UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

December 7, 1995

OFFICE OF
RESEARCH AND DEVELOPMENT

MEMORANDUM

SUBJECT: **Additional Documents for HWIR Review**

FROM: Joseph Greenblott, Regulatory Support Staff
Office of Research and Science Integration (8104)

TO: Addressees

Please find attached two addendum to the HWIR Multipathway risk analysis, together with copies of April 26 - 27, 1995 SAB Meeting Minutes and a June 20, 1995 memorandum on the OMB Review. We are still awaiting the final SAB review report.

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EXECUTIVE OFFICE OF THE PRESIDENT
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JUN 20 1995

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MEMORANDUM FOR SALLY KATZEN

THROUGH: James B. MacRae, Jr.

FROM: Arthur G. Fraas AF
Jonathan Gledhill

SUBJECT: Limited Review of EPA's Risk Assessment for the Hazardous Waste Identification Rule (HWIR)

**Summary**

We have given a quick look at EPA's draft 2,000 page (albeit incomplete) risk assessment methodology supporting the Hazardous Waste Identification Rule (HWIR) and have a variety of concerns with EPA's approach. In addition, the analysis submitted by EPA is incomplete, contains errors, and apparently is undergoing continous revision. As a result, we do not know whether (or to what extent) EPA is addressing our concerns and those identified in the Science Advisory Board review of EPA's methodology. What we do know is that in some instances EPA's estimate of a "safe" level for a chemical is hundreds or millions of times lower than that chemical's concentration in unpolluted soils. Adopting the draft numbers as regulatory levels will release only a small fraction of the low risk wastes currently regulated under extremely expensive RCRA hazardous waste standards. We are very concerned that both we and EPA will not have enough time to review these issues before the August 15 judicial deadline for the HWIR proposal.

**Limits to a Full Review of EPA's Draft Methodology**

Three constraints preclude our ability to undertake a comprehensive review at this point. First, EPA has not given us a complete version of the analysis used to derive 'safe' levels. In particular, EPA has yet to provide us with key components -- the groundwater methodology and results -- of its risk assessment methodology. Second, EPA is currently revising parts of the draft methodology it has already provided us. Third, EPA staff told the SAB that the current version of the methodology contains numerous arithmetic errors. Based on EPA's expected schedule to complete the risk assessment, we do not expect to have an opportunity to review a complete methodology and results before the judicial deadline.

In place of a comprehensive review, we examined some of the final results [illegible] and numerous scenarios in the draft version. We identified several troubling problems that EPA may or may not correct by the time of proposed rule. Whether or not EPA corrects the problems we have identified, they illustrate

three principal concerns with EPA's rulemaking schedule: (1) there is no time for an external review of the complete methodology; (2) there is no time for validation of the methodology with actual site data; and (3) there is no time to characterize the degree of conservatism imbedded in the "safe" levels. In its recent public hearing on the HWIR risk assessment, EPA's Science Advisory Board (SAB) raised similar questions. The SAB is unlikely to complete its formal report on this risk assessment package before the end of the summer.

**The HWIR Methodology's General Approach**

The analysis assumes that industry manages solid waste in three different ways. For each of these management methods, EPA evaluates 43 different ways waste could migrate from the dumps to humans or wildlife. The analysis back-calculates the waste concentration that will ensure the human or environmental receptor does not face a risk above EPA's risk goals (for example, a one-in-a-million increase in cancer risk over a lifetime). For all 129 waste unit/exposure pathway combinations, EPA sets the lowest back-calculated waste concentration as the draft "safe" level for that chemical.

**Concerns with "Results"**

The analysis lists draft "safe" levels for each chemical in the analysis. As the table below indicates, some calculated "safe" levels are lower than the concentration typically found in uncontaminated soils. If wastes with concentrations lower than these "safe" levels are the only wastes that would exit hazardous waste regulation, hazardous waste would have to be "cleaner" than background soils.

| Chemical | Average Concentration in U.S. Soils | HWIR Draft Exit Level | Ratio |
|---|---|---|---|
| Arsenic | 5 | 0.02 | 250 |
| Barium | 430 | 200 | 2 |
| Benzo(α)pyrene | rural > 0.002<br>urban > 0.1 | 0.0000002 | > 20,000<br>> 1,000,000 |
| Beryllium | 6 | 0.002 | 300 |
| Vanadium | 100 | 90 | 1.1 |

Average concentrations in U.S. soils from Report to Congress on Cement Kiln Dust, Office of Solid Waste, USEPA, December 1993. Soils and levels from HWIR Draft, Table 7-1.

In addition, the exit values for three other metals -- nickel, mercury, and copper -- are within the range of natural concentrations in U.S. soils.[1] People are also exposed to chemicals in other settings. For example, benzo(α)pyrene is found in burnt meat and other roasted food. The benzo(α)pyrene concentration in a cup of coffee is often 100,000 times greater than EPA's draft exit level. As stated above, these numbers may or may not be the proposed exit levels, because EPA staff will be trying to correct arithmetic errors and other analytic problems in the risk assessment.

**Methodology Problems**

To calculate a "safe" level, EPA makes six explicit conservative assumptions in each of the 43 different risk assessment pathways. The methodology includes two conservative assumptions for the source contamination in the tank, ash pile, or other waste management unit, two conservative assumptions for the migration of contaminant from the waste unit to the human receptor, and two conservative assumptions for the human or animal intake. The analysis does not calculate the cumulative level of conservatism -- e.g., 99.999 percent of the population would be exposed to lower risks -- of these six conservative assumptions. In addition, since one pathway uses one set of six conservative assumptions and another pathway uses a different set, it is very hard to compare the level of conservatism across the 43 pathways. It is even more troubling to find, though, that the analysis contains a number of additional implicit conservative assumptions in methodologies or input data. A few of these implicit assumptions or problematic methodologies are discussed below:

- **No Biodegradation.** EPA staff state that, for over 70 percent of chemicals, the calculated "safe" pathway assumes waste is managed in land treatment units (LTUs). In LTUs, operators spread contaminated sludges onto a field and till sludges into the upper soil layer. In a well-designed unit, microbes in the soil degrade the organic chemicals. Although modern LTUs rely principally on biological degradation, EPA conservatively assumes that no biodegradation occurs. In effect, EPA assumes 40 years open waste dumping.

- **No Chemical Degradation.** Some chemicals immediately break apart if exposed to water. However, since the analysis conservatively assumes this chemical degradation does not occur, some exit levels are based on chemically implausible scenarios. For example, a chemical with a half-life of 96 hours in water is assumed to stay intact after over 40 years of exposure to rainfall, soil moisture, and root crop (e.g., potatoes) moisture to reach a human receptor.[2]

- **Soil Runoff Methodology.** EPA fundamentally misapplies an empirical equation to predict how much of eroded soil reaches an adjacent stream or agricultural field.[3] Thirty-two percent of the draft exit levels depend on this erroneous approach.

- **No Other Environmental Regulations.** Certain exposure pathways are barred or substantially reduced by non-RCRA environmental regulation. For example, EPA stormwater control regulations limit contaminated soil runoff.[4] Wind-blown dust is constrained by EPA's particulate matter standards. EPA's BACT, MACT, and other air emission standards control volatile organic emissions from tanks. The analysis appears to assume that other regulatory controls do not exist or that practices violate other EPA regulations for decades.

- **Equilibrium Analysis.** The analysis assumes that contaminants bound to soils and sediments disperse throughout a water body or field as soon as they reach it. In a very recent SAB review of this approach in another risk assessment document, the SAB found that these equilibrium assumptions are unsuitable for regulatory purposes due to the substantial scientific uncertainties in the models.[5] In general, equilibrium models overpredict off-site contamination.

- **Off-Site Wind Conditions.** In many key pathways, an off-site agricultural field is contaminated by wind-blown dust from a LTU. The local winds are curious; in EPA's methodology, wind blows across the LTU and scatters contaminated dust onto the farmer's field, but does not blow any dust off of the farmer's field.[6] It is also unclear whether EPA even assumes that soil erodes from the farmer's field.[7] By allowing contaminants to enter the field and restricting the ways to exit, the analysis overstates the likely concentration in the field.

Exposure Scenario Problems

The calculated "safe" levels for the pathways are derived from some physically impossible scenarios of human exposure. In addition, some exposure scenarios, while not physically impossible, are highly improbable. The analysis provides little information for the public to ascertain how probable (and thus protective) the exposure scenarios are.

- **Location of Units.** In each exposure scenario, EPA locates the off-site receptor at the point that receives the maximum contamination. For example, a large LTU is located on the banks of a small stream that is used for drinking water and subsistence fish consumption. The analysis locates a

subsistence farmer's field in the area downwind from a large LTU that has the maximum dust deposition. Although there is some small possibility that these scenarios could occur, without an estimate of the probability, policy officials and the public can not determine whether EPA's draft levels are protective in 90, 99, or 99.999999 percent of actual LTU conditions.

- **Human Residency Immediately After Waste Placement.** For sixty percent of the chemicals, the calculated "safe" levels assume an adult or child takes up residence on the waste unit immediately after it closes (assumed to be 40 years after waste placement). It is hard to imagine this scenario unless local zoning officials and private developers conspire to mask the property's past use. Residential construction would generally place additional soil on the waste layers to block exposure. Although there is a very small possibility that this scenario could occur, the analysis does not estimate the likelihood.

- **Subsistence Fisher.** Nine percent of the exit levels are designed to be protective of a fisher using a small stream for subsistence fish consumption. In these situations, contaminated soil erodes from a large LTU, reaches the stream, and either settles to the bottom or flows suspended in the water. However, EPA constrains the maximum amount of sediment in stream flow to levels tolerable to fish. Therefore, because EPA's methodologies overpredict the amount of sediment that reaches this stream, a large amount -- four inches of sediment -- settles on the bottom of the stream channel each year.[8] Since the stream channel is only on average seven inches deep, this extreme sedimentation would likely fill up the entire channel within a few years. Real streams do not silt up so quickly.[9]

  To predict exit levels, the analysis is based on the smallest stream size able to support fish for human consumption.[10] EPA uses fish consumption rates for this subsistence fisher that are derived from a study of Native Americans fishing on the Columbia River.[11] The Columbia River is 250 times longer and has a flow rate 17,000 times greater than the small stream in the analysis.[12] Fish are certainly less plentiful and smaller in a smaller stream of the sort modelled by EPA. A subsistence fisher would have to expend a much greater effort to catch the same amount of food as the Columbia River fishers. Despite the poor fishing prospects, the subsistence fisher catches all of his or her fish (140 lbs of edible filet each year) in this stream.[13]

- **Fruit and Vegetable Crop Yields.** EPA's assumed subsistence farmer grows ninety percent of his or her yearly consumption fruit, leafy vegetables, fruiting vegetables (e.g., tomatoes, cucumbers), and legumes on a 75-acre field. However, given EPA's consumption and crop yield assumptions, the farmer needs over 480 acres of land to grow enough food that EPA assumes he or she eats.[14] The risk assessment's values must be erroneous. For example, the analysis assumes an eleven square-foot patch yields only 20 milligrams of edible fruit.[15]

**END NOTES**

1. Average concentrations in U.S. soils from Report to Congress on Cement Kiln Dust, Office of Solid Waste, USEPA, December 1993. Draft exit levels from Review Draft, Table 8-1.

2. An EPA report calculates the neutral (pH = 7) hydrolysis half-life for phorate to be 96 hours. (See Jackson, J. et al., "Measurement of Hydrolysis Rate Constants for Evaluation of Hazardous Waste Land Disposal: Volume 3. Data on 70 Chemicals," Environmental Research Laboratory, Office of Research and Development, EPA, 1988.) The lowest exit level for phorate is exposure pathway 9 for a land treatment unit, assuming a subsistence farmer consumes root crops grown directly on top of the closed unit. (See Review Draft, Table 8-1).

3. EPA used an empirical equation to estimate sediment delivery ratio from Vanoni, V.A., Sediment Engineering, American Society of Civil Engineering, 1977. Although researchers generally estimate watershed-specific sediment delivery ratios, Vanoni formed a general relationship from the work of many authors. In Vanoni's empirical equation, a basin's sediment delivery ratio is proportional to the -1/8 power of the drainage area. However, Vanoni's derived his empirical relationship from sediment measurements of complete drainage basins, not incomplete watersheds like a waste management unit. In these empirical models, mobilized soil either travels to a channel or settles inside the drainage basin. Across the waste management unit, mobilized soil either travels to a channel or settles on adjoining land outside the waste management unit. Since eroded soil from the waste management unit could come to rest on land elsewhere in the watershed, the percentage reaching water bodies is likely to be far less than EPA's value. As a further illustration of this problem, EPA often uses another empirical model to estimate sediment delivery ratios.

Further, EPA predicts three times as much sediment delivery from the waste management unit -- assumed to be on relatively flat land next to the stream -- than from the more steeply-sloped land in the rest of watershed. This relationship is exactly the opposite of what is observed in most watershed studies. See Johnson, R.R., *Putting Soil Movement in Perspective*, J. Prod. Agric. 1:5-12, 1988.

4. Storm-water run-off discharges from industrial activity is regulated under 40 CFR 122.26. Pollution prevention plans and best management practices are required to reduce pollutants (defined as the Toxic Release Inventory list) in stormwater discharges.

5. USEPA Science Advisory Board, Review of Draft "Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions," 1994.

6. The constant to account for soil losses in the off-site agricultural field includes a leaching constant, a degradation constant (set to zero), a volatilization constant, a surface run-off constant, a soil erosion constant, but not a soil loss constant to account for particulate erosion. See equation 6-102 on page 6-167 of the Review Draft, for example.

7. In the example calculations presented to the Science Advisory Board's subcommittee, there is no value for the soil loss constant due to soil erosion. However, as discussed in the previous note, the analysis explicitly includes this loss mechanism.

8. In the example calculations presented to the Science Advisory Board's subcommittee, the rate of burial in the stream (Equation 6-397) is 0.1 meters, or approximately four inches per year.

9. If a watershed really had such high levels of erosion, much more sediment would likely stay suspended in the water and thus preclude extensive aquatic life.

10. See Review Draft, page 6-640.

11. See Review Draft, page 5-146.

12. In the analysis the small stream is 8.5 km long and has a flow rate of 10,000,000 liters per year. The Columbia-Snake river system is 2,120 km in length with a flow rate of 169,000,000,000,000 liters per year. See Showers, Victor. World Facts and Figures, Wiley & Sons, Inc., New York: 1979.

13. See Review Draft, page 5-146.

14. Calculated from daily intake rates and annual crop yields given in Table 6-16 on page 6-634 of the Review Draft.

15. The fruit crop yield is $2.3 \times 10^{-3}$ kg of dry weight/$m^2$ in the draft analysis. See Review Draft, page 6-635. The dry weight to wet weight conversion factor for fruit is 6.67. See Review Draft, page 5-146. Therefore, a farmer yields only $17 \times 10^{-6}$ kg (approx. 20 milligrams) of fruit per square meter of cultivation.

RESEARCH TRIANGLE INSTITUTE

Center for Environmental Analysis

November 1995

# Supplemental Technical Support Document for the Hazardous Waste Identification Rule:

## *Risk Assessment for Human and Ecological Receptors*

Volume 1

Prepared for

**U.S. Environmental Protection Agency**
Office of Solid Waste
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# 1.0 INTRODUCTION

This document is a supplement to the *Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors*, dated August 1995. It describes changes in methods and inputs since the August 1995 document, and corrects a few errors in the August 1995 document.

This document is organized into 5 sections. This introductory section provides an overview of the changes and document corrections, and provides an index to sections, tables, and equations in the August 1995 document affected by the changes and corrections. Section 2 of this document describes each of the changes or corrections in more detail, and includes revised equations or tables as necessary. Section 3 provides references. Following the references are updated Appendices A (chemical properties data, updated to include silver), B (new ecological toxicological profiles for several chemicals), and D (revised central tendency results) and new results (as revised tables for Section 8 of the August 1995 document; bound separately).

Many of the changes apply to more than one section of the August 1995 document, and some sections are affected by more than one change. To assist the reader in locating changes, Table S-1 lists sections, tables, and equations in the August 1995 document affected by the changes described in this document, and shows which changes apply to each affected section. The changes are identified in the table by the number used below.

## 1.1 Changes in Methods

Many of the changes in the methods used in the analysis involved adding additional loss mechanisms in soil or water throughout many of the pathways. These include:

1. Biodegradation (corrected) and hydrolysis (added) in the land application unit
2. Biodegradation, hydrolysis, erosion, and runoff losses from the off-site field
3. Biodegradation, hydrolysis, and volatilization losses from surface water
4. Burial and volatile losses in surface water for surface impoundment spills

In addition, several changes were made to pathways involving soil erosion to an off-site field, including:

5. Correction to account for soil eroding onto the off-site field and adjustment to the sediment delivery ratio to account for sources that are significantly larger than the receiving field

## Table S-1. Index of Sections, Equations, and Tables Affected by Changes

| Section | What Affected | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.7.4 | Table 1-8 | | | | | | x | | | | | | | | | | |
| 4.3.2 | Table 4-4 | | | | | | | | | x | | | | | | | |
| | Table 4-5 | | | | | | | | | x | | | | | | | |
| 5.2.4 | Table 5-3 | | | | | | | | | | | | | | | x | |
| 5.2.7 | Table 5-6 | | | | | | | | | | | | | x | | | |
| | Eqn 5-64 | | | | | | | | | | | | | | x | | |
| | Eqn 5-67 | | | | | | | | | | | | | | x | | |
| 5.3.2 | Table 5-15 | | | | | | | | | x | | | | | | | |
| | Table 5-16 | | | | | | | | | x | | | | | | | |
| 6.3.2.2 | discussion | | x | | | x | | | | | | x | | | | | |
| 6.3.2.3 | Eqn 6-2, 2a-c | | x | | | | | | | | | | | | | | |
| | Eqn 2c | | | | | | | | | | | x | x | | | | |
| | Eqn 6-10 | | | | | | | | | | | x | x | | | | |
| 6.5.2.1 | Eqn 6-13 | | | x | | | | | | | | | | | | | |
| | Eqn 6-15 | | | | | | | | | | | x | x | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.5.2.2 | Eqn 6-21a&b | | | | x | | | | | | | | | | | | |
| | Eqn 6-23 | | | x | | | | | | | | | | | | | |
| | Eqn 6-25 | | | | | | | | | | | x | x | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.5.2.3 | Eqn 6-32 | | | x | | | | | | | | | | | | | |
| | Eqn 6-34 | | | | | | | | | | | x | x | | | | |
| | Eqn 6-38 | | x | | | | | | | | | | | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.6.1.2.1 | Eqn 6-49 | | x | | | | | | | | | | | | | | |
| 6.6.1.2.4 | discussion | | x | | | x | | | | | | x | | | | | |
| 6.6.2.2.1 | Eqn 6-74 | | x | | | | | | | | | | | | | | |
| 6.6.2.2.4 | discussion | | x | | | x | | | | | | x | | | | | |
| 6.6.2.2.5 | Eqn 6-90 | | | x | | | | | | | | | | | | | |
| | Eqn 6-92 | | | | | | | | | | | x | x | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.6.2.2.6 | Eqn 6-99a | | | | x | | | | | | | | | | | | |
| | Eqn 6-100 | | | x | | | | | | | | | | | | | |
| | Eqn 6-102 | | | | | | | | | | | x | x | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.6.2.2.7 | Eqn 6-109 | | | x | | | | | | | | | | | | | |
| | Eqn 6-111 | | | | | | | | | | | x | x | | | | |
| | Eqn 6-115 | | x | | | | | | | | | | | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.6.3.2.1 | Eqn 6-131 | | | x | | | | | | | | | | | | | |
| | Eqn 6-133 | | | | | | | | | | | x | x | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.6.3.2.2 | Eqn 6-142 a&b | | | | x | | | | | | | | | | | | |
| | Eqn 6-143a | | | | x | | | | | | | | | | | | |
| | Eqn 6-144a | | | | x | | | | | | | | | | | | |
| | Eqn 6-145 | | | x | | | | | | | | | | | | | |
| | Eqn 6-147 | | | | | | | | | | | x | x | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |

## Table S-1. Index of Sections, Equations, and Tables Affected by Changes

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| 6.6.3.2.3 | Eqn 6-158 | | | x | | | | | | | | | | | | | |
| | Eqn 6-160 | | | | | | | | | | | x | x | | | | |
| | Eqn 6-164 | | x | | | | | | | | | | | | | | |
| | all Eqns | | | | | | | | | | x | | | | | | |
| 6.7.5.1 | Table 6-20 | | | | | | | | | | x | | | | | | |
| 7.1.6 | Table 7-5 | | | | | | x | | | | | | | | | | |
| 7.3.1.2 | discussion | | | | | | | | x | | | | | | | | |
| 7.3.5.3 | Eqn 7-12 | | | | | x | | x | | | | | | | | | |
| | Eqn 7-14 | | | | | x | | x | | | | | | | | | |
| | Eqn 7-15 | | x | | | | | | | | | | | | | | |
| 7.3.6 | Eqn 7-21, 7-21a-d | x | | | | | | | | | | | | | | | |
| | Eqn 7-38 | x | | | | | | | | | | | | | | | |
| | discussion | | | | | | | | x | | | | | | | | |
| 7.4.5.3 | Eqn 7-50 | | | | | x | | | | | | | | | | | |
| | Eqn 7-51 | | | | | x | | | | | | | | | | | |
| | Eqn 7-53 | | x | | | | | | | | | | | | | | |
| 7.5.5.2 | Eqn 7-69 | | | | x | | | | | | | | | | | | |
| 7.7.6.2 | Table 7-45 | | | | | | | | | | x | | | | | | |
| 8.0 | all | x | x | x | x | x | x | x | x | x | x | x | x | | | | |
| Appendix A | Table A-6 | x | x | x | | | | | | | | | | | | | |
| | all tables | | | | | | | | | | | | | | | | x |
| Appendix B | selected profiles | | | | | | | | | x | | | | | | | |
| Appendix D | all | x | x | x | x | x | x | x | x | x | x | x | x | | | | |

6. Elimination of the soil erosion pathway for waste piles when the receiving field is large relative to the waste pile (i.e., for ecological receptors and cattle)
7. Elimination of high end parameter combinations for the land application unit to eliminate situations where the receiving field is significantly larger than the source

Finally, one change in the scenario for closed land application units was made:

8. A 10 year period of non-use between closure and the start of any activities leading to on-site exposures was added

### 1.2 Changes in Input Values

The input values for the following parameters were changed:

9. Several ecological benchmarks were revised
10. The stream order used to determine inputs for the high end waterbody was changed to reflect a larger stream
11. The Universal Soil Loss Equation (USLE) length slope factor for land application units was changed to reflect 2 percent slope for consistency with the groundwater analysis
12. The USLE cover factor was changed to reflect a greater degree of ground cover

### 1.3 Document Errata

The following reflect corrections to the documentation, not changes in the methods or inputs:

13. Fish concentration units for Table 5-6 have been changed to mg/g from mg/kg in the August 1995 document
14. Fish intake units in Equations 5-64 and 5-67 have been changed to mg/kg/d from µg/kg/d in the August 1995 document
15. Water concentrations in Table 5-3 for chemicals after lead have been changed to reflect an exposure duration of 30 years instead of 9 years
16. Appendix A has been revised to include silver

# 2.0 DESCRIPTION OF CHANGES AND CORRECTIONS

This section describes each of the changes or corrections and provides revised equations and tables where necessary. For each change, the original approach documented in the August 1995 document is described, followed by a description of the revised approach. Section numbers refer to the August 1995 document unless explicitly identified as referring to this document. Revised tables and equations are provided at the end of each subsection, following any discussion, and retain the table or equation number from the August 1995 document. New equations, where necessary, are given the number of the equation they should follow, plus a letter. For example, equations inserted between original equations 6-1 and 6-2 would be numbered 6-1a, 6-1b, etc.

## 2.1 Biodegradation and Hydrolysis in the Land Application Unit

*Original approach*: Releases from the land application unit were partitioned among volatilization, runoff, leaching, and biodegradation. Using a small time step (1/50th of a year, or about 1 week), each loss was calculated sequentially for the time step. Biodegradation rates were based on half-life data from Howard (1991), and were assumed to include transport losses such as volatilization. Therefore, to estimate biodegradation losses, calculated losses for volatilization, runoff, and leaching were subtracted from the total loss implied by the half-life (see Equation 7-38). If these losses exceeded the total loss, biodegradation losses were set to zero. Checks were made to ensure that the sum of all losses did not exceed the total mass of contaminant available.

*Revised approach*: Further review of the biodegradation data suggest that these values should be taken to exclude transport losses, and therefore used directly to calculate biodegradation losses. In addition, hydrolysis half-life data from Howard (1991) were also used. For hydrolysis half-lives less than one year, the half-life was converted to a rate and used. Where hydrolysis half-life was longer than a year, hydrolysis was not considered to be an important loss mechanism, and was not included. The biodegradation and hydrolysis half-life data and corresponding rates are shown in Table A-6 (new table; provided at the end of this document as part of a complete Appendix A).

All of the loss processes modeled in the partitioning are assumed to be first-order (see, for example, U.S. EPA, 1993a, in which volatilization, leaching, runoff, and biodegradation losses from soil are assumed to be first-order). A first order rate constant was calculated for volatilization, leaching, and runoff losses and added to the first order biodegradation and hydrolysis rate constants from Howard (1991) to determine an overall loss constant. This overall loss constant is then applied to the initial mass of contaminant for a particular time step, and the

total loss calculated. This change typically has little effect on the results, but ensures that in situations where the different loss processes must compete for a limited quantity of contaminant, that actual losses to each mechanism accurately reflect that. Equation 7-27 has been revised to reflect this change, and several new equations (7-27a, 7-27b, 7-27c, and 7-27d) have been added. Equation 7-38 should be deleted.

The use of a single biodegradation or hydrolysis half life introduces some uncertainty to the analysis. It is widely recognized that half-life data is a function of both the inherent physical and chemical properties of the constituent, as well as the physical and chemical properties of the contaminated media (Mackay et al. (1992)). In addition, there very often is a wide range of half-life values for a given chemical in the literature. However, many studies and respected references which contain compilations of literature data, such as Howard et al. (1991) (henceforth referred to as "*Howard*"), do not include a complete description of the physical and chemical properties that exist in the contaminated media under study. Therefore, the selection of a single half-life value for use in the model implies that the environmental conditions that existed in the selected study are approximately the same as the environmental conditions simulated in the model. *Howard* was used as the primary reference for half-life data even though it may be somewhat limited with respect to the level of detail it includes concerning the physical and chemical characteristics of the contaminated media. In addition, there also exists some question as to whether the half-life values cited in *Howard* reflect the effects of not only degradation but also of abiotic transport processes such as leaching and volatilization. However, the *Howard* reference specifically states that the degradation half-life data do not include the effects of transport processes. Also, the half-life data for a given media are coupled with a brief description of the type of degradation process which corresponds to that data. Therefore, the data obtained from the *Howard* reference appear to represent a single degradation process, and thus can be used in the model without any adjustments. In addition, *Howard* is presented as a "...valuable source of ...half-lives..." in Mackay et al. (1992), another respected source of physical and chemical property compilations for organic constituents.

*Effects of Physical and Chemical Characteristics of Soil on Degradation Half-Lives*

The physical and chemical characteristics of soil affect both the microbial populations in soil and the subsequent aerobic biodegradation potential of soil. Some of these same physical and chemical characteristics can also affect hydrolysis rates. There are a number of properties that are believed to affect degradation rates in soil, such as:

*(1) the oxygen level*

Molecular oxygen serves two different functions during aerobic biodegradation of organic compounds: 1) it acts as a final electron acceptor for those electrons liberated during the

degradation of organic compounds; and 2) oxygen may also function as the reactant during the initial steps of organic compound biodegradation. The supply of available molecular oxygen often limits the extent of biodegradation in contaminated media.

*(2) pH*

The pH of a system may also affect the biodegradation rates in a media. Studies have been conducted that indicate microbial growth and subsequent biodegradation will be at a maximum if the soil/microbe environment is maintained within a certain pH range. Certain microorganisms may only be viable or may only be capable of metabolizing organic compounds if their environment is maintained at a certain pH range. Therefore, there may be differences in biodegradation rates of similar organic compounds if the pH is different in the environments containing the compounds. For example, the biodegradation rate of a given compound in soil with a pH of 3 may be smaller than the biodegradation rate of that same compound in a soil with a pH of 6.5. This pH difference may indicate that different types of microbial populations are present in the contaminated media and thus the potential for biodegradation may also be different in the media.

The pH of an aquatic system also affects the hydrolysis rate. Surface waters with a typical aquatic pH range of $5<pH<8$ can have different hydrolysis rates depending on the specific pH of that water, which is a function of the concentration of hydrogen and hydroxyl ions in the water.

*(3) temperature*

The microorganisms that are involved with the biodegradation of organic compounds may also be sensitive to temperature. Temperature can affect the rate of microbial growth and metabolic activity. Biodegradation rates decrease as temperature decreases. At extreme temperatures, microorganisms can even cease to be viable.

Temperature also affects the hydrolysis of organic compounds in water. The rate of hydrolysis increases with temperature. In fact, the hydrolysis rate is highly sensitive to changes in temperature.

*(4) organic compound concentration*

There is an ideal rate of microbial growth that any given system can sustain, which is in part a function of the amount of substrate (e.g., organic compound) available in the system. The microorganisms use the organic compounds as a source of energy used to produce new cell material. However, a system can be overloaded with organic substrate if the organic substrate was introduced to the system at a concentration high enough to exhibit toxic effects on the microbial community or if there was not an accompanying

increase in the oxygen available to the microorganisms.

*(5) mineral nutrients*
The addition of organic carbon contaminants to a system also necessitates an additional increase in the amount of essential nutrients (e.g., inorganic nitrogen and phosphorous) if the nutritional balance is to be maintained in the system. Otherwise, the microorganisms involved with biodegradation will not have the resources necessary to conduct this process.

*(6) moisture content of soil*
The amount of water present in the soil pore spaces affects the rate at which oxygen can diffuse into the soil; oxygen diffuses through air faster than through water. Higher oxygen contents in soils serve to stimulate aerobic biodegradation. However, soil moisture also transports nutrients and organic substrate to the microorganisms in the soil. Whereas, too little soil moisture would inhibit both transport and subsequent biodegradation processes.

As discussed above, there are several factors which can affect soil degradation half-lives. Therefore, it is not unusual to see significant variations in published half-life data given the heterogeneous nature of soil from different locations. As a result, uncertainty is introduced when half-life data from the literature is used in the model without there being more information on the specific chemical and physical characteristics that existed in the media when the data was collected. This analysis assumes neutral pH, a constant temperature of 25 C, and fairly moist soil conditions. Applying these biodegradation rates using these steady state assumptions does not account for the environmental variability relevant to biodegradation. A more correct approach would be to use kinetic models that account for the above factors. For most situations, the approach used is not conservative, and will tend to overestimate biodegradation for many environmental conditions across the country. For example, winter temperatures in much of the country would probably preclude significant degradation during the winter months.

As the discussion and examples presented above demonstrate, there are several factors associated with the degradation half-life data that introduce uncertainty to this analysis.

## Partitioning Model: Mass Remaining at Time t

Active Land Application Unit.

$$M_t = (M_{t-1} + M_{app}) \cdot (1 - e^{-k_t t}) \quad (7\text{-}27)$$

Closed Land Application Unit

$$M_t = M_{t-1} \cdot (1 - e^{k_t t})$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $M_t$ | Mass remaining at time t (g) | Calculated | | |
| $M_0$ | Mass at time 0 (g) | 0 | | |
| $M_{app}$ | Mass contaminant applied in time step (g) | 3.8e+6 | 8.2e+8 | 7.3.2 |
| $k_t$ | Overall loss constant ($yr^{-1}$) | See Equation 7-27a | | |
| t | Time step (yr) | 0.02 | | 7.3.6 |

Source: Mass balance.

## Partitioning Model: Overall Loss Constant

$$k_t = k_{vol} + k_l + k_r + k_{bio} + k_h \quad (7\text{-}27a)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_t$ | Overall loss constant ($yr^{-1}$) | Calculated | | |
| $k_{vol}$ | Volatilization loss constant ($yr^{-1}$) | See Equation 7-27b | | |
| $k_l$ | Leaching loss constant ($yr^{-1}$) | See Equation 7-27c | | |
| $k_r$ | Runoff loss constant ($yr^{-1}$) | See Equation 7-27d | | |
| $k_{bio}$ | Biodegradation loss constant ($yr^{-1}$) | Chemical-specific | | |
| $k_h$ | Hydrolysis loss constant ($yr^{-1}$) | Chemical-specific | | |

Source: Mass balance.

## Partitioning Model: Calculated Volatilization Loss Constant

$$k_{vol} = \frac{M_{vol} \cdot 1000 mg/g}{C_{t-1} \cdot t \cdot A \cdot Z \cdot BD \cdot 10^{6} cm^{3}/m^{3} \cdot 10^{-3} kg/g} \quad (7\text{-}27b)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_{vol}$ | Volatilization loss constant ($yr^{-1}$) | Calculated | | |
| $M_{vol}$ | Mass volatilized (g) | See Equation 7-28 | | |
| $C_{t-1}$ | Soil concentration at time t-1 (mg/kg) | See Equation 7-26 | | |
| t | Time step (yr) | 0.02 | | 7.3.6 |
| A | Land application unit area ($m^2$) | 61,000 | 900,000 | 7.3.2 |
| Z | Depth of contamination (m) | 0.2 | | 7.3.2 |
| BD | Sludge/soil bulk density ($g/cm^3$) | 1.5 | | 7.3.3 |

Source: Mass balance.

## Partitioning Model: Calculated Leaching Loss Constant

$$k_l = \frac{M_l \cdot 1000 mg/g}{C_{t-1} \cdot t \cdot A \cdot Z \cdot BD \cdot 10^6 cm^3/m^3 \cdot 10^{-3} kg/g} \quad (7\text{-}27c)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_l$ | Leaching loss constant ($yr^{-1}$) | Calculated | | |
| $M_l$ | Mass leached (g) | See Equation 7-33 | | |
| $C_{t-1}$ | Soil concentration at time t-1 (mg/kg) | See Equation 7-26 | | |
| t | Time step (yr) | 0.02 | | 7.3.6 |
| A | Land application unit area ($m^2$) | 61,000 | 900,000 | 7.3.2 |
| Z | Depth of contamination (m) | 0.2 | | 7.3.2 |
| BD | Sludge/soil bulk density ($g/cm^3$) | 1.5 | | 7.3.3 |

Source: Mass balance.

## Partitioning Model: Calculated Runoff Loss Constant

$$k_r = \frac{M_r \cdot 1000 mg/g}{C_{t-1} \cdot t \cdot A \cdot Z \cdot BD \cdot 10^6 cm^3/m^3 \cdot 10^{-3} kg/g} \quad (7\text{-}27d)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_r$ | Runoff loss constant ($yr^{-1}$) | Calculated | | |
| $M_r$ | Mass lost to runoff (g) | See Equation 7-34 | | |
| $C_{t-1}$ | Soil concentration at time t-1 (mg/kg) | See Equation 7-26 | | |
| t | Time step (yr) | 0.02 | | 7.3.6 |
| A | Land application unit area ($m^2$) | 61,000 | 900,000 | 7.3.2 |
| Z | Depth of contamination (m) | 0.2 | | 7.3.2 |
| BD | Sludge/soil bulk density ($g/cm^3$) | 1.5 | | 7.3.3 |

Source: Mass balance.

## 2.2 Biodegradation, Hydrolysis, Erosion, and Runoff Losses in Off-site Field

*Original Approach:* Pathways involving contamination of an off-site field include a loss term that accounts for loss of contaminant from the soil by volatilization, leaching, and erosion/runoff. The pathways incorporating this term include pathways involving soil erosion to an off-site field, air deposition to off-site field, and deposition to watershed. For soil erosion and deposition to an off-site field, this loss term included only volatilization and leaching, while for deposition to watersheds, it included volatilization, leaching, erosion, and runoff.

*Revised approach:* This loss term has been modified to include losses to biodegradation and hydrolysis for both off-site fields and watersheds, and to add erosion and runoff for off-site fields. The original approach allowed for a balance in the amount of soil eroded onto and off of a field, but allowed contaminant to be eroded or deposited onto the field but not lost by erosion, leading to an accumulation of contaminant.

Because this loss term appears in several pathways, the affected equation appears several times in the original document. Equation 6-2 has been revised to reflect the correct equation for all instances of the soil loss constant; in some instances, only biodegradation and hydrolysis were added, while in others, erosion and runoff were added as well. The revised soil loss constant equation applies to the pathways, sections, and equations from the August 1995 document listed in Table S-2.

The discussion of uncertainty regarding soil degradation and hydrolysis found in Section 2.1 of this document applies here as well.

**Table S-2. Equations Affected by Revisions to the Soil Loss Constant**

| Pathway | Section | Equation | Biodeg & Hydrolysis | Erosion & Runoff |
|---|---|---|---|---|
| 3, 5, Terr II (offsite) | 6.3.2.2 (discussion)<br>7.3.5.3 (equation for LAU)<br>7.4.5.3 (equation for wastepile) | <br>7-15 (LAU)<br>7-53 (wastepile) | <br>added<br>added | <br>added<br>added |
| 4, 6, Terr III | 6.3.2.3 | 6-2 | added | added |
| 8, Terr V | 6.6.1.2.1 | 6-49 | added | added |
| 9 (off-site) | 6.6.1.2.4 (discussion)<br>7.3.5.3 (equation for LAU)<br>7.4.5.3 (equation for wastepile) | <br>7-15 (LAU)<br>7-53 (wastepile) | <br>added<br>added | <br>added<br>added |
| 10 | 6.6.2.2.1 | 6-74 | added | added |
| 11 (off-site) | 6.6.2.2.4 (discussion)<br>7.3.5.3 (equation for LAU)<br>7.4.5.3 (equation for wastepile) | <br>7-15 (LAU)<br>7-53 (wastepile) | <br>added<br>added | <br>added<br>added |
| 20, 38, Aq II | 6.5.2.3 | 6-38 | added | already included |
| 24 | 6.6.3.2.3 | 6-164 | added | already included |
| 36 | 6.6.2.2.7 | 6-115 | added | already included |

## Soil Loss Constant

$$k_s = k_{sl} + k_{sg} + k_{sv} + k_{sr} + k_{se} + k_{sh} \quad (6\text{-}2)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_s$ | Soil loss constant ($yr^{-1}$) | Calculated | | |
| $k_{sl}$ | Soil loss constant due to leaching ($yr^{-1}$) | See Equation 6-3 | | |
| $k_{sg}$ | Soil loss constant due to degradation ($yr^{-1}$) | Chemical-specific | | |
| $k_{sv}$ | Soil loss constant due to volatilization ($yr^{-1}$) | See Equation 6-5 | | |
| $k_{sr}$ | Soil loss constant due to surface runoff ($yr^{-1}$) | See Equation 6-2a | | |
| $k_{se}$ | Soil loss constant due to soil erosion ($yr^{-1}$) | See Equation 6-2b | | |
| $k_{sh}$ | Soil loss constant due to hydrolysis ($yr^{-1}$) | Chemical-specific | | |

Source: IEM (U.S. EPA, 1990e; 1993a).

## Soil Loss Constant Due to Runoff

$$k_{sr} = \left( \frac{R_f}{(\theta \bullet Z)} \right) \left( \frac{1}{1 + (Kd_s \bullet BD/\theta)} \right) \quad (6\text{-}2a)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_{sr}$ | Soil loss constant due to surface runoff ($yr^{-1}$) | Calculated | | |
| $R_f$ | Average annual runoff (cm/yr) | WMU-specific | | |
| $\theta$ | Soil volumetric water content ($mL/cm^3$) | From Equation 6-4 | | |
| Z | Soil mixing depth (cm) | 2.5 (untilled) | 1 (untilled) | 6.7.3.3 |
| BD | Soil bulk density ($g/cm^3$) | 1.5 | 1.2 | 6.7.3.1 |
| $Kd_s$ | Soil-water partition coefficient (mL/g) | Chemical-specific | | 6.7.6.1 |

Source: IEM (U.S. EPA, 1990e; 1993a).

## Soil Loss Constant Due to Erosion

$$k_{se} = \left( \frac{0.1 \bullet X_e}{BD \bullet Z} \right) \left( \frac{Kd_s \bullet BD}{\theta + Kd_s \bullet BD} \right) \quad (6\text{-}2b)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_{se}$ | Soil loss constant due to soil erosion ($yr^{-1}$) | Calculated | | |
| $X_e$ | Unit soil loss ($kg/m^2/yr$) | From Equation 6-2c | | |
| $\theta$ | Soil volumetric water content ($mL/cm^3$) | From Equation 6-4 | | |
| Z | Soil mixing depth (cm) | 2.5 (untilled) | 1 (untilled) | 6.7.3.3 |
| BD | Soil bulk density ($g/cm^3$) | 1.5 | 1.2 | 6.7.3.1 |
| $Kd_s$ | Soil-water partition coefficient (mL/g) | Chemical-specific | | 6.7.6.1 |

Source: IEM (U.S. EPA, 1990e; 1993a).

**Universal Soil Loss Equation**

$$X_e = R \bullet K \bullet LS \bullet C \bullet P \bullet 907.18\ kg/ton \bullet 245.7\ acre/km^2 \bullet 10^{-6}\ km \quad \text{(6-2c)}$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $X_e$ | Unit soil loss ($kg/m^2/yr$) | Calculated | | |
| R | USLE rainfall factor ($yr^{-1}$) | WMU-specific | | 6.7.3.2 |
| K | USLE erodibility factor (ton/acre) | 0.25 | | 6.7.3.2 |
| LS | USLE length-slope factor (unitless) | 1 | 3 | 6.7.3.2 |
| C | USLE cover factor (unitless) | 0.1 | 0.5 | 6.7.3.2 |
| P | USLE erosion control practice factor (unitless) | 1 | | 6.7.3.2 |

Source: IEM (U.S. EPA, 1990e; 1993a).

