

SPRTA 2023 Model User's Guide

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1.0 INTRODUCTION

1.1 Background

The first version of the Placer County travel demand model was developed for use in Placer County's 1992 Congestion Management Program. It was pieced together from earlier models for individual cities and from SACOG's regional model. This model was superseded in 1996 by a new model developed for use in updating the County's General Plan and for preparing nexus studies for impact fees in unincorporated parts of Placer County. The model was developed in MINUTP, a software package that was widely used at the time but has since been replaced by other, more powerful software packages. Trips to and from the other five counties in the SACOG region were based on SACOG's regional model SACMET.

The next model was developed in the early 2000's. It was sponsored by the Placer County Transportation Commission, now known as the Placer County Transportation Planning Agency (PCTPA), for use in the initial nexus study for the South Placer Regional Transportation Agency (SPRTA) impact fee program in 2002. There is limited documentation for this model, but it is clear that it switched software platforms from MINUTP to CUBE, and focused on the southwest portion of the county. The model was updated in 2007, 2009, and 2014 for use in of updates of the SPRTA fees.

In addition to the SPRTA model, there are other models currently in use that cover all or part of the SPRTA region. These include SACOG's SACSIM model, the replacement for SACMET, and local models maintained for the cities of Roseville, Rocklin, and Lincoln.

In 2020 PCTPA engaged WSP to update the SPRTA model for use in a nexus update of the SPRTA fee program. The updated model is intended for use in PCTPA's planning work and by member agencies in their traffic studies. In the interests of continuity, many features of previous models have been carried over into the new model; for example the CUBE software platform and the land use categories. However, new features have been added to keep abreast of modeling needs. For example, a component has been added to forecast VMT pursuant to a new requirement under SB-743.

1.2 Purpose of this Report

The purpose of this guide is to provide information that new users of the SPRTA model may find useful. The guide discusses the contents of the files that comprise the model and describes how to perform the most common modeling tasks.

A companion document, the *SPRTA 2021 Model Development Report*. It describes the structure, input data, model assumptions, and validation results of the updated PCTPA Model. This report can then be cited in the documentation of studies that make use of the model as evidence that the model used met or exceeded industry standards for accuracy.

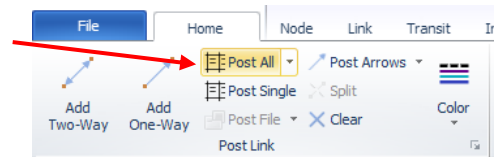
2.0 DISPLAY DATA

2.1 Displaying Network Data

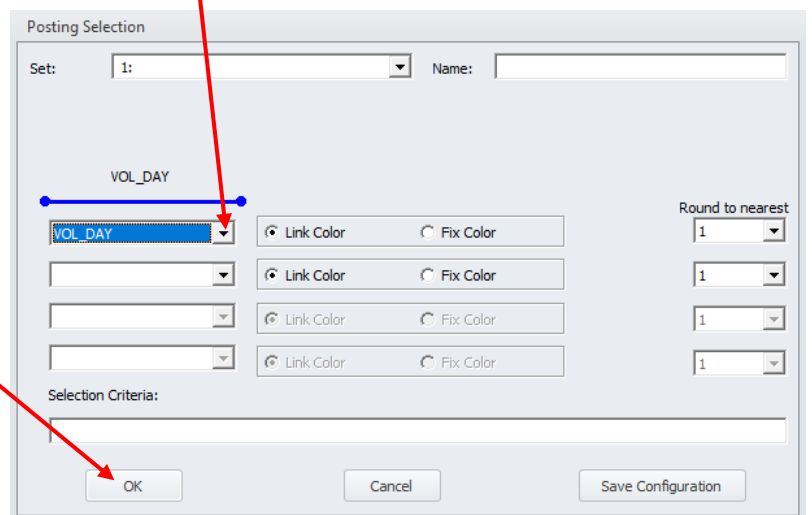
2.1.1 Labeling Daily Loaded Volumes

The model output files, including loaded network files, are stored in each model year's **outputs** folder. The 2019 daily loaded volumes can be displayed as follow:

- 1) Open the **2019/outputs/LOADED_2019_DAILY.NET** file using Cube.
- 2) Click the **Post All** icon under Post Link group (Home → Post Link → Post All)



- 3) In the Posting Selection, click the pull-down button (pointed below) and select **VOL_DAY**, which contains directional daily volumes.

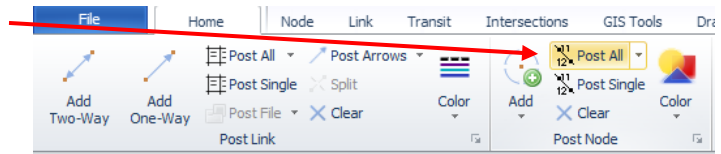


- 4) Click OK to display directional daily loaded volumes.

