SMART GROWTH INDEX®

A Sketch Tool for Community Planning

Version 2.0

Getting Started Guide

November 2002

Prepared for the
U.S. ENVIRONMENTAL PROTECTION AGENCY
by
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CONTENTS

1. Introduction

Smart Growth INDEX (SGI) is a GIS-based sketch tool for supporting community planning. As shown in Figure 1.1, it is designed to analyze static (single point in time) sketches created by users. SGI evaluates sketches with a set of indicators that measure land-use, transportation, and environmental characteristics of the sketch area. Users may compare sketches to existing conditions, future goals, and to alternative sketches with weightings of indicator importance. Sketches may simulate a current point in time or a future year, such as a 20-year planning horizon.

The Getting Started Guide is intended to help new SGI users get up and running quickly. It is designed for both general and advanced users. Advanced users designated by their organizations as SGI "stewards" should also review the Steward Guide before installing and using the software.

The Getting Started Guide takes the new user through the following orientation steps:

- *Sample sketch tour.* This brief tour illustrates the tool's interface and highlights its major functions.
- *Database preparation.* This is a tutorial on populating SGI's database with local GIS shapefiles.
- *Sketch creation and evaluation.* The tutorial continues with step-by-step instruction on building sketches, running the model, and reporting results.
- *Additional learning exercise.* To test SGI skills, a six-step learning exercise is outlined.

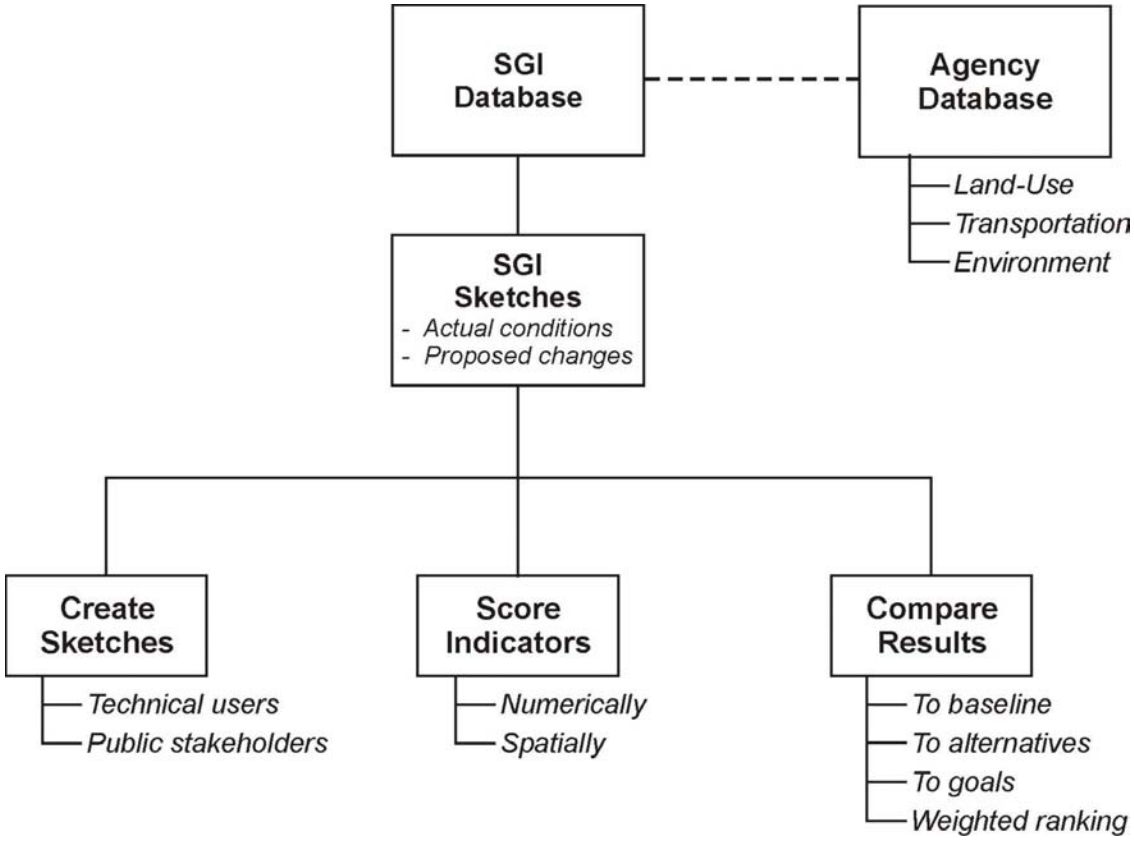
In addition to the Getting Started Guide, new users should review the Indicator Dictionary and Community Process Guide to gain complete familiarity with SGI.

Land-Use Shapefile Terminology

Much of SGI's modeling deals with land-use shapefiles, and for that reason it is important that new users understand the terminology used to distinguish the following three types of land-use shapefiles used in SGI:

- *Base Land-Use.* These parcel-level shapefiles are used in base sketches to represent baseline conditions that alternate sketches can be measured against. Base sketch land-use can either be existing land-use in an area, or it can be a baseline concept of proposed uses, e.g. an initial development proposal for a greenfield area.

Figure 1.1
SIMPLIFIED SGI STRUCTURE & FUNCTIONS



- *Alternate Land-Use.* These parcel-level shapefiles are used in alternate sketches to represent uses that are alternatives to base sketch uses. When the base sketch represents existing conditions, alternate sketch land-uses often represent alternative planning scenarios that can be compared to existing conditions. In cases where the base sketch represents a baseline development proposal for a greenfield area, alternate sketch uses often represent alternative designs of the development proposal.

- *Planned Land-Use.* The term "planned" is used to denote land-use shapefiles that represent official plan designations that govern development in a sketch area. These shapefiles are used by indicators that score sketch consistency with applicable plans. At the user's discretion, if these are parcel-level shapefiles they may also be used for the base or alternate land-use purposes described above, e.g. planned land-use could be used for base sketch land-use in evaluating an area's current adopted plan; or planned land-use could be used for alternate sketch land-use when the adopted plan is being reevaluated among several alternative plans.

GIS Software Requirements

SGI is built as a MapObjects/Visual Basic application that operates on its own without standard GIS platforms like ArcView or ArcGIS. However, SGI does require GIS files in shapefile format, so access to an ESRI GIS is necessary for efficient operations.

2. Installing SGI

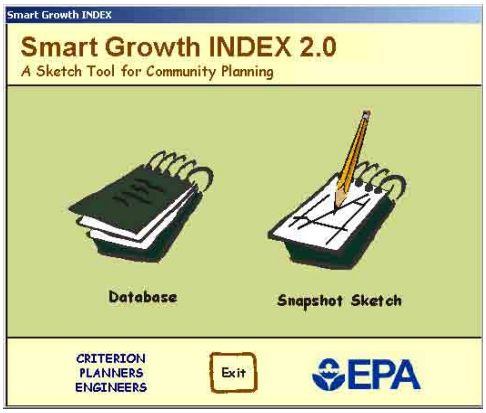
Installation of SGI should be accomplished with the assistance of advanced users designated by the organizations as SGI "stewards." Detailed guidance on installation procedures is given in the Steward Guide.

3. Touring SGI

This section introduces the new user to SGI with a tour of its interface and main functions. This is not an exhaustive tour of all SGI details, but rather a quick orientation of highlights. The primary objective is familiarization with SGI's interface. A detailed step-by-step tutorial follows the tour. Both the tour and tutorial use illustrative data from South Burlington, Vermont.

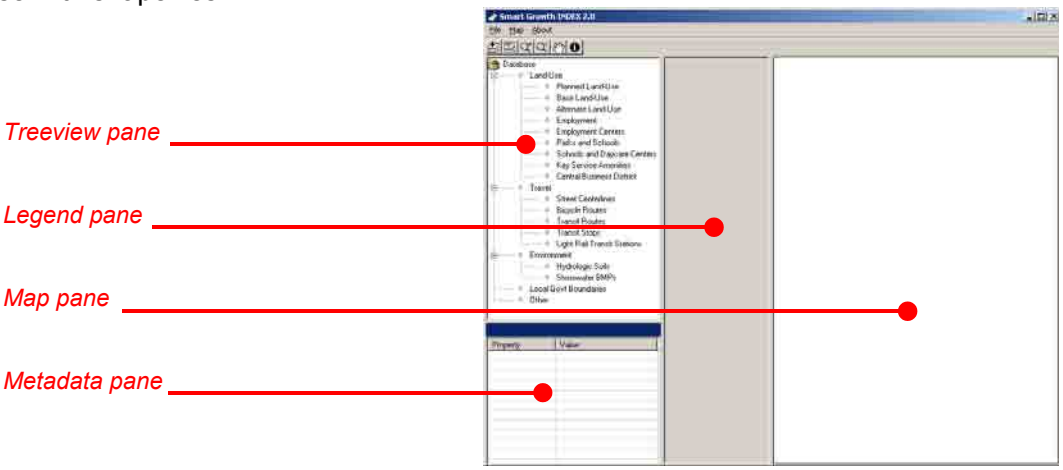
Starting the Application

➤ Start SGI by clicking on the desktop icon or SGI in your Windows list of installed programs. The startup screen will appear. The start-up screen provides entry points into SGI's two main components: 1) the Database that contains all shapefiles needed for supporting sketches; and 2) the Snapshot Sketch modeler that performs a static (single point in time) analysis of a user-created scenario.

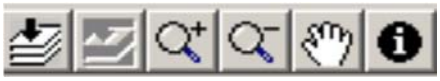


Viewing the Database

➤ Snapshot sketches are assembled from shapefile information in the Database. The Database can contain as much of the user organization's geography as desired. Click the Database icon and the Database window appears; the image shown below has been supplemented with labels explaining the major pieces of the SGI interface. This interface design is used throughout SGI. The Database window is empty because the first task in the following tutorial is populating the Database with shapefiles.



The Database menu bar has three pull-down menus: File, containing shapefile and exit commands; Map, for controlling map layers; and About, containing software registration information. The tool bar includes the following buttons:

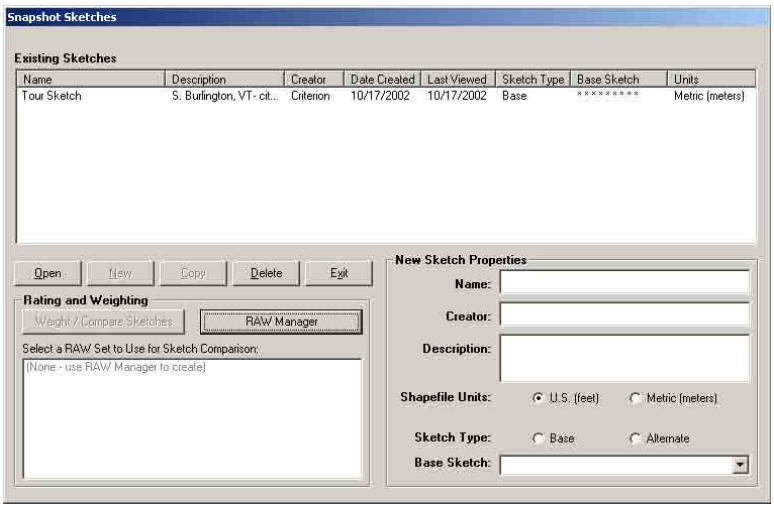


Zoom to Extent All Layers | Zoom to Extent Selected Layer | Zoom In | Zoom Out | Pan | Identify

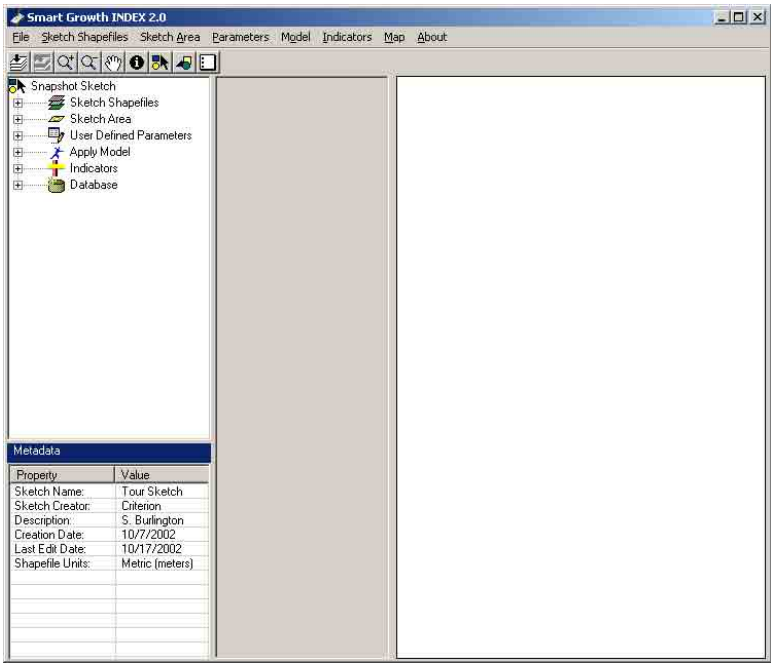
➤ Close the Database window to exit the Database and return to the start-up screen.

Viewing a Tour Sketch

➤ On the startup screen, click the Snapshot Sketch icon and the Sketch Manager window appears. The sketch manager window gives access to the following functions: 1) all new sketches are started in the New Sketch Properties frame; 2) all Existing Sketches are listed with applicable metadata; 3) sketches can be Opened, Copied, Deleted, or Exited; and 4) the sketch rating and weighting (RAW) functionality can be applied through the Rating and Weighting frame.

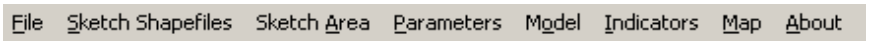


➤ Select the Tour Sketch in the Existing Sketches list box and click the Open button. The Sketch window appears. This window's layout is the same as the Database window. The exceptions are additional menus and tools in the menu and tool bars; and the treeview in the upper left pane is configured for the snapshot modeling process.

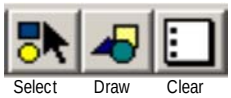


Menu Bar

➤ The Menu Bar contains the following pull-down menus:



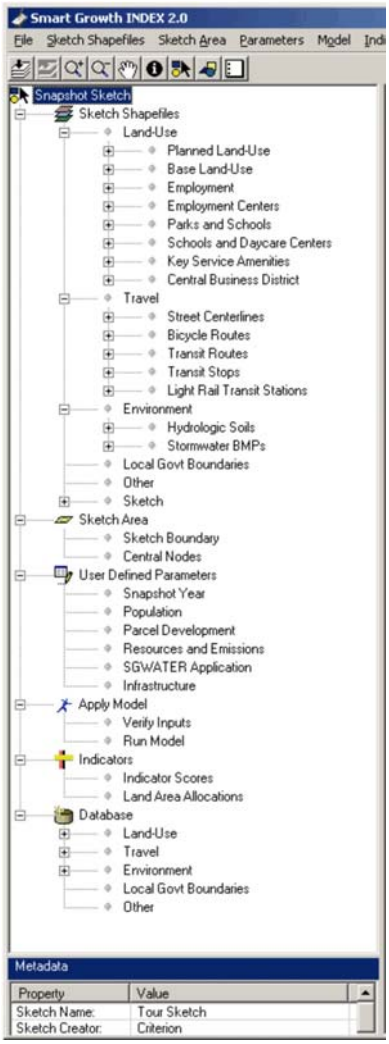
➤ In addition to File, Map, and About that appeared on the Database menu bar, when working on a sketch the following additional menus are enabled: Sketch Shapefiles, Sketch Area, Parameters, Model, and Indicators. These menus access the same treeview nodes that are described below for the Sketch Treeview. In addition to the buttons found on the Database window, the Tool Bar now contains the following tools that are enabled when working on sketches:



Sketch Treeview

➤ The sketch treeview in the upper left pane is intended as the primary interface device for operating SGI. It is operated by single-clicking to expand (open) and collapse (close) its nodes; and by double-clicking on the lowest tier nodes to open files or dialogs. Holding the mouse

button down on a shapefile in the treeview allows it to be dragged and dropped elsewhere on the interface. When expanded, the treeview appears as follows:



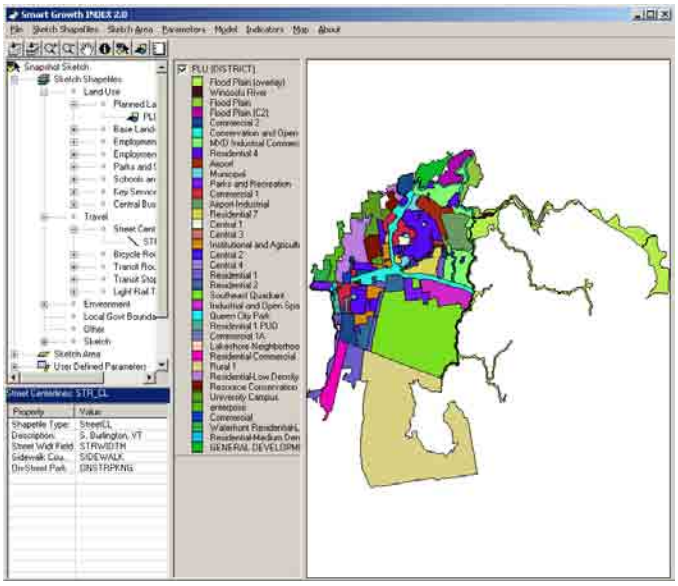
The treeview contains the following nodes organized to follow the general sequence of sketching:

- *Sketch shapefiles. The user populates this node with shapefiles from the read-only version of the Database for the vicinity where a sketch is intended.*
- *Sketch area. The user defines a specific sketch area boundary.*
- *User-defined parameters. These are non-spatial inputs for defining various sketch parameters.*
- *Apply model. Inputs are verified, and indicators are selected and calculated.*
- *Indicators. Indicator results are viewed in numeric and map form.*
- *Database. This is the read-only version of the Database used for retrieving shapefiles desired for a sketch.*

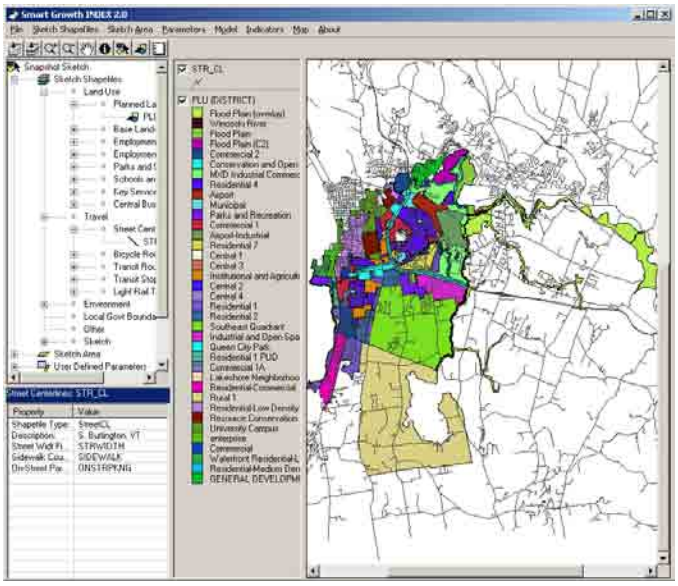
Viewing Maps

➤ On the treeview, expand the nodes for Sketch Shapefiles, Land-use, and Planned Land-Use. Single-click the PLU shapefile that you have exposed, hold the mouse button down, drag the shapefile over to the legend pane, and release the mouse button.

