TransModeler Training
1-Network Development

presented to

Caltrans, District 1-Eureka

presented by

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CAMBRIDGE SYSTEMATICS

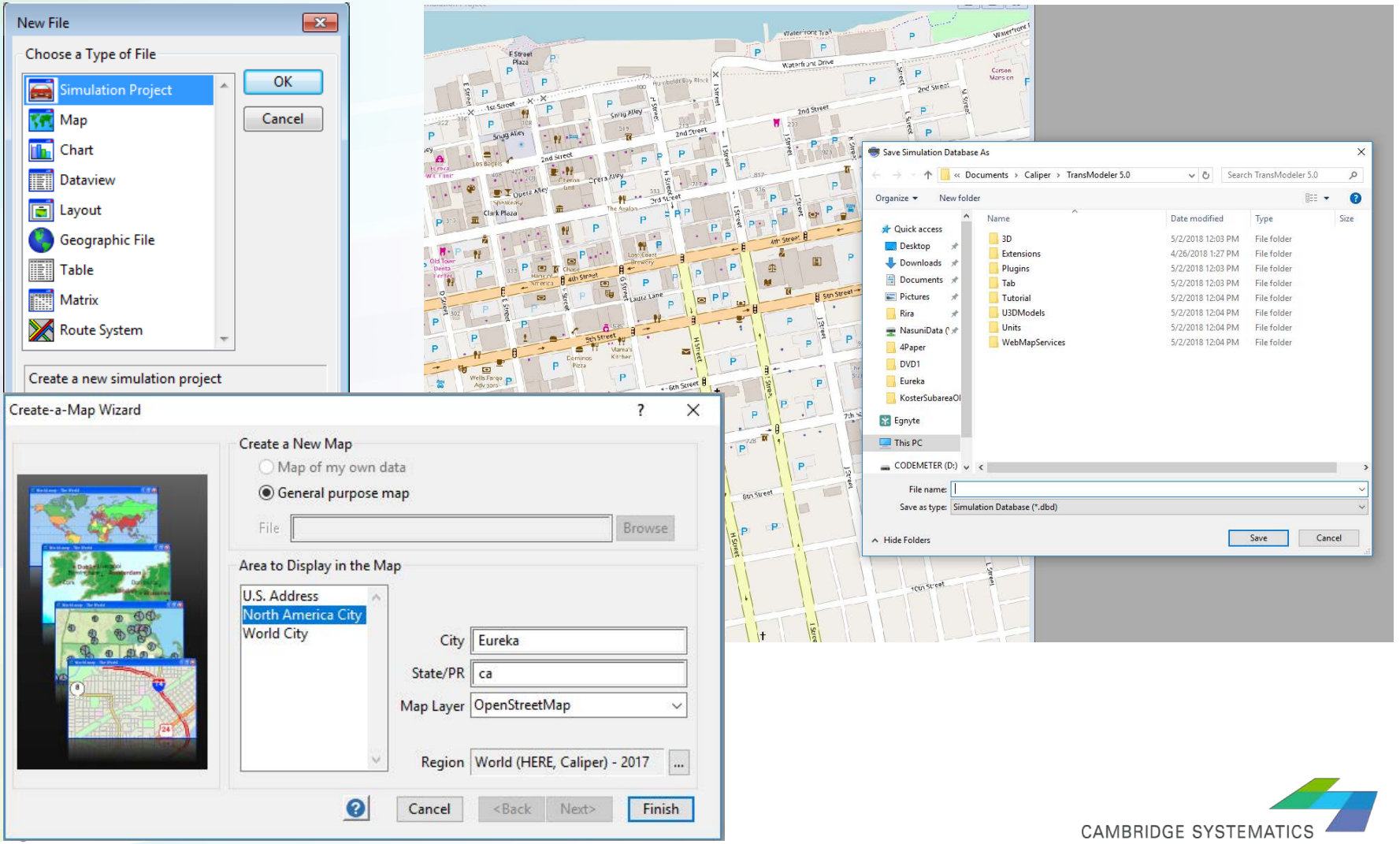
Think Forward

May 2018

Webinar 1- May 1st, 2018

- Overview
- Creating Network From Scratch
- TransCAD Model Conversion
- Network Editing
- Network Parameters
- Eureka Model Developed by Caliper
- Signal coding
- Count coding
- Zone Connector/Aggregation

Create Network From Scratch



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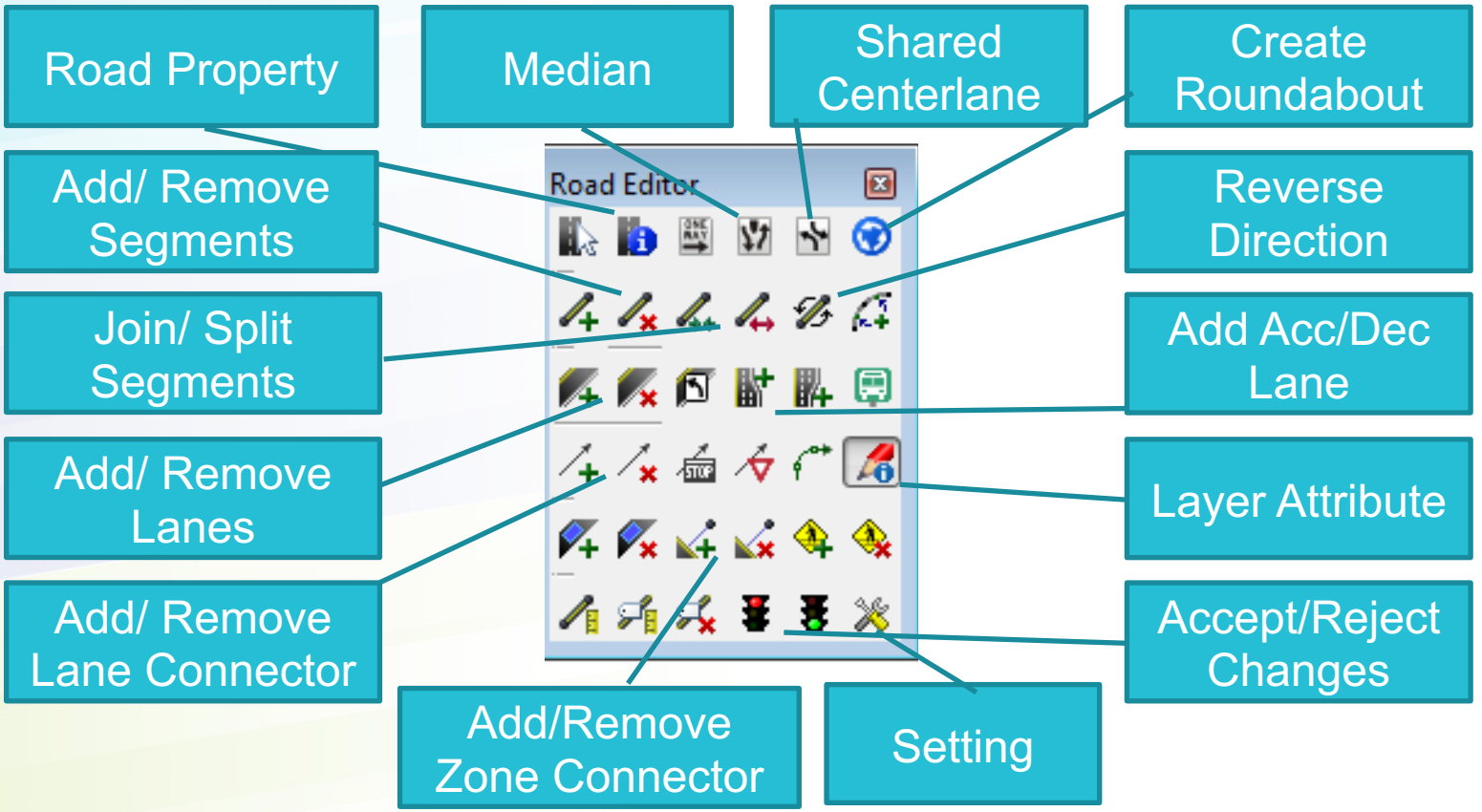
Network Editing - Editing Toolbox

- Project → Road Editor → Toolbox



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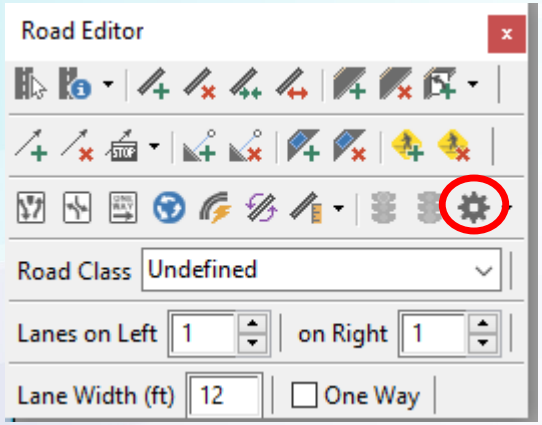
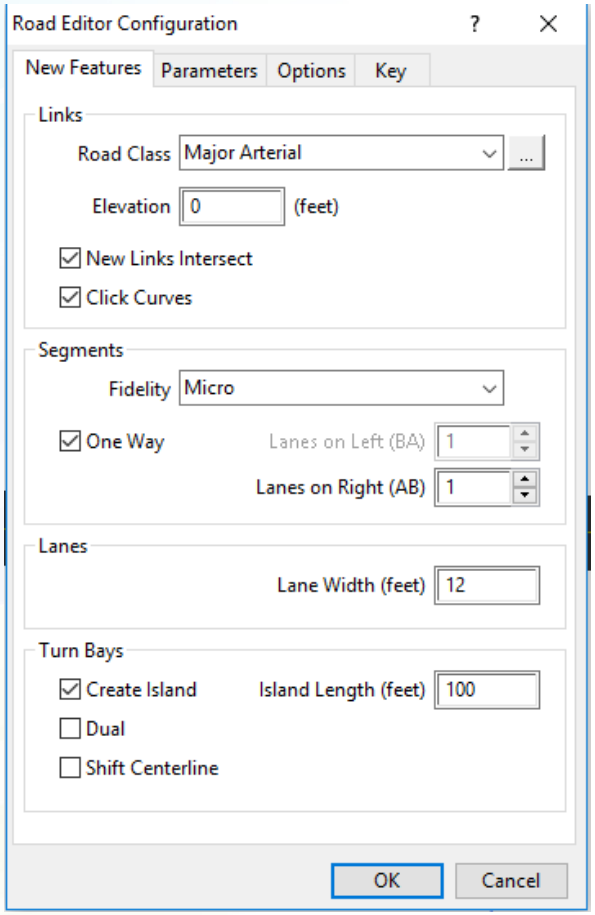
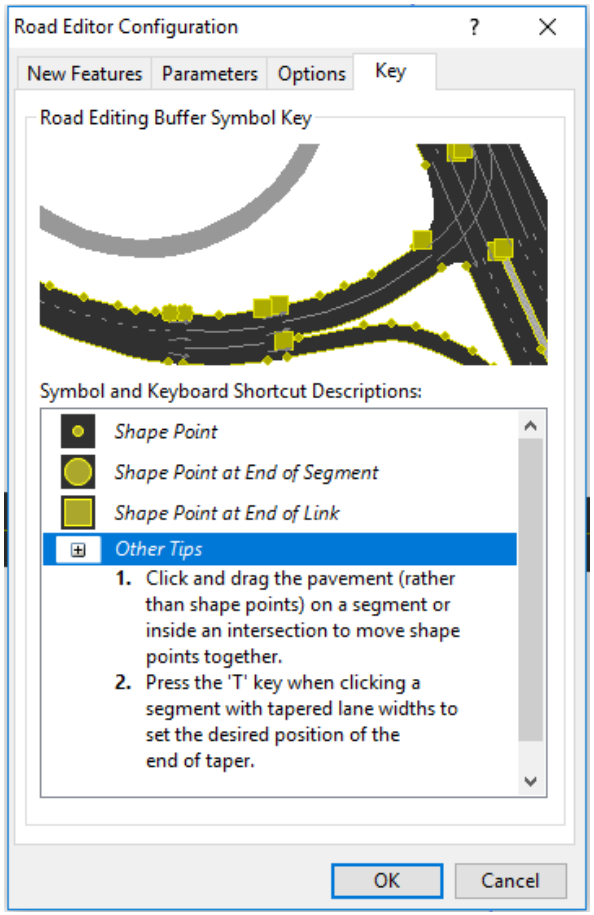
Editing Toolbox-Settings







