2004-14G
USER'S GUIDE

USER'S GUIDE TO Mn/DOT'S DECISION SUPPORT TOOL FOR TRANSPORTATION RELATED CHEMICALS

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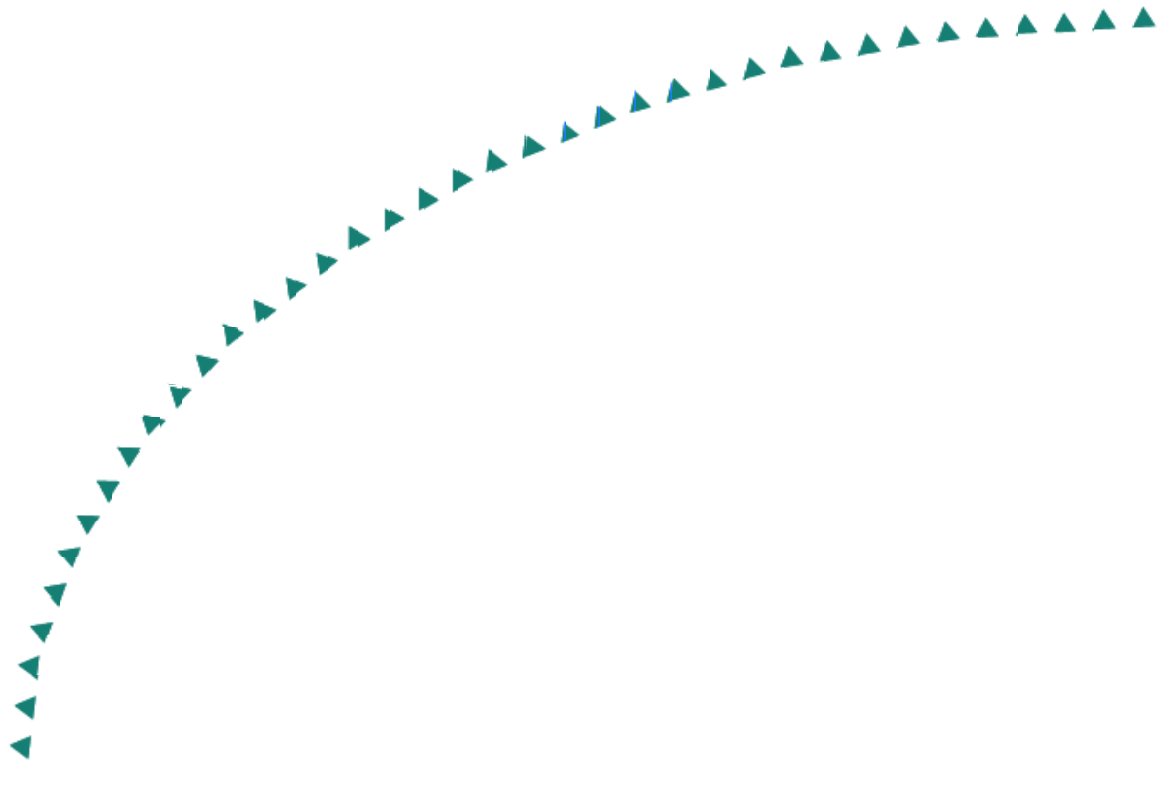

User's Guide

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The decision tool (software) is available upon request on CD-ROM (in both Windows 2000 and XP versions) at: www.lrrb.org

16. Abstract (Limit: 200 words)

This is the User's Guide for running the decision support tool described in Mn/DOT report 2004-14. A Multimedia Urban Model, or MUM, was developed to estimate the fate and potential risks to ecological receptors posed by chemical contaminants emitted from vehicle emissions. The decision tool has three components derived from the MUM that has been applied to the Minneapolis/St. Paul Twin Cities. The first, MUM-Fate, estimates the long-term average concentrations of contaminants in 81 geographic segments and nine media in warm (spring-summer-fall) and cold (winter) scenarios. Secondly, MUM-Exposure estimates the exposure of these contaminants by selected bird and mammal species that are representative of aquatic and terrestrial routes of exposure. Third, MUM-Risk estimates the potential risk posed by the estimated intake of contaminants, as determined by comparison against toxicological benchmarks. The decision tool also estimates the potential risk posed by estimated air, water and sediment concentrations in comparison to media-specific benchmarks. The decision tool is designed to consider volatile and semi-volatile organic compounds that may be persistent or metabolizable, as well as metals. The decision tool is available as a computer program with a user-friendly interface and that runs in a Windows™ environment. The decision tool (software program) contains an extensive database of physical-chemical properties, intake rates and diets of species and toxicological benchmarks.

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USER'S GUIDE TO MNDOT'S DECISION SUPPORT TOOL FOR TRANSPORTATION RELATED CHEMICALS

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 ORGANIZATION OF THE USER'S GUIDE

This manual is intended to help the user to employ the Multimedia Urban Model and associated exposure and risk models for Minneapolis/St. Paul area. The theoretical basis of the model and the structure of the input files for the model are described in detail in the Technical Document. It is important to read the technical manual before using the model. The model is written in Visual Basic and prepared to be run from a PC platform with a Microsoft Windows (98+) operating system. Running the model is achieved through interacting with a "user-friendly" Graphical Users Interface (GUI). This manual helps the user to interact with GUI effectively when running the program.

This manual is divided into two subsections:

- Section 1 describes the model; and
- Section 2 describes how to input data and run the model.

1.2 MODEL BASICS

The Minnesota model tracks the movement of Persistent Organic Pollutants (POPs, also described as semi-volatile organic compounds or SOCs or SVOCs) and selected metals through seven environmental *compartments* (air, surface water, sediment, soil, organic film on impervious surfaces, vegetation, and snow) in the urban area of Minneapolis/St.Paul. The model provides spatially resolved chemical fate information for 81 geographic *boxes* that cover the Minneapolis/St. Paul area. Each geographic box contains all environmental compartments. The model has two major modules: 1) the fate and transport module which estimates the abiotic concentrations in the environment, and 2) the exposure and risk module which calculates the dose and risk to ecological receptors.

The fate and transport module is one component of a larger decision-making tool that will enable the user to perform a screening level ecological risk assessment. The complete version of the model uses the estimated chemical concentrations calculated by the fate and transport module to calculate the dose received by selected terrestrial and aquatic ecological receptors through multiple exposure pathways (e.g., inhalation, ingestion). Subsequently, the dose estimates will be compared to appropriate toxicological

benchmarks included in the model's database to calculate the risks. The selected ecological receptors are specific to Minneapolis/St. Paul area.

All the default parameter values required by the model are provided in several input files associated with the model. The user can modify these parameters permanently by updating the data files or temporarily during running the model.

1.3 HARDWARE AND SOFTWARE REQUIREMENTS

The Minnesota model is a Windows-based program written and compiled using the Visual BASIC programming language. To run effectively, a minimum hardware system is required. Table 1 below lists the hardware required for running the model.

TABLE 1
HARDWARE REQUIREMENTS

Hardware required	
System	IBM compatible PC
Operating System	Microsoft Windows 98+
Processor	Pentium II processor and faster
RAM	32 MB recommended
Hard drive space	9 MB minimum available space
Accessories	CD-ROM drive

1.4 INSTALLATION OF THE MODEL

This user's guide is accompanied by a CD-ROM containing distribution files (the files required for installation of the model on the local hard drive) and source codes. Table 2 lists the files that contain the source code and databases required for the model. In order to install the model to a hard drive, simply copy the files on the CD_ROM to the local hard drive in a directory named "MinDOT Model". Running the model is achieved by executing the "MIN.exe" file.

During the first run of the model, if the user sees various error messages suggesting that files are missing or not loaded in the registry, the problem is very likely related to the user's administrative rights on the machine on which the model is running. A solution is to have an "administrator" log onto the machine as an "administrator" and run the program. Thereafter, the program will work for anyone logged on to that particular computer.

TABLE 2

MODEL FILES

Data.vbp	grid18.min	grid45.min	grid72.min
Data.vbw	grid19.min	grid46.min	grid73.min
data_exch.bas	grid2.min	grid47.min	grid74.min
Datcal.xls	grid20.min	grid48.min	grid75.min
em_data.inp	grid21.min	grid49.min	grid76.min
Form1.frm	grid22.min	grid5.min	grid77.min
FrmBackground.frm	grid23.min	grid50.min	grid78.min
FrmDataIn.frm	grid24.min	grid51.min	grid79.min
FrmDataIn.frx	grid25.min	grid52.min	grid8.min
FrmMain.frm	grid26.min	grid53.min	grid80.min
FrmMain.frx	grid27.min	grid54.min	grid81.min
FrmMapMain.frm	grid28.min	grid55.min	grid9.min
FrmMapSec.frm	grid29.min	grid56.min	interbox.inp
FrmMedia.frm	grid3.min	grid57.min	main.bas
FrmOutGraphic.frm	grid30.min	grid58.min	media.dim
FrmOutGraphic.frx	grid31.min	grid59.min	media.pcp
FrmOutIntermedia.frm	grid32.min	grid6.min	media-bak.dim
FrmOutMassConc.frm	grid33.min	grid60.min	met_data.inp
FrmOutSpatial.frm	grid34.min	grid61.min	metals.pcp
frmstart.frm	grid35.min	grid62.min	MINN.min
FrmSteady.frm	grid36.min	grid63.min	Module3.bas
grid1.min	grid37.min	grid64.min	organics.pcp
grid10.min	grid38.min	grid65.min	orig.min
grid11.min	grid39.min	grid66.min	roads.inp
grid12.min	grid4.min	grid67.min	sewer_sys.min
grid13.min	grid40.min	grid68.min	trans_data.inp
grid14.min	grid41.min	grid69.min	version_1.vbp
grid15.min	grid42.min	grid7.min	version_1.vbw
grid16.min	grid43.min	grid70.min	
grid17.min	grid44.min	grid71.min	

The program also contains several Dynamic Link Library (DLL) Files in the Windows Systems directory.

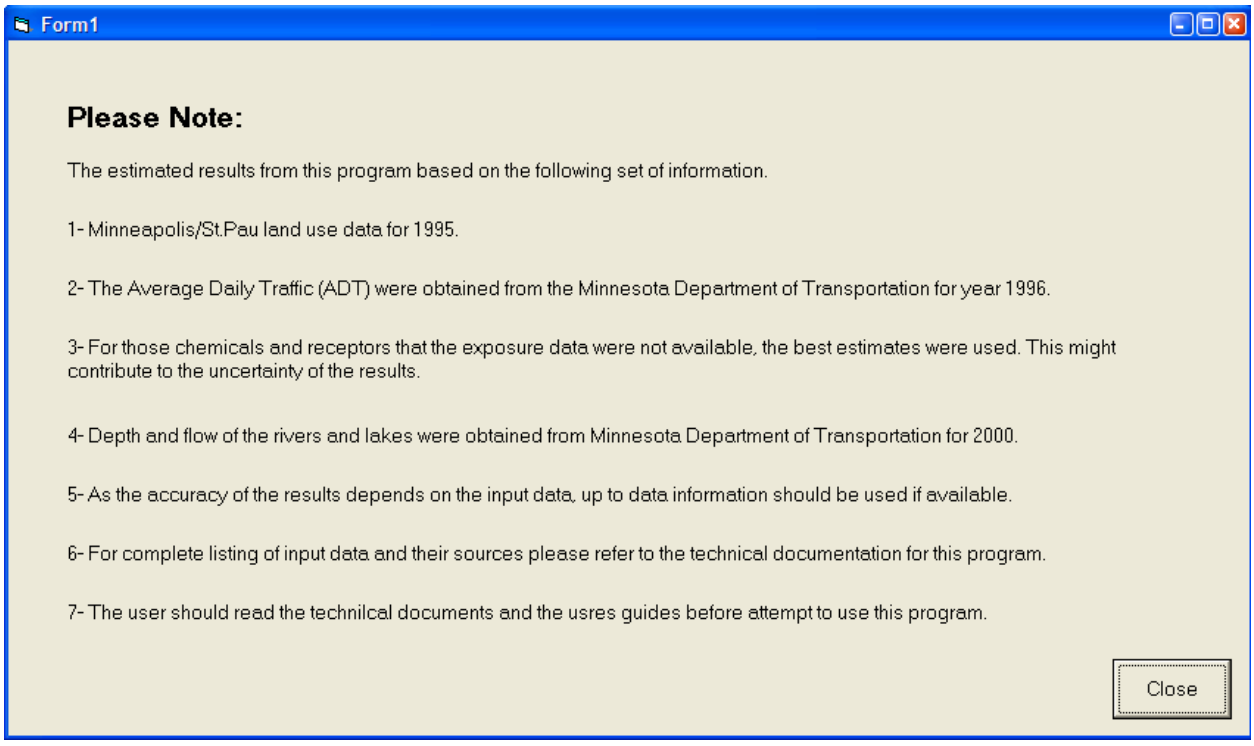
1.5 USER INTERFACE

The user interface comprises a series of windows with drop-down menus and toolbars to allow the user to carry out various tasks. The tasks are:

- to input and modify the parameter values;
- to define a new project;
- to retrieve an old project;
- to modify the project information;
- to run the program;
- to save the information from the project; and
- to view the results.

