Environmental Protection Agency

Support Document for the Development of Generic Numerical Standards and Risk Assessment Procedures

The Voluntary Action Program
Division of Environmental Response & Revitalization

October 2024

This document was prepared as supplemental guidance to accompany the administrative rules for the Ohio Environmental Protection Agency's Voluntary Action Program concerning generic numerical standards (Ohio Administrative Code 3745-300-08) and property-specific risk assessment procedures (Ohio Administrative Code 3745-300-09). This guidance is effective upon the adoption of these rules and all other Voluntary Action Program rules filed with the Ohio General Assembly Joint Committee on Agency Rule Review into Section 3745-300 of the Ohio Administrative Code.

Please direct any questions, comments, or requests for technical assistance to:

The Voluntary Action Program
Ohio Environmental Protection Agency
Division of Environmental Response and Revitalization
P.O. Box 1049
Columbus, Ohio 43216-1049

Telephone: (614) 644-2924
Facsimile: (614) 644-3146

Regularly updated information regarding the Voluntary Action Program is available from the VAP home page.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF EQUATIONS

Part A: Calculation of generic numerical standards

Generic numerical standards are listed in OAC 3745-300-08 Appendix A. For chemicals without generic numerical standards, standards should be derived in accordance with OAC 3745-300-09 and chemical and physical data and toxicity data should be obtained from the hierarchy of sources.

All the following equations have been described elsewhere (1)(2)(3)(4)(5)(6)(7). The equations are reproduced in the current document primarily for convenience; however, in some instances they have been modified to remain consistent with specific rule language.

Please note that the generic numerical standards and their development are often similar to the regional screening levels (RSLs) that are generated and regularly updated by the U.S. EPA (7). In fact, many of the exposure factors and mathematical constructs used by the RSLs were used to generate generic numerical standards. However, unlike the RSLs, the generic numerical standards developed by Ohio EPA are cleanup goals, not screening levels. A volunteer or certified professional should not attempt to derive a property-specific cleanup standard in accordance with OAC 3745-300-09 using the RSLs without consulting this document and Ohio EPA. Risk and hazard goals, climate-specific constants, exposure factors, toxicity criteria, and other parameters are specific to the VAP and are different from the RSLs.

---

(1) U.S. EPA 1989. Risk assessment guidance for Superfund. Volume I: Human health evaluation manual (Part A). Interim Final. EPA/540/1-89/002.
(2) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.
(3) U.S. EPA 2009. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part F). Final. OSWER 9285.7-82.
(4) U.S. EPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. Washington, DC. OSWER No. 9355.4-17A.
(5) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
(6) U.S. EPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120.
(7) U.S. EPA 2023. Regional Screening Levels (RSLs) - User's Guide. November 2023.

1. Calculation of generic numerical direct-contact soil standards

The generic numerical direct-contact soil standards in Tables I, II, III and IV of OAC 3745-300-08 Appendix A were calculated deterministically using point values to describe each potential exposure scenario. This is different from historical generic numerical soil direct-contact standards that were calculated probabilistically utilizing Monte Carlo Simulation (MCS) as a technique to model heterogeneous human receptor populations. Standards generated in accordance with OAC 3745-300-09 may be calculated probabilistically or deterministically. Regardless of the approach, probabilistic or deterministic, the mathematical models used to generate soil standards are intended to simulate the mass of chemicals transported from soil to receptor, the mass transfer of chemicals through human epithelial barriers, and the soil concentration at which an adverse human health effect may occur. The fraction contaminated (FC) term represents the proportion of soil that is contaminated by the chemical(s) of concern at the property. The FC term assumes random activity and exposure patterns for receptors at the property. An FC term equal to 0.5 was used to calculate all pathway-specific target soil concentrations for residential land use, commercial land use with high frequency child exposure, commercial and industrial land use, and construction activities.

The standards for single chemical noncarcinogens and the standards for single chemical carcinogens in OAC 3745-300-08 Appendix A are equal target concentrations in soil calculated using the following equation. A chemical's total target concentration in soil for a given endpoint is comprised of three exposure pathways: incidental ingestion of soil, inhalation of particles emitted from soil, and dermal contact with soil. The final generic numerical soil direct-contact standard for a single chemical reported in OAC 3745-300-08 Appendix A is a chemical's lowest standard for a single chemical or soil saturation value. If a chemical's target concentration in soil for a particular endpoint exceeded unity (1E+06 mg/kg), the target concentration was reported as 1E+06 mg/kg.

Equation 1: Target concentration in soil for any endpoint

$$TCS_{total} = \frac{1}{\left(\frac{1}{TCS_{oral}}\right) + \left(\frac{1}{TCS_{inhalation}}\right) + \left(\frac{1}{TCS_{dermal}}\right)}$$

TCS_{total} = Total target concentration in soil (mg/kg)
TCS_{oral} = Target concentration in soil for oral pathway (mg/kg)
$TCS_{inhalation}$ = Target concentration in soil for inhalation pathway (mg/kg)
TCS_{dermal} = Target concentration in soil for dermal pathway (mg/kg)

The target concentrations in soil reflect cumulative effects of multiple routes of exposure. If warranted by property-specific conditions such as engineering controls, specific pathways may be eliminated. In addition to cumulative effects through multiple intake pathways, the cumulative effects of multiple contaminants must be considered. To address this concern, adjustments are made to individual target concentrations such that the total hazard index for the non-cancer endpoint and the target risk goal for

the combined carcinogenic and mutagenic endpoints do not exceed the appropriate levels indicated in OAC 3745-300-08 and OAC 3745-300-09. For non-carcinogens, grouping contaminants based on target organs and mechanism of action may be appropriate and result in the derivation of multiple hazard indices. Soil ingestion exposures account for relative bioavailability (RBA). RBA accounts for differences in the bioavailability of a contaminant between the medium of exposure (*e.g.*, soil) and the media associated with the toxicity value. The 60% oral RBA for arsenic in soil is empirically-based (8). It represents an upper-bound estimate from numerous studies where the oral RBA of soil-borne arsenic in samples collected from across the U.S. was experimentally determined against the water-soluble form. The RBA does not apply to dermal exposures. Note that the dermal pathway was only quantified when RAGS Part E (9) provides a dermal absorption value in Exhibit 3-4 or the website.

---

(8) U.S. EPA 2021. Fact Sheet: Arsenic RBA and IVBA – Relative Bioavailability and In Vitro Bioaccessibility of Arsenic in Soil.
(9) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.

1.1 Non-carcinogenic endpoint

The following equations were used to determine non-carcinogenic target concentrations in soil for oral, inhalation, and dermal exposure routes. These routes of exposure were combined using Equation 1 to calculate a total target concentration in soil for each chemical. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Exposure factors for a child receptor were used for all exposure routes with a non-carcinogenic endpoint for residential land use and commercial land use with high frequency child exposure because this results in the most conservative non-carcinogenic target concentrations in soil.

Equation 2: Non-carcinogenic target concentration in soil for oral pathway

$$TCS_{oral} = \frac{THQ \times ATN \times BW}{EF \times ED \times \left(\frac{1}{RfD}\right) \times IRS \times CF \times RBA \times FC}$$

TCS_{oral} = Target concentration in soil for oral pathway (mg/kg)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
BW = Body weight (kg) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
RfD = Oral reference dose (mg/kg-day) (see Table 5)
IRS = Soil ingestion rate (mg/day) (see Table 6)
CF = Conversion factor (CF = 1E-06 kg/mg)
RBA = Relative bioavailability (chemical-specific)
FC = Fraction contaminated (FC = 0.5)

Equation 3: Non-carcinogenic target concentration in soil for inhalation pathway

$$TCS_{inhalation} = \frac{THQ \times ATN}{EF \times ED \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1}{RfC}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right) \times FC}$$

$TCS_{inhalation}$ = Target concentration in soil for inhalation pathway (mg/kg)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
RfC = Reference concentration (mg/m^3) (see Table 5)
VF = Volatilization factor (m^3/kg) (chemical specific; see Equations 8 and 9)
PEF = Particulate emission factor (m^3/kg) (see Table 6)
FC = Fraction contaminated (FC = 0.5)

Equation 4: Non-carcinogenic target concentration in soil for dermal pathway pathway

$$TCS_{dermal} = \frac{THQ \times ATN \times BW}{EF \times ED \times \left(\frac{GIABS}{RfD}\right) \times AF \times SAS \times ABS \times CF \times FC}$$

TCS_{dermal} = Target concentration in soil for dermal pathway (mg/kg)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
BW= Body weight (kg) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
RfD = Oral reference dose (mg/kg-day) (see Table 5)
GIABS = Gastrointestinal absorption factor (see Table 5)
AF = Soil to skin adherence factor (see Table 6)
SAS = Skin surface area exposed to soil (see Table 6)
ABS = Dermal absorption factor (see Table 5)
CF = Conversion factor (CF = 1E-06 kg/mg)
FC = Fraction contaminated (FC = 0.5)

1.2 Carcinogenic endpoint

The following equations were used to determine carcinogenic target concentrations in soil for oral, inhalation, and dermal pathways. These pathways were combined using Equation 1 to calculate a total target concentration in soil for each chemical. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Mutagenicity is a specific type of carcinogenicity. U.S. EPA identifies whether a chemical is considered carcinogenic with a mutagenic mode of action in accordance with the 2005 cancer guidelines (10) and the *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (11). If a chemical is considered mutagenic, the mutagenic equations are used to determine carcinogenic target concentrations in soil for residential land use only. Because age-dependent adjustment factors are applied to receptor populations between the ages of 0 and 16 years, consideration of the mutagenic mode of action is not applicable to adult receptors for commercial/industrial land use or construction activities. For commercial industrial land use with high frequency child exposure, the generic standards incorporate age-dependent adjustment factors for children aged 0 to 6 years. The generic numerical direct-contact soil standards and indoor air standards for commercial land use with high frequency child exposure represent exposures to a child receptor from ages 0 to 6 and a default commercial/industrial adult receptor. This was determined to be protective of children aged 6 to 16 years for commercial land use with high frequency child exposure.

The generic numerical standards in OAC 3745-300-08 Appendix A consider the chemicals listed in Table 1 to be mutagenic. Standards generated in accordance with OAC 3745-300-09 must consult the toxicity criteria hierarchy and determine whether the chemical is carcinogenic by a mutagenic mode of action.

Table 1: Chemicals with a Mutagenic Mode of Action

Chemical	CAS RN	Reference
Acrylamide	79-06-1	IRIS (1)
Benz[a]anthracene	56-55-3	Benzo[a]pyrene (2)
Benzidine	92-87-5	Supplemental Guidance (3)
Benzo[a]pyrene	50-32-8	IRIS (4)
Benzo[k]fluoranthene	207-08-9	Benzo[a]pyrene
Chromium(VI)	18540-29-9	Cal EPA and IRIS (5)(6)
Chrysene	218-01-9	Benzo[a]pyrene
Dibenz[a,h]anthracene	53-70-3	Supplemental Guidance
Dibromo-3-chloropropane, 1,2-	96-12-8	PPRTV (7)
Dimethylbenz(a)anthracene, 7,12-	57-97-6	Supplemental Guidance
Ethylene Oxide	75-21-8	IRIS (8)
Indeno[1,2,3-cd]pyrene	193-39-5	Benzo[a]pyrene
Methylcholanthrene, 3-	56-49-5	Supplemental Guidance
Methylene Chloride	75-09-2	IRIS (9)

Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	PPRTV (10)
Nitrosodiethylamine, N-	55-18-5	Supplemental Guidance
Nitrosodimethylamine, N-	62-75-9	Supplemental Guidance
Nitroso-N-ethylurea, N-	759-73-9	Supplemental Guidance
Nitroso-N-methylurea, N-	684-93-5	Supplemental Guidance
Safrole	94-59-7	Supplemental Guidance
Trichloroethene	79-01-6	IRIS (11)
Urethane	51-79-6	Supplemental Guidance
Vinyl Chloride	75-01-4	IRIS (12)

(1) U.S. EPA 2010. Toxicological Review of Acrylamide. Integrated Risk Information System (IRIS).
(2) U.S. EPA 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Research and Development. EPA/600/R-93/089.
(3) U.S. EPA 2005 Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F.
(4) U.S. EPA 1998. Toxicological Review of Benzo[a]pyrene. Integrated Risk Information System (IRIS).
(5) CAL EPA 2011. Public Health Goal for Chemicals in Drinking Water – Hexavalent Chromium (Cr VI). Office of Environmental Health Hazard Assessment.
(6) U.S. EPA 1998. Toxicological Review of Hexavalent Chromium. Integrated Risk Information System (IRIS).
(7) U.S. EPA 2006. Provisional Peer-Reviewed Toxicity Values for Dibromo-3-Chloropropane, 1,2-. Office of Research and Development, Washington, DC. EPA/690/R-06/011F.
(8) U.S. EPA 2016. Toxicological Review of Ethylene Oxide. Integrated Risk Information System (IRIS).
(9) U.S. EPA 2016. Toxicological Review of Dichloromethane. Integrated Risk Information System (IRIS).
(10) U.S. EPA 2006. Provisional Peer Reviewed Toxicity Values for 4,4'-Methylenebis (2-chloroaniline). Office of Research and Development, Washington, DC. EPA/690/R-06/021F.
(11) U.S. EPA 2011. Toxicological Review of Trichloroethylene. Integrated Risk Information System (IRIS).
(12) U.S. EPA 2000. Toxicological Review of Vinyl Chloride. Integrated Risk Information System (IRIS).

Equation 5: Carcinogenic target concentration in soil for oral pathway

For residential land use (non-mutagenic mode of action):

$$TCS_{oral} = \frac{TCR \times ATC}{SF \times IFS_{adj} \times CF \times RBA \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_c \times EF \times IRS_c}{BW_c}\right] + \left[\frac{ED_a \times EF \times IRS_a}{BW_a}\right]$$

For commercial land use with high frequency child exposure (non-mutagenic mode of action):

$$TCS_{oral} = \frac{TCR \times ATC \times BW}{SF \times ED \times EF \times IRS \times CF \times RBA \times FC}$$

For residential land use (mutagenic mode of action):

$$TCS_{oral} = \frac{TCR \times ATC}{SF \times IFSM_{adj} \times CF \times RBA \times FC}$$

$$where\ IFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times IRS_c \times 10}{BW_c}\right) + \left(\frac{ED_{2-6} \times EF \times IRS_c \times 3}{BW_c}\right) + \left(\frac{ED_{6-16} \times EF \times IRS_a \times 3}{BW_a}\right) + \left(\frac{ED_{16-26} \times EF \times IRS_a \times 1}{BW_a}\right)$$

For commercial land use with high frequency child exposure (mutagenic mode of action):

a) Ages 0 to 6

$$TCS_{oral} = \frac{TCR \times ATC}{SF \times IFSM_{adj} \times CF \times RBA \times FC}$$

$$where\ IFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times IRS_{0-6} \times 10}{BW_{0-6}}\right) + \left(\frac{ED_{2-6} \times EF \times IRS_{0-6} \times 3}{BW_{0-6}}\right)$$

Equation 5 is continued on the next page.

Equation 5: Carcinogenic target concentration in soil for oral pathway (continued)

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{oral} = \frac{TCR \times ATC \times BW_{6-16}}{EF \times ED \times (SF \times 3) \times IRS_{6-16} \times CF \times RBA \times FC}$$

For commercial/industrial land use and construction activities:

$$TCS_{oral} = \frac{TCR \times ATC \times BW}{SF \times EF \times ED \times IRS \times CF \times RBA \times FC}$$

TCS_{oral} = Target concentration in soil for oral pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
SF = Slope factor ((mg/kg-day)$^{-1}$) (see Table 5)
EF = Exposure frequency (see Table 6)
IFS_{adj} = Age-adjusted soil ingestion factor (mg/kg)
CF = Conversion factor (CF = 1E-06 kg/mg)
RBA = Relative bioavailability (chemical-specific)
ED = Exposure duration (years) (see Table 6)
IRS = Soil ingestion rate (mg/day) (see Table 6)
BW = Body weight (kg) (see Table 6)
$IFSM_{adj}$ = Mutagenic age-adjusted soil ingestion factor (mg/kg)
FC = Fraction contaminated (FC = 0.5)

Equation 6: Carcinogenic target concentration in soil for inhalation pathway

For residential land use and commercial land use with high frequency child exposure (non-mutagenic mode of action), commercial/industrial land use, and construction activities:

$$TCS_{inhalation} = \frac{TCR \times ATC}{IUR \times \left(\frac{10^3\ \mu g}{1\ mg}\right) \times EF \times ED \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right) \times FC}$$

For residential land use (mutagenic mode of action):

$$\boldsymbol{TCS_{inhalation} = \frac{TCR \times ATC}{EF \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times IURM_{adj} \times \left(\frac{10^3\ \mu g}{1\ mg}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right) \times FC}}$$

$$\boldsymbol{where\ IURM_{adj} = (ED_{0-2} \times IUR \times 10) + (ED_{2-6} \times IUR \times 3) + (ED_{6-16} \times IUR \times 3) + (ED_{16-26} \times IUR \times 1)}$$

For commercial land use with high frequency child exposure (mutagenic mode of action):

a) Ages 0 to 6

$$\boldsymbol{TCS_{inhalation} = \frac{TCR \times ATC}{EF \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times IURM_{adj} \times \left(\frac{10^3\ \mu g}{1\ mg}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right) \times FC}}$$

$$where\ IURM_{adj} = (ED_{0-2} \times IUR \times 10) + (ED_{2-6} \times IUR \times 3)$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{inhalation} = \frac{TCR \times ATC}{(IUR \times 3) \times \left(\frac{10^3\ \mu g}{1\ mg}\right) \times EF \times ED \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right) \times FC}$$

$TCS_{inhalation}$ = Target concentration in soil for inhalation pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
IUR = Inhalation unit risk ($(\mu g/m^3)^{-1}$) (see Table 5)
EF = Exposure frequency (days) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
VF = Volatilization factor (m^3/kg) (chemical-specific; see Equations 8 and 9)
PEF = Particulate emission factor (m^3/kg) (see Table 6)
$IURM_{adj}$ = Mutagenic age-adjusted inhalation unit risk factor ($(\mu g/m^3)^{-1}$)
FC = Fraction contaminated (FC = 0.5)

Equation 7: Carcinogenic target concentration in soil for dermal pathway

For residential land use (non-mutagenic mode of action):

$$TCS_{dermal} = \frac{TCR \times ATC}{\left(\frac{SF}{GIABS}\right) \times DFS_{adj} \times ABS \times CF \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_c \times EF \times SAS_c \times AF_c}{BW_c}\right] + \left[\frac{ED_a \times EF \times SAS_a \times AF_a}{BW_a}\right]$$

For commercial land use with high frequency child exposure (non-mutagenic mode of action):

$$TCS_{dermal} = \frac{TCR \times ATC \times BW}{\left(\frac{SF}{GIABS}\right) \times ED \times EF \times SAS \times AF \times ABS \times CF \times FC}$$

For residential land use (mutagenic mode of action):

$$TCS_{dermal} = \frac{TCR \times ATC}{\left(\frac{SF}{GIABS}\right) \times DFSM_{adj} \times ABS \times CF \times FC}$$

$$where\ DFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times AF_c \times SAS_c \times 10}{BW_c}\right) + \left(\frac{ED_{2-6} \times EF \times AF_c \times SAS_c \times 3}{BW_c}\right) + \left(\frac{ED_{6-16} \times EF \times AF_a \times SAS_a \times 3}{BW_a}\right) + \left(\frac{ED_{16-26} \times EF \times AF_a \times SAS_a \times 1}{BW_a}\right)$$

For commercial land use with high frequency child exposure (mutagenic mode of action):

a) Ages 0 to 6

$$TCS_{dermal} = \frac{TCR \times ATC}{\left(\frac{SF}{GIABS}\right) \times DFSM_{adj} \times ABS \times CF \times FC}$$

$$where\ DFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times AF_{0-6} \times SAS_{0-6} \times 10}{BW_{0-6}}\right) + \left(\frac{ED_{2-6} \times EF \times AF_{0-6} \times SAS_{0-6} \times 3}{BW_{0-6}}\right)$$

Equation 7 is continued on the next page.

Equation 7: Carcinogenic target concentration in soil for dermal pathway (continued)

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{dermal} = \frac{TCR \times ATC \times BW_{6-16}}{EF \times ED \times \left[\left(\frac{SF}{GIABS}\right) \times 3\right] \times AF_{6-16} \times SAS_{6-16} \times ABS \times CF \times FC}$$

For commercial/industrial land use and construction activities:

$$TCS_{dermal} = \frac{TCR \times ATC \times BW}{EF \times ED \times \left(\frac{SF}{GIABS}\right) \times AF \times SAS \times ABS \times CF \times FC}$$

TCS_{dermal} = Target concentration in soil for dermal pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
SF = Slope factor ((mg/kg-day)$^{-1}$) (see Table 5)
GIABS = Gastrointestinal absorption factor (unitless) (see Table 5)
EF = Exposure frequency (days/year) (see Table 6)
DFS_{adj} = Age-adjusted dermal soil contact factor (mg/kg)
ABS = Dermal absorption factor (unitless) (see Table 5)
CF = Conversion factor (CF = 1E-06 kg/mg)
ED = Exposure duration (years) (see Table 6)
SAS = Skin surface area exposed to soil (cm^2/day) (see Table 6)
AF = Soil to skin adherence factor (unitless) (see Table 6)
BW = Body weight (kg) (see Table 6)
$DFSM_{adj}$ = Mutagenic age-adjusted dermal soil contact factor (mg/kg)
FC = Fraction contaminated (FC = 0.5)

---

(10) U.S. EPA 2005. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. March 2005 EPA/630/P-03/001F.
(11) U.S. EPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. March 2005. EPA/630/R-03/003F.

1.4 Volatilization factor

Equation 8: Volatilization factor

For residential land use, commercial land use with high frequency child exposure, and commercial/industrial land use:

$$\boldsymbol{VF} = \frac{\boldsymbol{\frac{Q}{C_w}} \times (\boldsymbol{3.14} \times \boldsymbol{D_A} \times \boldsymbol{T})^{\boldsymbol{\frac{1}{2}}} \times \left(\boldsymbol{\frac{1\ m^2}{10^4\ cm^2}}\right)}{(\boldsymbol{2} \times \boldsymbol{\rho_b} \times \boldsymbol{D_A})}$$

$$where\ \frac{Q}{C_{wind}} = A \times e^{\frac{[(ln\ A_{site}) - B]^2}{C}}$$

$$where\ D_A = \frac{\left[\left(\theta_a{}^{\frac{10}{3}} \times D_{ia} \times H'\right) + \left(\theta_w{}^{\frac{10}{3}} \times D_{iw}\right)\right] \div n^2}{(\rho_b \times K_d + \theta_w + \theta_a \times H')}$$

Parameter		Default value	Reference
VF	Volatilization factor (m^3/kg)	*chemical-specific*	Equation 6 (2)
Q/C_{wind}	Inverse of the ratio of the geometric mean air concentration to the emission flux at the center of a square source	Calculated; 85.63 g/m^2-s per kg/m^3	Exhibit D-2 (1)
D_A	Apparent diffusivity (cm^2/s)	*chemical-specific*	Equation 6 (2)
T	Exposure interval for volatilization	9.5E+08 seconds	p. 24 (2)
ρ_b	Dry soil bulk density	1.5 kg/L	p. 24 (2)
A, B, C	Volatilization factor dispersion constants for Q/C_{wind}	A = 12.8612, B = 20.5164, C = 237.2798	Exhibit D-2 (Cleveland, OH) (1)
A_{site}	Area of site	0.5 acres	p. B-8 (1)
θ_a	Air-filled soil porosity	0.28	p. 24 (2)
D_{ia}	Diffusivity in air (cm^2/s)	*chemical-specific*	-
H'	Henry's law constant (dimensionless)	*chemical-specific*	-
θ_w	Water-filled soil porosity	0.15	p. 24 (2)
D_{iw}	Diffusivity in water (cm^2/s)	*chemical-specific*	-
n	Total soil porosity	0.43	p. 24 (2)
ρ_b	Dry soil bulk density	1.5 kg/L	p. 24 (2)
K_d	Soil-water partition coefficient (L/kg)	*chemical-specific*	-

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

(2) U.S. EPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. Washington, DC. OSWER No. 9355.4-17A.

Equation 9: Subchronic volatilization factor

For construction activities:

$$VF_{subchronic} = \left[\frac{(3.14 \times D_A \times T)^{\frac{1}{2}}}{2 \times \rho_b \times D_A}\right] \times \left(\frac{1\ m^2}{10^4\ cm^2}\right) \times \frac{Q}{C_{sa}} \times \frac{1}{F_D}$$

$$where\ D_A = \frac{\left[\left(\theta_a{}^{\frac{10}{3}} \times D_{ia} \times H'\right) + \left(\theta_w{}^{\frac{10}{3}} \times D_{iw}\right)\right] \div n^2}{(\rho_b \times K_d + \theta_w + \theta_a \times H')}$$

$$where\ \frac{Q}{C_{sa}} = A \times e^{\frac{[(ln\ A_c) - B]^2}{C}}$$

$$where\ F_D = 0.1852 + \frac{5.3537}{t_c} + \frac{-9.6318}{t_c{}^2}$$

Parameter		Default value	Reference
$VF_{subchronic}$	Subchronic volatilization factor (m^3/kg)	Calculated; *chemical-specific*	Equation 5-14 (1)
D_A	Apparent diffusivity (cm^2/s)	Calculated; *chemical-specific*	Equation 5-14 (1)
T	Total time over which construction occurs	3.1536E+07 seconds (a)	-
ρ_b	Dry soil bulk density	1.5 g/cm^3	p. 24 (2)
Q/C_{sa}	Inverse of the ratio of the 1-h geometric mean air concentration to the volatilization flux at the center of a square site	Calculated; 14.31 g/m^2-s per kg/m^3	Equation E-15 (1)
F_D	Dispersion correction factor	Calculated; 0.187	Equation E-16 (1)
θ_a	Air-filled soil porosity	0.28	p. 24 (2)
D_{ia}	Diffusivity in air (cm^2/s)	*See Table 2*	-
H'	Henry's law constant (dimensionless)	*See Table 2*	-
θ_w	Water-filled soil porosity	0.15	p. 24 (2)
D_{iw}	Diffusivity in water (cm^2/s)	*See Table 2*	-
n	Total soil porosity	0.43	p. 24 (2)
K_d	Soil-water partition coefficient (L/kg)	*See Table 2*	-
A, B, C	Volatilization factor dispersion constants for Q/C_{sa}	A = 2.4538, B = 17.5660, C = 189.0426	p. E-17 (1)
A_c	Areal extent of contamination	0.5 acres	p. 5-20 (1)
t_c	Duration of construction	2,880 hours (b)	-

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

(2) U.S. EPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. Washington, DC. OSWER No. 9355.4-17A.

(a) T = ED (1 year) x 365 days/year x 24 hours/day x 3,600 seconds/day = 3.1536E+07 seconds

(b) t_c = ED (1 year) x 120 days/year x 24 hours/day = 2,880 hours

1.5 Particulate emission factor

Equation 10: Particulate emission factor

For residential land use, commercial land use with high frequency child exposure, and commercial/industrial land use:

$$PEF = \frac{Q}{C_w} \times \frac{\left(\frac{3{,}600\ seconds}{1\ hour}\right)}{0.036 \times (1-V) \times \left(\frac{U_m}{U_t}\right)^3 \times F(x)}$$

$$where\ \frac{Q}{C_{wind}} = A \times e^{\frac{[(ln\ A_{site})-B]^2}{C}}$$

Parameter		Default	Reference
PEF	Particulate emission factor	Calculated; 9.50E+08 m^3/kg	Equation 10 (2)
Q/C_{wind}	Inverse of the ratio of the geometric mean air concentration to the emission flux at the center of a square source	Calculated; 85.63 g/m^2-s per kg/m^3	Exhibit D-2 (1)
V	Fraction of vegetative cover	0.5	p. 32 (2)
U_m	Mean annual wind speed	4.83 m/s	p. D-6 (Cleveland, OH) (2)
U_t	Equivalent threshold value of wind speed at 7 m	11.32 m/s	p. D-6 (Cleveland, OH) (2)
F(x)	Function dependent on U_m/U_t	0.232	p. D-6 (Cleveland, OH) (2)
A, B, C	Volatilization factor dispersion constants for Q/C_{wind}	A = 12.8612, B = 20.5164, C = 237.2798	Exhibit D-2 (Cleveland, OH) (1)
A_{site}	Area of site	0.5 acres	p. 32 (2)

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

(2) U.S. EPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. Washington, DC. OSWER No. 9355.4-17A.

Equation 11: Subchronic particulate emission factor

For construction activities:

$$PEF_{subchronic} = \frac{(PEF_{urt} + PEF_{other})}{2}$$

$PEF_{subchronic}$ = Subchronic particulate emission factor activities (m^3/kg)
PEF_{urt} = Particulate emission factor for unpaved road traffic (m^3/kg) (Equation 82)
PEF_{other} = Particulate emission factor for wind erosion and other construction activities (m^3/kg) (Equation 93)

Equation 12: Particulate emission factor for unpaved road traffic

$$PEF_{urt} = \left(\frac{Q}{C_{sr}}\right) \times \left(\frac{1}{F_D}\right) \times \frac{(T \times A_R)}{\left\{\frac{\left[2.6 \times \left(\frac{s}{12}\right)^{0.8} \left(\frac{W}{s_{road}}\right)^{0.4}\right]}{\left(\frac{M_{dry}}{0.2}\right)^{0.3}} \times \frac{(365-p)}{365} \times 281.9 \times (\sum VKT)_{fleet}\right\}}$$

$$where\ \frac{Q}{C_{sr}} = A \times \exp\left[\frac{(\ln A_{site} - B)^2}{C}\right]$$

$$where\ F_D = 0.1852 + \frac{5.3537}{t_c} + \frac{-9.6318}{(t_c)^2}$$

Parameter		Default	Reference
PEF_{urt}	Particulate emission factor for unpaved road traffic	Calculated; 9.10E+05 m^3/kg	Equation E-18 (1)
Q/C_{sr}	Inverse of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site	Calculated; 16.40 g/m^2-s per kg/m^3	Equation E-16 (1)
F_D	Dispersion correction factor	Calculated; 0.191	Equation E-16 (1)
T	Total time over which construction occurs	3.456E+06 seconds (a)	-
A_R	Surface area of contaminated road segment	Calculated; 868 m^2 (b)	p.E-27 (1)
s_{road}	Road surface silt content	8.5%	p. E-20 (1)
W	Mean vehicle weight	8 tons	p. E-20 (1)
M_{dry}	Road surface material moisture content	0.2%	p. E-20 (1)
p	Mean number of days with at least 0.01 inches of precipitation	120 days	Exhibit E-4 (1)
$(\Sigma VKT)_{fleet}$	Sum of fleet kilometers traveled	Calculated; 512 km (c)	p. E-27 (1)
A, B, C	Volatilization factor dispersion constants for Q/C_{sr}	A = 12.9351, B = 5.7383, C = 71.7711	p. E-22 (1)
A_{site}	Area of site	5.0 acres	p. E-27 (1)
t_c	Duration of construction	960 hours (d)	-

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

(a) T = ED (1 year) x 120 days/year x 8 hours/day x 3600 seconds/day = 3.456E+06 seconds

(b) A_R = 20 ft x 467 ft x 0.092903 m^2/ft^2 = 868 m^2

(c) ΣVKT_{fleet} = (30 vehicles x 467 ft/day x 120 days x 3,281 ft/km = 512 km

(d) t_c = ED (1 year) x 120 days/year x 8 hours/day = 960 hours

Equation 13: Particulate emission factor for wind erosion and other construction activities

$$PEF_{other} = \frac{Q}{C_{sa}} \times \frac{1}{F_D} \times \frac{1}{< J'_T >}$$

$$where \ \frac{Q}{C_{sa}} = A \times \exp\left[\frac{(\ln A_c - B)^2}{C}\right]$$

$$where \ F_D = 0.1852 + \frac{5.3537}{t_c} + \frac{-9.6318}{(t_c)^2}$$

Parameter		Default value	Reference
PEF_{other}	Particulate emission factor for wind erosion and other construction activities	Calculated; 2.59E+07 m^3/kg	Equation E-26 (1)
Q/C_{sa}	Inverse of the 1-h geometric mean air concentration and the volatilization flux at the center of a square emission source	Calculated; 9.44 g/m^2-s per kg/m^3	Equation E-15 (1)
F_D	Dispersion correction factor	Calculated; 0.191	Equation E-16 (1)
$<J'_T>$	Total time-averaged PM_{10} unit emission flux for construction activities other than traffic on unpaved roads	Equation 10 on p. 25	-
A, B, C	Volatilization factor dispersion constants for Q/C_{sa}	A = 2.4538, B = 17.5660, C = 189.0426	p. E-17 (1)
A_c	Areal extent of contamination	5 acres	p. E-28 (1)
t_c	Duration of construction	960 hours (a)	-

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

(a) t_c = ED (1 year) x 120 days/year x 8 hours/day = 960 hours

Equation 14: Total time-averaged PM_{10} unit emission flux for construction activities other than traffic on unpaved roads

$$< J'_T > \; = \; \frac{\left(M_{wind} + M_{excav} + M_{doz} + M_{grade} + M_{till}\right)}{(A_c \times ED)}$$

$$where\ M_{wind} = 0.036 \times (1 - V) \times \left(\frac{U_m}{U_t}\right)^3 \times F(x) \times A_{surf} \times ED \times \left(\frac{8{,}760\ hours}{1\ year}\right)$$

$$where\ M_{excav} = 0.35 \times 0.0016 \times \frac{\left(\frac{U_m}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \times \rho_{soil} \times A_{excav} \times d_{excav} \times N_{dump} \times \left(\frac{10^3\ g}{1\ kg}\right)$$

$$where\ M_{doz} \; = 0.75 \times \frac{0.45(s_{soil})^{1.5}}{(M)^{1.4}} \times \frac{(\sum VKT)_{doz}}{S_{doz}} \times \frac{10^3\ g}{1\ kg}$$

$$where\ M_{grade} \; = 0.60 \times 0.0056(S_{doz})^{\,2.0} \times (\Sigma\ VKT)_{grade} \times \frac{10^3\ g}{1\ kg}$$

$$where\ M_{till} = 1.1\ (s_{till})^{0.6} \times A_{till} \times \left(\frac{4{,}047 m^2}{1\ acre}\right) \times \left(\frac{10^{-4}\ ha}{1\ m^2}\right) \times \left(\frac{10^3 g}{1\ kg}\right) \times N_{till}$$

Equation 14 is continued on the next page.

Equation 14: Total time-averaged PM10 unit emission flux for construction activities other than traffic on unpaved roads (continued)

Parameter		Default value	Reference
$<J'_T>$	Total time-averaged PM_{10} unit emission flux for construction activities other than unpaved road traffic	Calculated; 1.91E-06 g/m^2-s	Equation E-25 (1)
M_{wind}	Unit mass emitted from wind erosion	Calculated; 1.15E+05 g	Equation E-20 (1)
M_{excav}	Unit mass emitted from excavation soil dumping	Calculated; 1.72E+03 g	Equation E-21 (1)
M_{doz}	Unit mass emitted from dozing operations	Calculated; 7.37E+07 g	Equation E-22 (1)
M_{grade}	Unit mass emitted from grading operations	Calculated; 1.08E+04 g	Equation E-23 (1)
M_{till}	Unit mass emitted from tilling operations	Calculated; 5.04E+03 g	Equation E-24 (1)
A_c	Areal extent of contamination	20,235 m^2	p. E-28 (1)
ED	Exposure duration	1 year	-
V	Fraction of vegetative cover	0	p. E-23 (1)
U_m	Mean annual wind speed (Cleveland, OH)	4.83 m/s	p. D-6 (2)
U_t	Equivalent threshold value of wind speed at 7 m (Cleveland, OH)	11.32 m/s	p. D-6 (2)
F(x)	Function dependent on U_m/U_t (Cleveland, OH)	0.232	p. D-6 (2)
A_{surf}	Areal extent of site with surface contamination	20,235 m^2	p. E-28 (1)
0.35	PM_{10} particle size multiplier	-	p. E-23 (1)
M	Gravimetric soil moisture content	12%	p. E-23 (1)
ρ_{soil}	In-site soil density	1.68 mg/m^3	p. E-24 (1)
A_{excav}	Areal extent of excavation	4,047 m^2	p. E-28 (1)
d_{excav}	Depth of excavation	1 m	p. E-28 (1)
N_{dump}	Number of times soil is dumped	2	p. E-24 (1)
0.75	PM_{10} scaling factor	-	p. E-24 (1)
s_{soil}	Soil silt content	6.9%	p. E-24 (1)
$(\Sigma VKT)_{doz}$	Sum of dozing kilometers traveled	24.79 km	p. E-28 (1)
S_{doz}	Average dozing speed	11.4 kph	p. E-24 (1)
0.60	PM_{10} scaling factor	-	p. E-24 (1)
S_{grade}	Average grading speed	11.4 kph	p. E-24 (1)
$(\Sigma VKT)_{grade}$	Sum of grading kilometers traveled	24.79 km	p. E-28 (1)
s_{till}	Soil silt content for tilling	18%	p. E-25 (1)
A_{till}	Areal extent of tilling	1 acre	p. E-28 (1)
N_{till}	Number of times soil is tilled	2	p. E-25 (1)

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

(2) U.S. EPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. Washington, DC. OSWER No. 9355.4-17A.

1.6 Soil saturation

It is recognized that in some instances, risk-based generic numerical soil direct-contact standards may exceed soil saturation levels. Under these conditions, it is possible that health hazards beyond chemical toxicity (*e.g.*, flammability) may exist. Moreover, the ability to accurately predict receptor uptake levels from free phase chemical contamination based upon any of the preceding mathematical models becomes highly problematic because free phase chemical contamination has not been incorporated into these models. Soil saturation levels are not calculated for chemicals that may be present in the solid phase at ambient soil temperature. Chemicals are assumed present in the solid phase at ambient soil temperature if they have a melting point above 20°C (Table C-3 (12)). For all other chemicals, soil saturation levels are calculated using the following equation. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

---

(12) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

Equation 15: Soil saturation concentration

$$C_{sat} = \left(\frac{S}{\rho_b}\right) \times (K_d \times \rho_b + \theta_w + H' \times \theta_a)$$

Symbol	Definition	Default	Reference
C_{sat}	Soil saturation concentration (mg/kg)	Calculated; *chemical-specific*	Equation 9 (1)
S	Solubility in water (mg/L-water)	*See Table 2*	-
ρ_b	Dry soil bulk density	1.5 kg/L	p. 24 (1)
K_d	Soil-water partition coefficient (L/kg)	*See Table 2*	-
θ_w	Water-filled soil porosity	0.15	p. 24 (1)
H’	Henry’s law constant (unitless)	*See Table 2*	-
θ_a	Air-filled soil porosity	0.28	p. 24 (1)

(1) U.S. EPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. Washington, DC. OSWER No. 9355.4-17A.

2. Calculation of generic indoor air standards due to vapor intrusion

Generic indoor air standards due to vapor intrusion are listed for the first time in OAC 3745-300-08 Appendix A. These standards were calculated deterministically for volatile compounds. Standards generated in accordance with OAC 3745-300-09 may be calculated probabilistically or deterministically. Regardless of the approach, probabilistic or deterministic, the mathematical models used to generate generic numerical indoor air standards from vapor intrusion are intended to account for the uptake of chemicals for the inhalation exposure pathway.

The standards for single chemical noncarcinogens and the standards for single chemical carcinogens in OAC 3745-300-08 Appendix A are equal to the non-carcinogenic target concentrations in air and the carcinogenic target concentrations in air calculated using the following equations. Unlike soil and groundwater, the inhalation exposure pathway is the only relevant exposure pathway for air; therefore, there is no need to combine exposure pathways to determine a chemical's target concentration in air. The final generic air standard due to vapor intrusion for a single chemical reported in OAC 3745-300-08 Appendix A is a chemical's lowest standard for a single chemical.

2.1 Non-carcinogenic endpoint

The following equations were used to determine non-carcinogenic target concentrations in air. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Exposure factors for a child receptor were used to determine non-carcinogenic target concentrations in air for residential land use and commercial land use with high frequency child exposure because this results in the most conservative non-carcinogenic target concentration in air.

