TABLE 3.—EPACMTP MODELING OPTIONS—Continued

Saturated Thickness	Site-based, from API/USGS hydrogeologic database.
Hydraulic Conductivity	Site-based, from API/USGS hydrogeologic database.
Porosity	Effective porosity derived from national distribution of aquifer particle diameter.
Bulk Density	Derived from porosity.
Dispersivity	Derived from a national distribution and is based on distance to the receptor well.
Groundwater Temperature	Site-based, from USGS regional temperature map.
Fraction Organic Carbon	National distribution, from EPA STORET database.
pH	National distribution, from EPA STORET database.
Receptor Well Location:	
Radial Distance	Nationwide distribution based the survey.
Angle Off-Center	Uniform within ± 90° from plume centerline.
Depth of Intake Point	(No restriction to be within plume) Uniform throughout saturated thickness of aquifer.

4. Other Risk Assessment Issues

a. Differences Between the Groundwater and Non-groundwater Analyses

As mentioned previously, the Agency conducted separate analyses for the evaluation of risks from groundwater and non-groundwater pathways. The groundwater pathways relied on a full Monte Carlo analysis; whereas the non-groundwater pathway analyses were performed using high-end and central tendency parameters, consistent EPA's risk characterization guidance (EPA 1995).

Although the approaches to the modeling differed, the Agency used the same data for parameter inputs (i.e., OSW's Industrial Subtitle D Survey, U.S. EPA 1986) to describe the waste management units common to both analyses (i.e, surface impoundments, waste piles, and land application units). However, even though the same data were used, some differences exist based on the different modeling approaches. These differences are discussed below.

(1) Infiltration

For the groundwater pathway analysis, the Agency used the HELP model to calculate the net infiltration rate for landfills, land application units and waste piles, as a function of regional climatic conditions and waste unit design characteristics (see EPACMTP background Document). The analysis used the meteorological data from 93 meteorological stations located throughout the United States to develop infiltration rate distributions using the HELP model.

For the non-groundwater analysis, the Agency used rainfall to calculate the recharge rate. The rainfall was selected from 29 meteorological stations distributed among 9 climate regions. However, the method for selecting the rainfall factor differed between the air release pathways and the overland release pathways.

- For the air release pathways, the Agency conducted a sensitivity analysis for each waste management unit type to rank the 29 meteorological stations with respect to several air modeling outputs, including maximum air concentration of pollutants, average air concentrations over the agricultural field and water body, and average deposition over the agricultural field and water body. Based on these sensitivity analyses, the Agency selected a central tendency location and high-end location for the air pathway for each of the waste management units. Thus, locations with meteorologic data, including the rainfall factor, approaching the central tendency and high-end values were selected for each waste management unit.
- For the overland release pathways, the Agency ranked the rainfall factors from the 29 meteorological stations and selected the 50th and 90th percentile based on the distribution of the 29 meteorological stations.

(2) Density of Waste Applied to the Land Application Unit

The approach used in the groundwater analysis assumed the bulk density of the applied waste to be 1 gram per cubic centimeter (g/cc) because the waste was assumed to be comprised predominantly of water. However, changes in the density of applied waste do not significantly affect the results of the groundwater modeling results.

The approach used in the non-groundwater analysis assumed the bulk density of waste to be analogous to the density of sewage sludge (i.e., 1.4 g/cc). The waste in the LAU is a mixture of industrial waste and soil. The central tendency bulk density for soil (i.e., 1.5 g/cc) is similar to the bulk density assumed for industrial waste. Because the waste is incorporated into soil, the properties of the waste/soil mixture are needed. There is little variability in bulk density for the type of soil used in the analysis (i.e., loam), thus, the same value was used for central tendency and high-end estimates of the waste/soil mixture bulk density.

(3) Unsaturated Zone Characteristics

The groundwater pathway analysis used the characteristics (e.g., percent organic matter, saturated hydraulic conductivity) of the entire unsaturated zone as input into the modeling analysis. The non-groundwater pathway analysis used as input the characteristics of only the upper portions of the unsaturated zone because these characteristics were those significant for the surface exposure pathways.

(4) Hydrolysis Rates

The hydrolysis rate for a chemical constituent is used in the Monte Carlo groundwater pathway analysis as a function of temperature and pH of the groundwater at the Monte Carlo realized site. The Agency used hydrolysis rates for constituents that have been measured through appropriate structure activity relationships. They have been reviewed by a panel of experts from the Agency's Office of Research and Development (USEPA, 1993). The non-groundwater pathway analysis used hydrolysis rates from the ''Handbook of Environmental Fate and Exposure Data for Organic Chemicals'' (Howard et. al, 1993).

b. Other Groundwater Pathway Analysis Issues

(1) Use of 1,000 Year Versus 10,000 Year Exposure Time Horizon

The Agency's proposal is based on a 10,000 year time horizon for the groundwater pathway. This means that the determination of leachate concentration limits is based on the highest (30-year average) concentration that occurs within 10,000 years from the start of the release. Although this longer time horizon has been used in other programs (U.S. Nuclear Regulatory