➤ Click the check box for the PLU shapefile on the legend pane and the PLU layer will now appear on the legend and map panes:



➤ Expand the Travel and Street Centerlines nodes in the treeview, and drag the STR_CL shapefile onto the legend pane. When you click the checkbox next to STR_CL in the legend pane, the map changes. The last shapefile dragged onto the legend pane is automatically placed as the uppermost map layer. Once a shapefile has been dragged onto the legend pane, the user can modify the order of layers by dragging and dropping layers vertically within the legend pane. In this way, you can build maps with several layers presented as you desire.



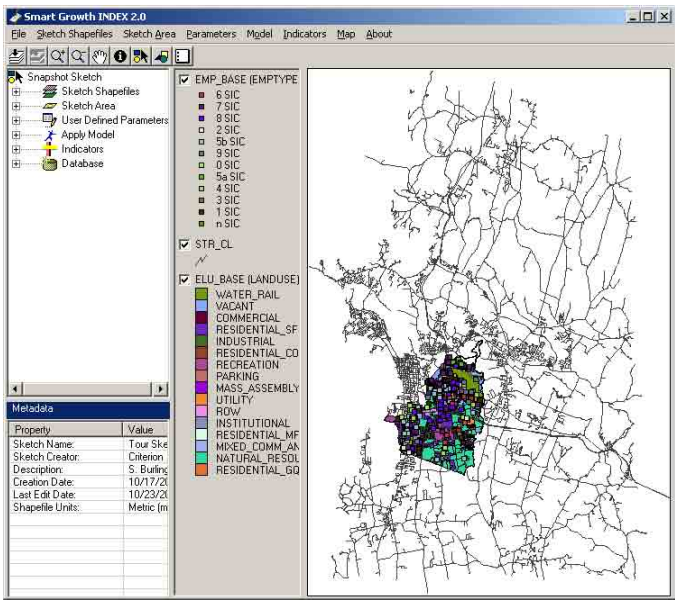
Clearing Maps

➤ Under the Map menu, the map pane can be cleared of either single active layers or all layers. Click Remove All Layers and the map pane is now empty.

Loading Previously Saved Maps

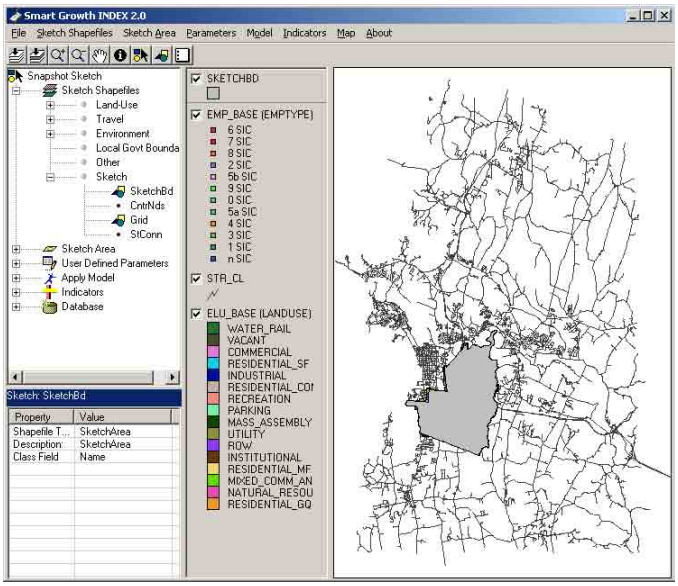
➤ Under the Map menu, click the Load Map option and the following dialog appears:

➤ Select the “Parcels with Streets, Emps” map, click the Load button, and the map and legend panes change to appear as follows:



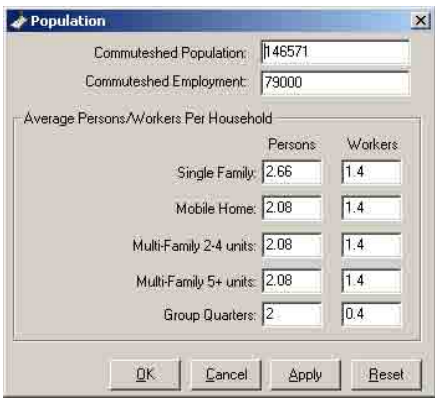
Defining a Sketch Area

➤ On the treeview, expand the Sketch node and drag the SKETCHBD file onto the legend pane. This illustrates a sketch area boundary previously created by selecting several adjoining features in the area of interest. SGI indicators are calculated for parcels inside the sketch boundary. However, users should supply shapefiles for a reasonable distance surrounding the sketch boundary because SGI searches for features relevant to a sketch that may lie outside the sketch boundary, e.g. a bus stop outside the boundary may be the closest transit stop for dwellings inside the boundary edge.



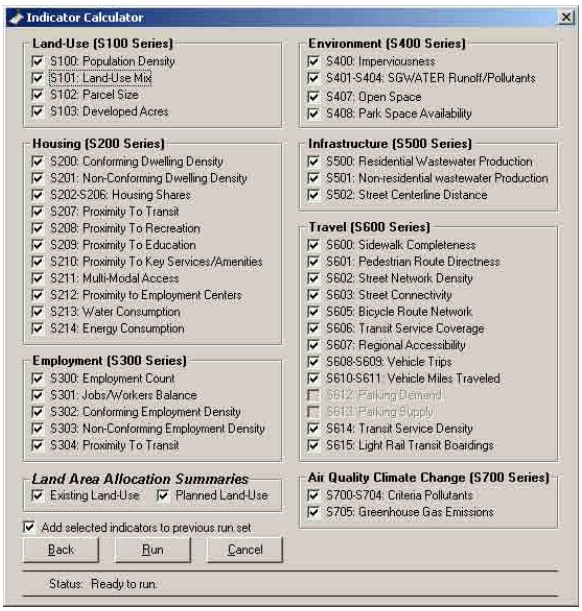
Setting User-Defined Parameters

➤ On the sketch treeview, expand the User-Defined Parameters node, double-click the Population node, and the following dialog appears. This sample illustrates one of a series of forms that allow users to define sketches with either defaults or unique local values describing a variety of sketch parameters. Click the Cancel button to close the window.



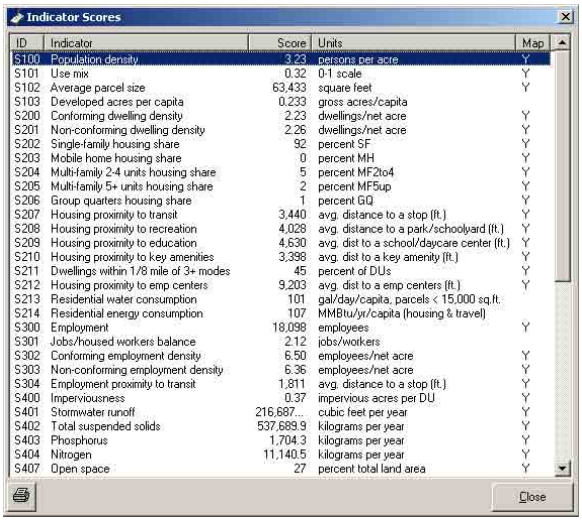
Applying the Model

➤ On the sketch treeview, expand the Apply Model node, double-click the Run Model node, and the following dialog appears. This illustrates the user's selection of indicators for a particular model run. Users may select any number of indicators for a particular run based on relevance to the sketch purpose and data availability. Click the Cancel button to close the window.



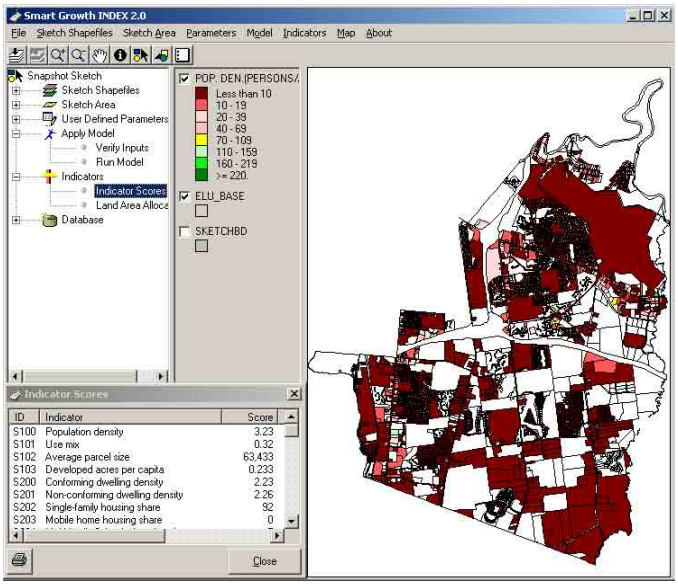
Viewing Indicator Results

➤ Expand the Indicators node on the treeview, double-click the Indicator Scores node, and the Indicators window appears with results for the sample sketch:



ID	Indicator	Score	Units	Map
S100	Population density	3.23	persons per acre	Y
S101	Use mix	0.32	0-1 scale	Y
S102	Average parcel size	63,433	square feet	Y
S103	Developed acres per capita	0.233	gross acres/capita	
S200	Conforming dwelling density	2.23	dwellings/net acre	Y
S201	Non-conforming dwelling density	2.26	dwellings/net acre	Y
S202	Single-family housing share	92	percent SF	Y
S203	Mobile home housing share	0	percent MH	Y
S204	Multi-family 2-4 units housing share	5	percent MF2to4	Y
S205	Multi-family 5+ units housing share	2	percent MF5up	Y
S206	Group quarters housing share	1	percent GQ	Y
S207	Housing proximity to transit	3,440	avg. distance to a stop (ft.)	Y
S208	Housing proximity to recreation	4,028	avg. distance to a park/schoolyard (ft.)	Y
S209	Housing proximity to education	4,630	avg. dist to a school/daycare center (ft.)	Y
S210	Housing proximity to key amenities	3,398	avg. dist to a key amenity (ft.)	Y
S211	Dwellings within 1/8 mile of 3+ modes	45	percent of DUs	Y
S212	Housing proximity to emp centers	9,203	avg. dist to a emp centers (ft.)	Y
S213	Residential water consumption	101	gal/day/capita, parcels < 15,000 sq.ft.	
S214	Residential energy consumption	107	MMBtu/yr/capita (housing & travel)	
S300	Employment	18,098	employees	Y
S301	Jobs/housed workers balance	2.12	jobs/workers	
S302	Conforming employment density	6.50	employees/net acre	Y
S303	Non-conforming employment density	6.36	employees/net acre	Y
S304	Employment proximity to transit	1,811	avg. distance to a stop (ft.)	Y
S400	Imperviousness	0.37	impervious acres per DU	Y
S401	Stormwater runoff	216,687...	cubic feet per year	Y
S402	Total suspended solids	537,689.9	kilograms per year	Y
S403	Phosphorus	1,704.3	kilograms per year	Y
S404	Nitrogen	11,140.5	kilograms per year	Y
S407	Open space	27	percent total land area	Y

➤ The Indicators window presents calculated indicators according to their identification number, name, numeric score, unit of measurement, and a "Y/N" notation of indicator map availability. Double-clicking on any indicator denoted with a "Y" will automatically generate parcel-level mapping of indicator results. Double-click the Population Density indicator in the Indicators window. The Indicator window shifts its position and the map and legend panes are loaded with the Population Density map:



This completes the sample sketch tour. Close the Sketch and Sketch Manager windows, and return to the SGI start-up screen to begin the tutorial that follows.

4. Preparing the Database

Beginning with this section, the remainder of the Getting Started Guide presents a tutorial that leads the new user through all of SGI's components and functions. In the course of the tutorial, you will populate the Database, create a Base Sketch, an Alternate Sketch, and a RAW comparison of the two sketches.

The first step in the tutorial is preparing SGI's Database. The Database is intended to hold shapefiles for any area that may be the subject of a sketch. For example, cities or counties could load shapefiles for their entire jurisdiction and then be capable of sketching anywhere in their jurisdiction. Alternatively, areas can be added incrementally to the Database to support sketching on an as-needed basis.

Data requirements for sketches are determined by indicator selection. As with geography, users may populate the Database for the entire range of indicators that can be used in sketching, or shapefiles can be added on an as-needed basis according to sketch-by-sketch indicator selection. Each indicator's data requirements are itemized in the Indicator Dictionary. Table 4.1 lists all shapefiles and attributes, and the indicators they affect.

Aside from geographic and indicator considerations, the other task in populating the Database with local shapefiles is assigning local attributes to SGI's required shapefile fields. For example, of a locality's uniquely-named classifications for residential uses, SGI needs to know which are single-family and which are multi-family.

Each shapefile has a specific function and must be placed in a specific location in the Database. As mentioned above, some shapefiles also require assignment of their attributes to SGI's required fields. When adding land-use shapefiles to the Database, keep the following terminology distinctions in mind for the three types of land-use polygon shapefiles used by SGI:

- *Base Land-Use.* These parcel-level shapefiles are used in base sketches to represent baseline conditions that alternative sketches can be measured against. Base sketch land-use can either be existing land-use in an area, or it can be a baseline concept of proposed uses, e.g. an initial development proposal for a greenfield area.

- *Alternate Land-Use.* These parcel-level shapefiles are used in alternate sketches to represent uses that are alternatives to base sketch uses. When the base sketch represents existing conditions, alternate sketch land-uses often represent alternative planning scenarios that can be compared to existing conditions. In cases where the base sketch represents a baseline development proposal for a greenfield area, alternate sketch uses often represent alternative designs of the development proposal.

