

Development of Unsaturated-Zone Leaching and Saturated-Zone Mixing Model

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A screening level model was developed for simulation of pollutant migration through the unsaturated-zone and subsequent mixing within the saturated-zone. This one-dimensional finite difference model simulates the transport processes of liquid-phase advection, liquid- and vapor-phase dispersion, sorption, and decay of the contaminant. Using a simple mass-balance technique, the saturated-zone module estimates mixing of the unsaturated-zone leachate with groundwater. The model can be a useful tool in making preliminary assessments of the potential impacts of contaminants in the subsurface. The model can handle vertical heterogeneity of the soil columns and non-uniform initial contaminant concentration. The model was verified by comparing to an analytical solution and laboratory soil column experiments. Three different soil sample sizes of Ottawa quartz sand and 480 ppm saline water as groundwater contamination were used to be validated successfully in a lab steady state soil column study. The graphical user interface based on the Microsoft Window function was added in the model so that input data preparation and output data visualization processes are automated.