

Example of a Soil Screening Level Assessment using the Terrestrial Toxicity Database (Example No. 6)

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Introduction

The U.S. Army Engineer Research and Development Center (ERDC) developed the Adaptive Risk Assessment Modeling System (ARAMS™) to provide the Army with the capability to perform human and ecologically based risk/hazard assessments associated with past practice and current activities at military installations. The intent of the system is to provide a platform from which a variety of assessments can be performed. The system is envisioned to help a risk analyst visualize an assessment from source, through multiple environmental media (e.g., groundwater, surface water, air, and land), to sensitive receptors of concern (e.g., humans and ecological endpoints).

ARAMS uses the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES) developed by the Pacific Northwest National Laboratory (PNNL) for linking disparate objects, such as environmental fate/transport models, databases, spreadsheets, etc. FRAMES is a Windows-based software platform that provides an interactive user interface and, more importantly, specifications to allow a variety of DOS and Windows-based environmental codes to be integrated within a single framework.

This document is intended to serve as a tutorial for helping new users with the application of ARAMS/FRAMES and the components within this system. This example does not include the steps for project planning and the use of associated tools under the “File” menu. These tools help the user plan the risk assessment including development of the conceptual site model and the Risk Assessment Guidelines for Superfund (RAGS) Part D Table 1 for human health risk assessment. Several Help files within ARAMS explain these tools.

Example Description

This case will use “measured” time-varying soil concentrations with soil screening-level (SSL) benchmarks to conduct an ecological screen. The measured soil values are entered using the User Defined object and the SCF Soil Module. SSL benchmark values are obtained from the Terrestrial Toxicity Database (TTD). These values are then used by the Wildlife Ecological Assessment Program (WEAP) to determine the screening-level eco hazard quotient (EHQ) values, where $EHQ = \frac{\text{soil concentration}}{\text{SSL}}$. A value greater than 1.0 indicates that the constituent may pose a concern and warrants further study. WEAP is a software package that summarizes ecological health impacts to various organisms from exposures to constituents. The FRAMES working space will look like Figure 1 when completed. The primary purpose of this example is to demonstrate the use of TTD for SSLs.

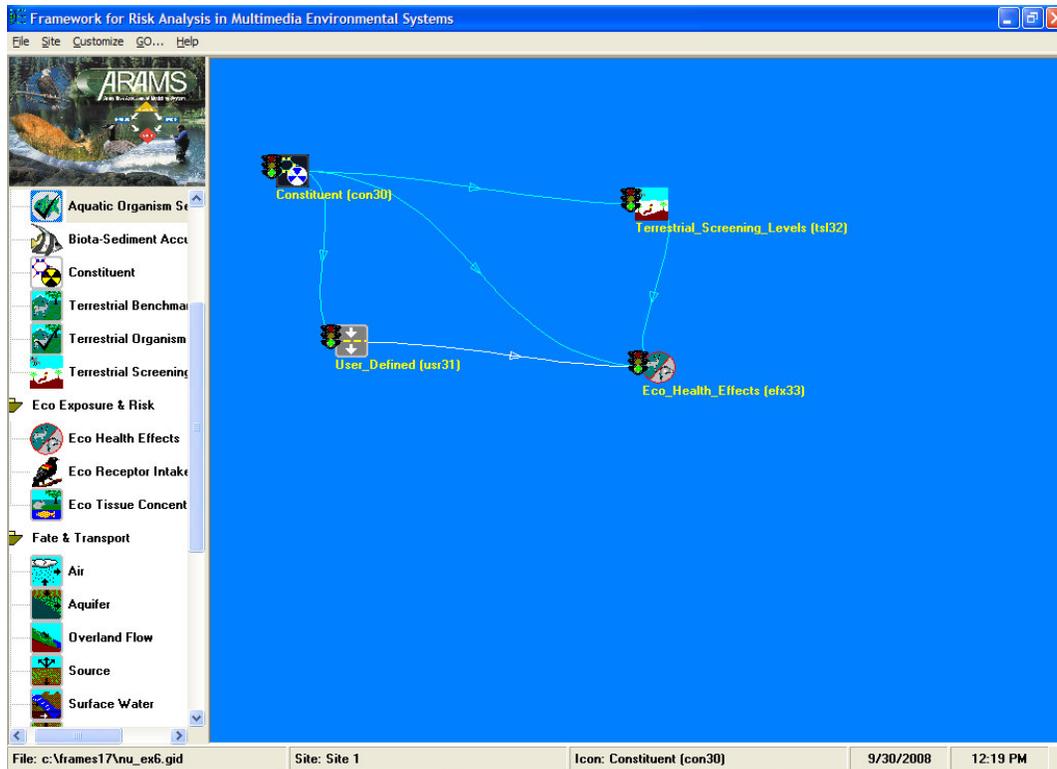


Figure 1. Object workspace for example application

Input Data

- Double-click on “ARAMS Icon” to open “ARAMS info and Disclaimer” window and then select “Accept” to continue.



- Choose FRAMES in the ARAMS toolbar to launch FRAMES. (Note: If this is the first time you have used ARAMS, you will need to configure it for FRAMES by selecting “File” “***Must Configure Path to FRAMES***” and supplying the path to the “fui.exe” file).
- While ARAMS/FRAMES is running, click “File” and choose “New” and a window titled “Global Input Data Open New” will appear (see Figure 2). In the “File Name” box, type the project name (e.g., “Ex6,” maximum of 8 characters) and click “Open” (see Figure 3). **Do not name the “new file” “Example6” because it will write over the existing “Example6” file that was distributed with the tutorial.** A window titled “Create New Site” will appear. Type the project site name (e.g., “Site 1”) and click “OK” (see Figure 4).

