Santa Cruz County Travel Model User Guide
Santa Cruz County Regional Transportation Commission

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Santa Cruz County Travel Model User Guide

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1 SCCRTC County-Wide Model Installation Instructions

**Step 1:** Unzip the package to C drive, and save to a folder called “SCCRTC_Model” so that the resulting file path is C:\SCCRTC_Model\. Under this folder, the following files and subfolders should be included. Copy the SCCRTC.bmp file to the TransCAD\bmp folder located here: C:\Program Files\TransCAD 6.0\bmp.

<table>
<thead>
<tr>
<th>Name</th>
<th>Date modified</th>
<th>Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>model</td>
<td>2/12/2016 12:59 PM</td>
<td>File folder</td>
<td></td>
</tr>
<tr>
<td>VR2010</td>
<td>2/12/2016 12:59 PM</td>
<td>File folder</td>
<td></td>
</tr>
<tr>
<td>YR2040</td>
<td>2/12/2016 12:59 PM</td>
<td>File folder</td>
<td></td>
</tr>
<tr>
<td>MOD_SCCRTC.bin</td>
<td>2/12/2016 12:59 PM</td>
<td>IN File</td>
<td>52 KB</td>
</tr>
<tr>
<td>MOD_SCCRTC.DCB</td>
<td>2/12/2016 12:59 PM</td>
<td>DCB File</td>
<td>1 KB</td>
</tr>
<tr>
<td>scrrtc_model1</td>
<td>2/12/2016 12:59 PM</td>
<td>1 File</td>
<td>16 KB</td>
</tr>
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<td>scrrtc_model2</td>
<td>2/12/2016 12:59 PM</td>
<td>2 File</td>
<td>3 KB</td>
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<tr>
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<td>2/12/2016 12:59 PM</td>
<td>3 File</td>
<td>10 KB</td>
</tr>
<tr>
<td>scrrtc_model4</td>
<td>2/12/2016 12:59 PM</td>
<td>4 File</td>
<td>564 KB</td>
</tr>
<tr>
<td>scrrtc_model5</td>
<td>2/12/2016 12:59 PM</td>
<td>5 File</td>
<td>66 KB</td>
</tr>
<tr>
<td>scrrtc_model6</td>
<td>2/12/2016 12:59 PM</td>
<td>6 File</td>
<td>4 KB</td>
</tr>
<tr>
<td>scrrtc_model.dbd</td>
<td>5/28/2015 12:59 AM</td>
<td>Calliper Standard Geographic ...</td>
<td>2 KB</td>
</tr>
</tbody>
</table>

**Step 2:** Open TransCAD version 6, click **Tools -> Setup Add-Ins**, add SCCRTC Model in the Add-in dialog box by selecting **Add**. The model will initially show as “Untitled” in the dialog box. Give the model a description and name as shown below. Next select the **Browse** button and navigate to the SCCRTC_model.dbd file located on the C drive under C:\SCCRTC_Model. Select **OK** to complete the Setup process. Make sure the Dialog Box option is selected and not Macro.
If you want to re-compile the model, click `` and select the file named `SCCRTC_Model.lst` under `C:\SCCRTC_Model\model\`, and you will be asked for the file names for the interface, you can select `sccrtc_model.dbd` file under `C:\SCCRTC_Model\` and overwrite the existing interface. Then go through the step above to set up the model. If the icon `` is not shown on the TransCAD menu, click `Tools -> GIS Developer’s Kit`, and this icon will appear.

**Step 3:** After setting up the model, go back to the TransCAD interface, click `Tools -> Add-Ins`, select `SCCRTC Model`, the SCCRTC model graphic user interface (GUI) will be shown as follows. For the first time opening the SCCRTC model, the model will open a dialog box to ask for the model table, the model table is named `MOD_SCCRTC.bin` under `C:\SCCRTC_Model\`. 

![SCCRTC Model GUI](image)
Step 4: Click **Setup** on the top right corner of the GUI, the Model Scenario Manager box shows up with all the detailed setup for each stage, as shown below. At this interface, you can change the scenario by double clicking the folder that you want to change. You can also change the input and output files for a specific stage under the tabs of Input Files and Output Files by clicking Change File or Change Folder at the bottom of the Scenario Manager. Parameters can be directly revised under the tab of Parameters. Detailed description of the major input/output files and parameters used in the model are included in next section.

![Model Scenario Manager](image)

Step 5: To run a complete model run, select a scenario under **Scenarios** in the main model GUI, and then click **Setup** to open the Model Scenario Manager box. In the Scenario Manager box, make sure all the inputs/outputs and parameters are set up correctly for each stage and the status of each input files listed for each step should be “Exists”. Then click **OK** to get back to the main model GUI, uncheck **Stop after stage** on the main model GUI and then click **Network Initialization** and the model starts running all the way to the end.

Step 6: If you only want to run specific steps, first click the button left of the Stage button on the main model GUI. As shown below, a **Stage Step Settings** dialog box shows up, which includes all the sub-steps in this stage. You can check or uncheck these sub-steps based on your needs. Once it is done, click **OK** and get back to the main model GUI, then click the stage button and all the checked sub-steps will be run.
Although it should not be needed in most cases, the GUI can be recompiled as needed after making changes to the script changes, if it lost, or for different versions of TransCAD using the GISDK tool and selecting the SCCRTC_Model.lst which reads in the associated RSC files.
2 Components of the Model

The SCCRTC model consists of four types of components, namely input data, model steps, model outputs, and parameters. The input data are files prepared by the modeler. The model outputs are data files produced by the model. Some of the output files are also used as inputs into the subsequent steps in the model.

2.1 Input Files

The following is a list of the model input files and their descriptions. The column “Module” provides the model steps that use the corresponding input file.

