential exposures. The estimated exposure point concentrations were then used to estimate potential health risks for onsite residents. For this assessment the potential health risk and hazards posed by VOCs detected in "shallow" and "deep" soil gas were evaluated separately. Potential health risk and hazards posed by VOCs detected in shallow soil gas were evaluated using only soil gas analytical data collected at depths of 3 and 5 feet below ground surface (bgs). Potential health risk and hazards posed by VOCs detected in deep soil gas were evaluated using only soil gas analytical data collected at a depth of 15 feet bgs.

The estimated cancer risk and total hazard index that could result from residential exposures to onsite soil via incidental ingestion, dermal contact, and indoor air inhalation are summarized below in Table ES-1.

The only organic chemicals detected in soil were TPH. TPH is not considered to be carcinogenic. Therefore, exposure to soil is deemed to pose no significant cancer risks to future onsite residents. Using the maximum TPH concentrations detected in soil at the Subject Property, the total hazard index from residential exposures to onsite soil via incidental ingestion and dermal contact was estimated to be 0.02 (Table ES-1). The Hazard Index generally considered acceptable to the DTSC is 1.0. All estimated Hazard Indices are equal to or below 1.0 (Table ES-1) and therefore considered acceptable to California health and environmental protection agencies.

Results of the HHRA indicate that exposure to chemicals detected in soil gas could carry a potential cancer risk of less than four cancer cases in an exposed population of one million

people (4E-06; Table ES-1). The estimated incremental cancer risk is within the risk management range of 1E-05 and 1E-06 considered acceptable to the California Department of Toxic Substances Control (DTSC).

Table ES-1. Estimated Cancer Risks and Health Hazards for Future Onsite Residents

	Adult and Child Combined Incremental Cancer Risk (unitless)	Hazard Index Estimated for Children Only (unitless)
Cancer Risk and Hazard Index Estimated to Result from Exposure to Soil and Dust While Outdoors at the Subject Property.	0.0	0.02
Maximum Health Risk and Hazard Index Estimated to Result Exclusively from Exposure to Indoor Air from VOCs Detected at a Depth of 3 Feet bgs.	7E-07	0.1
Maximum Health Risk and Hazard Index Estimated to Result Exclusively from Exposure to Indoor Air from VOCs Detected at a Depth of 5 Feet bgs.	4E-06	0.1
Maximum Health Risk and Hazard Index Estimated to Result Exclusively from Exposure to Indoor Air from VOCs Detected at a Depth of 15 Feet bgs.	9E-07	0.04

As for lead in soil, the average soil lead concentration (represented by the 95 percent upper confidence limit on the arithmetic mean) was estimated to be 30.93 milligrams per kilogram (mg/kg). This value is lower than the DTSC's soil screening level for lead (80 mg/kg). Therefore, it is concluded that lead in soil does not pose a health threat to future onsite residents.

Based on the results of the HHRA, it is ETSI's opinion that site remediation is not warranted and that the Subject Property can be developed into a residential complex without the need to install a vapor intrusion mitigation system.

The risk and hazard calculations assumed multiple exposures to chemicals via incidental soil ingestion, dermal contact, and inhalation of indoor vapors in accordance with DTSC guidance. The results are based on multiple health-protective assumptions. For example, it was assumed that a VOC reservoir is located under the Subject Property and that this VOC reservoir is large and strong enough to continuously release VOC vapors for up to 26 years. However, no VOC reservoir is known to exist under the Subject Property.

All conclusions and recommendations presented in this report are based on reported chemical concentrations and the proposed future residential land use of the Subject Property. In this risk assessment, all fate-and-transport models, parameters, toxicity data and assumptions were applied in accordance with federal and state regulatory guidelines. These guidelines are meant to protect the public and tend to overestimate potential health risks. As such, this risk assessment

provides an estimate of the upper boundary of potential health risks, rather than an accurate representation of true health risks posed by the Subject Property.

1.0 INTRODUCTION

At the request of Leighton and Associates, Inc. (Leighton), Enviro-Tox Services, Inc. (ETSI) conducted a Human Health Risk Assessment (HHRA) for the property located at 2750 and 2800 Casitas Avenue and 2800 Kerr Street in Los Angeles, California ("the Subject Property"; Figure 1). Although the 5.61-acre parcel is currently industrial property, plans exist to build a residential complex at the Subject Property. The objective of the HHRA was to determine whether traces of metals, total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs) detected in soil and soil gas under the property represent a threat to future occupants of the proposed residential complex.

The HHRA was performed in conformance with the following guidance from the U.S. Environmental Protection Agency (USEPA) and the California Department of Toxic Substances Control (DTSC):

- California Department of Toxic Substances Control. 2015. *Preliminary Endangerment Assessment Guidance Manual.*
- California Department of Toxic Substances Control. 2015. *Human Health Risk Assessment (HHRA) Note Number 3.*
- California Department of Toxic Substances Control. 2011. *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*.
- U.S. Environmental Protection Agency. 1989. *Risk Assessment Guidance for Superfund: Volume l - Human Health Evaluation Manual.*
- U.S. Environmental Protection Agency. 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.*
- U.S. Environmental Protection Agency. 2015. *Regional Screening Levels*.

As required by the USEPA and DTSC, this HHRA quantitatively evaluates the potential health impacts associated with human exposure to chemicals detected in soil and soil gas at the Subject Property. Site characterization data collected during the most recent site investigation were compiled into a database and statistically analyzed to establish representative chemical concentrations. Then, where appropriate, environmental fate and transport models were used to estimate the concentrations of the chemicals to which human receptors might be exposed.

Conservative methods, models, and assumptions have been utilized during the preparation of this HHRA in accordance with the guidelines of the USEPA and DTSC. In addition, the risk assessment incorporates, to the extent possible, recent improvements and refinements in the practice of risk assessment. Current regulatory guidance requires risk assessments to be conservative in nature and to overestimate potential health risks. Therefore, actual risks associated with conditions evaluated in this risk assessment are likely to be lower than those described herein.

2.0 SITE CHARACTERIZATION

Environmental conditions in soil and soil gas at the Subject Property were recently investigated by Leighton. Results of Leighton investigations have been detailed in their site assessment reports (Leighton 2015a and 2015b). With the consent of Leighton, site characterization information summarized below was taken from their referenced reports. The soil and soil gas analytical data plus the figures showing a site plan and sampling locations are shown on Figures 1 and 2.

2.1 BACKGROUND

The Subject Property covers approximately 5.61 acres and is surrounded by Extra Space Storage to the north; the Los Angeles River to the south; the Glendale Freeway (2 Freeway) to the west; and Casitas Avenue, the former Union Pacific Railroad Taylor Yard Parcel G-1, and the current Metrolink railroad tracks to the east. The Subject Property is occupied by Greco Décor, Inc., a furniture and prop assembly/storage business, and Nelson Miller, Inc., a light industrial/manufacturing business.

The Subject Property is developed with one, approximately 117,000 square-foot concrete tilt-up, slab-on-grade foundation, structure. The Subject Property is occupied by Greco Décor, Inc., a furniture and prop assembly/storage business, and Nelson Miller, Inc., a light industrial/manufacturing business.

Greco Décor, Inc. occupies the northwest half of the onsite structure and primarily utilizes the space for the assembly and storage of props and furniture. Nelson-Miller, Inc. occupies the southeast half of the onsite structure and manufactures metal and plastic nameplates, graphic overlays, domed labels, membrane switches, keypads, light guides, and touchscreens, in addition to several other products. A majority of the structure is single story with a partial second story located within the portion of the structure occupied by Nelson-Miller, Inc. The remainder of the Subject Property is asphalt-paved with parking located to the north, east, and southeast of the structure. Minimal landscaping is located within the asphalt-paved areas. The immediate Subject

Property vicinity consists primarily of commercial and light industrial properties, with some residential properties.

2.2 OCTOBER 2015 SOIL AND SOIL GAS INVESTIGATION

In August 2015, 14 exploratory soil borings (LB1 through LB14) were advanced to total depths between 1.5 feet and 20 feet bgs. The approximate locations of the borings are shown on Figure 2. Borings LB1 through LB4, LB10, and LB12 through LB15 were advanced in areas outside and around the onsite building. Borings LB5 through LB8 and LB11 were advanced inside the onsite building, primarily within the portion of the building occupied by Nelson-Miller, Inc.

Soil samples were generally collected at depths of 0.5 feet, 2 feet, 5 feet, and at 5-foot intervals thereafter to the total proposed depth of the boring; however, drilling refusal was encountered in several borings due to gravels and/or a possible subgrade concrete slab; therefore, soil samples were subsequently collected at the above intervals and at the depth of refusal, when possible.

Select soil samples collected were analyzed for one or more of the following constituents: TPH by EPA Method 8015M, polychlorinated biphenyls (PCBs) by EPA Method 8082, VOCs by EPA Method 8260B, and the 17 metals listed in the California Code of Regulations, Title 22, Article 11 (CAM 17 metals) by EPA Method 6010B/7471A. Only a few metals and TPH were detected in the soil samples. Soil sample analytical results are summarized in Tables 1 and 2.

Also in August 2015, Leighton monitored the installation of soil gas sampling probes in 11 of the 14 soil boring locations described above and shown on Figure 2. Soil gas probes were installed at depths ranging between 3 feet and 5 feet bgs in each boring. Probes were installed in some locations at depths shallower than the proposed depth of 5 feet bgs due to drilling refusal and at the discretion of the field geologist so that subsurface conditions could be evaluated for the presence of VOCs. A second soil gas probe placed at a depth of 15 feet bgs was installed in borings LB1, LB2, LB4, and LB13 to evaluate the vertical extent of VOCs in soil gas beneath the Subject Property.

Soil gas sample collection and chemical analysis was performed by an onsite mobile laboratory. Soil gas samples, including duplicates, were analyzed for VOCs by modified EPA Method 8260B. The laboratory results for soil gas are summarized in Table 3.

2.3 DECEMBER 2015 SOIL AND SOIL GAS INVESTIGATION

In December 2015, 14 exploratory soil borings (LB15 through LB28) were advanced to total depths between 2 feet and 40 feet bgs. The approximate locations of the borings are shown on Figure 2. Borings LB15 through LB18, LB20 through LB24, and LB26 through LB28 were advanced in areas outside and around the onsite buildings. Borings LB19 and LB25 were advanced inside the onsite building, within the portion of the building occupied by Nelson-Miller, Inc.

In soil borings LB25 through LB28, soil samples were generally collected at 5-foot intervals to the total depth of the borings. Additionally, soil samples were collected from borings LB21 through LB24 at depths of 0.5 feet bgs and 2 feet bgs. Soil samples were not collected from borings LB15 through LB20 where only soil gas sampling was performed. Soil samples collected from boring LB21 through LB24 were analyzed for lead by EPA Method 6010B and soil samples collected from boring LB25 through LB28 were analyzed for TPH by USEPA Method 8015M. Soil sample analytical results are summarized in Tables 1 and 2.

An attempt was made to collect a grab groundwater sample from boring LB27. Groundwater was anticipated to be encountered at a depth between 30 and 35 feet bgs based on previous investigations completed on the adjacent property to the east of the Subject Property. Groundwater was not encountered during this investigation at the maximum drill depth of 40 feet bgs; therefore, a grab groundwater sample was not collected from boring LB27.

Also in December 2015, Leighton monitored the installation of soil gas sampling probes in 8 of the 14 soil boring locations described above and shown on Figure 2. Nested soil gas probes were installed at depths of 5 and 15 feet bgs in each boring. Soil gas samples were analyzed for VOCs by modified EPA Method 8260B. Soil gas analytical results are summarized in Table 3.

3.0 SELECTION OF CHEMICALS OF POTENTIAL CONCERN

All chemicals detected at the Subject Property (Tables 1, 2, and 3) were included in a formal selection of chemicals of potential concern (COPC). As described in current USEPA and DTSC risk assessment guidance, the purpose of selecting COPCs is to focus the assessment on those chemicals that could reasonably be expected to pose a significant health risk. COPCs were selected so that the most prevalent, and potentially toxic, compounds detected at the Subject Property (i.e., those chemicals that represent the greatest potential threat to human health) were quantitatively evaluated in the health risk evaluation.

3.1 ORGANIC COMPOUNDS

The only organic compounds detected in soil were total petroleum hydrocarbons (TPH; Table 1). TPH is a mixture of hundreds of organic chemicals that are found in crude oil, natural gas, coal, coal tar, petroleum products, and other similar materials. It is not possible to determine the chemical, physical, and toxicological properties of TPH because its composition varies widely depending on its source, composition, and the industrial processes it is subjected to. In addition, petroleum hydrocarbons in the environment (soil, water, and air) vary widely from one site to another because it is subjected to modifications by chemical, physical, and biological processes naturally present in the environment. Because of these considerations, it is not practicable to evaluate every compound present in petroleum products in a risk assessment. For these reasons, risk assessments of petroleum hydrocarbons are conducted by assessing the potential impacts from a select group of "indicator" chemicals. The indicator chemicals usually selected are those chemicals known to be present in most petroleum hydrocarbons and that are known to be the most toxic, persistent, and mobile in the environment. The chemicals that are known to be the most toxic and persistent components of TPH are the aromatic compounds.

Since aromatic compounds were analyzed for and not detected in soil at the Subject Property, TPH detected in soil is believed to be limited to low-toxicity, aliphatic hydrocarbons. The TPH risk evaluation was conducted using methodology and toxicity values published by the USEPA (2015). For this evaluation it was assumed that the TPH fractions were composed exclusively of aliphatic fractions.

3.2 METALS

In accordance with USEPA (1989) and DTSC (2015a) risk assessment guidance, metals found at a site at concentrations similar to or equal to ambient, background concentrations should not be included in a risk assessment. The natural, background soil metal concentrations at the Subject Property are unknown, therefore detected metals were included in the evaluation. However, for simplification, metal concentrations detected at the Subject Property were not carried through the risk evaluation but were only compared to concentrations deemed safe for residential sites by the the DTSC (2015b). Only those metals whose maximum detected concentrations exceeded the DTSC's screening levels (DTSC-SL; 2015b) were included in the quantitative evaluation of health risks. The comparison of maximum detected concentrations to DTSC-SL is presented in Table 2. The only metal detected at the Subject Property that had a maximum detected concentration higher than its corresponding soil screening level was lead. Therefore, lead was included in this risk assessment as a COPC.

4.0 EXPOSURE ASSESSMENT

California health and environmental protection agencies require the remediation of chemical-impacted soil if the chemicals are found to represent a threat to human health and the environment. Similarly, environmental cleanup has to be conducted to the extent that the threat posed by the release is reduced to acceptable levels. The purpose of this HHRA was to determine if metals, TPH, and VOCs detected in soil and soil gas at the Subject Property represent a threat to human health and the environment.

4.1 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) shows all potentially complete exposure pathways for a given environmental source. The CSM identifies potential chemical sources, release mechanisms, transport media, routes of chemical migration through the environment, exposure media, and potential receptors. The CSM for the Subject Property is presented in Figure 3. The following paragraphs define the exposure pathways evaluated in this HHRA and the rationale for their inclusion or elimination from consideration.

The current development plan for the property involves the construction of a multilevel, slab-on-grade residential complex. Therefore, future onsite residents will not be in contact with soils while at the Subject Property. However, it is conceivable that the residential complex could be surrounded by landscaped areas. If this is the case, future onsite residents could come in contact with soil while outdoors. Therefore, the incidental ingestion of and dermal contact with impacted soil is considered to be an extremely unlikely but complete exposure pathway.

This HHRA assumed that a potential source of VOCs exists under the Subject Property at depths between 3 and 15 feet below ground surface (bgs). It was also assumed that this potential VOC source would be active for the next 26 years and that VOC vapors may migrate up to the surface and enter a building through cracks in its foundation. This potential VOC source was also assumed to contain and produce all the VOCs that were identified in soil gas at the Subject Property. Thus, the volatilization and vapor intrusion into onsite buildings is considered to be a potential exposure pathway, and is evaluated in this HHRA.

Groundwater under the Subject Property does not appear to have been impacted by site-related chemicals (Leighton 2015c). Therefore, the groundwater exposure pathway is not considered to be a complete exposure pathway for future onsite residents.

4.2 POTENTIAL RECEPTORS

Given that current plans for redevelopment of the Subject Property include the construction of a residential complex, the future onsite receptors are likely to be adult and child residents. Default exposure parameters that define the potential receptors at the residential complex are presented in Table 4.

It can be said that other non-residential receptors (such as construction workers, maintenance workers, and trespassers) could come in contact with soil during redevelopment of the Subject Property. Therefore, in an effort to be protective of most receptors, this HHRA evaluated health risks for the most sensitive and highly exposed individuals. This HHRA included the evaluation of adult and child residential receptors that might be exposed to soil and dust for up to 26 years. The child receptors evaluated were assumed to be exposed to high levels of dust and soil, 350 days a year for up to six years of their early lives. If residual chemicals are found to be safe for children (at an age when humans are more sensitive and vulnerable), then it can be said that exposure to soil does not pose a health risk to other human receptors (such as construction and maintenance workers) who are not as sensitive and who will have shorter exposure durations.

Although offsite residential populations and any potentially sensitive subpopulations located within a one-mile radius of the Subject Property may also be exposed to chemicals identified at the Subject Property, their exposures should be substantially less than those estimated for onsite residential receptors because of wind dispersion and dilution. Therefore, only exposure to future onsite residents is quantitatively evaluated in this assessment.

4.3 SOIL AND DUST EXPOSURE POINT CONCENTRATIONS

Only traces of a few metals and TPH were detected in soil at the Subject Property (Tables 1 and 2). Exposure to these chemicals may occur via inhalation of fugitive dust. Inhalation exposure to non-volatile compounds is typically minor in fugitive dust when compared to direct ingestion

exposure (USEPA, 2002). Nevertheless, a relationship must be estimated between the chemical concentration in soil and the concentration in air due to fugitive dust emissions from surface soil.

The potential dust and particle emissions from the Subject Property were estimated using an approach recommended by the USEPA (2002) and DTSC for screening risk evaluations. The approach is based on the calculation of a particulate emission factor (PEF) for each COPC detected at the Subject Property. The PEF represents an annual average emission rate based on wind erosion. The PEF equation can be found in the *Soil Screening Guidance: User's Guide* (USEPA, 2002). The emissions part of the PEF equation is based on the "unlimited reservoir" model developed to estimate particulate emissions due to wind erosion (Cowherd et al., 1985). The dispersion part of the PEF equation includes a dispersion coefficient (Q/C) in units of grams per square meter-second per kilogram per cubic meter (g/m^2-s per kg/m^3).

For this property, the Q/C value of 68.81 g/m^2-s per kg/m^3 was selected as the inverse of the mean concentration at the center of a 10-acre site located in Los Angeles, California (USEPA, 2002). Using this Q/C term and the default assumption of 50 percent vegetative coverage, a PEF value of 9.97E+08 m^3/kg was calculated for the Subject Property (Table 5). The PEF is used in this risk evaluation to estimate inhalation exposures to particulates at the Subject Property.

4.4 VAPOR INHALATION OF CHEMICALS IN INDOOR AIR

The potential for chemical volatilization and building intrusion was modeled using the DTSC (2014) spreadsheet program for the Johnson and Ettinger (1991) vapor intrusion model as modified by DTSC in December 2014 (SG-SCREEN version 2.0).

For this assessment the potential health risk and hazards posed by VOCs detected in "shallow" and "deep" soil gas were evaluated separately. Potential health risk and hazards posed by VOCs detected in shallow soil gas were evaluated using only soil gas analytical data collected at depths of 3 and 5 feet below ground surface (bgs). Potential health risk and hazards posed by VOCs detected in deep soil gas were evaluated using only soil gas analytical data collected at a depth of 15 feet bgs.

The method selected to estimate chemical volatilization and migration was obtained from the DTSC's *"Guidance for the Evaluation and Migration of Subsurface Vapor Intrusion to Indoor Air"* (DTSC 2011). This method is consistent with USEPA (2003) vapor intrusion risk assessment guidance. The method used the following assumptions:

- The potential VOC source occurs at constant depths of 3, 5, and 15 feet bgs.
- The gas-phase chemical migrates vertically through soil pore space up to the ground surface by advection and steady-state diffusion.
- The soil between the chemical sources and the ground surface is assumed to be homogeneous.
- Vapor diffusion is described by a single chemical-specific effective diffusion coefficient.
- No retardation of the soil gas occurs as the chemical migrates from its source to the ground surface.
- Soil gas migrates through cracks in the building foundations and mixes instantaneously with indoor air, resulting in an ambient indoor air concentration.
- Future buildings at the Subject Property will be slab-on-grade construction.
- The potential source chemical concentration does not decrease over time.

The point of departure for chemical volatilization modeling was the soil gas data collected at the Subject Property at 3, 5, and 15 feet bgs (Table 3). Soil gas data represent volatile chemicals that are found in soil-pore spaces and that have the potential to migrate from their subsurface soil up to indoor air.

The method assumes that the potential source chemical concentration does not decrease over time and that the depth to the top of the chemical source remains constant, which results in an overestimation of long term exposure effects. The model considers the flux rate of the chemicals to be a result of Fickian steady state diffusion of the vapor through the soil matrix.

The Johnson and Ettinger model was used to estimate chemical concentrations in indoor air. The rate of soil gas infiltration into the buildings is dependent on a number of environmental and

structural factors, such as the temperature and pressure differentials between the soil column and indoor air; the types of heating and cooling systems used in the buildings; and various lifestyle factors of the building occupants. The two primary processes that lead to gas infiltration are diffusion and convection.

Because this model ignores a number of possible attenuation factors, it is likely that it over-predicts the VOC flux to indoor air. However, because of its simplicity, this approach provides a simple method to estimate the likely maximum rate at which chemicals would be transported to the surface soils and into a building.

The Johnson and Ettinger model assumes that the concentrations in indoor air are proportional to the flux throughout the soil column, and that a gas infiltrating into a building through the foundation floor is uniformly and instantaneously mixed within the air space above the lowest occupied floor of the building. Site-specific soil chemical properties are unknown. Therefore, default soil physical parameters recommended by the DTSC were used in the evaluation.

5.0 TOXICITY ASSESSMENT

In order to evaluate the potential adverse effects associated with exposure to chemicals, the relationship between the dose of each chemical and the incidence or potential of an adverse health effect in an exposed population must be determined. This is known as dose-response assessment and is based on data collected from animal studies and theoretical precepts about what might occur in humans.

This risk assessment considers both carcinogenic and non-carcinogenic health effects associated with chemical exposures based on dose-response criteria published by various regulatory agencies.

In this assessment, chronic toxicity criteria were selected in accordance with DTSC's HHRA Note No. 3 (DTSC, 2015b). The sources of toxicological values were:

(1) USEPA Region IX Regional Screening Levels tables (USEPA, 2015).

(2) Cal/EPA Cancer Potency Factors (OEHHA, 2016)

(3) USEPA's Integrated Risk Information System (IRIS)

5.1 NON-CARCINOGENIC DOSE-RESPONSE CRITERIA

It is widely accepted that most biological effects of chemical substances occur only after a threshold dose is reached. For the purpose of establishing non-carcinogenic criteria levels, this threshold dose is usually derived from either the no observed adverse effect level (NOAEL) or the lowest observed adverse effect level (LOAEL), as determined in chronic animal exposure studies. The NOAEL is defined as the highest dose at which no adverse effects occur, while the LOAEL is defined as the lowest dose at which adverse effects begin to appear. NOAELs and LOAELs are used by the USEPA to establish reference doses (RfDs) for acceptable levels of human intake.

A RfD is the dose of a chemical that is not expected to cause adverse health effects over a lifetime of daily exposure in the most sensitive population. Uncertainty factors are used to set

RfDs, representing an attempt to account for limitations in the quality or quantity of available data. Most RfDs include a 100-fold safety factor that is based on 1) a factor of 10 to account for uncertainties in extrapolating animal data to human health effects, and 2) another 10-fold safety factor to account for differences in sensitivity within the human population. Furthermore, if an available database is incomplete, or if the involved chemical is persistent or bioaccumulative, additional 10-fold safety factors may be applied. Reference doses for all COPCs are compiled in Table 6.

5.2 CARCINOGENIC DOSE-RESPONSE CRITERIA

The currently accepted regulatory approach assumes that all potentially carcinogenic chemicals should be treated as if they do not have thresholds. This regulatory approach, which was used to evaluate carcinogenic risks for this document, assumes that the dose-response curve for carcinogens allows for zero risk at zero dose (i.e., for all doses, some cancer risk is assumed to be present). Since animal testing is performed at relatively high doses for the purposes of eliciting a carcinogenic response, various mathematical models are used to estimate the theoretically plausible response at low doses. The accuracy of the projected risk depends on how well the model predicts the true relationship between dose and risk at levels where this relationship cannot actually be measured.

Health risks for exposures to carcinogens are defined in terms of probabilities. The probabilities quantify the likelihood of a carcinogenic response in an individual that receives a given dose of a particular compound. These probabilities are calculated based on the potential dose and the carcinogenic slope factor (SF) for a chemical.

The SF, which is expressed in units of inverse milligrams per kilogram-day $(mg/kg\text{-}day)^{-1}$, is the 95 percent upper confidence limit of the probability of carcinogenic response per unit daily intake of a chemical over a lifetime. The SF multiplied by the lifetime average daily intake of the chemical (dose) provides an estimate of the 95 percent upper confidence limit of the theoretical cancer risk for the specific dose. The SFs used in this risk assessment to estimate carcinogenic dose-assessment risks are presented in Table 6.

5.3 HEALTH RISK EVALUATION FOR LEAD EXPOSURE

The carcinogenic and non-carcinogenic toxicity criteria described above do not apply to inorganic lead. RfD and CSF are not applicable because of incomplete knowledge of the complex physiological dynamics of lead in the body (DTSC 2015b). Alternative methods have been developed to evaluate potential health risks from exposures to inorganic lead. These methods are based on establishing a target blood-lead level that is not expected to result in toxicity. The target level approach is considered appropriate because lead toxicity effects are typically only observed above certain blood-lead levels (DTSC 2015b).

6.0 RISK CHARACTERIZATION

Risk characterization combines information obtained in the exposure assessment and fate and transport modeling with toxicological parameters to obtain an estimate of potential health effects. Risk characterization is conducted in two distinct steps. First, quantification of the daily intake (dose) of the chemical is estimated. Intake assumptions including absorption and bioavailability factors, frequency and duration of exposure, age of receptor, body weight, and exposure rates are used to calculate the dose. The second step in the risk characterization process compares the estimated daily dose to cancer potency factors and reference doses to obtain an estimate of potential health risks and hazards.

