CAMBRIDGE SYSTEMATICS

Think Forward

# District 3 Modeling Support

## *Modeling Basics – What Modelers Do*

***presented to***

*District 3 Staff*

CAMBRIDGE SYSTEMATICS

Think Forward

Caliper

FEHR PEERS

April 17, 2017 Morning Session

# April 18 – AM Session

- Objectives
- Interests
  - » What is needed to be learned
  - » Basic through advanced
- Individual models
- Traffic studies, TCR, PI, other studies
- Framework for the rest of the Task Order

# District 3

- Diverse
- Many models
- Interregional/
  - » Inter-county travel




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# Task Order Objectives

- Train Caltrans staff for use and review of models/model data
- Assist with actual/real projects (if possible)
- Group and individualized training appropriate for skill level and job requirements
- Documentation and resources to serve as knowledge bank for future employees
- Assist with presentation and analysis of model data produced in-house and by others

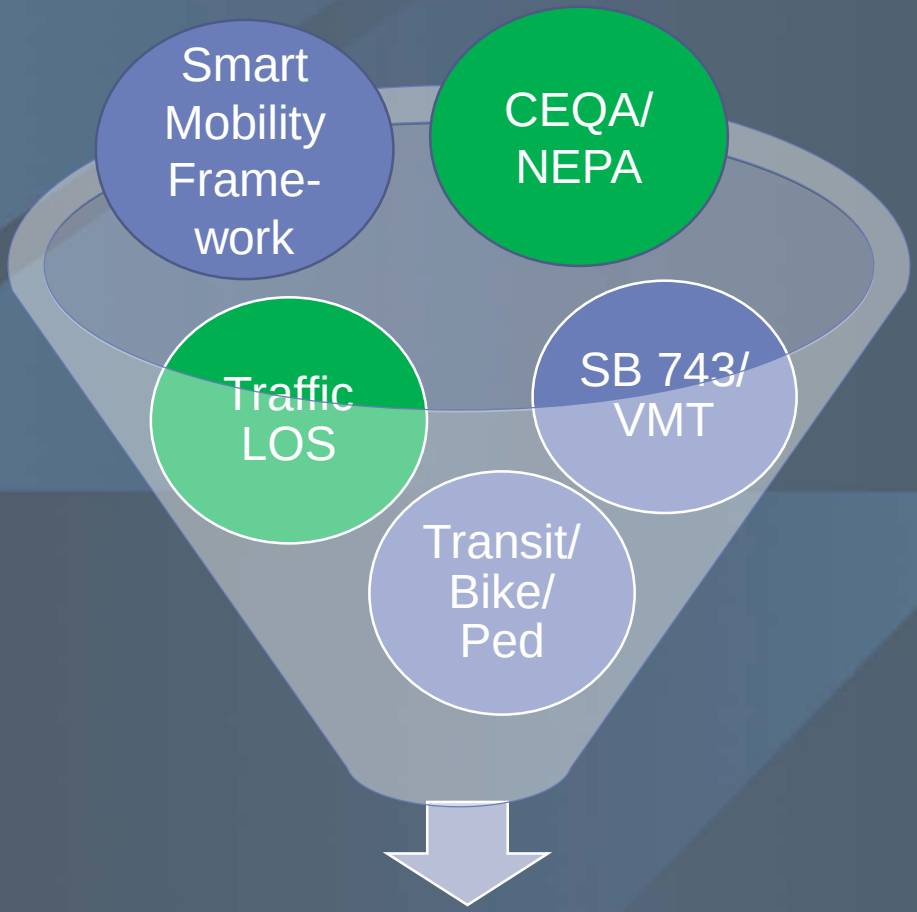
# District 3 Interests

- Your thoughts …

# District 3 Models

- SACSIM (SACOG)
  - » Various SACOG Region County Models
- TRPA Model
- BCAG Model
- NCTC Model
- Other Models

# A Changing Planning Framework



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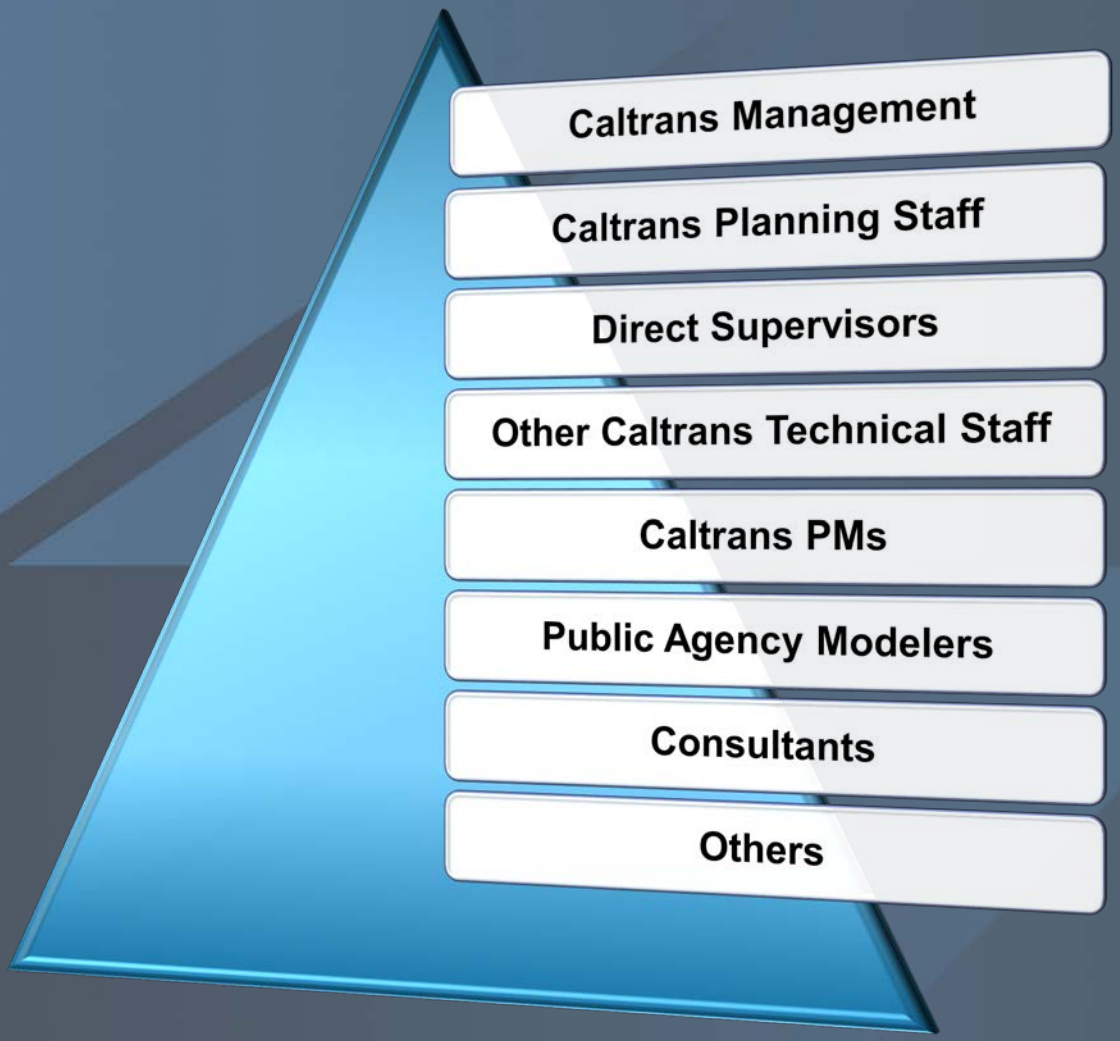
# District 3 Modeling Context

- Need to understand multiple models / multiple county/regional conditions
- Support traffic microsim
- SB 743, AB 32
- Weekday versus weekend travel
  - » Interregional travel, truck travel
- Staff retention (Issue at other districts)

# Modeling Group as Service Bureau




Time sensitive
Critical path
Credible



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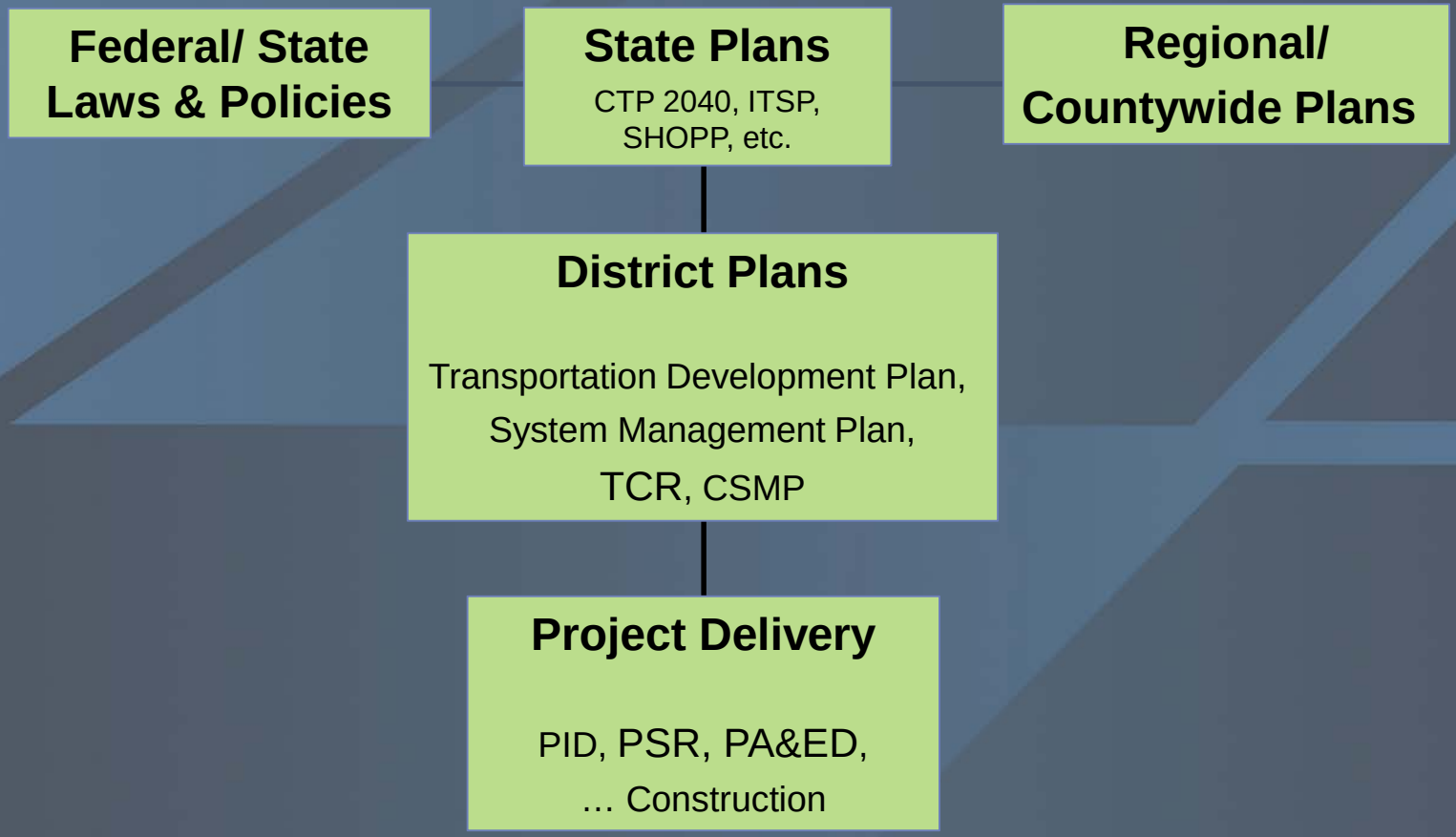
# District Planning Process



# Project Delivery


Modeling activities are generally front-loaded:
This applies for both project delivery and for planning activities



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# Transportation Concept Reports

- All State Highways
  - » Updated periodically
- Generally straightforward data requirements – Except when they are not
  - » CSMP
- Base year / Horizon year
- Auto / Truck splits
  - » AADT
  - » Peak hour splits
  - » VMT
  - » LOS, V/C

# TCR Reporting – Example 1

## SR-54 Corridor Performance

54-1 Location Description: I-5 IC to the I-805 IC

*WESTBOUND*

| BASE YEAR (BY): 2010 | HORIZON YEAR (HY): 2040 |
|---|---|
| BY AADT: 58,000 | HY AADT: *72,575* |
| BY LOS: C | HY LOS with RTP Improvements: C |
| | HY LOS with no RTP Improvements: D |
| BY VMT: 110,200 | HY VMT: 137,892.5 |
| BY Vehicle Occupancy Rate: Not available | HY Vehicle Occupancy Rate: *Not available* |
| BY Daily Vehicle Hours of Delay (35 MPH): Not available | HY Daily Vehicle Hours of Delay (35 MPH): *Not available* |
| BY Truck Traffic AADT: 1508 | HY Truck Traffic AADT: *1887* |
| BY Total Trucks (% of AADT): 2.60% | HY Total Trucks (% of AADT): *2.60%* |
| BY 5+ Axle Truck Traffic AADT: 109 | HY 5+ Axle Truck Traffic AADT: *136* |
| BY 5+ Axle Trucks (% of AADT): 0.19% | HY 5+ Axle Trucks (% of AADT): *0.19%* |
| BY Peak Hour Volume: 4,250 | HY Peak Hour Volume: *5,443* |
| BY Peak Hour VMT: 8,075 | HY Peak Hour VMT: *10,341.7* |
| BY Peak Hour V/C: 0.64 | HY Peak Hour VC: *0.82* |
| BY Peak Hour Average Speed: >60 mph | HY Peak Hour Average Speed: *>60 mph* |