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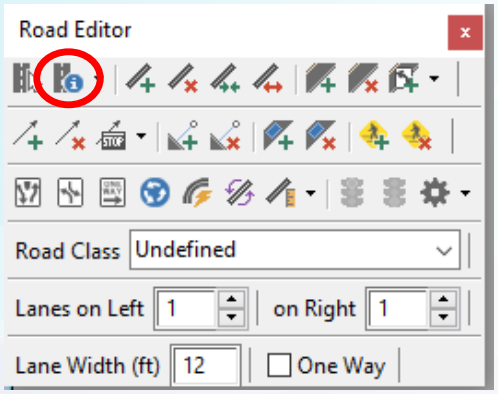
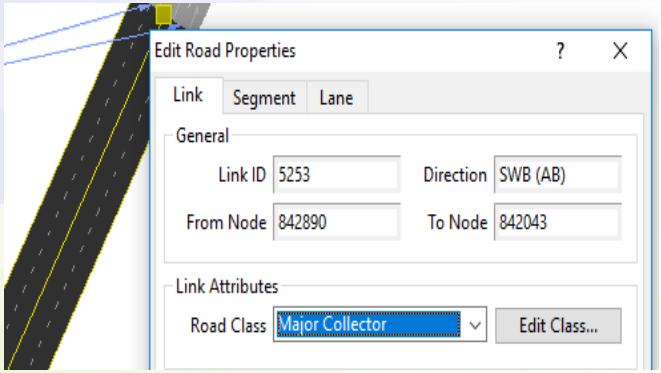
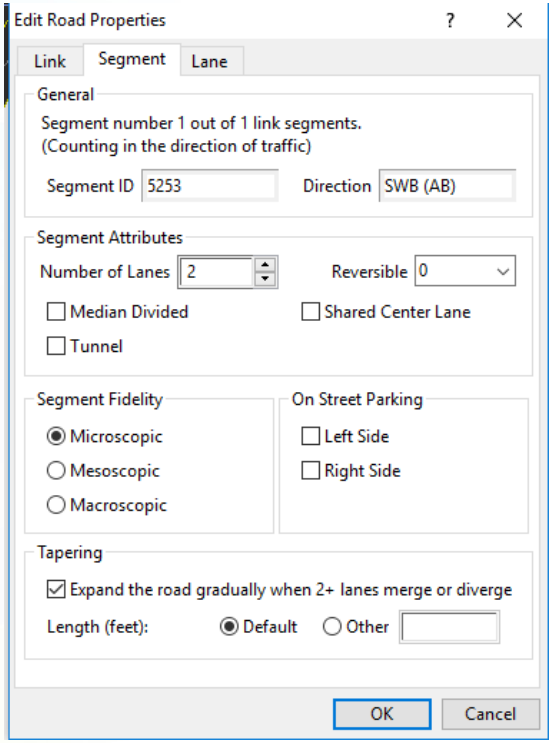
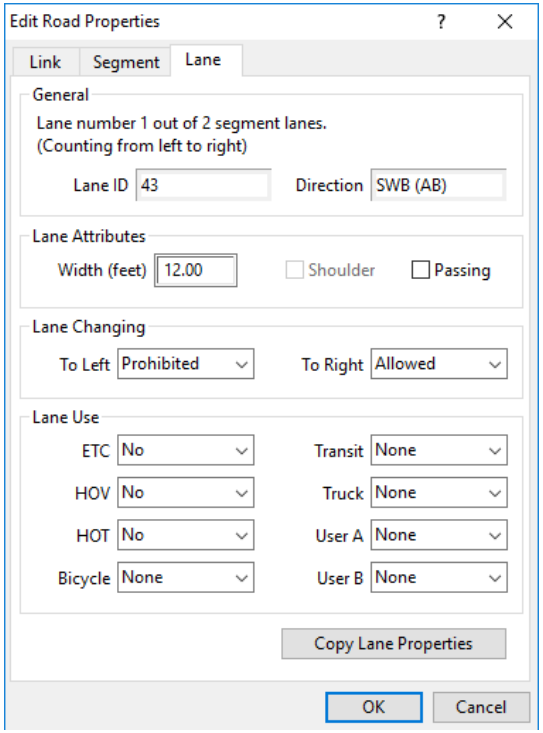
Editing Toolbox-Properties-Line Layers









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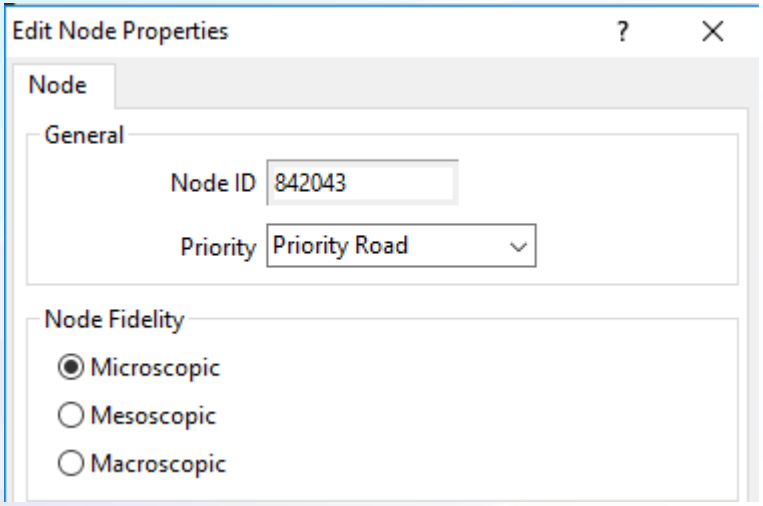
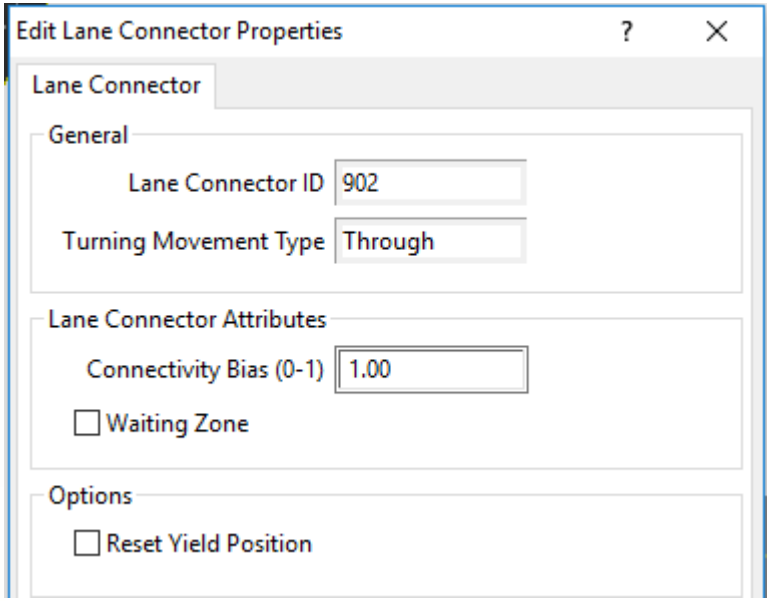
Editing Toolbox-Properties
Node & Lane Connector Layers





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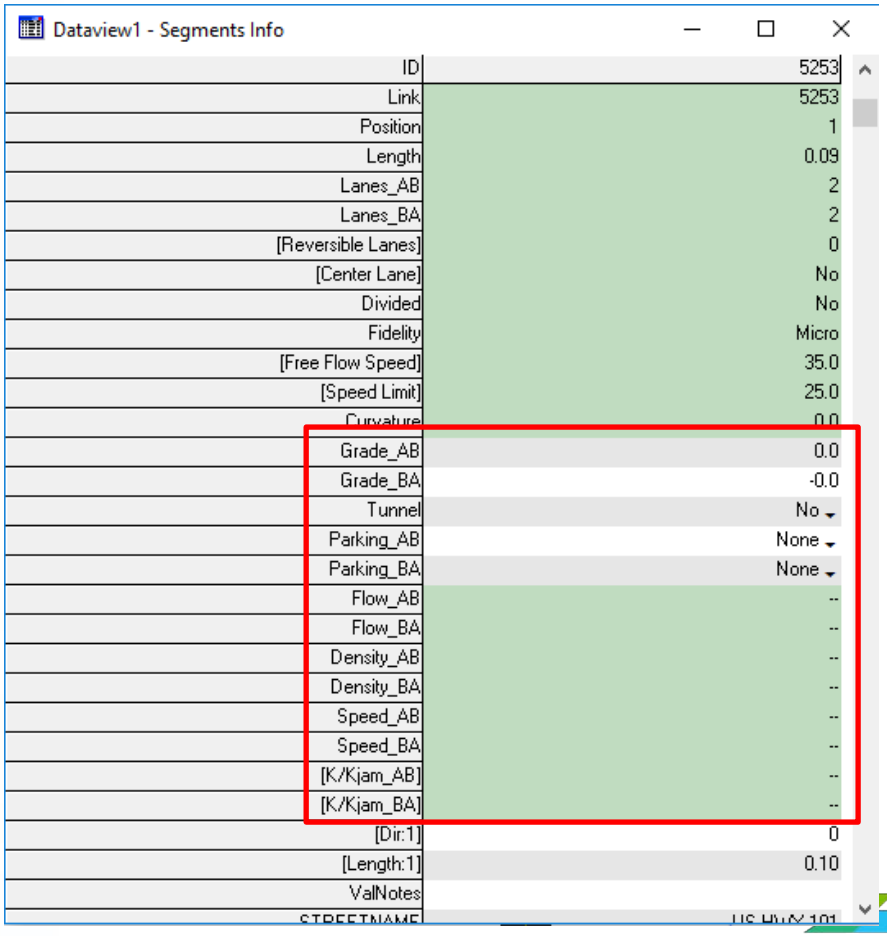
Network Editing – Line Layers