## 2.3Biodegradation, Hydrolysis, and Volatilization Losses from Surface Water

*Original Approach:* Pathways involving contamination of surface water include a dissipation term that accounts for loss of contaminant from the water column by volatilization and burial in sediment. The pathways incorporating this term include pathways involving diffusion from air directly to surface water, soil erosion to surface water, and deposition to watershed. For soil erosion to surface water and deposition to a watershed, this loss term included only burial in sediment, while for diffusion from air directly to surface water, it included volatilization and burial in sediment. Volatilization losses were omitted for overland pathways because contaminants that have a tendency to volatilize would likely do so before reaching the waterbody.

*Revised approach:* This dissipation term has been modified to include losses to biodegradation in the water column, hydrolysis in the water column and sediment, and volatilization where it had been omitted. Volatilization losses, though not likely to be significant for the overland pathways, have been included in the overland pathways for completeness.

Because this dissipation term appears in several pathways, the affected equation appears several times in the original document. Equation 6-13 has been revised to reflect the correct equation for all instances of the dissipation rate; in some instances, only biodegradation and hydrolysis were added, while in others, volatilization was added as well. The equations for calculating inputs to the volatilization term (overall transfer rate and dissolved fraction) appear in the August 1995 document in several places (for example, Equations 6-17 and 6-19) and are not repeated here. The dissipation equation in the August 1995 document contained two typographical errors; these are also corrected in the revised equation. The revised dissipation rate equation applies to the pathways, sections, and equations from the August 1995 document listed in Table S-3.

The discussion of uncertainty regarding soil degradation and hydrolysis found in Section 2.1 of this document applies to degradation in water as well.

**Table S-3. Equations Affected by Revisions to the Surface Water Dissipation Rate**

| Pathway | Section | Equation | Biodeg & Hydrolysis | Volatilization |
|---|---|---|---|---|
| 17, 37, Aq I | 6.5.2.1 | 6-13 | added | already included |
| 19, 42, Aq III | 6.5.2.2 | 6-23 | added | added |
| 20, 38, Aq II | 6.5.2.3 | 6-32 | added | added |
| 21 | 6.6.3.2.1 | 6-131 | added | already included |
| 23 | 6.6.3.2.2 | 6-145 | added | added |
| 24 | 6.6.3.2.3 | 6-158 | added | added |
| 33 | 6.6.2.2.5 | 6-90 | added | already included |
| 35 | 6.6.2.2.6 | 6-100 | added | added |
| 36 | 6.6.2.2.7 | 6-109 | added | added |

## Water Concentration Dissipation Rate with Volatilization

$$k_{wt} = k_b + k_v + k_{bio} + k_h \qquad (6\text{-}13)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_{wt}$ | Overall total water concentration dissipation rate ($yr^{-1}$) | Calculated | | |
| $k_b$ | Burial rate ($yr^{-1}$) | See Equation 6-13a | | |
| $k_v$ | Volatilization rate ($yr^{-1}$) | See Equation 6-13b | | |
| $k_{bio}$ | Biodegradation rate ($yr^{-1}$) | See Equation 6-13c | | |
| $k_h$ | Hydrolysis rate ($yr^{-1}$) | Chemical-specific | | |

Source: IEM (U.S. EPA, 1990e; 1993a).

## Burial Rate

$$k_b = \left( \frac{\theta_{bs} + BS \bullet Kd_{bs} \bullet 10^{-6} kg/mg}{1 + Kd_{sw} \bullet TSS \bullet 10^{-6} kg/mg} \right) \qquad (6\text{-}13a)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_b$ | Burial rate ($yr^{-1}$) | Calculated | | |
| $\theta_{bs}$ | Bed sediment porosity (unitless) | 0.6 | | 6.7.5.2 |
| BS | Bed sediment concentration (mg sediment/L) | $10^6$ | | 6.7.5.2 |
| $Kd_{bs}$ | Bed sediment/sediment pore water partition coefficient (L/kg) | Chemical-specific | | 6.7.6.1 |
| $Kd_{sw}$ | Suspended sediment/surface water partition coefficient (L/kg) | Chemical-specific | | 6.7.6.1 |
| TSS | Total suspended solids (mg/L) | 10 | 80 | 6.7.5.2 |
| $W_b$ | Rate of burial (m/yr) | See Equation 6-14 | | |
| $D_b$ | Depth of bed sediments (m) | 0.03 | | 6.7.5.1 |

Source: IEM (U.S. EPA, 1990e; 1993a).

**Volatilization Rate**

$$k_v = \frac{K_v \cdot f_{water} \cdot f_d}{D_z} \qquad (6\text{-}13b)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_v$ | Volatilization rate ($yr^{-1}$) | Calculated | | |
| $K_v$ | Overall transfer rate (m/yr) | See Equation 6-17 | | |
| $f_{water}$ | Fraction in water column (unitless) | See Equation 6-20 | | |
| $f_d$ | Dissolved fraction (unitless) | See Equation 6-19 | | |
| $D_z$ | Depth of waterbody (m) | 0.67 | 0.18 | 6.7.5.1 |

Source: IEM (U.S. EPA, 1990e; 1993a).

## Biodegradation Rate

$$k_{bio} = f_{water} \cdot k_{gw} + f_{benth} \cdot k_{gs} \quad \text{(6-13c)}$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $k_{bio}$ | Biodegradation rate ($yr^{-1}$) | Calculated | | |
| $f_{water}$ | Fraction in water column (unitless) | See Equation 6-20 | | |
| $f_{benth}$ | Fraction in sediments (unitless) | $= 1 - f_{water}$ | | |
| $k_{gw}$ | Biodegradation rate in water ($yr^{-1}$) | Chemical-specific | | |
| $k_{gs}$ | Biodegradation rate in sediment ($yr^{-1}$) | 0 (Data unavailable) | | |

Source: IEM (U.S. EPA, 1990e; 1993a).

## 2.4 Surface Water Loss Processes for Surface Impoundment Spills

*Original approach:* Pathways involving contamination of surface water include a loss term that accounts for loss of contaminant from the waterbody by several different mechanisms, including volatilization and burial in bed sediment. These loss terms were inadvertently omitted from the surface impoundment spill pathways

*Revised approach:* Losses due to volatilization, burial, biodegradation, and hydrolysis have been added for surface impoundment spills. Table S-4 shows the pathways, sections, and equations affected by this change. Equations 6-142a, 6-143a, 6-144a, and 6-144b have been added to illustrate this calculation for surface impoundments. In addition, Equation 7-69 has been revised.

**Table S-4. Equations Affected by Revisions to Surface Impoundment Spills**

| Pathway | Section | Equation Added | Description of Equation Added |
|---|---|---|---|
| 19, 42, Aq III | 6.5.2.2 | 6-21a (see 6-142a)<br>6-21b (see 6-142b)<br>6-22a (see 6-144a) | Load from dissolved water conc.<br>Fraction dissolved<br>Load from bed sediment conc. |
| 23 | 6.6.3.2.2 | 6-142a<br>6-142b<br>6-143a<br>6-144a | Load from dissolved water conc.<br>Fraction dissolved<br>Load from total water conc.<br>Load from bed sediment conc. |
| 35 | 6.6.2.2.6 | 6-99a (see 6-143a) | Load from total water conc. |

## Surface Impoundment Spill Load: from Dissolved Water Concentration

$$L_{spill} = \frac{C_{dw} \bullet \left(Vf_z \bullet f_{water} + k_{wt} \bullet V\right) \bullet 10^3 L/m^3 \cdot 10^{-3} g/mg}{f_{water} \cdot f_d} \bullet \frac{d_w}{d_z} \qquad (6\text{-}142a)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $L_{spill}$ | Load from surface impoundment spill (g/yr) | Calculated | | |
| $C_{dw}$ | Dissolved water concentration (mg/L) | From Equation 6-139 | | |
| $Vf_z$ | Waterbody flow volume (L/yr) | 3e+11 | 1.3e+10 | 6.7.5.1 |
| $f_{water}$ | Fraction of total waterbody contamination in water column (unitless) | See Equation 6-151 | | |
| $k_{wt}$ | Overall total water concentration dissipation rate ($yr^{-1}$) | See Equation 6-145 | | |
| V | Flow-independent mixing volume (L) | 6.7e+8 | 8.3e+6 | 6.7.5.1 |
| $f_d$ | Fraction of contaminant dissolved in water column (unitless) | See Equation 6-142b | | |
| $d_w$ | Depth of water column (m) | 0.64 | 0.15 | 6.7.5.1 |
| $d_z$ | Total depth of waterbody (water column and sediment) (m) | 0.67 | 0.18 | 6.7.5.1 |

Source: IEM (U.S. EPA. 1990e: 1993a).

## Dissolved Fraction

$$f_d = \frac{1}{1 + Kd_{sw} \bullet TSS \bullet 10^{-6} kg/mg} \quad \text{(6-142b)}$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $f_d$ | Dissolved fraction (unitless) | Calculated | | |
| $Kd_{sw}$ | Suspended sediment/surface water partition coefficient (L/kg) | Chemical-specific | | 6.7.6.1 |
| TSS | Total suspended solids (mg/L) | 10 | 80 | 6.7.5.2 |

Source: IEM (U.S. EPA, 1990e; 1993a).

## Surface Impoundment Spill Load: from Total Water Column Concentration

$$L_{spill} = \frac{C_{wt} \bullet \left(Vf_z \bullet f_{water} + k_{wt} \bullet V\right) \bullet 10^3 L/m^3 \cdot 10^{-3} g/mg}{f_{water}} \bullet \frac{d_w}{d_z} \qquad (6\text{-}143a)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $L_{spill}$ | Load from Surface Impoundment spill (g/yr) | Calculated | | |
| $C_{wt}$ | Total water column concentration (mg/L) | From Equation 6-140 | | |
| $Vf_z$ | Waterbody flow volume (L/yr) | 3e+11 | 1.3e+10 | 6.7.5.1 |
| $f_{water}$ | Fraction of total waterbody contamination in water column (unitless) | See Equation 6-151 | | |
| $k_{wt}$ | Overall total water concentration dissipation rate ($yr^{-1}$) | See Equation 6-145 | | |
| V | Flow-independent mixing volume (L) | 6.7e+8 | 8.3e+6 | 6.7.5.1 |
| $d_w$ | Depth of water column (m) | 0.64 | 0.15 | 6.7.5.1 |
| $d_z$ | Total depth of waterbody (water column and sediment) (m) | 0.67 | 0.18 | 6.7.5.1 |

Source: IEM (U.S. EPA, 1990e; 1993a).

## Surface Impoundment Spill Load: from Bottom Sediment Concentration

This algorithm was used for dioxins and PCBs.

$$L_{spill} = \frac{C_{bs} \bullet \left(Vf_s \bullet f_{water} + k_{wt} \bullet V\right) \bullet 10^3 L/m^3 \cdot 10^{-3} g/mg}{f_{benth}} \bullet \frac{d_b}{d_z} \qquad (6\text{-}144a)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $L_{spill}$ | Load from surface impoundment spill (g/yr) | Calculated | | |
| $C_{bs}$ | Contaminant concentration in bottom sediment (mg/kg) | From Equation 6-141 | | |
| $Vf_s$ | Waterbody flow volume (L/yr) | 3e+11 | 1.3e+10 | 6.7.5.1 |
| $f_{water}$ | Fraction of total waterbody contamination in water column (unitless) | See Equation 6-151 | | |
| $k_{wt}$ | Overall total water concentration dissipation rate ($yr^{-1}$) | See Equation 6-145 | | |
| V | Flow-independent mixing volume (L) | 6.7e+8 | 8.3e+6 | 6.7.5.1 |
| $f_{benth}$ | Fraction of contaminant in bed sediments (unitless) | $= 1 - f_{water}$ | | |
| $d_b$ | Depth of bed sediments (m) | 0.03 | | 6.7.5.1 |
| $d_z$ | Total depth of waterbody (water column and sediment) (m) | 0.67 | 0.18 | 6.7.5.1 |

Source: IEM (U.S. EPA, 1990e; 1993a).

## 2.5 Correction to Account for Soil Eroded to Off-site Fields and Adjustment to Sediment Delivery Ratio

*Original approach:* The equation for backcalculating the soil concentration in a waste management unit from the soil concentration in an off-site field contaminated by erosion from the source did not account for the mass of soil added to the field via erosion.

In addition, the sediment delivery ratio, a term that describes how much of the soil eroded from the source reaches the off-site field, did not adequately account for differences in area between the source and receiving field. The sediment delivery ratio was adjusted using a ratio of the two areas if the receiving field was smaller than the source.

*Revised approach*: The equation for backcalculating on-site soil concentration from off-site soil concentration has been revised to include a term to account for the soil eroded onto the off-site field (Equation 7-12 for land application units and 7-50 for wastepiles). In addition, the equation for sediment delivery ratio (Equation 7-14 for land application units and 7-51 for wastepiles) has also been revised to use a ratio of the square root of the areas of the source and receiving field, as suggested by the Dioxin document (U.S. EPA, 1994a). While these equations appear in Section 7 (7.3.5.3 and 7.4.5.3), they are also discussed in Sections 6.3.2.2, 6.6.1.2.4, and 6.6.2.2.4.

## Land Application Unit: Soil Erosion: Soil Concentration

$$C_{soil,on} = \frac{C_{soil,off} \bullet \left(k_s \bullet BD \bullet A_f \bullet Z + X_e \cdot A_s \cdot SD \cdot ER\right)}{X_e \bullet A_s \bullet SD \bullet ER \bullet (1 - e^{-k_s t})} \quad (7\text{-}12)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $C_{soil,on}$ | Concentration in soil on site (mg/kg) | Calculated | | |
| $C_{soil,off}$ | Concentration in soil off site (mg/kg) | From Equations 5-5, 5-6, 5-12, 5-22, 6-70, 6-71, 6-86, 6-87 | | |
| $X_e$ | Unit soil loss (kg/m²/yr) | See Equation 7-13 | | |
| $A_s$ | Area of land application unit (m²) | 61,000 | 900,000 | 7.3.2 |
| SD | Sediment delivery ratio (unitless) | See Equation 7-14 | | |
| ER | Soil enrichment ratio (unitless) | 3 (organics)<br>1 (metals) | | 7.7.4.1 |
| $k_s$ | Soil loss constant (yr⁻¹) | See Equation 7-15 | | |
| BD | Soil bulk density (kg/m³) | 1.5 | 1.2 | 7.7.2 |
| $A_f$ | Area of off-site field (m²) Garden<br>Field | 5,100<br>2,000,000 | 2,024<br>300,000 | 7.7.4.2 |
| Z | Field soil mixing depth (m) | 0.2 (tilled)<br>0.025 (untilled) | 0.1 (tilled)<br>0.01 (untilled) | 7.7.4.3 |
| t | Time period of erosion (yr) | 20 (farmer)<br>9 (other) | 40 (farmer)<br>30 (others) | 7.7.6.1 |

Source: By analogy to IEM (U.S. EPA, 1990e; 1993a).

**Land Application Unit: Sediment Delivery Ratio**

If $A_f < A_s$

$$SD = a \bullet (A_s)^{-0.125} \bullet \sqrt{\frac{A_f}{A_s}} \qquad (7\text{-}14)$$

If $A_f > A_s$:

$$SD = a \bullet (A_s)^{-0.125}$$

| Parameter | Definition | | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|---|
| SD | Sediment delivery ratio (unitless) | | Calculated | | |
| a | Empirical intercept coefficient (unitless) | | 2.1 | 1.9 | 7.7.4.5 |
| $A_s$ | Area of land application unit ($m^2$) | | 61,000 | 900,000 | 7.3.2 |
| $A_f$ | Area of field ($m^2$) | garden | 5,100 | 2,024 | 7.7.4.2 |
| | | field | 2,000,000 | 300,000 | |

Source: Modified from IEM (U.S. EPA, 1990e; 1993a) using Dioxin document (U.S. EPA, 1994a).

## Wastepile: Soil Erosion: Soil Concentration

$$C_{soil,on} = \frac{C_{soil,off} \bullet \left(k_s \bullet BD \bullet A_f \bullet Z + X_e \cdot A_s \cdot SD \cdot ER\right)}{X_e \bullet A_s \bullet SD \bullet ER \bullet (1 - e^{-k_s t})} \quad (7\text{-}50)$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| $C_{soil,on}$ | Concentration in soil on site (mg/kg) | Calculated | | |
| $C_{soil,off}$ | Concentration in soil off site (mg/kg) | From Equations 5-5, 5-6, 5-12, 5-22, 6-70, 6-71, 6-86, 6-87 | | |
| $X_e$ | Unit soil loss (kg/m$^2$/yr) | See Equation 7-52 | | |
| $A_s$ | Area of wastepile (m$^2$) | 120 | 5,300 | 7.4.2 |
| SD | Sediment delivery ratio (unitless) | See Equation 7-51 | | |
| ER | Soil enrichment ratio (unitless) | 3 (organics)<br>1 (metals) | | 7.7.4.1 |
| $k_s$ | Soil loss constant (yr$^{-1}$) | See Equation 7-53 | | |
| BD | Soil bulk density (kg/m$^3$) | 1.5 | 1.2 | 7.7.2 |
| $A_f$ | Area of off-site field Garden (m$^2$) | 5,100 | 2,024 | 7.7.4.2 |
| Z | Field soil mixing depth (m) | 0.2 (tilled)<br>0.025 (untilled) | 0.1 (tilled)<br>0.01 (untilled) | 7.7.4.3 |
| t | Time period of erosion (yr) | 20 (farmer)<br>9 (other) | 40 (farmer)<br>30 (others) | 7.7.6.1 |

Source: By analogy to IEM (U.S. EPA, 1990e; 1993a).

## Wastepile: Sediment Delivery Ratio

If $A_f < A_s$

$$SD = a \bullet (A_s)^{-0.125} \bullet \sqrt{\frac{A_f}{A_s}} \qquad (7\text{-}51)$$

If $A_f > A_s$:

$$SD = a \bullet (A_s)^{-0.125}$$

| Parameter | Definition | Central tendency value | High-end value | Refer to |
|---|---|---|---|---|
| SD | Sediment delivery ratio (unitless) | Calculated | | |
| a | Empirical intercept coefficient (unitless) | 2.1 | 2.1 | 7.7.4.5 |
| $A_s$ | Area of wastepile ($m^2$) | 120 | 5,300 | 7.4.2 |
| $A_f$ | Area of field ($m^2$) garden | 5,100 | 2,024 | 7.7.4.2 |

Source: Modified from IEM (U.S. EPA, 1990e; 1993a) using Dioxin document (U.S. EPA, 1994a).

## 2.6 Elimination of Erosion Pathways with Source Much Smaller than Receiving Field

*Original approach:* Several modeled scenarios for soil erosion involved a situation where the source is much smaller than the receiving field. This occurs for the wastepile when the receiving field is an agricultural field for beef/milk pathways (pathway 11 off-site) or an ecological habitat for ecological pathways (pathway Terr II). The area of the agricultural field is 2,000,000 $m^2$ for central tendency, and 300,000 $m^2$ for high end; the area of the ecological habitat is 2,000,000 $m^2$. The wastepile area, by contrast is 120 $m^2$ for central tendency and 5,300 $m^2$ for high end.

*Revised approach:* The correction to the sediment delivery ratio used for erosion pathways described in section 2.5 accounts for situations where the receiving field is smaller than the source. In this case, where the receiving field is much larger than the source, even using the larger wastepile and the smaller field, it seems unlikely that this will be an important pathway given the disparity in areas. Therefore, pathways 11 (off-site) and Terr II were dropped for wastepiles.

## 2.7 Correction to Erosion Pathways with Source Much Larger than Receiving Field

*Original approach:* Pathway Terr II, soil erosion to an ecological habitat, uses an ecological habitat area of 2,000,000 $m^2$. When the land application unit area is set to its central tendency value (61,000 $m^2$), this combination of parameters results in a scenario unlikely to be of concern as only a small portion of the 2,000,000 $m^2$ is likely to be contaminated.

*Revised approach:* The sediment delivery ratio adjustment for erosion to an off-site field described in section 2.5 is an adequate adjustment when the source area is somewhat larger than the receiving field. In this case, the difference is greater. Therefore, the land application unit parameters are always set to high end values for the Terr II pathway. Only one other fate and transport/waste management unit characterization parameter is set to high end values, to maintain two of these parameters set to high end values.

## 2.8 Ten-year Period of Non-Use Before On-site Exposures on Closed Land Application Unit

*Original approach:* In the original approach, exposures to residential receptors on a closed land application unit were assumed to start immediately upon closure of the unit, with no period of non-use for changes in land use or residential construction. This was not considered to be a realistic scenario.

*Revised approach:* The model has been revised to allow a 10-year period of non-use between land application unit closure and the start of any on-site residential exposures. This more realistic scenario allows time for zoning changes and residential development. However, because the chemicals of concern in the on-site closed land application unit pathways are highly persistent, the change has little effect on the exit criteria backcalculated.

## 2.9 Revised Ecological Benchmarks

Since the release of the August 1995 document, some of the ecological benchmarks have been changed to incorporate new data/analyses and several preliminary comments. In particular, the toxicological profiles presented in Appendix B have been expanded to provide detail on the calculation of soil fauna benchmarks and aquatic community benchmarks. The sediment community benchmarks have also been revised to reflect changes in input data (e.g., log $K_{oc}$) and assumptions (e.g., organic fraction or $f_{oc}$) used in the multiple pathway model. In preparing additional materials for the profiles, it was discovered that some of the benchmarks for fish and aquatic invertebrates were incorrectly reported in $\mu$g/L instead of mg/L in Table 4-4 in Section 4.3.2. These values have been corrected and are presented in Table 4-4 below. It should be noted that these benchmarks are the values that were used in the most recent model calculations.

The following sections present supporting calculations and data for the revised soil fauna benchmarks (see Section 4.3.4, revised sediment community benchmarks, and the aquatic benchmarks (see Section 4.3.5) derived using Tier II methods described in the August 1995 document (i.e., secondary chronic values). The expanded materials for the ecological toxicity profiles will result in this reorganization of the tables:

- **Table 1. Toxicological Benchmarks for Representative Mammals and Birds Associated with the Freshwater Ecosystem**
- **Table 2. Toxicological Benchmarks for Aquatic Organisms Associated with the Freshwater Ecosystem**
- **Table 3. SCV Calculation for Constituent (new)**
- **Table 4. Toxicological Benchmarks for Wildlife Associated with the Terrestrial Ecosystem**
- **Table 5. Calculation of Soil Fauna Benchmark for Constituent (new)**
- **Table 6. Data Set Used to Derive Soil Fauna Benchmark for Constituent (new)**
- **Table 7. Biological Uptake Values**

### 2.9.1 Soil Fauna Benchmarks

For soil fauna, soil ecological toxicity benchmarks were developed using methods analogous to those used in deriving the National Ambient Water Quality Criteria (AWQC). In brief, the soil fauna benchmarks were estimated to protect 95% of the species found in a "typical" soil community, including earthworms, insects, and other various soil fauna. Microflora were not included in the soil community primarily because of the difficulty in assigning ecological significance to effects levels for soil microorganisms, especially with respect to adaptation and recovery of microbial populations. It should be noted, however, that microflora make up approximately 80-90% of the biomass and biological activity in soil.[1] As described in Section 3.3.3.2 of the August 1995 document, eight taxa of soil fauna were identified to capture the key structural (e.g., trophic elements) and functional (e.g., decomposers) components of the soil ecosystem. The methodology presumes that protecting 95% of the soil species with a 50th percentile level of confidence will ensure long-term sustainability of a functioning soil community and, therefore, allow for multiple uses (e.g., residential, agricultural) of the "contaminated" area.

The toxicity data on soil fauna were gleaned from several major compendia and supplemented with additional studies identified in the open literature. Generally, studies were not eliminated from the data set unless: (1) the statistical quality of the study data were deemed inadequate, (2) the endpoint was considered inappropriate to develop benchmarks (e.g., $LC_{50}$ values), or (3) the study species did not fit in any of the eight taxonomic categories. In short, acceptable toxicity data were limited to soil studies (vs. aqueous studies) on measurement endpoints believed to be relevant to population survival (e.g., growth, reproduction). Insufficient data were identified within the time frame for this analysis to delineate the relationship between toxicity and the form of the metal applied to soil (i.e., sulfate, chloride). However, it seems apparent that metal salts are both more mobile and more toxic in the soil community.

The approach to calculating benchmarks for the soil community was based on efforts by Dutch scientists (i.e., the RIVM methodology) to develop hazardous concentrations (HC) at specified levels of protection (primarily 95%) at both a 95th percentile and a 50th percentile level of confidence. For the soil fauna benchmarks, the 50th percentile level of confidence was selected because the 95th percentile appeared to be overly conservative for a "no effects" approach. The key assumptions in the Dutch methodology are that: (1) NOEC and LOEC data are distributed logistically, and (2) the 95% level of protection is ecologically significant. The

[1] Preliminary comparisons of toxicity data between soil fauna and microflora suggest that benchmarks for soil fauna will likely be protective of microflora.

following formula was used to calculate soil fauna benchmarks:

$$HC_{5\%} = [x_m - k_l\, s_m] \qquad (4\text{-}7)$$

where $HC_{5\%}$ = soil concentration protecting 95% of the soil species
$x_m$ = sample mean of the log NOEC and LOEC data
$k_l$ = extrapolation constant for calculating the one-side leftmost confidence limit for a 95% protection level
$s_m$ = sample standard deviation of the log NOEC and LOEC data

It is important to note that only one value for $k_l$ is calculated for the 50th and 95th percentile confidence limits, respectively, for each sample size (m). Consequently, it is assumed that: (1) there is just one extrapolation constant with the required confidence property for each species sample size, and (2) extrapolation factors may be determined through Monte Carlo simulation by generating random sample averages and deviations for the *standard* logistic distribution and adjusting for a specified confidence level (i.e., 50th or 95th). Like the AWQC, the means to verify protection of a true field community at the 95% level of protection are currently unavailable or prohibited by cost.

The August 1995 document contained soil fauna benchmarks for five metals: cadmium, copper, lead, mercury, and zinc. A reevaluation of the data on mercury indicated that toxicity data were available on an insufficient number of taxa to represent the soil community (i.e., less than four categories). As a result, the soil fauna benchmark for mercury has been withdrawn pending the identification of additional data. The benchmarks for the other metals have been revised based on an analysis of the appropriateness of the toxicity data with respect to the study selection criteria described in Section 4.3.4. For example, a feeding study conducted in an agar/fungi matrix for nematodes (*Aphelenchus avenae*) was considered inappropriate for benchmark development because the lead cation is highly available to the worms in this food source. The study value of 0.082 mg/kg was omitted from the data set, resulting in an increase in the soil fauna benchmark from the original value of 0.25 mg/kg to 28 mg/kg. In addition, the data set for zinc has been expanded to include several lowest observed effects concentrations (LOECs) to augment the species-specific data. Based on an analysis of all available data on zinc toxicity to soil organisms, it was felt that the interim soil fauna benchmark of 0.036 mg/kg (based on four studies) was inappropriately conservative and indicative of the importance of considering as many of the eight taxonomic groupings as possible. A soil benchmark of 23 mg/kg was derived from the expanded data set on zinc toxicity to soil organisms. The soil fauna

benchmarks for lead and copper have also been revised and are now 28 mg/kg and 21 mg/kg, respectively.

Although background concentrations were evaluated with respect to the soil fauna benchmarks (see *Elements in North American Soils* by Dragun and Chiasson, 1991), background concentrations *per se* were not presumed to be appropriate target levels to protect the soil community. Whereas background concentrations include naturally occurring metals that are relatively immobile, hazardous waste streams contain a variety of metals species that may be both mobile and, because of their bioavailability, highly toxic to soil fauna. In addition, adaptation to background metals by indigenous soil communities may not be relevant to soils in which metal-containing wastes are introduced over a much shorter time scale.

A series of tables is introduced in this section as a supplement to the toxicological profiles in Appendix B. For each of the remaining metals - cadmium, copper, lead, and zinc - two tables are presented that describe the calculation of the soil fauna benchmarks (Table 5) and the data set upon which the benchmark was based (Table 6). Table 5 presents the calculation of the soil fauna benchmark, including the equation (4-7) and all of the inputs (e.g., toxicity values, standard deviation) required by the methods. Table 6 presents the complete data set from which the soil fauna benchmark was derived and includes the species, taxonomic groupings, endpoints, and references.

# Table 4-4. Toxicological Benchmarks for Ecological Receptors in the Freshwater Ecosystem

| | Mammals (mg/kg-d) | | | Birds (mg/kg-d) | | | | | | | | | Fish/ Daphnids (mg/l) | | Sediment community (mg/kg) | | Aquatic Plants (ug/l) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituent name** | mink | river otter | | Bald eagle | Osprey | Great blue heron | Mallard | Lesser Scaup | King-fisher | Spotted Sand-piper | Herring Gull | | | | | | | |
| DDT | 3.7E-01 | 2.0E-01 | a* | 2.0E-02 | 2.0E-02 | 2.0E-02 | 2.0E-02 | 2.0E-02 | 4.0E-02 | 5.0E-02 | 2.0E-02 | p | 1.3E-05 | i | 1.7E+00 | i | 3.0E-01 | i |
| Benzo(a)pyrene | 4.4E-01 | 2.6E-01 | p | ID | ID | ID | ID | ID | ID | ID | ID | | 1.3E-05 | i | 6.5E-01 | i | ID | |
| Parathion | 4.4E-01 | 2.7E-01 | a* | 1.2E+00 | 1.5E+00 | 1.5E+00 | 1.7E+00 | 1.9E+00 | 2.9E+00 | 3.8E+00 | 1.8E+00 | i | 1.3E-05 | a | 3.8E-03 | a | ID | |
| Benz(a)anthracene (1,2-) | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 2.5E-05 | i | 5.0E-01 | i | ID | |
| Chlordane | 1.9E+00 | 1.1E+00 | a* | ID | ID | ID | ID | ID | ID | ID | ID | | 1.7E-04 | a | 1.4E+01 | a | ID | |
| Hexachlorocyclohexane, gamma- (Lindane) | ID | ID | | 5.4E-01 | 6.8E-01 | 6.5E-01 | 7.7E-01 | 8.5E-01 | 1.3E+00 | 1.7E+00 | 7.9E-01 | a | 8.0E-05 | a | 1.9E-02 | a | 5.0E+02 | i |
| Dieldrin | 1.0E-02 | 6.0E-03 | a | 4.0E-02 | 4.0E-02 | 4.0E-02 | 5.0E-02 | 5.0E-02 | 8.0E-02 | 1.1E-01 | 5.0E-02 | a | 6.3E-05 | a | 5.9E-01 | a | ID | |
| Hexachlorophene | 1.4E+00 | 7.5E-01 | a* | ID | ID | ID | ID | ID | ID | ID | ID | | ID | | ID | | ID | |
| Endrin | 2.3E-01 | 1.3E-01 | a | 2.0E-02 | 3.0E-02 | 2.0E-02 | 3.0E-02 | 3.0E-02 | 5.0E-02 | 6.0E-02 | 3.0E-02 | a | 6.1E-05 | a | 2.9E-01 | a | ID | |
| Methoxychlor | 7.2E+01 | 4.0E+01 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 3.0E-05 | a | 1.5E-01 | a | ID | |
| Heptachlor | 3.3E-01 | 2.0E-01 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 6.9E-06 | i | 4.9E-01 | i | 2.7E+01 | i |
| Hexachlorocyclopentadiene | 3.9E+01 | 2.2E+01 | a* | ID | ID | ID | ID | ID | ID | ID | ID | | 7.5E-04 | i | 7.5E+00 | i | ID | |
| Acenaphthene | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 2.3E-02 | a | 6.2E+00 | a | 5.2E+02 | i |
| Diethyl phthalate | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 2.2E-01 | i | 3.2E+00 | i | 8.6E+04 | i |
| Butylbenzyl phthalate | 1.7E+02 | 9.2E+01 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 1.6E-02 | i | 4.6E+01 | i | ID | |
| Pentachlorophenol | 3.0E+00 | 1.8E+00 | a | 1.6E+00 | 4.1E+01 | 3.7E+01 | 4.4E+01 | 4.9E+01 | 7.4E+01 | 1.0E+02 | 4.5E+01 | i | 1.3E-02 | a* | ID | | ID | |
| Trichlorophenoxyacetic acid, 2,4,5- | 2.8E+01 | 1.5E+01 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 1.0E-02 | i | 9.0E-01 | i | ID | |
| Endosulfan | 2.9E+00 | 1.8E+00 | a* | ID | ID | ID | ID | ID | ID | ID | ID | | 5.6E-05 | a | 3.0E-02 | a | ID | |
| Bis(2-ethylhexyl)phthalate (also DEHP) | 3.2E+01 | 1.8E+01 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 5.5E-03 | i* | 4.1E+03 | i | ID | |
| Di-n-octyl phthalate | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | ID | | ID | | ID | |
| Hexachlorobenzene | 1.2E+00 | 7.1E-01 | a* | 2.6E-01 | 3.2E-01 | 2.9E-01 | 3.4E-01 | 3.8E-01 | 5.8E-01 | 7.9E-01 | 3.5E-01 | i | 6.0E-03 | a | 1.9E+02 | a | ID | |
| Dimethyl phthalate | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 1.4E-01 | i | 2.5E-01 | i | ID | |
| Kepone | 6.0E-01 | 3.6E-01 | a | 4.1E+00 | 5.0E+00 | 4.6E+00 | 5.4E+00 | 6.1E+00 | 9.1E+00 | 1.2E+01 | 5.7E+00 | a | 3.6E-04 | i | 2.9E+00 | i | ID | |
| Fluoranthene | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 6.2E-03 | a | 3.6E+01 | a | 5.4E+04 | i |
| Chrysene | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | ID | | ID | | ID | |
| Methyl parathion | 1.7E+00 | 1.0E+00 | a | 3.5E-01 | 4.3E-01 | 3.9E-01 | 4.6E-01 | 5.2E-01 | 7.8E-01 | 1.1E+00 | 4.7E-01 | a | 3.2E-05 | i | 1.1E-03 | i | ID | |
| Aldrin | 5.2E-02 | 3.1E-02 | p | 4.0E-03 | 5.0E-03 | 5.0E-03 | 6.0E-03 | 6.0E-03 | 9.0E-03 | 1.3E-02 | 6.0E-03 | p* | 1.8E-05 | i | 2.2E+00 | i | ID | |
| Pentachlorobenzene | 3.6E+00 | 2.0E+00 | p | ID | ID | ID | ID | ID | ID | ID | ID | | 1.6E-03 | i | 1.2E+01 | i | ID | |
| Heptachlor epoxide | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 5.1E-04 | i | 2.1E+00 | i | ID | |
| Polychlorinated biphenyls (Aroclor-1254) | 1.6E-01 | 9.0E-02 | a | 1.2E-01 | 1.6E-01 | 1.5E-01 | 1.8E-01 | 1.9E-01 | 2.9E-01 | 3.9E-01 | 1.8E-01 | p | 6.1E-05 | i | 4.7E+00 | i | 1.0E-01 | i |
| TCDD, 2,3,7,8- | 4.3E-07 | 2.6E-07 | a | 1.4E-05 | 1.2E-05 | 1.1E-05 | 1.3E-05 | 1.5E-05 | 2.2E-05 | 2.9E-05 | 1.4E-05 | i | ID | | ID | | ID | |
| Lead | 3.2E-03 | 9.0E-03 | a* | 5.9E-03 | 7.5E-03 | 7.1E-03 | 8.4E-03 | 9.4E-03 | 1.4E-02 | 1.9E-02 | 8.7E-03 | p | 3.2E-03 | a | ID | | 5.0E+02 | i |
| Mercury | 3.0E-01 | 1.7E-01 | a* | 5.0E-03 | 6.0E-03 | 5.0E-03 | 6.0E-03 | 7.0E-03 | 1.1E-02 | 1.5E-02 | 7.0E-03 | a | 1.3E-03 | i* | ID | | 5.0E+00 | i |
| Molybdenum | 7.5E-02 | 4.1E-02 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 2.4E-01 | i | ID | | ID | |
| Nickel | 3.3E+01 | 2.0E+01 | a* | ID | ID | ID | ID | ID | ID | ID | ID | | 1.6E-01 | a* | ID | | 5.0E+00 | i |

## Table 4-4. Toxicological Benchmarks for Ecological Receptors in the Freshwater Ecosystem

| | Mammals (mg/kg-d) | | | Birds (mg/kg-d) | | | | | | | | | Fish/ Daphnids (mg/l) | | Sediment community (mg/kg) | | Aquatic Plants (ug/l) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituent name** | mink | river otter | | Bald eagle | Osprey | Great blue heron | Mallard | Lesser Scaup | King-fisher | Spotted Sand-piper | Herring Gull | | | | | | | |
| Silver | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 3.6E-04 | i | ID | | 3 0E+01 | i |
| Antimony | 1 3E-01 | 7.0E-02 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 3 0E-02 | a | ID | | 6 1E+02 | i |
| Arsenic V | 3.9E+00 | 2 4E+00 | a* | 3 9E+00 | 5 0E+00 | 4.7E+00 | 5.5E+00 | 6 2E+00 | 9.2E+00 | 1 2E+01 | 5 8E+00 | a | 8 1E-03 | a | ID | | 4.8E+01 | i |
| Barium | ID | ID | | 4 1E+01 | 5 2E+01 | 4.9E+01 | 5 8E+01 | 6.4E+01 | 9.6E+01 | 1.3E+02 | 6 0E+01 | a | 1 0E+00 | i | ID | | ID | |
| Beryllium | ID | ID | | ID | ID | ID | ID | ID | ID | ID | ID | | 5.1E-03 | i | ID | | 1 0E+05 | i |
| Cadmium | 8 2E-01 | 4.9E-01 | a | 1.4E+00 | 1.7E+00 | 1.6E+00 | 1 9E+00 | 2 1E+00 | 3.2E+00 | 4.3E+00 | 1 9E+00 | a | 1.1E-03 | a* | ID | | 2 0E+00 | i |
| Chromium VI | 1.2E+00 | 7.4E-01 | p* | ID | ID | ID | ID | ID | ID | ID | ID | | 1.1E-02 | a* | ID | | 2 0E+00 | i |
| Copper | 1 8E+00 | 1 0E+00 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 1.2E-02 | a* | ID | | 1 0E+00 | i |
| Vanadium | 3.5E-01 | 2 2E-01 | p | 1.1E+00 | 1 3E+00 | 1.1E+00 | 1 3E+00 | 1 5E+00 | 2.3E+00 | 3.2E+00 | 1.3E+00 | a | 1.9E-02 | i | ID | | ID | |
| Zinc | 1.4E+02 | 8.0E+01 | a | ID | ID | ID | ID | ID | ID | ID | ID | | 1.1E-01 | a* | ID | | 3.0E+01 | i |
| Selenium | 3.0E-02 | 2 0E-02 | a | 7.3E-01 | 9.0E-01 | 8.2E-01 | 9.8E-01 | 1.1E+00 | 1.6E+00 | 2.2E+00 | 9.9E-01 | a | 5.0E-03 | a | ID | | 1.0E+02 | i |
| Toxaphene | 1.2E+00 | 6.9E-01 | p* | 3.0E-02 | 3.0E-02 | 3 0E-02 | 4.0E-02 | 4.0E-02 | 6 0E-02 | 8.0E-02 | 4 0E-02 | a | 1 3E-05 | a | 1.7E-01 | a | ID | |

## Table 5. Calculation of Soil Fauna Benchmark for Cadmium

| Species | data points | NOEC (mg/kg) | ln(NOEC) |
|---|---|---|---|
| *Panagrellus silusiae* | 1 | 10 | 2.30 |
| *Platynothrus peltifer* | 1 | 0.97 | -0.03 |
| *Orchesella cincta* | 1 | 18.7 | 2.93 |
| *Lumbricus rubellus* | 1 | 13 5 | 2.60 |
| *Eisenia foetida* | 1 | 13.8 | 2.62 |
| *Porcellio scaber* | 1 | 3.33 | 1.20 |
| *Helix aspersa* | 1 | 3.63 | 1.29 |
| | arithmetic mean | 11.4 | 2.09 |
| | geometric mean | 8.0 | |
| | standard deviation | 6.6 | 1.20 |
| | | | |
| | | | |
| **Equation to calculate soil benchmark** | | | |
| HC(5) = exp ( Xm - Kl * Sm ) | | | |
| | | | |
| p = percentage of species not to be protected | | | 5 |
| Sm = stdev of the ln(NOEC) | | | 1.20 |
| Xm = mean of the ln(NOEC) values | | | 2.09 |
| Kl = stdev correction factor ,m=7,q1=.05 at 95% CL | | | 3.59 |
| Kl = stdev correction factor ,m=7,q1=.05 at 50% CL | | | 1.78 |
| m = number of species categories | | | 7 |
| HC(p) = Hazardous Concentration to p% of species, 95% CL | | | 0.1070 |
| HC(p) = Hazardous Concentration to p% of species, 50% CL | | | 1 |

## Table 6. Data Set Used to Derive Soil Fauna Benchmark for Cadmium

| species | LOEC/NOEC | endpoint | soil concentration (mg/kg) | taxonomic grouping | reference |
|---|---|---|---|---|---|
| *Panagrellus Silusiae* | NOEC | growth | 10 | group 1 | Haight et al., 1982 |
| *Platynothrus peltifer* | NOEC | growth & reproduction | 0.97 | group 2 | van Straalen et al., 1989 |
| *Orchesella cincta* | NOEC | growth & reproduction | 18.7 | group 4 | van Straalen et al., 1989 |
| *Lumbricus rubellus* | NOEC | reproduction | 13.5 | group 5 | van de Meent et al., 1990 |
| *Eisenia foetida* | NOEC | growth & reproduction | 13.8 | group 6 | Malecki et al., 1982 |
| *Porcellio scaber* | NOEC | reproduction & sexual development | 3.33 | group 7 | van de Meent et al., 1990 |
| *Helix aspersa* | NOEC | reproduction | 3.63 | group 8 | Russel et al., 1981 |