Peak Period Length: 1 hour  Peak Hour Time of Day: 0700-0  Peak Hour Directional Split: 65%

Bottlenecks: No reoccurring observed bottlenecks

*District 12 SR 54*

# TCRs – Model Data

- Select roadway segments
- Observed Base Year Data
  - » Traffic Counts, PeMS, Caltrans Count Book
- Travel Model
  - » Base horizon + Horizon year
  - » Horizon year: With and without projects
- Adjust future forecasts
  - » Observed + model growth
- HCM
  - » For LOS – may involve Traffic Ops

# TCR Reporting – Example 2

| | | | FUTURE 2020 | | | | | | | | | 2020 CONCEPT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Seg.* | *POST MILE* | *LIMIT* | *2020 NO BUILD* | *R/U UB* | *2020 ADT* | *PEAK Hr* | *2-WAY PEAK Hr Vol* | *TRUCK PEAK Hr* | *DIRECT SPLIT* | *2020 V/C* | *2020 LOS* | FACILITY | Lanes Added | LOS |
| 1 | 0.0/R2.4 | Jct I-15 to Main St./Montara Road | 4 MF | U | 30,000 | 10.8% | 2,700 | 10% | 65% | 0.41 | A | 4 MF | 0 | A |
| 2 | R2.4/7.2 | Main St/Montara Road to "A" St | 4 MF | R | 25,000 | 10.8% | 2,700 | 10% | 65% | 0.41 | A | 4 MF | 0 | A |
| 3 | R7.2/107.2 | "A" St to Goffs Road | 4 MF | R | 22,500 | 12.4% | 2,800 | 12% | 70% | 0.46 | B | 4 MF | 0 | B |
| 4 | 15.0/44.2 | Goffs Road to Jct SR 95N | 4 MF | R | 20,000 | 12.5% | 2,500 | 14% | 70% | 0.47 | B | 4 MF | 0 | B |
| 5 | 44.2/49.5 | Jct SR 95N to Jct SR 95S | 4 MF | R | 19,000 | 12.4% | 2,350 | 14% | 70.0% | 0.44 | B | 4 MF | 0 | B |
| 6 | 49.5/59.4 | Jct SR 95S to Arizona State Line | 4 MF | R | 15,000 | 10.0% | 1,500 | 12% | 75.0% | 0.37 | B | 4 MF | 0 | B |

*District 8 I-40*

# Project Study Report

- Early Project Delivery Document
  - » Inform Purpose and Need
- Travel Model Forecasts Required
  - » Traffic counts collected specifically for project (plus off the shelf data - HPMS)
  - » Big Data (Origin-Destination)
- Base Year / Opening Year / Horizon Year
  - » Mainline, ramps, intersections
  - » Detailed, link level analyses
- Auto, truck, multimodal
- Traffic assignment to inform HCM
  - » Changes in VMT/GHG?

# PSR Example

| Segment | | Type | Balanced 2040 No-Project | |
|---|---|---|---|---|
| From | To | | AM Peak Hour (vph) | PM Peak Hour (vph) |
| Santa Anita Ave On-Ramp | Peck Rd SB Off-Ramp | Mainline | 0 | 0 |
| | | Express | 214 | 1,885 |
| Peck Rd SB Off-Ramp | | Off-Ramp | 0 | 0 |
| Peck Rd SB Off-Ramp | Peck Rd NB Off-Ramp | Mainline | 6,114 | 4,933 |
| | | Express | 214 | 1,885 |
| Peck Rd NB Off-Ramp | | Off-Ramp | 521 | 704 |
| Peck Rd NB Off-Ramp | Valley Blvd On-Ramp | Mainline | 5,593 | 4,229 |
| | | Express | 214 | 1,885 |
| Valley Blvd On-Ramp | | On-Ramp | 234 | 167 |
| Valley Blvd On-Ramp | Stewart St On-Ramp | Mainline | 5,827 | 4,396 |
| | | Express | 214 | 1,885 |

*SR 60/I-605/I-10 PSR*

# Project Approval and Environmental Document

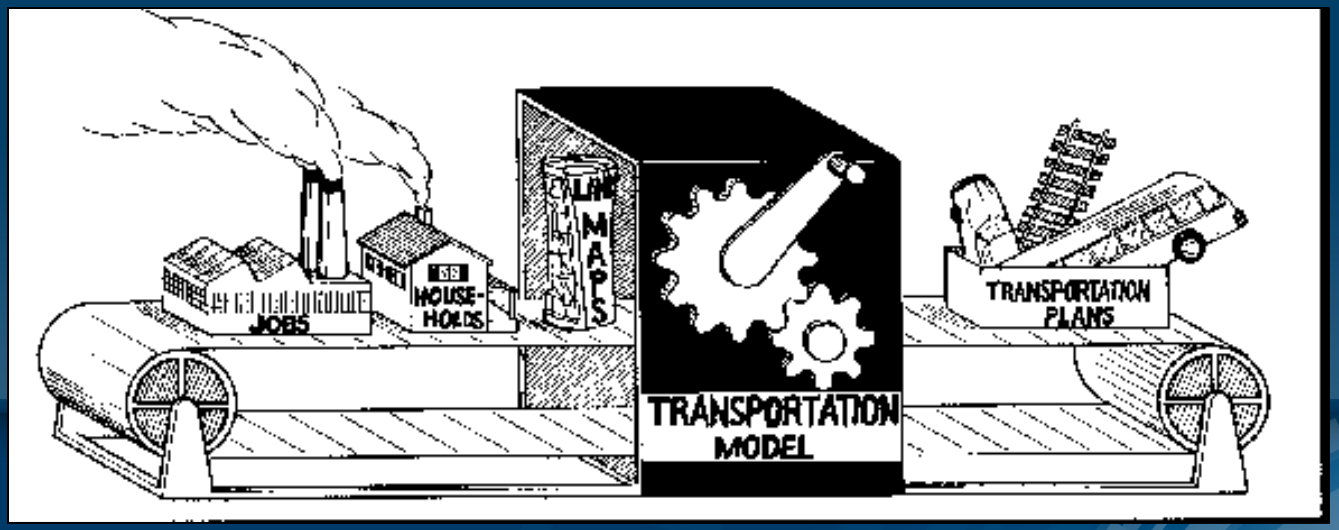
- Purpose & Need
- Environmental document
  - » CEQA, NEPA
- Travel model forecasts required – support traffic microsimulation
  - » Traffic counts collected specifically for project
  - » Big Data (Origin-Destination)
- Base year / Opening year / Horizon year
  - » Primarily trip tables to inform traffic analysis
    - Traffic assignment may be conducted
- Auto/ HOV, truck, transit
- SB 743 – VMT analysis

# Other Areas Where Model Data Are and Can Be Used

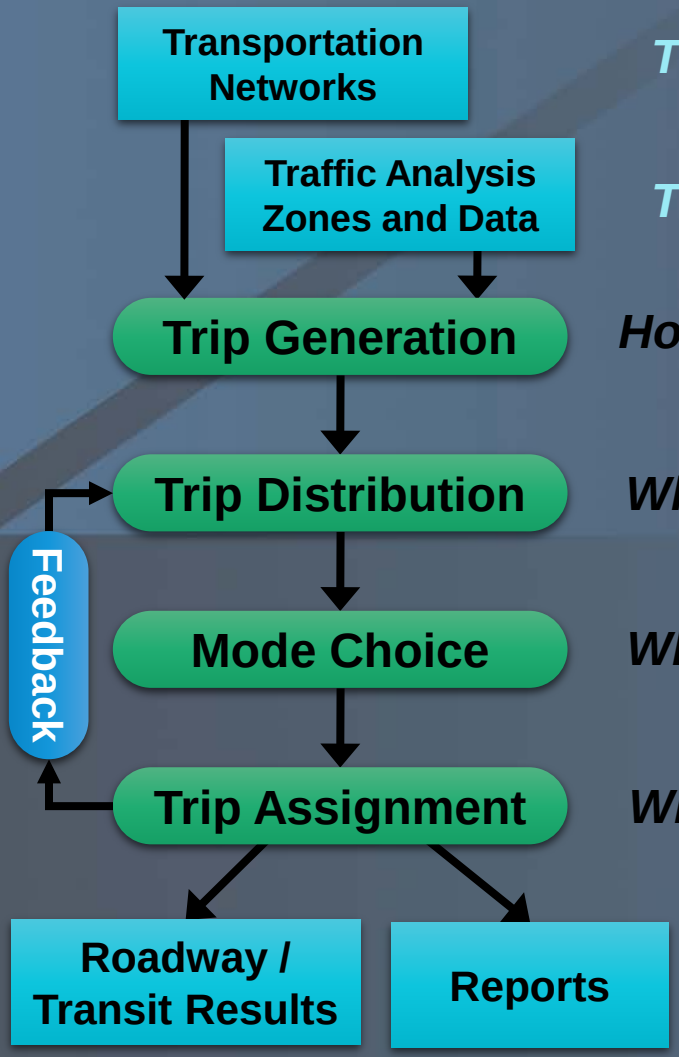
- Discussion

# Travel Modeling Basics

# Opening the Black Box



# The Four Steps




*Transportation Supply*

*Transportation Demand*

*How many trips?*

*Where will they go?*

*What mode?*

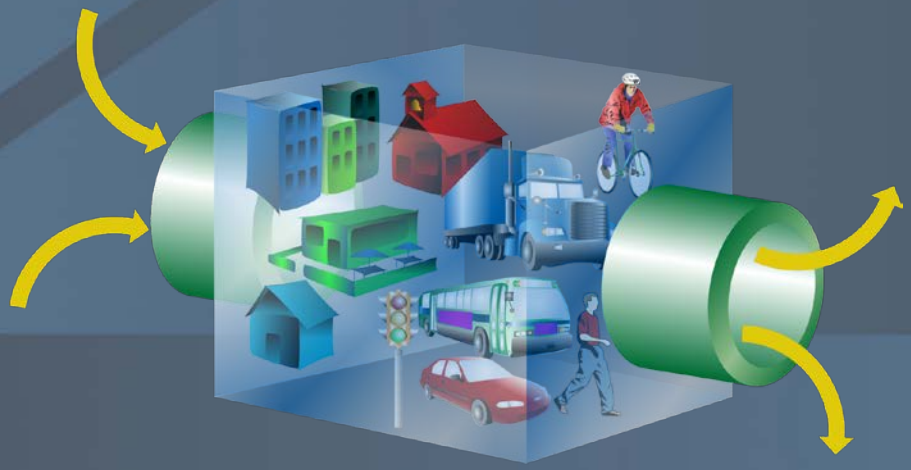
*What route?*

*Forecasts*

# Model Inputs and Outputs

## Inputs

- Transportation Networks
- Socioeconomic Data
- External Data
- Special Generators
- Model Parameters



## Outputs

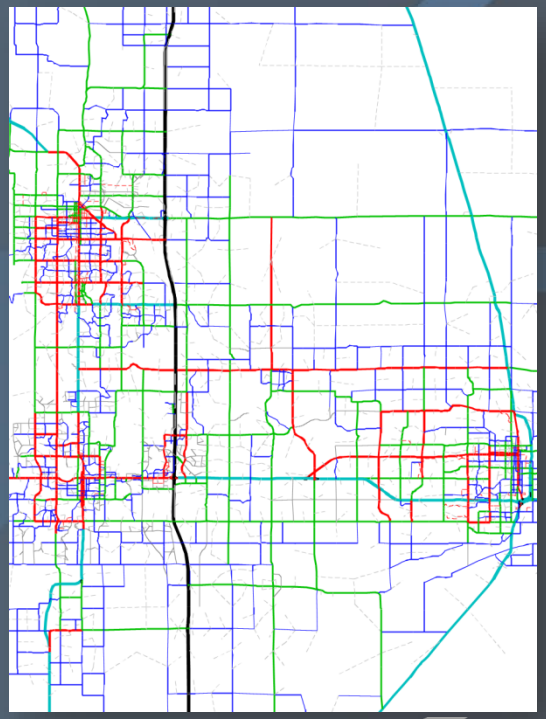
- Trips by Mode
- Traffic Volumes
- Congested Speeds
- Transit Volumes
- Summary Information

# Model Inputs and Outputs

**Inputs**

- **Transportation Networks**
- **Socioeconomic Data**
- **External Data**
- **Special Generators**
- **Model Parameters**