- Not only different line layers carry specific network parameters, but each produce certain output.
- Segment:

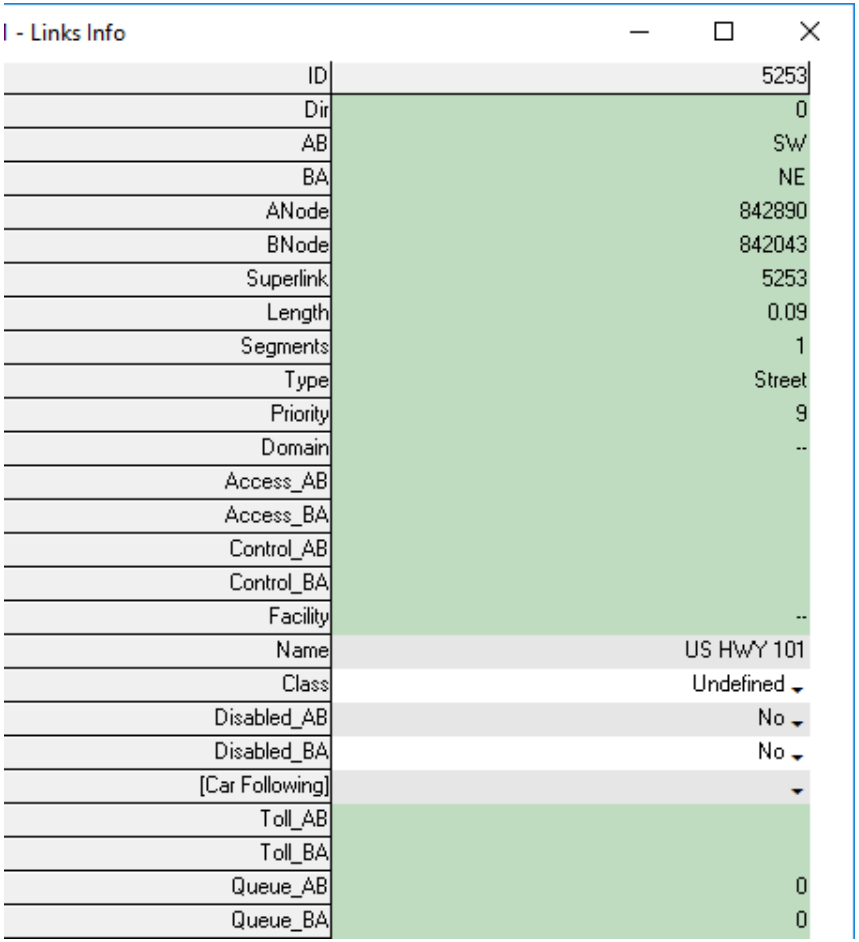
Flow, Density, and Speed will be updated continuously during the simulation, and output report can be generated based on user-defined time aggregation.

Fidelity, grade and parking information are input to this layer



Network Editing – Line Layers

- Link:
  Queue and toll information will be dynamically updated during simulation. Road class, car following, priority, are examples of parameters that are only editable through link layer.



ID	5253
Dir	0
AB	SW
BA	NE
ANode	842890
BNode	842043
Superlink	5253
Length	0.09
Segments	1
Type	Street
Priority	9
Domain	--
Access_AB	
Access_BA	
Control_AB	
Control_BA	
Facility	--
Name	US HWY 101
Class	Undefined
Disabled_AB	No
Disabled_BA	No
[Car Following]	
Toll_AB	
Toll_BA	
Queue_AB	0
Queue_BA	0

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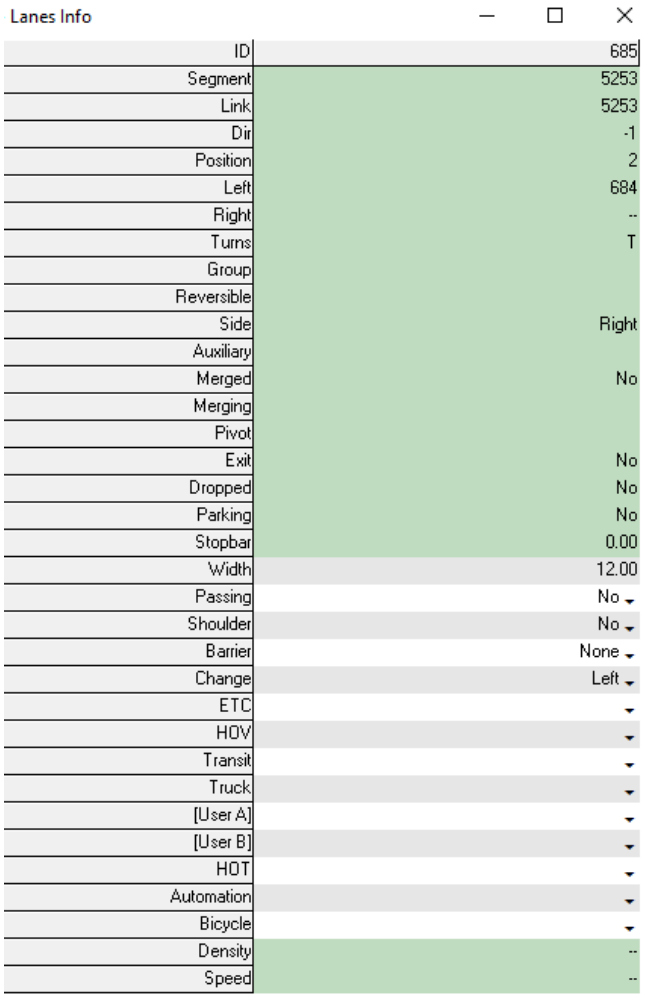
Network Editing – Line Layers

- Lane:
  Density and speed per lane are dynamically updated during simulation and can be collected by user-defined aggregation level after simulation.

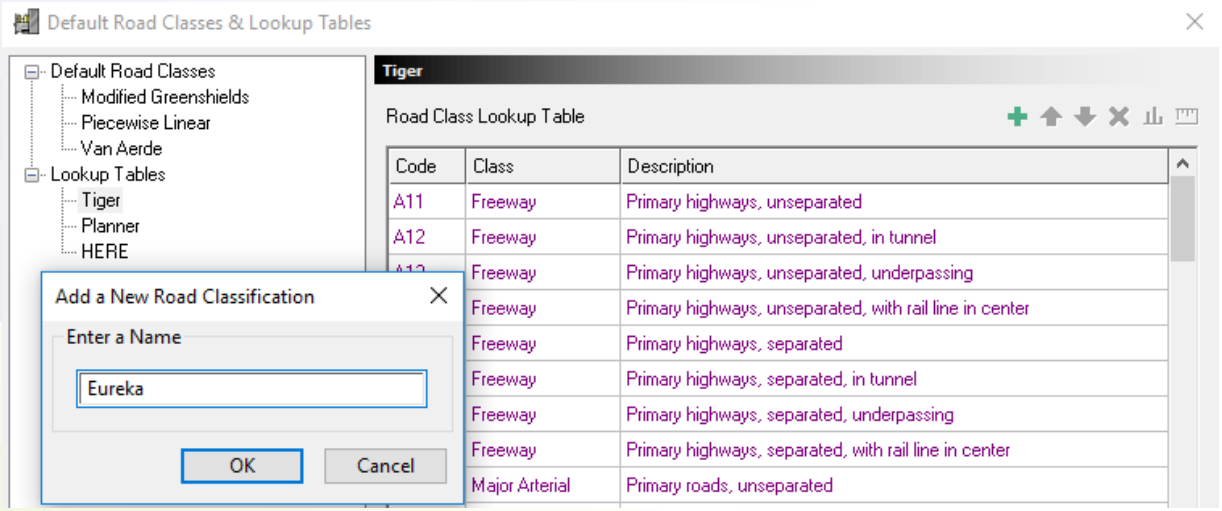
  Lane restriction/ discount for certain user such as trucks, HOV are defined in this layer

  Lane change restriction is defined in this layer.



Create Network From Line Layer

- Import Subarea Model
  1. File → Open (.dbd)
  2. Make a selection set of TAZs in the TranCAD .dbd (activate the node layer)*
  3. Optional: Create a custom lookup table for road classification: Parameters→ Road Classification → Default Road Classes & Lookup Tables
     Right click on Lookup Tables and select Add. You can later edit this list.



