San Antonio Multimodal Model Version 5

User's Guide

User’s Guide
DRAFT

prepared for

Alamo Area Metropolitan Planning Organization

prepared by

Cambridge Systematics, Inc.

report

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1.0 Introduction

This User's Guide provides instructions on operating the San Antonio Multimodal Model (SAMM) Version 5. Information is provided regarding installation of the model, management of model scenario data, and running of the model.

The model is run from the TransCAD software platform through a customized user interface. This interface provides access to custom calculations developed specifically for the San Antonio area. Scenario and file management is achieved through a scenario management system integrated into the custom user interface. A basic understanding of the TransCAD software program is required to get the most out of the model.

2.0 System Requirements

The model must be run on a computer running Windows 7 or later and the TransCAD software program. Specific system requirements are shown in Table 2.1.

The listed requirements are suggested minimums; a computer that does not meet these requirements may still succeed in running the model. Increased processor speeds, multiple processor cores, and additional memory will reduce the amount of time required to run the model. The required disk space for installation must be available on the drive where TransCAD has been installed. The required disk space for additional scenarios can be on a local or network drive and must be available before attempting to run the model. However, model run times will be considerably longer if the model is run from a network drive instead of a local drive.

Table 2.1 System Requirements

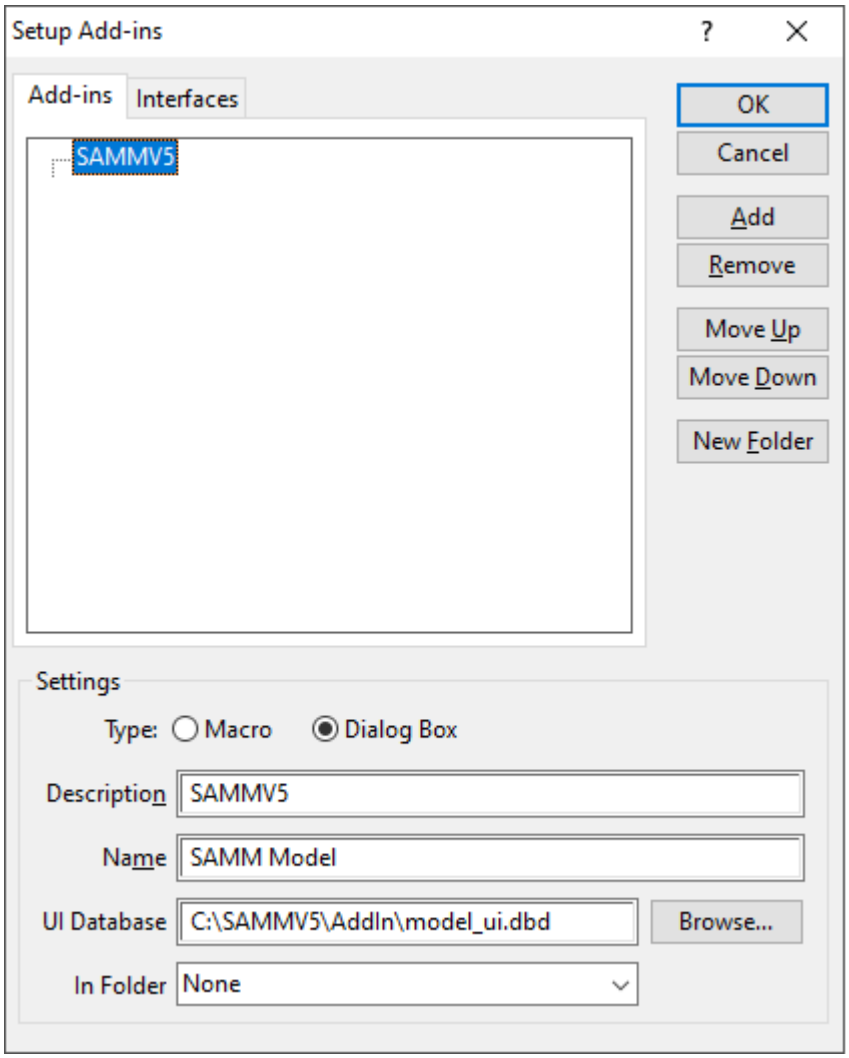
Elements	Requirements
Operating System	Windows 7 or later A 64-bit operating system is recommended
Processor	Intel Core i5 processor or later (i7 or Xeon recommended) Multiple cores will significantly improve model run times.
Memory	4 GB – 12 GB At least 8 GB of memory is recommended.
TransCAD Software	Version 8.0, Build 22365 recommended. Use of different builds is not recommended.
Microsoft Office	Version 2007 or later, current version recommended.
Disk Space (Installation and input data)	750 MB
Disk Space (Each scenario)	40 GB for each scenario (with retention of all intermediate and output files)
Software Type	MS Office and TransCAD must either both be 32-bit or both be 64-bit, 64-bit recommended.

3.0 Installing the Model Add-In

The travel model add-in can be installed by copying the *AddIn* folder from the installation media to the *SAMMV5* model directory. The *AddIn* folder can also be copied from a computer where the model has already been installed. It is important that the *SAMMV5* folder is installed in a user writable location, as the TransCAD program modifies files within this directory.

Once the model files have been copied, the model must be added to the TransCAD Add-Ins list. To do this, open TransCAD and select *Tools → GIS Developer's Kit → Setup Add-Ins...* from the menu. A new entry for the SAMMV5 model should be populated as shown in Figure 3.1, with the *UI Database* field modified to point to the folder where the model files were copied.

Figure 3.1 Model Add-In Dialog Box



3.1 Model Folder Contents

- The complete model dataset and Add-In is contained within the *SAMMV5* directory. As described above, this directory can be placed in a location of the user's choice (e.g., *C:\SAMMV5* or *D:\Models\SAMMV5*).

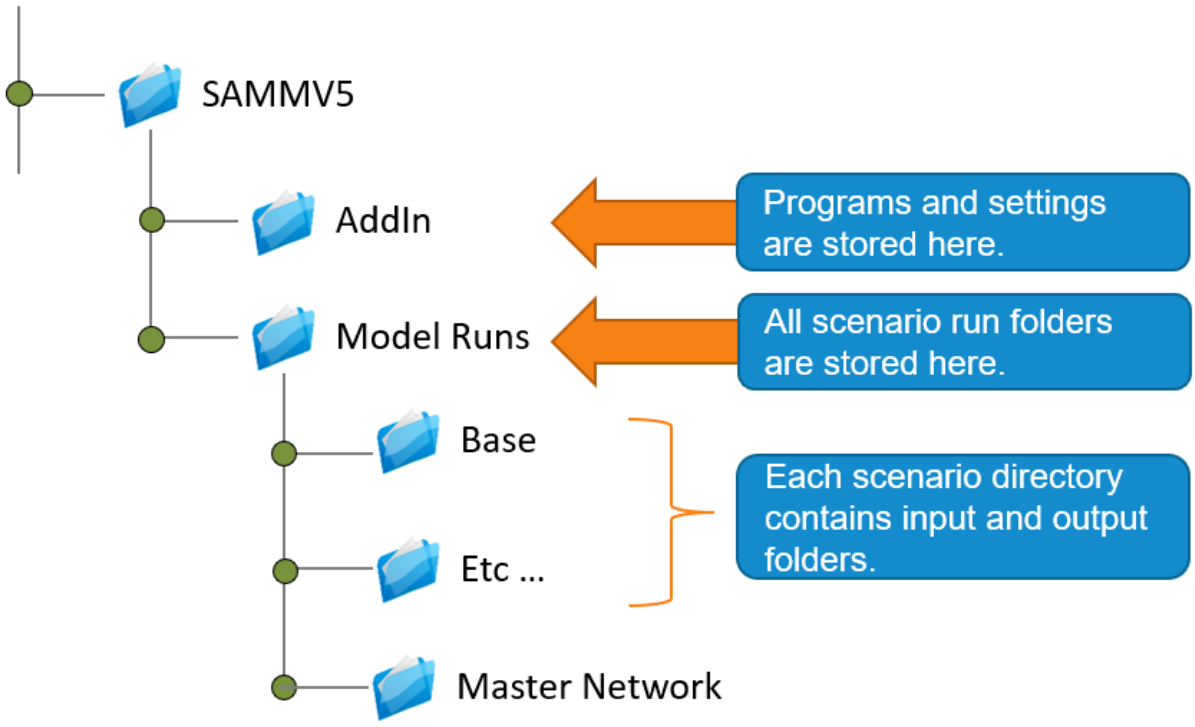
This directory contains the sub-folders listed below and shown in ***AddIn:*** This folder contains the model Add-In files, as well as some configuration files that allow the model dialog box to retain settings between sessions.

- ***Model Runs:*** This folder contains the input and output data associated with each of the scenarios defined in the scenario manager.

Figure 3.2.

- ***AddIn:*** This folder contains the model Add-In files, as well as some configuration files that allow the model dialog box to retain settings between sessions.
- ***Model Runs:*** This folder contains the input and output data associated with each of the scenarios defined in the scenario manager.

Figure 3.2 Example Model Directory Tree



4.0 Running the Model

The model is controlled through a series of dialog boxes. These dialog boxes allow the user to specify custom model run settings or to copy settings from a previously defined scenario. Users may also run the travel model, create reports and maps, and specify model run options. Steps required to complete a successful model run are described below.

4.1 Collecting the Required Data

To successfully run the travel model, various data files are required. Some input files are optional and will provide additional functionality. Each file is identified by a short keyword as identified in Table 4.1. All input files should be collected and placed in a model input directory. Input files will not be modified when the model is run.

Table 4.1 Model Input File Listing

ID	Description and Notes	Required/Optional
Master Network	The master roadway geographic file (*.dbd)	Optional
Master Routes	The master route system file (*.rts)	Optional
Network	The scenario roadway geographic file (*.dbd), can be created from the master network.	Required
Routes	The scenario route system file (*.rts), can be created from the master route system.	Required
RouteMode	Table listing the mode value of each numbered route in the transit route system (*.bin) Routes not listed will default to the mode value coded directly on each route. This table is included to allow interlined routes of different modes to make use of different stop dwell times.	Required
MODE	TransCAD transit mode definition file (*.bin)	Required
MODEXFER	TransCAD transit mode transfer definition file (*.bin)	Required
TransitDelay	Transit delay lookup file (*.bin) All values are currently set to zero, as the model uses stop delay instead of speed adjustment factors.	Required
TransitSpeed	Transit speed lookup file for default BRT and LRT speeds (*.bin)	Required
SpeedCap	Link speed and capacity lookup file by facility and area type (*.bin)	Required
TAZ	Traffic analysis zone polygon file (*.dbd)	Required
ZoneData	Socioeconomic and demographic file (*.bin)	Required
DemographicSettings	Definition of Trip Gen Dimensions for HBW (*.bin) Demographic settings for other trip purposes should be placed in the same folder.	Required
JointDistribution	Joint Distribution of Household Variables (*.bin)	Required
TripPurp	HBW trip purpose definition (*.bin) Additional file must be located in the same folder: SA_TripPurp_Other.bin	Required
ProdRates	HBW TripCal production rates (*.bin)	Required

ID	Description and Notes	Required/Optional
	Additional file must be located in the same folder: SA_ProdRates_Other.bin	
AttrSetting	Defines the variables for which attraction rates are available (*.bin)	Required
AttrRates	HBW TripCal attraction rates (*.bin) Additional file must be located in the same folder: SA_AttrRates_Other.bin	Required
ExternalTotals	Total External trip ends by external stations for autos and trucks (*.bin)	Required
EESeed	EE seed matrix to create final EE matrix (*.mtx)	Required
VACoef	Table containing vehicle availability model coefficient values (*.bin)	Required
TODFactors	Time of day trip distribution factor file (*.bin)	Required
DCCoef	Table containing destination choice model coefficients (*.bin)	Required
KFactors	K-factor matrix (*.mtx)	Optional
ModeCoef	Table containing mode choice model coefficient values (*.bin)	Required
ModeNest	Table containing mode choice nesting coefficients (*.bin)	Required
AutoOcc	Table containing auto occupancy values for the HOV3+ mode by trip purpose and time period (*.bin)	Required
ModeTargets	Table containing mode choice model calibration targets (*.bin) This table is only needed when running the mode choice model calibration routine.	Optional
ModeParam	Excel file containing mode choice model constants and density coefficients (*.xls)	Required
TODFactorsAssign	Time of day factor file for trip assignment (*.bin)	Required
SelQry	TransCAD select link/node query file (*.qry)	Optional
SelQry Trn	Transit Select Link/Node/Route/Stop Query file (*.qry)	Optional
SubArea	Subarea geographic file (*.dbd)	Optional
TurnPen	Turn Penalty File (*.bin)	Optional

4.2 Creating and Running a Scenario

4.2.1 User Interface

After the input data has been collected, a scenario must be defined from the model dialog box. Model scenarios are accessible from the scenario toolbox and contain information about the following for each scenario:

- Input and output directories,
- Filenames,
- Route system year/alternative, and
- Advanced settings and parameters.

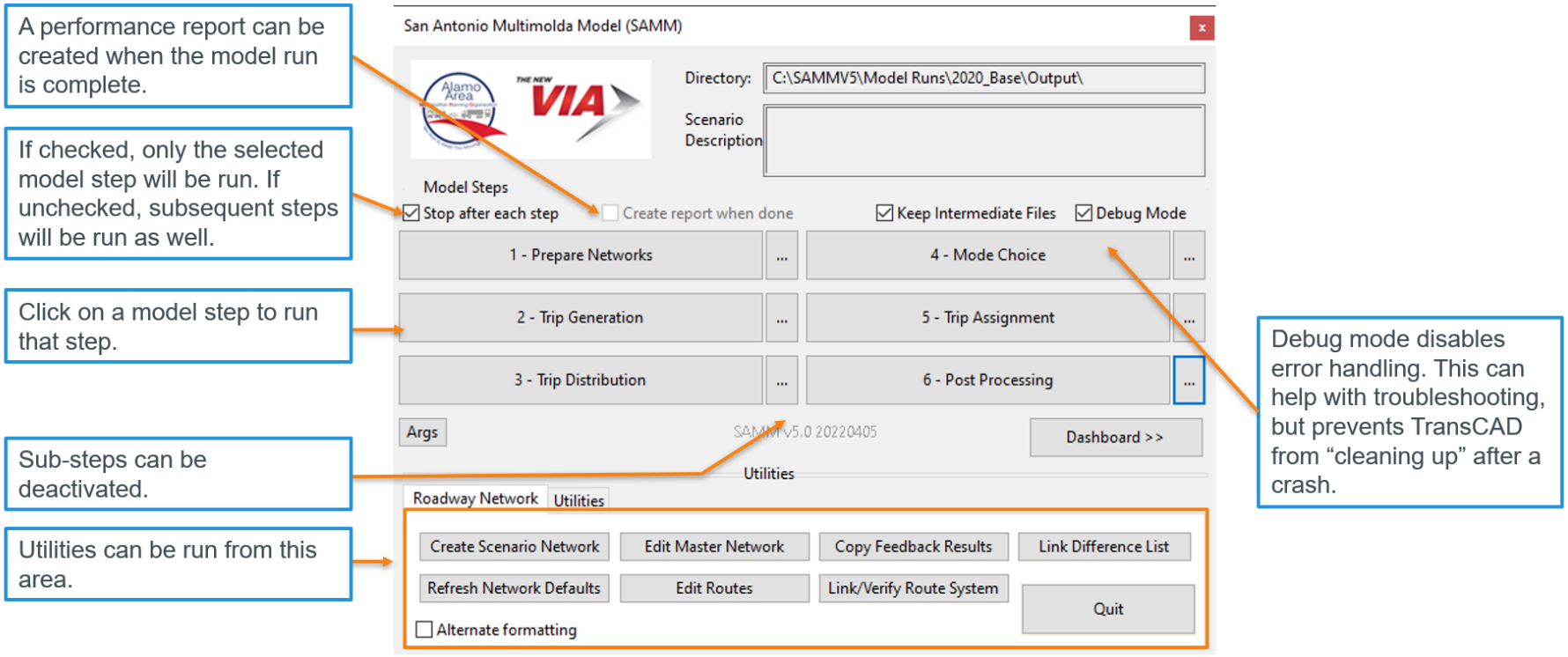
Scenarios can be copied based on existing scenarios or can be created from scratch using default settings. Figure 4.1 and Figure 4.2 show the user interface of the San Antonio Multimodal Model (SAMM). When creating or editing a scenario, use the steps listed below. ***It is recommended that these steps are performed in order***.