Equation 16: Non-carcinogenic target concentration in air

For residential land use, commercial land use with high frequency child exposure, and commercial/industrial land use:

$$TCA = \frac{THQ \times ATN \times \left(\frac{10^3\ \mu g}{1\ mg}\right)}{EF \times ED \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1}{RfC}\right)}$$

TCA = Target concentration in air (µg/m^3)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)

2.2 Carcinogenic endpoint

The following equations were used to determine carcinogenic target concentrations in air. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Mutagenicity is a specific type of carcinogenicity. A chemical is considered mutagenic if it is explicitly stated that the chemical is carcinogenic by a mutagenic mode of action in the chemical's toxicological profile in IRIS. If a chemical is mutagenic according to IRIS, the mutagenic equations are used to determine carcinogenic target concentrations in air for residential land use only. Because age-dependent adjustment factors are applied to receptor populations between the ages of 0 and 16 years, consideration of the mutagenic mode of action is not applicable to commercial/industrial land use.

The generic numerical standards in OAC 3745-300-08 Appendix A consider acrylamide, benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, ethylene oxide, indeno(1,2,2-cd)pyrene, methylene chloride, trichloroethylene, 1,2,3-trichloropropane, and vinyl chloride to be mutagenic. Standards generated in accordance with OAC 3745-300-09 must consult the toxicity criteria hierarchy and, if an inhalation unit risk is derived from IRIS, must determine whether the chemical is carcinogenic by a mutagenic mode of action.

Equation 17: Carcinogenic target concentration in air

For residential land use and commercial land use with high frequency child exposure (non-mutagenic mode of action) and commercial/industrial land use:

$$\boldsymbol{TCA} = \frac{\boldsymbol{TCR} \times \boldsymbol{ATC}}{\boldsymbol{EF} \times \boldsymbol{ED} \times \boldsymbol{ETA} \times \left(\frac{\boldsymbol{1\ day}}{\boldsymbol{24\ hours}}\right) \times \boldsymbol{IUR}}$$

For residential land use (mutagenic mode of action):

$$TCA = \frac{TCR \times ATC}{EF \times ET \times \left(\frac{1\ day}{24\ hours}\right) \times IURM_{adj}}$$

$$\boldsymbol{where\ IURM}_{\boldsymbol{adj}} = (\boldsymbol{ED}_{\boldsymbol{0-2}} \times \boldsymbol{IUR} \times \boldsymbol{10}) + (\boldsymbol{ED}_{\boldsymbol{2-6}} \times \boldsymbol{IUR} \times \boldsymbol{3}) + (\boldsymbol{ED}_{\boldsymbol{6-16}} \times \boldsymbol{IUR} \times \boldsymbol{3}) + (\boldsymbol{ED}_{\boldsymbol{16-26}} \times \boldsymbol{IUR} \times \boldsymbol{1})$$

For commercial land use with high frequency child exposure (mutagenic mode of action):

a) Ages 0 to 6

$$TCA = \frac{TCR \times ATC}{EF \times ET \times \left(\frac{1\ day}{24\ hours}\right) \times IURM_{adj}}$$

$$where\ IURM_{adj} = (ED_{0-2} \times IUR \times 10) + (ED_{2-6} \times IUR \times 3)$$

b) Ages 6 to 16

$$TCA = \frac{TCR \times ATC}{EF \times ED \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times (IUR \times 3)}$$

TCA = Target concentration in air (µg/m^3)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
IUR = Inhalation unit risk factor ((µg/m^3)$^{-1}$) (see Table 5)
$IURM_{adj}$ = Mutagenic inhalation unit risk factor ((µg/m^3)$^{-1}$) (chemical-specific)

3. Calculation of generic unrestricted potable use standards for groundwater

The generic unrestricted potable use standards for groundwater listed in OAC 3745-300-08 Appendix A were calculated deterministically, except for those based on maximum contaminant levels (MCLs) established in the National Primary Drinking Water Regulations. This is different from previous risk-based generic unrestricted potable use standards for groundwater that were calculated probabilistically, utilizing Monte Carlo Simulation (MCS) as a technique to model heterogeneous human receptor populations exposed through each potential exposure scenario. Standards generated in accordance with OAC 3745-300-09 may be calculated probabilistically or deterministically. Regardless of the approach, probabilistic or deterministic, the mathematical models are intended to account for the uptake of chemicals for all relevant exposure pathways.

The standards for single chemical noncarcinogens and the standards for single chemical carcinogens in OAC 3745-300-08 Appendix A are equal to the non-carcinogenic target concentrations in groundwater and the carcinogenic target concentrations in groundwater calculated using the following equations. A chemical's total target concentration in groundwater for a given endpoint is comprised of three exposure pathways: ingestion of groundwater, inhalation of volatiles from groundwater, and dermal contact with groundwater. Note that the dermal pathway was only quantified if the chemical is within the effective prediction domain as determined by Equations 3.9 and 3.10 in RAGS Part E (13). Please consult Ohio EPA Division of Environmental Response and Revitalization for help determining if a chemical is within the effective prediction domain. Generic unrestricted potable use standards for groundwater are based upon the residential land use scenario.

If an MCL for a chemical does not exist, the final generic unrestricted potable use standard for a single chemical reported in OAC 3745-300-08 Appendix A is that chemical's lowest standard for a single chemical. Chemicals with risk-based standards for a single chemical are subject to multiple chemical adjustments.

If an MCL for a chemical does exist, then the MCL is that chemical's final generic unrestricted potable use standard for a single chemical reported in OAC 3745-300-08 Appendix A. Chemicals with a generic unrestricted potable use standard for a single chemical based on an MCL should not be included in multiple chemical adjustments.

---

(13) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.

Equation 18: Target concentration in groundwater for any endpoint

$$TCG_{total} = \frac{1}{\left(\frac{1}{TCG_{oral}}\right) + \left(\frac{1}{TCG_{inhalation}}\right) + \left(\frac{1}{TCG_{dermal}}\right)}$$

TCG_{total} = Target concentration in groundwater for all pathways (µg/L)
TCG_{oral} = Target concentration in groundwater for oral pathway (µg/L)
$TCG_{inhalation}$ = Target concentration in groundwater for inhalation pathway (µg/L)
TCG_{dermal} = Target concentration in groundwater for dermal pathway (µg/L)

3.1 Non-carcinogenic endpoint

The following equations were used to determine target concentrations in groundwater for oral, inhalation, and dermal pathways. The dermal pathway was calculated for chemicals within the effective predictive domain (EPD) (14). These pathways were combined using Equatio18 to calculate a single-chemical non-carcinogenic generic numerical standard for each chemical when applicable. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Exposure factors for a child receptor were used to develop target concentrations for potable use exposures because this results in the most conservative non-carcinogenic target concentrations in groundwater.

---

(14) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.

Equation 19: Non-carcinogenic target concentration in groundwater for oral pathway

$$TCG_{oral} = \frac{THQ \times ATN_c \times BW_c \times \left(\frac{10^3\ \mu g}{1\ mg}\right)}{EF \times ED_c \times \left(\frac{1}{RfD}\right) \times IRW_c}$$

TCG_{oral} = Target concentration in groundwater for oral pathway (µg/L)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
BW = Body weight (kg) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
RfD = Oral reference dose (mg/kg-day) (see Table 5)
IRW = Water ingestion rate (L/day) (see Table 6)

Equation 20: Non-carcinogenic target concentration in groundwater for inhalation pathway

$$TCG_{inhalation} = \frac{THQ \times ATN_c \times \left(\frac{10^3\ \mu g}{1\ mg}\right)}{EF \times ED_c \times ETA_c \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1}{RfC}\right) \times K}$$

$TCG_{inhalation}$ = Target concentration in groundwater for inhalation pathway (µg/L)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
RfC = Reference concentration (mg/m^3) (see Table 5)
K = Andelman volatilization factor ($K = 0.5\ L/m^3$)

Equation 21: Non-carcinogenic target concentration in groundwater for dermal pathway

For organic chemicals if $ETW_c \leq t^*$:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ETW_c}{\pi}}}$$

For organic chemicals if $ETW_c > t^*$:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{FA \times K_p \times \left[\left(\frac{ETW_c}{1+B}\right) + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]}$$

For inorganic chemicals:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{K_p \times ETW_c}$$

ETW = Water event duration (hours/event) (see Table 6)
t* = Time to reach a steady state (hours) (Equation 27)
TCG_{dermal} = Target concentration in groundwater for dermal pathway (µg/L)
DA_{event} = Absorbed dose per event (µg/cm^2-event) (Equation28)
FA = Fraction absorbed (unitless) (chemical-specific)
K_p = Dermal permeability coefficient (cm/hour) (see Table 2)
τ_{event} = Lag time per event (hours/event) (Equation 26)
B = Ratio of the permeability coefficient across the stratum corneum vs. the permeability coefficient across the viable epidermis (Equation 25)

3.2 Carcinogenic endpoint

The following equations were used to determine target concentrations in groundwater for oral, inhalation, and dermal pathways. The dermal pathway was calculated for chemicals within the effective predictive domain (EPD) (15). These pathways were combined using Equatio18 to calculate a single-chemical carcinogenic generic numerical standard for each chemical when applicable. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Mutagenicity is a special instance of carcinogenicity. A chemical is considered mutagenic if it is explicitly stated that the chemical is carcinogenic by a mutagenic mode of action in the chemical's toxicological profile in IRIS. If a chemical is mutagenic according to IRIS, the mutagenic equations are used to determine carcinogenic target concentrations in groundwater.

The generic numerical standards in OAC 3745-300-08 Appendix A consider acrylamide, benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, ethylene oxide, indeno(1,2,2-cd)pyrene, methylene chloride, trichloroethylene, 1,2,3-trichloropropane, and vinyl chloride to be mutagenic; however, because MCLs exist for trichloroethylene and vinyl chloride, risk-based standards are not generated for these two chemicals. Standards generated in accordance with OAC 3745-300-09 must consult the toxicity criteria hierarchy and, if a slope factor and/or inhalation unit risk is derived from IRIS, must determine whether the chemical is carcinogenic by a mutagenic mode of action.

---

(15) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.

Equation 22: Carcinogenic target concentration in groundwater for oral pathway

For chemicals with a non-mutagenic mode of action:

$$TCG_{oral} = \frac{TCR \times ATC \times \left(\frac{10^3 \mu g}{1\ mg}\right)}{SF \times EF \times IFW_{adj}}$$

$$where\ IFW_{adj} = \left(\frac{ED_c \times IRW_c}{BW_c}\right) + \left(\frac{ED_a \times IRW_a}{BW_a}\right)$$

For chemicals with a mutagenic mode of action:

$$TCG_{oral} = \frac{TCR \times ATC \times \left(\frac{10^3 \mu g}{1\ mg}\right)}{SF \times EF \times IFWM_{adj}}$$

$$where\ IFWM_{adj} = \left(\frac{ED_{0-2} \times IRW_c \times 10}{BW_c}\right) + \left(\frac{ED_{2-6} \times IRW_c \times 3}{BW_c}\right) + \left(\frac{ED_{6-16} \times IRW_a \times 3}{BW_a}\right) + \left(\frac{ED_{16-30} \times IRW_a \times 1}{BW_a}\right)$$

TCG_{oral} = Target concentration in groundwater for oral pathway (µg/L)
TCR = Target cancer risk ($TCR = 10^{-5}$)
ATC = Carcinogenic averaging time (ATC = 25,550 days)
SF = Slope factor ($(mg/kg\text{-}day)^{-1}$) (see Table 5)
EF = Exposure frequency (days/year) (see Table 6)
$IFWM_{adj}$ = Mutagenic age-adjusted groundwater ingestion factor (mg/day)
ED = Exposure duration (years) (see Table 6)
IRW = Water ingestion rate (L/day) (see Table 6)
BW = Body weight (kg) (see Table 6)
IFW_{adj} = Age-adjusted groundwater ingestion factor (mg/day)

Equation 23: Carcinogenic target concentration in groundwater for inhalation pathway

For chemicals with a non-mutagenic mode of action:

$$TCG_{inhalation} = \frac{TCR \times ATC}{IUR \times EF \times ED \times ETA \times \left(\frac{1\ day}{24\ hours}\right) \times K}$$

For chemicals with a mutagenic mode of action:

$$TCG_{inhalation} = \frac{TCR \times ATC}{EF \times ET \times \left(\frac{1\ day}{24\ hours}\right) \times IURM_{adj} \times K}$$

$$\boldsymbol{where\ IURM_{adj}} = (\boldsymbol{ED_{0-2} \times IUR \times 10}) + (\boldsymbol{ED_{2-6} \times IUR \times 3}) + (\boldsymbol{ED_{6-16} \times IUR \times 3}) + (\boldsymbol{ED_{16-30} \times IUR \times 1})$$

$TCG_{inhalation}$ = Target concentration in groundwater for inhalation pathway (µg/L)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
IUR = Inhalation unit risk ($(\mu g/m^3)^{-1}$) (see Table 5)
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
K = Andelman volatilization factor (K = 0.5 L/m^3)

Equation 24: Carcinogenic target concentration in groundwater for dermal pathway

For organic chemicals with a non-mutagenic mode of action if $ETW_{adj} \leq t^*$:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{2 \times FA \times K_p \times \sqrt{\frac{6 \times \tau_{event} \times ETW_{adj}}{\pi}}}$$

For organic chemicals with a non-mutagenic mode of action if $ETW_{adj} > t^*$:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{FA \times K_p \times \left[\left(\frac{ETW_{adj}}{1+B}\right) + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]}$$

For inorganic chemicals with a non-mutagenic mode of action:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{K_p \times ETW_{adj}}$$

$$where\ ETW_{adj} = \frac{(ETW_c \times ED_c) + (ETW_a \times ED_a)}{ED_c + ED_a}$$

For all chemicals with a mutagenic mode of action:

$$TCG_{dermal} = \frac{DA_{event} \times \left(\frac{10^3 cm}{1\ L}\right)}{K_p \times ETWM_{adj}}$$

$$where\ ETWM_{adj} = \frac{(ETW_c \times ED_c + ETW_a \times ED_a)}{(ED_c + ED_a)}$$

ETW_{adj} = Age-adjusted water event duration (hours/event)
t^* = time to reach a steady state (hours) (Equation 27)
TCG_{dermal} = Target concentration in groundwater for dermal pathway (µg/L)
DA_{event} = Absorbed dose per event (µg/cm^2-event) (Equation28)
FA = Fraction absorbed (dimensionless) (chemical-specific)
K_p = Dermal permeability coefficient (cm/hour) (see Table 2)
τ_{event} = Lag time per event (hours/event) (Equation 26)
B = Ratio of the permeability coefficient across the stratum corneum vs. the permeability coefficient across the viable epidermis (Equation 25)
ETW = Water exposure event duration (hours/event) (see Table 6)
ED = Exposure duration (years) (see Table 6)
$ETWM_{adj}$ = Mutagenic age-adjusted water event duration (hours/event)

3.3 Supporting equations

The following equations support those used to determine target concentrations in groundwater for oral, inhalation, and dermal pathways. Refer to Table for all chemical-specific parameters and Table for all land use and receptor-specific exposure factors.

Equation 25: Ratio of the permeability coefficient across the stratum corneum vs. the permeability coefficient across the viable epidermis

$$B = K_p \times \frac{\sqrt{MW}}{2.6}$$

B = Ratio of the permeability coefficient across the stratum corneum vs. the permeability coefficient across the viable epidermis (unitless)
K_p = Dermal permeability coefficient (cm/hour) (see Table 2)
MW = Molecular weight (g/mole) (see Table 2)

Equation 26: Lag time per event

$$\tau_{event} = \frac{{I_{SC}}^2}{(6 \times D_{sc})}$$

$$where\ D_{sc} = l_{sc} \times 10^{(-2.80 - 0.0056 \times MW)}$$

τ_{event} = Lag time per event (hours/event)
I_{SC} = Apparent thickness of the stratum corneum (I_{SC} = 0.001 cm)
D_{sc} = Effective diffusion coefficient for chemical transfer through the stratum corneum (unitless)
MW = Molecular weight (g/mole) (see Table 2)

Equation 27: Time to reach a steady state

$$If\ B \leq 0.6,\ then\ t^* = 2.4 \times \tau_{event}$$

$$If\ B > 0.6,\ then\ t^* = 6 \times \tau_{event} \times \left(b - \sqrt{b^2 - c^2}\right)$$

$$where\ b = \frac{2 \times (1+b)^2}{\pi} - c\ and\ c = \frac{1 + 3 \times B + 3 \times B^2}{3 \times (1+B)}$$

B = Ratio of the permeability coefficient across the stratum corneum vs. the permeability coefficient across the viable epidermis (unitless) (Equation 25)
t* = time to reach a steady state (hours)
τ_{event} = Lag time per event (hours/event) (Equation 26)

Equation 28: Absorbed dose per event

For non-carcinogenic endpoint:

$$DA_{event} = \frac{THQ \times ATN_c \times \left(\frac{10^3 \mu g}{1\,mg}\right) \times BW_c}{\left(\frac{1}{RfD \times GIABS}\right) \times EVW \times ED_c \times EF \times SAW_c}$$

For carcinogenic endpoint (non-mutagenic mode of action):

$$DA_{event} = \frac{TCR \times ATC \times \left(\frac{10^3 \mu g}{1\,mg}\right)}{\left(\frac{SF}{GIABS}\right) \times EF \times DFW_{adj}}$$

$$where\ DFW_{adj} = \left(\frac{EVW \times ED_c \times SAW_c}{BW_c}\right) + \left(\frac{EVW \times ED_a \times SAW_a}{BW_a}\right)$$

For carcinogenic endpoint (mutagenic mode of action):

$$DA_{event} = \frac{TCR \times ATC \times \left(\frac{10^3 \mu g}{1\,mg}\right)}{\left(\frac{SF}{GIABS}\right) \times EF \times DFWM_{adj}}$$

$$where\ DFSM_{adj} = \left(\frac{ED_{0-2} \times EVW \times SAW_c \times 10}{BW_c}\right) + \left(\frac{ED_{2-6} \times EVW \times SAW_c \times 3}{BW_c}\right) + \left(\frac{ED_{6-16} \times EVW \times SAW_a \times 3}{BW_a}\right) + \left(\frac{ED_{16-30} \times EVW \times SAW_a \times 1}{BW_a}\right)$$

DA_{event} = Absorbed dose per event (µg/cm^2-event)
THQ = Target hazard quotient (THQ = 1)
ATN = Non-carcinogenic averaging time (days) (see Table 6)
BW = Body weight (kg) (see Table 6)
RfD = Oral reference dose (mg/kg-day) (see Table 5)
GIABS = Gastrointestinal absorption factor (see Table 5)
ED = Exposure duration (years) (see Table 6)
EVW = Water event frequency (events/day) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
SAW = Skin surface area exposed to water (cm^2) (see Table 6)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
SF = Slope factor ((mg/kg-day)$^{-1}$) (see Table 5)
DFW_{adj} = Age-adjusted water dermal contact factor (cm^2-event/kg)
$DFWM_{adj}$ = Mutagenic age-adjusted water dermal contact factor (cm^2-event/kg)

Part B: Chemical-specific parameters

All chemical-specific parameters, including toxicity criteria, used to develop the generic numerical standards are summarized in Table .

The development of reliable cleanup standards is dependent upon several sets of data describing the physical/chemical properties of each chemical, the uptake of chemicals by a receptor from contaminated media, and possible adverse health effect due to exposure. The development of generic numerical standards utilized source hierarchies for chemical/physical data and toxicity data. These source hierarchies should be used when generating standards in accordance with OAC 3745-300-09.

1. Physical/chemical data

The physical/chemical parameters that were used to develop the generic numerical standards and the supporting reference(s), in order of decreasing preference for each parameter, appear in Table . Physical/chemical data appear in Table . The chemical-specific parameters that are used in the supporting calculations for dermal exposures to groundwater are in Table 4.

Table 2: Summary of Chemical-Specific Parameters

Parameter		Reference(s) in order of decreasing preference
ABS	Dermal absorption factor (unitless)	Exhibit 3-4 (3)
B	Ratio of the permeability coefficient across the stratum corneum vs. the permeability coefficient across the viable epidermis (unitless)	Calculated; Equation A.1 (3)
D_A	Apparent diffusivity (cm^2/s)	Calculated; Equation 6 (11)
DA_{event}	Absorbed dose per event ($\mu g/cm^2$-event)	Calculated; Equation 3.2 – 3.4 (3)
D_{ia}	Diffusivity in air (cm^2/s)	(1); Exhibit C-1 (2)
D_{iw}	Diffusivity in water (cm^2/s)	(1); Exhibit C-1 (2)
D_{sc}	Effective diffusion coefficient for chemical transfer through the stratum corneum (unitless)	Calculated; Equation A.2 – A.3 (3)
EPD	Effective predictive domain (unitless)	Calculated; Equation 3.9 & 3.10 (3)
FA	Fraction absorbed (unitless)	Calculated; Exhibit B-3 (3)
GIABS	Gastrointestinal absorption factor (unitless)	Exhibit 4-1 (3)
H'	Henry's law constant (unitless) (at 25°C unless otherwise stated in the source)	(4i); Exhibit C-1 (2); (5i); (4ii); (6)
IUR	Inhalation unit risk $((\mu g/m^3)^{-1})$	See Table 4
K_d	Soil-water partition coefficient (cm^3/g)	Calculated for organics (K_{oc} x f_{oc}); Exhibit C-4 (pH 6.8) (2) or (10) for inorganics
K_{oc}	Organic carbon partition coefficient (L/kg) (b)	(4ii); Exhibit C-1 (2); (5ii); (4i); (5i)
K_p	Dermal permeability coefficient (cm/hr)	(4ii); Appendix B (3)
MP	Melting point (°C)	(4i); Exhibit C-3 (2); (7); (8); (9); (4ii)
MW	Molecular weight (g/mole)	(4); (7); (8); (9); (5)
RfC	Reference concentration (mg/m^3)	See Table 4
RfD	Oral reference dose (mg/kg-day)	See Table 4
S	Solubility in water (mg/L) (at 25°C unless otherwise stated in the source)	(4i); Table 46 (12); (7); (5i); (8); (11); (5ii); (4ii); (6)
SF	Slope factor $((mg/kg\text{-}day)^{-1})$	See Table 4
t*	Time to reach a steady state (hours)	Calculated; Equation A.5 – A.8 (3)
τ_{event}	Lag time per event (hours/event)	Calculated; Equation A.4 (3)
VF	Volatilization factor (chemical and scenario-specific)	Calculated; Equation 8 & 9

(1) WATER9.
(2) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
(3) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.
(4) The Estimation Programs Interface (EPI) Suite™. U.S. EPA and Syracuse Research Corporation. (i = experimental values, ii = estimated values)
(5) Yaws' Handbook of Thermodynamic and Physical Properties of Chemical Compounds. (i = experimental values, ii = estimated values)
(6) PHYSPROP Database. Syracuse Research Corporation (SRC).
(7) CRC Handbook of Chemistry and Physics.
(8) Perry's Chemical Engineers' Handbook.
(9) Baes, C.F. 1984.
(10) U.S. EPA 1996. Soil Screening Guidance (Technical Background Document. EPA/540/R-95/128.

Table 3: Physical/chemical data

Chemical	CAS Number	MW (gms/mol)	Source	Melting Point (°C)	Source	Henry's Law Constant (unitless)	Source	Air Diffusivity (cm^2/s)	Source	Water Diffusivity (cm^2/s)	Source	Koc (L/kg)	Source	Kd (cm^3/g)	Source	Solubility in Water (mg/L)	Source	Kp (cm/hr)	Source
Inorganics/Metals																			
Aluminum Phosphide	20859-73-8	5.8E+01	(6)	2.6E+03	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Antimony (Metallic)	7440-36-0	1.2E+02	(7)	6.3E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	4.50E+01	(2)	NA	NA	1.00E-03	(3)
Antimony Trioxide	1309-64-4	2.9E+02	(4)	5.7E+02	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Arsenic, Inorganic	7440-38-2	7.5E+01	(7)	2.7E+02	(7)	NA	NA	NA	NA	NA	NA	NA	NA	2.90E+01	(2)	NA	NA	1.00E-03	(3)
Barium	7440-39-3	1.4E+02	(4)	7.1E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	4.10E+01	(2)	NA	NA	1.00E-03	(3)
Beryllium and Compounds	7440-41-7	9.0E+00	(4)	9.9E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	7.90E+02	(2)	NA	NA	1.00E-03	(3)
Cadmium	7440-43-9	1.1E+02	(6)	3.2E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	7.50E+01	(2)	NA	NA	1.00E-03	(3)
Chlorine	7782-50-5	7.1E+01	(6)	-1.0E+02	(6)	4.8E-01	(6)	1.5E-01	(1)	2.2E-05	(1)	NA	NA	2.50E-01	(13)	6.3E+03	(6)	1.00E-03	(3)
Chromium(III)	16065-83-1	5.2E+01	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.80E+06	(2)	NA	NA	1.00E-03	(3)
Chromium(VI)	18540-29-9	5.2E+01	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.90E+01	(2)	1.7E+06	(7)	2.00E-03	(3)
Chromium, Total	7440-47-3	5.2E+01	(6)	1.9E+03	(6)	NA	NA	NA	NA	NA	NA	NA	NA	1.80E+06	(2)	NA	NA	1.00E-03	(3)
Cobalt Compounds	7440-48-4	5.9E+01	(4)	1.5E+03	(7)	NA	NA	NA	NA	NA	NA	NA	NA	4.50E+01	(13)	NA	NA	4.00E-04	(3)
Copper	7440-50-8	6.4E+01	(6)	1.1E+03	(6)	NA	NA	NA	NA	NA	NA	NA	NA	3.50E+01	(13)	NA	NA	1.00E-03	(3)
Disodium Phosphate	7558-79-4	1.4E+02	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Hydrogen Chloride	7647-01-0	3.5E+01	(4)	-1.1E+02	(7)	2.0E-08	(10)	1.9E-01	(1)	2.3E-05	(1)	NA	NA	NA	NA	6.7E+05	(10)	1.00E-03	(3)
Hydrogen Fluoride	7664-39-3	2.0E+01	(6)	-8.4E+01	(6)	4.3E-03	(6)	2.2E-01	(1)	2.2E-05	(1)	NA	NA	NA	NA	1.0E+06	(6)	1.00E-03	(3)
Hydrogen Sulfide	7783-06-4	3.4E+01	(6)	-8.5E+01	(6)	3.5E-01	(6)	1.9E-01	(1)	2.2E-05	(1)	NA	NA	NA	NA	3.7E+03	(6)	1.00E-03	(3)
Fluorine (Soluble Fluoride)	7782-41-4	3.8E+01	(6)	-2.2E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	1.50E+02	(13)	1.7E+00	(6)	1.00E-03	(3)
Manganese Compounds	7439-96-5	5.5E+01	(6)	1.2E+03	(6)	NA	NA	NA	NA	NA	NA	NA	NA	6.50E+01	(13)	NA	NA	1.00E-03	(3)
Mercury and Compounds	7439-97-6	2.0E+02	(6)	-3.9E+01	(6)	3.5E-01	(6) VP/S**	3.1E-02	(1)	6.3E-06	(1)	NA	NA	5.20E+01	(2)	6.0E-02	(6)	1.00E-03	(3)
Nickel Soluble Salts	7440-02-0	5.9E+01	(6)	1.5E+03	(7)	NA	NA	NA	NA	NA	NA	NA	NA	6.50E+01	(2)	NA	NA	2.00E-04	(3)
Phosphine	7803-51-2	3.4E+01	(6)	-1.3E+02	(6)	1.0E+00	(6)	1.9E-01	(1)	2.2E-05	(1)	NA	NA	NA	NA	2.6E+05	(8)	1.00E-03	(3)
Selenious Acid	7783-00-8	1.3E+02	(6)	7.0E+01	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.0E+05	(8)	1.00E-03	(3)
Selenium	7782-49-2	7.9E+01	(6)	2.2E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	5.00E+00	(2)	NA	NA	1.00E-03	(3)
Silver	7440-22-4	1.1E+02	(6)	9.6E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	8.30E+00	(2)	NA	NA	6.00E-04	(3)
Sodium Azide	26628-22-8	6.5E+01	(4)	3.0E+02	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.1E+05	(7)	1.00E-03	(3)
Sodium Fluoride	7681-49-4	4.2E+01	(6)	9.9E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	1.50E+02	(13)	4.2E+04	(6)	1.00E-03	(3)
Sodium Fluoroacetate	62-74-8	1.0E+02	(6)	2.0E+02	(6)	4.5E-05	(6)	8.8E-02	(1)	1.0E-05	(1)	1.4E+00	(4)	8.64E-03	(14)	1.1E+06	(6)	1.32E-06	(4)
Sodium Tripolyphosphate	7758-29-4	3.7E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Sulfuric Acid	7664-93-9	9.8E+01	(6)	1.0E+01	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+06	(6)	1.00E-03	(3)
Thallium (Soluble Salts)	7440-28-0	2.0E+02	(4)	3.0E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	7.10E+01	(2)	NA	NA	1.00E-03	(3)
Titanium Tetrachloride	7550-45-0	1.9E+02	(7)	-2.4E+01	(6)	NA	NA	3.8E-02	(1)	9.1E-06	(1)	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Trisodium Phosphate	7601-54-9	1.6E+02	(6)	7.5E+01	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Vanadium Compounds	7440-62-2	5.1E+01	(4)	1.9E+03	(7)	NA	NA	NA	NA	NA	NA	NA	NA	1.00E+03	(2)	NA	NA	1.00E-03	(3)
Zinc and Compounds	7440-66-6	6.5E+01	(6)	4.2E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	6.20E+01	(2)	NA	NA	6.00E-04	(3)
Zinc Phosphide	1314-84-7	2.6E+02	(7)	4.2E+02	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.00E-04	(3)
Cyanides																			
Calcium Cyanide	592-01-8	9.2E+01	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Copper Cyanide	544-92-3	9.0E+01	(6)	4.7E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00E-03	(3)
Cyanide (CN-)	57-12-5	2.6E+01	(6)	NA	NA	4.2E-03	(12)	2.1E-01	(1)	2.5E-05	(1)	NA	NA	9.90E+00	(2)	9.5E+04	(6)	1.00E-03	(3)
Cyanogen	460-19-5	5.2E+01	(6)	-2.8E+01	(6)	2.2E-01	(4)	1.2E-01	(1)	1.4E-05	(1)	NA	NA	NA	NA	8.0E+03	(7)	8.90E-04	(3)
Cyanogen Bromide	506-68-3	1.1E+02	(6)	5.2E+01	(6)	1.0E+00	(4)	9.8E-02	(1)	1.4E-05	(1)	NA	NA	NA	NA	NA	NA	2.55E-04	(3)
Cyanogen Chloride	506-77-4	6.1E+01	(6)	-6.6E+00	(6)	7.9E-02	(5)	1.2E-01	(1)	1.4E-05	(1)	NA	NA	NA	NA	6.0E+04	(6)	3.94E-04	(3)
Hydrogen Cyanide	74-90-8	2.7E+01	(6)	-1.3E+01	(6)	5.4E-03	(6)	1.7E-01	(1)	1.7E-05	(1)	NA	NA	9.90E+00	(2)	1.0E+06	(6)	1.00E-03	(3)
Potassium Cyanide	151-50-8	6.5E+01	(6)	6.3E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.2E+05	(6)	2.00E-03	(3)
Potassium Silver Cyanide	506-61-6	2.0E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00E-03	(3)
Silver Cyanide	506-64-9	1.3E+02	(6)	3.2E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.3E+01	(6)	1.00E-03	(3)
Sodium Cyanide	143-33-9	4.9E+01	(6)	5.6E+02	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8E+05	(7)	1.00E-03	(3)
Zinc Cyanide	557-21-1	1.2E+02	(6)	8.0E+01	(8)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.7E+00	(7)	6.00E-04	(3)
Lead Compounds																			
Lead Acetate	301-04-2	3.3E+02	(6)	3.3E+02	(6)	NA	NA	3.3E-02	(1)	9.6E-06	(1)	1.0E+00	(4)	6.00E-03	(14)	1.6E+03	(6)	2.08E-05	(4)
Lead and Compounds*	7439-92-1	2.1E+02	(4)	3.3E+02	(4)	NA	NA	NA	NA	NA	NA	NA	NA	9.00E+02	(13)	NA	NA	1.00E-04	(3)
Lead Phosphate	7446-27-7	8.1E+02	(6)	1.0E+03	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0E+00	(7)	1.00E-03	(3)
Lead Subacetate	1335-32-6	8.1E+02	(6)	1.6E+02	(4)	NA	NA	2.2E-02	(1)	2.6E-06	(1)	1.0E+01	(4)	6.22E-02	(14)	6.3E+04	(6)	1.03E-10	(4)
Tetraethyl Lead	78-00-2	3.2E+02	(6)	-1.3E+02	(6)	2.3E+01	(6)	2.5E-02	(1)	6.4E-06	(1)	6.5E+02	(4)	3.89E+00	(14)	2.9E-01	(6)	1.37E-02	(4)
Semi-Volatile Organic Compounds (SVOCs)																			
Acenaphthene	83-32-9	1.5E+02	(6)	9.3E+01	(6)	7.5E-03	(6)	5.1E-02	(1)	8.3E-06	(1)	5.0E+03	(4)	3.02E+01	(14)	3.9E+00	(6)	8.60E-02	(4)
Acetophenone	98-86-2	1.2E+02	(6)	2.0E+01	(6)	4.3E-04	(6)	6.5E-02	(1)	8.7E-06	(1)	5.2E+01	(4)	3.11E-01	(14)	6.1E+03	(6)	3.72E-03	(4)
Acetylaminofluorene, 2-	53-96-3	2.2E+02	(6)	1.9E+02	(6)	7.8E-09	(6)	5.2E-02	(1)	6.0E-06	(1)	2.2E+03	(4)	1.32E+01	(14)	5.5E+00	(6)	1.04E-02	(4)
Acrylamide	79-06-1	7.1E+01	(6)	8.5E+01	(6)	7.0E-08	(4)	1.1E-01	(1)	1.3E-05	(1)	5.7E+00	(4)	3.42E-02	(14)	3.9E+05	(6)	2.24E-04	(4)
Alachlor	15972-60-8	2.7E+02	(6)	4.0E+01	(6)	3.4E-07	(6)	2.3E-02	(1)	5.7E-06	(1)	3.1E+02	(4)	1.87E+00	(14)	2.4E+02	(6)	1.05E-02	(4)
Aldicarb	116-06-3	1.9E+02	(6)	9.9E+01	(6)	5.9E-08	(4)	3.2E-02	(1)	7.2E-06	(1)	2.5E+01	(4)	1.48E-01	(14)	6.0E+03	(6)	7.55E-04	(4)
Aldicarb Sulfone	1646-88-4	2.2E+02	(6)	1.4E+02	(6)	1.4E-07	(4)	5.2E-02	(1)	6.1E-06	(1)	1.0E+01	(4)	6.00E-02	(14)	1.0E+04	(6)	3.71E-05	(4)
Aldrin	309-00-2	3.6E+02	(6)	1.0E+02	(6)	1.8E-03	(6)	2.3E-02	(1)	5.8E-06	(1)	8.2E+04	(4)	4.92E+02	(14)	1.7E-02	(6)	2.93E-01	(4)
Aminobiphenyl, 4-	92-67-1	1.7E+02	(6)	5.4E+01	(6)	6.0E-06	(4)	6.2E-02	(1)	7.3E-06	(1)	2.5E+03	(4)	1.48E+01	(14)	2.2E+02	(6)	1.40E-02	(4)
Ammonium Sulfamate	7773-06-0	1.1E+02	(7)	1.3E+02	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3E+06	(8)	1.00E-03	(3)
Aniline	62-53-3	9.3E+01	(6)	-6.0E+00	(6)	8.3E-05	(6)	8.3E-02	(1)	1.0E-05	(1)	7.0E+01	(4)	4.21E-01	(14)	3.6E+04	(6)	1.86E-03	(4)
Anthracene	120-12-7	1.8E+02	(6)	2.2E+02	(6)	2.3E-03	(6)	3.9E-02	(1)	7.9E-06	(1)	1.6E+04	(4)	9.82E+01	(14)	4.3E-02	(6)	1.42E-01	(4)
Aroclor 1016	12674-11-2	2.6E+02	(6)	1.0E+02	(4)	8.2E-03	(4)	2.5E-02	(1)	6.6E-06	(1)	4.8E+04	(4)	2.86E+02	(14)	4.2E-01	(6)	3.05E-01	(4)
Aroclor 1221	11104-28-2	1.9E+02	(6)	3.4E+01	(4)	9.3E-03	(6)	5.8E-02	(1)	6.7E-06	(1)	8.4E+03	(4)	5.04E+01	(14)	1.5E+01	(6)	1.68E-01	(4)
Aroclor 1232	11141-16-5	1.9E+02	(6)	3.4E+01	(4)	3.0E-02	(4)	3.3E-02	(1)	7.5E-06	(1)	8.4E+03	(4)	5.04E+01	(14)	1.5E+00	(6)	1.68E-01	(4)
Aroclor 1242	53469-21-9	2.9E+02	(6)	1.2E+02	(4)	1.4E-02	(6)	4.3E-02	(1)	5.0E-06	(1)	7.8E+04	(4)	4.69E+02	(14)	2.8E-01	(6)	5.45E-01	(4)
Aroclor 1248	12672-29-6	2.9E+02	(6)	1.2E+02	(4)	1.8E-02	(6)	2.4E-02	(1)	6.2E-06	(1)	7.7E+04	(4)	4.59E+02	(14)	1.0E-01	(6)	4.75E-01	(4)
Aroclor 1254	11097-69-1	3.3E+02	(6)	1.4E+02	(4)	1.2E-02	(6)	2.4E-02	(1)	6.1E-06	(1)	1.3E+05	(4)	7.83E+02	(14)	4.3E-02	(6)	7.51E-01	(4)
Aroclor 1260	11096-82-5	4.0E+02	(6)	1.6E+02	(4)	1.4E-02	(6)	3.5E-02	(1)	4.1E-06	(1)	3.5E+05	(4)	2.10E+03	(14)	1.4E-02	(6)	9.86E-01	(4)
Atrazine	1912-24-9	2.2E+02	(6)	1.7E+02	(6)	9.6E-08	(4)	2.6E-02	(1)	6.8E-06	(1)	2.2E+02	(4)	1.35E+00	(14)	3.5E+01	(6)	5.24E-03	(4)
Auramine	492-80-8	2.7E+02	(6)	1.4E+02	(6)	1.5E-07	(6)	4.6E-02	(1)	5.3E-06	(1)	4.5E+03	(4)	2.67E+01	(14)	5.4E+01	(6)	4.76E-03	(4)
Benomyl	17804-35-2	2.9E+02	(6)	1.4E+02	(4)	2.0E-10	(6)	4.3E-02	(1)	5.1E-06	(1)	3.4E+02	(4)	2.02E+00	(14)	3.8E+00	(6)	9.43E-04	(4)
Benzenethiol	108-98-5	1.1E+02	(6)	-1.5E+01	(6)	1.4E-02	(4)	7.3E-02	(1)	9.5E-06	(1)	2.3E+02	(4)	1.40E+00	(14)	8.4E+02	(6)	1.78E-02	(4)
Benzidine	92-87-5	1.8E+02	(6)	1.2E+02	(6)	2.1E-09	(6)	3.5E-02	(1)	7.5E-06	(1)	1.2E+03	(4)	7.14E+00	(14)	3.2E+02	(6)	1.13E-03	(4)
Benz[a]anthracene	56-55-3	2.3E+02	(6)	8.4E+01	(6)	4.9E-04	(6)	2.6E-02	(1)	6.7E-06	(1)	1.8E+05	(4)	1.06E+03	(14)	9.4E-03	(6)	5.52E-01	(4)
Benzo[a]pyrene	50-32-8	2.5E+02	(6)	1.8E+02	(6)	1.9E-05	(6)	2.5E-02	(1)	6.6E-06	(1)	5.9E+05	(4)	3.52E+03	(14)	1.6E-03	(6)	7.13E-01	(4)
Benzo[b]fluoranthene	205-99-2	2.5E+02	(6)	1.7E+02	(6)	2.7E-05	(6)	2.5E-02	(1)	6.4E-06	(1)	6.0E+05	(4)	3.60E+03	(14)	1.5E-03	(6)	4.17E-01	(4)
Benzo[k]fluoranthene	207-08-9	2.5E+02	(6)	2.2E+02	(6)	2.4E-05	(6)	2.5E-02	(1)	6.4E-06	(1)	5.9E+05	(4)	3.52E+03	(14)	8.0E-04	(6)	6.91E-01	(4)
Benzoic Acid	65-85-0	1.2E+02	(6)	1.2E+02	(6)	1.6E-06	(4)	7.0E-02	(1)	9.8E-06	(1)	6.0E-01	(2)	3.60E-03	(14)	3.4E+03	(6)	5.65E-03	(4)
Biphenyl, 1,1'-	92-52-4	1.5E+02	(6)	6.9E+01	(6)	1.3E-02	(6)	4.7E-02	(1)	7.6E-06	(1)	5.1E+03	(4)	3.08E+01	(14)	7.5E+00	(6)	9.43E-02	(4)
Bis(2-chloroethoxy)methane	111-91-1	1.7E+02	(6)	-3.2E+01	(6)	1.6E-04	(4)	6.1E-02	(1)	7.1E-06	(1)	1.4E+01	(4)	8.63E-02	(14)	7.8E+03	(6)	1.22E-03	(4)
Bis(2-chloroethyl)ether	111-44-4	1.4E+02	(6)	-5.2E+01	(6)	7.0E-04	(4)	5.7E-02	(1)	8.7E-06	(1)	3.2E+01	(4)	1.93E-01	(14)	1.7E+04	(6)	1.78E-03	(4)
Bis(chloromethyl)ether	542-88-1	1.1E+02	(6)	-4.2E+01	(6)	1.8E-01	(4)	7.6E-02	(1)	1.0E-05	(1)	9.7E+00	(4)	5.82E-02	(14)	2.2E+04	(6)	8.55E-04	(4)
Bis(2-ethylhexyl)phthalate	117-81-7	3.9E+02	(6)	-5.5E+01	(6)	1.1E-05	(4)	1.7E-02	(1)	4.2E-06	(1)	1.2E+05	(4)	7.18E+02	(14)	2.7E-01	(6)	1.13E+00	(4)
Butyl Benzyl Phthlate	85-68-7	3.1E+02	(6)	6.1E+01	(4)	5.2E-05	(4)	2.1E-02	(1)	5.2E-06	(1)	7.2E+03	(4)	4.29E+01	(14)	2.7E+00	(6)	3.85E-02	(4)
Cacodylic Acid	75-60-5	1.4E+02	(6)	2.0E+02	(6)	7.4E-13	(6)	7.1E-02	(1)	8.3E-06	(1)	4.4E+01	(4)	2.63E-01	(14)	2.0E+06	(6)	4.60E-04	(4)
Captan	133-06-2	3.0E+02	(6)	1.8E+02	(6)	2.9E-07	(4)	2.6E-02	(1)	6.9E-06	(1)	2.5E+02	(4)	1.51E+00	(14)	5.1E+00	(6)	2.34E-03	(4)
Carbaryl	63-25-2	2.0E+02	(6)	1.5E+02	(6)	1.3E-07	(4)	2.7E-02	(1)	7.1E-06	(1)	3.5E+02	(4)	2.13E+00	(14)	1.1E+02	(6)	4.31E-03	(4)
Carbofuran	1563-66-2	2.2E+02	(6)	1.5E+02	(6)	1.3E-07	(4)	2.6E-02	(1)	6.6E-06	(1)	9.5E+01	(4)	5.72E-01	(14)	3.2E+02	(6)	3.13E-03	(4)
Carbosulfan	55285-14-8	3.8E+02	(6)	2.5E+01	(6)	2.1E-05	(4)	1.8E-02	(1)	4.4E-06	(1)	1.2E+04	(4)	7.18E+01	(14)	3.0E-01	(6)	5.79E-02	(4)
Chloramben	133-90-4	2.1E+02	(6)	2.0E+02	(6)	1.6E-09	(4)	5.4E-02	(1)	6.4E-06	(1)	2.1E+01	(4)	1.28E-01	(14)	7.0E+02	(6)	2.01E-03	(4)
Chlordane	12789-03-6	4.1E+02	(6)	1.1E+02	(4)	2.0E-03	(4)	2.1E-02	(1)	5.4E-06	(1)	3.4E+04	(4)	2.03E+02	(14)	5.6E-02	(4)	1.07E-01	(4)
Chlordecone (Kepone)	143-50-0	4.9E+02	(6)	3.5E+02	(4)	2.2E-06	(4)	2.0E-02	(1)	4.9E-06	(1)	1.8E+04	(4)	1.05E+02	(14)	2.7E+00	(6)	1.09E-02	(4)
Chloro-2-methylaniline HCl, 4-	3165-93-3	1.8E+02	(6)	1.6E+02	(4)	6.4E-05	(6)	6.0E-02	(1)	7.0E-06	(1)	3.5E+02	(4)	2.11E+00	(14)	9.5E+02	(6)	1.80E-05	(4)
Chloroacetic Acid	79-11-8	9.5E+01	(4)	6.3E+01	(4)	3.8E-07	(4)	9.4E-02	(1)	1.2E-05	(1)	1.4E+00	(4)	8.64E-03	(14)	8.6E+05	(4)	6.47E-04	(4)
Chloroacetophenone, 2-	532-27-4	1.5E+02	(6)	5.7E+01	(6)	1.4E-04	(6)	5.2E-02	(1)	8.7E-06	(1)	9.9E+01	(4)	5.93E-01	(14)	1.1E+03	(8)	4.06E-03	(4)
Chloroaniline, p-	106-47-8	1.3E+02	(6)	7.3E+01	(6)	4.7E-05	(4)	7.0E-02	(1)	1.0E-05	(1)	1.1E+02	(4)	6.76E-01	(14)	3.9E+03	(6)	4.96E-03	(4)
Chlorobenzilate	510-15-6	3.3E+02	(6)	3.7E+01	(6)	3.0E-06	(4)	2.2E-02	(1)	5.5E-06	(1)	1.5E+03	(4)	9.23E+00	(14)	1.3E+01	(6)	3.31E-02	(4)
Chloronaphthalene, Beta-	91-58-7	1.6E+02	(6)	6.1E+01	(4)	1.3E-02	(6)	4.5E-02	(1)	7.7E-06	(1)	2.5E+03	(4)	1.49E+01	(14)	1.2E+01	(6)	7.49E-02	(4)
Chlorophenol, 2-	95-57-8	1.3E+02	(6)	9.8E+00	(6)	4.6E-04	(6)	6.6E-02	(1)	9.5E-06	(1)	3.9E+02	(2)	2.33E+00	(14)	1.1E+04	(6)	7.99E-03	(4)
Chlorpyrifos	2921-88-2	3.5E+02	(6)	4.2E+01	(6)	1.2E-04	(6)	3.8E-02	(1)	4.5E-06	(1)	7.3E+03	(4)	4.37E+01	(14)	1.1E+00	(6)	3.34E-02	(4)
Chrysene	218-01-9	2.3E+02	(6)	2.6E+02	(6)	2.1E-04	(6)	2.6E-02	(1)	6.7E-06	(1)	1.8E+05	(4)	1.08E+03	(14)	2.0E-03	(6)	5.96E-01	(4)
Cresol, m-	108-39-4	1.1E+02	(6)	1.2E+01	(6)	3.5E-05	(6)	7.3E-02	(1)	9.3E-06	(1)	3.0E+02	(4)	1.80E+00	(14)	2.3E+04	(6)	7.77E-03	(4)
Cresol, o-	95-48-7	1.1E+02	(6)	3.0E+01	(6)	4.9E-05	(6)	7.3E-02	(1)	9.3E-06	(1)	3.1E+02	(4)	1.84E+00	(14)	2.6E+04	(6)	7.66E-03	(4)
Cresol, p-	106-44-5	1.1E+02	(6)	3.6E+01	(6)	4.1E-05	(6)	7.2E-02	(1)	9.2E-06	(1)	3.0E+02	(4)	1.80E+00	(14)	2.2E+04	(6)	7.54E-03	(4)
Cresol, p-chloro-m-	59-50-7	1.4E+02	(6)	6.7E+01	(6)	1.0E-04	(4)	7.0E-02	(1)	8.1E-06	(1)	4.9E+02	(4)	2.95E+00	(14)	3.8E+03	(6)	2.85E-02	(4)
Cresols	1319-77-3	3.2E+02	(6)	3.0E+01	(4)	2.5E-05	(6)	4.0E-02	(1)	4.7E-06	(1)	3.1E+02	(4)	1.84E+00	(14)	9.1E+03	(6)	7.66E-03	(4)
DDD	72-54-8	3.2E+02	(6)	1.1E+02	(6)	2.7E-04	(6)	4.1E-02	(1)	4.7E-06	(1)	1.2E+05	(4)	7.05E+02	(14)	9.0E-02	(6)	2.51E-01	(4)
DDE, p,p'-	72-55-9	3.2E+02	(6)	8.9E+01	(6)	1.7E-03	(6)	2.3E-02	(1)	5.9E-06	(1)	1.2E+05	(4)	7.05E+02	(14)	4.0E-02	(6)	5.45E-01	(4)
DDT	50-29-3	3.5E+02	(6)	1.1E+02	(6)	3.4E-04	(6)	3.8E-02	(1)	4.4E-06	(1)	1.7E+05	(4)	1.01E+03	(14)	5.5E-03	(6)	6.28E-01	(4)
Diallate	2303-16-4	2.7E+02	(6)	2.5E+01	(6)	1.6E-04	(4)	4.5E-02	(1)	5.3E-06	(1)	6.4E+02	(4)	3.87E+00	(14)	1.4E+01	(6)	4.60E-02	(4)
Diazinon	333-41-5	3.0E+02	(6)	8.8E+01	(4)	4.6E-06	(6)	2.1E-02	(1)	5.2E-06	(1)	3.0E+03	(4)	1.82E+01	(14)	4.0E+01	(6)	1.04E-02	(4)
Dibenz[a,h]anthracene	53-70-3	2.8E+02	(6)	2.7E+02	(6)	5.8E-06	(4)	2.4E-02	(1)	6.0E-06	(1)	1.9E+06	(4)	1.15E+04	(14)	2.5E-03	(6)	9.53E-01	(4)
Dibutyl Phthalate	84-74-2	2.8E+02	(6)	-3.5E+01	(6)	7.4E-05	(6)	2.1E-02	(1)	5.3E-06	(1)	1.2E+03	(4)	6.94E+00	(14)	1.1E+01	(6)	4.20E-02	(4)
Dicamba	1918-00-9	2.2E+02	(6)	1.2E+02	(6)	8.9E-08	(4)	2.9E-02	(1)	7.8E-06	(1)	2.9E+01	(4)	1.74E-01	(14)	8.3E+03	(6)	2.65E-03	(4)
Dichlorobenzene, 1,2-	95-50-1	1.5E+02	(6)	-1.7E+01	(6)	7.8E-02	(6)	5.6E-02	(1)	8.9E-06	(1)	3.8E+02	(4)	2.30E+00	(14)	1.6E+02	(6)	4.46E-02	(4)
Dichlorobenzene, 1,4-	106-46-7	1.5E+02	(6)	5.2E+01	(6)	9.9E-02	(6)	5.5E-02	(1)	8.7E-06	(1)	3.8E+02	(4)	2.25E+00	(14)	8.1E+01	(6)	4.53E-02	(4)
Dichlorobenzidine, 3,3'-	91-94-1	2.5E+02	(6)	1.3E+02	(6)	1.2E-09	(6)	4.7E-02	(1)	5.5E-06	(1)	3.2E+03	(4)	1.91E+01	(14)	3.1E+00	(6)	1.28E-02	(4)
Dichlorophenol, 2,4-	120-83-2	1.6E+02	(6)	4.5E+01	(6)	1.8E-04	(4)	4.9E-02	(1)	8.7E-06	(1)	1.5E+02	(2)	8.82E-01	(14)	5.6E+03	(6)	2.06E-02	(4)
Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	2.2E+02	(6)	1.4E+02	(6)	1.4E-06	(4)	5.2E-02	(1)	7.3E-06	(1)	3.0E+01	(4)	1.78E-01	(14)	6.8E+02	(6)	6.64E-03	(4)
Dichloropropionic acid, 2,2-	75-99-0	1.4E+02	(4)	-5.0E+00	(6)	2.3E-06	(4)	6.0E-02	(1)	9.4E-06	(1)	3.2E+00	(4)	1.94E-02	(14)	5.0E+05	(6)	8.15E-04	(4)
Dichlorvos	62-73-7	2.2E+02	(6)	-6.0E+01	(6)	2.3E-05	(6)	2.8E-02	(1)	7.3E-06	(1)	5.4E+01	(4)	3.24E-01	(14)	8.0E+03	(6)	8.04E-04	(4)
Dieldrin	60-57-1	3.8E+02	(6)	1.8E+02	(6)	4.1E-04	(6)	2.3E-02	(1)	6.0E-06	(1)	2.0E+04	(4)	1.21E+02	(14)	2.0E-01	(6)	3.26E-02	(4)
Diethanolamine	111-42-2	1.1E+02	(6)	2.8E+01	(6)	1.6E-09	(4)	7.7E-02	(1)	9.8E-06	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	4.51E-05	(4)
Diethyl Phthalate	84-66-2	2.2E+02	(6)	-4.1E+01	(6)	2.5E-05	(4)	2.6E-02	(1)	6.7E-06	(1)	1.0E+02	(4)	6.29E-01	(14)	1.1E+03	(6)	3.60E-03	(4)
Diethylstilbestrol	56-53-1	2.7E+02	(6)	1.7E+02	(6)	2.4E-10	(6)	4.6E-02	(1)	5.3E-06	(1)	2.7E+05	(4)	1.64E+03	(14)	1.2E+01	(6)	1.14E-01	(4)
Dimethoate	60-51-5	2.3E+02	(6)	5.2E+01	(6)	9.9E-09	(4)	2.6E-02	(1)	6.7E-06	(1)	1.3E+01	(4)	7.66E-02	(14)	2.3E+04	(6)	2.67E-04	(4)
Dimethoxybenzidine, 3,3'-	119-90-4	2.4E+02	(6)	1.4E+02	(6)	1.9E-09	(6)	4.9E-02	(1)	5.7E-06	(1)	5.1E+02	(4)	3.05E+00	(14)	6.0E+01	(6)	1.06E-03	(4)
Dimethylamino azobenzene [p-]	60-11-7	2.3E+02	(6)	1.2E+02	(6)	1.6E-08	(6)	5.1E-02	(1)	6.0E-06	(1)	2.0E+03	(4)	1.22E+01	(14)	2.3E-01	(6)	9.43E-02	(4)
Dimethylbenz(a)anthracene, 7,12-	57-97-6	2.6E+02	(6)	1.2E+02	(6)	1.5E-04	(4)	4.7E-02	(1)	5.5E-06	(1)	4.9E+05	(4)	2.96E+03	(14)	6.1E-02	(6)	4.08E-01	(4)
Dimethylbenzidine, 3,3'-	119-93-7	2.1E+02	(6)	1.3E+02	(6)	2.6E-09	(6)	5.3E-02	(1)	6.2E-06	(1)	3.2E+03	(4)	1.91E+01	(14)	1.3E+03	(6)	3.62E-03	(4)
Dimethylphenol, 2,4-	105-67-9	1.2E+02	(6)	2.5E+01	(6)	3.9E-05	(6)	6.2E-02	(1)	8.3E-06	(1)	4.9E+02	(4)	2.95E+00	(14)	7.9E+03	(6)	1.09E-02	(4)
Dinitrobenzene, 1,2-	528-29-0	1.7E+02	(6)	1.2E+02	(6)	2.2E-06	(4)	4.5E-02	(1)	8.3E-06	(1)	3.6E+02	(4)	2.15E+00	(14)	1.3E+02	(6)	2.37E-03	(4)
Dinitrobenzene, 1,3-	99-65-0	1.7E+02	(6)	9.0E+01	(6)	2.0E-06	(6)	4.8E-02	(1)	9.2E-06	(1)	3.5E+02	(4)	2.11E+00	(14)	5.3E+02	(6)	1.74E-03	(4)
Dinitrobenzene, 1,4-	100-25-4	1.7E+02	(6)	1.7E+02	(6)	3.4E-06	(6)	4.9E-02	(1)	9.4E-06	(1)	3.5E+02	(4)	2.11E+00	(14)	6.9E+01	(6)	1.67E-03	(4)
Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	2.7E+02	(6)	1.1E+02	(6)	2.3E-06	(6)	4.6E-02	(1)	5.4E-06	(1)	1.7E+04	(4)	9.92E+01	(14)	1.5E+01	(6)	2.75E-02	(4)
Dinitrophenol, 2,4-	51-28-5	1.8E+02	(6)	1.2E+02	(6)	3.5E-06	(6)	4.1E-02	(1)	9.1E-06	(1)	4.6E+02	(4)	2.76E+00	(14)	2.8E+03	(6)	1.87E-03	(4)
Dinitrotoluene, 2,4-	121-14-2	1.8E+02	(6)	7.1E+01	(6)	2.2E-06	(6)	3.8E-02	(1)	7.9E-06	(1)	5.8E+02	(4)	3.45E+00	(14)	2.0E+02	(6)	3.08E-03	(4)
Dinitrotoluene, 2,6-	606-20-2	1.8E+02	(6)	6.6E+01	(6)	3.1E-05	(4)	3.7E-02	(1)	7.8E-06	(1)	5.9E+02	(4)	3.52E+00	(14)	1.8E+02	(6)	3.70E-03	(4)