* Refer to slides 8-10

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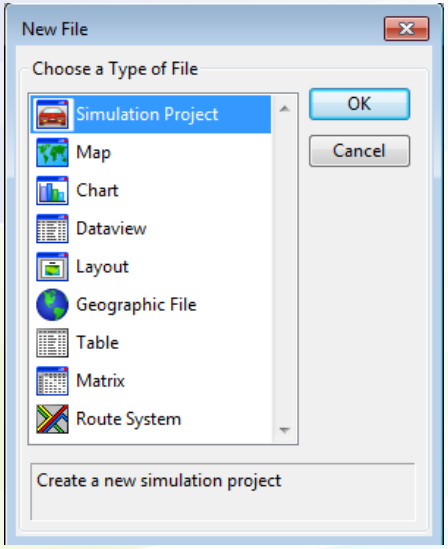
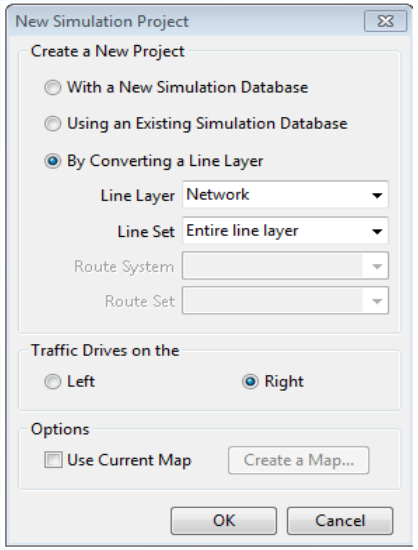
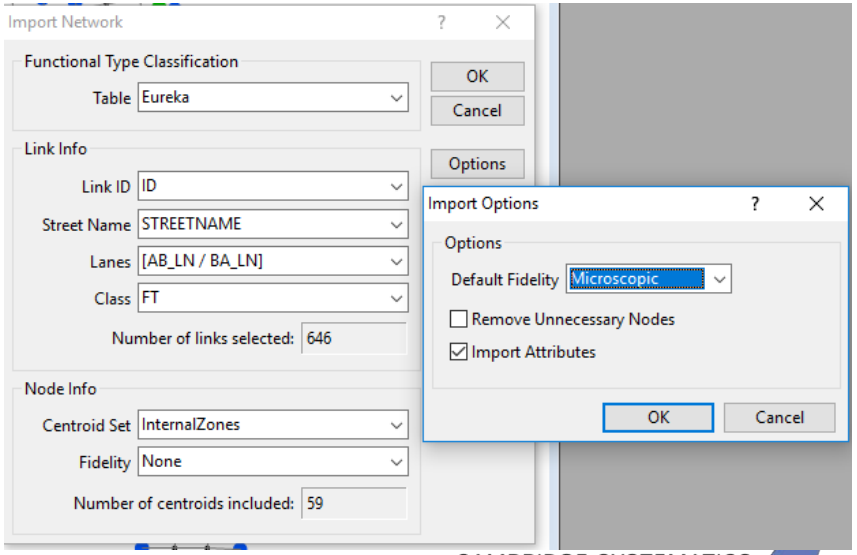
Create Network From Line Layer

- Import Subarea Model
  4. File → New Simulation Project
  5. The program will ask you to save the .dbd, save it in a new folder in which you want to have your simulation database. This way, the original .dbd file in the old folder will remain accessible/editable by TransCAD.
     *Note: If you have not created a road classification lookup table in step 3, select "None" for Functional Type Classification



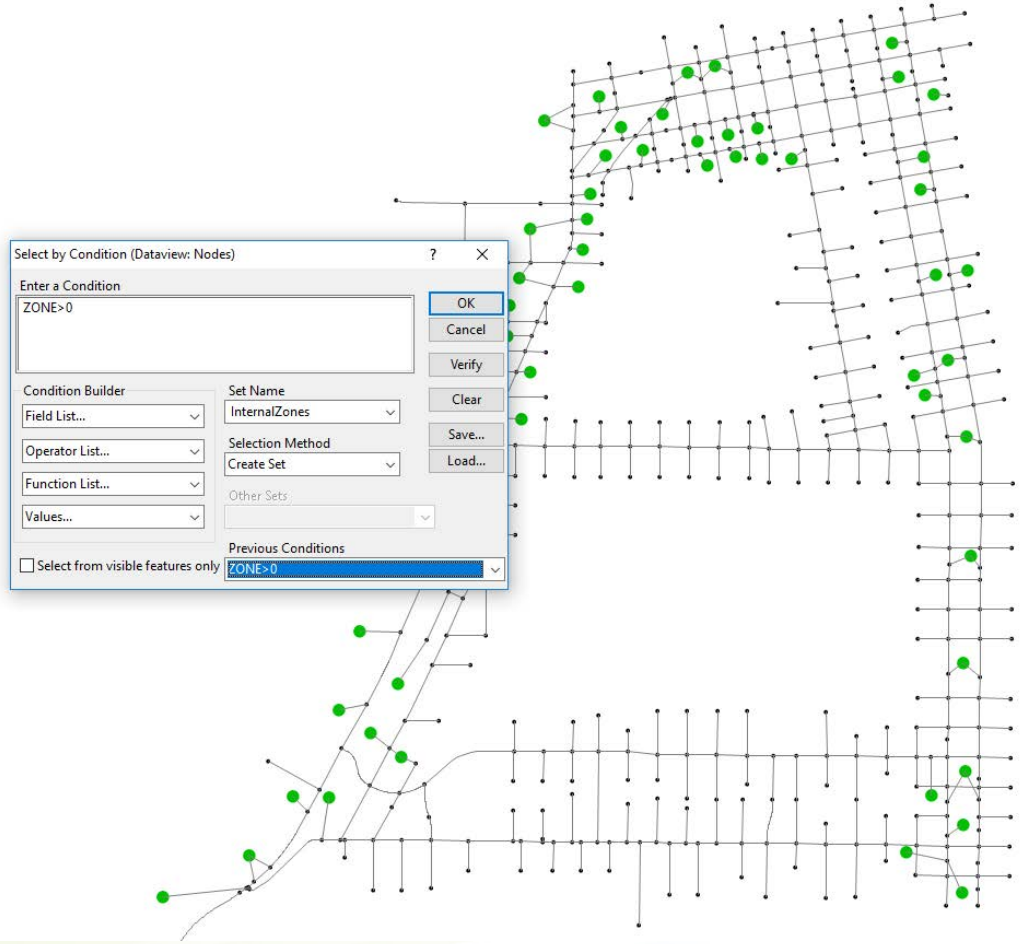




Centroids vs Boundary Nodes

- TransCAD subarea contains internal and external zones. Internal zones are the ones that were TAZs in the initial, regional model; external zones are the ones created by cutting the subarea from the regional model.
- When you make a selection set in the node layer for TAZs, Transmodeler creates centroid and centroid connectors for them.
- If your selection set only includes internal zones, Transmodeler creates centroids only for internal zones, but still recognizes the external zones as nodes with type “Boundary” when creates a simulation data base.
- Trips can be generated from and destined to both Centroids and Boundary nodes

Eureka Subarea-Internal Zones



Contains 59 zones.

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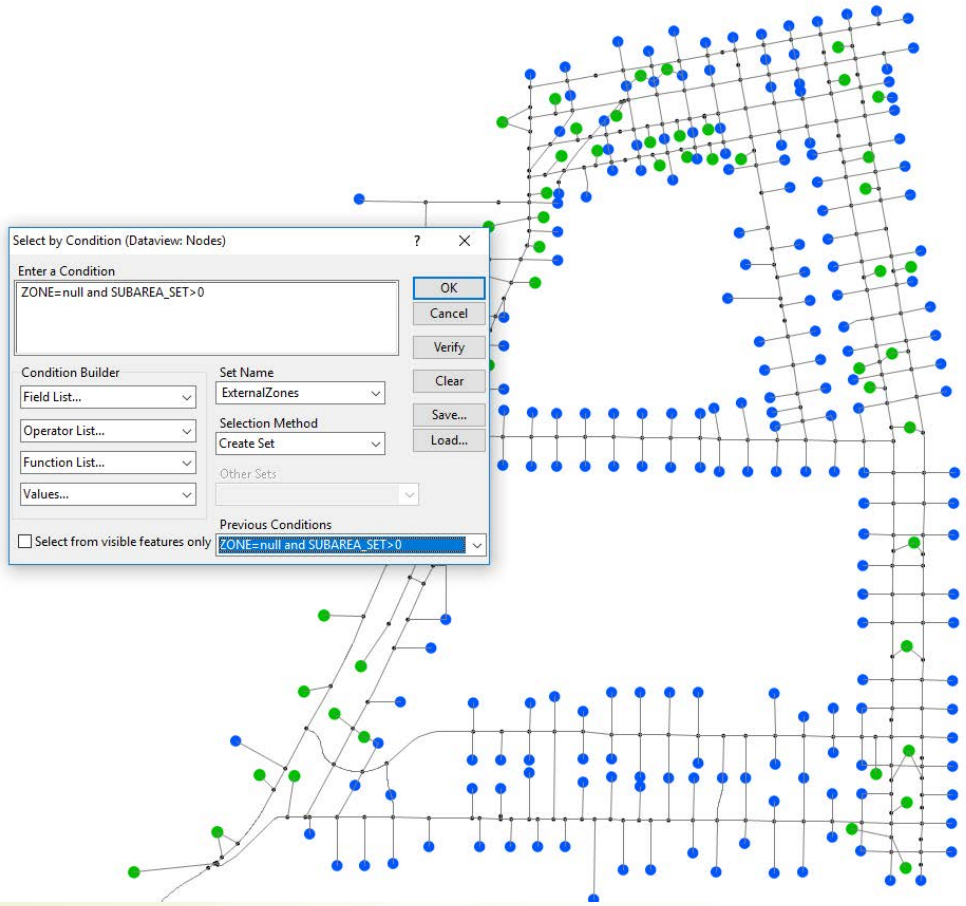
Eureka Subarea-External Zones



Contains 203 zones (blue dots)

They didn't exist in the original, regional model, but were created as the subarea was cut from the regional model

Associated Matrix with this subarea is a square 262*262 matrix

(262=203+59)

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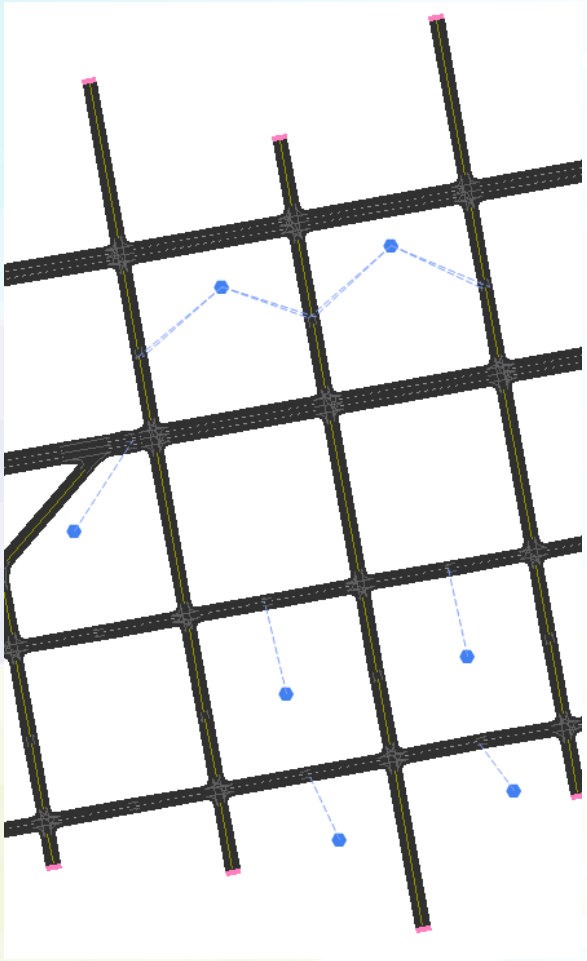
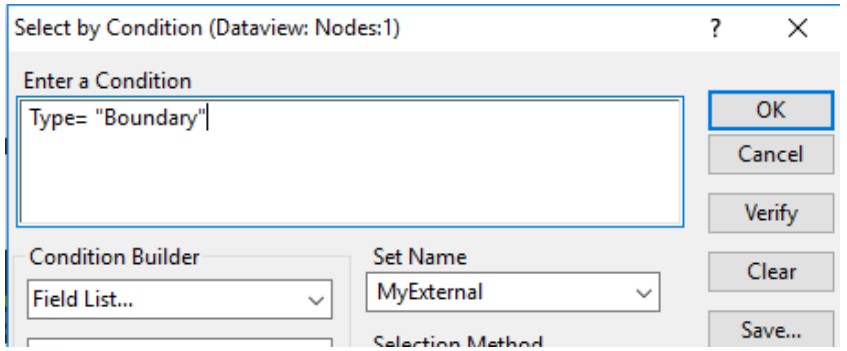
Only Internal Zones converted to Centroids



Only Internal Zones (59 zones) are created as centroids. However, noes such as 842288 are created with Type=Boundary
Shown in pink selection set

These nodes can generate and attract trips.