2.1.2 Labeling Node/TAZ numbers

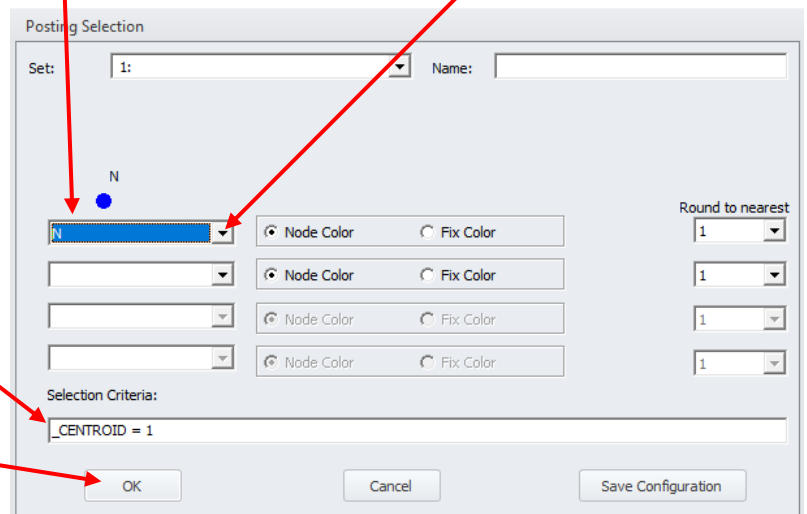
The Node/TAZ numbers can be displayed as follow:

- 1) Open any network file such as **2019/outputs/LOADED_2019_DAILY.NET** using Cube.
- 2) Click the **Post All** icon under Post Node group (Home → Post Node → Post All)



- 3) In the Posting Selection, the attribute **N** should be already selected. If not, click the pull-down button (pointed below) and select **N** (from node attributes), which contains node numbers.

- 4) To display node numbers, skip this step and go to Step 5. To display the only nodes representing TAZ numbers, add criteria, **_CENTROID = 1**, as shown:

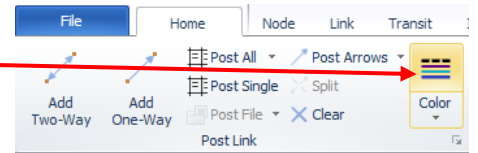


- 5) Click OK to display node or TAZ numbers.

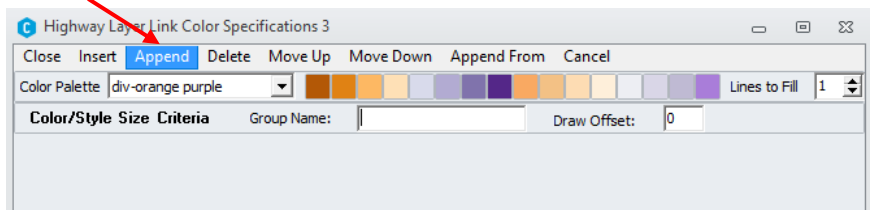
2.1.3 Displaying a Link Attribute Using Color

Colors can be utilized to display network attributes. The following steps demonstrate how to display the number of lanes in the 2019 working network.

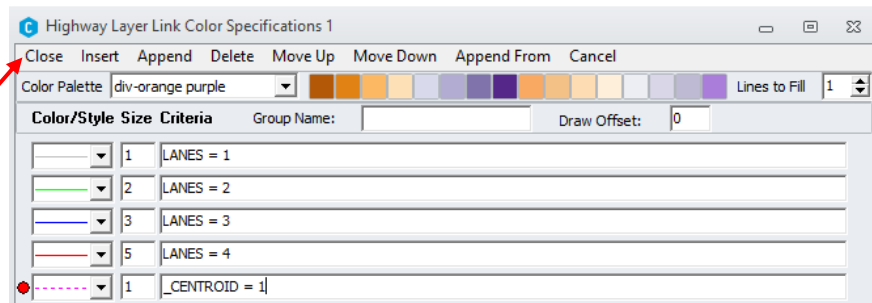
- 1) Open the **2019/outputs/Roads_2019.NET** using Cube.
- 2) Click the **Color** icon under Post Link group (Home → Post Link → Color)



- 3) In the color setting, click the **Append** or **Insert** button to add another row.



- 4) The color/thickness/line type of links can be defined in the color setting as shown below:

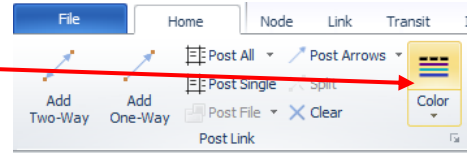


- 5) Click **Close** to apply the color setting.