Upon running the program, the first window that appears on the screen is the introductory window. Clicking on the screen removes the introductory window and starts the program. If the user does not click on the screen, the introductory screen will disappear automatically after 15 seconds. Prior to the main window, a message appears on the screen that warns the users of the limitations of the program and the main assumptions made to develop the model (Figure 1).

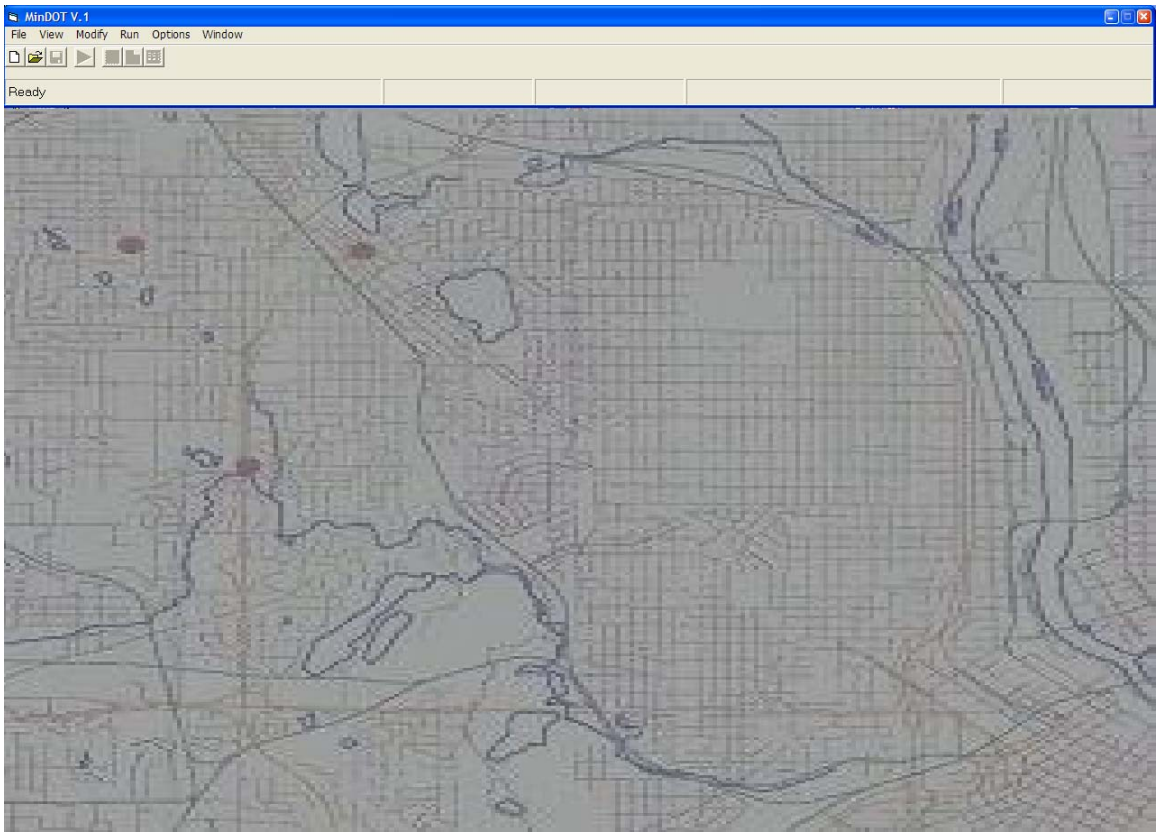
FIGURE 1
WARNING WINDOW



By pressing the “Close” button, this window will disappear and the main window will be shown on the screen.

Figure 2 illustrates the main window of the user interface. The main window contains a drop-down menu, a toolbar, and a status bar. The status bar indicates the mode of operation of the model, the date and time, the chemical name, and the name and address of the active project. Table 3 shows the menu items and their function while running the program. It should be noted that some of the menu items are only enabled after either defining a new project, opening a saved project or after running the model.

FIGURE 2
MAIN WINDOW OF THE PROGRAM CONTAINING THE DROP-DOWN MENU AND THE TOOLBAR



Alternatively, toolbar buttons can be used instead of some of the menu items. Each button is equipped with a pop-up tool-tip-text, which describes its function when the mouse pointer is held steady on the button. These functions are:

- the first toolbar button opens a new project;
- the second toolbar button opens a saved project;

- the third toolbar button saves the current project;
- the fourth button performs the calculations in steady-state mode;
- the fifth views the graphical results; and
- the sixth button views the landscape properties of each box;
- the seventh button views the tabular results.

TABLE 3
MAIN WINDOW DROP-DOWN MENU ITEMS

MENU ITEM	FUNCTION	ENABLE STATUS
File		
New project	Opens a new project	Always
Open project	Retrieves a saved project	Always
Close project	Closes a project	After opening a project
Save project	Saves a project to a file	After opening a project
Save As	Saves an old project to a new file	After opening a project
Exit	Exits the program	Always
Modify		
Chemical properties	Modifies the chemical properties	After opening a project
Meteorological data	Modifies the climate data	After opening a project
Transport rates	Modifies the transport rates	After opening a project
Transformation rates	Modifies the reaction half lives	After opening a project
Run		
Steady state	Runs the model in steady state mode	After opening a project
Unsteady state	Runs the model in unsteady state mode	After opening a project
View		
Map	Shows landscape data	After completing the calculations
Intermedia transport	Shows the intermedia transport rates	After completing the calculations
Mass and Concentration	Shows the calculation details	After completing the calculations
Graphical Output	Shows the graphical results	After completing the calculations
Spatial distribution	Shows the spatial distribution of concentrations	After completing the calculations
Window		
Tile	Sets the windows in tile format	Always
Cascade	Sets the windows in cascade format	Always

After opening a new project or retrieving an old project, the data input window will appear on the screen. When a new project is opened, all the fields in the data input window are blank. After selecting a chemical, all the required parameter values will be retrieved from the data files. The user is able to modify any of the parameters retrieved from the databases by selecting the corresponding field and changing the content. When an old project is opened, required parameter values are automatically retrieved from the corresponding project file and put into the fields of the data input window. The data

input window is a multi-panel window that contains several fields in each panel for data input. Clicking on each tab shows the contents of each panel. Figures 3 to 13 show the tabs included in the data input window.

2.0 INPUTTING THE DATA AND RUNNING THE MODEL

2.1 DATA INPUT

After opening a new project or retrieving a saved project, the program opens the "Data Input" window. The "Data Input" window comprises 10 tabs with the following captions:

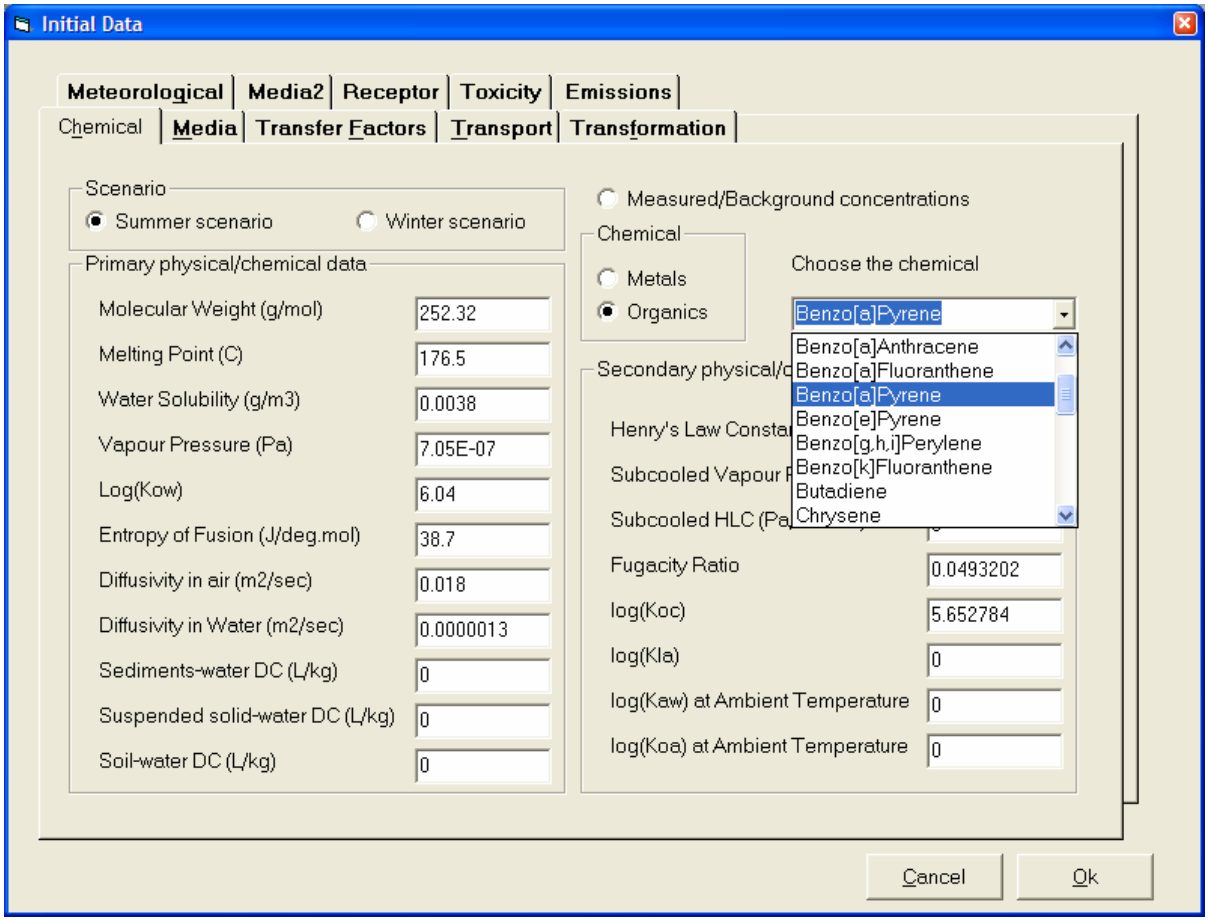
1. Chemical;
2. Media;
3. Media2;
4. Transfer Factors;
5. Transport;
6. Transformation;
7. Meteorological;
8. Receptors;
9. Toxicity; and
10. Emissions.

It is recommended that the user select the tabs in the same order that they appear on the data input window and examine all the parameter values. The user may modify any or all of the parameter values prior to running the model. The following paragraphs provide information relating to the above seven panels.

Chemical Data

With a new project opened, the first steps are to define the seasonal mode (winter or summer scenarios) and to select a chemical from the "Contaminant" list box. There are two categories of chemicals: 1) metals and 2) organics. After selecting the chemical category by clicking on the proper option box, the chemical can be selected from the list box. After selecting a chemical from the contaminant list box located in the "Chemical" tab (for example "Benzo [a] pyrene" in Figure 3), all the fields in all the panels will be filled with the default values retrieved from the database. Alternatively, the user can input data for a chemical not contained in the model's library.

FIGURE 3
DATA INPUT WINDOW: CHEMICAL TAB



As shown in Figure 3, the "Chemical" tab includes a box listing all the available chemicals in the model's database. This panel allows the user to choose a contaminant and retrieve all the properties of the selected chemical required for running the program. The default values provided by the database can be replaced with new values by inputting the values in the corresponding fields. If an improper value is entered, the program will notify the user and provide an opportunity to re-enter the proper value.