- Roadway Networks
  - » Contains roadway characteristics
    - Number of Lanes
    - Roadway Type (Freeway, arterial, etc.)
    - Area Type (CBD, Urban, Suburban, Rural)
- Transit Networks
  - » All fixed route transit service



# Model Inputs and Outputs

**Inputs**

- **Transportation Networks**
- **Socioeconomic Data**
- **External Data**
- **Special Generators**
- **Model Parameters**

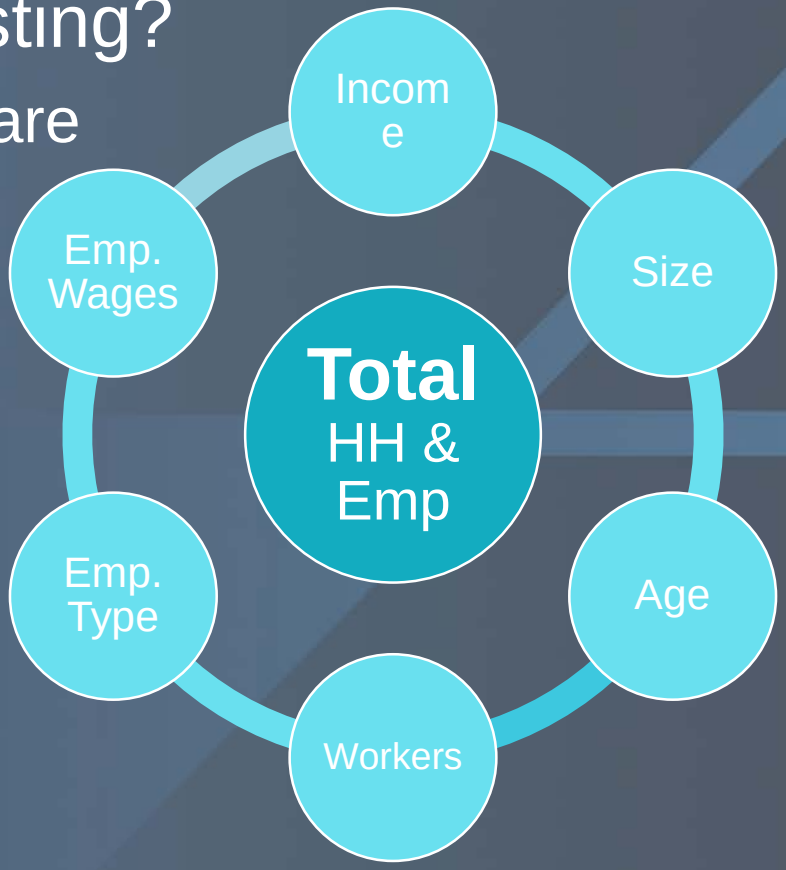
- Identifies **demand** for travel
- Household data
  - » Average household **size**
  - » Median household **income**
  - » Number of resident **workers**
  - » **Age** of household residents
  - » And more…
- Employment data
  - » By 13 industries
  - » By Wage level

# Model Inputs and Outputs

**Inputs**

- **Transportation Networks**
- **Socioeconomic Data**
- **External Data**
- **Special Generators**
- **Model Parameters**

- How Much Detail is Needed for scenario testing?
  - » Only totals are required

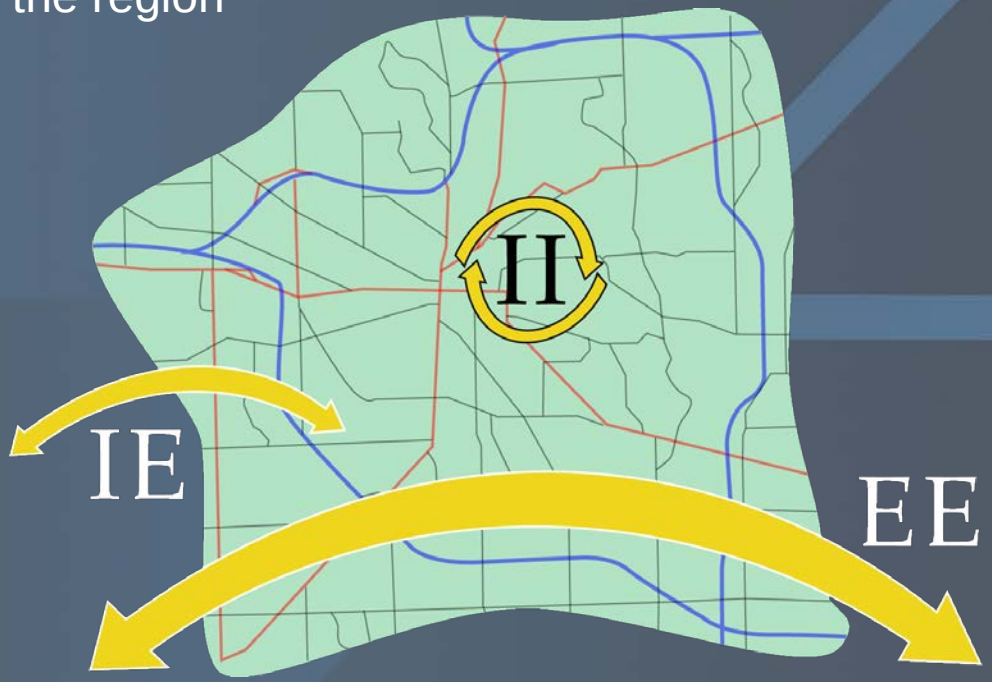


# Model Inputs and Outputs

## Inputs

- Transportation Networks
- Socioeconomic Data
- External Data
- Special Generators
- Model Parameters

- Model travel:
  - To/from the region
  - Through the region



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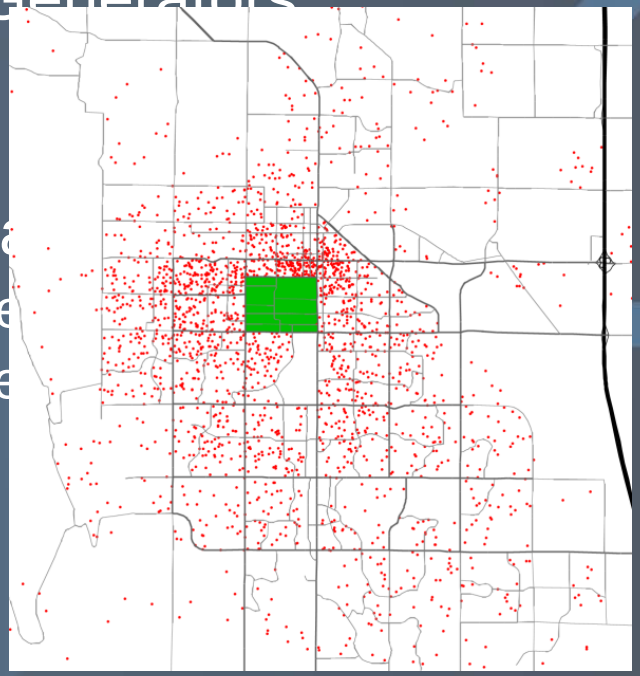
# Model Inputs and Outputs

**Inputs**

- **Transportation Networks**
- **Socioeconomic Data**
- **External Data**
- **Special Generators**
- **Model Parameters**

- Unique locations not well represented by employment data
  - » SCAG's Special Generators:
    - Ports
    - Airports
  - » Potential Additiona
    - Large Warehouse
    - Specific study are



# Model Inputs and Outputs

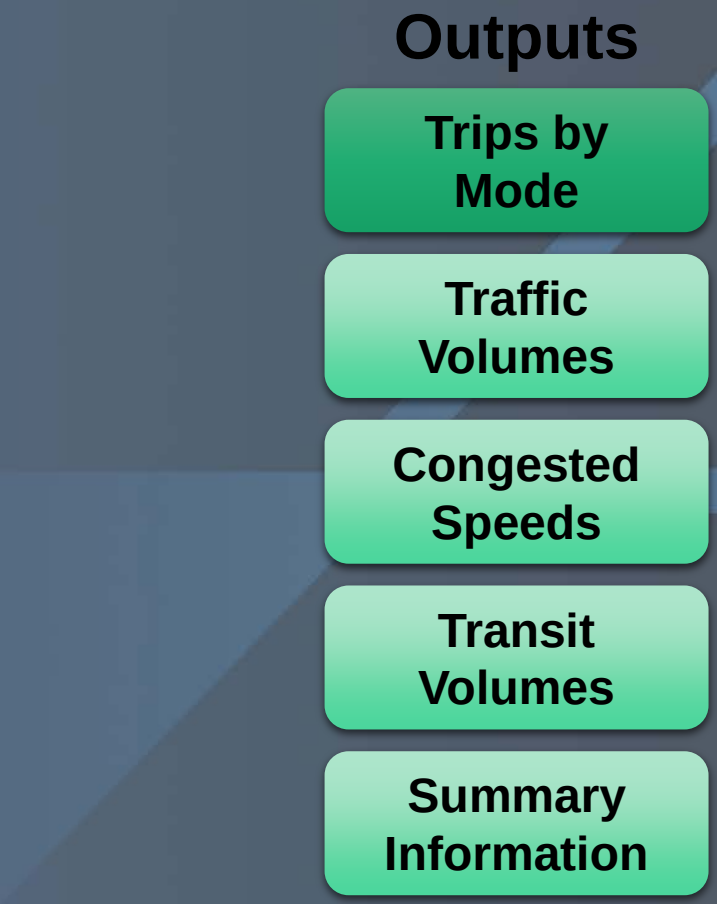
**Inputs**

- **Transportation Networks**
- **Socioeconomic Data**
- **External Data**
- **Special Generators**
- **Model Parameters**

- Represent the way people behave
  - » How many trips are made?
  - » How far will people travel?
  - » What impacts decisions about travel mode?
  - » How does congestion impact travel?
- Source Data
  - » Household Travel Surveys
  - » On-Board Transit Surveys
  - » Speed Surveys
  - » Big Data
  - » Validated to traffic counts

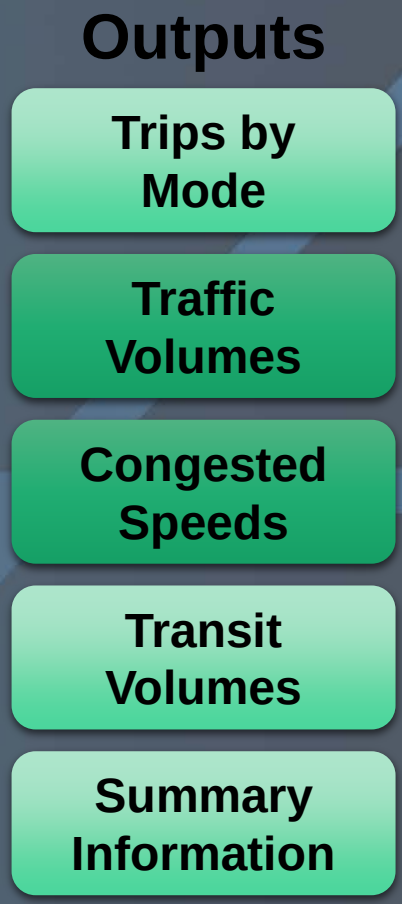
# Model Inputs and Outputs

- Information about each trip
  - Start/end
  - Time of day
  - Mode of travel
  - Purpose of trip
  - Trip time and distance



# Model Inputs and Outputs

- By Time of Day
  - » Daily
  - » AM, PM, Mid-Day, Evening, Night
  - » AM and PM Peak Hours
- Turn Movements
  - » Better estimated with assistance of base-year counts
- Congested speed based on volume



# Model Inputs and Outputs

- By Time of Day
  - » Peak and Off-Peak
  - » Daily sum
- By route or route group
  - » Also by stop, but with less accuracy
- Useful for Big-Picture transit analysis
  - » Detailed analysis requires localized model refinement
- Transit trips are removed from the highway network

**Outputs**

- **Trips by Mode**
- **Traffic Volumes**
- **Congested Speeds**
- **Transit Volumes**
- **Summary Information**

# Model Inputs and Outputs

- Performance Report
  - » Summaries of model results
  - » Useful for planners and engineers
- Planning Tools
  - » Maps and charts
  - » Results presented for general understanding
    - VMT, VHT, Delay
    - Level of Service
    - Trip Lengths
    - Trip Patterns

