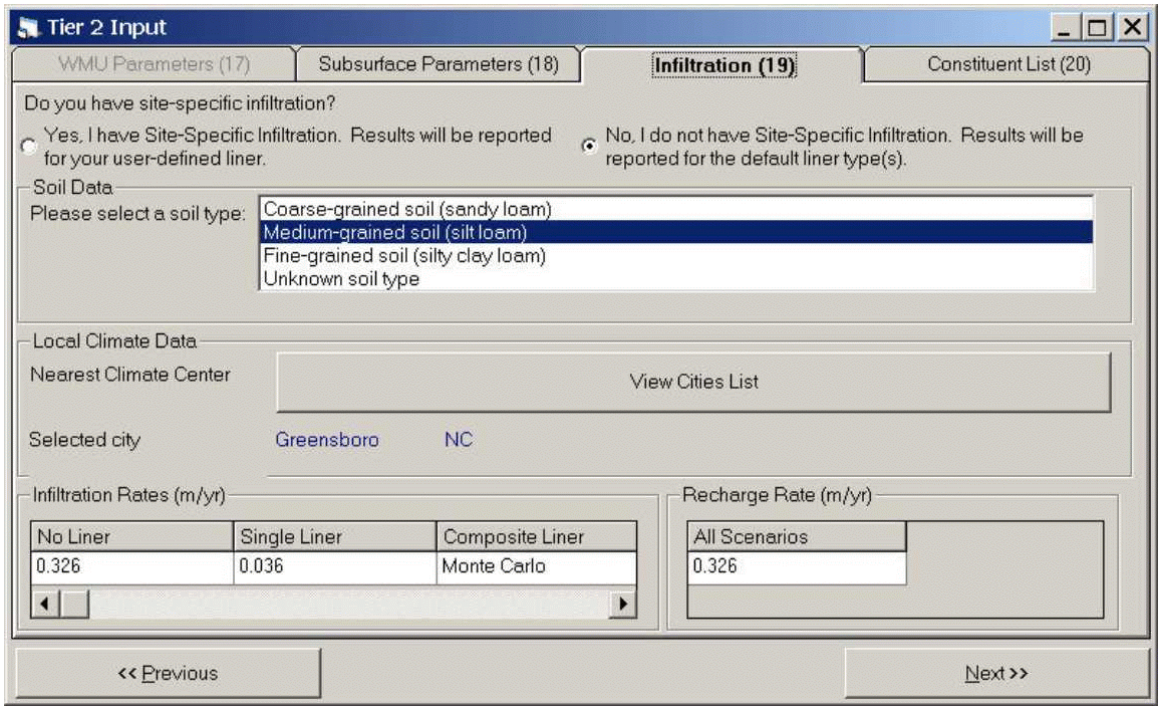

Figure 5.32 Tier 2 Input: Infiltration (19) - Landfill.