1. Specify a scenario name and identify the scenario input and output directories.
2. As necessary, identify input files by name. Most files will be found automatically, but some files may need to be located manually.
3. Choose whether the model is to be run in Feedback mode in the General tab.
4. *Optional:* Review the output filenames (modification is not recommended).
5. *Optional:* Review the advanced settings (modification is not recommended, except for the **DemographicCode** parameter).

Note that the Advanced tab in the Scenario Editor allows the user to edit values that are not often changed. The advanced interface does not prevent the user from entering invalid or inconsistent data, however, which may cause the model to crash or produced invalid results. The one parameter the user may want to change in the Advanced tab is the **DemographicCode** parameter in the Trip Generation (TGN) model. This parameter is set to "_YY" where YY is the demographic year (e.g. 20, 25, 35, etc.).

Figure 4.3 shows the SAMM dashboard, including the subarea extraction utility. Figure 4.4 shows the SAMM summary report dialog box and the different reports available to the user. Figure 4.5 shows the SAMM scenario toolbox where the scenarios are created. Figure 4.6 - Figure 4.9 show the different scenario editor tabs.

Figure 4.1 The Model Dialog Box – Roadway Network Utilities



The interface features a number of Roadway Network utilities that are meant to automate otherwise tedious tasks:

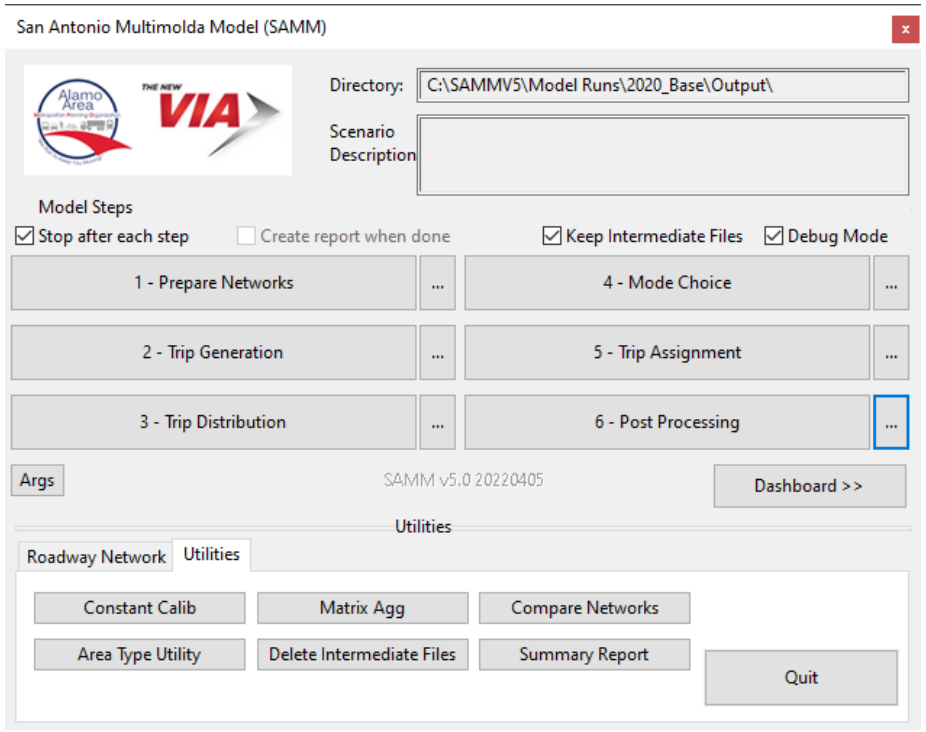
1. **Create Scenario Network:** creates scenario network from master network.
2. **Edit Master Network:** loaded the project browser interface.
3. **Copy Feedback Results**: allows the user to copy feedback speeds from previous runs.
4. **Link Difference List:** produces a spreadsheet listing roadway links along with their corresponding projects and attributes.
5. **Refresh Network Defaults:** Updates built-in network styles and exports the network to address potential issues that can be introduced after editing the network.

6. **Edit Routes**: reloads routes then opens a map that allows the user to edit the transit network.

7. **Link/Verify Route System**: links route system to highway network and verifies routes connectivity and directionality.

The interface also features other utilities such as:

Figure 4.2 The Model Dialog Box – Other Utilities



1. **Constant Calib**: allows the user to calibrate the mode choice constants to the mode targets. This is used only when calibrating/validating the model.

2. **Matrix Agg**: produces aggregated peak and off-peak trip distribution matrices by area type and sector.

3. **Compare Networks:** compares scenario networks of different years and outputs list of links with different attributes.

4. **Area Type Utility**: tags area types from the TAZ layer onto the network (not currently used).

5. **Delete Intermediate Files**: deletes the intermediate files produced in the Trip Distribution and Mode Choice model steps.

6. **Summary Report**: opens the summary report dialog box to select reports of interest.

