RISK-BASED STANDARDS FOR KANSAS

RSK MANUAL – 5TH VERSION

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT

BUREAU OF ENVIRONMENTAL REMEDIATION

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PREFACE:

The Kansas Department of Health and Environment (KDHE)/Bureau of Environmental Remediation (BER) originally developed the Risk-Based Standards for Kansas (RSK) Manual in March of 1999. Chemical-specific and media-specific risk-based cleanup goals were calculated using guidance and directives from the United States Environmental Protection Agency (EPA) and various other technical resources. Prior to initial development of the RSK Manual, an Environmental Workgroup was established consisting of members of industry and the public to assist in determining appropriate risk-based cleanup levels. The risk-based cleanup levels determined by the Environmental Workgroup are incorporated into the RSK Manual. The RSK Manual assists KDHE/BER project managers to fairly and consistently address contaminated sites in the State of Kansas.

This edition of the RSK Manual, replaces all previous editions. Past versions of the RSK Manual are obsolete and should not be used for future decisions related to the characterization or remediation of contaminated properties/sites. This October 2010, Revised September 2015, RSK Manual contains several updates to the existing text, tables, and appendices, including the following significant changes:

- KDHE/BER has updated all of the contaminant specific parameters in Appendix B and the contaminant toxicity data in Appendix C to be consistent with current available information.
- KDHE/BER has updated the default parameters in the exposure equations to be consistent with current EPA guidance.
- KDHE/BER has modified the exposure equations to incorporate the use of EPA's current inhalation toxicity units. Inhalation reference concentration (RfC) has replaced inhalation reference dose (RfDi) for non-carcinogenic toxicity; inhalation unit risk (IUR) has replaced inhalation cancer slope factor (SFi) for carcinogenic toxicity.
- KDHE/BER has modified Appendix A to include a separate column for the calculated soil saturation value for each organic contaminant. The user should remember to use this value in conjunction with the values in the soil pathway column (based on health risk) and the soil to groundwater column.
- KDHE/BER has removed the risk-based cleanup levels for polychlorinated biphenyls (PCBs). BER project managers and the regulated community will address PCB-contaminated media according to BER policy.
- September 2015; KDHE/BER has updated the guidance and tables for Total Petroleum Hydrocarbons and Light Non-Aqueous Phase Liquid and Nitrate.

The RSK Manual is only applicable to contaminated properties or sites participating in appropriate state cleanup programs. Use of risk-based values established within the RSK Manual without KDHE/BER oversight may constitute misapplication of the RSK Manual and may result in risk management decisions not supported by KDHE/BER. A more detailed discussion of the appropriate use of the RSK Manual is included in Section 2.2.

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1.0 INTRODUCTION

The Risk-Based Standards for Kansas (RSK) Manual is a guidance document which describes the process for establishing chemical-specific and site-specific cleanup goals for soil, groundwater, and indoor air that are protective of human health and the environment. This document was created to establish a consistent and streamlined decision-making process for addressing contaminated sites managed by the Kansas Department of Health and Environment (KDHE)/Bureau of Environmental Remediation (BER). The RSK Manual is meant to serve as a tool for evaluation of the need for additional assessment or cleanup at contaminated sites, when considered in conjunction with other site-specific conditions. The RSK Manual is a compilation of risk-based cleanup goals for contaminants in soil and groundwater for which federal standards have not been established; groundwater cleanup goals based on federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs) for public drinking water supplies; risk-based acceptable concentrations of contaminants in indoor air at residences; and supporting chemical, physical, and toxicological properties for the contaminants considered herein.

The procedures and methodologies contained in this document have been employed to be consistent with federal guidance and directives to assess potential human health risk posed by exposure to environmental contamination. Federal guidance and directives were established subsequent to the promulgation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). KDHE believes that proper employment of this manual will result in risk-based remediation that is consistent with federally promulgated standards, including the Safe Drinking Water Act, and is protective of human health as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

KDHE calculated the chemical-specific and media-specific risk-based cleanup goals in this document using guidance and directives from the United States Environmental Protection Agency (EPA) and other technical resources, which are referenced throughout this document and listed in Section 8.0, "REFERENCES." This document is the fifth version of the Risk-Based Standards for Kansas Manual and supercedes all previous versions.

2.0 PUBLIC USE OF THE RSK MANUAL

2.1 Benefits of the RSK Manual

The primary benefit of the RSK Manual is the predetermination of acceptable cleanup goals without requiring the performance of costly and time-consuming baseline risk assessments and/or contaminant fate and transport models. The RSK Manual provides the public with a streamlined,

cost-effective approach to determine whether some form of remedial action is warranted at a contaminated site**.** Use of the RSK Manual by Kansas industry, Kansas residents, and KDHE/BER will also promote consistency of remedial requirements at contaminated sites and ensure that remedial actions are protective of human health and the environment. The RSK Manual promotes flexibility by providing tabulated risk-based cleanup goals as well as the opportunity to develop site-specific cleanup goals based on factors including land use and institutional controls.

2.2 Limitations of Use

The RSK Manual is only applicable to contaminated properties or sites that are participating in appropriate state cleanup programs. KDHE/BER project managers will work with the public and regulated community to ensure appropriate application of this guidance. Risk-based cleanup levels defined in this manual are applicable for a single contaminant, in a single medium, under standard and conservative default exposure assumptions. Risk-based cleanup levels have several additional limitations. Specifically excluded from consideration in the RSK Manual are cumulative risk from multiple contaminants or media, relative source contribution, and risk to ecological receptors. KDHE/BER recommends consideration of the following additional limitations when using the RSK Manual:

- Additional state, federal, and/or local laws or regulations may be applicable at certain sites. Examples of such applicable or relevant and appropriate requirements include local public health laws and ordinances, requirements of groundwater management districts, zoning for land use designation, and compliance with Resource Conservation and Recovery Act (RCRA) regulations.
- Aesthetic or other criteria may drive the need for remediation independent of risk-based standards.
- The risk-based cleanup values for soils do not apply to sediments. Users of the RSK Manual must consult with the KDHE/BER project manager regarding appropriate sediment screening and remediation goals, and also follow KDHE/BER policy "BER-ARS-045 - Sediment Policy."
- The risk-based cleanup values for groundwater do not apply to surface water. Surface water cleanup levels shall meet the Kansas surface water quality criteria as established in K.A.R. 28-16-28.

The RSK Manual should not be used for environmental audits, environmental assessments, or other non-KDHE/BER managed activities. Use of risk-based values established within the RSK Manual without KDHE/BER oversight may constitute misapplication of the RSK Manual and may result in risk management decisions not supported by KDHE/BER. The RSK Manual is not intended for use by environmental consultants on contaminated sites in the State of Kansas that are not participating in a KDHE/BER cleanup program. The KDHE/BER project manager will make the final determination if the risk-base cleanup values in this manual are appropriate for the current and future use of a contaminated site.

3.0 TIERED APPROACH

A primary goal of KDHE/BER programs is to insure contaminated sites are remediated to the extent necessary to protect the public from unacceptable risks potentially caused by exposure to contaminated media. The RSK Manual provides a tiered approach for establishing cleanup goals at contaminated sites in Kansas. The tiers are summarized as follows:

- Tier 1 is a comparison of the concentration of a naturally occurring contaminant to the background concentration of that contaminant in the affected medium, using methods approved by KDHE/BER to determine background.
- Tier 2 is a comparison of the concentration of a contaminant to the risk-based cleanup values in the KDHE Tier 2 Risk-Based Summary Table, found in Appendix A of this document.
- Tier 3 involves collecting the necessary data, under KDHE/BER direction, to replace default values in the Tier 2 equations with site-specific information.

The following sections of the RSK Manual contain detailed information on definitions, formulas, input parameters and the use of the three tiers, including a discussion of the rationale and process for determining soil and groundwater cleanup levels for contaminated sites.

The tiered approach presented in the RSK Manual is not acceptable at all contaminated sites. In some instances, KDHE/BER may require a full baseline risk assessment. Examples of such instances include sites at which a cumulative risk from multiple contaminants must be examined and sites at which the remedial efforts must be consistent with the NCP. Coordination with the appropriate state program is necessary to determine if the tiered approach in the RSK Manual is applicable to a contaminated site.

3.1 Tier 1 - Comparison to Background

Tier 1 cleanup levels may be determined for contaminants of concern that are naturally present in the environment. This class of contaminants includes metals such as lead, arsenic, cadmium, and chromium, among others, and inorganic pollutants such as nitrate and chloride, among others. In addition, certain substances that are endemically enriched in various environments, such as industrial tracts or agricultural lands, as a result of their widespread employment by humans may be evaluated as a Tier 1 contaminant. For sites with naturally-occurring contaminants, KDHE/BER may allow the background concentration to be the cleanup goal in that medium.

To establish Tier 1 cleanup levels, background concentrations of naturally-occurring contaminants must be determined at the site. If pre-existing background environmental quality data is not available or not representative of the site, then the collection and analysis of background samples will be required to determine background environmental quality. A site-specific number of samples, approved by KDHE/BER, must be collected. Review and approval of the background sampling plan by the KDHE/BER project manager is necessary prior to the collection of any background samples.

3.2 Tier 2 Risk-Based Summary Table

Appendix A of the RSK Manual is the Tier 2 Risk-Based Summary Table. The table contains chemical-specific, risk-based cleanup values for over 190 contaminants in soil and groundwater, including metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and herbicides. These cleanup values, based upon current EPA toxicity values for the contaminants and default exposure factors, represent the concentrations at which the contaminants pose an acceptable human health risk to receptors, including sensitive groups (children or the elderly), over a lifetime.

3.2.1 Contaminant Toxicity

Human health risk can be described as the probability of suffering harm as a consequence of chronic, or long-term, exposure to contaminated media. Contaminants which pose a health risk are generally classified into two separate categories. *Non-carcinogens* are contaminants that lack evidence of increasing the potential for developing cancer over a lifetime. *Carcinogens* are contaminants that may increase the potential for developing cancer over the lifetime of an exposed individual.

For *non-carcinogens* a threshold concentration is quantified for each contaminant based upon clinically-determined critical toxicological effects such as liver damage, kidney damage, central nervous system disorders, etc. The threshold concentration is referred to as a reference dose (RfD) or a reference concentration (RfC). The lower the RfD or RfC value for a contaminant, the more toxic it is relative to contaminants with higher RfDs or RfCs. Exposure to a contaminant concentration below these threshold concentrations should not cause a critical toxicological effect; however, long-term exposure to a contaminant concentration exceeding the RfD or RfC may cause a critical toxicological effect. Risk assessors calculate the ratio of a contaminant concentration to the RfD or RfC to determine the Hazard Index (HI). If the HI is less than or equal to 1, the contaminant concentration is considered acceptable. The Tier 2 cleanup values in Appendix A for non-carcinogens are based upon an HI equal to 1.

For carcinogens, the probability of increasing the potential for developing a cancer as a result of chronic exposure to contaminated media is quantified based upon clinical studies of exposed populations, including humans, where available, or test animals in the absence of documented human exposures. The contaminant-specific carcinogenic risk factor is referred to as a slope factor (SF) for dermal and ingestion exposures, and an inhalation unit risk factor (IUR) for inhalation exposures. The higher the SF or IUR value for a carcinogenic contaminant, the more toxic it is relative to carcinogenic contaminants with lower SF or IUR values. Risk assessors quantify the probability of developing a cancer as a result of chronic exposure to carcinogenic contaminated media by multiplying the contaminant concentration by the contaminant SF or IUR. The resulting value is expressed in terms of one additional cancer incidence per population exposed; for example, one additional cancer incidence per ten thousand (1 in 10,000) exposed individuals, which may be

expressed as 1×10^{-4}. For known or suspected carcinogens, EPA acceptable exposure levels are those that represent an excess upper bound lifetime cancer risk to an individual between 1×10^{-4} and 1×10^{-6}. The Tier 2 cleanup values in Appendix A for carcinogens are based upon a 1×10^{-5} risk.

For the purpose of developing the Tier 2 Risk-Based Summary Table, KDHE/BER used established contaminant-specific toxicity values developed and maintained by the EPA. Toxicological data were obtained from the following sources, listed in order of preference:

1. EPA Integrated Risk Information System (IRIS) website, June 2010
2. EPA Regional Screening Level (RSL) Tables, May 17, 2010
3. EPA Health Effects Assessment Summary Tables (HEAST), July 1997
4. Other EPA documents
5. California Office of Environmental Health Hazard Assessment

For contaminants which lack toxicological data for a given route of exposure, KDHE/BER used route-to-route extrapolations. For example, anthracene has an oral reference dose (RfD), but no toxicological data for the inhalation pathway. KDHE/BER used the RfD to extrapolate an inhalation reference concentration (RfC) for anthracene, to then be used in the inhalation exposure pathway equations for that contaminant.

Contaminant toxicological data are provided in Appendix C. KDHE/BER evaluated the contaminants in Appendix A for both carcinogenic and non-carcinogenic health effects. The determining risk-based concentration is based upon the lower contaminant concentration of the carcinogenic risk or non-carcinogenic risk.

3.2.2 Exposure Factors

Individuals exposed to environmental contaminants are referred to as receptors. For the Tier 2 Risk-Based Summary Table, KDHE/BER has identified two general categories of receptors, residents and non-residents, according to the appropriate land-use designation for each site. The significant differences between the two receptor classes include exposure frequency, exposure duration, and the consideration that children are potentially exposed at residential land-use scenarios and are more sensitive to environmental contaminants. The non-residential land-use scenario is based upon industrial or commercial settings where adult workers are considered the potentially exposed receptor.

Human health risk-based contaminant concentrations for the residential scenario were calculated for soil, groundwater, and indoor air. Contaminant concentrations for non-residential scenarios were calculated for soil and groundwater. The soil exposure pathways evaluated in the human health risk-based calculations include incidental ingestion of soil, inhalation of airborne particulates (dusts), inhalation of chemicals volatilizing from the soil (volatile compounds only), and dermal contact with soil (organic compounds only). The reasoning for evaluating dermal contact for organic

contaminants only is based upon chemical-specific absorption factors. In general, inorganic contaminants have a much lower absorption factor than organic contaminants. Exposure pathways evaluated for groundwater include ingestion, inhalation of chemicals volatilizing from the water (volatile compounds only), and dermal contact with water. The exposure pathway for indoor air is limited to inhalation of volatile organic contaminants.

Default exposure factors were obtained primarily from EPA documents, including *Risk Assessment Guidance for Superfund Supplemental Guidance Standard Default Exposure Factors* (OSWER Directive, 9285.6-03), dated March 25, 1991; and *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*, dated July 2004. Exposure factors used in the Tier 2 Risk-Based Summary Table are presented in Table 1, Table 2, and Table 3 for groundwater, soil, and indoor air, respectively.

For the residential land use scenario, child exposure parameters were used to evaluate non-carcinogenic risks in soil, groundwater, and indoor air, since child exposure parameters are more sensitive to this class of environmental contaminants. Adult exposure parameters were used to evaluate carcinogenic risks for residents because, as a result of the methodologies used to calculate risk, the exposure to adults is the most significant receptor category. Adult exposure parameters were used to evaluate both carcinogenic and non-carcinogenic risks for non-residents as they are typically the only receptors in a non-residential land-use scenario.

3.2.3 Groundwater

The Tier 2 Risk-Based Summary Table groundwater concentrations presented in Appendix A are derived with the assumption that aquifers in Kansas are sources of potable water. (For a detailed discussion on aquifer use, RSK Manual users are encouraged to refer to KDHE/BER policy "BER-RS-045 - Considerations for Groundwater Use and Applying RSK Standards to Contaminated Groundwater.") Accordingly, for those contaminants for which the federal Safe Drinking Water Act has promulgated primary maximum contaminant levels (MCLs), Tier 2 groundwater cleanup concentrations for both residential and non-residential land use scenarios are the MCLs. For all other contaminants addressed within this document, cleanup values are risk-based and are the product of Equations 1 and 2, for carcinogenic and non-carcinogenic contaminants, respectively. In the event groundwater is to be used as a source of drinking water, the groundwater cleanup concentration defaults to the residential land use concentration irrespective of land use. Exposure factors used in the equations are provided in Table 1. Contaminant chemical, physical, and toxicological data are provided in Appendices B and C.