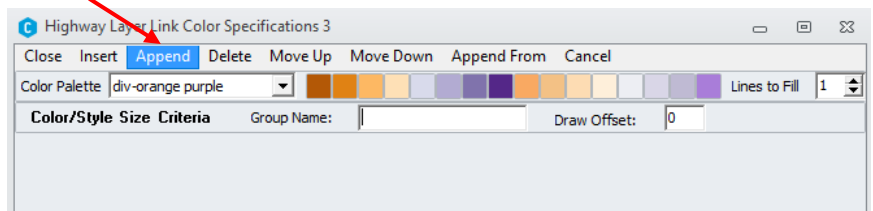
2.1.4 Hide Unnecessary Links in Master Network

Users may start with each year's model network or master network as a starting point of editing model network. The following procedure demonstrates how to display the only links actively used by the 2019 model:

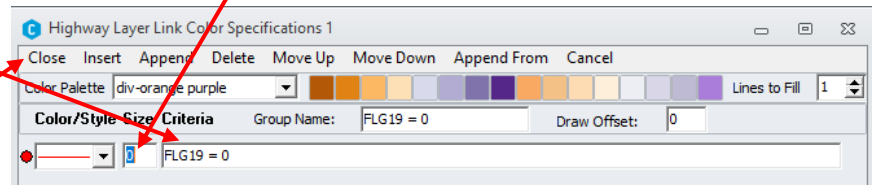
- 1) Open the **_MasterNet/Roads_Master_vXX.NET** file using Cube.
- 2) Click the **Color** icon under Post Link group (Home → Post Link → Color)



- 3) In the color setting, click the **Append** or **Insert** button to add another row.



- 4) Type **FLG19 = 0** in the Criteria section and type **0** (zero) in Size.

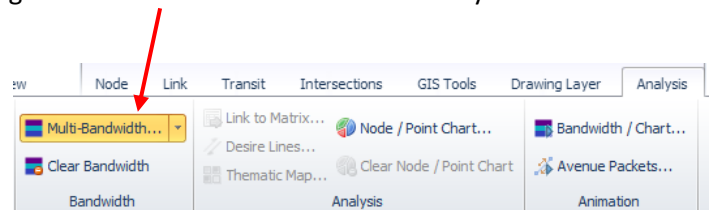


- 5) Click **Close** to apply the color setting.

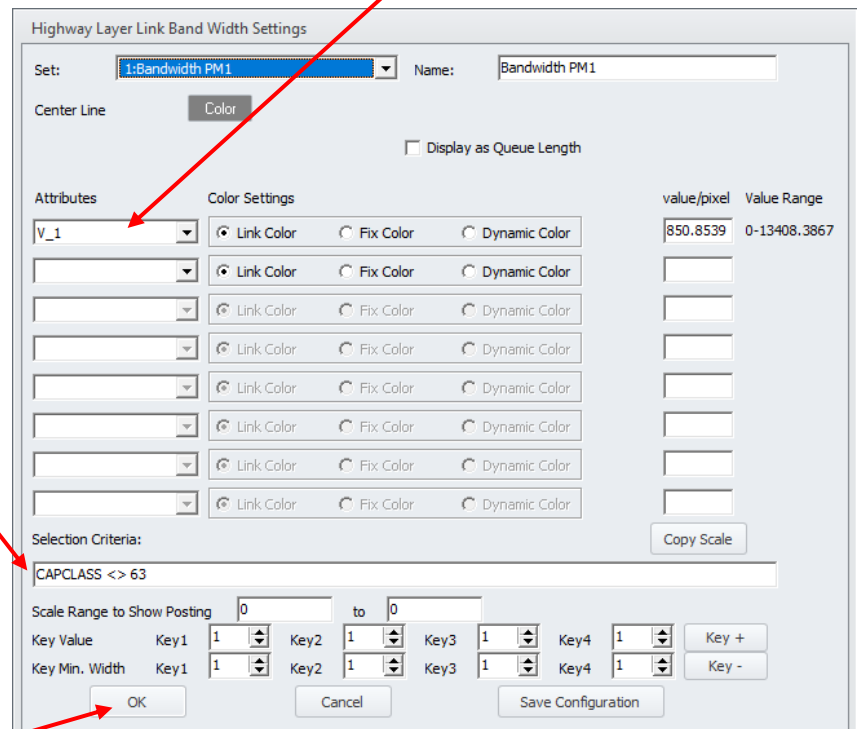
2.2 Create Bandwidth Map with V/C Ratio

The following steps demonstrate how to display PM 1-hour volumes by link thickness and V/C ratio by color.