6.1 AVERAGE DAILY DOSE / LIFETIME DAILY DOSE

This section discusses the methods used to quantify the average daily dose (ADD) of COPCs that may be received by the potential receptors from the ingestion, dermal contact, and inhalation of chemicals detected in soil and soil gas at the Subject Property. An ADD is calculated to estimate non-carcinogenic health hazards. A lifetime daily dose (LDD) is calculated to obtain the potential lifetime doses of carcinogenic chemicals that are received by the potential receptors.

The general equation used to estimate the average daily dose is:

$$ADD = \frac{CR \bullet EPC \bullet CF \bullet EF \bullet ED}{BW \bullet AT \bullet 365}$$

where:

ADD= Average daily intake (mg/kg/day)
CR = Contact rate; the amount of medium contacted per unit of time or event (e.g., soil ingestion rate [mg/hour])
EPC = Exposure point concentration (e.g., mg/kg soil or mg/m^3 vapor or airborne dust particles)
CF = Unit conversion factor (e.g., 1E-06 kg/mg)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (years)

The LDD is estimated using the same equation. The only difference is that the averaging time (AT) is assumed to be a human average lifetime (70 years).

As the parameters used in this HHRA involve hypothetical residential receptors, default parameters that approximate typical exposure conditions were used (Table 4).

6.2 SOIL EXPOSURE NON-CARCINOGENIC HEALTH HAZARDS

Non-carcinogenic chemical doses were estimated and compared to the chemical-specific RfDs presented in Table 6. A ratio of the dose to RfD was calculated to derive a hazard quotient (HQ), as shown below.

$$HQ = \frac{ADD}{RfD}$$

where:

HQ = Hazard quotient; ratio of estimated dose to reference dose (unitless)
ADD= Estimated dose for non-carcinogenic chemicals (mg/kg-day)
RfD = Chronic reference dose for chemical (mg/kg-day)

The HQs for each chemical and all exposure pathways were summed to estimate the hazard index (HI) for each receptor, as follows:

$$HI = \sum_{n}^{1} HQ_i$$

where:

HI = Hazard index, unitless
HQi = as defined above, unitless

Since children are known to be more sensitive to chemical exposures, HQs and HIs estimated for children are higher than those estimated for adult receptors. Therefore, it is customary in risk assessments to report only HQs and HIs estimated for child receptors. This reporting convention is followed in this HHRA.

The estimated HIs are compared to an acceptable hazard level. Implicit in the HI is the assumption of a threshold level of exposure below which no adverse effects are expected to occur. For example, if the HI exceeds unity (because site-specific exposure exceeds the RfD), then the potential for non-cancer adverse effects may exist. In general, the greater the value above 1.0, the greater the potential hazard. In contrast, HIs of less than 1.0 indicate that no adverse health effects are expected to occur from exposure to chemicals at the Subject Property.

Using the maximum TPH concentrations detected in soil at the Subject Property, the total hazard index from residential exposures to onsite soil via incidental ingestion and dermal contact was estimated to be 0.02 (Table 7). Supporting calculations presented in Tables A-1 through A-4 of Appendix A.

6.3 SOIL EXPOSURE CANCER RISK ESTIMATES

This section discusses the calculation of the lifetime dose estimate and resulting carcinogenic risks from exposures to COPCs detected at the Subject Property.

Cancer risks are expressed as the upper-bound, increased likelihood of an individual developing cancer as a result of exposure to a particular chemical. For example, a cancer risk of 1E-04 refers to an upper-bound increased chance of one in ten thousand of developing cancer over a lifetime (0.01 percent risk). The potential increase in cancer risk from exposure to the chemicals detected in soil at the Subject Property is in addition to a background risk of Americans developing cancer. The background risk is one chance in three (0.3 or 3E-01) for every American female, and one chance in two (0.5 or 5E-01) for every American male, of eventually developing cancer (ACS, 1997). The chemical-specific exposure estimates (i.e., the lifetime average daily dose or LADD) are multiplied by the chemical- and route-specific slope factor to arrive at a unitless probability (e.g., 1E-05) of an individual developing cancer.

The LDD estimated for each COPC represents the estimated amount of chemical absorbed daily over a lifetime. The LDD is used to calculate a carcinogenic risk as follows:

$$CR = LDD \bullet SF$$

where:

CR = Upper-bound excess lifetime carcinogenic risk (unitless)
LDD = Lifetime Daily Dose (mg/kg/day)
SF = Slope factor $(mg/kg/day)^{-1}$

TPH is not considered to be carcinogenic (USEPA 2015). Therefore, cancer risks estimated to result from soils exposure at the Subject Property are considered to be essentially zero (Table 7). Supporting calculations presented in Tables A-5 through A-8 of Appendix A.

6.4 LEAD EXPOSURE HEALTH HAZARDS

Given the unique toxicological and pharmacological properties of lead, the Hazard Quotient method is inappropriate for this chemical. For lead, the DTSC (2015b) recommends comparing detected soil lead concentrations to published soil screening levels. For this evaluation, the soil screening levels published by the DTSC (2015b) was used as the soil screening concentration. The soil lead screening level for residential exposure scenarios has been set at 80 mg/kg (DTSC, 2015b). Only sample SB4-0.5 had a soil lead concentration higher than 80 mg/kg (Table 2). However, the 95 percent upper confidence limit on the arithmetic mean (95UCL) soil lead concentration for the Subject Property was estimated to be 30.93 mg/kg (Appendix E). Since this value is lower than the DTSC's screening level, it is concluded that lead in soil does not pose a health threat to future onsite residents.

6.5 VAPOR INTRUSION RISK CHARACTERIZATION

Potential cancer risks and health hazards that could results from vapor intrusion were evaluated using a slightly different method. The Johnson and Ettinger model used to simulate vapor intrusion contains a module for estimating potential doses as well as cancer risks and health hazards associated with a given dose. For this assessment, the Johnson and Ettinger model was used to estimate the potential health risks and hazards associated with indoor VOC exposures. Copies of the Johnson and Ettinger model spreadsheets used in this evaluation are included in Appendices B, C, and D.

The total Hazard Quotients estimated to result from inhalation of vapors emanating from the potential soil gas sources at 3, 5, and 15 feet bgs were estimated to be:

- 0.11 for VOCs detected at a depth of 3 feet bgs (Table 8);
- 0.11 for VOCs detected at a depth of 5 feet bgs (Table 9); and,
- 0.04 for VOCs detected at a depth of 15 feet bgs (Table 10).

All Hazard Quotients estimated to result from vapor intrusion into indoor air are below the benchmark value of 1.0. Copies of the models used to estimate health risks and hazard associated with exposure to indoor air are presented in Appendices B, C, and D.

The total cancer risk from indoor inhalation of vapors emanating from the potential soil gas sources at depths of 3, 5, and 15 feet bgs were estimated to be:

- 7.1E-07 for VOCs detected at a depth of 3 feet bgs (Table 8);
- 3.9E-06 for VOCs detected at a depth of 5 feet bgs (Table 9); and
- 8.5E-07 for VOCs detected at a depth of 15 feet bgs (Table 10).

Copies of the models used to estimate cancer risks and health hazards associated with exposure to indoor air are presented in Appendices B, C, and D.

The estimated excess cancer risks were compared to the risk level considered acceptable by federal and state regulatory agencies. The target cancer risk level identified by the DTSC (2015a) in the PEA Guidance Manual is one in one million (1E-06). However, the USEPA has established acceptable incremental cancer risk levels to be within the risk range of one in 10,000 (1E-04) and 1E-06; risks greater than 1E-04 are generally considered unacceptable. Cal-EPA has defined a risk of one in 100,000 (1E-05) as the "no significant level" for carcinogens under California's Safe Water and Toxic Enforcement Act (Proposition 65). Further, most California air districts use the 1E-05 risk level as the notification trigger level under California's AB2588 Toxic Hot Spots Program. Thus, although agencies will exercise caution in determining whether risks within the range of 1E-04 and 1E-06 require additional investigation or some form of risk management, there is a general precedent that predicted cancer risks that are on the low end of this range will generally be considered acceptable and not warrant further evaluation. Cancer risks estimated in this HHRA are very close to the 1E-06 benchmark and therefore considered to be acceptable.

The results are based on multiple health-protective assumptions. For example, it was assumed that a VOC source is located under a residential building at the Subject Property. The existing source of VOCs was also assumed to be large and strong enough to continuously release VOC vapors for up to 26 years.

7.0 SUMMARY AND CONCLUSIONS

The HHRA presented in this report evaluated the potential health risks posed by the presence of trace concentrations of metals and TPH in soil and VOCs in soil gas at the Subject Property.

Environmental investigations conducted at the Subject Property revealed the presence of trace quantities of man-made chemicals in soil and soil gas under the property. The only chemicals detected in soil were a few metals and TPH. Chemicals detected in soil gas included traces of petroleum-derived aromatic hydrocarbons and chlorinated hydrocarbons.

The potential vapor emissions that could be produced by detected VOCs were evaluated in the HHRA. The estimated vapor emissions were used to obtain potential indoor air chemical concentrations that could result from subsurface vapor intrusion. The potential health risk associated with VOC vapor intrusion and subsequent residential exposures were evaluated in this HHRA.

The current development plan for the Subject Property involves the construction of a multilevel residential complex in which case, future onsite residents will not be in contact with soils while at the Subject Property. However, it is conceivable that the residential complex could be surrounded by landscaped areas. Therefore, the incidental ingestion and dermal contact with impacted soil was considered to be an extremely unlikely but complete exposure pathway.

Screening-level emission estimation methods were used to predict potential chemical emissions and resulting residential exposures. The estimated exposure point concentrations were then used to estimate potential health risks for onsite residents.

In an effort to be protective of future occupants of the Subject Property, the HHRA evaluated health risks for the most sensitive and highly exposed individuals. The HHRA included the evaluation of adults and children exposed to soil and dust for 20 and 6 years, respectively. The child receptors evaluated were assumed to be exposed to high levels of dust and soil, 350 days a year for up to six years of their early lives. If residual chemicals do not pose a health risk to children (at an age when humans are more sensitive and vulnerable), then it is safe to say that

exposure to soils does not pose a health risk to other human receptors (such as construction and maintenance workers) who are not as sensitive and who will have shorter exposure durations.

The only organic chemicals detected in soil were TPH. TPH is not considered to be carcinogenic. Therefore, exposure to soil is deemed to pose no significant cancer risks to future onsite residents. Using the maximum TPH concentrations detected in soil at the Subject Property, the total hazard index from residential exposures to onsite soil via incidental ingestion and dermal contact was estimated to be 0.02 (Table 7). The Hazard Index generally considered acceptable to the DTSC is 1.0. Therefore, it can be concluded that TPH in soil does not pose a health threat to future onsite residents.

Results of the HHRA indicate that exposure to chemicals detected in soil gas could carry a potential cancer risk of less than four cancer cases in an exposed population of one million people (4E-06). The estimated incremental cancer risk is within the risk management range of 1E-05 and 1E-06 considered acceptable to the California Department of Toxic Substances Control (DTSC). The Hazard Indices estimated to result from inhalation of indoor air potentially impacted by VOCs detected in soil gas were all below 1.0 (Tables 8, 9 and 10). Therefore, it can be concluded that VOCs detected in soil gas at the Subject Property do not pose a health threat to future onsite residents.

As for lead in soil, the average soil lead concentration (represented by the 95UCL) was estimated to be 30.93 mg/kg. This value is lower than the DTSC's soil screening level for lead (80 mg/kg). Therefore, it is concluded that lead in soil does not pose a health threat to future onsite residents.

Based on the results of the HHRA, it is ETSI's opinion that site remediation is not warranted and that the Subject Property can be developed into a residential complex without the need to install a vapor intrusion mitigation system.

The risk and hazard calculations assumed multiple exposures to chemicals via incidental soil ingestion, dermal contact and inhalation of indoor vapors in accordance with USEPA (1989) and DTSC (2015a) guidance. The results are based on multiple health-protective assumptions. For example, it was assumed that a VOC reservoir is located under the Subject Property and that this

VOC reservoir is large and strong enough to continuously release VOC vapors for up to 26 years. However, no VOC reservoir is known to exist under the Subject Property.

All conclusions and recommendations presented in this report are based on reported chemical concentrations and the proposed future land use of the Subject Property. In this risk assessment, all fate-and-transport models, parameters, toxicity data and assumptions were applied in accordance with federal and state regulatory guidelines. These guidelines are meant to protect the public and tend to overestimate potential health risks. As such, this risk assessment provides an estimate of the upper boundary of potential health risks, rather than an accurate representation of true health risks posed by the Subject Property.

8.0 REFERENCES

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TABLES

Table 1
Summary of Organic Chemical Soil Analytical Results
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Sample ID	Total Petroleum Hydrocarbons (TPH) mg/kg		
	C6-C12	C13-C22	C23-C40
LB2-0.5	<1	<10	89
LB5-0.5	<1	21	140
LB9-0.5	<1	19	75
LB12-0.5	<1	30	220
LB13-0.5	<1	<10	120
LB14-0.5	<1	32	310
LB8-0.5	<1	<10	120
LB2-2	<1	<10	<10
LB8-2	<1	17	110
LB9-2	<1	<10	58
LB12-2	<1	12	150
LB12-2-D	<1	15	120
LB13-2	<1	24	230
LB14-2	<1	<10	120
LB2-5	<1	<10	<10
LB12-5	<1	130	200
LB13-5	<1	<10	<10
LB13-5-D	<1	<10	<10
LB25-5	<1	<10	<10
LB26-5	<1	31	50
LB27-5	<1	60	230
LB28-5	<1	<10	<10
LB2-10	<1	<10	<10
LB12-10	<1	41	160
LB13-10	<1	<10	<10
LB25-10	<1	<10	<10
LB26-10	<1	<10	<10
LB27-10	<1	<10	<10
LB28-10	<1	<10	<10

Notes:

mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
<1.0 = Not detected at concentrations greater than 0.01 mg/kg

Table 2
Summary of Soil Metal Analytical Results*
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Sample ID	Metals by EPA Method 6010B/7471A (mg/kg)									
	Antimony	Arsenic	Barium	Total Chromium	Cobalt	Copper	Lead	Nickel	Vanadium	Zinc
LB1-0.5	<2	<1	84	11	5.4	12	6.9	7.6	26	39
LB1-2	<2	<1	68	9.5	4.6	8.3	1.5	6.0	23	28
LB1-5	<2	<1	65	8.5	4.4	7.2	1.3	5.5	21	27
LB2-0.5	<2	2.4	68	11	6.0	19	33	7.3	23	63
LB2-2	<2	1.9	89	12	6.6	15	3.8	8.8	23	35
LB2-5	<2	1.0	49	6.7	3.2	6.1	3.1	4.1	19	19
LB4-0.5	4.8	2.5	81	13	4.8	31	93	8.3	26	61
LB4-2	<2	5.4	100	13	6.0	22	27	11	30	63
LB5-0.5	<2	2.6	69	11	4.9	18	31	7.5	24	50
LB8-0.5	<2	2.4	67	11	15	18	35	7.6	22	50
LB9-0.5	<2	3.3	64	11	4.2	14	39	7.0	22	52
LB10-0.5	<2	2.4	75	13	4.6	22	35	8.2	27	54
LB10-2	<2	2.6	77	12	4.9	20	38	8.6	25	59
LB10-5	<2	1.9	55	10	3.9	11	15	6.1	22	42
LB10-5-D	<2	5.2	64	9.3	4.0	14	22	6.8	21	44
LB14-0.5	<2	2.2	67	15	4.1	16	23	7.8	21	43
LB21-0.5	--	--	--	--	--	--	17	--	--	--
LB21-2	--	--	--	--	--	--	24	--	--	--
LB22-0.5	--	--	--	--	--	--	2.0	--	--	--
LB22-2	--	--	--	--	--	--	35	--	--	--
LB23-0.5	--	--	--	--	--	--	27	--	--	--
LB23-2	--	--	--	--	--	--	26	--	--	--
LB24-0.5	--	--	--	--	--	--	16	--	--	--
LB24-2	--	--	--	--	--	--	26	--	--	--
Max.	4.8	5.4	100	15	15	31	93	11	30	63
Screening Criteria	31	12.00	15,000	36,000	23	3,100	80	490	390	23,000

Notes:

* = Only metals detected in at least one sample are reported.

mg/kg = Milligrams per kilogram

Table 3
Summary of Soil Vapor Analytical Results
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Sample ID	Sample Depth (feet bgs)	Benzene	cis-1,2,-Dichloroethylene	Methylene chloride	Napthalene	n-Propylbenzene	Styrene	Tetrachloroethylene	Toluene	Trichloroethylene	1,3,5- Trimethylbenzene	1,2,4-Trimethylbenzene	m,p-Xylene
		(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
LB1-5	5.0	0.50	0.23	<0.10	0.07	<0.10	<0.10	0.05	<0.20	<0.02	<0.10	<0.10	<0.10
LB1-15	15	0.26	0.19	<0.10	<0.02	<0.10	<0.10	0.16	<0.20	0.31	<0.10	<0.10	<0.10
LB2-5	5.0	<0.02	<0.10	<0.10	<0.02	<0.10	<0.10	2.9	<0.20	<0.02	<0.10	<0.10	<0.10
LB2-15	15	<0.02	<0.10	<0.10	<0.02	<0.10	<0.10	2.2	<0.20	0.05	<0.10	<0.10	<0.10
LB3-5	5.0	0.02	<0.10	<0.10	<0.02	<0.10	<0.10	2.0	<0.20	<0.02	<0.10	<0.10	<0.10
LB4-5	5.0	0.04	<0.10	<0.10	<0.02	<0.10	<0.10	0.09	0.39	<0.02	<0.10	<0.10	<0.10
LB4-15	15	0.05	<0.10	<0.10	<0.02	<0.10	<0.10	0.24	0.46	<0.02	<0.10	0.14	0.12
LB4-15 REP	15	0.03	<0.10	<0.10	<0.02	<0.10	<0.10	0.13	0.22	<0.02	<0.10	<0.10	<0.10
LB5-3	3.0	<0.02	<0.10	<0.10	<0.02	<0.10	<0.10	0.07	<0.20	<0.02	<0.10	<0.10	<0.10
LB6-3.5	3.5	0.08	<0.10	<0.10	<0.02	0.43	<0.10	0.09	<0.20	0.02	0.65	1.1	<0.10
LB9-3.5	3.5	0.06	<0.10	<0.10	<0.02	<0.10	<0.10	0.12	<0.20	0.03	<0.10	<0.10	<0.10
LB10-5	5.0	0.07	<0.10	<0.10	<0.02	<0.10	<0.10	<0.02	0.41	<0.02	<0.10	<0.10	<0.10
LB11-3	3.0	0.03	<0.10	0.15	<0.02	<0.10	<0.10	0.11	<0.20	<0.02	<0.10	0.18	<0.10
LB13-5	5.0	0.05	<0.10	<0.10	0.05	<0.10	<0.10	0.08	0.44	<0.02	<0.10	<0.10	<0.10
LB13-15	15	0.06	<0.10	<0.10	<0.02	<0.10	<0.10	0.06	<0.20	<0.02	<0.10	<0.10	<0.10
LB14-2.5	2.5	0.03	<0.10	<0.10	<0.02	<0.10	0.14	<0.02	<0.20	<0.02	<0.10	<0.10	<0.10
LB15-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	1.10	<0.020	<0.020	<0.020	<0.020	<0.020
LB15-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	2.30	<0.020	<0.020	<0.020	<0.020	<0.020
LB16-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.995	<0.020	<0.020	<0.020	<0.020	<0.020
LB16-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	1.96	<0.020	<0.020	<0.020	<0.020	<0.020
LB17-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.582	<0.020	<0.020	<0.020	<0.020	<0.020
LB17-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.935	<0.020	0.293	<0.020	<0.020	<0.020
LB18-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.246	<0.020	<0.020	<0.020	<0.020	<0.020
LB18-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.861	<0.020	<0.020	<0.020	<0.020	<0.020
LB19-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.200	<0.020	<0.020	<0.020	<0.020	<0.020
LB19-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	1.36	<0.020	<0.020	<0.020	<0.020	<0.020
LB19-15 DUP	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	1.43	<0.020	<0.020	<0.020	<0.020	<0.020
LB20-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.177	<0.020	<0.020	<0.020	<0.020	<0.020
LB20-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	2.17	<0.020	0.305	<0.020	<0.020	<0.020
LB25-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.180	<0.020	<0.020	<0.020	<0.020	<0.020
LB25-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.220	<0.020	<0.020	<0.020	<0.020	<0.020
LB26-5	5.0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.110	<0.020	<0.020	<0.020	<0.020	<0.020
LB26-15	15	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.181	<0.020	<0.020	<0.020	<0.020	<0.020

Notes:

<X = Not detected at concentrations greater than X ug/L
µg/L = Micrograms per liter
bgs = Below ground surface
REP = Duplicate sample

Table 4
Exposure Parameters Used to Characterize Onsite Receptors
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Exposure Parameters	Units	Residential Scenario		
		Adult	Child	Source
Soil Ingestion Rate (IR-S)	mg/day	100	200	DTSC 2014
Skin Surface Area (SA)	cm^2/day	6,032	2,900	DTSC 2014
Skin Adsorption Factor (ABS)	unitless	chem-specific	chem-specific	DTSC 1994/USEPA 1997a
Adherence Factor (AF)	mg/cm^2	0.07	0.20	DTSC 2014
Fraction of Soil Exposed (FE)	unitless	1.0	1.0	DTSC 2014
Inhalation Rate of Air (IR-A)	m^3/day	20	10	DTSC 2014
Exposure Frequency (EF)	days/year	350	350	DTSC 2014
Exposure Frequency (dermal; EFd)	days/year	350	350	DTSC 2014
Exposure Duration (ED)	years	20	6	DTSC 2014
Exposure Time (ET)	hours	24	24	DTSC 2014
Conversion Factor (CF)	kg/mg	1.0E-06	1.0E-06	--
Body Weight (BW)	kg	80	15	DTSC 2014
Averaging Time for Noncarcinogens (AT_n)	days	7,300	2,190	USEPA 1989 (ED*365 dys/yr)
Averaging Hours for Noncarcinogens (AT_n)	hours	175,200	52,560	USEPA 2009
Averaging Time for Carcinogens (AT_c)	days	25,550	25,550	USEPA 1989
Averaging Hours for Carcinogens (AT_c)	hours	613,200	613,200	USEPA 2009

Table 5
Particulate Emission Factor Calculation
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Soil Parameters	Value Used	Units	Reference
Water filled soil porosity (Theta w)	0.15	(Lwater-Lsoil)	Site Specific
Total soil porosity (n)	0.43	(Lpore-Lsoil)	Site Specific
Air filled soil porosity (Theta a)	0.28	(Lair-Lsoil)	Site Specific
Soil particle density (ps)	2.50	g/cm^3	Site Specific
Exposure Interval (T)	9.50E+08	sec	Default (EPA 1996)
Soil Bulk Density (Pb)	1.62	g/cm^3	Site Specific
Fraction organic carbon in soil	2.00E-03	unitless	Site Specific
Inverse of mean concentration (Q/C)	68.81	(g/m^2-s per kg/m^3)	Default for a 10-acre site in Los Angeles (EPA 1996)
Fraction of vegetative cover (G)	0.5	unitless	Default (EPA 1996)
Mean Annual Wind speed (Um)	4.69	m/s	Default (EPA 1996)
Equivalent threshold value of wind speed at 7m (Ut)	11.32	m/s	Default (EPA 1996)
Function dependent on Um/Ut (Fx)	1.94E-01	unitless	Default (EPA 1996)
Particulate Emission Factor (PEF)	9.97E+08	m^3/kg	Calculated

Formulas:

PEF = Q/C*[3600/(0.036* (1-G) * $(Um/Ut)^3$ * Fx)]

Q/C = inverse of mean concentration at center of a 0.5 acre square source (g/m2-s per kg/m3)

G = fraction of vegetative cover (unitless)

Um = mean annual wind speed (m/s)

Ut = equivalent threshold value of wind speed at 7 meters (m/s)

F(x) = function dependent on Um/Ut (unitless)

Table 6
Toxicity Criteria of Chemicals of Potential Concern
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

Chemical	Chronic Oral Reference Dose (RfDo) [mg/kg-day]		Inhalation Reference Concentration (RfCi) [ug/m^3]		Oral Cancer Slope Factor (CSFo) [mg/kg-day]$^{-1}$		Inhalation Unir Risk (IUR) [ug/m^3]$^{-1}$	
TPH								
TPH-DRO (C13-C22) aliphatic	1.0E-02	e	1.0E+02	e	NA	e	NA	e
TPH-ORO (C23-C40) aliphatic	3.0E+00	e	NA	e	NA	e	NA	e
VOCs								
1,2-Dichloroethylene (cis)	NA		7.0E-03	c	NA		0.0E+00	c
1,2,4-Trimethylbenzene	NA		7.0E-03	c	NA		0.0E+00	c
1,3,5-Trimethylbenzene	NA		3.5E-02	c	NA		0.0E+00	c
Benzene	NA		3.0E-03	c	NA		2.9E-05	c
Methylene chloride	NA		4.0E-01	c	NA		1.0E-06	c
n-Propylbenzene	NA		1.0E+00	c	NA		0.0E+00	c
Naphthalene	NA		3.0E-03	c	NA		3.4E-05	c
Styrene	NA		9.0E-01	c	NA		0.0E+00	c
Tetrachloroethylene	NA		3.5E-02	c	NA		5.9E-06	c
Toluene	NA		3.0E-01	c	NA		0.0E+00	c
Trichloroethylene	NA		2.0E-03	c	NA		4.1E-06	c
Xylenes, total	NA		1.0E-01	c	NA		0.0E+00	c

Notes:
c = Cal/EPA Cancer Potency Database 2015
e = U.S. EPA Region 9, Regional Screening Levels tables

Table 7
Estimated Cumulative Risks and Health Hazards from Multipathway Soil Exposure
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Residential Exposure Scenario		
	Maximum Detected Concentration (mg/kg)	Cancer Risk Adult & Child	Hazard Index Child
TPH			
TPH-DRO (C13-C22) aliphatic	130	--	2.1E-01
TPH-ORO (C23-C40) aliphatic	310	--	1.7E-03
TOTAL RISKS and HAZARDS		**0.0E+00**	**2.2E-01**

Notes:
" * " compound not a COPC; " -- " Not Applicable
Includes Incidental Soil Ingestion, Dermal Contact, and Fugitive Dust Inhalation for metals, PAHs, pesticides, TPH and VOCs
EPC: Exposure Point Concentration in milligrams per kilogram used in the risk and hazard calculations

Table 8
Estimated Incremental Cancer Risks and Health Hazards that May Result
From Inhalation of VOCs Detected at a Depth of 3 Feet Below Ground Surface
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Residential Exposure Scenario		
	Estimated Indoor Air Conc. (ug/m^3)	Cancer Risk	Hazard Quotient
VOCs			
1,2-Dichloroethylene (cis)	0.0E+00	0.0E+00	0.0E+00
1,2,4-Trimethylbenzene	5.3E-01	0.0E+00	7.3E-02
1,3,5-Trimethylbenzene	3.1E-01	0.0E+00	8.6E-03
Benzene	5.2E-02	5.4E-07	1.7E-02
Methylene chloride	1.1E-01	3.8E-08	2.6E-04
n-Propylbenzene	2.1E-01	0.0E+00	2.0E-04
Naphthalene	0.0E+00	0.0E+00	0.0E+00
Styrene	7.7E-02	0.0E+00	8.2E-05
Tetrachloroethylene	5.0E-02	1.1E-07	1.4E-03
Toluene	0.0E+00	0.0E+00	0.0E+00
Trichloroethylene	1.6E-02	2.3E-08	7.7E-03
Xylenes, total	0.0E+00	0.0E+00	0.0E+00
TOTAL RISKS and HAZARDS		**7.1E-07**	**1.1E-01**

Notes:
" * " compound not a COPC; " -- " Not Applicable
Includes Indoor Inhalation of VOCs.
EPC: Exposure Point Concentration in milligrams per cubic meter of air.