## Table 5. Calculation of Soil Fauna Benchmark for Copper

| species/category | data points | NOEC (mg/kg) | ln(NOEC) |
|---|---|---|---|
| Nematodes | 1 | 143 | 4.96 |
| *Platynothrus peltifer* | 1 | 84 | 4.43 |
| *Onychiurus armatus* | 1 | 1304 | 7.17 |
| *Lumbricus rubellus* | 3 | 122 | 4.81 |
| *Eisenia andrei* | 2 | 70 | 4.25 |
| *Porcellio scaber* | 1 | 28.5 | 3.35 |
| *Arion ater* | 1 | 12.5 | 2.53 |
| | arithmetic mean | 345 | 5.12 |
| | geometric mean | 168 | |
| | standard deviation | 537 | 1.18 |
| | | | |
| | | | |
| **Equation to calculate soil benchmark** | | | |
| HC(5) = exp ( Xm - Kl * Sm ) | | | |
| | | | |
| p = percentage of species not to be protected | | | 5 |
| Sm = stdev of the ln(NOEC) | | | 1.18 |
| Xm = mean of the ln(NOEC) values | | | 5.12 |
| Kl = stdev correction factor ,m=7,q1=.05 at 95% CL | | | 3.59 |
| Kl = stdev correction factor ,m=7,q1=.05 at 50% CL | | | 1.78 |
| m = number of species categories | | | 7 |
| HC(p) = Hazardous Concentration to p% of species, 95% CL | | | 2.43 |
| HC(p) = Hazardous Concentration to p% of species, 50% CL | | | **21** |

## Table 6. Data Set Used to Derive Soil Fauna Benchmark for Copper

| species/category | LOEC/NOEC | endpoint | soil concentration (mg/kg) | geometric mean (mg/kg) | taxonomic grouping | reference |
|---|---|---|---|---|---|---|
| Nematodes | NOEC | abundance | 143 | | group 1 | Parmelee et al., 1993 |
| *Platynothrus peltifer* | NOEC | reproduction | 84 | | group 2 | Denneman and van Straalen, 1991 |
| *Onychiurus armatus* | NOEC<br>NOEC | growth &<br>reproduction | 1304 | | group 4 | Bengtsson et al., 1983 |
| *Lumbricus rubellus* | NOEC<br>NOEC<br>NOEC | reproduction<br>litter breakdown<br>growth | 40<br>83<br>493 | 122 | group 5 | van de Meent et al., 1990 |
| *Eisenia andrei* | NOEC | reproduction<br>growth | 72<br>68 | 70 | group 6 | van Gestel et al., 1989<br>van de Meent et al., 1990 |
| *Porcellio scaber* | NOEC | survival | 28.5 | | group 7 | Hopkin and Hames, 1994 |
| *Arion ater* | NOEC | litter breakdown | 12.5 | | group 8 | Marigomez et al., 1986 |

## Table 5. Calculation of Soil Fauna Benchmark for Lead

| Species | data points | NOEC (mg/kg) | ln(NOEC) |
|---|---|---|---|
| *Platynothrus peltifer* | 1 | 252 | 5.53 |
| *Onychiurus armatus* | 1 | 643 | 6.47 |
| *Lumbricus rubellus* | 2 | 523 | 6.26 |
| *Dendrobanea ribida* | 2 | 800 | 6.68 |
| *Porcellio scaber* | 1 | 23.4 | 3.15 |
| *Arion ater* | 1 | 586 | 6.37 |
| | arithmetic mean | 471 | 5.74 |
| | geometric mean | 312 | |
| | standard deviation | 284 | 1.33 |
| | | | |
| | | | |
| **Equation to calculate soil benchmark** | | | |
| HC(5) = exp ( Xm - KI * Sm) | | | |
| | | | |
| p = percentage of species not to be protected | | | 5 |
| Sm = stdev of the ln(NOEC) | | | 1.33 |
| Xm = mean of the ln(NOEC) values | | | 5.74 |
| KI = stdev correction factor ,m=6,q1=.05 at 95% CL | | | 3.93 |
| KI = stdev correction factor ,m=6,q1=.05 at 50% CL | | | 1.81 |
| m = number of species categories | | | 6 |
| HC(p) = Hazardous Concentration to p% of species, 95% CL | | | 1.69 |
| HC(p) = Hazardous Concentration to p% of species, 50% CL | | | **28** |

**Table 6. Data Set Used to Derive Soil Fauna Benchmark for Lead**

| species | LOEC/NOEC | endpoint | soil concentration (mg/kg) | geometric mean (mg/kg) | taxonomic grouping | reference |
|---|---|---|---|---|---|---|
| *Platynothrus peltifer* | NOEC | reproduction | 252 | | group 2 | Denneman and van Straalen, 1991 |
| *Onychiurus armatus* | NOEC | growth & reproduction | 643 | | group 4 | Bengtsson et al., 1985 |
| *Lumbricus rubellus* | NOEC<br>NOEC | reproduction<br>growth | 241<br>1133 | 523 | group 5 | van de Meent et al., 1990<br>van de Meent et al., 1990 |
| *Dendrobanea ribida* | NOEC<br>NOEC | reproduction<br>reproduction | 797<br>803 | 800 | group 6 | Bengtsson et al., 1986<br>Bengtsson et al., 1986 |
| *Porcellio scaber* | NOEC | reproduction | 23.4 | | group 7 | van de Meent et al., 1990 |
| *Arion ater* | NOEC | litter breakdown | 586 | | group 8 | Marigomez et al., 1986 |

## Table 5. Calculation of Soil Fauna Benchmark for Zinc

| Species | data points | NOEC/LOEC (mg/kg) | ln (NOEC/LOEC) |
|---|---|---|---|
| Mites (group 2 soil mite) | 1 | 14600 | 9.59 |
| Collembola (group 3 insect) | 2 | 4088 | 8.32 |
| Enchytreids (group 5 annelid) | 3 | 894 | 6.80 |
| Earthworms (group 6 annelid) | 5 | 145 | 4.97 |
| *Porcellio scaber (group 7 arthropod)* | 4 | 607 | 6.41 |
| *Arion ater (group 8 mollusc)* | 1 | 73 | 4.29 |
| | arithmetic mean | 3401 | 6.73 |
| | geometric mean | 836 | |
| | standard deviation | 5686 | 1.99 |
| | | | |
| | | | |
| **Equation to calculate soil benchmark** | | | |
| HC(5) = exp ( Xm - Kl * Sm ) | | | |
| | | | |
| p = percentage of species not to be protected | | | 5 |
| Sm = stdev of the ln(NOEC) | | | 1.99 |
| Xm = mean of the ln(NQEC) values | | | 6.73 |
| Kl = stdev correction factor ,m=6,q1=.05 at 95% CL | | | 3.93 |
| Kl = stdev correction factor ,m=6,q1=.05 at 50% CL | | | 1.81 |
| m = number of species categories | | | 6 |
| HC(p) = Hazardous Concentration to p% of species, 95% CL | | | 0.33 |
| HC(p) = Hazardous Concentration to p% of species, 50% CL | | | **23** |

## Table 6. Data Set Used to Derive Soil Fauna Benchmark for Zinc

| species/category | LOEC/NOEC | endpoint | soil concentration (mg/kg) | geometric mean (mg/kg) | taxonomic grouping | reference |
|---|---|---|---|---|---|---|
| Mites | LOEC | diversity indices | 14600 | 14600 | group 2 | Tyler et al., 1989 |
| Collembola | LOEC | density | 649 | 4088 | group 3 | Tyler et al., 1989 |
| Collembola | LOEC | vert. distribution | 25750 | | | Tyler et al., 1989 |
| Enchytreids | LOEC | density | 171 | 894 | group 5 | Tyler et al., 1989 |
| Enchytreids | LOEC | vert. distribution | 2023 | | | Tyler et al., 1989 |
| Enchytreids | LOEC | species number | 2068 | | | Tyler et al., 1989 |
| Earthworms | LOEC | density | 171 | 145 | group 6 | Tyler et al., 1989 |
| Earthworms | LOEC | density | 2023 | | | Tyler et al., 1989 |
| *Eisenia fetida* | NOEC | coccoon prod. | 0.22 | | | Spurgeon et al., 1994 |
| *Eisenia foetida* | NOEC | growth | 741 | | | Neuhauser et al., 1985 |
| *Eisenia foetida* | NOEC | growth | 1120 | | | Malecki et al., 1982 |
| *Porcellio scaber* | NOEC | growth | 444 | 607 | group 7 | Hopkin & Hames, 1994 |
| *Porcellio scaber* | NOEC | growth | 289 | | | van de Meent et al., 1990 |
| *Porcellio scaber* | NOEC | litter breakdown | 727 | | | van de Meent et al., 1990 |
| *Porcellio scaber* | NOEC | reproduction | 1455 | | | van de Meent et al., 1990 |
| *Arion ater* | NOEC | litter breakdown | 73 | | group 8 | Marigomez et al., 1986 |

### 2.9.2 Revisions to Aquatic Benchmarks

This section presents updated secondary chronic values (SCVs) and sediment community benchmarks to the August 1995 document. A number of aquatic benchmarks were based on SCVs as described in Section 4.3.5 of the August 1995 document. In the appendix to the August 1995 document, the units on some SCV's were entered incorrectly in the ecological toxicity profiles, although the correct values and units were used in the models. For the chemicals listed below in Table 2.9-1, the SCV's have been updated to correspond to the model inputs.

**Table 2.9-1. Updated Secondary Chronic Values (SCVs)**

| chemical | August 1995 document SCV | Updated SCV |
|---|---|---|
| benz(a)anthracene | 2.5E-02 | 2.5E-05 |
| butyl benzyl phthalate | 1.6E+01 | 1.6E-02 |
| bis(2-ethylhexyl)phthalate | 5.5E+0 | 5.5E-03 |
| dimethyl phthalate | 1.4E+2 | 1.4E-01 |
| heptachlor | 6.9E-03 | 6.9E-06 |
| heptachlor epoxide | 5.1E-01 | 5.1E-04 |
| kepone | 3.2E-04 | 3.6E-04 |
| pentachlorobenzene | 1.6E+0 | 1.6E-03 |
| polychlorinated biphenyls | 1.9E-04 | 6.1E-05 |

In addition to these revisons, the following typographical errors have been corrected from the August 1995 document:

- Hexachlorobenzene profile, Table 2, fish and aquatic invertebrates should be reported as 6.0E-03, not 3.68E-03.
- Hexachlorocyclopentadiene profile, Fish and aquatic invertebrates text, the SCV reported in the text should be 7.5E-04, not 6.9E-03.
- Mercury profile, Fish and aquatic invertebrates text and Table 2, the SCV of 1.3E-03 should be reported as a FCV of 1.3E-03.

As a result of updated SCVs, as well as revised $K_{oc}$ values, many of the sediment benchmarks have also changed. As discussed in Section 4.3.6 of the August 1995 document, the equilibrium partitioning (EqP) method was used to calculate the sediment benchmarks which are equivalent to sediment quality criteria (SQC). For this analysis, the sediment $f_{oc}$ was assumed to be 0.05, the mean value of the range suggested in the Addendum: Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions (U.S. EPA, 1993a).

In the August 1995 document, the specific data used to calculate SCVs were inadvertently omitted from the ecological toxicity profiles. The Tier II values were generally taken from three sources in order of priority:

- Great Lakes Water Quality Initiative
- Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1994 Revision (Suter and Mabrey, 1994)
- derived from AQUatic Toxicity Information REtrieval System (AQUIRE), 1994.

For a few chemicals, data available in AQUIRE were more recent than data presented in Suter and Mabrey (1994). For these chemicals, an AQUIRE-derived SCV was preferred over the SCV listed by Suter and Mabrey (1994). The sources of data for the SCVs calculated in Suter and Mabrey (1994) and derived from AQUIRE are listed, by chemical, in the following tables. As explained above, these tables may be inserted as Table 3 in the ecological toxity profiles in Appendix B. The reader may refer to Section 4.3.6 in the August 1995 document for a full explanation of the calculation procedures for SCVs.

## Table 2.9-2. Updated Sediment Benchmarks

| CHEMICAL | Koc | SEDIMENT (mg/kg sediment) | | Basis | Reference |
|---|---|---|---|---|---|
| | | old value | new value | | |
| acenapthene | 7139 | 9 | 8.2 | FCV | U.S.EPA, 1993i |
| aldrin | 2453466 | 2.19 | 2.21 | SCV | GLI, 1992c |
| benz(a)anthracene | 401218 | 0.49 | 0.5 | SCV | AQUIRE, 1995 |
| benzo(a)pyrene | 1014869 | 0.67 | 0.65 | SCV | AQUIRE, 1995 |
| Bis(2-ethylhexyl)phthalate | 15003065 | 5,800 | 4,126 | SCV | AQUIRE, 1995 |
| butyl benzyl phthalate | 57280 | 17.4 | 45.8 | SCV | AQUIRE, 1995 |
| chlordane | 1632450 | 0.517 | 13.9 | FCV | U.S.EPA, 1980 |
| DDT | 2625851 | 4.1 | 1.7 | SCV | GLI, 1992c |
| dieldrin | 190103 | 0.072 | 0.59 | FCV | U.S.EPA, 1993c |
| diethyl phthalate | 287 | 2.2 | 3.2 | SCV | AQUIRE, 1995 |
| dimethyl phthalate | 35 | 0.29 | 0.245 | SCV | AQUIRE, 1995 |
| endosulfan | 10730 | 0.0074 | 0.03 | FCV | U.S.EPA, 1980 |
| endrin | 94245 | 0.39 | 0.29 | FCV | U.S.EPA, 1993m |
| heptachlor | 1425148 | 0.029 | 0.49 | SCV | GLI, 1992c |
| heptachlor epoxide | 82277 | 1.2 | 2.1 | SCV | AQUIRE, 1995 |
| hexachlorobenzene | 616808 | 76.5 | 185 | FCV * | U.S.EPA, 1980 |
| hexachlorcyclopentadiene | 198907 | 2.5 | 7.45 | SCV | AQUIRE, 1995 |
| kepone | 162248 | 0.483 | 2.9 | SCV | AQUIRE, 1995 |
| lindane | 4644 | 0.017 | 0.019 | FCV | U.S.EPA, 1986 |
| methoxychlor | 98610 | 0.043 | 0.15 | FCV | U.S.EPA, 1980 |
| methyl parathion | 710 | 1.04E-03 | 0.0011 | SCV | AQUIRE, 1995 |
| parathion | 5823 | 3.62E-03 | 0.0038 | FCV | 51 FR 43667 |
| pentachlorobenzene | 148204 | 8.06 | 11.8 | SCV | AQUIRE, 1995 |
| polychlorinated biphenyls | 1542642 | 14.5 | 4.7 | SCV | AQUIRE, 1995 |
| toxaphene | 255141 | 0.0535 | 0.17 | FCV | U.S.EPA, 1980 |
| 245-Trichlorophenoxyacetic acid | 1795 | 0.62 | 0.9 | SCV | AQUIRE, 1995 |

* = The AWQC document states: "the available data indicate that HCB does not cause significant adverse effects on freshwater aquatic life at or below 6 ug/l"

# Table 3. SCV Calculation for Arsenic (Suter Mabrey, 1994)

| Chemical/Data Type | Value (ug/l) | Species | Source |
|---|---|---|---|
| **Arsenic V** | | | |
| **acute values** | < 8100 | Daphnia magna | EPA, 1985b |
| | 7400 | Daphnia magna | Biesinger and Christensen, 1972 |
| | 3600 | Daphnia pulex | EPA, 1985b |
| | 49,600 | Daphnia pulex | *ibid.* |
| | 850 | Bosmina longirostris | *ibid* |
| | 10,800 | Rainbow trout | *ibid.* |
| | 25,600 | Fathead minnow | DeFoe, 1982 |
| | 49,000 | Mosquitofish | EPA, 1985b |
| | | | |
| **SAV** | 170.00 | | |
| **A-C ratios:** | 28.7 | Fathead minnow | Defoe, 1982 |
| **SACR** | 20 9 | | |
| | | | |
| **SCV=SAV/SACR** | 8.133971292 | | |

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| barium 7440-39-3 | | | | | |
| acute values | 410000 | Daphnia magna (d) | Cladocera (Suborder) | 410000 | AQUIRE |
| SAV | 18721 46 | GMAV=410000 n=1, SVAF=21 9 | | | |
| SACR | 18 | | | | |
| SCV=SAV/SACR | 1040 081177 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes
(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish.etc )
(c) a third family in the phylum Chordata (e g , fish, amphibian, etc )
(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)
(e) a benthic crustacean (e g . ostracod, isopod, amphipod, crayfish, etc.)
(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)
(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc )
(h) a family in any order of insect or any phylum not already represented

# Table 3. SCV Calculation for Benzo(a)anthracene

| Chemical/Data Type | | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|---|
| benzo(a)anthracene 56-55-3 | | | | | | |
| | acute values | 10 | Daphnia pulex (d) | Cladocera (Suborder) | 10 | AQUIRE |
| | SAV | 0.46 | GMAV=10, n=1, SVAF=21.9 | | | |
| | SACR | 18 | | | | |
| | SCV=SAV/SACR: | 0.025367834 | | | | |

| Dataset Requirements |
|---|
| (a) the family Salmonidae in the class Osteichthyes |
| (b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.) |
| (c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.) |
| (d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.) |
| (e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.) |
| (f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.) |
| (g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.) |
| (h) a family in any order of insect or any phylum not already represented |

# Table 3. SCV Calculation for Benzo(a)pyrene

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| benzo(a)pyrene 50-32-8 | | | | | |
| acute values | 5 | Daphnia pulex (d) | Cladocera (Suborder) | 5 | AQ |
| SAV | 0.23 | GMAV=5, n=1, SVAF=21.9 | | | |
| SACR | 18 | | | | |
| SCV=SAV/SACR | 0.012683917 | | | | |

| Dataset Requirements |
|---|
| (a) the family Salmonidae in the class Osteichthyes |
| (b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.) |
| (c) a third family in the phylum Chordata (e g., fish, amphibian, etc.) |
| (d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.) |
| (e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.) |
| (f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.) |
| (g) a family in a phylum other than Arthropoda or Chordata (e g., Rotifera, Annelida, Mollusca, etc.) |
| (h) a family in any order of insect or any phylum not already represented |

# Table 3. SCV Calculation for Beryllium (Suter Mabrey, 1994)

| Chemical/Data Type | Value (ug/l) | Species | Source |
|---|---|---|---|
| Beryllium | | | |
| acute values | 7900 | Daphnia magna | EPA, 1980f |
| | 2500 | Daphnia magna | Kimball, n.d. |
| | 4800 | Goldfish | *ibid.* |
| | 3250 | Fathead minnow | *ibid* |
| | 200 | Fathead minnow | *ibid.* |
| | 150 | Fathead minnow | *ibid.* |
| | 150 | Fathead minnow | *ibid.* |
| | 11,000 | Fathead minnow | *ibid.* |
| | 20,000 | Fathead minnow | *ibid.* |
| | 15,000 | Fathead minnow | *ibid.* |
| | 18,000 | Fathead minnow | Kimball, n.d. |
| | 4,400 | Flagfish | EPA, 1980f |
| | 3,530 | Flagfish | *ibid.* |
| | 3530 | Flagfish | *ibid.* |
| | 32,000 | Guppy | *ibid.* |
| | 28,000 | Guppy | *ibid.* |
| | 32,000 | Guppy | *ibid.* |
| | 24,000 | Guppy | *ibid.* |
| | 160 | Guppy | *ibid.* |
| | 19,000 | Guppy | *ibid.* |
| | 450 | Guppy | *ibid.* |
| | 130 | Guppy | *ibid.* |
| | 200 | Guppy | *ibid.* |
| | 20,000 | Guppy | *ibid.* |
| | 13,700 | Guppy | *ibid.* |
| | 6100 | Guppy | *ibid.* |
| | 160 | Guppy | *ibid.* |
| | 12,000 | Bluegill | *ibid.* |
| | 1,300 | Bluegill | *ibid.* |
| | | | |
| SAV | 271.00 | | |
| A-C ratios: | 472 | Daphnia magna | Kimball, n.d. |
| SACR | 53 3 | | |
| | | | |
| SCV=SAV/SACR | 5.084427767 | | |

# Table 3. SCV Calculation for Bis(2-ethylhexyl)phthalate

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| **Bis(2-ethylhexyl)phthalate** | | | | | |
| **117-81-7** | | | | | |
| **acute values** | 11,000 | Daphnia magna (d) | Cladocera (suborder) | 11,000 | AQUIRE |
| | 690 | Channel catfish (b) | Ictalundae | 690 | AQUIRE |
| | 42,100 | Largemouth bass (c) | Centrarchidae | 37,217 | AQUIRE |
| | 32,900 | Largemouth bass | | | AQUIRE |
| | 139,500 | Rainbow trout (a) | Salmonidae | 144,268 | AQUIRE |
| | 149,200 | Rainbow trout | | | AQUIRE |
| **SAV** | 98.57 | GMAV=690, n=4, SVAF=7 | | | |
| **SACR** | 18 | | | | |
| **SCV = SAV/SACR** | 5.476190476 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

# Table 3. SCV Calculation for Butylbenzyl phthalate

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| Butylbenzyl phthalate 85-68-7 | | | | | |
| acute values | 92000 | Daphnia magna (d) | Cladocera (suborder) | 12869 | AQUIRE |
| | 1800 | Daphnia magna | Cladocera (suborder) | | AQUIRE |
| | 43,000 | bluegill (b) | Centrarchidae | 43,000 | AQUIRE |
| | 2,320 | fathead minnow (c) | Cyprinidae | **2,320** | AQUIRE |
| **SAV** | 290.00 | GMAV=2320, n=3, SVAF=8 | | | |
| **SACR** | 18 | | | | |
| **SCV = SAV/SACR** | 16.11111111 | | | | |
| | **Dataset Requirements** | | | | |
| | (a) the family Salmonidae in the class Osteichthyes | | | | |
| | (b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.) | | | | |
| | (c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.) | | | | |
| | (d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.) | | | | |
| | (e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.) | | | | |
| | (f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.) | | | | |
| | (g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.) | | | | |
| | (h) a family in any order of insect or any phylum not already represented | | | | |

# Table 3. SCV Calculation for Diethyl phthalate

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| diethyl phthalate 84-66-2 | | | | | |
| acute values | 52,000 | Daphnia magna (d) | Cladocera (Suborder) | 52,000 | AQU |
| | 31,800 | Fathead minnow (c) | Cyprinidae | **31,800** | AQUIRE |
| | 98,200 | Bluegill (b) | Centrarchidae | 98,200 | AQUIRE |
| | | | | | |
| **SAV** | 3975 00 | GMAV=31,800, n=3, SVAF=8 | | | |
| | | | | | |
| **SACR** | 18 | | | | |
| | | | | | |
| **SCV=SAV/SACR** | 220 8333333 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc )

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

# Table 3. SCV Calculation for Dimethyl phthalate

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| **Dimethyl phthalate** | | | | | |
| **131-11-3** | | | | | |
| **acute values** | 33,000 | Daphnia magna (d) | Cladocera (Suborder) | **33,000** | AQUIRE |
| | 121,000 | Fathead minnow (c) | Cyprinidae | 121,000 | AQUIRE |
| **SAV** | 2538.46 | GMAV=33,000, n=2, SVAF=13 | | | |
| **SACR** | 18 | | | | |
| **SCV=SAV/SACR** | 141.025641 | | | | |
| | **Dataset Requirements** | | | | |
| | (a) the family Salmonidae in the class Osteichthyes | | | | |
| | (b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.) | | | | |
| | (c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.) | | | | |
| | (d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.) | | | | |
| | (e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.) | | | | |
| | (f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.) | | | | |
| | (g) a family in a phylum other than Arthropoda or Chordata (e.g , Rotifera, Annelida, Mollusca, etc.) | | | | |
| | (h) a family in any order of insect or any phylum not already represented | | | | |

# Table 3. SCV Calculation for Heptachlor Epoxide

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| heptachlor epoxide 1024-57-3 | | | | | |
| acute values | 240* | Daphnia magna (d) | Cladocera (suborder) | 240 | AQUIRE |
| | 120 * | Guppy (c) | Poeciliidae | 120 | AQUIRE |
| SAV | 9 23 | GMAV=120, n=2, SAVF=13 | | | |
| SACR | 18 | | | | |
| SCV=SAV/SACR | 0.512820513 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

* = chemical conc. was initially reported as some form of the chemical, thus the conc. was re-calculated

# Table 3. SCV Calculation for Hexachlorocyclopentadiene

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| Hexachlorocyclopentadiene | | | | | |
| 77-47-4 | | | | | |
| acute values | 39** | Daphnia magna (d) | Cladocera (suborder) | 45 | EG&G Bionomics, 1977 as cited in U S EPA, 1980 |
| | 52** | Daphnia magna | | | Union Carbide Env. Services, 1977 as cited in U.S. EPA, 1980 |
| | 7 | Fathead minnow (c) | Cyprinidae | 57 | Spehar et al., 1979 |
| | 180 | Fathead minnow | | | EG&G Bionomics, 1977 as cited in U.S.EPA, 1980 |
| | 104 | Fathead minnow | | | Henderson, 1956 as cited in U.S.EPA, 1994 |
| | 78 | Fathead minnow | | | Henderson, 1956 as cited in U S.EPA, 1994 |
| | 59 | Fathead minnow | | | Henderson, 1956 as cited in U.S.EPA, 1994 |
| | 97 | Channel catfish | Ictaluridae | 97 | EG&G Bionomics, 1977 as cited in U.S.EPA, 1980 |
| | 130 | Bluegill (b) | Centrarchidae | 130 | EG&G Bionomics, 1977 as cited in U.S.EPA, 1980 |
| SAV | 5.63 | GMAV=45, n=3, SVAF=8 | | | |
| SACR | 7.49599786 | SACR=geomean (18+18+1.3) | ACR=1.3 (Spehar et al., 1979) | | |
| SCV = SAV/SACR | 0.75040043 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

** = 50% effect levels as sited in AWQC document. Exposure duration was not specified

# Table 3. SCV Calculation for Kepone

| Chemical/Data Type | Value (ug/l) | Species (min. req.) | Family | GMAV | Source |
|---|---|---|---|---|---|
| kepone 143-50-0 | | | | | |
| acute values | 260 | Daphnia magna | Cladocera (suborder) | 260 | AQUIRE |
| | 230 | Chironomus tentans (midge) (f) | Diptera (order) | 211 | AQUIRE |
| | 230 | Chironomus tentans (midge) | | | |
| | 220 | Chironomus tentans (midge) | | | |
| | 170 | Chironomus tentans (midge) | | | |
| | 40 | Calanoid copepod (d) | Calanoida (order) | 40 | AQUIRE |
| | 180 | Scud | Amphipoda | 180 | AQUIRE |
| | 512 | Channel Catfish (c) | Ictaluridae | 465 | AQUIRE |
| | 422 | Channel Catfish | | | AQUIRE |
| | 30 | Bluegill (b) | Centrarchidae | 57 | AQUIRE |
| | 50 | Bluegill | | | AQUIRE |
| | 66 | Bluegill | | | AQUIRE |
| | 62 | Bluegill | | | AQUIRE |
| | 50 | Bluegill | | | AQUIRE |
| | 140 | Redear Sunfish | | | AQUIRE |
| | 96 | Redear Sunfish | | | AQUIRE |
| | 64 | Redear Sunfish | | | AQUIRE |
| | 44 | Redear Sunfish | | | AQUIRE |
| | 29 | Redear Sunfish | | | AQUIRE |
| | 420 | Fathead Minnow | Cyprinidae | 378 | AQUIRE |
| | 340 | Fathead Minnow | | | AQUIRE |
| | 120.9 | Daggerblade grass shrimp (g) | Caridea (section) | 120 | AQUIRE |
| | 120 | Daggerblade grass shrimp | | | AQUIRE |
| | | | | | |
| SAV | 6.56 | GMAV = 40, n=5, SAVF = 6.1 | | | |
| | | | | | |
| SACR | 18 | | | | |
| | | | | | |
| SCV=SAV/SACR | 0.364298725 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

## Table 3. FCV Calculation for Mercury (Suter Mabrey, 1994)

| Chemical/Data Type | Value (ug/l) | Species | Source |
|---|---|---|---|
| Mercury, inorganic | | | |
| Final acute value | 4.86 | | EPA, 1985g |
| Final ACR | 3 73 | | *ibid.* |
| Final CV | 1.3 | | *ibid.* |

# Table 3. SCV Calculation for Methyl Parathion

| Chemical/Data Type | Value (ug/l) | Species | Family | SMAV | GMAV | Source |
|---|---|---|---|---|---|---|
| methyl parathion | | | | | | |
| 298-00-0 | | | | | | |
| acute values | 3.5 | Cenodaphnia dubia (water flea) | Cladocera (suborder) | 3.5 | 3 5 | AC |
| | 9.1 | Daphnia magna (d) | Cladocera (suborder) | 8.34 | 8.34 | AQUIRE |
| | 8.5 | Daphnia magna | | | | AQUIRE |
| | 8 | Daphnia magna | | | | AQUIRE |
| | 7.8 | Daphnia magna | | | | AQUIRE |
| | 5 | Mosquito fish | Poecilidae | 5 | 5 | AQUIRE |
| | 3600 | Pumpkinseed | Centrarchidae | 3600 | 2656 04 | AQUIRE |
| | 1600 | Bluegill (b) | Centrarchidae | 1959.59 | | AQUIRE |
| | 2400* | Bluegill | | | | |
| | 14000 | White perch | Percichthyidae | 14000 | 7457 | AQUIRE |
| | 790 | Striped bass (c) | Percichthyidae | 3972 | | AQUIRE |
| | 5000 | Striped bass | | | | AQUIRE |
| | 4500 | Striped bass | | | | AQUIRE |
| | 14000 | Striped bass | | | | AQUIRE |
| | 14800 | Carp | Cyprinidae | 14800 | 14800 | AQUIRE |
| | 5900 | Catfish | Ictaluridae | 5900 | 5900 | AQUIRE |
| | 2800 | Rainbow trout (a) | Salmonidae | 2800 | 2800 | AQUIRE |
| | 7850 | Fathead minnow | Cypinidae | 7073 | 7073 | AQUIRE |
| | 4460 | Fathead minnow | | | | AQUIRE |
| | 8170 | Fathead minnow | | | | AQUIRE |
| | 5360 | Fathead minnow | | | | AQUIRE |
| | 6910 | Fathead minnow | | | | AQUIRE |
| | 9500* | Fathead minnow | | | | |
| | 8300* | Fathead minnow | | | | |
| | 7500* | Fathead minnow | | | | |
| | 6200 | Guppy | Poecilidae | 7795 | 7795 | AQUIRE |
| | 9800* | Guppy | Poecilidae | | | AQ |
| | 3 | White river crayfish (e) | Macrura (Section) | 3 | 3 | AQ |
| | 4200 ** | Dugesia dororocephala - flatworm (g) | Turbellaria (class) | 2372 | 2372 | AQUIRE |
| | 2000 ** | Dugesia dororocephala - flatworm | | | | AQUIRE |
| | 2900 ** | Dugesia dororocephala - flatworm | | | | AQUIRE |
| | 1300 ** | Dugesia dororocephala - flatworm | | | | AQUIRE |
| | | | | | | |
| SAV | 0.58 | GMAV=3, n=6, SAVF=5.2 | | | | |
| SACR | 18 | | | | | |
| SCV = SAV/SACR | 0.032051282 | | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

* = chemical conc. was initially reported as some form of the chemical, thus the conc. was re-calculated

** = 7-day LC50 study

# Table 3. SCV Calculation for Molybdenum (Suter Mabrey, 1994)

| Chemical/Data Type | Value (ug/l) | Species | Source |
|---|---|---|---|
| Molybdenum | | | |
| acute values | 206,800 | Daphnia magna | Kimball, n d. |
| SAV | 10087.00 | | |
| A-C ratios: | 235 | Daphnia magna | Kimball, n.d. |
| SACR | 42.2 | | |
| SCV=SAV/SACR | 239.028436 | | |

# Table 3. SCV Calculation for PCB Aroclor-1254

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| Aroclor-1254 11097-69-1 | | | | | |
| acute values | 19 * | Daphnia magna (d) | Cladocera (Suborder) | 11.80 * | AQ |
| | 1.1 * | Daphnia magna | Cladocera (Suborder) | | AQUIRE |
| | 19 * | Daphnia magna | Cladocera (Suborder) | | AQUIRE |
| | 23 * | Daphnia magna | Cladocera (Suborder) | | AQUIRE |
| | 25 * | Daphnia magna | Cladocera (Suborder) | | AQUIRE |
| | 9 | Corophium insidiosum - scud | Amphipoda | 9 | AQUIRE |
| | 2400 | Gammarus fasciatus - scud | Amphipoda | 2400 | AQUIRE |
| | 2400 | Gammarus pseudolimnaeus-scud | Amphipoda | | AQUIRE |
| | 12000 | channel catfish | Ictaluridae | 145 | AQUIRE |
| | 1.76 | channel catfish | Ictaluridae | | AQUIRE |
| | 200 | damselfly (f) | Odonata | 200 | AQUIRE |
| | 200 | damselfly | Odonata | | AQUIRE |
| | 2740 | bluegill (b) | Centrarchidae | 38 | AQUIRE |
| | 0.53 | redear sunfish | Centrarchidae | | AQUIRE |
| | 42500 | cutthroat trout | Salmonidae | 116 | AQUIRE |
| | 42000 | cutthroat trout | Salmonidae | | AQUIRE |
| | 0.32 | rainbow trout (a) | Salmonidae | | AQUIRE |
| | 7.7 | fathead minnow (c) | Cyprinidae | 7.7 | AQUIRE |
| | 100 | crayfish | Macrura (section) | 93 | AQUIRE |
| | 100 | crayfish | Macrura (section) | | AQUIRE |
| | 80 | crayfish | Macrura (section) | | AQUIRE |
| | 3 ** | grass shrimp | Coridea (section) | 3 ** | AQUIRE |
| | 3 ** | grass shrimp | | | AQUIRE |
| | | | | | |
| SAV | 0.58 | GMAV=3, n=6, SVAF=5.2 | | | |
| | | | | | |
| SACR | 9.510496247 | =geomean(18,18,2.655) | Suter & Mabrey, 1994 | | |
| | | | | | |
| SCV=SAV/SACR | 0.060661722 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

* = daphnid studies were 14-day reproductive EC50s

** = 7-day LC50 value

# Table 3. SCV Calculation for Pentachlorobenzene

| Chemical/Data Type | Value (ug/l) | Species | Family | GMAV | Source |
|---|---|---|---|---|---|
| pentachlorobenzene | | | | | |
| 608-93-5 | | | | | |
| acute values: | 300 4 | Daphnia magna (d) | Cladocera (Suborder) | 446 | AQUIRE |
| | 300.4 | Daphnia magna | | | AQUIRE |
| | 350.4 | Daphnia magna | | | AQUIRE |
| | 1252 | Daphnia magna | | | AQUIRE |
| | 230 | Chironomus riparius (midge) (f) | Diptera (order) | 230 | AQUIRE |
| | 280 * | Rainbow trout (a) | Salmonidae | 280 | AQUIRE |
| SAV | 28.75 | GMAV=230, n=3, SVAF=8 | | | |
| SACR | 18 | | | | |
| SCV=SAV/SACR | 1.597222222 | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes

(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)

(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)

(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)

(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)

(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc )

(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)

(h) a family in any order of insect or any phylum not already represented

* = 8-day LC50 study

# Table 3. SCV Calculation for Silver (Suter Mabrey, 1994)

| Chemical/Data Type | Value (ug/l) | Species | Source |
|---|---|---|---|
| Silver | | | |
| **Final Acute Value** | 4.1 | | EPA, 1980y |
| | | | |
| **A-C ratios:** | 2 | Daphnia magna | Kimball, n.d. |
| | 54 | Rainbow trout | *ibid.* |
| | 14 | Mysid shrimp | *ibid.* |
| **SACR** | 11.5 | | |
| | | | |
| **SCV=SAV/SACR** | 0.356521739 | | |

# Table 3. SCV Calculation for (2,4,5-Trichlorophenoxy) acetic acid

| Chemical/Data Type | Value (ug/l) | Species | Family | SMAV | GMAV | Source |
|---|---|---|---|---|---|---|
| trichlorophenoxyacetic acid 93-76-5 | | | | | | |
| acute values | 19800 | Ceriodaphnia dubia (d) | Cladocera (suborder) | 18931 | 18931 | AQUIRE |
| | 18100 | Ceriodaphnia dubia | Cladocera (suborder) | | | AQUIRE |
| | 41100 | carp | Cyprinidae | 41100 | 41100 | AQUIRE |
| | 17400 | banded killifish | Cyprinodontidae | 17400 | 17400 | AQUIRE |
| | 109300 | rotifer (g) | Monogonta (class) | 109300 | 109300 | AQUIRE |
| | 20000 | pumpkinseed (c) | Centrarchidae | 20000 | 20000 | AQUIRE |
| | 150* | rainbow trout (a) | Salmonidae | **1142** | **1142** | AQUIRE |
| | 8700* | rainbow trout | Salmonidae | | | AQUIRE |
| | 16400 | white perch | Percichthyidae | 16400 | 15474 | AQUIRE |
| | 14600 | striped bass (b) | Percichthyidae | 14600 | | AQUIRE |
| | 28100 | guppy | Poecilidae | 28100 | 28100 | AQUIRE |
| **SAV** | 187.21 | GMAV=1142, n=5,SVAF=6 1 | | | | |
| **SACR** | 18 | | | | | |
| **SCV=SAV/SACR** | 10.4007286 | | | | | |

**Dataset Requirements**

(a) the family Salmonidae in the class Osteichthyes
(b) one other family (preferably a commercially, or recreationally important, warmwater species) in the class Osteichthyes (e.g., bluegill, channel catfish,etc.)
(c) a third family in the phylum Chordata (e.g., fish, amphibian, etc.)
(d) a planktonic crustacean (e.g. a cladoceran, copepod, etc.)
(e) a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)
(f) an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)
(g) a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)
(h) a family in any order of insect or any phylum not already represented

= chemical conc. was initially reported as some form of the chemical, thus the conc. was re-calculated

# Table 3. SCV Calculation for Vanadium (Suter Mabrey, 1994)

| Chemical/Data Type | Value (ug/l) | Species | Source |
|---|---|---|---|
| Vanadium | | | |
| acute values | 1520 | Daphnia magna | Kimball, n.d. |
| | 1850 | Fathead minnow | *ibid.* |
| | 7000 | Brook trout | Ernst and Garside, 1987 |
| | 11,200 | Flagfish | Holdway and Sprague, 1979 |
| | 4060 | Daphnia magna | Beusen and Neven, 1987 |
| | | | |
| SAV | 284 00 | | |
| A-C ratios: | 10.88 | Fathead minnow | Kimball, n.d. |
| | 140 | Flagfish | Holdway and Spague, 1979 |
| | 2.137 | Daphnia magna | Beusen and Neven, 1987 |
| Final ACR. | 14.8 | | |
| | | | |
| SCV=SAV/SACR | 19.18918919 | | |

## 2.10 Stream Order/Waterbody Characterization

*Original approach:* The waterbody used in the modeling was characterized using average values for a selected stream order. For the original approach, the central tendency stream order was stream order 5 and the high end stream order was stream order 3, a smaller stream providing less dilution, and therefore higher chemical concentrations. However, there was some question as to whether a stream order 3 stream was large enough to support a subsistence fisher, as was implied by one of the scenarios modeled. (The characteristics of streams of various order are shown in Tables 6-19 and 7-44 in the August 1995 document, and are not repeated here).

*Revised approach:* Because there is some controversy around the size of the high end stream with respect to the scenarios modeled, the Agency decided to perform a second set of runs using a larger, stream order 4 stream as the high end stream. Results for both stream order 3 and stream order 4 as the high end stream are provided in the new results included with the present document. The additional parameter values are shown below in a revised Table 6-20 (this revised table should also be substituted for Table 7-45). This change affects inputs for most equations associated with the sections and pathways noted in Table S-5.

**Table S-5. Equations Affected by Change in Surface Waterbody Characterization**

| Pathway | Section | Equations |
|---|---|---|
| 17, 37, Aq I | 6.5.2.1 | all |
| 19, 42, Aq III | 6.5.2.2 | all |
| 20, 38, Aq II | 6.5.2.3 | all |
| 21 | 6.6.3.2.1 | all |
| 23 | 6.6.3.2.2 | all |
| 24 | 6.6.3.2.3 | all |
| 33 | 6.6.2.2.5 | all |
| 35 | 6.6.2.2.6 | all |
| 36 | 6.6.2.2.7 | all |

## Table 6-20. Characterization of Central Tendency and High End Waterbodies

| Parameter | Central tendency | Alternate High End | High end |
|---|---|---|---|
| Stream order | 5 | 4 | 3 |
| Watershed area | 1.3e+9 $m^2$ | 2.8e+8 $m^2$ | 6e+7 $m^2$ |
| Flow | 3e+8 $m^3$/yr (3e+11 L/yr) | 6.3e+7 $m^3$/yr (6.3e+10 L/yr) | 1.3e+7 $m^3$/yr (1.3e+10 L/yr) |
| Velocity | 0.7 m/s | 0.55 m/s | 0.5 m/s |
| Depth | 0.67 m | 0.34 m | 0.18 m |
| Width | 23 m | 11 m | 5.5 m |
| Length | 45,000 m | 19,000 m | 8,500 m |
| Waterbody area (length × width) | 1e+6 $m^2$ | 2.2e+5 $m^2$ | 4.6e+4 $m^2$ |
| Flow independent mixing volume (length × width × depth) | 6.7e+5 $m^3$ (6.7e+8 L) | 7.3e+4 $m^3$ (7.3e+7 L) | 8.3e+3 $m^3$ (8.3e+6 L) |
| Depth (bed sediment) | 0.03 m | 0.03 m | 0.03 m |
| Depth (water column) | 0.64 m | 0.31 m | 0.15 m |

## 2.11 Land Application Unit USLE Length Slope Factor

*Original approach:* The Universal Soil Loss Equation (USLE) uses a factor called the Length-Slope factor (LS) as one input to determine the amount of soil eroded from a particular area. The model uses the USLE in three different contexts: for erosion from a land application unit, erosion from a wastepile, and erosion from a watershed. a single set of central tendency and high end values were used for LS; these were 1 and 3, respectively, and were used for all three situations in which the USLE is used. These reflect a range of possible slopes and distances that were felt to be applicable to all three situations.