<table>
<thead>
<tr>
<th>File</th>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa_Cruz_BaseYear_Highway.dbd</td>
<td>Network Initialization</td>
<td>Base Year Initial highway network for Santa Cruz County – the current version is generated from AMBAG highway network. Detailed information of the variables in the input highway network are included in the Travel Model Development Report.</td>
</tr>
<tr>
<td>Santa_Cruz_BaseYear_Transit.rt</td>
<td>Network Initialization</td>
<td>Base Year transit routes system for Santa Cruz County – the current version is generated from AMBAG transit route system. Detailed information of the variables in the transit network are included in the Travel Model Development Report.</td>
</tr>
<tr>
<td>SCC_Base_Year_TAZ.dbd</td>
<td>Trip Generation</td>
<td>TAZ system for Santa Cruz County</td>
</tr>
<tr>
<td>Network_Lookup.csv</td>
<td>Network Initialization</td>
<td>The speed, capacity, lanes, alpha, and beta are coded on each link to maximize the calibration ability of local conditions. For facilities that are missing values and as the starting point of calibration, a lookup file to determine hourly capacity, volume delay function parameters and bike speed (mph) based on link functional classification, speed, area type and lane width. This lookup table is directly from AMBAG model, and is only applied to the highway links with missing values on those variables.</td>
</tr>
<tr>
<td>MODE.DBF</td>
<td>Network Initialization</td>
<td>Defines transit modes, modes of highway links for transit access, and associated parameters used in the transit path building process.</td>
</tr>
<tr>
<td>Turn_Penalties_AM/PM/MD/NT_2010.csv</td>
<td>Network Initialization</td>
<td>Turning penalty for each time period. Currently not used but available for project application.</td>
</tr>
<tr>
<td>Data_TAZ_2010.csv</td>
<td>Network Skimming</td>
<td>Provides origin and destination terminal times (in minute) at TAZ level. Terminal times are additional time at either trip end to account for things such as walking to the garage to get your car after you leave your house on the origin and finding a parking spot and walking to the sidewalk on the destination.</td>
</tr>
<tr>
<td>CrossClassPA.csv</td>
<td>Trip Generation</td>
<td>Includes trip rates for cross-classification models and</td>
</tr>
<tr>
<td>File Name</td>
<td>Column</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SED_SCC.csv</td>
<td>Trip Generation</td>
<td>Socioeconomic input data, generated from AMBAG model population synthesizer and the census data. Detailed information of the variables in the land use data file are included in the Travel Model Development Report.</td>
</tr>
<tr>
<td>IXXI_Split.csv</td>
<td>Trip Generation</td>
<td>Fractions of the total trips that represent trips that enter (XI) and exit (IX) the model area for each zone by purpose, generated from the CHTS database. This data is used to calculate the XI and IX productions and attractions from the overall productions and attractions generated based on the trip rates in CrossClassPA.csv.</td>
</tr>
<tr>
<td>SpecialGenerators.csv</td>
<td>Trip Generation</td>
<td>Zonal level productions and attractions by purpose from special generators, including visitor PAs (directly from the AMBAG model) and Group Quarter PAs.</td>
</tr>
<tr>
<td>K_Factors_SCC.mtx</td>
<td>Trip Distribution</td>
<td>K factors used in trip distribution</td>
</tr>
<tr>
<td>SCC_ObsModeSplit.csv</td>
<td>Trip Distribution</td>
<td>Observed distance-based auto mode split for each service population category for internal and external trips, generated from the CHTS dataset. This data is used to calculate the composite travel time used as the impedance in the trip distribution model. This calculation is to generate the combined travel time used as impedance for trip distribution. Because auto modes dominate, the bike and pedestrian travel times will have very limited impact on the combined travel time, therefore they are not included in the composite. If significant HOV facilities that would result in a different trip time by mode are planned or implemented in the future, the values can be updated to reflect the forecast mode split.</td>
</tr>
<tr>
<td>SCC_ObsTodFactors.csv</td>
<td>Mode Choice</td>
<td>Time of day factors by purpose for II, IX and XI trips respectively, generated from the CHTS dataset. This data is used to split the daily trips to trips in peak and off-peak periods for use in mode choice.</td>
</tr>
<tr>
<td>SCCRTC_MC_PK/OP.mdl</td>
<td>Mode Choice</td>
<td>Mode choice nested logit model structure with the utility function setup for each choice by purpose and time period (i.e., peak and off-peak periods).</td>
</tr>
<tr>
<td>Through_Trips_2010.mtx</td>
<td>Time of Day</td>
<td>Trips traveling completely through (XX trips) the Santa Cruz County model area, generated from the AMBAG model.</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>File Name</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateways_IXXI_SCC.csv</td>
<td>Time of Day</td>
<td>External gateway productions and attractions by time period, based on the AMBAG model data.</td>
</tr>
<tr>
<td>Hourly.bin</td>
<td>Time of Day</td>
<td>Include PA to OD factors and time of day factors</td>
</tr>
<tr>
<td>SCC_IXXI_ObsModeShare.csv</td>
<td>Time of Day</td>
<td>Observed mode share for IX and XI trips, generated from the CHTS dataset</td>
</tr>
<tr>
<td>CriticalLink.qry</td>
<td>Traffic Assignment</td>
<td>Include selectlink/selectzone queries if perform select link/zone analysis</td>
</tr>
</tbody>
</table>

2.2 Model Stages

The model stages, shown here in the user interface, are individually described below.

**Network Initialization**: The process calculates all the required variables in the networks, such as capacity for each time period in the highway network and initial wait time in the transit network, and creates a virtual highway network (the set of .net files) and virtual transit networks by time period (the set of .tnw files) from the input roadway network and route system. These outputs are used in the following skimming and assignment processes.

**Network Skimming**: The model develops link costs associated with every roadway segment which are used to test various routes and modes of travel to determine the lowest cost combination to travel from each specific TAZ to every other TAZ in the model via both highway and transit paths. The link cost is in dollars and calculated as the combination of travel time and distance. This data is stored in a matrix which is used by subsequent stages of the model.

In the highway skim, the cost is in dollar, including both distance and time. It doesn’t include parking cost, as these data is not available in the highway network. It can be incorporated if the parking cost is coded in the link layer.

Transit fare is included in the cost of transit path when building transit skim. Transit amenities do not clearly apply to the mode choice model as an independent variables. Its impact is included in the alternative specific constant of each transit mode.

**Trip Generation**: The model uses the input socioeconomic data and associated trip rates to calculate trip productions and attractions for each traffic analysis zone (TAZ). The trip productions and attractions are then split to internal-internal (II), internal-external (IX) and external-internal (XI) trips based on split ratios from IXXI_Split.csv. This is the total number of person trips produced or attracted regardless of destination.

**Trip Distribution**: The model uses a gravity model to estimate the number of total person trips regardless of mode from each TAZ to every other TAZ in the model. The gravity model utilizes the composite skim data from the network skimming stage along with friction factors and k-factors. The friction factors are generated from the Gamma Function.

**Mode Choice**: The daily trips from Trip Distribution step are disaggregated to peak and off-peak periods, using the factors in SCC_ObsTodFactors.csv. The mode choice model utilizes the outputs from skimming process and trip distribution, and estimates the mode for each person trip using the nested logit model, with utility functions estimated for each travel mode by purpose and time period (i.e., peak and off-peak periods).
**Time of Day:** This model utilizes outputs from mode choice, and convert the trips from PA format to OD format. It also segregates the trips by time of day and then converts the person trips to vehicle trips. In addition, this model includes the external module, which generates the IX and XI trips by mode for both peak and off-peak periods, and converts the IX/XI trips to vehicle trips from PA to OD format for each time period. The IX and XI vehicle trips are combined with II vehicle trips in the final OD matrix file, which are used in the assignment.

**Traffic Assignment:** The model uses an iterative assignment procedure whereby the quickest route is determined for each of the trips in the Origin-Destination (O-D) matrix, taking into account traffic congestion caused by other trips, for AM and midday time periods. This step is part of the feedback loop process, i.e., AM loaded network represents the peak period condition, while the MD loaded network represents the off-peak period condition in the next feedback loop.

**Feedback Loop:** The model uses a feedback stage to input estimated congested travel speeds from the previous AM peak period and midday period vehicle assignment into the network skimming stage of the model. The model then runs through mode choice and time of day. The O-D matrices are once again estimated and assigned to the roadway network to produce a new set of assignment results and congested speeds, ready for the next feedback loop if not the last loop.

**Final Assignment:** After the feedback loops is complete, the traffic assignment for PM and night time periods are executed. In addition, the AM and PM peak hour trip tables are generated and assigned. The daily assignment results are calculated and exported to the loaded network shape file. In addition, the transit trip tables are generated based on the mode choice outputs and assigned to the transit system. At the end, major model outputs, such as outputs from mode choice, highway assignment and transit assignment, are summarized and reported.

### 2.3 Important Output Files

The following is a list of the major model output files and their descriptions. Note that in all the files, the cost related variables are in dollars, while the time and distance related variables are in minutes and in miles respectively.