Table 9
Estimated Incremental Cancer Risks and Health Hazards that May Result
From Inhalation of VOCs Detected at a Depth of 5 Feet Below Ground Surface
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Residential Exposure Scenario		
	Estimated Indoor Air Conc. (ug/m^3)	Cancer Risk	Hazard Quotient
VOCs			
1,2-Dichloroethylene (cis)	9.4E-02	0.0E+00	1.3E-02
1,2,4-Trimethylbenzene	0.0E+00	0.0E+00	0.0E+00
1,3,5-Trimethylbenzene	0.0E+00	0.0E+00	0.0E+00
Benzene	2.1E-01	2.1E-06	6.6E-02
Methylene chloride	0.0E+00	0.0E+00	0.0E+00
n-Propylbenzene	0.0E+00	0.0E+00	0.0E+00
Naphthalene	2.1E-02	2.5E-07	6.7E-03
Styrene	0.0E+00	0.0E+00	0.0E+00
Tetrachloroethylene	7.3E-01	1.5E-06	2.0E-02
Toluene	1.6E-01	0.0E+00	5.2E-04
Trichloroethylene	0.0E+00	0.0E+00	0.0E+00
Xylenes, total	0.0E+00	0.0E+00	0.0E+00
TOTAL RISKS and HAZARDS		**3.9E-06**	**1.1E-01**

Notes:
" * " compound not a COPC; " -- " Not Applicable
Includes Indoor Inhalation of VOCs.
EPC: Exposure Point Concentration in milligrams per cubic meter of air.

Table 10
Estimated Incremental Cancer Risks and Health Hazards that May Result
From Inhalation of VOCs Detected at a Depth of 15 Feet Below Ground Surface
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Residential Exposure Scenario		
	Estimated Indoor Air Conc. (ug/m^3)	Cancer Risk	Hazard Quotient
VOCs			
1,2-Dichloroethylene (cis)	2.7E-02	0.0E+00	3.7E-03
1,2,4-Trimethylbenzene	1.4E-02	0.0E+00	1.9E-03
1,3,5-Trimethylbenzene	0.0E+00	0.0E+00	0.0E+00
Benzene	3.8E-02	3.9E-07	1.2E-02
Methylene chloride	0.0E+00	0.0E+00	0.0E+00
n-Propylbenzene	0.0E+00	0.0E+00	0.0E+00
Naphthalene	0.0E+00	0.0E+00	0.0E+00
Styrene	0.0E+00	0.0E+00	0.0E+00
Tetrachloroethylene	1.9E-01	4.1E-07	5.3E-03
Toluene	5.9E-02	0.0E+00	1.9E-04
Trichloroethylene	3.5E-02	5.1E-08	1.7E-02
Xylenes, total	1.4E-02	0.0E+00	1.3E-04
TOTAL RISKS and HAZARDS		**8.5E-07**	**4.0E-02**

Notes:
" * " compound not a COPC; " -- " Not Applicable
Includes Indoor Inhalation of VOCs.
EPC: Exposure Point Concentration in milligrams per cubic meter of air.

FIGURES

Project: 11056.001	Eng/Geol: JH
Scale:1 " = 2,000 '	Date: June 2015

Base Map: ESRI ArcGIS Online 2015
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

SITE LOCATION MAP

2800 Casitas Avenue
Los Angeles, California

Figure 1

Leighton

Map Saved as P:\Drafting\11056\001\Maps\11056-001_F01_SLM_20150624.mxd on 6/24/2015 10:29:30 AM

LEGEND

- Approximate Subject Site Boundary
- LB14 Previous Boring Location (August 2015)
- LB20 Soil Gas Sampling Location (December 2015)
- LB24 Soil Sampling Location (December 2015)
- LB26 Soil/Soil Gas Sampling Location (December 2015)

N

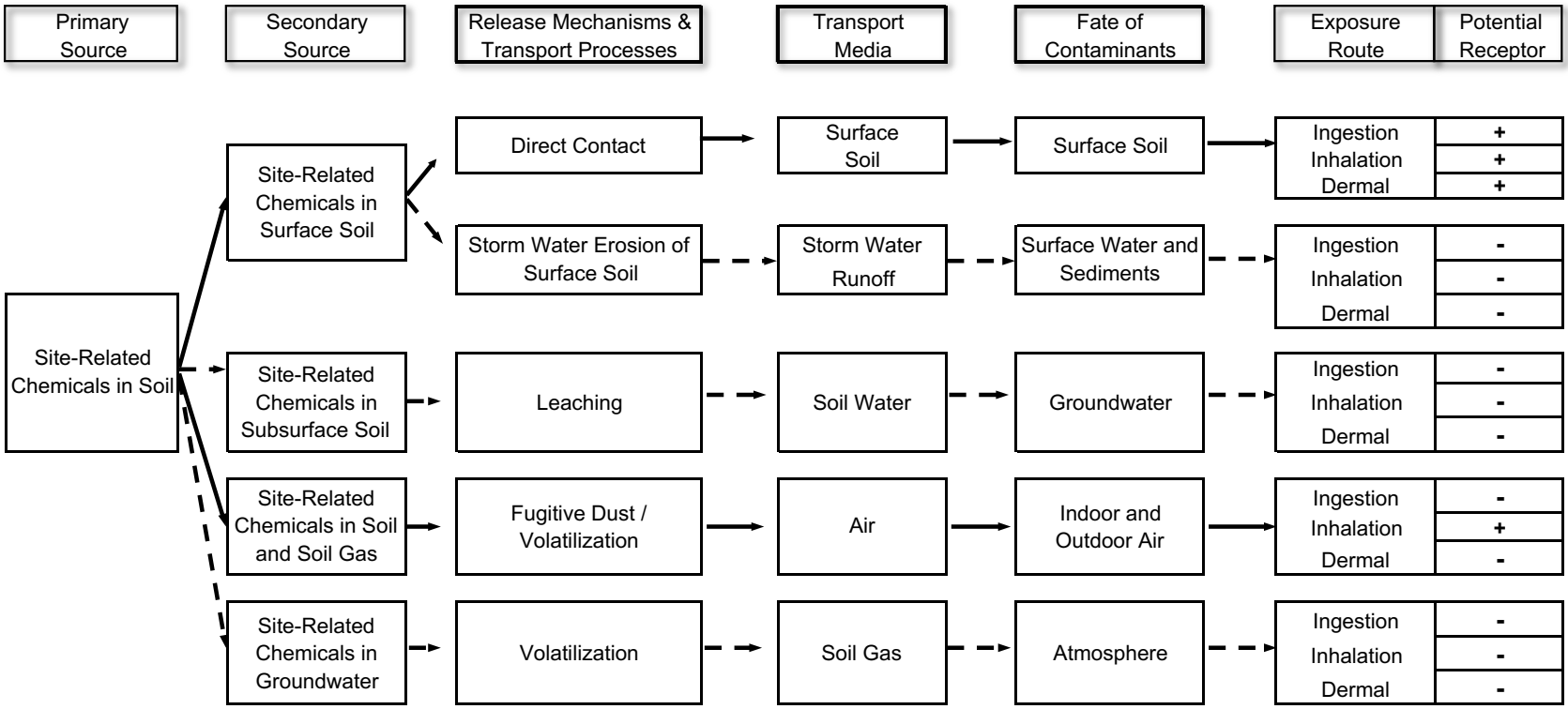
SITE PLAN

2750 and 2800 Casitas Avenue and
2800 Kerr Street
Los Angeles, California

Project No.	11056.004
Scale	Not to Scale
Engr./Geol.	BFM
Drafted By	BFM
Date	December 2015

Leighton

Figure 2



ENVIRO-TOX services, inc.

Figure 3

Conceptual Site Model

Date:	01/25/16
Project	Casitas HHRA
Source	

APPENDIX A

Cancer Risk and Health Hazard Calculation Spreadsheets

Table A-1
Health Hazards from Incidental Soil Ingestion
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Concentration (mg/kg)	Oral Reference Dose (mg/kg-d)	Residential Scenario	
			Average Daily Intake (mg/kg-d) Child	Hazard Quotient (Unitless) Child
TPH				
TPH-DRO (C13-C22) aliphatic	130	1.0E-02	1.66E-03	1.66E-01
TPH-ORO (C23-C40) aliphatic	310	3.0E+00	3.96E-03	1.32E-03
Total Hazard Index				**1.7E-01**

Notes:
"--" not applicable or not available
Equations:
Child $INTAKE_{noncancer}$ (mg/kg-day) = (($CS_{residential}$ * IR-S_{child} * EF_{child} * ED_{child} * CF) / (BW_{child} * $AT_{noncancer}$))
Noncancer Hazard = ($INTAKE_{noncancer}$ / RfD)

Table A-2
Health Hazards from Dermal Contact with Soil
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Concentration (mg/kg)	Soil-to-Skin Absorption Factor (unitless)	Oral/Dermal Reference Dose (mg/kg-d)	Residential Scenario	
				Average Daily Intake (mg/kg-d) Child	Hazard Quotient (Unitless) Child
TPH					
TPH-DRO (C13-C22) aliphatic	130	0.1	1.0E-02	4.82E-04	4.82E-02
TPH-ORO (C23-C40) aliphatic	310	0.1	3.0E+00	1.15E-03	3.83E-04
Total Hazard Index					**4.9E-02**

Notes:
"--" not applicable or not available
Equations:
Child $INTAKE_{noncancer}$ (mg/kg-day) = (($CS_{residential}$ * SA_{child} * AF_{child} * ABS * EF_{child} * ED_{child} * CF) / (BW_{child} * $AT_{noncancer}$))
Noncancer Hazard = ($INTAKE_{noncancer}$ / RfD)

Table A-3
Health Hazards from Inhalation of Outdoor Air
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Concentration (mg/kg)	PEF or VEF (m^3/kg)	Inhalation Reference Concentration[a] (ug/m^3)	Residential Scenario	
				Exposure Concentration (ug/m^3) Child	Hazard Quotient (Unitless) Child
TPH					
TPH-DRO (C13-C22) aliphatic	130	9.97E+08	1.0E+02	1.25E-04	1.25E-06
TPH-ORO (C23-C40) aliphatic	310	9.97E+08	NA	2.98E-04	NA
Total Hazard Index					**1.2E-06**

Notes:
"--" not applicable or not available
Equations:
Particulate: Child Exposure-$_{noncancer}$ (ug/m^3) = ($CS_{residential}$ *(1/PEF) * EF_{child} * ED_{child} * ET_{child}) / ($AT_{noncancer}$))
VOCs: Child Exposure-$_{noncancer}$ (ug/m^3) = ($CS_{residential}$ * Etchild * EF_{child} * ED_{child} * (1/VF)) / ($AT_{noncancer}$))
Noncancer Hazard = ($INTAKE_{noncancer}$ / RfD)

Table A-4
Cumulative Health Hazards from Multipathway Soil Exposure
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Conc. (mg/kg)	Residential Noncancer Hazard			
		Child Resident			
		Ingestion of Soil	Dermal	Inhalation	Total HI
TPH					
TPH-DRO (C13-C22) aliphatic	130	1.66E-01	4.82E-02	1.25E-06	2.1E-01
TPH-ORO (C23-C40) aliphatic	310	1.32E-03	3.83E-04	NA	1.7E-03
Total Hazard Index					**2.2E-01**

Note:
"--" not applicable or not available

Table A-5
Cancer Risks from Incidental Soil Ingestion
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Concentration (mg/kg)	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Residential Scenario	
			Average Daily Intake (mg/kg-d) Adult & Child	Cancer Risk (Unitless) Adult & Child
TPH				
TPH-DRO (C13-C22) aliphatic	130	NA	1.87E-04	NA
TPH-ORO (C23-C40) aliphatic	310	NA	4.46E-04	NA
Total Cancer Risk				**0.0E+00**

Notes:
"--" not applicable or not available
Equations:
Adult/Child $INTAKE_{cancer}$ (mg/kg-day) = $(CS_{residential} * EF * ING_{adjusted} * CF) / (AT_{cancer})$
Where $ING_{adjusted} = [(IR\text{-}S_{child} * ED_{child} / BW_{child}) + (IR\text{-}S_{adult} * ED_{adult} / BW_{adult})]$
Cancer Risk = $(INTAKE_{cancer} * CSF)$

Table A-6
Cancer Risks from Dermal Contact with Soil
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Concentration (mg/kg)	Soil-to-Skin Absorption Factor (unitless)	Oral/Dermal Slope Factor $(mg/kg\text{-}d)^{-1}$	Residential Scenario	
				Average Daily Intake (mg/kg-d) Adult & Child	Cancer Risk (Unitless) Adult & Child
TPH					
TPH-DRO (C13-C22) aliphatic	130	0.1	NA	6.01E-05	NA
TPH-ORO (C23-C40) aliphatic	310	0.1	NA	1.43E-04	NA
Total Cancer Risk					**0.0E+00**

Notes:
"--" not applicable or not available
Equations:
Adult/Child $INTAKE_{cancer}$ (mg/kg-day) = $(CS_{residential} * SAF_{adjusted} * ABS * CF) / (AT_{cancer})$
Where $SAF_{adjusted} = [(SA_{child} * AF_{child} * EF_{child} * ED_{child} / BW_{child}) + (SA_{adult} * AF_{adult} * EF_{adult} * ED_{adult} / BW_{adult})]$
Cancer Risk = $(INTAKE_{cancer} * CSF)$

Table A-7
Cancer Risks from Inhalation of Outdoor Air
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Maximum Soil Concentration (mg/kg)	PEF or VF (m3/kg)	Inhalation Unit Risk $(ug/m^3)^{-1}$	Residential Scenario	
				Exposure Concentration (mg/kg-d) Adult & Child	Cancer Risk (Unitless) Adult & Child
TPH					
TPH-DRO (C13-C22) aliphatic	130	9.97E+08	NA	4.64E-05	NA
TPH-ORO (C23-C40) aliphatic	310	9.97E+08	NA	1.11E-04	NA
Total Cancer Risk					**0.0E+00**

Notes:
"--" not applicable or not available
Equations:
Particulate Exposure Concentartion (ug/m^3) = $(CS*EF_{child}*ED_{child}*ET_{child})/(PEF*AT_c))+(CS*EF_{adult}*ED_{adult}*ET_{adult})/(PEF*AT_c))$
VOC Exposure Concentration (ug/m^3) = (CS * EF * ED * ET) / (VF * ATc)
Cancer Risk = $(INTAKE_{cancer} * CSF)$

Table A-8
Cumulative Cancer Risks from Multipathway Soil Exposure
Residential Exposure Scenario
2750 and 2800 Casitas Avenue and 2800 Kerr Street
Los Angeles, California

COPC	Max. Resid Soil Conc. (mg/kg)	Residential Cancer Risk			
		Adult & Child Resident			
		Ingestion	Dermal	Inhalation	Total Risk
TPH					
TPH-DRO (C13-C22) aliphatic	130	NA	NA	NA	--
TPH-ORO (C23-C40) aliphatic	310	NA	NA	NA	--
Total Cancer Risk					**0.0E+00**

Note:
"--" not applicable or not available

APPENDIX B

Johnson and Ettinger Model Spreadsheets for VOCs Detected at a Depth of 3 Feet Below Ground Surface

USEPA SG-SCREEN
Version 2.0, 04/2003

DTSC Modification March 2014

Department of Toxic Substances Control
Vapor Intrusion Screening Model - Soil Gas

DATA ENTRY SHEET

Land Use: **Residential**

Exposure Scenario: **For VOCs Detected at a Depth of 3 Feet Below Ground Surface**

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Soil Gas Conc. ($\mu g/m^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu g/m^3$)	Cancer Risk (unitless)	Noncancer Hazard (unitless)
156592	0.00E+00			cis-1,2-Dichloroethylene	0.00E+00	6.5E-04	0.0E+00	NA	0.0E+00
95636	1.10E+03			1,2,4-Trimethylbenzene	1.10E+03	4.9E-04	5.3E-01	NA	7.3E-02
108678	6.50E+02			1,3,5-Trimethylbenzene	6.50E+02	4.8E-04	3.1E-01	NA	8.6E-03
71432	8.00E+01			Benzene	8.00E+01	6.6E-04	5.2E-02	5.4E-07	1.7E-02
75092	1.50E+02			Methylene chloride (dichloromethane)	1.50E+02	7.1E-04	1.1E-01	3.8E-08	2.6E-04
103651	4.30E+02			n-Propylbenzene	4.30E+02	4.8E-04	2.1E-01	NA	2.0E-04
91203	0.00E+00			Naphthalene	0.00E+00	4.9E-04	0.0E+00	0.0E+00	0.0E+00
100425	1.40E+02			Styrene	1.40E+02	5.5E-04	7.7E-02	NA	8.2E-05
127184	1.20E+02			Tetrachloroethylene	1.20E+02	4.2E-04	5.0E-02	1.1E-07	1.4E-03
108883	0.00E+00			Toluene	0.00E+00	5.9E-04	0.0E+00	NA	0.0E+00
79016	3.00E+01			Trichloroethylene	3.00E+01	5.4E-04	1.6E-02	2.3E-08	7.7E-03
95476	0.00E+00			o-Xylene	0.00E+00	5.4E-04	0.0E+00	NA	0.0E+00
					TOTAL			7.1E-07	1.1E-01

Results Summary

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	91.44	24	SC		

MORE ↓

Lookup Soil Parameters

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE ↓

ENTER Averaging time for carcinogens,	ENTER Averaging time for noncarcinogens,	ENTER Exposure duration,	ENTER Exposure frequency,	ENTER Exposure Time	ENTER Air Exchange Rate	ENTER Ceiliing Height

	Lookup Receptor Parameters	AT_C (yrs)	AT_{NC} (yrs)	ED (yrs)	EF (days/yr)	ET (hrs/day)	ACH $(hour)^{-1}$	CH (cm)
EW=>	Residential	70	26	26	350	24	0.5	243.84
						(NEW)	(NEW)	(= **8.0** feet)
	END							

CAS	Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$
156592	cis-1,2-Dichloroethylene	8.84E-02	1.13E-05	4.08E-03	25	7,192	333.65	544.00	0.0E+00
95636	1,2,4-Trimethylbenzene	6.07E-02	7.92E-06	6.16E-03	25	9,369	442.30	649.17	0.0E+00
108678	1,3,5-Trimethylbenzene	6.02E-02	7.84E-06	8.77E-03	25	9,321	437.89	637.25	0.0E+00
71432	Benzene	8.95E-02	1.03E-05	5.55E-03	25	7,342	353.24	562.16	2.9E-05
75092	Methylene chloride (dichloromethane)	9.99E-02	1.25E-05	3.25E-03	25	6,706	313.00	510.00	1.0E-06
103651	n-Propylbenzene	6.02E-02	7.83E-06	1.05E-02	25	9,123	432.20	630.00	0.0E+00
91203	Naphthalene	6.05E-02	8.38E-06	4.40E-04	25	10,373	491.14	748.40	3.4E-05
100425	Styrene	7.11E-02	8.78E-06	2.75E-03	25	8,737	418.31	636.00	0.0E+00
127184	Tetrachloroethylene	5.05E-02	9.46E-06	1.77E-02	25	8,288	394.40	620.20	5.9E-06
108883	Toluene	7.78E-02	9.20E-06	6.64E-03	25	7,930	383.78	591.79	0.0E+00
79016	Trichloroethylene	6.87E-02	1.02E-05	9.85E-03	25	7,505	360.36	544.20	4.1E-06
95476	o-Xylene	6.89E-02	8.53E-06	5.18E-03	25	8,661	417.60	630.30	0.0E+00

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 3 Feet Below Ground Surface

CAS	Chemical	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)
156592	cis-1,2-Dichloroethylene	7.0E-03	96.94	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
95636	1,2,4-Trimethylbenzene	7.0E-03	120.20	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
108678	1,3,5-Trimethylbenzene	3.5E-02	120.20	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
71432	Benzene	3.0E-03	78.11	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
75092	Methylene chloride (dichloromethane)	4.0E-01	84.93	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
103651	n-Propylbenzene	1.0E+00	120.19	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
91203	Naphthalene	3.0E-03	128.18	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
100425	Styrene	9.0E-01	104.15	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
127184	Tetrachloroethylene	3.5E-02	165.83	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
108883	Toluene	3.0E-01	92.14	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
79016	Trichloroethylene	2.0E-03	131.39	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09
95476	o-Xylene	1.0E-01	106.17	76.44	0.188	0.299	1.78E-09	0.837	1.49E-09

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 3 Feet Below Ground Surface

CAS	Chemical	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)
156592	cis-1,2-Dichloroethylene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	7,592	3.91E-03
95636	1,2,4-Trimethylbenzene	4,000	1.10E+03	3.39E+04	1.00E+06	5.00E-03	15	11,516	5.77E-03
108678	1,3,5-Trimethylbenzene	4,000	6.50E+02	3.39E+04	1.00E+06	5.00E-03	15	11,495	8.22E-03
71432	Benzene	4,000	8.00E+01	3.39E+04	1.00E+06	5.00E-03	15	7,977	5.30E-03
75092	Methylene chloride (dichloromethane)	4,000	1.50E+02	3.39E+04	1.00E+06	5.00E-03	15	6,884	3.13E-03
103651	n-Propylbenzene	4,000	4.30E+02	3.39E+04	1.00E+06	5.00E-03	15	11,186	9.85E-03
91203	Naphthalene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	12,768	4.09E-04
100425	Styrene	4,000	1.40E+02	3.39E+04	1.00E+06	5.00E-03	15	10,294	2.59E-03
127184	Tetrachloroethylene	4,000	1.20E+02	3.39E+04	1.00E+06	5.00E-03	15	9,410	1.68E-02
108883	Toluene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	9,001	6.31E-03
79016	Trichloroethylene	4,000	3.00E+01	3.39E+04	1.00E+06	5.00E-03	15	8,382	9.39E-03
95476	o-Xylene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	10,245	4.89E-03

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 3 Feet Below Ground Surface

CAS	Chemical	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{V} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)
156592	cis-1,2-Dichloroethylene	1.60E-01	1.80E-04	2.29E-03	76.44	15	0.00E+00	1.25	8.33E+01	2.29E-03
95636	1,2,4-Trimethylbenzene	2.37E-01	1.80E-04	1.57E-03	76.44	15	1.10E+03	1.25	8.33E+01	1.57E-03
108678	1,3,5-Trimethylbenzene	3.37E-01	1.80E-04	1.56E-03	76.44	15	6.50E+02	1.25	8.33E+01	1.56E-03
71432	Benzene	2.18E-01	1.80E-04	2.31E-03	76.44	15	8.00E+01	1.25	8.33E+01	2.31E-03
75092	Methylene chloride (dichloromethane)	1.28E-01	1.80E-04	2.58E-03	76.44	15	1.50E+02	1.25	8.33E+01	2.58E-03
103651	n-Propylbenzene	4.04E-01	1.80E-04	1.55E-03	76.44	15	4.30E+02	1.25	8.33E+01	1.55E-03
91203	Naphthalene	1.68E-02	1.80E-04	1.58E-03	76.44	15	0.00E+00	1.25	8.33E+01	1.58E-03
100425	Styrene	1.06E-01	1.80E-04	1.84E-03	76.44	15	1.40E+02	1.25	8.33E+01	1.84E-03
127184	Tetrachloroethylene	6.88E-01	1.80E-04	1.30E-03	76.44	15	1.20E+02	1.25	8.33E+01	1.30E-03
108883	Toluene	2.59E-01	1.80E-04	2.01E-03	76.44	15	0.00E+00	1.25	8.33E+01	2.01E-03
79016	Trichloroethylene	3.85E-01	1.80E-04	1.77E-03	76.44	15	3.00E+01	1.25	8.33E+01	1.77E-03
95476	o-Xylene	2.00E-01	1.80E-04	1.78E-03	76.44	15	0.00E+00	1.25	8.33E+01	1.78E-03

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 3 Feet Below Ground Surface

CAS	Chemical	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
156592	cis-1,2-Dichloroethylene	5.00E+03	4.72E+31	**6.50E-04**	0.00E+00	NA	7.0E-03	**NA**	**0.0E+00**
95636	1,2,4-Trimethylbenzene	5.00E+03	1.46E+46	**4.86E-04**	5.35E-01	NA	7.0E-03	**NA**	**7.3E-02**
108678	1,3,5-Trimethylbenzene	5.00E+03	3.31E+46	**4.83E-04**	3.14E-01	NA	3.5E-02	**NA**	**8.6E-03**
71432	Benzene	5.00E+03	1.93E+31	**6.56E-04**	5.24E-02	2.9E-05	3.0E-03	**5.4E-07**	**1.7E-02**
75092	Methylene chloride (dichloromethane)	5.00E+03	1.03E+28	**7.10E-04**	1.07E-01	1.0E-06	4.0E-01	**3.8E-08**	**2.6E-04**
103651	n-Propylbenzene	5.00E+03	3.77E+46	**4.83E-04**	2.08E-01	NA	1.0E+00	**NA**	**2.0E-04**
91203	Naphthalene	5.00E+03	7.72E+45	**4.88E-04**	0.00E+00	3.4E-05	3.0E-03	**0.0E+00**	**0.0E+00**
100425	Styrene	5.00E+03	2.30E+39	**5.51E-04**	7.72E-02	NA	9.0E-01	**NA**	**8.2E-05**
127184	Tetrachloroethylene	5.00E+03	3.33E+55	**4.18E-04**	5.02E-02	5.9E-06	3.5E-02	**1.1E-07**	**1.4E-03**
108883	Toluene	5.00E+03	1.01E+36	**5.90E-04**	0.00E+00	NA	3.0E-01	**NA**	**0.0E+00**
79016	Trichloroethylene	5.00E+03	6.36E+40	**5.36E-04**	1.61E-02	4.1E-06	2.0E-03	**2.3E-08**	**7.7E-03**
95476	o-Xylene	5.00E+03	4.36E+40	**5.38E-04**	0.00E+00	NA	1.0E-01	**NA**	**0.0E+00**
							TOTAL	7.1E-07	1.1E-01

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 3 Feet Below Ground Surface

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

NEW => Receptor Lookup Table (added by HERO)

Receptor Type	AT_C (yrs)	AT_{NC} (yrs)	ED (yrs)	EF (days/yr)	ET (hrs/day)	ACH (1/hour)
Residential	70	26	26	350	24	0.5
Commercial	70	25	25	250	8	1
User-Defined						

Notes on Toxicity Criteria (see cell comments for individual chemical toxicity values)

1. Chemical name (blue) = Carcinogens with IUR
2. Values are from USEPA IRIS database except as indicated.
3. **Bold** = Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) toxicity value
4. IUR or RfC (red) = revised values (March 2014 update of December 2011 values)
5. X denotes route extrapolation from oral toxicity criteria.
   (Values posted by USEPA or OEHHA as inhalation criteria, including cancer slope factors, are not denoted except as in original USEPA 2002 Draft VI guidance.)