- 1) Open the **2019/outputs/LOADED_2019_PM1.NET** file using Cube.
- 2) First, create a bandwidth map by clicking the Multi-Bandwidth icon under Analysis ribbon tab (Analysis → Multi-Bandwidth)

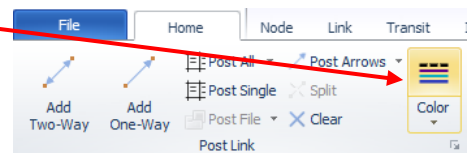


- 3) In the bandwidth setting, select a volume attribute, such as V_1, which contains the directional PM 1-hour volumes.

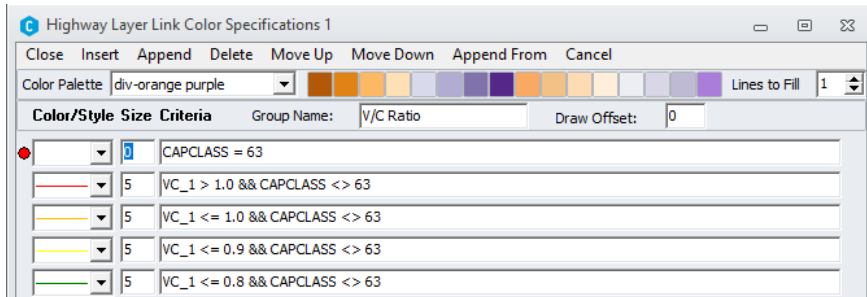


- 4) If users desire to hide centroid connectors, type **CAPCLASS <> 63** in Selection Criteria.

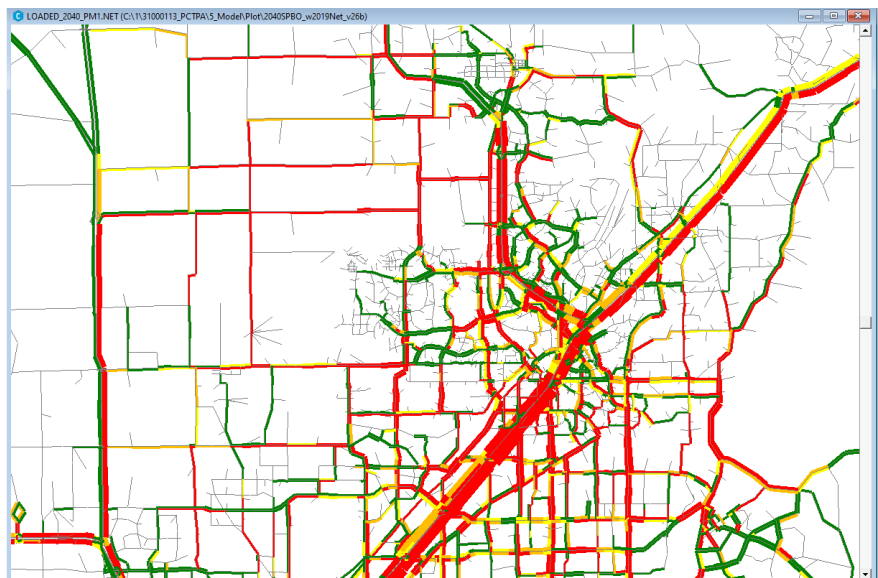
- 5) Click OK to apply the bandwidth map.
- 6) To apply the V/C ratio by color, click the **Color** icon under Post Link group (Home → Post Link → Color).



- 7) Colors could be defined for each V/C ratio range as follow. Additional rows can be added by clicking the **Append** or **Insert** menu.

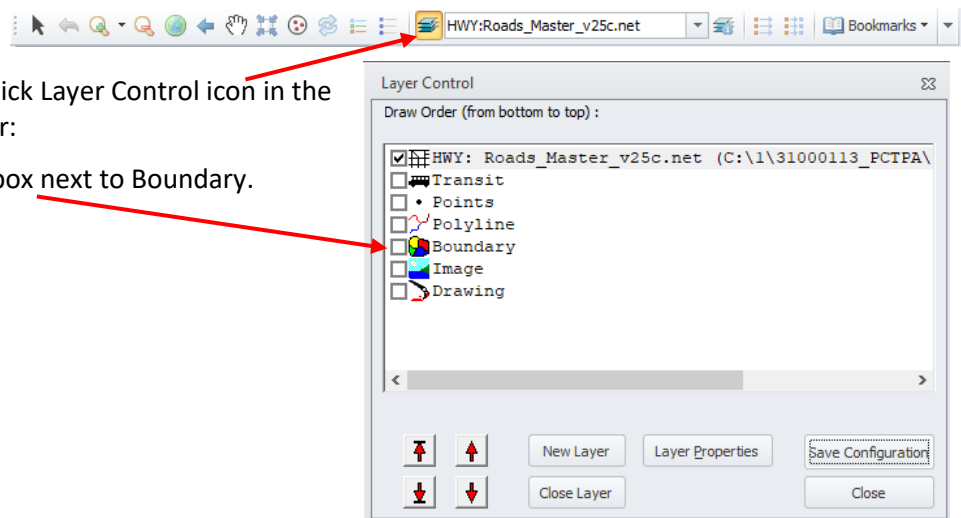


- 8) Click **Close** to apply the color setting. The bandwidth map with V/C ratio will be displayed as follow:

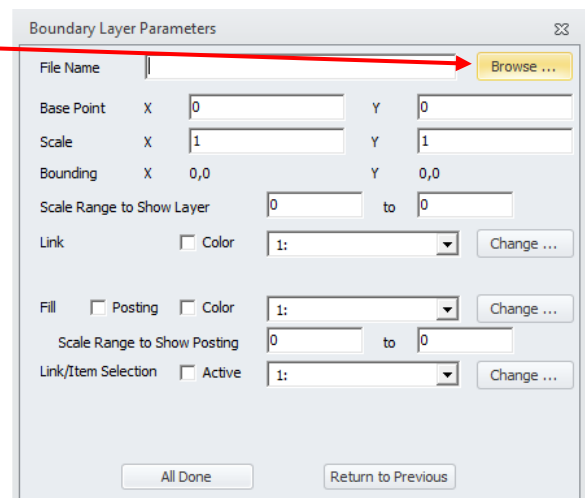


2.3 Displaying TAZ Data with a Boundary Layer

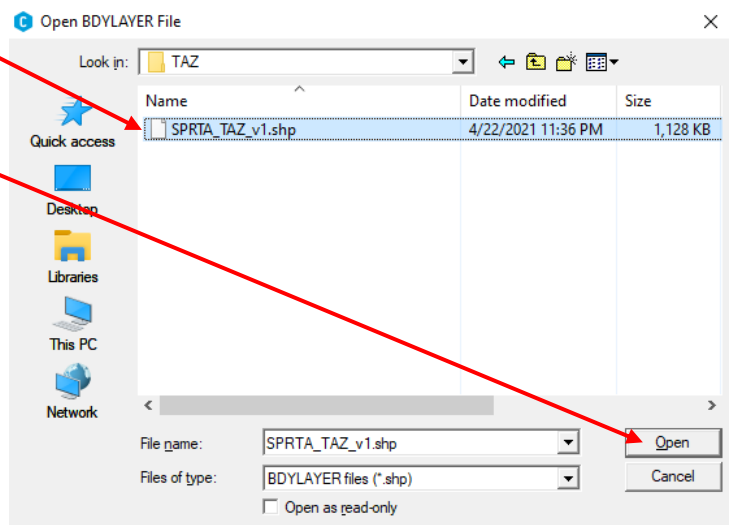
- 1) To display TAZ boundary as another layer, click Layer Control icon in the Network Toolbar:
- 2) Click the check box next to Boundary.



- 3) In the Boundary Layer Parameters, click the **Browse** button.



- 4) Select a TAZ boundary shape file and click **Open**.



- 5) Then, it will go back to the Boundary Layer Parameter window. Click **All Done** to apply the boundary setting.

3.0 EDITING NETWORK FILE

3.1 Editing the Attributes of a Single Link

- 1) Open either the scenario network file (**2019/outputs/Roads_2019.NET**) or the master network file (**_MasterNet/Roads_Master_vXX.NET**) using Cube, depending on which network is a starting point of a new project.
- 2) Click the arrow icon in the Network Toolbar and click a link in the network for edit.



- 3) In Highway Links, you can overwrite attributes for the selected link.
- 4) Once the edit is complete, click the **Save Current Item** button.

Highway Links		
AX/BX	6765858.4159	6766888.9272
AY/BY	2057908.6499	2057047.2694
A	2785	13609
B	13609	2785
NAME	SUNSET BLVD	SUNSET BLVD
DISTANCE	0.2544	0.2544
VAL_ID	0	0
AVGTRVLDST	0	0
LANES	3	3
SPEED	45	45
CAPCLASS	3	3
HOVLINK	0	0
PREVOL_AM	0	0
PREVOL_PM	0	0
PREVOL_OP	0	0

- 5) Click **Save** in File menu to save the changes to the network file.