Figure 4.3 SAMM Dashboard Dialog Box

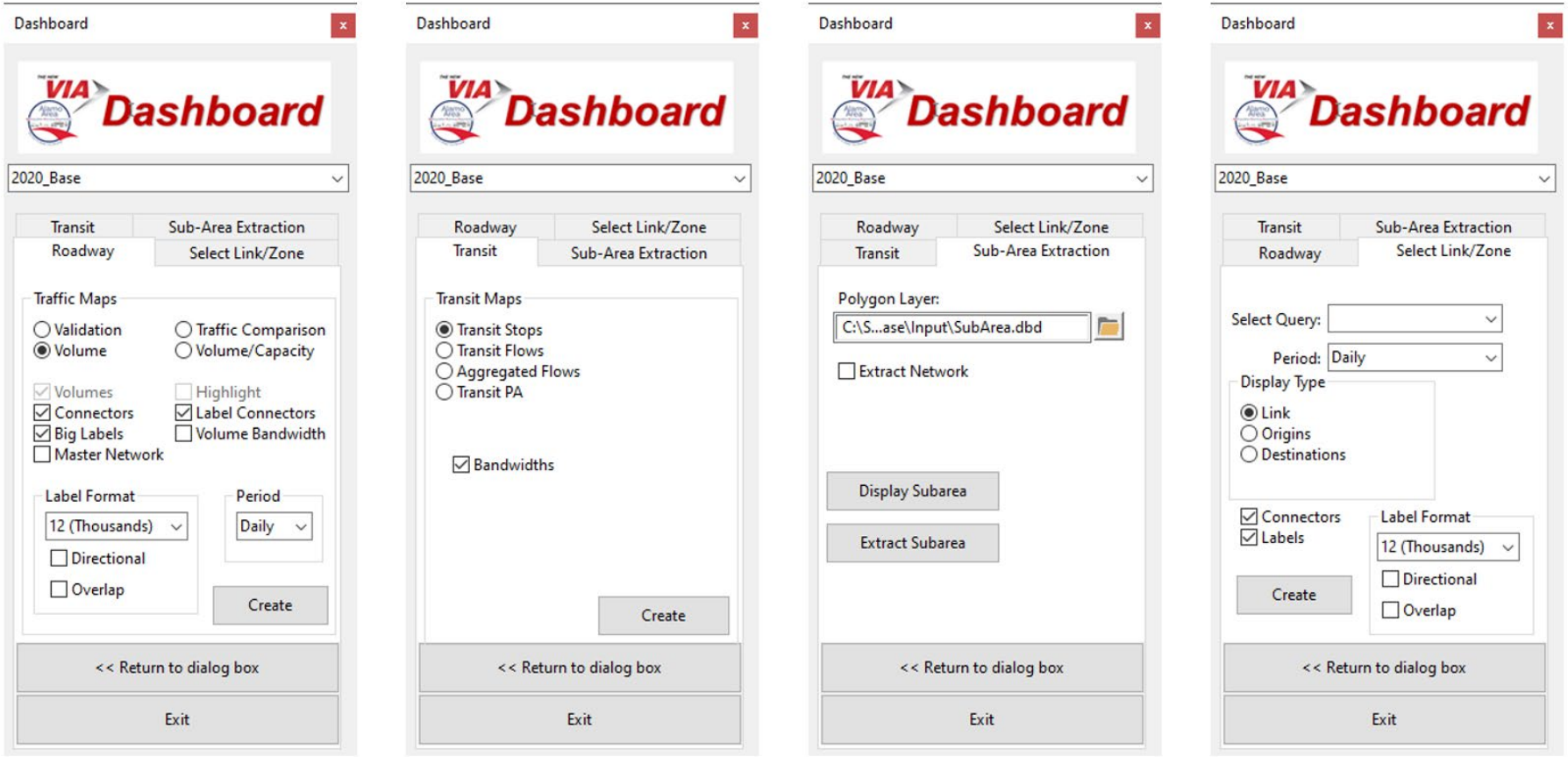


Figure 4.4 SAMM Summary Report Dialog Box

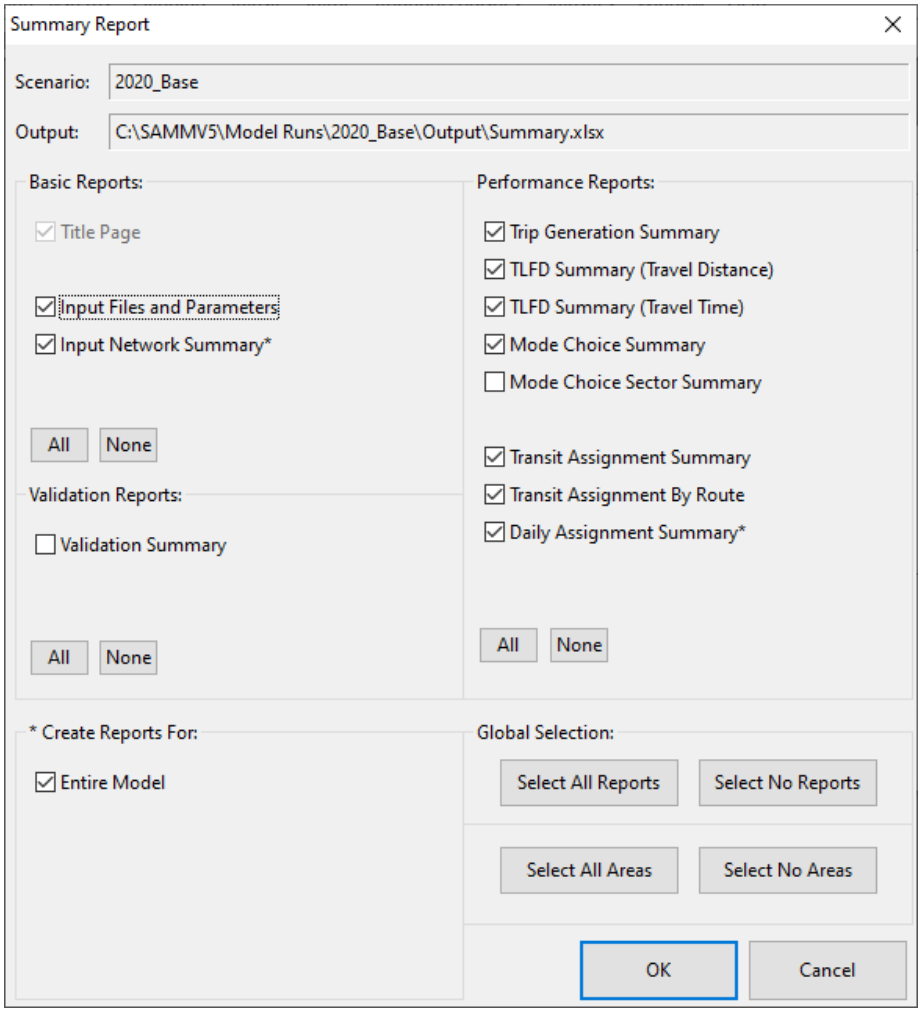


Figure 4.5 SAMM Scenario Toolbox

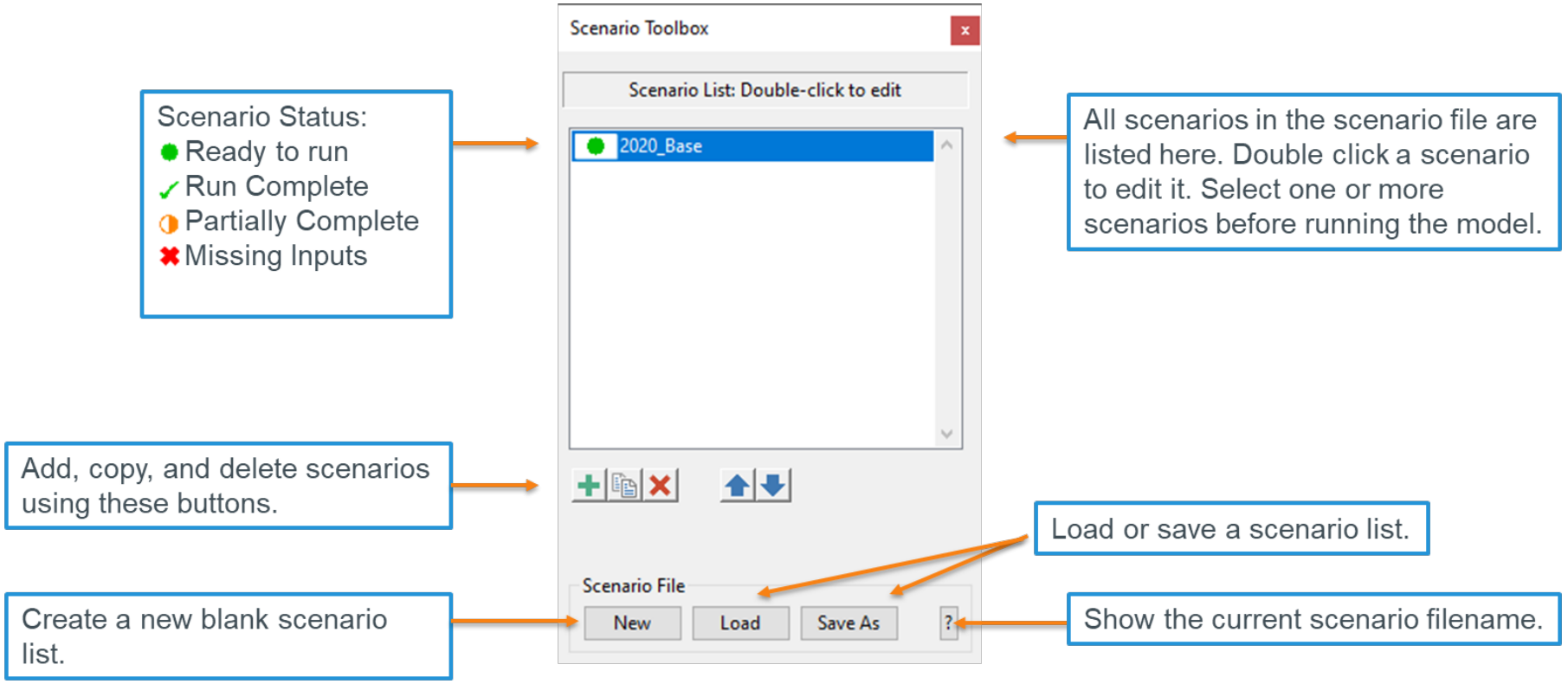


Figure 4.6 SAMM Scenario Editor - Inputs

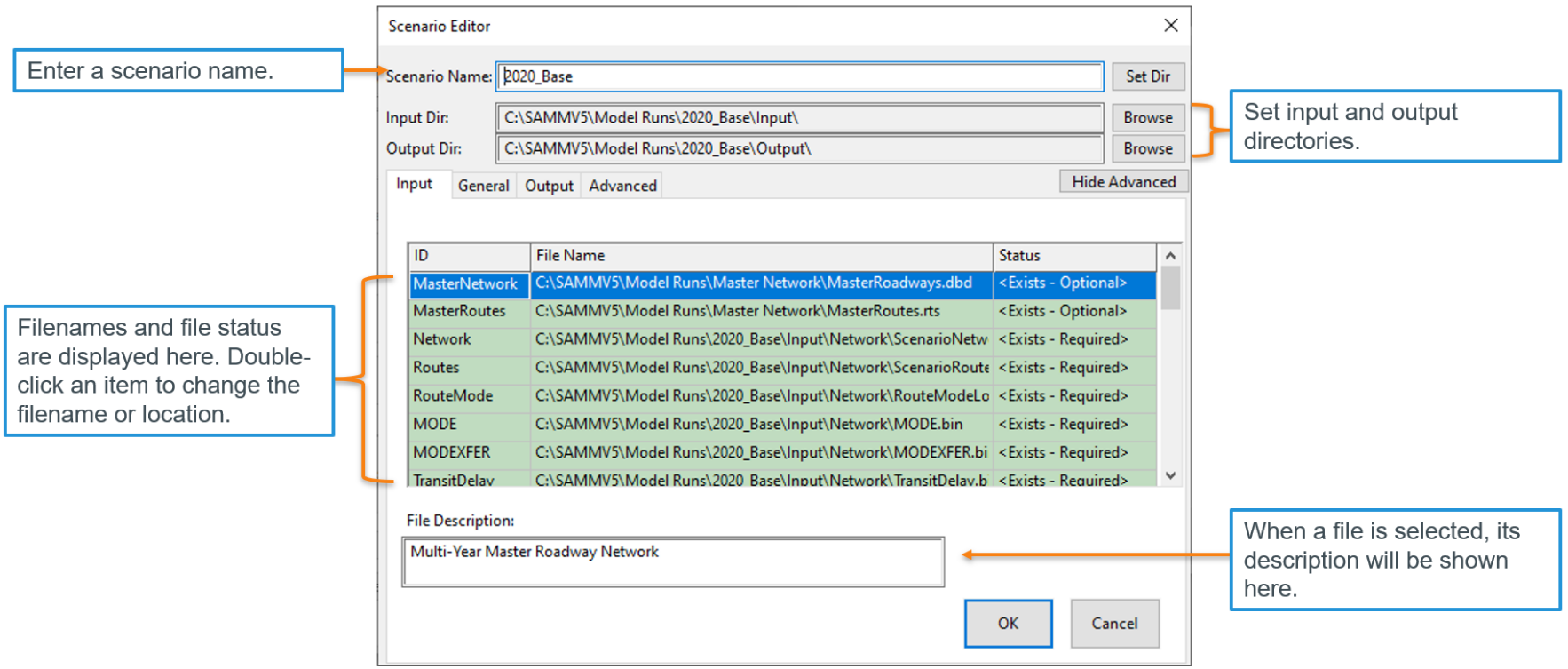


Figure 4.7 SAMM Scenario Editor - General

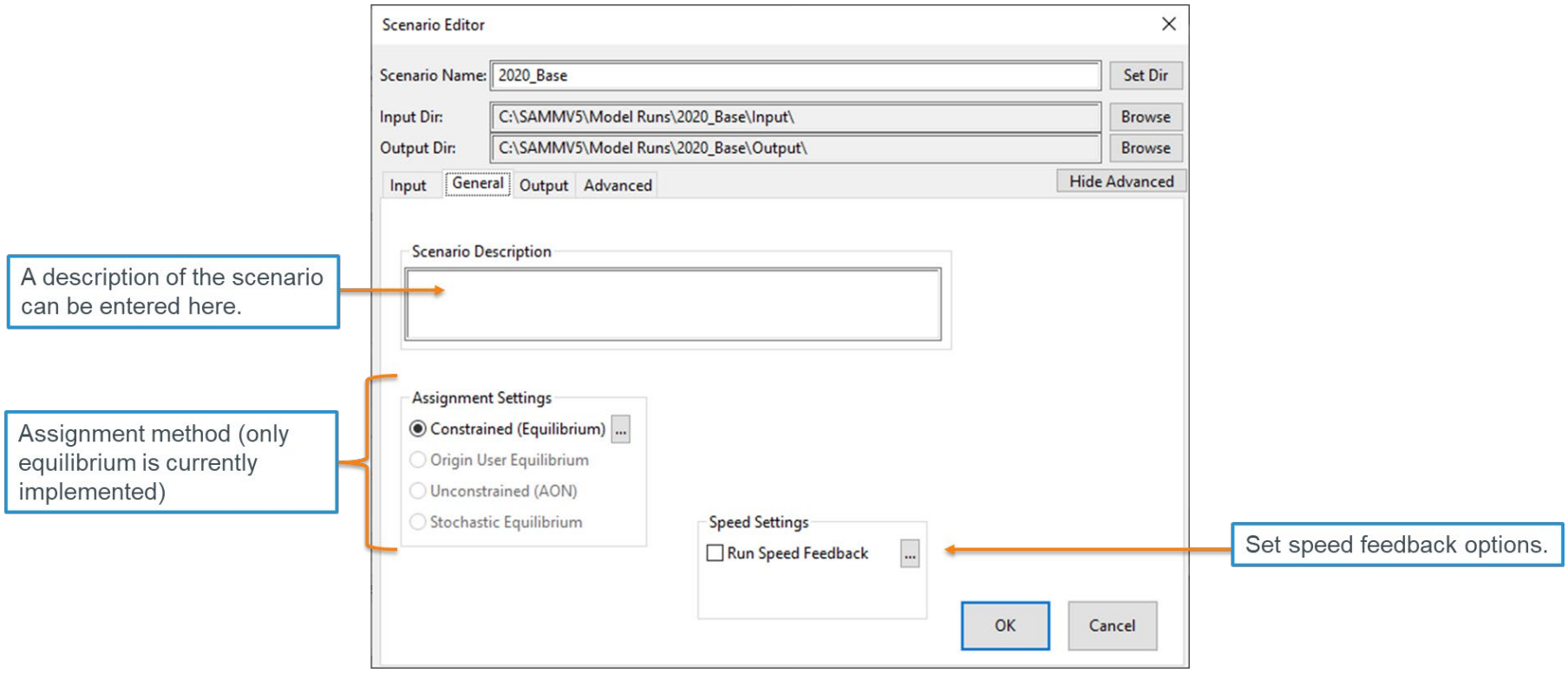
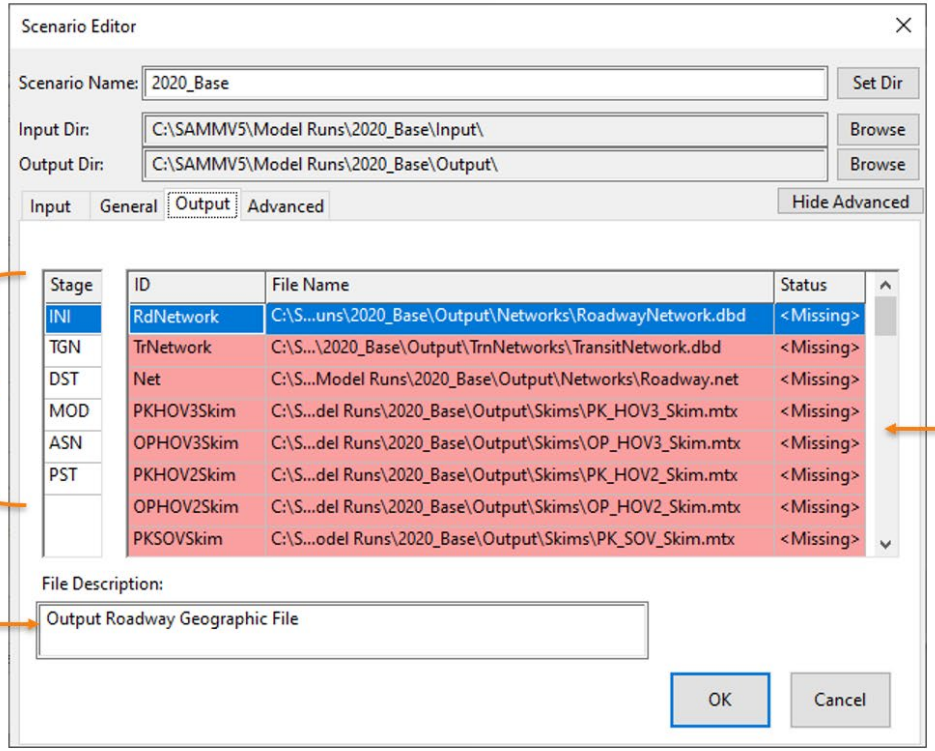


Figure 4.8 SAMM Scenario Editor - Output



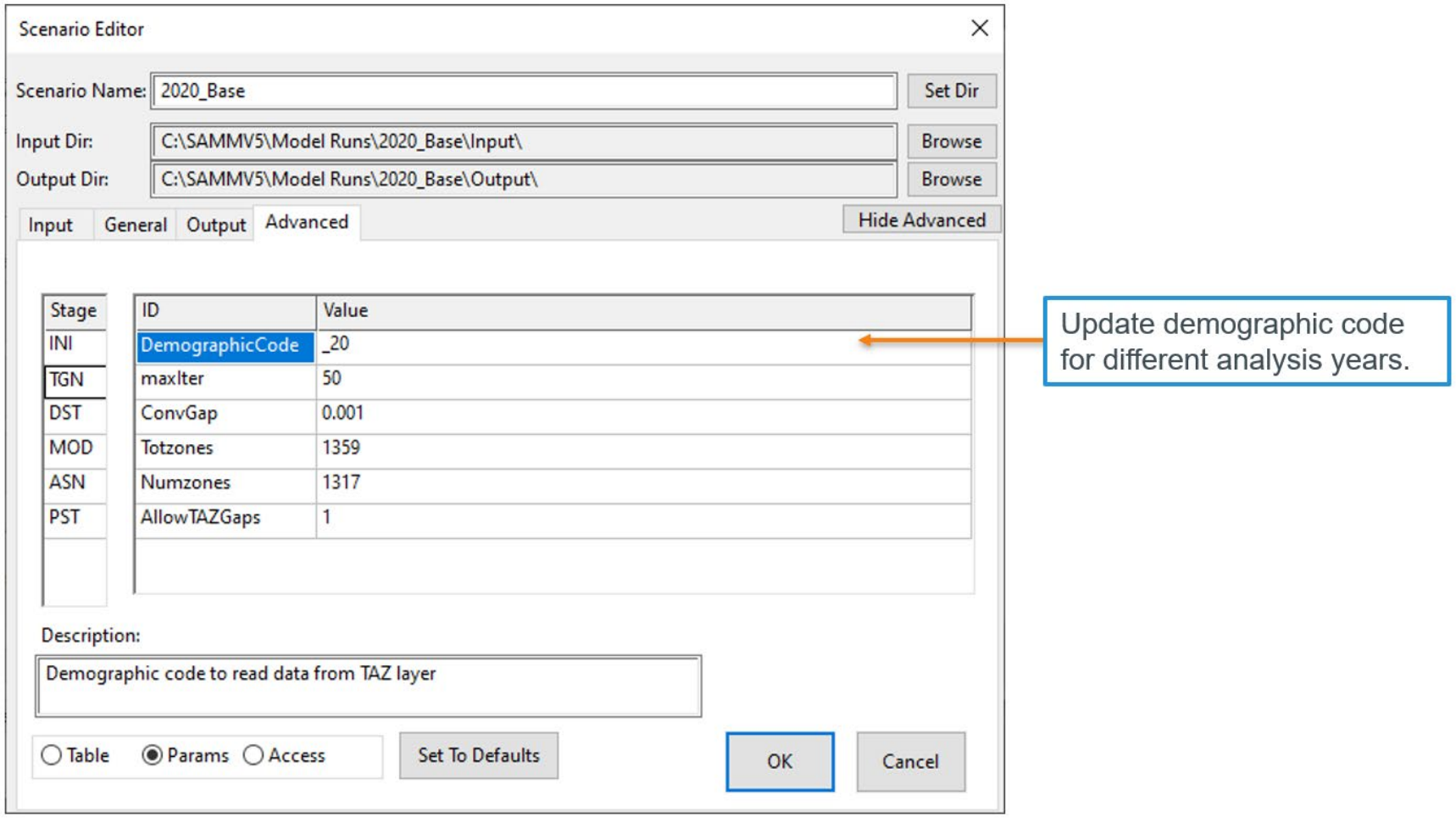
Different model stages are listed here.

When a file is selected, its description will be shown here.

Filenames and file status are displayed here. Double-click an item to change the filename or location.

Note: *Files will be missing until the model has been run.*

Figure 4.9 SAMM Scenario Editor – Demographic Code



The model dialog box, shown in Figure 4.1, provides a great deal of flexibility in how the model is run, but in most cases a very simple approach can be taken.

- To run a standard, complete model run simply start the model dialog box, create a scenario, identify any missing files, and click on *Step 1 – Prepare Networks*. The model will be run with the standard default settings.
- To automatically create a performance report when the model run is complete, select the appropriate checkbox.
- If buttons are disabled, this is usually due to missing input files or invalid settings.

4.2.2 Network Utilities

Master Networks

A pair of tools allow editing a master network and creating a scenario network based on a master network file. These tools are described in Section 4.3 - Working with the Master Network.