Table 4.1

INDICATORS BY SHAPEFILE AND ATTRIBUTE

Shapefile	Shapefile Attributes	
Bike route centerline (line)	Year of establishment (4-digit year).	S211: Dwellings within 1/8 mi. of 3+ modes
		S605: Bicycle network
Central business district (point)	None.	S615: Rail transit boardings
Employment establishments (point)	Employee count (integer).	S100: Population density
		S103: Developed acres per capita
		S104: Land-use diversity
		S300: Employment
		S301: Jobs/housed workers balance
		S302: Conforming employment density
		S303: Non-conforming employment density
		S304: Employment proximity to transit
		S501: Nonresidential wastewater production
		S608: Home-based vehicle trips (alt case)
		S609: Non-home-based vehicle trips (alt case)
		S610: Home-based vehicle miles traveled (alt case)
		S611: Non-home-based vehicle miles traveled (alt case)
		S615: Rail transit boardings
Employment centers (point)	None.	S212: Housing proximity to employment center
Key amenities (point)	Year of establishment (4-digit year).	S210: Housing proximity to key amenities
Light rail stations (point)	Is terminal station (boolean: Y/N).	S615: Rail transit boardings
	Has parking (boolean: Y/N).	S615: Rail transit boardings
Parcel land-use *(base & alternate)* (polygon)	Land-use class (string).	S101: Use mix
		S102: Average parcel size
		S400: Imperviousness
		S401: Stormwater runoff
		S402: Total suspended solids
		S403: Phosphorus
		S404: Nitrogen

Table 4.1 *Continued*

Shapefile	Shapefile Attributes	
Parcel land-use *Continued*	Land-use class *Continued*	S407: Open space
		S612: Parking demand
	Dwelling unit structure type (string).	S100: Population density
		S103: Developed acres per capita
		S202: Single-family housing share
		S203: Mobile home housing share
		S204: Multi-family 2-4 housing share
		S205: Multi-family 5+ units housing share
		S206: Group quarters housing share
		S214: Residential energy consumption
		S301: Jobs/housed workers balance
		S400: Imperviousness
		S500: Residential wastewater production
		S608: Home-based vehicle trips (alt case)
		S609: Non home-based vehicle trips (alt case)
		S610: Home-based vehicle miles traveled (alt case)
		S611: Non home-based vehicle miles traveled (alt case)
		S615: Rail transit boardings
	Dwelling unit count (integer).	S100: Population density
		S103: Developed acres per capita
		S200: Conforming dwelling density
		S201: Nonconforming dwelling density
		S202: Single-family housing share
		S203: Mobile home housing share
		S204: Multi-family 2-4 housing share
		S205: Multi-family 5+ units housing share
		S206: Group quarters housing share
		S207: Housing proximity to transit
		S208: Housing proximity to recreation
		S209: Housing proximity to education
		S210: Housing proximity to key amenities
Parcel land-use *Continued*	Dwelling unit count *Continued*	S211: Dwellings within 1/8 mi. of 3+ modes

Table 4.1 *Continued*

Shapefile	Shapefile Attributes	
		S212: Housing proximity to employment center
		S213: Residential water consumption
		S214: Residential energy consumption
		S301: Jobs/housed workers balance
		S400: Imperviousness
		S408: Park space availability
		S500: Residential wastewater production
		S612: Parking demand
		S615: Rail transit boardings
	Off-street parking space count (integer).	S613: Parking supply
	Building floor area in sq.ft. (integer).	S612: Parking demand
	Shapefile only – no attribute required.	S304: Employment proximity to transit
		S601: Pedestrian route directness
Parks and schools (polygon)	Year of establishment (4-digit year).	S208: Housing proximity to recreation
		S408: Park space availability
Planned land-use (polygon)	Land-use class (string).	S200: Conforming dwelling density
		S302: Conforming employment density
Schools and daycare facilities (point)	Year of establishment (4-digit year).	S209: Housing proximity to education
Soils (polygon)	NRCS hydrologic group type (string: A, B, C, or D).	S401: Stormwater runoff
		S402: Total suspended solids
		S403: Phosphorus
		S404: Nitrogen
Stormwater best management practices (a polygon for each BMP/location set)	Percent removal for each BMP/pollutant set (integer).	S402: Total suspended solids
		S403: Phosphorus
		S404: Nitrogen
Street centerlines (line)	Street width in ft. (integer).	S211: Dwellings within 1/8 mi. of 3+ modes
		S400: Imperviousness
		S401: Stormwater runoff
		S402: Total suspended solids
		S403: Phosphorus

Table 4.1 *Continued*

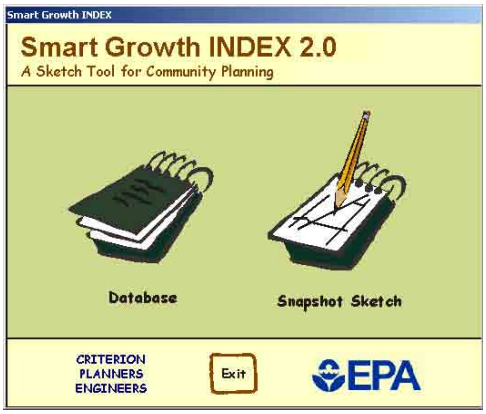
Shapefile	Shapefile Attributes	Indicators Affected
Street centerlines *Continued*	Street width in ft. *Continued*	S404: Nitrogen
	Sidewalk presence (integer: 0 = none; 1 = one side of street only; 2 = both sides).	S600: Sidewalk completeness
		S608: Home-based vehicle trips (alt case)
		S609: Non home-based vehicle trips (alt case)
		S610: Home-based vehicle miles traveled (alt case)
		S611: Non home-based vehicle miles traveled (alt case)
	On-street parking space count (integer).	S613: Parking supply
	Shapefile only – no attribute required.	S207: Housing proximity to transit
		S208: Housing proximity to recreation
		S209: Housing proximity to education facilities
		S210: Housing proximity to key amenities
		S212: Housing proximity to employment center
		S502: Street centerline distance
		S601: Pedestrian route directness
		S602: Street network density
		S603: Street connectivity
		S605: Bicycle network
		S608: Home-based vehicle trips (alt case)
		S609: Non home-based vehicle trips (alt case)
		S610: Home-based vehicle miles traveled (alt case)
		S611: Non home-based vehicle miles traveled (alt case)
Transit routes (line)	Transit vehicles per day on route (integer).	S211: Dwellings within 1/8 mi. of 3+ modes
		S614: Transit service density
	Year of route establishment (4-digit year).	S211: Dwellings within 1/8 mi. of 3+ modes
		S614: Transit service density
Transit stops (point)	None.	S207: Housing proximity to transit
		S304: Employment proximity to transit
		S606: Transit stop coverage

Note: 1. *No nulls are allowed in any record.*
2. *The attribute "year of establishment" is the year a feature became, or will become, operable; this allows planned future features to be recognized during future year simulations. If year recognition is not needed, the attribute can be set to NONE.*
3. *Street centerlines must have perfect connectivity to support indicator calculations.*
4. *Shapefile names must conform to 8.3 file name format.*

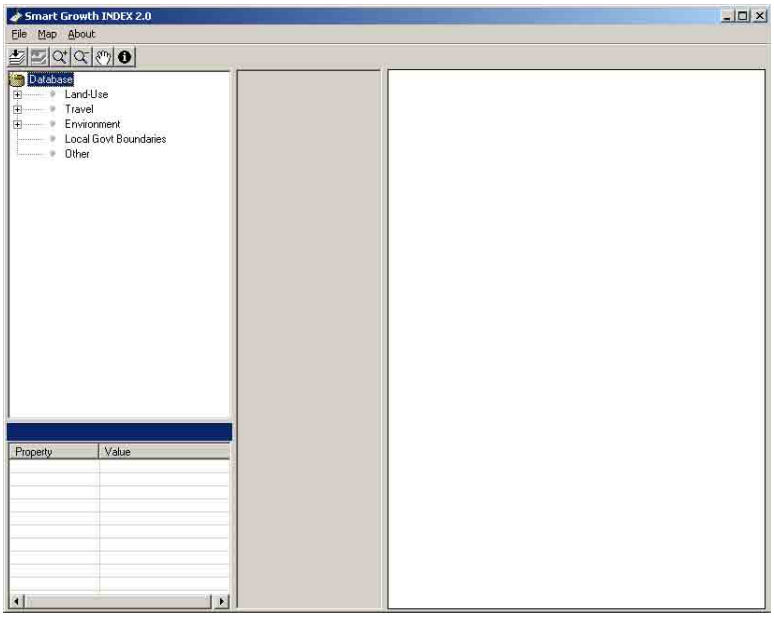
- *Planned Land-Use.* The term "planned" is used to distinguish land-use shapefiles that represent designations contained in official plans that govern development in a sketch area. These shapefiles are used by indicators that score sketch consistency with applicable plans. At the user's discretion, if these shapefiles are parcel-level they may also be used for the base or alternate land-use purposes described above, e.g. planned land-use could be used for base sketch land-use in evaluating an area's current adopted plan; or planned land-use could be used for alternate sketch land-use when the adopted plan is being reevaluated among several alternative plans. When the same shapefile will be used for Planned Land-Use and Base or Alternate Land-Use, the shapefile should be copied and renamed. One copy of the shapefile can then be added as the Planned Land-Use and the other copy added as the Base or Alternate Land-Use.

Opening the Database

➤ Start SGI and the startup screen will appear:

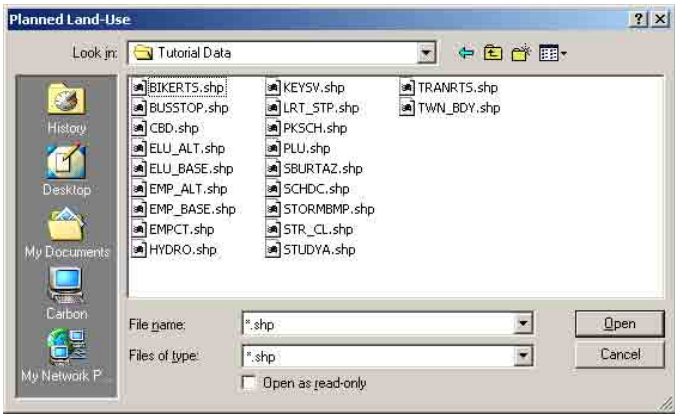


➤ Click the Database icon and the Database window will open:



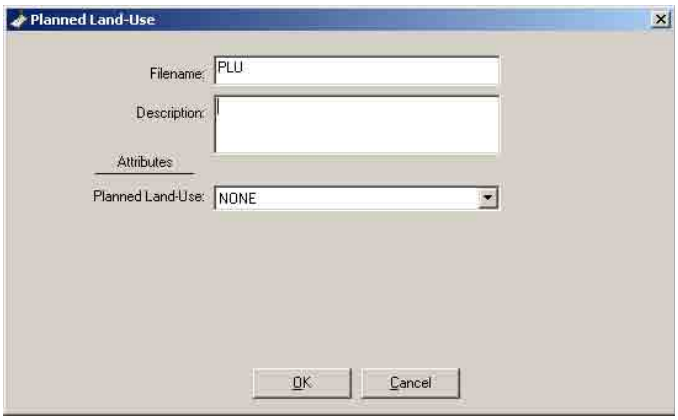
Adding Shapefiles to the Database

➤ Expand the Land-Use node, double-click the sub-node Planned Land-Use and a Windows file dialog appears. Within the dialog, navigate to the SGI application folder (by default, "C:\Program Files\Criterion\Smart Growth 2"), open the "Tutorial Data" folder, and the dialog changes to appear as follows:



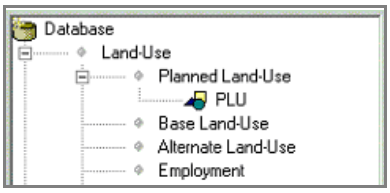
➤ Select the shapefile called "PLU.shp", click Open, and the following dialog appears:

Note that the Filename text box contains the name of the file you just selected, without the extension ".shp". This will be the case with every shapefile you add.



➤ Enter a file description. Then select the local attribute name ZONE in the combo box to the right of SGI's Planned Land-Use field. This will assign the local attribute ZONE to SGI's Planned Land-Use field:

➤ Click OK to save your entry. The Database treeview now shows the shapefile under the Planned Land-Use node:

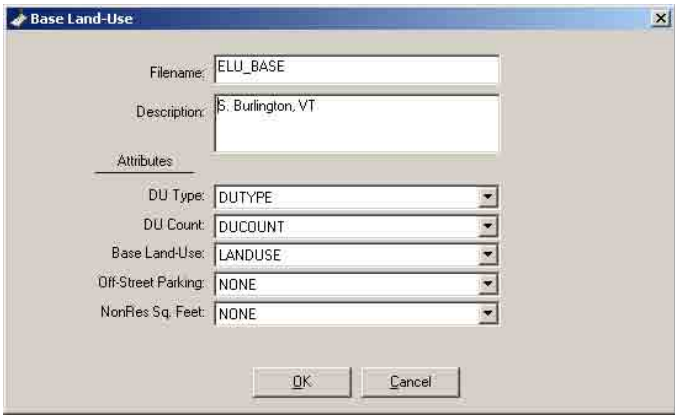


Shapefiles may be added, deleted, or viewed using either the File menu or by right-clicking the mouse to access a similar menu. If you make a mistake while choosing attributes for the fields of a shapefile, you may double-click the shapefile in the Database treeview to edit shapefile properties. If you do not discover a shapefile mistake until you are creating a sketch, you must return to the Database to correct the mistake.

Adding Remaining Shapefiles to Database

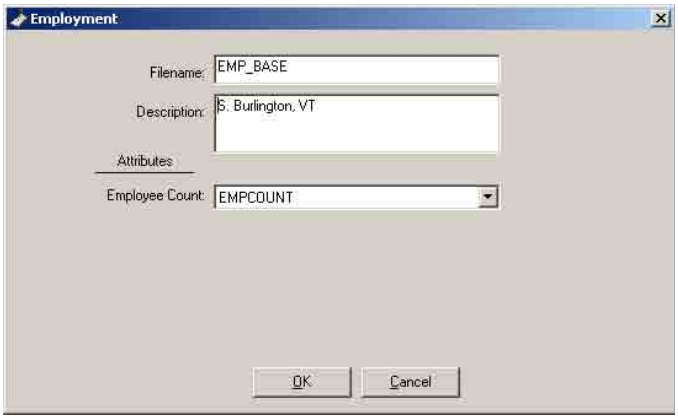
The balance of this section contains dialogs for adding remaining shapefiles in the Tutorial Data folder to the Database. When making entries in the following dialogs, no nulls are allowed in any attribute field. The attribute "Year" is the four-digit year that a feature became or will become operable. This allows users to have certain planned future features recognized if a future year is being simulated; setting the field to NONE will result in a feature always being recognized regardless of the sketch year.

Base Land-Use



The tutorial data purposely does not include off-street parking spaces or non-residential building square footage, so both attribute fields must be set to NONE for the tutorial.

Employment



Employment Centers

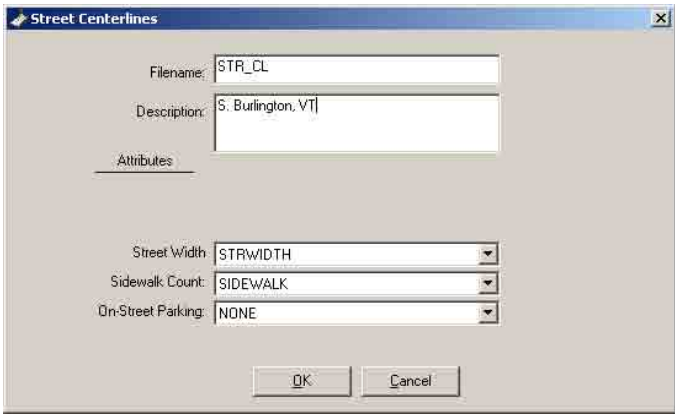
Parks and Schools

Schools and Daycare Centers

Key Services and Amenities

Central Business District

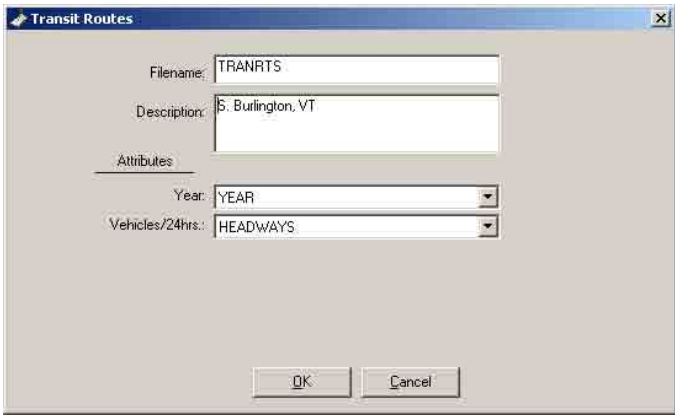
Street Centerlines



Street centerlines must have perfect connectivity to support indicator calculations. The tutorial data set purposely does not include on-street parking spaces, so that attribute field must be set to NONE for the tutorial.

Bicycle Routes

Transit Routes



Transit Routes should include bus and rail transit routes.

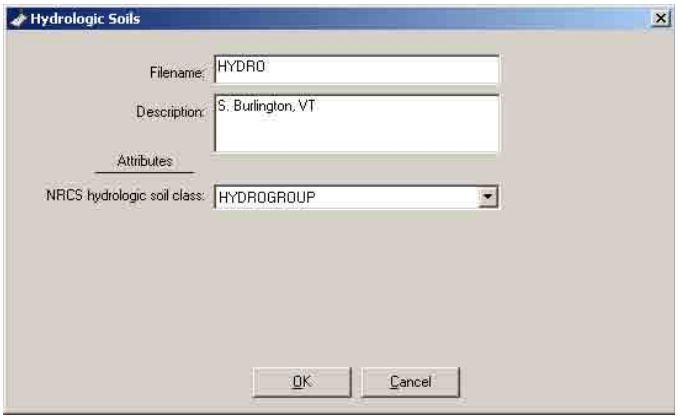
Transit Stops

Transit Stops should include bus and rail transit stops.

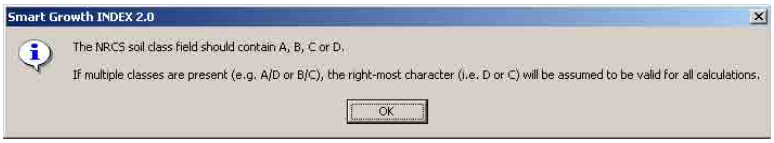
Light Rail Transit Stations

The questions refer to whether a rail station is the terminus of the rail line, and whether the station is a park-and-ride type.

Hydrologic Soils

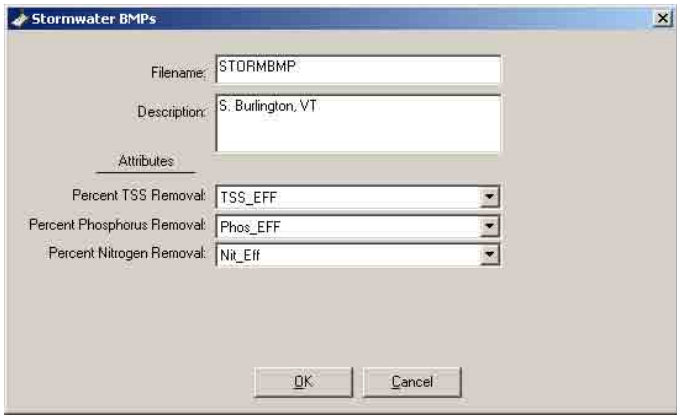


When you first double-click the Hydrologic Soils node, the following information dialog appears advising you that the NRCS group type must be entered as A, B, C, or D:



Click OK and complete the soil file description and attribute dialog.

Stormwater Best Mgmt. Practices



Stormwater best management practices (BMPs) are user-created features defined in three ways: 1) BMP type, e.g. grass swales, constructed wetlands, porous pavement; 2) spatial extent of the BMP in polygon form; and pollutant removal efficiency (%) of the BMP for each of three pollutants. The tutorial BMPs include infiltration trenches, constructed wetlands, and water quality inlets at the removal efficiencies listed in Table 4.2.