*Revised approach:* In order to be consistent with the groundwater analysis, which used a source slope of 2 percent for the land application unit, LS was changed for the land application unit (but not the wastepile) to reflect a 2 percent slope. The revised LS values for land application units are 0.3 for central tendency and 0.5 for high end. These lower values will result in less erosion off the land application unit. These revised values were also applied to the watershed in which the land application unit is located, as this is likely to have a similar slope to the unit. This change affects the pathways and sections noted in Table S-6.

## 2.12 USLE Cover Factor

*Original approach:* The Universal Soil Loss Equation (USLE) uses a factor called the Cover factor as one input to determine the amount of soil eroded from a particular area. This factor was set to values of 0.1 (central tendency) and 0.5 (high end), reflecting an average of values for weeds and grasses assuming no canopy and 50 percent and 0 percent groundcover, respectively.

*Revised approach:* The USLE Cover factor values used were appropriate to a waste management unit with no ground cover, but were considered unrealistic for off-site fields and watersheds, especially since off-site fields were modeled as growing forage or vegetables. Therefore, the USLE cover factor for off-site fields and watersheds was changed to reflect 80 percent and 40 percent groundcover, averaging values for weeds and grasses, and no appreciable canopy. The new central tendency and high end values are, respectively, 0.03 and 0.1. This change affects the pathways and sections noted in Table S-6.

**Table S-6. Equations Affected by Revisions to USLE Input Parameters**

| Pathway | Section | Equation | LS | Cover |
|---|---|---|---|---|
| 3, 5, Terr II | 6.3.2.2 (discussion)<br>7.3.5.3 (LAU equation) | 7-13 | yes | no |
| 4,6, Terr III | 6.3.2.3 | 6-10 | yes | yes |
| 8, Terr V | 6.6.1.2.1 | 6-2c (new) | yes | yes |
| 9 off | 6.6.1.2.4 (discussion)<br>7.3.5.3 (LAU equation) | 7-13 | yes | no |
| 10 | 6.6.2.2.1 | 6-2c (new) | yes | yes |
| 11 off | 6.6.2.2.4 (discussion)<br>7.3.5.3 (LAU equation) | 7-13 | yes | no |
| 17, 37, Aq I | 6.5.2.1 | 6-15 | yes | yes |
| 19, 42, Aq III | 6.5.2.2 | 6-25 | yes | yes |
| 20, 38, Aq II | 6.5.2.3 | 6-34 | yes | yes |
| 21 | 6.6.3.2.1 | 6-133 | yes | yes |
| 23 | 6.6.3.2.2 | 6-147 | yes | yes |
| 24 | 6.6.3.2.3 | 6-160 | yes | yes |
| 33 | 6.6.2.2.5 | 6-92 | yes | yes |
| 35 | 6.6.2.2.6 | 6-102 | yes | yes |
| 36 | 6.6.2.2.7 | 6-111 | yes | yes |

### 2.13 Errata: Fish Concentration Units

The units for fish concentration in Table 5-6 should be mg/g, not mg/kg. .

### 2.14 Errata: Fish Intake Units

The units for fish intake in Equations 5-64 and 5-67 should be mg/kg/d, not µg/kg/d.

### 2.15 Errata: Water Exposure Values

The values for water concentration by ingestion in Table 5-3 for chemicals after lead inadvertently reflected an exposure duration of 9 years instead of 30 years. a corrected version of Table 5-3 is attached.

### 2.16 Errata: Silver Added to Appendix A

Appendix A has been revised to include physical-chemical properties data for silver.

## Table 5-3. Exposure Media Concentrations for Water (mg/L)

| | | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| Chemical | CAS | Adult resident | Adult resident | Child resident |
| Acenaphthene | 83329 | 2e+00 | 1e+00 | 7e-01 |
| Acetone | 67641 | 4e+00 | 1e+03 | 6e+02 |
| Acetonitrile | 75058 | 2e-01 | 7e+01 | 4e+01 |
| Acetophenone | 98862 | 4e+00 | 7e+01 | 4e+01 |
| Acrolein | 107028 | 7e-01 | 1e+02 | 8e+01 |
| Acrylamide | 79061 | 2e-05 | 2e-02 | 5e-02 |
| Acrylonitrile | 107131 | 2e-04 | 2e-02 | 5e-02 |
| Aldrin | 309002 | 5e-06 | 2e-07 | 5e-07 |
| Allyl chloride | 107051 | NA | NA | NA |
| Aniline | 62533 | 1e-02 | 7e-01 | 2e+00 |
| Antimony | 7440360 | 1e-02 | 6e+00 | 3e+00 |
| Arsenic | 7440382 | 6e-05 | 2e-02 | 5e-02 |
| Barium | 7440393 | 3e+00 | 1e+03 | 5e+02 |
| Benz(*a*)anthracene | 56553 | 8e-05 | 4e-06 | 1e-05 |
| Benzene | 71432 | 3e-03 | 2e-02 | 5e-02 |
| Benzidine | 92875 | 4e-07 | 1e-05 | 3e-05 |
| Benzo(*a*)pyrene | 50328 | 1e-05 | 4e-07 | 1e-06 |
| Benzo(*b*)fluoranthene | 205992 | 7e-05 | 2e-06 | 6e-06 |
| Benzyl alcohol | 100516 | 1e+01 | 5e+02 | 3e+02 |
| Benzyl chloride | 100447 | 5e-04 | 4e-03 | 1e-02 |
| Beryllium | 7440417 | 2e-05 | 8e-03 | 2e-02 |
| Bis(2-chloroisopropyl) ether | 39638329 | 1e-03 | 8e-03 | 2e-02 |
| Bis(2-chlorethyl)ether | 111444 | 8e-05 | 4e-03 | 1e-02 |
| Bis(2-ethylhexyl)phthalate | 117817 | 6e-03 | 8e-05 | 2e-04 |
| Bromodichloromethane | 75274 | 1e-03 | 2e-02 | 5e-02 |
| Bromoform (tribromomethane) | 75252 | 1e-02 | 2e-01 | 5e-01 |
| Butanol | 71363 | 4e+00 | 2e+02 | 1e+02 |
| Butyl-4,6-dinitrophenol, 2-sec- (dinoseb) | 88857 | 4e-02 | 1e-01 | 8e-02 |
| Butylbenzylphthalate | 85687 | 7e+00 | 3e+00 | 2e+00 |

(continued)

Table 5-3 (continued)

| Chemical | CAS | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| | | Adult resident | Adult resident | Child resident |
| Cadmium | 7440439 | 4e-02 | 1e+01 | 7e+00 |
| Carbon disulfide | 75150 | 4e+00 | 3e+01 | 2e+01 |
| Carbon tetrachloride | 56235 | 7e-04 | 3e-03 | 8e-03 |
| Chlordane | 57749 | 7e-05 | 5e-06 | 1e-05 |
| Chloro-1,3-butadiene, 2- (chloroprene) | 126998 | NA | NA | NA |
| Chloroaniline, *p*- | 106478 | 1e-01 | 2e+00 | 1e+00 |
| Chlorobenzene | 108907 | 7e-01 | 2e+00 | 1e+00 |
| Chlorobenzilate | 510156 | 3e-04 | 3e-04 | 8e-04 |
| Chlorodibromomethane | 124481 | 1e-03 | 2e-02 | 4e-02 |
| Chloroform | 67663 | 1e-02 | 2e-01 | 5e-01 |
| Chlorophenol, 2- | 95578 | 2e-01 | 2e+00 | 9e-01 |
| Chromium VI | 7440473 | 2e-01 | 7e+01 | 3e+01 |
| Chrysene | 218019 | 3e-03 | 2e-04 | 4e-04 |
| Copper | 7440504 | 1e+00 | 5e+02 | 3e+02 |
| Cresol, *m*- | 108394 | 2e+00 | 2e+01 | 1e+01 |
| Cresol, *o*- | 95487 | 2e+00 | 2e+01 | 1e+01 |
| Cresol, *p*- | 106445 | 2e-01 | 2e+00 | 1e+00 |
| Cumene | 98828 | 1e+00 | 1e+00 | 7e-01 |
| DDD | 72548 | 4e-04 | 2e-05 | 5e-05 |
| DDE | 72559 | 3e-04 | 5e-06 | 1e-05 |
| DDT | 50293 | 3e-04 | 9e-06 | 2e-05 |
| Di-*n*-butyl phthalate | 84742 | 4e+00 | 2e+00 | 1e+00 |
| Di-*n*-octyl phthalate | 117840 | 7e-01 | 3e-03 | 1e-03 |
| Diallate | 2303164 | 1e-03 | 8e-04 | 2e-03 |
| Dibenz(*a*,*h*)anthracene | 53703 | 1e-05 | 2e-07 | 5e-07 |
| Dibromo-3-chloropropane, 1,2- | 96128 | 6e-05 | 9e-04 | 2e-03 |
| Dichlorobenzene, 1,2- | 95501 | 3e+00 | 4e+00 | 2e+00 |
| Dichlorobenzene, 1,4- | 106467 | 4e-03 | 5e-03 | 1e-02 |
| Dichlorobenzidine, 3,3- | 91941 | 2e-04 | 5e-04 | 1e-03 |

(continued)

## Table 5-3 (continued)

| Chemical | CAS | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| | | Adult resident | Adult resident | Child resident |
| Dichlorodifluoromethane | 75718 | 7e+00 | 6e+01 | 3e+01 |
| Dichloroethane, 1,1- | 75343 | 9e-04 | 1e-02 | 3e-02 |
| Dichloroethane, 1,2- | 107062 | 9e-04 | 2e-02 | 6e-02 |
| Dichloroethylene, 1,1- | 75354 | 1e-04 | 1e-03 | 3e-03 |
| Dichloroethylene, *cis*-1,2- | 156592 | 4e-01 | 4e+00 | 2e+00 |
| Dichloroethylene, *trans*-1,2- | 156605 | 7e-01 | 6e+00 | 3e+00 |
| Dichlorophenol, 2,4- | 120832 | 1e-01 | 3e-01 | 2e-01 |
| Dichlorophenoxyacetic acid, 2,4- (2,4-D) | 94757 | 4e-01 | 3e+00 | 1e+00 |
| Dichloropropane, 1,2- | 78875 | 1e-03 | 1e-02 | 4e-02 |
| Dichloropropene, 1,3- | 542756 | 5e-04 | 5e-03 | 1e-02 |
| Dichloropropene, *cis*-1,3- | 10061015 | 5e-04 | 5e-03 | 1e-02 |
| Dichloropropene, *trans*-1,3- | 10061026 | 5e-04 | 5e-03 | 1e-02 |
| Dieldrin | 60571 | 5e-06 | 2e-06 | 4e-06 |
| Diethyl phthalate | 84662 | 3e+01 | 3e+02 | 2e+02 |
| Diethylstilbestrol | 56531 | 2e-08 | 4e-09 | 1e-08 |
| Dimethoate | 60515 | 7e-03 | 2e+00 | 8e-01 |
| Dimethyl phthalate | 131113 | 4e+02 | 1e+04 | 8e+03 |
| Dimethylbenz(*a*)anthracene, 7,12- | 57976 | 3e-06 | 5e-08 | 1e-07 |
| Dimethylbenzidine, 3,3'- | 119937 | 9e-06 | 7e-05 | 2e-04 |
| Dimethylphenol, 2,4- | 105679 | 7e-01 | 5e+00 | 3e+00 |
| Dimethyoxybenzidine, 3,3'- | 119904 | 6e-03 | 2e-01 | 6e-01 |
| Dinitrobenzene, 1,3- | 99650 | 4e-03 | 1e-01 | 7e-02 |
| Dinitrophenol, 2,4- | 51285 | 7e-02 | 3e+00 | 1e+00 |
| Dinitrotoluene, 2,4- | 121142 | 7e-02 | 1e+00 | 7e-01 |
| Dinitrotoluene, 2,6- | 606202 | 4e-02 | 8e-01 | 4e-01 |
| Dioxane, 1,4- | 123911 | 8e-03 | 3e+00 | 9e+00 |
| Diphenylamine | 122394 | 9e-01 | 1e+00 | 7e-01 |
| Disulfoton | 298044 | 1e-03 | 2e-03 | 1e-03 |
| Endosulfan | 115297 | 2e-01 | 6e-01 | 3e-01 |

(continued)

## Table 5-3 (continued)

| Chemical | CAS | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| | | Adult resident | Adult resident | Child resident |
| Endrin | 72208 | 1e-02 | 5e-03 | 3e-03 |
| Epichlorohydrin | 106898 | 9e-03 | 1e+00 | 4e+00 |
| Ethoxyethanol, 2- | 110805 | 1e+01 | 4e+03 | 2e+03 |
| Ethyl acetate | 141786 | 3e+01 | 3e+03 | 1e+03 |
| Ethyl ether | 60297 | 7e+00 | 4e+02 | 2e+02 |
| Ethyl methacrylate | 97632 | 3e+00 | 7e+01 | 4e+01 |
| Ethyl methanesulfonate | 62500 | 3e-07 | 8e-05 | 2e-04 |
| Ethylbenzene | 100414 | 4e+00 | 6e+00 | 3e+00 |
| Ethylene dibromide | 106934 | 1e-06 | 3e-05 | 7e-05 |
| Ethylene thiourea | 96457 | 1e-04 | 1e-01 | 3e-01 |
| Fluoranthene | 206440 | 1e+00 | 2e-01 | 1e-01 |
| Fluorene | 86737 | 1e+00 | 6e-01 | 3e-01 |
| Formaldehyde | 50000 | 7e+00 | 1e+03 | 7e+02 |
| Formic acid | 64186 | 7e+01 | 3e+04 | 2e+04 |
| Furan | 110009 | 4e-02 | 8e-01 | 5e-01 |
| Heptachlor | 76448 | 2e-05 | 1e-06 | 3e-06 |
| Heptachlor epoxide | 1024573 | 9e-06 | 5e-06 | 1e-05 |
| Hexachloro-1,3-butadiene | 87683 | 1e-03 | 3e-04 | 9e-04 |
| Hexachlorobenzene | 118741 | 5e-05 | 3e-06 | 9e-06 |
| Hexachlorocyclohexane, α- (α-BHC) | 319846 | 1e-05 | 3e-05 | 7e-05 |
| Hexachlorocyclohexane, β- (β-BHC) | 319857 | 5e-05 | 9e-05 | 2e-04 |
| Hexachlorocyclohexane, γ- (lindane) | 58899 | 7e-05 | 1e-04 | 4e-04 |
| Hexachlorocyclopentadiene | 77474 | 3e-01 | 3e-02 | 2e-02 |
| Hexachloroethane | 67721 | 6e-03 | 6e-03 | 2e-02 |
| Hexachlorophene | 70304 | 1e-02 | 1e-04 | 6e-05 |
| Indeno(1,2,3-*c,d*) pyrene | 193395 | 2e-04 | 4e-06 | 1e-05 |
| Isobutyl alcohol | 78831 | 1e+01 | 7e+02 | 4e+02 |
| Isophorone | 78591 | 9e-02 | 2e+00 | 5e+00 |
| Kepone | 143500 | 2e-06 | 1e-06 | 3e-06 |
| Lead | 7439921 | 1.5e-02 | NA | NA |

(continued)

## Table 5-3 (continued)

| Chemical | CAS | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| | | Adult resident. | Adult resident | Child resident |
| Mercury | 7439976 | 1e-02 | 4e+00 | 2e+00 |
| Methacrylonitrile | 126987 | 4e-03 | 3e-01 | 2e-01 |
| Methanol | 67561 | 2e+01 | 9e+03 | 5e+03 |
| Methoxychlor | 72435 | 2e-01 | 7e-02 | 4e-02 |
| Methyl bromide (bromomethane) | 74839 | 5e-02 | 2e+00 | 1e+00 |
| Methyl chloride (chloromethane) | 74873 | NA | NA | NA |
| Methyl ethyl ketone | 78933 | 2e+01 | 3e+03 | 2e+03 |
| Methyl isobutyl ketone | 108101 | 2e+00 | 7e+01 | 4e+01 |
| Methyl methacrylate | 80626 | 3e+00 | 8e+01 | 4e+01 |
| Methyl parathion | 298000 | 9e-03 | 6e-02 | 4e-02 |
| Methylcholanthrene, 3- | 56495 | 3e-06 | 8e-08 | 2e-07 |
| Methylene bromide | 74953 | 4e-01 | 1e+01 | 6e+00 |
| Methylene chloride | 75092 | 1e-02 | 3e-01 | 9e-01 |
| Molybdenum | 7439987 | 2e-01 | 7e+01 | 3e+01 |
| *N*-Nitrosodi-*n*-propylamine | 621647 | 1e-05 | 4e-04 | 1e-03 |
| *N*-Nitrosodiphenylamine | 86306 | 2e-02 | 5e-02 | 1e-01 |
| *N*-Nitrosopiperidine | 100754 | 2e-06 | 2e-04 | 6e-04 |
| *N*-Nitrosopyrrolidine | 930552 | 4e-05 | 1e-02 | 4e-02 |
| Naphthalene | 91203 | 1e+00 | 2e+00 | 1e+00 |
| Naphthylamine | 91598 | NA | NA | NA |
| Nickel | 7440020 | 7e-01 | 3e+02 | 1e+02 |
| Nitrobenzene | 98953 | 2e-02 | 3e-01 | 1e-01 |
| Nitropropane, 2- | 79469 | NA | NA | NA |
| Nitrosodi-*n*-butylamine | 924163 | 2e-05 | 1e-04 | 3e-04 |
| Nitrosodiethylamine | 55185 | 6e-07 | 7e-05 | 2e-04 |
| Nitrosodimethylamine | 62759 | 2e-06 | 9e-04 | 2e-03 |
| Nitrosomethylethylamine | 10595956 | 4e-06 | 1e-03 | 3e-03 |
| Octamethylpyrophosphoramide | 152169 | 7e-02 | 2e+02 | 9e+01 |
| Parathion | 56382 | 2e-01 | 4e-01 | 2e-01 |
| Pentachlorobenzene | 608935 | 3e-02 | 4e-03 | 2e-03 |

(continued)

Table 5-3 (continued)

| Chemical | CAS | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| | | Adult resident | Adult resident | Child resident |
| Pentachloronitrobenzene (PCNB) | 82688 | 3e-04 | 2e-04 | 5e-04 |
| Pentachlorophenol | 87865 | 7e-04 | 1e-04 | 4e-04 |
| Phenol | 108952 | 2e+01 | 5e+02 | 3e+02 |
| Phenyl mercuric acetate | 62384 | 3e-03 | 1e-01 | 6e-02 |
| Phenylenediamine, *m*- | 108452 | 2e-01 | 6e+01 | 3e+01 |
| Phorate | 298022 | 7e-03 | 1e-02 | 6e-03 |
| Polychlorinated biphenyls | 1336363 | 1e-05 | 3e-07 | 7e-07 |
| Pronamide | 23950585 | 3e+00 | 7e+00 | 4e+00 |
| Pyrene | 129000 | 1e+00 | 1e-01 | 7e-02 |
| Pyridine | 110861 | 4e-02 | 3e+00 | 1e+00 |
| Safrole | 94597 | 5e-04 | 2e-03 | 7e-03 |
| Selenium | 7782492 | 2e-01 | 7e+01 | 3e+01 |
| Strychnine | 57249 | 1e-02 | 6e-01 | 3e-01 |
| Styrene | 100425 | 7e+00 | 2e+01 | 9e+00 |
| TCDD, 2,3,7,8- | 1746016 | 5e-10 | 1e-11 | 3e-11 |
| Tetrachlorobenzene, 1,2,4,5- | 95943 | 1e-02 | 3e-03 | 2e-03 |
| Tetrachloroethane, 1,1,1,2- | 630206 | 3e-03 | 2e-02 | 5e-02 |
| Tetrachloroethane, 1,1,2,2- | 79345 | 4e-04 | 4e-03 | 1e-02 |
| Tetrachloroethylene | 127184 | 4e-01 | 2e+00 | 1e+00 |
| Tetrachlorophenol, 2,3,4,6- | 58902 | 1e+00 | 6e-01 | 3e-01 |
| Tetraethyldithiopyrophosphate | 3689245 | 2e-02 | 4e-02 | 2e-02 |
| Thallium (I) | 7440280 | 3e-03 | 1e+00 | 5e-01 |
| Toluene | 108883 | 7e+00 | 2e+01 | 1e+01 |
| Toluenediamine, 2,4- | 95807 | 3e-05 | 4e-03 | 1e-02 |
| Toluidine, *o*- | 95534 | 4e-04 | 1e-02 | 3e-02 |
| Toluidine, *p*- | 106490 | 4e-04 | 1e-02 | 3e-02 |
| Toxaphene | 8001352 | 8e-05 | 2e-05 | 6e-05 |
| Trichloro-1,2,2-trifluoroethane, 1,1,2- | 76131 | 1e+03 | 3e+03 | 2e+03 |
| Trichlorobenzene, 1,2,4- | 120821 | 4e-01 | 2e-01 | 1e-01 |
| Trichloroethane, 1,1,1- | 71556 | NA | NA | NA |

(continued)

Table 5-3 (continued)

| Chemical | CAS | Ingestion | Dermal | |
|---|---|---|---|---|
| | | | Bathing | |
| | | Adult resident | Adult resident | Child resident |
| Trichloroethane, 1,1,2- | 79005 | 1e-03 | 2e-02 | 5e-02 |
| Trichloroethylene | 79016 | 8e-03 | 1e-02 | 3e-02 |
| Trichlorofluoromethane | 75694 | 1e+01 | 6e+01 | 3e+01 |
| Trichlorophenol, 2,4,5- | 95954 | 4e+00 | 3e+00 | 2e+00 |
| Trichlorophenol, 2,4,6- | 88062 | 8e-03 | 9e-03 | 3e-02 |
| Trichlorophenoxyacetic acid, 2,4,5-(245-T) | 93765 | 4e-01 | 1e+00 | 7e-01 |
| Trichlorophenoxypropionic acid, 2,4,5-(silvex) | 93721 | 3e-01 | 9e-01 | 5e-01 |
| Trichloropropane, 1,2,3- | 96184 | 2e-01 | 2e+00 | 1e+00 |
| Trinitrobenzene, *sym*- | 99354 | 2e-03 | 2e-01 | 8e-02 |
| Tris (2,3-dibromopropyl) phosphate | 126727 | 9e-06 | 5e-04 | 1e-03 |
| Vanadium | 7440622 | 3e-01 | 1e+02 | 5e+01 |
| Vinyl chloride | 75014 | 4e-05 | 8e-04 | 2e-03 |
| Xylenes (total) | 1330207 | 7e+01 | 1e+02 | 6e+01 |
| Zinc | 7440666 | 1e+01 | 4e+03 | 2e+03 |

NA = Not applicable.

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# Appendix A

## Summary of Physical/Chemical Properties

## LIST OF TABLES

**Table**

## Table A-1. Physical Chemical Properties Data for HWIR Chemicals

| CAS Number | Chemical Name | Chemical Type | Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Physical-Chemical Properties | | | | | | | | |
| 83-32-9 | Acenaphthene | Organic | 7.1E+03 | varies | 8.3E+03 | 3.0E-06 | 4.1E+00 | 154.21 | 1.1E-04 | 8.0E-06 | 8.0E-02 |
| 67-64-1 | Acetone | Organic | 5.8E-01 | varies | 5.8E-01 | 3.0E-01 | 6.0E+05 | 58.08 | 2.9E-05 | 1.1E-05 | 1.2E-01 |
| 75-05-8 | Acetonitrile | Organic | 4.6E-01 | varies | 4.6E-01 | 1.2E-01 | 2.0E+05 | 41.05 | 2 4E-05 | 1.7E-05 | 1.3E-01 |
| 98-86-2 | Acetophenone | Organic | 4.1E+01 | varies | 4.4E+01 | 5.2E-04 | 6.1E+03 | 120.16 | 1.0E-05 | 8.0E-06 | 8.0E-02 |
| 107-02-8 | Acrolein | Organic | 9.8E-01 | varies | 9.8E-01 | 3.5E-01 | 2.1E+05 | 56.06 | 9.4E-05 | 1.2E-05 | 1.1E-01 |
| 79-06-1 | Acrylamide | Organic | 1.1E-01 | varies | 1.1E-01 | 9.2E-06 | 2.2E+06 | 71.08 | 3.0E-10 | 1 1E-05 | 9.7E-02 |
| 107-13-1 | Acrylonitrile | Organic | 1.8E+00 | varies | 1.8E+00 | 1.4E-01 | 7.5E+04 | 53.06 | 1.0E-04 | 1.3E-05 | 1.2E-01 |
| 309-00-2 | Aldrin | Organic | 2.5E+06 | varies | 3.2E+06 | 2.2E-08 | 7.8E-02 | 364.93 | 1.0E-04 | 8.0E-06 | 8.0E-02 |
| 107-05-1 | Allyl chloride | Organic | 2.7E+01 | varies | 2.8E+01 | 4.8E-01 | 3 4E+03 | 76.53 | 1.1E-02 | 8 0E-06 | 8.0E-02 |
| 62-53-3 | Aniline | Organic | 9.2E+00 | varies | 9.5E+00 | 8.8E-04 | 3.6E+04 | 93.10 | 2.3E-06 | 8.3E-06 | 7.0E-02 |
| 7440-36-0 | Antimony | Metal | NA | 2.0E+00 | NA | NA | NA | NA | NA | NA | NA |
| 7440-38-2 | Arsenic | Metal | NA | 2.9E+01 | NA | NA | NA | NA | NA | NA | NA |
| 7440-39-3 | Barium | Metal | NA | 5.3E+02 | NA | NA | NA | NA | NA | NA | NA |
| 56-55-3 | Benz(a)anthracene | Organic | 4.0E+05 | varies | 5.0E+05 | 2.0E-10 | 1.3E-02 | 228.28 | 3.6E-06 | 9.0E-06 | 6.1E-02 |
| 71-43-2 | Benzene | Organic | 1.2E+02 | varies | 1.3E+02 | 1.2E-01 | 1.8E+03 | 78.00 | 5.5E-03 | 9.8E-06 | 8.8E-02 |
| 92-87-5 | Benzidine* | Organic | 4.3E+01 | varies | 4.6E+01 | 1.1E-10 | 5.2E+02 | 184.23 | 3.9E-11 | 1.5E-05 | 8.0E-02 |
| 50-32-8 | Benzo(a)pyrene | Organic | 1.0E+06 | varies | 1.3E+06 | 6.4E-12 | 1.9E-03 | 252.00 | 8.4E-07 | 9.0E-06 | 4.3E-02 |
| 205-99-2 | Benzo(b)fluoranthene | Organic | 1.2E+06 | varies | 1.6E+06 | 4.9E-10 | 4.3E-03 | 252.00 | 2.9E-05 | 8.0E-06 | 8.0E-02 |
| 100-51-6 | Benzyl alcohol | Organic | 1.2E+01 | varies | 1.3E+01 | 1.4E-04 | 4.0E+04 | 108.10 | 3 9E-07 | 8.0E-06 | 8.0E-02 |
| 100-44-7 | Benzyl chloride | Organic | 1.8E+02 | varies | 2.0E+02 | 1 6E-03 | 4.9E+02 | 126.58 | 4.0E-04 | 7.8E-06 | 7.5E-02 |
| 7440-41-7 | Beryllium | Metal | NA | 7.0E+01 | NA | NA | NA | NA | NA | NA | NA |
| 39638-32-9 | Bis (2-chloroisopropyl) ether | Organic | 3.4E+02 | varies | 3.8E+02 | 1.0E-03 | 1.7E+03 | 171.07 | 1 0E-04 | 6.4E-06 | 6.0E-02 |
| 111-44-4 | Bis(2-chlorethyl)ether | Organic | 1.5E+01 | varies | 1.6E+01 | 1.8E-03 | 1.2E+04 | 143.02 | 2.1E-05 | 7.5E-06 | 6.9E-02 |
| 117-81-7 | Bis(2-ethylhexyl)phthalate | Organic | 1.5E+07 | varies | 2.0E+07 | 8 5E-09 | 4.0E-01 | 390.54 | 8.3E-06 | 3.7E-06 | 3.5E-02 |
| 75-27-4 | Bromodichloromethane | Organic | 1.2E+02 | varies | 1.3E+02 | 7.7E-02 | 4.0E+03 | 163.80 | 3.2E-03 | 8.0E-06 | 8.0E-02 |
| 75-25-2 | Bromoform (Tribromomethane) | Organic | 2.0E+02 | varies | 2.2E+02 | 7.8E-03 | 3.2E+03 | 252.77 | 6 1E-04 | 8.0E-06 | 8.0E-02 |
| 71-36-3 | Butanol | Organic | 6.1E+00 | varies | 6.3E+00 | 8.6E-03 | 7.5E+04 | 74.12 | 8 5E-06 | 9.3E-06 | 8.0E-02 |
| 88-85-7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinose | Organic | 1.2E+03 | varies | 1.4E+03 | 9.9E-05 | 5.2E+01 | 240.20 | 4 6E-04 | 8 0E-06 | 8 0E-02 |
| 85-68-7 | Butylbenzylphthalate | Organic | 5.7E+04 | varies | 6.9E+04 | 1.6E-08 | 2.6E+00 | 312.40 | 1.9E-06 | 8.0E-06 | 8.0E-02 |

Known to ionize under environmental conditions

* Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

## Table A-1. Physical Chemical Properties Data for HWIR Chemicals

| CAS Number | Chemical Name | Chemical Type | Physical-Chemical Properties: Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7440-43-9 | Cadmium | Metal | NA | 1.6E+02 | NA | NA | NA | NA | NA | NA | NA |
| 75-15-0 | Carbon disulfide | Organic | 9.3E+01 | varies | 1 0E+02 | 4.5E-01 | 2.7E+03 | 76.14 | 1.3E-02 | 1.0E-05 | 1 0E-01 |
| 56-23-5 | Carbon tetrachloride | Organic | 4 8E+02 | varies | 5.4E+02 | 1.5E-01 | 7.9E+02 | 154.00 | 2.9E-02 | 8.8E-06 | 7.8E-02 |
| 57-74-9 | Chlordane | Organic | 1.6E+06 | varies | 2.1E+06 | 3.5E-08 | 2.2E-01 | 409.80 | 6.7E-05 | 8 0E-06 | 8.0E-02 |
| 126-99-8 | Chloro-1,3-butadiene, 2- (Chloroprene | Organic | 1.1E+02 | varies | 1.2E+02 | 2.8E-01 | 6.3E+02 | 88.54 | 3.9E-02 | 1.0E-05 | 1.0E-01 |
| 106-47-8 | Chloroaniline, p- | Organic | 6.6E+01 | varies | 7.1E+01 | 2.8E-03 | 3.4E+03 | 127.57 | 1.1E-04 | 8.0E-06 | 8 0E-02 |
| 108-90-7 | Chlorobenzene | Organic | 6.5E+02 | varies | 7.2E+02 | 1.6E-02 | 4.1E+02 | 112.56 | 4.4E-03 | 8.7E-06 | 7.3E-02 |
| 510-15-6 | Chlorobenzilate | Organic | 2.0E+04 | varies | 2.4E+04 | 4.8E-09 | 1.3E+01 | 325.20 | 1.2E-07 | 8.0E-06 | 8.0E-02 |
| 124-48-1 | Chlorodibromomethane | Organic | 1.4E+02 | varies | 1.5E+02 | 4.1E-02 | 3.4E+03 | 208.30 | 2.5E-03 | 8.0E-06 | 8.0E-02 |
| 67-66-3 | Chloroform | Organic | 7.7E+01 | varies | 8.3E+01 | 2.7E-01 | 8.0E+03 | 119.00 | 4.0E-03 | 1.0E-05 | 1.0E-01 |
| 95-57-8 | Chlorophenol, 2- | Organic | 1.3E+02 | varies | 1.4E+02 | 2.8E-03 | 2.1E+04 | 128.56 | 1.7E-05 | 8 0E-06 | 8.0E-02 |
| 7440-47-3 | Chromium VI | Metal | NA | 1.8E+01 | NA | NA | NA | NA | NA | NA | NA |
| 218-01-9 | Chrysene | Organic | 4.0E+05 | varies | 5.0E+05 | 1.0E-11 | 1 9E-03 | 228.30 | 1.2E-06 | 8.0E-06 | 8.0E-02 |
| 7440-50-8 | Copper | Metal | NA | 2.2E+01 | NA | NA | NA | NA | NA | NA | NA |
| 108-39-4 | Cresol, m- | Organic | 8.6E+01 | varies | 9.3E+01 | 1.9E-04 | 2.3E+04 | 108.15 | 8.8E-07 | 1.0E-05 | 7.4E-02 |
| 95-48-7 | Cresol, o- | Organic | 9.0E+01 | varies | 9.8E+01 | 4.2E-04 | 2.8E+04 | 108.15 | 1.6E-06 | 8.3E-06 | 7.4E-02 |
| 106-44-5 | Cresol, p- | Organic | 8.3E+01 | varies | 8.9E+01 | 1.7E-04 | 2.3E+04 | 108.13 | 8.2E-07 | 1.0E-05 | 7.4E-02 |
| 98-82-8 | Cumene | Organic | 3.3E+03 | varies | 3.8E+03 | 6.0E-03 | 5.6E+01 | 120.20 | 1.3E-02 | 7.1E-06 | 8.6E-02 |
| 72-54-8 | DDD | Organic | 9.9E+05 | varies | 1.3E+06 | 1.1E-09 | 7.3E-02 | 320.05 | 5.0E-06 | 8.0E-06 | 8.0E-02 |
| 72-55-9 | DDE | Organic | 4.4E+06 | varies | 5.8E+06 | 7.5E-09 | 1.9E-02 | 318.03 | 1.2E-04 | 8.0E-06 | 8.0E-02 |
| 50-29-3 | DDT | Organic | 2.6E+06 | varies | 3.4E+06 | 5.2E-10 | 3.4E-03 | 354.49 | 5.4E-05 | 8 0E-06 | 8.0E-02 |
| 84-74-2 | Di-n-butyl phthalate | Organic | 3.4E+04 | varies | 4.1E+04 | 5.6E-08 | 1.1E+01 | 278.34 | 1.4E-06 | 7.9E-06 | 4.4E-02 |
| 117-84-0 | Di-n-octyl phthalate | Organic | 8.4E+07 | varies | 1.1E+08 | 5.9E-09 | 4.0E-02 | 390.54 | 5.7E-05 | 8.0E-06 | 8.0E-02 |
| 2303-16-4 | Diallate | Organic | 2.6E+04 | varies | 3.1E+04 | 2.0E-07 | 1.4E+01 | 270.24 | 3.8E-06 | 8.0E-06 | 8.0E-02 |
| 53-70-3 | Dibenz(a,h)anthracene | Organic | 3.8E+06 | varies | 4.9E+06 | 2.7E-14 | 6.7E-04 | 278.33 | 1.1E-08 | 8.0E-06 | 8.0E-02 |
| 96-12-8 | Dibromo-3-chloropropane, 1,2- | Organic | 2.0E+02 | varies | 2.2E+02 | 1.0E-03 | 1.2E+03 | 236.36 | 2.0E-04 | 8.0E-06 | 8.0E-02 |
| 95-50-1 | Dichlorobenzene, 1,2- | Organic | 2.4E+03 | varies | 2.7E+03 | 1.8E-03 | 1.3E+02 | 147.01 | 2.1E-03 | 7.9E-06 | 6.9E-02 |
| 106-46-7 | Dichlorobenzene, 1,4- | Organic | 2.3E+03 | varies | 2.6E+03 | 1.4E-03 | 7.3E+01 | 147.01 | 2.8E-03 | 7.9E-06 | 6.9E-02 |
| 91-94-1 | Dichlorobenzidine, 3,3'- | Organic | 2.8E+03 | varies | 3.2E+03 | 2.9E-10 | 3.5E+00 | 253.13 | 2.1E-08 | 8.0E-06 | 8.0E-02 |

* Kno nize under environmental conditions
' miscible; solubility estimated from Henry's Law Constant and Vapor Pressu

Table A-1. Physical Chemical Properties Data for HWIR Chemicals

| CAS Number | Chemical Name | Chemical Type | Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Physical-Chemical Properties | | | | | | | | |
| 75-71-8 | Dichlorodifluoromethane | Organic | 1.3E+02 | varies | 1.4E+02 | 6.4E+00 | 3.0E+02 | 120.90 | 2.6E+00 | 8.0E-06 | 8.0E-02 |
| 75-34-3 | Dichloroethane, 1,1- | Organic | 5.8E+01 | varies | 6.2E+01 | 3.0E-01 | 5.2E+03 | 98.96 | 5.8E-03 | 8.0E-06 | 8 0E-02 |
| 107-06-2 | Dichloroethane, 1,2- | Organic | 2.8E+01 | varies | 3.0E+01 | 1.1E-01 | 8.3E+03 | 98.96 | 1.3E-03 | 9.9E-06 | 1 0E-01 |
| 75-35-4 | Dichloroethylene, 1,1- | Organic | 1.2E+02 | varies | 1.3E+02 | 7.9E-01 | 3.0E+03 | 96.94 | 2.5E-02 | 8.0E-06 | 8.0E-02 |
| 156-59-2 | Dichloroethylene, cis-1,2- | Organic | 6.7E+01 | varies | 7.2E+01 | 2.3E-01 | 4.9E+03 | 96.95 | 4 5E-03 | 8 0E-06 | 8.0E-02 |
| 156-60-5 | Dichloroethylene, trans-1,2- | Organic | 1.1E+02 | varies | 1.2E+02 | 4.6E-01 | 8.0E+03 | 96.95 | 5.6E-03 | 8.0E-06 | 8.0E-02 |
| 120-83-2 | Dichlorophenol, 2,4- | Organic | 1.1E+03 | varies | 1.2E+03 | 7.2E-06 | 4.9E+03 | 163.01 | 2.4E-07 | 8.0E-06 | 8.0E-02 |
| 94-75-7 | Dichlorophenoxyacetic acid, 2,4- (2,4- | Organic | 4.5E+02 | varies | 5.0E+02 | 1.4E-05 | 6.8E+02 | 221.04 | 4.5E-06 | 6.5E-06 | 5.9E-02 |
| 78-87-5 | Dichloropropane, 1,2- | Organic | 8.6E+01 | varies | 9.3E+01 | 6.7E-02 | 2.7E+03 | 112.99 | 2.8E-03 | 8.7E-06 | 7.8E-02 |
| 542-75-6 | Dichloropropene, 1,3- | Organic | 9.3E+01 | varies | 1.0E+02 | 4.1E-02 | 1.5E+03 | 110.98 | 2.9E-03 | 8.0E-06 | 8.0E-02 |
| 10061-01-5 | Dichloropropene, cis-1,3- | Organic | 9.3E+01 | varies | 1.0E+02 | 4.9E-02 | 2.7E+03 | 110.97 | 2.0E-03 | 8.0E-06 | 8.0E-02 |
| 10061-02-6 | Dichloropropene, trans-1,3- | Organic | 9.3E+01 | varies | 1.0E+02 | 4.0E-02 | 2.8E+03 | 110.97 | 1.6E-03 | 8.0E-06 | 8.0E-02 |
| 60-57-1 | Dieldrin | Organic | 1.9E+05 | varies | 2.3E+05 | 1.3E-09 | 1.9E-01 | 380.95 | 2.7E-06 | 8.0E-06 | 8.0E-02 |
| 84-66-2 | Diethyl phthalate | Organic | 2.9E+02 | varies | 3.2E+02 | 2.2E-06 | 8.8E+02 | 222.20 | 5.5E-07 | 8.0E-06 | 8.0E-02 |
| 56-53-1 | Diethylstilbestrol | Organic | 9.6E+04 | varies | 1.2E+05 | 1.4E-12 | 1.3E+04 | 268.34 | 3.0E-14 | 8.0E-06 | 8.0E-02 |
| 60-51-5 | Dimethoate | Organic | 4.8E+00 | varies | 4.9E+00 | 6.7E-09 | 2.5E+04 | 229.28 | 6.2E-11 | 8.0E-06 | 8.0E-02 |
| 131-11-3 | Dimethyl phthalate | Organic | 3.5E+01 | varies | 3.7E+01 | 1.2E-05 | 4.2E+03 | 194.19 | 5.8E-07 | 6.3E-06 | 6.7E-02 |
| 57-97-6 | Dimethylbenz(a)anthracene, 7,12- | Organic | 3.2E+06 | varies | 4.2E+06 | 3.8E-12 | 5.0E-02 | 256 35 | 1.9E-08 | 8.0E-06 | 8.0E-02 |
| 119-93-7 | Dimethylbenzidine, 3,3'- * | Organic | 4.3E+02 | varies | 4.8E+02 | 4.9E-10 | 1.2E+03 | 212 28 | 8 6E-11 | 8.0E-06 | 8.0E-02 |
| 105-67-9 | Dimethylphenol, 2,4- * | Organic | 2.1E+02 | varies | 2.3E+02 | 1.7E-04 | 6.2E+03 | 122.16 | 3.3E-06 | 8.0E-06 | 8.0E-02 |
| 119-90-4 | Dimethyoxybenzidine, 3,3'- * | Organic | 6.0E+01 | varies | 6.5E+01 | 3.3E-10 | 2.4E+02 | 244.32 | 3.3E-10 | 8.0E-06 | 8.0E-02 |
| 99-65-0 | Dinitrobenzene, 1,3- | Organic | 3.0E+01 | varies | 3.2E+01 | 4.0E-07 | 5.4E+02 | 168.10 | 1.2E-07 | 7.6E-06 | 2 8E-01 |
| 51-28-5 | Dinitrophenol, 2,4- | Organic | 3.3E+01 | varies | 3.5E+01 | 1.5E-07 | 5.8E+03 | 184.11 | 4.8E-09 | 8.0E-06 | 8.0E-02 |
| 121-14-2 | Dinitrotoluene, 2,4- | Organic | 9.5E+01 | varies | 1.0E+02 | 2.3E-07 | 2.8E+02 | 182.13 | 1.5E-07 | 7.1E-06 | 2.0E-01 |
| 606-20-2 | Dinitrotoluene, 2,6- | Organic | 6.9E+01 | varies | 7.4E+01 | 7.5E-07 | 1.1E+03 | 182 14 | 1 3E-07 | 8.0E-06 | 8.0E-02 |
| 123-91-1 | Dioxane, 1,4- ** | Organic | 4.1E-01 | varies | 4.1E-01 | 5.0E-02 | 9.0E+05 | 88.10 | 4.9E-06 | 1.0E-05 | 2.3E-01 |
| 122-39-4 | Diphenylamine* | Organic | 2.6E+03 | varies | 3.0E+03 | 5.6E-06 | 3.0E+02 | 169.23 | 3.2E-06 | 6.3E-06 | 6.8E-02 |
| 298-04-4 | Disulfoton | Organic | 8.2E+03 | varies | 9.5E+03 | 3.7E-07 | 1.6E+01 | 274.38 | 6.2E-06 | 8.0E-06 | 8.0E-02 |
| 115-29-7 | Endosulfan | Organic | 1.1E+04 | varies | 1.3E+04 | 1.3E-08 | 2.3E-01 | 406.95 | 2.3E-05 | 8.0E-06 | 8.0E-02 |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-1. Physical Chemical Properties Data for HWIR Chemicals .