Double-click on the Constituent icon so that the icon appears on the upper left corner of the main screen. Repeat this operation to place the following additional icons into the workspace:

“User Defined”
“Terrestrial Screening Levels”
“Eco Health Effects”

Click on and drag each icon to its respective position on the workspace. Connect the Constituent icon with the User Defined icon by holding down SHIFT, left-clicking on the Constituent Icon, dragging the cursor to the User Defined icon, and releasing the mouse button (Note: To remove this line, repeat the steps used to connect it. To remove an icon from the screen, right-click and a menu will appear with different options. Click “Delete” and the icon will be taken out.).

In the same fashion, connect the following pairs of icons:

<i>Constituent</i>	→	<i>User Defined (already done)</i>
<i>Constituent</i>	→	<i>Terrestrial Screening Levels</i>
<i>Constituent</i>	→	<i>Eco Health Effects</i>
<i>User Defined</i>	→	<i>Eco Health Effects</i>
<i>Terrestrial Screening Levels</i>	→	<i>Eco Health Effects</i>

FRAMES should now look something like Figure 1.

CONSTITUENT DATABASE MODULE

Right-click the Constituent icon and choose General Info (see Figure 5). When the General Info screen opens, select “FRAMES Constituent Database Selection” in the “Select from applicable models” text box (see Figure 6). Click OK at the bottom of the screen to return to the workspace area. The status light attached to the constituent icon will change from black to red. Right-click on the constituent icon in the main screen and choose User Input. The Constituent Selection screen will open (see Figure 7). The constituent used in this case is 1,1 Dichloroethylene. Scroll to select the constituent from the constituents list or use the Search option to search for it. Click the “Add >>>” button to add the constituent to the selected constituents list. Click “File” and choose “Save and Exit” to return to the workspace screen. The Constituent icon’s status light will change from red to green.