#### Table 2.2: Important outputs from SCCRTC model

<table>
<thead>
<tr>
<th>File</th>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim_AM/MD_DA.mtx</td>
<td>Network Skimming</td>
<td>Highway skims for Drive Alone for AM and MD time periods respectively, including cost, time and distance skim matrices.</td>
</tr>
<tr>
<td>Skim_AM/MD_SR2.mtx</td>
<td>Network Skimming</td>
<td>Highway skims for Shared Ride 2 for AM and MD time periods respectively, including cost, time and distance skim matrices.</td>
</tr>
<tr>
<td>Skim_AM/MD_SR3.mtx</td>
<td>Network Skimming</td>
<td>Highway skims for Shared Ride 3+ for AM and MD time periods respectively, including cost, time and distance skim matrices.</td>
</tr>
<tr>
<td>Skim_AM/MD_Walk.mtx</td>
<td>Network Skimming</td>
<td>Walk skims for AM and MD time periods respectively, including time and distance skim matrices.</td>
</tr>
<tr>
<td>File Name</td>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Skim_AM/MD_Bike.mtx</td>
<td>Network Skimming</td>
<td>Bike skims for AM and MD time periods respectively, including time and distance skim matrices.</td>
</tr>
<tr>
<td>TrnSkim_WLOC_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Walk to local bus transit skims for AM and MD time periods respectively, including skims for wait time, walk time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_WEXP_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Walk to express bus transit skims for AM and MD time periods respectively, including skims for wait time, walk time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_WLRT_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Walk to Light Rail transit skims for AM and MD time periods respectively, including skims for wait time, walk time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_WCRT_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Walk to Commuter Rail transit skims for AM and MD time periods respectively, including skims for wait time, walk time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_ALOC_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Drive to local bus transit skims for AM and MD time periods respectively, including skims for wait time, walk time, drive time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_AEXP_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Drive to express bus transit skims for AM and MD time periods respectively, including skims for wait time, walk time, drive time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_ALRT_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Drive to Light Rail transit skims for AM and MD time periods respectively, including skims for wait time, walk time, drive time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_ACRT_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Drive to Commuter Rail transit skims for AM and MD time periods respectively, including skims for wait time, walk time, drive time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_WALL_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Walk to transit skims for AM and MD time periods respectively, including skims for wait time, walk time, drive time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>TrnSkim_AALL_AM/MD.mtx</td>
<td>Network Skimming</td>
<td>Drive to transit skims for AM and MD time periods respectively, including skims for wait time, walk time, drive time, in-vehicle time, total time, fare, transfer, etc.</td>
</tr>
<tr>
<td>PA_II_Balanced.bin</td>
<td>Trip Generation</td>
<td>Balanced productions and attractions for the internal trips</td>
</tr>
<tr>
<td>PA_II.mtx</td>
<td>Trip Distribution</td>
<td>Daily Person trip table</td>
</tr>
<tr>
<td>PA_II_PK.mtx</td>
<td>Mode Choice</td>
<td>Person trip table for peak period</td>
</tr>
<tr>
<td>File Name</td>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PA_II_OP.mtx</td>
<td>Mode Choice</td>
<td>Person trip table for off-peak period</td>
</tr>
<tr>
<td>HW_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Home-based work trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>HS_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Home-based shopping trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>HK_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Home-based school trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>HC_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Home-based college trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>HO_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Home-based other trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>WO_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Work-based other trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>OO_Trips_PK/OP.mtx</td>
<td>Mode Choice</td>
<td>Other-based other trips by mode for peak and off-peak periods respectively.</td>
</tr>
<tr>
<td>PA_IXXI_PK.mtx</td>
<td>Time of Day</td>
<td>Person trip table for IX and XI trips for peak period</td>
</tr>
<tr>
<td>PA_IXXI_OP.mtx</td>
<td>Time of Day</td>
<td>Person trip table for IX and XI trips for off-peak period</td>
</tr>
<tr>
<td>OD_AM/PM/MD/NT.mtx</td>
<td>Time of Day</td>
<td>Internal OD vehicle trip tables for DA, SR2 and SR3+, for AM, PM, midday and night time periods respectively.</td>
</tr>
<tr>
<td>OD_AM/PM/MD/NT_IXXI.mtx</td>
<td>Time of Day</td>
<td>IX and XI OD vehicle trip tables for DA, SR2 and SR3+, for AM, PM, midday and night time periods respectively.</td>
</tr>
<tr>
<td>Final_OD_AM/PM/MD/NT.mtx</td>
<td>Time of Day</td>
<td>Final OD vehicle trip tables including II, IX, XI and XX trips for DA, SR2, SR3+, for AM, PM, midday and night time periods respectively.</td>
</tr>
<tr>
<td>Final_OD_AM/PM_PH.mtx</td>
<td>Time of Day</td>
<td>Final OD vehicle trip tables including II, IX, XI and XX trips for DA, SR2, SR3+ and EE, for AM and PM peak hour respectively.</td>
</tr>
<tr>
<td>Assignment_AM/MD/PM/NT.bin</td>
<td>Traffic Assignment</td>
<td>Flow table for AM, PM, midday and night time periods respectively, in binary format.</td>
</tr>
<tr>
<td>Assignment_AM/MD/PM/NT.dbf</td>
<td>Traffic Assignment</td>
<td>Flow table for AM, PM, midday and night time periods respectively, in DBF format.</td>
</tr>
<tr>
<td>Turning_Vol_AM/MD/PM/NT.dbf</td>
<td>Traffic Assignment</td>
<td>Turning movements for pre-defined intersections in the AM, PM, midday and night time periods respectively.</td>
</tr>
<tr>
<td>Assignment_AM/PM_PH.bin</td>
<td>Final Assignment</td>
<td>Flow table for AM and PM peak hour respectively, in binary format.</td>
</tr>
<tr>
<td>Assignment_AM/PM_PH.dbf</td>
<td>Final Assignment</td>
<td>Flow table for AM and PM peak hour respectively, in DBF format.</td>
</tr>
<tr>
<td>Turning_Vol_AM/PMPH.dbf</td>
<td>Final Assignment</td>
<td>Turning movements for pre-defined intersections in the AM and PM peak hour respectively.</td>
</tr>
<tr>
<td>Assignment_daily.bin</td>
<td>Final Assignment</td>
<td>Daily flow table in the binary format.</td>
</tr>
<tr>
<td>File Name</td>
<td>Assignment Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assignment_daily.csv</td>
<td>Final Assignment</td>
<td>Daily flow table in the .CSV format</td>
</tr>
<tr>
<td>Trn_PKTrips.mtx</td>
<td>Final Assignment</td>
<td>Transit trip table for peak period</td>
</tr>
<tr>
<td>Trn_OPTrips.mtx</td>
<td>Final Assignment</td>
<td>Transit trip table for off-peak period</td>
</tr>
<tr>
<td>WLOC_ONOFPK/OP.bin</td>
<td>Final Assignment</td>
<td>Walk to local bus assignment output – ons and offs for peak and off-peak time periods respectively.</td>
</tr>
<tr>
<td>WEXP_ONOFPK/OP.bin</td>
<td>Final Assignment</td>
<td>Walk to express bus assignment output – ons and offs for peak and off-peak time periods respectively.</td>
</tr>
<tr>
<td>DLOC_ONOFPK/OP.bin</td>
<td>Final Assignment</td>
<td>Drive to local bus assignment output – ons and offs for peak and off-peak time periods respectively.</td>
</tr>
<tr>
<td>DEXP_ONOFPK/OP.bin</td>
<td>Final Assignment</td>
<td>Drive to express bus assignment output – ons and offs for peak and off-peak time periods respectively.</td>
</tr>
<tr>
<td>Loaded_net.shp</td>
<td>Final Assignment</td>
<td>Loaded network shape file.</td>
</tr>
<tr>
<td>MC_Summary</td>
<td>Final Assignment</td>
<td>Summary of Mode Choice model results</td>
</tr>
<tr>
<td>HwyVol_AM/MD/PM/NT_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of Highway assignment results for AM, Midday, PM, and night time periods.</td>
</tr>
<tr>
<td>HwyVol_AMPH/PMPH_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of Highway assignment results for AM and PM peak hour.</td>
</tr>
<tr>
<td>HwyVol_DY_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of daily Highway assignment results.</td>
</tr>
<tr>
<td>TrnAsgn_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of transit assignment results.</td>
</tr>
</tbody>
</table>