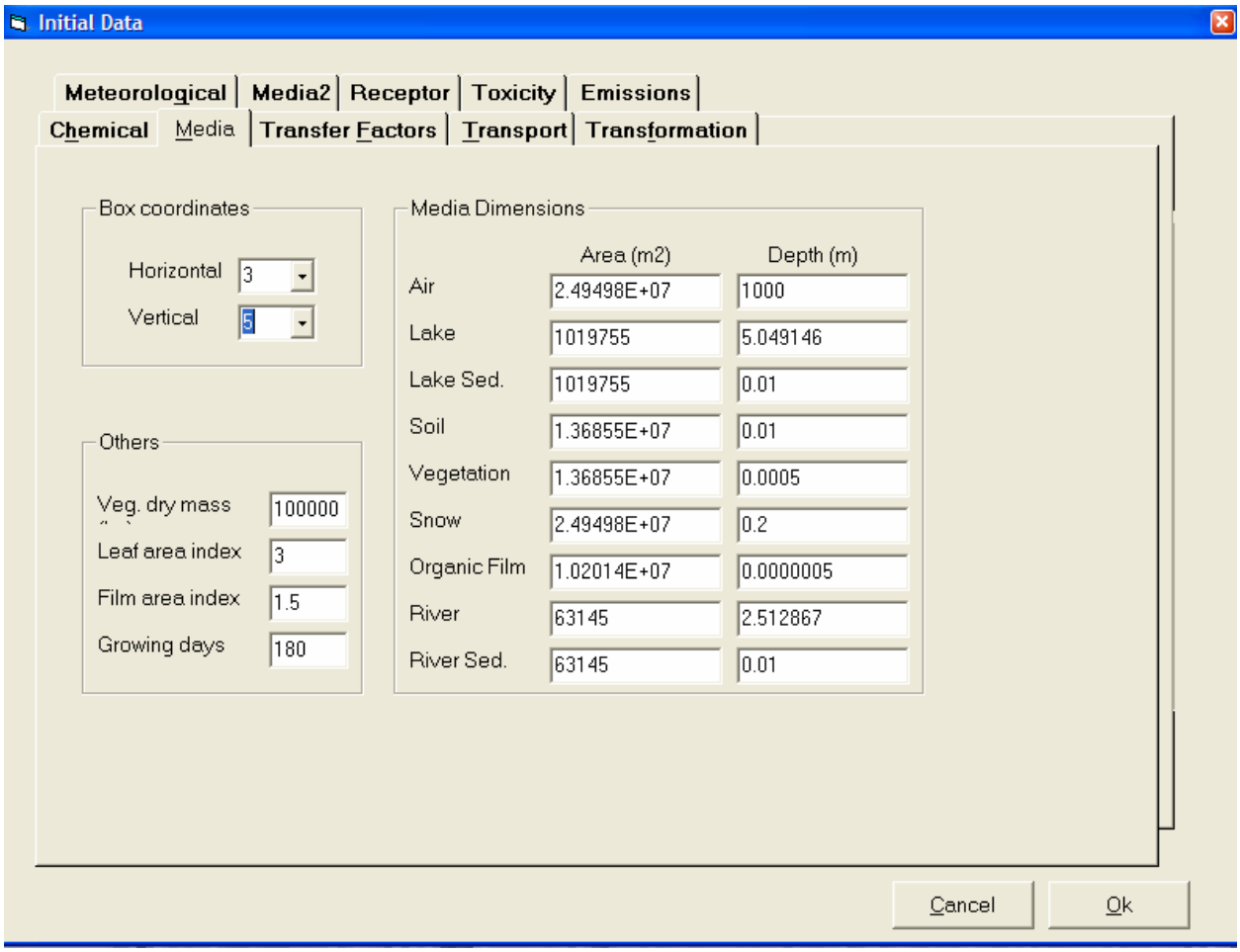
Environmental Media Data

The next set of data describes the geography of the area. The "Media" tab contains "Box Coordinate" text boxes (Figure 4) that contain Figures 1 to 9. Each box in the model represents a geographic area of 5 km x 5 km. Each box is identified with a horizontal and a vertical coordinate that can be selected from these boxes. The data listed for each

geographic box are media dimensions (areas and depths), densities and some other site-specific properties that are required to perform mass balance calculations in the model.

The database contains default values for each box of 5 km x 5 km. The default values for the depths of each compartment are based on the average active layer of the compartments in terms of chemical mobility. The user can overwrite these values. Other geographically-specific data are listed in the "Media2" tab.

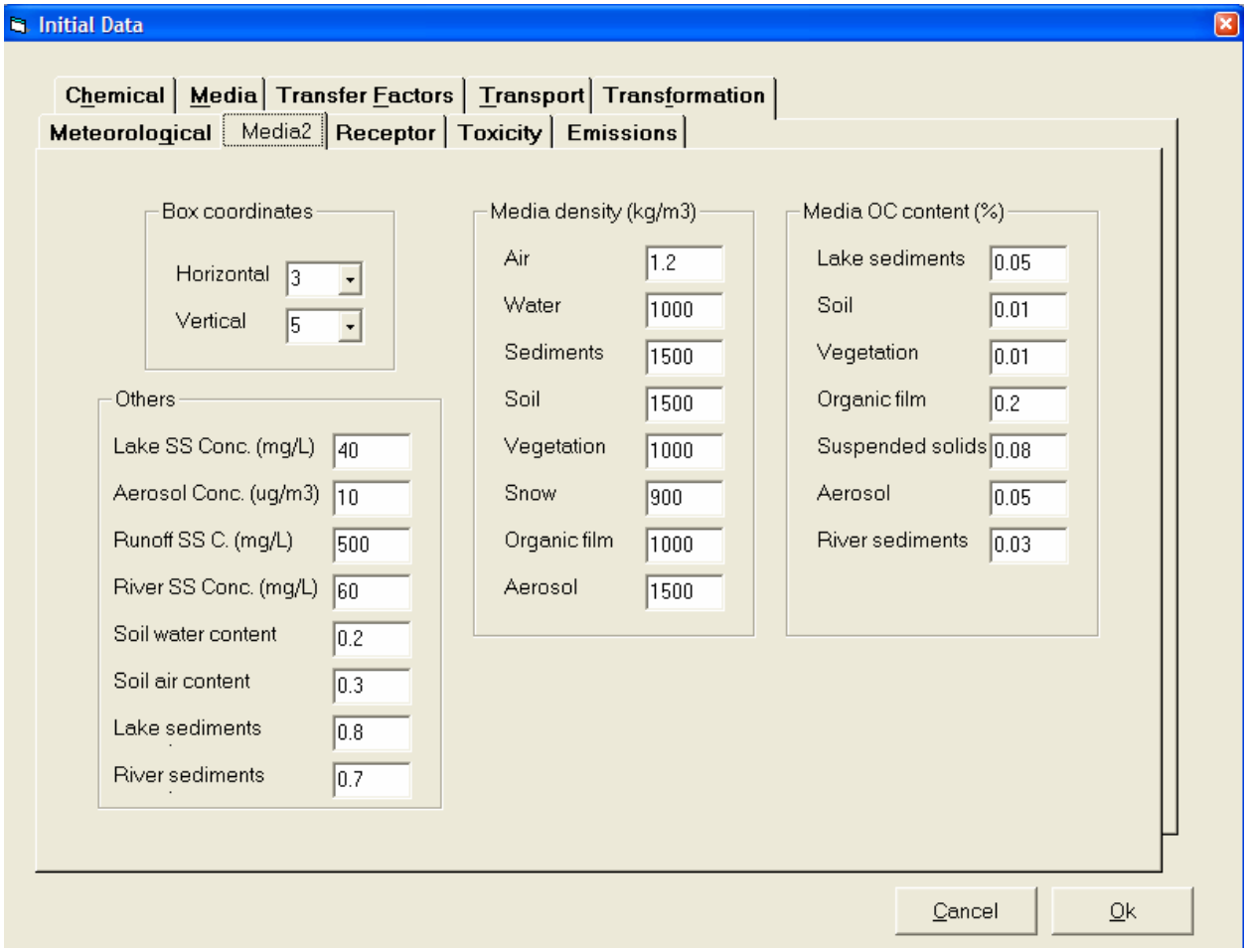
FIGURE 4
DATA INPUT WINDOW: MEDIA TAB



Additional environmental media data

Additional environmental media data appear in the "Media2" tab (see Figure 5). This information includes media (e.g., soil, sediment) density, organic matter content, porosity, and some other parameters. The default values in this panel are not specific to the study area. The user can replace them with site-specific measured values.

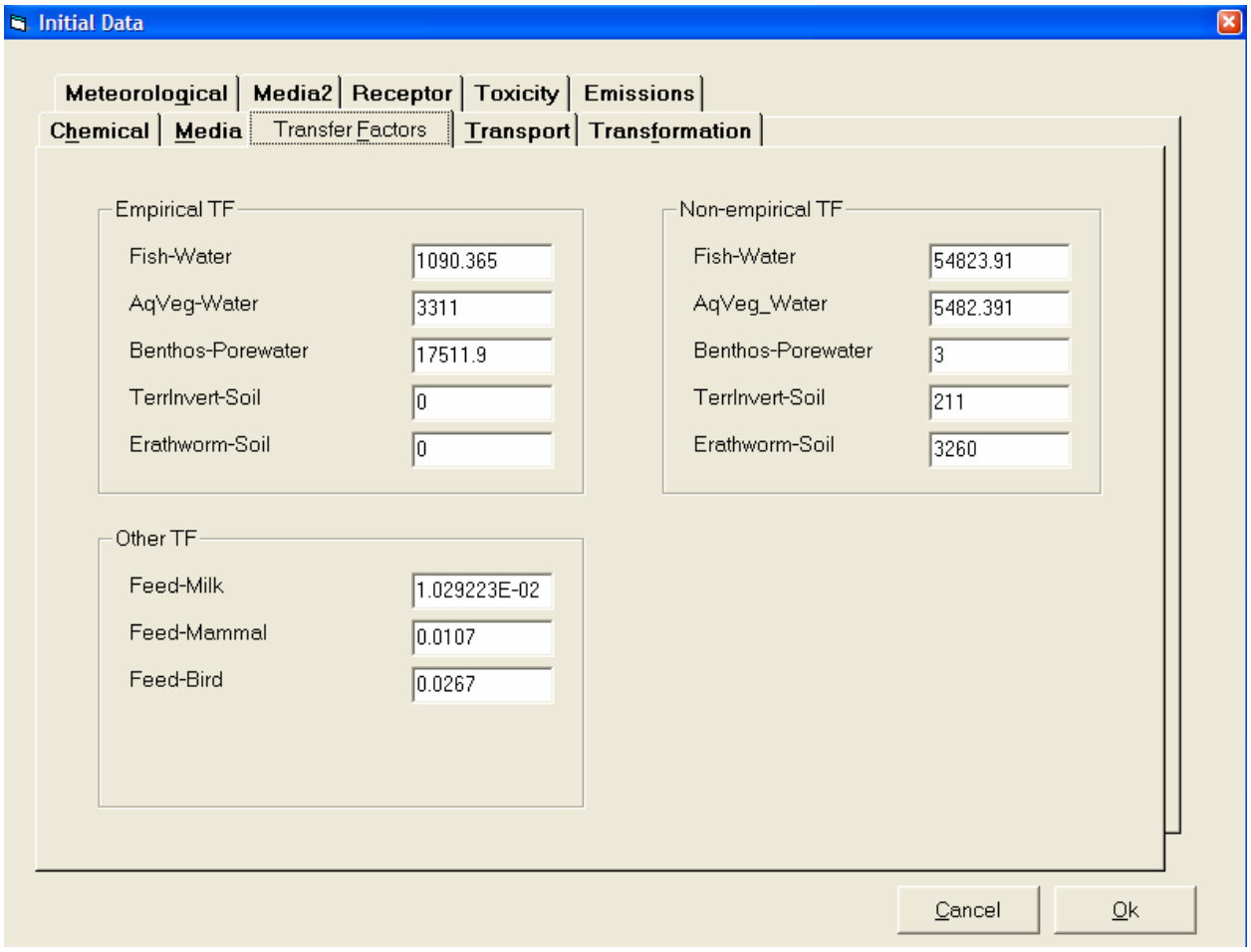
FIGURE 5
DATA INPUT WINDOW: MEDIA 2 TAB



Transfer Factors

Empirical and non-empirical transfer factors for the selected chemical are shown in the "Transfer Factors" tab. These parameters are required to estimate the biotic concentrations using estimated abiotic concentrations in the environmental compartments. Non-empirical values refer to those which are estimated using equations as opposed to measurements. Figure 6 shows the "Transfer Factors" tab and the data retrieved for benzo [a] pyrene.