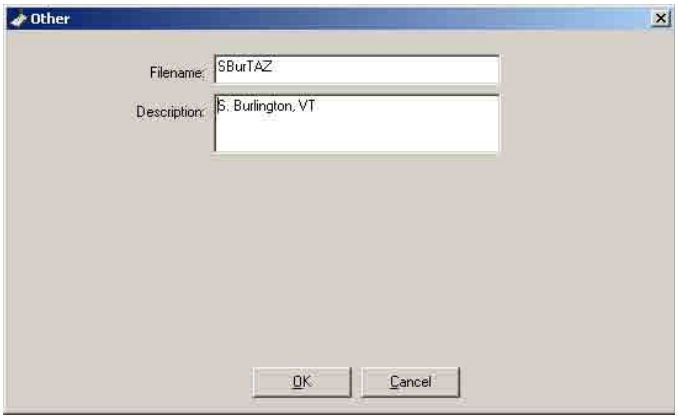
The Local Government node is not used in the tutorial. It is used when sketches are large enough to encompass multiple jurisdictions and users want to report results by jurisdiction. It is also possible to use a local government boundary as a sketch area boundary if the local government boundary coincides with the purpose of the sketch.

Table 4.2
STORMWATER BEST MANAGEMENT PRACTICE GUIDANCE
(BMP types and % pollutant removal)

BMP Type	Total Suspended Solids	Total Phosphorus	Total Nitrogen
Wet Ponds	90	65	48
Extended Detention Ponds	80	45	35
Grassed Swales	70	30	25
Filter Strips	70	40	30
Infiltration Trenches	85	65	60
Infiltration Basins	85	65	60
Sand Filters	80	60	40
Constructed Wetlands	90	65	48
Water Quality Inlets	30	5	5
Porous Pavement	90	65	85

Source: EPA/GKY

The Other node in the Database is a location for shapefiles that may be used to supplement SGI-required shapefiles. For example, SGI does not require a "rivers and streams" shapefile, but you may wish to add such a feature to enhance SGI maps. Another use for the Other folder is storing shapefiles that coincidentally represent desired sketch area boundaries, e.g. traffic analysis zones or census tracts. For purposes of the tutorial, traffic analysis zones will be used to assemble a sketch boundary.



With the Database now prepared, close the Database window and return to the startup screen.

5. Creating a Sketch

You should now be back at the SGI startup screen, which displays the Database and Snapshot icons. If this is not open, start SGI and this screen will appear.

Creating a New Sketch

➤ Click the Snapshot Sketch icon and the Sketch Management window will appear:

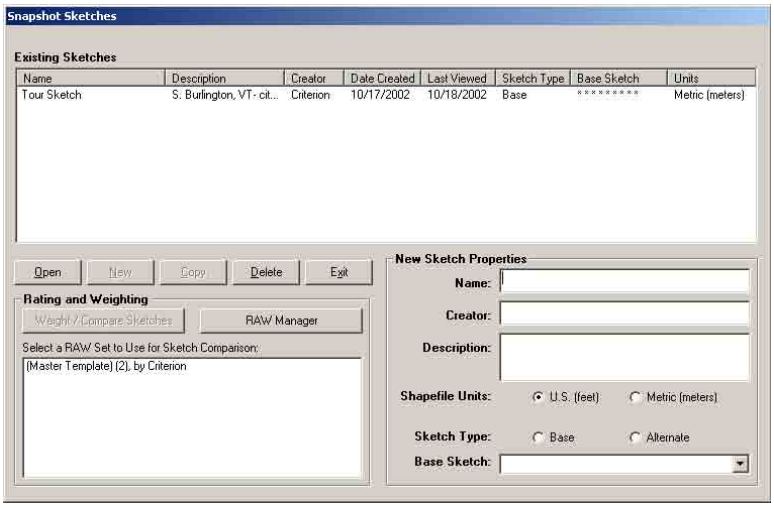
The Sketch Management window contains four functional areas:

- *New Sketch Properties frame. Metadata is entered here for all new sketches, including sketch name; user creating the sketch; a brief description of the sketch; local shapefile units (SGI can accept U.S. or metric shapefiles, but results are only reported in U.S. units); type of sketch (base or alternate); and a listing of previous base sketches to which new alternate sketches can be linked.*

- *Sketch management buttons. These buttons add new sketches to the stored roster of existing sketches, and allow for opening, copying, deleting, and exiting sketches.*

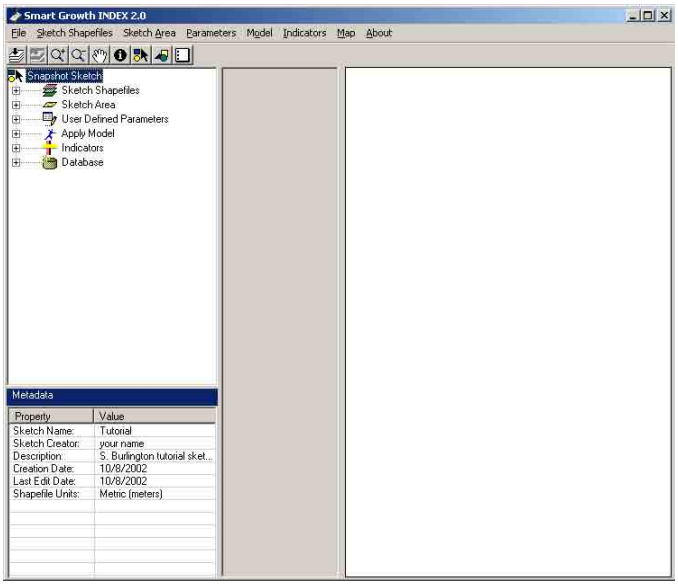
- *Existing sketches list. This is a roster of all existing sketches and their metadata. Selecting an existing sketch and clicking the Open button allows access to the sketch.*

- *Rating and Weighting frame. These buttons and selection list enable access to SGI's rating and weighting function, which is detailed in Section 11 of the Guide.*



➤ In the New Sketch Properties frame, enter "Tutorial" as the sketch name; enter your name as the creator; enter a description of the sketch as a tutorial; select Metric as the shapefile units; and select sketch type as Base. The Base Sketch combo box remains empty until one or more base sketches have been completed, at which point the box is used for selecting a base sketch that any number of alternate sketches can be linked to.

➤ The New button will become active after you choose your sketch type. Click it and the sketch is added to the Existing Sketches list box. Select the Tutorial sketch, click Open, and the following Sketch window appears:



The layout of the Sketch window matches the Database window except for additional menus and tool buttons, and treeview nodes that correspond to the sketch modeling process. The main steps you will follow in using the treeview to execute a sketch include:

- Moving shapefiles from the read-only version of the Database at the bottom of the treeview up to the Sketch Shapefiles node at the top of the treeview.
- Defining the sketch area boundary.
- Setting parameters for various elements of a sketch.
- Selecting indicators and running the model.
- Viewing results.

The remainder of this section describes the first step of moving shapefiles from the read-only Database up to the Sketch Shapefiles node. Regardless of the method used for moving shapefiles (double-clicking or dragging and dropping), SGI automatically places Database shapefiles into the correct sub-node of the Sketch Shapefiles node.

Adding the Planned Land-Use Shapefile to the Sketch

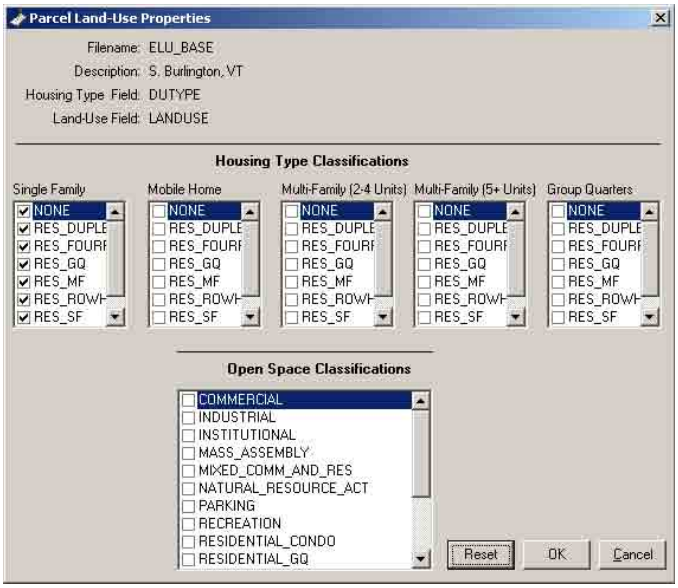
➤ Expand the Database, Land-Use, and Planned Land-Use nodes, and double-click the PLU shapefile. After the shapefile is copied to the Sketch Shapefiles node and its contents analyzed, the Planned Land-Use Properties dialog will appear prompting you to classify the values in the land-use fields for this sketch. In this step you are classifying unique local field values to SGI's planned land-use classes of Residential and/or Non-Residential. Using the Reset button on this or other dialogs will reset inputs to the last saved entries. For purposes of the tutorial, default settings have already been made in the dialog.

Using the Reset button on this or other dialogs will reset inputs to the last saved entries.

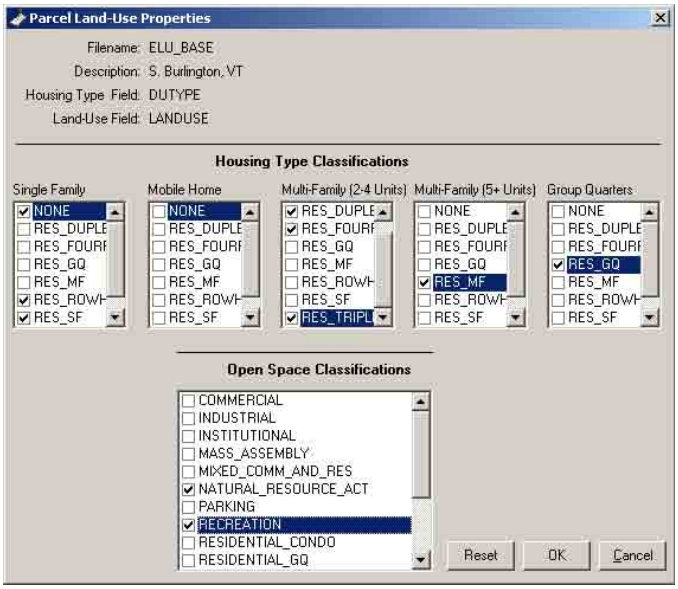
➤ Click OK and the Land-Use Properties dialog will close and the shapefile is now in the sketch.

Adding the Base Land-Use Shapefile to the Sketch

➤ Expand the Database and the Base Land-Use nodes, double-click the ELU_BASE shapefile, and the following dialog appears:



➤ In this step you are classifying unique local field values to SGI's housing type and open space classes. Under Housing Type, check the classifications as shown in the dialog below. Under Open Space, check VACANT in addition to the two checks shown in the dialog below.



➤ Click OK to save your settings and close this dialog.

Adding Remaining Shapefiles to the Sketch

Using the same procedure as described above, you may now move the remaining shapefiles needed for the sketch from the read-only Database up to the Sketch Shapefiles node of the treeview. None of the remaining shapefiles require the kind of classification dialogs you just completed; after double-clicking on a remaining shapefile in the Database node, you will be advised by a message box that no further setup is required for moving the shapefile up to the Sketch Shapefiles node. Add the following shapefiles to the sketch by either double-clicking on them in the read-only Database at the bottom of the treeview, or by dragging them from the Database up to the Sketch Shapefiles node:

- Employment (EMP_BASE).
- Employment centers (EMPCT).
- Parks and schools (PKSCH).
- Schools and daycare (SCHDC).
- Key service amenities (KEYSV).
- Central business district (CBD).
- Street centerlines (STR_CL).
- Bicycle routes (BIKERTS).
- Transit routes (TRANRTS).
- Transit stops (BUSSTOP).
- Light rail transit stations (LRT_STP).
- Hydrologic soils (HYDRO).
- Stormwater best management practices (STORMBMP).
- Other (SBURTAZ).

You have now assembled all of the shapefiles needed for the tutorial sketch in the Snapshot Sketches node. You may always return to the read-only Database node to collect any shapefiles that may have been missed.

It is important to note that the version of SGWATER presently embedded in SGI is configured for evaluating urban land-uses under antecedent moisture condition (AMC) 2 that applies to average soil moisture levels. If the sketch involves either non-urban land-uses and/or AMC 1 or 3 levels, your SGI steward must update the methodology's curve numbers. This procedure is explained in the Steward Guide, and should only be performed by a steward that has reviewed separate SGWATER documentation and is familiar with the methodology.

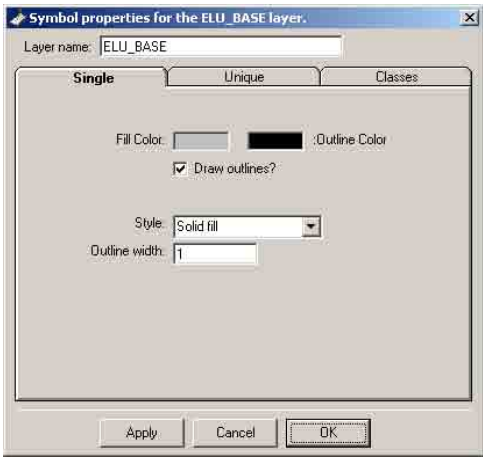
6. Saving Maps and Legends

When shapefiles are dragged onto the legend pane, a legend is automatically created for that shapefile layer. Individual legends for single layers can be customized and saved as default legends. One or more layers can be assembled into custom maps that can be saved as default maps. This section describes the procedure for customizing maps and legends to suit local preferences for presentation purposes. This is only intended to help comprehension of sketch maps; indicator calculations are not affected by presentation styles. Absent user-selected default maps and legends, SGI assigns gray to polygons, black to lines, and red to points for each map and legend.

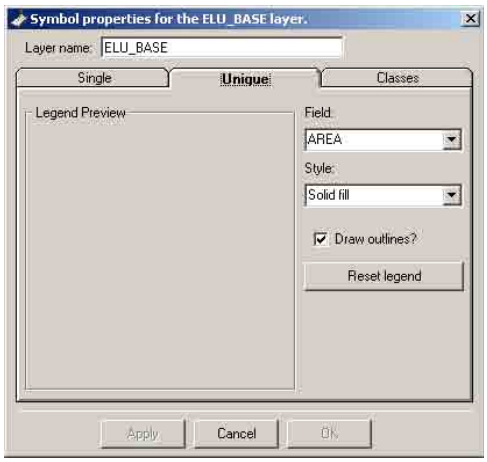
Modifying and Saving a Default Legend

➤ From the Sketch Shapefiles node in the treeview, drag the ELU_BASE shapefile onto the legend pane.

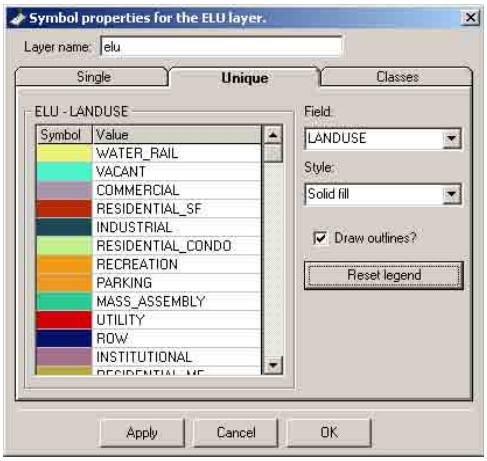
➤ Double-click the ELU map layer in the legend pane and the Symbol Properties window is displayed. This window contains three tabs: 1) Single for one color and style for all features; 2) Unique for a different color for each unique value in the chosen field; and 3) Classes for a range of colors corresponding to a range of values in the chosen field. When using dialogs such as this and others with Apply and OK buttons, click Apply to add inputs incrementally while leaving the dialog open, and click OK to save all inputs and close the dialog.



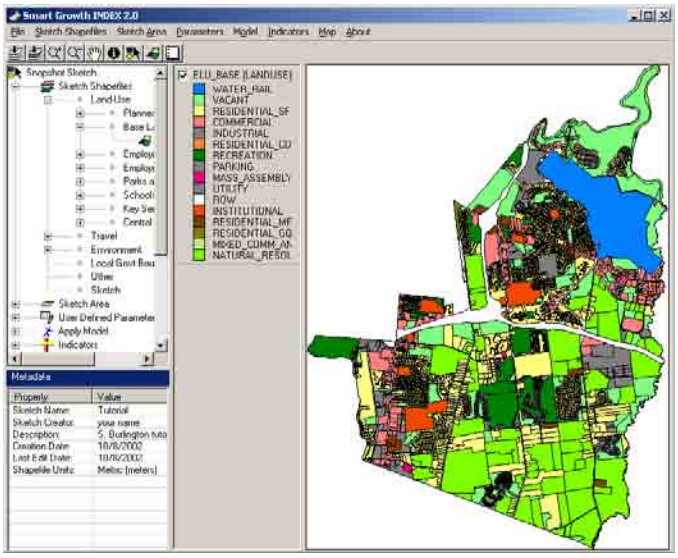
➤ Click the Unique tab to view Unique display options:



➤ In the Field combo box, select LANDUSE, then click Reset Legend to preview the new display colors. Double-clicking on individual symbols (colors) opens a Windows color palette for selecting preferred colors.



➤ Select new colors for a few of the land-use classes. Click Apply and then OK, and the ELU shapefile's appearance on the map and legend panes is changed as illustrated below (your colors will vary from the example below depending on the colors you selected):



Saving and Viewing a Default Legend

➤ From the Map menu choose Save Default Shapefile Legend to save the legend created above.

➤ From the Map menu choose Remove All Layers.

➤ Drag the ELU_BASE shapefile from the treeview to the legend pane. The map is now shown with the custom default legend created above.

Saving a Map

➤ Add employment points to the map by dragging the EMP_BASE shapefile from the treeview to the legend pane.