Independent of the MCLs and risk-based cleanup standards in Appendix A, KDHE/BER requires remediation at all sites with non-aqueous phase liquid (NAPL) contaminants present in the groundwater.

3.2.4 Soils

KDHE/BER has identified three potential conditions which must be assessed collectively to determine the appropriate Tier 2 concentration for a contaminant in soil. The first condition is impact to human health via ingestion of contaminated soil, inhalation of VOCs and/or fugitive emission dusts, and dermal contact with contaminated soil. The second condition to be assessed is the contaminant concentration in soil which would be protective of groundwater. The third condition is provided for in *Risk Assessment Guidance for Superfund: Volume 1-Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)*, which indicates the soil saturation concentration for each contaminant be quantified to determine the concentration at which it could be reasonably assumed that free phase product is present. The appropriate Tier 2 soil cleanup concentration is the lesser of the calculated values for acceptable impact to human health, the soil saturation concentration, or potential threat to groundwater.

KDHE/BER calculated the risk-based cleanup values for each contaminant in soil using the exposure factors provided in Table 2, the contaminant chemical, physical, and toxicological data provided in Appendices B and C, and Equations 3 and 4 (for carcinogens and non-carcinogens, respectively). For each of the two land use scenarios, the Tier 2 Risk-Based Summary Table provides a soil concentration value for each contaminant based upon the threat to human health. Each chemical-specific concentration has a letter beside to inform the user of the adverse health effect upon which the Tier 2 Soil Pathway is based. For carcinogenic risk, the notation is "c". For non-carcinogenic risk, the notation is "n."

The methodology used to determine soil cleanup levels incorporates the additive adverse human health effects associated with the inhalation of vapors from soil contaminated with VOCs. EPA toxicity data indicate that risks posed from exposure to certain contaminants in soil via the inhalation pathway far outweigh the risks posed via ingestion; therefore, the human health risk-based concentrations have been calculated to address this pathway as well. For the purposes of this document, VOCs are those organic chemicals having a Henry's Law constant greater than 1×10^{-5} atmospheres per cubic meter per mole (atm-m3/mol) and a molecular weight less than 200 grams/mole. To calculate inhalation exposure risk for VOCs, each contaminant's volatilization factor (VF) must first be calculated. The VF is assumed to be 0.5 liters per cubic meter (L/m^3) for volatilization from water to air based upon studies by Andelman 1990. The soil-to-air VF is used to define the relationship between the concentration of the contaminant in soil and the flux of the volatilized contaminant to air. The VF equation (Equation 5) represents a dispersion model that simulates the dispersion of contaminants into the atmosphere. Chemical-specific parameters needed to complete the calculation in Equation 5 can be found in Appendix B.

The soil saturation concentration corresponds to the contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the contaminant may be present as a pure liquid phase for contaminants that are liquid at ambient soil temperatures and pure solid phase for compounds that are solid at ambient soil temperatures. The Tier 2 Risk-Based Summary Table

includes, for each organic contaminant, a soil saturation concentration calculated by KDHE/BER using Equation 6. If the chemical-specific soil saturation concentration is less than its corresponding human health risk-based concentration, the soil saturation concentration is to be used as the Tier 2 cleanup value.

3.2.5 Soil to Groundwater Protection

Contaminants leaching from soil to groundwater may pose a significant threat to groundwater quality. Soil contamination cleanups may be driven by chemical-specific soil to groundwater pathway concentrations to protect groundwater quality. The methodology for calculating soil concentrations sufficiently protective to prevent the migration of soil contaminants to groundwater was derived from the document titled, "*Soil Screening Guidance: Technical Background Document,"* OSWER 9355.4-17A, EPA/540/R-95/128 May 1996. The "*Soil Screening Guidance"* document was employed because it is supported by EPA, has been extensively peer-reviewed, and the methodology presented therein is relatively simple.

Migration of a contaminant from soil to groundwater can be simplified for modeling purposes to a two-stage process: (1) release of the contaminant in soil leachate and (2) transport of the contaminant soil leachate through the underlying soil to the aquifer and, conceptually, to a receptor well at that location. For the purposes of this document, KDHE/BER assumes the receptor well to be at the source area; therefore, fate and transport modeling is not an element of the Tier 2 Risk-Based Summary Table. KDHE/BER has adopted EPA's screening dilution factor of 20 for calculating chemical-specific soil-to-groundwater pathway concentrations.

Equation 7 is the soil-to-groundwater equation used to calculate the concentration of a contaminant in soil above which a threat of the contaminant entering the groundwater is a concern. Tier 2 soil-to-groundwater pathway concentrations are back-calculated from acceptable groundwater concentrations (MCLs or human health risk-based concentrations determined using Equations 1 and 2). The acceptable groundwater concentration is multiplied by the dilution factor of 20 to obtain a target leachate concentration.

Although simplified, the methodology described in this section is theoretically and operationally consistent with investigation and modeling efforts that are conducted to develop soil cleanup goals and cleanup levels for protection of groundwater at Superfund sites. Simplifying assumptions for the migration to groundwater pathway include:

- The source is infinite (i.e., steady-state concentrations will be maintained in groundwater over the exposure period);
- Contaminants are uniformly distributed throughout the zone of contamination;
- Soil contamination extends from the surface to the groundwater table (i.e., adsorption sites are filled in the unsaturated zone beneath the area of contamination);
- There is no chemical or biological degradation in the unsaturated zone;
- Equilibrium soil/water partitioning is instantaneous and linear in the contaminated soil;
- The receptor well is at the source area (i.e., there is no dilution from recharge down-gradient of the property and the well is screened within the plume);
- The aquifer is unconsolidated and unconfined (surficial);
- Aquifer properties are homogenous and isotropic;
- There is no attenuation (i.e., adsorption or degradation) of contaminants in the aquifer; and,
- The contaminant does not exist as free product in the soil at the property.

3.2.6 Exceptions to Tier 2 Methodology

For a few contaminants listed in the Tier 2 Risk-Based Summary Table, alternative methods were employed to determine chemical-specific concentrations that are protective of human health, are environmentally safe, or preserve the aesthetic quality of drinking water supplies. Alternative methods include the use of health advisory data in the absence of chemical-specific toxicological data, consideration of drinking water odor and taste thresholds, and the consideration of potential for explosive environments, as examples. For these contaminants, the cleanup concentrations are generally more stringent than strictly human health risk-based concentrations.

3.3 Tier 3

Tier 3 offers the opportunity to determine site-specific risk-based contaminant concentrations that are protective of human health and the environment. Tier 3 involves the substitution of site-specific parameters into the equations used to calculate Tier 2 cleanup values. Tier 3 evaluations can be a substantial increase in effort relative to Tier 2, and must be performed with KDHE/BER oversight, including the submittal of appropriate work plans to perform any necessary additional work. KDHE/BER will not authorize the performance of a Tier 3 analysis for contaminants of concern that are regulated by federal, state or local laws, such as the federal Safe Drinking Water Act which mandates MCLs for drinking water aquifers.

Default assumption parameters employed by KDHE/BER to calculate Tier 2 risk-based cleanup goals are included in Equations 5, 6, and 7. Parameters for which site-specific data may be substituted to perform a Tier 3 analysis are denoted with an asterisk. Data which may be necessary to complete a Tier 3 evaluation can include additional geological, geophysical or hydrological data, including items such as unsaturated zone physical and geological properties (vertical distribution profiling of fraction organic carbon, bulk density, total porosity, air-filled porosity, water-filled porosity, etc.), thickness of unsaturated zone, thickness of the saturated aquifer, aquifer transmissivity, hydraulic conductivity, gradient, infiltration rate, and longitudinal, lateral, and vertical dispersivities.

The following are examples of measures that may be undertaken as part of a Tier 3 analysis:

- The use of property-specific numerical soil or groundwater modeling to predict the effect of contaminant fate and transport mechanisms, including heterogeneous geological conditions (Any model used for a Tier 3 evaluation must be approved by the department project manager and must be a public domain model. In the event a proprietary model or any other model that KDHE/BER does not possess is used in a Tier 3 analysis, the department may request a copy of the model for review and approval.);
- Characterization of property sources and exposure pathways by using property assessment data to identify relevant sources, transport mechanisms, impacted media, and exposure pathways;
- Research to determine appropriate pesticide-specific standard application rates, followed by a comparison of site-specific pesticide contaminant levels to the modeled pesticide levels in the contaminated media based upon proper application;
- Identification of all potential receptors. Actual or potential receptors should be differentiated based on current and likely future land use, and upon the ability to place institutional controls at the property to eliminate potential exposure pathways;
- An evaluation of potential remedial actions that would reduce the human health or environmental risk to acceptable levels; and,
- Recalculation of health-based risk considering the site-specific speciation of metal contaminants.

In the event a site-specific Tier 3 analysis determines that Tier 2 cleanup goals are not protective of human health or the environment, the more stringent Tier 3 cleanup goals will become the site-specific cleanup goals for the site.

4.0 INDOOR AIR CONCENTRATIONS

VOC contamination may migrate from soil and/or groundwater into dwellings or other occupied structures. Appendix A of the RSK Manual contains the concentrations of contaminants in indoor air at or above which KDHE/BER may require actions to mitigate the potential risk to human health posed by inhalation of those contaminants. Indoor air concentrations are provided for the residential scenario for each VOC present in Appendix A. KDHE/BER provides a detailed discussion on sampling of indoor air at residences and interpretation of data in *Kansas Vapor Intrusion Guidance - Chemical Vapor Intrusion and Residential Indoor Air*, dated June 2007.

KDHE/BER calculated the indoor air values in Appendix A using Equations 8 and 9 for carcinogenic and non-carcinogenic contaminants, respectively. For each VOC contaminant, the default exposure factors (from Table 3) and toxicity data (Appendix C) used to establish indoor air concentrations were the same as those used for the calculations of soil and groundwater cleanup values. The indoor air concentrations in Appendix A for non-carcinogens are based upon an HI equal to 1; the concentrations for carcinogens are based upon a 1×10^{-5} risk level.

The indoor air concentrations in Appendix A are considered acceptable for only a single contaminant and do not consider potential cumulative adverse health effects of multiple chemicals. The concentrations also do not consider cumulative effects of exposure to the same contaminant through multiple pathways. Consultation with the KDHE/BER project manager is essential before applying the indoor air concentrations in Appendix A to a residence. If multiple contaminants are present in the home, or more than one exposure pathway exists, a Baseline Risk Assessment may be necessary to evaluate the health risk to exposed residents.

Some of the indoor air values provided in Appendix A fall within the range of what may be consistent with background concentrations of chemicals in a home. Therefore, it is possible chemicals may be present at levels above the Appendix A indoor air concentrations, but not caused by migration of contaminants from the subsurface. Background conditions should be evaluated during indoor air assessment activities, in consultation with the KDHE/BER project manager.

5.0 TOTAL PETROLEUM HYDROCARBONS

Total petroleum hydrocarbons (TPH) for the purpose of this section of the RSK Manual include all undifferentiated hydrocarbon compounds with carbon ranges C^5 through C^{35}, and containing various percentages of straight chain alkanes, branched chain alkanes, cycloalkanes, straight chain alkenes, branched chain alkenes, cycloalkenes, alkyl benzenes, naphtheno benzenes, alkyl naphthalenes and polynuclear aromatics. TPH cleanup concentrations in soil and groundwater, as related to the Tier 2 values in Appendix A, must be quantified by summing TPH using EPA SW-846 modified method 8015, laboratory analytical methods OA1 for gasoline range organics (GRO) and OA2 for diesel range organics (DRO), or other methods approved by KDHE/BER.

The use of Tier 2 values for TPH-GRO and TPH-DRO must be used in conjunction with the values for individual constituents in order to determine site cleanup goals. These constituents include but are not limited to benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl-tert-butyl-ether (MTBE), ethylene dibromide (EDB), and 1,2-dichloroethane (1,2-DCA) for TPH-GRO and naphthalene, chrysene, pyrene, benzo[a]pyrene, and anthracene for TPH-DRO.

Considering that TPH detected at a site is commonly found as either GRO or DRO, KDHE has developed two separate Tier 2 risk-based concentrations based upon whether the TPH is entirely GRO or DRO. If the site has only one type of TPH (GRO or DRO), the risk-based cleanup concentrations for soil and groundwater are based upon their petroleum type as provided in Appendix A. For sites where both types of TPH are detected, the sum of the ratios of each hydrocarbon type must be calculated as follows:

$$\frac{X}{\text{GRO Tier 2 Value}} + \frac{Y}{\text{DRO Tier 2 Value}} = N$$

Where:

X = Detected GRO Concentration
Y = Detected DRO Concentration
N = Sum

For instance, where GRO and DRO are detected at 22 mg/kg and 1,000 mg/kg respectively, the hazard index would be determined as N = (22/220) + (1,000/2,000). Accordingly, N = 0.6, which is less than 1.0, therefore this scenario would be acceptable. Any N value greater than 1.0 would be considered an excessive risk and may require corrective action as determined by the KDHE/BER project manager.

KDHE/BER calculated the soil-to-groundwater pathway value for TPH-GRO by using the contaminant specific parameters of n-hexane. For TPH-DRO, the soil-to-groundwater pathway value is based upon the contaminant specific parameters of pyrene.

Non-residential TPH standards should not be used in the following situations unless approved by the KDHE/BER project manager:

- sites where contamination is caused by a responsible party that does not own or control the property;
- sites where an Environmental Use Control cannot be used to control future use of the property; or
- sites where contamination is located on the responsible party's property but is migrating or threatening to migrate to an adjacent property not under the ownership or control of the responsible party.

The current and future use of the property and the ownership of the property must be considered when determining the use of "Non-Residential" TPH Tier 2 levels. In most cases, the residential standards should be used as the target cleanup levels.

Independent of the TPH Tier 2 levels presented in Appendix A of this RSK Manual, all free product, including hydrocarbon saturated soil, must be addressed. KDHE has calculated soil saturation values for TPH GRO and TPH DRO of 3,300 mg/kg and 70,000 mg/kg, respectively. These values are estimates, and site-specific soil saturation values can vary based upon the nature of the product released at each site. However, these soil saturation values provide a default when a site-specific soil saturation value has not been calculated using Tier 3 methodology.

KDHE considers any apparent production on the groundwater surface to be a likely indicator of soil saturation, and therefore an indicator of the need to further evaluate the potential for free product and possible remediation at the site.

6.0 NITRATE, NITRITE, AND AMMONIA

Nitrate and ammonium are common soil contaminants of concern in Kansas related to agricultural fertilizer spills, animal wastes, septic systems, and a variety of other sources. These contaminants are treated differently from other Tier 2 contaminants as the soil cleanup guidelines provided below are not based on their potential toxicity to humans through exposure to contaminated soil, but on the potential for contamination in the soil to leach to groundwater. Nitrate and/or nitrite in groundwater pose significant threats of toxicity to human and animal infants, and cleanup of nitrate in groundwater can be an expensive, difficult, and time-consuming prospect. The soil cleanup guidelines provided below were developed by KDHE/BER in consultation with Kansas State University agronomy experts to provide non-site specific soil cleanup goals that are generally protective of groundwater and capable of sustaining vegetative growth.

Nitrate, nitrite, and ammonia or ammonium concentrations are typically reported "as nitrogen" or "as N." Analytical results expressed "as ammonia," "as nitrate," or "as nitrite" must be converted to "as N" based on the ratios of the molecular weight of nitrogen to the molecular weights of the compounds in question for comparison to the soil cleanup guidelines and groundwater standards provided below.

Soil Pathway:

- In areas where no vegetation is present (i.e., contamination in a gravel roadway, parking area, etc.) the following RSK standards apply:

  Upper 8 inches of soil - 85 milligrams/kilogram (mg/kg) total nitrate plus ammonia (N);

  Below 8 inches in depth - 40 mg/kg nitrate plus ammonia (N).