Table 3: Physical/chemical data

Chemical	CAS Number	MW (gms/mol)	Source	Melting Point (°C)	Source	Henry's Law Constant (unitless)	Source	Air Diffusivity (cm^2/s)	Source	Water Diffusivity (cm^2/s)	Source	Koc (L/kg)	Source	Kd (cm^3/g)	Source	Solubility in Water (mg/L)	Source	Kp (cm/hr)	Source
Dinitrotoluene Mixture, 2,4/2,6	25321-14-6	1.80E+02	(4)	6.00E+01	(4)	1.60E-05	(4)	5.90E-02	(1)	6.90E-06	(1)	5.90E+02	(4)	3.54	(14)	2.70E+02	(4)	4.16E-03	(4)
Dinoseb	88-85-7	2.4E+02	(6)	4.0E+01	(6)	1.9E-05	(4)	2.5E-02	(1)	6.5E-06	(1)	4.3E+03	(4)	2.58E+01	(14)	5.2E+01	(6)	1.63E-02	(4)
Diphenylhydrazine, 1,2-	122-66-7	1.8E+02	(6)	1.3E+02	(6)	2.0E-05	(4)	3.4E-02	(1)	7.2E-06	(1)	1.5E+03	(4)	9.03E+00	(14)	2.2E+02	(6)	1.30E-02	(4)
Diquat	2764-72-9	3.4E+02	(6)	3.4E+02	(6)	5.8E-12	(6)	2.1E-02	(1)	5.2E-06	(1)	9.3E+03	(4)	5.56E+01	(14)	7.1E+05	(6)	5.38E-03	(4)
Disulfoton	298-04-4	2.7E+02	(6)	-2.5E+01	(6)	8.8E-05	(4)	2.3E-02	(1)	5.7E-06	(1)	8.4E+02	(4)	5.03E+00	(14)	1.6E+01	(6)	2.12E-02	(4)
Diuron	330-54-1	2.3E+02	(6)	1.6E+02	(6)	2.1E-08	(4)	5.0E-02	(1)	5.9E-06	(1)	1.1E+02	(4)	6.55E-01	(14)	4.2E+01	(6)	4.66E-03	(4)
Endothall	145-73-3	1.9E+02	(6)	1.4E+02	(6)	1.6E-14	(4)	3.7E-02	(1)	8.2E-06	(1)	1.9E+01	(4)	1.16E-01	(14)	1.0E+05	(6)	2.63E-03	(4)
Endosulfan	115-29-7	4.1E+02	(6)	1.1E+02	(6)	2.7E-03	(6)	2.2E-02	(1)	5.8E-06	(1)	6.8E+03	(4)	4.06E+01	(14)	3.3E-01	(6)	2.86E-03	(4)
Endrin	72-20-8	3.8E+02	(6)	2.3E+02	(6)	2.6E-04	(6)	3.6E-02	(1)	4.2E-06	(1)	2.0E+04	(4)	1.21E+02	(14)	2.5E-01	(6)	3.26E-02	(4)
Epichlorohydrin	106-89-8	9.3E+01	(6)	-5.7E+01	(6)	1.2E-03	(4)	8.9E-02	(1)	1.1E-05	(1)	9.9E+00	(4)	5.94E-02	(14)	6.6E+04	(6)	9.44E-04	(4)
Ethion	563-12-2	3.8E+02	(6)	-1.3E+01	(6)	1.6E-05	(4)	1.9E-02	(1)	4.8E-06	(1)	8.8E+02	(4)	5.29E+00	(14)	2.0E+00	(6)	2.55E-02	(4)
Ethylene Glycol	107-21-1	6.2E+01	(6)	-1.3E+01	(6)	2.5E-06	(6)	1.2E-01	(1)	1.4E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	8.77E-05	(4)
Ethylene Thiourea	96-45-7	1.0E+02	(6)	2.0E+02	(6)	5.6E-10	(6)	8.7E-02	(1)	1.0E-05	(1)	1.3E+01	(4)	7.78E-02	(14)	2.0E+04	(6)	1.52E-04	(4)
Fluoranthene	206-44-0	2.0E+02	(6)	1.1E+02	(6)	3.6E-04	(6)	2.8E-02	(1)	7.2E-06	(1)	5.5E+04	(4)	3.33E+02	(14)	2.6E-01	(6)	3.08E-01	(4)
Fluorene	86-73-7	1.7E+02	(6)	1.1E+02	(6)	3.9E-03	(6)	4.4E-02	(1)	7.9E-06	(1)	9.2E+03	(4)	5.50E+01	(14)	1.7E+00	(6)	1.10E-01	(4)
Furan	110-00-9	6.8E+01	(6)	-8.6E+01	(6)	2.2E-01	(4)	1.0E-01	(1)	1.2E-05	(1)	8.0E+01	(4)	4.80E-01	(14)	1.0E+04	(6)	5.05E-03	(4)
Furfural	98-01-1	9.6E+01	(6)	-3.8E+01	(6)	1.5E-04	(4)	8.5E-02	(1)	1.1E-05	(1)	6.1E+00	(4)	3.65E-02	(14)	7.4E+04	(6)	8.48E-04	(4)
Glyphosate	1071-83-6	1.7E+02	(6)	1.9E+02	(6)	8.6E-11	(4)	6.2E-02	(1)	7.3E-06	(1)	2.1E+03	(11)	1.26E+01	(14)	1.1E+04	(6)	4.54E-08	(4)
Guthion	86-50-0	3.2E+02	(4)	7.3E+01	(4)	9.8E-07	(4)	2.3E-02	(1)	6.0E-06	(1)	5.2E+01	(4)	3.12E-01	(14)	2.1E+01	(4)	1.75E-03	(4)
Heptachlor	76-44-8	3.7E+02	(6)	9.6E+01	(6)	1.2E-02	(6)	2.2E-02	(1)	5.7E-06	(1)	4.1E+04	(4)	2.48E+02	(14)	1.8E-01	(6)	1.43E-01	(4)
Heptachlor Epoxide	1024-57-3	3.9E+02	(6)	1.6E+02	(6)	8.6E-04	(6)	2.4E-02	(1)	6.2E-06	(1)	1.0E+04	(4)	6.07E+01	(14)	2.0E-01	(6)	2.09E-02	(4)
Hexachlorobenzene	118-74-1	2.8E+02	(6)	2.3E+02	(6)	7.0E-02	(6)	2.9E-02	(1)	7.8E-06	(1)	6.2E+03	(4)	3.72E+01	(14)	6.2E-03	(6)	2.54E-01	(4)
Hexachlorobutadiene	87-68-3	2.6E+02	(6)	-2.1E+01	(6)	4.2E-01	(6)	2.7E-02	(1)	7.0E-06	(1)	8.5E+02	(4)	5.07E+00	(14)	3.2E+00	(6)	8.10E-02	(4)
Hexachlorocyclohexane, Alpha-	319-84-6	2.9E+02	(6)	1.6E+02	(6)	2.7E-04	(6)	4.3E-02	(1)	5.1E-06	(1)	2.8E+03	(4)	1.68E+01	(14)	2.0E+00	(6)	2.06E-02	(4)
Hexachlorocyclohexane, Beta-	319-85-7	2.9E+02	(6)	1.1E+02	(6)	1.8E-05	(6)	2.8E-02	(1)	7.4E-06	(1)	2.8E+03	(4)	1.68E+01	(14)	2.4E-01	(6)	2.06E-02	(4)
Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	2.9E+02	(6)	1.1E+02	(6)	2.1E-04	(6)	4.3E-02	(1)	5.1E-06	(1)	2.8E+03	(4)	1.68E+01	(14)	7.3E+00	(6)	2.06E-02	(4)
Hexachlorocyclohexane, Technical	608-73-1	2.9E+02	(6)	1.1E+02	(4)	2.1E-04	(4)	4.3E-02	(1)	5.1E-06	(1)	2.8E+03	(4)	1.68E+01	(14)	8.0E+00	(6)	2.06E-02	(4)
Hexachlorocyclopentadiene	77-47-4	2.7E+02	(6)	-9.0E+00	(6)	1.1E+00	(4)	2.7E-02	(1)	7.2E-06	(1)	1.4E+03	(4)	8.42E+00	(14)	1.8E+00	(6)	1.03E-01	(4)
Hexachloroethane	67-72-1	2.4E+02	(6)	1.9E+02	(6)	1.6E-01	(6)	3.2E-02	(1)	8.9E-06	(1)	2.0E+02	(4)	1.18E+00	(14)	5.0E+01	(6)	4.15E-02	(4)
Hexachlorophene	70-30-4	4.1E+02	(6)	1.7E+02	(6)	2.2E-11	(6)	3.5E-02	(1)	4.0E-06	(1)	6.7E+05	(4)	4.01E+03	(14)	1.4E+02	(6)	8.36E-01	(4)
Hexamethylene Diisocyanate, 1,6-	822-06-0	1.7E+02	(6)	-6.7E+01	(6)	2.0E-03	(6)	4.0E-02	(1)	7.2E-06	(1)	4.8E+03	(4)	2.89E+01	(14)	1.2E+02	(6)	2.37E-02	(4)
Hexamethylphosphoramide	680-31-9	1.8E+02	(6)	7.2E+00	(6)	8.2E-07	(6)	3.5E-02	(1)	6.9E-06	(1)	1.0E+01	(4)	6.00E-02	(14)	1.0E+06	(6)	2.37E-04	(4)
Hexanedioic Acid	124-04-9	1.5E+02	(6)	1.5E+02	(6)	1.9E-10	(4)	5.8E-02	(1)	9.2E-06	(1)	2.4E+01	(4)	1.46E-01	(14)	3.1E+04	(6)	2.68E-04	(4)
Hydroquinone	123-31-9	1.1E+02	(6)	1.7E+02	(6)	1.9E-09	(4)	8.0E-02	(1)	1.1E-05	(1)	2.4E+02	(4)	1.44E+00	(14)	7.2E+04	(6)	9.31E-04	(4)
Indeno[1,2,3-cd]pyrene	193-39-5	2.8E+02	(6)	1.6E+02	(6)	1.4E-05	(6)	2.5E-02	(1)	6.4E-06	(1)	2.0E+06	(2)	1.17E+04	(14)	1.9E-04	(6)	1.24E+00	(4)
Isophorone	78-59-1	1.4E+02	(6)	-8.1E+00	(6)	2.7E-04	(4)	5.3E-02	(1)	7.5E-06	(1)	6.5E+01	(4)	3.91E-01	(14)	1.2E+04	(6)	3.54E-03	(4)
Malathion	121-75-5	3.3E+02	(6)	2.8E+00	(6)	2.0E-07	(6)	2.1E-02	(1)	5.2E-06	(1)	3.1E+01	(4)	1.88E-01	(14)	1.4E+02	(6)	8.12E-04	(4)
Maleic Anhydride	108-31-6	9.8E+01	(6)	5.3E+01	(6)	1.6E-04	(6)	8.8E-02	(1)	1.1E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.6E+05	(8)	5.25E-03	(4)
Maleic Hydrazide	123-33-1	1.1E+02	(6)	3.1E+02	(6)	1.1E-09	(6)	8.2E-02	(1)	9.5E-06	(1)	3.3E+00	(4)	1.98E-02	(14)	4.5E+03	(6)	1.02E-04	(4)
Malononitrile	109-77-3	6.6E+01	(6)	3.2E+01	(6)	5.4E-06	(4)	1.2E-01	(1)	1.4E-05	(1)	3.3E+00	(4)	2.00E-02	(14)	1.3E+05	(6)	2.66E-04	(4)
Methomyl	16752-77-5	1.6E+02	(6)	7.8E+01	(6)	8.1E-10	(4)	4.8E-02	(1)	8.4E-06	(1)	1.0E+01	(4)	6.00E-02	(14)	5.8E+04	(6)	4.82E-04	(4)
Methoxychlor	72-43-5	3.5E+02	(6)	8.7E+01	(6)	8.3E-06	(6)	2.2E-02	(1)	5.6E-06	(1)	2.7E+04	(4)	1.61E+02	(14)	1.0E-01	(6)	4.28E-02	(4)
Methyl Parathion	298-00-0	2.6E+02	(6)	3.6E+01	(6)	4.1E-06	(6)	2.5E-02	(1)	6.4E-06	(1)	7.3E+02	(4)	4.38E+00	(14)	3.8E+01	(6)	4.16E-03	(4)
Methylaniline Hydrochloride, 2-	636-21-5	1.4E+02	(4)	2.2E+02	(6)	8.6E-05	(6)	6.9E-02	(1)	8.1E-06	(1)	1.2E+02	(4)	6.90E-01	(14)	8.3E+03	(4)	1.05E-05	(4)
Methylcholanthrene, 3-	56-49-5	2.7E+02	(6)	1.8E+02	(6)	2.1E-04	(4)	2.4E-02	(1)	6.1E-06	(1)	9.6E+05	(4)	5.77E+03	(14)	2.9E-03	(6)	9.03E-01	(4)
Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	2.7E+02	(6)	1.1E+02	(6)	1.7E-09	(6)	4.6E-02	(1)	5.4E-06	(1)	5.7E+03	(4)	3.42E+01	(14)	1.4E+01	(6)	1.97E-02	(4)
Methylenebisbenzenamine, 4,4'-	101-77-9	2.0E+02	(6)	9.3E+01	(6)	2.2E-09	(6)	5.6E-02	(1)	6.5E-06	(1)	2.1E+03	(4)	1.28E+01	(14)	1.0E+03	(6)	1.38E-03	(4)
Methylenediphenyl Diisocyanate	101-68-8	2.5E+02	(6)	3.8E+01	(6)	3.7E-05	(6)	2.4E-02	(1)	6.2E-06	(1)	2.8E+05	(4)	1.71E+03	(14)	8.3E-01	(6)	1.81E-01	(4)
Methylnaphthalene, 1-	90-12-0	1.4E+02	(6)	-3.0E+01	(6)	2.1E-02	(6)	5.3E-02	(1)	7.8E-06	(1)	2.5E+03	(4)	1.52E+01	(14)	2.6E+01	(6)	9.31E-02	(4)
Methylnaphthalene, 2-	91-57-6	1.4E+02	(6)	3.4E+01	(6)	2.1E-02	(6)	5.2E-02	(1)	7.8E-06	(1)	2.5E+03	(4)	1.49E+01	(14)	2.5E+01	(6)	9.17E-02	(4)
Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	1.5E+02	(4)	1.2E+02	(4)	5.0E-11	(4)	6.8E-02	(1)	8.0E-06	(1)	7.2E+01	(4)	4.32E-01	(14)	2.7E+05	(6)	5.72E-05	(4)
Naled	300-76-5	3.8E+02	(6)	2.7E+01	(6)	2.7E-03	(4)	2.5E-02	(1)	6.4E-06	(1)	1.3E+02	(4)	7.60E-01	(14)	1.5E+00	(6)	9.44E-05	(4)
Naphthylamine, 2-	91-59-8	1.4E+02	(6)	1.1E+02	(6)	3.3E-06	(6)	6.4E-02	(1)	1.0E-05	(1)	2.5E+03	(4)	1.49E+01	(14)	1.9E+02	(6)	8.07E-03	(4)
Nitroaniline, 4-	100-01-6	1.4E+02	(6)	1.5E+02	(6)	5.2E-08	(6)	6.4E-02	(1)	9.8E-06	(1)	1.1E+02	(4)	6.55E-01	(14)	7.3E+02	(6)	2.21E-03	(4)
Nitrobenzene	98-95-3	1.2E+02	(6)	5.7E+00	(6)	9.8E-04	(6)	6.8E-02	(1)	9.4E-06	(1)	2.3E+02	(4)	1.36E+00	(14)	2.1E+03	(6)	5.41E-03	(4)
Nitroglycerin	55-63-0	2.3E+02	(6)	1.4E+01	(6)	3.5E-06	(4)	2.9E-02	(1)	7.7E-06	(1)	1.2E+02	(4)	6.95E-01	(14)	1.4E+03	(6)	9.94E-04	(4)
Nitropropane, 2-	79-46-9	8.9E+01	(6)	-9.1E+01	(6)	4.9E-03	(4)	8.5E-02	(1)	1.0E-05	(1)	3.1E+01	(4)	1.85E-01	(14)	1.7E+04	(6)	2.06E-03	(4)
Nitrosodiethanolamine, N-	1116-54-7	1.3E+02	(6)	8.2E+01	(4)	2.0E-10	(6)	7.3E-02	(1)	8.5E-06	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	3.91E-05	(4)
Nitrosodiethylamine, N-	55-18-5	1.0E+02	(6)	-1.6E+01	(4)	1.5E-04	(6)	7.4E-02	(1)	9.1E-06	(1)	8.3E+01	(4)	4.98E-01	(14)	1.1E+05	(6)	8.72E-04	(4)
Nitrosodimethylamine, N-	62-75-9	7.4E+01	(6)	-3.9E+01	(4)	7.4E-05	(6)	9.9E-02	(1)	1.2E-05	(1)	2.3E+01	(4)	1.37E-01	(14)	1.0E+06	(6)	2.51E-04	(4)
Nitroso-di-N-butylamine, N-	924-16-3	1.6E+02	(6)	2.8E+01	(4)	5.4E-04	(6)	4.2E-02	(1)	6.8E-06	(1)	9.1E+02	(4)	5.49E+00	(14)	1.3E+03	(6)	1.13E-02	(4)
Nitroso-di-N-propylamine, N-	621-64-7	1.3E+02	(6)	6.8E+00	(4)	2.2E-04	(6)	5.6E-02	(1)	7.8E-06	(1)	2.8E+02	(4)	1.65E+00	(14)	1.3E+04	(6)	2.33E-03	(4)
Nitrosodiphenylamine, N-	86-30-6	2.0E+02	(6)	6.7E+01	(6)	4.9E-05	(6)	5.6E-02	(1)	6.5E-06	(1)	2.6E+03	(4)	1.58E+01	(14)	3.5E+01	(6)	1.45E-02	(4)
Nitrosomorpholine [N-]	59-89-2	1.2E+02	(6)	2.9E+01	(6)	1.0E-06	(6)	8.0E-02	(1)	9.3E-06	(1)	2.3E+01	(4)	1.35E-01	(14)	1.0E+06	(6)	1.78E-04	(4)
Nitroso-N-ethylurea, N-	759-73-9	1.2E+02	(6)	9.9E+01	(4)	5.4E-09	(6)	7.9E-02	(1)	9.3E-06	(1)	2.1E+01	(4)	1.26E-01	(14)	1.3E+04	(6)	4.90E-04	(4)
Nitroso-N-methylurea, N-	684-93-5	1.0E+02	(6)	1.2E+02	(4)	4.1E-09	(6)	8.6E-02	(1)	1.0E-05	(1)	1.1E+01	(4)	6.60E-02	(14)	1.4E+04	(6)	3.95E-04	(4)
Nitrosopiperidine [N-]	100-75-4	1.1E+02	(6)	6.8E+00	(4)	3.5E-05	(6)	7.0E-02	(1)	9.2E-06	(1)	1.7E+02	(4)	1.01E+00	(14)	7.7E+04	(6)	6.22E-04	(4)
Nitrosopyrrolidine, N-	930-55-2	1.0E+02	(6)	-3.1E+00	(4)	2.0E-06	(6)	8.0E-02	(1)	1.0E-05	(1)	9.2E+01	(4)	5.51E-01	(14)	1.0E+06	(6)	3.21E-04	(4)
Nitrotoluene, o-	88-72-2	1.4E+02	(6)	-1.0E+01	(6)	5.1E-04	(6)	5.9E-02	(1)	8.7E-06	(1)	3.7E+02	(4)	2.22E+00	(14)	6.5E+02	(6)	8.99E-03	(4)
Nitrotoluene, p-	99-99-0	1.4E+02	(6)	5.2E+01	(6)	2.3E-04	(6)	5.7E-02	(1)	8.4E-06	(1)	3.6E+02	(4)	2.18E+00	(14)	4.4E+02	(6)	1.00E-02	(4)
Octamethylpyrophosphoramide	152-16-9	2.9E+02	(6)	1.7E+01	(6)	1.5E-08	(6)	2.2E-02	(1)	5.4E-06	(1)	2.0E+01	(4)	1.21E-01	(14)	1.0E+06	(6)	8.30E-06	(4)
Octyl Phthalate, di-N-	117-84-0	3.9E+02	(6)	2.5E+01	(4)	1.1E-04	(4)	3.6E-02	(1)	4.2E-06	(1)	1.4E+05	(4)	8.45E+02	(14)	2.2E-02	(6)	2.43E+00	(4)
Oxamyl	23135-22-0	2.2E+02	(6)	1.0E+02	(6)	9.7E-09	(4)	2.3E-02	(1)	5.9E-06	(1)	1.0E+01	(4)	6.00E-02	(14)	2.8E+05	(6)	4.49E-05	(4)
Parathion	56-38-2	2.9E+02	(6)	6.1E+00	(6)	1.2E-05	(6)	2.3E-02	(1)	5.8E-06	(1)	2.4E+03	(4)	1.45E+01	(14)	1.1E+01	(6)	1.28E-02	(4)
Pentachlorobenzene	608-93-5	2.5E+02	(6)	8.6E+01	(6)	2.9E-02	(6)	2.9E-02	(1)	7.9E-06	(1)	3.7E+03	(4)	2.22E+01	(14)	8.3E-01	(6)	1.68E-01	(4)
Pentachloroethane	76-01-7	2.0E+02	(6)	-2.9E+01	(6)	7.9E-02	(4)	3.2E-02	(1)	8.6E-06	(1)	1.4E+02	(4)	8.17E-01	(14)	4.9E+02	(6)	1.58E-02	(4)
Pentachloronitrobenzene	82-68-8	3.0E+02	(6)	1.4E+02	(6)	1.8E-03	(4)	2.6E-02	(1)	6.9E-06	(1)	6.0E+03	(4)	3.60E+01	(14)	4.4E-01	(6)	4.18E-02	(4)
Pentachlorophenol	87-86-5	2.7E+02	(6)	1.7E+02	(6)	1.0E-06	(6)	3.0E-02	(1)	8.0E-06	(1)	5.9E+02	(2)	3.55E+00	(14)	1.4E+01	(6)	1.27E-01	(4)
Phenacetin	62-44-2	1.8E+02	(6)	1.4E+02	(6)	8.7E-09	(4)	6.0E-02	(1)	7.0E-06	(1)	4.1E+01	(4)	2.46E-01	(14)	7.7E+02	(6)	1.73E-03	(4)
Phenol	108-95-2	9.4E+01	(6)	4.1E+01	(6)	1.4E-05	(6)	8.3E-02	(1)	1.0E-05	(1)	1.9E+02	(4)	1.12E+00	(14)	8.3E+04	(6)	4.34E-03	(4)
Phenylmercuric Acetate	62-38-4	3.4E+02	(6)	1.5E+02	(6)	2.3E-08	(4)	3.9E-02	(1)	4.6E-06	(1)	5.6E+01	(4)	3.39E-01	(14)	4.4E+03	(6)	5.99E-05	(4)
Phorate	298-02-2	2.6E+02	(6)	-1.5E+01	(7)	1.8E-04	(4)	2.3E-02	(1)	5.9E-06	(1)	4.6E+02	(4)	2.76E+00	(14)	5.0E+01	(6)	1.26E-02	(4)
Phosphoric Acid	7664-38-2	9.8E+01	(6)	4.2E+01	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.5E+06	(7)	1.00E-03	(3)
Phthalic Anhydride	85-44-9	1.5E+02	(6)	1.3E+02	(6)	6.7E-07	(4)	5.9E-02	(1)	9.8E-06	(1)	1.0E+01	(4)	6.00E-02	(14)	6.2E+03	(6)	2.67E-03	(4)
Picloram	1918-02-1	2.4E+02	(6)	2.2E+02	(6)	2.2E-12	(4)	4.9E-02	(1)	5.7E-06	(1)	3.9E+01	(4)	2.33E-01	(14)	4.3E+02	(6)	1.27E-03	(4)
Polychlorinated Biphenyls, Total	1336-36-3	2.9E+02	(4)	1.2E+02	(4)	1.7E-02	(6)	2.4E-02	(1)	6.3E-06	(1)	7.8E+04	(4)	4.69E+02	(14)	7.0E-01	(6)	5.45E-01	(4)
Pronamide	23950–58–5	2.6E+02	(6)	1.6E+02	(6)	4.0E-07	(4)	4.7E-02	(1)	5.5E-06	(1)	4.0E+02	(4)	2.43E+00	(14)	1.5E+01	(6)	1.09E-02	(4)
Propargite	2312-35-8	3.5E+02	(6)	1.7E+02	(4)	2.6E-05	(4)	1.9E-02	(1)	4.8E-06	(1)	3.7E+04	(4)	2.20E+02	(14)	2.2E-01	(6)	3.56E-02	(4)
Propham	122-42-9	1.8E+02	(6)	8.7E+01	(6)	7.5E-06	(4)	3.6E-02	(1)	7.1E-06	(1)	2.2E+02	(4)	1.31E+00	(14)	1.8E+02	(6)	8.26E-03	(4)
Propoxur (Baygon)	114-26-1	2.1E+02	(4)	8.7E+01	(4)	5.8E-08	(4)	2.6E-02	(1)	6.6E-06	(1)	6.0E+01	(4)	3.60E-01	(14)	1.9E+03	(4)	1.07E-03	(4)
Pyrene	129-00-0	2.0E+02	(6)	1.5E+02	(6)	4.9E-04	(6)	2.8E-02	(1)	7.2E-06	(1)	5.4E+04	(4)	3.26E+02	(14)	1.4E-01	(6)	2.01E-01	(4)
Pyridine	110-86-1	7.9E+01	(6)	-4.2E+01	(6)	4.5E-04	(6)	9.3E-02	(1)	1.1E-05	(1)	7.2E+01	(4)	4.30E-01	(14)	1.0E+06	(6)	1.52E-03	(4)
Quinoline	91-22-5	1.3E+02	(6)	-1.5E+01	(6)	6.8E-05	(4)	6.2E-02	(1)	8.7E-06	(1)	1.5E+03	(4)	9.26E+00	(14)	6.1E+03	(6)	6.59E-03	(4)
Safrole	94-59-7	1.6E+02	(6)	1.1E+01	(6)	3.7E-04	(6)	4.4E-02	(1)	7.6E-06	(1)	2.1E+02	(4)	1.24E+00	(14)	1.2E+02	(6)	1.13E-02	(3)
Simazine	122-34-9	2.0E+02	(6)	2.3E+02	(6)	3.9E-08	(4)	2.8E-02	(1)	7.4E-06	(1)	1.5E+02	(4)	8.79E-01	(14)	6.2E+00	(6)	3.25E-03	(4)
Strychnine	57-24-9	3.3E+02	(6)	2.9E+02	(6)	3.1E-12	(6)	2.2E-02	(1)	5.6E-06	(1)	5.4E+03	(4)	3.24E+01	(14)	1.6E+02	(6)	3.99E-04	(4)
TCDD, 2,3,7,8-	1746-01-6	3.2E+02	(6)	3.1E+02	(6)	2.0E-03	(4)	4.7E-02	(1)	6.8E-06	(1)	2.5E+05	(4)	1.49E+03	(14)	2.0E-04	(6)	8.08E-01	(4)
Tetrachlorophenol, 2,3,4,6-	58-90-2	2.3E+02	(6)	7.0E+01	(6)	3.6E-04	(4)	5.0E-02	(1)	5.9E-06	(1)	2.8E+02	(2)	1.68E+00	(14)	2.3E+01	(6)	7.10E-02	(4)
Tetraethyl Dithiopyrophosphate	3689-24-5	3.2E+02	(6)	-3.2E+01	(4)	1.8E-04	(4)	2.1E-02	(1)	5.3E-06	(1)	2.7E+02	(4)	1.59E+00	(14)	3.0E+01	(6)	1.09E-02	(4)
Tetrahydrofuran	109-99-9	7.2E+01	(6)	-1.1E+02	(6)	2.9E-03	(6)	9.9E-02	(1)	1.1E-05	(1)	1.1E+01	(4)	6.45E-02	(14)	1.0E+06	(6)	1.25E-03	(4)
Thiofanox	39196-18-4	2.2E+02	(6)	5.7E+01	(6)	3.8E-07	(4)	5.2E-02	(1)	6.1E-06	(1)	7.2E+01	(4)	4.34E-01	(14)	5.2E+03	(6)	6.27E-03	(4)
Thiophanate, Methyl	23564-05-8	3.4E+02	(6)	1.7E+02	(6)	4.9E-08	(4)	3.9E-02	(1)	4.5E-06	(1)	3.3E+02	(4)	1.96E+00	(14)	2.7E+01	(6)	1.60E-04	(4)
Thiram	137-26-8	2.4E+02	(6)	1.6E+02	(6)	7.4E-06	(4)	2.6E-02	(1)	6.6E-06	(1)	6.1E+02	(4)	3.67E+00	(14)	3.0E+01	(6)	9.90E-04	(4)
Toluene-2,4-diisocyanate	584-84-9	1.7E+02	(4)	2.1E+01	(4)	2.7E-01	(6)	4.0E-02	(1)	7.8E-06	(1)	7.4E+03	(4)	4.45E+01	(14)	3.7E+01	(4)	5.05E-01	(4)
Toluene-2,6-diisocyanate	91-08-7	1.7E+02	(4)	1.8E+01	(4)	4.5E-04	(4)	6.1E-02	(1)	7.1E-06	(1)	7.6E+03	(4)	4.55E+01	(14)	3.8E+01	(4)	5.05E-02	(4)
Toluidine, p-	106-49-0	1.1E+02	(6)	4.4E+01	(6)	8.3E-05	(6)	7.1E-02	(1)	9.0E-06	(1)	1.1E+02	(4)	6.76E-01	(14)	6.5E+03	(6)	3.29E-03	(4)
Toxaphene	8001-35-2	4.5E+02	(6)	7.7E+01	(6)	2.5E-04	(6)	2.1E-02	(1)	5.3E-06	(1)	7.7E+04	(4)	4.63E+02	(14)	5.5E-01	(6)	5.18E-02	(4)
Triallate	2303-17-5	3.0E+02	(6)	2.9E+01	(6)	4.9E-04	(4)	2.2E-02	(1)	5.7E-06	(1)	1.0E+03	(4)	6.05E+00	(14)	4.0E+00	(6)	3.49E-02	(4)
Trichlorobenzene, 1,2,4-	120-82-1	1.8E+02	(6)	1.7E+01	(6)	5.8E-02	(6)	4.0E-02	(1)	8.4E-06	(1)	1.4E+03	(4)	8.14E+00	(14)	4.9E+01	(6)	7.05E-02	(4)
Trichlorophenol, 2,4,5-	95-95-4	2.0E+02	(6)	6.9E+01	(6)	6.6E-05	(4)	3.1E-02	(1)	8.1E-06	(1)	1.6E+03	(2)	9.58E+00	(14)	1.2E+03	(6)	3.62E-02	(4)
Trichlorophenol, 2,4,6-	88-06-2	2.0E+02	(6)	6.9E+01	(6)	1.1E-04	(4)	3.1E-02	(1)	8.1E-06	(1)	3.8E+02	(2)	2.29E+00	(14)	8.0E+02	(6)	3.46E-02	(4)
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	2.6E+02	(6)	1.5E+02	(6)	3.5E-07	(6)	2.9E-02	(1)	7.8E-06	(1)	1.1E+02	(4)	6.42E-01	(14)	2.8E+02	(6)	9.14E-03	(4)
Trichlorophenoxypropionic acid, -2,4,5	93-72-1	2.7E+02	(6)	1.8E+02	(6)	3.7E-07	(6)	2.3E-02	(1)	5.9E-06	(1)	1.8E+02	(4)	1.05E+00	(14)	7.1E+01	(6)	1.61E-02	(4)
Trifluralin	1582-09-8	3.4E+02	(6)	4.9E+01	(6)	4.2E-03	(6)	2.2E-02	(1)	5.6E-06	(1)	1.6E+04	(4)	9.83E+01	(14)	1.8E-01	(6)	7.28E-02	(4)
Trimethylbenzene, 1,2,3-	526-73-8	1.2E+02	(6)	-2.5E+01	(6)	1.8E-01	(6)	6.1E-02	(1)	8.0E-06	(1)	6.3E+02	(4)	3.76E+00	(14)	7.5E+01	(6)	8.97E-02	(4)
Trimethylbenzene, 1,2,4-	95-63-6	1.2E+02	(6)	-4.4E+01	(6)	2.5E-01	(6)	6.1E-02	(1)	7.9E-06	(1)	6.1E+02	(4)	3.69E+00	(14)	5.7E+01	(6)	8.57E-02	(4)
Trimethylbenzene, 1,3,5-	108-67-8	1.2E+02	(6)	-4.5E+01	(6)	3.6E-01	(6)	6.0E-02	(1)	7.8E-06	(1)	6.0E+02	(4)	3.61E+00	(14)	4.8E+01	(6)	6.21E-02	(4)
Trinitrobenzene, 1,3,5-	99-35-4	2.1E+02	(6)	1.2E+02	(6)	2.7E-07	(4)	2.9E-02	(1)	7.7E-06	(1)	1.7E+03	(4)	1.01E+01	(14)	2.8E+02	(6)	6.07E-04	(4)
Urethane	51-79-6	8.9E+01	(6)	4.9E+01	(6)	2.6E-06	(4)	8.5E-02	(1)	1.0E-05	(1)	1.2E+01	(4)	7.28E-02	(14)	4.8E+05	(6)	3.94E-04	(4)
Warfarin	81-81-2	3.1E+02	(6)	1.6E+02	(6)	1.1E-07	(4)	4.2E-02	(1)	4.9E-06	(1)	4.3E+02	(4)	2.56E+00	(14)	1.7E+01	(6)	1.82E-03	(4)
Volatile Organic Compounds (VOCs)																			
Acetaldehyde	75-07-0	4.4E+01	(6)	-1.2E+02	(6)	2.7E-03	(6)	1.3E-01	(1)	1.4E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	5.27E-04	(4)
Acetone	67-64-1	5.8E+01	(6)	-9.5E+01	(6)	1.4E-03	(6)	1.1E-01	(1)	1.2E-05	(1)	2.4E+00	(4)	1.42E-02	(14)	1.0E+06	(6)	5.12E-04	(4)
Acetonitrile	75-05-8	4.1E+01	(6)	-4.4E+01	(6)	1.4E-03	(6)	1.3E-01	(1)	1.4E-05	(1)	4.7E+00	(4)	2.80E-02	(14)	1.0E+06	(6)	5.48E-04	(4)
Acrolein	107-02-8	5.6E+01	(6)	-8.8E+01	(6)	5.0E-03	(6)	1.1E-01	(1)	1.2E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	2.1E+05	(6)	7.48E-04	(4)
Acrylic Acid	79-10-7	7.2E+01	(6)	1.3E+01	(6)	1.5E-05	(4)	1.0E-01	(1)	1.2E-05	(1)	1.4E+00	(4)	8.64E-03	(14)	1.0E+06	(6)	1.05E-03	(4)
Acrylonitrile	107-13-1	5.3E+01	(6)	-8.4E+01	(6)	5.6E-03	(6)	1.1E-01	(1)	1.2E-05	(1)	8.5E+00	(4)	5.11E-02	(14)	7.5E+04	(6)	1.16E-03	(4)
Allyl Alcohol	107-18-6	5.8E+01	(6)	-1.3E+02	(6)	2.0E-04	(6)	1.1E-01	(1)	1.2E-05	(1)	1.9E+00	(4)	1.14E-02	(14)	1.0E+06	(6)	9.59E-04	(4)
Allyl Chloride	107-05-1	7.7E+01	(6)	-1.3E+02	(6)	4.5E-01	(4)	9.4E-02	(1)	1.1E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	3.4E+03	(6)	1.12E-02	(4)
Benzene	71-43-2	7.8E+01	(6)	5.5E+00	(6)	2.3E-01	(6)	9.0E-02	(1)	1.0E-05	(1)	1.5E+02	(4)	8.75E-01	(14)	1.8E+03	(6)	1.49E-02	(4)
Benzotrichloride	98-07-7	2.0E+02	(6)	-5.0E+00	(6)	1.1E-02	(6)	3.1E-02	(1)	7.7E-06	(1)	1.0E+03	(4)	6.01E+00	(14)	5.3E+01	(6)	4.87E-02	(4)
Benzyl Chloride	100-44-7	1.3E+02	(6)	-4.5E+01	(6)	1.7E-02	(4)	6.3E-02	(1)	8.8E-06	(1)	4.5E+02	(4)	2.68E+00	(14)	5.3E+02	(6)	1.03E-02	(4)
Bis(2-chloro-1-methylethyl) Ether	108-60-1	1.7E+02	(6)	-9.7E+01	(6)	3.0E-03	(4)	4.0E-02	(1)	7.4E-06	(1)	8.3E+01	(4)	4.98E-01	(14)	1.7E+03	(6)	7.64E-03	(4)
Bromodichloromethane	75-27-4	1.6E+02	(6)	-5.7E+01	(6)	8.7E-02	(6)	5.6E-02	(1)	1.1E-05	(1)	3.2E+01	(4)	1.91E-01	(14)	3.0E+03	(6)	4.02E-03	(4)
Bromoform	75-25-2	2.5E+02	(6)	8.0E+00	(6)	2.2E-02	(6)	3.6E-02	(1)	1.0E-05	(1)	3.2E+01	(4)	1.91E-01	(14)	3.1E+03	(6)	2.35E-03	(4)
Bromomethane	74-83-9	9.5E+01	(6)	-9.4E+01	(6)	3.0E-01	(6)	1.0E-01	(1)	1.4E-05	(1)	1.3E+01	(4)	7.93E-02	(14)	1.5E+04	(6)	2.84E-03	(4)
Butadiene, 1,3-	106-99-0	5.4E+01	(6)	-1.1E+02	(6)	3.0E+00	(4)	1.0E-01	(1)	1.0E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	7.4E+02	(6)	1.64E-02	(4)
Butanol, N-	71-36-3	7.4E+01	(6)	-9.0E+01	(6)	3.6E-04	(6)	9.0E-02	(1)	1.0E-05	(1)	3.5E+00	(4)	2.08E-02	(14)	6.3E+04	(6)	2.31E-03	(4)
Butylbenzene, n-	104-51-8	1.3E+02	(6)	-8.8E+01	(6)	6.5E-01	(4)	5.3E-02	(1)	7.3E-06	(1)	1.5E+03	(4)	8.89E+00	(14)	1.2E+01	(6)	2.25E-01	(4)
Carbon Disulfide	75-15-0	7.6E+01	(6)	-1.1E+02	(6)	5.9E-01	(6)	1.1E-01	(1)	1.3E-05	(1)	2.2E+01	(4)	1.30E-01	(14)	2.2E+03	(6)	1.14E-02	(4)
Carbon Tetrachloride	56-23-5	1.5E+02	(6)	-2.3E+01	(6)	1.1E+00	(6)	5.7E-02	(1)	9.8E-06	(1)	4.4E+01	(4)	2.63E-01	(14)	7.9E+02	(6)	1.63E-02	(4)
Carbonyl Sulfide	463-58-1	6.0E+01	(6)	-1.4E+02	(6)	2.5E+01	(4)	1.2E-01	(1)	1.3E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.2E+03	(6)	9.42E-05	(4)
Chlorobenzene	108-90-7	1.1E+02	(6)	-4.5E+01	(6)	1.3E-01	(6)	7.2E-02	(1)	9.5E-06	(1)	2.3E+02	(4)	1.40E+00	(14)	5.0E+02	(6)	2.82E-02	(4)
Chloro-1,3-butadiene, 2-	126-99-8	8.9E+01	(6)	-1.3E+02	(6)	2.3E+00	(6)	8.4E-02	(1)	1.0E-05	(1)	6.1E+01	(4)	3.64E-01	(14)	8.7E+02	(6)	2.38E-02	(4)

