Update of Ecological Soil Screening Level (Eco-SSL) Guidance and Contaminant Specific Documents
March 2005

Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs) Attachment 4-1 Wildlife Exposure Factors and Bioaccumulation Models

In February 2005, EPA revised the exposure factors and bioaccumulation models used to calculate Eco-SSL values for wildlife. The Attachment issued in November of 2003 has been revised and replaced with an updated February 2005 version. The changes reflected in the February 2005 document include changes to the food ingestion rates, soil intake values and equations for estimating the uptake of metals, non-ionic organic chemicals and pentachlorophenol from soil into plants, soil invertebrates and mammals.

Food Ingestion Rate

In the original attachment document, the food ingestion rate (FIR) for each surrogate wildlife species was originally estimated based on the reported body weights of the species using an allometric scaling equation (Nagy, 1999). FIRs are now derived from reported food ingestion rates in the literature for each of the surrogate species. For each surrogate species, the FIR is the arithmetic mean of reported high end values.

Soil Intake

Ingestion of soil (P_s) was estimated in the original attachment document as a fraction of the food ingestion rate based on the equation reported in Beyer et al. (1984). For each surrogate wildife species, Monte Carlo simulation was used to estimate the 90th percentile of P_s by assigning a Probability Distribution Function (PDF) to each of four variables in the equation used to calculate P_s. In the February 2005 revision, the Monte Carlo simulation was repeated with two changes. A normal distribution instead of triangular distribution was assumed for the variable (y) for concentration of acid-insoluble ash in scat and the results were based on 100,000 iterations instead of 3200.

Estimating the Uptake of Metals from Soil into Dietary Items

There were no substantial changes to the equations used to estimate the uptake of metals from soil in the dietary items for wildlife. The February 2005 revision includes replacement values for the uptake of beryllium, barium and antimony into small mammals and for beryllium into plants. In the original attachment, factors from Baes et al. (1994) were used to estimate uptake from soil into small mammals. These values

were used as unitless factors from soil into tissue. In the February 2005 revision, the values represent fractions per unit of body weight. The original attachment reported an assumed uptake factor of 1 for beryllium from soil into plants. In the February 2005 revision, this assumption was replaced with an uptake regression equation based on empirical data from the literature relating the transformed concentration of beryllium in soil to the transformed concentration of beryllium in plant tissue. Vanadium was omitted from the original attachment and existing bioaccumulation values from Bechtel-Jacobs (1998), Sample et al.(1998a) and Sample et al. (1998b) were added for plants, earthworms and small mammals, respectively.

Estimating the Uptake of Non-Ionic Organic Chemicals from Soil into Plants

In the original attachment, the uptake of non-ionic organic chemicals from soil into plants was derived from chemical-specific empirical data or estimated using models. These uptake equations and models have been updated in the February 2005 revision. The updates result from the addition of new data. Unlike the original attachment, the February 2005 revision includes appendices that contain all the underlying empirical data used either to derive bioaccumulation factors, regressions and models.

Estimating the Uptake of Non-Ionic Organic Chemicals from Soil into Earthworms

In the original attachment, the uptake of non-ionic organic chemicals from soil into earthworms was estimated using a model that related uptake to the log octanol water partition coefficient (log K_{ow}) of the chemical based on the equation of Connell and Markwell (1990). In the February 2005 revision, this equation was replaced with that of Jager (1998). For DDT and dieldrin, empirical data from the literature were compiled and evaluated and regression equations relating concentration in soil to concentration in soil invertebrate were used to estimate uptake instead of the log K_{ow} based model.

Estimating the Uptake of Non-Ionic Organic Chemicals from Soil into Small Mammals

In the original attachment, the uptake of non-ionic organic chemicals from soil into small mammals was estimated using a model that related uptake to the log K_{ow} based on an analysis of empirical data from the literature for accumulation in beef. In the February 2005 revision, this model was removed as it showed a poor relationship between log K_{ow} and was replaced with empirical data for the Eco-SSL non-ionic organic chemicals (DDT and dieldrin). For DDT and dieldrin, empirical data from the literature were compiled and evaluated and regression equations relating concentration in diet to concentration in bird or mammal tissue (whole body or carcass) were used to estimate uptake.

Estimating the Uptake of Pentachlorophenol (PCP) from Soil into Dietary Items

In the original attachment, the uptake of PCP from soil into plants and earthworms were estimated using respective models that related uptake to the log K_{ow} of the chemical. In the February 2005 revision, empirical data from the literature were compiled and evaluated and the models were replaced with a median bioaccumulation factor (for plants) and an uptake regression equation (for earthworms).

Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)

Chapter 4 of the guidance document was revised to reflect the changes to Attachment 4-1. These pages (4-1 to 4-21) are marked as revised February 2004. The remainder of the guidance document remains unchanged.

Eco-SSL Documents for Antimony, Beryllium, Barium, Cadmium, Cobalt, Dieldrin and Lead

The contaminant specific Eco-SSL documents issued in November 2003 for antimony, beryllium, barium, cadmium, cobalt, dieldrin and lead have been revised to reflect the February 2005 revisions to Attachment 4-1. The revisions did not substantially change most of the final Eco-SSL values. The exception was for dieldrin where the Eco-SSL value for mammals decreased from 0.00028 mg/kg dw to 0.000032 mg/kg dw. The documents released in November 2003 for aluminum and iron remain unchanged.

Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs) Attachment 4-3 Eco-SSL Standard Operating Procedure (SOP) #4: Wildlife Toxicity Reference Value Literature Review, Data Extraction and Coding

In March 2005, EPA revised the coding guidelines for wildlife toxicity reference values (TRVs). This revision reflects changes and additions to procedures made as a result of ongoing data evaluation efforts for additional Eco-SSL contaminants. The changes primarily reflect the addition of default body weight values and a revision to Table 7 for nutrition requirements.

References

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