- In areas where vegetation is present (i.e., cultivated and cropped agricultural ground, pasture, lawn, etc.) the following RSK standards apply:

  Upper 24 inches of soil - 200 mg/kg total nitrate plus ammonia (N), or the maximum application rate recommended by Kansas State University for the particular crop;

  Below 24 inches in depth - 40 mg/kg nitrate plus ammonia (N).

Groundwater Pathway:

- The MCL for nitrate is 10.0 milligrams/liter (mg/L); the MCL for nitrite is 1.0 mg/L.

KDHE/BER will also consider the following site-specific conditions when determining the appropriate response action for a site contaminated by nitrate and/or ammonia.

1) If it is not possible to excavate soil to reach a 40 mg/kg total nitrate plus ammonia (N) level then the responsible party must determine the vertical extent of total nitrate plus ammonia (N) contamination through vertical profiling approved by KDHE/BER.

2) If groundwater is 50 feet or less in depth then groundwater monitoring wells may be requested by KDHE/BER in the area of contamination and hydraulically downgradient to the nitrate concentration in groundwater. Additional actions may be required:

a) If nitrate (N) in groundwater exceeds 20 mg/l then the responsible party may be required by KDHE/BER to install a remedial system to hydraulically contain and/or remove the contamination.

b) If nitrate (N) in groundwater is below the drinking water standard, or if the nitrate is shown to be from off-site sources, the monitoring points must be sampled in accordance with KDHE/BER identified sites reclassification criteria to monitor ground water quality. Please refer to KDHE/BER policy "BER-RS-024 - Reclassification Plan."

3) If groundwater depth exceeds 50 feet, the need for installation of monitoring wells will be determined by KDHE/BER on a case by case basis depending on groundwater usage, soil type, and soil concentration of nitrate plus ammonia (N). Depending on nitrate and nitrite concentrations in groundwater, additional actions may be required.

4) If vertical soil profiling indicates the presence of impervious bedrock (e.g., shale) isolating the nitrate/ammonia from groundwater, up to 200 mg/kg nitrate plus ammonia (N) can be left in place (as determined in consultation with the KDHE/BER project manager).

Excavation is commonly implemented as an appropriate response action to address soil contaminated with nitrate and/or ammonia. Nitrate and ammonia contaminated soil can be land applied on cultivated land at approved application rates. This approach requires the completion of the KDHE Land Application Work Plan and Agreement Form available from the KDHE/BER project manager.

Similar to the Tier 3 evaluations (see Section 3.3) for other contaminants, KDHE/BER will consider the use of site-specific information to modify nitrate cleanup goals. KDHE/BER will also consider cost/benefit analyses in the determination of cleanup goals.

7.0 TABLES, FORMULAS, AND EQUATIONS

TABLE 1

GROUNDWATER EXPOSURE FACTORS

ID	Description	Residents	Non-Residents
TR	**Target cancer risk**	**1E-06, 1E-05, 1E-04**	**1E-06, 1E-05, 1E-04**
THI	**Target hazard index**	**1**	**1**
BW	**Body weight (kg)**		
Bwa	**Adult**	**70**	**70**
BWc	**Child (0-6 years)**	**15**	**NA**
Irw	**Daily water ingestion rate (L/day)**		
Irwa	**Adult**	**2**	**1**
Irwc	**Child**	**1**	**NA**
INH	**Inhalation rate (m3/day)**		
INHa	**Adult**	**20**	**20**
INHc	**Child**	**10**	**NA**
VFw	**Volatilization Factor (L/m3)**	**0.5**	**0.5**
CF	**Conversion Factor (L/cm3)**	**0.001**	**0.001**
SA	**Skin Surface Area (cm2)**		
Saa	**Adult**	**18,000**	**18,000**
Sac	**Child**	**6,600**	**NA**
Kp	**Skin permeability coefficient (cm/hr)**	**Chemical-specific**	**Chemical-specific**
ET	**Exposure Time (hours/day)**	**1**	**0.5**
EF	**Exposure Frequency (days/year)**	**350**	**250**
ED	**Exposure Duration (years)**		
Edca	**Cancer (adult)**	**30**	**25**
Ednca	**Noncancer (adult)**	**30**	**25**
Edncc	**Noncancer (Child)**	**6**	**NA**
AT	**Averaging Time**		
ATca	**Cancer (adult)**	**70**	**70**
Atnca	**Noncancer (adult)**	**30**	**25**
Atncc	**Noncancer (child)**	**6**	**NA**
SFo	**Slope Factor, Oral (carcinogens)**	**Chemical-specific**	**Chemical-specific**
IUR	**Inhalation Unit Risk (carcinogens)**	**Chemical-specific**	**Chemical-specific**
RfDo	**Reference Dose, Oral**	**Chemical-specific**	**Chemical-specific**
RfC	**Reference Concentration**	**Chemical-specific**	**Chemical-specific**

Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A) EPA, 1991 Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors".

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Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment, EPA, 2004.

EQUATION 1 - GROUNDWATER / CARCINOGENS

Ing. & Derm. (mg/L) = $\dfrac{TR \times BW \times AT \times 365 \text{ days / year}}{EF \times ED \left[(IR_w \times SF_o) + (ET \times CF \times SA \times Kp \times SF_o)\right]}$

(ingestion and dermal exposure)

Inh. (mg/L) = $\dfrac{TR \times AT \times 365 \text{ days / year}}{EF \times ED \times IUR \times 1000ug/mg \times VF_w}$

(inhalation exposure, for only VOCs)

Tier 2 value (mg/L) = $\dfrac{1}{\dfrac{1}{\text{Ing. \& Derm.}} + \dfrac{1}{\text{Inh.}}}$

EQUATION 2 - GROUNDWATER / NON-CARCINOGENS

Ing. & Derm. (mg/L) = $\dfrac{THI \times BW \times AT \times 365 \text{ days / year}}{EF \times ED \times \left[(IR_w \times 1/RfD_o) + (ET \times CF \times SA \times Kp \times 1/RfD_o)\right]}$

(ingestion and dermal exposure)

Inh. (mg/L) = $\dfrac{THI \times AT \times 365 \text{ days / year}}{EF \times ED \times 1/RfC \times VF_w}$

(inhalation exposure, for only VOCs)

Tier 2 value (mg/L) = $\dfrac{1}{\dfrac{1}{\text{Ing. \& Derm.}} + \dfrac{1}{\text{Inh.}}}$

TABLE 2

SOIL EXPOSURE FACTORS

ID	Description	Residents	Non-Residents
TR	Target cancer risk	1E-06, 1E-05, 1E-04	1E-06, 1E-05, 1E-04
THI	Target hazard index	1	1
BW	Body weight (kg)		
Bwa	Adult	70	70
BWc	Child (0-6 years)	15	NA
INGs	Soil ingestion rate (mg/day)		
INGsa	Adult	100	50
INGsc	Child	200	NA
INH	Soil inhalation rate (m3/day)		
INHa	Adult	20	20
INHc	Child	10	NA
VFs	Soil Volatilization Factor (m3/kg)	Chemical-specific	Chemical-specific
CF	Conversion Factor (kg/mg)	1E-06	1E-06
PEF	Particulate Emission Factor (m3/kg)	1.18E+09	1.18E+09
SA	Skin Surface Area (cm2/day)		
Saa	Adult	5700	3300
Sac	Child	2800	NA
ABS	Absorption Factor (fraction)	0.1	0.1
AF	Adherence Factor (mg/cm2)	0.2	0.2
EF	Exposure Frequency (days/year)	350	250
ED	Exposure Duration (years)		
Edca	Cancer (adult)	30	25
Ednca	Noncancer (adult)	30	25
Edncc	Noncancer (child)	6	NA
AT	Averaging Time		
Atca	Cancer (adult)	70	70
Atnca	Noncancer (adult)	30	25
Atncc	Noncancer (child)	6	NA
SFo	Slope Factor, Oral (carcinogens)	Chemical-specific	Chemical-specific
IUR	Inhalation Unit Risk	Chemical-specific	Chemical-specific
RfDo	Reference Dose, Oral	Chemical-specific	Chemical-specific
RfC	Reference Concentration, Inhalation	Chemical-specific	Chemical-specific

See references in Table 1

EQUATION 3 - SOIL / CARCINOGENS

$$\text{Ing. \& Derm. (mg/kg)} = \frac{TR \times BW \times AT \times 365 \text{ days / year}}{EF \times ED \left[(ING_s \times CF \times SF_o) + (SF_o \times CF \times SA \times AF \times ABS)\right]}$$

(ingestion and dermal exposure)

$$\text{Inh. (mg/kg)} = \frac{TR \times AT \times 365 \text{ days / year}}{EF \times ED \times IUR \times 1000ug/mg \times \left[(1/VF_s) + (1/PEF)\right]}$$

(inhalation exposure)

$$\text{Tier 2 value (mg/kg)} = \frac{1}{\frac{1}{\text{Ing. \& Derm.}} + \frac{1}{\text{Inh.}}}$$

EQUATION 4 - SOIL / NON-CARCINOGENS

$$\text{Ing. \& Derm. (mg/kg)} = \frac{THI \times BW \times AT \times 365 \text{ days / year}}{EF \times ED \times \left[(ING_s \times CF \times 1/RfD_o) + (1/RfD_o \times CF \times SA \times AF \times ABS)\right]}$$

(ingestion and dermal exposure)

$$\text{Inh. (mg/kg)} = \frac{THI \times AT \times 365 \text{ days / year}}{EF \times ED \times (1/RfC) \times \left[(1/VF_{s)} + (1/PEF)\right]}$$

(inhalation exposure)

$$\text{Tier 2 value (mg/kg)} = \frac{1}{\frac{1}{\text{Ing. \& Derm.}} + \frac{1}{\text{Inh.}}}$$

EQUATION 5 VOLATILIZATION FACTOR EQUATION AND PARAMETERS

$$VF\ (m^3/kg) = \frac{Q}{C} * \frac{[(3.14)(D_A)(T)]^{1/2}}{2\ x\ \rho_b x D_A} x10^{-4}\ (m^2/cm^2)$$

$$\text{where } D_A = \frac{[(\theta_a^{10/3} D_i H' + \theta_w^{10/3} D_w)/n^2]}{\rho_b K_d + \theta_w + \theta_a H'}$$

Chemical-Specific Parameters	**Default**
VF = Volatilization factor (m^3/kg)	--
D_A = Apparent diffusivity (cm^2/s)	--
Q/C = Inverse of the mean concentration at the center of square source (g/m^2-s per kg/m^3)	81.64
T = Exposure interval (seconds)	9.5 E+08
ρ_b = Dry soil bulk density (g/cm^3)	1.5 *
θ_a= Air filled soil porosity (Lair/Lsoil)	0.28 *
n = Total soil porosity (Lpore/Lsoil)	0.43 *
θ_w= Water filled soil porosity (Lwater/Lsoil)	0.15 *
ρ_s = Soil particle density (g/cm^3)	2.65 *
Di = Diffusivity in air (cm^2/s)	Chemical-specific
RG = Universal Gas Constant (atm-m3/mole-K)	0.000082
TEMP = Temperature (K)	293
H = Henry's Law constant (atm-m^3/mol)	Chemical-specific
H' = Dimensionless Henry's Law constant	H/(RG x TEMP), chemical-specific
D_w = Diffusivity in water (cm^2/s)	Chemical-specific
Kd = Soil-water partition coefficient (cm3/g) = Kocfoc	Chemical-specific
Koc = Soil organic carbon-water partition coefficient (cm3/g)	Chemical-specific
Foc = Fraction organic carbon in soil (g/g)	0.01 *

***** *Asterisk notes the chemical-specific parameters that may be modified in a property-specific Tier 3 analyses.*

EQUATION 6 SOIL SATURATION EQUATION AND PARAMETERS

$$C_{sat} = \frac{S}{P_b}(K_d P_b + \theta_w + H'\theta_a)$$

Parameter Definition (units)	Default
Csat = Soil saturation concentration (mg/kg)	--
S = Solubility in water (mg/L-water)	chemical-specific
ρb = Dry soil bulk density (kg/L)	1.5 *
Kd = Soil-water partition coefficient (L/kg)	Koc × foc (chemical-specific)
Koc = Soil organic carbon/water partition coefficient (L/kg)	chemical-specific
foc = Fraction organic carbon in soil (g/g)	0.01 *
θw = Water-filled soil porosity (Lwater/Lsoil)	0.15 *
H' = Dimensionless Henry's law constant	Chemical-specific
θa = Air-filled soil porosity (Lair/Lsoil)	0.28 *
n = Total soil porosity (Lpore/Lsoil)	0.43 *
ρs = Soil particle density (kg/L)	2.65 *

* *Asterisk notes the physical and chemical-specific parameters that may be modified in a property-specific Tier 3 analysis.*

EQUATION 7 SOIL TO GROUNDWATER MIGRATION PATHWAY EQUATION

$$C_t = C_w \left\langle (K_d) + \frac{\theta_w + \theta_a H'}{\rho_b} \right\rangle$$

SOIL TO GROUND WATER PROTECTION PARAMETERS

Parameter Definition (units)	**Default**
Ct = Screening level in soil (mg/kg)	--
Cw = Target soil leachate concentration (mg/l)	(non-zero MCLG, MCL, or RBC) x 20 DAF
Koc = Soil organic carbon/water partition coefficient (l/kg)	Chemical-specific (see Appendix B)
foc = Fraction organic carbon in soil (g/g)	0.01 *
Kd = Soil-water partition coefficient (L/kg)	Chemical specific for inorganic contaminants; Koc × foc for organic contaminants
θw = Water-filled soil porosity (Lwater/Lsoil)	0.30 *
θa = Air-filled soil porosity (Lair/Lsoil)	0.13 *
n = Total soil porosity (Lpore/Lsoil)	0.43 *
ρb = Dry soil bulk density (kg/L)	1.5 *
ρs = Soil particle density (kg/L)	2.65 *
RG = Universal gas constant (atm-m3/mole-K)	0.000082
TEMP = Temperature (K)	293
H' = Dimensionless Henry's Law constant	H/(RG x TEMP), chemical-specific
H = Henry's Law constant (atm-m3/mol)	Chemical-specific

***** *Asterisk notes the physical and chemical-specific parameters that may be modified in a property-specific Tier 3 analysis.*

EQUATION 8 INDOOR AIR / CARCINOGENS

$$\text{Tier 2 value } (\mu g/m^3) = \frac{TR \times AT \times 365 \text{ days / year}}{EF \times ED \times IUR}$$

EQUATION 9 INDOOR AIR / NON-CARCINOGENS

$$\text{Tier 2 value } (\mu g/m^3) = \frac{THI \times AT \times 365 \text{ days/year} \times 1000 \ \mu g/mg}{EF \times ED \times (1/RfC)}$$

TABLE 3
INDOOR AIR EXPOSURE FACTORS

ID	Description	Value
TR	Target cancer risk	1E-06, 1E-05, 1E-04
THI	Target hazard index	1
EF	Exposure frequency (days/year)	350
ED	Exposure duration (years)	
	Cancer (adult)	30
	Non-cancer (adult)	30
	Non-cancer (child)	6
AT	Averaging time (years)	
	Cancer (adult)	70
	Non-cancer (adult)	30
	Non-cancer (child)	6
IUR	Inhalation Unit Risk factor	Chemical-specific
RfC	Reference concentration	Chemical-specific