➤ From the Map menu choose Save Map.

➤ Enter the name “Tutorial Map” in the New Map text box and click Save.

Loading a Saved Map

➤ From the Map menu choose Remove All Layers.

➤ From the Map menu choose Load Map.

➤ Click the “Tutorial Map” file you created.

➤ Click Load and the saved Tutorial Map appears.

7. Defining a Sketch Boundary and Central Nodes

A key task in creating a sketch is the definition of its boundary. This defines the area for which indicators are calculated and mapped. Because the boundary can significantly influence indicator results, its selection should be based on the purpose of the analysis and should consider relevant community features that may be present or absent in the vicinity of the sketch, e.g. in a housing study you might want to include a neighborhood park situated close to a residential area. Additional guidance on setting boundaries is given in the Community Process Guide. Sketch boundaries may be set in SGI using one of two methods:

- *Adopting a shapefile originally created for another purpose.* This approach uses a polygon shapefile created for another purpose, e.g. traffic analysis zone or census tract, when it favorably coincides with the purpose of the sketch.

- *Aggregating features to create a new unique boundary.* SGI drawing tools are used in this approach to select as many features as desired from any map layer, other than base or alternative land-use, to assemble a unique sketch boundary.

Before defining a boundary using either of these methods, the Sketch Shapefiles node in the treeview must be populated with a base land-use shapefile if a base sketch is being prepared, or an alternate land-use shapefile if an alternate case is being prepared; and an employment shapefile in either type of sketch. These shapefiles must be in the Sketch Shapefiles node before boundary definition because SGI automatically trims them to the boundary when it is created.

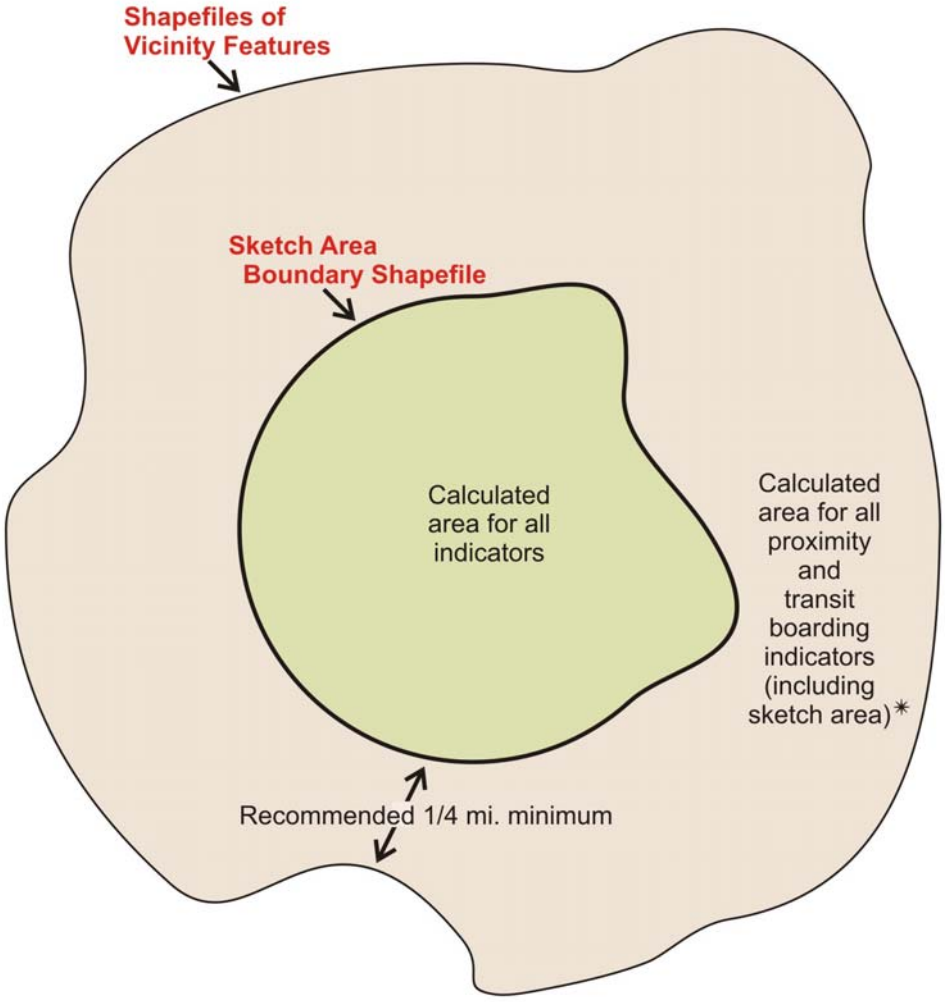
The vicinity surrounding a sketch boundary is also important because SGI measures street centerline distances to certain features that may lie outside the boundary as well as inside. As shown in Figure 7.1, all of the proximity indicators and the rail transit boarding indicator will search both inside and outside the boundary for relevant features. Therefore, you should not pre-trim shapefiles to the intended sketch boundary when populating the Database. Instead, use shapefiles that extend a reasonable distance beyond the intended sketch boundary, e.g. a transit stop shapefile should extend at least a quarter mile beyond the sketch boundary since residents inside the boundary edge may walk to a stop outside the boundary because the outside stop is closer to their homes than any stop inside the boundary.

Defining a Sketch Area Boundary

➤ From the Map menu choose remove all layers.

➤ Drag the SBURTAZ shapefile to the legend pane from the Other/Polygon sub-node in the Sketch Shapefiles node.

Figure 7.1
SKETCH BOUNDARY & VICINITY FEATURES

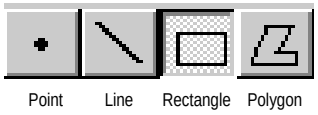


* Vicinity shapefiles should contain the following features when considered relevant to the sketch purpose: transit stops, schools, parks, employment centers, and other user-defined "key amenities." If a light rail transit system is part of the sketch area, vicinity shapefiles should also contain the closest central business district (point shapefile) served by the rail system.

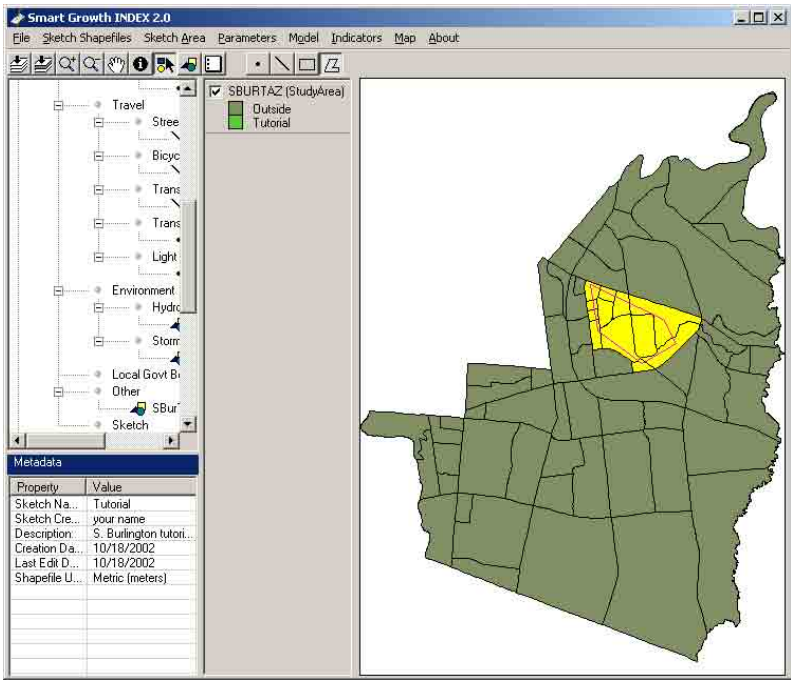
➤ Expand the Sketch Area node in the treeview and double-click the Sketch Boundary node. The Sketch Area Boundary dialog will open allowing you to add features incrementally to create the sketch boundary:

Leave the Sketch Area Boundary dialog open, and click on the Select Feature tool:

➤ When the Select Feature button is clicked, four additional tool buttons become active:



➤ Using any one of these tools, select the pre-highlighted features on the map (a group of traffic analysis zones have been pre-highlighted to guide you in setting a boundary that matches the remainder of the tutorial).



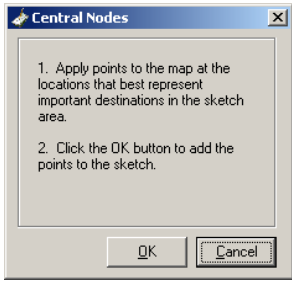
➤ When you have selected the highlighted features using the tool button, click the Add Features button and then OK on the Boundary dialog. Note that a new shapefile, SKETCHBD, has appeared in the treeview under the Sketch node.

Adding Central Nodes to the Sketch

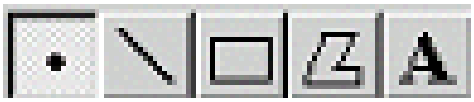
If you intend to run the Pedestrian Route Directness indicator, you must designate one or more central destination nodes in the sketch area. SGI uses these nodes for calculating pedestrian route directness from randomly-selected origin points within a one-half mile radius of the central nodes. You may designate as many central nodes as desired to adequately reflect important social gathering spots or activity centers in the sketch area. Once you have finished this step, it is not possible to return and add additional nodes incrementally; instead, it is necessary to return, delete all original nodes, and redesignate the new entire set.

➤ Drag the ELU_BASE shapefile from the treeview to the legend pane.

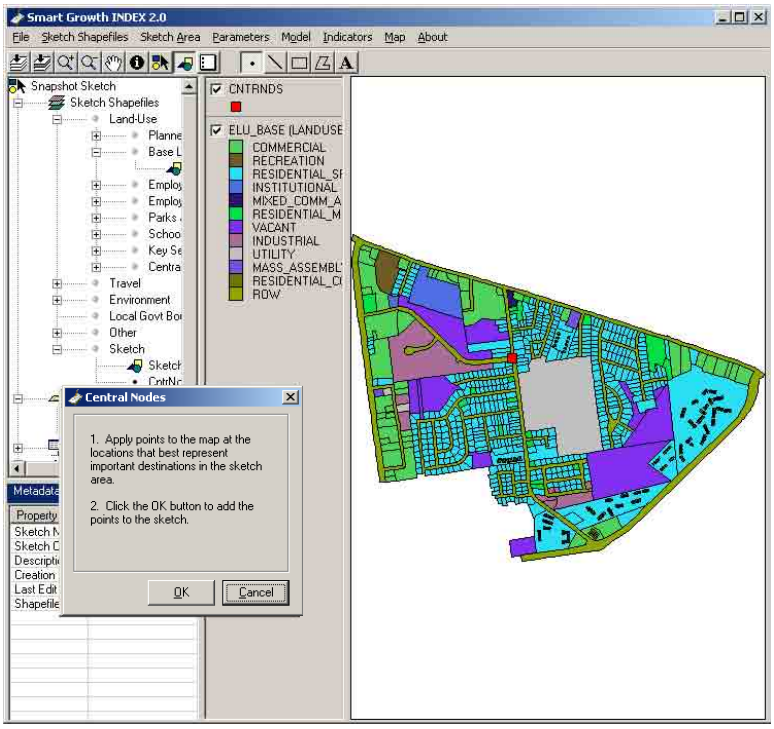
➤ Double-click the Central Nodes node in the treeview and the Central Nodes dialog appears:



➤ With the Central Nodes dialog box open, click the Graphic Tool button  to activate the following five draw buttons:



➤ Select the Point button and click on a location near the center of the map to illustrate a central destination node:



➤ After designating the central node with the Point button, click OK. Note that a new shapefile, CNTRNDS, has appeared in the treeview under the Sketch node.

8. Setting User-Defined Parameters

The next step is setting a variety of user-defined parameters (UDPs) that are non-spatial and therefore not contained in the shapefiles already loaded. These parameters include:

- *Snapshot year.* This is the year assumed for the sketch analysis, which can either be a current or future year. Sketches assumed for a future year automatically use shapefiles for facilities that are operable at that future point in time, e.g. a sketch simulating conditions in 2020 would use all bicycle routes designated through that year.
- *Population.* This sets the sketch area's commuteshed population and household sizes.
- *Parcel development.* These include parking rates, imperviousness, and non-point source pollutant loadings for each land-use class.
- *Resources and emissions.* These address a variety of transportation, energy, water, and air pollutant assumptions.
- *SGWATER stormwater analysis.* Rainfall data is selected and loaded into the U.S. EPA SGWATER stormwater application.
- *Infrastructure.* This sets wastewater production rates for residential and non-residential uses.

SGI is pre-loaded with UDP default values for the tutorial only. These tutorial defaults appear below in UDP dialogs and are documented further in the Steward Guide. Once you are generally familiar with operating SGI, an important task will be changing the UDP defaults to better match local conditions or data. Modifying UDP defaults should be done with the assistance of your SGI steward.

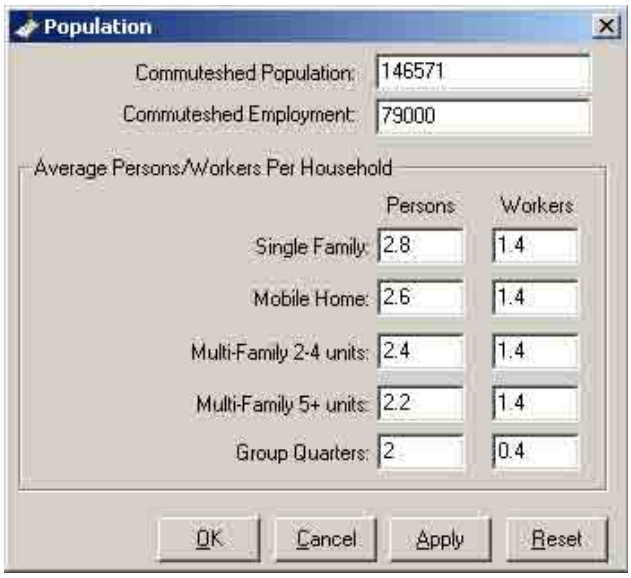
Snapshot Year

➤ Expand the User-Defined Parameters node in the treeview, double-click the Snapshot Year node, and the following dialog appears:

➤ Click OK to accept the tutorial default.

Population

➤ Double-click the Population node and the following dialog appears. The equivalent of a "household" for Group Quarters should be determined using local norms.



➤ Click the OK button to accept the tutorial defaults.

Parcel Development

If parking or stormwater indicators are desired for a sketch, each base or alternate land-use class must be given certain parcel development standards, including parking rates, amount of imperviousness, and non-point source pollutant loadings. Tables 8.1 and 8.2 are excerpted from SGWATER documentation as guidance for setting imperviousness and pollutant loading UDPs by land-use class (also see the Steward Guide for assistance.) All parcel development parameters must be set for all land-use classes when first used in any sketch. SGI automatically checks every time a sketch is created to make sure all land-use classes have previously set parcel development parameters. If any land-use class is found to be new, or to have parameters missing, SGI warns the user that additional settings are necessary. For purposes of the tutorial, a missing land-use class has been included.

➤ Double-click the Parcel Development node in the treeview and the following dialog appears:

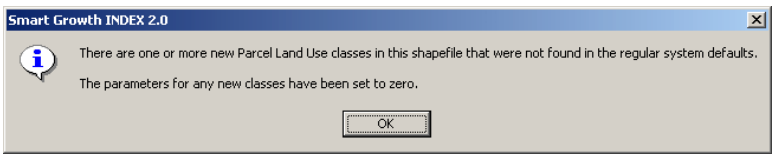


Table 8.1
IMPERVIOUSNESS GUIDANCE

Land Use Category	Characteristics	Curve Number by Soil Type			
		A	B	C	D
Residential	Average lot 1/8 acre or less, 65% average impervious area	77	85	90	92
	Average lot ¼ acre, 38% average impervious area	61	75	83	87
	Average lot 1/3 acre, 30% average impervious area	57	72	81	86
	Average lot ½ acre, 25% average impervious area	54	70	80	85
	Average lot 1 acre, 20% average impervious area	51	68	79	84
Commercial and business areas	85% impervious	81	88	91	93
Mixture of above land uses	85% impervious	89	92	94	95
Industrial districts	72% impervious	81	88	91	93