Table 3: Physical/chemical data

Chemical	CAS Number	MW (gms/mol)	Source	Melting Point (°C)	Source	Henry's Law Constant (unitless)	Source	Air Diffusivity (cm^2/s)	Source	Water Diffusivity (cm^2/s)	Source	Koc (L/kg)	Source	Kd (cm^3/g)	Source	Solubility in Water (mg/L)	Source	Kp (cm/hr)	Source
Chloroform	67-66-3	1.2E+02	(6)	-6.4E+01	(6)	1.5E-01	(6)	7.7E-02	(1)	1.1E-05	(1)	3.2E+01	(4)	1.91E-01	(14)	8.0E+03	(6)	6.83E-03	(4)
Chloromethane	74-87-3	5.0E+01	(6)	-9.8E+01	(6)	3.6E-01	(6)	1.2E-01	(1)	1.4E-05	(1)	1.3E+01	(4)	7.93E-02	(14)	5.3E+03	(6)	3.28E-03	(4)
Chloromethyl Methyl Ether	107-30-2	8.1E+01	(6)	-1.0E+02	(6)	1.2E-02	(6)	9.5E-02	(1)	1.1E-05	(1)	5.3E+00	(4)	3.19E-02	(14)	6.9E+04	(6)	9.05E-04	(4)
Crotonaldehyde, trans-	123-73-9	7.0E+01	(6)	-7.6E+01	(6)	7.9E-04	(6)	9.6E-02	(1)	1.1E-05	(1)	1.8E+00	(4)	1.08E-02	(14)	1.5E+05	(6)	1.59E-03	(4)
Cumene	98-82-8	1.2E+02	(6)	-9.6E+01	(6)	4.7E-01	(6)	6.0E-02	(1)	7.9E-06	(1)	7.0E+02	(4)	4.19E+00	(14)	6.1E+01	(6)	8.97E-02	(4)
Cyclohexane	110-82-7	8.4E+01	(6)	6.6E+00	(6)	6.1E+00	(6)	8.0E-02	(1)	9.1E-06	(1)	1.5E+02	(4)	8.75E-01	(14)	5.5E+01	(6)	1.02E-01	(4)
Cyclohexanone	108-94-1	9.8E+01	(6)	-3.1E+01	(6)	3.7E-04	(6)	7.7E-02	(1)	9.4E-06	(1)	1.7E+01	(4)	1.04E-01	(14)	2.5E+04	(6)	1.52E-03	(4)
Dibromo-3-chloropropane, 1,2-	96-12-8	2.4E+02	(6)	6.0E+00	(6)	6.0E-03	(4)	3.2E-02	(1)	8.9E-06	(1)	1.2E+02	(4)	6.95E-01	(14)	1.2E+03	(6)	6.85E-03	(4)
Dibromochloromethane	124-48-1	2.1E+02	(6)	-2.0E+01	(6)	3.2E-02	(6)	3.7E-02	(1)	1.1E-05	(1)	3.2E+01	(4)	1.91E-01	(14)	2.7E+03	(6)	2.89E-03	(4)
Dibromoethane, 1,2-	106-93-4	1.9E+02	(6)	9.9E+00	(6)	2.7E-02	(6)	4.3E-02	(1)	1.0E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	3.9E+03	(6)	2.78E-03	(4)
Dichloro-2-butene, 1,4-	764-41-0	1.3E+02	(6)	3.5E+00	(6)	3.5E-01	(6)	6.7E-02	(1)	9.3E-06	(1)	1.3E+02	(4)	7.89E-01	(14)	5.8E+02	(6)	1.66E-02	(4)
Dichlorodifluoromethane	75-71-8	1.2E+02	(6)	-1.6E+02	(6)	1.4E+01	(6)	7.6E-02	(1)	1.1E-05	(1)	4.4E+01	(4)	2.63E-01	(14)	2.8E+02	(6)	8.95E-03	(4)
Dichloroethane, 1,1-	75-34-3	9.9E+01	(6)	-9.7E+01	(6)	2.3E-01	(6)	8.4E-02	(1)	1.1E-05	(1)	3.2E+01	(4)	1.91E-01	(14)	5.0E+03	(6)	6.75E-03	(4)
Dichloroethane, 1,2-	107-06-2	9.9E+01	(6)	-3.6E+01	(6)	4.8E-02	(6)	8.6E-02	(1)	1.1E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	8.6E+03	(6)	4.20E-03	(4)
Dichloroethylene, 1,1-	75-35-4	9.7E+01	(6)	-1.2E+02	(6)	1.1E+00	(6)	8.6E-02	(1)	1.1E-05	(1)	3.2E+01	(4)	1.91E-01	(14)	2.4E+03	(6)	1.17E-02	(4)
Dichloroethylene, 1,2-cis-	156-59-2	9.7E+01	(6)	-8.0E+01	(6)	1.7E-01	(6)	8.8E-02	(1)	1.1E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	6.4E+03	(6)	1.10E-02	(4)
Dichloroethylene, 1,2-trans-	156-60-5	9.7E+01	(6)	-5.0E+01	(6)	3.8E-01	(6)	8.8E-02	(1)	1.1E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	4.5E+03	(6)	1.10E-02	(4)
Dichloropropane, 1,2-	78-87-5	1.1E+02	(6)	-1.0E+02	(6)	1.2E-01	(6)	7.3E-02	(1)	9.7E-06	(1)	6.1E+01	(4)	3.64E-01	(14)	2.8E+03	(6)	7.53E-03	(4)
Dichloropropane, 1,3-	142-28-9	1.1E+02	(6)	-1.0E+02	(6)	4.0E-02	(6)	7.4E-02	(1)	9.8E-06	(1)	7.2E+01	(4)	4.33E-01	(14)	2.8E+03	(6)	7.76E-03	(4)
Dichloropropene, 1,3-	542-75-6	1.1E+02	(6)	-5.0E+01	(6)	1.5E-01	(6)	7.6E-02	(1)	1.0E-05	(1)	7.2E+01	(4)	4.33E-01	(14)	2.8E+03	(6)	8.34E-03	(4)
Dihydrosafrole	94-58-6	1.6E+02	(6)	4.4E+01	(4)	5.0E-04	(6)	4.3E-02	(1)	7.4E-06	(1)	2.1E+02	(4)	1.24E+00	(14)	5.7E+01	(6)	4.52E-02	(4)
Dimethylaniline, N,N-	121-69-7	1.2E+02	(6)	2.5E+00	(6)	2.3E-03	(4)	6.3E-02	(1)	8.3E-06	(1)	7.9E+01	(4)	4.72E-01	(14)	1.5E+03	(6)	1.12E-02	(4)
Dimethylformamide	68-12-2	7.3E+01	(6)	-6.0E+01	(6)	3.0E-06	(6)	9.7E-02	(1)	1.1E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	1.30E-04	(4)
Dimethylhydrazine, 1,2-	540-73-8	6.0E+01	(6)	-9.0E+00	(6)	2.8E-06	(6)	1.1E-01	(1)	1.2E-05	(1)	1.5E+01	(4)	8.92E-02	(14)	1.0E+06	(6)	3.17E-04	(4)
Dioxane, 1,4-	123-91-1	8.8E+01	(6)	1.2E+01	(6)	2.0E-04	(6)	8.7E-02	(1)	1.1E-05	(1)	2.6E+00	(4)	1.58E-02	(14)	1.0E+06	(6)	3.32E-04	(4)
Epoxybutane, 1,2-	106-88-7	7.2E+01	(6)	-1.5E+02	(6)	7.4E-03	(4)	9.3E-02	(1)	1.0E-05	(1)	9.9E+00	(4)	5.94E-02	(14)	9.5E+04	(6)	2.31E-03	(4)
Ethoxyethanol, 2-	110-80-5	9.0E+01	(6)	-7.0E+01	(6)	1.9E-05	(6)	8.2E-02	(1)	9.7E-06	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	3.00E-04	(4)
Ethyl Acetate	141-78-6	8.8E+01	(6)	-8.4E+01	(6)	5.5E-03	(6)	8.2E-02	(1)	9.7E-06	(1)	5.6E+00	(4)	3.35E-02	(14)	8.0E+04	(6)	1.53E-03	(4)
Ethyl Acrylate	140-88-5	1.0E+02	(6)	-7.1E+01	(6)	1.4E-02	(4)	7.5E-02	(1)	9.1E-06	(1)	1.1E+01	(4)	6.39E-02	(14)	1.5E+04	(6)	3.24E-03	(4)
Ethyl Chloride (Chloroethane)	75-00-3	6.5E+01	(6)	-1.4E+02	(6)	4.5E-01	(6)	1.0E-01	(1)	1.2E-05	(1)	2.2E+01	(4)	1.30E-01	(14)	6.7E+03	(6)	6.07E-03	(4)
Ethyl Ether	60-29-7	7.4E+01	(6)	-1.2E+02	(6)	5.0E-02	(6)	8.5E-02	(1)	9.4E-06	(1)	9.7E+00	(4)	5.82E-02	(14)	6.0E+04	(6)	2.35E-03	(4)
Ethyl Methacrylate	97-63-2	1.1E+02	(6)	-7.5E+01	(6)	2.3E-02	(4)	6.5E-02	(1)	8.4E-06	(1)	1.7E+01	(4)	1.00E-01	(14)	5.4E+03	(6)	6.98E-03	(4)
Ethylbenzene	100-41-4	1.1E+02	(6)	-9.5E+01	(6)	3.2E-01	(6)	6.8E-02	(1)	8.5E-06	(1)	4.5E+02	(4)	2.68E+00	(14)	1.7E+02	(6)	4.93E-02	(4)
Ethylene Diamine	107-15-3	6.0E+01	(6)	1.1E+01	(6)	7.1E-08	(6)	1.1E-01	(1)	1.2E-05	(1)	1.5E+01	(4)	8.92E-02	(14)	1.0E+06	(6)	3.18E-05	(4)
Ethylene Oxide	75-21-8	4.4E+01	(6)	-1.1E+02	(6)	6.1E-03	(6)	1.3E-01	(1)	1.5E-05	(1)	3.2E+00	(4)	1.94E-02	(14)	1.0E+06	(6)	5.60E-04	(4)
Ethyleneimine	151-56-4	4.3E+01	(6)	-7.8E+01	(6)	4.9E-04	(4)	1.3E-01	(1)	1.4E-05	(1)	9.0E+00	(4)	5.43E-02	(14)	1.0E+06	(6)	5.81E-04	(4)
Formaldehyde	50-00-0	3.0E+01	(6)	-9.2E+01	(6)	1.4E-05	(6)	1.7E-01	(1)	1.7E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	4.0E+05	(6)	1.82E-03	(4)
Formic Acid	64-18-6	4.6E+01	(6)	8.3E+00	(6)	6.8E-06	(6)	1.5E-01	(1)	1.7E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	3.78E-04	(4)
Glycidaldehyde	765-34-4	7.2E+01	(6)	-6.2E+01	(6)	2.1E-05	(6)	1.1E-01	(1)	1.3E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	5.16E-04	(4)
Hexane, N-	110-54-3	8.6E+01	(6)	-9.5E+01	(6)	7.4E+01	(4)	7.3E-02	(1)	8.2E-06	(1)	1.3E+02	(4)	7.89E-01	(14)	9.5E+00	(6)	2.01E-01	(4)
Hydrazine	302-01-2	3.2E+01	(6)	2.0E+00	(6)	2.5E-05	(6)	1.7E-01	(1)	1.9E-05	(1)	2.0E+00	(9)	1.20E-02	(14)	1.0E+06	(6)	4.36E-05	(3)
Isobutyl Alcohol	78-83-1	7.4E+01	(6)	-1.1E+02	(6)	4.0E-04	(6)	9.0E-02	(1)	1.0E-05	(1)	2.9E+00	(4)	1.75E-02	(14)	8.5E+04	(6)	1.92E-03	(4)
Methacrylonitrile	126-98-7	6.7E+01	(6)	-3.6E+01	(6)	1.0E-02	(4)	9.6E-02	(1)	1.1E-05	(1)	1.3E+01	(4)	7.83E-02	(14)	2.5E+04	(6)	1.86E-03	(4)
Methanol	67-56-1	3.2E+01	(6)	-9.8E+01	(6)	1.9E-04	(6)	1.6E-01	(1)	1.6E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	1.0E+06	(6)	3.19E-04	(4)
Methyl Ethyl Ketone (2-Butanone)	78-93-3	7.2E+01	(6)	-8.7E+01	(6)	2.3E-03	(6)	9.1E-02	(1)	1.0E-05	(1)	4.5E+00	(4)	2.71E-02	(14)	2.2E+05	(6)	9.62E-04	(4)
Methyl Hydrazine	60-34-4	4.6E+01	(6)	-5.2E+01	(6)	1.2E-04	(6)	1.3E-01	(1)	1.4E-05	(1)	1.3E+01	(4)	7.99E-02	(14)	1.0E+06	(6)	1.73E-04	(4)
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	1.0E+02	(6)	-8.4E+01	(6)	5.6E-03	(4)	7.0E-02	(1)	8.3E-06	(1)	1.3E+01	(4)	7.56E-02	(14)	1.9E+04	(6)	3.19E-03	(4)
Methyl Isocyanate	624-83-9	5.7E+01	(6)	-4.5E+01	(6)	3.8E-02	(6)	1.2E-01	(1)	1.3E-05	(1)	4.0E+01	(4)	2.38E-01	(14)	2.9E+04	(6)	2.50E-03	(4)
Methyl Methacrylate	80-62-6	1.0E+02	(6)	-4.8E+01	(6)	1.3E-02	(4)	7.5E-02	(1)	9.2E-06	(1)	9.1E+00	(4)	5.48E-02	(14)	1.5E+04	(6)	3.55E-03	(4)
Methyl tert-Butyl Ether (MTBE)	1634-04-4	8.8E+01	(6)	-1.1E+02	(6)	2.4E-02	(6)	7.5E-02	(1)	8.6E-06	(1)	1.2E+01	(4)	6.94E-02	(14)	5.1E+04	(4)	2.11E-03	(4)
Methylene Chloride	75-09-2	8.5E+01	(6)	-9.5E+01	(6)	1.3E-01	(6)	1.0E-01	(1)	1.3E-05	(1)	2.2E+01	(4)	1.30E-01	(14)	1.3E+04	(6)	3.54E-03	(4)
Naphthalene	91-20-3	1.3E+02	(6)	8.0E+01	(6)	1.8E-02	(6)	6.0E-02	(1)	8.4E-06	(1)	1.5E+03	(4)	9.26E+00	(14)	3.1E+01	(6)	4.66E-02	(4)
Nickel Carbonyl	13463-39-3	1.7E+02	(7)	-1.9E+01	(7)	2.0E+01	(12)	4.3E-02	(1)	8.2E-06	(1)	NA	NA	NA	NA	1.8E+02	(8)	NA	NA
Phosgene	75-44-5	9.9E+01	(6)	-1.2E+02	(6)	6.8E-01	(6)	8.9E-02	(1)	1.2E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	6.8E+03	(5)	1.47E-04	(4)
Propargyl Alcohol	107-19-7	5.6E+01	(6)	-5.0E+01	(6)	4.7E-05	(4)	1.2E-01	(1)	1.3E-05	(1)	1.9E+00	(4)	1.14E-02	(14)	1.0E+06	(6)	4.24E-04	(4)
Propionaldehyde	123-38-6	5.8E+01	(6)	-8.0E+01	(6)	3.0E-03	(6)	1.1E-01	(1)	1.2E-05	(1)	1.0E+00	(4)	6.00E-03	(14)	3.1E+05	(6)	1.82E-03	(4)
Propylene Oxide	75-56-9	5.8E+01	(6)	-1.1E+02	(6)	2.8E-03	(4)	1.1E-01	(1)	1.2E-05	(1)	5.2E+00	(4)	3.12E-02	(14)	5.9E+05	(6)	7.74E-04	(4)
Styrene	100-42-5	1.0E+02	(6)	-3.1E+01	(6)	1.1E-01	(6)	7.1E-02	(1)	8.8E-06	(1)	4.5E+02	(4)	2.68E+00	(14)	3.1E+02	(6)	3.72E-02	(4)
Tetrachlorobenzene, 1,2,4,5-	95-94-3	2.2E+02	(6)	1.4E+02	(6)	4.1E-02	(6)	3.2E-02	(1)	8.8E-06	(1)	2.2E+03	(4)	1.33E+01	(14)	6.0E-01	(6)	1.17E-01	(4)
Tetrachloroethane, 1,1,1,2-	630-20-6	1.7E+02	(6)	-7.0E+01	(6)	1.0E-01	(6)	4.8E-02	(1)	9.1E-06	(1)	8.6E+01	(4)	5.16E-01	(14)	1.1E+03	(6)	1.59E-02	(4)
Tetrachloroethane, 1,1,2,2-	79-34-5	1.7E+02	(6)	-4.4E+01	(6)	1.5E-02	(6)	4.9E-02	(1)	9.3E-06	(1)	9.5E+01	(4)	5.70E-01	(14)	2.8E+03	(6)	6.94E-03	(4)
Tetrachloroethylene	127-18-4	1.7E+02	(6)	-2.2E+01	(6)	7.2E-01	(6)	5.0E-02	(1)	9.5E-06	(1)	9.5E+01	(4)	5.70E-01	(14)	2.1E+02	(6)	3.34E-02	(4)
Toluene	108-88-3	9.2E+01	(6)	-9.5E+01	(6)	2.7E-01	(6)	7.8E-02	(1)	9.2E-06	(1)	2.3E+02	(4)	1.40E+00	(14)	5.3E+02	(6)	3.11E-02	(4)
Trichloroethane, 1,1,1-	71-55-6	1.3E+02	(6)	-3.0E+01	(6)	7.0E-01	(6)	6.5E-02	(1)	9.6E-06	(1)	4.4E+01	(4)	2.63E-01	(14)	1.3E+03	(6)	1.26E-02	(4)
Trichloroethane, 1,1,2-	79-00-5	1.3E+02	(6)	-3.7E+01	(6)	3.4E-02	(6)	6.7E-02	(1)	1.0E-05	(1)	6.1E+01	(4)	3.64E-01	(14)	4.6E+03	(6)	5.04E-03	(4)
Trichloroethylene	79-01-6	1.3E+02	(6)	-8.5E+01	(6)	4.0E-01	(6)	6.9E-02	(1)	1.0E-05	(1)	6.1E+01	(4)	3.64E-01	(14)	1.3E+03	(6)	1.16E-02	(4)
Trichlorofluoromethane	75-69-4	1.4E+02	(6)	-1.1E+02	(6)	4.0E+00	(6)	6.5E-02	(1)	1.0E-05	(1)	4.4E+01	(4)	2.63E-01	(14)	1.1E+03	(6)	1.27E-02	(4)
Triethylamine	121-44-8	1.0E+02	(6)	-1.1E+02	(6)	6.1E-03	(6)	6.6E-02	(1)	7.9E-06	(1)	5.1E+01	(4)	3.05E-01	(14)	6.9E+04	(6)	3.90E-03	(4)
Vinyl Acetate	108-05-4	8.6E+01	(6)	-9.3E+01	(6)	2.1E-02	(4)	8.5E-02	(1)	1.0E-05	(1)	5.6E+00	(4)	3.35E-02	(14)	2.0E+04	(4)	1.57E-03	(4)
Vinyl Bromide	593-60-2	1.1E+02	(6)	-1.4E+02	(6)	5.0E-01	(6)	8.6E-02	(1)	1.2E-05	(1)	2.2E+01	(4)	1.30E-01	(14)	7.6E+03	(6)	4.35E-03	(4)
Vinyl Chloride	75-01-4	6.2E+01	(6)	-1.5E+02	(6)	1.1E+00	(6)	1.1E-01	(1)	1.2E-05	(1)	2.2E+01	(4)	1.30E-01	(14)	8.8E+03	(6)	8.38E-03	(4)
Xylenes	1330-20-7	1.1E+02	(6)	-2.5E+01	(4)	2.7E-01	(6)	6.9E-02	(1)	8.5E-06	(1)	3.8E+02	(4)	2.30E+00	(14)	1.1E+02	(6)	5.00E-02	(4)

*See paragraph (C)(3)(e) of rule 3745-300-08 of the Administrative Code.