See references in Table 1

8.0 REFERENCES

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APPENDIX A - KDHE TIER 2 RISK-BASED SUMMARY TABLE

		Residential Scenario							Non-residential Scenario					Soil
		Soil Pathway		Groundwater		Soil-to-Gw	Indoor air		Soil Pathway		Groundwater		Soil-to-Gw	Saturation
Contaminant	CAS No.	mg/kg		mg/L		mg/kg	ug/m^3		mg/kg		mg/L		mg/kg	mg/kg
Acenaphthene	83-32-9	3420	ns	0.253	n	255	219	n	30600	ns	0.521	n	526	196
Acetochlor	34256-82-1	1220	ns	0.303	n	19.3			17600	ns	1.96	n	125	688
Acetone	67-64-1	50300	n	11.5	n	51.6	32300	n	406000	ns	45.5	n	204	124000
Acetophenone	98-86-2	5200	ns	0.494	n	7.1	365	n	31300	ns	0.926	n	13.3	3790
Acrolein	107-02-8	0.192	n	4.15E-05	n	0.000175	0.0209	n	0.27	n	5.83E-05	n	0.000246	23500
Acrylamide	79-06-1	15.9	c	0.0017	c	0.00874			49.3	c	0.00571	c	0.0294	61200
Acrylonitrile	107-13-1	3.18	c	0.000491	c	0.0028	0.358	c	5.93	c	0.000978	c	0.00559	13900
Alachlor (Lasso)	15972-60-8	142	c	0.002	m	0.133			440	c	0.002	m	0.133	774
Aldicarb (Temik)	116-06-3	61.1	n	0.0156	n	0.139			881	n	0.102	n	0.906	2090
Aldrin	309-00-2	0.468	c	4.95E-05	c	0.812			1.45	c	0.000166	c	2.73	13.9
Aniline	62-53-3	428	n	0.108	n	1.95			4330	c	0.494	n	8.91	28900
Anthracene	120-12-7	18000	ns	1.15	n	3770	1100	n	221000	ns	2.5	n	8180	7.1
Antimony	7440-36-0	31.3	n	0.006	m				817	n	0.006	m		
Arsenic (see footnote)	7440-38-2	18.9	c	0.01	m				63.2	c	0.01	m		
Atrazine	1912-24-9	34.6	c	0.003	m	0.147			107	cs	0.003	m	0.147	81.4
Barium	7440-39-3	15300	n	2	m				277000	n	2	m		
Bentazon	25057-89-0	1830	ns	0.462	n	2.77			26400	ns	3	n	18	100
Benzene	71-43-2	15.9	c	0.005	m	0.168	3.12	c	28.2	c	0.005	m	0.168	2870
Benzidine	92-87-5	0.0346	c	3.67E-06	c	0.000887			0.107	c	1.23E-05	c	0.00298	3860
Benzo(a)anthracene	56-55-3	10.9	c	0.000223	c	7.89			33.8	cs	0.00075	c	26.5	16.6
Benzo(b)fluoranthene	205-99-2	10.9	cs	0.00016	c	19.2			33.8	cs	0.000537	c	64.4	8.99
Benzo(k)fluoranthene	207-08-9	109	cs	0.00162	c	190			338	cs	0.00543	c	638	4.7
Benzo(a)pyrene	50-32-8	1.09	c	0.0002	m	23.5			3.38	c	0.0002	m	23.5	9.52
Benzyl Chloride	100-44-7	14.6	c	0.000817	c	0.0762	0.497	c	28.5	c	0.00151	c	0.14	2400
Beryllium	7440-41-7	155	n	0.004	m				3650	n	0.004	m		
Bis(2-chloroethyl)ether	111-44-4	2.92	c	0.000124	c	0.00129	0.0737	c	6.01	c	0.000226	c	0.00236	7260
Bis(chloromethyl)ether	542-88-1	0.00102	c	6.52E-07	c	4.07E-06	0.000392	c	0.00174	c	1.20E-06	c	7.48E-06	5070
Bis(2-ethylhexyl)phthalate	117-81-7	569	cs	0.006	m	144			1760	cs	0.006	m	144	323
Bromacil	314-40-9	6110	ns	1.55	n	26.9			88100	ns	10.1	n	175	79.3
Bromodichloromethane	75-27-4	3.93	c	0.08	m	0.841	0.658	c	6.69	c	0.08	m	0.841	1320
Bromoform	75-25-2	1010	c	0.08	m	0.832			3120	cs	0.08	m	0.832	1310
Bromomethane	74-83-9	9.39	n	0.00702	n	0.0503	5.21	n	14.6	n	0.0132	n	0.0947	4380
1,3-Butadiene	106-99-0	0.697	c	0.000193	c	0.0033	0.811	c	1.36	c	0.000579	c	0.00992	776
Butyl Benzyl Phthalate	85-68-7	4190	cs	0.333	c	478			13000	cs	1.12	c	1610	193
Butylate	2008-41-5	3060	ns	0.576	n	46.8			44000	ns	3.44	n	279	178
n-Butylbenzene	104-51-8	1420	ns	0.169	n	50.9	183	n	3440	ns	0.392	n	118	252

APPENDIX A - KDHE TIER 2 RISK-BASED SUMMARY TABLE

		Residential Scenario							Non-residential Scenario					Soil
		Soil Pathway		Groundwater		Soil-to-Gw	Indoor air		Soil Pathway		Groundwater		Soil-to-Gw	Saturation
Contaminant	CAS No.	mg/kg		mg/L		mg/kg	ug/m^3		mg/kg		mg/L		mg/kg	mg/kg
sec-Butylbenzene	135-98-8	2760	ns	0.305	n	82.7	365	n	6540	ns	0.745	n	202	381
Cadmium	7440-43-9	39	n	0.005	m				965	n	0.005	m		
Caprolactam	105-60-2	30600	n	7.77	n	69.2			440000	ns	50.6	n	451	266000
Captan	133-06-2	3460	cs	0.366	c	19.9			10700	cs	1.23	c	67	13.4
Carbaryl (Sevin)	63-25-2	6110	ns	1.52	n	114			88100	ns	9.84	n	737	401
Carbazole	86-74-8	398	c	0.0287	c	52.7			1230	c	0.0965	c	177	1300
Carbofuran (Furadan)	1563-66-2	306	n	0.04	m	0.922			4400	ns	0.04	m	0.922	337
Carbon Disulfide	75-15-0	1020	ns	0.716	n	6.71	730	n	1680	ns	1.66	n	15.6	923
Carbon Tetrachloride	56-23-5	8.44	c	0.005	m	0.0734	4.06	c	14.7	c	0.005	m	0.0734	590
Chlordane	12789-03-6	22.7	cs	0.002	m	13.5			70.5	cs	0.002	m	13.5	18.9
Chlordecone (Kepone)	143-50-0	0.796	c	7.76E-05	c	0.272			2.47	c	0.000261	c	0.913	473
Chlorobenzene	108-90-7	380	n	0.1	m	5.1	52.1	n	740	n	0.1	m	5.1	1230
Chlorodifluoromethane	75-45-6	65400	ns	70.7	n	941	52100	n	98300	ns	132	n	1760	2040
Chloroform	67-66-3	4.22	c	0.08	m	0.85	1.06	c	7.14	c	0.08	m	0.85	3550
Chloromethane	74-87-3	146	n	0.127	n	0.924	93.9	n	223	n	0.238	n	1.73	1590
beta-Chloronaphthalene	91-58-7	4350	ns	0.344	n	172	292	n	30900	ns	0.7	n	350	291
o-Chlorotoluene	95-49-8	542	n	0.0889	n	7.18	73	n	1270	n	0.178	n	14.3	1480
Chlorpyrifos (Lorsban/Dursban)	2921-88-2	61.1	n	0.0128	n	18.7			881	ns	0.0786	n	115	81.7
Chromium - total	7440-47-3	33.6	c	0.1	m				111	c	0.1	m		
Chromium - hexavalent	18540-29-9	33.6	c						111	c				
Chromium - trivalent	16065-83-1	117000	n						3060000	n				
Chrysene	218-01-9	1090	cs	0.0223	c	805			3380	cs	0.075	c	2710	3.61
Cobalt	7440-48-4	23.4	n	0.00468	n				579	n	0.0306	n		
Copper	7440-50-8	3130	n	1.3	m				81700	n	1.3	m		
Cumene	98-82-8	2540	ns	0.451	n	65.1	417	n	5680	ns	0.968	n	140	439
Cyanazine (Bladex)	21725-46-2	9.47	c	0.000995	c	0.0307			29.4	c	0.00334	c	0.103	245
Cyanide, free	57-12-5	46.9	n	0.2	m				1230	n	0.2	m		
Cyclohexane	110-82-7	8770	ns	7.02	n	307	6260	n	13300	ns	14.7	n	644	149
Cyclohexylamine	108-91-8	12200	n	3.04	n	31.7			176000	n	19.7	n	206	422000
Dacthal	1861-32-1	611	ns	0.142	n	15.1			8810	ns	0.9	n	95.6	2.61
DDD	72-54-8	33.2	c	0.00135	c	31.8			103	c	0.00455	c	107	106
DDE	72-55-9	23.4	c	0.00103	c	24.1			72.5	cs	0.00345	c	81.1	47
DDT	50-29-3	23.4	cs	0.00073	c	24.6			72.5	cs	0.00245	c	82.8	9.27
Diazinon	333-41-5	42.8	n	0.0102	n	6.26			617	n	0.0654	n	40	1220
Dibenzo(a,h)anthracene	53-70-3	1.09	c	8.05E-06	c	3.08			3.38	c	2.70E-05	c	10.3	47.6
Dibenzofuran	132-64-9	58.2	n	0.00413	n	7.59	3.65	n	579	ns	0.0086	n	15.8	284

APPENDIX A - KDHE TIER 2 RISK-BASED SUMMARY TABLE

		Residential Scenario							Non-residential Scenario					Soil
		Soil Pathway		Groundwater		Soil-to-Gw	Indoor air		Soil Pathway		Groundwater		Soil-to-Gw	Saturation
Contaminant	CAS No.	mg/kg		mg/L		mg/kg	ug/m^3		mg/kg		mg/L		mg/kg	mg/kg
1,4-Dibromobenzene	106-37-6	611	ns	0.135	n	10.7			8810	ns	0.837	n	66.3	77.2
Dibromochloromethane	124-48-1	94.7	c	0.08	m	0.834			294	c	0.08	m	0.834	1150
1,2-Dibromo-3-chloropropane	96-12-8	9.93	c	0.0002	m	0.00543			30.7	c	0.0002	m	0.00543	1550
Dibutyl Phthalate	84-74-2	6110	ns	1.35	n	318			88100	ns	8.4	n	1980	131
Dicamba	1918-00-9	1830	n	0.461	n	4.52			26400	ns	2.99	n	29.4	3240
1,2-Dichlorobenzene	95-50-1	2340	ns	0.6	m	48.4	209	n	5340	ns	0.6	m	48.4	615
1,4-Dichlorobenzene	106-46-7	37.5	c	0.075	m	5.94	2.21	c	63.7	c	0.075	m	5.94	315
Dichlorodifluoromethane	75-71-8	227	n	0.366	n	13.5	209	n	323	n	0.567	n	21	883
1,1-Dichloroethane	75-34-3	46.8	c	0.025	c	0.269	15.2	c	79.9	c	0.0461	c	0.496	2320
1,2-Dichloroethane	107-06-2	6.27	c	0.005	m	0.06	0.936	c	10.9	c	0.005	m	0.06	4340
1,1-Dichloroethylene	75-35-4	313	n	0.007	m	0.0859	209	n	484	n	0.007	m	0.0859	1510
cis-1,2-Dichloroethylene	156-59-2	23	n	0.07	m	0.855	7.3	n	38.7	n	0.07	m	0.855	3380
trans-1,2-Dichloroethylene	156-60-5	202	n	0.1	m	1.22	62.6	n	333	n	0.1	m	1.22	2390
2,4-Dichlorophenol	120-83-2	183	n	0.0412	n	4.22			2640	n	0.258	n	26.4	22600
4-(2,4-Dichlorophenoxy)butyric acid	94-82-6	489	ns	0.115	n	2.71			7050	ns	0.727	n	17.2	49.9
2,4-Dichlorophenoxyacetic acid	94-75-7	611	ns	0.07	m	0.695			8810	ns	0.07	m	0.695	268
1,2-Dichloropropane	78-87-5	12.9	c	0.005	m	0.0817	2.43	c	22.3	c	0.005	m	0.0817	2040
1,3-Dichloropropene	542-75-6	23.3	c	0.0049	c	0.0916	6.08	c	45.2	c	0.0117	c	0.219	2380
Dichlorvos	62-73-7	27.4	c	0.00291	c	0.0431			85.1	c	0.00979	c	0.145	5120
Dieldrin	60-57-1	0.497	c	4.80E-05	c	0.193			1.54	c	0.000161	c	0.649	39.2
Diethyl Phthalate	84-66-2	48900	ns	12.2	n	305			705000	ns	79	n	1970	1240
2,4-Dimethylphenol	105-67-9	1220	n	0.292	n	29.9			17600	n	1.86	n	190	39500
2,4-Dinitrophenol	51-28-5	122	n	0.031	n	2.98			1760	n	0.202	n	19.4	13100
2,4-Dinitrotoluene	121-14-2	25.7	c	0.00267	c	0.318			79.6	c	0.00898	c	1.07	1170
2,6-Dinitrotoluene	606-20-2	5.31	c	0.000557	c	0.0677			16.4	c	0.00187	c	0.227	900
Di-n-octyl Phthalate	117-84-0	1220	ns	0.0184	n	518			17600	ns	0.0894	n	2520	0.649
Dinoseb	88-85-7	61.1	n	0.0141	n	12.2			881	n	0.0891	n	76.9	2240
1,4-Dioxane	123-91-1	79.6	c	0.00849	c	0.0384			247	c	0.0285	c	0.129	126000
Dioxin (2,3,7,8-TCDD)	1746-01-6	4.28E-05	n	3.00E-08	m	0.00149			0.00019	c	3.00E-08	m	0.00149	0.498
Diphenylamine	122-39-4	1530	ns	0.314	n	53.1			22000	ns	1.91	n	324	443
Diuron	330-54-1	122	ns	0.0304	n	0.784			1760	ns	0.196	n	5.07	50
Endosulfan	115-29-7	367	ns	0.0921	n	125			5290	ns	0.598	n	811	22
Endrin	72-20-8	18.3	n	0.002	m	8.04			264	ns	0.002	m	8.04	50.3
Ethyl Chloride	75-00-3	18200	ns	14	n	128	10400	n	28100	ns	26.4	n	241	2690
s-Ethyl Dipropylthiocarbamate (EPTC)	759-94-4	1410	ns	0.12	n	4.41	91.3	n	11700	ns	0.229	n	8.43	653
Ethylbenzene	100-41-4	82	c	0.7	m	65.6	9.73	c	145	c	0.7	m	65.6	781