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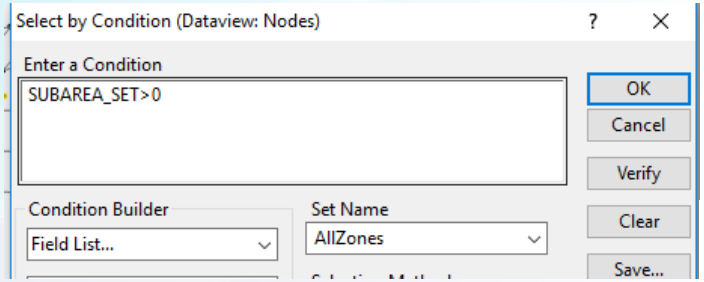
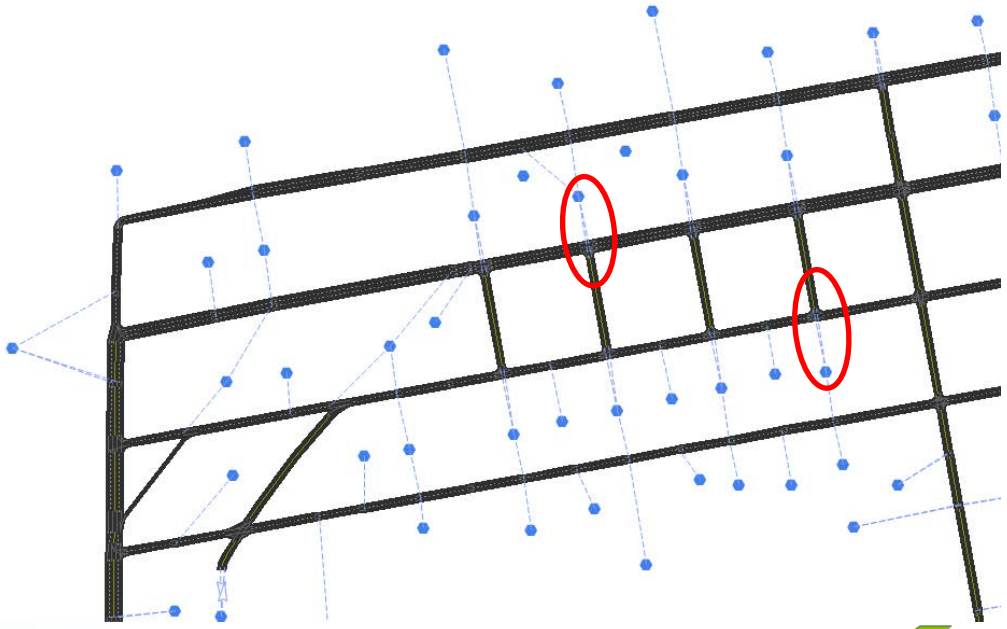
All zones were converted to Centroids

If we select all internal and external zones to be converted to centroids during simulation database creation:



All 262 zones (internal and external) will be converted to centroids, matching the size of the trip tables.

Centroid connectors are not supposed to connect to intersections, only to the middle of links. Therefore, centroid connectors shown in red circles should be moved.



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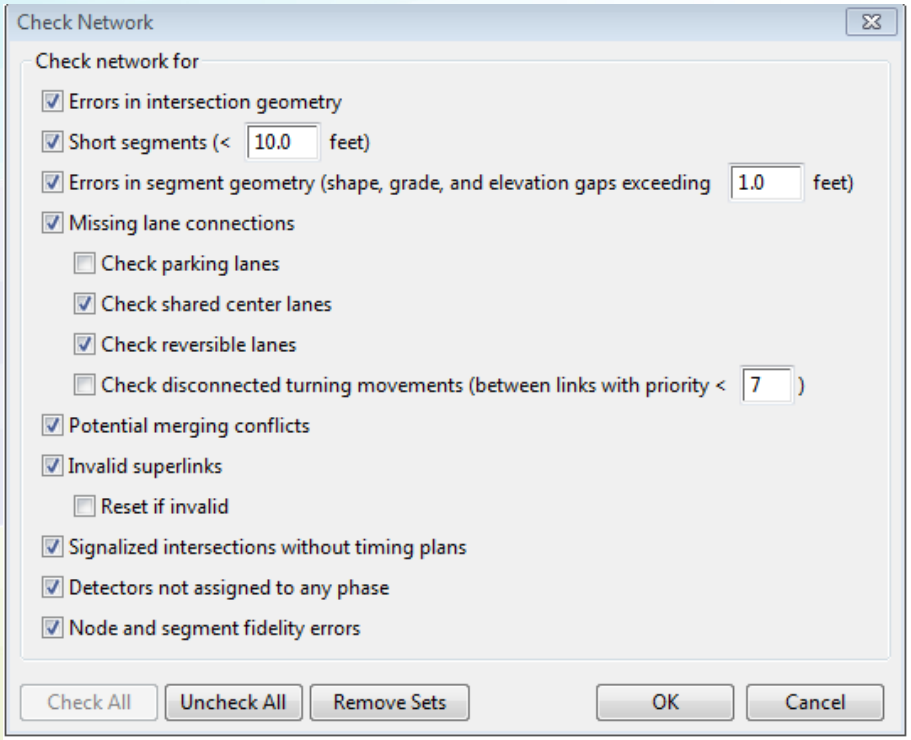
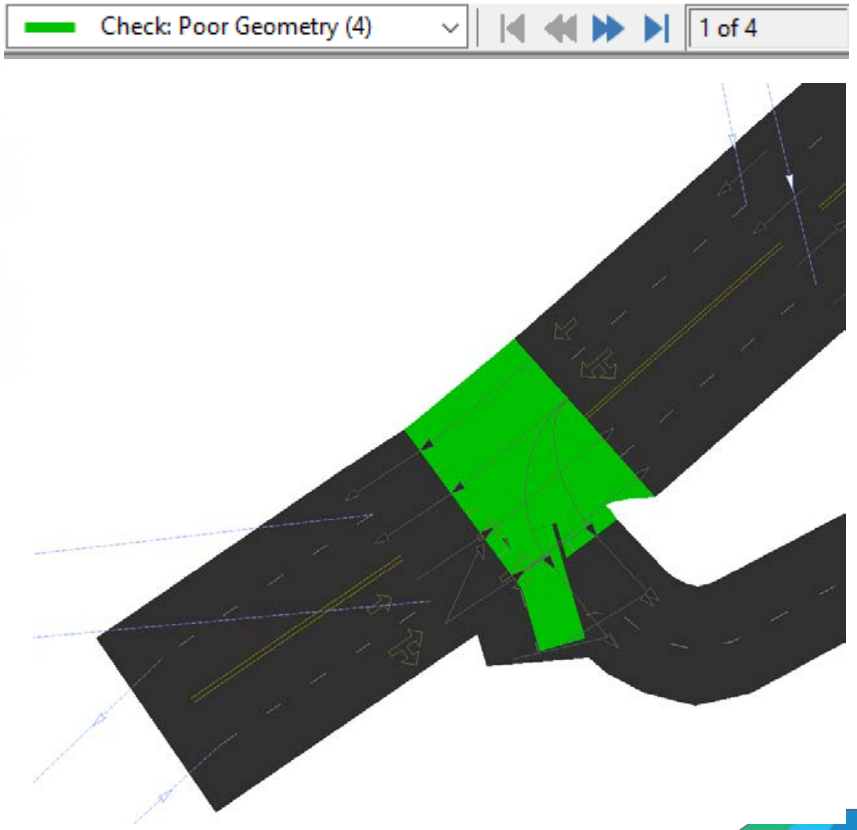
Centroid Connectors

- Don’t connect centroids to intersection/nodes
- Don’t connect centroids to the major roads
- Should more or less represent the traffic loading in the real world
- May be adjusted during the calibration and based on traffic counts.
- Zones shouldn’t be connected to each other with zone connectors.

Network Checking, Cleaning

- Project → Road Editor → Check Network
  - For each problematic item, a selection set is created in the associated layer





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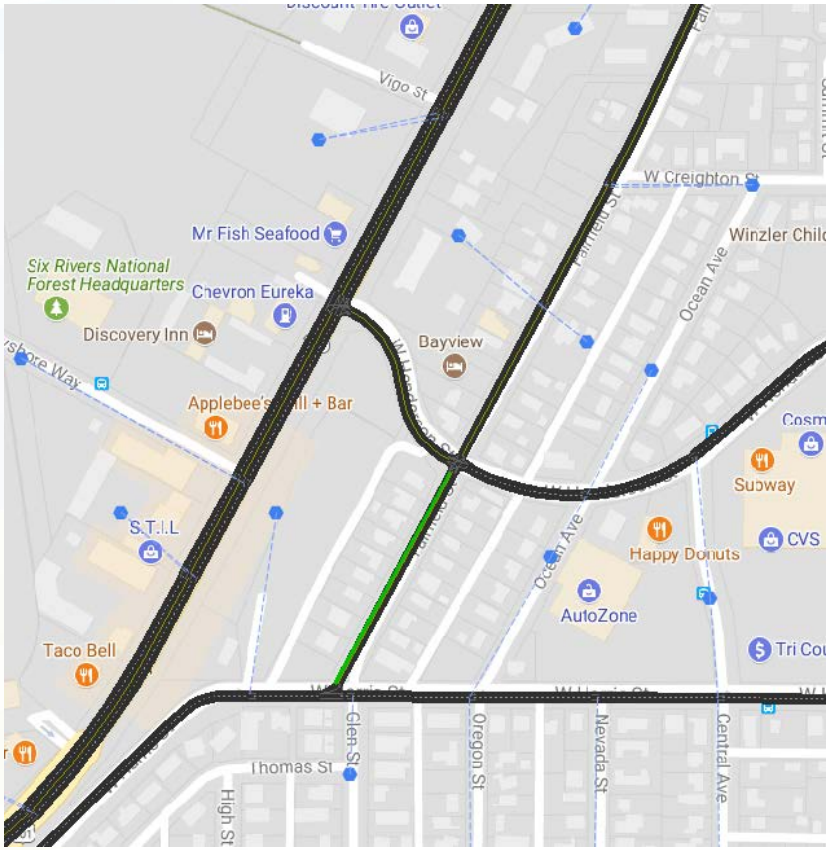
Network Editing - Imagery

