trophic levels. As a result, toxicity benchmarks for bioaccumulative constituents cannot be used as acceptable medium exposure concentrations; exposure estimates must incorporate the bioaccumulation potential in the food chain. For nonbioaccumulating constituents, where toxicity benchmarks that are medium specific (i.e., concentration units—mg/kg or mg/L)) can be used as acceptable medium concentrations for ecological receptors (e.g., Ambient Water Quality Criteria).

In the aquatic ecosystem, for bioaccumulative chemicals (log K_{ow}>4), bioaccumulation factors (BAFs) were estimated using models developed by Thomann (1989x) for the limnetic (or pelagic) food chain and Thomann et al. (1992x) for the littoral food chain (i.e., sediment-based). However, for constituents with log K_{ow} above 6.5, only measured values were used. The Agency is considering using the Gobas model since it can be used for constituents with log K_{ow} above 6.5. Further, switching to the Gobas model would be consistent with the Great Lakes Initiative which recently switched to that model. The results produced by either the Thomann models or the Gobas model are very similar. The tissue concentration (TC) was estimated for prey based on the intake, body weight, and dietary preference (i.e., trophic level of fish consumed) of the representative predator species. Protective surface water concentration was calculated by dividing the tissue concentration (TC) by the bioaccumulation factor for the appropriate trophic level. For nonbioaccumulative chemicals, the protective surface water concentration for fish and aquatic organisms was the Final Chronic Value (FCV) or Secondary Chronic Value (SCV) as described in Section 4 of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors. For upper trophic level aquatic wildlife such as mink and osprey, protective surface water concentrations were calculated based on the consumption of contaminated fish and water. The benthic community was included in the littoral ecosystem. Protective sediment concentrations were estimated using the equilibrium partitioning (Eqp) methods developed by Di Toro et al. (1991x). As explained in Section 4 of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors, the sediment benchmark was calculated by multiplying the FCV (or SCV) by the octanol/carbon partition coefficient (K_{oc}) and adjusting for the fraction organic carbon (f_{oc}) in the sediment. EPA requests comment on the selection of the bioaccumulation model, the potential switch to the Gobas model, BAFs used, dietary assumptions, and how tissue concentrations were calculated.

For receptors in the generic terrestrial ecosystem, methods used represented a range of dietary habits across trophic levels for wildlife, including plants and organisms that live in the soil (i.e., soil fauna). (See the discussion on the development of soil and plant benchmarks elsewhere in today's rule.) For higher trophic level wildlife, dietary preferences, daily intake, and bioconcentration factors for prey items were identified or estimated to calculate protective soil concentrations. The key equation used to back-calculate soil concentrations as a function of dietary exposure (including soil ingestion), and the exposure inputs (e.g., body weights, daily intake) for ecological receptors are discussed in Section 5.3 of the Risk Assessment. The Agency requests comment on the equations and inputs used in the generic terrestrial ecosystem modeling.

The following types of exposure were not assessed in the assessment:

- Inhalation by ecological receptors—No suitable methodology was available.
- Dermal contact with soil—No suitable methodology or sufficient toxicity data were available.
- Dermal contact with water—No suitable methodology or sufficient toxicity data were available.

3. Groundwater Fate and Transport Modeling

In the risk analysis previously described in the section, the pathways involving groundwater are only modeled (back-calculated) to the wellhead, i.e., to the point of exposure at a water well. For groundwater modeling from the waste management unit (i.e., surface impoundment) to the water well, the Agency used a separate fate and transport analysis. This section describes the groundwater model and the modeling procedures for the various waste management scenarios for the groundwater path. The details of the model and the modeling procedures are presented in the background documents (USEPA, 1995 a-f).

The Agency has developed specialized subsurface fate and transport modeling for four waste management options: (1) Landfills; (2) surface impoundments; (3) waste piles; and (4) land application units. All four waste management scenarios assume that the waste if exempted could be managed in the respective RCRA Subtitle D units. In deriving the exemption levels, the Agency needs to evaluate the fate and transport of constituents from the waste unit to the nearby drinking water wells. The potential migration of constituents from a waste unit to the leachate at the bottom of the waste unit can be simulated by the laboratory test, the Toxicity Leaching Procedure (TCLP), or the Synthetic Precipitation Leaching Procedure (SPLP), Method 1312. Although one procedure may be more applicable for some wastes than the other procedure, as described on page 21483 of the Federal Register Notice of May 20, 1992 (57 FR 21450), the Agency is soliciting comments on the applicability and use of one test over the other for this proposal.

The fate and transport of constituents in leachate from the bottom of the waste unit through the unsaturated zone and to a drinking water well in the saturated zone is estimated using a fate and transport model. The Agency proposes to use EPACMTP (EPA's Composite Model for leachate migration with Transformation Products) for this purpose. The EPACMTP considers not only the subsurface fate and transport of chemical constituents, but also the formation and the fate and transport of transformation (daughter) products. The Agency also solicits comments on the technical correctness and applicability of the model and the data for this proposal.

The Agency proposed the use of a subsurface fate and transport model (EPASMOD) on June 13,1986 (51 FR 21648) in the Toxicity Characteristic (TC) Rule. However, after receiving numerous comments, the Agency revised the model and the data used in the model (53 FR 28692) and the enhanced model (EPACML) was used in the TC Final Rule (55 FR 11798). The EPACMTP replaces the EPACML for use in this proposal. The EPACMTP was recently published in a refereed journal (Kool, Sudicky and Saleem, Journal of Contaminant Hydrology 17(1994) 69–90) and has been reviewed by the EPA's Science Advisory Board (SAB). The SAB commended the Agency for making for its significant improvements to the model. They also stated that it represents the state of the art for such analyses. However, they also recommended additional testing of the model.

The modeling approach used for this proposed rulemaking includes three major categories of enhancements over the EPACML and the approach for the TC rule. The enhancements fall into the