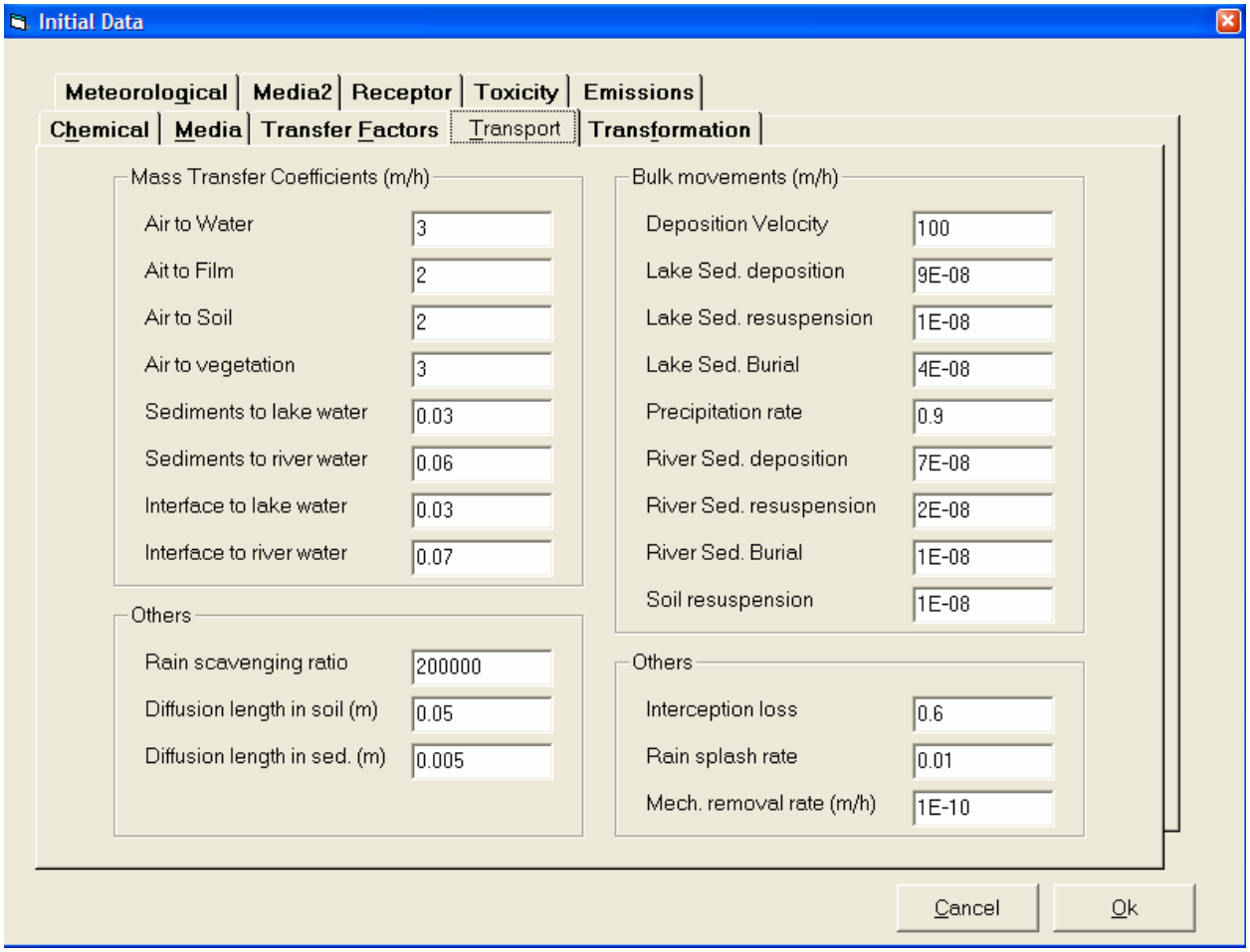
FIGURE 6
DATA INPUT WINDOW: TRANSFER FACTORS TAB



Transport Data

The parameters appearing in the "Transport" tab are required to calculate the bulk movement and diffusive migration of chemicals among compartments (see Figure 7). The default values used are the best available estimates taken from the literature and model calibration. It is not recommended these values be changed unless site-specific values are available. The precipitation rate provided is an average value for the Minneapolis/St. Paul area.

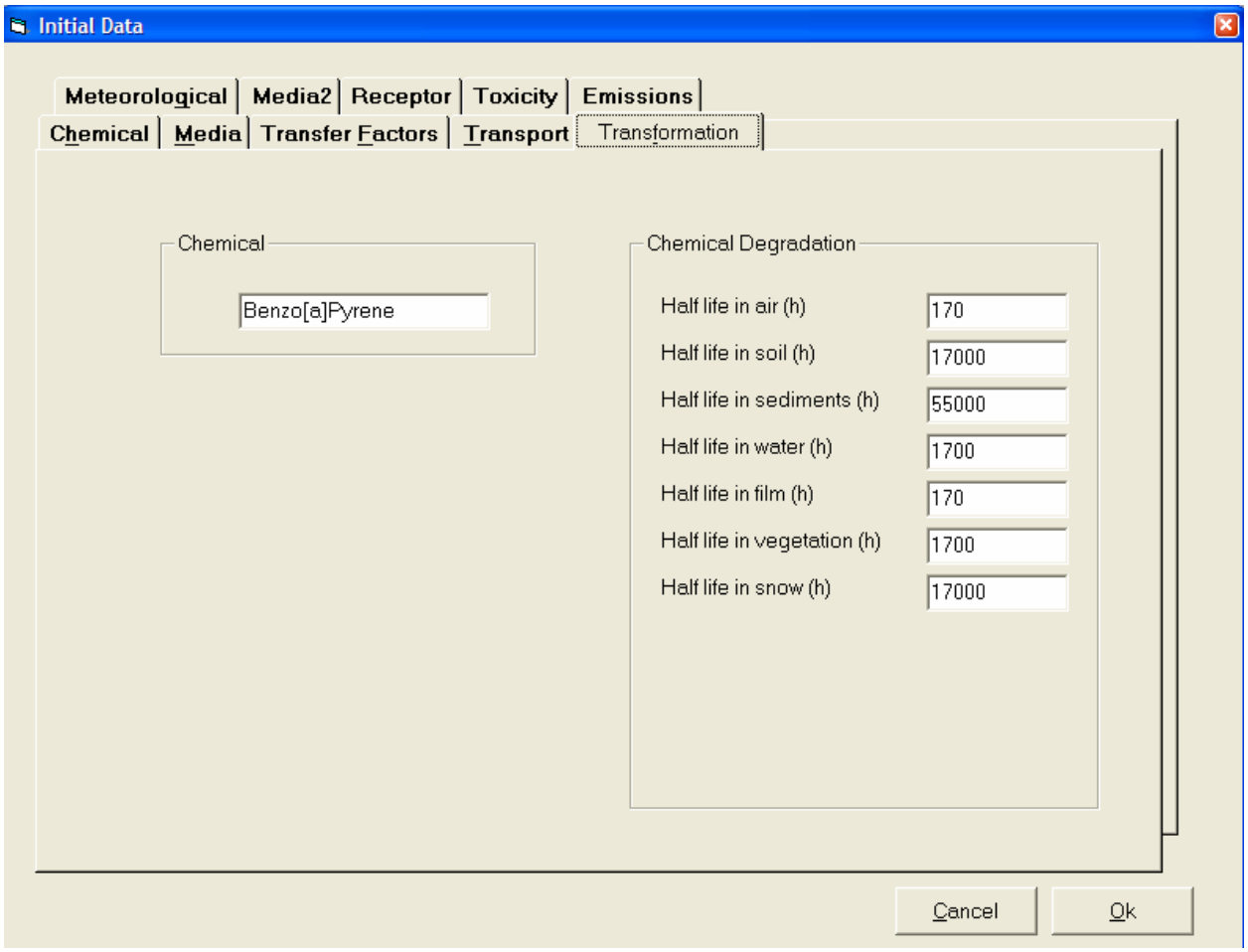
FIGURE 7
DATA INPUT WINDOW: TRANSPORT TAB



Transformation data

The parameters appearing in the "Transformation" tab are required to calculate the rate of transformation of the semi-volatile organic compounds in each environmental compartment (see Figure 8 for benzo [a] pyrene). The default values used are the best available estimates from the literature. It is recommended these values not be changed unless updated chemical-specific values are available.

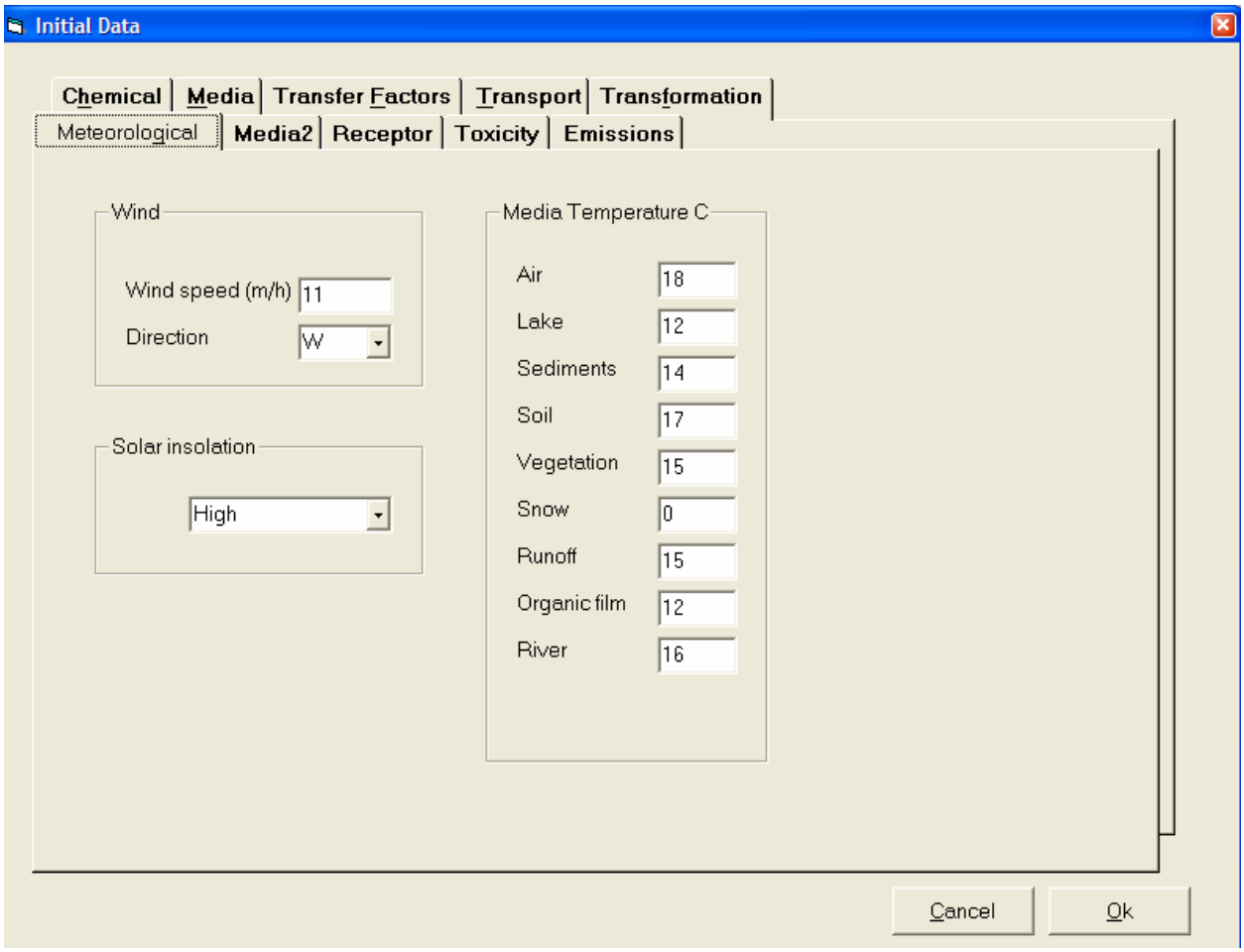
FIGURE 8
DATA INPUT WINDOW: TRANSFORMATION TAB



Climatic data

The "Meteorological" tab includes environmental compartment temperatures, wind speed and direction, and solar insolation (see Figure 9). The data are specific to the study area and should not be changed unless more accurate measured values are available. Wind speed and direction are required to calculate interbox transport and solar insolation is required to determine the atmospheric stability class.