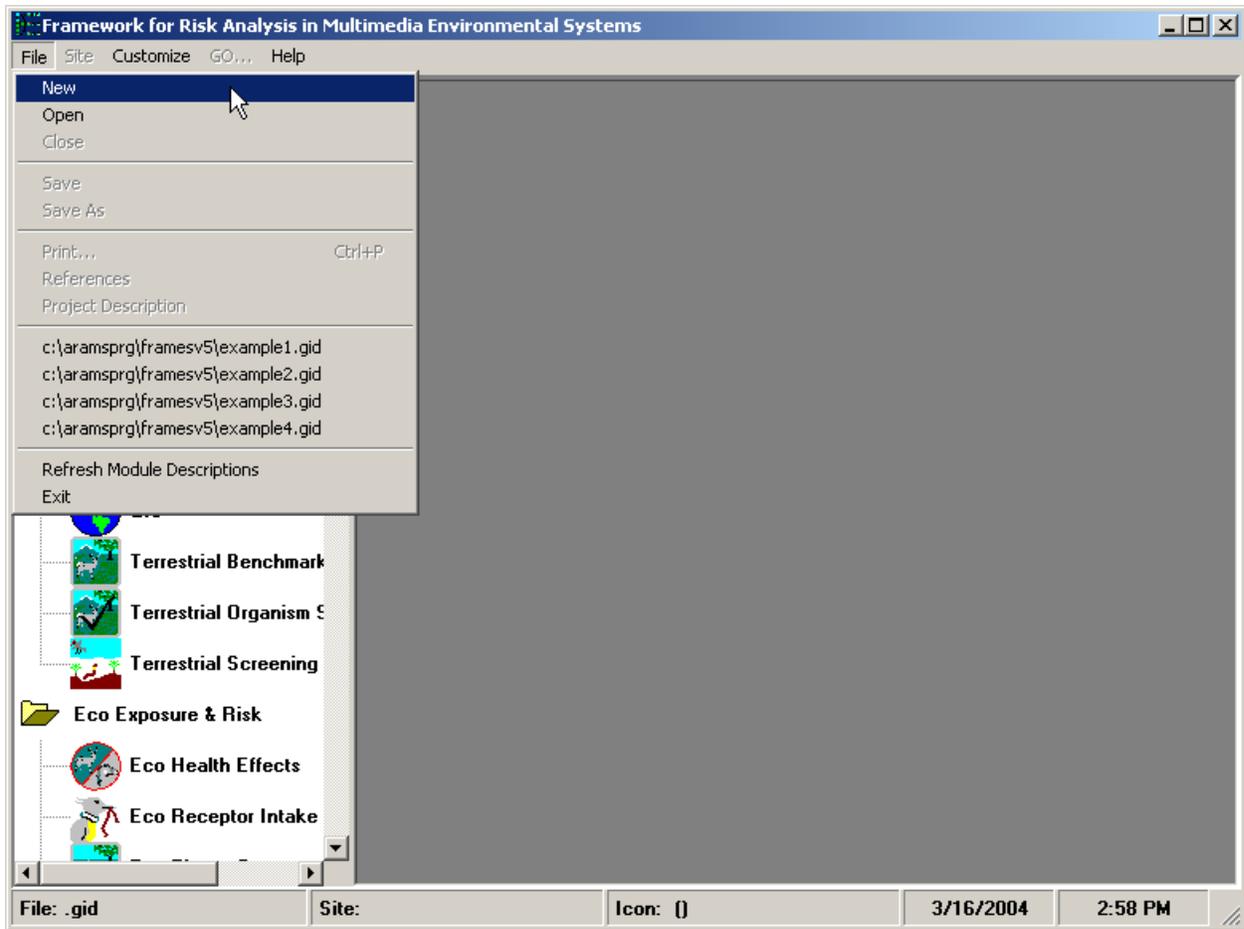


Figure 2. Opening a new file

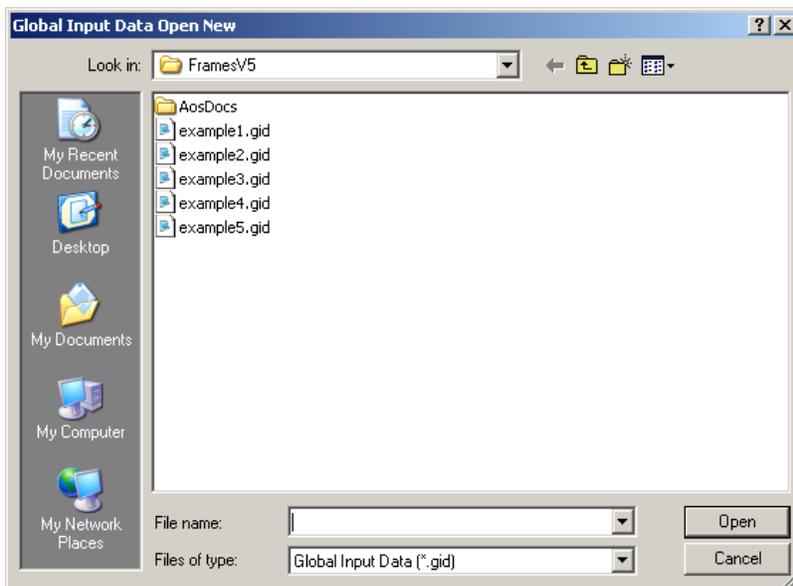


Figure 3. Global Input Data Open New (New File Window)

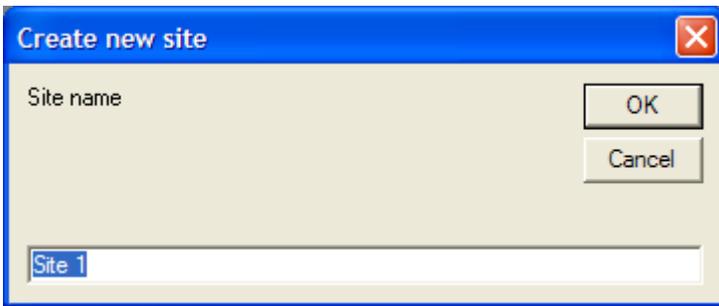


Figure 4. Create New Site Screen (Input “Site name” box)

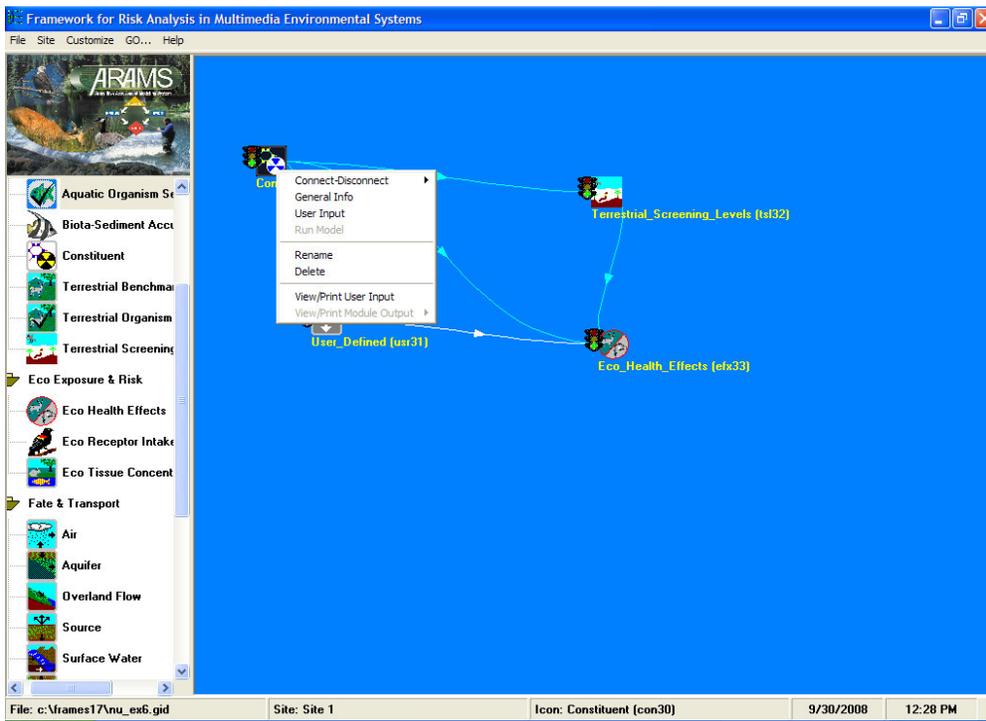


Figure 5. Workspace Screen (Right-click on the Constituent icon)