- Maps → Imagery → Google Map
  - Slow downs panning



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Exercise - Network Editing

- Select / move / extend / add / remove shape points
- Add / remove segment (intersect / direction / lane # / road class / fidelity)
- Split / join segment / links
- Add / remove lane / lane barrier
- Add acceleration / deceleration lanes
- Add / remove lane connectors
- Add / remove zone connectors
- Add / remove median
- Add shared center lane / Turn Bay
- Add roundabout
- Smooth curves
- Reverse direction

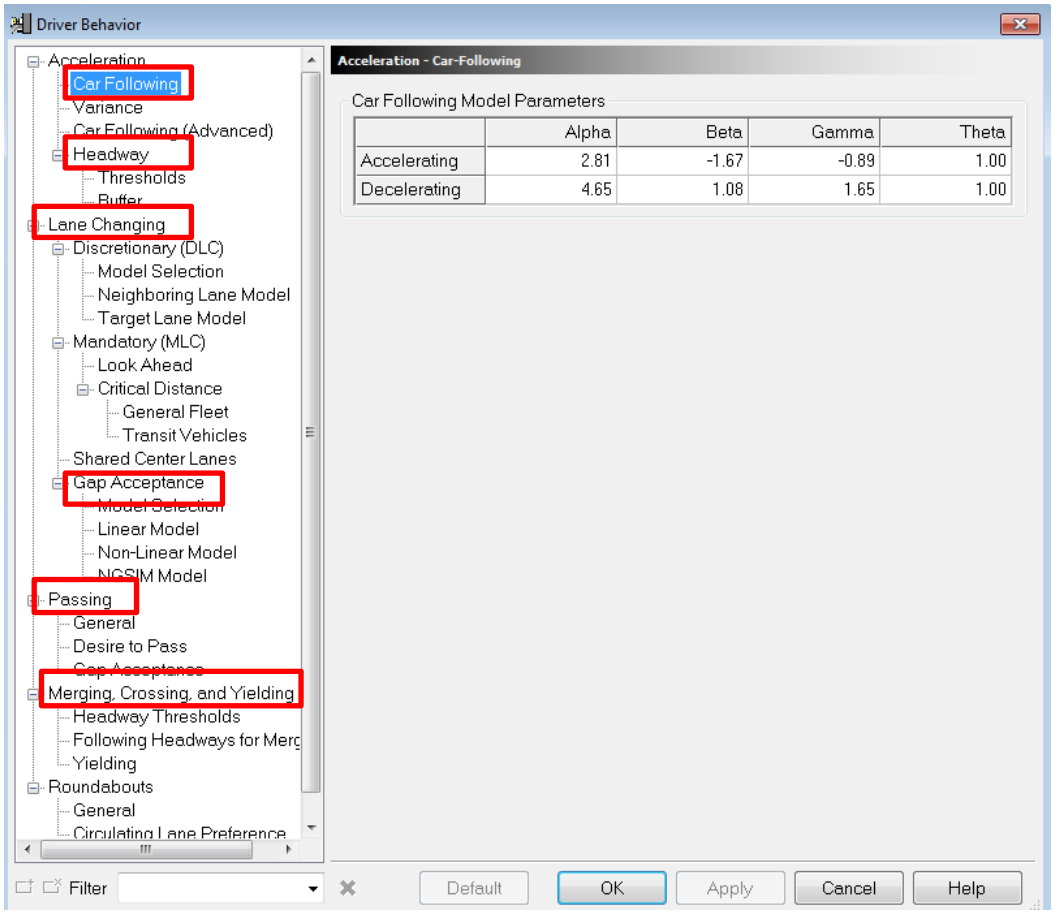
Network Editing - Fidelity

- Nodes and Segments have a property called “Fidelity”
- Determines how travel time is calculated
- Macroscopic*, Mesoscopic, Microscopic
- Each fidelity level requires certain set of parameters that can be edited through Parameters→ Edit Road Classes, Parameters → Driver Behavior, and Parameters → Mesoscopic/Macroscopic
- Network can include all fidelity levels (Hybrid)
- Default fidelity is decided at the time of network conversion, but can be edited

* When model fidelity is set as Macro or Meso, network details will be hidden (by default)

Fidelity - Microscopic

- 3 main categories: Network related, general, and driver behavior
- Microscopic simulation models **individual vehicles**' car following and lane changing. Segment's speed is average of speeds of all vehicles that passed that segment during that time interval.
- Driver behavior parameters can be changed through Parameters >Driving Behavior.



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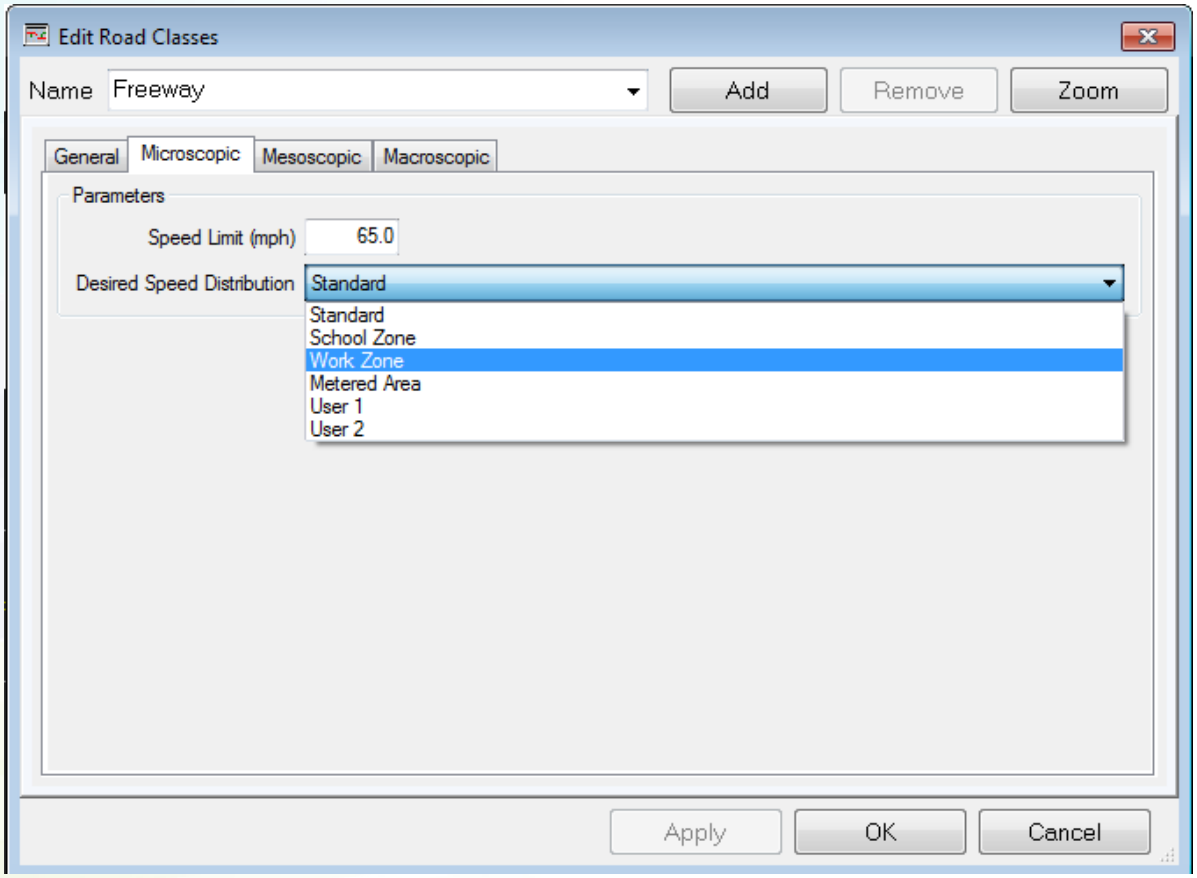
Microscopic Parameters- Road Class



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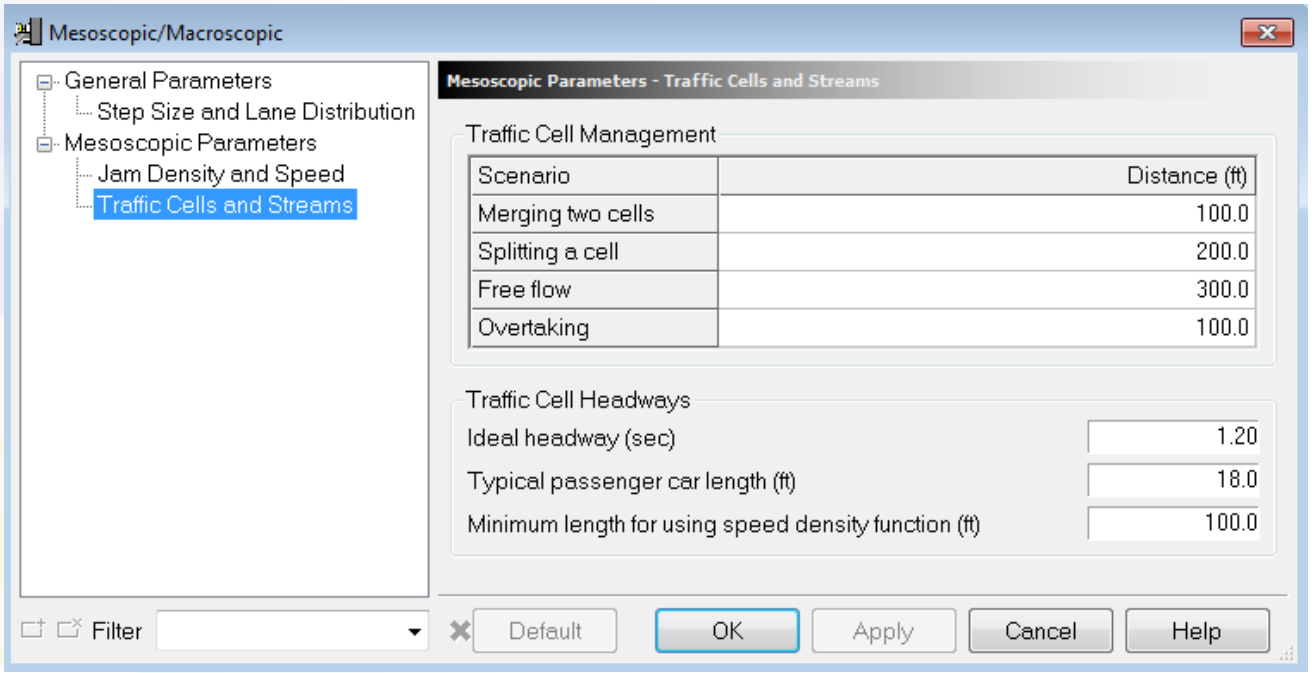
Fidelity - Mesoscopic