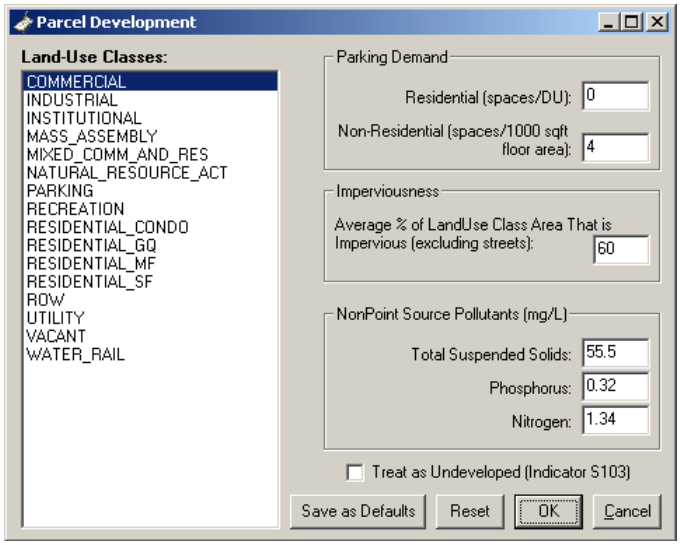
Source: EPA/GKY

Table 8.2
NONPOINT SOURCE POLLUTANT LOADING GUIDANCE

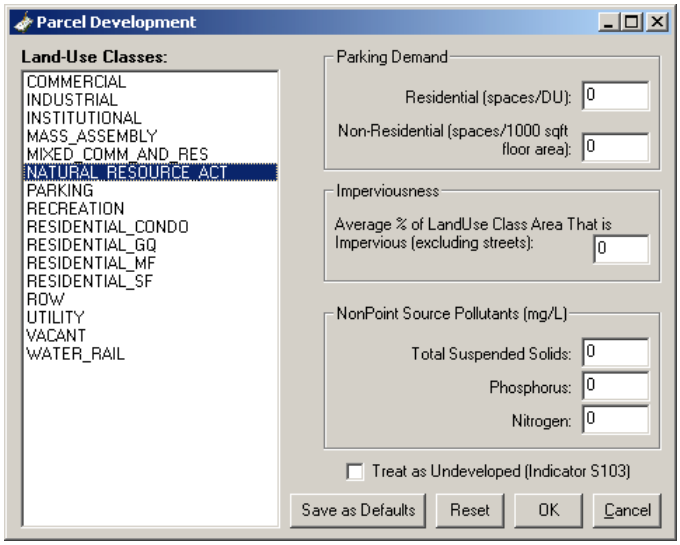
			Pollutants		
B&J Land-Use	**Description**	**Units**	**Nitrogen**	**Total Phosphorus**	**Suspended Solids**
Residential	Single-family residential	mg/L	1.82000	0.57000	41.00000
	Mobile home park	mg/L	1.82000	0.57000	41.00000
	Multi-family residential, moderate density	mg/L	1.82000	0.57000	41.00000
	Multi-family residential, high density	mg/L	1.82000	0.57000	41.00000
	Other residential	mg/L	1.82000	0.57000	41.00000
Commercial	Commercial, office	mg/L	1.34000	0.32000	55.50000
	Commercial, retail or service	mg/L	1.34000	0.32000	55.50000
Mixed	Commercial/office/residential mix	mg/L	1.57000	0.35000	57.90000
	Commercial/residential mix	mg/L	1.57000	0.35000	57.90000
	Commercial/office mix	mg/L	1.57000	0.35000	57.90000
	Shopping Center	mg/L	1.57000	0.35000	57.90000
Industrial	Light industrial	mg/L	1.26000	0.28000	60.50000
	Heavy industrial	mg/L	1.26000	0.28000	60.50000
	Warehouse/storage	mg/L	1.26000	0.28000	60.50000
Commercial	Public Assembly	mg/L	1.34000	0.32000	55.50000
	Institutional	mg/L	1.34000	0.32000	55.50000
	School	mg/L	1.34000	0.32000	55.50000
Open/ Undeveloped	Park	mg/L	1.50000	0.12000	70.00000
	Open space	mg/L	1.50000	0.12000	70.00000
Agricultural	Agricultural, general	mg/L	4.40000	1.30000	107.00000
	Agriculture, livestock	mg/L	0.70000	0.01000	1.00000
	Agricultural, crops	mg/L	4.40000	1.30000	107.00000
Transportation	Rights-of-way	mg/L	1.86000	0.22000	73.50000
	Parking	mg/L	1.86000	0.22000	73.50000
Open/ Undeveloped	Vacant	mg/L	1.50000	0.12000	70.00000
	Other/miscellaneous	mg/L	0.00000	0.00000	0.00000

Source: EPA/GKY

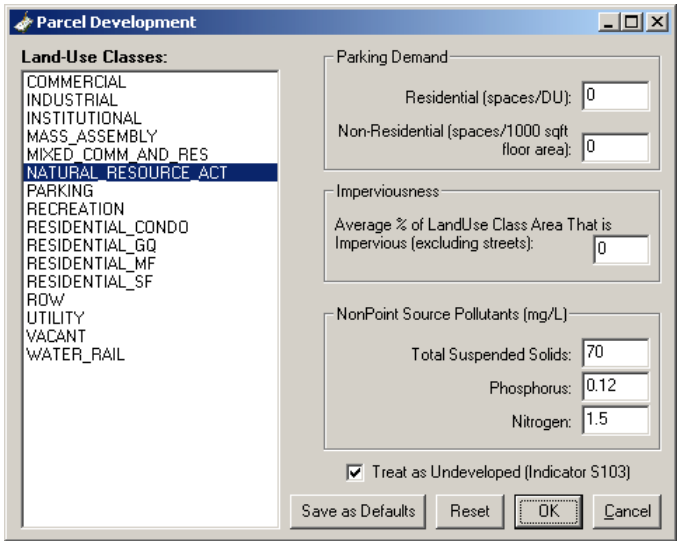
➤ Click OK and the following form appears:



➤ Select the NATURAL_RESOURCE_ACT land-use class. You will see the parameters are all zero:



➤ Fill in the UDP form as indicated below for Non-Point Source Pollutants and Undevelopable status. Using the checkbox "Treat as Undevelopable" categorizes a land-use class as non-buildable for purposes of the Developed Acres Per Capita indicator (S103).



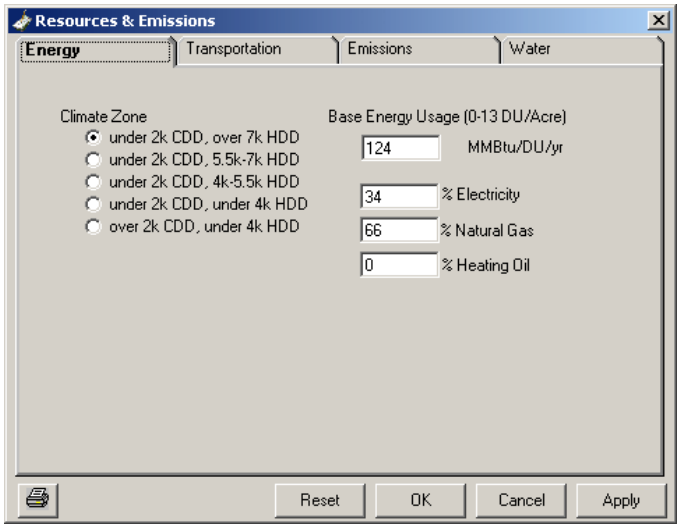
➤ Since SGI encountered a new land-use class in this example, save it to the default table for later use by clicking Save as Defaults.

➤ Click OK to proceed.

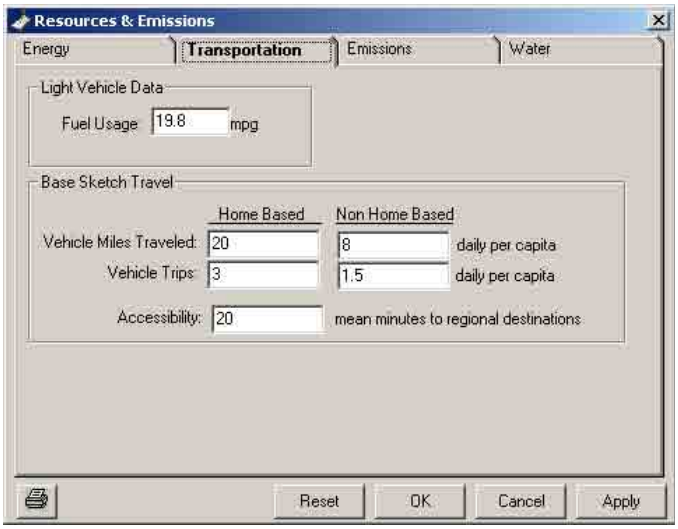
Resources and Emissions

➤ Double-click the Resources and Emissions node in the treeview and the following dialog appears. Visit the four tabs of Energy, Transportation, Emissions, and Water to view and accept the default settings as shown below. On the Water tab, choose the Water Requirement Region in the combo box that most closely corresponds to your region.

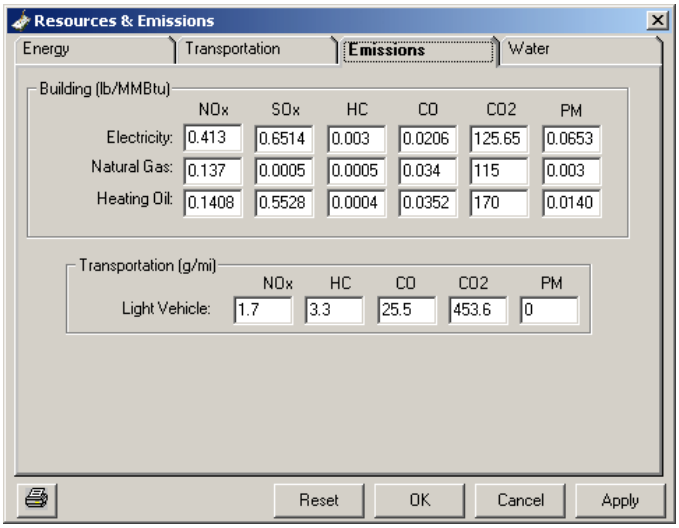
Energy



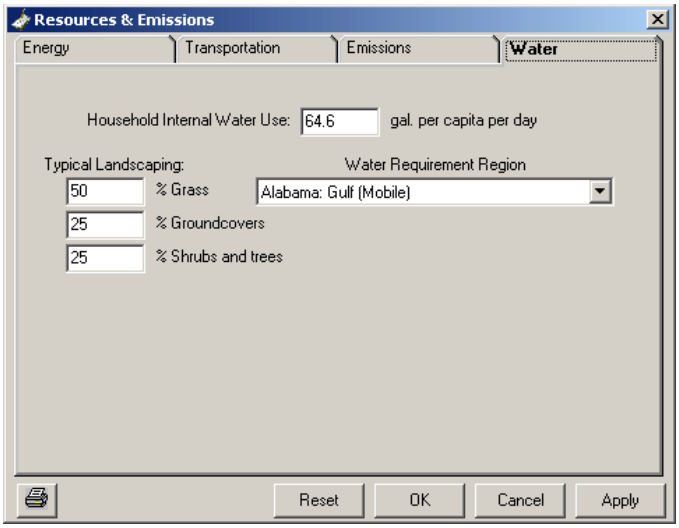
Transportation



Emissions



Domestic Water

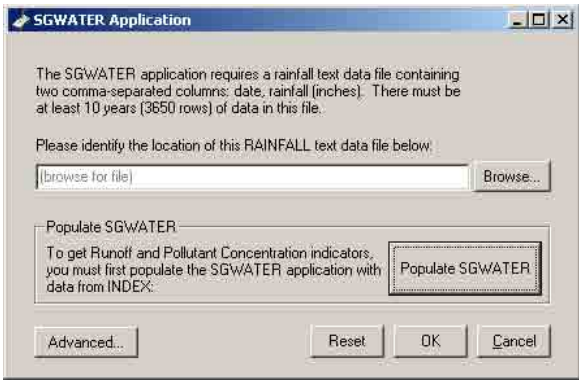


➤ Click OK to accept your water region choice and the other tutorial defaults.

SGWATER Stormwater Analysis

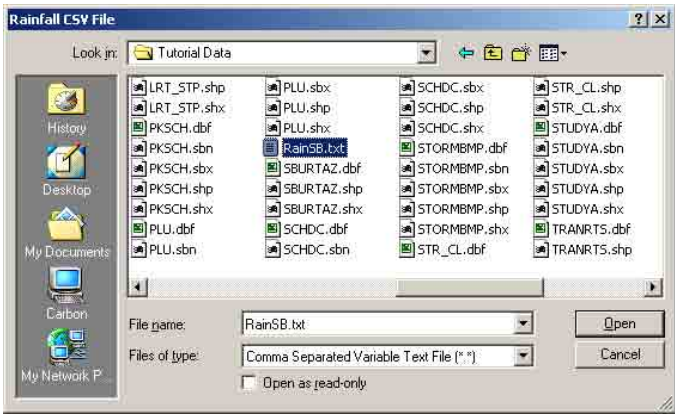
SGI employs a U.S. EPA methodology called SGWATER to calculate indicators of imperviousness, stormwater runoff, and non-point source pollution from the runoff. It is important to note that SGWATER as presently embedded in SGI is configured for evaluating urban land-uses under antecedent moisture condition (AMC) 2 that applies to average soil moisture levels. If the sketch involves non-urban land-uses, you must obtain steward assistance to update the methodology's curve numbers prior to sketching. This procedure is described in the Steward Guide, and should only be performed by a steward that has reviewed separate SGWATER documentation and is familiar with the methodology. To run SGI indicators, you must first populate the embedded SGWATER application with rainfall data (distinct from the domestic water usage selection made earlier).

➤ Double-click the SGWATER Application node in the treeview and the following dialog appears:



➤ Click the Browse button and the following dialog appears:

➤ Click OK and then locate the rainSB.txt file in your Tutorial Data folder:

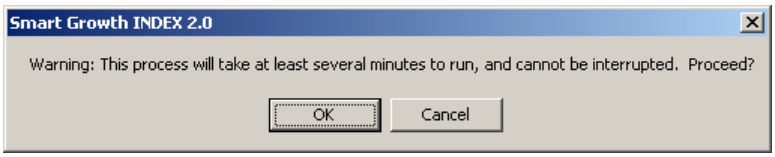


➤ Click Open.

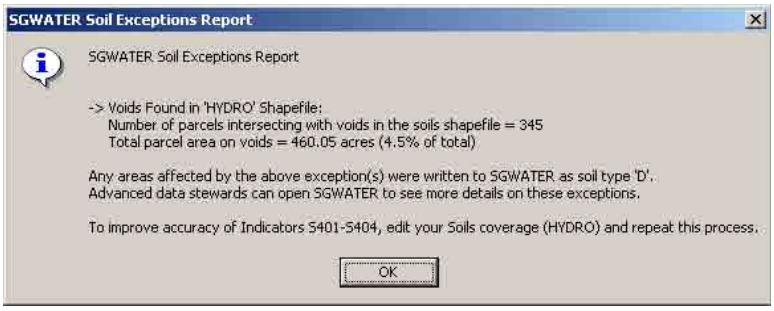
➤ Click OK to return to the SGWATER application manager.

➤ Click the Populate SGWATER button and the following warning appears:

This warning cautions users that populating the SGWATER application can add significant time to the normal sketch process depending on sketch area size. Users not intending to evaluate stormwater in their sketch should skip the SGWATER application to expedite set-up. If the SGWATER application is populated, the selected rainfall data will continue to be used for all subsequent sketches unless changed by the user. If for some reason the population process is interrupted by a complete shut-down of SGI, you must restart the process from the beginning.



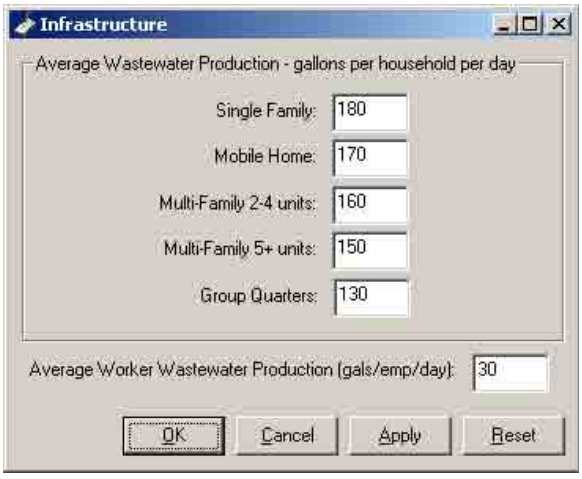
➤ Click OK to proceed with populating SGWATER with rainfall data; for the tutorial, this will take approximately 10 minutes using a 1.7 GHz processor. At the conclusion of populating SGWATER, a dialog will appear advising that the step has been satisfactorily completed, or the following dialog will appear advising that voids were found in the soils coverage and they have been assigned soil type D. This is only an advisory message to alert users to the potential need for upgrading their soils coverage; it does not stop the user from completing SGWATER calculations.



➤ When finished, click the OK button on the SGWATER Application dialog.

Infrastructure

➤ Double-click the Infrastructure UDP node in the treeview and the following dialog appears:



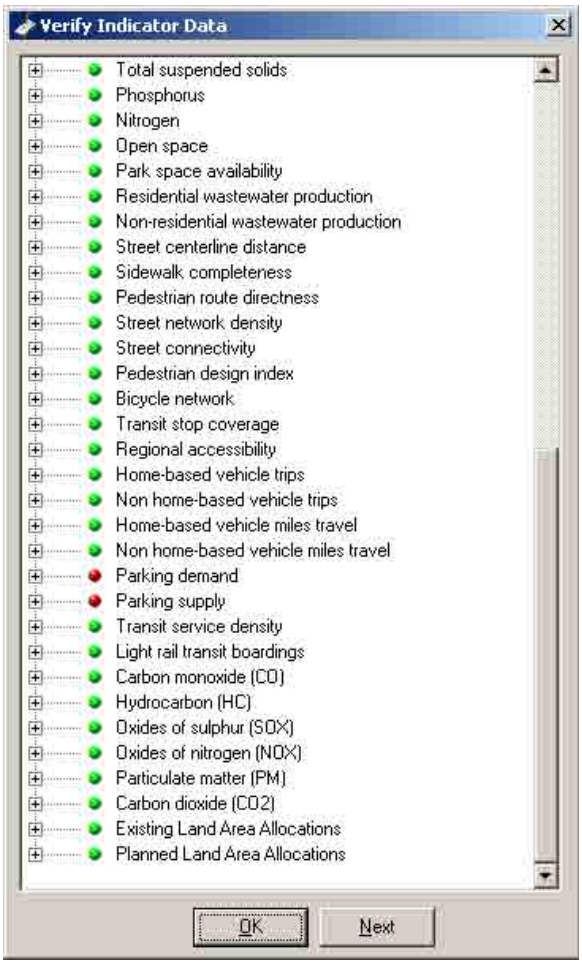
➤ Click OK to accept the tutorial defaults.