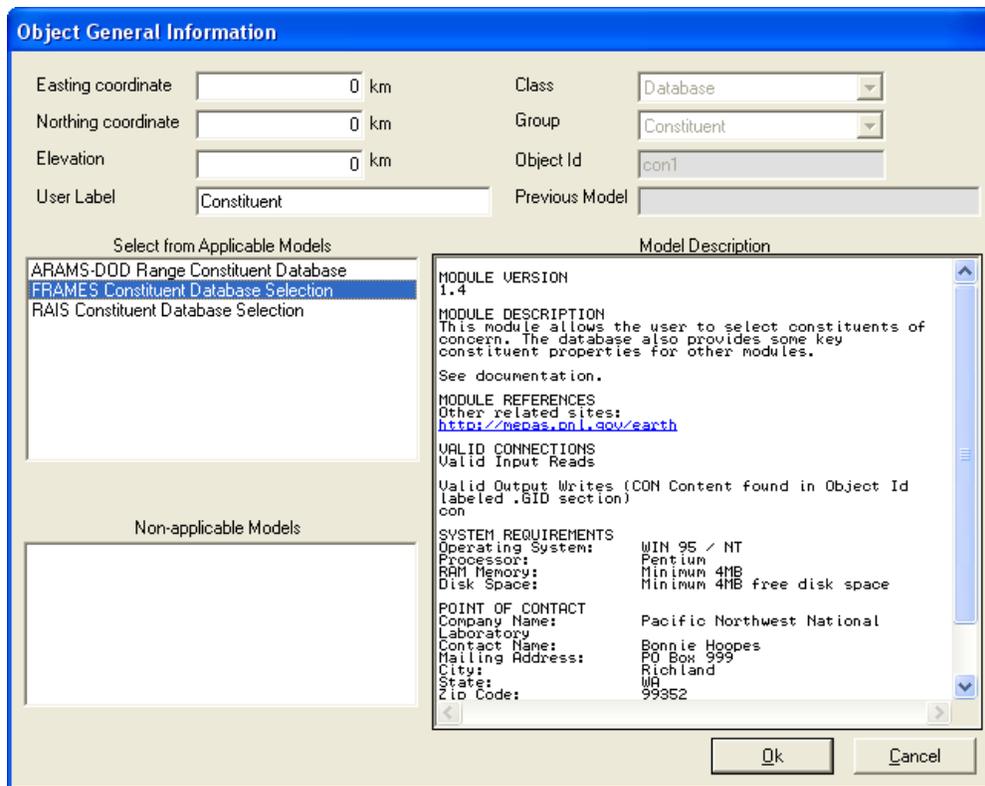


Figure 6. Object General Information screen

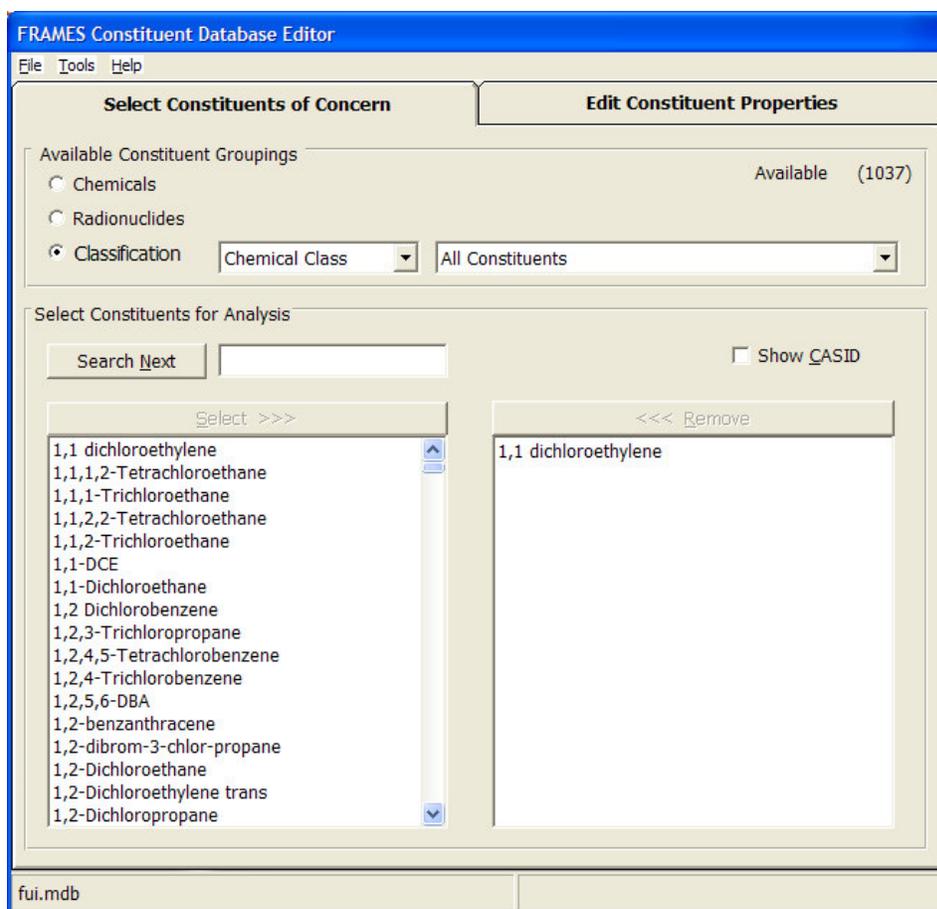


Figure 7. FRAMES Constituent Selection Screen (Constituents of Concern tab)

The following is a listing of all data input required by the remaining modules used in this example. *Names of object icons* are in bold, italics, and underlined headings. *Menu items* (displayed by right-clicking on the icon) are shown below the module in bold and indented to the right of the icon names. *Explanations* of data required by each menu item are indented further to the right. To save information for your scenario, select “File” and then “Save” from the main FRAMES menu.