- In mesoscopic simulation, vehicles are organized into platoons called traffic **cells and streams**. While the model tracks individual vehicles, the simulation of vehicle movements is based on aggregate speed-density relationships.
- Parameters → Mesoscopic/ Macroscopic



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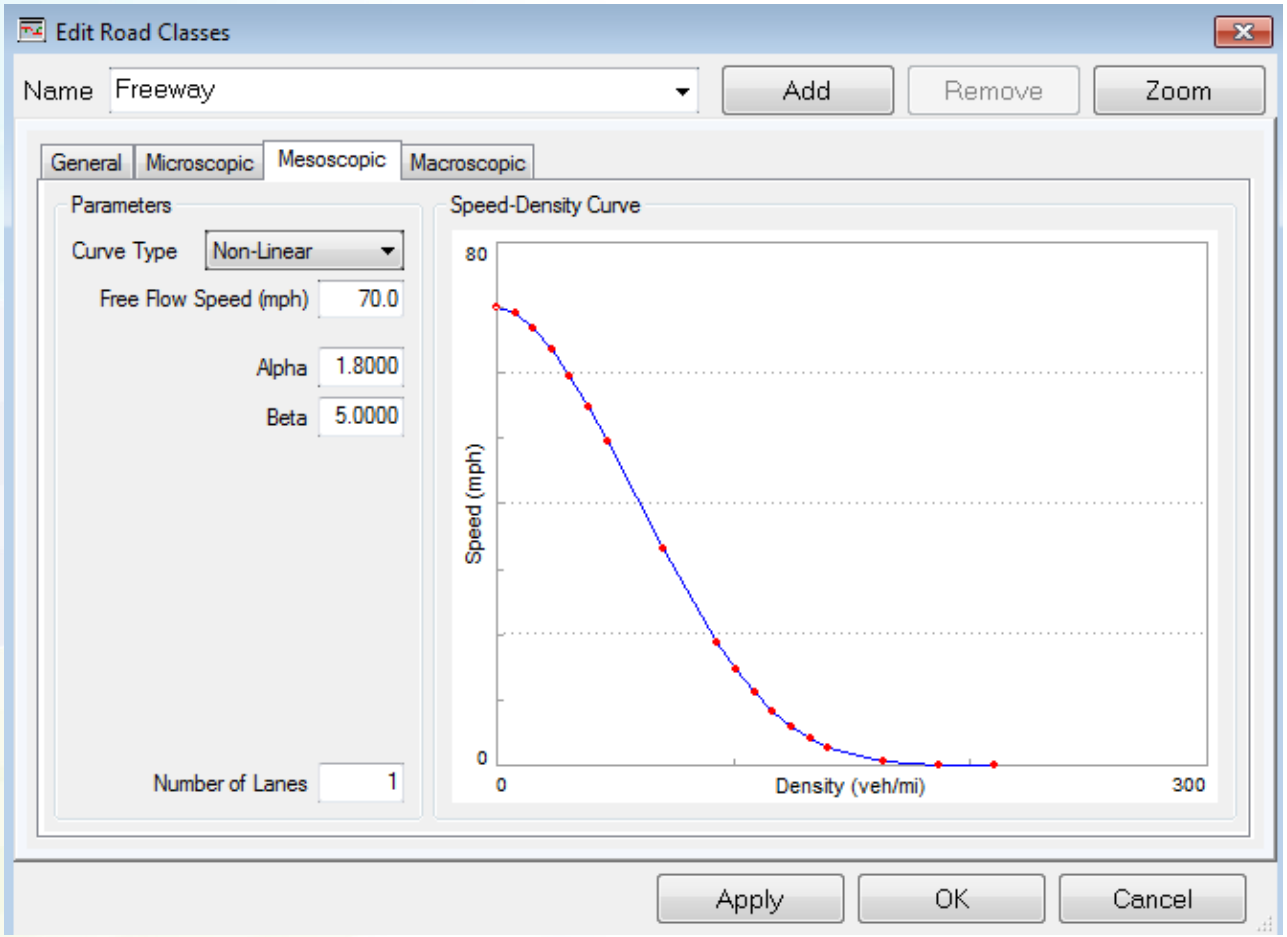
Mesoscopic Parameters – Road Class



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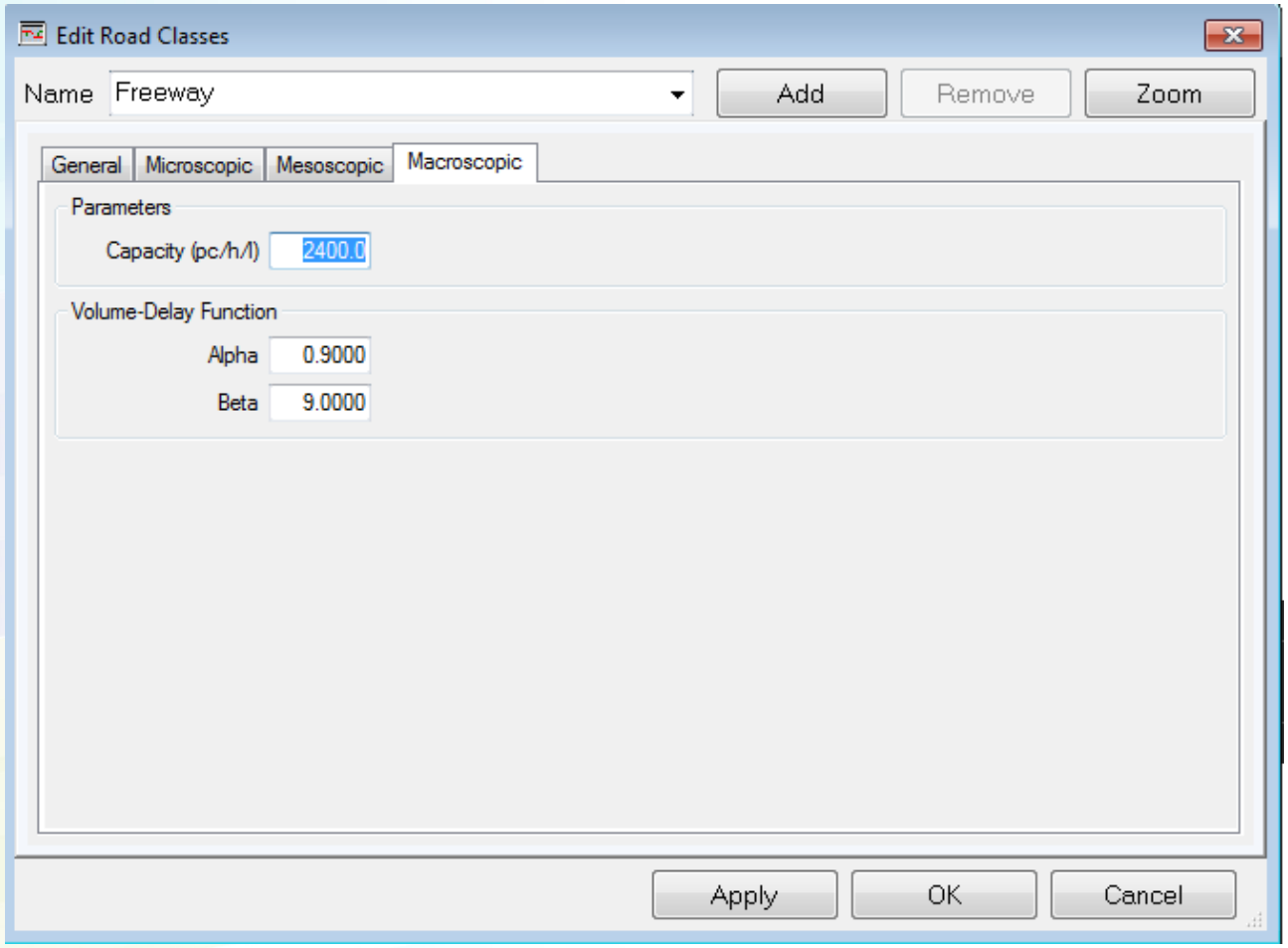
Fidelity - Macroscopic

- Macroscopic simulation uses BPR function to estimate segment's travel time based on volume.
- Within all fidelity levels, TransModeler tracks individual vehicles, and a trajectory file can be generated regardless of fidelity level.
- Despite macroscopic models used in static traffic assignment tools, even with a link fidelity of macro, maximum number of vehicles passing a link is restrained by link capacity and storage, and queue starts forming once these values are reached.

Macroscopic Parameters- Road Classes



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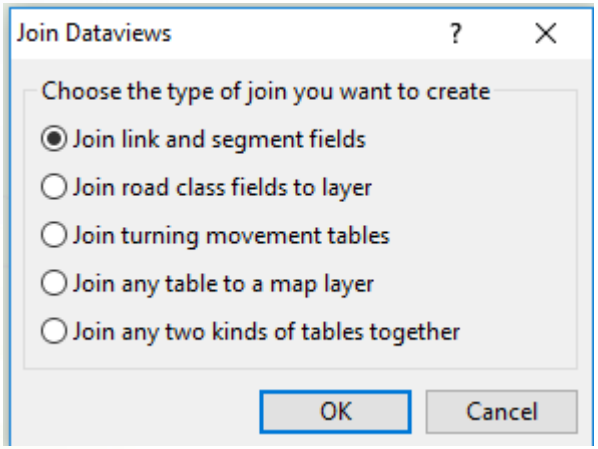
Network Editing - Road Classes

- Each road class share the same network attributes such as free flow speed, VDF function parameters, capacity, saturation flow rate, etc.
- Default classes can be edited and new classes can be defined through Parameters→ Edit Road Classes.
- Capacity and free flow speed can be assigned through road class or based on segment attribute, but other network parameters can be assigned to a link only through road class definition. If any of these parameters need to be set differently for a single link, a new road class should be defined and assigned to that link.