Compare Networks

The Compare Networks tool compare two networks of two different years, and highlights links that are in one network but not the other. For the links that are common to both networks, the tool also checks for links having:

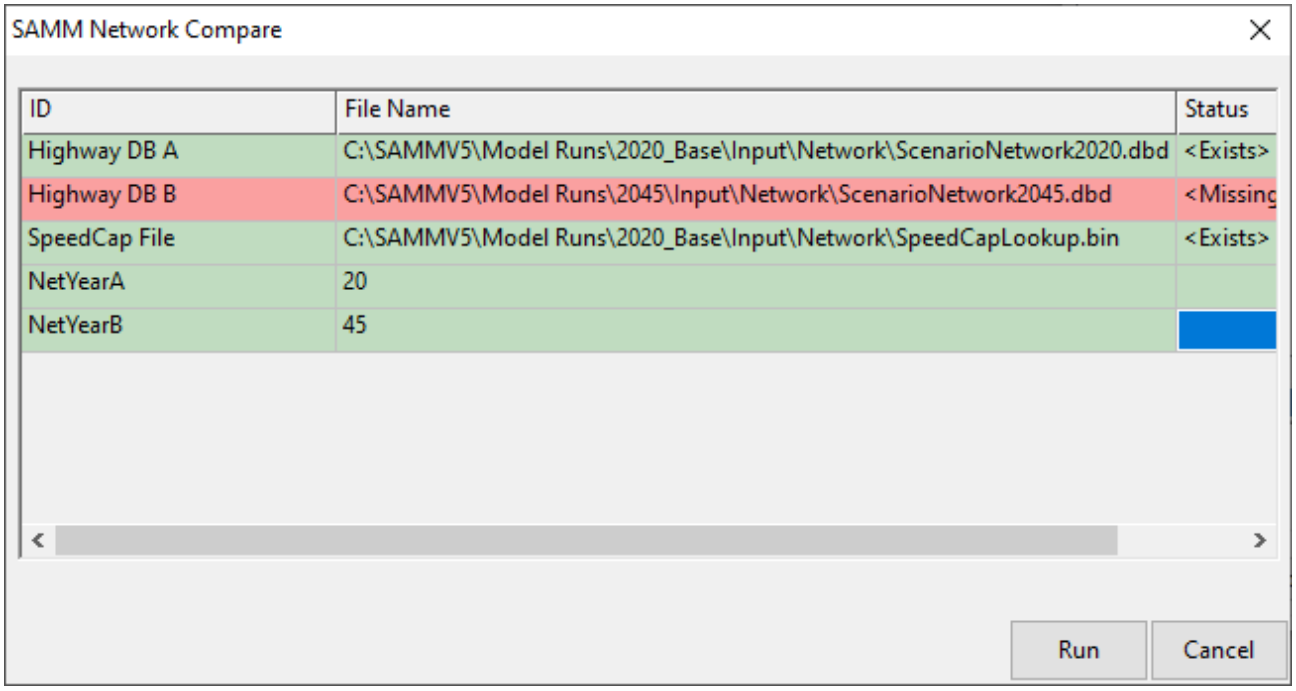
- Same facility type, same area type, and/or same number of lanes; different capacity
- Different facility type, different area type, and/or different number of lanes; same capacity
- Different facility type, different area type, and/or different number of lanes; different capacity

The tool can be found in the Utilities section in the model interface (Figure 4.2).

When the tool launches (Figure 4.10), it asks that the user point to the two network files, the location of the speed capacity lookup table for capacity calculations, and the two comparison years for notation purposes. The files are selected by double clicking on File Name, whereas the years are updated by typing in the proper suffix.

The tool will not work if NetYearA is the same as NetYearB.

Figure 4.10 SAMM Network Compare Dialog Box

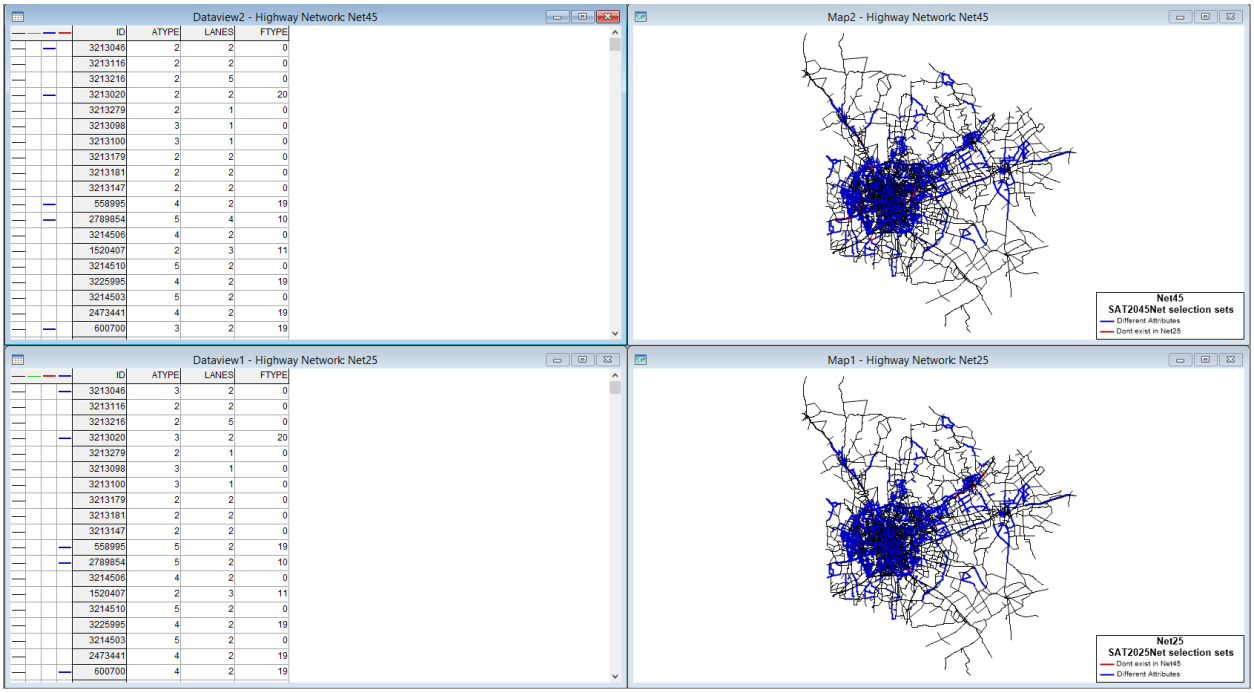


The output files are stored in the Output folder in the directory where Highway DB A is located. These are:

1. A table listing link IDs of links in Highway DB A but not in Highway DB B.
2. A table listing link IDs of links in Highway DB B but not in Highway DB A.
3. A table listing link IDs of links common to both networks with differences in link attributes (facility type, area type, and/or number of lanes) but same link capacities.
4. A table listing link IDs of links common to both networks with differences in link attributes (facility type, area type, and/or number of lanes) and different link capacities.
5. A table listing link IDs of links common to both networks with identical link attributes (facility type, area type, and/or number of lanes) but different link capacities.
6. An HTML file that consolidates the comparisons presented in the tables above.

In addition to the output files the tool generates, the user is presented with the output results in both tabular and map formats, shown in Figure 4.11.

Figure 4.11 SAMM Network Compare Sample Output

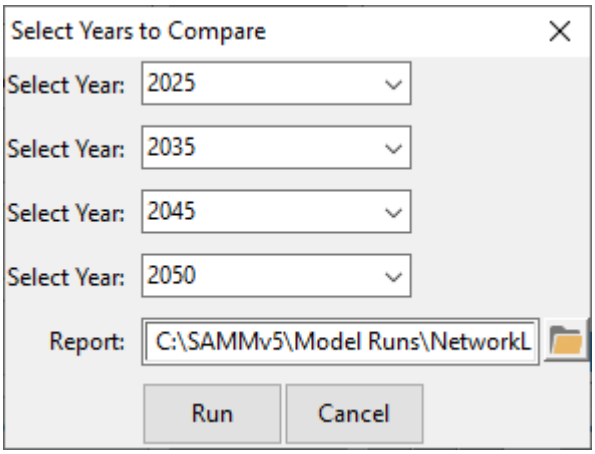


Link Difference Tool

The Link Different List tool lists out all the links in the master network along with their associated projects, if applicable, and the facility type and number of lanes in the 2017 base network as well as four additional user-defined years. The tool can be found in the Roadway Network section in the model interface.

When the tool launches, it asks that the user to define four years to list attributes for in addition to the 2017 base year (see Figure 4.12). The user can also select the directory where the CSV output file will be saved. If fewer than four years are needed, the user can repeat the same year as needed and then delete columns from the resulting list.

Figure 4.12 Link Difference List Tool

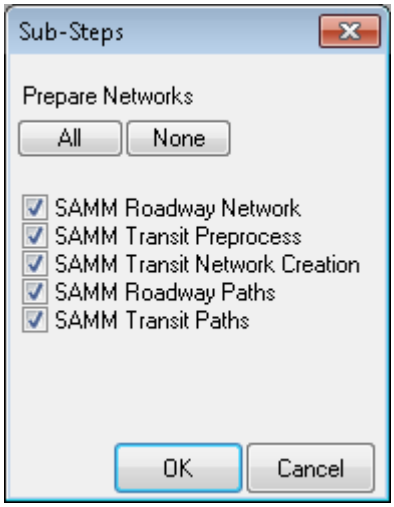


4.2.3 Running Selected Model Steps

The user interface can be set to run only selected model steps or sub-steps. To run only a single step, click the "Stop after each step" checkbox in the main model dialog box. When this box is checked, the selected step will be run, but subsequent steps will not. When this checkbox is cleared, subsequent steps will be run automatically.

To exclude certain sub-steps or to run only selected sub-steps, the dialog shown in Figure 4.13 can be used. By clicking on the ··· button to the left of each model step, the user can enable or disable specific steps. The behavior of the "Stop after each step" checkbox is not changed when sub-steps are enabled or disabled.

Figure 4.13 Sub-Steps Dialog Box



4.2.4 Running Speed Feedback

Speed feedback can be enabled for a scenario from within the scenario editor. When enabled, speed feedback will only be run if:

1. The model is *not* set to stop after each step, and
2. The model is started from Step 1.

Otherwise, the model will be run as if the selected scenario is not set to run speed feedback. When the model is run with speed feedback enabled, a file named "Feedback.txt" is created in the model output directory. This file is updated as the model runs and contains a history of speed feedback convergence process. The file can be used to determine whether speed feedback has converged successfully or additional iterations are needed. Furthermore, the file can be opened while the model is running to check speed feedback convergence progress in real time.

When performing alternatives analysis exercises, it is often preferable to run the model without including the effects of speed feedback. In such cases, it is still important that trip distribution patterns are consistent with a baseline scenario (e.g., an existing plus committed model run). Running the travel model with speed

feedback enabled also requires considerably longer than running the model with speed feedback disabled. It is possible to run the model without speed feedback and utilize speed feedback results from a previous model run to produce consistent trip distribution results. To do this, follow the steps listed below:

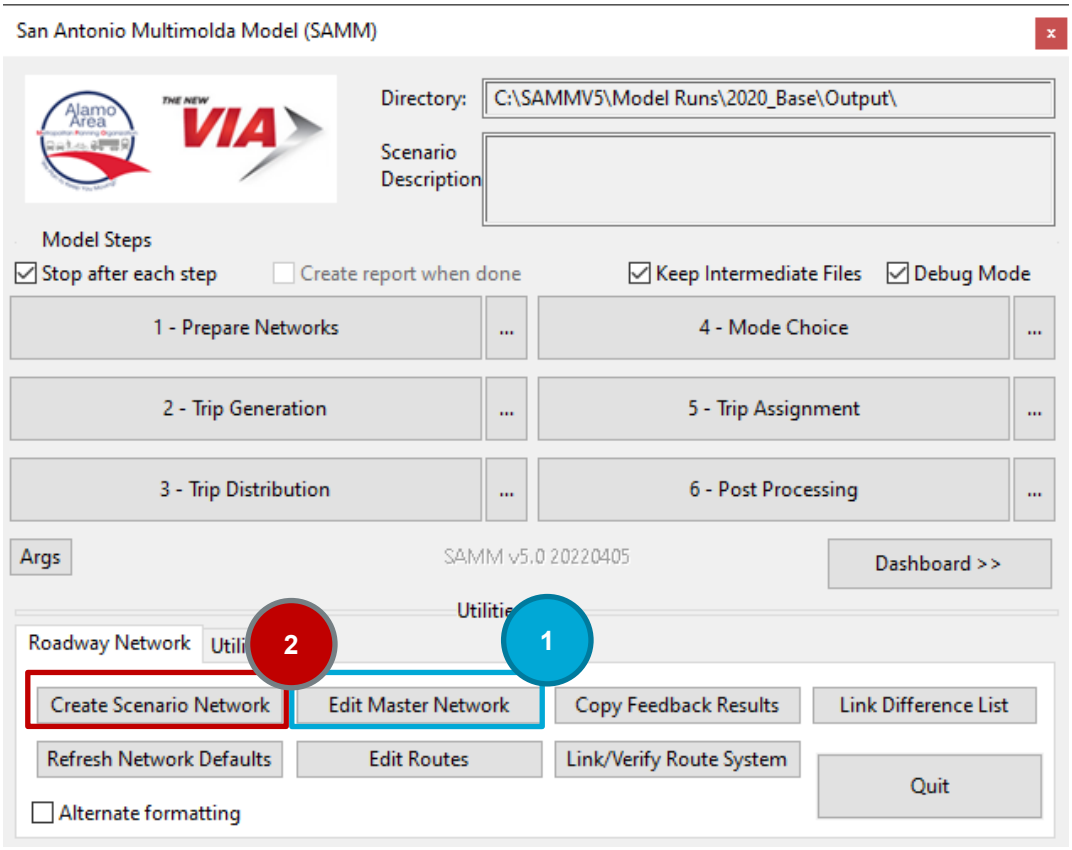
1. Run a complete model run with speed feedback enabled.
2. Use the *Copy Feedback Results* utility to save resulting speeds to the input network file.
3. Create a new scenario that uses similar roadway and socioeconomic data assumptions.
4. The scenario may include network alternatives or changes to socioeconomic data.
5. Set the new scenario to run without speed feedback.
6. Run the new scenario.

The speed feedback utility copies AM and MD speeds after assignment onto the roadway network. They serve as “warm-up” peak and off-peak speeds, respectively, for the skimming procedure of the subsequent iteration.

4.3 Working with the Master Network

The master roadway network stores roadway data representing different years in one consolidated network layer. To accomplish this, selected network attribute names are appended with a two- through four-digit suffix representing a particular year. By representing multiple networks in one network file, consistency between baseline and forecast networks is enforced. Furthermore, this approach eliminates the need to edit multiple network files when making a change in a baseline or interim year network.

The figure below identifies buttons that allow 1) editing the master network and 2) creating a scenario network. The sections that follow provide guidance on working with the master network tools.



4.3.1 Representation of Networks by Year

When a particular network is selected for use in the travel model, only attributes corresponding to links belong to the selected year are used by the travel model. Of utmost importance is the facility type attribute. If this attribute is -1 on a link for a particular year, that link will be "closed" to traffic (i.e., will not exist) in the network when that year is selected. If a valid facility type value is found, then the remaining attributes specified for that year will be referenced by the travel model.