Chemical Properties Lookup Table (K_{oc}, D_a, D_w, S, H', H values updated per USEPA November 2013 RSL Table)

DTSC-Recommended Toxicity Criteria Values Used to Calculate Risk and Hazard (last updated March 2014) (0.0E+00 = no value available)

NEW => 11 Additional Chemicals (CAS No. in red)		Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a	Diffusivity in water, D_w	Pure component water solubility, S	Henry's law constant H'	Henry's law constant at reference temperature, H	Henry's law constant reference temperature, T_R	Normal boiling point, T_B	Critical temperature, T_C	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$	Inhalation Unit Risk IUR	Reference conc., RfC	Molecular weight, MW	Extrapolated from oral toxicity value		Comment Flag
CAS No.	Chemical	(cm^3/g)	(cm^2/s)	(cm^2/s)	(mg/L)	(unitless)	($atm-m^3/mol$)	(°C)	(°K)	(°K)	(cal/mol)	($\mu g/m^3)^{-1}$	(mg/m^3)	(g/mol)	IUR (X)	RfC (X)	(y)
56235	Carbon tetrachloride	4.39E+01	5.71E-02	9.79E-06	7.93E+02	1.13E+00	2.76E-02	25	349.9	556.6	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			
57749	Chlordane	3.38E+04	3.44E-02	4.02E-06	5.60E-02	1.99E-03	4.85E-05	25	624.2	885.7	14,000	**3.4E-04**	7.0E-04	4.10E+02			
58899	gamma-HCH (Lindane)	2.81E+03	4.33E-02	5.06E-06	7.30E+00	2.10E-04	5.14E-06	25	596.6	839.4	15,000	**3.1E-04**	1.1E-03	2.91E+02		X	
60297	Ethyl ether	9.70E+00	8.52E-02	9.36E-06	6.04E+04	5.03E-02	1.23E-03	25	307.5	466.7	6,338	0.0E+00	7.0E-01	7.41E+01		X	
60571	Dieldrin	2.01E+04	2.33E-02	6.01E-06	1.95E-01	4.09E-04	1.00E-05	25	613.3	842.3	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	
67641	Acetone	2.36E+00	1.06E-01	1.15E-05	1.00E+06	1.43E-03	3.50E-05	25	329.2	508.1	6,955	0.0E+00	3.1E+01	5.81E+01			
67663	Chloroform	3.18E+01	7.69E-02	1.09E-05	7.95E+03	1.50E-01	3.67E-03	25	334.3	536.4	6,988	2.3E-05	9.8E-02	1.19E+02			
67721	Hexachloroethane	1.97E+02	3.21E-02	8.89E-06	5.00E+01	1.59E-01	3.89E-03	25	458.0	695.0	9,510	**1.1E-05**	3.0E-02	2.37E+02			
71432	Benzene	1.46E+02	8.95E-02	1.03E-05	1.79E+03	2.27E-01	5.55E-03	25	353.2	562.2	7,342	**2.9E-05**	**3.0E-03**	7.81E+01			y
71556	1,1,1-Trichloroethane	4.39E+01	6.48E-02	9.60E-06	1.29E+03	7.03E-01	1.72E-02	25	347.2	545.0	7,136	0.0E+00	**1.0E+00**	1.33E+02			
72435	Methoxychlor	2.69E+04	2.21E-02	5.59E-06	1.00E-01	8.30E-06	2.03E-07	25	651.0	848.5	16,000	0.0E+00	1.8E-02	3.46E+02		X	
72559	DDE	1.18E+05	4.08E-02	4.76E-06	4.00E-02	1.70E-03	4.16E-05	25	636.4	860.4	15,000	**9.7E-05**	0.0E+00	3.18E+02	X		
74839	Methyl bromide (bromomethane)	1.32E+01	1.00E-01	1.35E-05	1.52E+04	3.00E-01	7.34E-03	25	276.7	467.0	5,714	0.0E+00	**5.0E-03**	9.49E+01			
74873	Methyl chloride (chloromethane)	1.32E+01	1.24E-01	1.36E-05	5.32E+03	3.61E-01	8.82E-03	25	249.0	416.3	5,115	0.0E+00	9.0E-02	5.05E+01			y
74908	Hydrogen cyanide	3.80E+00	1.68E-01	1.68E-05	1.00E+06	5.44E-03	1.33E-04	25	299.0	456.7	6,676	0.0E+00	8.0E-04	2.70E+01			
74953	Methylene bromide (dibromomethane)	2.17E+01	5.51E-02	1.19E-05	1.19E+04	3.36E-02	8.22E-04	25	370.0	583.0	7,868	0.0E+00	4.0E-03	1.74E+02			
75003	Chloroethane (ethyl chloride)	2.17E+01	1.04E-01	1.16E-05	6.71E+03	4.54E-01	1.11E-02	25	285.3	460.4	5,879	1.3E-06	1.0E+01	6.45E+01	X		y
75014	Vinyl chloride (chloroethene)	2.17E+01	1.07E-01	1.20E-05	8.80E+03	1.14E+00	2.78E-02	25	259.3	432.0	5,250	**7.8E-05**	1.0E-01	6.25E+01			
75058	Acetonitrile	4.67E+00	1.34E-01	1.41E-05	1.00E+06	1.41E-03	3.45E-05	25	354.6	545.5	7,110	0.0E+00	6.0E-02	4.11E+01			
75070	Acetaldehyde	1.00E+00	1.28E-01	1.35E-05	1.00E+06	2.73E-03	6.67E-05	25	293.1	466.0	6,157	**2.7E-06**	9.0E-03	4.41E+01			
75092	Methylene chloride (dichloromethane)	2.17E+01	9.99E-02	1.25E-05	1.30E+04	1.33E-01	3.25E-03	25	313.0	510.0	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			
75150	Carbon disulfide	2.17E+01	1.06E-01	1.30E-05	2.16E+03	5.89E-01	1.44E-02	25	319.0	552.0	6,391	0.0E+00	7.0E-01	7.61E+01			
75218	Ethylene oxide	3.24E+00	1.34E-01	1.45E-05	1.00E+06	6.05E-03	1.48E-04	25	283.6	469.0	6,104	**8.8E-05**	**3.0E-02**	4.41E+01			
75252	Bromoform	3.18E+01	3.57E-02	1.04E-05	3.10E+03	2.19E-02	5.35E-04	25	422.4	696.0	9,479	1.1E-06	7.0E-02	2.53E+02		X	
75274	Bromodichloromethane	3.18E+01	5.63E-02	1.07E-05	3.03E+03	8.67E-02	2.12E-03	25	363.2	585.9	7,800	**3.7E-05**	7.0E-02	1.64E+02	X	X	
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.7	485.0	6,286	0.0E+00	1.0E-01	7.85E+01			y
75343	1,1-Dichloroethane	3.18E+01	8.36E-02	1.06E-05	5.04E+03	2.30E-01	5.62E-03	25	330.6	523.0	6,895	**1.6E-06**	7.0E-01	9.90E+01	X	X	
75354	1,1-Dichloroethylene	3.18E+01	8.63E-02	1.10E-05	2.42E+03	1.07E+00	2.61E-02	25	304.8	576.1	6,247	0.0E+00	**7.0E-02**	9.69E+01			
75456	Chlorodifluoromethane	3.18E+01	1.03E-01	1.33E-05	2.77E+03	1.66E+00	4.06E-02	25	232.4	369.3	4,836	0.0E+00	5.0E+01	8.65E+01			
75694	Trichlorofluoromethane	4.39E+01	6.54E-02	1.00E-05	1.10E+03	3.97E+00	9.70E-02	25	296.7	471.0	5,999	0.0E+00	7.0E-01	1.37E+02			
75718	Dichlorodifluoromethane	4.39E+01	7.60E-02	1.08E-05	2.80E+02	1.40E+01	3.43E-01	25	243.2	385.0	9,421	0.0E+00	1.0E-01	1.21E+02			
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.97E+02	3.76E-02	8.59E-06	1.70E+02	2.15E+01	5.26E-01	25	320.7	487.3	6,463	0.0E+00	3.0E+01	1.87E+02			
76448	Heptachlor	4.13E+04	2.23E-02	5.70E-06	1.80E-01	1.20E-02	2.94E-04	25	603.7	846.3	13,000	**1.2E-03**	1.8E-03	3.73E+02		X	
77474	Hexachlorocyclopentadiene	1.40E+03	2.72E-02	7.22E-06	1.80E+00	1.10E+00	2.70E-02	25	512.2	746.0	10,931	0.0E+00	2.0E-04	2.73E+02			
78831	Isobutanol	2.92E+00	8.97E-02	1.00E-05	8.50E+04	4.00E-04	9.78E-06	25	381.0	547.8	10,936	0.0E+00	1.1E+00	7.41E+01		X	
78875	1,2-Dichloropropane	6.07E+01	7.33E-02	9.73E-06	2.80E+03	1.15E-01	2.82E-03	25	369.5	572.0	7,590	**1.0E-05**	4.0E-03	1.13E+02	X		
78933	Methylethylketone (2-butanone)	4.51E+00	9.14E-02	1.02E-05	2.23E+05	2.33E-03	5.69E-05	25	352.5	536.8	7,481	0.0E+00	5.0E+00	7.21E+01			
79005	1,1,2-Trichloroethane	6.07E+01	6.69E-02	1.00E-05	4.59E+03	3.37E-02	8.24E-04	25	386.2	602.0	8,322	1.6E-05	2.0E-04	1.33E+02			
79016	Trichloroethylene	6.07E+01	6.87E-02	1.02E-05	1.28E+03	4.03E-01	9.85E-03	25	360.4	544.2	7,505	4.1E-06	2.0E-03	1.31E+02			y
79209	Methyl acetate	3.06E+00	9.58E-02	1.10E-05	2.43E+05	4.70E-03	1.15E-04	25	329.8	506.7	7,260	0.0E+00	3.5E+00	7.41E+01		X	
79345	1,1,2,2-Tetrachloroethane	9.49E+01	4.89E-02	9.29E-06	2.83E+03	1.50E-02	3.67E-04	25	419.6	661.2	8,996	**5.8E-05**	7.0E-02	1.68E+02		X	
79469	2-Nitropropane	3.08E+01	8.47E-02	1.02E-05	1.70E+04	4.87E-03	1.19E-04	25	393.2	594.0	8,383	2.7E-03	2.0E-02	8.91E+01			
80626	Methylmethacrylate	9.14E+00	7.50E-02	9.21E-06	1.50E+04	1.30E-02	3.19E-04	25	373.5	567.0	8,975	0.0E+00	7.0E-01	1.00E+02			
83329	Acenaphthene	5.03E+03	5.06E-02	8.33E-06	3.90E+00	7.52E-03	1.84E-04	25	550.5	803.2	12,155	0.0E+00	2.1E-01	1.54E+02		X	
86737	Fluorene	9.16E+03	4.40E-02	7.89E-06	1.69E+00	3.93E-03	9.62E-05	25	570.4	870.0	12,666	0.0E+00	1.4E-01	1.66E+02		X	
87683	Hexachloro-1,3-butadiene	8.45E+02	2.67E-02	7.03E-06	3.20E+00	4.21E-01	1.03E-02	25	486.2	738.0	10,206	2.2E-05	3.5E-03	2.61E+02		X	
88722	o-Nitrotoluene	3.71E+02	5.88E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.0	720.0	12,239	6.3E-05	3.2E-03	1.37E+02	X	X	y
91203	Naphthalene	1.54E+03	6.05E-02	8.38E-06	3.10E+01	1.80E-02	4.40E-04	25	491.1	748.4	10,373	**3.4E-05**	3.0E-03	1.28E+02			
91576	2-Methylnaphthalene	2.48E+03	5.24E-02	7.78E-06	2.46E+01	2.11E-02	5.18E-04	25	514.3	761.0	12,600	0.0E+00	1.4E-02	1.42E+02		X	
92524	Biphenyl	5.13E+03	4.71E-02	7.56E-06	6.94E+00	1.26E-02	3.08E-04	25	529.1	789.0	10,890	0.0E+00	4.0E-04	1.54E+02			y
95476	o-Xylene	3.83E+02	6.89E-02	8.53E-06	1.78E+02	2.12E-01	5.18E-03	25	417.6	630.3	8,661	0.0E+00	1.0E-01	1.06E+02			
95501	1,2-Dichlorobenzene	3.83E+02	5.62E-02	8.92E-06	1.56E+02	7.85E-02	1.92E-03	25	453.6	705.0	9,700	0.0E+00	2.0E-01	1.47E+02			

Chemical Properties Lookup Table (K_{oc}, D_a, D_w, S, H', H values updated per USEPA November 2013 RSL Table)

DTSC-Recommended Toxicity Criteria Values Used to Calculate Risk and Hazard (last updated March 2014)

(0.0E+00 = no value available)

NEW => 11 Additional Chemicals
(CAS No. in red)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$ (cal/mol)	Inhalation Unit Risk IUR ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Extrapolated from oral toxicity value: IUR (X)	Extrapolated from oral toxicity value: RfC (X)	Comment Flag (y)
95578	2-Chlorophenol	3.07E+02	6.61E-02	9.48E-06	1.13E+04	4.58E-04	1.12E-05	25	447.5	675.0	9,572	0.0E+00	1.8E-02	1.29E+02		X	
95636	1,2,4-Trimethylbenzene	6.14E+02	6.07E-02	7.92E-06	5.70E+01	2.52E-01	6.16E-03	25	442.3	649.2	9,369	0.0E+00	7.0E-03	1.20E+02			
96128	1,2-Dibromo-3-chloropropane	1.16E+02	3.21E-02	8.90E-06	1.23E+03	6.01E-03	1.47E-04	25	469.0	703.5	9,960	6.0E-03	2.0E-04	2.36E+02			
96184	1,2,3-Trichloropropane	1.16E+02	5.75E-02	9.24E-06	1.75E+03	1.40E-02	3.43E-04	25	430.0	652.0	9,171	8.6E-03	3.0E-04	1.47E+02	X		y
96333	Methyl acrylate	5.84E+00	8.60E-02	1.02E-05	4.94E+04	8.14E-03	1.99E-04	25	353.7	536.0	7,749	0.0E+00	2.0E-02	8.61E+01			
97632	Ethylmethacrylate	1.67E+01	6.53E-02	8.38E-06	5.40E+03	2.34E-02	5.73E-04	25	390.0	571.0	10,957	0.0E+00	3.0E-01	1.14E+02			
98066	tert-Butylbenzene	1.00E+03	5.30E-02	7.37E-06	2.95E+01	5.40E-01	1.32E-02	25	442.1	1,220.0	8,980	0.0E+00	4.0E-01	1.34E+02			
98828	Cumene	6.98E+02	6.03E-02	7.86E-06	6.13E+01	4.70E-01	1.15E-02	25	425.6	631.1	10,335	0.0E+00	4.0E-01	1.20E+02			y
98862	Acetophenone	5.19E+01	6.52E-02	8.72E-06	6.13E+03	4.25E-04	1.04E-05	25	475.0	709.5	11,732	0.0E+00	3.5E-01	1.20E+02		X	
98953	Nitrobenzene	2.26E+02	6.81E-02	9.45E-06	2.09E+03	9.81E-04	2.40E-05	25	484.0	719.0	10,566	4.0E-05	9.0E-03	1.23E+02			
100414	Ethylbenzene	4.46E+02	6.85E-02	8.46E-06	1.69E+02	3.22E-01	7.88E-03	25	409.3	617.2	8,501	**2.5E-06**	1.0E+00	1.06E+02			
100425	Styrene	4.46E+02	7.11E-02	8.78E-06	3.10E+02	1.12E-01	2.75E-03	25	418.3	636.0	8,737	0.0E+00	**9.0E-01**	1.04E+02			
100447	Benzylchloride	4.46E+02	6.34E-02	8.81E-06	5.25E+02	1.68E-02	4.12E-04	25	452.0	685.0	8,773	**4.9E-05**	1.0E-03	1.27E+02	X		
100527	Benzaldehyde	1.11E+01	7.44E-02	9.46E-06	6.95E+03	1.09E-03	2.67E-05	25	452.0	695.0	11,658	0.0E+00	3.5E-01	1.06E+02		X	
103651	n-Propylbenzene	8.13E+02	6.02E-02	7.83E-06	5.22E+01	4.29E-01	1.05E-02	25	432.2	630.0	9,123	0.0E+00	1.0E+00	1.20E+02			
104518	n-Butylbenzene	1.48E+03	5.28E-02	7.33E-06	1.18E+01	6.50E-01	1.59E-02	25	456.5	660.5	9,290	0.0E+00	1.8E-01	1.34E+02		X	
106423	p-Xylene	3.75E+02	6.82E-02	8.42E-06	1.62E+02	2.82E-01	6.90E-03	25	411.5	616.2	8,525	0.0E+00	1.0E-01	1.06E+02			
106467	1,4-Dichlorobenzene	3.75E+02	5.50E-02	8.68E-06	8.13E+01	9.85E-02	2.41E-03	25	447.2	684.8	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			
106898	Epichlorohydrin	9.91E+00	8.89E-02	1.11E-05	6.59E+04	1.24E-03	3.04E-05	25	390.0	600.0	10	**2.3E-05**	1.0E-03	9.25E+01			
106934	1,2-Dibromoethane (ethylene dibromide)	3.96E+01	4.30E-02	1.04E-05	3.91E+03	2.66E-02	6.50E-04	25	404.6	583.0	8,310	6.0E-04	**8.0E-04**	1.88E+02			
106990	1,3-Butadiene	3.96E+01	1.00E-01	1.03E-05	7.35E+02	3.01E+00	7.36E-02	25	268.6	425.0	5,370	**1.7E-04**	**2.0E-03**	5.41E+01			
107028	Acrolein	1.00E+00	1.12E-01	1.22E-05	2.12E+05	4.99E-03	1.22E-04	25	325.6	506.0	6,731	0.0E+00	2.0E-05	5.61E+01			
107062	1,2-Dichloroethane	3.96E+01	8.57E-02	1.10E-05	8.60E+03	4.82E-02	1.18E-03	25	356.7	561.0	7,643	2.6E-05	7.0E-03	9.90E+01			
107131	Acrylonitrile	8.51E+00	1.14E-01	1.23E-05	7.45E+04	5.64E-03	1.38E-04	25	350.3	519.0	7,786	**2.9E-04**	2.0E-03	5.31E+01			
108054	Vinyl acetate	5.58E+00	8.49E-02	1.00E-05	2.00E+04	2.09E-02	5.11E-04	25	345.7	519.1	7,800	0.0E+00	**2.0E-01**	8.61E+01			
108101	Methylisobutylketone (4-methyl-2-pentanc	1.26E+01	6.98E-02	8.35E-06	1.90E+04	5.64E-03	1.38E-04	25	389.5	571.0	8,243	0.0E+00	3.0E+00	1.00E+02			y
108203	Diisopropyl ether (DIPE)	2.28E+01	6.54E-02	7.76E-06	8.80E+03	7.76E-06	2.56E-03	25	341.5	499.9	6,950	0.0E+00	7.0E-01	1.02E+02			
108383	m-Xylene	3.75E+02	6.84E-02	8.44E-06	1.61E+02	2.94E-01	7.18E-03	25	412.3	617.1	8,523	0.0E+00	1.0E-01	1.06E+02			
108601	bis(2-Chloroisopropyl)ether	8.29E+01	3.99E-02	7.36E-06	1.70E+03	3.03E-03	7.42E-05	25	460.0	690.0	9,695	1.0E-05	1.4E-01	1.71E+02		X	
108678	1,3,5-Trimethylbenzene	6.02E+02	6.02E-02	7.84E-06	4.82E+01	3.59E-01	8.77E-03	25	437.9	637.3	9,321	0.0E+00	3.5E-02	1.20E+02		X	
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.9	572.2	7,474	0.0E+00	7.0E-01	9.82E+01			y
108883	Toluene	2.34E+02	7.78E-02	9.20E-06	5.26E+02	2.71E-01	6.64E-03	25	383.8	591.8	7,930	0.0E+00	**3.0E-01**	9.21E+01			
108907	Chlorobenzene	2.34E+02	7.21E-02	9.48E-06	4.98E+02	1.27E-01	3.11E-03	25	404.9	632.4	8,410	0.0E+00	5.0E-02	1.13E+02			
109660	Pentane, n-	7.22E+01	8.21E-02	8.80E-06	3.80E+01	5.11E+01	1.25E+00	25	309.0	469.7	6,155	0.0E+00	1.0E+00	7.22E+01			
109693	1-Chlorobutane	7.22E+01	7.84E-02	9.33E-06	1.10E+03	6.83E-01	1.67E-02	25	351.6	542.0	7,263	0.0E+00	1.4E-01	9.26E+01		X	
109999	Tetrahydrofuran	1.08E+01	9.54E-02	1.08E-05	1.00E+06	2.88E-03	7.05E-05	25	339.0	541.0	7,074	0.0E+00	2.0E+00	7.21E+01			y
110009	Furan	8.00E+01	1.03E-01	1.17E-05	1.00E+04	2.21E-01	5.40E-03	25	304.6	490.2	6,477	0.0E+00	3.5E-03	6.81E+01		X	y
110543	Hexane	1.32E+02	7.31E-02	8.17E-06	9.50E+00	7.36E+01	1.80E+00	25	341.7	508.0	6,895	0.0E+00	7.0E-01	8.62E+01			
110827	Cyclohexane	1.46E+02	8.00E-02	9.11E-06	5.50E+01	6.13E+00	1.50E-01	25	353.7	553.4	7,154	0.0E+00	6.0E+00	8.42E+01			
111444	Bis(2-chloroethyl)ether	3.22E+01	5.67E-02	8.71E-06	1.72E+04	6.95E-04	1.70E-05	25	451.2	659.8	10,803	**7.1E-04**	0.0E+00	1.43E+02			
115297	Endosulfan	6.76E+03	2.25E-02	5.76E-06	3.25E-01	2.66E-03	6.50E-05	25	674.4	942.9	14,000	0.0E+00	2.1E-02	4.07E+02		X	
118741	Hexachlorobenzene	6.20E+03	2.90E-02	7.85E-06	6.20E-03	6.95E-02	1.70E-03	25	582.6	825.0	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	
120821	1,2,4-Trichlorobenzene	1.36E+03	3.96E-02	8.40E-06	4.90E+01	5.81E-02	1.42E-03	25	486.2	725.0	10,471	0.0E+00	2.0E-03	1.81E+02			
123739	Crotonaldehyde (2-butenal)	1.79E+00	9.56E-02	1.08E-05	1.50E+05	7.93E-04	1.94E-05	25	375.2	568.0	9	5.4E-04	0.0E+00	7.01E+01	X		
123911	1,4-Dioxane	2.63E+00	8.74E-02	1.05E-05	1.00E+06	1.96E-04	4.80E-06	25	374.3	587.2	8,164	**7.7E-06**	3.0E-02	8.81E+01			
124481	Dibromochloromethane	3.18E+01	3.66E-02	1.06E-05	2.70E+03	3.20E-02	7.83E-04	25	416.1	678.2	5,900	**2.7E-05**	7.0E-02	2.08E+02		X	
126987	Methacrylonitrile	1.31E+01	9.64E-02	1.06E-05	2.54E+04	1.01E-02	2.47E-04	25	363.3	554.0	7,600	0.0E+00	3.0E-02	6.71E+01			
126998	2-Chloro-1,3-butadiene (chloroprene)	6.07E+01	8.42E-02	1.00E-05	8.37E+02	2.29E+00	5.61E-02	25	332.4	525.0	8,075	3.0E-04	2.0E-02	8.85E+01			
127184	Tetrachloroethylene	9.49E+01	5.05E-02	9.46E-06	2.06E+02	7.24E-01	1.77E-02	25	394.4	620.2	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			
129000	Pyrene	5.43E+04	2.78E-02	7.25E-06	1.35E-01	4.87E-04	1.19E-05	25	668.0	936.0	14,370	0.0E+00	1.1E-01	2.02E+02		X	
132649	Dibenzofuran	9.16E+03	4.11E-02	7.38E-06	3.10E+00	8.71E-03	2.13E-04	25	560.0	824.0	66,400	0.0E+00	3.5E-03	1.68E+02		X	
135988	sec-Butylbenzene	1.33E+03	5.28E-02	7.34E-06	1.76E+01	7.20E-01	1.76E-02	25	446.5	679.0	88,730	0.0E+00	4.0E-01	1.34E+02			
141786	Ethylacetate	5.58E+00	8.23E-02	9.70E-06	8.00E+04	5.48E-03	1.34E-04	25	350.3	523.3	7,634	0.0E+00	7.0E-02	8.81E+01			
142289	1,3-Dichloropropane	7.22E+01	7.39E-02	9.82E-06	2.75E+03	3.99E-02	9.76E-04	25	393.9	590.9	8,103	0.0E+00	7.0E-02	1.13E+02		X	
156592	cis-1,2-Dichloroethylene	3.96E+01	8.84E-02	1.13E-05	6.41E+03	1.67E-01	4.08E-03	25	333.7	544.0	7,192	0.0E+00	7.0E-03	9.69E+01		X	
156605	trans-1,2-Dichloroethylene	3.96E+01	8.76E-02	1.12E-05	4.52E+03	1.67E-01	4.08E-03	25	320.9	516.5	6,717	0.0E+00	6.0E-02	9.69E+01			
205992	Benzo(b)fluoranthene	5.99E+05	4.76E-02	5.56E-06	1.50E-03	2.69E-05	6.57E-07	25	715.9	969.3	17,000	**1.1E-04**	0.0E+00	2.52E+02			
218019	Chrysene	1.81E+05	2.61E-02	6.75E-06	2.00E-03	2.14E-04	5.23E-06	25	714.2	979.0	16,455	**1.1E-05**	0.0E+00	2.28E+02			
309002	Aldrin	8.20E+04	3.72E-02	4.35E-06	1.70E-02	1.80E-03	4.40E-05	25	603.0	839.4	15,000	**4.9E-03**	1.1E-04	3.65E+02		X	
319846	alpha-HCH (alpha-BHC)	2.81E+03	4.33E-02	5.06E-06	2.00E+00	2.10E-04	5.14E-06	25	596.6	839.4	15,000	1.8E-03	0.0E+00	2.91E+02			
541731	1,3-Dichlorobenzene	3.79E+02	5.56E-02	8.80E-06	1.19E+02	8.85E-02	2.17E-03	25	446.0	684.0	9,230	0.0E+00	1.1E-01	1.47E+02		X	y
542756	1,3-Dichloropropene	7.22E+01	7.63E-02	1.01E-05	2.80E+03	1.45E-01	3.55E-03	25	381.2	587.4	7,900	**1.6E-05**	2.0E-02	1.11E+02			
542881	bis(Chloromethyl)ether	9.70E+00	7.63E-02	1.04E-05	2.20E+04	1.78E-01	4.36E-03	25	379.0	568.5	7,910	6.2E-02	0.0E+00	1.15E+02			y
630206	1,1,1,2-Tetrachloroethane	8.60E+01	4.82E-02	9.10E-06	1.07E+03	1.02E-01	2.50E-03	25	403.5	624.0	9,768	7.4E-06	1.1E-01	1.68E+02		X	
924163	N-Nitroso-di-n-butylamine	9.15E+02	6.49E-02	7.59E-06	1.27E+03	5.40E-04	1.32E-05	25	389.0	583.5	11,200	**3.1E-03**	0.0E+00	1.58E+02			
1634044	MTBE (methyl-*tert*-butyl ether)	1.16E+01	7.53E-02	8.59E-06	5.10E+04	2.40E-02	5.87E-04	25	328.3	497.1	6,678	**2.6E-07**	3.0E+00	8.82E+01			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	6.00E-02	4.67E-01	1.14E-02	25	629.9	1,750.0	14,127	0.0E+00	**3.0E-05**	2.01E+02			
123456789	TBD	5.20E+01	3.07E-02	6.30E-06	6.00E-02	4.67E-01	1.14E-02	25	629.9	1,750.0	14,127	0.0E+00	**1.0E+02**	2.01E+02			