3.2 Editing the Attributes of Multiple Links

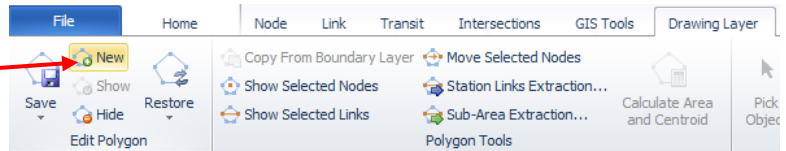
Cube has a function to fill in multiple records; however, limited options are available to select/define links. Options include:

- Define by condition/formula using values of attributes
- Select by polygon

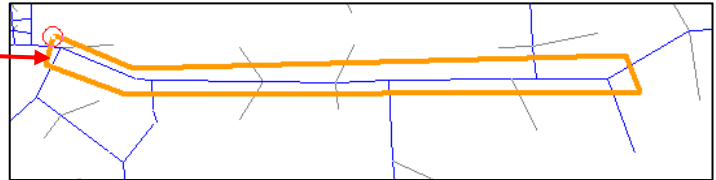
Users can use one of these options or a combination of both.

- 1) Depending on which network is a starting point of a new project, open either the scenario network file (**2019/outputs/Roads_2019.NET**) or the master network file (**_MasterNet/Roads_Master_vXX.NET**) using Cube.

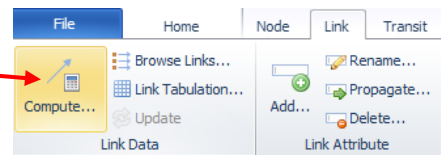
- 2) Click **New** under Drawing Layer (Drawing Layer → Edit Polygon → New)



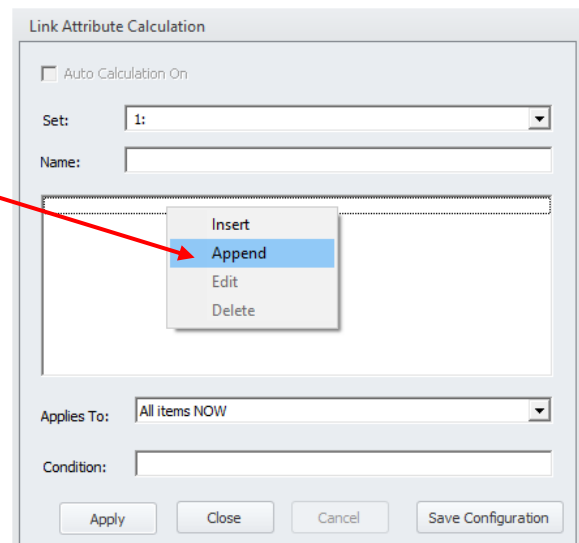
- 3) Draw a polygon to include targeted links.



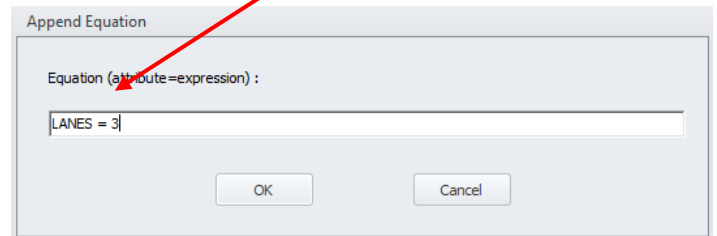
- 4) Click the **Compute** under the Link ribbon tab (Link → Link Data → Compute).



- 5) In Link Attribute Calculation, click the right-mouse button in the formula area and click **Append** or **Insert**.

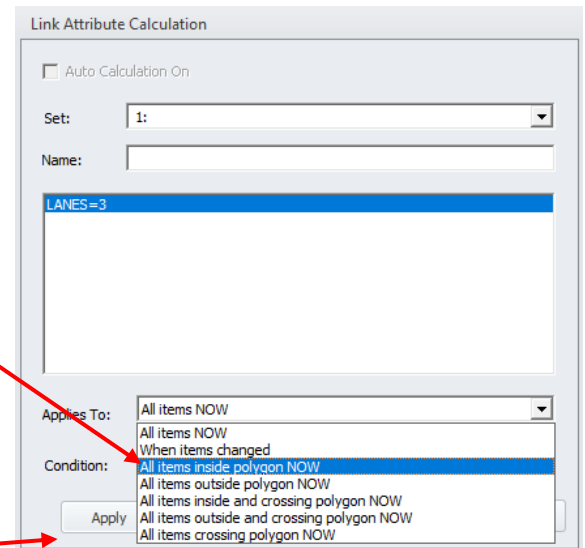


- In Equation, add a formula to fill an attribute with value, such as LANES = 3 and click OK.



- In Link Attribute Calculation, pick **All items inside polygon NOW** to apply to links within the polygon defined earlier.

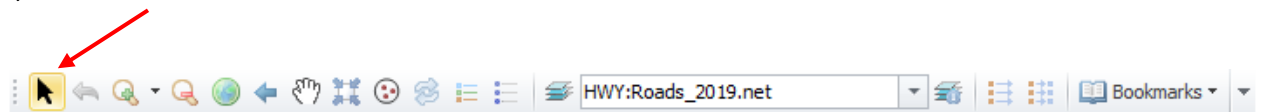
- Other conditions could be further applied in the Condition if necessary.