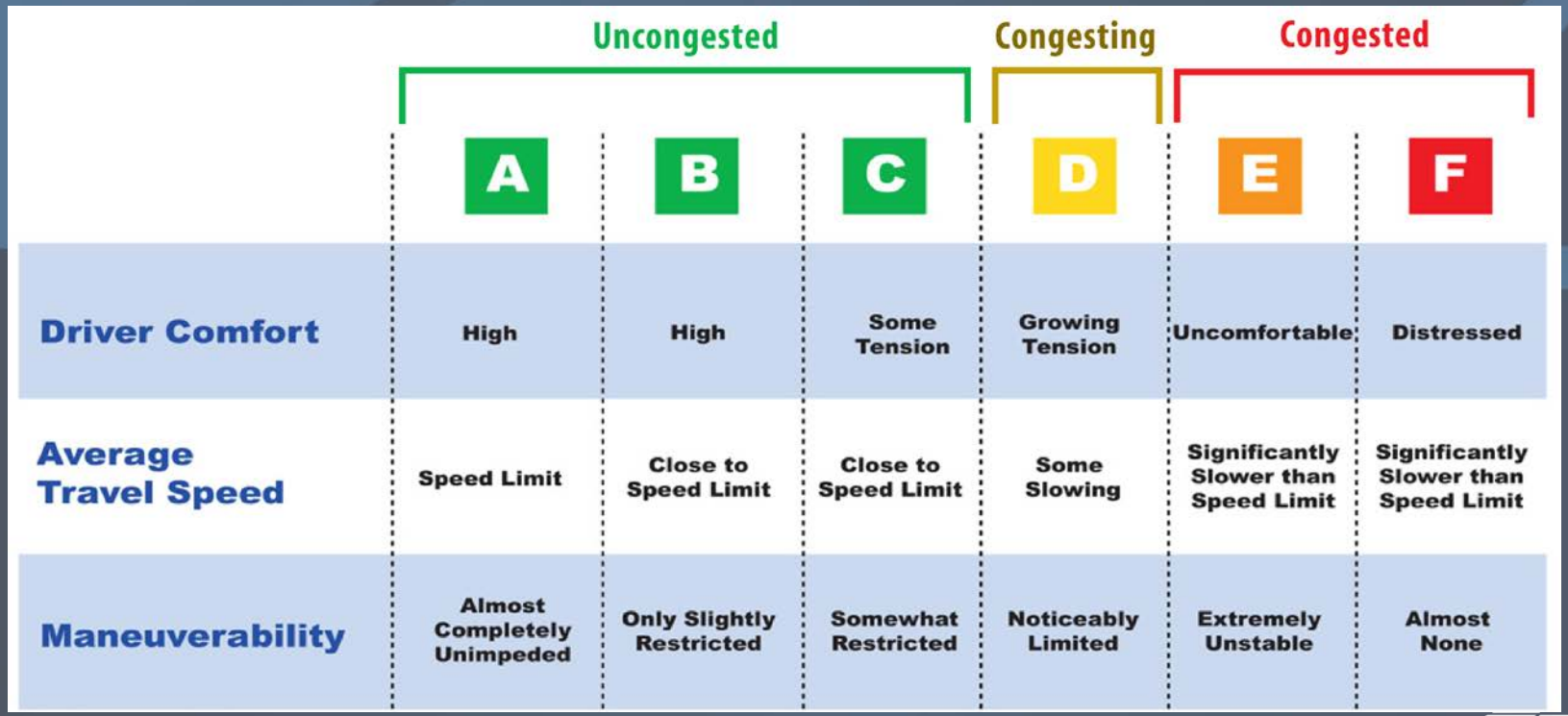
**Outputs**

- **Trips by Mode**
- **Traffic Volumes**
- **Congested Speeds**
- **Transit Volumes**
- **Summary Information**

# Example Applications

# Model Inputs and Outputs

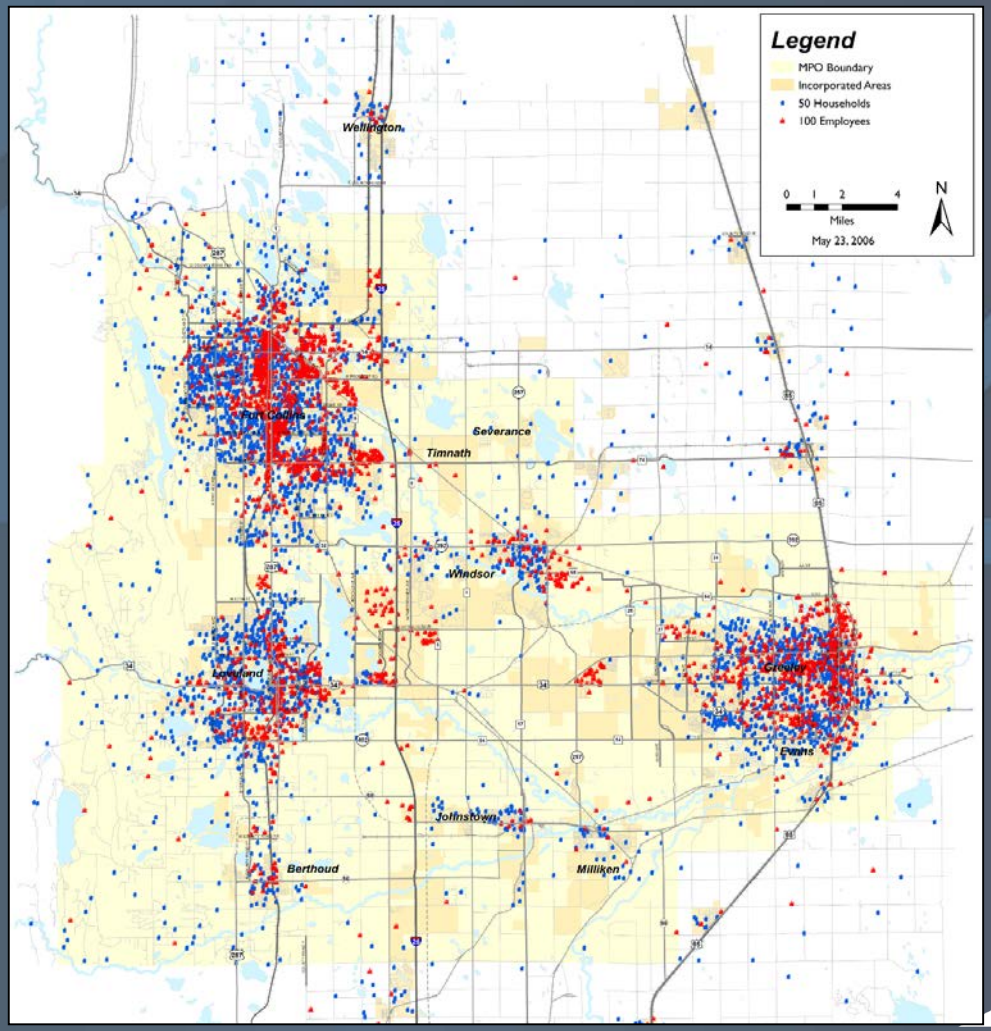
- The model can estimate level of service to help identify problem areas.



| | Uncongested | | | Congesting | Congested | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| **Driver Comfort** | High | High | Some Tension | Growing Tension | Uncomfortable | Distressed |
| **Average Travel Speed** | Speed Limit | Close to Speed Limit | Close to Speed Limit | Some Slowing | Significantly Slower than Speed Limit | Significantly Slower than Speed Limit |
| **Maneuverability** | Almost Completely Unimpeded | Only Slightly Restricted | Somewhat Restricted | Noticeably Limited | Extremely Unstable | Almost None |

# Household And Employment Growth

Today



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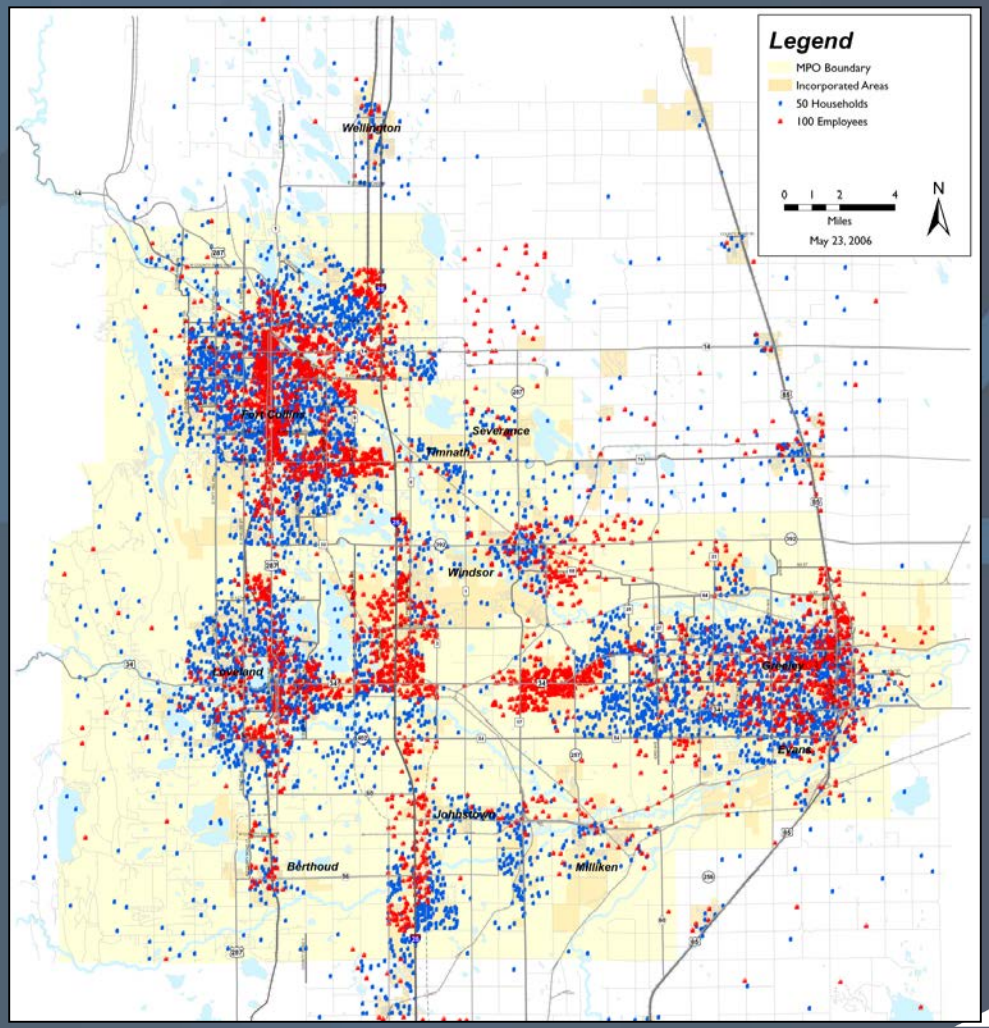
# Household And Employment Growth

Future



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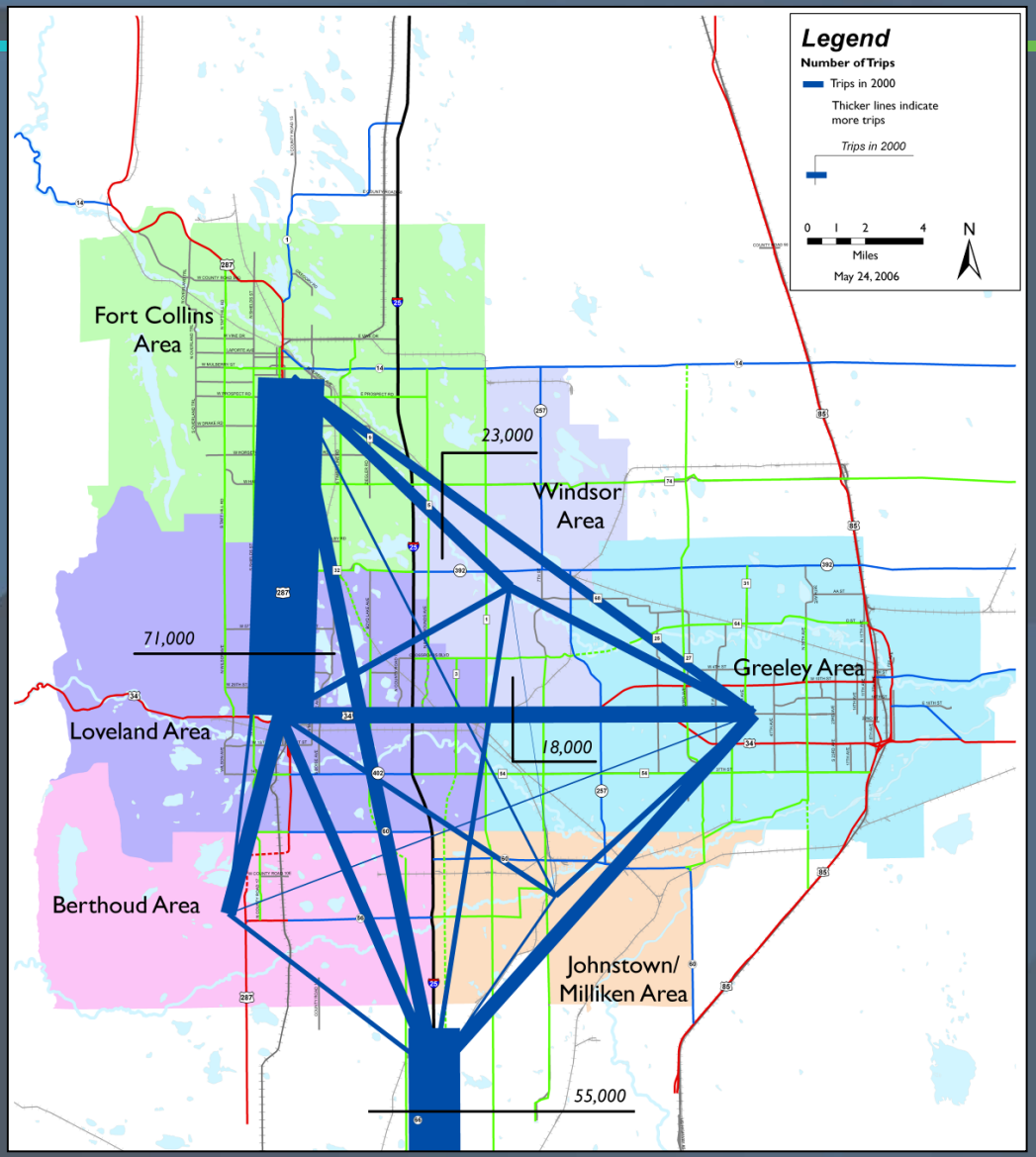
# Travel Patterns