| CAS Number | Chemical Name | Chemical Type | Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Physical-Chemical Properties | | | | | | | | |
| 72-20-8 | Endrin | Organic | 9.4E+04 | varies | 1.1E+05 | 7.7E-10 | 2.5E-01 | 380.93 | 1.2E-06 | 8.0E-06 | 8.0E-02 |
| 106-89-8 | Epichlorohydrin | Organic | 1.8E+00 | varies | 1.8E+00 | 2.2E-02 | 6.6E+04 | 92.53 | 3.0E-05 | 9.8E-06 | 8.6E-02 |
| 110-80-5 | Ethoxyethanol, 2- ** | Organic | 8.0E-01 | varies | 7.9E-01 | 7.0E-03 | 1.2E+01 | 90.12 | 5.1E-02 | 8 0E-06 | 8.0E-02 |
| 141-78-6 | Ethyl acetate | Organic | 4.8E+00 | varies | 4.9E+00 | 1.2E-01 | 6.4E+04 | 88.10 | 1.7E-04 | 9 7E-06 | 7.3E-02 |
| 60-29-7 | Ethyl ether | Organic | 6.5E+00 | varies | 6.8E+00 | 7.1E-01 | 6.1E+04 | 74.12 | 8.7E-04 | 9.3E-06 | 7.4E-02 |
| 97-63-2 | Ethyl methacrylate | Organic | 3.7E+01 | varies | 3.9E+01 | 2.3E-02 | 1.9E+04 | 114.14 | 1.4E-04 | 8.0E-06 | 8.0E-02 |
| 62-50-0 | Ethyl methanesulfonate | Organic | 1.1E+00 | varies | 1.1E+00 | 3.5E-04 | 4.9E+05 | 124.15 | 8.8E-08 | 8.0E-06 | 8.0E-02 |
| 100-41-4 | Ethylbenzene | Organic | 1.2E+03 | varies | 1.4E+03 | 1.3E-02 | 1.7E+02 | 106.17 | 7.7E-03 | 7.8E-06 | 7.5E-02 |
| 106-93-4 | Ethylene Dibromide | Organic | 5.3E+01 | varies | 5.6E+01 | 1.0E-02 | 4.2E+03 | 187.88 | 4.6E-04 | 8.0E-06 | 8.0E-02 |
| 96-45-7 | Ethylene thiourea | Organic | 2.2E-01 | varies | 2.2E-01 | 1.1E-04 | 1.2E+04 | 102.20 | 9.1E-07 | 8.0E-06 | 8.0E-02 |
| 206-44-0 | Fluoranthene | Organic | 1.1E+05 | varies | 1.3E+05 | 1.1E-08 | 2.3E-01 | 202.00 | 9.3E-06 | 8.0E-06 | 8.0E-02 |
| 86-73-7 | Fluorene | Organic | 1.4E+04 | varies | 1.6E+04 | 8.2E-07 | 1.9E+00 | 166.21 | 7.3E-05 | 8.0E-06 | 8.0E-02 |
| 50-00-0 | Formaldehyde | Organic | 8.9E-01 | varies | 8.9E-01 | 5.1E+00 | 5.5E+05 | 30.03 | 2.8E-04 | 2.0E-05 | 1.8E-01 |
| 64-18-6 | Formic Acid* | Organic | 2.9E-01 | varies | 2.9E-01 | 5.4E-02 | 1.0E+06 | 46.03 | 2 5E-06 | 1.4E-06 | 7.9E-02 |
| 110-00-9 | Furan | Organic | 2.1E+01 | varies | 2.2E+01 | 7.9E-01 | 1.0E+04 | 68.08 | 5.4E-03 | 1.2E-05 | 1.0E-01 |
| 76-44-8 | Heptachlor | Organic | 1.4E+06 | varies | 1.8E+06 | 4.3E-07 | 2.7E-01 | 373.35 | 5.9E-04 | 8.0E-06 | 8.0E-02 |
| 1024-57-3 | Heptachlor epoxide | Organic | 8.2E+04 | varies | 1.0E+05 | 5.7E-09 | 2.7E-01 | 389.20 | 8.3E-06 | 8.0E-06 | 8.0E-02 |
| 87-68-3 | Hexachloro-1,3-butadiene | Organic | 5.4E+04 | varies | 6.5E+04 | 2.3E-04 | 2.5E+00 | 260.76 | 2.4E-02 | 6.2E-06 | 5.6E-02 |
| 118-74-1 | Hexachlorobenzene | Organic | 6.2E+05 | varies | 7.8E+05 | 2 3E-08 | 8.6E-03 | 284.80 | 7.5E-04 | 5.9E-06 | 6.4E-02 |
| 319-84-6 | Hexachlorocyclohexane, alpha- (alpha | Organic | 5.4E+03 | varies | 6.3E+03 | 5.6E-08 | 2.4E+00 | 290.83 | 6.8E-06 | 8 0E-06 | 8.0E-02 |
| 319-85-7 | Hexachlorocyclohexane, beta- (beta-B | Organic | 5.6E+03 | varies | 6.5E+03 | 6.5E-10 | 5.4E-01 | 290.83 | 3.5E-07 | 8.0E-06 | 8.0E-02 |
| 58-89-9 | Hexachlorocyclohexane, gamma- (Lin | Organic | 4.6E+03 | varies | 5.4E+03 | 4.9E-08 | 4 2E+00 | 290.85 | 3.4E-06 | 8.0E-06 | 8.0E-02 |
| 77-47-4 | Hexachlorocyclopentadiene | Organic | 2.0E+05 | varies | 2.5E+05 | 9.6E-05 | 1.5E+00 | 273.00 | 1.7E-02 | 6.2E-06 | 5.6E-02 |
| 67-72-1 | Hexachloroethane | Organic | 8.6E+03 | varies | 1.0E+04 | 6.2E-04 | 4.1E+01 | 236.74 | 3.6E-03 | 6.8E-06 | 2.5E-03 |
| 70-30-4 | Hexachlorophene* | Organic | 2.6E+07 | varies | 3.5E+07 | 3.6E-15 | 3 0E-03 | 406.91 | 4 9E-10 | 8.0E-06 | 8.0E-02 |
| 193-39-5 | Indeno(1,2,3-cd) pyrene | Organic | 3.4E+06 | varies | 4.5E+06 | 1.9E-13 | 2.2E-05 | 276 34 | 2.4E-06 | 8 0E-06 | 8.0E-02 |
| 78-83-1 | Isobutyl alcohol | Organic | 5 5E+00 | varies | 5.6E+00 | 1.4E-02 | 7.6E+04 | 74.14 | 1 3E-05 | 8 0E-06 | 8.0E-02 |
| 78-59-1 | Isophorone | Organic | 4.7E+01 | varies | 5.0E+01 | 5.4E-04 | 1.2E+04 | 138.20 | 6.2E-06 | 6.8E-06 | 6.2E-02 |
| 143-50-0 | Kepone | Organic | 1.6E+05 | varies | 2.0E+05 | 3.9E-10 | 7.6E+00 | 490.68 | 2.5E-08 | 8.0E-06 | 8.0E-02 |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure

## Table A-1. Physical Chemical Properties Data for HWIR Chemicals

| CAS Number | Chemical Name | Chemical Type | Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Physical-Chemical Properties | | | | | | | | |
| 7439-92-1 | Lead | Metal | NA | 2.8E+05 | NA | NA | NA | NA | NA | NA | NA |
| 7439-97-6 | Mercury | Mercury | NA | 9.5E+04 | NA | 2.6E-06 | 5.6E-02 | 201.00 | 7.1E-10 | 8.0E-06 | 8.0E-02 |
| 126-98-7 | Methacrylonitrile | Organic | 3.4E+00 | varies | 3.5E+00 | 8.9E-02 | 2.5E+04 | 67.09 | 2.3E-04 | 8.0E-06 | 8.0E-02 |
| 67-56-1 | Methanol | Organic | 2.0E-01 | varies | 1.9E-01 | 1.6E-01 | 2.9E+04 | 32.04 | 1.7E-04 | 1.6E-05 | 1.5E-01 |
| 72-43-5 | Methoxychlor | Organic | 9.9E+04 | varies | 1.2E+05 | 1.6E-09 | 8.8E-02 | 345.65 | 6.3E-06 | 8.0E-06 | 8.0E-02 |
| 74-83-9 | Methyl bromide (Bromomethane) | Organic | 1.5E+01 | varies | 1.5E+01 | 2.2E+00 | 1.4E+04 | 94.95 | 1.4E-02 | 8.0E-06 | 8.0E-02 |
| 74-87-3 | Methyl chloride (Chloromethane) | Organic | 7.8E+00 | varies | 8.1E+00 | 5.7E+00 | 6.3E+03 | 50.49 | 4.5E-02 | 6.5E-06 | 1.3E-01 |
| 78-93-3 | Methyl ethyl ketone | Organic | 1.9E+00 | varies | 1.9E+00 | 1.2E-01 | 2.4E+05 | 72.10 | 3.6E-05 | 9.8E-06 | 8.1E-02 |
| 108-10-1 | Methyl isobutyl ketone | Organic | 1.5E+01 | varies | 1.5E+01 | 2.5E-02 | 2.0E+04 | 100.16 | 1 2E-04 | 7.8E-06 | 7.5E-02 |
| 80-62-6 | Methyl methacrylate | Organic | 2.3E+01 | varies | 2.4E+01 | 5.1E-02 | 1.6E+04 | 100.13 | 3.2E-04 | 8.6E-06 | 7.7E-02 |
| 298-00-0 | Methyl parathion | Organic | 7.1E+02 | varies | 7.9E+02 | 2.0E-08 | 5.0E+01 | 263.23 | 1.1E-07 | 8.0E-06 | 8.0E-02 |
| 56-49-5 | Methylcholanthrene, 3- | Organic | 2.0E+06 | varies | 2.6E+06 | 1.0E-11 | 1.9E-03 | 268.40 | 1.4E-06 | 8.0E-06 | 8.0E-02 |
| 74-95-3 | Methylene bromide | Organic | 3.9E+01 | varies | 4.2E+01 | 6.0E-02 | 1.1E+04 | 173.86 | 9.0E-04 | 8.0E-06 | 8.0E-02 |
| 75-09-2 | Methylene chloride | Organic | 1.7E+01 | varies | 1.8E+01 | 4.9E-01 | 1.7E+04 | 84.93 | 2.4E-03 | 1.2E-05 | 1.0E-01 |
| 7439-98-7 | Molybdenum | Metal | NA | 2.0E+01 | NA | NA | NA | NA | NA | NA | NA |
| 621-64-7 | N-Nitrosodi-n-propylamine | Organic | 2.4E+01 | varies | 2.5E+01 | 4.6E-03 | 1.5E+04 | 130.19 | 4.1E-05 | 8.0E-06 | 8.0E-02 |
| 86-30-6 | N-Nitrosodiphenylamine | Organic | 1.3E+03 | varies | 1.4E+03 | 1.3E-04 | 3.7E+01 | 198.23 | 7.0E-04 | 8.0E-06 | 8.0E-02 |
| 100-75-4 | N-Nitrosopiperidine | Organic | 4.2E+00 | varies | 4.3E+00 | 1.9E-04 | 1.5E+05 | 114.50 | 1 4E-07 | 8.0E-06 | 8.0E-02 |
| 930-55-2 | N-Nitrosopyrrolidine | Organic | 6.5E-01 | varies | 6.5E-01 | 2.3E-04 | 7.8E+05 | 100.11 | 2.9E-08 | 8.0E-06 | 8.0E-02 |
| 91-20-3 | Naphthalene | Organic | 2.0E+03 | varies | 2.3E+03 | 1.2E-04 | 3.1E+01 | 128.16 | 4 8E-04 | 7.5E-06 | 5 9E-02 |
| 91-59-8 | Naphthylamine* | Organic | 1.7E+02 | varies | 1.9E+02 | 2.8E-05 | 1.3E+03 | 143.19 | 3.1E-06 | 8.0E-06 | 8.0E-02 |
| 7440-02-0 | Nickel | Metal | NA | 8.2E+01 | NA | NA | NA | NA | NA | NA | NA |
| 98-95-3 | Nitrobenzene | Organic | 6.4E+01 | varies | 6.9E+01 | 3.2E-04 | 1.9E+03 | 123.11 | 2 1E-05 | 8.6E-06 | 7.6E-02 |
| 79-46-9 | Nitropropane, 2- * | Organic | 7.2E+00 | varies | 7.4E+00 | 2.4E-02 | 1.7E+05 | 89.09 | 1.2E-05 | 8.0E-06 | 8.0E-02 |
| 924-16-3 | Nitrosodi-n-butylamine | Organic | 2.3E+02 | varies | 2.6E+02 | 3.8E-04 | 1.1E+03 | 158.20 | 5.4E-05 | 8.0E-06 | 8.0E-02 |
| 55-18-5 | Nitrosodiethylamine | Organic | 3.0E+00 | varies | 3.0E+00 | 2.6E-03 | 2.0E+05 | 102.14 | 1.3E-06 | 8.0E-06 | 8 0E-02 |
| 62-75-9 | Nitrosodimethylamine | Organic | 2.8E-01 | varies | 2.7E-01 | 7.1E-03 | 1.0E+06 | 74.08 | 5.3E-07 | 8 0E-06 | 8.0E-02 |
| 10595-95-6 | Nitrosomethylethylamine | Organic | 7 6E-01 | varies | 7.6E-01 | 3.0E-03 | 3.0E+05 | 88 | 8.9E-07 | 8.0E-06 | 8.0E-02 |
| 152-16-9 | Octamethylpyrophosphoramide | Organic | 3.1E-01 | varies | 3.0E-01 | 1.3E-06 | 1.0E+06 | 286.26 | 3.8E-10 | 8.0E-06 | 8.0E-02 |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

## Table A-1. Physical Chemical Properties Data for HWIR Chemicals

| CAS Number | Chemical Name | Physical-Chemical Properties: Chemical Type | Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 56-38-2 | Parathion | Organic | 5.8E+03 | varies | 6.8E+03 | 1.3E-08 | 6.5E+00 | 291.27 | 5.7E-07 | 8 0E-06 | 8.0E-02 |
| 608-93-5 | Pentachlorobenzene | Organic | 1.5E+05 | varies | 1.8E+05 | 2.2E-06 | 6.5E-01 | 250.30 | 8.4E-04 | 6.3E-06 | 6.7E-02 |
| 82-68-8 | Pentachloronitrobenzene (PCNB) | Organic | 3.6E+04 | varies | 4.4E+04 | 3.1E-06 | 3.2E-02 | 295.36 | 2.9E-02 | 8 0E-06 | 8.0E-02 |
| 87-86-5 | Pentachlorophenol* | Organic | 1.0E+05 | varies | 1.2E+05 | 7.1E-07 | 1.3E+01 | 266.00 | 1.4E-05 | 6 1E-06 | 5.6E-02 |
| 108-95-2 | Phenol | Organic | 2.9E+01 | varies | 3.0E+01 | 5.7E-04 | 9.1E+04 | 94.11 | 6.0E-07 | 9.1E-06 | 8.2E-02 |
| 62-38-4 | Phenyl mercuric acetate | Organic | 1.6E+02 | varies | 1.7E+02 | 4.0E-09 | 4.4E+03 | 336.75 | 3.1E-10 | 8.0E-06 | 8.0E-02 |
| 108-45-2 | Phenylenediamine, m- * | Organic | 1.1E+00 | varies | 1.1E+00 | 3.0E-05 | 3.5E+05 | 108.60 | 9.2E-09 | 8.0E-06 | 8.0E-02 |
| 298-02-2 | Phorate | Organic | 5.6E+03 | varies | 6.5E+03 | 1.7E-06 | 3.8E+01 | 260.40 | 1.2E-05 | 8.0E-06 | 8.0E-02 |
| 1336-36-3 | Polychlorinated biphenyls | Organic | 1.5E+06 | varies | 2.0E+06 | 1.0E-07 | 8.0E-02 | 328.00 | 4.1E-04 | 1.0E-05 | 8.0E-02 |
| 23950-58-5 | Pronamide | Organic | 2.8E+03 | varies | 3.2E+03 | 5.3E-07 | 1.5E+01 | 256.13 | 9.0E-06 | 8.0E-06 | 8.0E-02 |
| 129-00-0 | Pyrene | Organic | 1.1E+05 | varies | 1.3E+05 | 5.6E-09 | 1.4E-01 | 202.24 | 8.3E-06 | 8.0E-06 | 8.0E-02 |
| 110-86-1 | Pyridine** | Organic | 4.6E+00 | varies | 4.7E+00 | 2.6E-02 | 3.0E+02 | 79.10 | 7.0E-03 | 7.6E-06 | 9.1E-02 |
| 94-59-7 | Safrole | Organic | 4.1E+02 | varies | 4.6E+02 | 1.1E-04 | 1.5E+03 | 162.19 | 1.2E-05 | 8.0E-06 | 8.0E-02 |
| 7782-49-2 | Selenium | Metal | NA | 4.3E+00 | NA | NA | NA | NA | NA | NA | NA |
| 7440-22-4 | Silver | Metal | NA | 4.0E-01 | NA | NA | NA | NA | NA | NA | NA |
| 57-24-9 | Strychnine* | Organic | 7.9E+01 | varies | 8.5E+01 | 2.2E-13 | 1.5E+02 | 334.40 | 4.9E-13 | 8.0E-06 | 8.0E-02 |
| 100-42-5 | Styrene | Organic | 7.8E+02 | varies | 8.7E+02 | 8.2E-03 | 2.6E+02 | 104.14 | 3.3E-03 | 8.0E-06 | 7.1E-02 |
| 1746-01-6 | TCDD, 2,3,7,8- | Organic | 1.4E+07 | varies | 1.1E+07 | 9.7E-13 | 1.9E-05 | 322.00 | 9.2E-06 | 8.0E-06 | 4.7E-02 |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | Organic | 3.6E+04 | varies | 4.4E+04 | 7.1E-06 | 1.3E+00 | 215.89 | 1.2E-03 | 8.0E-06 | 8.0E-02 |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | Organic | 3.9E+02 | varies | 4.3E+02 | 1.6E-02 | 1.1E+03 | 167.85 | 2.4E-03 | 7.9E-06 | 7.1E-02 |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | Organic | 2.2E+02 | varies | 2.5E+02 | 6.8E-03 | 3.1E+03 | 167.86 | 3.7E-04 | 7.9E-06 | 7.1E-02 |
| 127-18-4 | Tetrachloroethylene | Organic | 4.2E+02 | varies | 4.7E+02 | 2.4E-02 | 2.3E+02 | 165.85 | 1.7E-02 | 8.2E-06 | 7.2E-02 |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | Organic | 1.7E+04 | varies | 2.0E+04 | 6.6E-06 | 1.0E+02 | 231.89 | 1.5E-05 | 8.0E-06 | 8.0E-02 |
| 3689-24-5 | Tetraethyldithiopyrophosphate | Organic | 5.8E+03 | varies | 6.8E+03 | 3.3E-07 | 2.5E+01 | 322.31 | 4.2E-06 | 8.0E-06 | 8.0E-02 |
| 7440-28-0 | Thallium (I) | Metal | NA | 7.4E+01 | NA | NA | NA | NA | NA | NA | NA |
| 108-88-3 | Toluene | Organic | 5.1E+02 | varies | 5.6E+02 | 3.7E-02 | 5.6E+02 | 92.15 | 6.1E-03 | 8.6E-06 | 8.7E-02 |
| 95-80-7 | Toluenediamine, 2,4- | Organic | 2.5E+00 | varies | 2.5E+00 | 1.1E-07 | 7.5E+03 | 122.17 | 1.8E-09 | 8.0E-06 | 8.0E-02 |
| 95-53-4 | Toluidine, o- * | Organic | 2.1E+01 | varies | 2.2E+01 | 3.9E-04 | 1.7E+04 | 107.15 | 2.6E-06 | 8.0E-06 | 8.0E-02 |
| 106-49-0 | Toluidine, p- * | Organic | 2.4E+01 | varies | 2.5E+01 | 4.3E-04 | 7.6E+03 | 107.15 | 6.1E-06 | 8 0E-06 | 8.0E-02 |

Knov lze under environmental conditions

Co' miscible; solubility estimated from Henry's Law Constant and Vapor Pressu.

Table A-1. Physical Chemical Properties Data for HWIR Chemicals

| CAS Number | Chemical Name | Chemical Type | Koc (mL/g) | Kd (mL/g) | Kow (unitless) | Vapor pressure (atm) | Solubility (mg/L) | Molecular weight (g/mol) | Henry's Law constant (atm-m3/mol) | Diffusivity in water (cm2/s) | Diffusivity in air (cm2/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Physical-Chemical Properties* | | | | | | | | |
| 8001-35-2 | Toxaphene | Organic | 2.6E+05 | varies | 3.2E+05 | 5.5E-09 | 6.79E-01 | 414 | 3.4E-06 | 8.0E-06 | 8.0E-02 |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | Organic | 1.3E+03 | varies | 1.4E+03 | 4.8E-01 | 1.7E+02 | 187.38 | 5.3E-01 | 8 2E-06 | 7.8E-02 |
| 120-82-1 | Trichlorobenzene, 1,2,4- | Organic | 8.8E+03 | varies | 1.0E+04 | 4.4E-04 | 3.1E+01 | 181.45 | 2.6E-03 | 8.0E-06 | 8.0E-02 |
| 71-55-6 | Trichloroethane, 1,1,1- | Organic | 2.7E+02 | varies | 3.0E+02 | 1.6E-01 | 1.2E+03 | | 1.9E-02 | 8.8E-06 | 7.8E-02 |
| 79-00-5 | Trichloroethane, 1,1,2- | Organic | 1.0E+02 | varies | 1.1E+02 | 3.3E-02 | 4.4E+03 | 133.42 | 1.0E-03 | 8 8E-06 | 7 8E-02 |
| 79-01-6 | Trichloroethylene | Organic | 4.6E+02 | varies | 5.1E+02 | 9.5E-02 | 1.2E+03 | | 1.1E-02 | 9.1E-06 | 7.9E-02 |
| 75-69-4 | Trichlorofluoromethane | Organic | 3.1E+02 | varies | 3.4E+02 | 1.1E+00 | 1.1E+03 | 137.38 | 1.3E-01 | 9.7E-06 | 8.7E-02 |
| 95-95-4 | Trichlorophenol, 2,4,5- | Organic | 6.8E+03 | varies | 7.9E+03 | 2.1E-05 | 9.7E+02 | 197.46 | 4.4E-06 | 8.0E-06 | 8.0E-02 |
| 88-06-2 | Trichlorophenol, 2,4,6- | Organic | 4.3E+03 | varies | 5 0E+03 | 1.5E-05 | 7.5E+02 | 197.46 | 4.1E-06 | 8 0E-06 | 8.0E-02 |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (2 | Organic | 1.8E+03 | varies | 2.0E+03 | 9.9E-10 | 2 8E+02 | 255.49 | 9.1E-10 | 8 0E-06 | 8.0E-02 |
| 93-72-1 | Trichlorophenoxypropionic acid, 2,4,5- | Organic | 2.3E+03 | varies | 2.6E+03 | 6.8E-09 | 1.4E+02 | 269.51 | 1.3E-08 | 8.0E-06 | 8.0E-02 |
| 96-18-4 | Trichloropropane, 1,2,3- | Organic | 1.6E+02 | varies | 1.8E+02 | 4.9E-03 | 1.9E+03 | 147.40 | 3.8E-04 | 7.9E-06 | 7.1E-02 |
| 99-35-4 | Trinitrobenzene, sym- | Organic | 1.4E+01 | varies | 1.5E+01 | 1.3E-07 | 3.2E+02 | 213.11 | 8.6E-08 | 8.0E-06 | 8.0E-02 |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | Organic | 2.8E+03 | varies | 3.2E+03 | 2.0E-07 | 4.7E+00 | 697.70 | 3.0E-05 | 8.0E-06 | 8.0E-02 |
| 7440-62-2 | Vanadium | Metal | NA | 5.0E+01 | NA | NA | NA | NA | NA | NA | NA |
| 75-01-4 | Vinyl chloride | Organic | 3.0E+01 | varies | 3.2E+01 | 3.7E+00 | 2.7E+03 | 62.50 | 8.4E-02 | 1 2E-05 | 1.1E-01 |
| 1330-20-7 | Xylenes (total) | Organic | 1.3E+03 | varies | 1.5E+03 | 1.1E-02 | 1.9E+02 | 106.17 | 6.0E-03 | 8.0E-06 | 8.0E-02 |
| 7440-66-6 | Zinc | Metal | NA | 4.0E+01 | NA | NA | NA | NA | NA | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants: RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
|---|---|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 3.2E+01 | NA | 2.1E-01 | 2.1E-01 | 7.6E+02 | 7 6E+02 |
| 67-64-1 | Acetone | 8.4E-01 | NA | 5.3E+01 | 5.3E+01 | 1.1E-01 | 1.1E-01 |
| 75-05-8 | Acetonitrile | 8.4E-01 | NA | 6.1E+01 | 6.1E+01 | 1.0E-01 | 1.0E-01 |
| 98-86-2 | Acetophenone | 1.4E+00 | NA | 4.4E+00 | 4.4E+00 | 3 0E+01 | 3.0E+01 |
| 107-02-8 | Acrolein | 8.5E-01 | NA | 3.9E+01 | 3.9E+01 | 5.8E-02 | 5.8E-02 |
| 79-06-1 | Acrylamide | 8.3E-01 | NA | 1.4E+02 | 1.4E+02 | 1.7E+03 | 1 7E+03 |
| 107-13-1 | Acrylonitrile | 8.7E-01 | NA | 2.8E+01 | 2.8E+01 | 1 0E-01 | 1.0E-01 |
| 309-00-2 | Aldrin | 3.1E+03 | NA | 6.8E-03 | 6.8E-03 | 4.6E+05 | 4.6E+05 |
| 107-05-1 | Allyl chloride | 1.2E+00 | NA | 5.6E+00 | 5.6E+00 | 1.8E-02 | 1.8E-02 |
| 62-53-3 | Aniline | 9.9E-01 | NA | 1.1E+01 | 1.1E+01 | 2.7E+01 | 2.7E+01 |
| 7440-36-0 | Antimony | NA | 3.0E-02 | 2.0E-01 | 2.0E-01 | NA | NA |
| 7440-38-2 | Arsenic | NA | 8.0E-03 | 3.6E-02 | 6.0E-02 | NA | NA |
| 7440-39-3 | Barium | NA | 1.5E-02 | 1.5E-01 | 1.5E-01 | NA | NA |
| 56-55-3 | Benz(a)anthracene | 7.4E+02 | NA | 2.0E-02 | 2 0E-02 | 2.7E+04 | 2.7E+04 |
| 71-43-2 | Benzene | 2.1E+00 | NA | 2.3E+00 | 2.3E+00 | 1.9E-01 | 1.9E-01 |
| 92-87-5 | Benzidine* | 1.4E+00 | NA | 4.3E+00 | 4.3E+00 | 8.4E+06 | 8.4E+06 |
| 50-32-8 | Benzo(a)pyrene | 1.5E+03 | NA | 1.1E-02 | 1.1E-02 | 4.7E+04 | 4 7E+04 |
| 205-99-2 | Benzo(b)fluoranthene | 1.8E+03 | NA | 1.0E-02 | 1.0E-02 | 2.0E+04 | 2.0E+04 |
| 100-51-6 | Benzyl alcohol | 1.0E+00 | NA | 8.8E+00 | 8.8E+00 | 2.2E+02 | 2.2E+02 |
| 100-44-7 | Benzyl chloride | 2.6E+00 | NA | 1.8E+00 | 1.8E+00 | 3.9E+00 | 3.9E+00 |
| 7440-41-7 | Beryllium | NA | 1.5E-03 | 1.0E-02 | 1.0E-02 | NA | NA |
| 39638-32-9 | Bis (2-chloroisopropyl) ether | 3.7E+00 | NA | 1.2E+00 | 1.2E+00 | 3.0E+01 | 3.0E+01 |
| 111-44-4 | Bis(2-chlorethyl)ether | 1.1E+00 | NA | 7.7E+00 | 7.7E+00 | 5.1E+00 | 5.1E+00 |
| 117-81-7 | Bis(2-ethylhexyl)phthalate | 1.3E+04 | NA | 2,3E-03 | 2.3E-03 | 1.0E+06 | 1.0E+06 |
| 75-27-4 | Bromodichloromethane | 2.1E+00 | NA | 2.4E+00 | 2.4E+00 | 3.0E-01 | 3.0E-01 |
| 75-25-2 | Bromoform (Tribromomethane) | 2.8E+00 | NA | 1.7E+00 | 1.7E+00 | 2.9E+00 | 2.9E+00 |
| 71-36-3 | Butanol | 9.4E-01 | NA | 1.3E+01 | 1.3E+01 | 4.7E+00 | 4.7E+00 |
| 88-85-7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinose | 8.7E+00 | NA | 5.9E-01 | 5.9E-01 | 2.7E+01 | 2.7E+01 |
| 85-68-7 | Butylbenzylphthalate | 1.6E+02 | NA | 6 2E-02 | 6 2E-02 | 4.2E+05 | 4 2E+05 |

* Known ... ize under environmental conditions

** Con ... miscible; solubility estimated from Henry's Law Constant and Vapor Pressur

Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants | | | | | |
|---|---|---|---|---|---|---|---|
| | | RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
| 7440-43-9 | Cadmium | NA | 6.4E-02 | 3.6E-01 | 1.4E-01 | NA | NA |
| 75-15-0 | Carbon disulfide | 1.9E+00 | NA | 2.7E+00 | 2.7E+00 | 5.9E-02 | 5.9E-02 |
| 56-23-5 | Carbon tetrachloride | 4.6E+00 | NA | 1.0E+00 | 1.0E+00 | 1.6E-01 | 1.6E-01 |
| 57-74-9 | Chlordane | 2.2E+03 | NA | 8.6E-03 | 8.6E-03 | 4.5E+05 | 4.5E+05 |
| 126-99-8 | Chloro-1,3-butadiene, 2- (Chloroprene | 2.0E+00 | NA | 2.4E+00 | 2.4E+00 | 2.3E-02 | 2.3E-02 |
| 106-47-8 | Chloroaniline, p- | 1.6E+00 | NA | 3.3E+00 | 3.3E+00 | 4.9E+00 | 4.9E+00 |
| 108-90-7 | Chlorobenzene | 5.6E+00 | NA | 8.6E-01 | 8.6E-01 | 1.4E+00 | 1.4E+00 |
| 510-15-6 | Chlorobenzilate | 7.2E+01 | NA | 1.1E-01 | 1.1E-01 | 2.1E+06 | 2.1E+06 |
| 124-48-1 | Chlorodibromomethane | 2.2E+00 | NA | 2.2E+00 | 2.2E+00 | 4.6E-01 | 4.6E-01 |
| 67-66-3 | Chloroform | 1 7E+00 | NA | 3.0E+00 | 3.0E+00 | 1.5E-01 | 1.5E-01 |
| 95-57-8 | Chlorophenol, 2- | 2.2E+00 | NA | 2.2E+00 | 2.2E+00 | 6.6E+01 | 6.6E+01 |
| 7440-47-3 | Chromium VI | NA | 4.5E-03 | 7.5E-03 | 7.5E-03 | NA | NA |
| 218-01-9 | Chrysene | 7.4E+02 | NA | 2.0E-02 | 2.0E-02 | 2.5E+04 | 2.5E+04 |
| 7440-50-8 | Copper | NA | 2.5E-01 | 4.0E-01 | 2.4E-02 | NA | NA |
| 108-39-4 | Cresol, m- | 1.8E+00 | NA | 2.8E+00 | 2.8E+00 | 7.9E+02 | 7.9E+02 |
| 95-48-7 | Cresol, o- | 1.8E+00 | NA | 2.7E+00 | 2.7E+00 | 4.5E+02 | 4.5E+02 |
| 106-44-5 | Cresol, p- | 1.8E+00 | NA | 2.9E+00 | 2.9E+00 | 8.2E+02 | 8.2E+02 |
| 98-82-8 | Cumene | 1.8E+01 | NA | 3.3E-01 | 3.3E-01 | 2.8E+00 | 2.8E+00 |
| 72-54-8 | DDD | 1.5E+03 | NA | 1.2E-02 | 1.2E-02 | 3.5E+06 | 3.5E+06 |
| 72-55-9 | DDE | 4.8E+03 | NA | 4.8E-03 | 4.8E-03 | 7.2E+05 | 7.2E+05 |
| 50-29-3 | DDT | 3.2E+03 | NA | 6.5E-03 | 6.5E-03 | 9.4E+05 | 9.4E+05 |
| 84-74-2 | Di-n-butyl phthalate | 1.1E+02 | NA | 8.4E-02 | 8.4E-02 | 3.2E+05 | 3.2E+05 |
| 117-84-0 | Di-n-octyl phthalate | 4.9E+04 | NA | 8.5E-04 | 8.5E-04 | 9.3E+05 | 9.3E+05 |
| 2303-16-4 | Diallate | 8.7E+01 | NA | 9.8E-02 | 9.8E-02 | 8.9E+04 | 8.9E+04 |
| 53-70-3 | Dibenz(a,h)anthracene | 4.3E+03 | NA | 5.3E-03 | 5.3E-03 | 1.7E+08 | 1.7E+08 |
| 96-12-8 | Dibromo-3-chloropropane, 1,2- | 2.7E+00 | NA | 1.7E+00 | 1.7E+00 | 8.7E+00 | 8.7E+00 |
| 95-50-1 | Dichlorobenzene, 1,2- | 1.4E+01 | NA | 4.0E-01 | 4 0E-01 | 1.2E+01 | 1 2E+01 |
| 106-46-7 | Dichlorobenzene, 1,4- | 1.4E+01 | NA | 4.1E-01 | 4 1E-01 | 8.7E+00 | 8.7E+00 |
| 91-94-1 | Dichlorobenzidine, 3,3 | 1.6E+01 | NA | 3.6E-01 | 3 6E-01 | 1.5E+06 | 1.5E+06 |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants | | | | | |
|---|---|---|---|---|---|---|---|
| | | RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
| 75-71-8 | Dichlorodifluoromethane | 2.2E+00 | NA | 2.2E+00 | 2.2E+00 | 4.3E-04 | 4.3E-04 |
| 75-34-3 | Dichloroethane, 1,1- | 1.5E+00 | NA | 3.6E+00 | 3.6E+00 | 7.8E-02 | 7.8E-02 |
| 107-06-2 | Dichloroethane, 1,2- | 1.2E+00 | NA | 5.5E+00 | 5.5E+00 | 1 6E-01 | 1.6E-01 |
| 75-35-4 | Dichloroethylene, 1,1- | 2.1E+00 | NA | 2.3E+00 | 2.3E+00 | 4.1E-02 | 4.1E-02 |
| 156-59-2 | Dichloroethylene, cis-1,2- | 1.6E+00 | NA | 3.3E+00 | 3.3E+00 | 1.2E-01 | 1.2E-01 |
| 156-60-5 | Dichloroethylene, trans-1,2- | 2.0E+00 | NA | 2.5E+00 | 2.5E+00 | 1.6E-01 | 1.6E-01 |
| 120-83-2 | Dichlorophenol, 2,4- | 7.9E+00 | NA | 6.4E-01 | 6.4E-01 | 4.5E+04 | 4.5E+04 |
| 94-75-7 | Dichlorophenoxyacetic acid, 2,4- (2,4- | 4.4E+00 | NA | 1.1E+00 | 1.1E+00 | 9.4E+02 | 9.4E+02 |
| 78-87-5 | Dichloropropane, 1,2- | 1.8E+00 | NA | 2.8E+00 | 2.8E+00 | 2.5E-01 | 2.5E-01 |
| 542-75-6 | Dichloropropene, 1,3- | 1.9E+00 | NA | 2.7E+00 | 2.7E+00 | 2.6E-01 | 2.6E-01 |
| 10061-01-5 | Dichloropropene, cis-1,3- | 1.9E+00 | NA | 2.7E+00 | 2.7E+00 | 3.8E-01 | 3.8E-01 |
| 10061-02-6 | Dichloropropene, trans-1,3- | 1.9E+00 | NA | 2.7E+00 | 2.7E+00 | 4.8E-01 | 4.8E-01 |
| 60-57-1 | Dieldrin | 4.1E+02 | NA | 3.0E-02 | 3.0E-02 | 1.1E+06 | 1.1E+06 |
| 84-66-2 | Diethyl phthalate | 3.4E+00 | NA | 1.4E+00 | 1.4E+00 | 4.7E+03 | 4.7E+03 |
| 56-53-1 | Diethylstilbestrol | 2.4E+02 | NA | 4.5E-02 | 4.5E-02 | 4.7E+13 | 4.7E+13 |
| 60-51-5 | Dimethoate | 9.2E-01 | NA | 1.5E+01 | 1.5E+01 | 4.9E+05 | 4.9E+05 |
| 131-11-3 | Dimethyl phthalate | 1.3E+00 | NA | 4.8E+00 | 4.8E+00 | 4.5E+02 | 4.5E+02 |
| 57-97-6 | Dimethylbenz(a)anthracene, 7,12- | 3.8E+03 | NA | 5.8E-03 | 5.8E-03 | 8.1E+07 | 8.1E+07 |
| 119-93-7 | Dimethylbenzidine, 3,3'- * | 4.3E+00 | NA | 1.1E+00 | 1.1E+00 | 4 7E+07 | 4.7E+07 |
| 105-67-9 | Dimethylphenol, 2,4- * | 2 8E+00 | NA | 1.7E+00 | 1.7E+00 | 5.6E+02 | 5.6E+02 |
| 119-90-4 | Dimethyoxybenzidine, 3,3'- * | 1.6E+00 | NA | 3.5E+00 | 3.5E+00 | 1 4E+06 | 1.4E+06 |
| 99-65-0 | Dinitrobenzene, 1,3- | 1.3E+00 | NA | 5.3E+00 | 5.3E+00 | 1.8E+03 | 1.8E+03 |
| 51-28-5 | Dinitrophenol, 2,4- | 1.3E+00 | NA | 4.9E+00 | 4.9E+00 | 5.2E+04 | 5.2E+04 |
| 121-14-2 | Dinitrotoluene, 2,4- | 1.9E+00 | NA | 2.7E+00 | 2.7E+00 | 5 3E+03 | 5.3E+03 |
| 606-20-2 | Dinitrotoluene, 2,6- | 1.7E+00 | NA | 3.2E+00 | 3.2E+00 | 4.2E+03 | 4.2E+03 |
| 123-91-1 | Dioxane, 1,4- ** | 8.4E-01 | NA | 6.5E+01 | 6.5E+01 | 4.4E-01 | 4.4E-01 |
| 122-39-4 | Diphenylamine* | 1.5E+01 | NA | 3.8E-01 | 3.8E-01 | 9 0E+03 | 9.0E+03 |
| 298-04-4 | Disulfoton | 3 6E+01 | NA | 1.9E-01 | 1.9E-01 | 1.6E+04 | 1.6E+04 |
| 115-29-7 | Endosulfan | 4.4E+01 | NA | 1.7E-01 | 1.7E-01 | 5.6E+03 | 5.6E+03 |