SCS Soil Type	K_s (cm/h)
C	0.61
CL	0.34
L	0.50
LS	4.38
S	26.78
SC	0.47
SCL	0.55
SI	1.82
SIC	0.40
SICL	0.46
SIL	0.76
SL	1.60

NEW => Receptor Lookup Table (added by HERO)

Receptor Type	AT_C (yrs)
Residential	70
Commercial	70
User-Defined	

NEW => 11 Additional Chemicals
(CAS No. in red)

CAS No.	Chemical	USEPA-Recommended Toxicity Criteria Values November 2013 RSL Table: Inhalation Unit Risk IUR ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Extrapolated from oral toxicity value: IUR (X)	Extrapolated from oral toxicity value: RfC (X)	ARCHIVE Original USEPA Toxicity Criteria (USEPA 2002 Draft Vapor Intrusion Guidance): Unit Risk Factor URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Extrapolated from oral toxicity value: URF (X)	Extrapolated from oral toxicity value: RfC (X)
56235	Carbon tetrachloride	6.0E-06	1.0E-01			1.5E-05	0.0E+00		
57749	Chlordane	1.0E-04	7.0E-04			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	3.1E-04				3.7E-04	1.1E-03	X	X
60297	Ethyl ether					0.0E+00	7.0E-01		X
60571	Dieldrin	4.6E-03				4.6E-03	1.8E-04		X
67641	Acetone		3.1E+01			0.0E+00	3.5E-01		X
67663	Chloroform	2.3E-05	9.8E-02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.1E-05	3.0E-02			4.0E-06	3.5E-03		X
71432	Benzene	7.8E-06	3.0E-02			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane		5.0E+00			0.0E+00	2.2E+00		
72435	Methoxychlor					0.0E+00	1.8E-02		X
72559	DDE	9.7E-05		X		9.7E-05	0.0E+00	X	
74839	Methyl bromide (bromomethane)		5.0E-03			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)		9.0E-02			1.0E-06	9.0E-02		
74908	Hydrogen cyanide		8.0E-04			0.0E+00	3.0E-03		
74953	Methylene bromide (dibromomethane)		4.0E-03			0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)		1.0E+01			8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	8.8E-06	1.0E-01			8.8E-06	1.0E-01		
75058	Acetonitrile		6.0E-02			0.0E+00	6.0E-02		
75070	Acetaldehyde	2.2E-06	9.0E-03			2.2E-06	9.0E-03		
75092	Methylene chloride (dichloromethane)	1.0E-08	6.0E-01			4.7E-07	3.0E+00		
75150	Carbon disulfide		7.0E-01			0.0E+00	7.0E-01		
75218	Ethylene oxide	8.8E-05	3.0E-02			1.0E-04	0.0E+00		
75252	Bromoform	1.1E-06				1.1E-06	7.0E-02		X
75274	Bromodichloromethane	3.7E-05		X		1.8E-05	7.0E-02	X	X
75296	2-Chloropropane					0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	1.6E-06				0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene		2.0E-01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane		5.0E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane		7.0E-01			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane		1.0E-01			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroethane		3.0E+01			0.0E+00	3.0E+01		
76448	Heptachlor	1.3E-03				1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene		2.0E-04			0.0E+00	2.0E-04		
78831	Isobutanol					0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	1.0E-05	4.0E-03			1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)		5.0E+00			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	1.6E-05	2.0E-04			1.6E-05	1.4E-02		X
79016	Trichloroethylene	4.1E-06	2.0E-03			1.1E-04	4.0E-02	X	
79209	Methyl acetate					0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	5.8E-05				5.8E-05	2.1E-01		X
79469	2-Nitropropane	2.7E-03	2.0E-02			2.7E-03	2.0E-02		
80626	Methylmethacrylate		7.0E-01			0.0E+00	7.0E-01		
83329	Acenaphthene					0.0E+00	2.1E-01		X
86737	Fluorene					0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	2.2E-05				2.2E-05	7.0E-04		X
88722	o-Nitrotoluene					0.0E+00	3.5E-02		X
91203	Naphthalene	3.4E-05	3.0E-03			0.0E+00	3.0E-03		
91576	2-Methylnaphthalene					0.0E+00	7.0E-02		X
92524	Biphenyl		4.0E-04			0.0E+00	1.8E-01		X
95476	o-Xylene		1.0E-01			0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene		2.0E-01			0.0E+00	2.0E-01		

NEW => 11 Additional Chemicals (CAS No. in red)		USEPA-Recommended Toxicity Criteria Values November 2013 RSL Table				ARCHIVE Original USEPA Toxicity Criteria (USEPA 2002 Draft Vapor Intrusion Guidance)			
		Inhalation Unit Risk	Reference conc.,	Extrapolated from oral toxicity value		Unit Risk Factor	Reference conc.,	Extrapolated from oral toxicity value	
CAS No.	Chemical	IUR ($\mu g/m^3)^{-1}$	RfC (mg/m^3)	IUR (X)	RfC (X)	URF ($\mu g/m^3)^{-1}$	RfC (mg/m^3)	URF (X)	RfC (X)
95578	2-Chlorophenol					0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene		7.0E-03			0.0E+00	6.0E-03		
96128	1,2-Dibromo-3-chloropropane	6.0E-03	2.0E-04						
96184	1,2,3-Trichloropropane		3.0E-04			5.7E-04	4.9E-03	X	
96333	Methyl acrylate		2.0E-02			0.0E+00	1.1E-01		X
97632	Ethylmethacrylate		3.0E-01			0.0E+00	3.2E-01		X
98066	tert-Butylbenzene					0.0E+00	1.4E-01		X
98828	Cumene		4.0E-01			0.0E+00	4.0E-01		
98862	Acetophenone					0.0E+00	3.5E-01		X
98953	Nitrobenzene	4.0E-05	9.0E-03			0.0E+00	2.0E-03		
100414	Ethylbenzene	2.5E-06	1.0E+00			0.0E+00	1.0E+00		
100425	Styrene		1.0E+00			0.0E+00	1.0E+00		
100447	Benzylchloride	4.9E-05	1.0E-03			4.9E-05	0.0E+00	X	
100527	Benzaldehyde					0.0E+00	3.5E-01		X
103651	n-Propylbenzene		1.0E+00			0.0E+00	1.4E-01		X
104518	n-Butylbenzene					0.0E+00	1.4E-01		X
106423	p-Xylene		1.0E-01			0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	1.1E-05	8.0E-01			0.0E+00	8.0E-01		
106898	Epichlorohydrin	1.2E-06	1.0E-03						
106934	1,2-Dibromoethane (ethylene dibromide)	6.0E-04	9.0E-03			6.0E-04	9.0E-03		
106990	1,3-Butadiene	3.0E-05	2.0E-03			3.0E-05	0.0E+00		
107028	Acrolein		2.0E-05			0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	2.6E-05	7.0E-03			2.6E-05	0.0E+00		
107131	Acrylonitrile	6.8E-05	2.0E-03			6.8E-05	2.0E-03		
108054	Vinyl acetate		2.0E-01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-pentan		3.0E+00			0.0E+00	8.0E-02		
108203	Diisopropyl ether (DIPE)		7.0E-01						
108383	m-Xylene		1.0E-01			0.0E+00	1.0E-01		
108601	bis(2-Chloroisopropyl)ether	1.0E-05							
108678	1,3,5-Trimethylbenzene					0.0E+00	6.0E-03		
108872	Methylcyclohexane					0.0E+00	3.0E+00		
108883	Toluene		5.0E+00			0.0E+00	4.0E-01		
108907	Chlorobenzene		5.0E-02			0.0E+00	6.0E-02		
109660	Pentane, n-		1.0E+00						
109693	1-Chlorobutane					0.0E+00	1.4E+00		X
109999	Tetrahydrofuran		2.0E+00						
110009	Furan					0.0E+00	3.5E-03		X
110543	Hexane		7.0E-01			0.0E+00	2.0E-01		
110827	Cyclohexane		6.0E+00						
111444	Bis(2-chloroethyl)ether	3.3E-04				3.3E-04	0.0E+00		
115297	Endosulfan					0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	4.6E-04				4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene		2.0E-03			0.0E+00	2.0E-01		
123739	Crotonaldehyde (2-butenal)					5.4E-04	0.0E+00	X	
123911	1,4-Dioxane	5.0E-06	3.0E-02						
124481	Dibromochloromethane	2.7E-05				2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile		3.0E-02			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloroprene)	3.0E-04	2.0E-02			0.0E+00	7.0E-03		
127184	Tetrachloroethylene	2.6E-07	4.0E-02			3.0E-06	0.0E+00		
129000	Pyrene					0.0E+00	1.1E-01		X
132649	Dibenzofuran					0.0E+00	1.4E-02		X
135988	sec-Butylbenzene					0.0E+00	1.4E-01		X
141786	Ethylacetate					0.0E+00	3.2E+00		X
142289	1,3-Dichloropropane								
156592	cis-1,2-Dichloroethylene					0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene		6.0E-02			0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.1E-04				2.1E-04	0.0E+00	X	
218019	Chrysene	1.1E-05				2.1E-06	0.0E+00	X	
309002	Aldrin	4.9E-03				4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.8E-03				1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene					0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.0E-06	2.0E-02			4.0E-06	2.0E-02		
542881	bis(Chloromethyl)ether	6.2E-02							
630206	1,1,1,2-Tetrachloroethane	7.4E-06				7.4E-06	1.1E-01		X
924163	N-Nitroso-di-n-butylamine	1.6E-03							
1634044	MTBE (methyl-*tert*-butyl ether)	2.6E-07	3.0E+00			0.0E+00	3.0E+00		
7439976	Mercury (elemental)		3.0E-04			0.0E+00	3.0E-04		
123456789	TBD		3.0E-04			0.0E+00	3.0E-04		

APPENDIX C

Johnson and Ettinger Model Spreadsheets for VOCs Detected at a Depth of 5 Feet Below Ground Surface

USEPA SG-SCREEN
Version 2.0, 04/2003

DTSC Modification March 2014

Department of Toxic Substances Control
Vapor Intrusion Screening Model - Soil Gas

DATA ENTRY SHEET

Land Use: **Residential**

Exposure Scenario: **For VOCs Detected at a Depth of 5 Feet Below Ground Surface**

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156592	2.30E+02			cis-1,2-Dichloroethylene
95636	0.00E+00			1,2,4-Trimethylbenzene
108678	0.00E+00			1,3,5-Trimethylbenzene
71432	5.00E+02			Benzene
75092	0.00E+00			Methylene chloride (dichloromethane)
103651	0.00E+00			n-Propylbenzene
91203	7.00E+01			Naphthalene
100425	0.00E+00			Styrene
127184	2.90E+03			Tetrachloroethylene
108883	4.40E+02			Toluene
79016	0.00E+00			Trichloroethylene
95476	0.00E+00			o-Xylene

Results Summary

Soil Gas Conc. ($\mu g/m^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu g/m^3$)	Cancer Risk (unitless)	Noncancer Hazard (unitless)
2.30E+02	4.1E-04	9.4E-02	NA	1.3E-02
0.00E+00	3.0E-04	0.0E+00	NA	0.0E+00
0.00E+00	2.9E-04	0.0E+00	NA	0.0E+00
5.00E+02	4.1E-04	2.1E-01	2.1E-06	6.6E-02
0.00E+00	4.5E-04	0.0E+00	0.0E+00	0.0E+00
0.00E+00	2.9E-04	0.0E+00	NA	0.0E+00
7.00E+01	3.0E-04	2.1E-02	2.5E-07	6.7E-03
0.00E+00	3.4E-04	0.0E+00	NA	0.0E+00
2.90E+03	2.5E-04	7.3E-01	1.5E-06	2.0E-02
4.40E+02	3.7E-04	1.6E-01	NA	5.2E-04
0.00E+00	3.3E-04	0.0E+00	0.0E+00	0.0E+00
0.00E+00	3.3E-04	0.0E+00	NA	0.0E+00
TOTAL		3.9E-06		1.1E-01

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

Lookup Soil Parameters

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE ↓

ENTER Averaging time for carcinogens,	ENTER Averaging time for noncarcinogens,	ENTER Exposure duration,	ENTER Exposure frequency,	ENTER Exposure Time	ENTER Air Exchange Rate	ENTER Ceiliing Height

	Lookup Receptor Parameters	AT_C (yrs)	AT_{NC} (yrs)	ED (yrs)	EF (days/yr)	ET (hrs/day)	ACH $(hour)^{-1}$	CH (cm)
EW=>	Residential	70	26	26	350	24	0.5	243.84
						(NEW)	(NEW)	(= **8.0** feet)
	END							

CAS	Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF $(\mu g/m^3)^{-1}$
156592	cis-1,2-Dichloroethylene	8.84E-02	1.13E-05	4.08E-03	25	7,192	333.65	544.00	0.0E+00
95636	1,2,4-Trimethylbenzene	6.07E-02	7.92E-06	6.16E-03	25	9,369	442.30	649.17	0.0E+00
108678	1,3,5-Trimethylbenzene	6.02E-02	7.84E-06	8.77E-03	25	9,321	437.89	637.25	0.0E+00
71432	Benzene	8.95E-02	1.03E-05	5.55E-03	25	7,342	353.24	562.16	2.9E-05
75092	Methylene chloride (dichloromethane)	9.99E-02	1.25E-05	3.25E-03	25	6,706	313.00	510.00	1.0E-06
103651	n-Propylbenzene	6.02E-02	7.83E-06	1.05E-02	25	9,123	432.20	630.00	0.0E+00
91203	Naphthalene	6.05E-02	8.38E-06	4.40E-04	25	10,373	491.14	748.40	3.4E-05
100425	Styrene	7.11E-02	8.78E-06	2.75E-03	25	8,737	418.31	636.00	0.0E+00
127184	Tetrachloroethylene	5.05E-02	9.46E-06	1.77E-02	25	8,288	394.40	620.20	5.9E-06
108883	Toluene	7.78E-02	9.20E-06	6.64E-03	25	7,930	383.78	591.79	0.0E+00
79016	Trichloroethylene	6.87E-02	1.02E-05	9.85E-03	25	7,505	360.36	544.20	4.1E-06
95476	o-Xylene	6.89E-02	8.53E-06	5.18E-03	25	8,661	417.60	630.30	0.0E+00

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 5 Feet Below Ground Surface

CAS	Chemical	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)
156592	cis-1,2-Dichloroethylene	7.0E-03	96.94	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
95636	1,2,4-Trimethylbenzene	7.0E-03	120.20	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
108678	1,3,5-Trimethylbenzene	3.5E-02	120.20	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
71432	Benzene	3.0E-03	78.11	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
75092	Methylene chloride (dichloromethane)	4.0E-01	84.93	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
103651	n-Propylbenzene	1.0E+00	120.19	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
91203	Naphthalene	3.0E-03	128.18	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
100425	Styrene	9.0E-01	104.15	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
127184	Tetrachloroethylene	3.5E-02	165.83	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
108883	Toluene	3.0E-01	92.14	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
79016	Trichloroethylene	2.0E-03	131.39	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09
95476	o-Xylene	1.0E-01	106.17	137.4	0.188	0.299	1.78E-09	0.837	1.49E-09

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 5 Feet Below Ground Surface

CAS	Chemical	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)
156592	cis-1,2-Dichloroethylene	4,000	2.30E+02	3.39E+04	1.00E+06	5.00E-03	15	7,592	3.91E-03
95636	1,2,4-Trimethylbenzene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	11,516	5.77E-03
108678	1,3,5-Trimethylbenzene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	11,495	8.22E-03
71432	Benzene	4,000	5.00E+02	3.39E+04	1.00E+06	5.00E-03	15	7,977	5.30E-03
75092	Methylene chloride (dichloromethane)	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	6,884	3.13E-03
103651	n-Propylbenzene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	11,186	9.85E-03
91203	Naphthalene	4,000	7.00E+01	3.39E+04	1.00E+06	5.00E-03	15	12,768	4.09E-04
100425	Styrene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	10,294	2.59E-03
127184	Tetrachloroethylene	4,000	2.90E+03	3.39E+04	1.00E+06	5.00E-03	15	9,410	1.68E-02
108883	Toluene	4,000	4.40E+02	3.39E+04	1.00E+06	5.00E-03	15	9,001	6.31E-03
79016	Trichloroethylene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	8,382	9.39E-03
95476	o-Xylene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	10,245	4.89E-03

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 5 Feet Below Ground Surface

CAS	Chemical	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{V} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)
156592	cis-1,2-Dichloroethylene	1.60E-01	1.80E-04	2.29E-03	137.4	15	2.30E+02	1.25	8.33E+01	2.29E-03
95636	1,2,4-Trimethylbenzene	2.37E-01	1.80E-04	1.57E-03	137.4	15	0.00E+00	1.25	8.33E+01	1.57E-03
108678	1,3,5-Trimethylbenzene	3.37E-01	1.80E-04	1.56E-03	137.4	15	0.00E+00	1.25	8.33E+01	1.56E-03
71432	Benzene	2.18E-01	1.80E-04	2.31E-03	137.4	15	5.00E+02	1.25	8.33E+01	2.31E-03
75092	Methylene chloride (dichloromethane)	1.28E-01	1.80E-04	2.58E-03	137.4	15	0.00E+00	1.25	8.33E+01	2.58E-03
103651	n-Propylbenzene	4.04E-01	1.80E-04	1.55E-03	137.4	15	0.00E+00	1.25	8.33E+01	1.55E-03
91203	Naphthalene	1.68E-02	1.80E-04	1.58E-03	137.4	15	7.00E+01	1.25	8.33E+01	1.58E-03
100425	Styrene	1.06E-01	1.80E-04	1.84E-03	137.4	15	0.00E+00	1.25	8.33E+01	1.84E-03
127184	Tetrachloroethylene	6.88E-01	1.80E-04	1.30E-03	137.4	15	2.90E+03	1.25	8.33E+01	1.30E-03
108883	Toluene	2.59E-01	1.80E-04	2.01E-03	137.4	15	4.40E+02	1.25	8.33E+01	2.01E-03
79016	Trichloroethylene	3.85E-01	1.80E-04	1.77E-03	137.4	15	0.00E+00	1.25	8.33E+01	1.77E-03
95476	o-Xylene	2.00E-01	1.80E-04	1.78E-03	137.4	15	0.00E+00	1.25	8.33E+01	1.78E-03

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 5 Feet Below Ground Surface

CAS	Chemical	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
156592	cis-1,2-Dichloroethylene	5.00E+03	4.72E+31	**4.09E-04**	9.42E-02	NA	7.0E-03	**NA**	**1.3E-02**
95636	1,2,4-Trimethylbenzene	5.00E+03	1.46E+46	**2.96E-04**	0.00E+00	NA	7.0E-03	**NA**	**0.0E+00**
108678	1,3,5-Trimethylbenzene	5.00E+03	3.31E+46	**2.94E-04**	0.00E+00	NA	3.5E-02	**NA**	**0.0E+00**
71432	Benzene	5.00E+03	1.93E+31	**4.14E-04**	2.07E-01	2.9E-05	3.0E-03	**2.1E-06**	**6.6E-02**
75092	Methylene chloride (dichloromethane)	5.00E+03	1.03E+28	**4.53E-04**	0.00E+00	1.0E-06	4.0E-01	**0.0E+00**	**0.0E+00**
103651	n-Propylbenzene	5.00E+03	3.77E+46	**2.94E-04**	0.00E+00	NA	1.0E+00	**NA**	**0.0E+00**
91203	Naphthalene	5.00E+03	7.72E+45	**2.98E-04**	2.09E-02	3.4E-05	3.0E-03	**2.5E-07**	**6.7E-03**
100425	Styrene	5.00E+03	2.30E+39	**3.41E-04**	0.00E+00	NA	9.0E-01	**NA**	**0.0E+00**
127184	Tetrachloroethylene	5.00E+03	3.33E+55	**2.52E-04**	7.29E-01	5.9E-06	3.5E-02	**1.5E-06**	**2.0E-02**
108883	Toluene	5.00E+03	1.01E+36	**3.67E-04**	1.62E-01	NA	3.0E-01	**NA**	**5.2E-04**
79016	Trichloroethylene	5.00E+03	6.36E+40	**3.30E-04**	0.00E+00	4.1E-06	2.0E-03	**0.0E+00**	**0.0E+00**
95476	o-Xylene	5.00E+03	4.36E+40	**3.31E-04**	0.00E+00	NA	1.0E-01	**NA**	**0.0E+00**
				Land Use: Residential			TOTAL	3.9E-06	1.1E-01

Exposure Scenario: For VOCs Detected at a Depth of 5 Feet Below Ground Surface

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

NEW => Receptor Lookup Table (added by HERO)

Receptor Type	AT_C (yrs)	AT_{NC} (yrs)	ED (yrs)	EF (days/yr)	ET (hrs/day)	ACH (1/hour)
Residential	70	26	26	350	24	0.5
Commercial	70	25	25	250	8	1
User-Defined						

Notes on Toxicity Criteria (see cell comments for individual chemical toxicity values)

1. Chemical name (blue) = Carcinogens with IUR
2. Values are from USEPA IRIS database except as indicated.
3. **Bold** = Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) toxicity value
4. IUR or RfC (red) = revised values (March 2014 update of December 2011 values)
5. X denotes route extrapolation from oral toxicity criteria.
   (Values posted by USEPA or OEHHA as inhalation criteria, including cancer slope factors, are not denoted except as in original USEPA 2002 Draft VI guidance.)