Joining Links and Segments

- Sometimes you start with FFS and capacity based on road user class (probably adopted from initial TransCAD network), but you want to switch to segment-level FFS and capacity, and change these values for limited segments. To keep these values for the segments that you don't want to change, you can create association between Links and Segments through Dataview→ Table→ Join →



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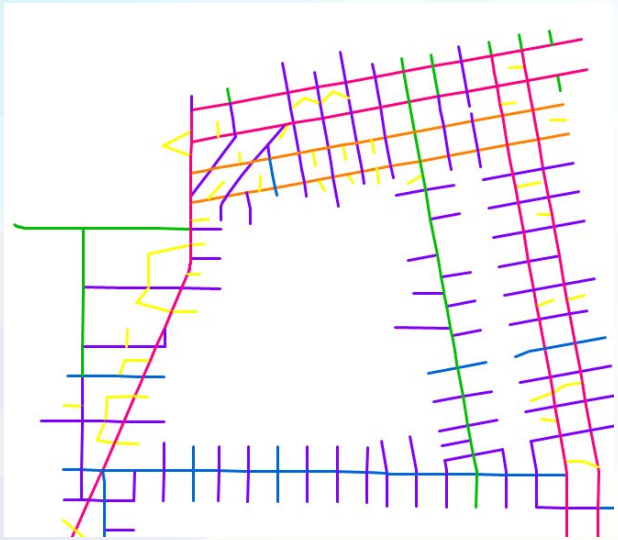
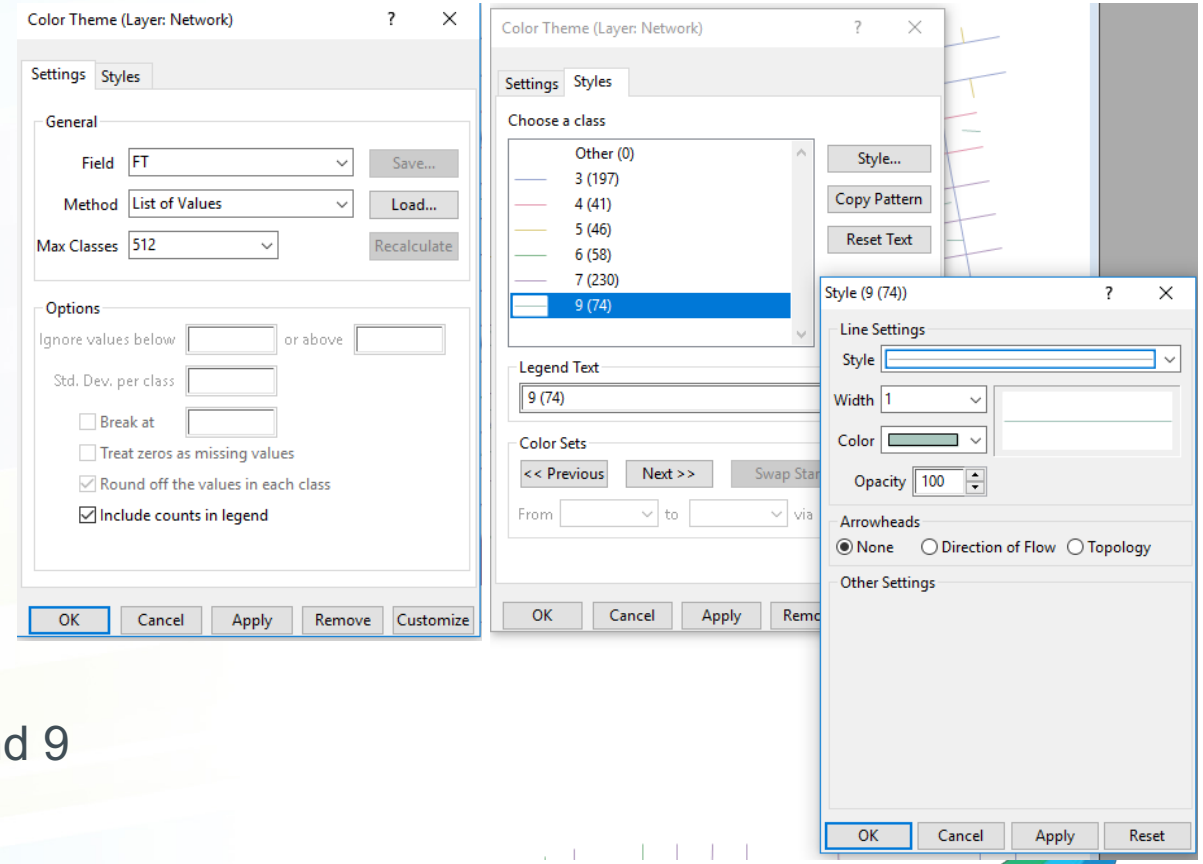
Eureka Subarea Road Class

In the .dbd layer:





Facility types of 3,4,5,6,7, and 9

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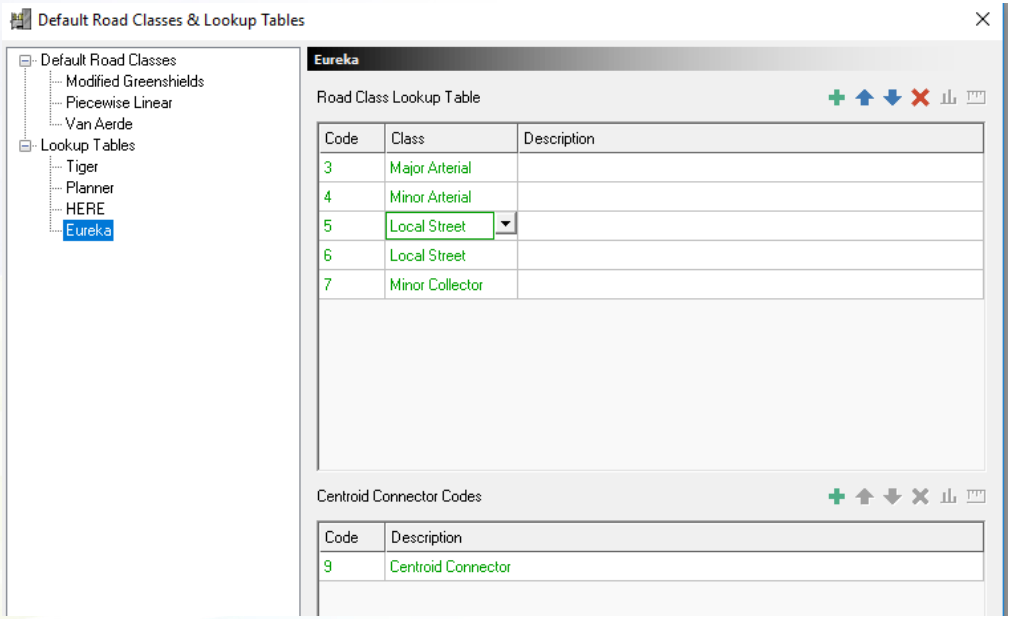
Eureka Subarea Road Class

- Through Parameters→ Road Classification→ Default Road Classes and Lookup Tables, and Parameters→ Road Classification→ Edit Road Classes you can modify the user road class. We start with a user class that corresponds with the regional model. Will revise it based on the local knowledge/ previous work by Caliper.



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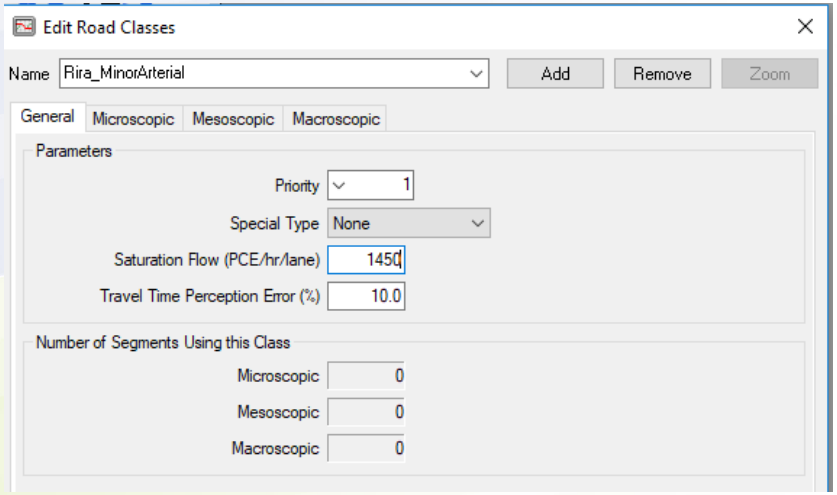
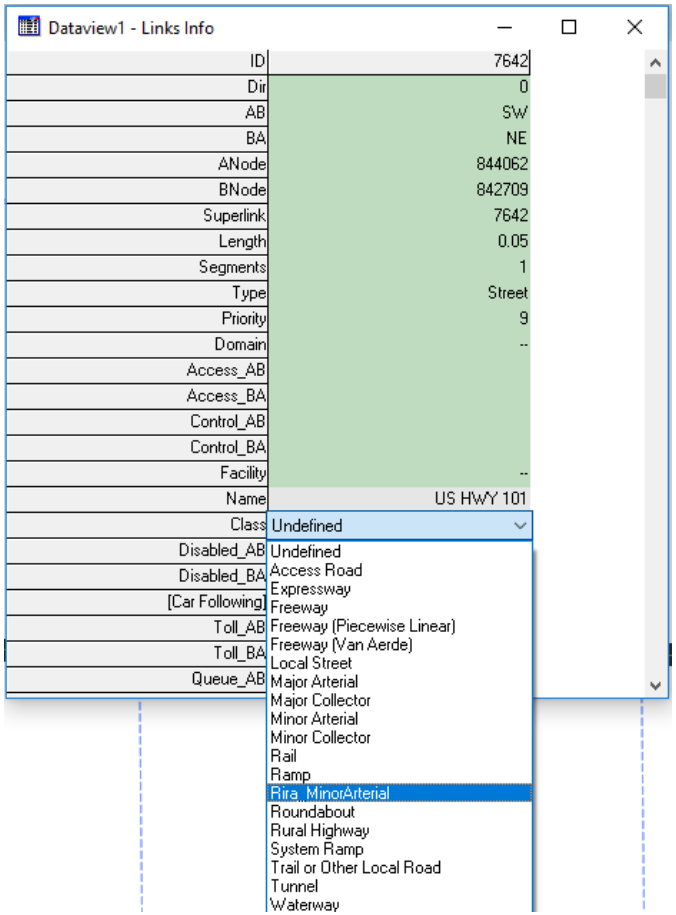
Eureka Subarea Road Class

You can assign user-defined road class to links, but not through the Eureka Lookup Table





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