Today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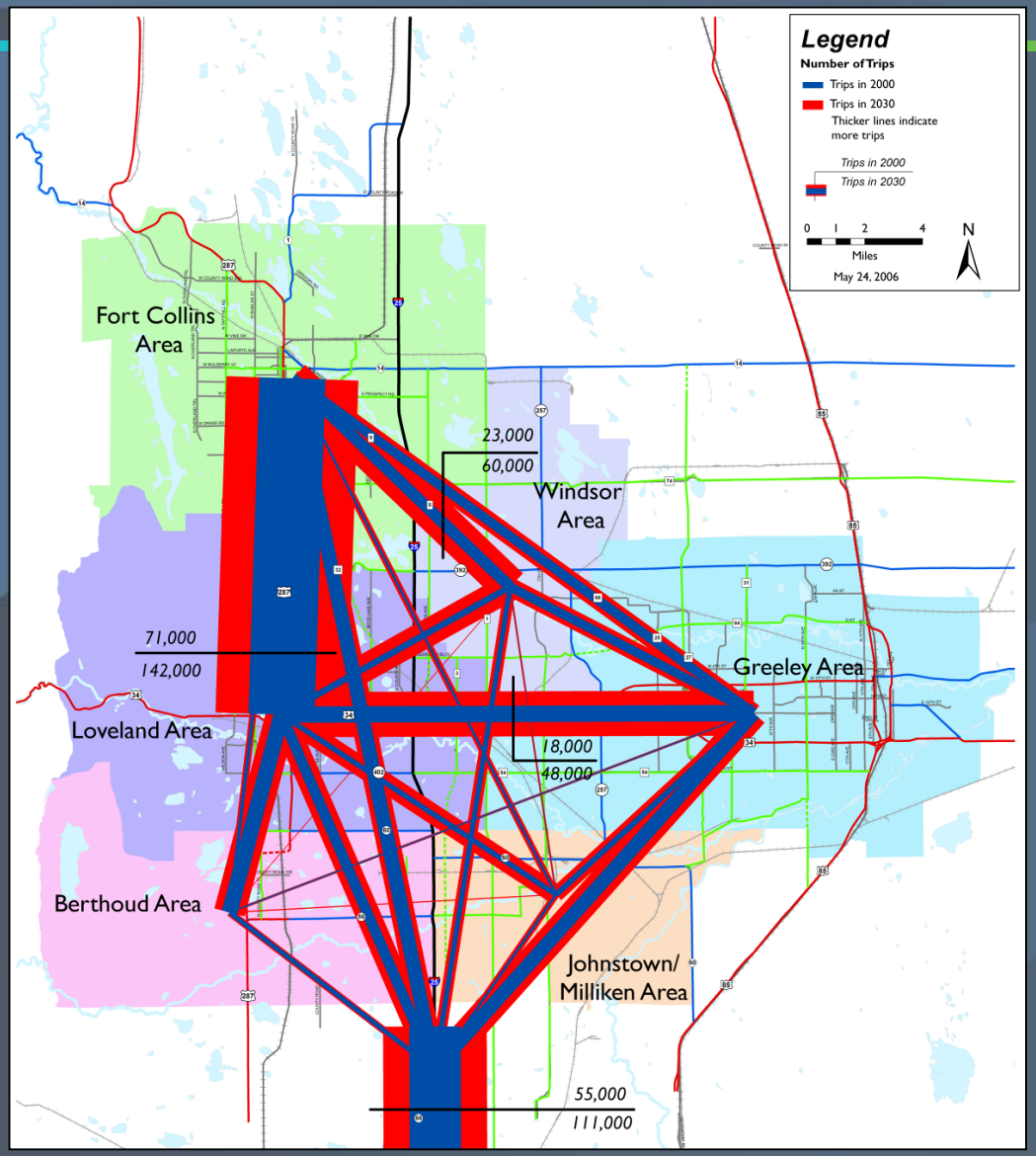
# Travel Patterns




Future



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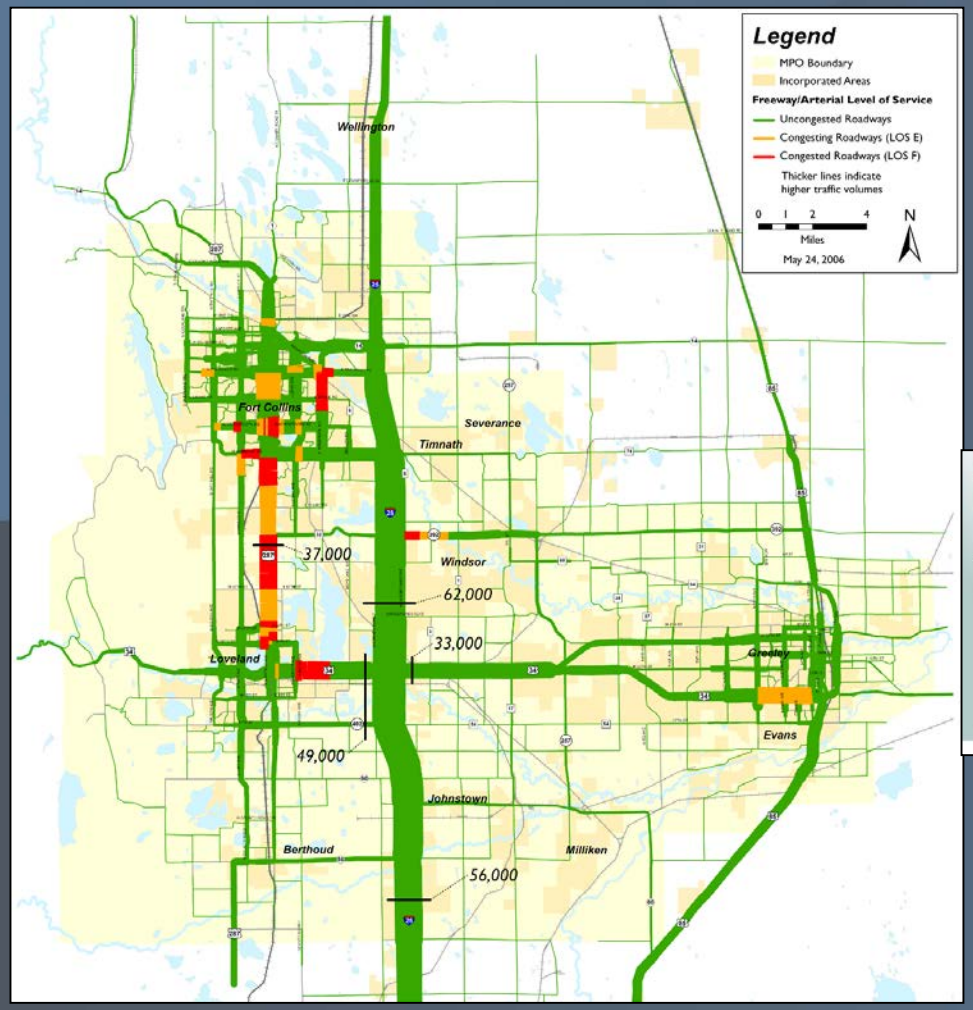
# Traffic Volumes And Congestion

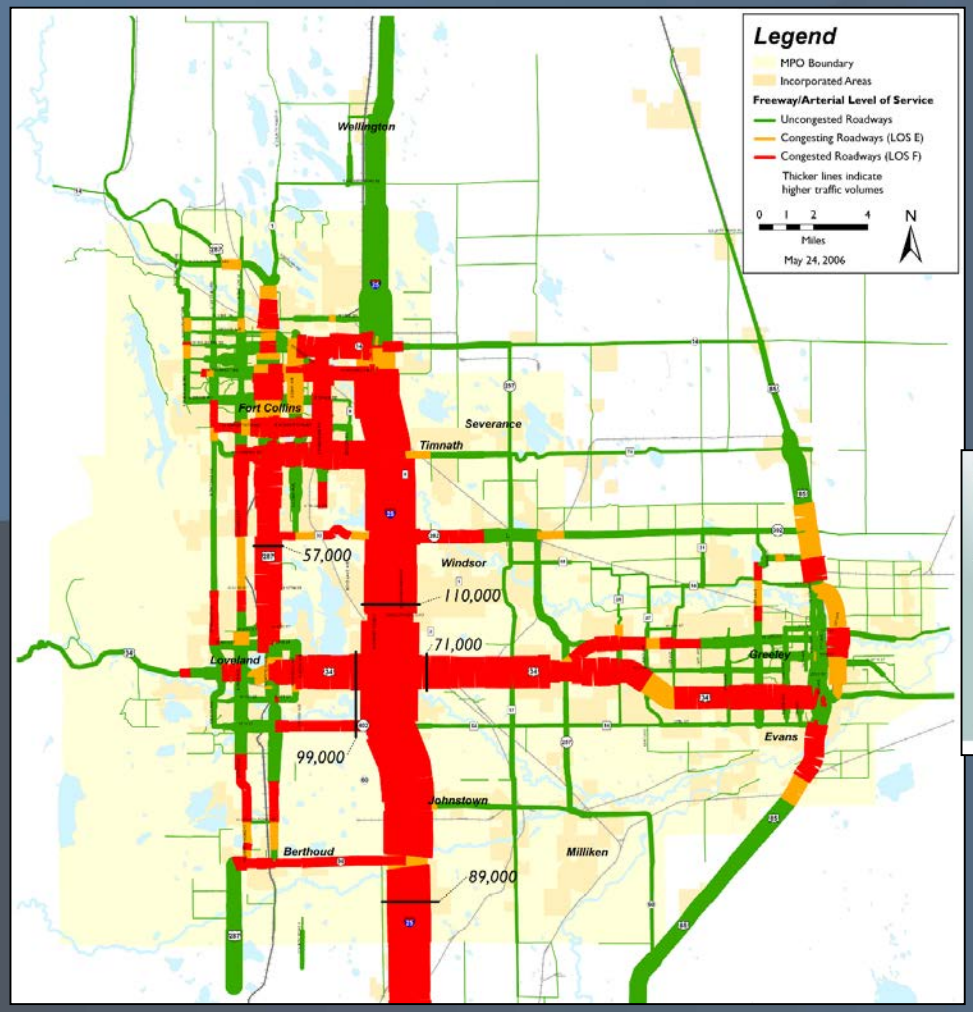



Today

**Travel Times**

| From/To | Today | 2030 | Increase |
|---|---|---|---|
| Fort Collins to Denver | 73 Minutes | 119 Minutes | 46 Minutes (63%) |
| Fort Collins to Greeley | 37 Minutes | 49 Minutes | 12 Minutes (32%) |
| Greeley to Loveland | 29 Minutes | 39 Minutes | 10 Minutes (34%) |
| Berthoud to Windsor | 24 Minutes | 37 Minutes | 13 Minutes (54%) |