This network structure can represent roadway facilities that do not exist in the current network but are planned for future construction. For example, if a new roadway is planned to be built by 2050, it can be represented in the 2050 roadway network but not in the base year roadway network. To implement this, the roadway is added as a new link to the master network layer, but is assigned a facility type of -1 for the base year. A valid 2050 facility type is assigned for this link, along with all other year-specific attributes for 2050.

Roadway network years can be added or deleted using the *Edit Network Year* utility.

4.3.2 Representation of Network Alternatives

Roadway network alternatives provide a mechanism for representing localized network changes individually or in combination. Data for alternatives are stored in a TransCAD Binary file associated with the roadway network geographic file. This table contains a project ID field, fields for all network attributes that can be altered as part of a project alternative, and additional fields for project descriptions and other relevant information. The network links associated with each project are identified by three fields on the roadway

network, PROJECT1, PROJECT2, and PROJECT3. Up to three projects can be applied to a link by entering the project ID in one or more of these fields.

4.3.3 Master Network Data Format

The master network uses a data format that allows management of multiple projects throughout the region, including different projects affecting the same link (e.g., project phasing). This is accomplished by maintaining a set of base year attributes directly on the network geographic file, with all project information stored in a separate table. As illustrated in the figure below, the master network geographic file and project table are combined, along with the associated transit route system, to create a scenario network representative of a specific year or set of projects.

The Create Scenario Network tool updates the following fields, allowing them to represent a user-specified set of future projects:

- DIR
- FUNCL
- FTYPE
- ATYPE
- LANES

4.3.4 Editing the Master Network

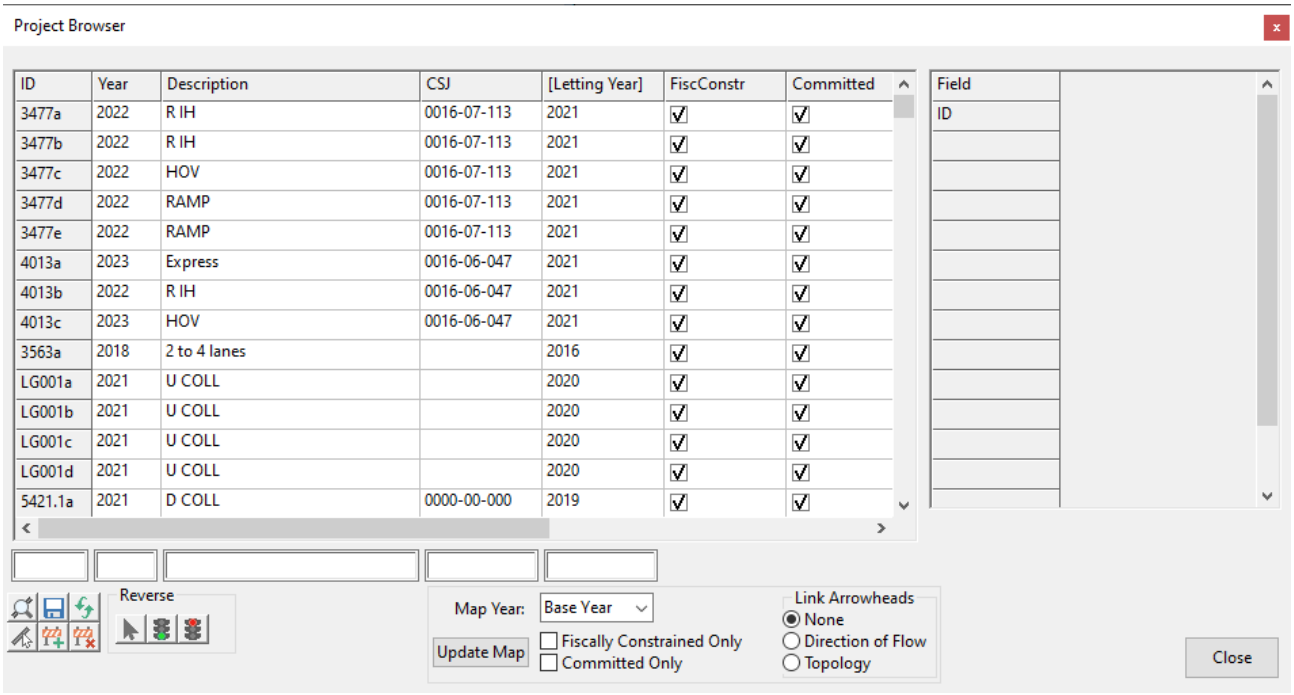
This utility creates a map containing the master roadway network, and then opens the Project Browser window, shown in Figure 4.14. The map is set up and formatted so the user can make changes to the roadway network layer. When launching this utility, the user will first be asked to reload the route system, which is a relatively quick operation. Unless there is an issue with the route system preventing it from being successfully reloaded[1], the route system should be reloaded each time this tool is used.

Edits to the network can be made by opening the *Layer Editing* toolbox (Tools → *Editing* → *Layer Editing Toolbox*). Details on this function can be found in the TransCAD help under *Adding, Deleting, and Editing Line Features.*

The project browser window allows the user to browse and edit all projects present on the Master Network, add new projects, and delete existing projects.

[1] The ability to skip the route system reload allows users to work with the master network editor in cases where the route system is not functional. However, the recommended practice is to correct route system problems prior to working with the master network.

Figure 4.14 Master Network Project Browser

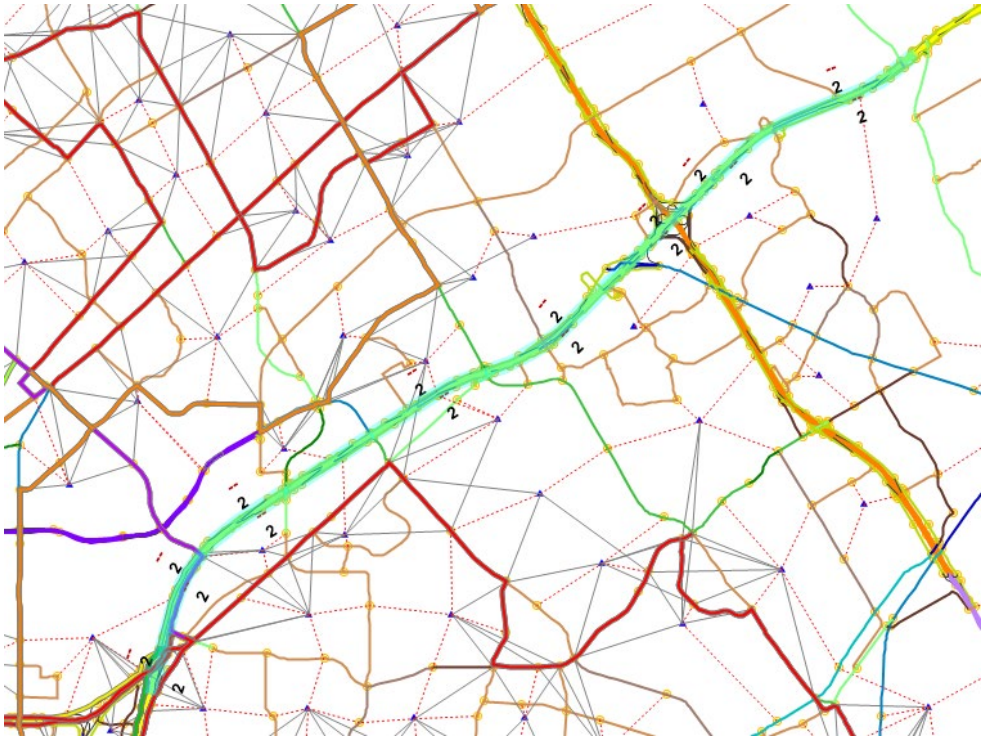


The Project Browser includes two data tables. On the left, the project list displays the project ID, year, and descriptive fields for available projects. On the right, a second table displays attributes for the selected project. Values in both the link and project attributes tables can be modified to edit the network. Only fields that are to be altered as part of the project need to be entered in the attributes table, any fields left blank will remain unchanged from the base condition. To indicate changes that have not been saved all fields that have been modified are highlighted in yellow until the Save button is clicked. Buttons at the bottom of the Project Browser function as described below.

Project Editing Tools

- The Reload button will discard any pending changes and reload the project list from disk.
- The Zoom button will zoom the workspace map to the selected project and highlight project links as demonstrated in Figure 4.15.

Figure 4.15 Master Network Project Browser – Zoom Example

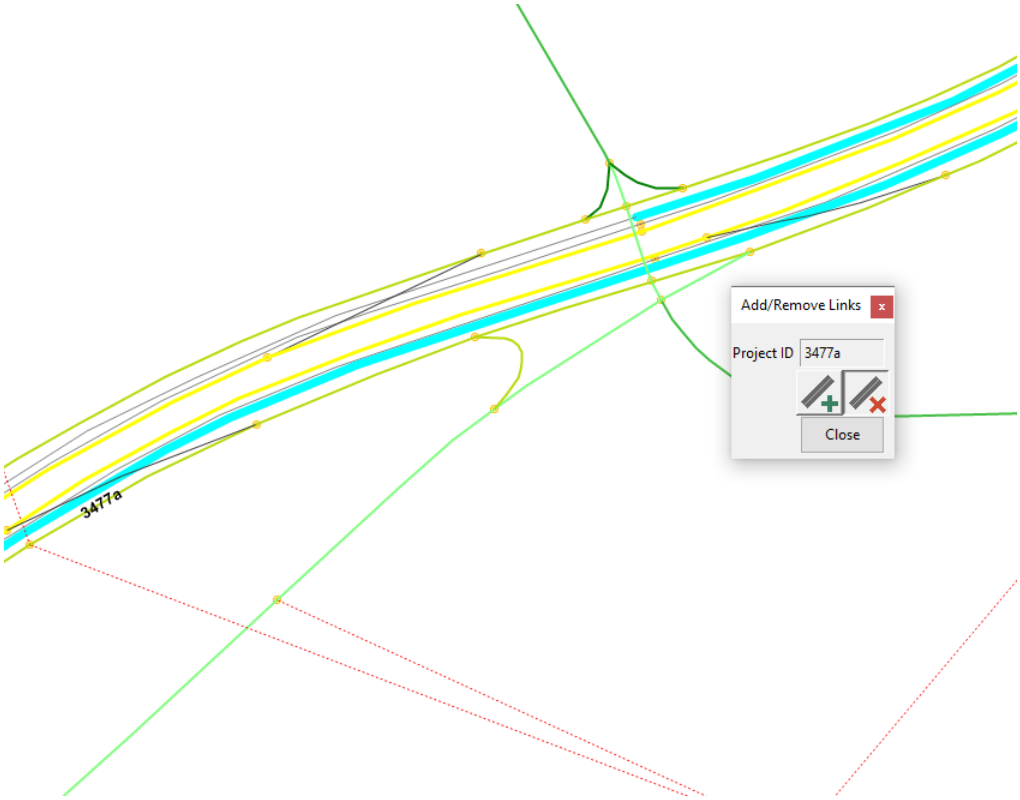


-  The **Add/Remove Links** button opens a toolbox that allows users to select which network links to include in the selected project. If any links are associated with the selected the project, the window will zoom to those links, highlight them, and label them with the project number. If a link is a part of more than one project, all associated project numbers will be displayed. A link can be included in up to three projects. An example workspace is shown in Figure 4.16.

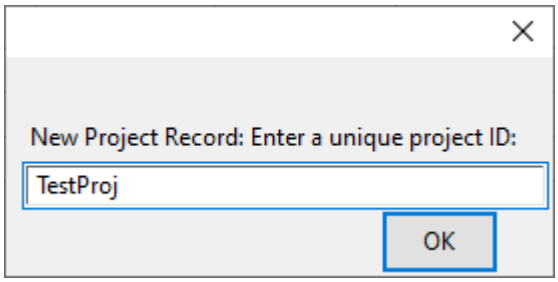
  To add a link to the current project, click on the **Add Link** button, then click on the link to be added. The utility will highlight and label the links as they are clicked to confirm they have been added. To remove a link from the current project, click the **Remove Link** button on the Add/Remove Links toolbox, then click the link you wish to remove from the project. The utility will remove the highlight and label from the link. Clicking the **Close** button will close the toolbox and return to the Project Browser window.

  Links must first be present in the network in order to add them to a project using this utility. Users may add links using the *Layer Editing* Toolbox, then include them in a project using the *Add/Remove Links* toolbox. The Add/Remove Links toolbox does not add or remove links from the network as a whole—only from specific projects.

Figure 4.16 Master Network Project Browser – Add/Remove Links Example



- The Add Project button will add a new record to the project list. A dialog box will ask for a unique project ID before adding the new record. Other project information and attributes can then be entered in the project list and attributes tables.



- The Delete Project button will remove the record of the current project from the project table, as well as remove references to that project number on the network layer.

- Clicking the Save button will save all pending edits to disk.

Link Reversal Tools

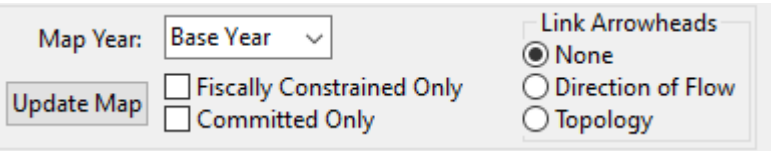
The link reversal tools allow the user to easily reverse the topology of a link. Clicking the arrow button in the Link Reversal tools allows the user to select a link. When a link has been selected it will be highlighted.

Clicking the green light button will reverse the direction of the link. Clicking the red light button will cancel the selection.

Map Year Tools

The map year tools change how the map is displayed. The Link Arrowheads radio buttons allow the user to display arrowheads on links showing either the link topology or direction of flow for one-way links.

The Map Year drop down menu allows the user to display projects in the map for a chosen year. Projects identified as active for the selected year will be displayed in the map with the appropriate link direction and facility type color theme. This can be helpful when editing projects as it allows the user to see the network as it would exist in a given year. Projects to be displayed can be selected by year as well as by their Fiscally Constrained or Committed status using the check boxes. Clicking the Update Map button will display the chosen settings in the map.



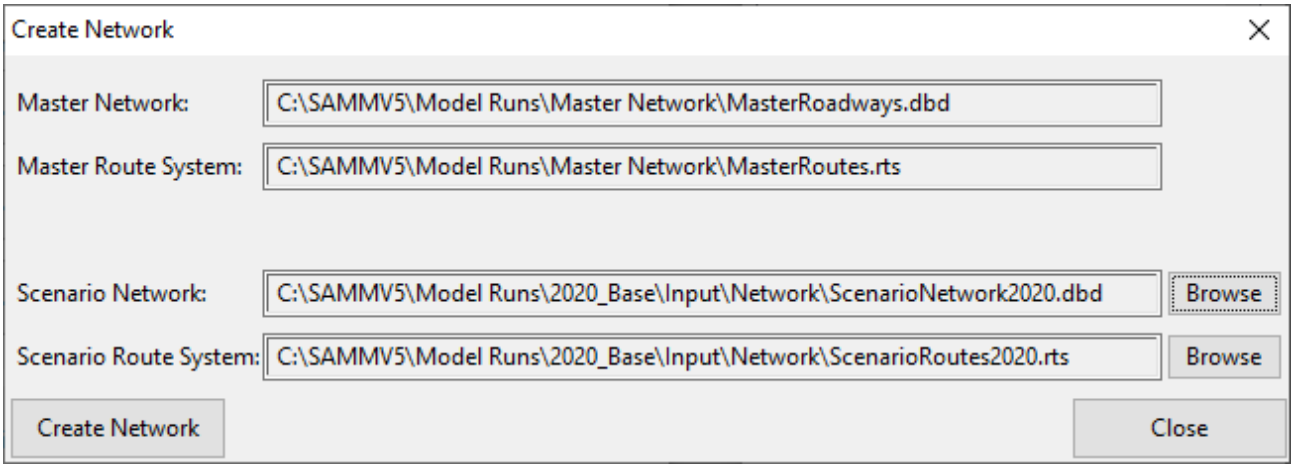
Closing the Project Browser

Clicking the **Close** button will close the Project Browser window, any unsaved changes to the project attributes or descriptive fields will be lost.