Note: DA=Drive Alone, SR2=Shared Ride 2 people, SR3+=Shared ride 3+ people, II=Internal-Internal (trips within the model area), IX=Internal-External (trips exported from the model area), XI=External-Internal (trips imported to the model area), EE=External-External (trips traveling through the model area)
2.4 Major Model Parameters

Two types of parameters are used in the model, one is the parameters used in the mathematical function that needs to be estimated and/or calibrated, such as parameters used in the gamma function in the trip distribution, and parameters used in the mode choice nested logit model; while the other is the generic parameters to set up the model run. The first type of parameters are described in details in the Travel Model Development Report. For scenario testing or future uprates, the parameters are available for modification within the User interface on the Parameters tab of the Module and can be accessed through the Setup button. The second type of the parameters are preset in the model table, which can be further adjusted by the users, as shown in Table 2.3.

Table 2.3: Major Parameters from SCCRTC model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit Time Factors</td>
<td>1.3, 1.1, 1.0, 1.0</td>
<td>Network Initialization</td>
<td>Transit travel time factors to highway time for modes of Local Bus, Express Bus, LRT, and CRT</td>
</tr>
<tr>
<td>Time Period Factors</td>
<td>2.5, 4, 2.5, 5, 5</td>
<td>Network Initialization</td>
<td>Factors to convert hourly capacity to the capacity for each time period</td>
</tr>
<tr>
<td>Walk Speed</td>
<td>3</td>
<td>Network Initialization</td>
<td>Walk speed</td>
</tr>
<tr>
<td>Bike Speed</td>
<td>10</td>
<td>Network Initialization</td>
<td>Bike speed</td>
</tr>
<tr>
<td>Max Driving Distance</td>
<td>5.5</td>
<td>Network Initialization</td>
<td>Maximum driving distance to from an origin to a transit station</td>
</tr>
<tr>
<td>Value of Time</td>
<td>0.083, 0.083, 0.083, ...</td>
<td>Network Initialization</td>
<td>Value of Time ($) for DA, SR2, SR3+, Local Bus, Express Bus, LRT, CRT, and general</td>
</tr>
<tr>
<td>Auto Operating Cost</td>
<td>0.147</td>
<td>Network Initialization</td>
<td>Auto Operation Cost ($/Mile)</td>
</tr>
<tr>
<td>Transit Mode Flag</td>
<td>1, 1, 0, 0</td>
<td>Network Skimming</td>
<td>If any of Local Bus, Express Bus, LRT or CRT exists</td>
</tr>
<tr>
<td>Gravity Model Iterations</td>
<td>10</td>
<td>Trip Distribution</td>
<td>Max. # of iterations for Gravity Model</td>
</tr>
<tr>
<td>HOV3 Occupancies</td>
<td>3.28, 3.48, 3.45, 3.28, 3.77, 3.50, 3.50, 3.50</td>
<td>Time of Day Traffic Assignment</td>
<td>HOV3 vehicle occupancy rates for HBW, HBS, HBK, HBC, HBO, WBO, OBO, EE, and average</td>
</tr>
<tr>
<td>Peak Hours</td>
<td>7, 17</td>
<td>Time of Day Traffic Assignment</td>
<td>AM and PM peak-hour start hours: 7 for 7-8am, 17 for 17-18pm</td>
</tr>
<tr>
<td>Max Assignment Iterations</td>
<td>200</td>
<td>Traffic Assignment Final Assignment</td>
<td>Max. # of iterations for highway assignment</td>
</tr>
<tr>
<td>Assignment Convergence</td>
<td>0.0001</td>
<td>Traffic Assignment Final Assignment</td>
<td>Convergence for highway assignment</td>
</tr>
<tr>
<td>Max Feedback Iteration</td>
<td>3</td>
<td>Feedback Loop</td>
<td>Max. # of Feedback Loops</td>
</tr>
<tr>
<td>Max Assignment Iterations Peak Hour</td>
<td>10</td>
<td>Final Assignment</td>
<td>Max. # of iterations for peak hour highway assignment</td>
</tr>
<tr>
<td>Peak Hour Factor</td>
<td>0.34, 0.26</td>
<td>Final Assignment</td>
<td>Peak hour factor for AM and PM</td>
</tr>
</tbody>
</table>
3 TransCAD Basics

The most common task for model users is to display data produced by the model. The sections below explain how to display various types of data produced by TransCAD models.

3.1 Opening a Roadway Network

1) To open a roadway network, start TransCAD.
2) Open the location of the roadway network named Santa_Cruz_BaseYear_Highway.dbd., under YR2010/inputs/Networks.
3) Double-click on the file or drag it into the grey space in TransCAD, you will see a little “+” sign notifying that it will be added to map.
4) Now, the roadway network is displayed and below is what should be on the screen.

3.2 Commonly Used Tools

When a roadway network is opened, the Toolbox Toolbar also opens by default. If it does not, it can be opened by pressing F8 or going to Tools > Toolbox. The Toolbox is shown below, and several of the most commonly utilized tools are described.
Zoom Tools: Allow you to zoom in and out by creating a zoom extent box on the map. Alternatively, the scroll wheel can be used to zoom.

Pan Tool: Allows you to pan across a map. Alternatively, the scroll wheel can be used for panning by pressing it and panning.

Info Tool: Allows you to select on a map feature and view its’ attributes in a dataview window that automatically opens.

At the top of the TransCAD window are the Standard Tools. These include common tools such as new document, open, save, and print on the left hand side, as can be seen below:

Other commonly used tools are:

Working Layer: This is the working layer manager; sets the active working layer.

New Dataview: Opens a new dataview with the attributes of the active working layer.

Join Dataviews: Joins two dataviews together based on a common identifier. This tool is used extensively to join model outputs to a roadway network for displaying results.

Map Layers: Displays the layers in the map in order of display and allows for hiding or showing individual layers, as well as setting styles and labels for each layer.

Show or hide the legend: Toggles a legend with the visible layers and map scale on and off.

Layer Styles: Shortcut to the style menu of the active working layer where style, width, color, and arrowheads can be modified.

Automatic Labels: Shortcut to the labels menu of the active working layer where labels can be modified for all available fields.
Main Toolbox: Shortcut to the Toolbox Toolbar, alternative to pressing F8.