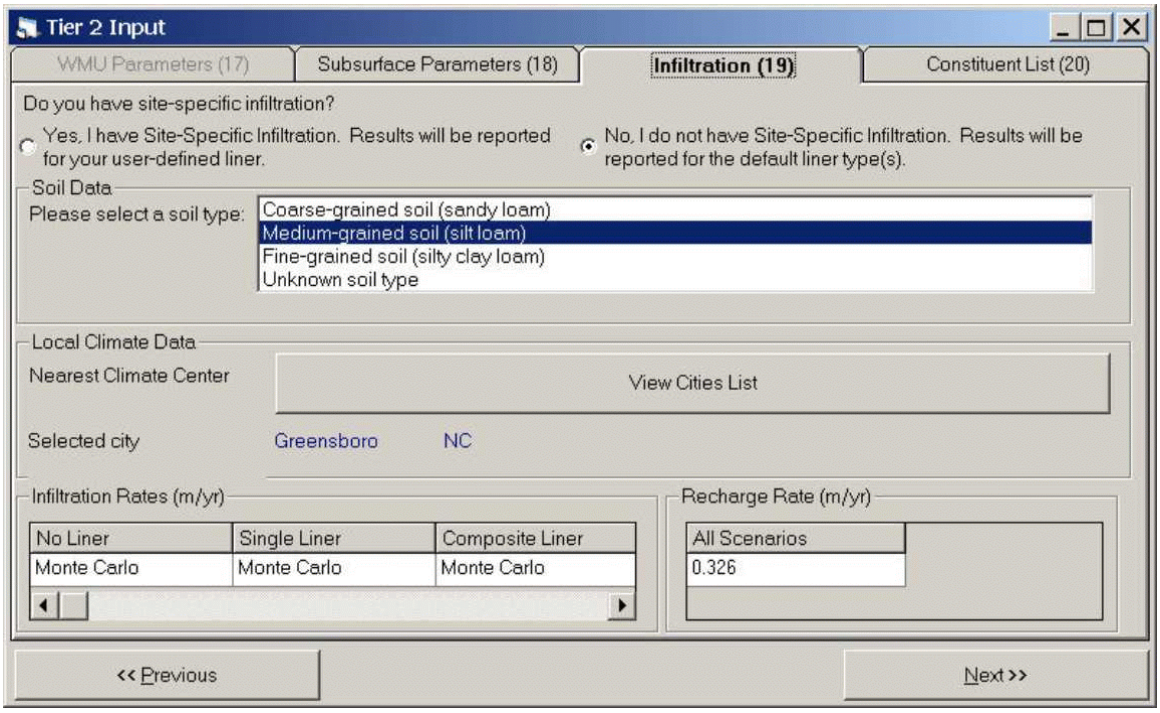

Figure 5.33 Tier 2 Input: Infiltration (19) - Surface Impoundment.