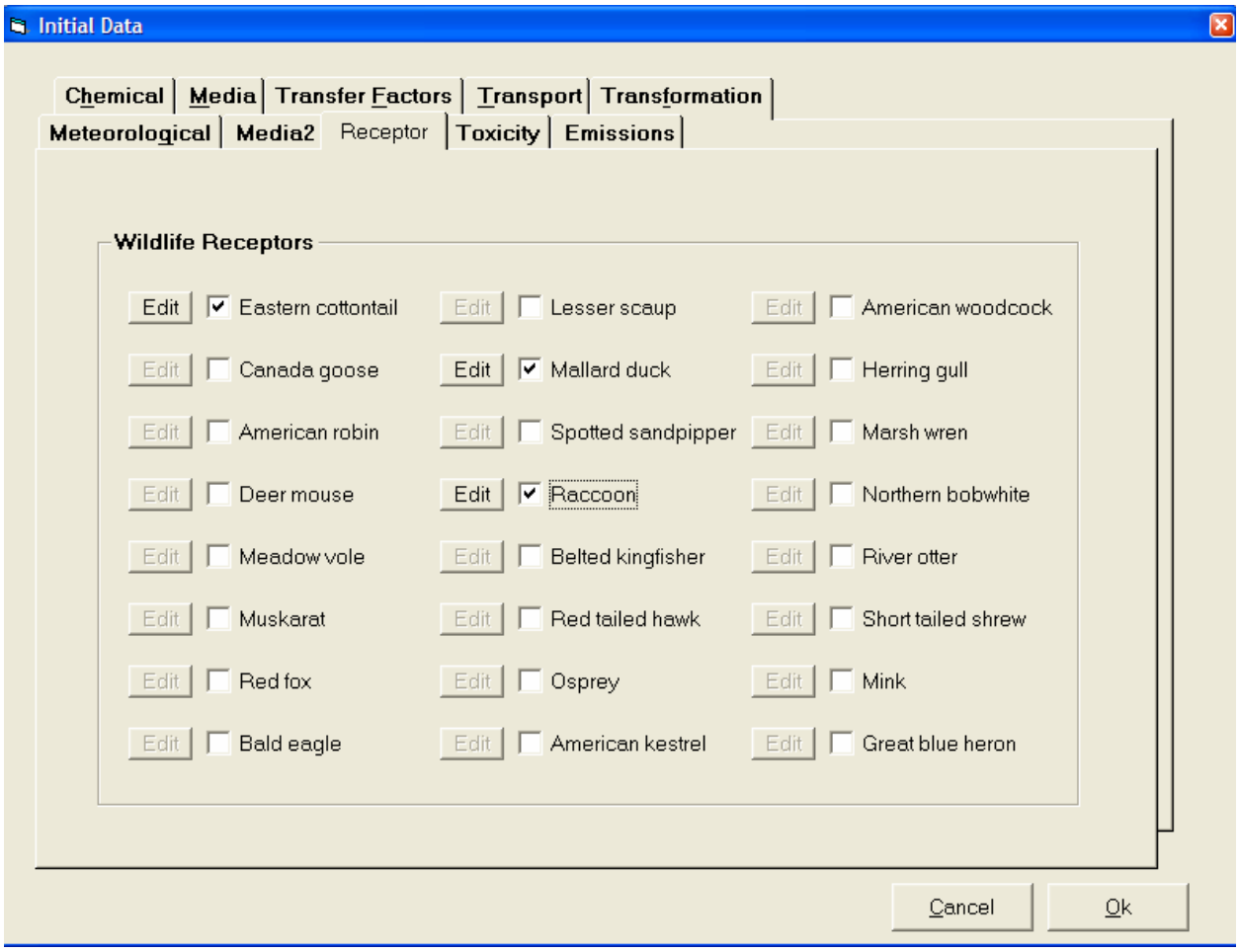
FIGURE 9
DATA INPUT WINDOW: METEOROLOGICAL TAB



Receptors

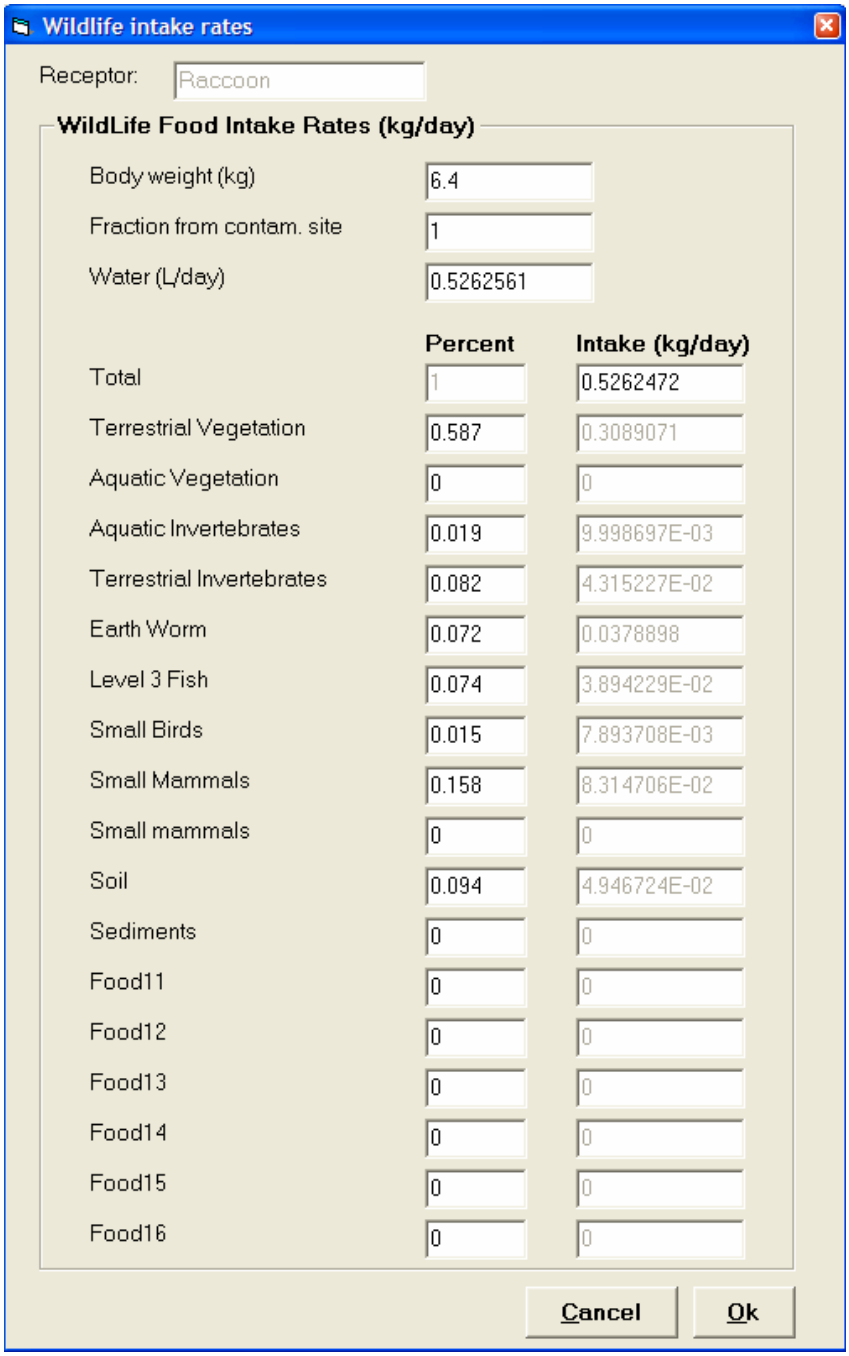
The "Receptor" tab contains a group of aquatic and terrestrial receptors that are specific to the Minneapolis/St. Paul area (Figure 10). Check off the box beside the receptor name to select a receptor.

FIGURE 10
DATA INPUT WINDOW: RECEPTOR TAB



When a receptor is selected, a command button with the caption "Edit" will be activated for that receptor. If this command button is pressed, a new window will appear that contains the receptor ecological profile and exposure characteristics (Figure 11). This information includes body weight, food and water ingestion rate, inhalation rate, and food ingredients. The user is able to modify the default values that are taken from the program database.

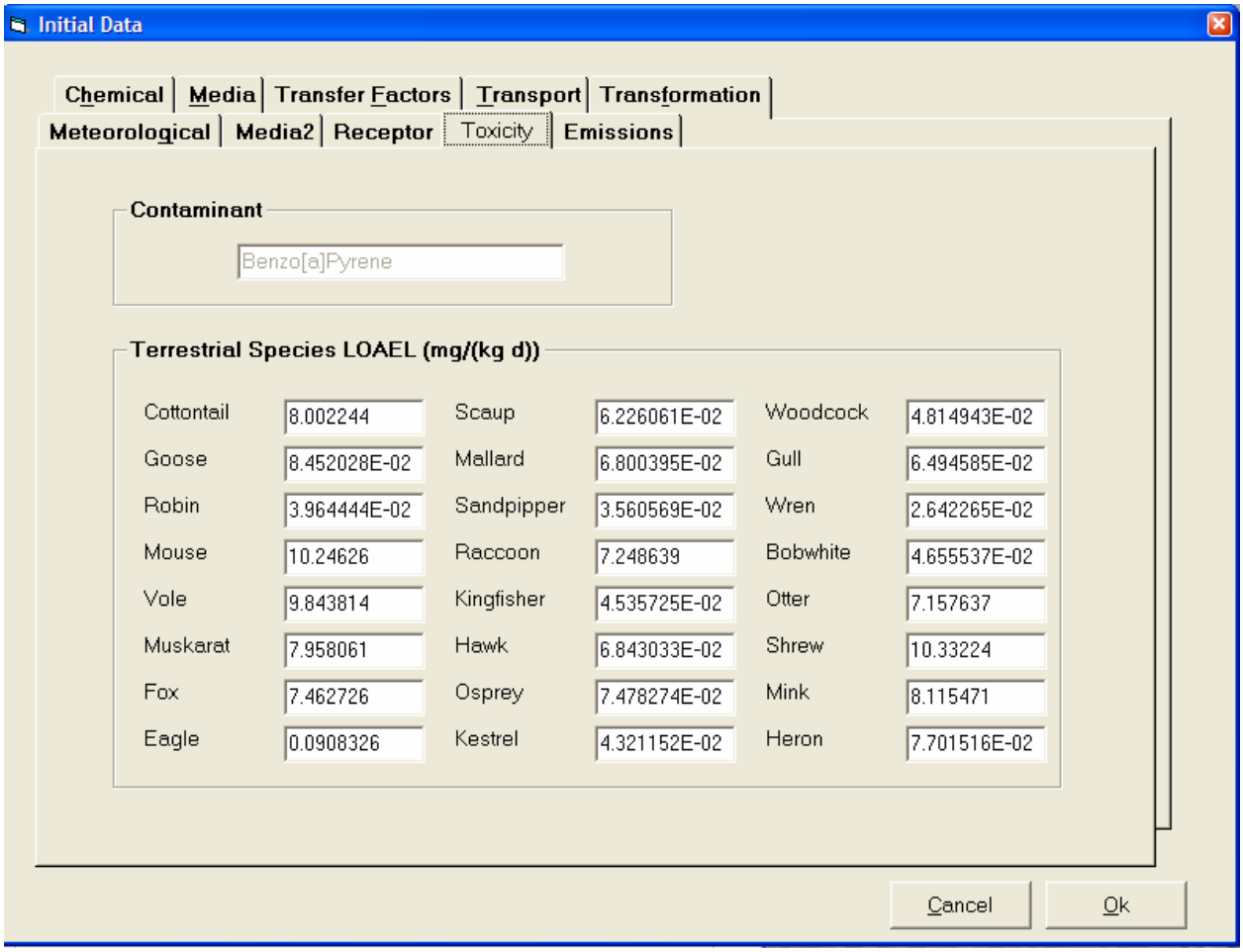
FIGURE 11
RECEPTOR EXPOSURE PROFILE



Toxicity Data

Toxicological benchmarks that are used to estimate the hazard quotients as a measure of the risk to the health of the wildlife are shown in the "Toxicity" tab (Figure 12). The toxicity values are reported for considered aquatic and terrestrial receptors in the model.