# Traffic Volumes And Congestion




## Future

| Travel Times | | | |
|---|---|---|---|
| From/To | Today | 2030 | Increase |
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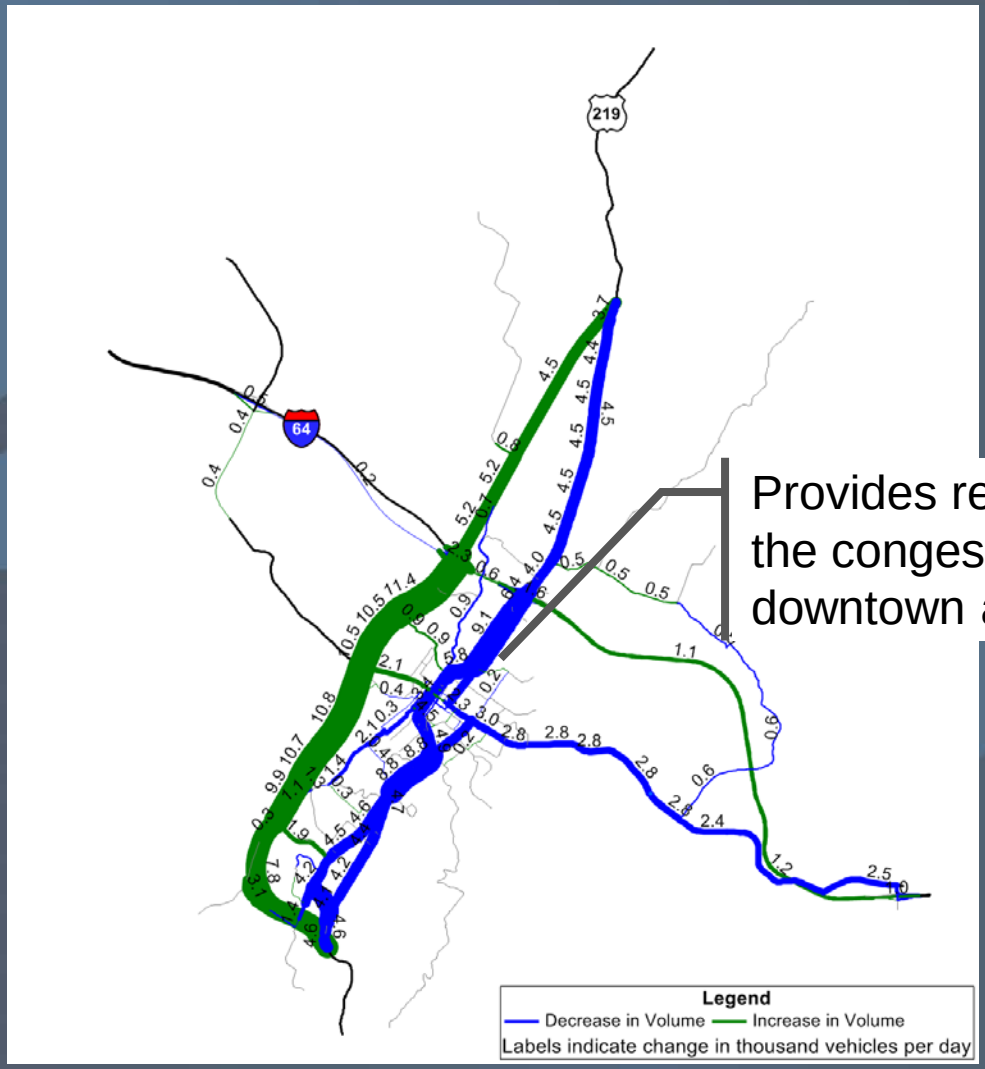
# Where Does The Traffic Go?

A new bypass serves through traffic




Provides relief in the congested downtown area



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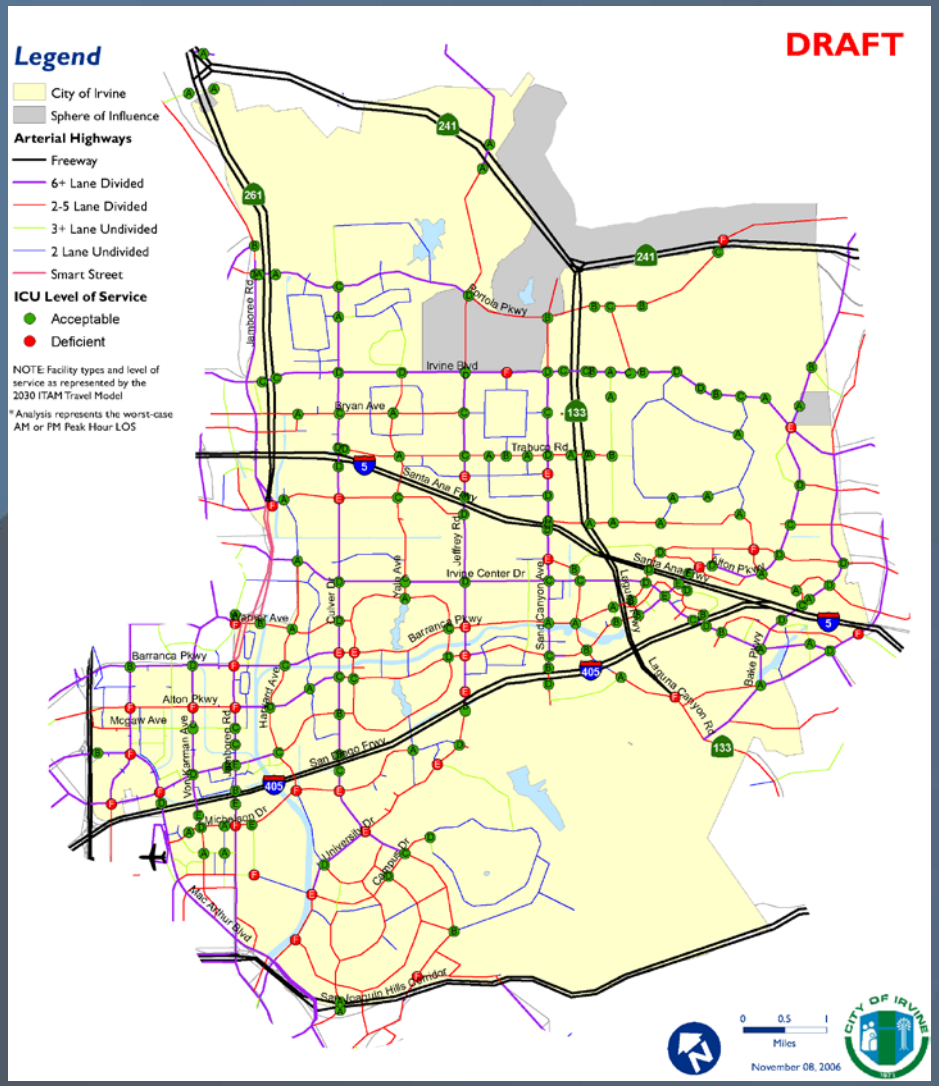
# Intersection Los Reporting



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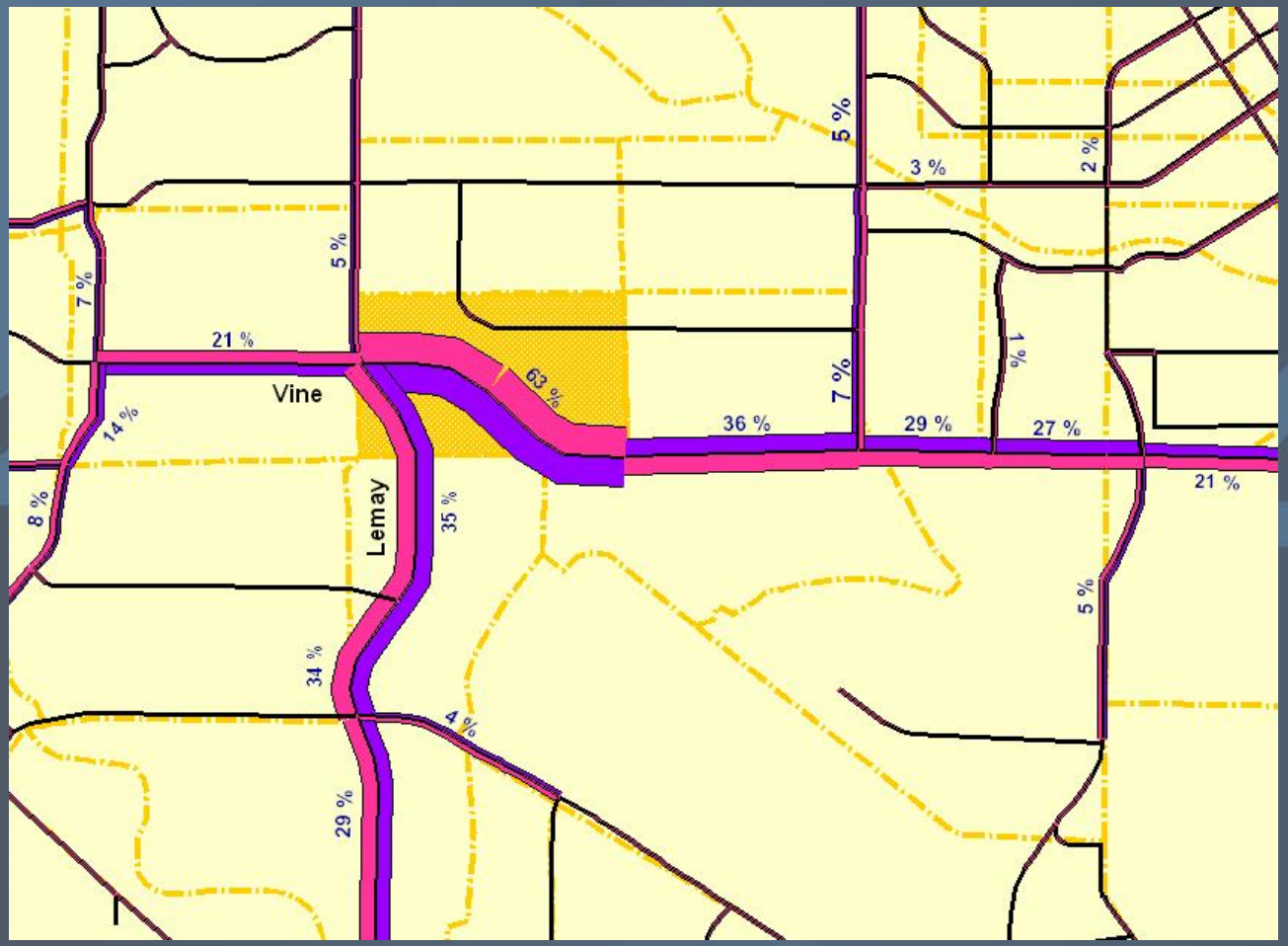
# Traffic Impact Analysis



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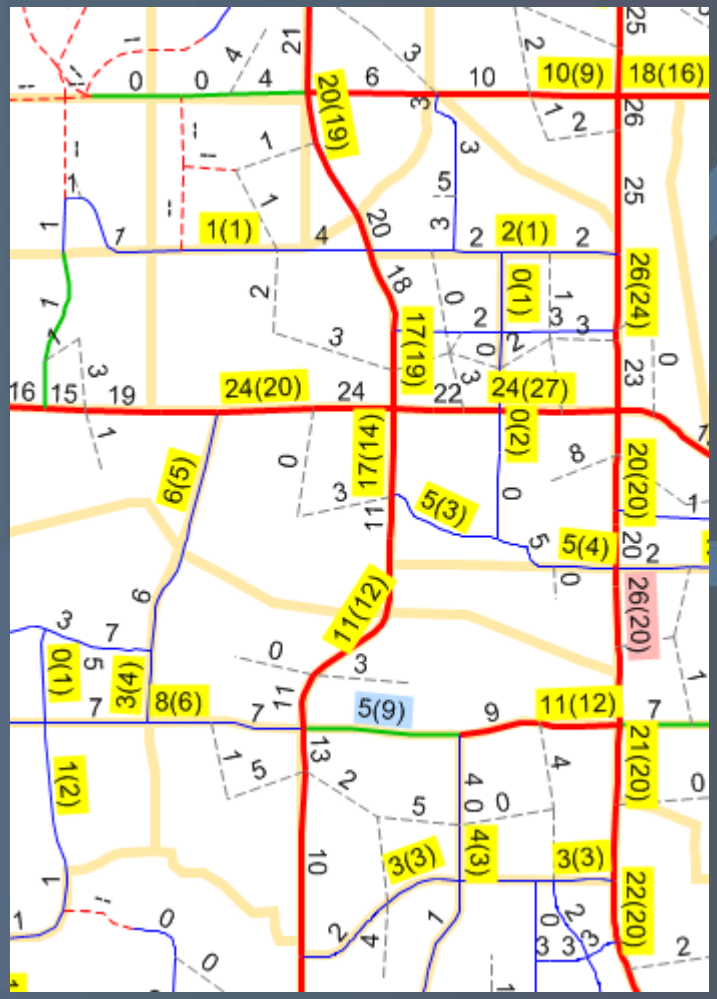
# Model Validation / Post-Processing

# Matching Local Data

- Surveys & reasonableness checks
  - » Final Trip Rates
  - » Travel Times
  - » District to District travel patterns
- Traffic count data
  - » VMT by subregion, facility type, and area type
  - » Corridor and localized review