Kno )nize under environmental conditions

C miscible; solubility estimated from Henry's Law Constant and Vapor Pressi

Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants: RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
|---|---|---|---|---|---|---|---|
| 72-20-8 | Endrin | 2.4E+02 | NA | 4.6E-02 | 4.6E-02 | 1.2E+06 | 1.2E+06 |
| 106-89-8 | Epichlorohydrin | 8.7E-01 | NA | 2.8E+01 | 2.8E+01 | 3.4E-01 | 3.4E-01 |
| 110-80-5 | Ethoxyethanol, 2- ** | 8.5E-01 | NA | 4.4E+01 | 4.4E+01 | 8 6E-05 | 8 6E-05 |
| 141-78-6 | Ethyl acetate | 9.2E-01 | NA | 1.5E+01 | 1.5E+01 | 1.8E-01 | 1.8E-01 |
| 60-29-7 | Ethyl ether | 9.5E-01 | NA | 1.3E+01 | 1.3E+01 | 4.9E-02 | 4.9E-02 |
| 97-63-2 | Ethyl methacrylate | 1.3E+00 | NA | 4.7E+00 | 4.7E+00 | 2.0E+00 | 2.0E+00 |
| 62-50-0 | Ethyl methanesulfonate | 8.5E-01 | NA | 3.6E+01 | 3.6E+01 | 7.2E+01 | 7.2E+01 |
| 100-41-4 | Ethylbenzene | 8.7E+00 | NA | 5.9E-01 | 5.9E-01 | 1.6E+00 | 1.6E+00 |
| 106-93-4 | Ethylene Dibromide | 1.5E+00 | NA | 3.8E+00 | 3.8E+00 | 8.8E-01 | 8.8E-01 |
| 96-45-7 | Ethylene thiourea | 8.3E-01 | NA | 9.3E+01 | 9.3E+01 | 1 2E+00 | 1.2E+00 |
| 206-44-0 | Fluoranthene | 2.7E+02 | NA | 4.3E-02 | 4.3E-02 | 3.5E+03 | 3.5E+03 |
| 86-73-7 | Fluorene | 5.4E+01 | NA | 1.4E-01 | 1.4E-01 | 2.3E+03 | 2.3E+03 |
| 50-00-0 | Formaldehyde | 8.5E-01 | NA | 4.1E+01 | 4.1E+01 | 1.8E-02 | 1.8E-02 |
| 64-18-6 | Formic Acid* | 8.3E-01 | NA | 7.9E+01 | 7.9E+01 | 5.9E-01 | 5.9E-01 |
| 110-00-9 | Furan | 1.1E+00 | NA | 6.5E+00 | 6.5E+00 | 2.8E-02 | 2.8E-02 |
| 76-44-8 | Heptachlor | 2.0E+03 | NA | 9.3E-03 | 9.3E-03 | 4.4E+04 | 4.4E+04 |
| 1024-57-3 | Heptachlor epoxide | 2.1E+02 | NA | 5.0E-02 | 5 0E-02 | 1.4E+05 | 1 4E+05 |
| 87-68-3 | Hexachloro-1,3-butadiene | 1.5E+02 | NA | 6.4E-02 | 6.4E-02 | 3.1E+01 | 3.1E+01 |
| 118-74-1 | Hexachlorobenzene | 1.0E+03 | NA | 1.5E-02 | 1.5E-02 | 3.5E+02 | 3.5E+02 |
| 319-84-6 | Hexachlorocyclohexane, alpha- (alpha | 2.6E+01 | NA | 2.5E-01 | 2.5E-01 | 9.2E+03 | 9.2E+03 |
| 319-85-7 | Hexachlorocyclohexane, beta- (beta-B | 2.7E+01 | NA | 2.4E-01 | 2.4E-01 | 1.8E+05 | 1.8E+05 |
| 58-89-9 | Hexachlorocyclohexane, gamma- (Lin | 2.3E+01 | NA | 2.7E-01 | 2.7E-01 | 1.5E+04 | 1.5E+04 |
| 77-47-4 | Hexachlorocyclopentadiene | 4.3E+02 | NA | 3.0E-02 | 3.0E-02 | 1.8E+02 | 1.8E+02 |
| 67-72-1 | Hexachloroethane | 3.7E+01 | NA | 1.9E-01 | 1.9E-01 | 2.8E+01 | 2.8E+01 |
| 70-30-4 | Hexachlorophene* | 1.9E+04 | NA | 1.7E-03 | 1.7E-03 | 1.2E+12 | 1.2E+12 |
| 193-39-5 | Indeno(1,2,3-cd) pyrene | 4.0E+03 | NA | 5.6E-03 | 5.6E-03 | 5.4E+04 | 5.4E+04 |
| 78-83-1 | Isobutyl alcohol | 9.3E-01 | NA | 1.4E+01 | 1.4E+01 | 2.6E+00 | 2.6E+00 |
| 78-59-1 | Isophorone | 1.4E+00 | NA | 4.0E+00 | 4.0E+00 | 5 8E+01 | 5.8E+01 |
| 143-50-0 | Kepone | 3.6E+02 | NA | 3.3E-02 | 3.3E-02 | 9.7E+07 | 9 7E+07 |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants: RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
|---|---|---|---|---|---|---|---|
| 7439-92-1 | Lead | NA | 9.0E-03 | 1.3E-05 | 1.3E-05 | NA | NA |
| 7439-97-6 | Mercury | 1.4E-02 | NA | 8.0E-03 | 2.0E-03 | 2.3E-04 | 2.3E-04 |
| 126-98-7 | Methacrylonitrile | 9.0E-01 | NA | 1.9E+01 | 1.9E+01 | 9.0E-02 | 9.0E-02 |
| 67-56-1 | Methanol | 8.3E-01 | NA | 1.0E+02 | 1.0E+02 | 5 6E-03 | 5.6E-03 |
| .72-43-5 | Methoxychlor | 2.5E+02 | NA | 4.5E-02 | 4.5E-02 | 2.3E+05 | 2.3E+05 |
| 74-83-9 | Methyl bromide (Bromomethane) | 1.1E+00 | NA | 7.9E+00 | 7.9E+00 | 7.3E-03 | 7.3E-03 |
| 74-87-3 | Methyl chloride (Chloromethane) | 9.7E-01 | NA | 1.2E+01 | 1.2E+01 | 1.2E-03 | 1.2E-03 |
| 78-93-3 | Methyl ethyl ketone | 8.7E-01 | NA | 2.7E+01 | 2.7E+01 | 3.1E-01 | 3.1E-01 |
| 108-10-1 | Methyl isobutyl ketone | 1.1E+00 | NA | 7.9E+00 | 7.9E+00 | 8.5E-01 | 8.5E-01 |
| 80-62-6 | Methyl methacrylate | 1.2E+00 | NA | 6.2E+00 | 6.2E+00 | 5.1E-01 | 5.1E-01 |
| 298-00-0 | Methyl parathion | 6.0E+00 | NA | 8.2E-01 | 8.2E-01 | 6.4E+04 | 6.4E+04 |
| 56-49-5 | Methylcholanthrene, 3- | 2.7E+03 | NA | 7.5E-03 | 7.5E-03 | 6.7E+05 | 6.7E+05 |
| 74-95-3 | Methylene bromide | 1.4E+00 | NA | 4.5E+00 | 4.5E+00 | 3 3E-01 | 3.3E-01 |
| 75-09-2 | Methylene chloride | 1.1E+00 | NA | 7.3E+00 | 7.3E+00 | 5.1E-02 | 5 1E-02 |
| 7439-98-7 | Molybdenum | NA | 6.0E-02 | 2.5E-01 | 8.5E-01 | NA | NA |
| 621-64-7 | N-Nitrosodi-n-propylamine | 1.2E+00 | NA | 6.0E+00 | 6.0E+00 | 4.2E+00 | 4 2E+00 |
| 86-30-6 | N-Nitrosodiphenylamine | 9.0E+00 | NA | 5.8E-01 | 5.8E-01 | 1.9E+01 | 1.9E+01 |
| 100-75-4 | N-Nitrosopiperidine | 9.1E-01 | NA | 1.7E+01 | 1.7E+01 | 1.8E+02 | 1.8E+02 |
| 930-55-2 | N-Nitrosopyrrolidine | 8.4E-01 | NA | 5.0E+01 | 5.0E+01 | 1 2E+02 | 1.2E+02 |
| 91-20-3 | Naphthalene | 1.2E+01 | NA | 4.4E-01 | 4.4E-01 | 4.4E+01 | 4 4E+01 |
| 91-59-8 | Naphthylamine* | 2.5E+00 | NA | 1.9E+00 | 1.9E+00 | 4.9E+02 | 4.9E+02 |
| 7440-02-0 | Nickel | NA | 8.0E-03 | 3.2E-02 | 1.1E-01 | NA | NA |
| 98-95-3 | Nitrobenzene | 1.6E+00 | NA | 3.3E+00 | 3.3E+00 | 2.5E+01 | 2.5E+01 |
| 79-46-9 | Nitropropane, 2- * | 9.6E-01 | NA | 1.2E+01 | 1.2E+01 | 3.8E+00 | 3.8E+00 |
| 924-16-3 | Nitrosodi-n-butylamine | 3.0E+00 | NA | 1.6E+00 | 1.6E+00 | 3.8E+01 | 3.8E+01 |
| 55-18-5 | Nitrosodiethylamine | 8.9E-01 | NA | 2.0E+01 | 2.0E+01 | 1.4E+01 | 1.4E+01 |
| 62-75-9 | Nitrosodimethylamine | 8.3E-01 | NA | 8.3E+01 | 8.3E+01 | 2.6E+00 | 2.6E+00 |
| 10595-95-6 | Nitrosomethylethylamine | 8.4E-01 | NA | 4.5E+01 | 4.5E+01 | 4.7E+00 | 4.7E+00 |
| 152-16-9 | Octamethylpyrophosphoramide | 8.3E-01 | NA | 7.7E+01 | 7.7E+01 | 4.1E+03 | 4.1E+03 |

* Kno nize under environmental conditions

** C· miscible; solubility estimated from Henry's Law Constant and Vapor Pressu

## Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants | | | | | |
|---|---|---|---|---|---|---|---|
| | | RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
| 56-38-2 | Parathion | 2.8E+01 | NA | 2.4E-01 | 2.4E-01 | 1.2E+05 | 1.2E+05 |
| 608-93-5 | Pentachlorobenzene | 3.4E+02 | NA | 3.5E-02 | 3.5E-02 | 2.7E+03 | 2.7E+03 |
| 82-68-8 | Pentachloronitrobenzene (PCNB) | 1.1E+02 | NA | 8.1E-02 | 8.1E-02 | 1.7E+01 | 1.7E+01 |
| 87-86-5 | Pentachlorophenol* | 2.5E+02 | NA | 4.4E-02 | 4.4E-02 | 2.6E+03 | 2.6E+03 |
| 108-95-2 | Phenol | 1.2E+00 | NA | 5.4E+00 | 5.4E+00 | 3.5E+02 | 3.5E+02 |
| 62-38-4 | Phenyl mercuric acetate | 2.4E+00 | NA | 2.0E+00 | 2.0E+00 | 4.3E+06 | 4.3E+06 |
| 108-45-2 | Phenylenediamine, m- * | 8.5E-01 | NA | 3.6E+01 | 3.6E+01 | 6.9E+02 | 6.9E+02 |
| 298-02-2 | Phorate | 2.7E+01 | NA | 2.4E-01 | 2.4E-01 | 5.5E+03 | 5.5E+03 |
| 1336-36-3 | Polychlorinated biphenyls | 2.1E+03 | NA | 8.9E-03 | 8.9E-03 | 1.7E+03 | 1.7E+03 |
| 23950-58-5 | Pronamide | 1.6E+01 | NA | 3.6E-01 | 3.6E-01 | 3.4E+03 | 3.4E+03 |
| 129-00-0 | Pyrene | 2.6E+02 | NA | 4.3E-02 | 4.3E-02 | 3.7E+03 | 3.7E+03 |
| 110-86-1 | Pyridine** | 9.2E-01 | NA | 1.6E+01 | 1.6E+01 | 4.1E-03 | 4.1E-03 |
| 94-59-7 | Safrole | 4.2E+00 | NA | 1.1E+00 | 1.1E+00 | 3.1E+02 | 3.1E+02 |
| 7782-49-2 | Selenium | NA | 2.2E-02 | 1.6E-02 | 6.0E-03 | NA | NA |
| 7440-22-4 | Silver | NA | 1.0E-01 | 4.0E-01 | 4.0E-01 | NA | NA |
| 57-24-9 | Strychnine* | 1.7E+00 | NA | 3.0E+00 | 3.0E+00 | 1.3E+09 | 1.3E+09 |
| 100-42-5 | Styrene | 6.4E+00 | NA | 7.7E-01 | 7.7E-01 | 2.3E+00 | 2.3E+00 |
| 1746-01-6 | TCDD, 2,3,7,8- | 1.2E+04 | NA | 3.3E-03 | 3.3E-03 | 4.6E+05 | 4.6E+05 |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | 1.1E+02 | NA | 8.1E-02 | 8.1E-02 | 4.0E+02 | 4 0E+02 |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | 4.0E+00 | NA | 1.2E+00 | 1.2E+00 | 1.5E+00 | 1.5E+00 |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | 2.9E+00 | NA | 1.6E+00 | 1.6E+00 | 5.3E+00 | 5.3E+00 |
| 127-18-4 | Tetrachloroethylene | 4.3E+00 | NA | 1.1E+00 | 1.1E+00 | 2.3E-01 | 2.3E-01 |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | 6.3E+01 | NA | 1.3E-01 | 1.3E-01 | 3.4E+02 | 3.4E+02 |
| 3689-24-5 | Tetraethyldithiopyrophosphate | 2.8E+01 | NA | 2.4E-01 | 2.4E-01 | 1.6E+04 | 1.6E+04 |
| 7440-28-0 | Thallium (I) | NA | 4.0E-04 | 4.0E-03 | 4.0E-03 | NA | NA |
| 108-88-3 | Toluene | 4.8E+00 | NA | 1.0E+00 | 1 0E+00 | 7.7E-01 | 7.7E-01 |
| 95-80-7 | Toluenediamine, 2,4- | 8.8E-01 | NA | 2.3E+01 | 2.3E+01 | 8.2E+03 | 8.2E+03 |
| 95-53-4 | Toluidine, o- * | 1.1E+00 | NA | 6.5E+00 | 6.5E+00 | 5.8E+01 | 5.8E+01 |
| 106-49-0 | Toluidine, p- * | 1.2E+00 | NA | 6.0E+00 | 6.0E+00 | 2.8E+01 | 2.8E+01 |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-2. Biotransfer Factors for Plants for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Plants | | | | | |
|---|---|---|---|---|---|---|---|
| | | RCF (ug/g WW plant)/(ug/mL soil water) | Br - root veg (ug/g DW plant)/(ug/g soil) | Br - leafy veg (ug/g DW plant)/(ug/g soil) | Br - forage (ug/g DW plant)/(ug/g soil) | Bv - leafy veg (ug/g DW plant)/(ug/g air) | Bv - forage (ug/g DW plant)/(ug/g air) |
| 8001-35-2 | Toxaphene | 5.2E+02 | NA | 2.6E-02 | 2.6E-02 | 1.2E+06 | 1.2E+06 |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | 9.0E+00 | NA | 5.8E-01 | 5.8E-01 | 2.5E-02 | 2.5E-02 |
| 120-82-1 | Trichlorobenzene, 1,2,4- | 3.8E+01 | NA | 1.9E-01 | 1.9E-01 | 4.0E+01 | 4.0E+01 |
| 71-55-6 | Trichloroethane, 1,1,1- | 3.3E+00 | NA | 1.4E+00 | 1.4E+00 | 1.3E-01 | 1.3E-01 |
| 79-00-5 | Trichloroethane, 1,1,2- | 2.0E+00 | NA | 2.5E+00 | 2.5E+00 | 8.5E-01 | 8.5E-01 |
| 79-01-6 | Trichloroethylene | 4.5E+00 | NA | 1.1E+00 | 1.1E+00 | 4.1E-01 | 4.1E-01 |
| 75-69-4 | Trichlorofluoromethane | 3.5E+00 | NA | 1.3E+00 | 1.3E+00 | 2.1E-02 | 2.1E-02 |
| 95-95-4 | Trichlorophenol, 2,4,5- | 3.1E+01 | NA | 2.2E-01 | 2.2E-01 | 1.8E+04 | 1.8E+04 |
| 88-06-2 | Trichlorophenol, 2,4,6- | 2.2E+01 | NA | 2.8E-01 | 2.8E-01 | 1.2E+04 | 1.2E+04 |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (2 | 1.2E+01 | NA | 4.7E-01 | 4.7E-01 | 2.1E+07 | 2.1E+07 |
| 93-72-1 | Trichlorophenoxypropionic acid, 2,4,5- | 1.4E+01 | NA | 4.1E-01 | 4.1E-01 | 1.8E+06 | 1.8E+06 |
| 96-18-4 | Trichloropropane, 1,2,3- | 2.5E+00 | NA | 1.9E+00 | 1.9E+00 | 3.7E+00 | 3.7E+00 |
| 99-35-4 | Trinitrobenzene, sym- | 1.1E+00 | NA | 8.1E+00 | 8.1E+00 | 1.2E+03 | 1.2E+03 |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | 1.6E+01 | NA | 3.6E-01 | 3.6E-01 | 1.0E+03 | 1.0E+03 |
| 7440-62-2 | Vanadium | NA | 3 0E-03 | 5.5E-03 | 5.5E-03 | NA | NA |
| 75-01-4 | Vinyl chloride | 1.3E+00 | NA | 5.3E+00 | 5.3E+00 | 2.6E-03 | 2.6E-03 |
| 1330-20-7 | Xylenes (total) | 9.2E+00 | NA | 5.7E-01 | 5.7E-01 | 2.2E+00 | 2.2E+00 |
| 7440-66-6 | Zinc | NA | 4.4E-02 | 2.5E-01 | 9.6E-02 | NA | NA |

* Knov ze under environmental conditions

** Co- miscible; solubility estimated from Henry's Law Constant and Vapor Pressur

## Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 83-32-9 | Acenaphthene | 2.1E-04 | 6.6E-05 | NA | NA | NA | 2.9E+02 | NA |
| 67-64-1 | Acetone | 1.4E-08 | 4.6E-09 | NA | NA | NA | 1.7E-01 | NA |
| 75-05-8 | Acetonitrile | 1.1E-08 | 3.6E-09 | NA | NA | NA | 1 4E-01 | NA |
| 98-86-2 | Acetophenone | 1.1E-06 | 3.5E-07 | NA | NA | NA | 6.2E+00 | NA |
| 107-02-8 | Acrolein | 2.5E-08 | 7.8E-09 | NA | NA | NA | 3.3E-01 | NA |
| 79-06-1 | Acrylamide | 2.8E-09 | 8.7E-10 | NA | NA | NA | 7.7E-02 | NA |
| 107-13-1 | Acrylonitrile | 4.5E-08 | 1.4E-08 | NA | NA | NA | 6.0E-01 | NA |
| 309-00-2 | Aldrin | 7.9E-02 | 2.5E-02 | NA | NA | 2.1E+06 | NA | NA |
| 107-05-1 | Allyl chloride | 7.1E-07 | 2.2E-07 | NA | NA | NA | 3.7E+00 | NA |
| 62-53-3 | Aniline | 2.4E-07 | 7.6E-08 | NA | NA | NA | 1.6E+00 | NA |
| 7440-36-0 | Antimony | 1.0E-03 | 1.0E-04 | NA | NA | NA | 0.0E+00 | NA |
| 7440-38-2 | Arsenic | 2 0E-03 | 6.0E-03 | NA | NA | NA | 1.8E+01 | NA |
| 7440-39-3 | Barium | 1.5E-04 | 3.5E-04 | NA | NA | NA | NA | NA |
| 56-55-3 | Benz(a)anthracene | 1.3E-02 | 4.0E-03 | NA | NA | 4.0E+01 | NA | NA |
| 71-43-2 | Benzene | 3.4E-06 | 1.1E-06 | NA | NA | NA | 4.3E+00 | NA |
| 92-87-5 | Benzidine* | 1.1E-06 | 3.6E-07 | NA | NA | NA | 3.0E+00 | NA |
| 50-32-8 | Benzo(a)pyrene | 3.2E-02 | 1.0E-02 | NA | NA | 1.0E+03 | NA | NA |
| 205-99-2 | Benzo(b)fluoranthene | 4.0E-02 | 1.3E-02 | NA | NA | 1.0E+03 | NA | NA |
| 100-51-6 | Benzyl alcohol | 3.2E-07 | 1.0E-07 | NA | NA | NA | 1.9E+00 | NA |
| 100-44-7 | Benzyl chloride | 5.0E-06 | 1.6E-06 | NA | NA | NA | 1.7E+01 | NA |
| 7440-41-7 | Beryllium | 1.0E-03 | 9.0E-07 | NA | NA | NA | 9.5E+01 | NA |
| 39638-32-9 | Bis (2-chloroisopropyl) ether | 9.5E-06 | 3.0E-06 | NA | NA | NA | 2 9E+01 | NA |
| 111-44-4 | Bis(2-chlorethyl)ether | 4.1E-07 | 1.3E-07 | NA | NA | NA | 3.7E+00 | NA |
| 117-81-7 | Bis(2-ethylhexyl)phthalate | 5.0E-01 | 1.6E-01 | NA | NA | 1.2E+02 | NA | NA |
| 75-27-4 | Bromodichloromethane | 3.2E-06 | 1.0E-06 | NA | NA | NA | 1.0E+01 | NA |
| 75-25-2 | Bromoform (Tribromomethane) | 5.6E-06 | 1.8E-06 | NA | NA | NA | 1 9E+01 | NA |
| 71-36-3 | Butanol | 1.6E-07 | 5.0E-08 | NA | NA | NA | 1 2E+00 | NA |
| 88-85-7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinose | 3.5E-05 | 1.1E-05 | NA | NA | NA | 8.0E+01 | NA |
| 85-68-7 | Butylbenzylphthalate | 1.7E-03 | 5.5E-04 | NA | NA | 1.4E+03 | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 7440-43-9 | Cadmium | 1.6E-04 | 1.0E-05 | NA | NA | NA | 3.2E+01 | NA |
| 75-15-0 | Carbon disulfide | 2.5E-06 | 7.9E-07 | NA | NA | NA | 1.0E+01 | NA |
| 56-23-5 | Carbon tetrachloride | 1.3E-05 | 4.3E-06 | NA | NA | NA | 1.7E+01 | NA |
| 57-74-9 | Chlordane | 5.2E-02 | 1.7E-02 | NA | NA | 4.8E+05 | NA | NA |
| 126-99-8 | Chloro-1,3-butadiene, 2- (Chloroprene | 3.0E-06 | 9.5E-07 | NA | NA | NA | 1.1E+01 | NA |
| 106-47-8 | Chloroaniline, p- | 1.8E-06 | 5.6E-07 | NA | NA | NA | 7.9E+00 | NA |
| 108-90-7 | Chlorobenzene | 1.8E-05 | 5.8E-06 | NA | NA | NA | 1.9E+01 | NA |
| 510-15-6 | Chlorobenzilate | 6.0E-04 | 1.9E-04 | NA | NA | 1.3E+03 | NA | NA |
| 124-48-1 | Chlorodibromomethane | 3.7E-06 | 1.2E-06 | NA | NA | NA | 1.4E+01 | NA |
| 67-66-3 | Chloroform | 2.1E-06 | 6.6E-07 | NA | NA | NA | 2.8E+00 | NA |
| 95-57-8 | Chlorophenol, 2- | 3.5E-06 | 1.1E-06 | NA | NA | NA | 1.3E+01 | NA |
| 7440-47-3 | Chromium VI | 5.5E-03 | 1.5E-03 | NA | NA | NA | 3.0E+00 | NA |
| 218-01-9 | Chrysene | 1.3E-02 | 4.0E-03 | NA | NA | 4.0E+01 | NA | NA |
| 7440-50-8 | Copper | 1.0E-02 | 1.5E-03 | NA | NA | NA | 0.0E+00 | NA |
| 108-39-4 | Cresol, m- | 2.3E-06 | 7.4E-07 | NA | NA | NA | 9.3E+00 | NA |
| 95-48-7 | Cresol, o- | 2 5E-06 | 7.8E-07 | NA | NA | NA | 1.0E+01 | NA |
| 106-44-5 | Cresol, p- | 2.2E-06 | 7.1E-07 | NA | NA | NA | 8.9E+00 | NA |
| 98-82-8 | Cumene | 9.5E-05 | 3.0E-05 | NA | NA | NA | 1.9E+02 | NA |
| 72-54-8 | DDD | 3.2E-02 | 1.0E-02 | NA | NA | 1.2E+06 | NA | NA |
| 72-55-9 | DDE | 1.4E-01 | 4.6E-02 | NA | NA | 7.6E+06 | NA | NA |
| 50-29-3 | DDT | 8 5E-02 | 2.7E-02 | NA | NA | 1.9E+06 | NA | NA |
| 84-74-2 | Di-n-butyl phthalate | 1.0E-03 | 3.2E-04 | NA | NA | 1.5E+03 | NA | NA |
| 117-84-0 | Di-n-octyl phthalate | 2.9E+00 | 9.1E-01 | NA | NA | 1.2E+02 | NA | NA |
| 2303-16-4 | Diallate | 7.8E-04 | 2.5E-04 | NA | NA | 1.8E+04 | NA | NA |
| 53-70-3 | Dibenz(a,h)anthracene | 1.2E-01 | 3.9E-02 | NA | NA | 1.0E+03 | NA | NA |
| 96-12-8 | Dibromo-3-chloropropane, 1,2- | 5.5E-06 | 1.7E-06 | NA | NA | NA | 1.6E+01 | NA |
| 95-50-1 | Dichlorobenzene, 1,2- | 6 8E-05 | 2.1E-05 | NA | NA | NA | 2.5E+02 | NA |
| 106-46-7 | Dichlorobenzene, 1,4- | 6.6E-05 | 2.1E-05 | NA | NA | NA | 2.2E+02 | NA |
| 91-94-1 | Dichlorobenzidine, 3,3'- | 8.1E-05 | 2.6E-05 | NA | NA | NA | 1.7E+02 | NA |

* Kn ilize under environmental conditions

** Co miscible; solubility estimated from Henry's Law Constant and Vapor Pressu

Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 75-71-8 | Dichlorodifluoromethane | 3.6E-06 | 1.1E-06 | NA | NA | NA | 1.3E+01 | NA |
| 75-34-3 | Dichloroethane, 1,1- | 1.5E-06 | 4.9E-07 | NA | NA | NA | 6.8E+00 | NA |
| 107-06-2 | Dichloroethane, 1,2- | 7.4E-07 | 2.3E-07 | NA | NA | NA | 5.1E+00 | NA |
| 75-35-4 | Dichloroethylene, 1,1- | 3.4E-06 | 1.1E-06 | NA | NA | NA | 1.2E+01 | NA |
| 156-59-2 | Dichloroethylene, cis-1,2- | 1.8E-06 | 5.8E-07 | NA | NA | NA | 5.7E+00 | NA |
| 156-60-5 | Dichloroethylene, trans-1,2- | 3.0E-06 | 9.3E-07 | NA | NA | NA | 9 6E+00 | NA |
| 120-83-2 | Dichlorophenol, 2,4- | 3.0E-05 | 9.5E-06 | NA | NA | NA | 6.6E+01 | NA |
| 94-75-7 | Dichlorophenoxyacetic acid, 2,4- (2,4- | 1.3E-05 | 4.0E-06 | NA | NA | NA | 6.1E+01 | NA |
| 78-87-5 | Dichloropropane, 1,2- | 2.3E-06 | 7.4E-07 | NA | NA | NA | 1.1E+01 | NA |
| 542-75-6 | Dichloropropene, 1,3- | 2.5E-06 | 7.9E-07 | NA | NA | NA | 6.3E+00 | NA |
| 10061-01-5 | Dichloropropene, cis-1,3- | 2.5E-06 | 7.9E-07 | NA | NA | NA | 5.3E+00 | NA |
| 10061-02-6 | Dichloropropene, trans-1,3- | 2.5E-06 | 7.9E-07 | NA | NA | NA | 5.3E+00 | NA |
| 60-57-1 | Dieldrin | 5.9E-03 | 1.9E-03 | NA | NA | 3.8E+04 | NA | NA |
| 84-66-2 | Diethyl phthalate | 7.9E-06 | 2.5E-06 | NA | NA | NA | 2.3E+01 | NA |
| 56-53-1 | Diethylstilbestrol | 3.0E-03 | 9.3E-04 | NA | NA | 6.8E+03 | NA | NA |
| 60-51-5 | Dimethoate | 1.2E-07 | 3.9E-08 | NA | NA | NA | 8.4E-01 | NA |
| 131-11-3 | Dimethyl phthalate | 9.3E-07 | 3.0E-07 | NA | NA | NA | 6.8E+00 | NA |
| 57-97-6 | Dimethylbenz(a)anthracene, 7,12- | 1.0E-01 | 3.3E-02 | NA | NA | 1.0E+03 | NA | NA |
| 119-93-7 | Dimethylbenzidine, 3,3'- * | 1.2E-05 | 3.8E-06 | NA | NA | NA | 1 8E+01 | NA |
| 105-67-9 | Dimethylphenol, 2,4- * | 5.8E-06 | 1.8E-06 | NA | NA | NA | 3.1E+01 | NA |
| 119-90-4 | Dimethyoxybenzidine, 3,3'- * | 1.6E-06 | 5.1E-07 | NA | NA | NA | 7.0E+00 | NA |
| 99-65-0 | Dinitrobenzene, 1,3- | 7.9E-07 | 2.5E-07 | NA | NA | NA | 4.0E+00 | NA |
| 51-28-5 | Dinitrophenol, 2,4- | 8.9E-07 | 2.8E-07 | NA | NA | NA | 4.2E+00 | NA |
| 121-14-2 | Dinitrotoluene, 2,4- | 2.6E-06 | 8.1E-07 | NA | NA | NA | 1.0E+01 | NA |
| 606-20-2 | Dinitrotoluene, 2,6- | 1.9E-06 | 5.9E-07 | NA | NA | NA | 8.1E+00 | NA |
| 123-91-1 | Dioxane, 1,4- ** | 1.0E-08 | 3.2E-09 | NA | NA | NA | 1 6E-01 | NA |
| 122-39-4 | Diphenylamine* | 7 6E-05 | 2.4E-05 | NA | NA | NA | 8.3E+01 | NA |
| 298-04-4 | Disulfoton | 2.4E-04 | 7.6E-05 | NA | NA | 5.4E+02 | NA | NA |
| 115-29-7 | Endosulfan | 3.2E-04 | 1.0E-04 | NA | NA | NA | 1.5E+02 | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 72-20-8 | Endrin | 2.9E-03 | 9.1E-04 | NA | NA | 1.6E+04 | NA | NA |
| 106-89-8 | Epichlorohydrin | 4.5E-08 | 1.4E-08 | NA | NA | NA | 4.5E-01 | NA |
| 110-80-5 | Ethoxyethanol, 2- ** | 2.0E-08 | 6.3E-09 | NA | NA | NA | 2.2E-01 | NA |
| 141-78-6 | Ethyl acetate | 1.2E-07 | 3.9E-08 | NA | NA | NA | 9.9E-01 | NA |
| 60-29-7 | Ethyl ether | 1.7E-07 | 5.4E-08 | NA | NA | NA | 1.3E+00 | NA |
| 97-63-2 | Ethyl methacrylate | 9.8E-07 | 3.1E-07 | NA | NA | NA | 4.7E+00 | NA |
| 62-50-0 | Ethyl methanesulfonate | 2.8E-08 | 8.9E-09 | NA | NA | NA | 2.9E-01 | NA |
| 100-41-4 | Ethylbenzene | 3.5E-05 | 1.1E-05 | NA | NA | NA | 7.6E+01 | NA |
| 106-93-4 | Ethylene Dibromide | 1.4E-06 | 4.5E-07 | NA | NA | NA | 6.4E+00 | NA |
| 96-45-7 | Ethylene thiourea | 5.5E-09 | 1.7E-09 | NA | NA | NA | 7.9E-02 | NA |
| 206-44-0 | Fluoranthene | 3.3E-03 | 1.0E-03 | NA | NA | 9.6E+01 | NA | NA |
| 86-73-7 | Fluorene | 4.1E-04 | 1.3E-04 | NA | NA | 8.9E+01 | NA | NA |
| 50-00-0 | Formaldehyde | 2.2E-08 | 7.1E-09 | NA | NA | NA | 4.9E-01 | NA |
| 64-18-6 | Formic Acid* | 7.2E-09 | 2.3E-09 | NA | NA | NA | 9.8E-02 | NA |
| 110-00-9 | Furan | 5 5E-07 | 1.7E-07 | NA | NA | NA | 3 0E+00 | NA |
| 76-44-8 | Heptachlor | 4.6E-02 | 1.4E-02 | NA | NA | 8.0E+03 | NA | NA |
| 1024-57-3 | Heptachlor epoxide | 2.5E-03 | 7.9E-04 | NA | NA | 3.5E+03 | NA | NA |
| 87-68-3 | Hexachloro-1,3-butadiene | 1.6E-03 | 5.1E-04 | NA | NA | 2.5E+03 | NA | NA |
| 118-74-1 | Hexachlorobenzene | 1.9E-02 | 6.2E-03 | NA | NA | 2.1E+05 | NA | NA |
| 319-84-6 | Hexachlorocyclohexane, alpha- (alpha | 1 6E-04 | 5.0E-05 | NA | NA | 1.6E+03 | NA | NA |
| 319-85-7 | Hexachlorocyclohexane, beta- (beta-B | 1.6E-04 | 5.1E-05 | NA | NA | 1.6E+03 | NA | NA |
| 58-89-9 | Hexachlorocyclohexane, gamma- (Lin | 1.3E-04 | 4.3E-05 | NA | NA | 1.6E+03 | NA | NA |
| 77-47-4 | Hexachlorocyclopentadiene | 6.2E-03 | 1.9E-03 | NA | NA | 5.8E+03 | NA | NA |
| 67-72-1 | Hexachloroethane | 2.5E-04 | 7.9E-05 | NA | NA | 9.5E+02 | NA | NA |
| 70-30-4 | Hexachlorophene* | 8.7E-01 | 2.8E-01 | NA | NA | NA | NA | NA |
| 193-39-5 | Indeno(1,2,3-cd) pyrene | 1.1E-01 | 3.5E-02 | NA | NA | 1.0E+03 | NA | NA |
| 78-83-1 | Isobutyl alcohol | 1.4E-07 | 4.5E-08 | NA | NA | NA | 1 0E+00 | NA |
| 78-59-1 | Isophorone | 1.3E-06 | 4 0E-07 | NA | NA | NA | 7.6E+00 | NA |
| 143-50-0 | Kepone | 5.0E-03 | 1.6E-03 | NA | NA | 1.8E+03 | NA | NA |

* Know e under environmental conditions

** Cor ilscible, solubility estimated from Henry's Law Constant and Vapor Pressure

Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 7439-92-1 | Lead | 3.0E-04 | 2.5E-04 | NA | NA | 8.0E+00 | NA | NA |
| 7439-97-6 | Mercury | 8.0E-05 | 1.0E-04 | NA | NA | 1.3E+05 | NA | NA |
| 126-98-7 | Methacrylonitrile | 8.7E-08 | 2.8E-08 | NA | NA | NA | 7.0E-01 | NA |
| 67-56-1 | Methanol | 4.9E-09 | 1.5E-09 | NA | NA | NA | 6.4E-02 | NA |
| 72-43-5 | Methoxychlor | 3.0E-03 | 9.5E-04 | NA | NA | 1.9E+03 | NA | NA |
| 74-83-9 | Methyl bromide (Bromomethane) | 3.9E-07 | 1.2E-07 | NA | NA | NA | 2.0E+00 | NA |
| 74-87-3 | Methyl chloride (Chloromethane) | 2.0E-07 | 6.5E-08 | NA | NA | NA | 1.4E+00 | NA |
| 78-93-3 | Methyl ethyl ketone | 4.8E-08 | 1.5E-08 | NA | NA | NA | 4.4E-01 | NA |
| 108-10-1 | Methyl isobutyl ketone | 3.9E-07 | 1.2E-07 | NA | NA | NA | 2.3E+00 | NA |
| 80-62-6 | Methyl methacrylate | 6.0E-07 | 1.9E-07 | NA | NA | NA | 3.2E+00 | NA |
| 298-00-0 | Methyl parathion | 2.0E-05 | 6.3E-06 | NA | NA | NA | 4.8E+01 | NA |
| 56-49-5 | Methylcholanthrene, 3- | 6.6E-02 | 2.1E-02 | NA | NA | 1.9E+06 | NA | NA |
| 74-95-3 | Methylene bromide | 1.0E-06 | 3.3E-07 | NA | NA | NA | 1.7E+01 | NA |
| 75-09-2 | Methylene chloride | 4.5E-07 | 1.4E-07 | NA | NA | NA | 2.6E+00 | NA |
| 7439-98-7 | Molybdenum | 6.0E-03 | 1.5E-03 | NA | NA | NA | NA | NA |
| 621-64-7 | N-Nitrosodi-n-propylamine | 6.3E-07 | 2.0E-07 | NA | NA | NA | 3.2E+00 | NA |
| 86-30-6 | N-Nitrosodiphenylamine | 3.6E-05 | 1.1E-05 | NA | NA | NA | 7.8E+01 | NA |
| 100-75-4 | N-Nitrosopiperidine | 1.1E-07 | 3.4E-08 | NA | NA | NA | 8.2E-01 | NA |
| 930-55-2 | N-Nitrosopyrrolidine | 1.6E-08 | 5.1E-09 | NA | NA | NA | 1.9E-01 | NA |
| 91-20-3 | Naphthalene | 5.8E-05 | 1.8E-05 | NA | NA | NA | 7.4E+01 | NA |
| 91-59-8 | Naphthylamine* | 4.8E-06 | 1.5E-06 | NA | NA | NA | 1.7E+01 | NA |
| 7440-02-0 | Nickel | 6.0E-03 | 1.0E-03 | NA | NA | NA | 4.0E+00 | NA |
| 98-95-3 | Nitrobenzene | 1.7E-06 | 5.5E-07 | NA | NA | NA | 2.1E+00 | NA |
| 79-46-9 | Nitropropane, 2- * | 1.9E-07 | 5.9E-08 | NA | NA | NA | 7.2E-01 | NA |
| 924-16-3 | Nitrosodi-n-butylamine | 6.5E-06 | 2.0E-06 | NA | NA | NA | 2.1E+01 | NA |
| 55-18-5 | Nitrosodiethylamine | 7.6E-08 | 2.4E-08 | NA | NA | NA | 6.3E-01 | NA |
| 62-75-9 | Nitrosodimethylamine | 6.8E-09 | 2.1E-09 | NA | NA | NA | 7.4E-01 | NA |
| 10595-95-6 | Nitrosomethylethylamine | 1.9E-08 | 6.0E-09 | NA | NA | NA | 3.1E+00 | NA |
| 152-16-9 | Octamethylpyrophosphoramide | 7.6E-09 | 2.4E-09 | NA | NA | NA | 1.0E-01 | NA |

* Known to ionize under environmental conditions
** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 56-38-2 | Parathion | 1.7E-04 | 5.4E-05 | NA | NA | NA | 2.7E+02 | NA |
| 608-93-5 | Pentachlorobenzene | 4.6E-03 | 1.4E-03 | NA | NA | 1.1E+04 | NA | NA |
| 82-68-8 | Pentachloronitrobenzene (PCNB) | 1.1E-03 | 3.5E-04 | NA | NA | 8.0E+02 | NA | NA |
| 87-86-5 | Pentachlorophenol* | 3.1E-03 | 9.8E-04 | NA | NA | 7.9E+03 | NA | NA |
| 108-95-2 | Phenol | 7.6E-07 | 2.4E-07 | NA | NA | NA | 3 9E+00 | NA |
| 62-38-4 | Phenyl mercuric acetate | 4.3E-06 | 1.3E-06 | NA | NA | NA | 1.5E+01 | NA |
| 108-45-2 | Phenylenediamine, m- * | 2.8E-08 | 8.9E-09 | NA | NA | NA | 2.9E-01 | NA |
| 298-02-2 | Phorate | 1.6E-04 | 5.1E-05 | NA | NA | NA | 2 7E+02 | NA |
| 1336-36-3 | Polychlorinated biphenyls | NA | NA | 4.8E+00 | 4.8E+00 | NA | NA | 1.0E+00 |
| 23950-58-5 | Pronamide | 8.1E-05 | 2.6E-05 | NA | NA | NA | 9.8E+01 | NA |
| 129-00-0 | Pyrene | 3.2E-03 | 1.0E-03 | NA | NA | 1.7E+01 | NA | NA |
| 110-86-1 | Pyridine** | 1.2E-07 | 3.7E-08 | NA | NA | NA | 8.5E-01 | NA |
| 94-59-7 | Safrole | 1.1E-05 | 3.6E-06 | NA | NA | NA | 3.3E+01 | NA |
| 7782-49-2 | Selenium | 3.0E-03 | 4.5E-03 | NA | NA | NA | 8.8E+01 | NA |
| 7440-22-4 | Silver | 3.0E-03 | 2.0E-02 | NA | NA | NA | 0.0E+00 | NA |
| 57-24-9 | Strychnine* | 2.1E-06 | 6.8E-07 | NA | NA | NA | 8.8E+00 | NA |
| 100-42-5 | Stryene | 2.2E-05 | 6.9E-06 | NA | NA | NA | 5.4E+01 | NA |
| 1746-01-6 | TCDD, 2,3,7,8- | NA | NA | 2.7E+00 | 2.7E+00 | NA | NA | 6.7E-02 |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | 1.1E-03 | 3.5E-04 | NA | NA | 2.8E+03 | NA | NA |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | 1.1E-05 | 3.4E-06 | NA | NA | NA | 6.5E+01 | NA |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | 6.2E-06 | 1.9E-06 | NA | NA | NA | 7.7E+00 | NA |
| 127-18-4 | Tetrachloroethylene | 1.2E-05 | 3.7E-06 | NA | NA | NA | 3.4E+01 | NA |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | 5.0E-04 | 1.6E-04 | NA | NA | 1.1E+03 | NA | NA |
| 3689-24-5 | Tetraethyldithiopyrophosphate | 1.7E-04 | 5.4E-05 | NA | NA | NA | 2.8E+02 | NA |
| 7440-28-0 | Thallium (I) | 4.0E-02 | 2.0E-03 | NA | NA | NA | 6.7E+01 | NA |
| 108-88-3 | Toluene | 1.4E-05 | 4.5E-06 | NA | NA | NA | 4 1E+01 | NA |
| 95-80-7 | Toluenediamine, 2,4- | 6.3E-08 | 2.0E-08 | NA | NA | NA | 4.6E+01 | NA |
| 95-53-4 | Toluidine, o- * | 5.5E-07 | 1.7E-07 | NA | NA | NA | 2.9E+00 | NA |
| 106-49-0 | Toluidine, p- * | 6.3E-07 | 2.0E-07 | NA | NA | NA | 3.5E+00 | NA |