4.3.5 Creating a Scenario Network

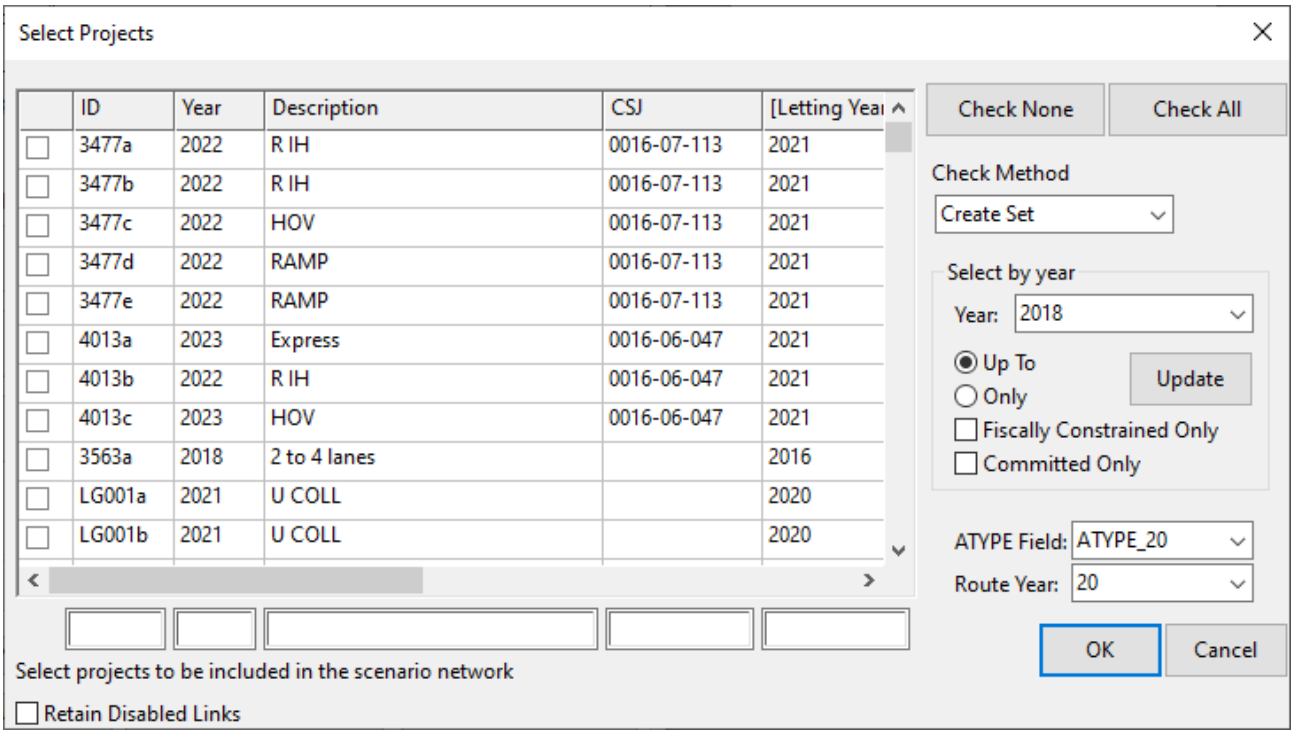
The **Create Scenario Network** button opens a dialog box where the user can specify the location of the master network and route system as well as the desired location of the scenario network and route system.

Figure 4.17 Create Scenario Network Dialog Box



The *Create Network* button then opens the list of projects coded onto the master network, and allows the user to select which projects to be included in the scenario network.

Figure 4.18 Create Scenario Network Utility – Select Projects



The Select Projects Dialog Box

The Select Projects dialog box functions similarly to the Project Browser in the *Edit Master Network* utility, but it does not allow projects to be modified. Projects are listed along with their descriptive fields. The user may filter the list of projects using text boxes below the project fields. Projects to be included in the scenario network are selected using the checkboxes to the left of the project in the list.

Project Selection Tools

The Select Projects dialog box contains tools to assist in the selection of projects. All projects can be selected using the *Check All* button or all checks can be cleared using the *Check None* button. Projects can also be selected in sets. The *Check Method* drop down determines if projects are to be added to a set, removed from the set, or if a new set is to be created. The *Select by year* tool can then be used to select projects based on the project year, and Fiscally Constrained or Committed status. This allows the user to quickly select all projects from a given year, and ensures no projects are omitted.

Selected projects are updated any time a user changes settings in the select by year section of the dialog box, or when the user clicks the **Update** button.

Route Year Selection

The route system year to be copied from the master route system to the scenario route system can be selected from the *Route Year* drop down box in the Select Projects dialog box. All available route years on

the master route system will be listed in the drop-down list. The Route Year should be the same as the scenario network year unless the user wishes to test different transit policies and scenarios. In such cases, it may be necessary to edit the route system file for compatibility with a specific set of projects.

Area Type Field Selection

The area type field to be copied from the master network can be selected from the *ATYPE Field* drop down box in the Select Projects dialog box. This area type field is typically the same year as the scenario network unless the user is running a No Build scenario whereby future demographics will be applied to a network that is not fully developed, say 2050 demographics on a 2020 network. In that case, ATYPE_50 should be selected from the ATYPE Field drop-down menu.

Network Creation

After selections are made, the *OK* button exports a scenario network and route system to the user-defined folder which reflects the defined network year, route system year, and area type field. All projects that have not been selected for this scenario will not show in the scenario network.

4.4 Model Inputs and Outputs

This section outlines the different input files used in each of the model steps, and the various output files resulting from these model steps.

4.4.1 Prepare Networks

This step builds the highway and transit networks. It processes the roadway network by adding to and populating fields in the network, such as capacities by time period, speeds, free-flow times, congested times, volume delay function parameters (alpha and beta), and non-motorized attributes. This step then generates transit networks based on the input route system.

After processing networks, the prepare networks step generates highway, transit, and non-motorized skims.

The input files to this step are listed in Table 4.2 and the output files are shown in Table 4.3.

Table 4.2 Step 1 – Prepare Networks Input Files

Input	Description	File Path	Intermediate
Network	Roadway geographic file	Input\Network\ScenarioNetworkYYYY.dbd	N
SpeedCap	Link speed and capacity lookup file by facility and area type	Input\Network\SpeedCapLookup.bin	N
Routes	Route system file	Input\Network\ScenarioRoutesYYYY.rts	N
RouteMode	Table listing the mode value of each numbered route in the transit route system	Input\Network\RouteModeLookup.bin	N
MODE	TransCAD transit mode definition file	Input\Network\MODE.bin	N
MODEXFER	TransCAD transit mode transfer definition file	Input\Network\MODEXFER.bin	N

TransitDelay	Transit delay lookup file	Input\Network\TransitDelay.bin	N
TransitSpeed	Transit speed lookup file for default BRT and LRT speeds	Input\Network\TransitSpeed.bin	N

Table 4.3 Step 1 – Prepare Networks Output Files

Output	Description	File Path	Intermediate
RdNetwork	Output roadway geographic file	Output\Networks\RoadwayNetwork.dbd	Y
TrNetwork	Output transit geographic file	Output\TrnNetworks\TransitNetwork.dbd	Y
Net	Highway network	Output\Networks\Roadway.net	Y
{PK,OP}{SOV,HOV2,HOV3}Skim	Peak and off-peak highway skims by auto mode	Output\Skims\{PK,OP}_{SOV,HOV2,HOV3}_Skim.mtx	Y
NMSkim	Non-motorized skims	Output\Skims\NMSkim.mtx	Y
{PK,OP}{Walk,Drive}{LOC,EXP,BRT,LRT}Skm	Peak and off-peak transit skims by transit mode and access mode	Output\TrnSkims\Transit{PK,OP}{Walk,Drive}{LOC,EXP,BRT,LRT}.mtx	Y
{PK,OP}{Walk,Drive}{LOC,EXP,BRT,LRT}Tnw	Peak and off-peak transit networks by transit mode and access mode	Output\TrnNetworks\Transit{PK,OP}{Walk,Drive}{LOC,EXP,BRT,LRT}.tnw	N

4.4.2 Trip Generation

This step runs TripCAL6 within the model stream, then runs the vehicle availability model. It then applies time of day factors to separate trips into peak and off-peak time periods.

The input files to this step are listed in Table 4.4 and the output files are shown in Table 4.5.

Table 4.4 Step 2 – Trip Generation Input Files

Input	Description	File Path	Intermediate
TAZ	Master traffic analysis zone polygon file with multi-year demographics	Input\TAZ\SA_Master_TAZ.dbd	N
ZoneData	Socioeconomic and demographic file	Input\TAZ\ZoneDataYYYY.bin	N
DemographicSettings	Cross-classification definition file	Input\TripGen\Demog\SA_Demographics_Setting_HBW.bin	N
JointDistribution	Joint distribution of households	Input\TripGen\Demog\SA_JointDistrib.bin	N
TripPurp	Trip purpose definition file	Input\TripGen\SA_TripPurp_HBW.bin	N
ProdRates	Production rates by purpose	Input\TripGen\SA_ProdRates_HBW.bin	N
AttrSetting	Attraction variable definition file	Input\TripGen\SA_AttrSetting.bin	N
AttrRates	Attraction rates by purpose	Input\TripGen\SA_AttrRates_BW.bin	N
ExternalTotals	Total External trip ends by external stations for autos and trucks	Input\Externals\ExternalTotals2020.bin	N
EESeed	EE seed matrix to create final EE matrix	Input\Externals\EE_seed.mtx	N
VACoef	Table containing vehicle availability model coefficient values (*.bin)	Input\TripGen\VA_Coef.bin	N
TODFactors	Time of day distribution factor file	Input\TripDist\TOD_Factors.bin	N

Table 4.5 Step 2 – Trip Generation Output Files

Output	Description	File Path	Intermediate
PATable	Productions and attractions by trip purpose	• Output\TripGen\PATable.bin •	N
DY_VA_ProdTable	Productions segmented by vehicle sufficiency	• Output\TripGen\DY_VA_ProdTable.bin	N

PKOP_VA_ProdTable	Segmented production table by TOD factors, final table used in later models	•	Output\TripGen\PKOP_VA_ProdTable.bin	Y
PKOP_VA_AttrTable	Segmented attraction table, used to doubly constrain attractions	•	Output\TripGen\PKOP_VA_AttrTable.bin	Y
VA_SumTable	Summary of home-based trips with vehicle availability information	•	Output\TripGen\VA_Summary_ HomeBasedTrips.bin	N
Accessibility	Zone accessibility table	•	Output\TripGen\Zone_Accessibility.bin	N
EETrips	Through trip matrix	•	Output\Externals\EETrips.mtx	Y

4.4.3 Trip Distribution

This step calculates the mode choice logsums and probabilities, then runs the destination choice model.

The input files to this step are listed in Table 4.6 and the output files are shown in Table 4.7.

Table 4.6 Step 3 – Trip Distribution Input Files

Input	Description	File Path	Intermediate
{PK,OP}{SOV,HOV2,HOV3}Skim	Peak and off-peak highway skims by auto mode	Output\Skims\{PK,OP}_{SOV,HOV2,HOV3}_ Skim.mtx	Y
{PK,OP}{Walk,Drive}{LOC,EXP, BRT,LRT}Skm	Peak and off-peak transit skims by transit mode and access mode	Output\TrnSkims\Transit{PK,OP}{ Walk,Drive}{LOC,EXP,BRT,LRT}.mtx	Y
NMSkim	Non-motorized skims	Output\Skims\NMSkim.mtx	Y
ModeCoef	Table containing mode choice model coefficient values	Input\ModeChoice\ModeCoef.bin	N
ModeParam	Excel file containing mdoe choice model constants and	Input\ModeChoice\ModeParamsScaled\ModeParams.xls	N

	density coefficients		
ModeNest	Table containing mode choice nesting coefficients	Input\ModeChoice\ModeNest.bin	N
ZoneData	Socioeconomic and demographic file	Input\TAZ\ZoneDataYYYY.bin	N
TAZ	Traffic analysis zone polygon file	Input\TAZ\SA_Master_TAZ.dbd	N
PKOP_VA_ProdTable	Segmented production table by TOD factors, final table used in later models	Output\TripGen\PKOP_VA_ProdTable.bin	Y
PKOP_VA_AttrTable	Segmented attraction table, used to doubly constrain attractions	Output\TripGen\PKOP_VA_AttrTable.bin	Y
DCCoef	Table containing destination choice model coefficients	Input\TripDist\DC_Coef.bin	N

-
-

Table 4.7 Step 3 – Trip Distribution Output Files

Output	Description	File Path	Intermediate
{PK.OP}mclogsum	Mode choice logsums by segment	Output\ModeSplit\ModeModel\{PK,OP}_ mc_logsums.mtx	Y
{PK,OP}dist	Peak and off-peak person trip PA matrices by segment	Output\TripDist\{PK,OP}_Person_ Trips_Segments.mtx	Y
{DY,PK.OP}distSum	Peak and off-peak aggregated trip PA matrices	Output\TripDist\{DY,PK,OP}_Person_ Trips.mtx	N
{Dist,Time}TLFD	Distance and time trip length frequency distributions by segment	Output\TripDist\{Dist,Time}_TLFD_ {PK,OP}{purpose}.mtx	N

{PK,OP}distExLo	Peak and off-peak distributed EI trips	Output\TripDist\{PK,OP}_Gravity_Exlo.mtx	Y
{PK,OP}distTrTx	Peak and off-peak distributed Truck Taxi trips	Output\TripDist\{PK,OP}_Gravity_TrTx.mtx	Y
ZoneDat	Zonal matrix variables matrix	Output\ModeSplit\ZonalMatrixVariables.mtx	N

-

4.4.4 Mode Choice

This step multiples probabilities calculated in the destination choice step by the person trip table resulting from destination choice.

The input files to this step are listed in Table 4.8 and the output files are shown in Table 4.9.