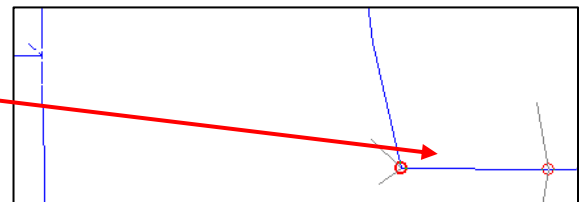
- Click **Apply** to complete the computation.
- Click **Save** in File menu to save the changes to the network file.

3.3 Adding a Link

- Open a network file.
- Click the **arrow** icon in the Network Toolbar.

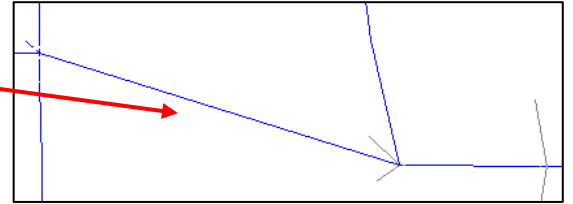


- Click a link that has a similar set of attributes that is desired for a new link.



- Ctrl+C and then Ctrl+V. Then the arrow shape mouse will turn into the + shape.

-
- 5) Draw a new link connecting the start and endpoint.



- 6) Click **Save** in File menu to save the changes to the network file.

3.4 Deleting a Link

Deleting a link in Cube is straightforward. Select a link with the arrow icon in the Network Toolbar. Press the **Delete** button on the keyboard and save the file.

4.0 RUNNING THE MODEL

4.1 Cube Voyager 6.4.4

SPRTA Model was developed using Cube/Voyager 6.4.4 software. Users will need to purchase the Cube/Voyager license from Bentley Systems, Incorporated (www.bentley.com). It should be noted that using a different version of Cube/Voyager program may result in a different result or may not work.

4.2 Running a model

SPRTA Model is designed with two steps: a pre-step that generates a scenario network file from the master network file and a regular model step. Users may choose to run either only the regular model step or both steps.

4.2.1 Run without Master Network

If a user doesn't need to edit the model network or need to edit a network simply, the only folder needed is a scenario year folder. Here are steps to run a 2019 model:

- 1) Copy the 2019 folder to any folder on your computer.
- 2) Edit any input files if necessary. A scenario network is stored in the "output" folder. All other input files are stored in the "inputs" folder.
- 3) Run the SPRTA regular model script (SPRTA_Script_2019_vXX.s) with Voyager 6.4.4 by double-clicking it. The SPRTA Model does not require a prefix in Voyager.

For other scenarios, a user can repeat Steps 1 to 3 above.

4.2.2 Run with Master Network

If a user needs to edit the model network extensively for both 2019 and 2040 network files, using the master network will provide consistent editing for both years and will save time by editing a network file once. Here are steps to run a 2019 model:

- 1) Copy the "_MasterNet" folder to any folder on your computer.
- 2) Copy the 2019 folder to the folder where the "_MasterNet" folder is copied to.
- 3) Edit any input files if necessary, including the master network file. All other input files are stored in the "inputs" folder.
- 4) Run the SPRTA Pre-step script (SPRTA_Pre-Step_CreateNet_2019_vXX.s) with Voyager 6.4.4 by double-clicking it. This script will generate a 2019 network file from the master network file. The SPRTA Model does not require a prefix in Voyager.
- 5) Once the Pre-step run is complete, run the SPRTA regular model script (SPRTA_Script_2019_vXX.s).

For other scenarios, a user can repeat Steps 2 to 5 above.

5.0 DESCRIPTION OF MODEL FIELDS

The starting point of developing the SPRTA Model network was the SACSIM19 network files. Thus, the SPRTA Model network inherited the SACSIM19 coding code.

Exhibit 1: Master Network Fields

Network Field	Description
DISTANCE	Auto-generated link distance (miles).
FLGxx	Flag indicating whether links should be turned-on or off for each model year.
LANESxx	Number of through-lanes in the link's direction
SPEEDxx	Free-flow speed, or average travel speed with no congestion.
CAPCLASSxx	Capacity class code (see Capacity Class Lookup Table).
HOVLINKxx	0 = All trips permitted 1 = Walk and bicycle trip only 2 = HOV-only facility in freeway 3 = HOV-only bypass lane at metered on-ramp
PREVOLAMxx	Non-Placer County traffic (AM 1-hour) for each model year from SACSIM19.
PREVOLPMxx	Non-Placer County traffic (PM 1-hour) for each model year from SACSIM19.
PREVOLOPxx	Non-Placer County traffic (Off peak period) for each model year from SACSIM19.
FLG_PRELOAD	Flag indicating links with preload.
BIKExx	Bike link facility information inherited from SACSIM19. Not used in SPRTA Model.
VAL_ID	Traffic counts location ID.
AVGTRVDST	Average travel distance of Placer County traffic from each gateway per Replica.
Notes: xx indicates a two-digit model year	

