



Risk Based Guidance for the Soil Leaching Pathway User's Guide

a Fact Sheet prepared by the Site Response Section
of the Minnesota Pollution Control Agency
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The Site Response Section (SRS) of the Minnesota Pollution Control Agency (MPCA) developed the document entitled "Risk Based Guidance For Evaluating The Soil Leaching Pathway" as part of a section wide guidance development effort. The document is intended to be used for evaluation of the soil leaching pathway at Voluntary Investigation and Cleanup (VIC) and Superfund sites.

Evaluation of the soil leaching pathway consists of an assessment of the risk posed to ground water and associated receptors from a source of soil contamination in the unsaturated zone. Contaminant and generic soil properties are used to predict soil concentration levels that are considered to represent an unacceptable risk to ground water via the leaching pathway. These levels are referred to as Soil Leaching Values (SLVs) and are intended to serve as guidelines for making corrective action decisions. This guidance utilizes a three tiered approach that entails gathering progressively greater amounts of site specific information

A Tier 1 evaluation of the leaching pathway is designed to screen out contaminants or sources that are not considered to represent a risk to ground water and to identify sources and contaminants of potential concern (COPC) by comparing a suite of site soil concentration values to a suite of tabulated Tier 1 SLVs. Tier 1 SLVs may be used as cleanup criteria in some instances, although a Tier 2 or Tier 3 evaluation will provide a more realistic estimation of risk to ground water. The rationale is presented for Tier 1 SLVs, and the generic assumptions and equations used to generate these values are discussed. A dilution attenuation factor (DAF) that provides an estimation of the decrease in concentration as leachate enters and mixes with site ground water is available at all Tiers.

At the Tier 2 level additional site data is typically available which allows for a more site specific evaluation. A series of electronic spreadsheets (the Spreadsheet) are provided with supporting guidance to allow users to enter site specific information and develop site specific Tier 2 SLVs. Using the Spreadsheet, Tier 2 SLVs may be generated based on modifications of the Tier 1 partitioning equation or, for a limited number of compounds, using soil leachate concentrations (SLCs, risk values based on leachate alone prior to ground water mixing) developed by MPCA using the Seasonal Soil Compartment Model (SESOIL). A depth to water adjustment is available at Tier 2 expressed by the Contaminant Redistribution Factor (CRF). The Tier 2 SLV thus equals the $(SLC) \cdot (DAF) \cdot (CRF)$. Site specific estimates of the DAF are encouraged utilizing specific site hydrologic characteristics and tabulated estimates of infiltration rates. In most circumstances a Tier 2 evaluation will result in a SLV that is appreciably higher than the

Tier 1 value. Site specific inputs used at the Tier 2 level include: soil organic carbon content; soil pH; infiltration rate; depth to ground water; hydraulic conductivity; hydraulic gradient; source length; and mixing depth in aquifer. Development of a site specific soil-water partition coefficient is an option at Tier 2 or Tier 3.

Since both Tier 1 and Tier 2 utilize an equilibrium partitioning equation along with generic site inputs designed principally for unconsolidated glacial or alluvial conditions, some site conditions will not be appropriate for either a Tier 1 or Tier 2 evaluation and may require a Tier 3 evaluation. These conditions include soils in which free phase product serves as a leaching source, karstic conditions and unusual chemical soil environments that may serve to enhance or inhibit contaminant leaching.

A Tier 3 evaluation allows a user to go beyond guidance currently available in this guidance as long as justifiable supporting rationale is provided that is consistent with the risk based policies in Site Response Section. A Tier 3 evaluation will typically evaluate the predicted effect of site specific conditions - such as estimating the effect on leaching due to specific site geology; geochemical environments, hydrology, or biodegradation processes. Tier 3 evaluations may incorporate site specific modeling and may require in some cases special monitoring requirements or treatability studies.

Draft Document Availability

Individual sections of the Risk Based Site Evaluation (RBSE) Manual are being released to the public in draft form for comment as they become available. Please contact SRS to see what sections are currently available. Guidelines to be released include ground water policy, site characterization and sampling requirements, remedy selection, etc. All draft guidelines are to be used with assistance from Minnesota Pollution Control Agency staff assigned to a specific site.

A photocopy fee of approximately \$0.20 per page will be charged for draft sections of the RBSE Manual in excess of 20 pages. To receive copies of the current and future documents or to be placed on a mailing list to receive notices regarding the guidance development efforts please send written requests to:

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Written comments regarding the guidelines may be sent to the *SRS Guidance Coordination Team* at the same address.