* Know e under environmental conditions

** Cor iiscible; solubility estimated from Henry's Law Constant and Vapor Pressure

Table A-3. Biotransfer Factors for Cattle and Fish for HWIR Chemicals

| CAS Number | Chemical Name | Biotransfer Factors for Cattle and Fish | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ba - beef (day/kg) | Ba - milk (day/kg) | BCF - beef (unitless) | BCF - milk (unitless) | BAF (L/kg) | BCF (L/kg) | BSAF (unitless) |
| 8001-35-2 | Toxaphene | 7.9E-03 | 2.5E-03 | NA | NA | 2.1E+06 | NA | NA |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | 3.6E-05 | 1.1E-05 | NA | NA | NA | 8.2E+01 | NA |
| 120-82-1 | Trichlorobenzene, 1,2,4- | 2 6E-04 | 8.1E-05 | NA | NA | NA | 8.5E+02 | NA |
| 71-55-6 | Trichloroethane, 1,1,1- | 7.6E-06 | 2.4E-06 | NA | NA | NA | 2.1E+01 | NA |
| 79-00-5 | Trichloroethane, 1,1,2- | 2.8E-06 | 8.9E-07 | NA | NA | NA | 1.2E+01 | NA |
| 79-01-6 | Trichloroethylene | 1 3E-05 | 4.1E-06 | NA | NA | NA | 2.2E+01 | NA |
| 75-69-4 | Trichlorofluoromethane | 8.5E-06 | 2.7E-06 | NA | NA | NA | 2.6E+01 | NA |
| 95-95-4 | Trichlorophenol, 2,4,5- | 2.0E-04 | 6.3E-05 | NA | NA | NA | 2 3E+02 | NA |
| 88-06-2 | Trichlorophenol, 2,4,6- | 1.3E-04 | 4.0E-05 | NA | NA | NA | 2.2E+02 | NA |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (2 | 5.1E-05 | 1.6E-05 | NA | NA | NA | 7.8E+01 | NA |
| 93-72-1 | Trichlorophenoxypropionic acid, 2,4,5- | 6.5E-05 | 2.0E-05 | NA | NA | NA | 1.3E+02 | NA |
| 96-18-4 | Trichloropropane, 1,2,3- | 4.5E-06 | 1.4E-06 | NA | NA | NA | 3.1E+01 | NA |
| 99-35-4 | Trinitrobenzene, sym- | 3 8E-07 | 1.2E-07 | NA | NA | NA | 2.2E+00 | NA |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | 8.1E-05 | 2.6E-05 | NA | NA | NA | 1.6E+02 | NA |
| 7440-62-2 | Vanadium | 2.5E-03 | 2.0E-03 | NA | NA | NA | NA | NA |
| 75-01-4 | Vinyl chloride | 7.9E-07 | 2.5E-07 | NA | NA | NA | 2.1E+00 | NA |
| 1330-20-7 | Xylenes (total) | 3.7E-05 | 1.2E-05 | NA | NA | NA | 7.5E+01 | NA |
| 7440-66-6 | Zinc | 1.2E-04 | 3.0E-05 | NA | NA | 4.4E+00 | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 83-32-9 | Acenaphthene | 6.0E-02 | NA | NA | NA | NA |
| 67-64-1 | Acetone | 1.0E-01 | NA | NA | NA | NA |
| 75-05-8 | Acetonitrile | 6.0E-03 | NA | 5.0E-02 | NA | NA |
| 98-86-2 | Acetophenone | 1.0E-01 | NA | NA | NA | NA |
| 107-02-8 | Acrolein | 2.0E-02 | NA | 2.0E-05 | NA | NA |
| 79-06-1 | Acrylamide | 2.0E-04 | 4.5E+00 | NA | 1.3E-03 | 4.6E+00 |
| 107-13-1 | Acrylonitrile | NA | 5.4E-01 | 2.0E-03 | 6.8E-05 | 2.4E-01 |
| 309-00-2 | Aldrin | 3.0E-05 | 1 7E+01 | NA | 4.9E-03 | 1.7E+01 |
| 107-05-1 | Allyl chloride | NA | NA | 1.0E-03 | NA | NA |
| 62-53-3 | Aniline | NA | 5.7E-03 | 1 0E-03 | NA | NA |
| 7440-36-0 | Antimony | 4.0E-04 | NA | NA | NA | NA |
| 7440-38-2 | Arsenic | 3.0E-04 | 1.5E+00 | NA | 4.3E-03 | 1.5E+01 |
| 7440-39-3 | Barium | 7.0E-02 | NA | 5.0E-04 | NA | NA |
| 56-55-3 | Benz(a)anthracene | NA | 1.1E+00 | NA | NA | NA |
| 71-43-2 | Benzene | NA | 2.9E-02 | NA | 8.3E-06 | 2.9E-02 |
| 92-87-5 | Benzidine* | 3.0E-03 | 2.3E+02 | NA | 6.7E-02 | 2.3E+02 |
| 50-32-8 | Benzo(a)pyrene | NA | 7.3E+00 | NA | 1.7E-03 | 6.0E+00 |
| 205-99-2 | Benzo(b)fluoranthene | NA | 1.2E+00 | NA | NA | NA |
| 100-51-6 | Benzyl alcohol | 3.0E-01 | NA | NA | NA | NA |
| 100-44-7 | Benzyl chloride | NA | 1.7E-01 | NA | NA | NA |
| 7440-41-7 | Beryllium | 5.0E-03 | 4 3E+00 | NA | 2.4E-03 | 8.4E+00 |
| 39638-32-9 | Bis (2-chloroisopropyl) ether | 4.0E-02 | 7.0E-02 | NA | NA | NA |
| 111-44-4 | Bis(2-chlorethyl)ether | NA | 1.1E+00 | NA | 3.3E-04 | 1.2E+00 |
| 117-81-7 | Bis(2-ethylhexyl)phthalate | 2.0E-02 | 1.4E-02 | NA | NA | NA |
| 75-27-4 | Bromodichloromethane | 2.0E-02 | 6 2E-02 | NA | NA | NA |
| 75-25-2 | Bromoform (Tribromomethane) | 2.0E-02 | 7.9E-03 | NA | 1.1E-06 | 3.9E-03 |
| 71-36-3 | Butanol | 1.0E-01 | NA | NA | NA | NA |
| 88-85-7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinose | 1.0E-03 | NA | NA | NA | NA |
| 85-68-7 | Butylbenzylphthalate | 2.0E-01 | NA | NA | NA | NA |

* Know[illegible]e under environmental conditions

** Cor[illegible]iscible; solubility estimated from Henry's Law Constant and Vapor Pressure

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 7440-43-9 | Cadmium | 1.0E-03 (food)<br>5.0E-04 (water) | NA | NA | 1.8E-03 | 6.3E+00 |
| 75-15-0 | Carbon disulfide | 1.0E-01 | NA | 1.0E-02 | NA | NA |
| 56-23-5 | Carbon tetrachloride | 7.0E-04 | 1.3E-01 | NA | 1.5E-05 | 5.3E-02 |
| 57-74-9 | Chlordane | 6.0E-05 | 1.3E+00 | NA | 3.7E-04 | 1.3E+00 |
| 126-99-8 | Chloro-1,3-butadiene, 2- (Chloroprene | NA | NA | 7.0E-03 | NA | NA |
| 106-47-8 | Chloroaniline, p- | 4.0E-03 | NA | NA | NA | NA |
| 108-90-7 | Chlorobenzene | 2.0E-02 | NA | 2.0E-02 | NA | NA |
| 510-15-6 | Chlorobenzilate | 2.0E-02 | 2.7E-01 | NA | NA | NA |
| 124-48-1 | Chlorodibromomethane | 2.0E-02 | 8.4E-02 | NA | NA | NA |
| 67-66-3 | Chloroform | 1.0E-02 | 6.1E-03 | NA | 2.3E-05 | 8.1E-02 |
| 95-57-8 | Chlorophenol, 2- | 5.0E-03 | NA | NA | NA | NA |
| 7440-47-3 | Chromium VI | 5.0E-03 | NA | NA | 1.2E-02 | 4 2E+01 |
| 218-01-9 | Chrysene | NA | 3 2E-02 | NA | NA | NA |
| 7440-50-8 | Copper | 3.7E-02 | NA | NA | NA | NA |
| 108-39-4 | Cresol, m- | 5.0E-02 | NA | NA | NA | NA |
| 95-48-7 | Cresol, o- | 5.0E-02 | NA | NA | NA | NA |
| 106-44-5 | Cresol, p- | 5.0E-03 | NA | NA | NA | NA |
| 98-82-8 | Cumene | 4.0E-02 | NA | 9.0E-03 | NA | NA |
| 72-54-8 | DDD | NA | 2.4E-01 | NA | NA | NA |
| 72-55-9 | DDE | NA | 3.4E-01 | NA | NA | NA |
| 50-29-3 | DDT | 5.0E-04 | 3.4E-01 | NA | 9.7E-05 | 3.4E-01 |
| 84-74-2 | Di-n-butyl phthalate | 1.0E-01 | NA | NA | NA | NA |
| 117-84-0 | Di-n-octyl phthalate | 2.0E-02 | NA | NA | NA | NA |
| 2303-16-4 | Diallate | NA | 6.1E-02 | NA | NA | NA |
| 53-70-3 | Dibenz(a,h)anthracene | NA | 8.1E+00 | NA | NA | NA |
| 96-12-8 | Dibromo-3-chloropropane, 1,2- | NA | 1.4E+00 | 2.0E-04 | NA | 6.9E-07 |
| 95-50-1 | Dichlorobenzene, 1,2- | 9.0E-02 | NA | 2.0E-01 | NA | NA |
| 106-46-7 | Dichlorobenzene, 1,4- | NA | 2.4E-02 | 8.0E-01 | NA | NA |
| 91-94-1 | Dichlorobenzidine, 3,3'- | NA | 4.5E-01 | NA | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 75-71-8 | Dichlorodifluoromethane | 2.0E-01 | NA | 2.0E-01 | NA | NA |
| 75-34-3 | Dichloroethane, 1,1- | NA | 9.1E-02 | 5.0E-01 | NA | NA |
| 107-06-2 | Dichloroethane, 1,2- | NA | 9.1E-02 | NA | 2.6E-05 | 9.1E-02 |
| 75-35-4 | Dichloroethylene, 1,1- | 9.0E-03 | 6.0E-01 | NA | 5.0E-05 | 1.8E-01 |
| 156-59-2 | Dichloroethylene, cis-1,2- | 1.0E-02 | NA | NA | NA | NA |
| 156-60-5 | Dichloroethylene, trans-1,2- | 2.0E-02 | NA | NA | NA | NA |
| 120-83-2 | Dichlorophenol, 2,4- | 3.0E-03 | NA | NA | NA | NA |
| 94-75-7 | Dichlorophenoxyacetic acid, 2,4- (2,4- | 1.0E-02 | NA | NA | NA | NA |
| 78-87-5 | Dichloropropane, 1,2- | NA | 6.8E-02 | 4.0E-03 | NA | NA |
| 542-75-6 | Dichloropropene, 1,3- | 3.0E-04 | 1.8E-01 | 2.0E-02 | NA | 1.3E-01 |
| 10061-01-5 | Dichloropropene, cis-1,3- | 3.0E-04 | 1.8E-01 | 2.0E-02 | 3.7E-05 | 1.3E-01 |
| 10061-02-6 | Dichloropropene, trans-1,3- | 3.0E-04 | 1.8E-01 | 2.0E-02 | 3.7E-05 | 1.3E-01 |
| 60-57-1 | Dieldrin | 5.0E-05 | 1.6E+01 | NA | 4.6E-03 | 1.6E+01 |
| 84-66-2 | Diethyl phthalate | 8.0E-01 | NA | NA | NA | NA |
| 56-53-1 | Diethylstilbestrol | NA | 4.7E+03 | NA | NA | NA |
| 60-51-5 | Dimethoate | 2.0E-04 | NA | NA | NA | NA |
| 131-11-3 | Dimethyl phthalate | 1.0E+01 | NA | NA | NA | NA |
| 57-97-6 | Dimethylbenz(a)anthracene, 7,12- | NA | 2.5E+01 | NA | NA | NA |
| 119-93-7 | Dimethylbenzidine, 3,3'- * | NA | 9.2E+00 | NA | NA | NA |
| 105-67-9 | Dimethylphenol, 2,4- * | 2.0E-02 | NA | NA | NA | NA |
| 119-90-4 | Dimethyoxybenzidine, 3,3'- * | NA | 1.4E-02 | NA | NA | NA |
| 99-65-0 | Dinitrobenzene, 1,3- | 1.0E-04 | NA | NA | NA | NA |
| 51-28-5 | Dinitrophenol, 2,4- | 2.0E-03 | NA | NA | NA | NA |
| 121-14-2 | Dinitrotoluene, 2,4- | 2.0E-03 | NA | NA | NA | NA |
| 606-20-2 | Dinitrotoluene, 2,6- | 1.0E-03 | NA | NA | NA | NA |
| 123-91-1 | Dioxane, 1,4- ** | NA | 1.1E-02 | NA | NA | NA |
| 122-39-4 | Diphenylamine* | 2.5E-02 | NA | NA | NA | NA |
| 298-04-4 | Disulfoton | 4.0E-05 | NA | NA | NA | NA |
| 115-29-7 | Endosulfan | 6.0E-03 | NA | NA | NA | NA |

* Kno nize under environmental conditions

** Co miscible; solubility estimated from Henry's Law Constant and Vapor Pressu

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 72-20-8 | Endrin | 3.0E-04 | NA | NA | NA | NA |
| 106-89-8 | Epichlorohydrin | 2.0E-03 | 9.9E-03 | 1.0E-03 | 1.2E-06 | 4.2E-03 |
| 110-80-5 | Ethoxyethanol, 2- ** | 4.0E-01 | NA | 2.0E-01 | NA | NA |
| 141-78-6 | Ethyl acetate | 9.0E-01 | NA | NA | NA | NA |
| 60-29-7 | Ethyl ether | 2.0E-01 | NA | NA | NA | NA |
| 97-63-2 | Ethyl methacrylate | 9.0E-02 | NA | NA | NA | NA |
| 62-50-0 | Ethyl methanesulfonate | NA | 2.9E+02 | NA | NA | NA |
| 100-41-4 | Ethylbenzene | 1.0E-01 | NA | 1.0E+00 | NA | NA |
| 106-93-4 | Ethylene Dibromide | NA | 8.5E+01 | 2.0E-04 | 2.2E-04 | 7.7E-01 |
| 96-45-7 | Ethylene thiourea | 8.0E-05 | 6.0E-01 | NA | NA | NA |
| 206-44-0 | Fluoranthene | 4.0E-02 | NA | NA | NA | NA |
| 86-73-7 | Fluorene | 4.0E-02 | NA | NA | NA | NA |
| 50-00-0 | Formaldehyde | 2.0E-01 | NA | NA | 1.3E-05 | 4.6E-02 |
| 64-18-6 | Formic Acid* | 2.0E+00 | NA | NA | NA | NA |
| 110-00-9 | Furan | 1.0E-03 | NA | NA | NA | NA |
| 76-44-8 | Heptachlor | 5.0E-04 | 4.5E+00 | NA | 1.3E-03 | 4.6E+00 |
| 1024-57-3 | Heptachlor epoxide | 1.3E-05 | 9.1E+00 | NA | 2.6E-03 | 9.1E+00 |
| 87-68-3 | Hexachloro-1,3-butadiene | 2.0E-04 | 7.8E-02 | NA | 2.2E-05 | 7.7E-02 |
| 118-74-1 | Hexachlorobenzene | 8.0E-04 | 1.6E+00 | NA | 4.6E-04 | 1.6E+00 |
| 319-84-6 | Hexachlorocyclohexane, alpha- (alpha | NA | 6.3E+00 | NA | 1.8E-03 | 6.3E+00 |
| 319-85-7 | Hexachlorocyclohexane, beta- (beta-B | NA | 1.8E+00 | NA | 5.3E-04 | 1.9E+00 |
| 58-89-9 | Hexachlorocyclohexane, gamma- (Lin | 3.0E-04 | 1.3E+00 | NA | NA | NA |
| 77-47-4 | Hexachlorocyclopentadiene | 7.0E-03 | NA | 7.0E-05 | NA | NA |
| 67-72-1 | Hexachloroethane | 1.0E-03 | 1.4E-02 | NA | 4.0E-06 | 1.4E-02 |
| 70-30-4 | Hexachlorophene* | 3.0E-04 | NA | NA | NA | NA |
| 193-39-5 | Indeno(1,2,3-cd) pyrene | NA | 4.0E-01 | NA | NA | NA |
| 78-83-1 | Isobutyl alcohol | 3.0E-01 | NA | NA | NA | NA |
| 78-59-1 | Isophorone | 2.0E-01 | 9.5E-04 | NA | NA | NA |
| 143-50-0 | Kepone | NA | 4.8E+01 | NA | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 7439-92-1 | Lead | NA | NA | NA | NA | NA |
| 7439-97-6 | Mercury | 3.0E-04 (HgCl2)<br>1.0E-04 (MethylHg) | NA | 3.0E-04 | NA | NA |
| 126-98-7 | Methacrylonitrile | 1.0E-04 | NA | 7.0E-04 | NA | NA |
| 67-56-1 | Methanol | 5.0E-01 | NA | NA | NA | NA |
| 72-43-5 | Methoxychlor | 5.0E-03 | NA | NA | NA | NA |
| 74-83-9 | Methyl bromide (Bromomethane) | 1.4E-03 | NA | 5.0E-03 | NA | NA |
| 74-87-3 | Methyl chloride (Chloromethane) | NA | NA | NA | 1.8E-06 | 6.3E-03 |
| 78-93-3 | Methyl ethyl ketone | 6.0E-01 | NA | 1.0E+00 | NA | NA |
| 108-10-1 | Methyl isobutyl ketone | 5.0E-02 | NA | 8.0E-02 | NA | NA |
| 80-62-6 | Methyl methacrylate | 8.0E-02 | NA | NA | NA | NA |
| 298-00-0 | Methyl parathion | 2.5E-04 | NA | NA | NA | NA |
| 56-49-5 | Methylcholanthrene, 3- | NA | 2.6E+01 | NA | NA | NA |
| 74-95-3 | Methylene bromide | 1.0E-02 | NA | NA | NA | NA |
| 75-09-2 | Methylene chloride | 6.0E-02 | 7.5E-03 | 3.0E+00 | 4.7E-07 | 1.6E-03 |
| 7439-98-7 | Molybdenum | 5.0E-03 | NA | NA | NA | NA |
| 621-64-7 | N-Nitrosodi-n-propylamine | NA | 7.0E+00 | NA | NA | NA |
| 86-30-6 | N-Nitrosodiphenylamine | NA | 4.9E-03 | NA | NA | NA |
| 100-75-4 | N-Nitrosopiperidine | NA | 3.8E+01 | NA | NA | NA |
| 930-55-2 | N-Nitrosopyrrolidine | NA | 2.1E+00 | NA | 6.1E-04 | 2.1E+00 |
| 91-20-3 | Naphthalene | 4.0E-02 | NA | NA | NA | NA |
| 91-59-8 | Naphthylamine* | NA | NA | NA | NA | NA |
| 7440-02-0 | Nickel | 2.0E-02 | NA | NA | NA | NA |
| 98-95-3 | Nitrobenzene | 5.0E-04 | NA | 2.0E-03 | NA | NA |
| 79-46-9 | Nitropropane, 2- * | NA | NA | 2.0E-02 | NA | 9.4E+00 |
| 924-16-3 | Nitrosodi-n-butylamine | NA | 5.4E+00 | NA | 1.6E-03 | 5.6E+00 |
| 55-18-5 | Nitrosodiethylamine | NA | 1.5E+02 | NA | 4.3E-02 | 1.5E+02 |
| 62-75-9 | Nitrosodimethylamine | NA | 5.1E+01 | NA | 1.4E-02 | 4.9E+01 |
| 10595-95-6 | Nitrosomethylethylamine | NA | 2.2E+01 | NA | NA | NA |
| 152-16-9 | Octamethylpyrophosphoramide | 2.0E-03 | NA | NA | NA | NA |

* Kno[illegible]nize under environmental conditions
** Co[illegible] miscible; solubility estimated from Henry's Law Constant and Vapor Pressu

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 56-38-2 | Parathion | 6.0E-03 | NA | NA | NA | NA |
| 608-93-5 | Pentachlorobenzene | 8.0E-04 | NA | NA | NA | NA |
| 82-68-8 | Pentachloronitrobenzene (PCNB) | 3.0E-03 | 2.6E-01 | NA | NA | NA |
| 87-86-5 | Pentachlorophenol* | 3.0E-02 | 1.2E-01 | NA | NA | NA |
| 108-95-2 | Phenol | 6.0E-01 | NA | NA | NA | NA |
| 62-38-4 | Phenyl mercuric acetate | 8.0E-05 | NA | NA | NA | NA |
| 108-45-2 | Phenylenediamine, m- * | 6.0E-03 | NA | NA | NA | NA |
| 298-02-2 | Phorate | 2.0E-04 | NA | NA | NA | NA |
| 1336-36-3 | Polychlorinated biphenyls | NA | 7.7E+00 | NA | NA | NA |
| 23950-58-5 | Pronamide | 7.5E-02 | NA | NA | NA | NA |
| 129-00-0 | Pyrene | 3.0E-02 | NA | NA | NA | NA |
| 110-86-1 | Pyridine** | 1.0E-03 | NA | 7.0E-03 | NA | NA |
| 94-59-7 | Safrole | NA | 1.8E-01 | NA | NA | NA |
| 7782-49-2 | Selenium | 5.0E-03 | NA | NA | NA | NA |
| 7440-22-4 | Silver | NA | NA | NA | NA | NA |
| 57-24-9 | Strychnine* | 3.0E-04 | NA | NA | NA | NA |
| 100-42-5 | Styrene | 2.0E-01 | NA | 1.0E+00 | NA | NA |
| 1746-01-6 | TCDD, 2,3,7,8- | NA | 1.6E+05 | NA | NA | 1.6E+05 |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | 3.0E-04 | NA | NA | NA | NA |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | 3.0E-02 | 2.6E-02 | NA | 7.4E-06 | 2.6E-02 |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | NA | 2.0E-01 | NA | 5.8E-05 | 2.0E-01 |
| 127-18-4 | Tetrachloroethylene | 1.0E-02 | NA | NA | NA | NA |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | 3.0E-02 | NA | NA | NA | NA |
| 3689-24-5 | Tetraethyldithiopyrophosphate | 5.0E-04 | NA | NA | NA | NA |
| 7440-28-0 | Thallium (I) | 8.0E-05 | NA | NA | NA | NA |
| 108-88-3 | Toluene | 2.0E-01 | NA | 4.0E-01 | NA | NA |
| 95-80-7 | Toluenediamine, 2,4- | NA | 3.2E+00 | NA | NA | NA |
| 95-53-4 | Toluidine, o- * | NA | 2.4E-01 | NA | NA | NA |
| 106-49-0 | Toluidine, p- * | NA | 1.9E-01 | NA | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-4. Health Benchmarks for HWIR Chemicals

| CAS Number | Chemical Name | Health Benchmarks | | | | |
|---|---|---|---|---|---|---|
| | | RfD (mg/kg/day) | Oral CSF (mg/kg/day)-1 | RfC (mg/m3) | Inhal URF (ug/m3)-1 | Inhal CSF (mg/kg/day)-1 |
| 8001-35-2 | Toxaphene | NA | 1.1E+00 | NA | 3.2E-04 | 1.1E+00 |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | 3.0E+01 | NA | 3.0E+01 | NA | NA |
| 120-82-1 | Trichlorobenzene, 1,2,4- | 1.0E-02 | NA | 9.0E-03 | NA | NA |
| 71-55-6 | Trichloroethane, 1,1,1- | NA | NA | 1.0E+00 | NA | NA |
| 79-00-5 | Trichloroethane, 1,1,2- | 4.0E-03 | 5.7E-02 | NA | 1.6E-05 | 5.6E-02 |
| 79-01-6 | Trichloroethylene | NA | 1.1E-02 | NA | 1.7E-06 | NA |
| 75-69-4 | Trichlorofluoromethane | 3.0E-01 | NA | 7.0E-01 | NA | NA |
| 95-95-4 | Trichlorophenol, 2,4,5- | 1.0E-01 | NA | NA | NA | NA |
| 88-06-2 | Trichlorophenol, 2,4,6- | NA | 1.1E-02 | NA | 3.1E-06 | 1.1E-02 |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (2 | 1.0E-02 | NA | NA | NA | NA |
| 93-72-1 | Trichloropnenoxypropionic acid, 2,4,5- | 8.0E-03 | NA | NA | NA | NA |
| 96-18-4 | Trichloropropane, 1,2,3- | 6.0E-03 | NA | NA | NA | NA |
| 99-35-4 | Trinitrobenzene, svm- | 5.0E-05 | NA | NA | NA | NA |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | NA | 9.8E+00 | NA | NA | NA |
| 7440-62-2 | Vanadium | 7.0E-03 | NA | NA | NA | NA |
| 75-01-4 | Vinyl chloride | NA | 1.9E+00 | NA | NA | 3.0E-01 |
| 1330-20-7 | Xylenes (total) | 2.0E+00 | NA | 3.0E-01 | NA | NA |
| 7440-66-6 | Zinc | 3.0E-01 | NA | NA | NA | NA |

* Know ...ize under environmental conditions

** Co... miscible; solubility estimated from Henry's Law Constant and Vapor Pressu...

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters: Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
|---|---|---|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 1.3E-01 | 8.3E-01 | 6.0E+00 | 7.6E-01 | 1.2E+00 | 9.7E-01 | NA |
| 67-64-1 | Acetone | 5.7E-04 | 5.8E-05 | 4.7E-01 | 2.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 75-05-8 | Acetonitrile | 6.1E-04 | 4.6E-05 | 3.7E-01 | 1.6E-01 | 3.3E-01 | 3.0E-01 | NA |
| 98-86-2 | Acetophenone | 5.1E-03 | 4.4E-03 | 1.1E+00 | 4.7E-01 | 3.4E-01 | 3.0E-01 | NA |
| 107-02-8 | Acrolein | 8.5E-04 | 9.8E-05 | 4.6E-01 | 1.9E-01 | 3.3E-01 | 3.0E-01 | NA |
| 79-06-1 | Acrylamide | 1.5E-04 | 1.1E-05 | 5.7E-01 | 2.4E-01 | 3.3E-01 | 3.0E-01 | NA |
| 107-13-1 | Acrylonitrile | 1.4E-03 | 1.8E-04 | 4.4E-01 | 1.8E-01 | 3.3E-01 | 3.0E-01 | NA |
| 309-00-2 | Aldrin | 4.7E-01 | 3.2E+02 | 6.9E+01 | 1.5E+01 | 3.2E+02 | 6.4E+04 | NA |
| 107-05-1 | Allyl chloride | 7.0E-03 | 2.8E-03 | 6.2E-01 | 2.6E-01 | 3.4E-01 | 3.0E-01 | NA |
| 62-53-3 | Aniline | 2.6E-03 | 9.5E-04 | 7.8E-01 | 3.2E-01 | 3.3E-01 | 3.0E-01 | NA |
| 7440-36-0 | Antimony | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 7440-38-2 | Arsenic | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 7440-39-3 | Barium | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 56-55-3 | Benz(a)anthracene | 8.6E-01 | 5.0E+01 | 1.0E+01 | 2.2E+00 | 5.0E+01 | 1.6E+03 | NA |
| 71-43-2 | Benzene | 2.1E-02 | 1.3E-02 | 6.3E-01 | 2.6E-01 | 3.5E-01 | 3.1E-01 | NA |
| 92-87-5 | Benzidine* | 2.2E-03 | 4.6E-03 | 2.8E+00 | 1.2E+00 | 3.4E-01 | 3.0E-01 | NA |
| 50-32-8 | Benzo(a)pyrene | 1.2E+00 | 1.3E+02 | 1.4E+01 | 3.0E+00 | 1.3E+02 | 1.1E+04 | NA |
| 205-99-2 | Benzo(b)fluoranthene | 1.4E+00 | 1.6E+02 | 1.4E+01 | 3.0E+00 | 1.6E+02 | 1.6E+04 | NA |
| 100-51-6 | Benzyl alcohol | 2.6E-03 | 1.3E-03 | 9.6E-01 | 4.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 100-44-7 | Benzyl chloride | 1.4E-02 | 2.0E-02 | 1.2E+00 | 5.2E-01 | 3.5E-01 | 3.1E-01 | NA |
| 7440-41-7 | Beryllium | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 39638-32-9 | Bis (2-chloroisopropyl) ether | 1.2E-02 | 3.8E-02 | 2.3E+00 | 9.7E-01 | 3.7E-01 | 3.1E-01 | NA |
| 111-44-4 | Bis(2-chlorethyl)ether | 1.8E-03 | 1.6E-03 | 1.6E+00 | 6.5E-01 | 3.3E-01 | 3.0E-01 | NA |
| 117-81-7 | Bis(2-ethylhexyl)phthalate | 1.2E+00 | 2.0E+03 | 9.9E+01 | 2.1E+01 | 2.0E+03 | 2.5E+06 | NA |
| 75-27-4 | Bromodichloromethane | 5.9E-03 | 1.3E-02 | 2.1E+00 | 8.7E-01 | 3.5E-01 | 3.1E-01 | NA |
| 75-25-2 | Bromoform (Tribromomethane) | 2.6E-03 | 2.2E-02 | 7.3E+00 | 3.0E+00 | 3.6E-01 | 3.1E-01 | NA |
| 71-36-3 | Butanol | 2.5E-03 | 6.3E-04 | 5.9E-01 | 2.5E-01 | 3.3E-01 | 3.0E-01 | NA |
| 88-85-7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinose | 1.1E-02 | 1.4E-01 | 8.3E+00 | 2.6E+00 | 4.7E-01 | 3.5E-01 | NA |
| 85-68-7 | Butylbenzylphthalate | 6.5E-02 | 6.9E+00 | 3.4E+01 | 7.0E+00 | 7.3E+00 | 3.3E+01 | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters: Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
|---|---|---|---|---|---|---|---|---|
| 7440-43-9 | Cadmium | 1.0E-03 | NA | NA | NA | NA | NA | 1.0E-02 |
| 75-15-0 | Carbon disulfide | 1.7E-02 | 1.0E-02 | 6.1E-01 | 2.5E-01 | 3.4E-01 | 3.1E-01 | NA |
| 56-23-5 | Carbon tetrachloride | 1.9E-02 | 5.4E-02 | 1.8E+00 | 7.6E-01 | 3.9E-01 | 3.2E-01 | NA |
| 57-74-9 | Chlordane | 1.9E-01 | 2.1E+02 | 1.3E+02 | 2.8E+01 | 2.1E+02 | 2.8E+04 | NA |
| 126-99-8 | Chloro-1,3-butadiene, 2- (Chloroprene | 1.6E-02 | 1.2E-02 | 7.3E-01 | 3.0E-01 | 3.5E-01 | 3.1E-01 | NA |
| 106-47-8 | Chloroaniline, p- | 6.5E-03 | 7.1E-03 | 1.3E+00 | 5.2E-01 | 3.4E-01 | 3.1E-01 | NA |
| 108-90-7 | Chlorobenzene | 4.2E-02 | 7.2E-02 | 1.0E+00 | 4.3E-01 | 4.1E-01 | 3.3E-01 | NA |
| 510-15-6 | Chlorobenzilate | 2.5E-02 | 2.4E+00 | 4.5E+01 | 8.4E+00 | 2.7E+00 | 4.6E+00 | NA |
| 124-48-1 | Chlorodibromomethane | 3.5E-03 | 1.5E-02 | 3.9E+00 | 1.6E+00 | 3.5E-01 | 3.1E-01 | NA |
| 67-66-3 | Chloroform | 8.3E-03 | 8.3E-03 | 1.1E+00 | 4.7E-01 | 3.4E-01 | 3 1E-01 | NA |
| 95-57-8 | Chlorophenol, 2- | 1.1E-02 | 1.4E-02 | 1.3E+00 | 5.3E-01 | 3.5E-01 | 3.1E-01 | NA |
| 7440-47-3 | Chromium VI | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 218-01-9 | Chrysene | 8.6E-01 | 5.0E+01 | 1.0E+01 | 2.2E+00 | 5.0E+01 | 1.6E+03 | NA |
| 7440-50-8 | Copper | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 108-39-4 | Cresol, m- | 1.0E-02 | 9.3E-03 | 9.6E-01 | 4.0E-01 | 3.4E-01 | 3.1E-01 | NA |
| 95-48-7 | Cresol, o- | 1.1E-02 | 9.8E-03 | 9.6E-01 | 4.0E-01 | 3.4E-01 | 3.1E-01 | NA |
| 106-44-5 | Cresol, p- | 1.0E-02 | 8.9E-03 | 9.6E-01 | 4.0E-01 | 3.4E-01 | 3.1E-01 | NA |
| 98-82-8 | Cumene | 1.2E-01 | 3.8E-01 | 2.8E+00 | 4.7E-01 | 7.1E-01 | 5 0E-01 | NA |
| 72-54-8 | DDD | 4.6E-01 | 1.3E+02 | 3.7E+01 | 7.8E+00 | 1.3E+02 | 1.0E+04 | NA |
| 72-55-9 | DDE | 1.4E+00 | 5.8E+02 | 3.6E+01 | 7.6E+00 | 5.8E+02 | 2.1E+05 | NA |
| 50-29-3 | DDT | 5.7E-01 | 3.4E+02 | 6.0E+01 | 1.3E+01 | 3.4E+02 | 7.3E+04 | NA |
| 84-74-2 | Di-n-butyl phthalate | 7.2E-02 | 4.1E+00 | 2.2E+01 | 4.4E+00 | 4.4E+00 | 1.2E+01 | NA |
| 117-84-0 | Di-n-octyl phthalate | 4.2E+00 | 1.1E+04 | 9.9E+01 | 2.1E+01 | 1.1E+04 | 8.4E+07 | NA |
| 2303-16-4 | Diallate | 6.6E-02 | 3.1E+00 | 2.0E+01 | 3.9E+00 | 3.4E+00 | 7.2E+00 | NA |
| 53-70-3 | Dibenz(a,h)anthracene | 2.1E+00 | 4.9E+02 | 2.1E+01 | 4.4E+00 | 4.9E+02 | 1.5E+05 | NA |
| 96-12-8 | Dibromo-3-chloropropane, 1,2- | 3.2E-03 | 2.2E-02 | 5.8E+00 | 2.4E+00 | 3.6E-01 | 3.1E-01 | NA |
| 95-50-1 | Dichlorobenzene, 1,2- | 6.6E-02 | 2.7E-01 | 3.4E+00 | 6.9E-01 | 6.0E-01 | 4.2E-01 | NA |
| 106-46-7 | Dichlorobenzene, 1,4- | 6.5E-02 | 2.6E-01 | 3.4E+00 | 6.9E-01 | 6.0E-01 | 4.2E-01 | NA |
| 91-94-1 | Dichlorobenzidine, 3,3'- | 1.7E-02 | 3.2E-01 | 1.7E+01 | 3.1E+00 | 6.6E-01 | 4.6E-01 | NA |

* Kn ɔnize under environmental conditions

** C y miscible, solubility estimated from Henry's Law Constant and Vapor Press

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
| 75-71-8 | Dichlorodifluoromethane | 1.2E-02 | 1.4E-02 | 1.1E+00 | 4.8E-01 | 3.5E-01 | 3.1E-01 | NA |
| 75-34-3 | Dichloroethane, 1,1- | 8.9E-03 | 6.2E-03 | 8.4E-01 | 3.5E-01 | 3.4E-01 | 3.0E-01 | NA |
| 107-06-2 | Dichloroethane, 1,2- | 5.2E-03 | 3.0E-03 | 8.4E-01 | 3.5E-01 | 3.4E-01 | 3.0E-01 | NA |
| 75-35-4 | Dichloroethylene, 1,1- | 1.6E-02 | 1.3E-02 | 8.2E-01 | 3.4E-01 | 3.5E-01 | 3.1E-01 | NA |
| 156-59-2 | Dichloroethylene, cis-1,2- | 1.0E-02 | 7.2E-03 | 8.2E-01 | 3.4E-01 | 3.4E-01 | 3.1E-01 | NA |
| 156-60-5 | Dichloroethylene, trans-1,2- | 1.4E-02 | 1.2E-02 | 8.2E-01 | 3.4E-01 | 3.5E-01 | 3.1E-01 | NA |
| 120-83-2 | Dichlorophenol, 2,4- | 3.0E-02 | 1.2E-01 | 2.5E+00 | 8.6E-01 | 4.5E-01 | 3.5E-01 | NA |
| 94-75-7 | Dichlorophenoxyacetic acid, 2,4- (2,4- | 7.1E-03 | 5.0E-02 | 4.7E+00 | 2.0E+00 | 3.8E-01 | 3.2E-01 | NA |
| 78-87-5 | Dichloropropane, 1,2- | 9.8E-03 | 9.3E-03 | 1.0E+00 | 4.3E-01 | 3.4E-01 | 3.1E-01 | NA |
| 542-75-6 | Dichloropropene, 1,3- | 1.1E-02 | 1.0E-02 | 1.0E+00 | 4.2E-01 | 3.4E-01 | 3.1E-01 | NA |
| 10061-01-5 | Dichloropropene, cis-1,3- | 1.1E-02 | 1.0E-02 | 1.0E+00 | 4.2E-01 | 3.4E-01 | 3.1E-01 | NA |
| 10061-02-6 | Dichloropropene, trans-1,3- | 1.1E-02 | 1.0E-02 | 1.0E+00 | 4.2E-01 | 3.4E-01 | 3.1E-01 | NA |
| 60-57-1 | Dieldrin | 5.9E-02 | 2.3E+01 | 8.8E+01 | 1.8E+01 | 2.4E+01 | 3.6E+02 | NA |
| 84-66-2 | Diethyl phthalate | 5.0E-03 | 3.2E-02 | 4.8E+00 | 2.0E+00 | 3 6E-01 | 3.1E-01 | NA |
| 56-53-1 | Diethylstilbestrol | 1.7E-01 | 1.2E+01 | 1.8E+01 | 3.8E+00 | 1.2E+01 | 9.1E+01 | NA |
| 60-51-5 | Dimethoate | 2.4E-04 | 4.9E-04 | 5.3E+00 | 2.2E+00 | 3.3E-01 | 3.0E-01 | NA |
| 131-11-3 | Dimethyl phthalate | 1.6E-03 | 3.7E-03 | 3.2E+00 | 1.3E+00 | 3.4E-01 | 3.0E-01 | NA |
| 57-97-6 | Dimethylbenz(a)anthracene, 7,12- | 2.6E+00 | 4.2E+02 | 1.5E+01 | 3.2E+00 | 4.2E+02 | 1.1E+05 | NA |
| 119-93-7 | Dimethylbenzidine, 3,3'- * | 7.7E-03 | 4.8E-02 | 4.1E+00 | 1.7E+00 | 3 8E-01 | 3 2E-01 | NA |
| 105-67-9 | Dimethylphenol, 2,4- * | 1.6E-02 | 2.3E-02 | 1.2E+00 | 4.9E-01 | 3.6E-01 | 3.1E-01 | NA |
| 119-90-4 | Dimethyoxybenzidine, 3,3'- * | 1.2E-03 | 6.5E-03 | 6.5E+00 | 2.7E+00 | 3.4E-01 | 3.1E-01 | NA |
| 99-65-0 | Dinitrobenzene, 1,3- | 2.1E-03 | 3.2E-03 | 2.2E+00 | 9.3E-01 | 3.4E-01 | 3.0E-01 | NA |
| 51-28-5 | Dinitrophenol, 2,4- | 1.8E-03 | 3.5E-03 | 2.8E+00 | 1.2E+00 | 3.4E-01 | 3.0E-01 | NA |
| 121-14-2 | Dinitrotoluene, 2,4- | 3.9E-03 | 1.0E-02 | 2.7E+00 | 1.1E+00 | 3.4E-01 | 3.1E-01 | NA |
| 606-20-2 | Dinitrotoluene, 2,6- | 3.1E-03 | 7.4E-03 | 2.7E+00 | 1.1E+00 | 3.4E-01 | 3.1E-01 | NA |
| 123-91-1 | Dioxane, 1,4- ** | 2.9E-04 | 4 1E-05 | 7.2E-01 | 3.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 122-39-4 | Diphenylamine* | 5.2E-02 | 3.0E-01 | 5.0E+00 | 9.4E-01 | 6 4E-01 | 4 4E-01 | NA |
| 298-04-4 | Disulfoton | 2.7E-02 | 9.5E-01 | 3.4E+01 | 4.1E+00 | 1.3E+00 | 1 1E+00 | NA |
| 115-29-7 | Endosulfan | 5.1E-03 | 1.3E+00 | 1.9E+02 | 2.7E+01 | 1.6E+00 | 1.7E+00 | NA |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters: Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
|---|---|---|---|---|---|---|---|---|
| 72-20-8 | Endrin | 3.5E-02 | 1.1E+01 | 8.9E+01 | 1.8E+01 | 1.2E+01 | 8.7E+01 | NA |
| 106-89-8 | Epichlorohydrin | 7.8E-04 | 1.8E-04 | 7.7E-01 | 3.2E-01 | 3.3E-01 | 3.0E-01 | NA |
| 110-80-5 | Ethoxyethanol, 2- ** | 4.6E-04 | 7.9E-05 | 7.4E-01 | 3.1E-01 | 3.3E-01 | 3.0E-01 | NA |
| 141-78-6 | Ethyl acetate | 1.7E-03 | 4.9E-04 | 7.2E-01 | 3.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 60-29-7 | Ethyl ether | 2.6E-03 | 6.8E-04 | 5.9E-01 | 2.5E-01 | 3.3E-01 | 3.0E-01 | NA |
| 97-63-2 | Ethyl methacrylate | 5.2E-03 | 3.9E-03 | 1.0E+00 | 4.3E-01 | 3.4E-01 | 3.0E-01 | NA |
| 62-50-0 | Ethyl methanesulfonate | 3.6E-04 | 1.1E-04 | 1.2E+00 | 5.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 100-41-4 | Ethylbenzene | 7.3E-02 | 1.4E-01 | 1.3E+00 | 3.9E-01 | 4.7E-01 | 3.5E-01 | NA |
| 106-93-4 | Ethylene Dibromide | 2.4E-03 | 5.6E-03 | 2.9E+00 | 1.2E+00 | 3.4E-01 | 3.0E-01 | NA |
| 96-45-7 | Ethylene thiourea | 1.5E-04 | 2.2E-05 | 8.8E-01 | 3.7E-01 | 3.3E-01 | 3.0E-01 | NA |
| 206-44-0 | Fluoranthene | 4.8E-01 | 1.3E+01 | 7.2E+00 | 1.5E+00 | 1.4E+01 | 1.1E+02 | NA |
| 86-73-7 | Fluorene | 1.8E-01 | 1.6E+00 | 5.4E+00 | 9.0E-01 | 2.0E+00 | 2.4E+00 | NA |
| 50-00-0 | Formaldehyde | 1.2E-03 | 8.9E-05 | 3.2E-01 | 1.3E-01 | 3.3E-01 | 3.0E-01 | NA |
| 64-18-6 | Formic Acid* | 4.1E-04 | 2.9E-05 | 4.0E-01 | 1.7E-01 | 3.3E-01 | 3.0E-01 | NA |
| 110-00-9 | Furan | 6.5E-03 | 2.2E-03 | 5.5E-01 | 2.3E-01 | 3.4E-01 | 3.0E-01 | NA |
| 76-44-8 | Heptachlor | 2.8E-01 | 1.8E+02 | 7.8E+01 | 1.7E+01 | 1.8E+02 | 2.1E+04 | NA |
| 1024-57-3 | Heptachlor epoxide | 2.9E-02 | 1.0E+01 | 1.0E+02 | 2.1E+01 | 1.0E+01 | 6.7E+01 | NA |
| 87-68-3 | Hexachloro-1,3-butadiene | 1.3E-01 | 6.5E+00 | 1.7E+01 | 3.4E+00 | 6.8E+00 | 2.9E+01 | NA |
| 118-74-1 | Hexachlorobenzene | 5.3E-01 | 7.8E+01 | 2.3E+01 | 4.8E+00 | 7.8E+01 | 3.9E+03 | NA |
| 319-84-6 | Hexachlorocyclohexane, alpha- (alpha | 1.6E-02 | 6.3E-01 | 3.7E+01 | 5.2E+00 | 9.6E-01 | 7.3E-01 | NA |
| 319-85-7 | Hexachlorocyclohexane, beta- (beta-B | 1.6E-02 | 6.5E-01 | 3.8E+01 | 5.2E+00 | 9.8E-01 | 7.5E-01 | NA |
| 58-89-9 | Hexachlorocyclohexane, gamma- (Lin | 1.4E-02 | 5.4E-01 | 3.5E+01 | 5.2E+00 | 8.7E-01 | 6.3E-01 | NA |
| 77-47-4 | Hexachlorocyclopentadiene | 2.8E-01 | 2.5E+01 | 1.9E+01 | 4.0E+00 | 2.5E+01 | 3.9E+02 | NA |
| 67-72-1 | Hexachloroethane | 4.7E-02 | 1.0E+00 | 2.0E+01 | 2.4E+00 | 1.3E+00 | 1.2E+00 | NA |
| 70-30-4 | Hexachlorophene* | 1.4E+00 | 3.5E+03 | 1.3E+02 | 2.7E+01 | 3.5E+03 | 7.7E+06 | NA |
| 193-39-5 | Indeno(1,2,3-cd) pyrene | 2.1E+00 | 4.5E+02 | 2.0E+01 | 4.2E+00 | 4.5E+02 | 1.3E+05 | NA |
| 78-83-1 | Isobutyl alcohol | 2.3E-03 | 5.6E-04 | 5.9E-01 | 2.5E-01 | 3.3E-01 | 3.0E-01 | NA |
| 78-59-1 | Isophorone | 4.4E-03 | 5.0E-03 | 1.5E+00 | 6.1E-01 | 3.4E-01 | 3.0E-01 | NA |
| 143-50-0 | Kepone | 1.1E-02 | 2.0E+01 | 4.1E+02 | 8.6E+01 | 2.0E+01 | 2.6E+02 | NA |