APPENDIX A - KDHE TIER 2 RISK-BASED SUMMARY TABLE

		Residential Scenario							Non-residential Scenario					Soil
		Soil Pathway		Groundwater		Soil-to-Gw	Indoor air		Soil Pathway		Groundwater		Soil-to-Gw	Saturation
Contaminant	CAS No.	mg/kg		mg/L		mg/kg	ug/m^3		mg/kg		mg/L		mg/kg	mg/kg
Ethylene Dibromide	106-93-4	0.483	c	5.00E-05	m	0.000598	0.0406	c	0.859	c	5.00E-05	m	0.000598	1960
Ethylene Glycol	107-21-1	122000	ns	31.3	n	131			1760000	ns	204	n	858	110000
Fluoranthene	206-44-0	2440	ns	0.255	n	2830			35200	ns	1.37	n	15200	144
Fluorene	86-73-7	2360	ns	0.162	n	297	146	n	25900	ns	0.341	n	626	155
Fonofos (Dyfonate)	944-22-9	122	n	0.0266	n	4.65			1760	ns	0.164	n	28.8	136
Formaldehyde	50-00-0	175	c	0.0184	c	0.0774			542	c	0.0619	c	0.26	44000
Furan	110-00-9	12.4	n	0.00493	n	0.1	3.65	n	21.3	n	0.00925	n	0.189	9410
Glyphosate (Roundup)	1071-83-6	6110	ns	0.7	m	2.94			88100	ns	0.7	m	2.94	1160
Heptachlor	76-44-8	1.77	c	0.0004	m	3.3			5.48	c	0.0004	m	3.3	74.3
Heptachlor Epoxide	1024-57-3	0.794	n	0.0002	m	0.405			2.71	c	0.0002	m	0.405	20.2
Hexachlorobenzene	118-74-1	4.97	cs	0.001	m	1.24			15.4	cs	0.001	m	1.24	0.385
Hexachlorobutadiene	87-68-3	61.1	ns	0.00632	c	1.1			316	ns	0.0212	c	3.69	27.6
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	7.24	c	0.0002	m	0.113			22.4	c	0.0002	m	0.113	206
Hexachlorocyclopentadiene	77-47-4	366	ns	0.05	m	14.3			5210	ns	0.05	m	14.3	25.8
Hexachloroethane	67-72-1	42.8	n	0.00914	n	0.399			617	ns	0.0563	n	2.46	105
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	72.4	cs	0.00772	c	0.168			224	cs	0.0259	c	0.566	59.1
n-Hexane	110-54-3	656	ns	0.316	n	50.1	730	n	1100	ns	1.06	n	167	145
Hydrazine	302-01-2	5.67	c	0.000134	n				19	c	0.000876	n		
Hydrazine Sulfate	10034-93-2	5.67	c	0.000284	c				19	c	0.000953	c		
Indeno(1,2,3-cd)pyrene	193-39-5	10.9	cs	0.000117	c	45.5			33.8	cs	0.000392	c	153	3.71
Lead	7439-92-1	400	k	0.015	m				1000	k	0.015	m		
Malathion	121-75-5	1220	ns	0.311	n	3.19			17600	ns	2.03	n	20.8	59
Manganese	7439-96-5	9300	n	0.05	M				66200	n	0.05	M		
Mercury	7439-97-6	2	k	0.002	m				20	k	0.002	m		
Methoxychlor	72-43-5	306	ns	0.04	m	215			4400	ns	0.04	m	215	26.9
Methyl Ethyl Ketone	78-93-3	26000	n	4.92	n	24.2	5210	n	101000	ns	11.8	n	57.8	32500
Methyl Isobutyl Ketone	108-10-1	4450	ns	1.02	n	6.69	3130	n	34800	ns	4.17	n	27.2	4310
Methyl tert-Butyl Ether	1634-04-4	585	c	0.133	c	0.848	93.6	c	1050	c	0.262	c	1.66	11200
Methylene Chloride	75-09-2	312	n	0.005	m	0.0429	626	n	1880	n	0.005	m	0.0429	4440
1-Methylnaphthalene	90-12-0	141	c	0.00429	c	2.19	2.94	c	310	c	0.00833	c	4.25	655
2-Methylnaphthalene	91-57-6	209	n	0.0167	n	8.34	14.6	n	1280	ns	0.0346	n	17.3	612
2-Methylphenol	95-48-7	3060	n	0.744	n	48.6			44000	n	4.78	n	312	82000
3-Methylphenol	108-39-4	3060	n	0.744	n	47.7			44000	n	4.77	n	306	70500
4-Methylphenol	106-44-5	6110	n	1.49	n	95.5			88100	ns	9.56	n	613	66700
Metolachlor (Dual)	51218-45-2	9170	ns	2.3	n	233			132000	ns	14.9	n	1510	2640
Metribuzin (Sencor)	21087-64-9	1530	ns	0.388	n	5.67			22000	ns	2.53	n	36.9	663

APPENDIX A - KDHE TIER 2 RISK-BASED SUMMARY TABLE

		Residential Scenario						Non-residential Scenario					Soil
		Soil Pathway		Groundwater		Soil-to-Gw	Indoor air	Soil Pathway		Groundwater		Soil-to-Gw	Saturation
Contaminant	CAS No.	mg/kg		mg/L		mg/kg	ug/m^3	mg/kg		mg/L		mg/kg	mg/kg
Naphthalene	91-20-3	30.5	c	0.00111	c	0.349	0.716 c	64.7	c	0.00211	c	0.659	482
Nickel	7440-02-0	1540	n	0.312	n			32400	n	2.04	n		
Nitrobenzene	98-95-3	32.2	c	0.00101	c	0.0496	0.608 c	72.9	c	0.00185	c	0.0912	4940
Nitrofurazone	59-87-0	6.12	c	0.000654	c	0.0484		19	c	0.0022	c	0.163	755
Nitroguanidine	556-88-7	6110	ns	1.56	n	12.7		88100	ns	10.2	n	83	1350
2-Nitropropane	79-46-9	0.151	c	1.50E-05	c	0.000153	0.00901 c	0.276	c	2.75E-05	c	0.00028	6950
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	3060	ns	0.782	n	86.3		44000	ns	5.11	n	564	27.1
Oxamyl	23135-22-0	1530	n	0.2	m	1.2		22000	n	0.2	m	1.2	56000
Paraquat	1910-42-5	275	n	0.0704	n	95.7		3960	n	0.46	n	625	47500000
Parathion	56-38-2	367	ns	0.0864	n	42.2		5290	ns	0.549	n	268	268
Pendimethalin (Prowl)	40487-42-1	2440	ns	0.356	n	401		35200	ns	2.01	n	2260	16.9
Pentachlorophenol	87-86-5	19.9	c	0.001	m	0.996		61.7	c	0.001	m	0.996	696
Perchlorate	7790-98-9	54.7	n	0.0109	n	0.0435		1430	n	0.0709	n	0.284	
Permethrin (Ambush)	52645-53-1	3060	ns	0.33	n	7830		44000	ns	1.78	n	42300	7.13
Phenol	108-95-2	18300	n	4.56	n	189		264000	ns	29.5	n	1220	163000
Phenylphenol	90-43-7	4190	c	0.381	c	514		13000	c	1.28	c	1730	47100
Phosphine	7803-51-2	23.5	n	0.00466	n			612	n	0.0304	n		
Picloram (Tordon)	1918-02-1	4280	ns	0.5	m	5.88		61700	ns	0.5	m	5.88	210
Profluralin	26399-36-0	367	ns	0.0589	n	360		5290	ns	0.339	n	2070	30.5
Prometon	1610-18-0	917	n	0.222	n	7		13200	ns	1.43	n	44.9	1110
Propachlor (Ramrod)	1918-16-7	794	n	0.2	n	8.96		11500	ns	1.3	n	58.2	1240
Propazine (Miloguard)	139-40-2	1220	ns	0.299	n	21.8		17600	ns	1.92	n	140	30.5
n-Propylbenzene	103-65-1	4070	ns	0.66	n	110	1040 n	14300	ns	1.91	n	320	434
Pyrene	129-00-0	1830	ns	0.202	n	2190		26400	ns	1.09	n	11900	73.4
Pyridine	110-86-1	51.5	n	0.00496	n	0.091	3.65 n	301	n	0.00928	n	0.17	817000
Selenium	7782-49-2	391	n	0.05	m			10200	n	0.05	m		
Silver	7440-22-4	391	n	0.0779	n			10200	n	0.508	n		
Simazine (Princap)	122-34-9	66.3	cs	0.004	m	0.133		206	cs	0.004	m	0.133	9.7
Styrene	100-42-5	7020	ns	0.1	m	9.34	1040 n	20400	ns	0.1	m	9.34	1420
Terbacil (Sinbar)	5902-51-2	794	ns	0.201	n	2.82		11500	ns	1.31	n	18.3	427
Terbufos (Counter)	13071-79-9	1.53	n	0.000316	n	0.0645		22	n	0.00193	n	0.394	51.2
Tert-butyl Alcohol	75-65-0	2410	c	0.256	c	1.13		7470	c	0.859	c	3.8	18300
1,1,1,2-Tetrachloroethane	630-20-6	27.8	c	0.00535	c	0.114	3.29 c	48.8	c	0.00991	c	0.212	1050
1,1,2,2-Tetrachloroethane	79-34-5	8.21	c	0.000694	c	0.016	0.42 c	15.2	c	0.00128	c	0.0294	2980
Tetrachloroethylene	127-18-4	109	n	0.005	m	0.121	41.7 n	210	n	0.005	m	0.121	244
2,3,4,6-Tetrachlorophenol	58-90-2	1830	ns	0.32	n	191		26400	ns	1.87	n	1120	685

APPENDIX A - KDHE TIER 2 RISK-BASED SUMMARY TABLE

		Residential Scenario							Non-residential Scenario						Soil
		Soil Pathway		Groundwater		Soil-to-Gw	Indoor air		Soil Pathway		Groundwater		Soil-to-Gw		Saturation
Contaminant	CAS No.	mg/kg		mg/L		mg/kg	ug/m^3		mg/kg		mg/L		mg/kg		mg/kg
Tetrahydrofuran	109-99-9	22200	n	3.21	n	19.8	2090	n	49000	n	5.49	n	33.8		2080000
Tetryl	479-45-8	244	n	0.0624	n	57.7			3520	ns	0.407	n	377		3420
Toluene	108-88-3	4320	ns	1	m	51.2	5210	n	29800	ns	1	m	51.2		1310
Total Petroleum Hydrocarbons - LRH		550	n	0.35	n	50			950	n	0.95	n	150		
Total Petroleum Hydrocarbons - MRH		250	n	0.15	n	50			350	n	0.4	n	150		
Total Petroleum Hydrocarbons - HRH		6000	n	1	n	6000			27,500	n	2.5	n	13000		
Toxaphene	8001-35-2	7.24	cs	0.003	m	46.3			22.4	cs	0.003	m	46.3		5.38
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	13800	ns	3.94	n	321	31300	n	60000	ns	20.3	n	1660		1050
1,2,4-Trichlorobenzene	120-82-1	89.2	n	0.07	m	19.3	2.09	n	144	n	0.07	m	19.3		670
1,1,1-Trichloroethane	71-55-6	11800	ns	0.2	m	2.8	5210	n	18100	ns	0.2	m	2.8		864
1,1,2-Trichloroethane	79-00-5	2.38	n	0.005	m	0.081	0.209	n	3.37	n	0.005	m	0.081		3270
Trichloroethylene	79-01-6	5.85	n	0.005	m	0.0842	2.09	n	9.91	n	0.005	m	0.0842		1000
Trichlorofluoromethane	75-69-4	1000	n	1.09	n	21.5	730	n	1470	ns	1.9	n	37.5		1410
2,4,5-Trichlorophenol	95-95-4	6110	n	1.26	n	454			88100	ns	7.71	n	2770		21400
2,4,6-Trichlorophenol	88-06-2	61.1	n	0.0127	n	4.57			881	n	0.0777	n	27.9		14300
2,4,5-Trichlorophenoxyacetic Acid	93-76-5	611	ns	0.148	n	3.75			8810	ns	0.944	n	24		325
2,4,5-Trichlorophenoxypropionic acid	93-72-1	489	ns	0.05	m	1.95			7050	ns	0.05	m	1.95		132
1,2,3-Trichloropropane	96-18-4	0.0576	c	4.68E-06	c	0.000127	0.00284	c	0.107	c	8.62E-06	c	0.000234		2210
Trifluralin (Treflan)	1582-09-8	458	ns	0.0668	c	219			3200	ns	0.225	c	737		30.2
1,2,4-Trimethylbenzene	95-63-6	54	n	0.00844	n	1.07	7.3	n	126	n	0.0174	n	2.21		359
1,3,5-Trimethylbenzene	108-67-8	243	n	0.044	n	5.51	36.5	n	530	ns	0.0884	n	11.1		298
2,4,6-Trinitrotoluene	118-96-7	30.6	n	0.00777	n	4.4			440	n	0.0507	n	28.7		3250
Vinyl Acetate	108-05-4	1260	n	0.406	n	2.09	209	n	1800	n	0.581	n	2.99		3200
Vinyl Chloride	75-01-4	4.47	c	0.002	m	0.0205	5.53	c	9.21	c	0.002	m	0.0205		4600
Xylene (mixed isomers)	1330-20-7	936	ns	10	m	809	104	n	1410	ns	10	m	809		421
Zinc	7440-66-6	23500	n	4.67	n				613000	n	30.5	n			

Notes

n = The value is based on non-carcinogenic health risk, with a hazard index (HI) = 1.

c = The value is based on carcinogenic health risk with a target cancer risk of 10E-5.

ns or cs = The value is based upon health risk; however, the calculated saturation value is lower than the health risk value presented.

k = KDHE has established this value by means other than the equations in this manual.

m = The groundwater value is equal to the EPA MCL.

M = The groundwater value is equal to the EPA Secondary MCL.

Arsenic soil pathway values are calculated with a 60% relative bioavailability for ingestion.

Tier 2 Indoor Air values are presented in ug/m^3, which may be converted to parts per billion volume (ppbv) using the equation:

Tier 2 value (ug/m^3) x 24 / contaminant molecular weight (MW from App B) = concentration (ppbv)

APPENDIX B - CONTAMINANT SPECIFIC PARAMETERS

Contaminant	CAS No.	MW		H' (unitless)		Dia (cm^2/s)		Diw (cm^2/s)		Koc (L/kg)		S (mg/L)		Kp (cm/hr)	
Acenaphthene	83-32-9	154.21	a	7.50E-03	a	5.10E-02	a	8.30E-06	a	5027	a	3.9	a	8.60E-02	c
Acetochlor	34256-82-1	269.77	a	9.10E-07	a					298.4	a	223	a	4.95E-03	c
Acetone	67-64-1	58.08	a	1.40E-03	a	1.10E-01	a	1.10E-05	a	2.364	a	1000000	a	5.12E-04	c
Acetophenone	98-86-2	120.15	a	4.30E-04	a	6.50E-02	a	8.70E-06	a	51.85	a	6130	a	3.72E-03	c
Acrolein	107-02-8	56.06	a	5.00E-03	a	1.10E-01	a	1.20E-05	a	1	a	212000	a	6.50E-04	b
Acrylamide	79-06-1	71.08	a	7.00E-08	a					5.694	a	390000	a	2.20E-04	b
Acrylonitrile	107-13-1	53.06	a	5.60E-03	a	1.10E-01	a	1.20E-05	a	8.511	a	74500	a	1.20E-03	b
Alachlor (Lasso)	15972-60-8	269.77	a	3.40E-07	a					312.3	a	240	a	1.05E-02	c
Aldicarb (Temik)	116-06-3	190.26	a	5.90E-08	a					24.64	a	6030	a	7.55E-04	c
Aldrin	309-00-2	364.92	a	1.80E-03	a					82020	a	0.017	a	1.40E-03	b
Aniline	62-53-3	93.13	e	8.26E-05	e					70.23	e	36000	e	1.86E-03	e
Anthracene	120-12-7	178.24	a	2.30E-03	a	3.90E-02	a	7.90E-06	a	16360	a	0.0434	a	1.42E-01	c
Antimony	7440-36-0	124.78	a											1.00E-03	b
Arsenic	7440-38-2	77.95	a											1.00E-03	b
Atrazine	1912-24-9	215.69	a	9.60E-08	a					224.5	a	34.7	a	5.24E-03	c
Barium	7440-39-3	137.33	a											1.00E-03	b
Bentazon	25057-89-0	240.28	a	8.90E-08	a					10	a	500	a	2.52E-03	c
Benzene	71-43-2	78.11	a	2.30E-01	a	9.00E-02	a	1.00E-05	a	145.8	a	1790	a	1.50E-02	b
Benzidine	92-87-5	184.24	a	2.90E-09	a					1190	a	322	a	1.10E-03	b
Benzo(a)anthracene	56-55-3	228.3	a	4.90E-04	a					176900	a	0.0094	a	4.70E-01	b
Benzo(b)fluoranthene	205-99-2	252.32	a	2.70E-05	a					599400	a	0.0015	a	7.00E-01	b
Benzo(k)fluoranthene	207-08-9	252.32	a	2.40E-05	a					587400	a	0.0008	a	6.91E-01	c
Benzo(a)pyrene	50-32-8	252.32	a	1.90E-05	a					587400	a	0.00162	a	7.00E-01	b
Benzyl Chloride	100-44-7	126.59	a	1.70E-02	a	6.30E-02	a	8.80E-06	a	446.1	a	525	a	1.00E-02	b
Beryllium	7440-41-7	9.01	a											1.00E-03	b
Bis(2-chloroethyl)ether	111-44-4	143.01	a	7.00E-04	a	5.70E-02	a	8.70E-06	a	32.21	a	17200	a	1.80E-03	b
Bis(chloromethyl)ether	542-88-1	114.96	a	1.80E-01	a	7.60E-02	a	1.00E-05	a	9.699	a	22000	a	8.55E-04	c
Bis(2-ethylhexyl)phthalate	117-81-7	390.57	a	1.10E-05	a					119600	a	0.27	a	1.13E+00	c
Bromacil	314-40-9	261.12	c	5.69E-09	c					66.62	c	103.55	c	1.35E-03	c
Bromodichloromethane	75-27-4	163.83	a	8.70E-02	a	5.60E-02	a	1.10E-05	a	31.82	a	3030	a	4.60E-03	b
Bromoform	75-25-2	252.73	a	2.20E-02	a					31.82	a	3100	a	2.20E-03	b
Bromomethane	74-83-9	94.94	a	3.00E-01	a	1.00E-01	a	1.30E-05	a	13.22	a	15200	a	2.80E-03	b
1,3-Butadiene	106-99-0	54.09	a	3.00E+00	a	1.00E-01	a	1.00E-05	a	39.6	a	735	a	1.60E-02	b
Butyl Benzyl Phthalate	85-68-7	312.37	a	5.20E-05	a					7155	a	2.69	a	3.85E-02	c
Butylate	2008-41-5	217.37	a	3.50E-03	a					385.7	a	45	a	5.41E-02	c
n-Butylbenzene	104-51-8	134.22	c	5.69E-01	c	5.28E-02	d	7.33E-06	d	1482	c	16.8	c	2.25E-01	c
sec-Butylbenzene	135-98-8	134.22	c	5.69E-01	c	5.28E-02	d	7.33E-06	d	1331	c	28.2	c	3.01E-01	c