Chemical Properties Lookup Table (K_{oc}, D_a, D_w, S, H', H values updated per USEPA November 2013 RSL Table)

DTSC-Recommended Toxicity Criteria Values Used to Calculate Risk and Hazard (last updated March 2014) (0.0E+00 = no value available)

NEW => 11 Additional Chemicals (CAS No. in red)		Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a	Diffusivity in water, D_w	Pure component water solubility, S	Henry's law constant H'	Henry's law constant at reference temperature, H	Henry's law constant reference temperature, T_R	Normal boiling point, T_B	Critical temperature, T_C	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$	Inhalation Unit Risk IUR	Reference conc., RfC	Molecular weight, MW	Extrapolated from oral toxicity value		Comment Flag
CAS No.	Chemical	(cm^3/g)	(cm^2/s)	(cm^2/s)	(mg/L)	(unitless)	($atm-m^3/mol$)	(°C)	(°K)	(°K)	(cal/mol)	($\mu g/m^3)^{-1}$	(mg/m^3)	(g/mol)	IUR (X)	RfC (X)	(y)
56235	Carbon tetrachloride	4.39E+01	5.71E-02	9.79E-06	7.93E+02	1.13E+00	2.76E-02	25	349.9	556.6	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			
57749	Chlordane	3.38E+04	3.44E-02	4.02E-06	5.60E-02	1.99E-03	4.85E-05	25	624.2	885.7	14,000	**3.4E-04**	7.0E-04	4.10E+02			
58899	gamma-HCH (Lindane)	2.81E+03	4.33E-02	5.06E-06	7.30E+00	2.10E-04	5.14E-06	25	596.6	839.4	15,000	**3.1E-04**	1.1E-03	2.91E+02		X	
60297	Ethyl ether	9.70E+00	8.52E-02	9.36E-06	6.04E+04	5.03E-02	1.23E-03	25	307.5	466.7	6,338	0.0E+00	7.0E-01	7.41E+01		X	
60571	Dieldrin	2.01E+04	2.33E-02	6.01E-06	1.95E-01	4.09E-04	1.00E-05	25	613.3	842.3	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	
67641	Acetone	2.36E+00	1.06E-01	1.15E-05	1.00E+06	1.43E-03	3.50E-05	25	329.2	508.1	6,955	0.0E+00	3.1E+01	5.81E+01			
67663	Chloroform	3.18E+01	7.69E-02	1.09E-05	7.95E+03	1.50E-01	3.67E-03	25	334.3	536.4	6,988	2.3E-05	9.8E-02	1.19E+02			
67721	Hexachloroethane	1.97E+02	3.21E-02	8.89E-06	5.00E+01	1.59E-01	3.89E-03	25	458.0	695.0	9,510	**1.1E-05**	3.0E-02	2.37E+02			
71432	Benzene	1.46E+02	8.95E-02	1.03E-05	1.79E+03	2.27E-01	5.55E-03	25	353.2	562.2	7,342	**2.9E-05**	**3.0E-03**	7.81E+01			y
71556	1,1,1-Trichloroethane	4.39E+01	6.48E-02	9.60E-06	1.29E+03	7.03E-01	1.72E-02	25	347.2	545.0	7,136	0.0E+00	**1.0E+00**	1.33E+02			
72435	Methoxychlor	2.69E+04	2.21E-02	5.59E-06	1.00E-01	8.30E-06	2.03E-07	25	651.0	848.5	16,000	0.0E+00	1.8E-02	3.46E+02		X	
72559	DDE	1.18E+05	4.08E-02	4.76E-06	4.00E-02	1.70E-03	4.16E-05	25	636.4	860.4	15,000	**9.7E-05**	0.0E+00	3.18E+02	X		
74839	Methyl bromide (bromomethane)	1.32E+01	1.00E-01	1.35E-05	1.52E+04	3.00E-01	7.34E-03	25	276.7	467.0	5,714	0.0E+00	**5.0E-03**	9.49E+01			
74873	Methyl chloride (chloromethane)	1.32E+01	1.24E-01	1.36E-05	5.32E+03	3.61E-01	8.82E-03	25	249.0	416.3	5,115	0.0E+00	9.0E-02	5.05E+01			y
74908	Hydrogen cyanide	3.80E+00	1.68E-01	1.68E-05	1.00E+06	5.44E-03	1.33E-04	25	299.0	456.7	6,676	0.0E+00	8.0E-04	2.70E+01			
74953	Methylene bromide (dibromomethane)	2.17E+01	5.51E-02	1.19E-05	1.19E+04	3.36E-02	8.22E-04	25	370.0	583.0	7,868	0.0E+00	4.0E-03	1.74E+02			
75003	Chloroethane (ethyl chloride)	2.17E+01	1.04E-01	1.16E-05	6.71E+03	4.54E-01	1.11E-02	25	285.3	460.4	5,879	1.3E-06	1.0E+01	6.45E+01	X		y
75014	Vinyl chloride (chloroethene)	2.17E+01	1.07E-01	1.20E-05	8.80E+03	1.14E+00	2.78E-02	25	259.3	432.0	5,250	**7.8E-05**	1.0E-01	6.25E+01			
75058	Acetonitrile	4.67E+00	1.34E-01	1.41E-05	1.00E+06	1.41E-03	3.45E-05	25	354.6	545.5	7,110	0.0E+00	6.0E-02	4.11E+01			
75070	Acetaldehyde	1.00E+00	1.28E-01	1.35E-05	1.00E+06	2.73E-03	6.67E-05	25	293.1	466.0	6,157	**2.7E-06**	9.0E-03	4.41E+01			
75092	Methylene chloride (dichloromethane)	2.17E+01	9.99E-02	1.25E-05	1.30E+04	1.33E-01	3.25E-03	25	313.0	510.0	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			
75150	Carbon disulfide	2.17E+01	1.06E-01	1.30E-05	2.16E+03	5.89E-01	1.44E-02	25	319.0	552.0	6,391	0.0E+00	7.0E-01	7.61E+01			
75218	Ethylene oxide	3.24E+00	1.34E-01	1.45E-05	1.00E+06	6.05E-03	1.48E-04	25	283.6	469.0	6,104	**8.8E-05**	**3.0E-02**	4.41E+01			
75252	Bromoform	3.18E+01	3.57E-02	1.04E-05	3.10E+03	2.19E-02	5.35E-04	25	422.4	696.0	9,479	1.1E-06	7.0E-02	2.53E+02		X	
75274	Bromodichloromethane	3.18E+01	5.63E-02	1.07E-05	3.03E+03	8.67E-02	2.12E-03	25	363.2	585.9	7,800	**3.7E-05**	7.0E-02	1.64E+02	X	X	
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.7	485.0	6,286	0.0E+00	1.0E-01	7.85E+01			y
75343	1,1-Dichloroethane	3.18E+01	8.36E-02	1.06E-05	5.04E+03	2.30E-01	5.62E-03	25	330.6	523.0	6,895	**1.6E-06**	7.0E-01	9.90E+01	X	X	
75354	1,1-Dichloroethylene	3.18E+01	8.63E-02	1.10E-05	2.42E+03	1.07E+00	2.61E-02	25	304.8	576.1	6,247	0.0E+00	**7.0E-02**	9.69E+01			
75456	Chlorodifluoromethane	3.18E+01	1.03E-01	1.33E-05	2.77E+03	1.66E+00	4.06E-02	25	232.4	369.3	4,836	0.0E+00	5.0E+01	8.65E+01			
75694	Trichlorofluoromethane	4.39E+01	6.54E-02	1.00E-05	1.10E+03	3.97E+00	9.70E-02	25	296.7	471.0	5,999	0.0E+00	7.0E-01	1.37E+02			
75718	Dichlorodifluoromethane	4.39E+01	7.60E-02	1.08E-05	2.80E+02	1.40E+01	3.43E-01	25	243.2	385.0	9,421	0.0E+00	1.0E-01	1.21E+02			
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.97E+02	3.76E-02	8.59E-06	1.70E+02	2.15E+01	5.26E-01	25	320.7	487.3	6,463	0.0E+00	3.0E+01	1.87E+02			
76448	Heptachlor	4.13E+04	2.23E-02	5.70E-06	1.80E-01	1.20E-02	2.94E-04	25	603.7	846.3	13,000	**1.2E-03**	1.8E-03	3.73E+02		X	
77474	Hexachlorocyclopentadiene	1.40E+03	2.72E-02	7.22E-06	1.80E+00	1.10E+00	2.70E-02	25	512.2	746.0	10,931	0.0E+00	2.0E-04	2.73E+02			
78831	Isobutanol	2.92E+00	8.97E-02	1.00E-05	8.50E+04	4.00E-04	9.78E-06	25	381.0	547.8	10,936	0.0E+00	1.1E+00	7.41E+01		X	
78875	1,2-Dichloropropane	6.07E+01	7.33E-02	9.73E-06	2.80E+03	1.15E-01	2.82E-03	25	369.5	572.0	7,590	**1.0E-05**	4.0E-03	1.13E+02	X		
78933	Methylethylketone (2-butanone)	4.51E+00	9.14E-02	1.02E-05	2.23E+05	2.33E-03	5.69E-05	25	352.5	536.8	7,481	0.0E+00	5.0E+00	7.21E+01			
79005	1,1,2-Trichloroethane	6.07E+01	6.69E-02	1.00E-05	4.59E+03	3.37E-02	8.24E-04	25	386.2	602.0	8,322	1.6E-05	2.0E-04	1.33E+02			
79016	Trichloroethylene	6.07E+01	6.87E-02	1.02E-05	1.28E+03	4.03E-01	9.85E-03	25	360.4	544.2	7,505	4.1E-06	2.0E-03	1.31E+02			y
79209	Methyl acetate	3.06E+00	9.58E-02	1.10E-05	2.43E+05	4.70E-03	1.15E-04	25	329.8	506.7	7,260	0.0E+00	3.5E+00	7.41E+01		X	
79345	1,1,2,2-Tetrachloroethane	9.49E+01	4.89E-02	9.29E-06	2.83E+03	1.50E-02	3.67E-04	25	419.6	661.2	8,996	**5.8E-05**	7.0E-02	1.68E+02		X	
79469	2-Nitropropane	3.08E+01	8.47E-02	1.02E-05	1.70E+04	4.87E-03	1.19E-04	25	393.2	594.0	8,383	2.7E-03	2.0E-02	8.91E+01			
80626	Methylmethacrylate	9.14E+00	7.50E-02	9.21E-06	1.50E+04	1.30E-02	3.19E-04	25	373.5	567.0	8,975	0.0E+00	7.0E-01	1.00E+02			
83329	Acenaphthene	5.03E+03	5.06E-02	8.33E-06	3.90E+00	7.52E-03	1.84E-04	25	550.5	803.2	12,155	0.0E+00	2.1E-01	1.54E+02		X	
86737	Fluorene	9.16E+03	4.40E-02	7.89E-06	1.69E+00	3.93E-03	9.62E-05	25	570.4	870.0	12,666	0.0E+00	1.4E-01	1.66E+02		X	
87683	Hexachloro-1,3-butadiene	8.45E+02	2.67E-02	7.03E-06	3.20E+00	4.21E-01	1.03E-02	25	486.2	738.0	10,206	2.2E-05	3.5E-03	2.61E+02		X	
88722	o-Nitrotoluene	3.71E+02	5.88E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.0	720.0	12,239	6.3E-05	3.2E-03	1.37E+02	X	X	y
91203	Naphthalene	1.54E+03	6.05E-02	8.38E-06	3.10E+01	1.80E-02	4.40E-04	25	491.1	748.4	10,373	**3.4E-05**	3.0E-03	1.28E+02			
91576	2-Methylnaphthalene	2.48E+03	5.24E-02	7.78E-06	2.46E+01	2.11E-02	5.18E-04	25	514.3	761.0	12,600	0.0E+00	1.4E-02	1.42E+02		X	
92524	Biphenyl	5.13E+03	4.71E-02	7.56E-06	6.94E+00	1.26E-02	3.08E-04	25	529.1	789.0	10,890	0.0E+00	4.0E-04	1.54E+02			y
95476	o-Xylene	3.83E+02	6.89E-02	8.53E-06	1.78E+02	2.12E-01	5.18E-03	25	417.6	630.3	8,661	0.0E+00	1.0E-01	1.06E+02			
95501	1,2-Dichlorobenzene	3.83E+02	5.62E-02	8.92E-06	1.56E+02	7.85E-02	1.92E-03	25	453.6	705.0	9,700	0.0E+00	2.0E-01	1.47E+02			

Chemical Properties Lookup Table (K_{oc}, D_a, D_w, S, H', H values updated per USEPA November 2013 RSL Table)

DTSC-Recommended Toxicity Criteria Values Used to Calculate Risk and Hazard (last updated March 2014) (0.0E+00 = no value available)

NEW => 11 Additional Chemicals
(CAS No. in red)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$ (cal/mol)	Inhalation Unit Risk IUR ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Extrapolated from oral toxicity value: IUR (X)	Extrapolated from oral toxicity value: RfC (X)	Comment Flag (y)
95578	2-Chlorophenol	3.07E+02	6.61E-02	9.48E-06	1.13E+04	4.58E-04	1.12E-05	25	447.5	675.0	9,572	0.0E+00	1.8E-02	1.29E+02		X	
95636	1,2,4-Trimethylbenzene	6.14E+02	6.07E-02	7.92E-06	5.70E+01	2.52E-01	6.16E-03	25	442.3	649.2	9,369	0.0E+00	7.0E-03	1.20E+02			
96128	1,2-Dibromo-3-chloropropane	1.16E+02	3.21E-02	8.90E-06	1.23E+03	6.01E-03	1.47E-04	25	469.0	703.5	9,960	6.0E-03	2.0E-04	2.36E+02			
96184	1,2,3-Trichloropropane	1.16E+02	5.75E-02	9.24E-06	1.75E+03	1.40E-02	3.43E-04	25	430.0	652.0	9,171	8.6E-03	3.0E-04	1.47E+02	X		y
96333	Methyl acrylate	5.84E+00	8.60E-02	1.02E-05	4.94E+04	8.14E-03	1.99E-04	25	353.7	536.0	7,749	0.0E+00	2.0E-02	8.61E+01			
97632	Ethylmethacrylate	1.67E+01	6.53E-02	8.38E-06	5.40E+03	2.34E-02	5.73E-04	25	390.0	571.0	10,957	0.0E+00	3.0E-01	1.14E+02			
98066	tert-Butylbenzene	1.00E+03	5.30E-02	7.37E-06	2.95E+01	5.40E-01	1.32E-02	25	442.1	1,220.0	8,980	0.0E+00	4.0E-01	1.34E+02			
98828	Cumene	6.98E+02	6.03E-02	7.86E-06	6.13E+01	4.70E-01	1.15E-02	25	425.6	631.1	10,335	0.0E+00	4.0E-01	1.20E+02			y
98862	Acetophenone	5.19E+01	6.52E-02	8.72E-06	6.13E+03	4.25E-04	1.04E-05	25	475.0	709.5	11,732	0.0E+00	3.5E-01	1.20E+02		X	
98953	Nitrobenzene	2.26E+02	6.81E-02	9.45E-06	2.09E+03	9.81E-04	2.40E-05	25	484.0	719.0	10,566	4.0E-05	9.0E-03	1.23E+02			
100414	Ethylbenzene	4.46E+02	6.85E-02	8.46E-06	1.69E+02	3.22E-01	7.88E-03	25	409.3	617.2	8,501	**2.5E-06**	1.0E+00	1.06E+02			
100425	Styrene	4.46E+02	7.11E-02	8.78E-06	3.10E+02	1.12E-01	2.75E-03	25	418.3	636.0	8,737	0.0E+00	**9.0E-01**	1.04E+02			
100447	Benzylchloride	4.46E+02	6.34E-02	8.81E-06	5.25E+02	1.68E-02	4.12E-04	25	452.0	685.0	8,773	**4.9E-05**	1.0E-03	1.27E+02	X		
100527	Benzaldehyde	1.11E+01	7.44E-02	9.46E-06	6.95E+03	1.09E-03	2.67E-05	25	452.0	695.0	11,658	0.0E+00	3.5E-01	1.06E+02		X	
103651	n-Propylbenzene	8.13E+02	6.02E-02	7.83E-06	5.22E+01	4.29E-01	1.05E-02	25	432.2	630.0	9,123	0.0E+00	1.0E+00	1.20E+02			
104518	n-Butylbenzene	1.48E+03	5.28E-02	7.33E-06	1.18E+01	6.50E-01	1.59E-02	25	456.5	660.5	9,290	0.0E+00	1.8E-01	1.34E+02		X	
106423	p-Xylene	3.75E+02	6.82E-02	8.42E-06	1.62E+02	2.82E-01	6.90E-03	25	411.5	616.2	8,525	0.0E+00	1.0E-01	1.06E+02			
106467	1,4-Dichlorobenzene	3.75E+02	5.50E-02	8.68E-06	8.13E+01	9.85E-02	2.41E-03	25	447.2	684.8	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			
106898	Epichlorohydrin	9.91E+00	8.89E-02	1.11E-05	6.59E+04	1.24E-03	3.04E-05	25	390.0	600.0	10	**2.3E-05**	1.0E-03	9.25E+01			
106934	1,2-Dibromoethane (ethylene dibromide)	3.96E+01	4.30E-02	1.04E-05	3.91E+03	2.66E-02	6.50E-04	25	404.6	583.0	8,310	6.0E-04	**8.0E-04**	1.88E+02			
106990	1,3-Butadiene	3.96E+01	1.00E-01	1.03E-05	7.35E+02	3.01E+00	7.36E-02	25	268.6	425.0	5,370	**1.7E-04**	**2.0E-03**	5.41E+01			
107028	Acrolein	1.00E+00	1.12E-01	1.22E-05	2.12E+05	4.99E-03	1.22E-04	25	325.6	506.0	6,731	0.0E+00	2.0E-05	5.61E+01			
107062	1,2-Dichloroethane	3.96E+01	8.57E-02	1.10E-05	8.60E+03	4.82E-02	1.18E-03	25	356.7	561.0	7,643	2.6E-05	7.0E-03	9.90E+01			
107131	Acrylonitrile	8.51E+00	1.14E-01	1.23E-05	7.45E+04	5.64E-03	1.38E-04	25	350.3	519.0	7,786	**2.9E-04**	2.0E-03	5.31E+01			
108054	Vinyl acetate	5.58E+00	8.49E-02	1.00E-05	2.00E+04	2.09E-02	5.11E-04	25	345.7	519.1	7,800	0.0E+00	**2.0E-01**	8.61E+01			
108101	Methylisobutylketone (4-methyl-2-pentanc	1.26E+01	6.98E-02	8.35E-06	1.90E+04	5.64E-03	1.38E-04	25	389.5	571.0	8,243	0.0E+00	3.0E+00	1.00E+02			y
108203	Diisopropyl ether (DIPE)	2.28E+01	6.54E-02	7.76E-06	8.80E+03	7.76E-06	2.56E-03	25	341.5	499.9	6,950	0.0E+00	7.0E-01	1.02E+02			
108383	m-Xylene	3.75E+02	6.84E-02	8.44E-06	1.61E+02	2.94E-01	7.18E-03	25	412.3	617.1	8,523	0.0E+00	1.0E-01	1.06E+02			
108601	bis(2-Chloroisopropyl)ether	8.29E+01	3.99E-02	7.36E-06	1.70E+03	3.03E-03	7.42E-05	25	460.0	690.0	9,695	1.0E-05	1.4E-01	1.71E+02		X	
108678	1,3,5-Trimethylbenzene	6.02E+02	6.02E-02	7.84E-06	4.82E+01	3.59E-01	8.77E-03	25	437.9	637.3	9,321	0.0E+00	3.5E-02	1.20E+02		X	
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.9	572.2	7,474	0.0E+00	7.0E-01	9.82E+01			y
108883	Toluene	2.34E+02	7.78E-02	9.20E-06	5.26E+02	2.71E-01	6.64E-03	25	383.8	591.8	7,930	0.0E+00	**3.0E-01**	9.21E+01			
108907	Chlorobenzene	2.34E+02	7.21E-02	9.48E-06	4.98E+02	1.27E-01	3.11E-03	25	404.9	632.4	8,410	0.0E+00	5.0E-02	1.13E+02			
109660	Pentane, n-	7.22E+01	8.21E-02	8.80E-06	3.80E+01	5.11E+01	1.25E+00	25	309.0	469.7	6,155	0.0E+00	1.0E+00	7.22E+01			
109693	1-Chlorobutane	7.22E+01	7.84E-02	9.33E-06	1.10E+03	6.83E-01	1.67E-02	25	351.6	542.0	7,263	0.0E+00	1.4E-01	9.26E+01		X	
109999	Tetrahydrofuran	1.08E+01	9.54E-02	1.08E-05	1.00E+06	2.88E-03	7.05E-05	25	339.0	541.0	7,074	0.0E+00	2.0E+00	7.21E+01			y
110009	Furan	8.00E+01	1.03E-01	1.17E-05	1.00E+04	2.21E-01	5.40E-03	25	304.6	490.2	6,477	0.0E+00	3.5E-03	6.81E+01		X	y
110543	Hexane	1.32E+02	7.31E-02	8.17E-06	9.50E+00	7.36E+01	1.80E+00	25	341.7	508.0	6,895	0.0E+00	7.0E-01	8.62E+01			
110827	Cyclohexane	1.46E+02	8.00E-02	9.11E-06	5.50E+01	6.13E+00	1.50E-01	25	353.7	553.4	7,154	0.0E+00	6.0E+00	8.42E+01			
111444	Bis(2-chloroethyl)ether	3.22E+01	5.67E-02	8.71E-06	1.72E+04	6.95E-04	1.70E-05	25	451.2	659.8	10,803	**7.1E-04**	0.0E+00	1.43E+02			
115297	Endosulfan	6.76E+03	2.25E-02	5.76E-06	3.25E-01	2.66E-03	6.50E-05	25	674.4	942.9	14,000	0.0E+00	2.1E-02	4.07E+02		X	
118741	Hexachlorobenzene	6.20E+03	2.90E-02	7.85E-06	6.20E-03	6.95E-02	1.70E-03	25	582.6	825.0	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	
120821	1,2,4-Trichlorobenzene	1.36E+03	3.96E-02	8.40E-06	4.90E+01	5.81E-02	1.42E-03	25	486.2	725.0	10,471	0.0E+00	2.0E-03	1.81E+02			
123739	Crotonaldehyde (2-butenal)	1.79E+00	9.56E-02	1.08E-05	1.50E+05	7.93E-04	1.94E-05	25	375.2	568.0	9	5.4E-04	0.0E+00	7.01E+01	X		
123911	1,4-Dioxane	2.63E+00	8.74E-02	1.05E-05	1.00E+06	1.96E-04	4.80E-06	25	374.3	587.2	8,164	**7.7E-06**	3.0E-02	8.81E+01			
124481	Dibromochloromethane	3.18E+01	3.66E-02	1.06E-05	2.70E+03	3.20E-02	7.83E-04	25	416.1	678.2	5,900	**2.7E-05**	7.0E-02	2.08E+02		X	
126987	Methacrylonitrile	1.31E+01	9.64E-02	1.06E-05	2.54E+04	1.01E-02	2.47E-04	25	363.3	554.0	7,600	0.0E+00	3.0E-02	6.71E+01			
126998	2-Chloro-1,3-butadiene (chloroprene)	6.07E+01	8.42E-02	1.00E-05	8.37E+02	2.29E+00	5.61E-02	25	332.4	525.0	8,075	3.0E-04	2.0E-02	8.85E+01			
127184	Tetrachloroethylene	9.49E+01	5.05E-02	9.46E-06	2.06E+02	7.24E-01	1.77E-02	25	394.4	620.2	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			
129000	Pyrene	5.43E+04	2.78E-02	7.25E-06	1.35E-01	4.87E-04	1.19E-05	25	668.0	936.0	14,370	0.0E+00	1.1E-01	2.02E+02		X	
132649	Dibenzofuran	9.16E+03	4.11E-02	7.38E-06	3.10E+00	8.71E-03	2.13E-04	25	560.0	824.0	66,400	0.0E+00	3.5E-03	1.68E+02		X	
135988	sec-Butylbenzene	1.33E+03	5.28E-02	7.34E-06	1.76E+01	7.20E-01	1.76E-02	25	446.5	679.0	88,730	0.0E+00	4.0E-01	1.34E+02			
141786	Ethylacetate	5.58E+00	8.23E-02	9.70E-06	8.00E+04	5.48E-03	1.34E-04	25	350.3	523.3	7,634	0.0E+00	7.0E-02	8.81E+01			
142289	1,3-Dichloropropane	7.22E+01	7.39E-02	9.82E-06	2.75E+03	3.99E-02	9.76E-04	25	393.9	590.9	8,103	0.0E+00	7.0E-02	1.13E+02		X	
156592	cis-1,2-Dichloroethylene	3.96E+01	8.84E-02	1.13E-05	6.41E+03	1.67E-01	4.08E-03	25	333.7	544.0	7,192	0.0E+00	7.0E-03	9.69E+01		X	
156605	trans-1,2-Dichloroethylene	3.96E+01	8.76E-02	1.12E-05	4.52E+03	1.67E-01	4.08E-03	25	320.9	516.5	6,717	0.0E+00	6.0E-02	9.69E+01			
205992	Benzo(b)fluoranthene	5.99E+05	4.76E-02	5.56E-06	1.50E-03	2.69E-05	6.57E-07	25	715.9	969.3	17,000	**1.1E-04**	0.0E+00	2.52E+02			
218019	Chrysene	1.81E+05	2.61E-02	6.75E-06	2.00E-03	2.14E-04	5.23E-06	25	714.2	979.0	16,455	**1.1E-05**	0.0E+00	2.28E+02			
309002	Aldrin	8.20E+04	3.72E-02	4.35E-06	1.70E-02	1.80E-03	4.40E-05	25	603.0	839.4	15,000	**4.9E-03**	1.1E-04	3.65E+02		X	
319846	alpha-HCH (alpha-BHC)	2.81E+03	4.33E-02	5.06E-06	2.00E+00	2.10E-04	5.14E-06	25	596.6	839.4	15,000	1.8E-03	0.0E+00	2.91E+02			
541731	1,3-Dichlorobenzene	3.79E+02	5.56E-02	8.80E-06	1.19E+02	8.85E-02	2.17E-03	25	446.0	684.0	9,230	0.0E+00	1.1E-01	1.47E+02		X	y
542756	1,3-Dichloropropene	7.22E+01	7.63E-02	1.01E-05	2.80E+03	1.45E-01	3.55E-03	25	381.2	587.4	7,900	**1.6E-05**	2.0E-02	1.11E+02			
542881	bis(Chloromethyl)ether	9.70E+00	7.63E-02	1.04E-05	2.20E+04	1.78E-01	4.36E-03	25	379.0	568.5	7,910	6.2E-02	0.0E+00	1.15E+02			y
630206	1,1,1,2-Tetrachloroethane	8.60E+01	4.82E-02	9.10E-06	1.07E+03	1.02E-01	2.50E-03	25	403.5	624.0	9,768	7.4E-06	1.1E-01	1.68E+02		X	
924163	N-Nitroso-di-n-butylamine	9.15E+02	6.49E-02	7.59E-06	1.27E+03	5.40E-04	1.32E-05	25	389.0	583.5	11,200	**3.1E-03**	0.0E+00	1.58E+02			
1634044	MTBE (methyl-*tert*-butyl ether)	1.16E+01	7.53E-02	8.59E-06	5.10E+04	2.40E-02	5.87E-04	25	328.3	497.1	6,678	**2.6E-07**	3.0E+00	8.82E+01			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	6.00E-02	4.67E-01	1.14E-02	25	629.9	1,750.0	14,127	0.0E+00	**3.0E-05**	2.01E+02			
123456789	TBD	5.20E+01	3.07E-02	6.30E-06	6.00E-02	4.67E-01	1.14E-02	25	629.9	1,750.0	14,127	0.0E+00	**1.0E+02**	2.01E+02			