Selection Toolbox: Shortcut to the Selection Toolbox (shown below) for the active working layer. The toolbox has tools for several different methods of selection including select by pointing, select by circle, select by shape, etc.

Map Editing Toolbox: Shortcut to the Map Editing Toolbox (shown below) for the active working layer which has tools for adding, deleting, splitting, joining, and modifying or attributes.

3.3 Displaying Nodes

Once a roadway network is open in TransCAD, by default, only the links are displayed. To display the nodes, click on the Map Layers Button and the window below will come up.

Here, you can see that the Base Year Node layer is currently hidden. To show the layer, select the layer and click on show layer.
Once the node layer is shown, the node style can be modified from within this window by clicking the Style button. In the Style window, as shown below, settings such as the node icon, size, and color can be modified. You can “preview” what the nodes will look like by clicking on Apply. If you like the changes, click OK, and you are taken back to the Layers window, and then click Close to return to the network.

Now, you will notice that the working layer has changed to Base Year Nodes from the Base Year Links, as shown below.
The working layer pull down menu will have as many layers as are visible in the map layers. In order to select or modify anything within a specific layer, that layer must be selected under the working layers folder. To switch between working layer, simply click on the pull down menu and select the desired layer to activate, as shown below.

3.4 Displaying Link Topology

Link topology specifies the direction in which the link was drawn. The AB direction is the direction starting at A and ending at B and BA is the reverse direction. This is important because the AB and BA designations specify the attributes for the roadways in both directions of travel as they may differ. When topology is displayed, an arrow displays the direction in which the link was drawn, the AB direction. To display link topology:

1) Click on the Map Layers Button and the window below will display.

2) Select the Base Year Links layer and click on Style.

3) Select Topology and click OK.
4) Click Close and now topology is displayed for all roadway network links.

It is important to note that Direction of Flow is not the same as Topology. A link can be a one-way link and have the flow traveling in the BA direction.

Within the same style window, the line settings of the roadway network can also be changed to a different line style, different thickness, and different color.

3.5 Displaying Roadway Link Attributes

Posting link attributes is a good way to visually inspect the roadway network for the number of lanes (AM, PM, MD, and OP), posted speed, facility type, roadway name, and much more. To post any link attribute:

1) Click on the Map Layers Button , select the Base Year Links layer and click labels.

2) The Automatic Labels window will appear. Under field, select any field, in this example we are displaying facility type, [AB_Lanes / BA_Lanes], and click Apply.
In this same window, the font size, position, and color can also be customized for the labels to be as desired. Once all of the changes have been made, click OK and you are taken back to the map with the number of lanes displayed, as shown below. Similarly, posted speed, road names, and traffic volumes can be displayed using the procedure above.
3.6 Selecting Centroid Connectors

Centroid connectors connect TAZ centroids to the roadway network. All zone centroid connectors have a “Road Type” of “Centroid Connector” as a link attribute. Differentiating the centroid connectors from the roads is very important and makes modifying and inspecting the roadway network much easier. By default, all roadway network links, including centroid connectors are displayed with a common line type, color, and width. To select just the centroid connectors in the roadway network:

1) Ensure the working layer is set to Base Year Links.
2) Go to Selection > Select By Condition. At the top of the window you can confirm that the correct layer is about to be queried.
3) A condition must now be created to select roadway links that are centroid connectors. To create a condition, we will use the condition builder.

   a. A field under the field list must be selected. In this case, we will select “Functional_Class_Description”.
   
   b. Select an operator, in this case “=”.
   
   c. Type in “Centroid Connector” to complete the query (quotes are needed and it is case sensitive). The syntax should look like the one below. You can check to ensure the syntax is correct by clicking on Verify.

   d. The default name for this selection will always be Selection, but a different name can be created by typing it in under Set Name. In this case, let’s call it Centroid Connector. Click OK to execute the query.

   You will now notice that now some links are a different color, representing the centroid connectors, as seen below.
These centroid connectors can now be hidden, displayed as a different color, line type, and width than the rest of the roadway network by:

1) Go to **Selection > Setting**. There, you will see the Centroid Connector selection.

![Image of Selection Setting window]

2) To hide or modify the centroid connectors, select the selection and click **Style**.

3) To hide the centroid connectors, change the **Status** to **Invisible**.

4) In this same window, you can also change the style, width, and color of just the centroid connects. In this example, the centroid connects are all orange and dashed to easily differentiate them.

To drop (remove) or clear a selection set, simply go to **Selection > Setting**, select the desired layer, and click on **Drop Set** to remove, or **Clear Set** to clear it.

A simpler way to select centroids and centroid connectors is to access TransCAD’s Selection Menu, by going to **Selection – Select Centroid** as shown below:
This new function of TransCAD allows the user to automatically select centroids and centroid connectors by accessing the node and network layer simultaneously. By following the set up below, you can query the centroids for the Santa Cruz model.
3.7 Displaying TAZ Land Use Data

TAZ data is stored in tabular format in the land use file (SED_SCC.csv). However, it is sometimes useful to display this data graphically using a TAZ boundary layer file. To do this:

1) In TransCAD, open the TAZ boundary layer file named SCC_Base_Year_TAZ.dbd under the inputs/TAZ folder. Note that the objects in this file are polygons; not lines (as in a road layer) or points (as in a nodes layer).

2) Now bring in the land use data (SED_SCC.csv) located in the inputs folder into TransCAD by dragging it into the grey space in TransCAD. The table below will be displayed:
3) Make the TAZ geography file window the active window by clicking on it.

4) Click the “Join Dataviews” button, and select the field in each file that identifies the TAZ number. TransCAD will use these fields to correlate the records in the boundary layer with the records in the tabular file. The fields selected should be the ones shown below. Click “OK.”
5) A window will appear like the one below, which will display the combined data from the joined files, with the two connecting fields and all new fields from joined table highlighted in green.

To remove the join go to Dataview>Drop Join in the toolbar. Also closing the dataview of the SED_SCC removes the table from the work space and removes the join.

6) Now click on the boundary layer to re-activate it. You can now display data from the tabular file using the layer file. For example, to color-code the TAZ map by Total Households (TotHH), you would click on the Color Theme Map Wizard button. Then, pick “TotHH” as the field, “Optimal Breaks” as the method, and choose any number of classes greater than four (TransCAD will ignore any extras). You can also select a style, such as a color scheme, using the “Styles” tab.
7) The resulting display should look something like the figure below, depending on what style options you selected.

The most common task for model users is to display data produced by the model. Section 5 below explains how to display various types of data produced by TransCAD models.

3.8 Summarizing Route and Origin-Destination Travel Times

Open the loaded highway geographic file in Outputs\Networks
Select the roadways links making up the route/OD for summary using the Select by Pointing tool.

Open the dataview for the roadway network, and change the All Records data to Selected.

Click on the Compute Statistics Button.

The resulting table will summarize all of the statistics for the selected roadways, including travel time, average speed, average volume for each time period.
EDITING THE LANDUSE DATA

The socio economic data (SED_SCC.csv) is in *.csv format. Users can open this file in excel and modify the household, population and employment data if needed using the SED_SC.xls. This file uses AMBAG data as the base, but can be modified as needed.

1) Open SED_SCC.csv file in Microsoft excel.