For ease of presentation, the instructions below proceed with selecting module, entering data, running the module, and viewing module output. However, the user should select all object modules prior to entering data for each module.

USER DEFINED

General Info

A window titled “Object General Information” will appear. In the Label text box, put in “Known Soil Concentrations.” In “Select from Applicable Models,” choose “SCF Soil-Total Module” and click “Ok.” The status light next to the User Defined icon should turn red. Total or dissolved concentrations can be assessed for soil, sediment, and water.

The measured soil concentrations for this example are assumed to be total (i.e., particulate and dissolved).

User Input

A window titled “FRAMES User Defined Module” will appear. This module will be used to enter the known time-varying soil concentrations for 1,1-dichloroethylene. Enter the data given below and shown in Figure 8.

Time (yr)	Concentration (mg/kg)
0	125
10	250

Choose “Save and Exit” from the File menu to return to the work screen. The status light next to the User Defined icon should turn yellow.

Run Model

The model runs in the background. The status light next to the User Defined icon should turn green.

View/Print Module output

A second menu will appear (see Figure 9). Select “SCF Text View” to view a screen output like Figure 10. Choose “SCF Graphical View” to view output options for results to plot in Excel format (see Figure 11). Clicking “Chart” will generate Excel plots.

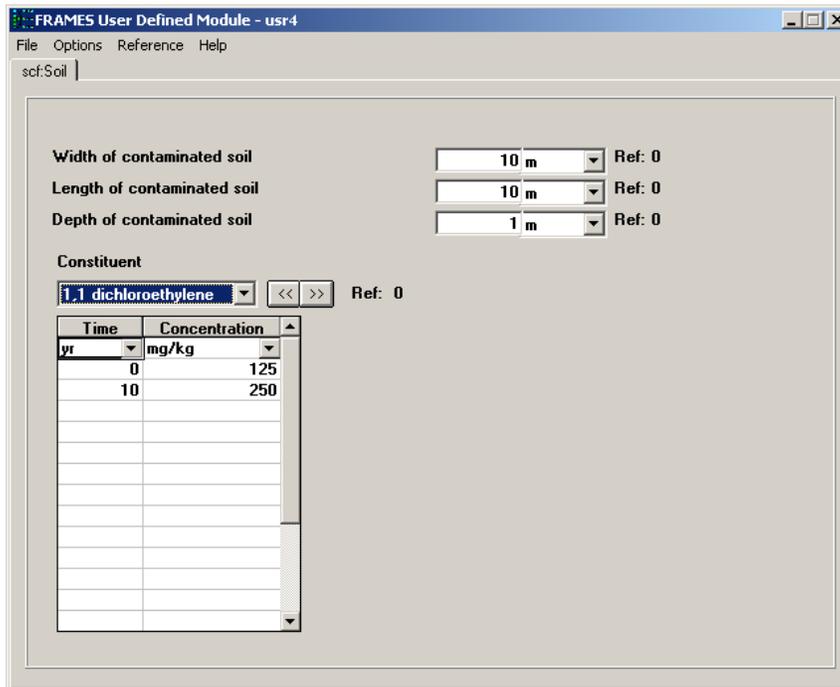


Figure 8. SCF Soil Module User Input screen

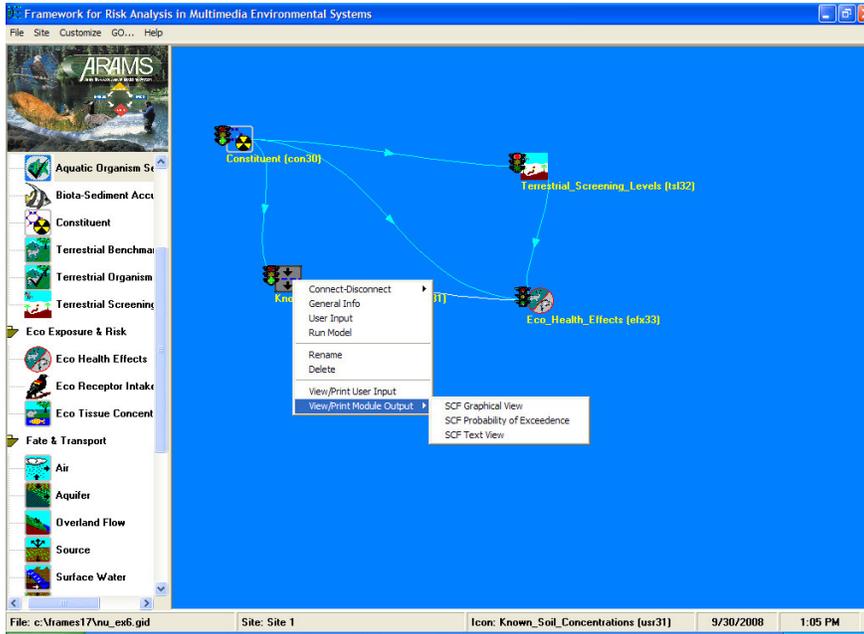


Figure 9. Selecting the Output display format

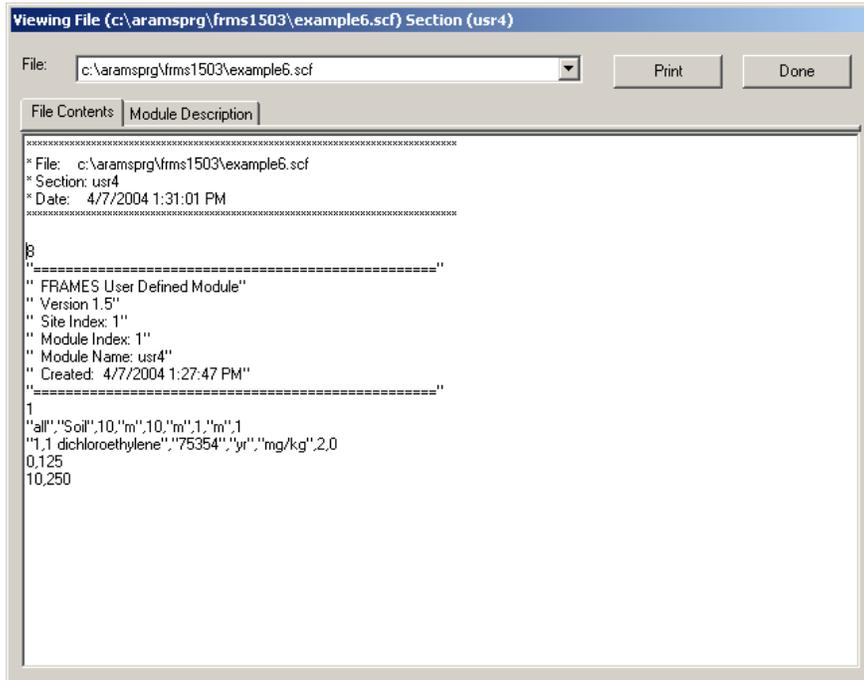


Figure 10. SCF Text View

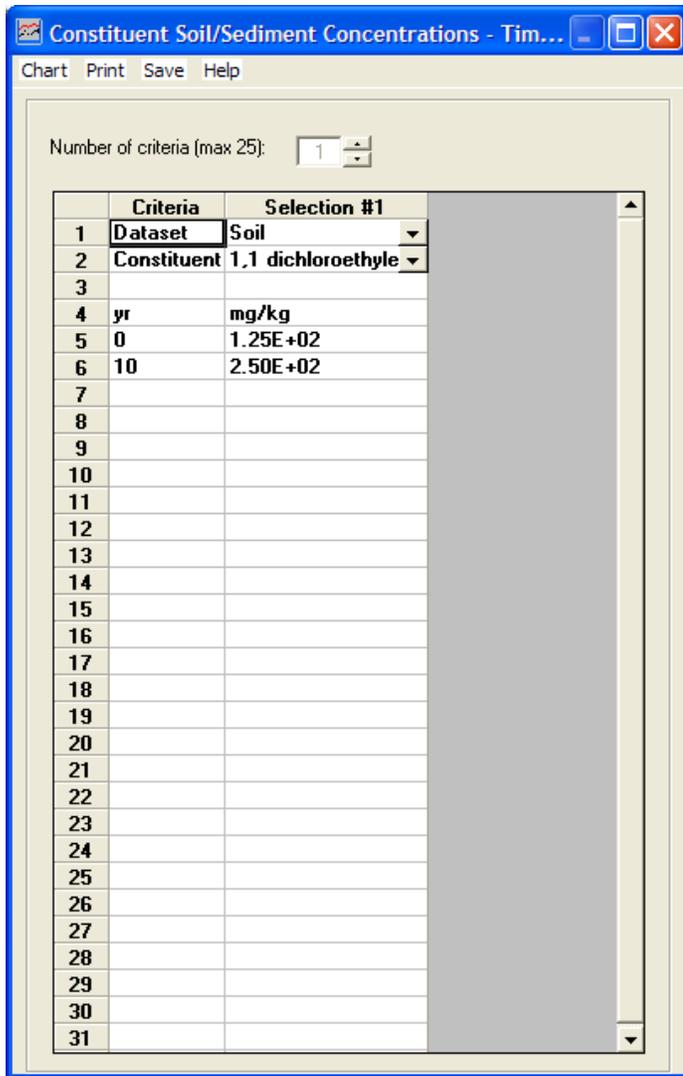