**Vapor Pressure = VP; Water Solubility = S

Key
(1) WATER9.
(2) U.S. EPA 2002. Supplemental guidance for developing soil screening levels for Superfund sites. OSWER 9355.4-24
(3) U.S. EPA 2004. Risk assessment guidance for Superfund. Volume I: Human health evaluation manual (Part E) Final. OSWER 9285.7-02.
(4) The Estimation Programs Interface (EPI) Suite™. U.S. EPA and Syracuse Research Corporation.
(5) Yaws' Handbook of Thermodynamic and Physical Properties of Chemical Compounds.
(6) PHYSPROP Database. Syracuse Research Corporation (SRC).
(7) CRC Handbook of Chemistry and Physics.
(8) Perry's Chemical Engineers' Handbook (Various Editions). McGraw-Hill. Green, Don W.; Perry, Robert H. (2008).
(9) PubChem. National Center for Biotechnology Information.
(10) Hazardous Substance Data Bank (HSDB).
(11) The ARS Pesticide Properties Database: U.S. Department of Agriculture, Agricultural Research Service. 2009.
(12) Regional Screening Levels. November 2023.
(13) Baes, C.F. 1984
(14) Calculated as Koc x Foc

Table 4: Groundwater dermal parameters

Chemical	CAS	In EPD? (a)	Organic?	Kp	FA (a)	B	τ_{event} (hours/event)	t (hr)
Inorganics/Metals								
Aluminum Phosphide	20859-73-8	YES	NO	1.00E-03	1.0	2.9E-03	2.2E-01	5.3E-01
Antimony (Metallic)	7440-36-0	YES	NO	1.00E-03	1.0	4.2E-03	5.1E-01	1.2E+00
Antimony Trioxide	1309-64-4	YES	NO	1.00E-03	1.0	6.6E-03	4.5E+00	1.1E+01
Arsenic, Inorganic	7440-38-2	YES	NO	1.00E-03	1.0	3.3E-03	2.8E-01	6.6E-01
Barium	7440-39-3	YES	NO	1.00E-03	1.0	4.5E-03	6.2E-01	1.5E+00
Beryllium and Compounds	7440-41-7	YES	NO	1.00E-03	1.0	1.2E-03	1.2E-01	2.8E-01
Cadmium	7440-43-9	YES	NO	1.00E-03	1.0	4.1E-03	4.5E-01	1.1E+00
Chlorine	7782-50-5	YES	NO	1.00E-03	1.0	3.2E-03	2.6E-01	6.3E-01
Chromium(III)	16065-83-1	YES	NO	1.00E-03	1.0	2.8E-03	2.1E-01	4.9E-01
Chromium(VI)	18540-29-9	YES	NO	2.00E-03	1.0	5.5E-03	2.1E-01	4.9E-01
Chromium, Total	7440-47-3	YES	NO	1.00E-03	1.0	2.8E-03	2.1E-01	4.9E-01
Cobalt	7440-48-4	YES	NO	4.00E-04	1.0	1.2E-03	2.2E-01	5.4E-01
Copper	7440-50-8	YES	NO	1.00E-03	1.0	3.1E-03	2.4E-01	5.7E-01
Disodium Phosphate	7558-79-4	YES	NO	1.00E-03	1.0	4.6E-03	6.6E-01	1.6E+00
Hydrogen Chloride	7647-01-0	YES	NO	1.00E-03	1.0	2.3E-03	1.7E-01	4.0E-01
Hydrogen Fluoride	7664-39-3	YES	NO	1.00E-03	1.0	1.7E-03	1.4E-01	3.3E-01
Hydrogen Sulfide	7783-06-4	YES	NO	1.00E-03	1.0	2.2E-03	1.6E-01	3.9E-01
Fluorine (Soluble Fluoride)	7782-41-4	YES	NO	1.00E-03	1.0	2.4E-03	1.7E-01	4.1E-01
Manganese Compounds	7439-96-5	YES	NO	1.00E-03	1.0	2.9E-03	2.1E-01	5.1E-01
Mercury and Compounds	7439-97-6	YES	NO	1.00E-03	1.0	5.4E-03	1.4E+00	3.4E+00
Nickel Soluble Salts	7440-02-0	YES	NO	2.00E-04	1.0	5.9E-04	2.2E-01	5.4E-01
Phosphine	7803-51-2	YES	NO	1.00E-03	1.0	2.2E-03	1.6E-01	3.9E-01
Selenious Acid	7783-00-8	YES	NO	1.00E-03	1.0	4.4E-03	5.5E-01	1.3E+00
Selenium	7782-49-2	YES	NO	1.00E-03	1.0	3.4E-03	2.9E-01	7.0E-01
Silver	7440-22-4	YES	NO	6.00E-04	1.0	2.4E-03	4.2E-01	1.0E+00
Sodium Azide	26628-22-8	YES	NO	1.00E-03	1.0	3.1E-03	2.4E-01	5.8E-01
Sodium Fluoride	7681-49-4	YES	NO	1.00E-03	1.0	2.5E-03	1.8E-01	4.3E-01
Sodium Fluoroacetate	62-74-8	NO	YES	1.32E-06	1.0	5.1E-06	3.8E-01	9.2E-01
Sodium Tripolyphosphate	7758-29-4	YES	NO	1.00E-03	1.0	7.4E-03	1.2E+01	2.9E+01
Sulfuric Acid	7664-93-9	YES	NO	1.00E-03	1.0	3.8E-03	3.7E-01	8.9E-01
Thallium (Soluble Salts)	7440-28-0	YES	NO	1.00E-03	1.0	5.5E-03	1.5E+00	3.5E+00
Titanium Tetrachloride	7550-45-0	YES	NO	1.00E-03	1.0	5.3E-03	1.2E+00	2.9E+00
Trisodium Phosphate	7601-54-9	YES	NO	1.00E-03	1.0	4.9E-03	8.7E-01	2.1E+00
Vanadium Compounds	7440-62-2	YES	NO	1.00E-03	1.0	2.7E-03	2.0E-01	4.9E-01
Zinc and Compounds	7440-66-6	YES	NO	6.00E-04	1.0	1.9E-03	2.4E-01	5.9E-01
Zinc Phosphide	1314-84-7	YES	NO	6.00E-04	1.0	3.7E-03	2.9E+00	7.0E+00
Cyanides								
Calcium Cyanide	592-01-8	YES	NO	1.00E-03	1.0	3.7E-03	3.4E-01	8.3E-01
Copper Cyanide	544-92-3	YES	NO	1.00E-03	1.0	3.6E-03	3.3E-01	8.0E-01
Cyanide (CN-)	57-12-5	YES	NO	1.00E-03	1.0	2.0E-03	1.5E-01	3.5E-01
Cyanogen	460-19-5	YES	NO	8.90E-04	1.0	2.5E-03	2.1E-01	4.9E-01
Cyanogen Bromide	506-68-3	YES	NO	2.55E-04	1.0	1.0E-03	4.1E-01	9.9E-01
Cyanogen Chloride	506-77-4	YES	NO	3.94E-04	1.0	1.2E-03	2.3E-01	5.6E-01
Hydrogen Cyanide	74-90-8	YES	NO	1.00E-03	1.0	2.0E-03	1.5E-01	3.6E-01
Potassium Cyanide	151-50-8	YES	NO	2.00E-03	1.0	6.2E-03	2.4E-01	5.8E-01
Potassium Silver Cyanide	506-61-6	YES	NO	2.00E-03	1.0	1.1E-02	1.4E+00	3.3E+00
Silver Cyanide	506-64-9	YES	NO	1.00E-03	1.0	4.5E-03	5.9E-01	1.4E+00
Sodium Cyanide	143-33-9	YES	NO	1.00E-03	1.0	2.7E-03	2.0E-01	4.7E-01
Zinc Cyanide	557-21-1	YES	NO	6.00E-04	1.0	2.5E-03	4.8E-01	1.1E+00
Lead Compounds								
Lead Acetate	301-04-2	YES	YES	2.08E-05	1.0	1.4E-04	7.2E+00	1.7E+01
Lead and Compounds	7439-92-1	YES	NO	1.00E-04	1.0	5.5E-04	1.5E+00	3.7E+00
Lead Phosphate	7446-27-7	YES	NO	1.00E-03	0.8	5.5E-04	1.5E+00	3.7E+00
Lead Subacetate	1335-32-6	NO	YES	1.03E-10	1.0	1.1E-09	3.4E+03	8.2E+03
Tetraethyl Lead	78-00-2	YES	YES	1.37E-02	0.9	9.5E-02	6.8E+00	1.6E+01
Semi-Volatile Organic Compounds (SVOCs)								
Acenaphthene	83-32-9	YES	YES	8.60E-02	1.0	4.1E-01	7.7E-01	1.8E+00
Acetophenone	98-86-2	YES	YES	3.72E-03	1.0	1.6E-02	5.0E-01	1.2E+00
Acetylaminofluorene, 2-	53-96-3	YES	YES	1.04E-02	1.0	6.0E-02	1.9E+00	4.5E+00
Acrylamide	79-06-1	YES	YES	2.24E-04	1.0	7.3E-04	2.6E-01	6.3E-01
Alachlor	15972-60-8	YES	YES	1.05E-02	0.9	6.6E-02	3.4E+00	8.2E+00
Aldicarb	116-06-3	YES	YES	7.55E-04	1.0	4.0E-03	1.2E+00	2.9E+00
Aldicarb Sulfone	1646-88-4	YES	YES	3.71E-05	1.0	2.1E-04	1.8E+00	4.4E+00
Aldrin	309-00-2	NO	YES	2.93E-01	1.0	2.2E+00	1.2E+01	4.8E+01
Aminobiphenyl, 4-	92-67-1	YES	YES	1.40E-02	1.0	7.0E-02	9.3E-01	2.2E+00

Table 4: Groundwater dermal parameters

Chemical	CAS	In EPD? (a)	Organic?	Kp	FA (a)	B	τ_{event} (hours/event)	t (hr)
Ammonium Sulfamate	7773-06-0	YES	NO	1.00E-03	1.0	4.1E-03	4.6E-01	1.1E+00
Aniline	62-53-3	YES	YES	1.86E-03	1.0	6.9E-03	3.5E-01	8.4E-01
Anthracene	120-12-7	YES	YES	1.42E-01	1.0	7.3E-01	1.0E+00	4.1E+00
Aroclor 1016	12674-11-2	NO	YES	3.05E-01	0.9	1.9E+00	2.9E+00	1.2E+01
Aroclor 1221	11104-28-2	YES	YES	1.68E-01	1.0	8.9E-01	1.2E+00	4.6E+00
Aroclor 1232	11141-16-5	YES	YES	1.68E-01	1.0	8.9E-01	1.2E+00	4.6E+00
Aroclor 1242	53469-21-9	NO	YES	5.45E-01	0.7	3.6E+00	4.5E+00	1.9E+01
Aroclor 1248	12672-29-6	NO	YES	4.75E-01	0.7	3.1E+00	4.5E+00	1.9E+01
Aroclor 1254	11097-69-1	NO	YES	7.51E-01	0.5	5.2E+00	7.1E+00	3.1E+01
Aroclor 1260	11096-82-5	NO	YES	9.86E-01	0.0	7.5E+00	1.7E+01	7.7E+01
Atrazine	1912-24-9	YES	YES	5.24E-03	1.0	3.0E-02	1.7E+00	4.1E+00
Auramine	492-80-8	YES	YES	4.76E-03	0.9	3.0E-02	3.3E+00	7.9E+00
Benomyl	17804-35-2	YES	YES	9.43E-04	1.0	6.2E-03	4.4E+00	1.1E+01
Benzenethiol	108-98-5	YES	YES	1.78E-02	1.0	7.2E-02	4.4E-01	1.0E+00
Benzidine	92-87-5	YES	YES	1.13E-03	1.0	5.9E-03	1.1E+00	2.7E+00
Benz[a]anthracene	56-55-3	NO	YES	5.52E-01	1.0	3.2E+00	2.0E+00	8.5E+00
Benzo[a]pyrene	50-32-8	NO	YES	7.13E-01	1.0	4.4E+00	2.7E+00	1.2E+01
Benzo[b]fluoranthene	205-99-2	NO	YES	4.17E-01	1.0	2.5E+00	2.7E+00	1.1E+01
Benzo[k]fluoranthene	207-08-9	NO	YES	6.91E-01	0.9	4.2E+00	2.7E+00	1.2E+01
Benzoic Acid	65-85-0	YES	YES	5.65E-03	1.0	2.4E-02	5.1E-01	1.2E+00
Biphenyl, 1,1'-	92-52-4	YES	YES	9.43E-02	1.0	4.5E-01	7.7E-01	1.8E+00
Bis(2-chloroethoxy)methane	111-91-1	YES	YES	1.22E-03	1.0	6.2E-03	9.8E-01	2.4E+00
Bis(2-chloroethyl)ether	111-44-4	YES	YES	1.78E-03	1.0	8.2E-03	6.6E-01	1.6E+00
Bis(chloromethyl)ether	542-88-1	YES	YES	8.55E-04	1.0	3.5E-03	4.6E-01	1.1E+00
Bis(2-ethylhexyl)phthalate	117-81-7	NO	YES	1.13E+00	0.8	8.6E+00	1.6E+01	7.3E+01
Butyl Benzyl Phthlate	85-68-7	YES	YES	3.85E-02	0.9	2.6E-01	5.9E+00	1.4E+01
Cacodylic Acid	75-60-5	YES	YES	4.60E-04	1.0	2.1E-03	6.2E-01	1.5E+00
Captan	133-06-2	YES	YES	2.34E-03	1.0	1.6E-02	5.1E+00	1.2E+01
Carbaryl	63-25-2	YES	YES	4.31E-03	1.0	2.4E-02	1.4E+00	3.4E+00
Carbofuran	1563-66-2	YES	YES	3.13E-03	1.0	1.8E-02	1.8E+00	4.4E+00
Carbosulfan	55285-14-8	YES	YES	5.79E-02	0.8	4.3E-01	1.4E+01	3.4E+01
Chloramben	133-90-4	YES	YES	2.01E-03	1.0	1.1E-02	1.5E+00	3.6E+00
Chlordane	12789-03-6	YES	YES	1.07E-01	0.7	8.3E-01	2.1E+01	8.0E+01
Chlordecone (Kepone)	143-50-0	YES	YES	1.09E-02	0.8	9.3E-02	5.9E+01	1.4E+02
Chloro-2-methylaniline HCl, 4-	3165-93-3	YES	YES	1.80E-05	1.0	9.2E-05	1.0E+00	2.5E+00
Chloroacetic Acid	79-11-8	YES	YES	6.47E-04	1.0	2.4E-03	3.6E-01	8.5E-01
Chloroacetophenone, 2-	532-27-4	YES	YES	4.06E-03	1.0	1.9E-02	7.7E-01	1.9E+00
Chloroaniline, p-	106-47-8	YES	YES	4.96E-03	1.0	2.2E-02	5.4E-01	1.3E+00
Chlorobenzilate	510-15-6	YES	YES	3.31E-02	0.8	2.3E-01	7.0E+00	1.7E+01
Chloronaphthalene, Beta-	91-58-7	YES	YES	7.49E-02	1.0	3.7E-01	8.6E-01	2.1E+00
Chlorophenol, 2-	95-57-8	YES	YES	7.99E-03	1.0	3.5E-02	5.5E-01	1.3E+00
Chlorpyrifos	2921-88-2	YES	YES	3.34E-02	0.8	2.4E-01	9.7E+00	2.3E+01
Chrysene	218-01-9	NO	YES	5.96E-01	1.0	3.5E+00	2.0E+00	8.5E+00
Cresol, m-	108-39-4	YES	YES	7.77E-03	1.0	3.1E-02	4.2E-01	1.0E+00
Cresol, o-	95-48-7	YES	YES	7.66E-03	1.0	3.1E-02	4.2E-01	1.0E+00
Cresol, p-	106-44-5	YES	YES	7.54E-03	1.0	3.0E-02	4.2E-01	1.0E+00
Cresol, p-chloro-m-	59-50-7	YES	YES	2.85E-02	1.0	1.3E-01	6.6E-01	1.6E+00
Cresols	1319-77-3	YES	YES	7.66E-03	0.9	5.3E-02	6.9E+00	1.7E+01
DDD	72-54-8	YES	YES	2.51E-01	0.8	1.7E+00	6.5E+00	2.6E+01
DDE, p,p'-	72-55-9	NO	YES	5.45E-01	0.8	3.7E+00	6.4E+00	2.7E+01
DDT	50-29-3	NO	YES	6.28E-01	0.7	4.5E+00	1.0E+01	4.4E+01
Diallate	2303-16-4	YES	YES	4.60E-02	0.9	2.9E-01	3.4E+00	8.2E+00
Diazinon	333-41-5	YES	YES	1.04E-02	0.9	7.0E-02	5.3E+00	1.3E+01
Dibenz[a,h]anthracene	53-70-3	NO	YES	9.53E-01	0.9	6.1E+00	3.8E+00	1.7E+01
Dibutyl Phthalate	84-74-2	YES	YES	4.20E-02	0.9	2.7E-01	3.8E+00	9.1E+00
Dicamba	1918-00-9	YES	YES	2.65E-03	1.0	1.5E-02	1.8E+00	4.4E+00
Dichlorobenzene, 1,2-	95-50-1	YES	YES	4.46E-02	1.0	2.1E-01	7.0E-01	1.7E+00
Dichlorobenzene, 1,4-	106-46-7	YES	YES	4.53E-02	1.0	2.1E-01	7.0E-01	1.7E+00
Dichlorobenzidine, 3,3'-	91-94-1	YES	YES	1.28E-02	1.0	7.8E-02	2.8E+00	6.6E+00
Dichlorophenol, 2,4-	120-83-2	YES	YES	2.06E-02	1.0	1.0E-01	8.6E-01	2.1E+00
Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	YES	YES	6.64E-03	1.0	3.8E-02	1.8E+00	4.4E+00
Dichloropropionic acid, 2,2-	75-99-0	YES	YES	8.15E-04	1.0	3.7E-03	6.6E-01	1.6E+00
Dichlorvos	62-73-7	YES	YES	8.04E-04	1.0	4.6E-03	1.8E+00	4.4E+00
Dieldrin	60-57-1	YES	YES	3.26E-02	0.8	2.4E-01	1.4E+01	3.4E+01
Diethanolamine	111-42-2	YES	YES	4.51E-05	1.0	1.8E-04	4.1E-01	9.8E-01
Diethyl Phthalate	84-66-2	YES	YES	3.60E-03	1.0	2.1E-02	1.8E+00	4.4E+00

Table 4: Groundwater dermal parameters

Chemical	CAS	In EPD? (a)	Organic?	Kp	FA (a)	B	τ_{event} (hours/event)	t (hr)
Diethylstilbestrol	56-53-1	YES	YES	1.14E-01	0.9	7.2E-01	3.3E+00	1.3E+01
Dimethoate	60-51-5	YES	YES	2.67E-04	1.0	1.6E-03	2.0E+00	4.9E+00
Dimethoxybenzidine, 3,3'-	119-90-4	YES	YES	1.06E-03	1.0	6.4E-03	2.5E+00	5.9E+00
Dimethylamino azobenzene [p-]	60-11-7	YES	YES	9.43E-02	1.0	5.4E-01	1.9E+00	4.6E+00
Dimethylbenz(a)anthracene, 7,12-	57-97-6	NO	YES	4.08E-01	0.9	2.5E+00	2.9E+00	1.2E+01
Dimethylbenzidine, 3,3'-	119-93-7	YES	YES	3.62E-03	1.0	2.0E-02	1.6E+00	3.9E+00
Dimethylphenol, 2,4-	105-67-9	YES	YES	1.09E-02	1.0	4.6E-02	5.1E-01	1.2E+00
Dinitrobenzene, 1,2-	528-29-0	YES	YES	2.37E-03	1.0	1.2E-02	9.2E-01	2.2E+00
Dinitrobenzene, 1,3-	99-65-0	YES	YES	1.74E-03	1.0	8.7E-03	9.2E-01	2.2E+00
Dinitrobenzene, 1,4-	100-25-4	YES	YES	1.67E-03	1.0	8.3E-03	9.2E-01	2.2E+00
Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	YES	YES	2.75E-02	0.9	1.7E-01	3.3E+00	7.8E+00
Dinitrophenol, 2,4-	51-28-5	YES	YES	1.87E-03	1.0	9.8E-03	1.1E+00	2.7E+00
Dinitrotoluene, 2,4-	121-14-2	YES	YES	3.08E-03	1.0	1.6E-02	1.1E+00	2.6E+00
Dinitrotoluene, 2,6-	606-20-2	YES	YES	3.70E-03	1.0	1.9E-02	1.1E+00	2.6E+00
Dinitrotoluene Mixture, 2,4/2,6	25321-14-6	YES	YES	4.16E-03	1.0	2.2E-02	1.1E+00	2.6E+00
Dinoseb	88-85-7	YES	YES	1.63E-02	0.9	9.7E-02	2.3E+00	5.6E+00
Diphenylhydrazine, 1,2-	122-66-7	YES	YES	1.30E-02	1.0	6.8E-02	1.1E+00	2.7E+00
Diquat	2764-72-9	YES	YES	5.38E-03	1.0	2.8E-02	1.1E+00	2.7E+00
Disulfoton	298-04-4	YES	YES	2.12E-02	0.9	1.4E-01	3.6E+00	8.7E+00
Diuron	330-54-1	YES	YES	4.66E-03	1.0	2.7E-02	2.1E+00	5.1E+00
Endothall	145-73-3	YES	YES	2.63E-03	1.0	1.4E-02	1.2E+00	2.8E+00
Endosulfan	115-29-7	YES	YES	2.86E-03	0.8	2.2E-02	2.0E+01	4.8E+01
Endrin	72-20-8	YES	YES	3.26E-02	1.0	2.4E-01	1.4E+01	3.4E+01
Epichlorohydrin	106-89-8	YES	YES	9.44E-04	1.0	3.5E-03	3.5E-01	8.3E-01
Ethion	563-12-2	YES	YES	2.55E-02	1.0	1.9E-01	1.5E+01	3.6E+01
Ethylene Glycol	107-21-1	YES	YES	8.77E-05	1.0	2.7E-04	2.3E-01	5.6E-01
Ethylene Thiourea	96-45-7	YES	YES	1.52E-04	1.0	5.9E-04	3.9E-01	9.4E-01
Fluoranthene	206-44-0	NO	YES	3.08E-01	1.0	1.7E+00	1.4E+00	5.7E+00
Fluorene	86-73-7	YES	YES	1.10E-01	1.0	5.5E-01	9.0E-01	2.2E+00
Furan	110-00-9	YES	YES	5.05E-03	1.0	1.6E-02	2.5E-01	6.1E-01
Furfural	98-01-1	YES	YES	8.48E-04	1.0	3.2E-03	3.6E-01	8.7E-01
Glyphosate	1071-83-6	NO	YES	4.54E-08	1.0	2.3E-07	9.3E-01	2.2E+00
Guthion	86-50-0	YES	YES	1.75E-03	1.0	1.2E-02	6.3E+00	1.5E+01
Heptachlor	76-44-8	YES	YES	1.43E-01	0.8	1.1E+00	1.3E+01	5.0E+01
Heptachlor Epoxide	1024-57-3	YES	YES	2.09E-02	0.8	1.6E-01	1.6E+01	3.8E+01
Hexachlorobenzene	118-74-1	NO	YES	2.54E-01	0.9	1.6E+00	4.1E+00	1.7E+01
Hexachlorobutadiene	87-68-3	YES	YES	8.10E-02	0.9	5.0E-01	3.0E+00	7.3E+00
Hexachlorocyclohexane, Alpha-	319-84-6	YES	YES	2.06E-02	0.9	1.4E-01	4.5E+00	1.1E+01
Hexachlorocyclohexane, Beta-	319-85-7	YES	YES	2.06E-02	0.9	1.4E-01	4.5E+00	1.1E+01
Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	YES	YES	2.06E-02	0.9	1.4E-01	4.5E+00	1.1E+01
Hexachlorocyclohexane, Technical	608-73-1	YES	YES	2.06E-02	0.9	1.4E-01	4.5E+00	1.1E+01
Hexachlorocyclopentadiene	77-47-4	YES	YES	1.03E-01	0.9	6.5E-01	3.5E+00	1.4E+01
Hexachloroethane	67-72-1	YES	YES	4.15E-02	1.0	2.5E-01	2.2E+00	5.3E+00
Hexachlorophene	70-30-4	NO	YES	8.36E-01	0.0	6.5E+00	2.0E+01	8.9E+01
Hexamethylene Diisocyanate, 1,6-	822-06-0	YES	YES	2.37E-02	1.0	1.2E-01	9.2E-01	2.2E+00
Hexamethylphosphoramide	680-31-9	YES	YES	2.37E-04	1.0	1.2E-03	1.1E+00	2.5E+00
Hexanedioic Acid	124-04-9	YES	YES	2.68E-04	1.0	1.2E-03	6.9E-01	1.7E+00
Hydroquinone	123-31-9	YES	YES	9.31E-04	1.0	3.8E-03	4.3E-01	1.0E+00
Indeno[1,2,3-cd]pyrene	193-39-5	NO	YES	1.24E+00	0.6	7.9E+00	3.7E+00	1.7E+01
Isophorone	78-59-1	YES	YES	3.54E-03	1.0	1.6E-02	6.2E-01	1.5E+00
Malathion	121-75-5	YES	YES	8.12E-04	1.0	5.7E-03	7.4E+00	1.8E+01
Maleic Anhydride	108-31-6	YES	YES	5.25E-03	1.0	2.0E-02	3.7E-01	8.9E-01
Maleic Hydrazide	123-33-1	YES	YES	1.02E-04	1.0	4.2E-04	4.5E-01	1.1E+00
Malononitrile	109-77-3	YES	YES	2.66E-04	1.0	8.3E-04	2.5E-01	5.9E-01
Methomyl	16752-77-5	YES	YES	4.82E-04	1.0	2.4E-03	8.5E-01	2.0E+00
Methoxychlor	72-43-5	YES	YES	4.28E-02	0.8	3.1E-01	9.1E+00	2.2E+01
Methyl Parathion	298-00-0	YES	YES	4.16E-03	1.0	2.6E-02	3.1E+00	7.5E+00
Methylaniline Hydrochloride, 2-	636-21-5	YES	YES	1.05E-05	1.0	4.8E-05	6.7E-01	1.6E+00
Methylcholanthrene, 3-	56-49-5	NO	YES	9.03E-01	0.8	5.7E+00	3.3E+00	1.5E+01
Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	YES	YES	1.97E-02	0.9	1.2E-01	3.3E+00	7.9E+00
Methylenebisbenzenamine, 4,4'-	101-77-9	YES	YES	1.38E-03	1.0	7.5E-03	1.4E+00	3.3E+00
Methylenediphenyl Diisocyanate	101-68-8	YES	YES	1.81E-01	0.9	1.1E+00	2.7E+00	1.0E+01
Methylnaphthalene, 1-	90-12-0	YES	YES	9.31E-02	1.0	4.3E-01	6.6E-01	1.6E+00
Methylnaphthalene, 2-	91-57-6	YES	YES	9.17E-02	1.0	4.2E-01	6.6E-01	1.6E+00
Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	YES	YES	5.72E-05	1.0	2.7E-04	7.0E-01	1.7E+00
Naled	300-76-5	YES	YES	9.44E-05	1.0	7.1E-04	1.4E+01	3.4E+01

Table 4: Groundwater dermal parameters

Chemical	CAS	In EPD? (a)	Organic?	Kp	FA (a)	B	τ_{event} (hours/event)	t (hr)
Naphthylamine, 2-	91-59-8	YES	YES	8.07E-03	1.0	3.7E-02	6.7E-01	1.6E+00
Nitroaniline, 4-	100-01-6	YES	YES	2.21E-03	1.0	1.0E-02	6.2E-01	1.5E+00
Nitrobenzene	98-95-3	YES	YES	5.41E-03	1.0	2.3E-02	5.1E-01	1.2E+00
Nitroglycerin	55-63-0	YES	YES	9.94E-04	1.0	5.8E-03	2.0E+00	4.7E+00
Nitropropane, 2-	79-46-9	YES	YES	2.06E-03	1.0	7.5E-03	3.3E-01	8.0E-01
Nitrosodiethanolamine, N-	1116-54-7	YES	YES	3.91E-05	1.0	1.7E-04	5.9E-01	1.4E+00
Nitrosodiethylamine, N-	55-18-5	YES	YES	8.72E-04	1.0	3.4E-03	3.9E-01	9.4E-01
Nitrosodimethylamine, N-	62-75-9	YES	YES	2.51E-04	1.0	8.3E-04	2.7E-01	6.6E-01
Nitroso-di-N-butylamine, N-	924-16-3	YES	YES	1.13E-02	1.0	5.5E-02	8.1E-01	1.9E+00
Nitroso-di-N-propylamine, N-	621-64-7	YES	YES	2.33E-03	1.0	1.0E-02	5.6E-01	1.4E+00
Nitrosodiphenylamine, N-	86-30-6	YES	YES	1.45E-02	1.0	7.9E-02	1.4E+00	3.3E+00
Nitrosomorpholine [N-]	59-89-2	YES	YES	1.78E-04	1.0	7.4E-04	4.7E-01	1.1E+00
Nitroso-N-ethylurea, N-	759-73-9	YES	YES	4.90E-04	1.0	2.0E-03	4.8E-01	1.1E+00
Nitroso-N-methylurea, N-	684-93-5	YES	YES	3.95E-04	1.0	1.5E-03	4.0E-01	9.5E-01
Nitrosopiperidine [N-]	100-75-4	YES	YES	6.22E-04	1.0	2.6E-03	4.6E-01	1.1E+00
Nitrosopyrrolidine, N-	930-55-2	YES	YES	3.21E-04	1.0	1.2E-03	3.8E-01	9.2E-01
Nitrotoluene, o-	88-72-2	YES	YES	8.99E-03	1.0	4.0E-02	6.2E-01	1.5E+00
Nitrotoluene, p-	99-99-0	YES	YES	1.00E-02	1.0	4.5E-02	6.2E-01	1.5E+00
Octamethylpyrophosphoramide	152-16-9	YES	YES	8.30E-06	1.0	5.4E-05	4.2E+00	1.0E+01
Octyl Phthalate, di-N-	117-84-0	NO	YES	2.43E+00	0.0	1.8E+01	1.6E+01	7.5E+01
Oxamyl	23135-22-0	YES	YES	4.49E-05	1.0	2.6E-04	1.8E+00	4.3E+00
Parathion	56-38-2	YES	YES	1.28E-02	0.9	8.4E-02	4.5E+00	1.1E+01
Pentachlorobenzene	608-93-5	YES	YES	1.68E-01	0.9	1.0E+00	2.7E+00	1.0E+01
Pentachloroethane	76-01-7	YES	YES	1.58E-02	1.0	8.6E-02	1.4E+00	3.4E+00
Pentachloronitrobenzene	82-68-8	YES	YES	4.18E-02	0.9	2.8E-01	4.7E+00	1.1E+01
Pentachlorophenol	87-86-5	YES	YES	1.27E-01	0.9	8.0E-01	3.3E+00	1.3E+01
Phenacetin	62-44-2	YES	YES	1.73E-03	1.0	8.9E-03	1.1E+00	2.5E+00
Phenol	108-95-2	YES	YES	4.34E-03	1.0	1.6E-02	3.5E-01	8.5E-01
Phenylmercuric Acetate	62-38-4	YES	YES	5.99E-05	1.0	4.2E-04	8.1E+00	1.9E+01
Phorate	298-02-2	YES	YES	1.26E-02	0.9	7.8E-02	3.0E+00	7.2E+00
Phosphoric Acid	7664-38-2	YES	NO	1.00E-03	1.0	3.8E-03	3.7E-01	8.9E-01
Phthalic Anhydride	85-44-9	YES	YES	2.67E-03	1.0	1.2E-02	7.1E-01	1.7E+00
Picloram	1918-02-1	YES	YES	1.27E-03	1.0	7.6E-03	2.4E+00	5.7E+00
Polychlorinated Biphenyls, Total	1336-36-3	NO	YES	5.45E-01	NA	3.6E+00	4.5E+00	1.9E+01
Pronamide	23950–58–5	YES	YES	1.09E-02	0.9	6.7E-02	2.9E+00	6.9E+00
Propargite	2312-35-8	YES	YES	3.56E-02	0.8	2.6E-01	9.7E+00	2.3E+01
Propham	122-42-9	YES	YES	8.26E-03	1.0	4.3E-02	1.1E+00	2.5E+00
Propoxur (Baygon)	114-26-1	YES	YES	1.07E-03	1.0	6.0E-03	1.6E+00	3.7E+00
Pyrene	129-00-0	YES	YES	2.01E-01	1.0	1.1E+00	1.4E+00	5.5E+00
Pyridine	110-86-1	YES	YES	1.52E-03	1.0	5.2E-03	2.9E-01	7.0E-01
Quinoline	91-22-5	YES	YES	6.59E-03	1.0	2.9E-02	5.6E-01	1.3E+00
Safrole	94-59-7	YES	YES	1.13E-02	1.0	5.5E-02	8.5E-01	2.0E+00
Simazine	122-34-9	YES	YES	3.25E-03	1.0	1.8E-02	1.4E+00	3.4E+00
Strychnine	57-24-9	YES	YES	3.99E-04	1.0	2.8E-03	7.8E+00	1.9E+01
TCDD, 2,3,7,8-	1746-01-6	NO	YES	8.08E-01	0.5	5.6E+00	6.7E+00	2.9E+01
Tetrachlorophenol, 2,3,4,6-	58-90-2	YES	YES	7.10E-02	0.9	4.2E-01	2.1E+00	5.0E+00
Tetraethyl Dithiopyrophosphate	3689-24-5	YES	YES	1.09E-02	0.9	7.5E-02	6.7E+00	1.6E+01
Tetrahydrofuran	109-99-9	YES	YES	1.25E-03	1.0	4.1E-03	2.7E-01	6.4E-01
Thiofanox	39196-18-4	YES	YES	6.27E-03	1.0	3.6E-02	1.8E+00	4.2E+00
Thiophanate, Methyl	23564-05-8	YES	YES	1.60E-04	1.0	1.1E-03	8.7E+00	2.1E+01
Thiram	137-26-8	YES	YES	9.90E-04	1.0	5.9E-03	2.3E+00	5.6E+00
Toluene-2,4-diisocyanate	584-84-9	YES	YES	5.05E-01	1.0	2.6E+00	9.9E-01	4.1E+00
Toluene-2,6-diisocyanate	91-08-7	YES	YES	5.05E-02	1.0	2.6E-01	9.9E-01	2.4E+00
Toluidine, p-	106-49-0	YES	YES	3.29E-03	1.0	1.3E-02	4.2E-01	1.0E+00
Toxaphene	8001-35-2	NO	YES	5.18E-02	0.8	4.2E-01	3.4E+01	8.2E+01
Triallate	2303-17-5	YES	YES	3.49E-02	0.9	2.3E-01	5.3E+00	1.3E+01
Trichlorobenzene, 1,2,4-	120-82-1	YES	YES	7.05E-02	1.0	3.7E-01	1.1E+00	2.6E+00
Trichlorophenol, 2,4,5-	95-95-4	YES	YES	3.62E-02	1.0	2.0E-01	1.3E+00	3.2E+00
Trichlorophenol, 2,4,6-	88-06-2	YES	YES	3.46E-02	1.0	1.9E-01	1.3E+00	3.2E+00
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	YES	YES	9.14E-03	0.9	5.6E-02	2.8E+00	6.8E+00
Trichlorophenoxypropionic acid, -2,4,5	93-72-1	YES	YES	1.61E-02	0.9	1.0E-01	3.4E+00	8.2E+00
Trifluralin	1582-09-8	YES	YES	7.28E-02	0.8	5.1E-01	7.9E+00	1.9E+01
Trimethylbenzene, 1,2,3-	526-73-8	YES	YES	8.97E-02	1.0	3.8E-01	5.0E-01	1.2E+00
Trimethylbenzene, 1,2,4-	95-63-6	YES	YES	8.57E-02	1.0	3.6E-01	5.0E-01	1.2E+00
Trimethylbenzene, 1,3,5-	108-67-8	YES	YES	6.21E-02	1.0	2.6E-01	5.0E-01	1.2E+00
Trinitrobenzene, 1,3,5-	99-35-4	YES	YES	6.07E-04	1.0	3.4E-03	1.6E+00	3.9E+00

Table 4: Groundwater dermal parameters

Chemical	CAS	In EPD? (a)	Organic?	Kp	FA (a)	B	τ_{event} (hours/event)	t (hr)
Urethane	51-79-6	YES	YES	3.94E-04	1.0	1.4E-03	3.3E-01	8.0E-01
Warfarin	81-81-2	YES	YES	1.82E-03	1.0	1.2E-02	5.6E+00	1.3E+01
Volatile Organic Compounds (VOCs)								
Acetaldehyde	75-07-0	YES	YES	5.27E-04	1.0	1.3E-03	1.9E-01	4.5E-01
Acetone	67-64-1	YES	YES	5.12E-04	1.0	1.5E-03	2.2E-01	5.3E-01
Acetonitrile	75-05-8	YES	YES	5.48E-04	1.0	1.4E-03	1.8E-01	4.3E-01
Acrolein	107-02-8	YES	YES	7.48E-04	1.0	2.2E-03	2.2E-01	5.2E-01
Acrylic Acid	79-10-7	YES	YES	1.05E-03	1.0	3.4E-03	2.7E-01	6.4E-01
Acrylonitrile	107-13-1	YES	YES	1.16E-03	1.0	3.3E-03	2.1E-01	5.0E-01
Allyl Alcohol	107-18-6	YES	YES	9.59E-04	1.0	2.8E-03	2.2E-01	5.3E-01
Allyl Chloride	107-05-1	YES	YES	1.12E-02	1.0	3.8E-02	2.8E-01	6.8E-01
Benzene	71-43-2	YES	YES	1.49E-02	1.0	5.1E-02	2.9E-01	6.9E-01
Benzotrichloride	98-07-7	YES	YES	4.87E-02	1.0	2.6E-01	1.3E+00	3.1E+00
Benzyl Chloride	100-44-7	YES	YES	1.03E-02	1.0	4.5E-02	5.4E-01	1.3E+00
Bis(2-chloro-1-methylethyl) Ether	108-60-1	YES	YES	7.64E-03	1.0	3.8E-02	9.5E-01	2.3E+00
Bromodichloromethane	75-27-4	YES	YES	4.02E-03	1.0	2.0E-02	8.7E-01	2.1E+00
Bromoform	75-25-2	YES	YES	2.35E-03	1.0	1.4E-02	2.7E+00	6.6E+00
Bromomethane	74-83-9	YES	YES	2.84E-03	1.0	1.1E-02	3.6E-01	8.6E-01
Butadiene, 1,3-	106-99-0	YES	YES	1.64E-02	1.0	4.6E-02	2.1E-01	5.1E-01
Butanol, N-	71-36-3	YES	YES	2.31E-03	1.0	7.6E-03	2.7E-01	6.6E-01
Butylbenzene, n-	104-51-8	NO	YES	2.25E-01	1.0	1.0E+00	5.9E-01	2.3E+00
Carbon Disulfide	75-15-0	YES	YES	1.14E-02	1.0	3.8E-02	2.8E-01	6.7E-01
Carbon Tetrachloride	56-23-5	YES	YES	1.63E-02	1.0	7.8E-02	7.6E-01	1.8E+00
Carbonyl Sulfide	463-58-1	YES	YES	9.42E-05	1.0	2.8E-04	2.3E-01	5.5E-01
Chlorobenzene	108-90-7	YES	YES	2.82E-02	1.0	1.2E-01	4.5E-01	1.1E+00
Chloro-1,3-butadiene, 2-	126-99-8	YES	YES	2.38E-02	1.0	8.6E-02	3.3E-01	7.9E-01
Chloroform	67-66-3	YES	YES	6.83E-03	1.0	2.9E-02	4.9E-01	1.2E+00
Chloromethane	74-87-3	YES	YES	3.28E-03	1.0	9.0E-03	2.0E-01	4.8E-01
Chloromethyl Methyl Ether	107-30-2	YES	YES	9.05E-04	1.0	3.1E-03	3.0E-01	7.1E-01
Crotonaldehyde, trans-	123-73-9	YES	YES	1.59E-03	1.0	5.1E-03	2.6E-01	6.2E-01
Cumene	98-82-8	YES	YES	8.97E-02	1.0	3.8E-01	5.0E-01	1.2E+00
Cyclohexane	110-82-7	YES	YES	1.02E-01	1.0	3.6E-01	3.1E-01	7.5E-01
Cyclohexanone	108-94-1	YES	YES	1.52E-03	1.0	5.8E-03	3.7E-01	8.9E-01
Dibromo-3-chloropropane, 1,2-	96-12-8	YES	YES	6.85E-03	1.0	4.1E-02	2.2E+00	5.3E+00
Dibromochloromethane	124-48-1	YES	YES	2.89E-03	1.0	1.6E-02	1.5E+00	3.7E+00
Dibromoethane, 1,2-	106-93-4	YES	YES	2.78E-03	1.0	1.5E-02	1.2E+00	2.8E+00
Dichloro-2-butene, 1,4-	764-41-0	YES	YES	1.66E-02	1.0	7.1E-02	5.3E-01	1.3E+00
Dichlorodifluoromethane	75-71-8	YES	YES	8.95E-03	1.0	3.8E-02	5.0E-01	1.2E+00
Dichloroethane, 1,1-	75-34-3	YES	YES	6.75E-03	1.0	2.6E-02	3.8E-01	9.0E-01
Dichloroethane, 1,2-	107-06-2	YES	YES	4.20E-03	1.0	1.6E-02	3.8E-01	9.0E-01
Dichloroethylene, 1,1-	75-35-4	YES	YES	1.17E-02	1.0	4.4E-02	3.7E-01	8.8E-01
Dichloroethylene, 1,2-cis-	156-59-2	YES	YES	1.10E-02	1.0	4.2E-02	3.7E-01	8.8E-01
Dichloroethylene, 1,2-trans-	156-60-5	YES	YES	1.10E-02	1.0	4.2E-02	3.7E-01	8.8E-01
Dichloropropane, 1,2-	78-87-5	YES	YES	7.53E-03	1.0	3.1E-02	4.5E-01	1.1E+00
Dichloropropane, 1,3-	142-28-9	YES	YES	7.76E-03	1.0	3.2E-02	4.5E-01	1.1E+00
Dichloropropene, 1,3-	542-75-6	YES	YES	8.34E-03	1.0	3.4E-02	4.4E-01	1.1E+00
Dihydrosafrole	94-58-6	YES	YES	4.52E-02	1.0	2.2E-01	8.7E-01	2.1E+00
Dimethylaniline, N,N-	121-69-7	YES	YES	1.12E-02	1.0	4.7E-02	5.0E-01	1.2E+00
Dimethylformamide	68-12-2	YES	YES	1.30E-04	1.0	4.3E-04	2.7E-01	6.5E-01
Dimethylhydrazine, 1,2-	540-73-8	YES	YES	3.17E-04	1.0	9.5E-04	2.3E-01	5.5E-01
Dioxane, 1,4-	123-91-1	YES	YES	3.32E-04	1.0	1.2E-03	3.3E-01	7.9E-01
Epoxybutane, 1,2-	106-88-7	YES	YES	2.31E-03	1.0	7.5E-03	2.7E-01	6.4E-01
Ethoxyethanol, 2-	110-80-5	YES	YES	3.00E-04	1.0	1.1E-03	3.4E-01	8.1E-01
Ethyl Acetate	141-78-6	YES	YES	1.53E-03	1.0	5.5E-03	3.3E-01	7.9E-01
Ethyl Acrylate	140-88-5	YES	YES	3.24E-03	1.0	1.2E-02	3.8E-01	9.2E-01
Ethyl Chloride (Chloroethane)	75-00-3	YES	YES	6.07E-03	1.0	1.9E-02	2.4E-01	5.8E-01
Ethyl Ether	60-29-7	YES	YES	2.35E-03	1.0	7.8E-03	2.7E-01	6.6E-01
Ethyl Methacrylate	97-63-2	YES	YES	6.98E-03	1.0	2.9E-02	4.6E-01	1.1E+00
Ethylbenzene	100-41-4	YES	YES	4.93E-02	1.0	2.0E-01	4.1E-01	9.9E-01
Ethylene Diamine	107-15-3	NO	YES	3.18E-05	1.0	9.5E-05	2.3E-01	5.5E-01
Ethylene Oxide	75-21-8	YES	YES	5.60E-04	1.0	1.4E-03	1.9E-01	4.5E-01
Ethyleneimine	151-56-4	YES	YES	5.81E-04	1.0	1.5E-03	1.8E-01	4.4E-01
Formaldehyde	50-00-0	YES	YES	1.82E-03	1.0	3.8E-03	1.5E-01	3.7E-01
Formic Acid	64-18-6	YES	YES	3.78E-04	1.0	9.9E-04	1.9E-01	4.6E-01
Glycidaldehyde	765-34-4	YES	YES	5.16E-04	1.0	1.7E-03	2.7E-01	6.4E-01
Hexane, N-	110-54-3	YES	YES	2.01E-01	1.0	7.2E-01	3.2E-01	1.2E+00

Table 4: Groundwater dermal parameters

Chemical	CAS	In EPD? (a)	Organic?	Kp	FA (a)	B	τ_{event} (hours/event)	t (hr)
Hydrazine	302-01-2	YES	YES	4.36E-05	1.0	9.5E-05	1.6E-01	3.8E-01
Isobutyl Alcohol	78-83-1	YES	YES	1.92E-03	1.0	6.4E-03	2.7E-01	6.6E-01
Methacrylonitrile	126-98-7	YES	YES	1.86E-03	1.0	5.9E-03	2.5E-01	6.0E-01
Methanol	67-56-1	YES	YES	3.19E-04	1.0	6.9E-04	1.6E-01	3.8E-01
Methyl Ethyl Ketone (2-Butanone)	78-93-3	YES	YES	9.62E-04	1.0	3.1E-03	2.7E-01	6.4E-01
Methyl Hydrazine	60-34-4	YES	YES	1.73E-04	1.0	4.5E-04	1.9E-01	4.6E-01
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	YES	YES	3.19E-03	1.0	1.2E-02	3.8E-01	9.2E-01
Methyl Isocyanate	624-83-9	YES	YES	2.50E-03	1.0	7.3E-03	2.2E-01	5.3E-01
Methyl Methacrylate	80-62-6	YES	YES	3.55E-03	1.0	1.4E-02	3.8E-01	9.2E-01
Methyl tert-Butyl Ether (MTBE)	1634-04-4	YES	YES	2.11E-03	1.0	7.6E-03	3.3E-01	7.9E-01
Methylene Chloride	75-09-2	YES	YES	3.54E-03	1.0	1.3E-02	3.1E-01	7.5E-01
Naphthalene	91-20-3	YES	YES	4.66E-02	1.0	2.0E-01	5.5E-01	1.3E+00
Nickel Carbonyl	13463-39-3	NO	YES	NA	NA	NA	NA	NA
Phosgene	75-44-5	YES	YES	1.47E-04	1.0	5.6E-04	3.8E-01	9.0E-01
Propargyl Alcohol	107-19-7	YES	YES	4.24E-04	1.0	1.2E-03	2.2E-01	5.2E-01
Propionaldehyde	123-38-6	YES	YES	1.82E-03	1.0	5.3E-03	2.2E-01	5.3E-01
Propylene Oxide	75-56-9	YES	YES	7.74E-04	1.0	2.3E-03	2.2E-01	5.3E-01
Styrene	100-42-5	YES	YES	3.72E-02	1.0	1.5E-01	4.0E-01	9.7E-01
Tetrachlorobenzene, 1,2,4,5-	95-94-3	YES	YES	1.17E-01	1.0	6.6E-01	1.7E+00	6.7E+00
Tetrachloroethane, 1,1,1,2-	630-20-6	YES	YES	1.59E-02	1.0	7.9E-02	9.2E-01	2.2E+00
Tetrachloroethane, 1,1,2,2-	79-34-5	YES	YES	6.94E-03	1.0	3.5E-02	9.2E-01	2.2E+00
Tetrachloroethylene	127-18-4	YES	YES	3.34E-02	1.0	1.7E-01	8.9E-01	2.1E+00
Toluene	108-88-3	YES	YES	3.11E-02	1.0	1.1E-01	3.5E-01	8.3E-01
Trichloroethane, 1,1,1-	71-55-6	YES	YES	1.26E-02	1.0	5.6E-02	5.9E-01	1.4E+00
Trichloroethane, 1,1,2-	79-00-5	YES	YES	5.04E-03	1.0	2.2E-02	5.9E-01	1.4E+00
Trichloroethylene	79-01-6	YES	YES	1.16E-02	1.0	5.1E-02	5.7E-01	1.4E+00
Trichlorofluoromethane	75-69-4	YES	YES	1.27E-02	1.0	5.7E-02	6.2E-01	1.5E+00
Triethylamine	121-44-8	YES	YES	3.90E-03	1.0	1.5E-02	3.9E-01	9.3E-01
Vinyl Acetate	108-05-4	YES	YES	1.57E-03	1.0	5.6E-03	3.2E-01	7.7E-01
Vinyl Bromide	593-60-2	YES	YES	4.35E-03	1.0	1.7E-02	4.2E-01	1.0E+00
Vinyl Chloride	75-01-4	YES	YES	8.38E-03	1.0	2.5E-02	2.4E-01	5.7E-01
Xylenes	1330-20-7	YES	YES	5.00E-02	1.0	2.0E-01	4.1E-01	9.9E-01

Notes:

(a) Values obtained from U.S. EPA Regional Screening Level (RSL) Online Calculator.