APPENDIX D

Johnson and Ettinger Model Spreadsheets for VOCs Detected at a Depth of 15 Feet Below Ground Surface

USEPA SG-SCREEN
Version 2.0, 04/2003

DTSC Modification March 2014

Department of Toxic Substances Control
Vapor Intrusion Screening Model - Soil Gas

DATA ENTRY SHEET

Land Use: **Residential**

Exposure Scenario: **For VOCs Detected at a Depth of 15 Feet Below Ground Surface**

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Soil Gas Conc. ($\mu g/m^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu g/m^3$)	Cancer Risk (unitless)	Noncancer Hazard (unitless)
					Results Summary				
156592	1.90E+02			cis-1,2-Dichloroethylene	1.90E+02	1.4E-04	2.7E-02	NA	3.7E-03
95636	1.40E+02			1,2,4-Trimethylbenzene	1.40E+02	1.0E-04	1.4E-02	NA	1.9E-03
108678	0.00E+00			1,3,5-Trimethylbenzene	0.00E+00	1.0E-04	0.0E+00	NA	0.0E+00
71432	2.60E+02			Benzene	2.60E+02	1.5E-04	3.8E-02	3.9E-07	1.2E-02
75092	0.00E+00			Methylene chloride (dichloromethane)	0.00E+00	1.6E-04	0.0E+00	0.0E+00	0.0E+00
103651	0.00E+00			n-Propylbenzene	0.00E+00	1.0E-04	0.0E+00	NA	0.0E+00
91203	0.00E+00			Naphthalene	0.00E+00	1.0E-04	0.0E+00	0.0E+00	0.0E+00
100425	0.00E+00			Styrene	0.00E+00	1.2E-04	0.0E+00	NA	0.0E+00
127184	2.30E+03			Tetrachloroethylene	2.30E+03	8.4E-05	1.9E-01	4.1E-07	5.3E-03
108883	4.60E+02			Toluene	4.60E+02	1.3E-04	5.9E-02	NA	1.9E-04
79016	3.10E+02			Trichloroethylene	3.10E+02	1.1E-04	3.5E-02	5.1E-08	1.7E-02
95476	1.20E+02			o-Xylene	1.20E+02	1.1E-04	1.4E-02	NA	1.3E-04
					TOTAL		8.5E-07		4.0E-02

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	457.2	24	SC		

MORE ↓

Lookup Soil Parameters

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE ↓

ENTER Averaging time for carcinogens,	ENTER Averaging time for noncarcinogens,	ENTER Exposure duration,	ENTER Exposure frequency,	ENTER Exposure Time	ENTER Air Exchange Rate	ENTER Ceiliing Height

	Lookup Receptor Parameters	AT_C (yrs)	AT_{NC} (yrs)	ED (yrs)	EF (days/yr)	ET (hrs/day)	ACH $(hour)^{-1}$	CH (cm)
EW=>	Residential	70	26	26	350	24	0.5	243.84
						(NEW)	(NEW)	(= **8.0** feet)
	END							

CAS	Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF $(\mu g/m^3)^{-1}$
156592	cis-1,2-Dichloroethylene	8.84E-02	1.13E-05	4.08E-03	25	7,192	333.65	544.00	0.0E+00
95636	1,2,4-Trimethylbenzene	6.07E-02	7.92E-06	6.16E-03	25	9,369	442.30	649.17	0.0E+00
108678	1,3,5-Trimethylbenzene	6.02E-02	7.84E-06	8.77E-03	25	9,321	437.89	637.25	0.0E+00
71432	Benzene	8.95E-02	1.03E-05	5.55E-03	25	7,342	353.24	562.16	2.9E-05
75092	Methylene chloride (dichloromethane)	9.99E-02	1.25E-05	3.25E-03	25	6,706	313.00	510.00	1.0E-06
103651	n-Propylbenzene	6.02E-02	7.83E-06	1.05E-02	25	9,123	432.20	630.00	0.0E+00
91203	Naphthalene	6.05E-02	8.38E-06	4.40E-04	25	10,373	491.14	748.40	3.4E-05
100425	Styrene	7.11E-02	8.78E-06	2.75E-03	25	8,737	418.31	636.00	0.0E+00
127184	Tetrachloroethylene	5.05E-02	9.46E-06	1.77E-02	25	8,288	394.40	620.20	5.9E-06
108883	Toluene	7.78E-02	9.20E-06	6.64E-03	25	7,930	383.78	591.79	0.0E+00
79016	Trichloroethylene	6.87E-02	1.02E-05	9.85E-03	25	7,505	360.36	544.20	4.1E-06
95476	o-Xylene	6.89E-02	8.53E-06	5.18E-03	25	8,661	417.60	630.30	0.0E+00

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 15 Feet Below Ground Surface

CAS	Chemical	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)
156592	cis-1,2-Dichloroethylene	7.0E-03	96.94	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
95636	1,2,4-Trimethylbenzene	7.0E-03	120.20	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
108678	1,3,5-Trimethylbenzene	3.5E-02	120.20	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
71432	Benzene	3.0E-03	78.11	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
75092	Methylene chloride (dichloromethane)	4.0E-01	84.93	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
103651	n-Propylbenzene	1.0E+00	120.19	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
91203	Naphthalene	3.0E-03	128.18	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
100425	Styrene	9.0E-01	104.15	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
127184	Tetrachloroethylene	3.5E-02	165.83	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
108883	Toluene	3.0E-01	92.14	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
79016	Trichloroethylene	2.0E-03	131.39	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09
95476	o-Xylene	1.0E-01	106.17	442.2	0.188	0.299	1.78E-09	0.837	1.49E-09

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 15 Feet Below Ground Surface

CAS	Chemical	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)
156592	cis-1,2-Dichloroethylene	4,000	1.90E+02	3.39E+04	1.00E+06	5.00E-03	15	7,592	3.91E-03
95636	1,2,4-Trimethylbenzene	4,000	1.40E+02	3.39E+04	1.00E+06	5.00E-03	15	11,516	5.77E-03
108678	1,3,5-Trimethylbenzene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	11,495	8.22E-03
71432	Benzene	4,000	2.60E+02	3.39E+04	1.00E+06	5.00E-03	15	7,977	5.30E-03
75092	Methylene chloride (dichloromethane)	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	6,884	3.13E-03
103651	n-Propylbenzene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	11,186	9.85E-03
91203	Naphthalene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	12,768	4.09E-04
100425	Styrene	4,000	0.00E+00	3.39E+04	1.00E+06	5.00E-03	15	10,294	2.59E-03
127184	Tetrachloroethylene	4,000	2.30E+03	3.39E+04	1.00E+06	5.00E-03	15	9,410	1.68E-02
108883	Toluene	4,000	4.60E+02	3.39E+04	1.00E+06	5.00E-03	15	9,001	6.31E-03
79016	Trichloroethylene	4,000	3.10E+02	3.39E+04	1.00E+06	5.00E-03	15	8,382	9.39E-03
95476	o-Xylene	4,000	1.20E+02	3.39E+04	1.00E+06	5.00E-03	15	10,245	4.89E-03

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 15 Feet Below Ground Surface

CAS	Chemical	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{V} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)
156592	cis-1,2-Dichloroethylene	1.60E-01	1.80E-04	2.29E-03	442.2	15	1.90E+02	1.25	8.33E+01	2.29E-03
95636	1,2,4-Trimethylbenzene	2.37E-01	1.80E-04	1.57E-03	442.2	15	1.40E+02	1.25	8.33E+01	1.57E-03
108678	1,3,5-Trimethylbenzene	3.37E-01	1.80E-04	1.56E-03	442.2	15	0.00E+00	1.25	8.33E+01	1.56E-03
71432	Benzene	2.18E-01	1.80E-04	2.31E-03	442.2	15	2.60E+02	1.25	8.33E+01	2.31E-03
75092	Methylene chloride (dichloromethane)	1.28E-01	1.80E-04	2.58E-03	442.2	15	0.00E+00	1.25	8.33E+01	2.58E-03
103651	n-Propylbenzene	4.04E-01	1.80E-04	1.55E-03	442.2	15	0.00E+00	1.25	8.33E+01	1.55E-03
91203	Naphthalene	1.68E-02	1.80E-04	1.58E-03	442.2	15	0.00E+00	1.25	8.33E+01	1.58E-03
100425	Styrene	1.06E-01	1.80E-04	1.84E-03	442.2	15	0.00E+00	1.25	8.33E+01	1.84E-03
127184	Tetrachloroethylene	6.88E-01	1.80E-04	1.30E-03	442.2	15	2.30E+03	1.25	8.33E+01	1.30E-03
108883	Toluene	2.59E-01	1.80E-04	2.01E-03	442.2	15	4.60E+02	1.25	8.33E+01	2.01E-03
79016	Trichloroethylene	3.85E-01	1.80E-04	1.77E-03	442.2	15	3.10E+02	1.25	8.33E+01	1.77E-03
95476	o-Xylene	2.00E-01	1.80E-04	1.78E-03	442.2	15	1.20E+02	1.25	8.33E+01	1.78E-03

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 15 Feet Below Ground Surface

CAS	Chemical	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
156592	cis-1,2-Dichloroethylene	5.00E+03	4.72E+31	**1.44E-04**	2.73E-02	NA	7.0E-03	**NA**	**3.7E-03**
95636	1,2,4-Trimethylbenzene	5.00E+03	1.46E+46	**1.00E-04**	1.41E-02	NA	7.0E-03	**NA**	**1.9E-03**
108678	1,3,5-Trimethylbenzene	5.00E+03	3.31E+46	**9.97E-05**	0.00E+00	NA	3.5E-02	**NA**	**0.0E+00**
71432	Benzene	5.00E+03	1.93E+31	**1.45E-04**	3.78E-02	2.9E-05	3.0E-03	**3.9E-07**	**1.2E-02**
75092	Methylene chloride (dichloromethane)	5.00E+03	1.03E+28	**1.61E-04**	0.00E+00	1.0E-06	4.0E-01	**0.0E+00**	**0.0E+00**
103651	n-Propylbenzene	5.00E+03	3.77E+46	**9.96E-05**	0.00E+00	NA	1.0E+00	**NA**	**0.0E+00**
91203	Naphthalene	5.00E+03	7.72E+45	**1.01E-04**	0.00E+00	3.4E-05	3.0E-03	**0.0E+00**	**0.0E+00**
100425	Styrene	5.00E+03	2.30E+39	**1.17E-04**	0.00E+00	NA	9.0E-01	**NA**	**0.0E+00**
127184	Tetrachloroethylene	5.00E+03	3.33E+55	**8.41E-05**	1.93E-01	5.9E-06	3.5E-02	**4.1E-07**	**5.3E-03**
108883	Toluene	5.00E+03	1.01E+36	**1.27E-04**	5.86E-02	NA	3.0E-01	**NA**	**1.9E-04**
79016	Trichloroethylene	5.00E+03	6.36E+40	**1.13E-04**	3.50E-02	4.1E-06	2.0E-03	**5.1E-08**	**1.7E-02**
95476	o-Xylene	5.00E+03	4.36E+40	**1.13E-04**	1.36E-02	NA	1.0E-01	**NA**	**1.3E-04**
							TOTAL	8.5E-07	4.0E-02

Land Use: Residential

Exposure Scenario: For VOCs Detected at a Depth of 15 Feet Below Ground Surface

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

NEW => Receptor Lookup Table (added by HERO)

Receptor Type	AT_C (yrs)	AT_{NC} (yrs)	ED (yrs)	EF (days/yr)	ET (hrs/day)	ACH (1/hour)
Residential	70	26	26	350	24	0.5
Commercial	70	25	25	250	8	1
User-Defined						

Notes on Toxicity Criteria (see cell comments for individual chemical toxicity values)

1. Chemical name (blue) = Carcinogens with IUR
2. Values are from USEPA IRIS database except as indicated.
3. **Bold** = Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) toxicity value
4. IUR or RfC (red) = revised values (March 2014 update of December 2011 values)
5. X denotes route extrapolation from oral toxicity criteria.
   (Values posted by USEPA or OEHHA as inhalation criteria, including cancer slope factors, are not denoted except as in original USEPA 2002 Draft VI guidance.)

Chemical Properties Lookup Table (K_{oc}, D_a, D_w, S, H', H values updated per USEPA November 2013 RSL Table)

DTSC-Recommended Toxicity Criteria Values Used to Calculate Risk and Hazard (last updated March 2014) (0.0E+00 = no value available)

NEW => 11 Additional Chemicals (CAS No. in red)		Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$ (cal/mol)	Inhalation Unit Risk IUR ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Extrapolated from oral toxicity value: IUR (X)	Extrapolated from oral toxicity value: RfC (X)	Comment Flag (y)
56235	Carbon tetrachloride	4.39E+01	5.71E-02	9.79E-06	7.93E+02	1.13E+00	2.76E-02	25	349.9	556.6	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			
57749	Chlordane	3.38E+04	3.44E-02	4.02E-06	5.60E-02	1.99E-03	4.85E-05	25	624.2	885.7	14,000	**3.4E-04**	7.0E-04	4.10E+02			
58899	gamma-HCH (Lindane)	2.81E+03	4.33E-02	5.06E-06	7.30E+00	2.10E-04	5.14E-06	25	596.6	839.4	15,000	**3.1E-04**	1.1E-03	2.91E+02		X	
60297	Ethyl ether	9.70E+00	8.52E-02	9.36E-06	6.04E+04	5.03E-02	1.23E-03	25	307.5	466.7	6,338	0.0E+00	7.0E-01	7.41E+01		X	
60571	Dieldrin	2.01E+04	2.33E-02	6.01E-06	1.95E-01	4.09E-04	1.00E-05	25	613.3	842.3	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	
67641	Acetone	2.36E+00	1.06E-01	1.15E-05	1.00E+06	1.43E-03	3.50E-05	25	329.2	508.1	6,955	0.0E+00	3.1E+01	5.81E+01			
67663	Chloroform	3.18E+01	7.69E-02	1.09E-05	7.95E+03	1.50E-01	3.67E-03	25	334.3	536.4	6,988	2.3E-05	9.8E-02	1.19E+02			
67721	Hexachloroethane	1.97E+02	3.21E-02	8.89E-06	5.00E+01	1.59E-01	3.89E-03	25	458.0	695.0	9,510	**1.1E-05**	3.0E-02	2.37E+02			
71432	Benzene	1.46E+02	8.95E-02	1.03E-05	1.79E+03	2.27E-01	5.55E-03	25	353.2	562.2	7,342	**2.9E-05**	**3.0E-03**	7.81E+01			y
71556	1,1,1-Trichloroethane	4.39E+01	6.48E-02	9.60E-06	1.29E+03	7.03E-01	1.72E-02	25	347.2	545.0	7,136	0.0E+00	**1.0E+00**	1.33E+02			
72435	Methoxychlor	2.69E+04	2.21E-02	5.59E-06	1.00E-01	8.30E-06	2.03E-07	25	651.0	848.5	16,000	0.0E+00	1.8E-02	3.46E+02		X	
72559	DDE	1.18E+05	4.08E-02	4.76E-06	4.00E-02	1.70E-03	4.16E-05	25	636.4	860.4	15,000	**9.7E-05**	0.0E+00	3.18E+02	X		
74839	Methyl bromide (bromomethane)	1.32E+01	1.00E-01	1.35E-05	1.52E+04	3.00E-01	7.34E-03	25	276.7	467.0	5,714	0.0E+00	**5.0E-03**	9.49E+01			
74873	Methyl chloride (chloromethane)	1.32E+01	1.24E-01	1.36E-05	5.32E+03	3.61E-01	8.82E-03	25	249.0	416.3	5,115	0.0E+00	9.0E-02	5.05E+01			y
74908	Hydrogen cyanide	3.80E+00	1.68E-01	1.68E-05	1.00E+06	5.44E-03	1.33E-04	25	299.0	456.7	6,676	0.0E+00	8.0E-04	2.70E+01			
74953	Methylene bromide (dibromomethane)	2.17E+01	5.51E-02	1.19E-05	1.19E+04	3.36E-02	8.22E-04	25	370.0	583.0	7,868	0.0E+00	4.0E-03	1.74E+02			
75003	Chloroethane (ethyl chloride)	2.17E+01	1.04E-01	1.16E-05	6.71E+03	4.54E-01	1.11E-02	25	285.3	460.4	5,879	1.3E-06	1.0E+01	6.45E+01	X		y
75014	Vinyl chloride (chloroethene)	2.17E+01	1.07E-01	1.20E-05	8.80E+03	1.14E+00	2.78E-02	25	259.3	432.0	5,250	**7.8E-05**	1.0E-01	6.25E+01			
75058	Acetonitrile	4.67E+00	1.34E-01	1.41E-05	1.00E+06	1.41E-03	3.45E-05	25	354.6	545.5	7,110	0.0E+00	6.0E-02	4.11E+01			
75070	Acetaldehyde	1.00E+00	1.28E-01	1.35E-05	1.00E+06	2.73E-03	6.67E-05	25	293.1	466.0	6,157	**2.7E-06**	9.0E-03	4.41E+01			
75092	Methylene chloride (dichloromethane)	2.17E+01	9.99E-02	1.25E-05	1.30E+04	1.33E-01	3.25E-03	25	313.0	510.0	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			
75150	Carbon disulfide	2.17E+01	1.06E-01	1.30E-05	2.16E+03	5.89E-01	1.44E-02	25	319.0	552.0	6,391	0.0E+00	7.0E-01	7.61E+01			
75218	Ethylene oxide	3.24E+00	1.34E-01	1.45E-05	1.00E+06	6.05E-03	1.48E-04	25	283.6	469.0	6,104	**8.8E-05**	**3.0E-02**	4.41E+01			
75252	Bromoform	3.18E+01	3.57E-02	1.04E-05	3.10E+03	2.19E-02	5.35E-04	25	422.4	696.0	9,479	1.1E-06	7.0E-02	2.53E+02		X	
75274	Bromodichloromethane	3.18E+01	5.63E-02	1.07E-05	3.03E+03	8.67E-02	2.12E-03	25	363.2	585.9	7,800	**3.7E-05**	7.0E-02	1.64E+02	X	X	
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.7	485.0	6,286	0.0E+00	1.0E-01	7.85E+01			y
75343	1,1-Dichloroethane	3.18E+01	8.36E-02	1.06E-05	5.04E+03	2.30E-01	5.62E-03	25	330.6	523.0	6,895	**1.6E-06**	7.0E-01	9.90E+01	X	X	
75354	1,1-Dichloroethylene	3.18E+01	8.63E-02	1.10E-05	2.42E+03	1.07E+00	2.61E-02	25	304.8	576.1	6,247	0.0E+00	**7.0E-02**	9.69E+01			
75456	Chlorodifluoromethane	3.18E+01	1.03E-01	1.33E-05	2.77E+03	1.66E+00	4.06E-02	25	232.4	369.3	4,836	0.0E+00	5.0E+01	8.65E+01			
75694	Trichlorofluoromethane	4.39E+01	6.54E-02	1.00E-05	1.10E+03	3.97E+00	9.70E-02	25	296.7	471.0	5,999	0.0E+00	7.0E-01	1.37E+02			
75718	Dichlorodifluoromethane	4.39E+01	7.60E-02	1.08E-05	2.80E+02	1.40E+01	3.43E-01	25	243.2	385.0	9,421	0.0E+00	1.0E-01	1.21E+02			
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.97E+02	3.76E-02	8.59E-06	1.70E+02	2.15E+01	5.26E-01	25	320.7	487.3	6,463	0.0E+00	3.0E+01	1.87E+02			
76448	Heptachlor	4.13E+04	2.23E-02	5.70E-06	1.80E-01	1.20E-02	2.94E-04	25	603.7	846.3	13,000	**1.2E-03**	1.8E-03	3.73E+02		X	
77474	Hexachlorocyclopentadiene	1.40E+03	2.72E-02	7.22E-06	1.80E+00	1.10E+00	2.70E-02	25	512.2	746.0	10,931	0.0E+00	2.0E-04	2.73E+02			
78831	Isobutanol	2.92E+00	8.97E-02	1.00E-05	8.50E+04	4.00E-04	9.78E-06	25	381.0	547.8	10,936	0.0E+00	1.1E+00	7.41E+01		X	
78875	1,2-Dichloropropane	6.07E+01	7.33E-02	9.73E-06	2.80E+03	1.15E-01	2.82E-03	25	369.5	572.0	7,590	**1.0E-05**	4.0E-03	1.13E+02	X		
78933	Methylethylketone (2-butanone)	4.51E+00	9.14E-02	1.02E-05	2.23E+05	2.33E-03	5.69E-05	25	352.5	536.8	7,481	0.0E+00	5.0E+00	7.21E+01			
79005	1,1,2-Trichloroethane	6.07E+01	6.69E-02	1.00E-05	4.59E+03	3.37E-02	8.24E-04	25	386.2	602.0	8,322	1.6E-05	2.0E-04	1.33E+02			
79016	Trichloroethylene	6.07E+01	6.87E-02	1.02E-05	1.28E+03	4.03E-01	9.85E-03	25	360.4	544.2	7,505	4.1E-06	2.0E-03	1.31E+02			y
79209	Methyl acetate	3.06E+00	9.58E-02	1.10E-05	2.43E+05	4.70E-03	1.15E-04	25	329.8	506.7	7,260	0.0E+00	3.5E+00	7.41E+01		X	
79345	1,1,2,2-Tetrachloroethane	9.49E+01	4.89E-02	9.29E-06	2.83E+03	1.50E-02	3.67E-04	25	419.6	661.2	8,996	**5.8E-05**	7.0E-02	1.68E+02		X	
79469	2-Nitropropane	3.08E+01	8.47E-02	1.02E-05	1.70E+04	4.87E-03	1.19E-04	25	393.2	594.0	8,383	2.7E-03	2.0E-02	8.91E+01			
80626	Methylmethacrylate	9.14E+00	7.50E-02	9.21E-06	1.50E+04	1.30E-02	3.19E-04	25	373.5	567.0	8,975	0.0E+00	7.0E-01	1.00E+02			
83329	Acenaphthene	5.03E+03	5.06E-02	8.33E-06	3.90E+00	7.52E-03	1.84E-04	25	550.5	803.2	12,155	0.0E+00	2.1E-01	1.54E+02		X	
86737	Fluorene	9.16E+03	4.40E-02	7.89E-06	1.69E+00	3.93E-03	9.62E-05	25	570.4	870.0	12,666	0.0E+00	1.4E-01	1.66E+02		X	
87683	Hexachloro-1,3-butadiene	8.45E+02	2.67E-02	7.03E-06	3.20E+00	4.21E-01	1.03E-02	25	486.2	738.0	10,206	2.2E-05	3.5E-03	2.61E+02		X	
88722	o-Nitrotoluene	3.71E+02	5.88E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.0	720.0	12,239	6.3E-05	3.2E-03	1.37E+02	X	X	y
91203	Naphthalene	1.54E+03	6.05E-02	8.38E-06	3.10E+01	1.80E-02	4.40E-04	25	491.1	748.4	10,373	**3.4E-05**	3.0E-03	1.28E+02			
91576	2-Methylnaphthalene	2.48E+03	5.24E-02	7.78E-06	2.46E+01	2.11E-02	5.18E-04	25	514.3	761.0	12,600	0.0E+00	1.4E-02	1.42E+02		X	
92524	Biphenyl	5.13E+03	4.71E-02	7.56E-06	6.94E+00	1.26E-02	3.08E-04	25	529.1	789.0	10,890	0.0E+00	4.0E-04	1.54E+02			y
95476	o-Xylene	3.83E+02	6.89E-02	8.53E-06	1.78E+02	2.12E-01	5.18E-03	25	417.6	630.3	8,661	0.0E+00	1.0E-01	1.06E+02			
95501	1,2-Dichlorobenzene	3.83E+02	5.62E-02	8.92E-06	1.56E+02	7.85E-02	1.92E-03	25	453.6	705.0	9,700	0.0E+00	2.0E-01	1.47E+02			

Chemical Properties Lookup Table (K_{oc}, D_a, D_w, S, H', H values updated per USEPA November 2013 RSL Table)

DTSC-Recommended Toxicity Criteria Values Used to Calculate Risk and Hazard (last updated March 2014)

(0.0E+00 = no value available)