2) The corresponding headings are stored in “SED_SCC.DCC” file. Users can open this file in a text editor such as notepad to view the headings.
3) Users can edit the land use data directly in the “SED_SCC.csv” file.

Note: While editing the SED data users should edit all dependent variables (if needed). For example if the number of households changes then all household-related variables such as household income (HHInc), Household size (HHsize) and those cross-classified household variables should be updated accordingly, to match the total number of households.

5 EDITING THE NETWORK FILE

5.1 Checking Network Coding

Using a combination of selection sets and displaying different information such as roadway name, facility type, number of lanes, speed, etc. and comparing it to the City’s aerial imagery, from Google Maps or Goggle Earth is an effective way of checking the roadway network. Below is a screenshot of the roadway network with centroids being displayed and the AM number of lanes displayed. Similarly, fieldwork or any other data can be used to check the information in the roadway network.
5.2 Configuring the Settings before Editing

Before you edit the network file in TransCAD, you need to configure the Geographic Editing Setting that tells TransCAD how to handle the link attribute data when links are merged or split.


![Map Editing Toolbox]

2) Click the Configure Settings icon in the Map Editing Toolbox. Then, click the Update button.

![Configure Geographic Editing Settings]

3) Choose an appropriate option for each data field. For example, splitting a link should not change the speeds, so select “Copy” for that field. In contrast, splitting a link should change the length, so for that field you should select “Divide proportionally.” When finished, click “OK”.

![Configure Geographic Editing Settings]

OK Cancel
5.3 Editing the Roadway Network Attributes

A roadway link attribute may need to be modified for several different reasons, including errors found utilizing the methods described in the previous section, modeling a future roadway network change, or simply testing out a proposed roadway project. Attributes such as facility type, number of lanes, peak hour parking restrictions, and speed can be modified in the roadway network. To modify a link attribute:

1) Select the network link you want to modify using the Info tool in the Tools window.
   a. The tools windows, shown in Section 2.2, should automatically display when you open the roadway network. If the window is not displayed, simply press F8 to display.

2) Click on the Info button to activate the tool

3) Select the desired link to be modified. The roadway link will now be selected and a data view window will open which shows all of the attributes associated with that roadway link.
4) To modify any attributes, click on the desired attribute and type in the desired amount. In this example, the AB and BA lanes will be changed to three lanes from one.
   
a. Type “3” into the appropriate boxes and click enter. This will automatically update the network.

5) This same method can be used to modify any attribute in the roadway network, with the exception of the ID field.

5.4 Deleting Roadway Links

To delete a roadway link, the Map Editing Toolbox will be used, and can be activated by pressing F10, or going to Tools - Map Editing – Toolbox.

To delete a link:

1) Click the delete line button and select the link to be deleted.
2) If the correct link was selected, as shown by it being highlighted, click on
receipt of save edit, if not
click on the receipt of cancel edits button and select again.

5.5 Splitting and Joining Roadway Links

Splitting a link is sometimes necessary at a specific location. In this example, we will be splitting Isbel
Drive, North of Market Street.

To split a link:

1) Enable the split link by clicking on the split line button.

2) Click on the link at the point at which the split is desired. The link will be selected, and will show
the place of the split. If the link selected is not correct or the location of the split is not correct,
the changes can be cancelled by clicking on the receipt of cancel edits button. If the split is correct,
the edit can be finalized and saved by clicking on the receipt of save edits button.

3) To create a “gap” split the link again using the process in 1 and 2 above.

As can be seen below, the link has been split and new nodes have been added at the location of the
split.
To join two or more lines together:

1) Activate the Join lines editor.
2) Select the point that both lines share, and both of the lines will be selected.
3) Save edits and the joined link will be saved.

5.6 Adding Roadway Links

The need to model a roadway not currently in the model or a new proposed roadway are just two reasons why adding a link to the roadway network would be necessary. In this example, we want to add a roadway connection by connecting Isbel Drive. To do so:

1) Open the roadway network
   a. In this example, the centroid connectors are differentiated for ease.
   b. Turn on the node layer and make them a visible color and size.
2) Zoom to where Isbel Drive needs to be connected. In the screenshot below, the orange square is where we will add Isbel Drive.
3) When adding links to the roadway network, an important thing to keep in mind is that both the start and end point of a link must snap to end existing node in order for there to be a connection between the two links.

4) Within the map editing toolbox, select the add line editor. 

5) Click on one of the nodes that will serve as an endpoint, then double click on the other endpoint to finish the line. Click save edits,
   a. It is important to note the direction in which the link is drawn. The AB direction will be in the direction in which the link is drawn, and BA the opposite.

6) Now there is a roadway link that has no attributes 
   a. Using the edit line attributes tool, first select the link you want to copy the attributes from, hold shift and select the new link with no attributes.
   b. The dataview should have two links showing. Now, highlight the link with the values to copy, right click, and click copy values.
   c. Any attributes that need to be further modified, i.e., if the new road has more lanes than the link that was used to copy the values from, can be done manually from within this dataview.
7) Now, as can be seen below, a new connection to Isbel Drive has been added to the roadway. Any TAZs that should be loading to Isbel Drive can now be connected to it and any erroneous centroid connectors can be removed.
5.7 Changing functional class Bike/HOV Links

New bike links can be added as described in section 5.6 above, and update the functional classifications of those new links to 88.

Similarly, HOV only links can be added to the highway network as described in section 5.6 above and updating their functional classification to 8 for HOV2 and 9 for HOV3+.

5.8 Transit only links

Transit only links are required to code rail transit services or other fixed guideway services with exclusive right of way. These links represent the alignments that those fixed guideway services operate on, with no access for auto trips. Transit only links are coded just as any highway link (see section 5.6). However the functional classification should be set to 44.

5.9 Modifying Centroid Connector Loading

In this example, we will add a centroid connector for TAZ 843 that connects to Isbel Drive, and remove the centroid connector that loads to the intersection of Branciforte and Creek Side Lane, as shown below. It is important to connect a new centroid connector before deleting the original centroid connector because if all centroid connectors are deleted, the TAZ will automatically be removed and will require re-exporting the entire roadway network to fix.
1) Enable the Map Editing Toolbar.

2) If necessary, the link that we will be connecting to will be split if no node exists at the desired connection point. In this case, a split is required.

3) Add a link between the TAZ and the new node, as seen below.

4) Copy the attributes for another centroid connector for TAZ 843 to the new link.

5) Delete any extra or incorrect centroid connectors.
5.10 Moving TAZ Centroids

The location of a TAZ centroid affects how the zone will load onto the roadway network since it will drive how far the centroid connectors are from the roadway. Shorter centroid connector will be favored over longer centroid connectors, given all other factors equal. This is one reason why the location of each TAZ centroid is important. As seen below for TAZ 843 (See figure below), the centroid connect loading is roughly the same on both sides, and will likely cause equal number of trips to use each centroid connector. Based on aerial analysis, it seems that the TAZ has access to a major arterial via Isbel Drive. If more development occurs at this TAZ, it may be warranted to relocate the centroid to a more centralized area or to the new center of activity.
To move a TAZ centroid connector:

1) For ease, show the nodes layer and make a selection set of just centroid connectors. The image above also has the TAZ number displayed.

2) Ensure the link layer is the active layer.
3) Enable the Map Editing toolbox.

4) Click on modify line \( \text{[image]} \) and select the node to be moved. All lines connected to that node will be selected.