Figure 11. SCF Soil Module output selection screen

TERRESTRIAL SCREENING LEVELS

General Info

A window titled “Object General Information” will appear. In “Select from Applicable Models,” choose “TTD - SSLs” and click “Ok.” The status light next to the Terrestrial Screening Levels icon should turn red.

User Input

After the module user interface comes up (see Figure 12), perform any aliasing on the constituents that you desire. By default, the chemicals are aliased to themselves when the user interface first comes up for a new case. The “GID Chemicals” section of the screen contains the list of constituents of concern that were passed from the Constituent database. Users can alias a constituent by clicking on a constituent in the “GID Chemi-

icals” and then selecting an appropriate alias from the list in the dialog that appears (see Figure 13) and pressing the “Accept” button. The constituents that are displayed on the aliasing dialog are those contained in the TTD database. However, for this example, we will use the default alias. Next, select the desired jurisdictions from the “Jurisdictions” at the top right of the main screen. For this case we will choose the “MHSPE” jurisdiction. Click the button labelled “Submit Query to Remote Database.” The available data will be loaded into a spreadsheet within the “Query Results” section of the main application screen as shown in Figure 14. Select the values to use by placing a check in the box in the last column of the list or by removing the checkmark beside those values that you do not wish to use. Finally, click the “File” menu and select “Save and Exit” from the main application screen to return to the workspace screen. The Terrestrial Screening Levels icon’s status light will change from red to green.