Exhibit 2: Scenario Network Fields

Network Field	Description
DISTANCE	Auto-generated link distance (miles).
VAL_ID	Traffic counts location ID.
AVGTRVDST	Average travel distance of Placer County traffic from each gateway per Replica.
LANES	Number of through-lanes in the link's direction
SPEED	Free-flow speed, or average travel speed with no congestion.
CAPCLASS	Capacity class code (see Capacity Class Lookup Table).
HOVLINK	0 = All trips permitted 1 = Walk and bicycle trip only 2 = HOV-only facility in freeway 3 = HOV-only bypass lane at metered on-ramp
PREVOLAM	Non-Placer County traffic (AM 1-hour) for each model year from SACSIM19.
PREVOLPM	Non-Placer County traffic (PM 1-hour) for each model year from SACSIM19.
PREVOLOP	Non-Placer County traffic (Off peak period) for each model year from SACSIM19.

Exhibit 3: Capacity Class Lookup Table in SACSIM19

Capacity Class		Capacity (vplph)	Free Flow Speed				
#	Description		Median	Average	Std.Dev.	Min	Max
1	Freeway (Mixed Flow)	2000	63	61	4	40	70
8	Freeway Lane (Pk Period HOV)	2000	60	51	13	20	63
51	Freeway (Auxiliary >= 1 mile)	2000	58	58	1	55	58
56	Freeway (Auxiliary <1 mile)	1500	58	55	3	50	58
12	High Capacity River Crossing	1500	42.5	43	3	40	45
2	Expressway	1000	50	49	6	35	55
3	Major Arterial	850	40	37	7	15	55
4	Minor Arterial	800	35	33	9	5	50
5	Collector	700	25	29	7	10	50
6	Freeway Ramp	1500	20	21	4	20	55
36	Ramp (Metered AM)	1500	20	21	4	20	55
46	Ramp (Metered PM)	1500	20	20	0	20	20
26	Low Capacity Ramp	500	20	18	4	10	20
16	High Capacity Ramp/Connector	2000	45	42	10	20	63
6	Ramp (HOV Bypass)	1500	20	21	4	20	55
22	Rural Highway	1000	55	51	5	35	55
24	Rural Arterial	750	40	40	6	20	55
7	Walk/Bike	n/a	3	3	0	3	3
9	Connector (Mixed Flow-HOV)	1500	63	63	0	63	63
62	Connector (PNR-Roadway)	n/a	20	20	0	20	20
63	Centroid Connector (TAZ to roadway)	n/a	20	20	0	20	20
99	Disabled	n/a	0	0	0	0	0

Source: SACOG 2020.

Tabular input files can be mostly edited by text editors or Excel. In the case of DBF, simple edits can be done in Cube. As MS-Excel no longer supports saving data as DBF, MS-Access or a third-party program may need to be used for extensive edits.

Exhibit 4: Land Use Fields

Label in Model	Land Use Description	Unit
TAZ	TAZ numbers	
ATYPE	Area Type. All fee districts are coded as area type 1.	
ATYPE_STR	Fee District description	
IX_A	Station Weights for IX attraction	
XI_P	Station Weights for XI production	
TERMINAL_O	Origin Terminal Time	
TERMINAL_D	Destination Terminal Time	
SFDU	Single Family Dwelling	DU
MFDU	Apartment	DU
ARDU	Senior Adult Housing-Detached	DU
RET	Shopping Center	1,000 SF
MALL	Mall	1,000 SF
OFF	Office	1,000 SF
IND	Industrial Park	1,000 SF
HTI	Light Industrial	1,000 SF
CC	Community Commercial	1,000 SF
CHURCH	Church	1,000 SF
LODGE	Club	1,000 SF
MED	Medical/Dental Office	1,000 SF
HOSP	Hospital	1,000 SF
CONV	Convalescent Hospital	1,000 SF
HOTEL	Hotel	Room
PQPL	Fire Station, Museum, Water Treatment	1,000 SF
PQPH	DMV, Post Office, Library, Police, Government Building	1,000 SF
SCHOOL	K-12 School	student
GOLF	Golf Course	Hole
PARK	City Park	Acre
CEM	Cemetery	Acre
FAIR	Fairgrounds	Acre
UNIV	University/College	student
Special	Special Generator	Trip
S1	Spare 1	none