FIGURE 12
DATA INPUT WINDOW: TOXICITY TAB

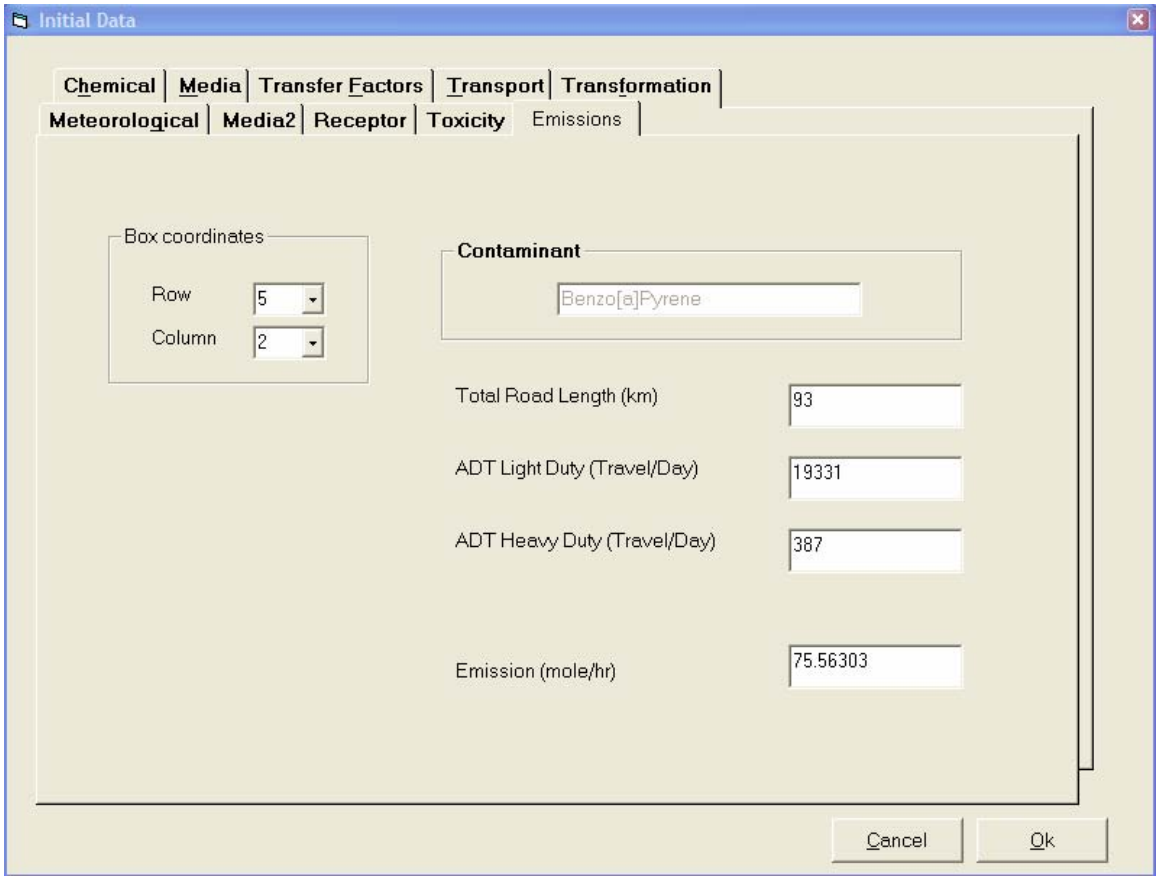


Emissions

The "Emission" tab includes the fields corresponding to traffic volume and road length for each box. These data are used to calculate the emission rate of the selected chemical from that specific box. (Figure 13, benzo [a] pyrene emission for box 2,5). The emissions are calculated using the traffic volume, total road length, and emission factors for the chemical. The box coordinates in this tab identify the specific box. To view box-

specific data, simply select the appropriate box coordinates. The user can substitute the default values with more recent available data.

FIGURE 13
DATA INPUT WINDOW: EMISSIONS TAB



Modifications of the input data in the input data window are accepted by clicking the "OK" command button at the bottom of the data input window. If the "Cancel" command button is clicked, the modifications will be discarded. In both cases, the data input window will disappear. If a non-numeric value is entered, this improper input of parameter values will be detected and notified to the user via the display of a warning message.

The user can save the project at any time while entering the data or after finishing the data input session. By saving the project, all the information required to run the model will be saved in an independent project file. The file name should be assigned by the user and the program assigns a "mdt" file name extension to the file. When attempting to save the project, the program will prompt the user for the file name.

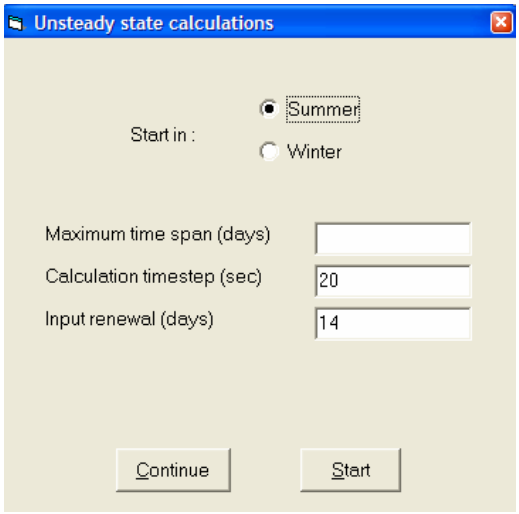
2.2 RUNNING THE MODEL

After finishing the data entry session, the user can run the model by selecting "run" from the drop-down menu item or by clicking on one of the run buttons on the toolbar. There are two choices for steady-state and unsteady-state (time dependent or transient) modes of calculation. For each mode the calculation can be performed for both summer and winter scenarios. If the steady-state mode is selected, the program performs the calculations and notifies the user after finishing the calculation. The model will notify the user when the calculations have been successfully completed.

For the unsteady-state mode, the user should identify the time period for which the calculation would be performed. The user is prompted for this information in the unsteady-state dialog-box that is activated after running the program (Figure 14). There are two other parameters required for unsteady-state calculations: 1) calculation time step (20 seconds by default); and 2) data renewal time or the time interval at which data are saved to a file (14 days by default). It is recommended that the user not change these two parameters in the dialog box. After each data renewal period the program stops the calculations and the user can change the input data for the next period. The intermediate results can be reviewed in the same manner as the steady-state results that are described in the next section.

In the next sections, the results from benzo [a] pyrene and for raccoon as receptor will be shown.

FIGURE 14
UNSTEADY-STATE DIALOG-BOX

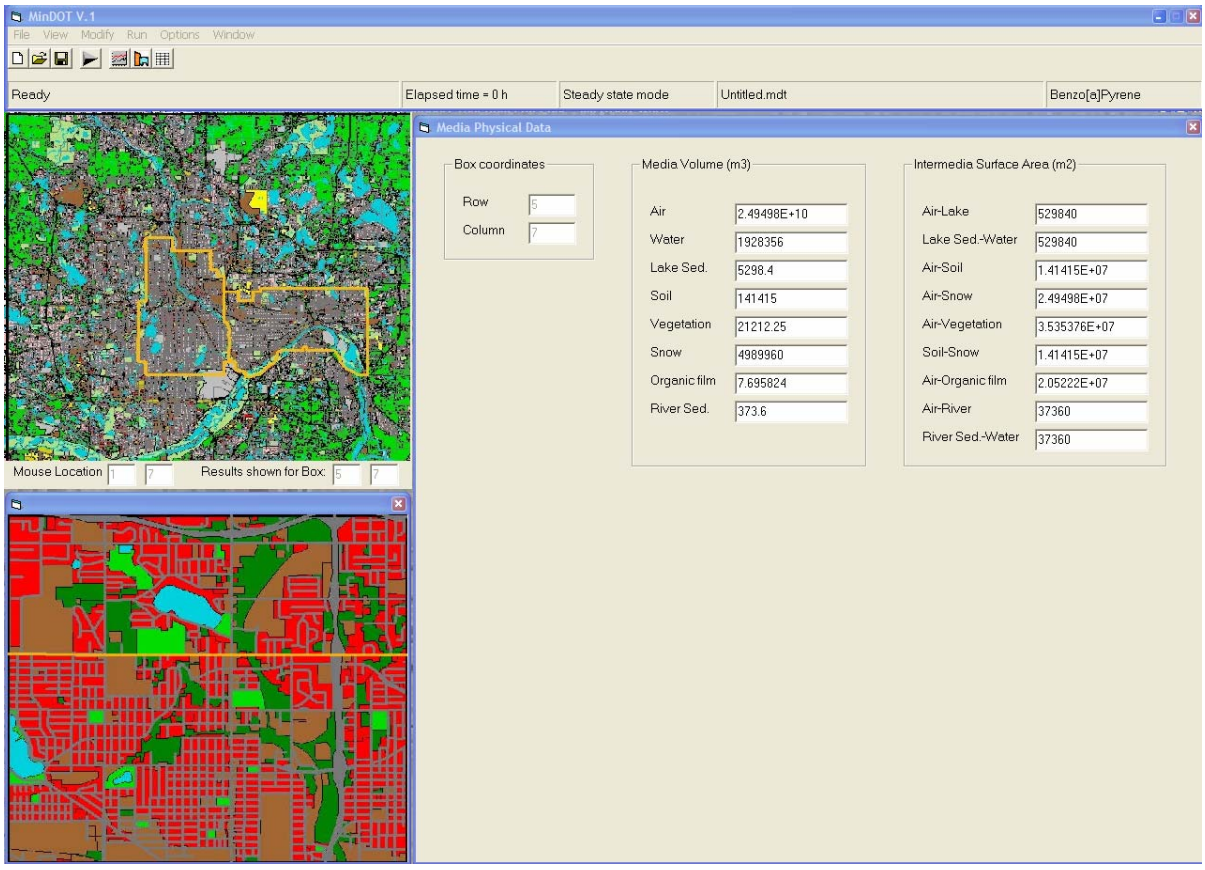


2.3 REVIEWING THE RESULTS

The user is able to view the results on the screen in tabular or graphic formats. This is made possible through a group of output windows. The user is able to access the output windows through the "view" option of the menu bar or through the command button at the bottom of each output window.

The first output window, "Map," displays the landscape information for each box. The information shown includes the area and volume of each environmental compartment in each box. The table indicates the results for each box that can be selected graphically by clicking the mouse on the desired location on the map on the left side of the screen. Figure 15 shows the results for box 5,7.

FIGURE 15
WINDOW DISPLAYING AREA AND SECTIONAL MAP ALONG WITH LANDSCAPE INFORMATION



Intermedia transport rates along with the area and sectional maps for box 5,7 are shown in Figure 16. Chemical mass and concentrations along with intermediate results (for example for box 5,7) are summarized as a table in Figure 17. The table indicates the results for each box that can be selected graphically by clicking the mouse on the desired location on the map on the left side of the screen. An enlarged portion of the map will also be displayed on the screen. The results are reported for all of the environmental compartments.