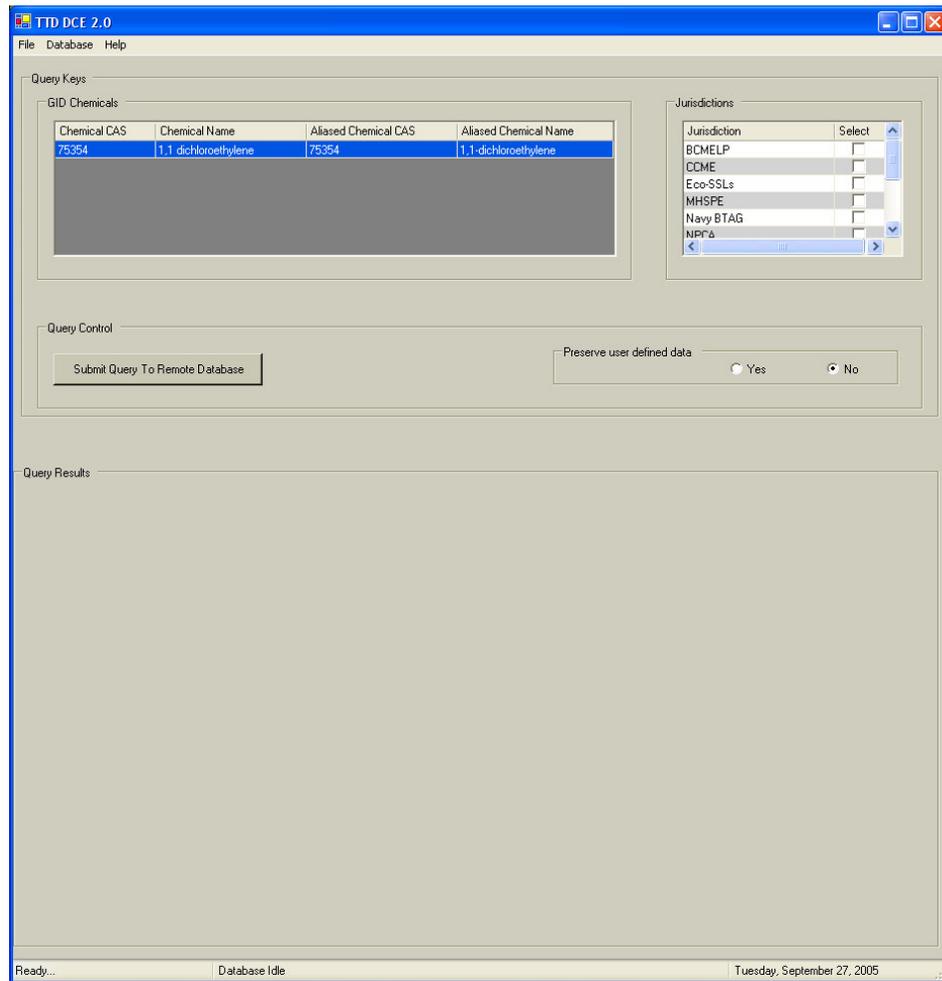


Figure 12. TTD-SSLs main screen

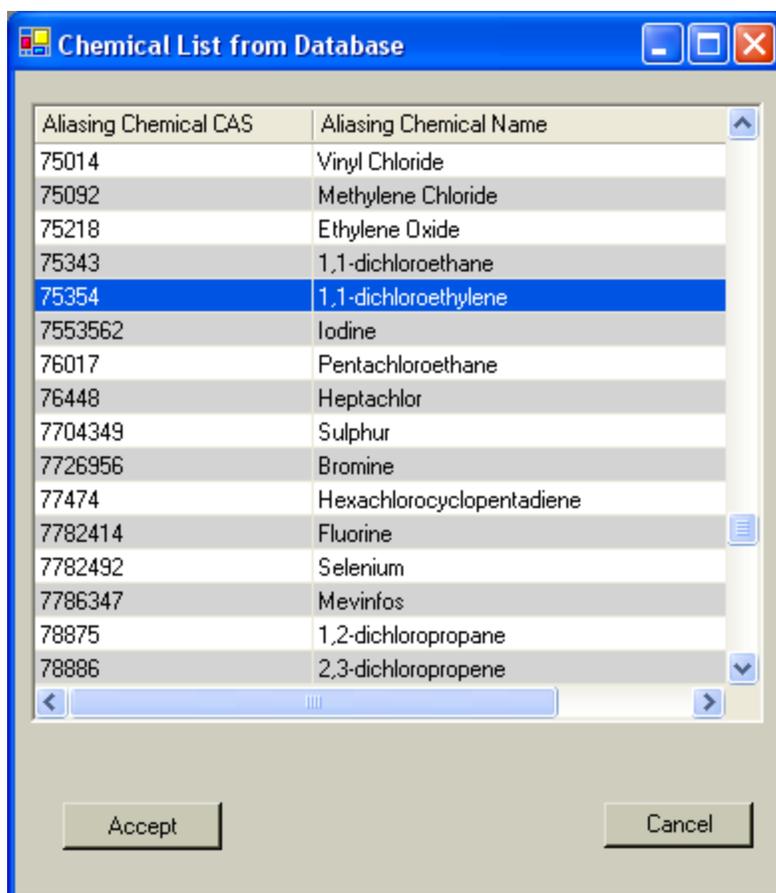


Figure 13. TTD-SSLs alias dialog

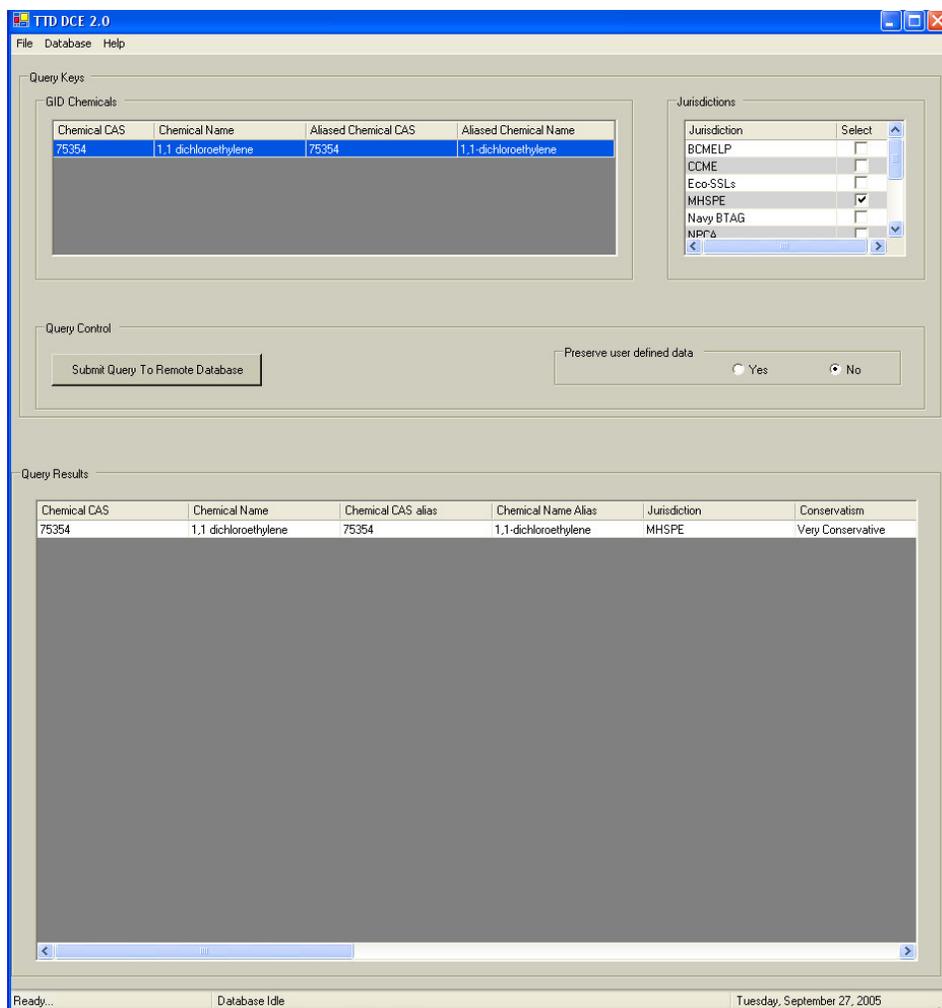


Figure 14. TTD-SSLs data retrieval

ECO HEALTH EFFECTS

General Info

A window titled “Object General Information” will appear. In “Select from Applicable Models,” choose “WEAP Terrestrial HQ” and click “Ok.” The status light next to the Eco Health Effects icon should turn red.

User Input

A window titled “Wildlife Ecological Assessment Program” will appear. The screen shown in Figure 15 will appear. Click ??? in the left hand panel to expand the data tree, and then click “Jurisdictions”. Ensure