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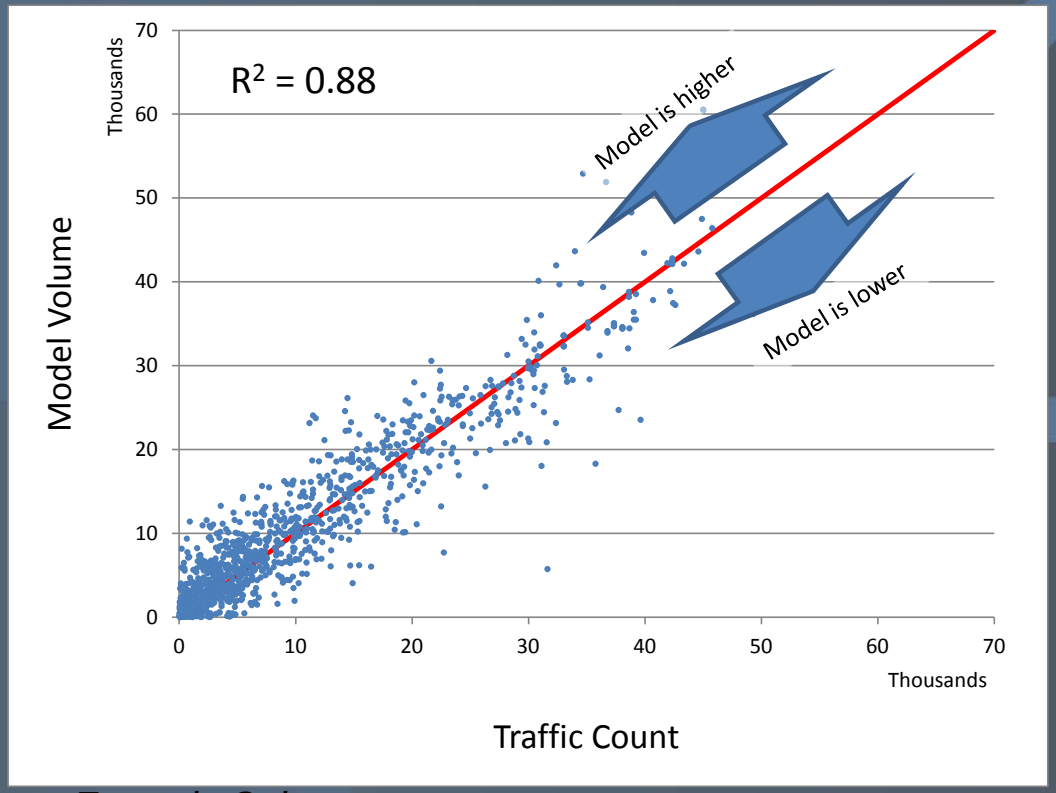
# Matching Counts

- How does the model work for today
  - Statistics
    - R-Squared
    - % RMSE
    - Volume / Count Ratio
    - Etc…
  - Screenlines
  - Corridor Review
  - Highest Errors




*Example Only*



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# Testing Sensitivity

- Dynamic validation
  - » Observe how the model reacts changes
    - Test big and small changes
    - Test the base and forecast year
  - » Do results make sense?

# Post Processing: *Reconciling to Counts*

- Is the model too low in the base year?
  - » Then the forecast is increased by the same amount
- Is the model too high in the base year?
  - » Then the forecast is decreased by the same amount
- Both ***Post Processed*** and ***Raw*** volumes are available for analysis

# Post Processing: *Reconciling to Counts*

**Use % Growth** *(e.g., traffic increases by 30%)*

$$Forecast_{ratio} = Raw\ Volume \cdot \frac{Count\ Volume}{Raw\ Base\ Year\ Volume}$$

**Use Volume Growth** *(e.g., traffic increases by 5,000 vehicles)*

$$Forecast_{diff} = Raw\ Volume + Count\ Volume - Raw\ Base\ Year\ Volume$$

**Use the Average**

$$Forecast_{avg} = \frac{Forecast_{ratio} + Forecast_{diff}}{2}$$

# *Travel Model*

# *Testing Demand Changes*


- Evaluate base, interim, and forecast year datasets
- Consider testing large development proposals (e.g., over 200 households or employees)
  - Use the model's trip distribution to compare to traffic study assumptions
  - Cross-check development model runs with ITE-based traffic studies


- Use the model to test very small developments
- Test unreasonable changes to the jobs/housing balance

# *Testing Roadway Changes*


- Test large and medium-scale capacity changes
- Test different roadway alternatives
- Test a comprehensive roadway plan
- Test various corridor configurations


- Test scenarios that do not impact system capacity
- Try to model very small capacity or speed changes
- Rely on the demand model to test interchange configurations

# *Non-motorized Results*


- Focus on potential non-motorized demand
  - E.g., 1, 2, and 5 mile trip bandwidths
  - Identify good places for infrastructure improvements
- Consider non-motorized model results to be a rough estimate
  - The model is only one tool to aid in analysis


- Expect detailed numbers
  - YES: "There is a high demand for a new bike lane in this corridor"
  - NO: "This new bike lane will result in X new bike trips"

# Transit Results


- Evaluate major system adjustments
- Test large route changes
- Focus on a system-wide results


- Test fine tuning of route alignments
- Expect detailed forecasts by transit route or transit stop
  - This information is available, but must be interpreted carefully by a transit professional

# Traffic Results


- Post process traffic volumes based on counts
- Focus on forecast **growth** rather than values
- Consider corridors as a whole
- Use the model to plan freeways, expressways, and arterials

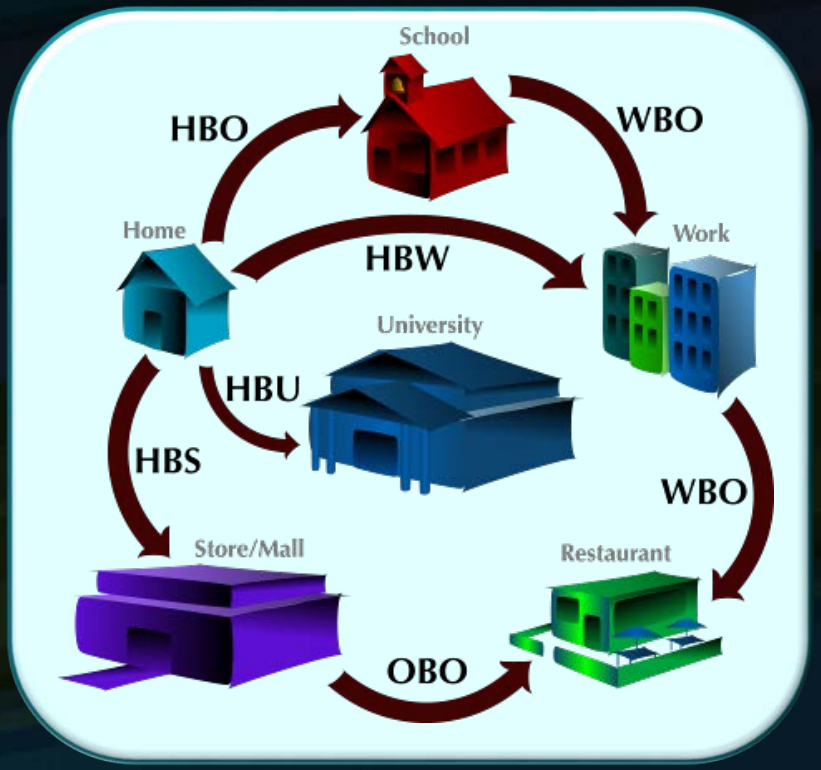

- Rely on raw model volumes
- Expect detailed collector and intersection forecasts
  - This information is available, but must be interpreted and may require additional post processing

# *Model Steps*

# *Trip Generation: How Many Trips?*

- Based on household survey
- Different trip purposes
- Generate all trips*
  - Walk
  - Bike
  - Transit
  - Auto

** This is different than ITE Trip Generation, which only considers vehicle trips*



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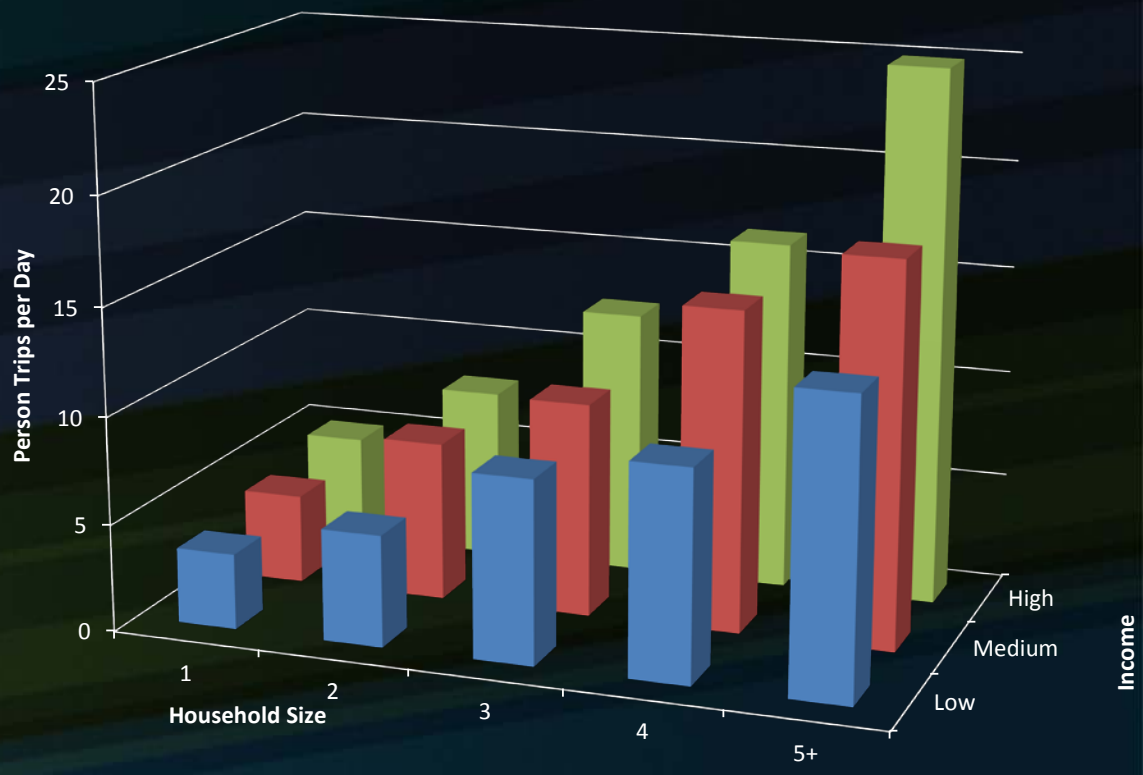
# *Trip Generation: How Many Trips?*

- Cross-classified production rates
  - » Household size & income
  - » Household Workers & Income

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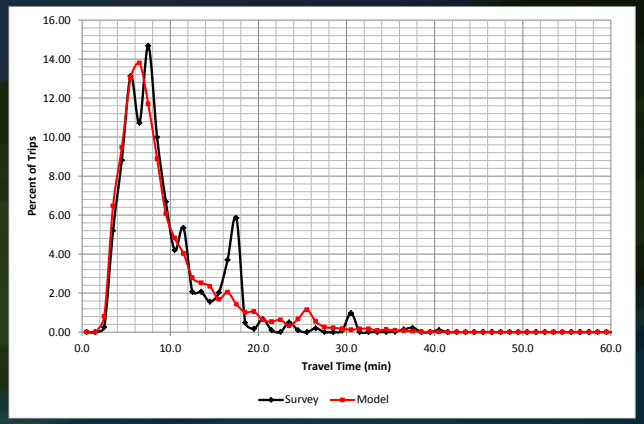
# *Trip Distribution: Where will they go?*

- Match
  - » Productions & attractions
- Survey Data
  - » Trip length distributions
  - » Subregion to subregion patterns

The *Gravity* concept can be used to model travel!