9. Running the Model

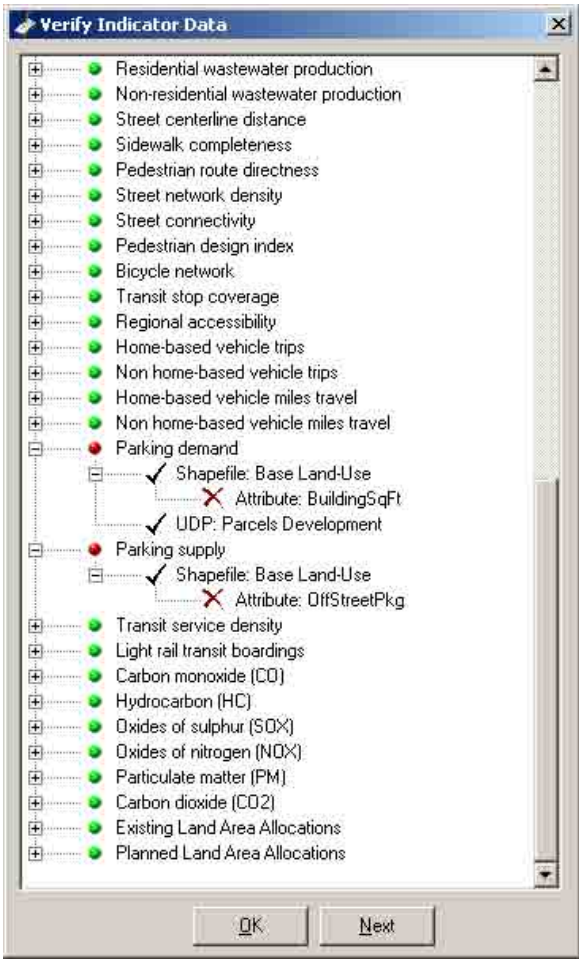
SGI is now ready to run the tutorial sketch and calculate indicator scores. Most sketch run times will vary from several minutes up to a few hours depending on: 1) sketch area size and complexity; 2) number and type of indicators selected for calculation; and 3) computer hardware specifications. The tutorial requires approximately 20 minutes using a 1.7 GHz processor. Users will need to gain run time experience with their particular hardware and data conditions. Time-intensive indicators are those measuring proximities and stormwater. Running the model is a two-step process: 1) verifying required inputs for indicators; and 2) selecting indicators to be calculated. Consideration of which indicators are relevant to an analysis should occur early in planning a sketch, particularly because of impacts on data requirements.

Verifying Inputs

➤ Expand the Apply Model node in the treeview and double-click the Verify Inputs node. After completing its check, the following dialog appears:



➤ Indicators with green lights are ready to run and indicators with red are not ready. Expand nodes with red lights to see what shapefiles, attributes, and/or UDPs are missing or configured improperly. In the tutorial sketch, Parking Demand and Parking Supply indicators will be unavailable because attributes for non-residential building square feet and on-street parking spaces were purposely not supplied for the base land-use and street centerline shapefiles. Input verification at this point gives you a chance to return to earlier steps and provide missing items. For purposes of the tutorial, the parking indicators will not be calculated.

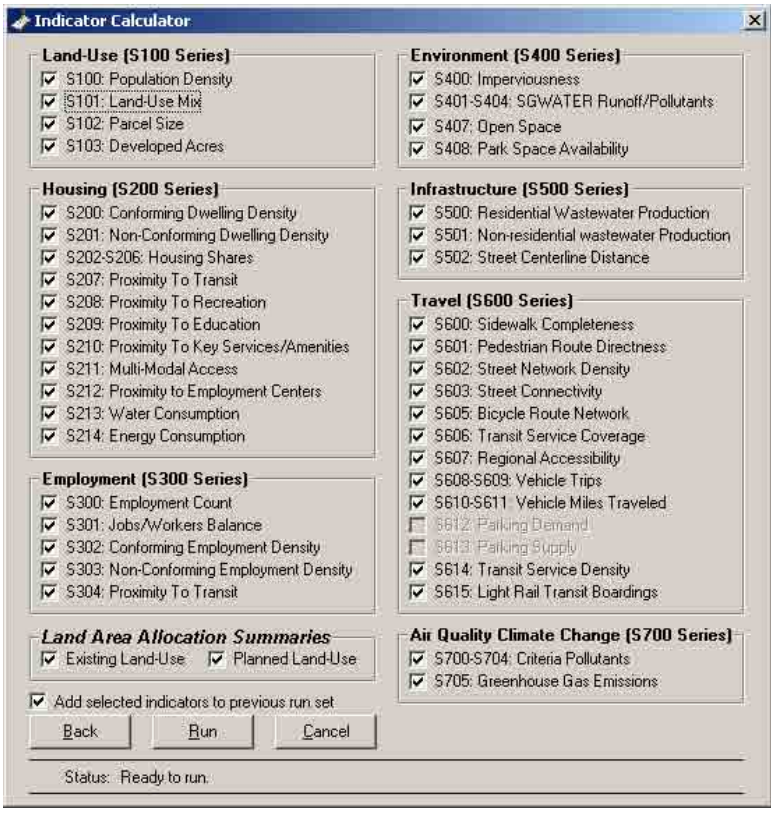


➤ Click the Next button to proceed.

Running the Model

➤ Upon clicking the Next button, the Indicator Calculator dialog appears showing all indicators that are ready for calculation. Unavailable indicators are disabled and will remain so until all required shapefiles or settings are supplied. You may also unselect any indicators that you do not want to calculate even if their inputs are satisfactory.

If you have already completed a run and are returning to add more indicators in a subsequent run, you can select the "Add selected indicators to last run set" checkbox to preserve previous indicator results and add scores for the newly selected indicators. The previous run's scores and newly calculated scores will appear together in a consolidated list shown in the next section. Users should exercise caution when making changes to sketches between runs if this feature is used because results are presented in a consolidated list that does not differentiate scores according to which run produced them.

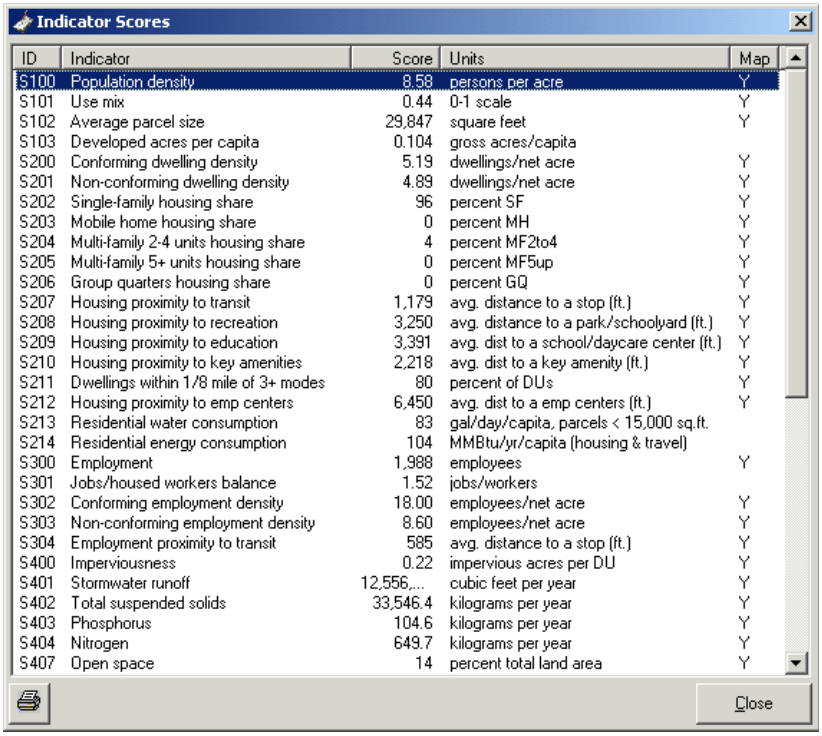


➤ When ready, click the Run button to calculate indicators. As the run proceeds, you can refer to the status bar at the bottom of the dialog to see how much of the run has been completed. Depending on your computer specifications, the tutorial will require approximately 20-30 minutes to run. A message box will advise you when the run is complete.

10. Viewing Results

Viewing Indicator Scores

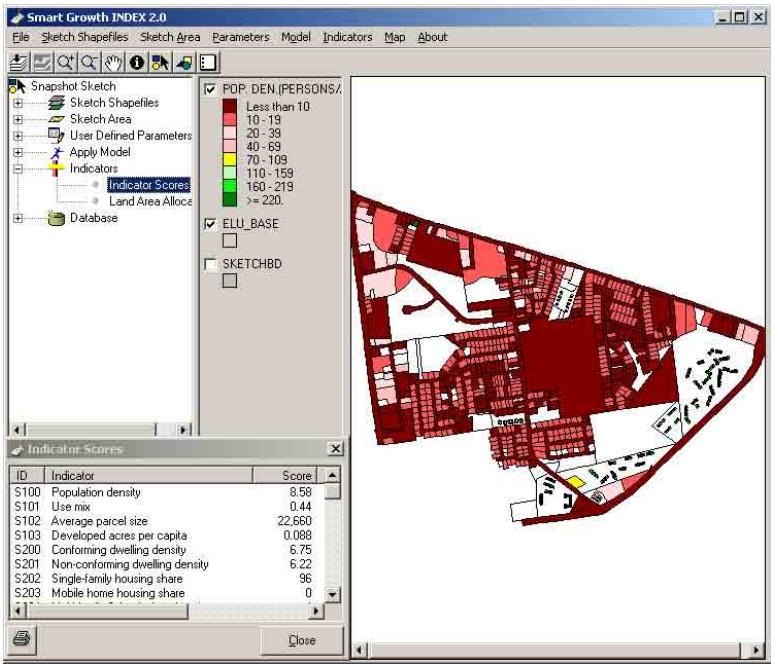
➤ Expand the Indicators node in the treeview, double-click the Indicator Scores node, and the following window appears. Detailed information on indicator definitions and calculation formulas is given in the Indicator Dictionary. To export indicator scores for presentation purposes, click the Print button, save as RTF, and import to any spreadsheet program.



ID	Indicator	Score	Units	Map
S100	Population density	8.58	persons per acre	Y
S101	Use mix	0.44	0-1 scale	Y
S102	Average parcel size	29,847	square feet	Y
S103	Developed acres per capita	0.104	gross acres/capita	
S200	Conforming dwelling density	5.19	dwellings/net acre	Y
S201	Non-conforming dwelling density	4.89	dwellings/net acre	Y
S202	Single-family housing share	96	percent SF	Y
S203	Mobile home housing share	0	percent MH	Y
S204	Multi-family 2-4 units housing share	4	percent MF2to4	Y
S205	Multi-family 5+ units housing share	0	percent MF5up	Y
S206	Group quarters housing share	0	percent GQ	Y
S207	Housing proximity to transit	1,179	avg. distance to a stop (ft.)	Y
S208	Housing proximity to recreation	3,250	avg. distance to a park/schoolyard (ft.)	Y
S209	Housing proximity to education	3,391	avg. dist to a school/daycare center (ft.)	Y
S210	Housing proximity to key amenities	2,218	avg. dist to a key amenity (ft.)	Y
S211	Dwellings within 1/8 mile of 3+ modes	80	percent of DUs	Y
S212	Housing proximity to emp centers	6,450	avg. dist to a emp centers (ft.)	Y
S213	Residential water consumption	83	gal/day/capita, parcels < 15,000 sq.ft.	
S214	Residential energy consumption	104	MMBtu/yr/capita (housing & travel)	
S300	Employment	1,988	employees	Y
S301	Jobs/housed workers balance	1.52	jobs/workers	
S302	Conforming employment density	18.00	employees/net acre	Y
S303	Non-conforming employment density	8.60	employees/net acre	Y
S304	Employment proximity to transit	585	avg. distance to a stop (ft.)	Y
S400	Imperviousness	0.22	impervious acres per DU	Y
S401	Stormwater runoff	12,556,...	cubic feet per year	Y
S402	Total suspended solids	33,546.4	kilograms per year	Y
S403	Phosphorus	104.6	kilograms per year	Y
S404	Nitrogen	649.7	kilograms per year	Y
S407	Open space	14	percent total land area	Y

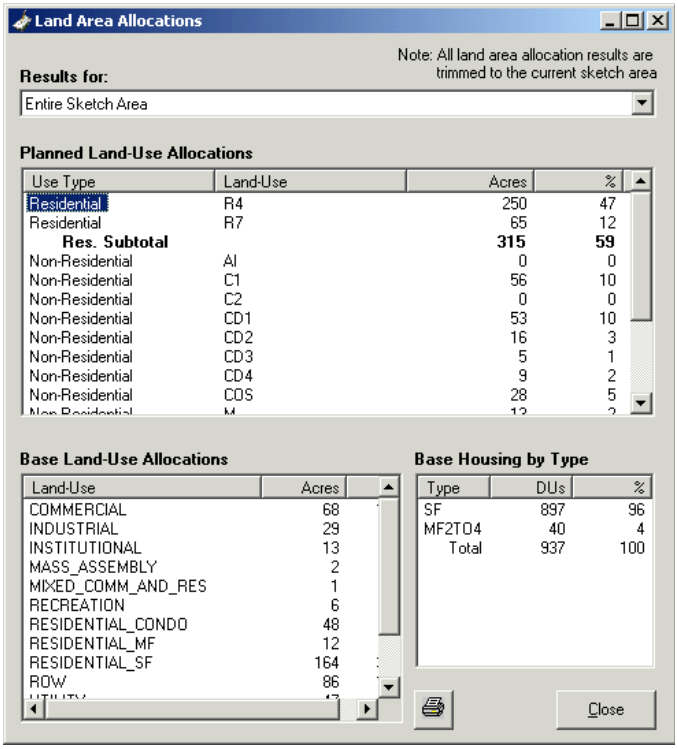
Viewing Indicator Maps

➤ Indicators with a “Y” in the Map column of the scores window also have maps depicting parcel-level indicator results. Double-clicking on these automatically generates the indicator map. Double-click the Population Density indicator in the scores window and the following appears:



Viewing Land Allocation Results

➤ In addition to indicator scores and maps, SGI produces a tabulation of land and housing allocations in a sketch. Double-click the Land Allocations node in the treeview and the following appears. If local government boundary shapefiles were provided for the sketch, the combo box at the top of this dialog will contain those jurisdictions by name, and when selected, results are shown for the selected jurisdiction.



11. Comparing Sketches

Multiple sketches can be compared in two ways: 1) indicator scores can be directly compared as calculated by SGI without any post-processing; or 2) an additional processing step can convert indicator scores for each sketch into a single overall score using rating and weighting (RAW) settings provided by users. The RAW function applies user-defined acceptability ratings to possible indicator scores and weightings of relative importance to indicators. This produces a single overall score for each sketch based on user opinions or local standards for issues being measured. Additional information on using the RAW function is provided in the Community Process Guide.

To demonstrate the RAW function, an alternate sketch must be prepared so it can be compared against the just completed base sketch. For this purpose, you will find the ELU_ALT shapefile containing alternate land-use, and the EMP_ALT shapefile containing employment, in the Tutorial Data folder. For illustrative purposes, these alternate land-use and employment shapefiles simulate residential and commercial infill in the sketch area. These will be the only changes you need to make for the alternate sketch to be sufficiently different from the base sketch. Essentially, you will be repeating the procedures described in Sections 4 through 9 of the Getting Started Guide.

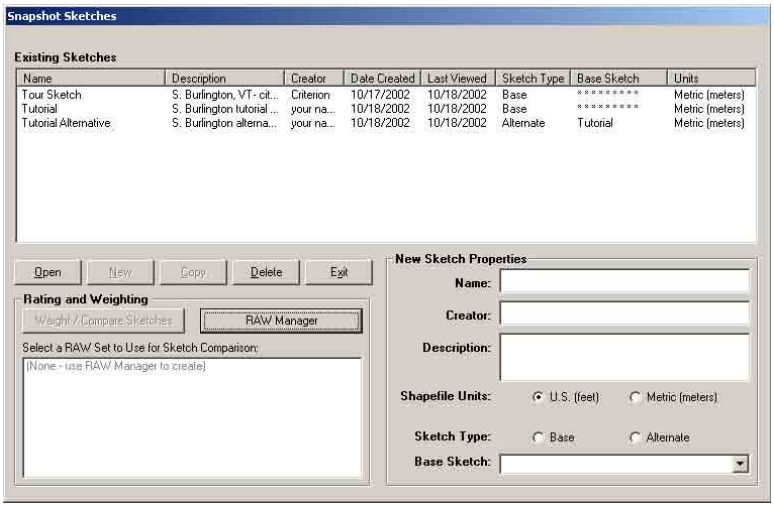
Return to the main Database and load the alternate land-use and employment shapefiles, and then create an alternate sketch following the same procedure that was used for the base sketch. Be sure to check Metric units, select the Alternate sketch type, and identify the Tutorial base sketch when setting the new sketch properties. Once indicator scores have been calculated for the alternate sketch, you will be ready to compare the base and alternate sketches using the RAW function in a two-step procedure:

- *Selecting a RAW set.* A RAW "set" is a group of saved rating and weighting settings that can be retrieved and applied to multiple sketches as desired. Users may want to develop and save multiple RAW sets depending on the topical focus of a sketch, its location, or stakeholder group, e.g. one RAW set for urban sketches and another for suburban sketches.

- *Applying RAW.* After the user selects a RAW set and sketches to compare, the model calculates their weighted scores and produces a chart and table ranking the sketches.