NEW => 11 Additional Chemicals
(CAS No. in red)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$ (cal/mol)	Inhalation Unit Risk IUR ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	Extrapolated from oral toxicity value: IUR (X)	Extrapolated from oral toxicity value: RfC (X)	Comment Flag (y)
95578	2-Chlorophenol	3.07E+02	6.61E-02	9.48E-06	1.13E+04	4.58E-04	1.12E-05	25	447.5	675.0	9,572	0.0E+00	1.8E-02	1.29E+02		X	
95636	1,2,4-Trimethylbenzene	6.14E+02	6.07E-02	7.92E-06	5.70E+01	2.52E-01	6.16E-03	25	442.3	649.2	9,369	0.0E+00	7.0E-03	1.20E+02			
96128	1,2-Dibromo-3-chloropropane	1.16E+02	3.21E-02	8.90E-06	1.23E+03	6.01E-03	1.47E-04	25	469.0	703.5	9,960	6.0E-03	2.0E-04	2.36E+02			
96184	1,2,3-Trichloropropane	1.16E+02	5.75E-02	9.24E-06	1.75E+03	1.40E-02	3.43E-04	25	430.0	652.0	9,171	8.6E-03	3.0E-04	1.47E+02	X		y
96333	Methyl acrylate	5.84E+00	8.60E-02	1.02E-05	4.94E+04	8.14E-03	1.99E-04	25	353.7	536.0	7,749	0.0E+00	2.0E-02	8.61E+01			
97632	Ethylmethacrylate	1.67E+01	6.53E-02	8.38E-06	5.40E+03	2.34E-02	5.73E-04	25	390.0	571.0	10,957	0.0E+00	3.0E-01	1.14E+02			
98066	tert-Butylbenzene	1.00E+03	5.30E-02	7.37E-06	2.95E+01	5.40E-01	1.32E-02	25	442.1	1,220.0	8,980	0.0E+00	4.0E-01	1.34E+02			
98828	Cumene	6.98E+02	6.03E-02	7.86E-06	6.13E+01	4.70E-01	1.15E-02	25	425.6	631.1	10,335	0.0E+00	4.0E-01	1.20E+02			y
98862	Acetophenone	5.19E+01	6.52E-02	8.72E-06	6.13E+03	4.25E-04	1.04E-05	25	475.0	709.5	11,732	0.0E+00	3.5E-01	1.20E+02		X	
98953	Nitrobenzene	2.26E+02	6.81E-02	9.45E-06	2.09E+03	9.81E-04	2.40E-05	25	484.0	719.0	10,566	4.0E-05	9.0E-03	1.23E+02			
100414	Ethylbenzene	4.46E+02	6.85E-02	8.46E-06	1.69E+02	3.22E-01	7.88E-03	25	409.3	617.2	8,501	**2.5E-06**	1.0E+00	1.06E+02			
100425	Styrene	4.46E+02	7.11E-02	8.78E-06	3.10E+02	1.12E-01	2.75E-03	25	418.3	636.0	8,737	0.0E+00	**9.0E-01**	1.04E+02			
100447	Benzylchloride	4.46E+02	6.34E-02	8.81E-06	5.25E+02	1.68E-02	4.12E-04	25	452.0	685.0	8,773	**4.9E-05**	1.0E-03	1.27E+02	X		
100527	Benzaldehyde	1.11E+01	7.44E-02	9.46E-06	6.95E+03	1.09E-03	2.67E-05	25	452.0	695.0	11,658	0.0E+00	3.5E-01	1.06E+02		X	
103651	n-Propylbenzene	8.13E+02	6.02E-02	7.83E-06	5.22E+01	4.29E-01	1.05E-02	25	432.2	630.0	9,123	0.0E+00	1.0E+00	1.20E+02			
104518	n-Butylbenzene	1.48E+03	5.28E-02	7.33E-06	1.18E+01	6.50E-01	1.59E-02	25	456.5	660.5	9,290	0.0E+00	1.8E-01	1.34E+02		X	
106423	p-Xylene	3.75E+02	6.82E-02	8.42E-06	1.62E+02	2.82E-01	6.90E-03	25	411.5	616.2	8,525	0.0E+00	1.0E-01	1.06E+02			
106467	1,4-Dichlorobenzene	3.75E+02	5.50E-02	8.68E-06	8.13E+01	9.85E-02	2.41E-03	25	447.2	684.8	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			
106898	Epichlorohydrin	9.91E+00	8.89E-02	1.11E-05	6.59E+04	1.24E-03	3.04E-05	25	390.0	600.0	10	**2.3E-05**	1.0E-03	9.25E+01			
106934	1,2-Dibromoethane (ethylene dibromide)	3.96E+01	4.30E-02	1.04E-05	3.91E+03	2.66E-02	6.50E-04	25	404.6	583.0	8,310	6.0E-04	**8.0E-04**	1.88E+02			
106990	1,3-Butadiene	3.96E+01	1.00E-01	1.03E-05	7.35E+02	3.01E+00	7.36E-02	25	268.6	425.0	5,370	**1.7E-04**	**2.0E-03**	5.41E+01			
107028	Acrolein	1.00E+00	1.12E-01	1.22E-05	2.12E+05	4.99E-03	1.22E-04	25	325.6	506.0	6,731	0.0E+00	2.0E-05	5.61E+01			
107062	1,2-Dichloroethane	3.96E+01	8.57E-02	1.10E-05	8.60E+03	4.82E-02	1.18E-03	25	356.7	561.0	7,643	2.6E-05	7.0E-03	9.90E+01			
107131	Acrylonitrile	8.51E+00	1.14E-01	1.23E-05	7.45E+04	5.64E-03	1.38E-04	25	350.3	519.0	7,786	**2.9E-04**	2.0E-03	5.31E+01			
108054	Vinyl acetate	5.58E+00	8.49E-02	1.00E-05	2.00E+04	2.09E-02	5.11E-04	25	345.7	519.1	7,800	0.0E+00	**2.0E-01**	8.61E+01			
108101	Methylisobutylketone (4-methyl-2-pentanc	1.26E+01	6.98E-02	8.35E-06	1.90E+04	5.64E-03	1.38E-04	25	389.5	571.0	8,243	0.0E+00	3.0E+00	1.00E+02			y
108203	Diisopropyl ether (DIPE)	2.28E+01	6.54E-02	7.76E-06	8.80E+03	7.76E-06	2.56E-03	25	341.5	499.9	6,950	0.0E+00	7.0E-01	1.02E+02			
108383	m-Xylene	3.75E+02	6.84E-02	8.44E-06	1.61E+02	2.94E-01	7.18E-03	25	412.3	617.1	8,523	0.0E+00	1.0E-01	1.06E+02			
108601	bis(2-Chloroisopropyl)ether	8.29E+01	3.99E-02	7.36E-06	1.70E+03	3.03E-03	7.42E-05	25	460.0	690.0	9,695	1.0E-05	1.4E-01	1.71E+02		X	
108678	1,3,5-Trimethylbenzene	6.02E+02	6.02E-02	7.84E-06	4.82E+01	3.59E-01	8.77E-03	25	437.9	637.3	9,321	0.0E+00	3.5E-02	1.20E+02		X	
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.9	572.2	7,474	0.0E+00	7.0E-01	9.82E+01			y
108883	Toluene	2.34E+02	7.78E-02	9.20E-06	5.26E+02	2.71E-01	6.64E-03	25	383.8	591.8	7,930	0.0E+00	**3.0E-01**	9.21E+01			
108907	Chlorobenzene	2.34E+02	7.21E-02	9.48E-06	4.98E+02	1.27E-01	3.11E-03	25	404.9	632.4	8,410	0.0E+00	5.0E-02	1.13E+02			
109660	Pentane, n-	7.22E+01	8.21E-02	8.80E-06	3.80E+01	5.11E+01	1.25E+00	25	309.0	469.7	6,155	0.0E+00	1.0E+00	7.22E+01			
109693	1-Chlorobutane	7.22E+01	7.84E-02	9.33E-06	1.10E+03	6.83E-01	1.67E-02	25	351.6	542.0	7,263	0.0E+00	1.4E-01	9.26E+01		X	
109999	Tetrahydrofuran	1.08E+01	9.54E-02	1.08E-05	1.00E+06	2.88E-03	7.05E-05	25	339.0	541.0	7,074	0.0E+00	2.0E+00	7.21E+01			y
110009	Furan	8.00E+01	1.03E-01	1.17E-05	1.00E+04	2.21E-01	5.40E-03	25	304.6	490.2	6,477	0.0E+00	3.5E-03	6.81E+01		X	y
110543	Hexane	1.32E+02	7.31E-02	8.17E-06	9.50E+00	7.36E+01	1.80E+00	25	341.7	508.0	6,895	0.0E+00	7.0E-01	8.62E+01			
110827	Cyclohexane	1.46E+02	8.00E-02	9.11E-06	5.50E+01	6.13E+00	1.50E-01	25	353.7	553.4	7,154	0.0E+00	6.0E+00	8.42E+01			
111444	Bis(2-chloroethyl)ether	3.22E+01	5.67E-02	8.71E-06	1.72E+04	6.95E-04	1.70E-05	25	451.2	659.8	10,803	**7.1E-04**	0.0E+00	1.43E+02			
115297	Endosulfan	6.76E+03	2.25E-02	5.76E-06	3.25E-01	2.66E-03	6.50E-05	25	674.4	942.9	14,000	0.0E+00	2.1E-02	4.07E+02		X	
118741	Hexachlorobenzene	6.20E+03	2.90E-02	7.85E-06	6.20E-03	6.95E-02	1.70E-03	25	582.6	825.0	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	
120821	1,2,4-Trichlorobenzene	1.36E+03	3.96E-02	8.40E-06	4.90E+01	5.81E-02	1.42E-03	25	486.2	725.0	10,471	0.0E+00	2.0E-03	1.81E+02			
123739	Crotonaldehyde (2-butenal)	1.79E+00	9.56E-02	1.08E-05	1.50E+05	7.93E-04	1.94E-05	25	375.2	568.0	9	5.4E-04	0.0E+00	7.01E+01	X		
123911	1,4-Dioxane	2.63E+00	8.74E-02	1.05E-05	1.00E+06	1.96E-04	4.80E-06	25	374.3	587.2	8,164	**7.7E-06**	3.0E-02	8.81E+01			
124481	Dibromochloromethane	3.18E+01	3.66E-02	1.06E-05	2.70E+03	3.20E-02	7.83E-04	25	416.1	678.2	5,900	**2.7E-05**	7.0E-02	2.08E+02		X	
126987	Methacrylonitrile	1.31E+01	9.64E-02	1.06E-05	2.54E+04	1.01E-02	2.47E-04	25	363.3	554.0	7,600	0.0E+00	3.0E-02	6.71E+01			
126998	2-Chloro-1,3-butadiene (chloroprene)	6.07E+01	8.42E-02	1.00E-05	8.37E+02	2.29E+00	5.61E-02	25	332.4	525.0	8,075	3.0E-04	2.0E-02	8.85E+01			
127184	Tetrachloroethylene	9.49E+01	5.05E-02	9.46E-06	2.06E+02	7.24E-01	1.77E-02	25	394.4	620.2	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			
129000	Pyrene	5.43E+04	2.78E-02	7.25E-06	1.35E-01	4.87E-04	1.19E-05	25	668.0	936.0	14,370	0.0E+00	1.1E-01	2.02E+02		X	
132649	Dibenzofuran	9.16E+03	4.11E-02	7.38E-06	3.10E+00	8.71E-03	2.13E-04	25	560.0	824.0	66,400	0.0E+00	3.5E-03	1.68E+02		X	
135988	sec-Butylbenzene	1.33E+03	5.28E-02	7.34E-06	1.76E+01	7.20E-01	1.76E-02	25	446.5	679.0	88,730	0.0E+00	4.0E-01	1.34E+02			
141786	Ethylacetate	5.58E+00	8.23E-02	9.70E-06	8.00E+04	5.48E-03	1.34E-04	25	350.3	523.3	7,634	0.0E+00	7.0E-02	8.81E+01			
142289	1,3-Dichloropropane	7.22E+01	7.39E-02	9.82E-06	2.75E+03	3.99E-02	9.76E-04	25	393.9	590.9	8,103	0.0E+00	7.0E-02	1.13E+02		X	
156592	cis-1,2-Dichloroethylene	3.96E+01	8.84E-02	1.13E-05	6.41E+03	1.67E-01	4.08E-03	25	333.7	544.0	7,192	0.0E+00	7.0E-03	9.69E+01		X	
156605	trans-1,2-Dichloroethylene	3.96E+01	8.76E-02	1.12E-05	4.52E+03	1.67E-01	4.08E-03	25	320.9	516.5	6,717	0.0E+00	6.0E-02	9.69E+01			
205992	Benzo(b)fluoranthene	5.99E+05	4.76E-02	5.56E-06	1.50E-03	2.69E-05	6.57E-07	25	715.9	969.3	17,000	**1.1E-04**	0.0E+00	2.52E+02			
218019	Chrysene	1.81E+05	2.61E-02	6.75E-06	2.00E-03	2.14E-04	5.23E-06	25	714.2	979.0	16,455	**1.1E-05**	0.0E+00	2.28E+02			
309002	Aldrin	8.20E+04	3.72E-02	4.35E-06	1.70E-02	1.80E-03	4.40E-05	25	603.0	839.4	15,000	**4.9E-03**	1.1E-04	3.65E+02		X	
319846	alpha-HCH (alpha-BHC)	2.81E+03	4.33E-02	5.06E-06	2.00E+00	2.10E-04	5.14E-06	25	596.6	839.4	15,000	1.8E-03	0.0E+00	2.91E+02			
541731	1,3-Dichlorobenzene	3.79E+02	5.56E-02	8.80E-06	1.19E+02	8.85E-02	2.17E-03	25	446.0	684.0	9,230	0.0E+00	1.1E-01	1.47E+02		X	y
542756	1,3-Dichloropropene	7.22E+01	7.63E-02	1.01E-05	2.80E+03	1.45E-01	3.55E-03	25	381.2	587.4	7,900	**1.6E-05**	2.0E-02	1.11E+02			
542881	bis(Chloromethyl)ether	9.70E+00	7.63E-02	1.04E-05	2.20E+04	1.78E-01	4.36E-03	25	379.0	568.5	7,910	6.2E-02	0.0E+00	1.15E+02			y
630206	1,1,1,2-Tetrachloroethane	8.60E+01	4.82E-02	9.10E-06	1.07E+03	1.02E-01	2.50E-03	25	403.5	624.0	9,768	7.4E-06	1.1E-01	1.68E+02		X	
924163	N-Nitroso-di-n-butylamine	9.15E+02	6.49E-02	7.59E-06	1.27E+03	5.40E-04	1.32E-05	25	389.0	583.5	11,200	**3.1E-03**	0.0E+00	1.58E+02			
1634044	MTBE (methyl-*tert*-butyl ether)	1.16E+01	7.53E-02	8.59E-06	5.10E+04	2.40E-02	5.87E-04	25	328.3	497.1	6,678	**2.6E-07**	3.0E+00	8.82E+01			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	6.00E-02	4.67E-01	1.14E-02	25	629.9	1,750.0	14,127	0.0E+00	**3.0E-05**	2.01E+02			
123456789	TBD	5.20E+01	3.07E-02	6.30E-06	6.00E-02	4.67E-01	1.14E-02	25	629.9	1,750.0	14,127	0.0E+00	**1.0E+02**	2.01E+02			

SCS Soil Type	K_s (cm/h)
C	0.61
CL	0.34
L	0.50
LS	4.38
S	26.78
SC	0.47
SCL	0.55
SI	1.82
SIC	0.40
SICL	0.46
SIL	0.76
SL	1.60

NEW => Receptor Lookup Table (added by HERO)

Receptor Type	AT_C (yrs)
Residential	70
Commercial	70
User-Defined	

NEW => 11 Additional Chemicals
(CAS No. in red)

CAS No.	Chemical	USEPA-Recommended Toxicity Criteria Values November 2013 RSL Table: Inhalation Unit Risk IUR ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Extrapolated from oral toxicity value: IUR (X)	Extrapolated from oral toxicity value: RfC (X)	ARCHIVE Original USEPA Toxicity Criteria (USEPA 2002 Draft Vapor Intrusion Guidance): Unit Risk Factor URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Extrapolated from oral toxicity value: URF (X)	Extrapolated from oral toxicity value: RfC (X)
56235	Carbon tetrachloride	6.0E-06	1.0E-01			1.5E-05	0.0E+00		
57749	Chlordane	1.0E-04	7.0E-04			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	3.1E-04				3.7E-04	1.1E-03	X	X
60297	Ethyl ether					0.0E+00	7.0E-01		X
60571	Dieldrin	4.6E-03				4.6E-03	1.8E-04		X
67641	Acetone		3.1E+01			0.0E+00	3.5E-01		X
67663	Chloroform	2.3E-05	9.8E-02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.1E-05	3.0E-02			4.0E-06	3.5E-03		X
71432	Benzene	7.8E-06	3.0E-02			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane		5.0E+00			0.0E+00	2.2E+00		
72435	Methoxychlor					0.0E+00	1.8E-02		X
72559	DDE	9.7E-05		X		9.7E-05	0.0E+00	X	
74839	Methyl bromide (bromomethane)		5.0E-03			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)		9.0E-02			1.0E-06	9.0E-02		
74908	Hydrogen cyanide		8.0E-04			0.0E+00	3.0E-03		
74953	Methylene bromide (dibromomethane)		4.0E-03			0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)		1.0E+01			8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	8.8E-06	1.0E-01			8.8E-06	1.0E-01		
75058	Acetonitrile		6.0E-02			0.0E+00	6.0E-02		
75070	Acetaldehyde	2.2E-06	9.0E-03			2.2E-06	9.0E-03		
75092	Methylene chloride (dichloromethane)	1.0E-08	6.0E-01			4.7E-07	3.0E+00		
75150	Carbon disulfide		7.0E-01			0.0E+00	7.0E-01		
75218	Ethylene oxide	8.8E-05	3.0E-02			1.0E-04	0.0E+00		
75252	Bromoform	1.1E-06				1.1E-06	7.0E-02		X
75274	Bromodichloromethane	3.7E-05		X		1.8E-05	7.0E-02	X	X
75296	2-Chloropropane					0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	1.6E-06				0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene		2.0E-01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane		5.0E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane		7.0E-01			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane		1.0E-01			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroethane		3.0E+01			0.0E+00	3.0E+01		
76448	Heptachlor	1.3E-03				1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene		2.0E-04			0.0E+00	2.0E-04		
78831	Isobutanol					0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	1.0E-05	4.0E-03			1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)		5.0E+00			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	1.6E-05	2.0E-04			1.6E-05	1.4E-02		X
79016	Trichloroethylene	4.1E-06	2.0E-03			1.1E-04	4.0E-02	X	
79209	Methyl acetate					0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	5.8E-05				5.8E-05	2.1E-01		X
79469	2-Nitropropane	2.7E-03	2.0E-02			2.7E-03	2.0E-02		
80626	Methylmethacrylate		7.0E-01			0.0E+00	7.0E-01		
83329	Acenaphthene					0.0E+00	2.1E-01		X
86737	Fluorene					0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	2.2E-05				2.2E-05	7.0E-04		X
88722	o-Nitrotoluene					0.0E+00	3.5E-02		X
91203	Naphthalene	3.4E-05	3.0E-03			0.0E+00	3.0E-03		
91576	2-Methylnaphthalene					0.0E+00	7.0E-02		X
92524	Biphenyl		4.0E-04			0.0E+00	1.8E-01		X
95476	o-Xylene		1.0E-01			0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene		2.0E-01			0.0E+00	2.0E-01		

NEW => 11 Additional Chemicals (CAS No. in red)		USEPA-Recommended Toxicity Criteria Values November 2013 RSL Table				ARCHIVE Original USEPA Toxicity Criteria (USEPA 2002 Draft Vapor Intrusion Guidance)			
		Inhalation Unit Risk	Reference conc.,	Extrapolated from oral toxicity value		Unit Risk Factor	Reference conc.,	Extrapolated from oral toxicity value	
CAS No.	Chemical	IUR ($\mu g/m^3)^{-1}$	RfC (mg/m^3)	IUR (X)	RfC (X)	URF ($\mu g/m^3)^{-1}$	RfC (mg/m^3)	URF (X)	RfC (X)
95578	2-Chlorophenol					0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene		7.0E-03			0.0E+00	6.0E-03		
96128	1,2-Dibromo-3-chloropropane	6.0E-03	2.0E-04						
96184	1,2,3-Trichloropropane		3.0E-04			5.7E-04	4.9E-03	X	
96333	Methyl acrylate		2.0E-02			0.0E+00	1.1E-01		X
97632	Ethylmethacrylate		3.0E-01			0.0E+00	3.2E-01		X
98066	tert-Butylbenzene					0.0E+00	1.4E-01		X
98828	Cumene		4.0E-01			0.0E+00	4.0E-01		
98862	Acetophenone					0.0E+00	3.5E-01		X
98953	Nitrobenzene	4.0E-05	9.0E-03			0.0E+00	2.0E-03		
100414	Ethylbenzene	2.5E-06	1.0E+00			0.0E+00	1.0E+00		
100425	Styrene		1.0E+00			0.0E+00	1.0E+00		
100447	Benzylchloride	4.9E-05	1.0E-03			4.9E-05	0.0E+00	X	
100527	Benzaldehyde					0.0E+00	3.5E-01		X
103651	n-Propylbenzene		1.0E+00			0.0E+00	1.4E-01		X
104518	n-Butylbenzene					0.0E+00	1.4E-01		X
106423	p-Xylene		1.0E-01			0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	1.1E-05	8.0E-01			0.0E+00	8.0E-01		
106898	Epichlorohydrin	1.2E-06	1.0E-03						
106934	1,2-Dibromoethane (ethylene dibromide)	6.0E-04	9.0E-03			6.0E-04	9.0E-03		
106990	1,3-Butadiene	3.0E-05	2.0E-03			3.0E-05	0.0E+00		
107028	Acrolein		2.0E-05			0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	2.6E-05	7.0E-03			2.6E-05	0.0E+00		
107131	Acrylonitrile	6.8E-05	2.0E-03			6.8E-05	2.0E-03		
108054	Vinyl acetate		2.0E-01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-pentane		3.0E+00			0.0E+00	8.0E-02		
108203	Diisopropyl ether (DIPE)		7.0E-01						
108383	m-Xylene		1.0E-01			0.0E+00	1.0E-01		
108601	bis(2-Chloroisopropyl)ether	1.0E-05							
108678	1,3,5-Trimethylbenzene					0.0E+00	6.0E-03		
108872	Methylcyclohexane					0.0E+00	3.0E+00		
108883	Toluene		5.0E+00			0.0E+00	4.0E-01		
108907	Chlorobenzene		5.0E-02			0.0E+00	6.0E-02		
109660	Pentane, n-		1.0E+00						
109693	1-Chlorobutane					0.0E+00	1.4E+00		X
109999	Tetrahydrofuran		2.0E+00						
110009	Furan					0.0E+00	3.5E-03		X
110543	Hexane		7.0E-01			0.0E+00	2.0E-01		
110827	Cyclohexane		6.0E+00						
111444	Bis(2-chloroethyl)ether	3.3E-04				3.3E-04	0.0E+00		
115297	Endosulfan					0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	4.6E-04				4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene		2.0E-03			0.0E+00	2.0E-01		
123739	Crotonaldehyde (2-butenal)					5.4E-04	0.0E+00	X	
123911	1,4-Dioxane	5.0E-06	3.0E-02						
124481	Dibromochloromethane	2.7E-05				2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile		3.0E-02			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloroprene)	3.0E-04	2.0E-02			0.0E+00	7.0E-03		
127184	Tetrachloroethylene	2.6E-07	4.0E-02			3.0E-06	0.0E+00		
129000	Pyrene					0.0E+00	1.1E-01		X
132649	Dibenzofuran					0.0E+00	1.4E-02		X
135988	sec-Butylbenzene					0.0E+00	1.4E-01		X
141786	Ethylacetate					0.0E+00	3.2E+00		X
142289	1,3-Dichloropropane								
156592	cis-1,2-Dichloroethylene					0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene		6.0E-02			0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.1E-04				2.1E-04	0.0E+00	X	
218019	Chrysene	1.1E-05				2.1E-06	0.0E+00	X	
309002	Aldrin	4.9E-03				4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.8E-03				1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene					0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.0E-06	2.0E-02			4.0E-06	2.0E-02		
542881	bis(Chloromethyl)ether	6.2E-02							
630206	1,1,1,2-Tetrachloroethane	7.4E-06				7.4E-06	1.1E-01		X
924163	N-Nitroso-di-n-butylamine	1.6E-03							
1634044	MTBE (methyl-*tert*-butyl ether)	2.6E-07	3.0E+00			0.0E+00	3.0E+00		
7439976	Mercury (elemental)		3.0E-04			0.0E+00	3.0E-04		
123456789	TBD		3.0E-04			0.0E+00	3.0E-04		

APPENDIX E

ProUCL Printout

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	1/22/16 1:16:43 PM
From File	Lead stats.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Lead (mg/kg)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	1.3	Mean	24.19
Maximum	93	Median	25
SD	19.27	Std. Error of Mean	3.934
Coefficient of Variation	0.797	Skewness	1.837

Normal GOF Test

Shapiro Wilk Test Statistic	0.819	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.181	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	30.93	95% Adjusted-CLT UCL (Chen-1995)	32.24
		95% Modified-t UCL (Johnson-1978)	31.18

Gamma GOF Test

A-D Test Statistic	1.178	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.766	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.29	k star (bias corrected MLE)	1.156
Theta hat (MLE)	18.76	Theta star (bias corrected MLE)	20.92
nu hat (MLE)	61.9	nu star (bias corrected)	55.5
MLE Mean (bias corrected)	24.19	MLE Sd (bias corrected)	22.5
		Approximate Chi Square Value (0.05)	39.38
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	38.42

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	34.09	95% Adjusted Gamma UCL (use when n<50)	34.94

51	**Lognormal GOF Test**											
52				Shapiro Wilk Test Statistic		0.839	**Shapiro Wilk Lognormal GOF Test**					
53				5% Shapiro Wilk Critical Value		0.916	Data Not Lognormal at 5% Significance Level					
54				Lilliefors Test Statistic		0.241	**Lilliefors Lognormal GOF Test**					
55				5% Lilliefors Critical Value		0.181	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59				Minimum of Logged Data		0.262	Mean of logged Data					2.751
60				Maximum of Logged Data		4.533	SD of logged Data					1.152
61												
62	**Assuming Lognormal Distribution**											
63				95% H-UCL		58.9	90% Chebyshev (MVUE) UCL					53.06
64				95% Chebyshev (MVUE) UCL		63.9	97.5% Chebyshev (MVUE) UCL					78.95
65				99% Chebyshev (MVUE) UCL		108.5						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71				95% CLT UCL		30.66	95% Jackknife UCL					30.93
72				95% Standard Bootstrap UCL		30.64	95% Bootstrap-t UCL					32.66
73				95% Hall's Bootstrap UCL		39.7	95% Percentile Bootstrap UCL					30.95
74				95% BCA Bootstrap UCL		32.52						
75				90% Chebyshev(Mean, Sd) UCL		35.99	95% Chebyshev(Mean, Sd) UCL					41.34
76				97.5% Chebyshev(Mean, Sd) UCL		48.76	99% Chebyshev(Mean, Sd) UCL					63.33
77												
78	**Suggested UCL to Use**											
79				95% Student's-t UCL		30.93						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												