APPENDIX B - CONTAMINANT SPECIFIC PARAMETERS

Contaminant	CAS No.	MW		H' (unitless)		Dia (cm^2/s)		Diw (cm^2/s)		Koc (L/kg)		S (mg/L)		Kp (cm/hr)	
Cadmium	7440-43-9	112.41	a											1.00E-03	b
Caprolactam	105-60-2	113.16	a	1.00E-06	a					24.5	a	772000	a	1.00E-03	c
Captan	133-06-2	300.59	a	2.90E-07	a					252.2	a	5.1	a	1.20E-03	b
Carbaryl (Sevin)	63-25-2	201.23	a	1.30E-07	a					354.8	a	110	a	4.31E-03	c
Carbazole	86-74-8	167.21	c	3.54E-06	c					9161	c	14.2	c	5.36E-02	c
Carbofuran (Furadan)	1563-66-2	221.26	a	1.30E-07	a					95.25	a	320	a	3.13E-03	c
Carbon Disulfide	75-15-0	76.13	a	5.90E-01	a	1.10E-01	a	1.30E-05	a	21.73	a	2160	a	1.70E-02	b
Carbon Tetrachloride	56-23-5	153.82	a	1.10E+00	a	5.70E-02	a	9.80E-06	a	43.89	a	793	a	1.60E-02	b
Chlordane	12789-03-6	409.78	a	2.00E-03	a					33780	a	0.056	a	1.07E-01	c
Chlordecone (Kepone)	143-50-0	490.64	a	2.20E-06	a					17500	a	2.7	a	1.09E-02	c
Chlorobenzene	108-90-7	112.56	a	1.30E-01	a	7.20E-02	a	9.50E-06	a	233.9	a	498	a	2.80E-02	b
Chlorodifluoromethane	75-45-6	86.47	a	1.70E+00	a	1.00E-01	a	1.30E-05	a	31.82	a	2770	a	2.68E-03	c
Chloroform	67-66-3	119.38	a	1.50E-01	a	7.70E-02	a	1.10E-05	a	31.82	a	7950	a	6.80E-03	b
Chloromethane	74-87-3	50.49	a	3.60E-01	a	1.20E-01	a	1.40E-05	a	13.22	a	5320	a	3.30E-03	b
beta-Chloronaphthalene	91-58-7	162.62	a	1.30E-02	a	4.50E-02	a	7.70E-06	a	2478	a	11.7	a	7.49E-02	c
o-Chlorotoluene	95-49-8	126.59	a	1.50E-01	a	6.30E-02	a	8.70E-06	a	382.9	a	374	a	5.72E-02	c
Chlorpyrifos (Lorsban/Dursban)	2921-88-2	350.59	a	1.20E-04	a					7283	a	1.12	a	3.34E-02	c
Chromium - total	7440-47-3	52.00	a											1.00E-03	b
Chromium - hexavalent	18540-29-9	52.00	e											2.00E-03	b
Chromium - trivalent	16065-83-1	52.00	e											1.00E-03	b
Chrysene	218-01-9	228.3	a	2.10E-04	a					180500	a	0.002	a	4.70E-01	b
Cobalt	7440-48-4	58.93	a											4.00E-04	b
Copper	7440-50-8	63.55	a											1.00E-03	b
Cumene	98-82-8	120.2	a	4.70E-01	a	6.00E-02	a	7.90E-06	a	697.8	a	61.3	a	8.97E-02	c
Cyanazine (Bladex)	21725-46-2	240.7	a	1.10E-10	a					134.1	a	170	a	2.09E-03	c
Cyanide, free	57-12-5	27.03	a	5.40E-03	a									1.00E-03	b
Cyclohexane	110-82-7	84.16	e	6.13E+00	e	8.00E-02	e	9.11E-06	e	145.8	e	55	e	1.02E-01	e
Cyclohexylamine	108-91-8	99.18	e	1.70E-04	e					32.17	e	1000000	e	4.25E-03	e
Dacthal	1861-32-1	331.97	a	8.90E-05	a					511.1	a	0.5	a	1.50E-02	c
DDD	72-54-8	320.05	a	2.70E-04	a					117500	a	0.09	a	1.80E-01	b
DDE	72-55-9	318.03	a	1.70E-03	a					117500	a	0.04	a	1.60E-01	b
DDT	50-29-3	354.49	a	3.40E-04	a					168600	a	0.0055	a	2.70E-01	b
Diazinon	333-41-5	304.35	a	4.60E-06	a					3034	a	40	a	1.04E-02	c
Dibenzo(a,h)anthracene	53-70-3	278.36	a	5.80E-06	a					1912000	a	0.00249	a	1.50E+00	b
Dibenzofuran	132-64-9	168.2	a	8.70E-03	a	4.10E-02	a	7.40E-06	a	9161	a	3.1	a	9.75E-02	c
1,4-Dibromobenzene	106-37-6	235.91	a	3.70E-02	a					375.3	a	20	a	2.45E-02	c
Dibromochloromethane	124-48-1	208.28	a	3.20E-02	a					31.82	a	2700	a	2.89E-03	c

APPENDIX B - CONTAMINANT SPECIFIC PARAMETERS

Contaminant	CAS No.	MW		H' (unitless)		Dia (cm^2/s)		Diw (cm^2/s)		Koc (L/kg)		S (mg/L)		Kp (cm/hr)	
1,2-Dibromo-3-chloropropane	96-12-8	236.33	a	6.00E-03	a					115.8	a	1230	a	6.85E-03	c
Dibutyl Phthalate	84-74-2	278.35	a	7.40E-05	a					1157	a	11.2	a	2.40E-02	b
Dicamba	1918-00-9	221.04	a	8.90E-08	a					29.01	a	8310	a	2.65E-03	c
1,2-Dichlorobenzene	95-50-1	147	a	7.80E-02	a	5.60E-02	a	8.90E-06	a	382.9	a	156	a	4.10E-02	b
1,4-Dichlorobenzene	106-46-7	147	a	9.90E-02	a	5.50E-02	a	8.70E-06	a	375.3	a	81.3	a	4.20E-02	b
Dichlorodifluoromethane	75-71-8	120.91	a	1.40E+01	a	7.80E-02	a	9.10E-06	a	43.89	a	280	a	9.00E-03	b
1,1-Dichloroethane	75-34-3	98.96	a	2.30E-01	a	8.40E-02	a	1.10E-05	a	31.82	a	5040	a	6.70E-03	b
1,2-Dichloroethane	107-06-2	98.96	a	4.80E-02	a	8.60E-02	a	1.10E-05	a	39.6	a	8600	a	4.20E-03	b
1,1-Dichloroethylene	75-35-4	96.94	a	1.10E+00	a	8.60E-02	a	1.10E-05	a	31.82	a	2420	a	1.20E-02	b
cis-1,2-Dichloroethylene	156-59-2	96.94	a	1.70E-01	a	8.80E-02	a	1.10E-05	a	39.6	a	6410	a	1.10E-02	c
trans-1,2-Dichloroethylene	156-60-5	96.94	a	1.70E-01	a	8.80E-02	a	1.10E-05	a	39.6	a	4520	a	1.10E-02	c
2,4-Dichlorophenol	120-83-2	163	a	1.80E-04	a					491.8	a	4500	a	2.10E-02	b
4-(2,4-Dichlorophenoxy)butyric acid	94-82-6	249.10	a	2.40E-07	a					98.4	a	46	a	1.39E-02	c
2,4-Dichlorophenoxyacetic acid	94-75-7	221.04	a	1.40E-06	a					29.63	a	677	a	6.64E-03	c
1,2-Dichloropropane	78-87-5	112.99	a	1.20E-01	a	8.10E-02	a	9.50E-06	a	60.7	a	2800	a	7.80E-03	b
1,3-Dichloropropene	542-75-6	110.97	a	1.50E-01	a	8.20E-02	a	9.60E-06	a	72.17	a	2800	a	4.30E-03	b
Dichlorvos	62-73-7	220.98	a	2.30E-05	a					53.96	a	8000	a	8.50E-04	b
Dieldrin	60-57-1	380.91	a	4.10E-04	a					20090	a	0.195	a	1.20E-02	b
Diethyl Phthalate	84-66-2	222.24	a	2.50E-05	a					104.9	a	1080	a	3.90E-03	b
2,4-Dimethylphenol	105-67-9	122.17	a	3.90E-05	a					491.8	a	7870	a	1.10E-02	b
2,4-Dinitrophenol	51-28-5	184.11	a	3.50E-06	a					460.8	a	2790	a	1.50E-03	b
2,4-Dinitrotoluene	121-14-2	182.14	a	2.20E-06	a					575.6	a	200	a	3.10E-03	b
2,6-Dinitrotoluene	606-20-2	182.14	a	3.10E-05	a					587.4	a	150.62	a	2.10E-03	b
Di-n-octyl Phthalate	117-84-0	390.57	c	4.83E-04	c					141000	c	0.00046	c	2.43E+00	c
Dinoseb	88-85-7	240.22	e	1.86E-05	e					4294	e	52	e	1.63E-02	e
1,4-Dioxane	123-91-1	88.11	a	2.00E-04	a					2.633	a	1000000	a	3.30E-04	b
Dioxin (2,3,7,8-TCDD)	1746-01-6	321.98	a	2.00E-03	a					249100	a	0.0002	a	8.10E-01	b
Diphenylamine	122-39-4	169.23	a	1.10E-04	a					825.8	a	53	a	3.73E-02	c
Diuron	330-54-1	233.1	a	2.10E-08	a					109.1	a	42	a	4.66E-03	c
Endosulfan	115-29-7	406.92	a	2.70E-03	a					6761	a	0.325	a	2.86E-03	c
Endrin	72-20-8	380.91	a	4.10E-04	a					20090	a	0.25	a	1.20E-02	b
Ethyl Chloride	75-00-3	64.52	a	4.50E-01	a	1.00E-01	a	1.20E-05	a	21.73	a	6710	a	6.10E-03	b
s-Ethyl Dipropylthiocarbamate (EPTC)	759-94-4	189.32	a	6.50E-04	a	2.90E-02	a	6.40E-06	a	164.1	a	375	a	1.84E-02	c
Ethylbenzene	100-41-4	106.17	a	3.20E-01	a	6.80E-02	a	8.50E-06	a	446.1	a	169	a	4.90E-02	b
Ethylene Dibromide	106-93-4	187.86	a	2.70E-02	a	4.30E-02	a	1.00E-05	a	39.6	a	3910	a	2.80E-03	b
Ethylene Glycol	107-21-1	62.07	a	2.50E-06	a					1	a	1000000	a	8.77E-05	c
Fluoranthene	206-44-0	202.26	a	3.60E-04	a					55450	a	0.26	a	2.20E-01	b

APPENDIX B - CONTAMINANT SPECIFIC PARAMETERS

Contaminant	CAS No.	MW		H' (unitless)		Dia (cm^2/s)		Diw (cm^2/s)		Koc (L/kg)		S (mg/L)		Kp (cm/hr)	
Fluorene	86-73-7	166.22	a	3.90E-03	a	4.40E-02	a	7.90E-06	a	9160	a	1.69	a	1.10E-01	c
Fonofos (Dyfonate)	944-22-9	246.32	a	2.90E-04	a					855.8	a	15.7	a	2.70E-02	c
Formaldehyde	50-00-0	30.03	a	1.40E-05	a					1	a	400000	a	1.80E-03	b
Furan	110-00-9	68.08	a	2.20E-01	a	1.00E-01	a	1.20E-05	a	79.99	a	10000	a	5.05E-03	c
Glyphosate (Roundup)	1071-83-6	169.07	a	8.60E-11	a					1	a	10500	a	9.69E-07	c
Heptachlor	76-44-8	373.32	a	1.20E-02	a					41260	a	0.18	a	1.43E-01	c
Heptachlor Epoxide	1024-57-3	389.32	a	8.60E-04	a					10110	a	0.2	a	2.09E-02	c
Hexachlorobenzene	118-74-1	284.78	a	7.00E-02	a					6195	a	0.0062	a	1.30E-01	b
Hexachlorobutadiene	87-68-3	260.76	a	4.20E-01	a					845.2	a	3.2	a	8.10E-02	b
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	290.83	a	2.10E-04	a					2807	a	7.3	a	1.10E-02	b
Hexachlorocyclopentadiene	77-47-4	272.77	a	1.10E+00	a					1404	a	1.8	a	1.03E-01	c
Hexachloroethane	67-72-1	236.74	a	1.60E-01	a					196.8	a	50	a	3.00E-02	b
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	222.12	a	8.20E-10	a					89.07	a	59.7	a	3.36E-04	c
n-Hexane	110-54-3	86.18	a	7.40E+01	a	7.30E-02	a	8.20E-06	a	131.5	a	9.5	a	2.01E-01	c
Hydrazine	302-01-2	32.05	a									1000000	a	4.40E-05	b
Hydrazine Sulfate	10034-93-2	128.1	a									30550	a	4.40E-05	b
Indeno(1,2,3-cd)pyrene	193-39-5	276.34	a	1.40E-05	a					1951000	a	0.00019	a	1.00E+00	b
Lead	7439-92-1	207.2	a											3.29E-04	c
Malathion	121-75-5	330.35	a	2.00E-07	a					31.27	a	143	a	8.12E-04	c
Manganese	7439-96-5	54.94	a											1.00E-03	b
Mercury	7439-97-6	200.59	a	4.70E-01	a							0.06	a	1.00E-03	b
Methoxychlor	72-43-5	345.66	a	8.30E-06	a					26890	a	0.1	a	4.28E-02	c
Methyl Ethyl Ketone	78-93-3	72.11	a	2.30E-03	a	9.10E-02	a	1.00E-05	a	4.51	a	223000	a	9.60E-04	b
Methyl Isobutyl Ketone	108-10-1	100.16	a	5.60E-03	a	7.00E-02	a	8.30E-06	a	12.6	a	19000	a	3.19E-03	c
Methyl tert-Butyl Ether	1634-04-4	88.15	a	2.40E-02	a	7.50E-02	a	8.60E-06	a	11.56	a	51000	a	2.11E-03	c
Methylene Chloride	75-09-2	84.93	a	1.30E-01	a	1.00E-01	a	1.30E-05	a	21.73	a	13000	a	3.50E-03	b
1-Methylnaphthalene	90-12-0	142.2	e	2.10E-02	e	5.28E-02	e	7.85E-06	e	2528	e	25.8	e	9.31E-02	e
2-Methylnaphthalene	91-57-6	142.2	a	2.10E-02	a	5.20E-02	a	7.80E-06	a	2478	a	24.6	a	9.17E-02	c
2-Methylphenol	95-48-7	108.14	a	4.90E-05	a					306.5	a	25900	a	7.70E-03	b
3-Methylphenol	108-39-4	108.14	a	3.50E-05	a					300.4	a	22700	a	7.80E-03	b
4-Methylphenol	106-44-5	108.14	a	4.10E-05	a					300.4	a	21500	a	7.70E-03	b
Metolachlor (Dual)	51218-45-2	283.8	a	3.70E-07	a					488.5	a	530	a	3.39E-03	c
Metribuzin (Sencor)	21087-64-9	214.29	a	4.80E-09	a					53.13	a	1050	a	1.32E-03	c
Naphthalene	91-20-3	128.18	a	1.80E-02	a	6.00E-02	a	8.40E-06	a	1544	a	31	a	4.70E-02	b
Nickel	7440-02-0	58.69	a											2.00E-04	b
Nitrobenzene	98-95-3	123.11	a	9.80E-04	a	6.80E-02	a	9.40E-06	a	226.4	a	2090	a	5.41E-03	c
Nitrofurazone	59-87-0	198.14	a	1.30E-11	a					349.7	a	210	a	1.72E-04	c