FIGURE 16
WINDOW DISPLAYING THE INTERMEDIA TRANSPORT RATES FOR EACH BOX

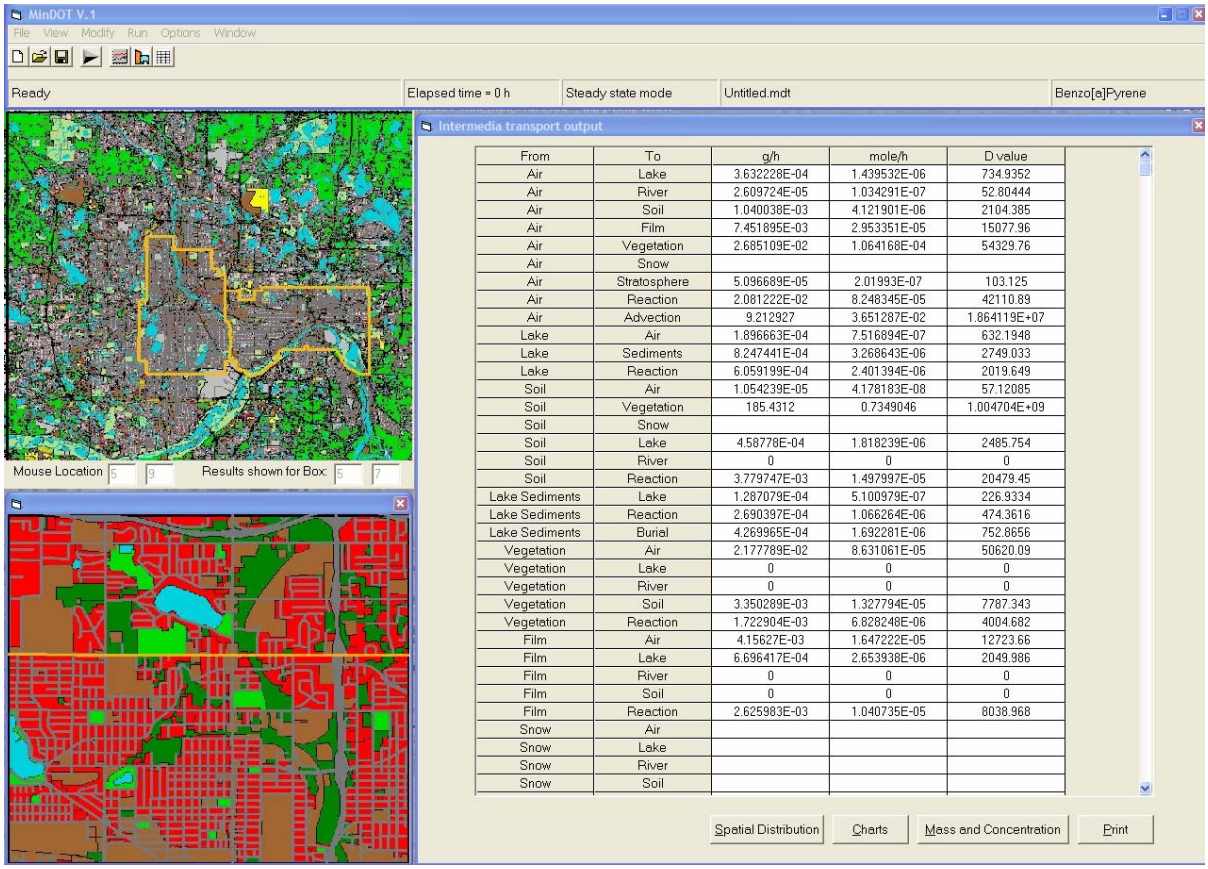
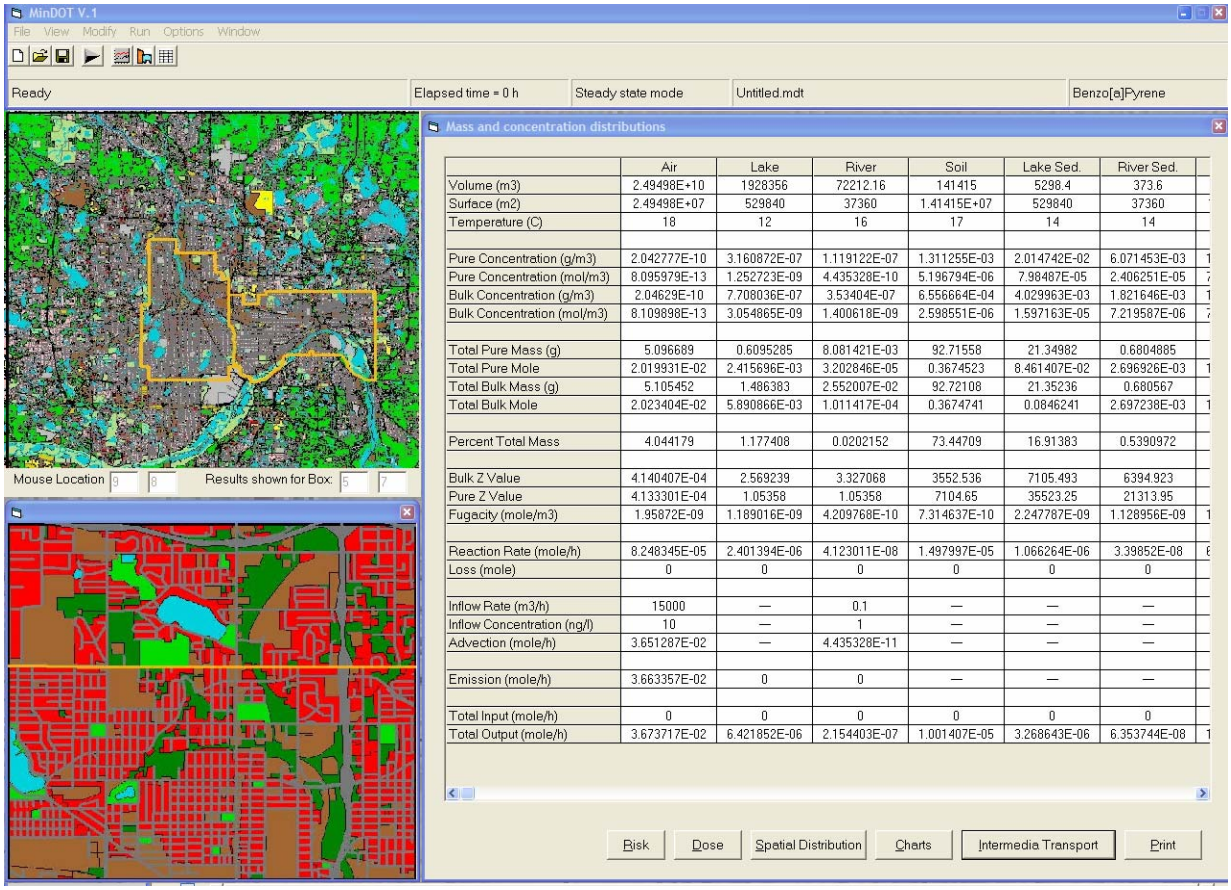


FIGURE 17
WINDOW DISPLAYING THE CALCULTED RESULTS FOR ENVIRONMENTAL COMPARTMENTS ALONG WITH THE AREA AND SECTION MAPS



	Air	Lake	River	Soil	Lake Sed.	River Sed.
Volume (m3)	2.49498E+10	1928356	72212.16	141415	5298.4	373.6
Surface (m2)	2.49498E+07	529840	37360	1.41415E+07	529840	37360
Temperature (C)	18	12	16	17	14	14
Pure Concentration (g/m3)	2.042777E-10	3.160872E-07	1.119122E-07	1.311255E-03	2.014742E-02	6.071453E-03
Pure Concentration (mol/m3)	8.095979E-13	1.252723E-09	4.435328E-10	5.196794E-06	7.98487E-05	2.406251E-05
Bulk Concentration (g/m3)	2.04629E-10	7.708036E-07	3.53404E-07	6.556664E-04	4.029963E-03	1.821646E-03
Bulk Concentration (mol/m3)	8.109898E-13	3.054865E-09	1.400618E-09	2.598551E-06	1.597163E-05	7.219587E-06
Total Pure Mass (g)	5.096689	0.6095285	8.081421E-03	92.71558	21.34982	0.6804885
Total Pure Mole	2.019931E-02	2.415696E-03	3.202846E-05	0.3674523	8.461407E-02	2.696926E-03
Total Bulk Mass (g)	5.105452	1.486383	2.552007E-02	92.72108	21.35236	0.680567
Total Bulk Mole	2.023404E-02	5.890866E-03	1.011417E-04	0.3674741	0.0846241	2.697238E-03
Percent Total Mass	4.044179	1.177408	0.0202152	73.44709	16.91383	0.5390972
Bulk Z Value	4.140407E-04	2.569239	3.327068	3552.536	7105.493	6394.923
Pure Z Value	4.133301E-04	1.05358	1.05358	7104.65	35523.25	21313.95
Fugacity (mole/m3)	1.95872E-09	1.189016E-09	4.209768E-10	7.314637E-10	2.247787E-09	1.128956E-09
Reaction Rate (mole/h)	8.248345E-05	2.401394E-06	4.123011E-08	1.497997E-05	1.066264E-06	3.39852E-08
Loss (mole)	0	0	0	0	0	0
Inflow Rate (m3/h)	15000	—	0.1	—	—	—
Inflow Concentration (ng/l)	10	—	1	—	—	—
Advection (mole/h)	3.651287E-02	—	4.435328E-11	—	—	—
Emission (mole/h)	3.663357E-02	0	0	—	—	—
Total Input (mole/h)	0	0	0	0	0	0
Total Output (mole/h)	3.673717E-02	6.421852E-06	2.154403E-07	1.001407E-05	3.268643E-06	6.353744E-08

The above results can be seen graphically as charts by choosing “Charts” button on the concentration screen (Figure 18 for box 5,7).

FIGURE 18
WINDOW DISPLAYING THE GRAPHICAL OUTPUT OF THE RESULTS

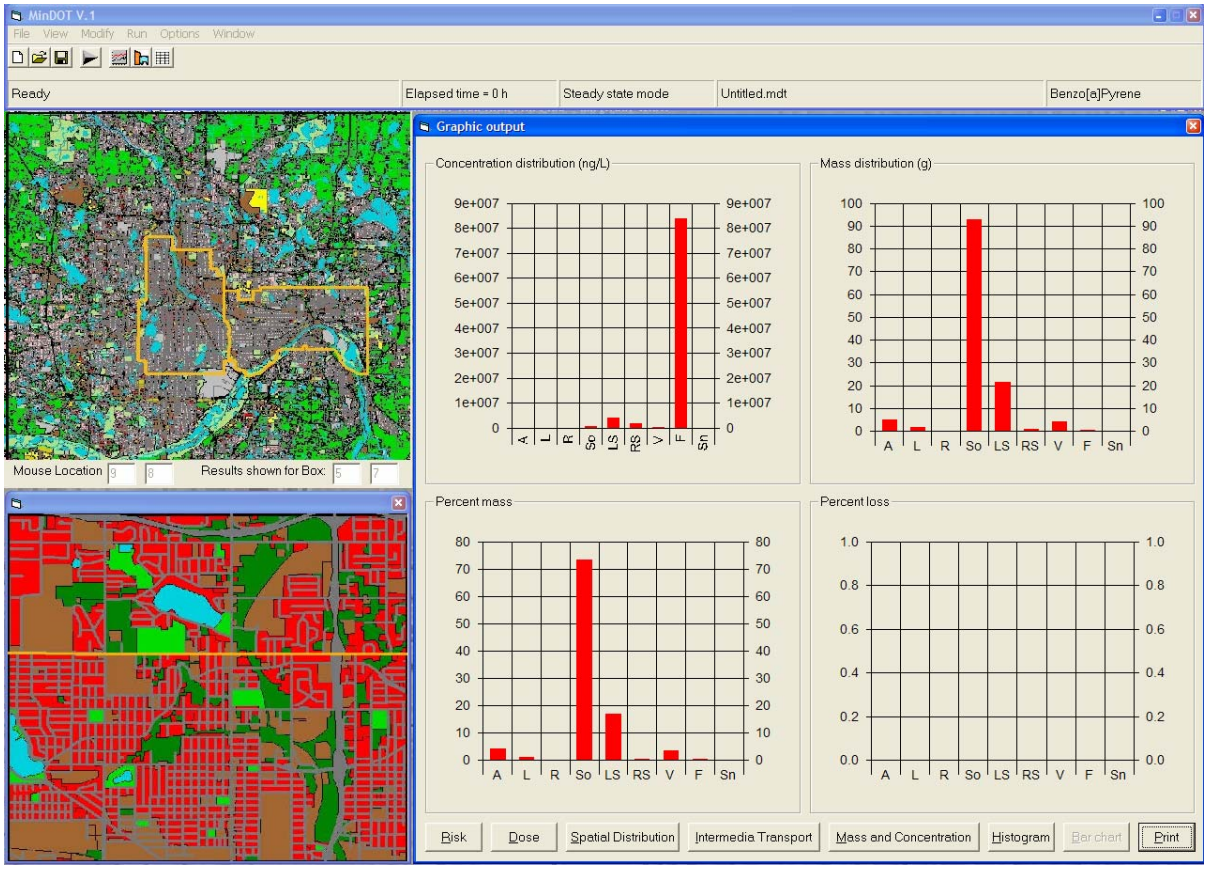
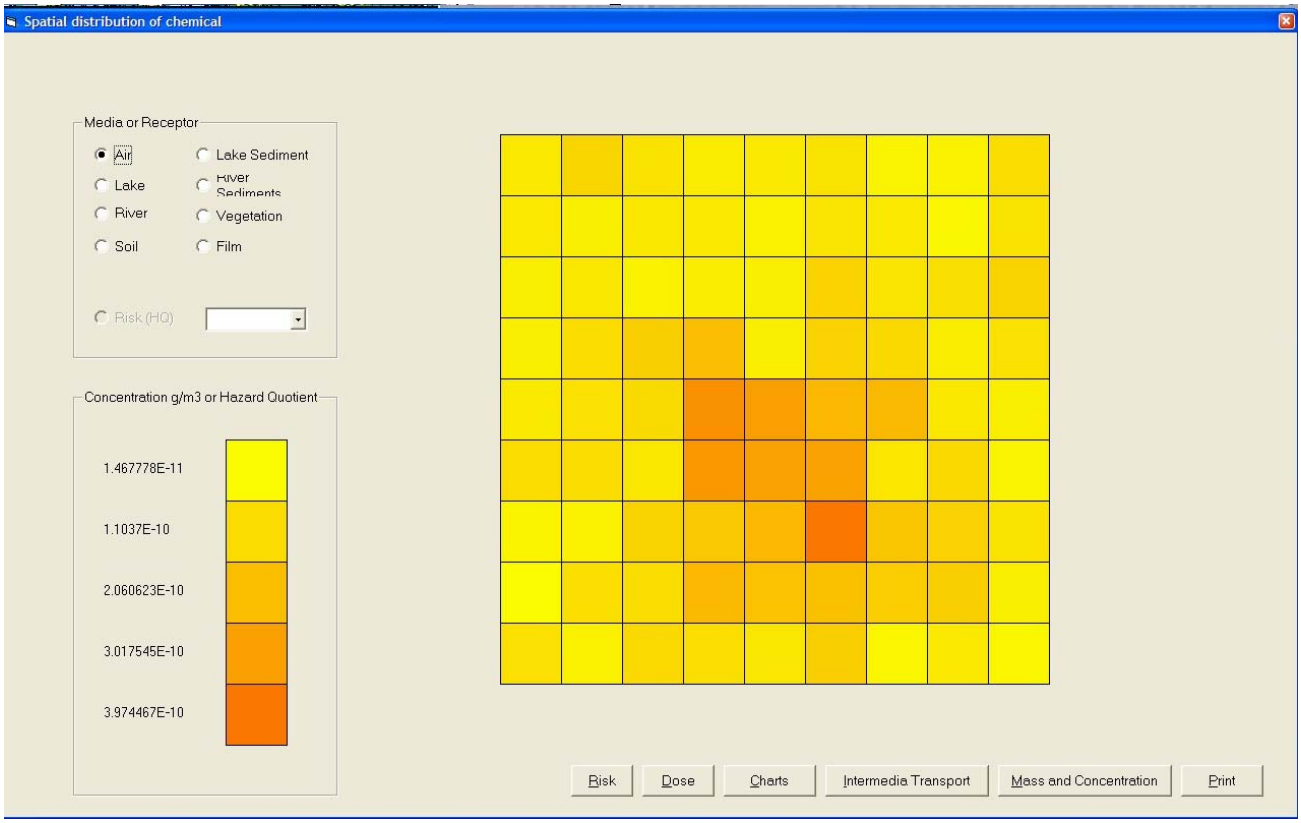