2. Toxicity criteria

To develop generic numerical standards for residential, commercial land use with high frequency child exposure, and commercial/industrial land uses, the following sources, in order of decreasing preference, were used to determine chronic toxicity values. To develop generic numerical standards for construction/excavation activities, the following sources, in order of decreasing preference, were also used to determine subchronic toxicity values. If no subchronic value was available in the following sources, the appropriate chronic value was used. When generating property-specific standards in accordance with OAC 3745-300-09, the most current update of the most preferred source should be consulted. Toxicity criteria appear in Table . The selection toxicity criteria only diverge from this hierarchy based on U.S. EPA's *Recommendations on the Use of Chronic or Subchronic Noncancer Values for Superfund Human Health Risk Assessments* (1).

1. U.S. EPA's Integrated Risk Information System (IRIS). IRIS is considered the most reliable source of toxicity information.

2. Provisional Peer Reviewed Toxicity Values (PPRTVs) derived by U.S. EPA's Superfund Health Risk Technical Support Center (STSC) for the EPA Superfund Program.

3. EPA's Office of Pesticide Programs (OPP) Human Health Benchmarks for Pesticides (HHBPs).

4. Minimal Risk Levels from the Agency for Toxic Substances and Disease Registry (ATSDR).

5. California Environmental Protection Agency's Office of Environmental Health Hazard Assessment's (OEHHA) Toxicity Criteria Database.

6. U.S. EPA Superfund Program's Health Effects Assessment Summary (HEAST).

Pathway-specific toxicity values for dermal exposure are seldom available. In the absence of pathway-specific toxicity values or information indicating that a particular pathway may not be applicable for a chemical, extrapolated toxicity values may be used. It is important to note, however, that direct route-to-route extrapolation may not be appropriate, particularly when original data are based upon studies employing administered rather than absorbed doses. In these instances, variability in chemical specific absorption efficiencies among different absorptive epithelial could result in invalid or highly uncertain toxicity values. Thus, appropriate route-to-route extrapolation should be confirmed by Ohio EPA Division of Environmental Response and Revitalization.

With regard to extrapolation of oral toxicity values to dermal exposure pathways, an oral toxicity value needs to be adjusted for the dermal pathway with a gastrointestinal absorption factor (GIABS) only when the gastrointestinal absorption of a chemical from a medium similar to the one utilized in the critical study is significantly less than 100%; otherwise, in the absence of a chemical-specific GIABS, oral toxicity values derived from studies using administered dose assume a default gastrointestinal

absorption efficiency of 100% (GIABS of 1.0). The recommendation to assume 100% absorption is based on review of the literature where it has been found that organic chemicals are generally well absorbed (> 50%) across the gastrointestinal tract. Although a wider range of absorption efficiencies have been reported for inorganic chemicals, the recommendation is to assume 100% absorption for inorganics lacking a chemical-specific GIABS. Therefore, a reference dose (or slope factor) derived from an administered dose critical study should be multiplied by a chemical-specific or default (1.0) GIABS such that the reference dose (or slope factor) is adjusted to account for the absorbed dose. See Table for the recommended GIABS for each chemical used to generate the generic numerical standards in OAC 3745-300-08.

Oral slope factors and reference doses are generally not extrapolated to assess inhaled exposures for chemicals lacking inhalation toxicity values. However, for pathways where inhalation is the only exposure route (*e.g.*, vapor intrusion), it may be appropriate to extrapolate slope factors or reference doses to inhalation unit risks or reference concentrations. Ohio EPA Division of Environmental Response and Remediation should be consulted to confirm whether extrapolation of an oral toxicity value to an inhalation toxicity value is appropriate.

---

(1) U.S. EPA 2021. *Recommendations on the Use of Chronic or Subchronic Noncancer Values for Superfund Human Health Risk Assessments*. Office of Superfund Remediation and Technology Innovation, Washington, D.C.

Table 5: Toxicity criteria

Chemical	CAS Number	Chronic Toxicity Values								Subchronic Toxicity Values				VOC	TO15	Mutagen	Relative Bio	GIABS	ABS	C_{SAT} (mg/kg)
		SF		IUR		RfD		RfC		RfD		RfC								
		$(mg/kg\text{-}day)^{-1}$	key	$(\mu g/m^3)^{-1}$	key	(mg/kg-day)	key	(mg/m^3)	key	(mg/kg-day)	key	(mg/m^3)	key							
Inorganics/Metals																				
Aluminum Phosphide	20859-73-8	NA	NA	NA	NA	4.0E-04	I	NA	NA	4.0E-04	H	NA	NA	NV	N		1	1	0	
Antimony (metallic)	7440-36-0	NA	NA	NA	NA	4.0E-04	I	3.0E-04	A	4.0E-04	P	1.0E-03	A	NV	N		1	0.15	0	
Antimony Trioxide	1309-64-4	NA	NA	NA	NA	NA	NA	2.0E-04	I	5.0E-01	P	2.0E-04	P	NV	N		1	0.15	0	
Arsenic, Inorganic	7440-38-2	1.5E+00	I	4.3E-03	I	3.0E-04	I	1.5E-05	C	NA	NA	NA	NA	NV	N		0.6	1	0.03	
Barium	7440-39-3	NA	NA	NA	NA	2.0E-01	I	5.0E-04	H	2.0E-01	A	5.0E-03	H	NV	N		1	0.07	0	
Beryllium and Compounds	7440-41-7	NA	NA	2.4E-03	I	2.0E-03	I	2.0E-05	I	5.0E-03	H	NA	NA	NV	N		1	0.007	0	
Cadmium	7440-43-9	NA	NA	1.8E-03	I	1.0E-04	A	1.0E-05	A	5.0E-04	A	NA	NA	NV	N		1	0.025	0.001	
Chlorine	7782-50-5	NA	NA	NA	NA	1.0E-01	I	1.5E-04	A	NA	NA	5.8E-03	A	V	N		1	1	0	2.78E+03
Chromium(III)	16065-83-1	NA	NA	NA	NA	1.5E+00	I	6.0E-05	C	1.5E+00	H	5.0E-03	A	NV	N		1	0.013	0	
Chromium(VI)	18540-29-9	5.0E-01	J	8.4E-02	S	3.0E-03	I	1.0E-04	I	5.0E-03	A	3.0E-04	A	NV	N	M	1	0.025	0	
Chromium, Total	7440-47-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	0.013	0	
Cobalt Compounds	7440-48-4	NA	NA	9.0E-03	P	3.0E-04	P	6.0E-06	P	3.0E-03	P	2.0E-05	P	NV	N		1	1	0	
Copper	7440-50-8	NA	NA	NA	NA	4.0E-02	H	NA	NA	4.0E-02	H	NA	NA	NV	N		1	1	0	
Disodium Phosphate	7558-79-4	NA	NA	NA	NA	1.0E+00	P	NA	NA	4.0E+00	P	NA	NA	NV	N		1	1	0	
Hydrogen Chloride	7647-01-0	NA	NA	NA	NA	NA	NA	2.0E-02	I	NA	NA	NA	NA	V	N		1	1	0	
Hydrogen Fluoride	7664-39-3	NA	NA	NA	NA	4.0E-02	C	1.4E-02	C	NA	NA	NA	NA	V	N		1	1	0	
Hydrogen Sulfide	7783-06-4	NA	NA	NA	NA	NA	NA	2.0E-03	I	3.0E-02	H	2.8E-02	A	V	N		1	1	0	
Fluorine (Soluble Fluoride)	7782-41-4	NA	NA	NA	NA	6.0E-02	I	1.3E-02	C	6.0E-02	H	NA	NA	NV	N		1	1	0	
Manganese Compounds	7439-96-5	NA	NA	NA	NA	2.4E-02	S	5.0E-05	I	1.4E-01	H	NA	NA	NV	N		1	0.04	0	
Mercury and Compounds	7439-97-6	NA	NA	NA	NA	NA	NA	3.0E-04	I	NA	NA	3.0E-04	H	V	N		1	1	0	3.13E+00
Nickel Soluble Salts	7440-02-0	NA	NA	2.6E-04	C	2.0E-02	I	1.4E-05	C	2.0E-02	H	NA	NA	NV	N		1	0.04	0	
Phosphine	7803-51-2	NA	NA	NA	NA	3.0E-04	I	3.0E-04	I	3.0E-04	H	3.0E-03	H	V	N		1	1	0	
Selenious Acid	7783-00-8	NA	NA	NA	NA	5.0E-03	I	NA	NA	5.0E-03	H	NA	NA	NV	N		1	1	0	
Selenium	7782-49-2	NA	NA	NA	NA	5.0E-03	I	2.0E-02	C	5.0E-03	H	NA	NA	NV	N		1	1	0	
Silver	7440-22-4	NA	NA	NA	NA	5.0E-03	I	NA	NA	5.0E-03	H	NA	NA	NV	N		1	0.04	0	
Sodium Azide	26628-22-8	NA	NA	NA	NA	4.0E-03	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0	
Sodium Fluoride	7681-49-4	NA	NA	NA	NA	5.0E-02	A	1.4E-02	C	NA	NA	NA	NA	NV	N		1	1	0	
Sodium Fluoroacetate	62-74-8	NA	NA	NA	NA	2.0E-05	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Sodium tripolyphosphate	7758-29-4	NA	NA	NA	NA	1.0E+00	P	NA	NA	4.0E+00	P	NA	NA	NV	N		1	1	0	
Sulfuric Acid	7664-93-9	NA	NA	NA	NA	NA	NA	1.0E-03	C	NA	NA	NA	NA	NV	N		1	1	0	
Thallium (Soluble Salts)	7440-28-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0	
Titanium Tetrachloride	7550-45-0	NA	NA	NA	NA	NA	NA	1.0E-04	A	NA	NA	1.0E-02	A	V	N		1	1	0	
Trisodium Phosphate	7601-54-9	NA	NA	NA	NA	1.0E+00	P	NA	NA	4.0E+00	P	NA	NA	NV	N		1	1	0	
Vanadium Compounds	7440-62-2	NA	NA	NA	NA	5.0E-03	S	1.0E-04	A	1.0E-02	A	NA	NA	NV	N		1	0.026	0	
Zinc and Compounds	7440-66-6	NA	NA	NA	NA	3.0E-01	I	NA	NA	3.0E-01	A	NA	NA	NV	N		1	1	0	
Zinc Phosphide	1314-84-7	NA	NA	NA	NA	3.0E-04	I	NA	NA	3.0E-03	H	NA	NA	NV	N		1	1	0	
Cyanides																				
Calcium Cyanide	592-01-8	NA	NA	NA	NA	1.0E-03	I	9.0E-03	C	4.0E-02	H	NA	NA	NV	N		1	1	0	
Copper Cyanide	544-92-3	NA	NA	NA	NA	5.0E-03	I	NA	NA	5.0E-02	H	NA	NA	NV	N		1	1	0	
Cyanide (CN-)	57-12-5	NA	NA	NA	NA	6.0E-04	I	8.0E-04	S	2.0E-02	H	NA	NA	V	N		1	1	0	9.54E+05
Cyanogen	460-19-5	NA	NA	NA	NA	1.0E-03	I	NA	NA	4.0E-02	H	NA	NA	V	N		1	1	0	
Cyanogen Bromide	506-68-3	NA	NA	NA	NA	9.0E-02	I	NA	NA	NA	NA	NA	NA	V	N		1	1	0	
Cyanogen Chloride	506-77-4	NA	NA	NA	NA	5.0E-02	I	NA	NA	5.0E-02	H	NA	NA	V	N		1	1	0	
Hydrogen Cyanide	74-90-8	NA	NA	NA	NA	6.0E-04	I	8.0E-04	I	NA	NA	NA	NA	V	N		1	1	0	1.00E+07
Potassium Cyanide	151-50-8	NA	NA	NA	NA	2.0E-03	I	9.0E-03	C	5.0E-02	H	NA	NA	NV	N		1	1	0	
Potassium Silver Cyanide	506-61-6	NA	NA	NA	NA	5.0E-03	I	NA	NA	2.0E-01	H	NA	NA	NV	N		1	0.04	0	
Silver Cyanide	506-64-9	NA	NA	NA	NA	1.0E-01	I	NA	NA	1.0E-01	H	NA	NA	NV	N		1	0.04	0	
Sodium Cyanide	143-33-9	NA	NA	NA	NA	1.0E-03	I	9.0E-03	C	5.0E-02	A	NA	NA	NV	N		1	1	0	
Zinc Cyanide	557-21-1	NA	NA	NA	NA	5.0E-02	I	NA	NA	5.0E-02	H	NA	NA	NV	N		1	1	0	
Lead Compounds																				
Lead Acetate	301-04-2	2.1E-01	C	8.0E-05	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Lead and Compounds*	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0	
Lead Phosphate	7446-27-7	8.5E-03	C	1.2E-05	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0	
Lead Subacetate	1335-32-6	3.8E-02	C	1.1E-05	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Tetraethyl Lead	78-00-2	NA	NA	NA	NA	1.0E-07	I	NA	NA	NA	NA	NA	NA	V	N		1	1	0	2.43E+00
Semi-Volatile Organic Compounds (SVOCs)																				
Acenaphthene	83-32-9	NA	NA	NA	NA	6.0E-02	I	NA	NA	2.0E-01	P	NA	NA	V	N		1	1	0.13	
Acetophenone	98-86-2	NA	NA	NA	NA	1.0E-01	I	NA	NA	NA	NA	NA	NA	V	Y		1	1	0	2.52E+03
Acetylaminofluorene, 2-	53-96-3	3.8E+00	C	1.3E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Acrylamide	79-06-1	5.0E-01	I	1.0E-04	I	2.0E-03	I	6.0E-03	I	1.0E-03	A	NA	NA	NV	N	M	1	1	0.1	
Alachlor	15972-60-8	5.6E-02	C	NA	NA	1.0E-02	I	NA	NA	1.0E-02	H	NA	NA	NV	N		1	1	0.1	
Aldicarb	116-06-3	NA	NA	NA	NA	1.0E-03	I	NA	NA	1.0E-03	H	NA	NA	NV	N		1	1	0.1	
Aldicarb Sulfone	1646-88-4	NA	NA	NA	NA	1.0E-03	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Aldrin	309-00-2	1.7E+01	I	4.9E-03	I	3.0E-05	I	NA	NA	4.0E-05	P	NA	NA	V	N		1	1	0	
Aminobiphenyl, 4-	92-67-1	2.1E+01	C	6.0E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Ammonium Sulfamate	7773-06-0	NA	NA	NA	NA	2.0E-01	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0	
Aniline	62-53-3	5.7E-03	I	1.6E-06	C	7.0E-03	P	1.0E-03	I	NA	NA	1.0E-02	H	NV	N		1	1	0.1	
Anthracene	120-12-7	NA	NA	NA	NA	3.0E-01	I	NA	NA	1.0E+00	P	NA	NA	V	N		1	1	0.13	
Aroclor 1016	12674-11-2	7.0E-02	I	2.0E-05	I	7.0E-05	I	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Aroclor 1221	11104-28-2	2.0E+00	I	5.7E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Aroclor 1232	11141-16-5	2.0E+00	I	5.7E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Aroclor 1242	53469-21-9	2.0E+00	I	5.7E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Aroclor 1248	12672-29-6	2.0E+00	I	5.7E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Aroclor 1254	11097-69-1	2.0E+00	I	5.7E-04	I	2.0E-05	I	NA	NA	3.0E-05	A	NA	NA	V	N		1	1	0.14	
Aroclor 1260	11096-82-5	2.0E+00	I	5.7E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Atrazine	1912-24-9	2.3E-01	C	NA	NA	3.0E-03	A	NA	NA	3.0E-03	A	NA	NA	NV	N		1	1	0.1	
Auramine	492-80-8	8.8E-01	C	2.5E-04	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Benomyl	17804-35-2	NA	NA	NA	NA	5.0E-02	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Benzenethiol	108-98-5	NA	NA	NA	NA	1.0E-03	P	NA	NA	1.0E-02	P	NA	NA	V	N		1	1	0	1.26E+03
Benzidine	92-87-5	2.3E+02	I	6.7E-02	I	3.0E-03	I	NA	NA	3.0E-03	H	NA	NA	NV	N	M	1	1	0.1	
Benz[a]anthracene	56-55-3	1.0E-01	I	6.0E-05	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N	M	1	1	0.13	
Benzo[a]pyrene	50-32-8	1.0E+00	I	6.0E-04	I	3.0E-04	I	2.0E-06	I	NA	NA	NA	NA	NV	N	M	1	1	0.13	
Benzo[b]fluoranthene	205-99-2	1.0E-01	I	6.0E-05	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.13	
Benzo[k]fluoranthene	207-08-9	1.0E-02	I	6.0E-06	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.13	
Benzoic Acid	65-85-0	NA	NA	NA	NA	4.0E+00	I	NA	NA	4.0E+00	P	2.0E-03	P	NV	N		1	1	0.1	
Biphenyl, 1,1'-	92-52-4	8.0E-03	I	NA	NA	5.0E-01	I	NA	NA	1.0E-01	P	NA	NA	V	N		1	1	0	
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	NA	NA	3.0E-03	P	NA	NA	3.0E-02	P	NA	NA	NV	N		1	1	0.1	
Bis(2-chloroethyl)ether	111-44-4	1.1E+00	I	3.3E-04	I	NA	NA	NA	NA	NA	NA	1.2E-01	A	V	Y		1	1	0	5.05E+03
Bis(chloromethyl)ether	542-88-1	2.2E+02	I	6.2E-02	I	NA	NA	NA	NA	NA	NA	1.4E-03	A	V	Y		1	1	0	4.22E+03
Bis(2-ethylhexyl)phthalate	117-81-7	1.4E-02	I	2.4E-06	C	2.0E-02	I	NA	NA	1.0E-04	A	3.2E-03	A	NV	N		1	1	0.1	
Butyl Benzyl Phthlate	85-68-7	1.9E-03	P	NA	NA	2.0E-01	I	NA	NA	2.0E+00	H	NA	NA	NV	N		1	1	0.1	
Cacodylic Acid	75-60-5	NA	NA	NA	NA	2.0E-02	A	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Captan	133-06-2	2.3E-03	C	6.6E-07	C	1.3E-01	I	NA	NA	1.3E-01	H	NA	NA	NV	N		1	1	0.1	
Carbaryl	63-25-2	NA	NA	NA	NA	1.0E-01	I	NA	NA	1.0E-01	H	NA	NA	NV	N		1	1	0.1	
Carbofuran	1563-66-2	NA	NA	NA	NA	5.0E-03	I	NA	NA	5.0E-03	H	NA	NA	NV	N		1	1	0.1	
Carbosulfan	55285-14-8	NA	NA	NA	NA	1.0E-02	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Chloramben	133-90-4	NA	NA	NA	NA	1.5E-02	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Chlordane	12789-03-6	3.5E-01	I	1.0E-04	I	5.0E-04	I	7.0E-04	I	6.0E-04	A	2.0E-04	A	V	N		1	1	0.04	
Chlordecone (Kepone)	143-50-0	1.0E+01	I	4.6E-03	C	3.0E-04	I	NA	NA	3.0E-03	A	NA	NA	NV	N		1	1	0.1	
Chloro-2-methylaniline HCl, 4-	3165-93-3	4.6E-01	H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Chloroacetic Acid	79-11-8	NA	NA	NA	NA	3.5E-03	C	NA	NA	NA	NA	NA	NA	NV			1	1	0.1	
Chloroacetophenone, 2-	532-27-4	NA	NA	NA	NA	NA	NA	3.0E-05	I	NA	NA	NA	NA	NV	N		1	1	0.1	
Chloroaniline, p-	106-47-8	2.0E-01	P	NA	NA	5.0E-04	P	NA	NA	5.0E-04	P	NA	NA	NV	N		1	1	0.1	
Chlorobenzilate	510-15-6	1.1E-01	C	3.1E-05	C	2.0E-02	I	NA	NA	2.0E-02	H	NA	NA	NV	N		1	1	0.1	
Chloronaphthalene, Beta-	91-58-7	NA	NA	NA	NA	8.0E-02	I	NA	NA	2.0E-01	P	NA	NA	V	N		1	1	0.13	
Chlorophenol, 2-	95-57-8	NA	NA	NA	NA	5.0E-03	I	NA	NA	8.0E-03	P	NA	NA	V	N		1	1	0	2.74E+04
Chlorpyrifos	2921-88-2	NA	NA	NA	NA	1.0E-03	A	NA	NA	3.0E-03	A	NA	NA	NV	N		1	1	0.1	
Chrysene	218-01-9	1.0E-03	I	6.0E-07	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.13	
Cresol, m-	108-39-4	NA	NA	NA	NA	5.0E-02	I	6.0E-01	C	4.0E-01	P	NA	NA	NV	N		1	1	0.1	
Cresol, o-	95-48-7	NA	NA	NA	NA	5.0E-02	I	6.0E-01	C	2.0E-01	P	NA	NA	NV	N		1	1	0.1	
Cresol, p-	106-44-5	NA	NA	NA	NA	2.0E-02	P	6.0E-01	C	2.0E-02	P	NA	NA	NV	N		1	1	0.1	
Cresol, p-chloro-m-	59-50-7	NA	NA	NA	NA	1.0E-01	A	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Cresols	1319-77-3	NA	NA	NA	NA	1.0E-01	A	6.0E-01	C	1.0E-01	A	NA	NA	NV	N		1	1	0.1	
DDD	72-54-8	2.4E-01	I	6.9E-05	C	5.0E-04	A	NA	NA	5.0E-04	A	NA	NA	NV	N		1	1	0.1	
DDE, p,p'-	72-55-9	3.4E-01	I	9.7E-05	C	5.0E-04	A	NA	NA	3.0E-04	P	NA	NA	V	N		1	1	0	
DDT	50-29-3	3.4E-01	I	9.7E-05	I	5.0E-04	I	NA	NA	5.0E-04	A	NA	NA	NV	N		1	1	0.03	
Diallate	2303-16-4	6.1E-02	H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Diazinon	333-41-5	NA	NA	NA	NA	7.0E-04	A	NA	NA	2.0E-03	A	1.0E-02	A	NV	N		1	1	0.1	
Dibenz[a,h]anthracene	53-70-3	1.0E+00	I	6.0E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.13	
Dibutyl Phthalate	84-74-2	NA	NA	NA	NA	1.0E-01	I	NA	NA	1.0E+00	H	NA	NA	NV	N		1	1	0.1	

Table 5: Toxicity criteria

Chemical	CAS Number	Chronic Toxicity Values								Subchronic Toxicity Values				VOC	TO15	Mutagen	Relative Bio	GIABS	ABS	C_{SAT} (mg/kg)
		SF		IUR		RfD		RfC		RfD		RfC								
		$(mg/kg\text{-}day)^{-1}$	key	$(\mu g/m^3)^{-1}$	key	(mg/kg-day)	key	(mg/m^3)	key	(mg/kg-day)	key	(mg/m^3)	key							
Dicamba	1918-00-9	NA	NA	NA	NA	3.0E-02	I	NA	NA	3.0E-02	H	NA	NA	NV	N		1	1	0.1	
Dichlorobenzene, 1,2-	95-50-1	NA	NA	NA	NA	9.0E-02	I	2.0E-01	H	6.0E-01	A	2.0E+00	H	V	Y		1	1	0	3.76E+02
Dichlorobenzene, 1,4-	106-46-7	5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	7.0E-02	A	1.2E+00	A	V	Y		1	1	0	
Dichlorobenzidine, 3,3'-	91-94-1	4.5E-01	I	3.4E-04	C	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.1	
Dichlorophenol, 2,4-	120-83-2	NA	NA	NA	NA	3.0E-03	I	NA	NA	2.0E-02	P	NA	NA	NV	N		1	1	0.1	
Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	NA	NA	NA	NA	1.0E-02	I	NA	NA	2.0E-01	A	NA	NA	NV	N		1	1	0.05	
Dichloropropionic acid, 2,2-	75-99-0	NA	NA	NA	NA	3.0E-02	I	NA	NA	3.0E-02	H	NA	NA	NV	N		1	1	0.1	
Dichlorvos	62-73-7	2.9E-01	I	8.3E-05	C	5.0E-04	I	5.0E-04	I	3.0E-03	A	2.7E-03	A	NV	N		1	1	0.1	
Dieldrin	60-57-1	1.6E+01	I	4.6E-03	I	5.0E-05	I	NA	NA	1.0E-04	A	NA	NA	NV	N		1	1	0.1	
Diethanolamine	111-42-2	NA	NA	NA	NA	2.0E-03	P	2.0E-04	P	2.0E-02	P	2.0E-03	P	NV	N		1	1	0.1	
Diethyl Phthalate	84-66-2	NA	NA	NA	NA	8.0E-01	I	NA	NA	6.0E+00	A	NA	NA	NV	N		1	1	0.1	
Diethylstilbestrol	56-53-1	3.5E+02	C	1.0E-01	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Dimethoate	60-51-5	NA	NA	NA	NA	2.2E-03	O	NA	NA	2.0E-04	H	NA	NA	NV	N		1	1	0.1	
Dimethoxybenzidine, 3,3'-	119-90-4	1.6E+00	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Dimethylamino azobenzene [p-]	60-11-7	4.6E+00	C	1.3E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Dimethylbenz(a)anthracene, 7,12-	57-97-6	2.5E+02	C	7.1E-02	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.13	
Dimethylbenzidine, 3,3'-	119-93-7	1.1E+01	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Dimethylphenol, 2,4-	105-67-9	NA	NA	NA	NA	2.0E-02	I	NA	NA	5.0E-02	P	NA	NA	NV	N		1	1	0.1	
Dinitrobenzene, 1,2-	528-29-0	NA	NA	NA	NA	1.0E-04	P	NA	NA	1.0E-03	P	NA	NA	NV	N		1	1	0.1	
Dinitrobenzene, 1,3-	99-65-0	NA	NA	NA	NA	1.0E-04	I	NA	NA	5.0E-04	A	NA	NA	NV	N		1	1	0.1	
Dinitrobenzene, 1,4-	100-25-4	NA	NA	NA	NA	1.0E-04	P	NA	NA	1.0E-03	P	NA	NA	NV	N		1	1	0.1	
Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	NA	NA	NA	NA	2.0E-03	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Dinitrophenol, 2,4-	51-28-5	NA	NA	NA	NA	2.0E-03	I	NA	NA	2.0E-02	P	NA	NA	NV	N		1	1	0.1	
Dinitrotoluene, 2,4-	121-14-2	3.1E-01	C	8.9E-05	C	2.0E-03	I	NA	NA	7.0E-03	A	NA	NA	NV	N		1	1	0.102	
Dinitrotoluene, 2,6-	606-20-2	1.5E+00	P	NA	NA	NA	NA	NA	NA	4.0E-03	A	NA	NA	NV	N		1	1	0.099	
Dinitrotoluene Mixture, 2,4/2,6	25321-14-6	6.8E-01	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Dinoseb	88-85-7	NA	NA	NA	NA	1.0E-03	I	NA	NA	1.0E-03	H	NA	NA	NV	N		1	1	0.1	
Diphenylhydrazine, 1,2-	122-66-7	8.0E-01	I	2.2E-04	I	NA	NA	NA	NA	5.0E-02	A	NA	NA	NV	N		1	1	0.1	
Diquat	2764-72-9	NA	NA	NA	NA	2.2E-03	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Disulfoton	298-04-4	NA	NA	NA	NA	4.0E-05	I	NA	NA	9.0E-05	A	6.0E-04	A	NV	N		1	1	0.1	
Diuron	330-54-1	NA	NA	NA	NA	2.0E-03	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Endothall	145-73-3	NA	NA	NA	NA	2.0E-02	I	NA	NA	2.0E-02	H	NA	NA	NV	N		1	1	0.1	
Endosulfan	115-29-7	NA	NA	NA	NA	6.0E-03	I	NA	NA	5.0E-03	A	NA	NA	V	N		1	1	0	
Endrin	72-20-8	NA	NA	NA	NA	3.0E-04	I	NA	NA	6.0E-04	A	NA	NA	NV	N		1	1	0.1	
Epichlorohydrin	106-89-8	9.9E-03	I	1.2E-06	I	6.0E-03	P	1.0E-03	I	6.0E-03	P	1.0E-02	P	V	Y		1	1	0	1.05E+04
Ethion	563-12-2	NA	NA	NA	NA	5.0E-04	I	NA	NA	2.0E-03	A	NA	NA	NV	N		1	1	0.1	
Ethylene Glycol	107-21-1	NA	NA	NA	NA	8.0E-01	A	4.0E-01	C	8.0E-01	A	NA	NA	NV	N		1	1	0.1	
Ethylene Thiourea	96-45-7	4.5E-02	C	1.3E-05	C	8.0E-05	I	NA	NA	8.0E-05	H	NA	NA	NV	N		1	1	0.1	
Fluoranthene	206-44-0	NA	NA	NA	NA	4.0E-02	I	NA	NA	1.0E-01	P	NA	NA	NV	N		1	1	0.13	
Fluorene	86-73-7	NA	NA	NA	NA	4.0E-02	I	NA	NA	8.0E-04	P	NA	NA	V	N		1	1	0.13	
Furan	110-00-9	NA	NA	NA	NA	1.0E-03	I	NA	NA	1.0E-02	H	NA	NA	V	N		1	1	0	6.22E+03
Furfural	98-01-1	NA	NA	NA	NA	3.0E-03	I	5.0E-02	H	3.0E-02	H	5.0E-01	H	V	N		1	1	0	1.01E+04
Glyphosate	1071-83-6	NA	NA	NA	NA	1.0E-01	I	NA	NA	1.0E+00	A	NA	NA	NV	N		1	1	0.1	
Guthion	86-50-0	NA	NA	NA	NA	3.0E-03	A	1.0E-02	A	3.0E-03	A	1.0E-02	A	NV	N		1	1	0.1	
Heptachlor	76-44-8	4.5E+00	I	1.3E-03	I	1.0E-04	A	NA	NA	1.0E-04	A	NA	NA	V	N		1	1	0	
Heptachlor Epoxide	1024-57-3	9.1E+00	I	2.6E-03	I	1.3E-05	I	NA	NA	1.3E-05	H	NA	NA	V	N		1	1	0	
Hexachlorobenzene	118-74-1	1.6E+00	I	4.6E-04	I	1.0E-05	P	NA	NA	1.0E-05	P	NA	NA	V	N		1	1	0	
Hexachlorobutadiene	87-68-3	7.8E-02	I	2.2E-05	I	1.0E-03	P	NA	NA	1.0E-03	P	NA	NA	V	Y		1	1	0	1.68E+01
Hexachlorocyclohexane, Alpha-	319-84-6	6.3E+00	I	1.8E-03	I	9.0E-04	A	NA	NA	2.0E-03	A	NA	NA	NV	N		1	1	0.1	
Hexachlorocyclohexane, Beta-	319-85-7	1.8E+00	I	5.3E-04	I	NA	NA	NA	NA	6.0E-04	A	NA	NA	NV	N		1	1	0.1	
Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	1.1E+00	C	3.1E-04	C	3.0E-04	I	NA	NA	8.0E-07	A	NA	NA	NV	N		1	1	0.04	
Hexachlorocyclohexane, Technical	608-73-1	1.8E+00	I	5.1E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Hexachlorocyclopentadiene	77-47-4	NA	NA	NA	NA	6.0E-03	I	2.0E-04	I	1.0E-01	A	1.1E-01	A	V	N		1	1	0	1.57E+01
Hexachloroethane	67-72-1	4.0E-02	I	1.1E-05	C	7.0E-04	I	3.0E-02	I	1.0E-02	A	5.8E+01	A	V	Y		1	1	0	
Hexachlorophene	70-30-4	NA	NA	NA	NA	3.0E-04	I	NA	NA	3.0E-03	H	NA	NA	NV	N		1	1	0.1	
Hexamethylene Diisocyanate, 1,6-	822-06-0	NA	NA	NA	NA	NA	NA	1.0E-05	I	NA	NA	2.1E-04	A	V	N		1	1	0	3.39E+03
Hexamethylphosphoramide	680-31-9	NA	NA	NA	NA	4.0E-04	P	NA	NA	4.0E-03	P	NA	NA	NV	N		1	1	0.1	
Hexanedioic Acid	124-04-9	NA	NA	NA	NA	2.0E+00	P	NA	NA	2.0E+00	P	NA	NA	NV	N		1	1	0.1	
Hydroquinone	123-31-9	6.0E-02	P	NA	NA	4.0E-02	P	NA	NA	4.0E-01	P	NA	NA	NV	N		1	1	0.1	
Indeno[1,2,3-cd]pyrene	193-39-5	1.0E-01	E	6.0E-05	E	NA	NA	NA	NA	NA	NA	NA	NA	NV		M	1	1	0.13	
Isophorone	78-59-1	9.5E-04	I	NA	NA	2.0E-01	I	2.0E+00	C	3.0E+00	A	NA	NA	NV	N		1	1	0.1	
Malathion	121-75-5	NA	NA	NA	NA	2.0E-02	I	NA	NA	2.0E-02	A	2.0E-02	A	NV	N		1	1	0.1	
Maleic Anhydride	108-31-6	NA	NA	NA	NA	1.0E-01	I	7.0E-04	C	1.0E-01	H	NA	NA	NV	N		1	1	0.1	
Maleic Hydrazide	123-33-1	NA	NA	NA	NA	5.0E-01	I	NA	NA	5.0E-01	H	NA	NA	NV	N		1	1	0.1	
Malononitrile	109-77-3	NA	NA	NA	NA	1.0E-04	P	NA	NA	1.0E-03	P	NA	NA	NV	N		1	1	0.1	
Methomyl	16752-77-5	NA	NA	NA	NA	2.5E-02	I	NA	NA	2.5E-02	H	NA	NA	NV	N		1	1	0.1	
Methoxychlor	72-43-5	NA	NA	NA	NA	5.0E-03	I	NA	NA	5.0E-03	A	NA	NA	NV	N		1	1	0.1	
Methyl Parathion	298-00-0	NA	NA	NA	NA	2.5E-04	I	NA	NA	7.0E-04	A	NA	NA	NV	N		1	1	0.1	
Methylaniline Hydrochloride, 2-	636-21-5	1.3E-01	C	3.7E-05	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Methylcholanthrene, 3-	56-49-5	2.2E+01	C	6.3E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.1	
Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.0E-01	P	4.3E-04	C	2.0E-03	P	NA	NA	2.0E-03	P	NA	NA	NV	N	M	1	1	0.1	
Methylenebisbenzenamine, 4,4'-	101-77-9	1.6E+00	C	4.6E-04	C	NA	NA	2.0E-02	C	8.0E-02	A	NA	NA	NV	N		1	1	0.1	
Methylenediphenyl Diisocyanate	101-68-8	NA	NA	NA	NA	NA	NA	6.0E-04	I	NA	NA	2.0E-05	H	NV	N		1	1	0.1	
Methylnaphthalene, 1-	90-12-0	NA	NA	NA	NA	7.0E-02	A	3.0E-06	P	NA	NA	3.0E-05	P	V	N		1	1	0.13	3.94E+02
Methylnaphthalene, 2-	91-57-6	NA	NA	NA	NA	4.0E-03	I	NA	NA	4.0E-03	P	NA	NA	V	N		1	1	0.13	
Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	8.3E+00	C	2.4E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV			1	1	0.1	
Naled	300-76-5	NA	NA	NA	NA	2.0E-03	I	NA	NA	NA	NA	NA	NA	V	N		1	1	0	
Naphthylamine, 2-	91-59-8	1.8E+00	C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitroaniline, 4-	100-01-6	2.0E-02	P	NA	NA	4.0E-03	P	6.0E-03	P	1.0E-02	P	2.0E-02	P	NV	N		1	1	0.1	
Nitrobenzene	98-95-3	NA	NA	4.0E-05	I	2.0E-03	I	9.0E-03	I	2.0E-02	A	1.5E-02	A	V	Y		1	1	0	3.05E+03
Nitroglycerin	55-63-0	1.7E-02	P	NA	NA	1.0E-04	P	NA	NA	1.0E-04	P	NA	NA	NV	N		1	1	0.1	
Nitropropane, 2-	79-46-9	NA	NA	NA	NA	NA	NA	2.0E-02	I	NA	NA	7.0E-02	P	V	Y		1	1	0	4.86E+03
Nitrosodiethanolamine, N-	1116-54-7	2.8E+00	I	8.0E-04	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitrosodiethylamine, N-	55-18-5	1.5E+02	I	4.3E-02	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.1	
Nitrosodimethylamine, N-	62-75-9	5.1E+01	I	1.4E-02	I	8.0E-06	P	NA	NA	8.0E-06	P	NA	NA	V	Y	M	1	1	0	2.37E+05
Nitroso-di-N-butylamine, N-	924-16-3	5.4E+00	I	1.6E-03	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0	
Nitroso-di-N-propylamine, N-	621-64-7	7.0E+00	I	2.0E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitrosodiphenylamine, N-	86-30-6	4.9E-03	I	2.6E-06	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitrosomorpholine [N-]	59-89-2	6.7E+00	C	1.9E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitroso-N-ethylurea, N-	759-73-9	2.7E+01	C	7.7E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.1	
Nitroso-N-methylurea, N-	684-93-5	1.2E+02	C	3.4E-02	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.1	
Nitrosopiperidine [N-]	100-75-4	9.4E+00	C	2.7E-03	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitrosopyrrolidine, N-	930-55-2	2.1E+00	I	6.1E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Nitrotoluene, o-	88-72-2	2.2E-01	P	NA	NA	9.0E-04	P	NA	NA	1.0E-02	P	NA	NA	V	N		1	1	0	1.51E+03
Nitrotoluene, p-	99-99-0	1.6E-02	P	NA	NA	4.0E-03	P	NA	NA	4.0E-03	P	NA	NA	NV	N		1	1	0.1	
Octamethylpyrophosphoramide	152-16-9	NA	NA	NA	NA	2.0E-03	H	NA	NA	2.0E-03	H	NA	NA	NV	N		1	1	0.1	
Octyl Phthalate, di-N-	117-84-0	NA	NA	NA	NA	1.0E-02	P	NA	NA	1.0E-01	P	NA	NA	NV	N		1	1	0.1	
Oxamyl	23135-22-0	NA	NA	NA	NA	2.5E-02	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Parathion	56-38-2	NA	NA	NA	NA	6.0E-03	H	NA	NA	9.0E-03	A	2.0E-05	A	NV	N		1	1	0.1	
Pentachlorobenzene	608-93-5	NA	NA	NA	NA	8.0E-04	I	NA	NA	8.0E-03	H	NA	NA	V	N		1	1	0	
Pentachloroethane	76-01-7	9.0E-02	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0	4.57E+02
Pentachloronitrobenzene	82-68-8	2.6E-01	H	NA	NA	3.0E-03	I	NA	NA	3.0E-03	H	NA	NA	V	N		1	1	0.1	
Pentachlorophenol	87-86-5	4.0E-01	I	5.1E-06	C	5.0E-03	I	NA	NA	3.0E-02	H	NA	NA	NV	N		1	1	0.25	
Phenacetin	62-44-2	2.2E-03	C	6.3E-07	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Phenol	108-95-2	NA	NA	NA	NA	3.0E-01	I	2.0E-01	C	6.0E-01	H	NA	NA	NV	N		1	1	0.1	
Phenylmercuric Acetate	62-38-4	NA	NA	NA	NA	8.0E-05	I	NA	NA	8.0E-05	H	NA	NA	NV	N		1	1	0.1	
Phorate	298-02-2	NA	NA	NA	NA	2.0E-04	H	NA	NA	2.0E-04	H	NA	NA	NV	N		1	1	0.1	
Phosphoric Acid	7664-38-2	NA	NA	NA	NA	1.0E+00	P	1.0E-02	I	4.0E+00	P	NA	NA	NV	N		1	1	0	
Phthalic Anhydride	85-44-9	NA	NA	NA	NA	2.0E+00	I	2.0E-02	C	2.0E+00	H	1.2E-01	H	NV	N		1	1	0.1	
Picloram	1918-02-1	NA	NA	NA	NA	7.0E-02	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Polychlorinated Biphenyls, Total	1336-36-3	2.0E+00	I	5.7E-04	I	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0.14	
Pronamide	23950–58–5	NA	NA	NA	NA	7.5E-02	I	NA	NA	7.5E-02	H	NA	NA	NV	N		1	1	0.1	
Propargite	2312-35-8	1.9E-01	O	NA	NA	4.0E-02	O	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Propham	122-42-9	NA	NA	NA	NA	2.0E-02	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Propoxur (Baygon)	114-26-1	NA	NA	NA	NA	4.0E-03	I	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Pyrene	129-00-0	NA	NA	NA	NA	3.0E-02	I	NA	NA	3.0E-01	P	NA	NA	V	N		1	1	0.13	
Pyridine	110-86-1	NA	NA	NA	NA	1.0E-03	I	NA	NA	1.0E-02	H	NA	NA	V	N		1	1	0	5.30E+05
Quinoline	91-22-5	3.0E+00	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Safrole	94-59-7	2.2E-01	C	6.3E-05	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.1	
Simazine	122-34-9	1.2E-01	H	NA	NA	5.0E-03	I	NA	NA	5.0E-03	H	NA	NA	NV	N		1	1	0.1	