5) Click on the node again and move to the desired location. All line connected to it will maintain their connection.

6) Once the location is satisfactory, accept the changes by clicking on the save edits button. The TAZ centroids are now updated as shown below.

5.11 Modifying TAZ Centroid Node Attributes

Modifying the centroid node attributes is very much like modifying the roadway link attributes. Modifications are done using the Info tool by selecting the desired node or modifying any attributes directly in the data view. To edit many node values at once, you can first select the nodes that need to be edited, if not all the nodes; and then fill the node attributes with the values you want for those nodes in the selection.
6  EDITING OTHER DATA

6.1 Editing Tabular Data

The model is set up such that most of the input files are in .csv format, which allows users editing input data directly through EXCEL or other text editors, outside of TransCAD. However there are a few input files in binary format (*.bin), which requires to be modified under TransCAD.

1) Open the hourly distribution file (Hourly.bin) under TransCAD.

![Hourly distribution file](image)

2) Hourly data can be changed directly in this window. When you are finished, close the window. TransCAD saves the file automatically, so there is no ‘undo’ function when editing .bin file under TransCAD.

3) The same procedure can be used to edit other types of tabular data (.bin or .dbf) such as the MODE.DBF file that defines the modes and parameters used in the transit skimming and assignment procedures.
6.2 Editing CSV Files

1) Open the period specific Turn Penalty file (Turn_Penalties_AM_2010.csv) in EXCEL. Columns A and B refer to From Link and To Link, while Column C indicates the turning penalty and the turn is prohibited if null.

```
   A   B   C
1   35349 19313
2   35349 19314
3   19402 19315
4   19402 19317
5   9941  13738
6   33104 47566
7   36598 23103
8
9
10
11
```

2) Data can be edited directly in EXCEL but saved as a *.csv file.

6.3 Editing Matrices

1) Open the Through Trips file (Through_Trips_2010.mtx) under TransCAD

2) Edit the data in any cell directly in this window.

3) TransCAD saves the file automatically, so there is no ‘undo’ function when editing .mtx file under TransCAD.
6.4 Adding Centroids

Although not required for the model to function, it is highly recommended that the TAZ shape file be modified prior to adding new centroids so that the area, land use, and connectivity of the new centroid are based on the area of the TAZ. The number of centroids and centroid locations in the highway network should be consistent with the SCCRTC TAZ shape file. If a new TAZ is added in the TAZ shape file, a new centroid is going to be coded in and then connects to the highway network through centroid connectors. However in TransCAD, when adding a new node, TransCAD will automatically number the node ID. To ensure the newly added centroid with required TAZ number, the following steps are described to accomplish this.

1) Open the highway network (Santa_Cruz_BaseYear_Highway.dbd). Add a new node (centroid) to the highway network, representing the new TAZ with TAZ ID 1465. Click on this new node (centroid), input the new TAZ ID, 1465 in this example, in the “TAZ_ID” field in the Base Year Node file as shown in figure below.
2) To ensure the newly added TAZ is coded as the required ID, set the Node layer of the network file the current layer, go to Dataview > Formula Fields. Type in the following formula “if (TAZ_ID>0) then TAZ_ID else ID” into the Formula section. This will create a new “Formula Field” in the node database.

3) To export the new network, make sure the link layer is active, go to Tools > Export
4) Click the button for “Node Data Field.” Then select “Formula Field.”

5) After clicking “OK”. The new network will be generated with updated ID field.

If link IDs are changed during the addition or splitting/joining of roadways, a similar process as described for node renumbering can be implemented, with the Data Field being the appropriate variable for link ID.
7 TRANSIT ROUTES

7.1 Displaying Transit Routes

The transit network is a separate system from the roadway network geographic database. The transit route system is named Santa_Cruz_BaseYear_Transit.rts, which includes a set of geographic databases for transit routes and transit stops, as well as the underlying highway network. The transit network is always associated and linked to a highway network. To link a correct underlying roadway network is essential.

To check what underlying highway network the transit network is associated with, open the transit network file (.rts), and in the layer manager, there will be a roadway network layer. Select the layer and the file path will be displayed at the bottom of the layer manager window, as shown below:

Both the transit and roadway network file should be in the same folder. If the roadway network being referenced is a roadway network in another folder, which can occur if files are copied over from another local or network drive, then they must be re-referenced.

To link a roadway network to a transit route system:

1) Close all files in TransCAD
2) Open the roadway network in TransCAD that you want the transit network to be associated with.
3) Go to Route Systems – Utilities - Move and select the route system
4) Choose the route system (*.rts) when prompted (.Inputs\Networks\)
5) In the dialog box, check to make sure the details are correct. Click OK. Close all the files

6) Open the transit network .rts file in TransCAD, and open the layers manager to check if the correct highway network is linked.

To view the transit network, open the .rts file in TransCAD, and the transit routes and the underlying highway network are both shown in the TransCAD window. Do not open the highway network separately.

1) To view the transit routes, open the route system, named Santa_Cruz_BaseYear_Transit.rts under the Inputs\Networks directory, in TransCAD. The transit route system will be shown in TransCAD as below.
2) Zooming into a smaller area to view the route system, you can see the alignments of transit routes in different colors, operating on highway links. Given that transit routes often share right-of-way, it is common to have multiple transit services operating on the same highway links, as shown below by using the info tool on a link with operating transit route. In this specific example, you can see that at least 4 different lines travel along this specific roadway link.

The default display method displays all the transit lines on the centerline, therefore it is hard to see how many lines are traveling along each link. To make the transit lines easier to see, under Map Layers,
select the 2010 Base Year Route, which are the transit routes. Click style and under offset, select Around Centerline. Click OK then Close. Now you will see all the transit routes operating on the highway links, as shown below.

7.2 Displaying Transit Stops

When the transit route system is open in TransCAD, by default, only the routes are shown. The stops layer is also included, however, it is not shown by default. To display transit stops, simply choose the stops layer in the layer manager and click Show Layer. Doing so will yield the map below.
Although this does show all of the transit stops, it is not very user friendly. It does not graphically show what line the stops are associated to, and the way to get any information is to click on each stop with the information tool. Displaying the stops in this fashion is not very helpful.

Alternatively, going to **Tools - Route System – Route Query Toolbox** will bring up the toolbox below:

With this toolbox, you are able to select any transit route and see the route on the map by itself and all the associated stops as shown below.
7.3 Verifying the Transit Network

The transit route system is dependent on the IDs of the links in the roadway network. When geographic edits are made to the roadway network, such as adding, removing, or splitting a link, these IDs may change and will no longer associate with the transit route system correctly. Some highway edits may affect more than just a simple transit system update, such as deleting link where routes run over, which will leave a “gap” in the transit route system, and ultimately not allow the model to run.

Fixing the route system errors will require the use of the route editor to fix the gap in the transit route system in order to ensure consistency between the roadway network IDs and the transit network IDs.

Whenever a transit route system is opened, TransCAD automatically checks the associated roadway network to see if it was recently modified. The first step is to ensure that the correct roadway network is associated to the transit route, as explained in section 6.2.

When the transit network is opened in TransCAD, if TransCAD detects that edits have been made to the roadway network, a message will display to update the transit route system, as can be seen below.
This dialog box should only display if modifications have been made to the roadway network. If modifications have been made, then click “Yes” and TransCAD will update the route system and make it consistent with the correct roadway network. If no edits have been made to the roadway network and the box comes up, it is very likely that the incorrect roadway network is associated to the transit network.