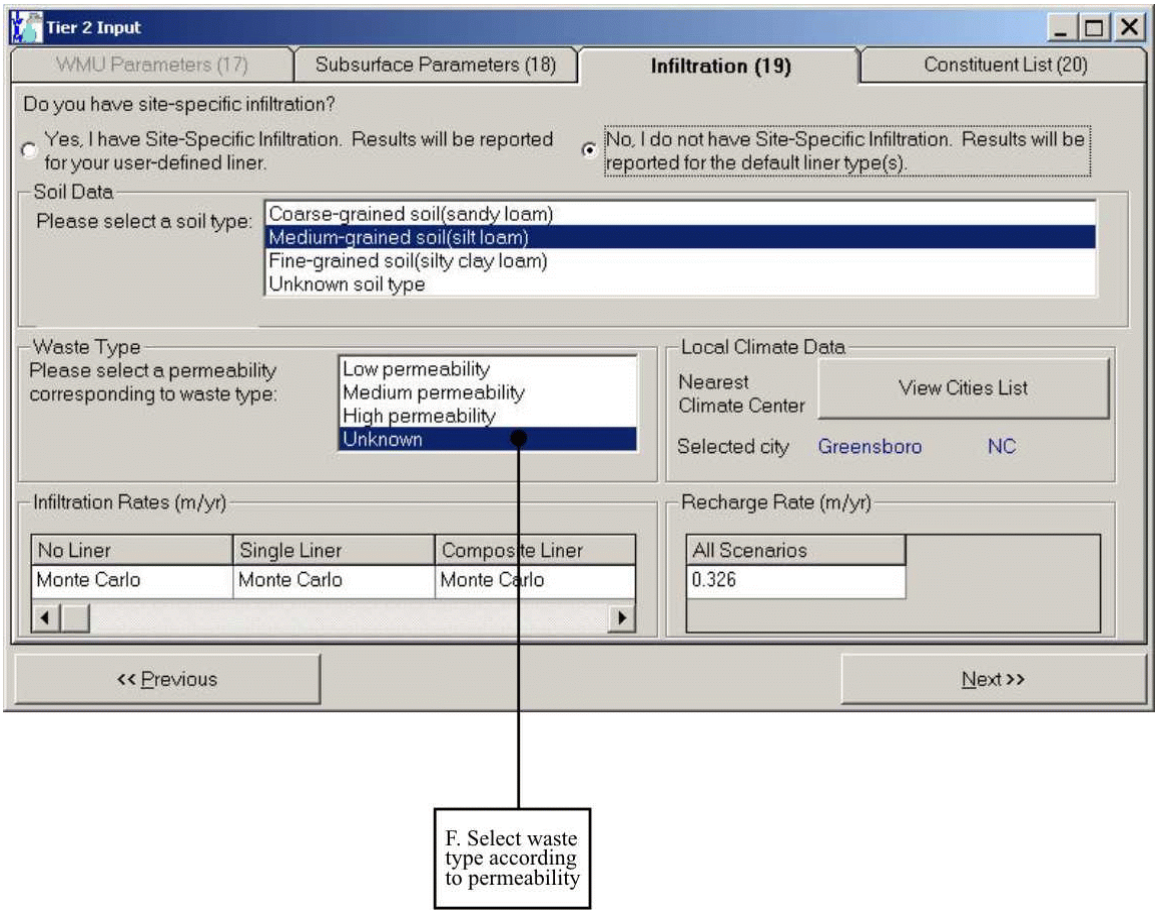

Figure 5.34 Tier 2 Input: Infiltration (19) - Waste Pile.

The features identified in Figures 5.30 through 5.34 are explained in more detail in the following paragraphs.

A. Specify Infiltration Data Option

Displayed at the top of screen 19 is the following question:

"Do you have a site-specific value for infiltration rate?"

Select one of the two available options:

- YES, I HAVE A SITE-SPECIFIC INFILTRATION RATE, or
- NO, I DO NOT HAVE A SITE-SPECIFIC INFILTRATION RATE

If you choose |No|, the Tier 2 evaluation will be performed for the default liner type(s). There are three liner types for landfills, surface impoundments, and waste piles (no liner, single clay liner, and composite liner). IWEM will evaluate only the no-liner scenario for land application units because engineered liners are not usually used at this type of facility.

If you choose |Yes|, the Infiltration Screen will appear as in Figure 5.36 and the Tier 2 evaluation will be performed for your specified WMU infiltration rate. This liner scenario is referred to as a "user-defined liner". This is the appropriate option to choose if you know the infiltration rate for your particular liner design.

The final result of a Tier 2 analysis is a recommended minimum liner design that is protective for all the selected constituents in your waste. When you specify a site-specific infiltration rate, IWEM will evaluate a "user-defined liner" scenario for protectiveness; otherwise, IWEM will evaluate all appropriate default liner scenarios.

B. Choose Soil Type

Regardless of whether or not you have a site-specific value for infiltration, you need to specify the soil type and geographic location of the WMU so that the model can generate a recharge rate for your site. Additionally, if you do not have a site-specific value for infiltration, the specified soil type and geographic location are used to estimate the infiltration rate for your site for the standard liner scenarios for landfills, land application units, and waste piles (infiltration rates for surface impoundments are a function of the ponding depth).

First, select the appropriate soil type from the choices shown in the |Soil Data| dialog box:

- Coarse-grained soil (sandy loam)
- Medium-grained soil (silt loam)
- Fine-grained soil (silty clay loam)
- Unknown soil type

If you choose one of the three default soil types, the Tier 2 Monte Carlo process will randomly assign values for the required soil-related input parameters according to probability distributions that are appropriate for the specified soil type. If you choose "unknown soil type" (the default selection), the Tier 2 Monte Carlo process will randomly select one of the three possible soil types in accordance with their nationwide frequency of occurrence. For more details, please see Section 4.2.3.2 of the *IWEM Technical Background Document* (U.S. EPA, 2002c).

C. Choose Climate Center

For unlined units, except SIs, and for single clay-lined LFs and WPs, infiltration and recharge rates for representative regions and locations, or "climate centers," around the country have been calculated based on meteorological data and soil type. By choosing the climate center that is representative of the modeled WMU site, you can use the infiltration and recharge rate(s) for this climate center as an estimate of the rate(s) expected at your site.