Table 5: Toxicity criteria

Chemical	CAS Number	Chronic Toxicity Values								Subchronic Toxicity Values				VOC	TO15	Mutagen	Relative Bio	GIABS	ABS	C_{SAT} (mg/kg)
		SF		IUR		RfD		RfC		RfD		RfC								
		$(mg/kg\text{-}day)^{-1}$	key	$(\mu g/m^3)^{-1}$	key	(mg/kg-day)	key	(mg/m^3)	key	(mg/kg-day)	key	(mg/m^3)	key							
Strychnine	57-24-9	NA	NA	NA	NA	3.0E-04	I	NA	NA	3.0E-03	H	NA	NA	NV	N		1	1	0.1	
TCDD, 2,3,7,8-	1746-01-6	1.3E+05	C	3.8E+01	C	7.0E-10	I	4.0E-08	C	2.0E-08	A	NA	NA	V	N		1	1	0.03	
Tetrachlorophenol, 2,3,4,6-	58-90-2	NA	NA	NA	NA	3.0E-02	I	NA	NA	1.0E-02	A	NA	NA	NV	N		1	1	0.1	
Tetraethyl Dithiopyrophosphate	3689-24-5	NA	NA	NA	NA	5.0E-04	I	NA	NA	5.0E-03	H	NA	NA	NV	N		1	1	0.1	
Tetrahydrofuran	109-99-9	NA	NA	NA	NA	9.0E-01	I	2.0E+00	I	NA	NA	NA	NA	V	Y		1	1	0	1.65E+05
Thiofanox	39196-18-4	NA	NA	NA	NA	3.0E-04	H	NA	NA	3.0E-04	H	NA	NA	NV	N		1	1	0.1	
Thiophanate, Methyl	23564-05-8	1.2E-02	O	NA	NA	1.6E-01	O	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Thiram	137-26-8	NA	NA	NA	NA	1.5E-02	O	NA	NA	6.0E-03	H	NA	NA	NV	N		1	1	0.1	
Toluene-2,4-diisocyanate	584-84-9	3.9E-02	C	1.1E-05	C	NA	NA	8.0E-06	C	NA	NA	NA	NA	V	N		1	1	0	
Toluene-2,6-diisocyanate	91-08-7	3.9E-02	C	1.1E-05	C	NA	NA	8.0E-06	C	NA	NA	NA	NA	V	N		1	1	0	1.71E+03
Toluidine, p-	106-49-0	3.0E-02	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NV	N		1	1	0.1	
Toxaphene	8001-35-2	1.1E+00	I	3.2E-04	I	9.0E-05	P	NA	NA	3.0E-04	P	NA	NA	NV	N		1	1	0.1	
Triallate	2303-17-5	7.2E-02	O	NA	NA	2.5E-02	O	NA	NA	1.3E-02	H	NA	NA	V	N		1	1	0	
Trichlorobenzene, 1,2,4-	120-82-1	2.9E-02	P	NA	NA	1.0E-02	I	2.0E-03	P	9.0E-02	P	2.0E-02	P	V	Y		1	1	0	4.04E+02
Trichlorophenol, 2,4,5-	95-95-4	NA	NA	NA	NA	1.0E-01	I	NA	NA	3.0E-01	P	NA	NA	NV	N		1	1	0.1	
Trichlorophenol, 2,4,6-	88-06-2	1.1E-02	I	3.1E-06	I	1.0E-03	P	NA	NA	5.0E-03	A	NA	NA	NV	N		1	1	0.1	
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	NA	NA	NA	NA	1.0E-02	I	NA	NA	1.0E-01	H	NA	NA	NV	N		1	1	0.1	
Trichlorophenoxypropionic acid, -2,4,5	93-72-1	NA	NA	NA	NA	8.0E-03	I	NA	NA	8.0E-03	H	NA	NA	NV	N		1	1	0.1	
Trifluralin	1582-09-8	7.7E-03	I	NA	NA	7.5E-03	I	NA	NA	7.5E-03	H	NA	NA	V	N		1	1	0	
Trimethylbenzene, 1,2,3-	526-73-8	NA	NA	NA	NA	1.0E-02	I	6.0E-02	I	4.0E-02	I	2.0E-01	I	V	Y		1	1	0	2.93E+02
Trimethylbenzene, 1,2,4-	95-63-6	NA	NA	NA	NA	1.0E-02	I	6.0E-02	I	4.0E-02	I	2.0E-01	I	V	Y		1	1	0	2.19E+02
Trimethylbenzene, 1,3,5-	108-67-8	NA	NA	NA	NA	1.0E-02	I	6.0E-02	I	4.0E-02	I	2.0E-01	I	V	Y		1	1	0	1.82E+02
Trinitrobenzene, 1,3,5-	99-35-4	NA	NA	NA	NA	3.0E-02	I	NA	NA	5.0E-04	H	NA	NA	NV	N		1	1	0.019	
Urethane	51-79-6	1.0E+00	C	2.9E-04	C	NA	NA	NA	NA	NA	NA	NA	NA	NV	N	M	1	1	0.1	
Warfarin	81-81-2	NA	NA	NA	NA	3.0E-04	I	NA	NA	3.0E-04	H	NA	NA	NV	N		1	1	0.1	
Volatile Organic Compounds (VOCs)																				
Acetaldehyde	75-07-0	NA	NA	2.2E-06	I	NA	NA	9.0E-03	I	NA	NA	NA	NA	V	Y		1	1	0	1.07E+05
Acetone	67-64-1	NA	NA	NA	NA	9.0E-01	I	NA	NA	6.0E-01	A	NA	NA	V	Y		1	1	0	1.14E+05
Acetonitrile	75-05-8	NA	NA	NA	NA	NA	NA	6.0E-02	I	6.0E-02	H	5.0E-01	H	V	Y		1	1	0	1.28E+05
Acrolein	107-02-8	NA	NA	NA	NA	5.0E-04	I	2.0E-05	I	4.0E-03	A	9.2E-05	A	V	Y		1	1	0	2.27E+04
Acrylic Acid	79-10-7	NA	NA	NA	NA	5.0E-01	I	2.0E-04	P	2.0E-01	P	2.0E-04	P	V	Y		1	1	0	1.09E+05
Acrylonitrile	107-13-1	5.4E-01	I	6.8E-05	I	1.0E-03	H	2.0E-03	I	1.0E-02	H	NA	NA	V	Y		1	1	0	1.13E+04
Allyl Alcohol	107-18-6	NA	NA	NA	NA	4.0E-03	P	NA	NA	4.0E-03	P	1.0E-03	P	V	N		1	1	0	1.11E+05
Allyl Chloride	107-05-1	2.1E-02	C	6.0E-06	C	NA	NA	1.0E-03	I	NA	NA	1.0E-02	H	V	Y		1	1	0	1.42E+03
Benzene	71-43-2	5.5E-02	I	7.8E-06	I	4.0E-03	I	3.0E-02	I	1.0E-02	P	8.0E-02	P	V	Y		1	1	0	1.82E+03
Benzotrichloride	98-07-7	1.3E+01	I	NA	NA	NA	NA	NA	NA	5.0E-05	P	NA	NA	V	N		1	1	0	3.24E+02
Benzyl Chloride	100-44-7	1.7E-01	I	4.9E-05	C	2.0E-03	P	1.0E-03	P	2.0E-03	P	4.0E-03	P	V	Y		1	1	0	1.46E+03
Bis(2-chloro-1-methylethyl) Ether	108-60-1	NA	NA	NA	NA	4.0E-02	I	NA	NA	NA	NA	NA	NA	V	N		1	1	0	1.02E+03
Bromodichloromethane	75-27-4	6.2E-02	I	3.7E-05	C	8.0E-03	P	NA	NA	8.0E-03	P	2.0E-02	P	V	Y		1	1	0	9.31E+02
Bromoform	75-25-2	7.9E-03	I	1.1E-06	I	2.0E-02	I	NA	NA	3.0E-02	P	NA	NA	V	Y		1	1	0	9.15E+02
Bromomethane	74-83-9	NA	NA	NA	NA	1.4E-03	I	5.0E-03	I	5.0E-03	P	1.0E-01	P	V	Y		1	1	0	3.59E+03
Butadiene, 1,3-	106-99-0	6.0E-01	C	3.0E-05	I	NA	NA	2.0E-03	I	NA	NA	NA	NA	V	Y		1	1	0	6.67E+02
Butanol, N-	71-36-3	NA	NA	NA	NA	1.0E-01	I	NA	NA	1.0E+00	H	NA	NA	V	N		1	1	0	7.64E+03
Butylbenzene, n-	104-51-8	NA	NA	NA	NA	5.0E-02	P	NA	NA	1.0E-01	P	NA	NA	V	Y		1	1	0	1.08E+02
Carbon Disulfide	75-15-0	NA	NA	NA	NA	1.0E-01	I	7.0E-01	I	1.0E-01	H	7.0E-01	H	V	Y		1	1	0	7.38E+02
Carbon Tetrachloride	56-23-5	7.0E-02	I	6.0E-06	I	4.0E-03	I	1.0E-01	I	7.0E-03	A	1.9E-01	A	V	Y		1	1	0	4.58E+02
Carbonyl Sulfide	463-58-1	NA	NA	NA	NA	NA	NA	1.0E-01	P	NA	NA	1.0E+00	P	V	Y		1	1	0	5.89E+03
Chlorobenzene	108-90-7	NA	NA	NA	NA	2.0E-02	I	5.0E-02	P	7.0E-02	P	5.0E-01	P	V	Y		1	1	0	7.61E+02
Chloro-1,3-butadiene, 2-	126-99-8	NA	NA	3.0E-04	I	2.0E-02	H	2.0E-02	I	2.0E-02	H	7.0E-02	H	V	Y		1	1	0	7.86E+02
Chloroform	67-66-3	3.1E-02	C	2.3E-05	I	1.0E-02	I	9.8E-02	A	1.0E-01	A	2.4E-01	A	V	Y		1	1	0	2.54E+03
Chloromethane	74-87-3	NA	NA	NA	NA	NA	NA	9.0E-02	I	NA	NA	3.0E+00	P	V	Y		1	1	0	1.32E+03
Chloromethyl Methyl Ether	107-30-2	2.4E+00	C	6.9E-04	C	NA	NA	NA	NA	NA	NA	NA	NA	V	Y		1	1	0	9.32E+03
Crotonaldehyde, trans-	123-73-9	1.9E+00	H	NA	NA	1.0E-03	P	NA	NA	1.0E-02	P	NA	NA	V	N		1	1	0	1.66E+04
Cumene	98-82-8	NA	NA	NA	NA	1.0E-01	I	4.0E-01	I	4.0E-01	H	9.0E-02	H	V	Y		1	1	0	2.68E+02
Cyclohexane	110-82-7	NA	NA	NA	NA	NA	NA	6.0E+00	I	NA	NA	1.8E+01	P	V	Y		1	1	0	1.17E+02
Cyclohexanone	108-94-1	NA	NA	NA	NA	5.0E+00	I	7.0E-01	P	2.0E+00	P	7.0E+00	P	V	N		1	1	0	5.11E+03
Dibromo-3-chloropropane, 1,2-	96-12-8	8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	2.0E-03	P	2.0E-03	P	V	Y	M	1	1	0	9.79E+02
Dibromochloromethane	124-48-1	8.4E-02	I	NA	NA	2.0E-02	I	NA	NA	7.0E-02	P	NA	NA	V	Y		1	1	0	8.02E+02
Dibromoethane, 1,2-	106-93-4	2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	NA	NA	2.0E-03	H	V	Y		1	1	0	1.34E+03
Dichloro-2-butene, 1,4-	764-41-0	NA	NA	4.2E-03	P	NA	NA	NA	NA	NA	NA	NA	NA	V	N		1	1	0	5.54E+02
Dichlorodifluoromethane	75-71-8	NA	NA	NA	NA	2.0E-01	I	NA	NA	5.0E-02	P	1.0E+00	P	V	Y		1	1	0	8.45E+02
Dichloroethane, 1,1-	75-34-3	5.7E-03	C	1.6E-06	C	2.0E-01	P	NA	NA	2.0E+00	P	NA	NA	V	Y		1	1	0	1.69E+03
Dichloroethane, 1,2-	107-06-2	9.1E-02	I	2.6E-05	I	NA	NA	7.0E-03	P	2.0E-02	P	7.0E-02	P	V	Y		1	1	0	2.98E+03
Dichloroethylene, 1,1-	75-35-4	NA	NA	NA	NA	5.0E-02	I	2.0E-01	I	9.0E-03	H	4.0E-03	A	V	Y		1	1	0	1.19E+03
Dichloroethylene, 1,2-cis-	156-59-2	NA	NA	NA	NA	2.0E-03	I	NA	NA	2.0E-02	P	NA	NA	V	Y		1	1	0	2.37E+03
Dichloroethylene, 1,2-trans-	156-60-5	NA	NA	NA	NA	2.0E-02	I	NA	NA	NA	A	NA	NA	V	Y		1	1	0	1.85E+03
Dichloropropane, 1,2-	78-87-5	3.7E-02	P	3.7E-06	P	4.0E-02	P	4.0E-03	I	4.0E-02	P	9.2E-03	A	V	Y		1	1	0	1.36E+03
Dichloropropane, 1,3-	142-28-9	NA	NA	NA	NA	2.0E-02	P	NA	NA	2.0E-01	P	NA	NA	V	Y		1	1	0	1.49E+03
Dichloropropene, 1,3-	542-75-6	1.0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	4.0E-02	A	3.6E-02	A	V	Y		1	1	0	1.57E+03
Dihydrosafrole	94-58-6	4.4E-02	C	1.3E-05	C	NA	NA	NA	NA	NA	NA	NA	NA	V	Y		1	1	0	
Dimethylaniline, N,N-	121-69-7	2.7E-02	P	NA	NA	2.0E-03	I	NA	NA	2.0E-03	P	NA	NA	V	Y		1	1	0	8.30E+02
Dimethylformamide	68-12-2	NA	NA	NA	NA	1.0E-01	P	3.0E-02	I	3.0E-01	P	7.0E-02	P	V	Y		1	1	0	1.06E+05
Dimethylhydrazine, 1,2-	540-73-8	5.5E+02	C	1.6E-01	C	NA	NA	NA	NA	8.0E-04	A	NA	NA	V	N		1	1	0	1.89E+05
Dioxane, 1,4-	123-91-1	1.0E-01	I	5.0E-06	I	3.0E-02	I	3.0E-02	I	5.0E-01	A	7.2E-01	A	V	Y		1	1	0	1.16E+05
Epoxybutane, 1,2-	106-88-7	NA	NA	NA	NA	NA	NA	2.0E-02	I	NA	NA	NA	NA	V	Y		1	1	0	1.53E+04
Ethoxyethanol, 2-	110-80-5	NA	NA	NA	NA	9.0E-02	P	4.0E-02	P	1.0E-01	P	4.0E-02	P	V	N		1	1	0	1.06E+05
Ethyl Acetate	141-78-6	NA	NA	NA	NA	7.0E-01	P	7.0E-02	P	7.0E-01	P	7.0E-01	P	V	Y		1	1	0	1.08E+04
Ethyl Acrylate	140-88-5	NA	NA	NA	NA	5.0E-03	P	8.0E-03	P	NA	NA	8.0E-03	P	V	Y		1	1	0	2.50E+03
Ethyl Chloride (Chloroethane)	75-00-3	NA	NA	NA	NA	NA	NA	4.0E+00	P	1.0E-01	P	4.0E+00	P	V	Y		1	1	0	2.12E+03
Ethyl Ether	60-29-7	NA	NA	NA	NA	2.0E-01	I	NA	NA	5.0E-01	P	3.0E+00	P	V	Y		1	1	0	1.01E+04
Ethyl Methacrylate	97-63-2	NA	NA	NA	NA	NA	NA	3.0E-01	P	1.0E-02	P	3.0E+00	P	V	N		1	1	0	1.10E+03
Ethylbenzene	100-41-4	1.1E-02	C	2.5E-06	C	5.0E-02	P	1.0E+00	I	5.0E-02	P	9.0E+00	P	V	Y		1	1	0	4.80E+02
Ethylene Diamine	107-15-3	NA	NA	NA	NA	9.0E-02	P	NA	NA	2.0E-01	P	NA	NA	V	N		1	1	0	1.89E+05
Ethylene Oxide	75-21-8	3.1E-01	C	3.0E-03	I	NA	NA	3.0E-02	C	NA	NA	1.3E-01	A	V	Y	M	1	1	0	1.21E+05
Ethyleneimine	151-56-4	6.5E+01	C	1.9E-02	C	NA	NA	NA	NA	NA	NA	NA	NA	V	Y		1	1	0	1.54E+05
Formaldehyde	50-00-0	2.1E-02	C	1.3E-05	I	2.0E-01	I	9.8E-03	A	3.0E-01	A	3.7E-02	A	V	Y		1	1	0	4.24E+04
Formic Acid	64-18-6	NA	NA	NA	NA	9.0E-01	P	NA	NA	9.0E-01	P	9.0E-04	P	V	N		1	1	0	1.06E+05
Glycidaldehyde	765-34-4	NA	NA	NA	NA	4.0E-04	I	1.0E-03	H	NA	NA	1.0E-02	H	V	N		1	1	0	1.06E+05
Hexane, N-	110-54-3	NA	NA	NA	NA	NA	NA	7.0E-01	I	3.0E-01	P	2.0E+00	P	V	Y		1	1	0	1.41E+02
Hydrazine	302-01-2	3.0E+00	I	4.9E-03	I	NA	NA	3.0E-05	P	NA	NA	9.0E-05	P	V	N		1	1	0	1.12E+05
Isobutyl Alcohol	78-83-1	NA	NA	NA	NA	3.0E-01	I	NA	NA	3.0E+00	H	NA	NA	V	N		1	1	0	1.00E+04
Methacrylonitrile	126-98-7	NA	NA	NA	NA	1.0E-04	I	3.0E-02	P	5.0E-02	P	3.0E-01	P	V	N		1	1	0	4.58E+03
Methanol	67-56-1	NA	NA	NA	NA	2.0E+00	I	2.0E+01	I	5.0E+00	H	NA	NA	V	Y		1	1	0	1.06E+05
Methyl Ethyl Ketone (2-Butanone)	78-93-3	NA	NA	NA	NA	6.0E-01	I	5.0E+00	I	2.0E+00	H	1.0E+00	H	V	Y		1	1	0	2.84E+04
Methyl Hydrazine	60-34-4	NA	NA	NA	NA	1.0E-03	P	NA	NA	1.0E-03	P	NA	NA	V	Y		1	1	0	1.80E+05
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	NA	NA	NA	NA	NA	NA	3.0E+00	I	8.0E-01	H	8.0E-01	H	V	Y		1	1	0	3.36E+03
Methyl Isocyanate	624-83-9	NA	NA	NA	NA	NA	NA	1.0E-03	C	NA	NA	NA	NA	V	Y		1	1	0	1.01E+04
Methyl Methacrylate	80-62-6	NA	NA	NA	NA	1.4E+00	I	7.0E-01	I	8.0E-02	H	NA	NA	V	Y		1	1	0	2.36E+03
Methyl tert-Butyl Ether (MTBE)	1634-04-4	1.8E-03	C	2.6E-07	C	NA	NA	3.0E+00	I	4.0E-01	A	3.6E+00	A	V	Y		1	1	0	8.87E+03
Methylene Chloride	75-09-2	2.0E-03	I	1.0E-08	I	6.0E-03	I	6.0E-01	I	6.0E-02	H	1.0E+00	A	V	Y	M	1	1	0	3.32E+03
Naphthalene	91-20-3	1.2E-01	C	3.4E-05	C	2.0E-02	I	3.0E-03	I	6.0E-01	A	NA	NA	V	Y		1	1	0.13	
Nickel Carbonyl	13463-39-3	NA	NA	2.6E-04	C	1.1E-02	C	1.4E-05	C	NA	NA	NA	NA	V	N		1	0.04	0	
Phosgene	75-44-5	NA	NA	NA	NA	NA	NA	3.0E-04	I	NA	NA	NA	NA	V	Y		1	1	0	1.61E+03
Propargyl Alcohol	107-19-7	NA	NA	NA	NA	2.0E-03	I	NA	NA	NA	NA	NA	NA	V	N		1	1	0	1.11E+05
Propionaldehyde	123-38-6	NA	NA	NA	NA	NA	NA	8.0E-03	I	NA	NA	NA	NA	V	Y		1	1	0	3.26E+04
Propylene Oxide	75-56-9	2.4E-01	I	3.7E-06	I	NA	NA	3.0E-02	I	NA	NA	3.0E-02	H	V	Y		1	1	0	7.77E+04
Styrene	100-42-5	NA	NA	NA	NA	2.0E-01	I	1.0E+00	I	NA	NA	3.0E+00	H	V	Y		1	1	0	8.67E+02
Tetrachlorobenzene, 1,2,4,5-	95-94-3	NA	NA	NA	NA	3.0E-05	P	NA	NA	3.0E-05	P	NA	NA	V	N		1	1	0	
Tetrachloroethane, 1,1,1,2-	630-20-6	2.6E-02	I	7.4E-06	I	3.0E-02	I	NA	NA	9.0E-02	P	NA	NA	V	Y		1	1	0	6.80E+02
Tetrachloroethane, 1,1,2,2-	79-34-5	2.0E-01	I	5.8E-05	C	2.0E-02	I	NA	NA	5.0E-02	I	NA	NA	V	Y		1	1	0	1.90E+03
Tetrachloroethylene	127-18-4	2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	8.0E-03	A	4.1E-02	A	V	Y		1	1	0	1.66E+02
Toluene	108-88-3	NA	NA	NA	NA	8.0E-02	I	5.0E+00	I	8.0E-01	P	5.0E+00	P	V	Y		1	1	0	8.18E+02
Trichloroethane, 1,1,1-	71-55-6	NA	NA	NA	NA	2.0E+00	I	5.0E+00	I	7.0E+00	I	5.0E+00	I	V	Y		1	1	0	6.40E+02
Trichloroethane, 1,1,2-	79-00-5	5.7E-02	I	1.6E-05	I	4.0E-03	I	NA	NA	4.0E-03	P	1.1E-02	A	V	Y		1	1	0	2.16E+03
Trichloroethylene	79-01-6	4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	5.0E-04	A	2.2E-03	A	V	Y	M	1	1	0	6.92E+02
Trichlorofluoromethane	75-69-4	NA	NA	NA	NA	3.0E-01	I	NA	NA	NA	NA	1.0E+00	P	V	Y		1	1	0	1.23E+03
Triethylamine	121-44-8	NA	NA	NA	NA	NA	NA	7.0E-03	I	NA	NA	NA	NA	V	Y		1	1	0	2.79E+04
Vinyl Acetate	108-05-4	NA	NA	NA	NA	1.0E+00	H	2.0E-01	I	1.0E+00	H	2.0E-01	H	V	Y		1	1	0	2.75E+03
Vinyl Bromide	593-60-2	NA	NA	1.5E-05	P	NA	NA	3.0E-03	I	NA	NA	3.0E-01	P	V	Y		1	1	0	2.47E+03

Table 5: Toxicity criteria

Chemical	CAS Number	Chronic Toxicity Values								Subchronic Toxicity Values				VOC	TO15	Mutagen	Relative Bio	GIABS	ABS	C_{SAT} (mg/kg)
		SF		IUR		RfD		RfC		RfD		RfC								
		$(mg/kg\text{-}day)^{-1}$	key	$(\mu g/m^3)^{-1}$	key	(mg/kg-day)	key	(mg/m^3)	key	(mg/kg-day)	key	(mg/m^3)	key							
Vinyl Chloride	75-01-4	7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	NA	NA	5.1E-02	A	V	Y	M	1	1	0	3.92E+03
Xylenes	1330-20-7	NA	NA	NA	NA	2.0E-01	I	1.0E-01	I	4.0E-01	P	4.0E-01	P	V	Y		1	1	0	2.60E+02

* = See paragraph (C)(3)(e) of rule 3745-300-08 of the Administrative Code

Key:	
I = IRIS	E = Environmental Criteria Assessment Office
P = PPRTV	S = See RSL User Guide Section 5
A = ATSDR	O = Office of Pesticide Programs
C = Cal EPA	V = Volatile
H = HEAST	NV = Not Volatile
J = New Jersey	M = Mutagen

Part C: Land use and activity categories and receptor-specific exposure factors

The generic numerical direct-contact soil standards and indoor air standards due to vapor intrusion are based upon the intended land use and receptor populations identified for the property. Generic numerical standards have been developed for residential land use, commercial land use with high frequency child exposure, commercial land use, industrial land use, and construction activities. Property-specific land use categories include recreational, community gardens, and urban agriculture. Application of generic numerical standards may be appropriate for property-specific land use categories based on the receptor populations and reasonably anticipated exposure factors and pathways if a demonstration is made accordance with OAC 3745-300-08 and OAC 3745-300-09. Table 6 contains a summary of the exposure factors used to develop the generic numerical standards.

1. Land use and activity categories

The land use and activity categories are summarized below.

1.1 Residential land use

Residential land use is land use with the potential for a high frequency of exposure of adults and children to dermal contact with soil, inhalation of vapors and particles from soil, incidental ingestion of soil, and inhalation of volatile compounds due to vapor intrusion from environmental media to indoor air. Examples of residential land use include but are not limited to residences; condominiums; apartments; dormitory residences; nursing homes, elder care and other long-term health care facilities; and correctional facilities.

1.1.1 Unrestricted residential land use

Unrestricted residential land use is considered protective for, and may be applied to, any land use, without further restriction.

1.1.2 Restricted residential land use

Restricted residential land use is considered protective for, and may be applied to, residential land uses appropriate for a point of compliance less than the minimum depth of ten feet required by rule 3745-300-07 of the Administrative Code. Restricted residential land use requires a central management entity to implement or oversee the institutional controls, engineering controls, and any other remedial activities used to comply with applicable standards pursuant to rule 3475-300-11 of the Administrative Code.

1.2 Commercial land use with high frequency child exposure

Commercial land use with high frequency child exposure is land use with the potential for exposure of adult workers or patrons to commercial facilities during a business day and the potential for high frequency exposures of children who are patrons to commercial facilities during the business day. Commercial land use has the potential for exposure of adults and children to dermal contact with soil, inhalation of vapors and particles from soil, incidental ingestion of soil, and inhalation of volatile compounds due to vapor intrusion to indoor air. Examples of commercial land use with high frequency child exposures include but are not limited to schools and day cares.

The generic numerical direct-contact soil standards and indoor air standards represent exposures to a child receptor from ages 0 to 6 and a default commercial/industrial adult receptor. Direct contact soil standards and indoor air standards are calculated for the child receptor using the equations labeled commercial land use with high frequency child exposure for ages 0 to 6. Direct contact soil standards and indoor air standards for children aged 6 to 16 years were also calculated and evaluated. It was determined that standards for children aged 0 to 6 or the commercial/industrial adult were protective of children aged 6 to 16 years. Standards are calculated for an adult receptor using the equations labeled commercial/industrial land use. The resulting single-chemical standard is the lower of the standards for a child aged 0 to 6 years or adult receptor. It may be appropriate to use standards for children aged 6 to 16 years on a property-specific basis.

1.3 Commercial land use

Commercial land use is land use with the potential for exposure of adult workers and patrons during a business day and the potential for low frequency exposures of children who are visitors to commercial facilities during the business day. Commercial land use has the potential for exposure of adults to dermal contact with soil, inhalation of vapors and particles from soil, incidental ingestion of soil, and inhalation of volatile compounds due to vapor intrusion to indoor air. Examples of commercial land use include but are not limited to shopping centers; restaurants; retail gasoline stations; retail establishments; professional offices; hospitals and clinics; religious institutions; hotels; motels; warehouses; and parking facilities.

1.4 Industrial land use

Industrial land use is land use with the potential for exposure of adult workers and patrons during a business day and the potential for low frequency exposures of children who are visitors to commercial or industrial facilities during the business day. Industrial land use has the potential for exposure of adults to dermal contact with soil, inhalation of vapors and particles from soil, incidental ingestion of soil, and inhalation of volatile compounds due to vapor intrusion to indoor air. Examples of industrial land use include but are not limited to manufacturing facilities such as metal-working shops, plating shops, blast furnaces, coke plants, oil refineries, brick factories, chemical and plastics plants; non-

public airport areas; lumberyards; power plants; limited access highways; railroad switching yards; and marine port facilities.

1.5 Construction activities

Construction activities include invasive activities that result in potential exposure of adult workers during the business day for a portion of one year. Exposures during construction activities are of greater intensity and shorter duration than those for the commercial and industrial land use categories. Construction activities have potential exposures of adults to dermal contact with soil, inhalation of vapors and particles from soil, and ingestion of soil. Examples of construction activities include but are not limited to excavation, grading, bulldozing; tilling; trenching; utility installation or maintenance, building construction; heavy equipment operation; and unpaved road traffic on a construction site.

1.6 Recreational land use

Recreational land use is a highly variable exposure scenario that requires determination of applicable standards through a property-specific risk assessment conducted pursuant to rule 3745-300-09 of the Administrative Code. Recreational land use has the potential for exposure of adults and children while engaged in recreational activities for dermal contact with soil or sediment, inhalation of vapors and particles from soil, incidental ingestion of soil or sediment, dermal contact with surface water, incidental ingestion of surface water, ingestion of fish, and inhalation of volatile compounds due to vapor intrusion to indoor air. Examples of recreational land use include but are not limited to multipurpose trails including pedestrian walkways, natural trails, and bike paths; boardwalks; restrooms and recreational shelters; parks; picnic areas; amphitheaters or outdoor performance spaces; playfields; open lawns; green spaces; pet play areas; fishing; boating; swimming; playgrounds; skate parks; educational programming facilities; public art displays; wildlife viewing; and overlooks or observation decks.

The generic direct-contact soil standards for residential land use or commercial land use with high frequency exposure to a child may be used as applicable standards for the recreational land use if a demonstration is made that the receptor populations and reasonably anticipated exposure factors and pathways are applicable, in accordance with OAC 3745-300-08 and OAC 3745-300-09.

1.7 Community gardens and urban agriculture land use

Community gardens and urban agriculture land use is generally defined as land use for the planting, growing, production, distribution, and marketing of locally produced food and other products within a community, including within the cores and edges of metropolitan areas. Community gardens and urban agriculture is land use with the potential for exposure of adults and children while engaged in gardening and agricultural activities to dermal contact with soil, inhalation of vapors and particles from soil, and incidental ingestion of soil. Examples of community gardens and urban agriculture land use include but

are not limited to community garden plots; urban farms; and agricultural crops in urban areas with potential historical contamination.

Although the residential generic direct-contact soil standards do not directly account for the consumption of fruits and vegetables, residential land use direct-contact soil standards would typically be considered protective. Exposure contaminants by the consuming fruits and vegetables is generally assumed to be minimal, but this exposure pathway may need to be evaluated on a property-specific basis depending on the contaminant and contaminant levels. In addition, subsistence farming exposure scenarios would need to be evaluated separately.

2. Exposure factors

A summary of the exposure factors used to develop the generic numerical standards is shown in Table 6. Exposure factors specific to the VAP are discussed in detail below.

2.1 Exposure frequency for commercial land use with high frequency child exposure

An exposure frequency of 250 days per year was selected for commercial land use with high frequency child exposure to be consistent with the U.S. EPA default exposure frequency for commercial and industrial workers.

2.2 Exposure time for commercial land use with high frequency child exposure

An exposure time of 10 hours per day was chosen by Ohio EPA based on best professional judgment and research on the time children ages 0-6 may spend at a day care center. Survey data from U.S. EPA's 2008 *Child-Specific Exposure Factors Handbook* indicates that the 90th percentile of children aged 3 to 6 years old spend time indoors at school for 570 minutes per day. This supports an upper bound exposure time of 10 hours per day (see Table 16-12).

2.3 Soil ingestion rate for commercial land use with high frequency child exposure

A soil ingestion rate of 100 mg/day was selected for children aged 0 to 6 years for commercial land use with high frequency child exposure. This represents a central tendency ingestion rate for ages 1 through 6 from U.S. EPA's September 2017 *Update for Chapter 5 of the Exposure Factors Handbook*. A central tendency soil ingestion rate of 50 mg/day represents children aged 6 to 16 years.

2.4 Exposure frequency for construction activities

An exposure frequency of 120 days/year for construction/excavation activities was chosen by Ohio EPA based on best professional judgment. This exposure frequency is representative of most activities that occur during development and redevelopment activities at a property including but not limited to

maintenance and installation of building footers and foundations, grading, and general construction on the property. This exposure frequency is also protective of short-term construction/excavation activities including but not limited to maintenance and installation of utility lines, sewer maintenance, and small construction projects.

2.5 Soil ingestion rate for construction activities

A soil ingestion rate of 200 mg/day was selected for construction activities in the VAP. This represents an upper percentile rate of ingestion of soil + dust for adults following a traditional rural lifestyle. U.S. EPA's September 2017 *Update for Chapter 5 of the Exposure Factors Handbook* indicates that this is appropriate for exposure scenarios where the soil ingestion rate may be higher for adults.