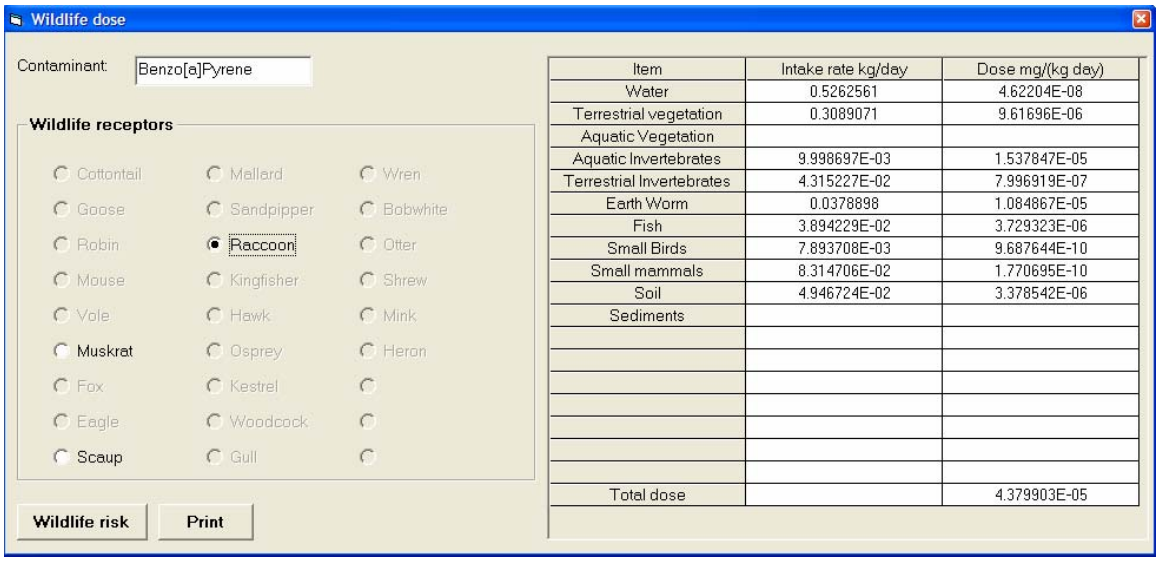
Figure 19 shows the spatial distribution of the concentrations of benzo[a]pyrene (as an example) among the boxes for the air compartment. Similar distributions for other compartments can be seen by selecting the proper option boxes on the same screen.

FIGURE 19
WINDOW DISPLAYING THE SPATIAL DISTRIBUTION OF THE MEDIA CONCENTRATIONS (g/m^3)



Calculated dose to the selected receptors can be viewed by selecting the "Dose" button on each of the screens that contains tabulated or graphical results and then selecting one of the receptors listed. An example of calculated dose for box 5,7 can be seen in Figure 20. The results include the breakdown of the dose to the selected receptor.

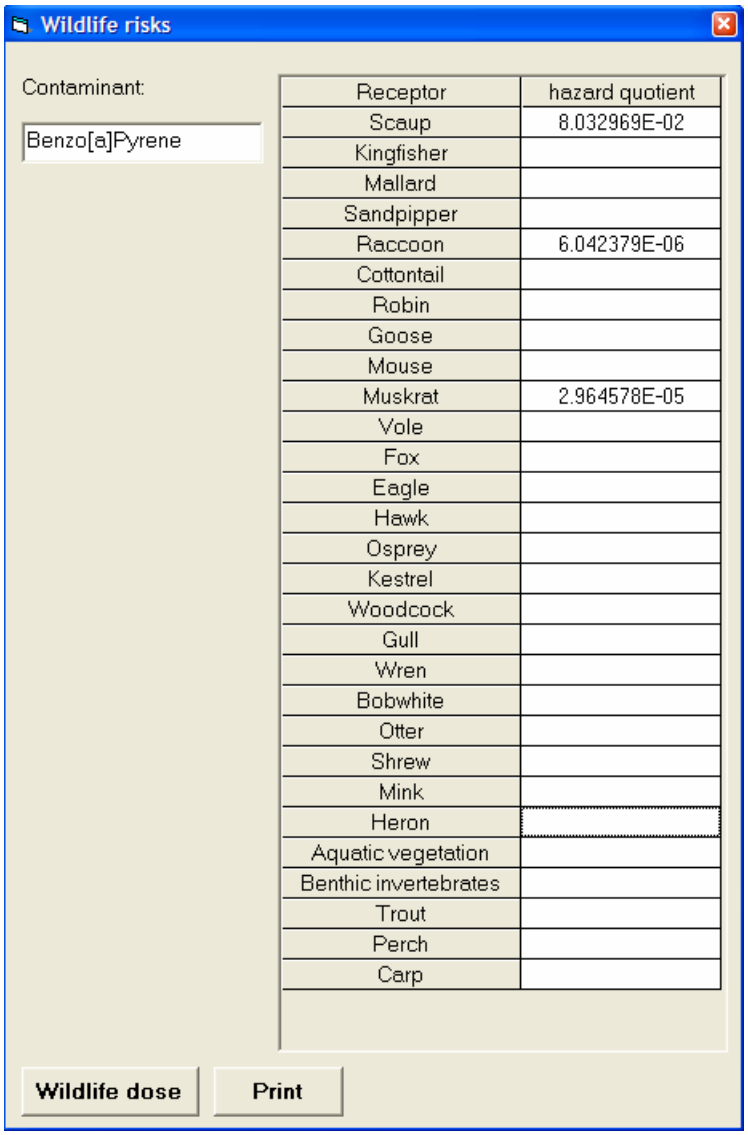
FIGURE 20
WINDOW DISPLAYING THE CALCULATED DOSE TO THE SELECTED RECEPTORS



Item	Intake rate kg/day	Dose mg/(kg day)
Water	0.5262561	4.62204E-08
Terrestrial vegetation	0.3089071	9.61696E-06
Aquatic Vegetation		
Aquatic Invertebrates	9.998697E-03	1.537847E-05
Terrestrial Invertebrates	4.315227E-02	7.996919E-07
Earth Worm	0.0378898	1.084867E-05
Fish	3.894229E-02	3.729323E-06
Small Birds	7.893708E-03	9.687644E-10
Small mammals	8.314706E-02	1.770695E-10
Soil	4.946724E-02	3.378542E-06
Sediments		
Total dose		4.379903E-05

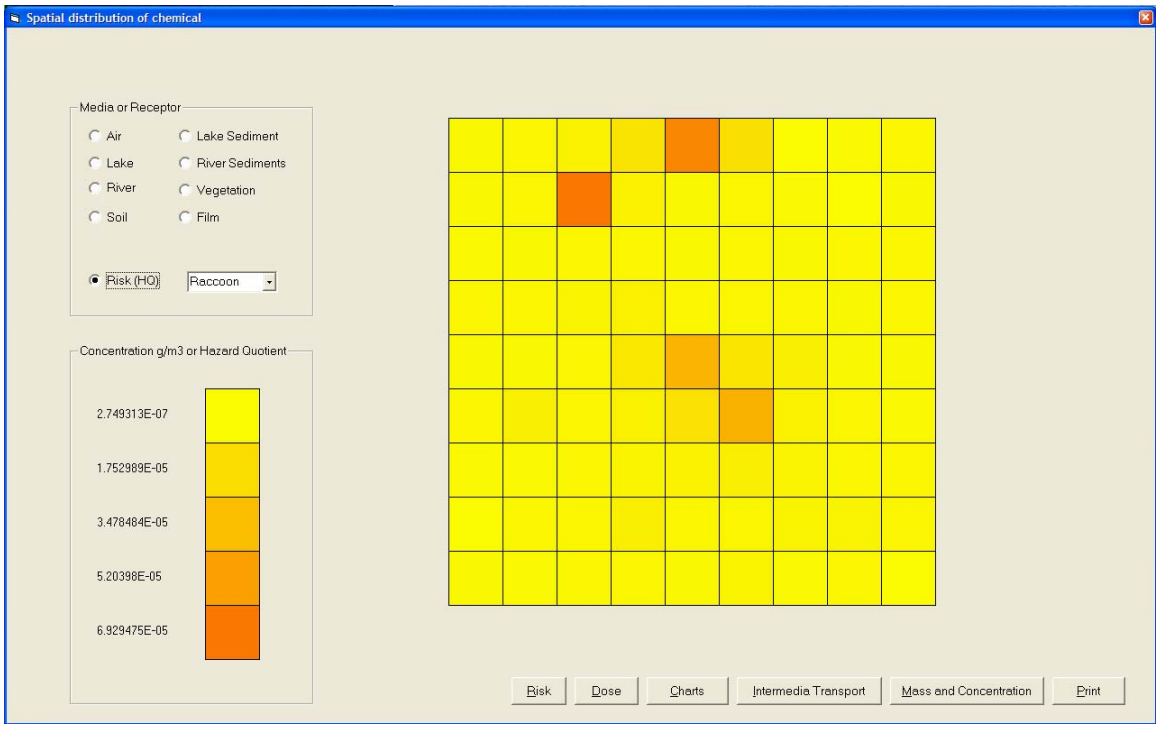
The hazard quotients or calculated risk to the selected ecological receptors can be seen by clicking on the “Wildlife risk” button (Figure 21 for box 5,7). If after checking the "Wildlife Risk" button and the "Wildlife Risk" box is empty, go to the "Mass and Concentration" screen and choose "Risk." The values will then be loaded into the "Wildlife Risk" box.

FIGURE 21
WINDOW DISPLAYING THE CALCULATED HAZARD QUOTIENTS (DIMENSIONLESS) FOR THE SELECTED RECEPTORS



Similar to the environmental concentrations, the spatial distribution of the Hazard Quotients (HQ) can also be seen by pressing the "Spatial distribution" button and choosing the "Risk (HQ)" followed by choosing the receptor from the list box. Figure 22 shows a typical spatial distribution of the raccoon's HQs.

FIGURE 22
WINDOW DISPLAYING THE CALCULATED HAZARD QUOTIENTS (DIMENSIONLESS) FOR THE SELECTED RECEPTORS



After viewing the results the program can be terminated by selecting the file menu and exiting. The project can be saved at any stage of executing the program. Each of the above forms can be printed as they are shown on the screen.

"Note: It is recommended that each chemical chose be run as its own modeling session. Changing chemicals in the "Chemical Properties" tab and rerunning the model does not automatically update all open data screens. Data screens are only updated after clicking a location on the map screen."