* Kno ionize under environmental conditions

** C y miscible, solubility estimated from Henry's Law Constant and Vapor Press

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters: Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
|---|---|---|---|---|---|---|---|---|
| 7439-92-1 | Lead | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 7439-97-6 | Mercury | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 126-98-7 | Methacrylonitrile | 1.8E-03 | 3.5E-04 | 5.4E-01 | 2 2E-01 | 3.3E-01 | 3.0E-01 | NA |
| 67-56-1 | Methanol | 3.8E-04 | 1 9E-05 | 3.3E-01 | 1.4E-01 | 3.3E-01 | 3.0E-01 | NA |
| 72-43-5 | Methoxychlor | 6.0E-02 | 1.2E+01 | 5.4E+01 | 1.1E+01 | 1.2E+01 | 9.6E+01 | NA |
| 74-83-9 | Methyl bromide (Bromomethane) | 3.5E-03 | 1.5E-03 | 8.0E-01 | 3.3E-01 | 3.3E-01 | 3.0E-01 | NA |
| 74-87-3 | Methyl chloride (Chloromethane) | 4.2E-03 | 8.1E-04 | 4.3E-01 | 1.8E-01 | 3.3E-01 | 3.0E-01 | NA |
| 78-93-3 | Methyl ethyl ketone | 1.1E-03 | 1.9E-04 | 5.8E-01 | 2.4E-01 | 3.3E-01 | 3.0E-01 | NA |
| 108-10-1 | Methyl isobutyl ketone | 3 3E-03 | 1.5E-03 | 8.6E-01 | 3.6E-01 | 3.3E-01 | 3.0E-01 | NA |
| 80-62-6 | Methyl methacrylate | 4.5E-03 | 2.4E-03 | 8.6E-01 | 3.6E-01 | 3.4E-01 | 3.0E-01 | NA |
| 298-00-0 | Methyl parathion | 5.4E-03 | 7.9E-02 | 8.5E+00 | 3.5E+00 | 4.1E-01 | 3.3E-01 | NA |
| 56-49-5 | Methylcholanthrene, 3- | 1.6E+00 | 2.6E+02 | 1.8E+01 | 3.8E+00 | 2.6E+02 | 4.4E+04 | NA |
| 74-95-3 | Methylene bromide | 2.3E-03 | 4.2E-03 | 2.4E+00 | 1.0E+00 | 3.4E-01 | 3.0E-01 | NA |
| 75-09-2 | Methylene chloride | 4.5E-03 | 1.8E-03 | 6.9E-01 | 2.9E-01 | 3.4E-01 | 3.0E-01 | NA |
| 7439-98-7 | Molybdenum | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 621-64-7 | N-Nitrosodi-n-propylamine | 3.0E-03 | 2.5E-03 | 1.3E+00 | 5.4E-01 | 3.4E-01 | 3.0E-01 | NA |
| 86-30-6 | N-Nitrosodiphenylamine | 2.1E-02 | 1.4E-01 | 4.8E+00 | 1.4E+00 | 4.8E-01 | 3.6E-01 | NA |
| 100-75-4 | N-Nitrosopiperidine | 1.1E-03 | 4.3E-04 | 1.0E+00 | 4.4E-01 | 3.3E-01 | 3.0E-01 | NA |
| 930-55-2 | N-Nitrosopyrrolidine | 3.4E-04 | 6.5E-05 | 8.6E-01 | 3.6E-01 | 3.3E-01 | 3.0E-01 | NA |
| 91-20-3 | Naphthalene | 7.7E-02 | 2.3E-01 | 2.4E+00 | 5.3E-01 | 5.6E-01 | 4.0E-01 | NA |
| 91-59-8 | Naphthylamine* | 1.1E-02 | 1.9E-02 | 1.6E+00 | 6.5E-01 | 3.5E-01 | 3.1E-01 | NA |
| 7440-02-0 | Nickel | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 98-95-3 | Nitrobenzene | 6.8E-03 | 6.9E-03 | 1.2E+00 | 4.9E-01 | 3.4E-01 | 3 1E-01 | NA |
| 79-46-9 | Nitropropane, 2- * | 2.3E-03 | 7.4E-04 | 7.3E-01 | 3.1E-01 | 3.3E-01 | 3.0E-01 | NA |
| 924-16-3 | Nitrosodi-n-butylamine | 1.1E-02 | 2.6E-02 | 1.9E+00 | 8.1E-01 | 3.6E-01 | 3.1E-01 | NA |
| 55-18-5 | Nitrosodiethylamine | 9.9E-04 | 3.0E-04 | 8.8E-01 | 3.7E-01 | 3.3E-01 | 3.0E-01 | NA |
| 62-75-9 | Nitrosodimethylamine | 2.7E-04 | 2.7E-05 | 5.9E-01 | 2.5E-01 | 3.3E-01 | 3.0E-01 | NA |
| 10595-95-6 | Nitrosomethylethylamine | 4.5E-04 | 7.6E-05 | 7.2E-01 | 3.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 152-16-9 | Octamethylpyrophosphoramide | 1.5E-05 | 3.0E-05 | 1.2E+01 | 4.9E+00 | 3.3E-01 | 3.0E-01 | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters: Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
|---|---|---|---|---|---|---|---|---|
| 56-38-2 | Parathion | 1.7E-02 | 6.8E-01 | 3.9E+01 | 5.2E+00 | 1.0E+00 | 7.8E-01 | NA |
| 608-93-5 | Pentachlorobenzene | 3.1E-01 | 1.8E+01 | 1.4E+01 | 2.9E+00 | 1.9E+01 | 2.2E+02 | NA |
| 82-68-8 | Pentachloronitrobenzene (PCNB) | 5.9E-02 | 4.4E+00 | 2.8E+01 | 5.5E+00 | 4.7E+00 | 1.4E+01 | NA |
| 87-86-5 | Pentachlorophenol* | 1.9E-01 | 1.2E+01 | 1.8E+01 | 3.7E+00 | 1.3E+01 | 1.0E+02 | NA |
| 108-95-2 | Phenol | 5.7E-03 | 3.0E-03 | 7.9E-01 | 3.3E-01 | 3.4E-01 | 3.0E-01 | NA |
| 62-38-4 | Phenyl mercuric acetate | 6.4E-04 | 1.7E-02 | 2.4E+01 | 9.9E+00 | 3.5E-01 | 3.1E-01 | NA |
| 108-45-2 | Phenylenediamine, m- * | 4.5E-04 | 1.1E-04 | 9.6E-01 | 4.0E-01 | 3.3E-01 | 3.0E-01 | NA |
| 298-02-2 | Phorate | 2 5E-02 | 6.5E-01 | 2.5E+01 | 3.4E+00 | 9.8E-01 | 7.5E-01 | NA |
| 1336-36-3 | Polychlorinated biphenyls | 1.3E+00 | 3.2E+02 | 2.5E+01 | 5.3E+00 | 3.2E+02 | 6.5E+04 | NA |
| 23950-58-5 | Pronamide | 1.6E-02 | 3.2E-01 | 1.7E+01 | 3.2E+00 | 6.6E-01 | 4.6E-01 | NA |
| 129-00-0 | Pyrene | 4.7E-01 | 1.3E+01 | 7.2E+00 | 1.5E+00 | 1.3E+01 | 1.1E+02 | NA |
| 110-86-1 | Pyridine** | 1.9E-03 | 4.7E-04 | 6.4E-01 | 2 7E-01 | 3.3E-01 | 3.0E-01 | NA |
| 94-59-7 | Safrole | 1.5E-02 | 4.6E-02 | 2.0E+00 | 8.5E-01 | 3.8E-01 | 3.2E-01 | NA |
| 7782-49-2 | Selenium | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 7440-22-4 | Silver | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 57-24-9 | Strychnine* | 4.1E-04 | 8.5E-03 | 2.3E+01 | 9 6E+00 | 3.4E-01 | 3.1E-01 | NA |
| 100-42-5 | Stryene | 5.4E-02 | 8.7E-02 | 9.1E-01 | 3.8E-01 | 4.2E-01 | 3.3E-01 | NA |
| 1746-01-6 | TCDD, 2,3,7,8- | 1.4E+00 | 6.3E+02 | 3.8E+01 | 8.1E+00 | 6.3E+02 | 2.5E+05 | 3.0E-02 |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | 1.8E-01 | 4.4E+00 | 9.1E+00 | 1.8E+00 | 4.7E+00 | 1.4E+01 | NA |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | 1.3E-02 | 4.3E-02 | 2.2E+00 | 9.2E-01 | 3.8E-01 | 3.2E-01 | NA |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | 9.0E-03 | 2.5E-02 | 2.2E+00 | 9.2E-01 | 3.6E-01 | 3.1E-01 | NA |
| 127-18-4 | Tetrachloroethylene | 1.5E-02 | 4.7E-02 | 2.2E+00 | 9.0E-01 | 3.8E-01 | 3.2E-01 | NA |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | 8.3E-02 | 2.0E+00 | 1.3E+01 | 2.3E+00 | 2.3E+00 | 3.4E+00 | NA |
| 3689-24-5 | Tetraethyldithiopyrophosphate | 1.1E-02 | 6.8E-01 | 6.0E+01 | 8.1E+00 | 1.0E+00 | 7.8E-01 | NA |
| 7440-28-0 | Thallium (I) | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 108-88-3 | Toluene | 4.7E-02 | 5.6E-02 | 7.7E-01 | 3.2E-01 | 3.9E-01 | 3.2E-01 | NA |
| 95-80-7 | Toluenediamine, 2,4- | 6.6E-04 | 2.5E-04 | 1.2E+00 | 4.9E-01 | 3.3E-01 | 3.0E-01 | NA |
| 95-53-4 | Toluidine, o- * | 3.8E-03 | 2.2E-03 | 9.5E-01 | 3.9E-01 | 3.4E-01 | 3.0E-01 | NA |
| 106-49-0 | Toluidine, p- * | 4.2E-03 | 2.5E-03 | 9.5E-01 | 3.9E-01 | 3.4E-01 | 3.0E-01 | NA |

* Kno onize under environmental conditions

** C miscible, solubility estimated from Henry's Law Constant and Vapor Press

Table A-5. Dermal Parameters for HWIR Chemicals

| CAS Number | Chemical Name | Dermal Parameters: Skin permeability constant for water (cm/hr) | Bunge Constant B (unitless) | Time to steady state t* (hr) | Lag time tau (hr) | c (unitless) | b (unitless) | Soil dermal absorption fraction (unitless) |
|---|---|---|---|---|---|---|---|---|
| 8001-35-2 | Toxaphene | 4.6E-02 | 3.2E+01 | 1.4E+02 | 2.9E+01 | 3.2E+01 | 6.5E+02 | NA |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | 2.4E-02 | 1.4E-01 | 4.1E+00 | 1.2E+00 | 4.8E-01 | 3.6E-01 | NA |
| 120-82-1 | Trichlorobenzene, 1,2,4- | 1.0E-01 | 1.0E+00 | 9.5E+00 | 1.1E+00 | 1.4E+00 | 1.2E+00 | NA |
| 71-55-6 | Trichloroethane, 1,1,1- | 1.1E-01 | 3.0E-02 | 2.1E-01 | 8.7E-02 | 3.6E-01 | 3 1E-01 | NA |
| 79-00-5 | Trichloroethane, 1,1,2- | 8.3E-03 | 1.1E-02 | 1.4E+00 | 5.7E-01 | 3.4E-01 | 3.1E-01 | NA |
| 79-01-6 | Trichloroethylene | 1.6E-01 | 5.1E-02 | 2.1E-01 | 8.7E-02 | 3.8E-01 | 3.2E-01 | NA |
| 75-69-4 | Trichlorofluoromethane | 1.7E-02 | 3.4E-02 | 1.4E+00 | 6.0E-01 | 3.7E-01 | 3.1E-01 | NA |
| 95-95-4 | Trichlorophenol, 2,4,5- | 7.0E-02 | 7.9E-01 | 1.1E+01 | 1.4E+00 | 1.1E+00 | 9.2E-01 | NA |
| 88-06-2 | Trichlorophenol, 2,4,6- | 5.0E-02 | 5.0E-01 | 9.2E+00 | 1.4E+00 | 8.3E-01 | 6.0E-01 | NA |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (2 | 1.2E-02 | 2.0E-01 | 1.3E+01 | 3.2E+00 | 5.4E-01 | 3.9E-01 | NA |
| 93-72-1 | Trichlorophenoxypropionic acid, 2,4,5- | 1.1E-02 | 2.6E-01 | 1.9E+01 | 3 9E+00 | 5.9E-01 | 4.2E-01 | NA |
| 96-18-4 | Trichloropropane, 1,2,3- | 9.5E-03 | 1.8E-02 | 1.7E+00 | 6.9E-01 | 3.5E-01 | 3.1E-01 | NA |
| 99-35-4 | Trinitrobenzene, sym- | 6.6E-04 | 1.5E-03 | 4.2E+00 | 1.7E+00 | 3.3E-01 | 3.0E-01 | NA |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | 3.3E-05 | 3.2E-01 | 8.6E+03 | 1.6E+03 | 6.6E-01 | 4.6E-01 | NA |
| 7440-62-2 | Vanadium | 1.0E-03 | NA | NA | NA | NA | NA | NA |
| 75-01-4 | Vinyl chloride | 9.2E-03 | 3.2E-03 | 5.1E-01 | 2.1E-01 | 3 4E-01 | 3.0E-01 | NA |
| 1330-20-7 | Xylenes (total) | 7.6E-02 | 1.5E-01 | 1.3E+00 | 3.9E-01 | 4.8E-01 | 3.6E-01 | NA |
| 7440-66-6 | Zinc | 1.0E-03 | NA | NA | NA | NA | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates: Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
|---|---|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 2.4E+03 | 2.5E+00 | 2.4E+03 | 2.5E+00 | NH | 0.0E+00 |
| 67-64-1 | Acetone | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 75-05-8 | Acetonitrile | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | > 150,000 yrs | 0.0E+00 |
| 98-86-2 | Acetophenone | NA | NA | NA | NA | NA | NA |
| 107-02-8 | Acrolein | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | ND | NA |
| 79-06-1 | Acrylamide | NA | NA | NA | NA | NA | NA |
| 107-13-1 | Acrylonitrile | 5.5E+02 | 1.1E+01 | 5.5E+02 | 1.1E+01 | 1.1E+07 | 0.0E+00 |
| 309-00-2 | Aldrin | 1.4E+04 | 4.3E-01 | 1.4E+04 | 4.3E-01 | 1.8E+04 | 0.0E+00 |
| 107-05-1 | Allyl chloride | 3.4E+02 | 1.8E+01 | 6.7E+02 | 9.0E+00 | 3.4E+02 | 1.8E+01 |
| 62-53-3 | Aniline | NA | NA | NA | NA | NA | NA |
| 7440-36-0 | Antimony | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 7440-38-2 | Arsenic | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 7440-39-3 | Barium | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 56-55-3 | Benz(a)anthracene | 1.6E+04 | 3.7E-01 | 1.6E+04 | 3.7E-01 | NH | 0.0E+00 |
| 71-43-2 | Benzene | 3.8E+02 | 1.6E+01 | 3.8E+02 | 1.6E+01 | NH | 0.0E+00 |
| 92-87-5 | Benzidine* | 1.9E+02 | 3.2E+01 | 1.9E+02 | 3.2E+01 | NH | 0.0E+00 |
| 50-32-8 | Benzo(a)pyrene | 1.3E+04 | 4.8E-01 | 1.3E+04 | 4.8E-01 | NH | 0.0E+00 |
| 205-99-2 | Benzo(b)fluoranthene | 1.5E+04 | 4.1E-01 | 1.5E+04 | 4.1E-01 | NH | 0.0E+00 |
| 100-51-6 | Benzyl alcohol | NA | NA | NA | NA | NA | NA |
| 100-44-7 | Benzyl chloride | 2.9E+02 | 2.1E+01 | 6.7E+02 | 9.0E+00 | 1.5E+01 | 4.0E+02 |
| 7440-41-7 | Beryllium | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 39638-32-9 | Bis (2-chloroisopropyl) ether | NA | NA | NA | NA | NA | NA |
| 111-44-4 | Bis(2-chlorethyl)ether | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 1.9E+05 | 0.0E+00 |
| 117-81-7 | Bis(2-ethylhexyl)phthalate | 5.5E+02 | 1.1E+01 | 5.5E+02 | 1.1E+01 | ND | NA |
| 75-27-4 | Bromodichloromethane | NA | NA | NA | NA | NA | NA |
| 75-25-2 | Bromoform (Tribromomethane) | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 6.0E+06 | 0.0E+00 |
| 71-36-3 | Butanol | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 88-85-7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinose | 3.0E+03 | 2.1E+00 | 3.0E+03 | 2.1E+00 | NH | 0 0E+00 |
| 85-68-7 | Butylbenzylphthalate | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NI | 0.0E+00 |

* Kr onize under environmental conditions

** r ly miscible, solubility estimated from Henry's Law Constant and Vapor Pres

Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
| 7440-43-9 | Cadmium | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 75-15-0 | Carbon disulfide | NA | NA | NA | NA | NA | NA |
| 56-23-5 | Carbon tetrachloride | 8.5E+03 | 7.2E-01 | 8.5E+03 | 7.2E-01 | 6.1E+07 | 0.0E+00 |
| 57-74-9 | Chlordane | 3.3E+04 | 1.8E-01 | 3.3E+04 | 1.8E-01 | > 197,000 years | 0.0E+00 |
| 126-99-8 | Chloro-1,3-butadiene, 2- (Chloroprene | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | ND | NA |
| 106-47-8 | Chloroaniline, p- | NA | NA | NA | NA | NA | NA |
| 108-90-7 | Chlorobenzene | 3.6E+03 | 1.7E+00 | 3.6E+03 | 1.7E+00 | > 879 years | 0.0E+00 |
| 510-15-6 | Chlorobenzilate | 8.4E+02 | 7.2E+00 | 8.4E+02 | 7.2E+00 | ND | NA |
| 124-48-1 | Chlorodibromomethane | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 2.4E+06 | 0.0E+00 |
| 67-66-3 | Chloroform | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 3.1E+07 | 0.0E+00 |
| 95-57-8 | Chlorophenol, 2- | NA | NA | NA | NA | NA | NA |
| 7440-47-3 | Chromium VI | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 218-01-9 | Chrysene | 2.4E+04 | 2.5E-01 | 2.4E+04 | 2.5E-01 | NH | 0.0E+00 |
| 7440-50-8 | Copper | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 108-39-4 | Cresol, m- | 7.0E+02 | 8.7E+00 | 7.0E+02 | 8.7E+00 | NH | 0.0E+00 |
| 95-48-7 | Cresol, o- | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 106-44-5 | Cresol, p- | 1.6E+01 | 3.8E+02 | 1.6E+01 | 3.8E+02 | NH | 0.0E+00 |
| 98-82-8 | Cumene | 1.9E+02 | 3.2E+01 | 1.9E+02 | 3.2E+01 | ND | NA |
| 72-54-8 | DDD | 1.4E+05 | 4.3E-02 | 1.4E+05 | 4.3E-02 | 2.1E+05 | 0.0E+00 |
| 72-55-9 | DDE | 1.4E+05 | 4.3E-02 | 1.4E+05 | 4.3E-02 | NH | 0.0E+00 |
| 50-29-3 | DDT | 1.4E+05 | 4.3E-02 | 1.4E+05 | 4.3E-02 | 1.9E+05 | 0.0E+00 |
| 84-74-2 | Di-n-butyl phthalate | 5.5E+02 | 1.1E+01 | 5.5E+02 | 1.1E+01 | 8.8E+04 | 0.0E+00 |
| 117-84-0 | Di-n-octyl phthalate | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | 9.4E+05 | 0.0E+00 |
| 2303-16-4 | Diallate | 2.2E+03 | 2.8E+00 | 2.2E+03 | 2.8E+00 | 5.8E+04 | 0.0E+00 |
| 53-70-3 | Dibenz(a,h)anthracene | 2.3E+04 | 2.7E-01 | 2.3E+04 | 2.7E-01 | NH | 0.0E+00 |
| 96-12-8 | Dibromo-3-chloropropane, 1,2- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 3.4E+05 | 0.0E+00 |
| 95-50-1 | Dichlorobenzene, 1,2- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | >879 years | 0.0E+00 |
| 106-46-7 | Dichlorobenzene, 1,4- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | >879 years | 0.0E+00 |
| 91-94-1 | Dichlorobenzidine, 3,3'- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates: Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
|---|---|---|---|---|---|---|---|
| 75-71-8 | Dichlorodifluoromethane | 4 3E+03 | 1.4E+00 | 4.0E+03 | 1.5E+00 | ND | NA |
| 75-34-3 | Dichloroethane, 1,1- | 3.7E+03 | 1.6E+00 | 3.7E+03 | 1.6E+00 | ND | NA |
| 107-06-2 | Dichloroethane, 1,2- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 9.6E+03 | 0.0E+00 |
| 75-35-4 | Dichloroethylene, 1,1- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 156-59-2 | Dichloroethylene, cis-1,2- | NA | NA | NA | NA | NA | NA |
| 156-60-5 | Dichloroethylene, trans-1,2- | NA | NA | NA | NA | NA | NA |
| 120-83-2 | Dichlorophenol, 2,4- | 1.7E+03 | 3.6E+00 | 2.0E+02 | 3.1E+01 | NH | 0.0E+00 |
| 94-75-7 | Dichlorophenoxyacetic acid, 2,4- (2,4- | 1.2E+03 | 5.1E+00 | 1.2E+03 | 5.1E+00 | NH | 0.0E+00 |
| 78-87-5 | Dichloropropane, 1,2- | 3.1E+04 | 2.0E-01 | 3.1E+04 | 2.0E-01 | 1.4E+05 | 0.0E+00 |
| 542-75-6 | Dichloropropene, 1,3- | 2.7E+02 | 2.2E+01 | 6.7E+02 | 9.0E+00 | 2.7E+02 | 2.2E+01 |
| 10061-01-5 | Dichloropropene, cis-1,3- | NA | NA | NA | NA | NA | NA |
| 10061-02-6 | Dichloropropene, trans-1,3- | NA | NA | NA | NA | NA | NA |
| 60-57-1 | Dieldrin | 2.6E+04 | 2.3E-01 | 2.6E+04 | 2.3E-01 | 9.2E+04 | 0.0E+00 |
| 84-66-2 | Diethyl phthalate | 1.3E+03 | 4.5E+00 | 1.3E+03 | 4.5E+00 | 7.7E+04 | 0.0E+00 |
| 56-53-1 | Diethylstilbestrol | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 60-51-5 | Dimethoate | 8.9E+02 | 6.8E+00 | 1.3E+03 | 4.5E+00 | 2.8E+03 | 2.2E+00 |
| 131-11-3 | Dimethyl phthalate | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01. | 2.8E+04 | 0.0E+00 |
| 57-97-6 | Dimethylbenz(a)anthracene, 7,12- | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | NH | 0.0E+00 |
| 119-93-7 | Dimethylbenzidine, 3,3'- * | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 105-67-9 | Dimethylphenol, 2,4- * | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 119-90-4 | Dimethyoxybenzidine, 3,3'- * | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 99-65-0 | Dinitrobenzene, 1,3- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 51-28-5 | Dinitrophenol, 2,4- | 6.3E+03 | 9.6E-01 | 6.3E+03 | 9.6E-01 | NH | 0.0E+00 |
| 121-14-2 | Dinitrotoluene, 2,4- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 606-20-2 | Dinitrotoluene, 2,6- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 123-91-1 | Dioxane, 1,4- ** | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 122-39-4 | Diphenylamine* | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | NH | 0.0E+00 |
| 298-04-4 | Disulfoton | 5.0E+02 | 1.2E+01 | 5.0E+02 | 1.2E+01 | 2.5E+03 | 2.5E+00 |
| 115-29-7 | Endosulfan | 2.2E+02 | 2.8E+01 | 2.2E+02 | 2.8E+01 | 2.2E+02 | 2.8E+01 |

* Kno[illegible]nize under environmental conditions.

** Co[illegible]miscible; solubility estimated from Henry's Law Constant and Vapor Pressu[illegible]

Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates: Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
|---|---|---|---|---|---|---|---|
| 72-20-8 | Endrin | NA | NA | NA | NA | NA | NA |
| 106-89-8 | Epichlorohydrin | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9 0E+00 | 2.0E+02 | 3.1E+01 |
| 110-80-5 | Ethoxyethanol, 2- ** | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | NH | 0 0E+00 |
| 141-78-6 | Ethyl acetate | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | 1.8E+04 | 0.0E+00 |
| 60-29-7 | Ethyl ether | NA | NA | NA | NA | NA | NA |
| 97-63-2 | Ethyl methacrylate | NA | NA | NA | NA | NA | NA |
| 62-50-0 | Ethyl methanesulfonate | 7.7E+01 | 7.9E+01 | 6.7E+02 | 9.0E+00 | 7.7E+01 | 7.9E+01 |
| 100-41-4 | Ethylbenzene | 2.4E+02 | 2 5E+01 | 2.4E+02 | 2.5E+01 | NH | 0.0E+00 |
| 106-93-4 | Ethylene Dibromide | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 1.9E+04 | 0.0E+00 |
| 96-45-7 | Ethylene thiourea | 6.7E+02 | 9 0E+00 | 6.7E+02 | 9.0E+00 | NI | 0.0E+00 |
| 206-44-0 | Fluoranthene | 1.1E+04 | 5.7E-01 | 1.1E+04 | 5.7E-01 | NH | 0.0E+00 |
| 86-73-7 | Fluorene | 1.4E+03 | 4.2E+00 | 1.4E+03 | 4.2E+00 | NH | 0.0E+00 |
| 50-00-0 | Formaldehyde | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 64-18-6 | Formic Acid* | 1.7E+02 | 3 6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 110-00-9 | Furan | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9 0E+00 | NH | 0.0E+00 |
| 76-44-8 | Heptachlor | 1.3E+02 | 4.7E+01 | 1.6E+03 | 3.9E+00 | 2.3E+01 | 2.6E+02 |
| 1024-57-3 | Heptachlor epoxide | 1.3E+04 | 4.6E-01 | 1.3E+04 | 4.6E-01 | NI | 0 0E+00 |
| 87-68-3 | Hexachloro-1,3-butadiene | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 118-74-1 | Hexachlorobenzene | 5.0E+04 | 1.2E-01 | 5.0E+04 | 1.2E-01 | NI | 0.0E+00 |
| 319-84-6 | Hexachlorocyclohexane, alpha- (alpha | 3.2E+03 | 1.9E+00 | 3.2E+03 | 1 9E+00 | 5 0E+03 | 1 2E+00 |
| 319-85-7 | Hexachlorocyclohexane, beta- (beta-B | 3.0E+03 | 2.0E+00 | 3.0E+03 | 2.0E+00 | 5.0E+03 | 1.2E+00 |
| 58-89-9 | Hexachlorocyclohexane, gamma- (Lin | 5.8E+03 | 1.1E+00 | 9.9E+03 | 6.1E-01 | 5.0E+03 | 1.2E+00 |
| 77-47-4 | Hexachlorocyclopentadiene | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | 1.7E+02 | 3.5E+01 |
| 67-72-1 | Hexachloroethane | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0.0E+00 |
| 70-30-4 | Hexachlorophene* | 7.9E+03 | 7.7E-01 | 7.9E+03 | 7.7E-01 | ND | NA |
| 193-39-5 | Indeno(1,2,3-cd) pyrene | 1.8E+04 | 3.5E-01 | 1.8E+04 | 3.5E-01 | NH | 0.0E+00 |
| 78-83-1 | Isobutyl alcohol | 1.7E+02 | 3.5E+01 | 1.7E+02 | 3.5E+01 | NH | 0.0E+00 |
| 78-59-1 | Isophorone | 6.7E+02 | 9 0E+00 | 6.7E+02 | 9.0E+00 | ND | NA |
| 143-50-0 | Kepone | 1.7E+04 | 3 5E-01 | 1.7E+04 | 3.5E-01 | NH | 0.0E+00 |

* Known to ionize under environmental conditions

** Completely miscible; solubility estimated from Henry's Law Constant and Vapor Pressure.

Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates: Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
|---|---|---|---|---|---|---|---|
| 7439-92-1 | Lead | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 7439-97-6 | Mercury | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 126-98-7 | Methacrylonitrile | NA | NA | NA | NA | NA | NA |
| 67-56-1 | Methanol | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 72-43-5 | Methoxychlor | 8.8E+03 | 6.9E-01 | 8.8E+03 | 6.9E-01 | 9.2E+03 | 0.0E+00 |
| 74-83-9 | Methyl bromide (Bromomethane) | 6.7E+02 | 9 0E+00 | 6.7E+02 | 9.0E+00 | 9.1E+02 | 6.7E+00 |
| 74-87-3 | Methyl chloride (Chloromethane) | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | 7.0E+03 | 8.7E-01 |
| 78-93-3 | Methyl ethyl ketone | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | > 50 years | 0.0E+00 |
| 108-10-1 | Methyl isobutyl ketone | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 80-62-6 | Methyl methacrylate | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | 3.5E+04 | 0.0E+00 |
| 298-00-0 | Methyl parathion | 8.6E+03 | 7.0E-01 | 1.7E+03 | 3.6E+00 | 1.7E+03 | 3.5E+00 |
| 56-49-5 | Methylcholanthrene, 3- | 3.4E+04 | 1.8E-01 | 3.4E+04 | 1.8E-01 | NH | 0.0E+00 |
| 74-95-3 | Methylene bromide | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | 1.6E+06 | 0.0E+00 |
| 75-09-2 | Methylene chloride | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | 6.2E+06 | 0.0E+00 |
| 7439-98-7 | Molybdenum | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 621-64-7 | N-Nitrosodi-n-propylamine | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0.0E+00 |
| 86-30-6 | N-Nitrosodiphenylamine | 8.2E+02 | 7.4E+00 | 8.2E+02 | 7.4E+00 | ND | NA |
| 100-75-4 | N-Nitrosopiperidine | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0.0E+00 |
| 930-55-2 | N-Nitrosopyrrolidine | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0.0E+00 |
| 91-20-3 | Naphthalene | 1.2E+03 | 5.3E+00 | 4.8E+02 | 1.3E+01 | NH | 0.0E+00 |
| 91-59-8 | Naphthylamine* | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 7440-02-0 | Nickel | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 98-95-3 | Nitrobenzene | 4.7E+03 | 1.3E+00 | 4.7E+03 | 1.3E+00 | NH | 0.0E+00 |
| 79-46-9 | Nitropropane, 2- * | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 924-16-3 | Nitrosodi-n-butylamine | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0 0E+00 |
| 55-18-5 | Nitrosodiethylamine | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0.0E+00 |
| 62-75-9 | Nitrosodimethylamine | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NI | 0.0E+00 |
| 10595-95-6 | Nitrosomethylethylamine | NA | NA | NA | NA | NA | NA |
| 152-16-9 | Octamethylpyrophosphoramide | NA | NA | NA | NA | NA | NA |

* Knc ɔnize under environmental conditions

** C· miscible; solubility estimated from Henry's Law Constant and Vapor Pressi

Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
| 56-38-2 | Parathion | NA | NA | NA | NA | NA | NA |
| 608-93-5 | Pentachlorobenzene | 8.3E+03 | 7.3E-01 | 8.3E+03 | 7.3E-01 | >879 years | 0.0E+00 |
| 82-68-8 | Pentachloronitrobenzene (PCNB) | 1.7E+04 | 3.6E-01 | 1.7E+04 | 3.6E-01 | 1.3E+04 | 0.0E+00 |
| 87-86-5 | Pentachlorophenol* | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 108-95-2 | Phenol | 2.4E+02 | 2.5E+01 | 8.4E+01 | 7.2E+01 | NH | 0.0E+00 |
| 62-38-4 | Phenyl mercuric acetate | NA | NA | NA | NA | NA | NA |
| 108-45-2 | Phenylenediamine, m- * | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | ND | NA |
| 298-02-2 | Phorate | 8.6E+03 | 7.0E-01 | 1.7E+03 | 3.6E+00 | 1.7E+03 | 3.5E+00 |
| 1336-36-3 | Polychlorinated biphenyls | NA | NA | NA | NA | NA | NA |
| 23950-58-5 | Pronamide | NA | NA | NA | NA | NA | NA |
| 129-00-0 | Pyrene | 4.6E+04 | 1.3E-01 | 4.6E+04 | 1.3E-01 | NH | 0.0E+00 |
| 110-86-1 | Pyridine** | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 94-59-7 | Safrole | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | NI | 0 0E+00 |
| 7782-49-2 | Selenium | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0 0E+00 |
| 7440-22-4 | Silver | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 57-24-9 | Strychnine* | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | ND | NA |
| 100-42-5 | Styrene | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | NH | 0.0E+00 |
| 1746-01-6 | TCDD, 2,3,7,8- | 1.4E+04 | 4.3E-01 | 1.4E+04 | 4.3E-01 | NH | 0.0E+00 |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | >879 years | 0.0E+00 |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | 1.6E+03 | 3.8E+00 | 6.7E+02 | 9.0E+00 | 1.6E+03 | 3.8E+00 |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | 1.1E+03 | 5.7E+00 | 4.3E+03 | 1.4E+00 | 1.1E+03 | 5.7E+00 |
| 127-18-4 | Tetrachloroethylene | 8.6E+03 | 7.0E-01 | 8.6E+03 | 7.0E-01 | NH | 0 0E+00 |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | 4.3E+03 | 1.4E+00 | 4.0E+03 | 1.5E+00 | NH | 0.0E+00 |
| 3689-24-5 | Tetraethyldithiopyrophosphate | NA | NA | NA | NA | NA | NA |
| 7440-28-0 | Thallium (I) | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 108-88-3 | Toluene | 5.3E+02 | 1.1E+01 | 5.3E+02 | 1.1E+01 | NH | 0.0E+00 |
| 95-80-7 | Toluenediamine, 2,4- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 95-53-4 | Toluidine, o- * | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | NH | 0.0E+00 |
| 106-49-0 | Toluidine, p- * | NA | NA | NA | NA | NA | NA |

* Known to ionize under environmental conditions

** Completely miscible, solubility estimated from Henry's Law Constant and Vapor Pressure.

## Table A-6. Degradation Half-Life and Rate Data for HWIR Chemicals

| CAS Number | Chemical Name | Degradation Half-Lives and Rates: Soil half-life (hours) | Soil Degradation Rate (yr-1) | Aqueous half-life (hours) | Aqueous Degradation Rate (yr-1) | Hydrolysis half-life (hours) | Hydrolysis rate (yr-1) |
|---|---|---|---|---|---|---|---|
| 8001-35-2 | Toxaphene | NA | NA | NA | NA | NA | NA |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | 8.6E+03 | 7.0E-01 | 8.6E+03 | 7.0E-01 | ND | NA |
| 120-82-1 | Trichlorobenzene, 1,2,4- | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | 3.0E+04 | 0.0E+00 |
| 71-55-6 | Trichloroethane, 1,1,1- | 6.6E+03 | 9.3E-01 | 6.6E+03 | 9.3E-01 | NI | 0.0E+00 |
| 79-00-5 | Trichloroethane, 1,1,2- | 8.8E+03 | 6.9E-01 | 8.8E+03 | 6.9E-01 | 3.3E+05 | 0.0E+00 |
| 79-01-6 | Trichloroethylene | 8.6E+03 | 7.0E-01 | 8.6E+03 | 7.0E-01 | 7.7E+03 | 7.9E-01 |
| 75-69-4 | Trichlorofluoromethane | 8.6E+03 | 7.0E-01 | 8.6E+03 | 7.0E-01 | ND | NA |
| 95-95-4 | Trichlorophenol, 2,4,5- | 1.7E+04 | 3.7E-01 | 1.7E+04 | 3.7E-01 | >8E+6 years | 0.0E+00 |
| 88-06-2 | Trichlorophenol, 2,4,6- | 1.7E+03 | 3.6E+00 | 1.7E+03 | 3.6E+00 | >8E+6 years | 0.0E+00 |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (2 | 4.8E+02 | 1.3E+01 | 4.8E+02 | 1.3E+01 | NI | 0.0E+00 |
| 93-72-1 | Trichlorophenoxypropionic acid, 2,4,5- | NA | NA | NA | NA | NA | NA |
| 96-18-4 | Trichloropropane, 1,2,3- | 8.6E+03 | 7.0E-01 | 8.6E+03 | 7 0E-01 | 3.9E+05 | 0.0E+00 |
| 99-35-4 | Trinitrobenzene, sym- | NA | NA | NA | NA | NA | NA |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | 1.7E+02 | 3.6E+01 | 1.7E+02 | 3.6E+01 | ND | NA |
| 7440-62-2 | Vanadium | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |
| 75-01-4 | Vinyl chloride | 4.3E+03 | 1.4E+00 | 4.3E+03 | 1.4E+00 | NH | 0.0E+00 |
| 1330-20-7 | Xylenes (total) | 6.7E+02 | 9.0E+00 | 6.7E+02 | 9.0E+00 | NH | 0.0E+00 |
| 7440-66-6 | Zinc | Metal | 0.0E+00 | Metal | 0.0E+00 | Metal | 0.0E+00 |







* Known ze under environmental conditions
** Com iiscible; solubility estimated from Henry's Law Constant and Vapor Pressure