Once this update has been performed, the route system will be consistent with the roadway network, but not all of the gaps or errors due to the roadway network edits are necessarily fixed.

Before fixing the remaining transit network errors, we must first reload, or refresh, the transit network by going to **Route Systems – Reload**. This may take some time because it refreshes the entire transit network.

Next, we need to verify the transit network and determine where the gaps, among other errors, may be present. The verify utility is found under **Route Systems – Verify**. The dialog box below will display and ensure that all boxes are selected.

In the process of verifying transit route system, TransCAD will report any issues that arise. The detailed information for the transit errors in the report file can be used to fix the transit errors using the route editing toolbox. Once all of the errors have been resolved using the editor toolbox, reload and verify must be run again to ensure all errors are fixed.

### 7.4 Editing the Transit Routes

The tool to edit the transit network is the Route Systems Editing Toolbox, which can be found under **Procedures - Route System - Editing Toolbox**.
To begin editing, the active layer must be set to the transit routes (2010 Base Year Route). The editor requires a highway .NET file to assist in route editing, and may prompt to ask for one. If it does, you may choose the file named 2010_Base_Year_Network_AM.NET in the Outputs\Networks folder if you are building off a previous run, but most times you will need to create a new .net file based off the latest roadway network. To create a .NET file:

1) Open the roadway network file that the route system is based on.
2) Go to **Procedures - Networks/Paths – Create**. The dialog box below will display

![Create Network dialog box](image)

3) For the purposes of editing the route system, only the Length field is required, which is set to Length by default. Click OK.
4) Enter a network filename and save to the desktop.

Now, a network has been created and is ready to be used by the route editor. Once created, the network file is automatically loaded, enabling the route system editing toolbox. The route system editing toolbox is shown below:

![Route System Toolbox](image)
1) Click on the white arrow and click on a transit route
2) If multiple routes pass through the same highway link, a dialog box with all these routes will show up. Select the route you want to edit.

![Pick Routes](Image)

3) The toolbox provides all type of edits to the transit network, such as add/remove a line, reverse/duplicate a line, realign/extend a line, delete a section of a line, insert into a line, add/remove/move a stop, and edit route and stop information.

For example, when fixing a gap in a transit route, the “Insert Into Route” tool can be used. The example below illustrates a route with a gap from node 24494 to node 95141 and back.

Using the tool, you would click on node 24494, then double-click on 95141 to fill the gap. This will add the route in that direction. For the opposite direction, first click on 95141 and then double click on 24494.
### 7.5 Editing Transit attributes

Users can easily edit transit attributes such as headways, mode and/or name as follows. Same way to update transit stop attributes, by choosing the stop.

1) Click on the info icon

2) Click on a transit line which needs editing, the route information is displayed. Click on the value that needs to be update and make a change. The changes will be saved to the route file.

3) All the required transit route and stop attributes need to be filled out. That is, peak and off-peak headways, fares, mode, etc. for transit routes, while the NodeID and RealStop for transit stops.

Given TransCAD does not allow multiple stops on the same transit routes connect to the same highway node, for those stops repeat the tagged highway nodes, their RealStop=0, otherwise =1.
To get the NodeID, go to **Transit -> Tag Stops to Node**, choose the stop variable to keep the highway node ID that the stop is associated with, and the search distance, as shown below. Then click OK and TransCAD will search the nearest highway node of each stop and tag the highway link ID to the stop.

![Tag Stops to Node](image)

### 7.6 Coding Rail Service or Routes with Exclusive Right of Way

To code a fixed guideway transit route with exclusive right of way, the transit-only links with functional class 44 needs to be coded to the highway network first. As explained in Section 5.8, those transit-only links represent the alignments of the transit segments with exclusive right of way, i.e., no auto or other non-transit vehicles can operate on those highway link.

**Step 1:** Code the transit-only links in the underlying highway network to represent the segments that a transit route operates with exclusive right of way.

**Step 2:** Follow the instructions in Section 8.4 to code the transit service along the transit-only links, and add transit stops accordingly. The travel times between neighboring stations are coded to the link variable “RAILTIME” of the transit-only links, assuming the travel times on the fixed-guideway are consistent and won’t be affected by the surrounding traffic condition.

**Step 3:** Associate each transit stop to the underlying highway nodes. For rail service or fixed guideway transit service, the underlying highway nodes are on the transit-only links, additional links need to be added to connect this underlying highway node to the highway network that auto can access, to ensure the access or egress between the highway system and this transit service.

**Step 4:** after editing the route alignment and stops, need to make sure all the key attributes in the routes system are filled out, following the instruction in Section 8.5.

### 8 DISPLAYING THE RESULTS OF THE MODEL RUN

Most traffic modeling software packages produce loaded network files that have a field showing the assigned traffic volume as a link attribute. TransCAD is different in that it stores assigned link volumes (among other data) in a tabular file separate from the network file. The user must therefore manually join the network file and a volume output file using the common field (Link ID) in order to display the assigned volumes.
8.1 Displaying Assigned Volumes

1) Open the roadway network file (Santa_Cruz_BaseYear_Highway.dbd). The link (streets) layer is displayed by default.

2) Click on the “New Dataview” icon and a window like the one below will come up.

3) Open a volume output file from the Final Assignment step (i.e., Assignment_XX.bin). Another dataview will open with the volume data, as shown below.
4) Click **Dataview – Join**, or click on the “Join” icon in the tool bar. The “Join” window will pop up. Select the field in each file that has a corresponding field with the same information in the other file.
5) Then click “OK.” The two database sets are now joined, as seen below, which means the volume data can be accessed from the network. If you scroll across the table, you will find that it now contains the fields from both files. If there are field names that are used in both files, TransCAD will change them slightly to keep the names unique (the altered field names are temporary and will automatically revert to their original names when the files are no longer joined).

6) Now, make the roadway network the active window, click the “Labels” icon in the tool bar. The Label window will appear. Display the AM directional volume by selecting AB_Flow / BA_Flow in the Field section. Select other options (Allow Duplicates, Font, Size, Color, etc.) as necessary. Other results data in this file that can also be displayed along the network includes AB_VMT/BA_VMT, AB_VHT/BA_VHT, AB_Speed/BA_Speed.

7) When you are finished, TransCAD will display the assigned volumes in a figure like the one shown below.

8) A bandwidth plot with these volumes can be created by going to Map > Scaled Symbol Theme and choosing the AB Flow /BA Flow field, and selecting Map Wizard. Manual intervals and bandwidth sizes can be specified if desired.
<table>
<thead>
<tr>
<th>File Name</th>
<th>Assignment Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC_Summary</td>
<td>Final Assignment</td>
<td>Summary of Mode Choice model results</td>
</tr>
<tr>
<td>HwyVol_AM/MD/PM/NT_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of Highway assignment results for AM, Midday, PM, and night time periods.</td>
</tr>
<tr>
<td>HwyVol_AMPH/PMPH_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of Highway assignment results for AM and PM peak hour.</td>
</tr>
<tr>
<td>HwyVol_DY_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of daily Highway assignment results.</td>
</tr>
<tr>
<td>TrnAsgn_Summary.bin (or .xls)</td>
<td>Final Assignment</td>
<td>Summary of transit assignment results.</td>
</tr>
</tbody>
</table>