Table 4.8 Step 4 – Mode Choice Input Files

Input	Description	File Path	Intermediate
{PK.OP}mclogsum	Mode choice logsums by segment	Output\ModeSplit\ModeModel\{PK,OP}_ mc_logsums.mtx	Y
{PK,OP}dist	Peak and off-peak person trip PA matrices by segment	Output\TripDist\{PK,OP}_Person_ Trips_Segments.mtx	Y
AutoOcc	Table containing auto occupancy values for the HOV3+ mode by trip purpose and time period	Input\ModeChoice\AutoOcc.bin	N
{PK,OP}{SOV,HOV2,HOV3}Skim	Peak and off-peak highway skims by auto mode	Output\Skims\{PK,OP}_{SOV,HOV2,HOV3}_ Skim.mtx	Y
{PK,OP}{Walk,Drive}{LOC,EXP, BRT,LRT}Skm	Peak and off-peak transit skims by transit mode and access mode	Output\TrnSkims\Transit{PK,OP}{ Walk,Drive}{LOC,EXP,BRT,LRT}.mtx	Y
NMSkim	Non-motorized skims	Output\Skims\NMSkim.mtx	Y
TAZ	Traffic analysis zone polygon file	Input\TAZ\SA_Master_TAZ.dbd	N

-

Table 4.9 Step 4 – Mode Choice Output Files

Output	Description	File Path	Intermediate
Veh{PK.OP}	Peak and off-peak vehicle trip PA matrices	Output\ModeSplit\{PK,OP}VehTrips.mtx	Y
Person{PK,OP}	Peak and off-peak person trip PA matrices	Output\ModeSplit\{PK,OP}PersonTrips.mtx	N
Trn{PK,OP}	Peak and off-peak transit trip PA matrices	Output\ModeSplit\{PK,OP}TrnTrips.mtx	Y
SchBusTrips	School bus trip PA matrix	Output\ModeSplit\SchoolBusTrips.mtx	N
SegmentTotals	Mode choice trip totals by segment	Output\ModeSplit\SegmentTotals.bin	N
DailyOD	Daily vehicle trip OD matrix	Output\ModeSplit\DailyOD.mtx	N

•

4.4.5 Trip Assignment

This step runs highway and transit assignment. The Time of Day sub-step applies time of day factors to further separate the peak and off-peak vehicle trip matrices in production to attraction (PA) format resulting from mode choice step into AM, PM, MD and NT matrices in origin-destination (OD) format.

The input files to this step are listed in Table 4.10 and the output files are shown in Table 4.11.

Table 4.10 Step 5 – Trip Assignment Input Files

Input	Description	File Path	Intermediate
Veh{PK.OP}	Peak and off-peak vehicle trip PA matrices	Output\ModeSplit\{PK,OP}VehTrips.mtx	Y
RdNetwork	Output roadway geographic file	Output\Networks\RoadwayNetwork.dbd	Y
Net	Highway network	Output\Networks\Roadway.net	Y
Trn{PK,OP}	Peak and off-peak transit trip PA matrices	Output\ModeSplit\{PK,OP}TrnTrips.mtx	Y
TrNetwork	Output transit geographic file	Output\TrnNetworks\TransitNetwork.dbd	Y
Routes	Route system file	Input\Network\ScenarioRoutesYYYY.rts	N
TODFactorsAssign	Time of day factor file for trip assignment	Input\Assignment\TOD_Factors_assign.bin	N

•

Table 4.11 Step 5 – Trip Assignment Output Files

Output	Description	File Path	Intermediate
{AM,PM,MD,NT}OD	AM, PM, MD and NT vehicle trip OF matrices	Output\HwyAssign\{AM,PM,MD, NT}OD.mtx	N
Flow{AM,PM,MD,NT,DY}	AM, PM, MD, NT and DY flow files	Output\HwyAssign\Flow{AM,PM, MD,NT,DY}.bin	N
{PK,OP}{Walk,Drive}{LOC,EXP,BRT,LRT}_TrnAsn}	Peak and off-peak boarding and flow files by transit mode and access mode	Output\TrnAssign\ PK,OP}{Walk,Drive}{LOC,EXP,BRT, LRT}_{OnOff,AFlow,WFlow, TFlow}.bin	Y

-
-

4.4.6 Post Processing

This step combines peak and off-peak transit assignment results to produce daily boardings and transit flows.

The input files to this step are listed in Table 4.12 and the output files are shown in Table 4.13.

Table 4.12 Step 6 – Post Processing Input Files

Input	Description	File Path	Intermediate
{PK,OP}{Walk,Drive}{LOC,EXP,BRT,LRT}_TrnAsn}	Peak and off-peak boarding and flow files by transit mode and access mode	Output\TrnAssign\ PK,OP}{Walk,Drive}{LOC,EXP,BRT, LRT}_{OnOff,AFlow,WFlow, TFlow}.bin	Y

-

Table 4.13 Step 6 – Post Processing Output Files

Output	Description	File Path	Intermediate
{PK,OP}{Walk,Drive}All TrnAsn	Peak and off-peak boarding and flow files by all transit modes and access modes	Output\TrnAssign\ PK,OP}{Walk,Drive}All_{OnOff,AFlow,WFlow, TFlow}.bin	N

-

5.0 Mapping Dashboard

The dashboard allows the model user to quickly create useful maps that visualize roadway and transit assignment results or display results of a select link or zone analysis. The dashboard also supports sub-area extraction, producing an origin-destination vehicle trip table for a selected area.

5.1 Roadway

The Roadway tab produces maps that visualize highway assignment. Types of roadway maps that can be created are listed below.

1. **Validation:** This map can only be run for the Daily time period as it compares daily assigned volumes to counts stored in the VAL_CNT field on the scenario network. Labels are color-coded to show where the assigned volumes are reasonably similar to the traffic count (yellow), are significantly higher than the count (red), or are significantly lower than the count (blue). Labels shown the daily model volume in thousands of daily vehicles, followed by the traffic count in parentheses, also in thousands of daily vehicles. Labels on links without counts only show the model results.

2. **Volume:** This map shows model volumes assigned to the highway network. If the Volume Bandwidth checkbox is activated, the map also varies the thickness of the link based on the assigned volumes.

3. **Traffic Comparison:** This map requires two completed scenarios and shows differences between two selected scenarios. It indicates the direction of change using line color and the magnitude of change using line thickness.

4. **Volume/Capacity:** This map uses a color theme to show volume to capacity (V/C) ratios resulting from traffic assignment, starting with green to indicate low V/C ratios, to red for high V/C ratios indicating increased congestion.

5.2 Transit

The transit tab produces maps that visualize transit assignment and mode choice results. Types of transit maps that can be created are listed below.

1. **Transit Stops:** This map shows the daily stop activity at each node, represented by as pie charts displaying boardings, alightings, and transfers.

2. **Transit Flows:** This map shows passenger volume between stops on each of the transit routes. In many cases, multiple routes share a link. In such cases, volumes are provided separately for each route traversing the link.

3. **Aggregated Flows:** This map shows the number of passengers between stops combined for all transit routes that use a link.

4. **Transit PA:** This is a dot-density map showing the density of transit productions and attractions by TAZ.

5.3 Sub-Area Extraction

The Sub-Area Extraction tab is used to extract trip tables for a defined subarea, while treating all links that cross the subarea boundary as external stations.

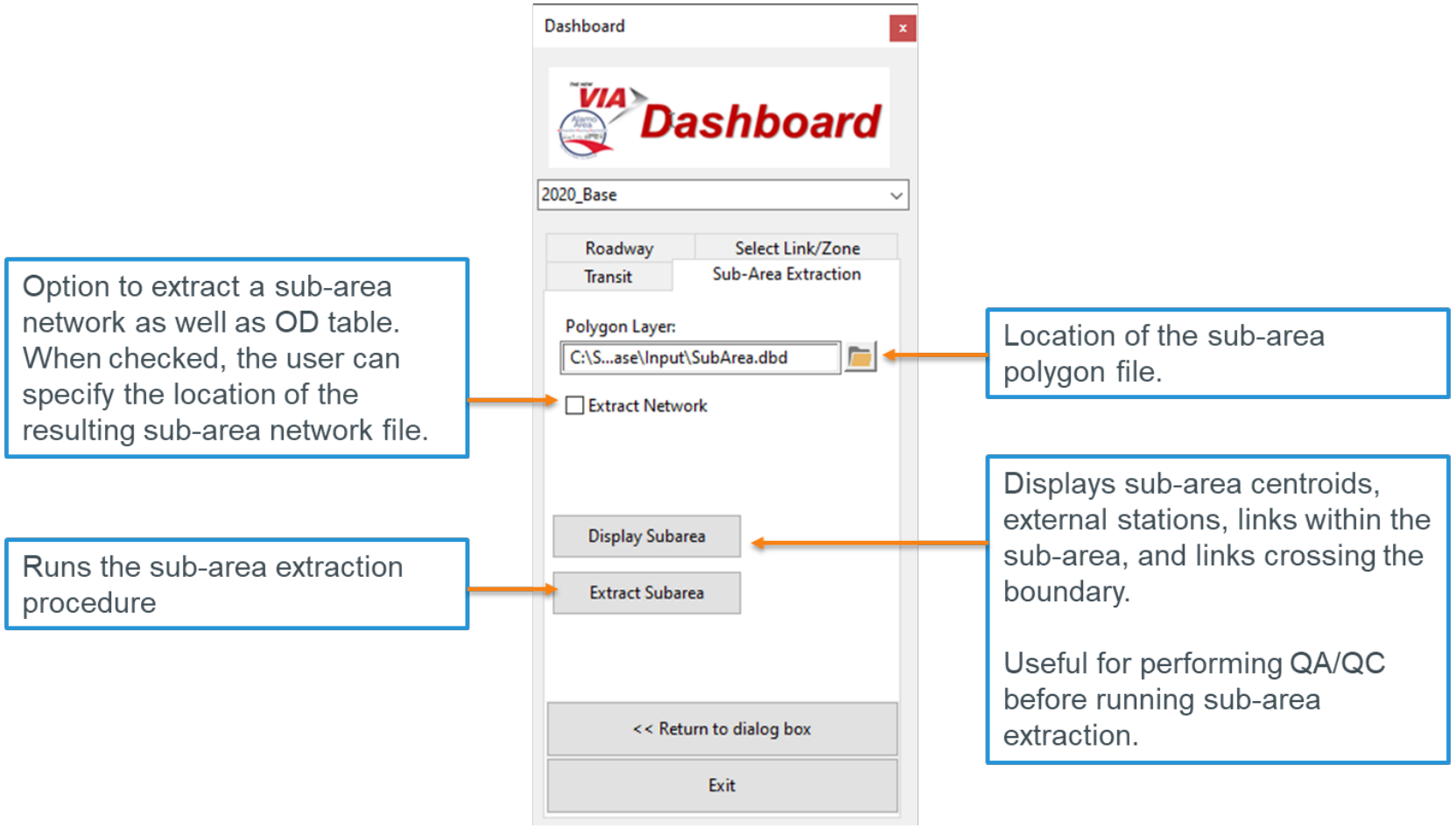
The input file for this tool is a geographic file (*.dbd) defining the subarea boundary. This file can be imported from an ESRI shapefile (.shp) or created within TransCAD as follows:

1. Open your roadway geographic file.
2. File > New > Geographic File > Area Layer
3. Add a dummy field to provide structure for the new layer.
4. Specify the path where the new file is to be saved.
5. Press F10 to show the Layer Editing toolbar.
6. Click on the Add Boundary Edge button to draw the boundaries of the subarea over the underlying network.
7. Press the green light button to save your changes.

The sub-area extraction runs traffic assignment by time period in subarea extraction mode. This extracts the subarea network and generates vehicle trip OD tables by time period for the subarea.

An annotated screenshot of the sub-area extraction utility is shown in Figure 5.1.

Figure 5.1 Subarea Extraction Utility



5.4 Select Link/Zone

The Select Link/Zone tab in the dashboard allows the user to visualize the results of a select link/zone analysis that has already been run. A select link/zone query is an optional input in the scenario manager. When it exists, the select link/zone analysis is run during traffic assignment. If a scenario has already been run, the user can identify the select link/zone query in the scenario manager and rerun traffic assignment step to create select link/zone analysis results without re-running the entire model.

6.0 Roadway Network Coding

This section describes the SAMM roadway scenario network format and coding conventions. The SAMM Add-In requires many fields to be correctly populated prior to the start of a model run. The model uses a set of lookup tables and formulas to fill capacity and speed values on the roadway network.

6.1 Roadway Network Data Dictionary

SAMM requires an input scenario network that contains information provided by users, as well as an output copy of the roadway network that includes additional information populated from lookup tables or calculated based on input data. Fields present on the input scenario network are listed in Table 6.1, along with notes about the source of such fields. Table 6.2 lists the fields created and populated in on the output scenario network during model Step 1 – Prepare Networks. Node fields are listed in Table 6.3.

Functional class, facility type, and area type codes are documented in Table 6.4 and Table 6.5.

Table 6.1 Roadway Network Link Fields

	Field Name	Description	Method / Notes
♦	ID	TransCAD unique link identifier	Auto
♦	Dir	Link direction (0, -1, or 1)	Manual via Master Network (3). Also managed by TransCAD.
♦	Length	Link length in miles	Auto
	[Street Name]	Street name	Manual
♦	FUNCL	One-digit functional class code	Manual via Master Network (3)
♦	FTYPE	Two-digit facility type code	Manual via Master Network (3)
♦	LANES	Total number of lanes (both directions)	Manual via Master Network (3)
♦	{AM/PM/MD/NT}_HOV_Flag	Indicates an HOV lane, with 2 allowing 2+ vehicles and 3 allowing 3+ vehicles	Manual via Master Network (3)
♦	Toll_Car	Toll for passenger vehicles in dollars	Manual via Master Network (3)
♦	Toll_Truck	Toll for trucks in dollars	Manual via Master Network (3)
♦	SPEED_U	User speed override. Replaces speeds from the lookup table for links with values.	Manual via Master Network (3)
♦	SPEED_HOV	Speed adjustment for HOV lanes. Value added to lookup tables speeds. Ignored if SPEED_U is used.	Manual via Master Network (3)
♦	SPEED_EX	Speed adjustment for Express lanes. Value added to lookup tables	Manual via Master Network (3)

	Field Name	Description	Method / Notes
		speeds. Ignored if SPEED_U is used.	
♦	{AB/BA}_CAPACITY_U	User capacity override. Values are entered as daily capacity per lane and converted to total capacity by time period.	Manual via Master Network (3)
♦	PKFB_AB / PKFB_BA	Congested travel speeds saved from a successful speed feedback run. If not present, values in SPEED_INPUT are used for trip distribution and mode choice.	Optional
♦	OPFB_AB / OPFB_BA		Optional
♦	ATYPE_{yy}	Area type code	Stored by year in the master network, separate from project alternatives.
	COMMENTS		
	DESCRIPTION		
	COUNTY	County containing link (text)	Manual
	CountyCode	County containing link (numeric code)	Manual
	[POSTED SPEED]	Posted speed limit	Manual
♦	ALPHA	Volume delay alpha value	Lookup (1)
♦	BETA	Volume delay beta value	Lookup (1)
	TAZ	Traffic analysis zone containing link	Manual
	MPO	Identifies links that are within the MPO boundary	
	Sector	Trip distribution / K-factor sector value	Manual
	Sector Trend	Sector growth rate	Manual
	Trend_05to15	10-year growth rate	Manual
	Trend_15to25	10-year growth rate	Manual
♦	SCFAC_AB / SCFAC_BA	Factor applied to streetcar travel time	Manual (2)
♦	GFAC_AB / GFAC_BA	Factor applied to fixed guideway travel time	Manual (2)
	Station_No	These fields contain traffic count information, including traffic counts from previous models.	
	[Station ID]		
	RAW_2000		
	RAW_2005		
	RAW_2010		
	RAW_2015		
	RAW_2020		
	COUNT_FLAG	Contains 1 to indicate a count is estimated, or 0 to indicate an actual count.	
	AXLE_FACTOR	Factor used to adjust raw counts for trucks.	
	COUNT2005	2005 traffic count value.	
	COUNT2010	2010 traffic count value. Values ending in “0” indicate actual counts, while values ending in “1” indicate estimated counts.	