APPENDIX B - CONTAMINANT SPECIFIC PARAMETERS

Contaminant	CAS No.	MW		H' (unitless)		Dia (cm^2/s)		Diw (cm^2/s)		Koc (L/kg)		S (mg/L)		Kp (cm/hr)	
Nitroguanidine	556-88-7	104.07	a	1.80E-10	a					20.65	a	4400	a	1.05E-04	c
2-Nitropropane	79-46-9	89.09	a	4.90E-03	a	8.50E-02	a	1.00E-05	a	30.8	a	17000	a	8.80E-04	b
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	296.16	a	3.50E-08	a					531.6	a	5	a	4.36E-05	c
Oxamyl	23135-22-0	219.26	a	9.70E-09	a					10	a	280000	a	4.49E-05	c
Paraquat	1910-42-5	257.16	a	1.30E-11	a					6780	a	700000	a	8.92E-07	c
Parathion	56-38-2	291.26	a	1.20E-05	a					2422	a	11	a	1.30E-02	b
Pendimethalin (Prowl)	40487-42-1	281.31	a	3.50E-05	a					5615	a	0.3	a	1.15E-01	c
Pentachlorophenol	87-86-5	266.34	a	1.00E-06	a					4959	a	14	a	3.90E-01	b
Perchlorate	7790-98-9	117.49	a									245000	a	1.00E-03	b
Permethrin (Ambush)	52645-53-1	391.3	a	7.60E-05	a					118800	a	0.006	a	2.08E-01	c
Phenol	108-95-2	94.11	a	1.40E-05	a					187.2	a	82800	a	4.30E-03	b
Phenylphenol	90-43-7	170.21	a	4.30E-05	a					6722	a	700	a	1.96E-02	c
Phosphine	7803-51-2	34	a									3.3	a	1.00E-03	b
Picloram (Tordon)	1918-02-1	241.46	a	2.20E-12	a					38.77	a	430	a	1.27E-03	c
Profluralin	26399-36-0	347.3	a	1.20E-02	a					30520	a	0.1	a	9.00E-02	c
Prometon	1610-18-0	225.3	a	3.70E-08	a					137.4	a	750	a	8.27E-03	c
Propachlor (Ramrod)	1918-16-7	211.69	a	1.50E-05	a					204.5	a	580	a	2.86E-03	c
Propazine (Miloguard)	139-40-2	229.71	a	1.90E-07	a					344.1	a	8.6	a	7.13E-03	c
n-Propylbenzene	103-65-1	120.2	a	4.30E-01	a	6.00E-02	a	7.80E-06	a	813.1	a	52.2	a	9.39E-02	c
Pyrene	129-00-0	202.26	a	4.90E-04	a					54340	a	0.135	a	2.01E-01	c
Pyridine	110-86-1	79.1	a	4.50E-04	a	9.30E-02	a	1.10E-05	a	71.72	a	1000000	a	1.52E-03	c
Selenium	7782-49-2	80.98	a											1.00E-03	b
Silver	7440-22-4	107.87	a											6.00E-04	b
Simazine (Princap)	122-34-9	201.66	a	3.90E-08	a					146.5	a	6.2	a	3.25E-03	c
Styrene	100-42-5	104.15	a	1.10E-01	a	7.10E-02	a	8.80E-06	a	446.1	a	310	a	3.70E-02	b
Terbacil (Sinbar)	5902-51-2	216.67	a	4.90E-09	a					50.1	a	710	a	1.72E-03	c
Terbufos (Counter)	13071-79-9	288.42	a	9.80E-04	a					998.9	a	5.07	a	3.58E-02	c
Tert-butyl Alcohol	75-65-0	74.12	c	4.08E-04	c					2.11	c	151000	c	1.03E-03	c
1,1,1,2-Tetrachloroethane	630-20-6	167.85	a	1.00E-01	a	4.80E-02	a	9.10E-06	a	86.03	a	1070	a	1.59E-02	c
1,1,2,2-Tetrachloroethane	79-34-5	167.85	a	1.50E-02	a	4.90E-02	a	9.30E-06	a	94.94	a	2830	a	6.90E-03	b
Tetrachloroethylene	127-18-4	165.83	a	7.20E-01	a	5.00E-02	a	9.50E-06	a	94.94	a	206	a	3.30E-02	b
2,3,4,6-Tetrachlorophenol	58-90-2	231.89	a	3.60E-04	a					2969	a	23	a	7.10E-02	c
Tetrahydrofuran	109-99-9	72.11	e	2.88E-03	e	9.54E-02	e	1.08E-05	e	10.75	e	1000000	e	1.25E-03	e
Tetryl	479-45-8	287.15	a	1.10E-07	a					4605	a	74	a	4.74E-04	c
Toluene	108-88-3	92.14	a	2.70E-01	a	7.80E-02	a	9.20E-06	a	233.9	a	526	a	3.10E-02	b
Total Petroleum Hydrocarbons - LRH		PLEASE REFER TO BUREAU OF ENVIRONMENTAL REMEDIATION POLICY # BER - 041, APPENDIX A													
Total Petroleum Hydrocarbons - MRH		PLEASE REFER TO BUREAU OF ENVIRONMENTAL REMEDIATION POLICY # BER - 041, APPENDIX A													

APPENDIX B - CONTAMINANT SPECIFIC PARAMETERS

Contaminant	CAS No.	MW	H' (unitless)	Dia (cm^2/s)	Diw (cm^2/s)	Koc (L/kg)	S (mg/L)	Kp (cm/hr)
Total Petroleum Hydorcarbons - HRH		PLEASE REFER TO BUREAU OF ENVIRONMENTAL REMEDIATION POLICY # BER - 041, APPENDIX A						
Toxaphene	8001-35-2	413.82 a	2.50E-04 a			77200 a	0.0069682 a	1.20E-02 b
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187.38 a	2.20E+01 a	3.80E-02 a	8.60E-06 a	196.8 a	170 a	1.75E-02 c
1,2,4-Trichlorobenzene	120-82-1	181.45 a	5.80E-02 a	4.00E-02 a	8.40E-06 a	1356 a	49 a	6.60E-02 b
1,1,1-Trichloroethane	71-55-6	133.41 a	7.00E-01 a	6.50E-02 a	9.60E-06 a	43.89 a	1290 a	1.30E-02 b
1,1,2-Trichloroethane	79-00-5	133.41 a	3.40E-02 a	6.70E-02 a	1.00E-05 a	60.7 a	4590 a	6.40E-03 b
Trichloroethylene	79-01-6	131.39 a	4.00E-01 a	6.90E-02 a	1.00E-05 a	60.7 a	1280 a	1.20E-02 b
Trichlorofluoromethane	75-69-4	137.37 a	4.00E+00 a	6.50E-02 a	1.00E-05 a	43.89 a	1100 a	1.30E-02 b
2,4,5-Trichlorophenol	95-95-4	197.45 a	6.60E-05 a			1777 a	1200 a	3.62E-02 c
2,4,6-Trichlorophenol	88-06-2	197.45 a	1.10E-04 a			1777 a	800 a	3.50E-02 b
2,4,5-Trichlorophenoxyacetic Acid	93-76-5	255.49 a	1.90E-06 a			107 a	278 a	9.14E-03 c
2,4,5-Trichlorophenoxypropionic acid	93-72-1	269.51 a	3.70E-07 a			175.3 a	71 a	1.61E-02 c
1,2,3-Trichloropropane	96-18-4	147.43 a	1.40E-02 a	5.70E-02 a	9.20E-06 a	115.8 a	1750 a	7.52E-03 c
Trifluralin (Treflan)	1582-09-8	335.29 a	4.20E-03 a			16390 a	0.184 a	7.28E-02 c
1,2,4-Trimethylbenzene	95-63-6	120.2 a	2.50E-01 a	6.10E-02 a	7.90E-06 a	614.3 a	57 a	8.57E-02 c
1,3,5-Trimethylbenzene	108-67-8	120.2 a	3.60E-01 a	6.00E-02 a	7.80E-06 a	602.1 a	48.2 a	6.21E-02 c
2,4,6-Trinitrotoluene	118-96-7	227.13 a	8.50E-07 a			2812 a	115 a	9.63E-04 c
Vinyl Acetate	108-05-4	86.09 a	2.10E-02 a	8.50E-02 a	1.00E-05 a	5.583 a	20000 a	1.57E-03 c
Vinyl Chloride	75-01-4	62.5 a	1.10E+00 a	1.10E-01 a	1.20E-05 a	21.73 a	8800 a	5.60E-03 b
Xylene (mixed isomers)	1330-20-7	106.17 a	2.10E-01 a	8.50E-02 a	9.90E-06 a	382.9 a	106 a	4.71E-02 c
Zinc	7440-66-6	67.41 a						6.00E-04 b

NOTES -- MW = Molecular Weight; H' = Unitless Henry's Law Constant; Dia = Diffusivity in Air; Diw = Diffusivity in Water; Koc = Soil organic carbon/water partition coefficient; S = Solubility; Kp = Skin permeability coefficient

Sources of information

a = USEPA Regional Screening Level Chemical-specific Parameters Supporting Table, May 17, 2010

b = USEPA "Risk Assessment Guidance for Superfund Volume I, Part E, July 2004

c = USEPA EPI Suite v4.0

d = The Risk Assessment Information System (RAIS) website, June 22, 2010

e = USEPA Regional Screening Level Chemical-specific Parameters Supporting Table, November 2013

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)		RfC (mg/m^3)		SfO $(mg/kg\text{-}day)^{-1}$		IUR $(ug/m^3)^{-1}$	
Acenaphthene	83-32-9	6.00E-02	i	2.10E-01	r				
Acetochlor	34256-82-1	2.00E-02	i	7.00E-02	r				
Acetone	67-64-1	9.00E-01	i	3.10E+01	e				
Acetophenone	98-86-2	1.00E-01	i	3.50E-01	r				
Acrolein	107-02-8	5.00E-04	i	2.00E-05	i				
Acrylamide	79-06-1	2.00E-03	i	6.00E-03	i	5.00E-01	i	1.00E-04	i
Acrylonitrile	107-13-1	4.00E-02	e	2.00E-03	i	5.40E-01	i	6.80E-05	i
Alachlor (Lasso)	15972-60-8	1.00E-02	i	3.50E-02	r	5.60E-02	e	1.60E-05	r
Aldicarb (Temik)	116-06-3	1.00E-03	i	3.50E-03	r				
Aldrin	309-00-2	3.00E-05	i	1.05E-04	r	1.70E+01	i	4.90E-03	i
Aniline	62-53-3	7.00E-03	e	1.00E-03	i	5.70E-03	i	1.60E-06	e
Anthracene	120-12-7	3.00E-01	i	1.05E+00	r				
Antimony	7440-36-0	4.00E-04	i	1.40E-03	r				
Arsenic	7440-38-2	3.00E-04	i	1.50E-05	e	1.50E+00	i	4.30E-03	i
Atrazine	1912-24-9	3.50E-02	i	1.23E-01	r	2.30E-01	e	6.57E-05	r
Barium	7440-39-3	2.00E-01	i	5.00E-04	e				
Bentazon	25057-89-0	3.00E-02	i	1.05E-01	r				
Benzene	71-43-2	4.00E-03	i	3.00E-02	i	5.50E-02	i	7.80E-06	i
Benzidine	92-87-5	3.00E-03	i	1.05E-02	r	2.30E+02	i	6.70E-02	i
Benzo(a)anthracene	56-55-3					7.30E-01	e	1.10E-04	e
Benzo(b)fluoranthene	205-99-2					7.30E-01	e	1.10E-04	e
Benzo(k)fluoranthene	207-08-9					7.30E-02	e	1.10E-04	e
Benzo(a)pyrene	50-32-8					7.30E+00	i	1.10E-03	e
Benzyl Chloride	100-44-7	2.00E-03	e	1.00E-03	e	1.70E-01	i	4.90E-05	e
Beryllium	7440-41-7	2.00E-03	i	2.00E-05	i			2.40E-03	i
Bis(2-chloroethyl)ether	111-44-4					1.10E+00	i	3.30E-04	i
Bis(chloromethyl)ether	542-88-1					2.20E+02	i	6.20E-02	i
Bis(2-ethylhexyl)phthalate	117-81-7	2.00E-02	i	7.00E-02	r	1.40E-02	i	2.40E-06	e
Bromacil	314-40-9	1.00E-01	o	3.50E-01	r				
Bromodichloromethane	75-27-4	2.00E-02	i	7.00E-02	r	6.20E-02	i	3.70E-05	e
Bromoform	75-25-2	2.00E-02	i	7.00E-02	r	7.90E-03	i	1.10E-06	i

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)		RfC (mg/m^3)		SfO $(mg/kg\text{-}day)^{-1}$		IUR $(ug/m^3)^{-1}$	
Bromomethane	74-83-9	1.40E-03	i	5.00E-03	i				
1,3-Butadiene	106-99-0	5.71E-04	r	2.00E-03	i	3.40E+00	e	3.00E-05	i
Butyl Benzyl Phthalate	85-68-7	2.00E-01	i	7.00E-01	r	1.90E-03	e	5.43E-07	r
Butylate	2008-41-5	5.00E-02	i	1.75E-01	r				
n-Butylbenzene	104-51-8	5.00E-02	e	1.75E-01	r				
sec-Butylbenzene	135-98-8	1.00E-01	e	3.50E-01	r				
Cadmium	7440-43-9	5.00E-04	i	1.00E-05	e			1.80E-03	i
Caprolactam	105-60-2	5.00E-01	i	1.75E+00	r				
Captan	133-06-2	1.30E-01	i	4.55E-01	r	2.30E-03	e	6.60E-07	e
Carbaryl (Sevin)	63-25-2	1.00E-01	i	3.50E-01	r				
Carbazole	86-74-8					2.00E-02	h	5.71E-06	r
Carbofuran (Furadan)	1563-66-2	5.00E-03	i	1.75E-02	r				
Carbon Disulfide	75-15-0	1.00E-01	i	7.00E-01	i				
Carbon Tetrachloride	56-23-5	4.00E-03	i	1.00E-01	i	7.00E-02	i	6.00E-06	i
Chlordane	12789-03-6	5.00E-04	i	7.00E-04	i	3.50E-01	i	1.00E-04	i
Chlordecone (Kepone)	143-50-0	3.00E-04	i	1.05E-03	r	1.00E+01	i	4.60E-03	e
Chlorobenzene	108-90-7	2.00E-02	i	5.00E-02	e				
Chlorodifluoromethane	75-45-6	1.43E+01	r	5.00E+01	i				
Chloroform	67-66-3	1.00E-02	i	9.80E-02	e	3.10E-02	e	2.30E-05	i
Chloromethane	74-87-3	2.57E-02	r	9.00E-02	i				
beta-Chloronaphthalene	91-58-7	8.00E-02	i	2.80E-01	r				
o-Chlorotoluene	95-49-8	2.00E-02	i	7.00E-02	r				
Chlorpyrifos (Lorsban/Dursban)	2921-88-2	1.00E-03	i	3.50E-03	r				
Chromium - total	7440-47-3	3.00E-03	i	1.00E-04	i	5.00E-01	e	1.20E-02	i
Chromium - hexavalent	18540-29-9	3.00E-03	i	1.00E-04	i	5.00E-01	e	1.20E-02	i
Chromium - trivalent	16065-83-1	1.50E+00	i	5.25E+00	r				
Chrysene	218-01-9					7.30E-03	e	1.10E-05	e
Cobalt	7440-48-4	3.00E-04	e	6.00E-06	e			9.00E-03	e
Copper	7440-50-8	4.00E-02	e	1.40E-01	r				
Cumene	98-82-8	1.00E-01	i	4.00E-01	i				
Cyanazine (Bladex)	21725-46-2	2.00E-03	e	7.00E-03	r	8.40E-01	e	2.40E-04	r