In many cases, selecting the climate center that is closest to your site will provide the best estimate of infiltration rate. A map of the IWEM climate centers is presented in Figure 6.4 of Section 6.2.3.3 of this document. You should, however, verify that the overall climate conditions at the selected climate station are representative of your site. Section 4.2.2 of the *IWEM Technical Background Document* (U.S. EPA, 2002c) provides a detailed discussion of how the infiltration rates were developed. To choose a climate center, click on the | VIEW CITIES LIST | button. The dialog box shown in Figure 5.35 will appear.

D. Infiltration Rate(s)

If you do not have a site-specific infiltration rate (see Figures 5.31 through 5.34), once you have selected a soil type and the nearest climate center, the model will estimate the infiltration rates for each of three standard liner scenarios (no liner, single clay liner, and composite liner) for your WMU site (note that only the no-liner scenario is evaluated for LAUs). The resulting value(s) are listed in the table at the bottom left of the infiltration screen.

E. Recharge Rate

Once you have selected a soil type and the appropriate climate center, the model will estimate the recharge rate for your WMU site. The resulting value is listed in the table at the bottom right of the infiltration screen.

F. Select Waste Type According to Permeability

For a WP, you must also specify the waste type permeability (this value is used in determining the no-liner and single clay-liner infiltration rate). There are three choices for waste permeability: high (4.1×10^{-2} centimeters per second [cm/sec]), medium (4.1×10^{-3} cm/sec), and low (5.0×10^{-5} cm/sec). These values are representative of wastes commonly disposed in WPs.

To choose a climate center to provide default recharge and infiltration data, click on the |VIEW CITIES LIST| button on the Infiltration (19) screen. The dialog box shown below in Figure 5.35 will then be displayed.