	Field Name	Description	Method / Notes
	COUNT2015	2015 traffic count value. In most cases, values ending in "0" indicate actual counts, while values ending in "1" indicate estimated counts.	
♦	COUNT2020	2020 traffic count value. In most cases, values ending in "0" indicate actual counts, while values ending in "1" indicate estimated counts.	
♦	VAL_CNT	Traffic count value used for validation.	
♦	PROJECT1	ID numbers to match links to projects in project table	Manual via Master Network (3)
♦	PROJECT2		
♦	PROJECT3		

Notes: Fields not listed are not required and are not used by model.

♦ indicates that a field is required on the input scenario network.

(1) Indicates that a field is computed by a lookup table or calculations during a model run. Any data present in such fields will be overwritten.

(2) These fields have been retained for backwards compatibility with prior modeling techniques, but it may be desirable to remove them from the network and macros. Their presence is currently required for a successful model run.

(3) These fields are managed via the Master Network tools.

Table 6.2 Calculated Network Fields

Field	Description	Field Formula
AltID	These fields are added to Scenario Networks from the project table.	Manually entered in the project table via the Master Network tools.
CSJ_ID		
MPO_ID		
Annotation		
Edits		
TIME	Free-flow travel time	Length * 60 / Free-flow speed (from lookup)
TIME_LOADED	Loaded time from a previous model run, optional and for user reference.	
SPEED_INPUT	Freeflow travel speed	From lookup table.
SPEED_LOADED	Loaded speed from a previous model run, optional and for user reference.	
TIME_AB	Directional free-flow travel time	If Dir >= 0 then TIME else 0
TIME_BA	Directional free-flow travel time	If Dir <= 0 then TIME else 0
PKSPD_AB	Peak directional congested speed	If PKFB_AB <> null then PKFB_AB else free-flow speed (1st feedback iteration)

PKSPD_BA	Peak directional congested speed	If PKFB_BA <> null then PKFB_BA else free-flow speed (1st feedback iteration)
OPSPD_AB	Off-peak directional congested speed	If OPFB_AB <> null then OPFB_AB else free-flow speed (1st feedback iteration)
OPSPD_BA	Off-peak directional congested speed	If OPFB_BA <> null then OPFB_BA else free-flow speed (1st feedback iteration)
PKTIME_AB	Peak directional congested travel time	Length * 60 / PKSPD_AB
PKTIME_BA	Peak directional congested travel time	Length * 60 / PKSPD_BA
OPTIME_AB	Off-peak directional congested travel time	Length * 60 / OPSPD_AB
OPTIME_BA	Off-peak directional congested travel time	Length * 60 / OPSPD_BA
CMP_Link	1 indicates link is over capacity.	Manually populated using model results.
CMP_VOL	Model volumes after manual adjustments.	Manually populated using model results.
CMP_VOL/Total Cap	Adjusted volumes over total capacity	Manually populated using model results.
WalkDist	Walk distance	Link length if FUNCL = 0 or FUNCL = 4 or FUNCL = 5 or FUNCL = 6 or FUNCL = 7 or FUNCL = 9 or FUNCL = 99 (where walk access is allowed)
WalkMode	Non-motorized mode value (for walk access/egress)	
WalkTime_AB / WalkTime_BA	Walk travel time (for walk access/egress)	Length/WalkSpeed*60
{AB/BA}_Capacity	Daily capacity by direction.	From lookup.
TOT_CAP	Total (two-way) capacity	From lookup.
{AB/BA}_AM_Cap	Directional AM capacity	Directional lanes * daily lane capacity * 0.09 / period capacity factor
{AB/BA}_PM_Cap	Directional PM capacity	Directional lanes * daily lane capacity * 0.09 / period capacity factor
{AB/BA}_MD_Cap	Directional MD capacity	Directional lanes * daily lane capacity * 0.09 / period capacity factor
{AB/BA}_NT_Cap	Directional NT capacity	Directional lanes * daily lane capacity * 0.09 / period capacity factor
{AB/BA}_daily_Cap	Directional daily capacity	Directional lanes * daily lane capacity
TOTVOLAM	Raw model volume, populated on the output network.	
TOTVOLMD	Raw model volume, populated on the output network.	
TOTVOLPM	Raw model volume, populated on the output network.	
TOTVOLNT	Raw model volume, populated on the output network.	

TOTVOL	Raw model volume, populated on the output network.	
VOL_V/Cap	Raw model volume over capacity	
TrnTime[PK/OP][m]_AB TrnTime[PK/OP][m]_BA	Directional transit time for peak or off-peak [PK/OP] by model [m].	Macro

Table 6.3 Roadway Network Node Fields

	Field Name	Description	Method
♦	ID	TransCAD unique link identifier. TAZ ID for centroid nodes.	Auto
♦	Longitude / Latitude	Link coordinates	Auto
♦	CentroidNode	Indicates TAZ centroids with a value of "1"	Manual
♦	PnR	Filled with a "1" for park and ride nodes, and a -1 for transit centers without parking	Macro
♦	PULSE	Maximum transfer wait time at locations with timed transfers	Macro
♦	PnR_XX	Park and ride values for transit scenario "XX"	Manual
♦	PULSE_XX	Timed transfer values for transit scenario "XX"	Manual
	PnR_Name	Park and ride or transit center name	Manual

Notes: Fields not listed are not required and are not used by the model.

♦ indicates that a field is require for a model run. Other fields are not required but are recommended.

Table 6.4 Functional Classification and Facility Type Codes

Functional Class	Facility Type	Facility Type Description	Symbology
0	0	Centroid Connector	Red dashed
1		Interstate Freeways	Yellow
	1	Radial IH Freeways – Mainlanes Only	Yellow
	2	Radial IH Freeways – Tolled Mainlanes	Yellow Dash
	3	Circumferential IH Freeways (Loops) – Mainlanes Only	Yellow
	4	Circumferential IH Freeways (Loops) – Tolled Mainlanes	Yellow Dash
2		Other Freeways	Orange
	5	Radial Other Freeways – Mainlanes Only	Orange
	6	Radial Other Freeways – Tolled Mainlanes	Orange Dash
	7	Circumferential Other Freeways (Loops) – Mainlanes Only	Orange

Functional Class	Facility Type	Facility Type Description	Symbology
	8	Circumferential Other Freeways (Loops) – Tolled Mainlanes	Orange Dash
3		Expressways	Purple
	9	Radial Expressways	Dark Purple
	10	Circumferential Expressways (Loops)	Light Purple
4		Principal Arterials	Blue
	11	Principal Arterial – Divided	Dark Blue
	12	Principal Arterial – Continuous Left Turn	Medium Blue
	13	Principal Arterial – Undivided	Light Blue
5		Minor Arterials	Green
	14	Minor Arterial – Divided	Dark Green
	15	Minor Arterial – Continuous Left Turn	Medium Green
	16	Minor Arterial – Undivided	Light Green
6		Collectors	Brown
	17	Collector – Divided	Dark Brown
	18	Collector – Continuous Left Turn	Medium Brown
	19	Collector – Undivided	Light Brown
7		Frontage Roads	Mustard
	20	Frontage Road	Mustard
8		Ramps	Grey
	21	Ramp (Between Frontage Road and Mainlanes)	Dark Grey
	22	Ramp (Freeway-to-Freeway Interchange Ramps)	Medium Grey
	23	Tolled Ramps (Mainlanes to Tolled Lanes)	Striped Grey
9		Transit	Indigo
	24	Transit only / Transit local	Dashed Indigo

Table 6.5 Area Type Codes

Area Type	Area Type Description
1	CBD
2	CBD Fringe
3	Urban
4	Suburban
5	Rural

6.2 HOV and Express Lanes

6.2.1 Vehicle Occupancy Restrictions

While HOV lanes are not present in the 2020 base year, HOV lanes are included in forecast networks. HOV lanes are identified by the following fields: AM_HOV_flag, PM_HOV_flag, MD_HOV_flag, and NT_HOV_flag. These fields can be populated with a value of 2 to indicate a lane allows vehicles with at least 2 occupants in a time period, or a 3 to indicate that a lane allows vehicles with at least 3 occupants in a time period.

6.2.2 HOV and Express Lane Speed Adjustments

The SPEED_HOV and SPEED_EX fields allow speed adjustments for HOV and express lanes, respectively. They are designed to allow coding of a speed differential for HOV and express lanes, which will make them more attractive than the parallel freeway lanes. For example, a value of 3 in the SPEED_HOV for a certain link will add 3 mph onto the free-flow travel speed resulting from the speed lookup table.

In cases where the SPEED_U field is populated with a speed override value, the user-specified speed will not be adjusted.

7.0 Route System Coding

This section describes the SAMM route system format and coding conventions. As described in Section 4.3, the model utilizes a Master Route System layer to minimize redundant route coding. This allows routes or groups of routes to be turned on and off through the scenario management interface.

7.1 Route System Data Dictionary

Fields present on the scenario route layer generated from a master route system are listed in Table 7.1. Stop fields are listed in Table 7.2.

Transit routes each have a specific mode value. The mode value allows certain characteristics such as dwell time to be specified by mode, and also allows creation of shortest path matrices that include only a subset of available modes (e.g., a local only transit path matrix). Mode values are listed in Table 7.3. However, it is possible to include additional modes in the route system by editing the input MODE.bin file.

Table 7.1 Route System Fields

	Field Name	Description	Method
♦	Route_ID	TransCAD unique route identifier	Auto
♦	Route_Name	Unique route name (e.g., “8 / 67 - SB,” “8 / 67 - NB,” “505 - EB”)	Manual
♦	Transit_Line	Non-unique name of transit line (e.g., “8 + 67,” “505)	Manual
	Line_Group	Line group (not used by the model macros)	Manual
♦	RouteNumber	Primary route number	Manual
	RouteDesc	Description of primary route	Manual
	RoutePattern	Optional primary route pattern ID (e.g, “A”, “B”, “Long”, “Short”)	Manual

	Field Name	Description	Method
	RouteDir	Primary route direction (e.g., “NB”, “SB”)	Manual
♦	CombRouteNumber	Secondary route number for interlined routes	Manual
	CombRouteDesc	Description of secondary route	Manual
	CombRoutePattern	Optional secondary route pattern ID (e.g, “A”, “B”, etc.)	Manual
	CombRouteDir	Secondary route direction (e.g., “NB”, “SB”)	Manual
	Comment	Space for optional user comments or notes	Manual
♦	MODE	Route Mode ID	Manual
♦	FARE	Average fare paid for initial boarding	Manual
♦	X_FARE	Average fare paid for transfer boarding	Manual
	DWELL	NOT USED and not read by the model.	n/a
♦	DoOnOff	Allows reporting of stop level data for a subset of routes	Manual
	SelRoutes	Carried over from previous model. No longer used.	n/a
	INIT_PEN	Carried over from interim model version. No longer used.	n/a
♦	PeakHdwy	Modified headway during the peak time period	Macro
♦	BaseHdwy	Modified headway during the off-peak time period	Macro
♦	PeakHdwyOrig	Unmodified headway during the peak time period	Macro
♦	PeakHdwyOrig	Unmodified headway during the off-peak time period	Macro
♦	PeakHdwyOrig_XXXX	Peak period headway for route system scenario XXXX	Manual (1)
♦	BaseHdwyOrig_XXXX	Off-peak period headway for route system scenario XXXX	Manual (1)

Notes: Fields not listed are not required and are not used by the model.

♦ indicates that a field is required for a model run.

(1) These fields must include a 2- through 4-digit scenario suffix. The scenario to use is selected from the model interface. Routes with null values in both peak and off-peak scenario headway fields are ignored by the model (i.e., do not exist for a given scenario).

Table 7.2 Route Stop Fields

	Field Name	Description	Method
♦	ID	TransCAD unique node identifier	Auto
♦	Longitude / Latitude	Link coordinates	Auto
♦	Route_ID	TransCAD Route ID (matches value on associated route)	Auto
♦	Pass Count	Transit route pass for which the stop is active	Auto
♦	Milepost	Distance from route origination point	Auto
♦	NearNode	ID of the closest node in the roadway node layer	Macro

♦	OnRoute	Route number on which the stop is located (1)	Manual
	PrimaryRoute	Primary route number (optional)	Manual
	CombRoute	Secondary route number (optional)	Manual
	RC_On	Optional field for inclusion of observed boarding data (2)	Manual
	RC_Off	Optional field for inclusion of observed alighting data (2)	Manual
	RC_Node	Optional field for summarization of modeled/observed data (2)	Manual
	Sched_Time	Scheduled time to next stop, NOT USED (3)	Manual

Notes: Fields not listed are not required and are not used by the model.

♦ indicates that a field is required for a model run.

(1) The OnRoute field is used in reporting only, and allows summarization of boardings on individual numbered routes within interlined route pairs or groups.

(2) The ride check (RC) fields can be used in localized validation exercises, but are not currently up to date.

(3) The Sched_Time field is currently disabled and not referenced by the model macros.

Table 7.3 Transit Network Mode Values

Mode ID	Mode Name	Mode Description / Notes
1	METRO	VIA's Metro transit mode (included in the local bus transit mode)
2	FREQ	VIA's Frequent transit mode (included in the local bus transit mode)
3	EXP	Express Bus
4	SKIP	VIA's Skip transit mode (included in the local bus transit mode)
5	Primo	Primo enhanced bus service (included in the local bus transit mode)
6	STCAR	Rubber tired streetcar (included in the local bus transit mode)
7	MDN_STCAR	Modern streetcar (for use in future scenario testing)
8	BRT	Bus Rapid Transit (for use in future scenario testing)
9	LRT	Light Rail Transit (for use in future scenario testing)
10	WALK	Used internally to identify links where walk access to transit is allowed
99	NO_WALK	Used internally to identify links where walk access to transit is not allowed

7.2 Linking Route System to Roadway Network

When route systems are moved between folders or computers, they sometimes retain an incorrect link to the underliying line layer. Ay time a route system is moved mnually – either a Master Route System or Scenario Route System – it should be linked to the correct line layer using the steps below.

1. Open the rodway line layer (*.dbd) network that should be linked to the Route System.

2. From the TransCAD menu, choose Route System[2] → Utilities → Move.

3. When prompted, select the route system that will be linked to the roadway line layer.

4. Leave all settings at the default values and click **OK**. TransCAD may show a message stating "The only line layer in the current map is already the line layer for the route system. Please add another line layer to the map." If this is the case, the route system is already correctly linked and no further action is necessary.

[2] If the **Route System** menu item is not visible, ensure that it is activated from the TransCAD **Procedures** menu.