Table 6: Summary of Land Use and Receptor-Specific Exposure Factors

Parameter		Residential Land Use		Commercial High Frequency Child		Commercial/ Industrial Land Use	Construction Activities	Reference
		a = adult	c = child	Ages 0-6	Ages 6-16 (g)			
AF	Soil to skin adherence factor	0.07	0.2	0.2	0.07	0.12	0.3	Exhibit 3-3 & Exhibit 3-5 (5)(8)
ATC	Carcinogenic averaging time	25,550 days (a)						p.6-23 (2)
ATNC	Non-carcinogenic averaging time	-	2,190 days (b)	-		9,125 days (c)	365 days (d)	p.6-23 (2)
BW	Body weight	80 kg	15 kg	15 kg	80 kg	80 kg	80 kg	p.15 (3); (8)
ED	Exposure duration	26 years (a = 20 years, c = 6 years) (e)		6 years (f)	10 years	25 years	1 year	p.15 (3); (8); Exhibit 5-1 (1)
EF	Exposure frequency	350 days/year		250 days/year		250 days/year	120 days/year	p.15 (3); (8)
ETA	Air exposure time	24 hours/day		10 hours/day		8 hours/day	8 hours/day	Table 1 (4); Table 16-12 (9); (8)
ETW	Water exposure time	0.71 hour/event	0.54 hour/event	-	-	-	-	Exhibit 3-2 (5); (8)
EVW	Water event frequency	1 event/day		-	-	-	-	Exhibit 3-2 (5); (8)
FC	Fraction contaminated	0.5						Sections 1.1 and 1.2
IRS	Soil ingestion rate	100 mg/day	200 mg/day	100 mg/day	50 mg/day	50 mg/day	200 mg/day	p.15 (3); Table 5-1 (6); (8)
IRW	Water ingestion rate	2.5 L/day	1 L/day	-	-	-	-	Exhibit 6-11 (2); (7); (8)
PEF	Particulate emission factor	9.50E+08		9.50E+08		9.50E+08	1.34E+07	Section 1.5
SAS	Skin surface area exposed to soil	6,032cm^2/day	2,373 cm^2/day	2,373 cm^2/day	6,032 cm^2/day	3,527 cm^2/day	3,527 cm^2/day	Exhibit 1-2 (1); (8)
SAW	Skin surface area exposed to water	19,652 cm^2	6,365 cm^2	-	-	-	-	Exhibit 3-2 (5); (8)
TCR	Target cancer risk	1 x 10^{-5}						VAP default
THQ	Target hazard quotient	1						VAP default
VF	Volatilization factor	*Chemical-specific*						Section 1.4

(1) U.S. EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
(2) U.S. EPA 1989. Risk assessment guidance for Superfund. Volume I: Human health evaluation manual (Part A). Interim Final. EPA/540/1-89/002.
(3) U.S. EPA 1991. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9285.6-03.
(4) U.S. EPA 2023. Regional Screening Levels (RSLs) - User's Guide. November 2023.
(5) U.S. EPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E). Final. OSWER 9285.7-02.
(6) U.S. EPA 2017. Update for Chapter 5 of the Exposure Factors Handbook. Office of Research and Development EPA/600/R-17/384F.
(7) U.S. EPA 1989a. Exposure Factors Handbook. Office of Health and Environmental Assessment. EPA/600/8-89/043.
(8) U.S. EPA 2014. . Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120.
(9) U.S. EPA 2008. Child-Specific Exposure Factors Handbook. Office of Research and Development. EPA/600/R-06/096F.

(a) ATC = lifetime (70 years) x 365 days/year = 25,550 days
(b) ATNC = ED (6 years) x 365 days/year = 2,190 days
(c) ATNC = ED (25 years) x 365 days/year = 9,125 days
(d) ATNC = ED (1 year) x 365 days/year = 365 days
(e) $ED_{0\text{-}2}$ = 2 years, $ED_{2\text{-}6}$ = 4 years, $ED_{6\text{-}16}$ = 10 years, $ED_{16\text{-}30}$ = 14 years
(f) $ED_{0\text{-}2}$ = 2 years, $ED_{2\text{-}6}$ = 4 years
(g) Refer to section 1.2 of Part C.

Part D: Chemical-specific generic numerical standards

1. Arsenic

Arsenic target concentrations in soil for oral pathways are calculated with a RBA factor of 0.6 for residential land use, commercial/industrial land use, and construction/excavation activities (1). The 60% oral RBA for arsenic in soil is empirically-based. It represents an upper-bound estimate from numerous studies where the oral RBA of soil-borne arsenic in samples collected from across the U.S. was experimentally determined against the water-soluble form. A property-specific relative bioavailability absorption fraction may be appropriate when supported by empirical data collected using U.S. EPA validated methods for estimating the relative bioavailability and bioaccessibility (2)(3).

---

(1) U.S. EPA 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil. OSWER 9200.1-113.
(2) U.S. EPA 2007. Estimation of Relative Bioavailability of Lead in Soil and Soil-like Materials Using In Vivo and In Vitro Methods. Office of Solid Waste and Emergency Response, Washington DC. OSWER 9285.7-77.
(3) U.S. EPA 2017. Standard Operating Procedure for an In Vitro Bioaccessibility Assay for Lead and Arsenic in Soil. Office of Land and Emergency Management, Washington DC. OLEM 9200.2-164.

2. Lead

Lead has important non-cancer adverse health effects and, lead does not appear to have a threshold exposure level so it must be evaluated differently. In the absence of toxicological benchmarks for lead (*e.g.*, a slope factor or reference dose), the generally accepted methodology for evaluating exposure is the comparison of estimated blood lead (PbB) concentrations from media exposures with PbB levels considered to be indicative of adverse health effects. Using this approach, Ohio EPA has developed soil generic numerical standards for residential land use, commercial land use with high frequency child exposure, commercial or industrial land use, and construction activities. The information provided in this section may also be used to evaluate lead in a property-specific risk assessment in accordance with OAC 3745-300-09. Further information regarding lead modeling can be on the U.S. EPA Lead at Superfund Sites website.

Because the soil generic numerical standards for lead are developed differently, lead should be evaluated individually as a chemical and should not be included in multiple chemical adjustments for cumulative risk calculations.

Lead is not volatile at ambient temperatures, so generic numerical indoor air standards were not calculated. Because an MCL has been established for lead, a risk-based unrestricted potable use standard for lead was not calculated.

Direct-contact soil standards for lead are calculated using two (2) models depending on land use and the receptor to be protected: (i) the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) is used to calculate acceptable soil lead levels for children based on target PbB levels and (ii)

the Adult Lead Methodology (ALM) is used to calculate acceptable soil lead levels for adults, based on fetal exposure.

2.1 Residential and commercial land use with high frequency child exposure

The soil generic numerical standard for lead that is protective of a child is 200 mg/kg for both residential land use and commercial land use with high frequency child exposure. This value is consistent with the U.S. EPA recommended removal management level for lead in residential soils (1). This approach is appropriate because the VAP requires a remedy when representative soil concentrations exceed the applicable standard.

Children are considered a sensitive subpopulation regarding lead toxicity. Ohio EPA derived this recommended lead screening level using the IEUBK Version 2.0, which was developed for children (2)(3). The model uses four interrelated modules to estimate PbB levels in children exposed to lead-contaminated media. The modules account for exposure, uptake, and the biokinetics of lead in the body and predict a probability distribution of PbB. The basis of the 200 mg/kg screening level was the use of the IEUBK Model with default input values for the physiological parameters (*e.g.*, soil ingestion rates, absorption, and bioavailability) and media concentrations (*i.e.*, drinking water, air, diet, dust, etc.). Under these default conditions and including an approximately 200 mg/kg level of lead in the soil, the model predicts that no more than 5% of the modeled population would exceed a target PbB level of 5 µg/dL.

Volunteers or certified professionals electing to perform a property-specific risk assessment for lead for a property with residential land use, commercial land use with high frequency child exposure, or recreational land use in accordance with 3745-300-09 are required to use the IEUBK Version 2.0 to determine risks to children from exposures to lead. A property-specific risk assessment may consider appropriate modifications to soil bioavailability when supported by property-specific data. Other changes to the U.S. EPA default values should be approached with caution. Ohio EPA will require a written justification that includes valid, defensible, site-specific information and monitoring data to support any changes prior to their use in a property-specific risk assessment. A property-specific bioavailability absorption fraction may be used when supported by empirical data collected using U.S. EPA validated methods for estimating the relative bioavailability and bioaccessibility of lead in soil (4)(5)(6).

The IEUBK User's Manual states, "the Technical Review Workgroup for Lead (TRW) does not recommend that site-specific estimates of the GSD_i be attempted. This parameter is particularly difficult to evaluate at a site, as it is demanding with regard to the amount and quality of the data and the potential complications in the analysis. Unless there are substantial differences and scientifically defensible studies documenting child behavior and Pb biokinetics at a site, the default GSD_i should be used (since it is based on national averages). Thus, site-specific GSD_i values should not be needed for most site assessments. Should the user decide to modify the GSD_i, IEUBK currently accepts values within the range of 1.3-1.8 for the GSD_i based on results of site-specific data." Therefore, Ohio EPA should be consulted when a site-specific GSD_i is being considered.

(1) U.S. EPA 2024. Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. Office of Land and Emergency Management (OLEM), Washington, D.C.
(2) U.S. EPA 2021.*User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Version 2.0*..
(3) U.S. EPA 2021. Overview of Changes to IEUBK Model Software.
(4) U.S. EPA 2021. Fact Sheet: Lead RBA and IVBA - Relative Bioavailability and In Vitro Bioaccessibility of Lead in Soil.
(5) U.S. EPA 2007. Estimation of Relative Bioavailability of Lead in Soil and Soil-like Materials Using In Vivo and In Vitro Methods. Office of Solid Waste and Emergency Response, Washington DC. OSWER 9285.7-77.
(6) U.S. EPA 2017. Standard Operating Procedure for an In Vitro Bioaccessibility Assay for Lead and Arsenic in Soil. Office of Land and Emergency Management, Washington DC. OLEM 9200.2-164

2.2 Commercial/Industrial land use

The generic numerical soil direct-contact standard for commercial/industrial land use is 800 mg/kg for lead. This value was derived using U.S. EPA methodology (1), and it is the U.S. EPA recommended screening level for non-residential land use.

U.S. EPA's Technical Review Workgroup for Lead has developed an approach for assessing risks associated with adult exposures to lead in soil and establishing cleanup goals that will protect adults and fetuses from lead in soil (1). This guidance does not recommend a specific target soil lead cleanup level but proposes a methodology that allows for the input of either property-specific data or default values to assess risk and develop property-specific cleanup goals. The ALM is intended for use until an integrated exposure biokinetic model for adults is developed by the U.S. EPA. Although it is acknowledged that other adult lead models are available and useable, the U.S. EPA concludes that the ALM is the most appropriate methodology for modeling adult exposures to lead for scenarios, primarily occupational, where relatively steady patterns of exposure are or are expected to occur. The ALM estimates whether the fetal PbB level will exceed a target PbB level of concern, based on the exposure of the mother. Using the U.S. EPA recommended inputs and VAP exposure parameters, the model predicts that no more than 5% of the modeled population would exceed a PbB level greater than 5 µg/dL.

The VAP has adopted U.S. EPA's ALM as its preferred methodology for calculating generic numerical standards for adult populations and recommends its use in any property-specific evaluation of lead risks for a number of technical reasons that include the following: the inclusion of inter-individual variability within the exposed population; the inclusion of assumptions regarding existing baseline PbB levels; the explicit protection of the developing fetus of a worker as the most sensitive subpopulation; the acceptance of the model's use in the scientific and regulatory communities; and the level of peer review and technical support documentation developed for the model. The spreadsheets used by the VAP to generate standards, along with the technical documentation supporting the input parameters, can be found on the U.S. EPA Lead at Superfund Sites website.

Ohio EPA reevaluated the ALM model defaults (*i.e.*, geometric standard deviation, baseline blood lead concentration, exposure frequency, etc.). Although the resulting soil concentrations varied, the

variability in the modeling results was considered trivial, and therefore, 800 mg/kg has been retained as the generic direct contact soil standard for lead for commercial/industrial land use in the VAP.

---

(1) U.S. EPA 2003. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001.
(2) U.S. EPA 2017. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56.

2.3 Construction activities

The generic numerical direct-contact soil standard protective of an adult receptor engaging in construction activities is 200 mg/kg for lead. This value was derived using the same U.S. EPA methodology used to derive the generic numerical soil direct-contact standard for commercial/industrial land use (1).

The ALM estimates whether the fetal blood lead level will exceed a target blood lead level of concern, based on the exposure of the mother. Using the U.S. EPA recommended inputs and VAP exposure parameters, the model predicts that no more than 5% of the modeled population would exceed a target PbB level of 5 µg/dL.

The following parameters were used in the ALM.

Geometric standard deviation (GSD_i): The GSD_i is a measure of the inter-individual variability in PdB concentrations in a population exposed to the same environmental lead levels. A default GSD_i value of 1.8 should be used (3). This value is based on the National Health and Nutrition Examination Survey (NHANES) data collected from 2009 - 2014.

Baseline Blood Lead Concentration (PbB_0): The baseline blood lead concentration (PbB_0) parameter in the ALM represents the geometric mean (GM) blood lead concentration (PbB) (µg/dL) in US women of child-bearing age. U.S. EPA estimates a PbB_0 of 0.6 µg/dL based on NHANES data collected from 2009-2014 (4).

Exposure frequency (EF): The exposure frequency used is 120 days/year. This is consistent with the default exposure frequency for construction activities in the VAP (Table).

Soil ingestion rate (IRS): The soil ingestion rate used is 200 mg/day. This is consistent with the default soil ingestion rate for construction activities in the VAP (Table).

---

(1) U.S. EPA 2003. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001.

(2) U.S. EPA 2017. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56.

3. Trichloroethylene

The toxicological review for trichloroethylene (TCE) by IRIS recommends that liver and non-Hodgkin lymphoma due to TCE exposure be addressed as a carcinogen with a non-mutagenic mode of action and that kidney risk due to TCE exposure be assessed as a carcinogen with a mutagenic mode of action. The slope factor (SF) and the inhalation unit risk (IUR) for liver and non-Hodgkin lymphoma are 3.7E-02 $(mg/kg\text{-}day)^{-1}$ and 3.1E-06 $(\mu g/m^3\text{-}day)^{-1}$, respectively. The SF and the IUR for kidney cancer are 9.3E-02 $(mg/kg\text{-}day)^{-1}$ and 1.0E-06 $(\mu g/m^3\text{-}day)^{-1}$, respectively. The adult-based toxicity values represent the sums of the values for the for the individual cancer types (1). Because age-dependent adjustment factors are applied to receptor populations between the ages of 0 and 16 years, consideration of the mutagenic mode of action is not applicable to commercial/industrial land use or construction/excavation activities.

Toxicity value adjustment factors are calculated to combine the oral slope factors and inhalation unit risks for the cancer endpoint and the mutagenic mode of action endpoint as shown in Equation 29.

The following equations were used to generate the carcinogenic target concentration in soil and the carcinogenic target concentration in air for residential land use. Because an MCL has been established for TCE, a risk-based carcinogenic target concentration in groundwater was not calculated for TCE.

---

(1) U.S. EPA 2011. Toxicological Review of Trichloroethylene. EPA/635/R-09/011F.

Equation 29: TCE toxicity adjustment factors

For the cancer oral slope factors:

$$CAF_o = \frac{CSF_o\ NHL + Liver\ oral\ slope\ factor}{CSF_o\ Adult - based\ oral\ slop\ factor}$$

For the mutagenic oral slope factors:

$$MAF_o = \frac{CSF_o\ Kideney\ oral\ slope\ factor}{CSF_o\ Adult - based\ oral\ slop\ factor}$$

For the cancer inhalation unit risks:

$$CAF_i = \frac{IUR\ NHL + Liver\ inhalation\ unit\ risk}{IUR\ Adult - based\ inhalation\ unit\ risk}$$

For the mutagenic inhalation unit risks:

$$MAF_i = \frac{IUR\ Kidney\ inhalation\ unit\ risk}{IUR\ Adult - based\ inhalation\ unit\ risk}$$

Parameter	Value	Reference
Oral cancer adjustment factor (CAF_o)	Calculated; 0.804	Equation 29 (1)
NHL+Liver oral slope factor (CSF_o)	3.7E-02 $(mg/kg\text{-}day)^{-1}$	IRIS
Adult-based oral slope factor (CSF_o)	4.6E-02 $(mg/kg\text{-}day)^{-1}$	IRIS
Oral mutagen adjustment factor (MAF_o)	Calculated; 0.202	Equation 29
Kidney oral slope factor (CSF_o)	9.3E-02 $(mg/kg\text{-}day)^{-1}$	IRIS
Inhalation cancer adjustment factor (CAF_i)	Calculated; 0.756	Equation 29
NHL+Liver inhalation unit risk (IUR)	3.1E-06 $(\mu g/m^3\text{-}day)^{-1}$	IRIS
Adult-based inhalation unit risk (IUR)	4.1E-06 $(\mu g/m^3\text{-}day)^{-1}$	IRIS
Inhalation mutagen adjustment factor (MAF_i)	Calculated; 0.244	Equation 29
Kidney inhalation unit risk (IUR)	1.0E-06 $(\mu g/m^3\text{-}day)^{-1}$	IRIS

3.1 Carcinogenic target concentration in soil

Special considerations for TCE were only necessary when determining the carcinogenic target concentration in soil for residential land use or commercial land use with high frequency child exposure; in which case, the following equations were used then combined using Equation 1.

Equation 30: TCE carcinogenic target concentration in soil for oral pathway

For residential land use:

$$TCS_{oral} = \frac{TCR \times ATC}{SF \times CF \times \left[\left(CAF_o \times IFS_{adj}\right) + \left(MAF_o \times IFSM_{adj}\right)\right] \times RBA \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_c \times EF \times IRS_c}{BW_c}\right] + \left[\frac{ED_a \times EF \times IRS_a}{BW_a}\right]$$

$$where\ IFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times IRS_c \times 10}{BW_c}\right) + \left(\frac{ED_{2-6} \times EF \times IRS_c \times 3}{BW_c}\right) + \left(\frac{ED_{6-16} \times EF \times IRS_a \times 3}{BW_a}\right) + \left(\frac{ED_{16-30} \times EF \times IRS_a \times 1}{BW_a}\right)$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCS_{oral} = \frac{TCR \times ATC}{SF \times CF \times \left[\left(CAF_o \times IFS_{adj}\right) + \left(MAF_o \times IFSM_{adj}\right)\right] \times RBA \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_{0-6} \times EF \times IRS_{0-6}}{BW_{0-6}}\right]$$

$$where\ IFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times IRS_{0-6} \times 10}{BW_{0-6}}\right) + \left(\frac{ED_{2-6} \times EF \times IRS_{0-6} \times 3}{BW_{0-6}}\right)$$

Equation 30 is continued on the next page.

Equation 30: TCE carcinogenic target concentration in soil for oral pathway (continued)

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{oral} = \frac{TCR \times ATC}{SF \times CF \times \left[\left(CAF_o \times IFS_{adj}\right) + \left(MAF_o \times IFSM_{adj}\right)\right] \times RBA \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_{6-16} \times EF \times IRS_{6-16}}{BW_{6-16}}\right]$$

$$where\ IFSM_{adj} = \left(\frac{ED_{6-16} \times EF \times IRS_{6-16} \times 10}{BW_{6-16}}\right)$$

TCS_{oral} = TCE carcinogenic target concentration in soil for oral pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Cancer averaging time (ATC = 25,550 days)
SF = Adult-based slope factor [4.6E-02 $(mg/kg\text{-}day)^{-1}$]
CF = Conversion factor (CF = 1E-06 kg/mg)
CAF^o = Oral cancer adjustment factor (unitless) (CAF_o = 0.804)
IFS_{adj} = Cancer age-adjusted soil ingestion factor (mg-year/kg-day)
MAF^o = Oral mutagen adjustment factor (unitless) (MAF_o = 0.202)
$IFSM_{adj}$ = Mutagen age-adjusted soil ingestion factor (mg-year/kg-day)
RBA = Relative bioavailability (chemical-specific)
FC = Fraction contaminated (FC = 0.5)
ED = Exposure duration (years) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
IRS = Soil ingestion rate (mg/day) (see Table 6)
BW = Body weight (kg) (see Table 6)

Equation 31: TCE carcinogenic target concentration in soil for inhalation pathway

For residential land use:

$$TCS_{inhalation} = \frac{TCR \times ATC}{IUR \times [(1/VF + 1/PEF)] \times \left(\frac{10^3 \mu g}{1\ mg}\right) \times \left(1\ day/24\ hours\right) \times \left\{\begin{array}{c}[CAF_i \times ED \times EF \times ETA] \times \\ [(ED_{0-2} \times EF \times ETA \times MAF_i \times 10) + (ED_{2-6} \times EF \times ETA \times MAF_i \times 3) + \\ (ED_{6-16} \times EF \times ETA \times MAF_i \times 3) + (ED_{16-26} \times EF \times ETA \times MAF_i \times 1)]\end{array}\right\} \times FC}$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCS_{inhalation} = \frac{TCR \times ATC}{IUR \times [(1/VF + 1/PEF)] \times\times \left(\frac{10^3 \mu g}{1\ mg}\right) \times \left(1\ day/24\ hours\right) \times \left\{\begin{array}{c}[CAF_i \times ED \times EF \times ETA] \times \\ [(ED_{0-2} \times EF \times ETA \times MAF_i \times 10) + (ED_{2-6} \times EF \times ETA \times MAF_i \times 3)]\end{array}\right\} \times FC}$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{inhalation} = \frac{TCR \times ATC}{IUR \times [(1/VF + 1/PEF)] \times\times \left(\frac{10^3 \mu g}{1\ mg}\right) \times \left(1\ day/24\ hours\right) \times \left\{\begin{array}{c}[CAF_i \times ED \times EF \times ETA] \times \\ [ED_{6-16} \times EF \times ETA \times MAF_i \times 3]\end{array}\right\} \times FC}$$

$TCS_{inhalation}$ = TCE carcinogenic target concentration in soil for inhalation pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Cancer averaging time (ATC = 25,550 days)
IUR = Adult-based inhalation unit risk [4.1E-06 $(\mu g/m^3)^{-1}$]
VF = Volatilization factor (m^3/kg) (Equation 8)
PEF = Particulate emission factor (m^3/kg) (see Table 5)
CAF_i = Inhalation cancer adjustment factor (unitless) (CAF_o = 0.756)
ED = Exposure duration (years) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
MAF_i = Inhalation mutagen adjustment factor (unitless) (MAF_i = 0.244)
FC = Fraction contaminated (FC = 0.5)

Equation 32: TCE carcinogenic target concentration in soil for dermal pathway

For residential land use:

$$TCS_{dermal} = \frac{TCR \times ATC}{\left({}^{SF}/_{GIABS}\right) \times CF \times \left[\left(CAF_o \times DFS_{adj} \times ABS\right) + \left(MAF_o \times DFSM_{adj} \times ABS\right)\right] \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_c \times EF \times SAS_c \times AF_c}{BW_c}\right] + \left[\frac{ED_a \times EF \times SAS_a \times AF_a}{BW_a}\right]$$

$$where\ DFSM_{adj} = \left(\frac{ED_{0-2} \times AF_c \times SAS_c \times 10}{BW_c}\right) + \left(\frac{ED_{2-6} \times AF_c \times SAS_c \times 3}{BW_c}\right) + \left(\frac{ED_{6-16} \times AF_a \times SAS_a \times 3}{BW_a}\right) + \left(\frac{ED_{16-30} \times AF_a \times SAS_a \times 1}{BW_a}\right)$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCS_{dermal} = \frac{TCR \times ATC}{\left({}^{SF}/_{GIABS}\right) \times CF \times \left[\left(CAF_o \times DFS_{adj} \times ABS\right) + \left(MAF_o \times DFSM_{adj} \times ABS\right)\right] \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_{0-6} \times EF \times SAS_{0-6} \times AF_{0-6}}{BW_{0-6}}\right]$$

$$where\ DFSM_{adj} = \left(\frac{ED_{0-2} \times EF \times AF_{0-6} \times SAS_{0-6} \times 10}{BW_{0-6}}\right) + \left(\frac{ED_{2-6} \times EF \times AF_{0-6} \times SAS_{0-6} \times 3}{BW_{0-6}}\right)$$

Equation 32 is continued on the next page.

Equation 32: TCE carcinogenic target concentration in soil for dermal pathway (continued)

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{dermal} = \frac{TCR \times ATC}{\left({}^{SF}/_{GIABS}\right) \times CF \times \left[\left(CAF_o \times DFS_{adj} \times ABS\right) + \left(MAF_o \times DFSM_{adj} \times ABS\right)\right] \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_{6-16} \times EF \times SAS_{6-16} \times AF_{6-16}}{BW_{6-16}}\right]$$

$$where\ DFSM_{adj} = \left(\frac{ED_{6-16} \times EF \times AF_{6-16} \times SAS_{6-16} \times 3}{BW_{6-16}}\right)$$

TCS_{oral} = TCE carcinogenic target concentration in soil for oral pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Cancer averaging time (ATC = 25,550 days)
SF = Adult-based slope factor [4.6E-02 $(mg/kg\text{-}day)^{-1}$]
GIABS = Gastrointestinal absorption factor (unitless) (see Table 5)
CF = Conversion factor (CF = 1E-06 kg/mg)
CAF^o = Oral cancer adjustment factor (CAF_o = 0.804)
DFS_{adj} = Cancer age-adjusted soil dermal contact factor (mg-year/kg-day)
ABS = Dermal absorption factor (unitless) (see Table 5)
MAF^o = Oral mutagen adjustment factor (unitless)
$DFSM_{adj}$ = Mutagen age-adjusted soil dermal contact factor (mg-year/kg-day)
FC = Fraction contaminated (FC = 0.5)
ED = Exposure duration (years) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
SAS = Skin surface area exposed to soil (cm^2/day) (see Table 6)
AF = Soil to skin adherence factor (unitless) (see Table 6)
BW = Body weight (kg) (see Table 6)

3.2 Carcinogenic target concentration in air

The following equation was used to calculate the carcinogenic target concentration in air.

Equation 33: TCE carcinogenic target concentration in air

For residential land use:

$$TCA_{inhalation} = \frac{TCR \times ATC}{IUR \times \left({}^{1\ day}/_{24\ hours}\right) \times \left\{\begin{array}{c}[CAF_i \times ED \times EF \times ETA] \times \\ \left[\begin{array}{c}(ED_{0-2} \times EF \times ETA \times MAF_i \times 10) + (ED_{2-6} \times EF \times ETA \times MAF_i \times 3) + \\ (ED_{6-16} \times EF \times ETA \times MAF_i \times 3) + (ED_{16-26} \times EF \times ETA \times MAF_i \times 1)\end{array}\right]\end{array}\right\}}$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCA_{inhalation} = \frac{TCR \times ATC}{IUR \times \left({}^{1\ day}/_{24\ hours}\right) \times \left\{\begin{array}{c}[CAF_i \times ED \times EF \times ETA] \times \\ [(ED_{0-2} \times EF \times ETA \times MAF_i \times 10) + (ED_{2-6} \times EF \times ETA \times MAF_i \times 3)]\end{array}\right\}}$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCA_{inhalation} = \frac{TCR \times ATC}{IUR \times \left({}^{1\ day}/_{24\ hours}\right) \times \left\{\begin{array}{c}[CAF_i \times ED \times EF \times ETA] \times \\ [ED_{6-16} \times EF \times ETA \times MAF_i \times 3]\end{array}\right\}}$$

TCA = Target concentration in air (µg/m^3)
TCR = Target cancer risk (TCR = 10^{-5})
ATC = Carcinogenic averaging time (ATC = 25,550 days)
IUR = Adult-based inhalation unit risk [4.1E-06 (µg/m^3)$^{-1}$]
CAF_i = Inhalation cancer adjustment factor (unitless) (CAF_o = 0.756)
ED = Exposure duration (years) (see Table 6)
EF = Exposure frequency (days/year) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
MAF_i = Inhalation mutagen adjustment factor (unitless) (MAF_i = 0.244)

4. Vinyl chloride

The toxicological review of vinyl chloride by IRIS presents two types of toxicity values - “continuous lifetime exposure during adulthood” and “continuous lifetime exposure from birth” slope factors and inhalation unit risks. The “continuous lifetime exposure during adult hood” slope factor and inhalation unit risk were chosen to generate carcinogenic target concentrations in soil and air for commercial/industrial land use and construction/excavation activities with no adjustment. Special considerations for vinyl chloride were necessary for residential land use to account early-life susceptibility to vinyl chloride. As shown in the equations below, the adult life-segment is pro-rated for exposure time, and child life-segment is not pro-rated to account for early-life susceptibility. Both life segments use the toxicity values for continuous lifetime exposure during adulthood. This method is used because studies have shown that the effects of early-life exposure are both qualitatively and quantitatively different, and the exact time-frame of early-life susceptibility is not known (1).

Because an MCL has been established for vinyl chloride, a risk-based unrestricted potable use standard for vinyl chloride was not calculated.

---

(1) U.S. EPA 2000. Toxicological Review of Vinyl Chloride. EPA/635R-00/004.

4.1 Carcinogenic target concentration in soil

The following equations were used to calculate the carcinogenic target concentrations in soil for the oral, inhalation, and dermal pathways for residential land use and commercial land use with high frequency child exposure. The carcinogenic target concentrations in soil for vinyl chloride calculated using the following equations were then combined using Equation 1.

Equation 34: Vinyl chloride carcinogenic target concentration in soil for oral pathway

For residential land use:

$$TCS_{oral} = \frac{TCR \times \left(\frac{1}{RBA}\right)}{\left[\left(\frac{SF \times IFS_{adj} \times CF}{ATC}\right) + \left(\frac{SF \times IRS_c \times CF}{BW_c}\right)\right] \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_c \times EF \times IRS_c}{BW_c}\right] + \left[\frac{ED_a \times EF \times IRS_a}{BW_a}\right]$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCS_{oral} = \frac{TCR \times \left(\frac{1}{RBA}\right)}{\left[\left(\frac{SF \times IFS_{adj} \times CF}{ATC}\right) + \left(\frac{SF \times IRS_{0-6} \times CF}{BW_{0-6}}\right)\right] \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_{0-6} \times EF \times IRS_{0-6}}{BW_{0-6}}\right]$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{oral} = \frac{TCR \times \left(\frac{1}{RBA}\right)}{\left[\left(\frac{SF \times IFS_{adj} \times CF}{ATC}\right) + \left(\frac{SF \times IRS_{6-16} \times CF}{BW_{6-16}}\right)\right] \times FC}$$

$$where\ IFS_{adj} = \left[\frac{ED_{6-16} \times EF \times IRS_{6-16}}{BW_{6-16}}\right]$$

TCS_{oral} = Target concentration in soil for oral pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
RBA = Relative bioavailability (chemical-specific)
SF = Slope factor ((mg/kg-day)$^{-1}$) [7.2E-01 (mg/kg-day)$^{-1}$]
EF = Exposure frequency (days/year) (see Table 6)
IFS_{adj} = Age-adjusted soil ingestion factor (mg/day)
CF = Conversion factor (CF = 1E-06 kg/mg)
ATC = Carcinogenic averaging time (ATC = 25,550 days)
IRS = Soil ingestion rate (mg/day) (see Table 6)
BW = Body weight (kg) (see Table 6)
FC = Fraction contaminated (FC = 0.5)
ED = Exposure duration (years) (see Table 6)

Equation 35: Vinyl chloride carcinogenic target concentration in soil for inhalation pathway

For residential land use:

$$TCS_{inhalation} = \frac{TCR}{\left\{\left[\frac{IUR \times EF \times ED_r \times ETA}{ATC \times VF \times \left(\frac{1\ mg}{10^3\ \mu g}\right) \times \left(\frac{24\ hours}{1\ day}\right)}\right] + \left[\frac{IUR}{VF \times \left(\frac{1\ mg}{10^3\ \mu g}\right)}\right]\right\} \times FC}$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCS_{inhalation} = \frac{TCR}{\left\{\left[\frac{IUR \times EF \times ED_{0-6} \times ETA}{ATC \times VF \times \left(\frac{1\ mg}{10^3\ \mu g}\right) \times \left(\frac{24\ hours}{1\ day}\right)}\right] + \left[\frac{IUR}{VF \times \left(\frac{1\ mg}{10^3\ \mu g}\right)}\right]\right\} \times FC}$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{inhalation} = \frac{TCR}{\left\{\left[\frac{IUR \times EF \times ED_{6-16} \times ETA}{ATC \times VF \times \left(\frac{1\ mg}{10^3\ \mu g}\right) \times \left(\frac{24\ hours}{1\ day}\right)}\right] + \left[\frac{IUR}{VF \times \left(\frac{1\ mg}{10^3\ \mu g}\right)}\right]\right\} \times FC}$$

$TCS_{inhalation}$ = Target concentration in soil for inhalation pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})

IUR = Inhalation unit risk ($(\mu g/m^3)^{-1}$) [4.4E-06 $(\mu g/m^3)^{-1}$]
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)
ATC = Carcinogenic averaging time (ATC = 25,550 days)
VF = Volatilization factor (m^3/kg) (Equation 8)
FC = Fraction contaminated (FC = 0.5)

Equation 36: Vinyl chloride carcinogenic target concentration in soil for dermal pathway

For residential land use:

$$TCS_{dermal} = \frac{TCR}{\left\{\left[\frac{\left(\frac{SF}{GIABS}\right) \times EF \times DFS_{adj} \times ABS \times CF}{ATC}\right] + \left[\frac{\left(\frac{SF}{GIABS}\right) \times AF_c \times SAS_c \times ABS \times CF}{BW_c}\right]\right\} \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_c \times SAS_c \times AF_c}{BW_c}\right] + \left[\frac{ED_a \times SAS_a \times AF_a}{BW_a}\right]$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCS_{dermal} = \frac{TCR}{\left\{\left[\frac{\left(\frac{SF}{GIABS}\right) \times EF \times DFS_{adj} \times ABS \times CF}{ATC}\right] + \left[\frac{\left(\frac{SF}{GIABS}\right) \times AF_{0-6} \times SAS_{0-6} \times ABS \times CF}{BW_{0-6}}\right]\right\} \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_{0-6} \times SAS_{0-6} \times AF_{0-6}}{BW_{0-6}}\right]$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCS_{dermal} = \frac{TCR}{\left\{\left[\frac{\left(\frac{SF}{GIABS}\right) \times DFS_{adj} \times ABS \times CF}{ATC}\right] + \left[\frac{\left(\frac{SF}{GIABS}\right) \times AF_{6-16} \times SAS_{6-16} \times ABS \times CF}{BW_c}\right]\right\} \times FC}$$

$$where\ DFS_{adj} = \left[\frac{ED_{6-16} \times EF \times SAS_{6-16} \times AF_{6-16}}{BW_{6-16}}\right]$$

TCS_{dermal} = Target concentration in soil for dermal pathway (mg/kg)
TCR = Target cancer risk (TCR = 10^{-5})
SF = Slope factor ((mg/kg-day)$^{-1}$) [7.2E-01 (mg/kg-day)$^{-1}$]
GIABS = Gastrointenstinal absorption factor (unitless) (see Table 5)
EF = Exposure frequency (days/year) (see Table 5)
DFS_{adj} = Age-adjusted dermal contact factor (mg-year/kg-day)
ABS = Dermal absorption factor (unitless) (see Table 5)
CF = Conversion factor (CF = 1E-06 kg/mg)
ATC = Carcinogenic averaging time (ATC = 25,550 days)
AF = Soil to skin adherence factor (unitless) (see Table 6)
SAS = Skin surface area exposed to soil (cm^2) (see Table 6)
BW = Body weight (kg) (see Table 6)
FC = Fraction contaminated (FC = 0.5)
ED = Exposure duration (years) (see Table 6)

4.2 Carcinogenic target concentration in air

The following equation was used to calculate the carcinogenic target concentration in air.

Equation 37: Vinyl chloride carcinogenic target concentration in air

For residential land use:

$$TCA = \frac{TCR}{\left\{IUR + \left[\frac{IUR \times EF \times ED_r \times ETA \times \left(\frac{1\ day}{24\ hours}\right)}{ATC}\right]\right\}}$$

For commercial land use with high frequency child exposure:

a) Ages 0 to 6

$$TCA = \frac{TCR}{\left\{IUR + \left[\frac{IUR \times EF \times ED_{0-6} \times ETA \times \left(\frac{1\ day}{24\ hours}\right)}{ATC}\right]\right\}}$$

b) Ages 6 to 16 (Refer to section 1.2 of Part C)

$$TCA = \frac{TCR}{\left\{IUR + \left[\frac{IUR \times EF \times ED_{6-16} \times ETA \times \left(\frac{1\ day}{24\ hours}\right)}{ATC}\right]\right\}}$$

TCA = Target concentration in air ($\mu g/m^3$)
TCR = Target cancer risk ($TCR = 10^{-5}$)
IUR = Inhalation unit risk ($(\mu g/m^3)^{-1}$) [4.4E-06 $(\mu g/m^3)^{-1}$]
EF = Exposure frequency (days/year) (see Table 6)
ED = Exposure duration (years) (see Table 6)
ETA = Air exposure time (hours/day) (see Table 6)

5. Total petroleum hydrocarbons (TPH)

The generic numerical standards for petroleum at residential or commercial/industrial properties are the standards established in rules adopted under division (B) of 3737.882 of the Ohio Revised Code, as provided in division (B)(1) of 3746.04 of the Ohio Revised Code. The State Fire Marshal's Bureau of Underground Storage Tank Regulations (BUSTR) administers the rules adopted under division (B) of 3737.882 of the Ohio Revised Code.

Petroleum-related chemicals of concern are dependent on the petroleum fraction of the released product. Indicator compounds for each petroleum fraction are as follows:

1. Light petroleum fractions (*e.g.*, natural gasoline, gasohol, or naphtha solvents) include benzene, toluene, ethylbenzene, methyl tert-butyl ether, total xylenes, naphthalene, and 1,2,4-trimethylbenzene.

2. Middle petroleum fractions (*e.g.*, kerosene, diesel fuel, or jet fuel) include benzene, toluene, ethylbenzene, total xylenes, acenaphthene, anthracene, chrysene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, and pyrene.

3. Heavy petroleum fractions (*e.g.*, hydraulic oil, lube oil, residual fuel oils) include acenaphthene, anthracene, chrysene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, and pyrene.

Additional petroleum constituents or typical impurities must also be considered to ensure applicable standards are for petroleum. Additional chemicals of concern that may be typical impurities of used motor oil, used cutting oil, or hydraulic oil must also be identified and included in the analysis of environmental media containing heavy petroleum fractions from the release of these products, as appropriate. Chemicals of concern must include 1,2-dichloroethane and 1,2-dibromoethane (ethylene dibromide) for releases of automotive gasoline formulated before January 1, 1996, racing fuel, or aviation gasoline releases (1)(2).

The following PAH are considered carcinogenic by a mutagenic mode of action: benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,2-cd)pyrene (3)(4). Age-dependent adjustment factors must be applied for residential receptor populations between the ages of 0 to 16 when evaluating exposure to environmental media containing these PAHs. For commercial industrial land use with high frequency child exposure, the generic standards incorporate age-dependent adjustment factors for children aged 0 to 6 years. The generic numerical direct-contact soil standards and indoor air standards for commercial land use with high frequency child exposure represent exposures to a child receptor from ages 0 to 6 and a default commercial/industrial adult receptor. This was determined to be protective of children aged 6 to 16 years for commercial land use with high frequency child exposure.

For properties in which the petroleum standard is developed through a property-specific risk assessment, soil saturation concentrations of total petroleum hydrocarbons (TPH) must be determined. The saturation limits are given in OAC 3745-300-09 and are listed in Table .

Table 7: Total Petroleum Hydrocarbon Soil Saturation Concentrations

Petroleum fraction	**Residual concentrations (mg/kg)**		
	Sand and gravel or unknown soil type *K_V: 10^{-3} – 10^{-4} cm/s*	**Silty/clayey sand** *K_V: 10^{-4} – 10^{-5} cm/s*	**Glacial till & silty clay** *K_V: < 10^{-5} cm/s*
Light (C_6-C_{12})	1,000	5,000	8,000
Middle (C_{10}-C_{20})	2,000	10,000	20,000
Heavy (C_6-C_{12})	5,000	20,000	40,000

Where mg/kg means milligrams per kilogram, K_V means vertical hydraulic conductivity of the unsaturated soil, cm/s means centimeters per second, and C_X means carbon chain length.

---

(1) BUSTR 2017. Technical Guidance Manual for the 2017 Closure, Corrective Action, and Petroleum Contaminated Soil Rules. Division of State Fire Marshal.

(2) U.S. EPA 2010. Recommendation for States, Tribes and EPA Regions to Investigate and Clean Up Lead Scavengers When Present at Leaking Underground Storage Tank (LUST) Sites. Office of Solid Waste and Emergency Response, Washington DC.

(3) U.S. EPA 1998. Toxicological Review of Benzo[a]pyrene. Integrated Risk Information System (IRIS).

(4) U.S. EPA 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Research and Development. EPA/600/R-93/089.