that the ??? jurisdiction is checked in the right hand panel. Click “File,” and choose “Save and Exit” to return to the workspace screen. The Eco Health Effects icon’s status light will change from red to yellow.

Run Model

The model runs in the background. The status light next to the Eco Health Effects icon should turn green.

View/Print Module Output

Choose “HQF Graphical View” to view a screen output like Figure 16. Click Chart to create an Excel plot like Figure 17.

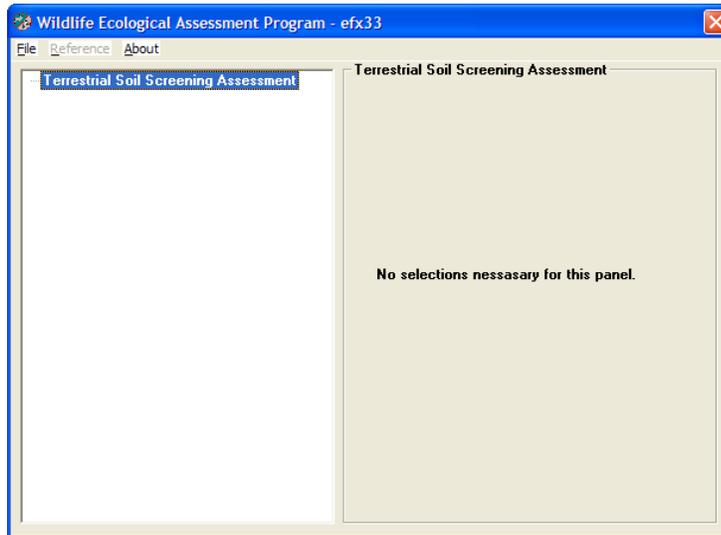


Figure 15. Wildlife Ecological Assessment Program

Figure 16. HQF Graphical View output selection screen

Figure 17. Eco Health Effects Output (Excel plot)