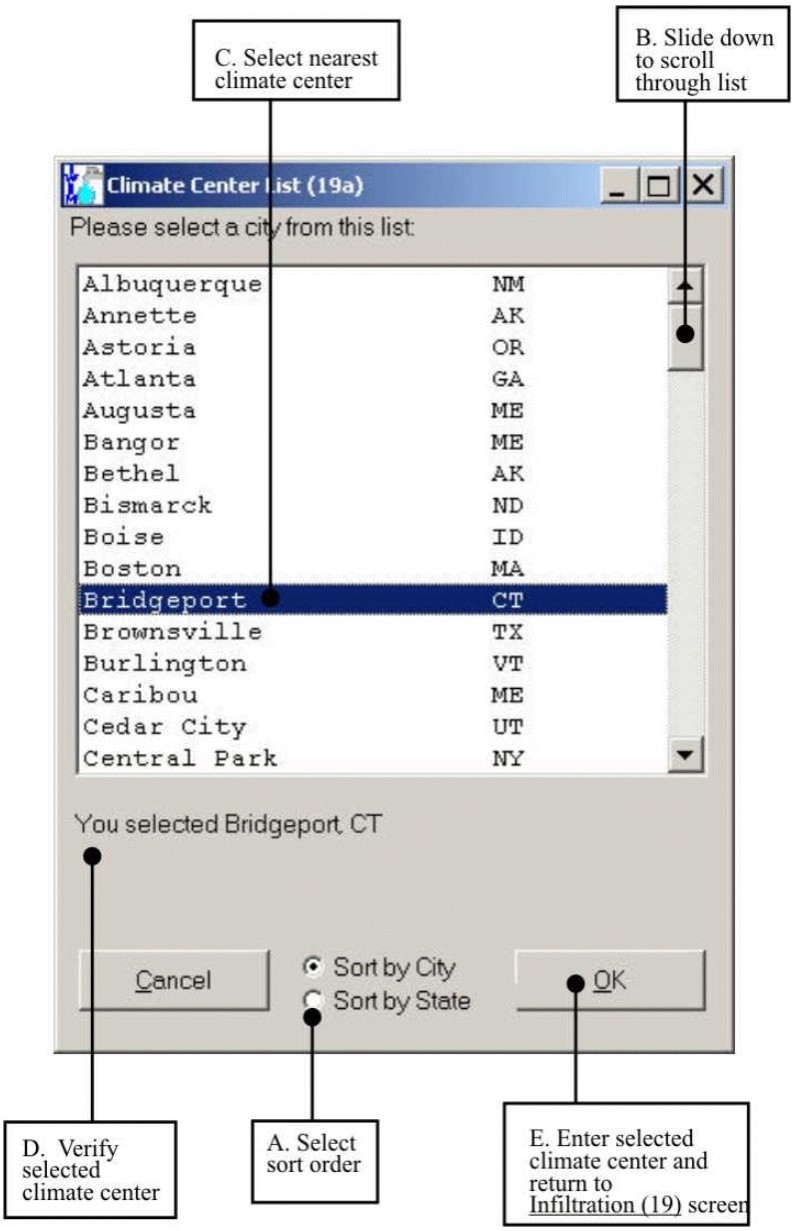

Figure 5.35 Tier 2 Input: Climate Center List (19a).

The features identified in Figure 5.35 are explained in more detail in the following paragraphs.

A. Select Sort Order

You can sort the climate centers alphabetically by city or by state by choosing one of the |SORT BY| options.

B. Slide Down to Scroll through List

You can view the entire list using the |ARROW| keys on the keyboard or by manipulating the scroll bar to the right of the list.

C. Select Nearest Climate Center

Select a climate center by using the |ARROW| keys to highlight an entry, or by a single click on the entry with your mouse.

D. Verify Selected Climate Center

You can verify that the correct climate center is selected by looking at the city name printed at the bottom of this dialog box.

E. Enter Selected Climate Center and Return to Infiltration (19) screen

Clicking on the |OK| button or double-clicking on the highlighted entry will enter your selection and return you to the Infiltration (19) screen.

If you choose the |YES, I HAVE SITE-SPECIFIC INFILTRATION| option at the top of the Infiltration (19) screen, then this screen will appear as shown in Figure 5.36.