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)		RfC (mg/m^3)		SfO $(mg/kg\text{-}day)^{-1}$		IUR $(ug/m^3)^{-1}$	
Cyanide, free	57-12-5	6.00E-04	i	8.00E-04	e				
Cyclohexane	110-82-7	1.71E+00	r	6.00E+00	i				
Cyclohexylamine	108-91-8	2.00E-01	i	7.00E-01	r				
Dacthal	1861-32-1	1.00E-02	i	3.50E-02	r				
DDD	72-54-8					2.40E-01	i	6.90E-05	e
DDE	72-55-9					3.40E-01	i	9.70E-05	e
DDT	50-29-3	5.00E-04	i	1.75E-03	r	3.40E-01	i	9.70E-05	i
Diazinon	333-41-5	7.00E-04	e	2.45E-03	r				
Dibenzo(a,h)anthracene	53-70-3					7.30E+00	e	1.20E-03	e
Dibenzofuran	132-64-9	1.00E-03	e	3.50E-03	r				
1,4-Dibromobenzene	106-37-6	1.00E-02	i	3.50E-02	r				
Dibromochloromethane	124-48-1	2.00E-02	i	7.00E-02	r	8.40E-02	i	2.70E-05	e
1,2-Dibromo-3-chloropropane	96-12-8	2.00E-04	e	2.00E-04	i	8.00E-01	e	6.00E-03	e
Dibutyl Phthalate	84-74-2	1.00E-01	i	3.50E-01	r				
Dicamba	1918-00-9	3.00E-02	i	1.05E-01	r				
1,2-Dichlorobenzene	95-50-1	9.00E-02	i	2.00E-01	e				
1,4-Dichlorobenzene	106-46-7	7.00E-02	e	8.00E-01	i	5.40E-03	e	1.10E-05	e
Dichlorodifluoromethane	75-71-8	2.00E-01	i	2.00E-01	e				
1,1-Dichloroethane	75-34-3	2.00E-01	e	7.00E-01	r	5.70E-03	e	1.60E-06	e
1,2-Dichloroethane	107-06-2	6.00E-03	e	7.00E-03	e	9.10E-02	i	2.60E-05	i
1,1-Dichloroethylene	75-35-4	5.00E-02	i	2.00E-01	i				
cis-1,2-Dichloroethylene	156-59-2	2.00E-03	i	7.00E-03	r				
trans-1,2-Dichloroethylene	156-60-5	2.00E-02	i	6.00E-02	e				
2,4-Dichlorophenol	120-83-2	3.00E-03	i	1.05E-02	r				
4-(2,4-Dichlorophenoxy)butyric acid	94-82-6	8.00E-03	i	2.80E-02	r				
2,4-Dichlorophenoxyacetic acid	94-75-7	1.00E-02	i	3.50E-02	r				
1,2-Dichloropropane	78-87-5	9.00E-02	e	4.00E-03	i	3.60E-02	e	1.00E-05	e
1,3-Dichloropropene	542-75-6	3.00E-02	i	2.00E-02	i	1.00E-01	i	4.00E-06	i
Dichlorvos	62-73-7	5.00E-04	i	5.00E-04	i	2.90E-01	i	8.30E-05	e
Dieldrin	60-57-1	5.00E-05	i	1.75E-04	r	1.60E+01	i	4.60E-03	i
Diethyl Phthalate	84-66-2	8.00E-01	i	2.80E+00	r				

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)		RfC (mg/m^3)		SfO $(mg/kg\text{-}day)^{-1}$		IUR $(ug/m^3)^{-1}$	
2,4-Dimethylphenol	105-67-9	2.00E-02	i	7.00E-02	r				
2,4-Dinitrophenol	51-28-5	2.00E-03	i	7.00E-03	r				
2,4-Dinitrotoluene	121-14-2	2.00E-03	i	7.00E-03	r	3.10E-01	e	8.90E-05	e
2,6-Dinitrotoluene	606-20-2	3.00E-04	e	1.05E-03	r	1.50E+00	e	4.29E-04	r
Di-n-octyl Phthalate	117-84-0	2.00E-02	h	7.00E-02	r				
Dinoseb	88-85-7	1.00E-03	i	3.50E-03	r				
1,4-Dioxane	123-91-1	3.00E-02	i	3.00E-02	i	1.00E-01	i	5.00E-06	i
Dioxin (2,3,7,8-TCDD)	1746-01-6	7.00E-10	i	4.00E-08	e	1.30E+05	e	3.80E+01	e
Diphenylamine	122-39-4	2.50E-02	i	8.75E-02	r				
Diuron	330-54-1	2.00E-03	i	7.00E-03	r				
Endosulfan	115-29-7	6.00E-03	i	2.10E-02	r				
Endrin	72-20-8	3.00E-04	i	1.05E-03	r				
Ethyl Chloride	75-00-3	2.86E+00	r	1.00E+01	i				
s-Ethyl Dipropylthiocarbamate (EPTC)	759-94-4	2.50E-02	i	8.75E-02	r				
Ethylbenzene	100-41-4	1.00E-01	i	1.00E+00	i	1.10E-02	e	2.50E-06	e
Ethylene Dibromide	106-93-4	9.00E-03	i	9.00E-03	i	2.00E+00	i	6.00E-04	i
Ethylene Glycol	107-21-1	2.00E+00	i	4.00E-01	e				
Fluoranthene	206-44-0	4.00E-02	i	1.40E-01	r				
Fluorene	86-73-7	4.00E-02	i	1.40E-01	r				
Fonofos (Dyfonate)	944-22-9	2.00E-03	i	7.00E-03	r				
Formaldehyde	50-00-0	2.00E-01	i	9.80E-03	e	4.55E-02	r	1.30E-05	i
Furan	110-00-9	1.00E-03	i	3.50E-03	r				
Glyphosate (Roundup)	1071-83-6	1.00E-01	i	3.50E-01	r				
Heptachlor	76-44-8	5.00E-04	i	1.75E-03	r	4.50E+00	i	1.30E-03	i
Heptachlor Epoxide	1024-57-3	1.30E-05	i	4.55E-05	r	9.10E+00	i	2.60E-03	i
Hexachlorobenzene	118-74-1	8.00E-04	i	2.80E-03	r	1.60E+00	i	4.60E-04	i
Hexachlorobutadiene	87-68-3	1.00E-03	e	3.50E-03	r	7.80E-02	i	2.20E-05	i
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	3.00E-04	i	1.05E-03	r	1.10E+00	e	3.10E-04	e
Hexachlorocyclopentadiene	77-47-4	6.00E-03	i	2.00E-04	i				
Hexachloroethane	67-72-1	7.00E-04	i	3.00E-02	i	4.00E-02	i	1.10E-05	e
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	3.00E-03	i	1.05E-02	r	1.10E-01	i	3.14E-05	r

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)		RfC (mg/m^3)		SfO $(mg/kg\text{-}day)^{-1}$		IUR $(ug/m^3)^{-1}$	
n-Hexane	110-54-3	6.00E-02	e	7.00E-01	i				
Hydrazine	302-01-2			3.00E-05	e	3.00E+00	i	4.90E-03	i
Hydrazine Sulfate	10034-93-2					3.00E+00	i	4.90E-03	i
Indeno(1,2,3-cd)pyrene	193-39-5					7.30E-01	e	1.10E-04	e
Lead	7439-92-1								
Malathion	121-75-5	2.00E-02	i	7.00E-02	r				
Manganese	7439-96-5	1.40E-01	i	5.00E-05	i				
Mercury	7439-97-6	1.60E-04	e	3.00E-04	i				
Methoxychlor	72-43-5	5.00E-03	i	1.75E-02	r				
Methyl Ethyl Ketone	78-93-3	6.00E-01	i	5.00E+00	i				
Methyl Isobutyl Ketone	108-10-1	8.00E-02	e	3.00E+00	i				
Methyl tert-Butyl Ether	1634-04-4	8.57E-01	r	3.00E+00	i	1.80E-03	e	2.60E-07	e
Methylene Chloride	75-09-2	6.00E-03	i	6.00E-01	i	2.00E-03	i	1.00E-08	i
1-Methylnaphthalene	90-12-0	7.00E-02	e	2.45E-01	r	2.90E-02	e	8.29E-06	r
2-Methylnaphthalene	91-57-6	4.00E-03	i	1.40E-02	r				
2-Methylphenol	95-48-7	5.00E-02	i	6.00E-01	e				
3-Methylphenol	108-39-4	5.00E-02	i	6.00E-01	e				
4-Methylphenol	106-44-5	1.00E-01	e	6.00E-01	e				
Metolachlor (Dual)	51218-45-2	1.50E-01	i	5.25E-01	r				
Metribuzin (Sencor)	21087-64-9	2.50E-02	i	8.75E-02	r				
Naphthalene	91-20-3	2.00E-02	i	3.00E-03	i	1.19E-01	r	3.40E-05	e
Nickel	7440-02-0	2.00E-02	i	9.00E-05	e			2.60E-04	e
Nitrobenzene	98-95-3	2.00E-03	i	9.00E-03	i	1.40E-01	r	4.00E-05	i
Nitrofurazone	59-87-0					1.30E+00	e	3.70E-04	e
Nitroguanidine	556-88-7	1.00E-01	i	3.50E-01	r				
2-Nitropropane	79-46-9	5.71E-03	r	2.00E-02	i	9.45E+00	r	2.70E-03	e
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	5.00E-02	i	1.75E-01	r				
Oxamyl	23135-22-0	2.50E-02	i	8.75E-02	r				
Paraquat	1910-42-5	4.50E-03	i	1.58E-02	r				
Parathion	56-38-2	6.00E-03	e	2.10E-02	r				
Pendimethalin (Prowl)	40487-42-1	4.00E-02	i	1.40E-01	r				

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)	RfC (mg/m^3)	SfO $(mg/kg\text{-}day)^{-1}$	IUR $(ug/m^3)^{-1}$
Pentachlorophenol	87-86-5	5.00E-03 i	1.75E-02 r	4.00E-01 i	5.10E-06 e
Perchlorate	7790-98-9	7.00E-04 i	2.45E-03 r		
Permethrin (Ambush)	52645-53-1	5.00E-02 i	1.75E-01 r		
Phenol	108-95-2	3.00E-01 i	2.00E-01 e		
Phenylphenol	90-43-7			1.90E-03 e	5.43E-07 r
Phosphine	7803-51-2	3.00E-04 i	3.00E-04 i		
Picloram (Tordon)	1918-02-1	7.00E-02 i	2.45E-01 r		
Profluralin	26399-36-0	6.00E-03 e	2.10E-02 r		
Prometon	1610-18-0	1.50E-02 i	5.25E-02 r		
Propachlor (Ramrod)	1918-16-7	1.30E-02 i	4.55E-02 r		
Propazine (Miloguard)	139-40-2	2.00E-02 i	7.00E-02 r		
n-Propylbenzene	103-65-1	1.00E-01 e	1.00E+00 e		
Pyrene	129-00-0	3.00E-02 i	1.05E-01 r		
Pyridine	110-86-1	1.00E-03 i	3.50E-03 r		
Selenium	7782-49-2	5.00E-03 i	2.00E-02 e		
Silver	7440-22-4	5.00E-03 i	1.75E-02 r		
Simazine (Princap)	122-34-9	5.00E-03 i	1.75E-02 r	1.20E-01 e	3.43E-05 r
Styrene	100-42-5	2.00E-01 i	1.00E+00 i		
Terbacil (Sinbar)	5902-51-2	1.30E-02 i	4.55E-02 r		
Terbufos (Counter)	13071-79-9	2.50E-05 e	8.75E-05 r		
Tert-butyl Alcohol	75-65-0			3.30E-03 c	9.43E-07 r
1,1,1,2-Tetrachloroethane	630-20-6	3.00E-02 i	1.05E-01 r	2.60E-02 i	7.40E-06 i
1,1,2,2-Tetrachloroethane	79-34-5	2.00E-02 i	7.00E-02 r	2.00E-01 i	5.80E-05 e
Tetrachloroethylene	127-18-4	6.00E-03 i	4.00E-02 i	2.10E-03 i	2.60E-07 i
2,3,4,6-Tetrachlorophenol	58-90-2	3.00E-02 i	1.05E-01 r		
Tetrahydrofuran	109-99-9	9.00E-01 i	2.00E+00 i		
Tetryl	479-45-8	4.00E-03 e	1.40E-02 r		
Toluene	108-88-3	8.00E-02 i	5.00E+00 i		
Total Petroleum Hydrocarbons - LRH		PLEASE REFER TO KDHE/BER POLICY # BER-041, APPENDIX A			
Total Petroleum Hydrocarbons - MRH		PLEASE REFER TO KDHE/BER POLICY # BER-041, APPENDIX A			
Total Petroleum Hydrocarbons - HRH		PLEASE REFER TO KDHE/BER POLICY # BER-041, APPENDIX A			

APPENDIX C - CONTAMINANT TOXICITY DATA

Contaminant	CAS No.	RfDo (mg/kg-day)		RfC (mg/m^3)		SfO $(mg/kg\text{-}day)^{-1}$		IUR $(ug/m^3)^{-1}$	
Toxaphene	8001-35-2					1.10E+00	i	3.20E-04	i
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	3.00E-01	i	3.00E+01	e				
1,2,4-Trichlorobenzene	120-82-1	1.00E-02	i	2.00E-03	e	2.90E-02	e	8.29E-06	r
1,1,1-Trichloroethane	71-55-6	2.00E+00	i	5.00E+00	i				
1,1,2-Trichloroethane	79-00-5	4.00E-03	i	2.00E-04	e	5.70E-02	i	1.60E-05	i
Trichloroethylene	79-01-6	5.00E-04	i	2.00E-03	i	4.60E-02	i	4.10E-06	i
Trichlorofluoromethane	75-69-4	3.00E-01	i	7.00E-01	e				
2,4,5-Trichlorophenol	95-95-4	1.00E-01	i	3.50E-01	r				
2,4,6-Trichlorophenol	88-06-2	1.00E-03	e	3.50E-03	r	1.10E-02	i	3.10E-06	i
2,4,5-Trichlorophenoxyacetic Acid	93-76-5	1.00E-02	i	3.50E-02	r				
2,4,5-Trichlorophenoxypropionic acid	93-72-1	8.00E-03	i	2.80E-02	r				
1,2,3-Trichloropropane	96-18-4	4.00E-03	i	3.00E-04	i	3.00E+01	i	8.57E-03	r
Trifluralin (Treflan)	1582-09-8	7.50E-03	i	2.63E-02	r	7.70E-03	i	2.20E-06	r
1,2,4-Trimethylbenzene	95-63-6	2.00E-03	r	7.00E-03	e				
1,3,5-Trimethylbenzene	108-67-8	1.00E-02	e	3.50E-02	r				
2,4,6-Trinitrotoluene	118-96-7	5.00E-04	i	1.75E-03	r	3.00E-02	i	8.57E-06	r
Vinyl Acetate	108-05-4	1.00E+00	e	2.00E-01	i				
Vinyl Chloride	75-01-4	3.00E-03	i	1.00E-01	i	7.20E-01	i	4.40E-06	i
Xylene (mixed isomers)	1330-20-7	2.00E-01	i	1.00E-01	i				
Zinc	7440-66-6	3.00E-01	i	1.05E+00	r				

Sources of Information

i = USEPA Integrated Risk Information System (IRIS) website
e = USEPA Regional Screening Level (RSL) Tables, May 2013
h = USEPA Health Effects Assessment Summary Tables, July 1997
o = Other EPA documents used by KDHE
c = California Office of Environmental Health Hazard Assessment
r = route-to-route extrapolation