Accessing the RAW Sets

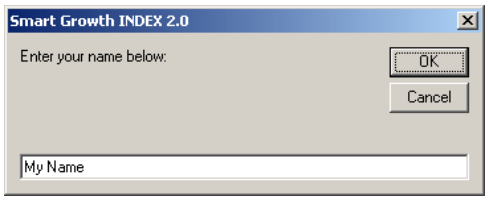
➤ Open the SGI startup screen, click the Snapshot Sketch button, and the Sketch Manager window appears:



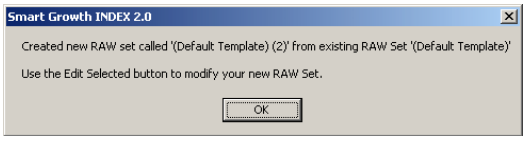
➤ Click the RAW Manager button and the following window appears:

Creating a RAW Set from the SGI Master Template

➤ SGI has a master template of RAW settings that are used for creating user-defined default RAW sets. Select the master template, click the Create New From Selected button, and enter your name in the following dialog:



➤ Click OK and the following message appears:

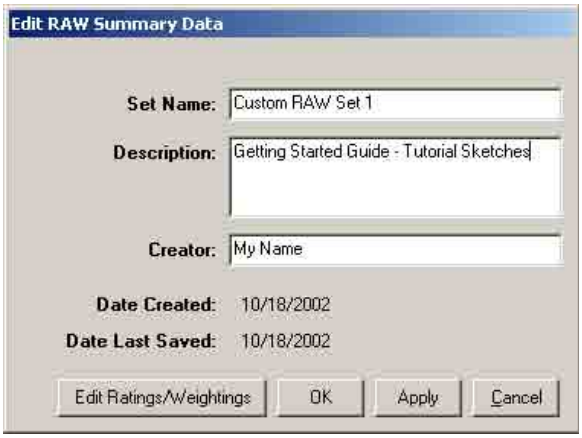


➤ Click OK and the newly-created RAW Set is listed in the RAW manager window:

Editing a RAW Set

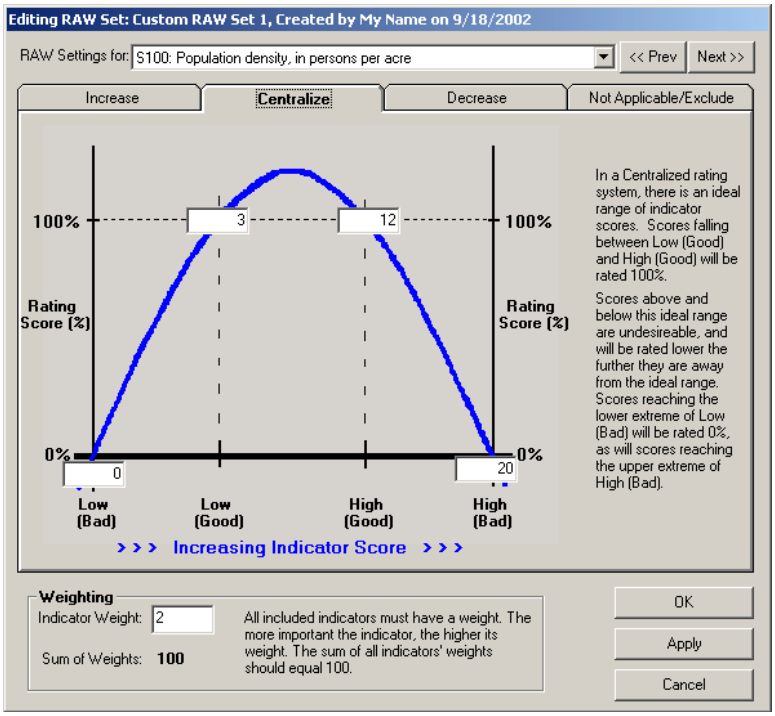
➤ Select the RAW set you just created, click the Edit Selected button, and the following dialog appears:

➤ Fill in the Set Name, Description, and Creator fields as indicated below:

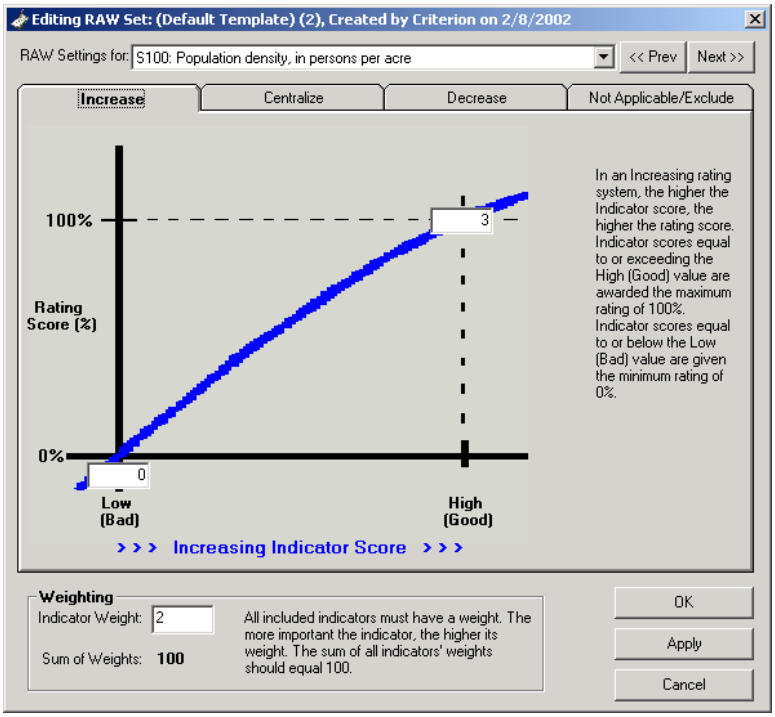


➤ Click the Apply button to save your changes and remain on this form.

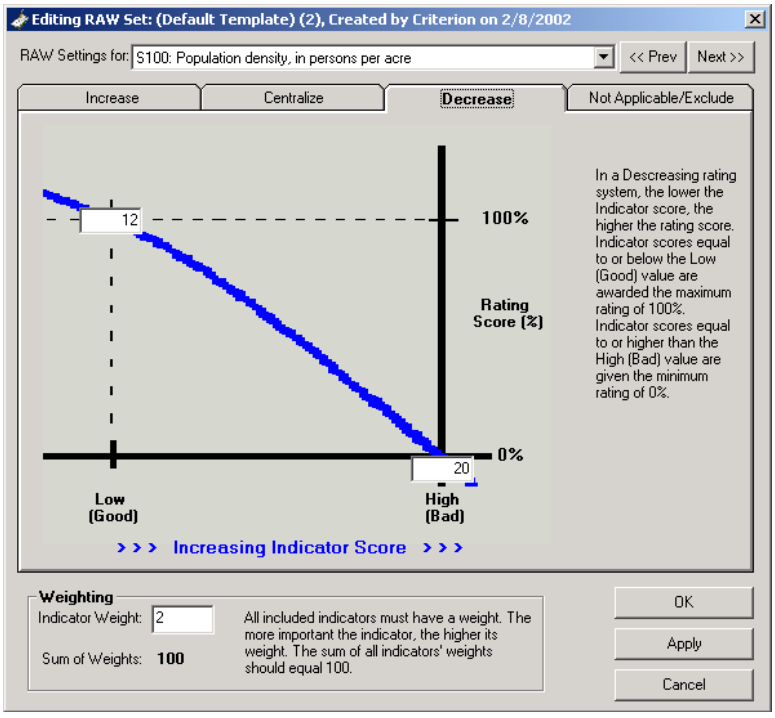
➤ To edit the rating and weighting settings, click the Edit Ratings/Weightings button. You are presented with the following form showing the first indicator (Population Density) and its default settings (inherited from the template on which you created this RAW set):



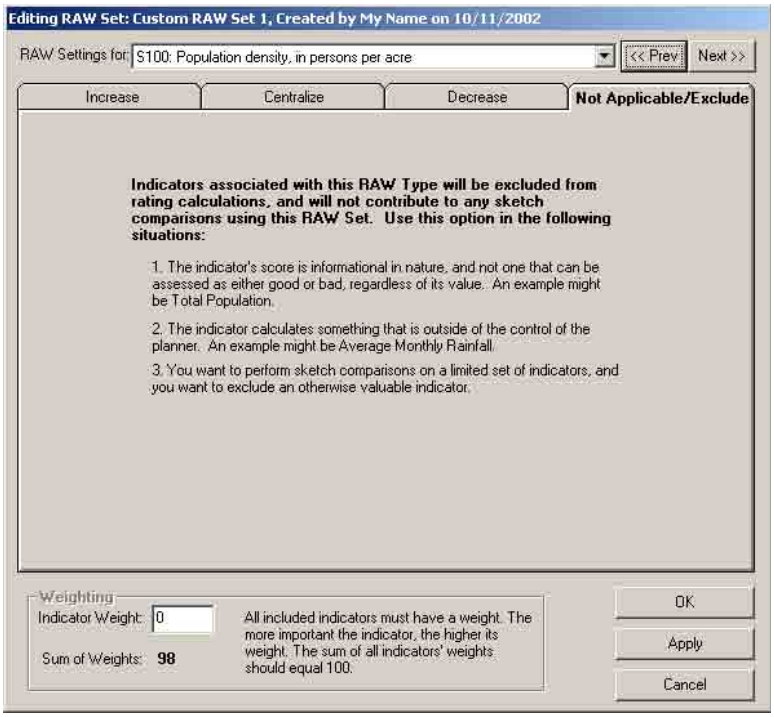
➤ Click the Increase tab and the dialog changes to show that you have identified Population Density as an indicator for which increasing scores are considered favorable:



➤ Click the Decrease tab and the dialog changes to show that you have identified Population Density as a indicator for which decreasing scores are considered favorable:



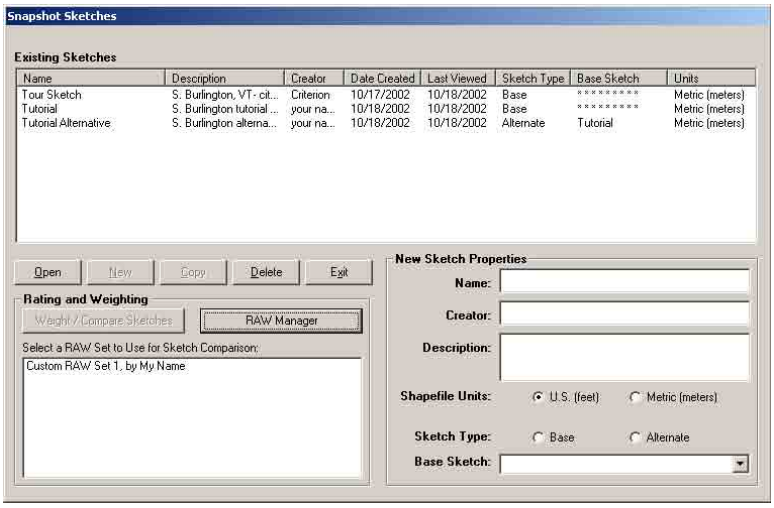
➤ Click the Not Applicable/Exclude tab and the dialog changes to show that you have identified Population Density as an indicator to be excluded from the RAW set:



➤ Click the Next and Previous buttons to change the indicator you are reviewing, thus changing the contents of the combo box at the top of the form and potentially the selected tab and weighting. Note that each indicator needs a weight indicating its importance relative to other indicators. When Not Applicable/Exclude is chosen, the weighting section is disabled because an excluded indicator cannot have a weight.

➤ Click the Cancel button to leave the RAW set and return to the RAW Manager.

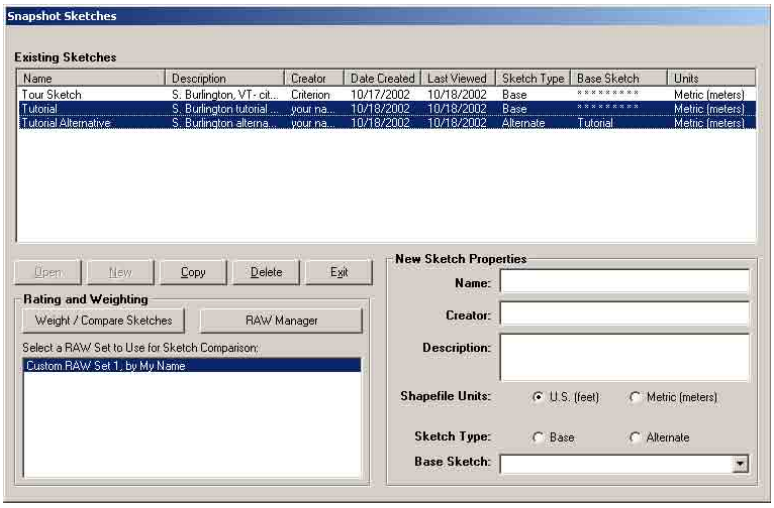
➤ Click the Exit button to return to the Project Manager window. The newly created RAW set is displayed in the RAW frame:



Comparing Multiple Sketches

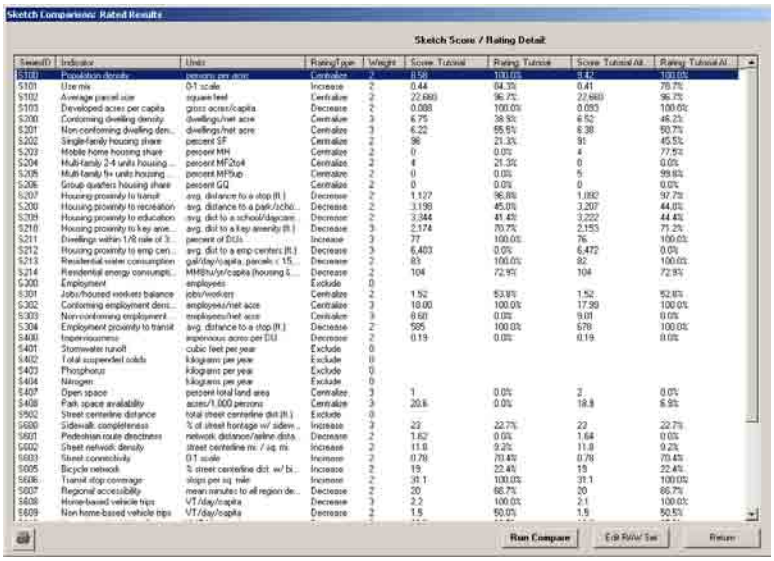
➤ Select your newly created RAW set from the Project Manager window.

➤ Using the Ctrl or Shift keys, select both the base and alternate tutorial sketches. The Weight/Compare Sketches button becomes enabled only when you have selected both a RAW set and more than one sketch:

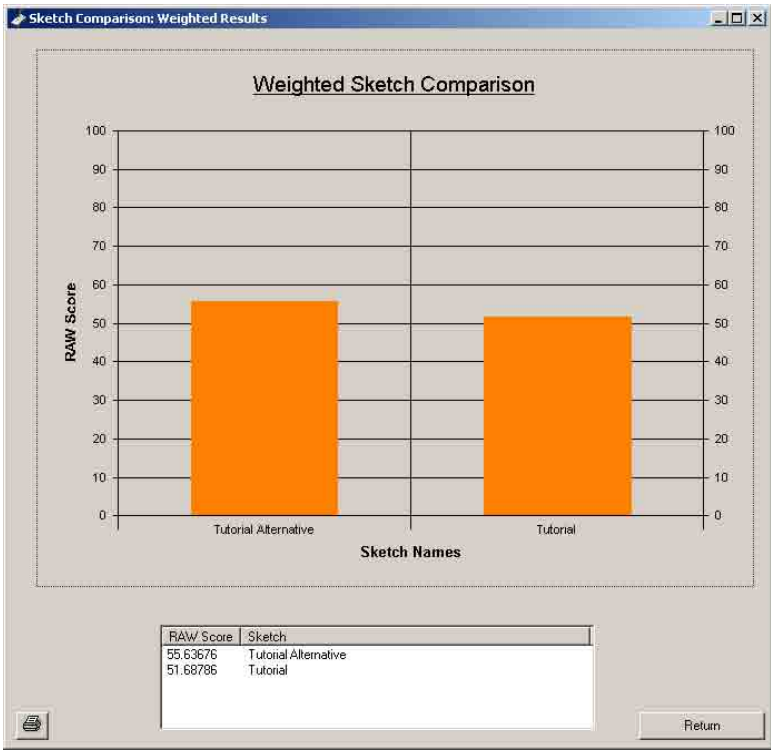


➤ Click the Weight/Compare Sketches button and the following results window appears:

If needed, adjust the column widths as required by dragging the list box header dividers left or right.



➤ Click the Run Compare button and the Weighted Results window appears with sketches ranked in bar chart form and overall weighted scores in a list box:



12. An Extra-Credit Learning Exercise

Now that you have successfully completed the Getting Started tutorial, you can populate SGI's main Database with local shapefiles and begin to create your own test sketches for more experience with the model. Since this is still a learning experience, you may want to improve your skills by focusing on one of the tool's basic applications: is a proposed development project favorable or unfavorable for an area? An example would be a partially-developed neighborhood where you conceptualize a hypothetical infill development project, e.g. a new residential subdivision, and evaluate its impacts.

Using data describing existing conditions in the vicinity, and shapefiles representing a hypothetical development project, you can exercise SGI's capabilities with the following six steps:

1. Determine which indicators are relevant to hypothetical project issues.

2. Measure existing conditions in the proposed project vicinity without the project. Calculate indicator scores for a reasonable impact area around the proposed project site, or for an already-established local boundary that encompasses the project site.

3. Measure build-out scores for the existing official land-use plan for the area without the project. Build-out indicator scores are the equivalent of plan goals. If an official plan doesn't apply to the area, measure a set of tentative objectives and goals.

4. Measure the area with the project included (modify #2 to include the project).

5. Gauge the type, direction, and magnitude of change in indicator scores between the baseline area (#2) and the area with the project (#4). Which indicator scores change, in what direction, and by how much?

6. Gauge the consistency of the project scores (#4) with the area's goals (#3). Does the project move indicator scores in the direction of the area's goals and if so, which indicators and by how much?