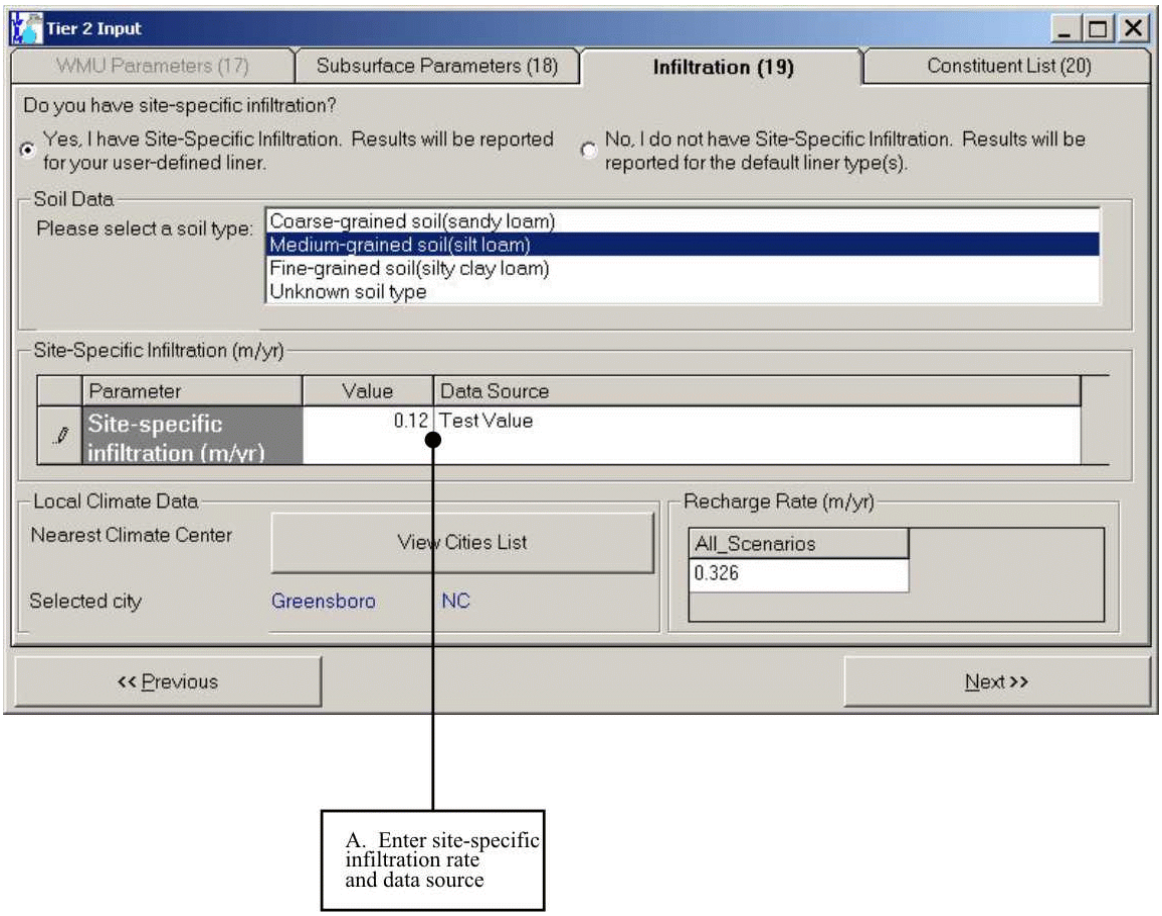

Figure 5.36 Tier 2 Input: Infiltration (19) - Site Specific Infiltration.

The features identified in Figure 5.36 are explained in more detail in the following paragraphs.

A. Enter Site-Specific Infiltration Rate and Data Source

Enter your site-specific infiltration rate and provide a brief explanation of the data source for your value in the | DATA SOURCE | cell. Both the value and your explanation will be included in the printed Tier 2 report.

5.5.1.5 Probabilistic Screening Module

The EPACMTP model used in IWEM to simulate ground-water fate and transport incorporates certain constraints to ensure that the parameter values that are selected in the

Tier 2 Monte Carlo process will represent physically realistic WMU settings. These constraints are:

1. The base of a LF or WP must be above the water table,
   or,
   The elevation of ponded water in a SI must be higher than the water table elevation; and

2. Infiltration- and recharge-induced mounding of the water table cannot rise above the ground surface.

If either one of these constraints is violated, the model will not run. Given the range of parameter values that may be generated in the Monte Carlo process, in combination with user-specified site-specific values, it is possible that the simulation model might encounter a scenario where a constraint is frequently violated, and the model is unable to complete the Monte Carlo simulation process.

IWEM screens your Tier 2 input values and parameter distributions prior to performing the EPACMTP Monte Carlo simulation to ensure that an adequate number of Monte Carlo realizations can be conducted. The Probabilistic Screening module of IWEM examines your inputs to determine if you have provided complete and valid information. If you specify a constant value for every parameter on screens 17 through 19, the screener will determine the magnitude of water table mounding (that is, IWEM will evaluate the constraints on hydraulic connections between the WMU and the water table). If the screening is successful, IWEM will take you to screen 20, otherwise a message box will alert you to the most violated constraint and suggest potential remedies. If all proposed remedies are inconsistent with site conditions, then IWEM is not appropriate for your site and a Tier 3 analysis should be considered.

If you do not provide site-specific values for all possible Tier 2 inputs, the screener will generate values for the missing input parameters according to their appropriate distributions, and then evaluate the constraints. The screening process usually takes ten or twenty seconds to complete, but can take up to a minute or two. A progress bar, like the one displayed below, is updated during the screening process.