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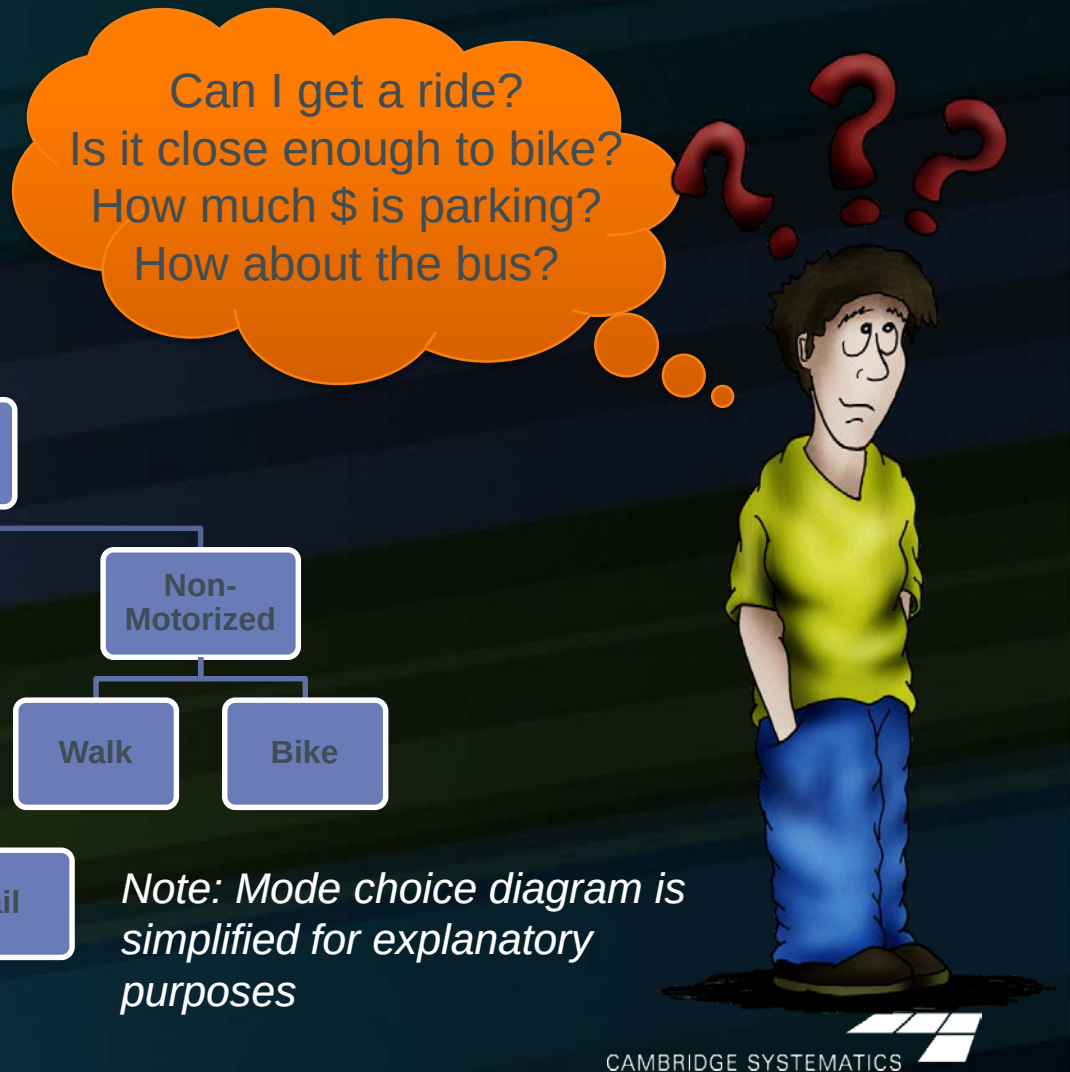
# Mode Choice: What Mode?

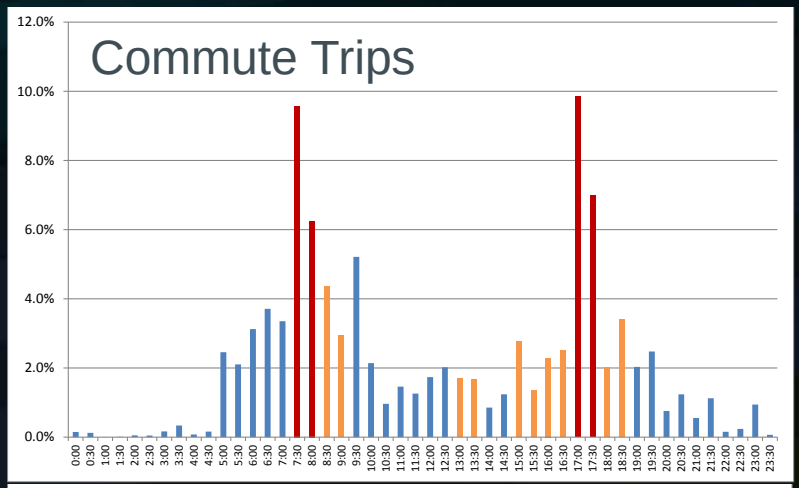
- Nested Logit Model
  - Consider all modes for each zone pair

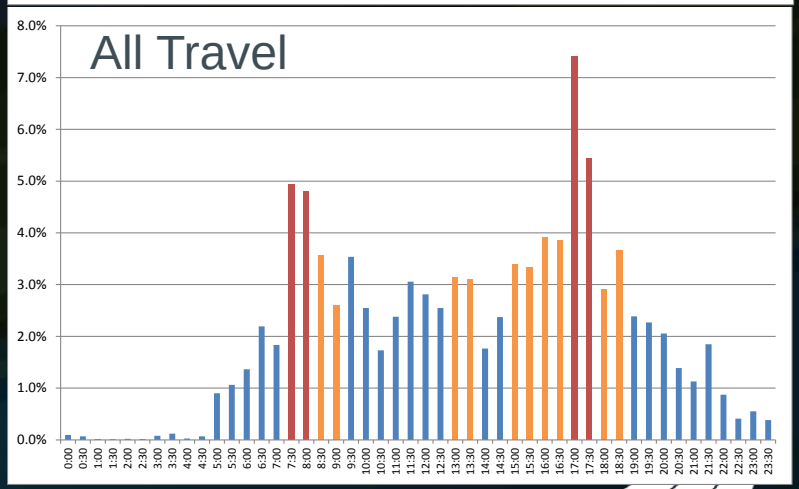




*Note: Mode choice diagram is simplified for explanatory purposes*

# *Traffic Assignment: What Route?*

- 4 to 5 time periods (depending on model version)
- Account for localized and peak period congestion

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# *Morning Wrap-Up*



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Think Forward

# TransCAD Travel Demand Model Training

*presented to*

*Caltrans District 3*

*presented by*

*Cambridge Systematics, Inc.*
*Caliper Corp.*

*April 18-19, 2017*

# Agenda

- TransCAD Files
- Layers
- Dataviews
- Selection Sets
- Joining Data
- Color theme
- Labels
- Scaled Symbol Theme
- Flow Map Utility
- Importing Shapefiles
- Creating Districts
- Calculating VMT by District
- Desire Lines
- Creating Networks
- Shortest Paths
- Network Skims
- Traffic Assignment

# TransCAD Files

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# File and Data Types

- Data Files actually contain information:
  - Tables (.bin, .DBF)
  - Geographic Files or Layers (.dbd, .shp)
  - Matrices (.mtx)

# File and Data Types

- Some files do not contain information:
  - Dataviews (.dvw)
  - Maps (.map) and workspaces (.wrk)
  - Matrix Views (.mvw)
- These files refer to other file types that contain data
  - Same concept as a project file (.mxd) in ArcMAP


**Never use File → Save As → "Dataview (.dvw)" or "Map (.map)" to save a copy for modification!**

# File and Data Types

- Geographic Files (.dbd) are GIS layers and can be edited and viewed.
  - We use line layers as “roadway networks”
- Route Systems (.rts) contain transit information
  - Route systems are linked to line layers
- Routable Network Files (.net, .tnw) are routable networks used internally by TransCAD.
  - Routable network files must be created before running certain tasks.
  - Separate networks for roadway and transit

# Layers

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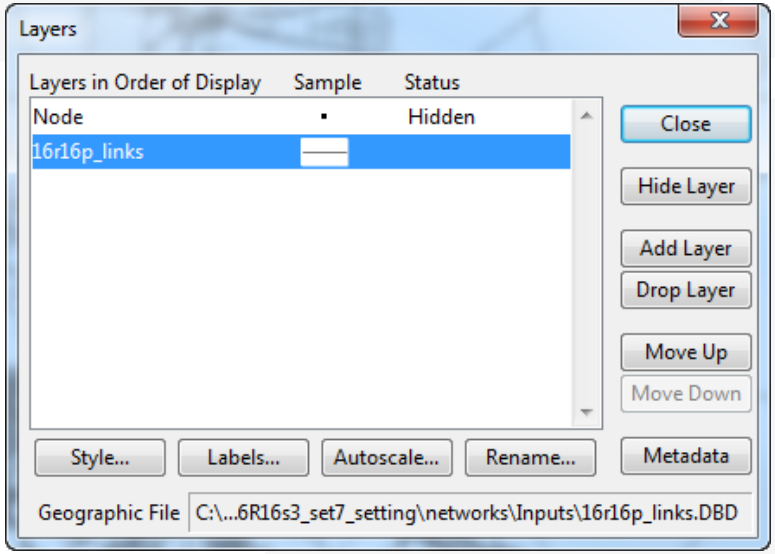
# Working with Layers

- Start by opening a map **or** a geographic (dbd) layer file
  - » Opening a layer will create a new map and add the layer
  - » Opening a map will load all saved layers, settings, etc.
- Access layers with the layers dialog box (  )



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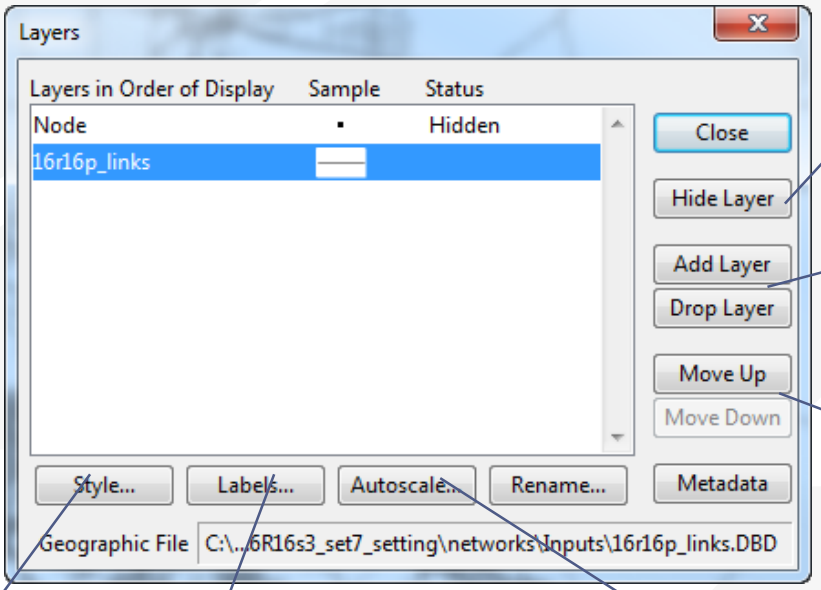
# Working with Layers

- **The Layers Dialog ( )**




Hide/show a layer

Add/Drop layers

Re-order layers

Change a layer style

Add/edit labels

Automatically show/hide layers as certain scales



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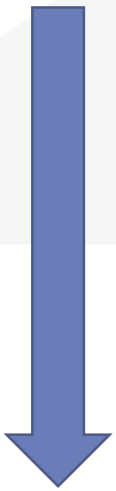
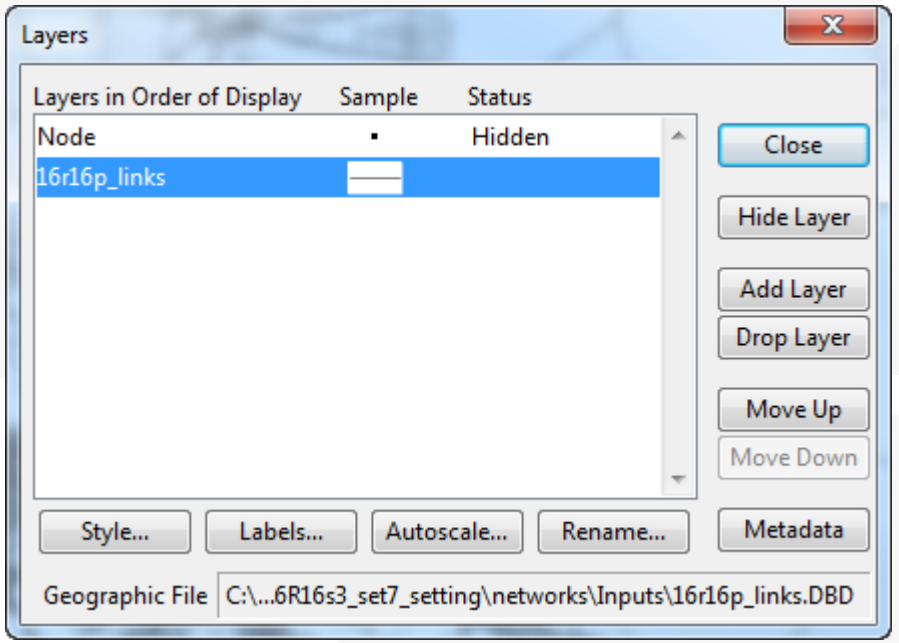
# Working with Layers

- **Layers are drawn from TOP to BOTTOM**

Top layer
(drawn first)



Bottom layer
(drawn last)



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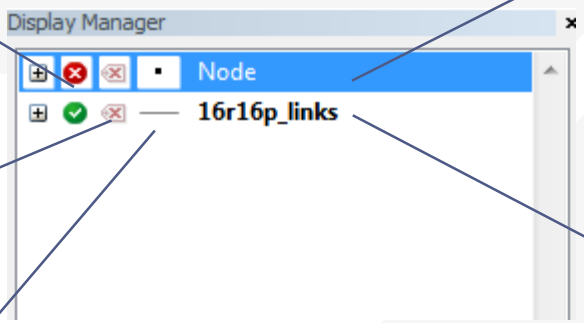
# Display Manager

- Activate from Map → Display Manager
- Quick access to layers, settings, etc.
  - Right-click for more settings, including *make working layer*

Hide/show a layer

Add/edit labels

Change a layer style




Node layer is **NOT** active

**Bold text:** links layer is active



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# Data Tables (“Dataviews”)

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# Working with dataviews

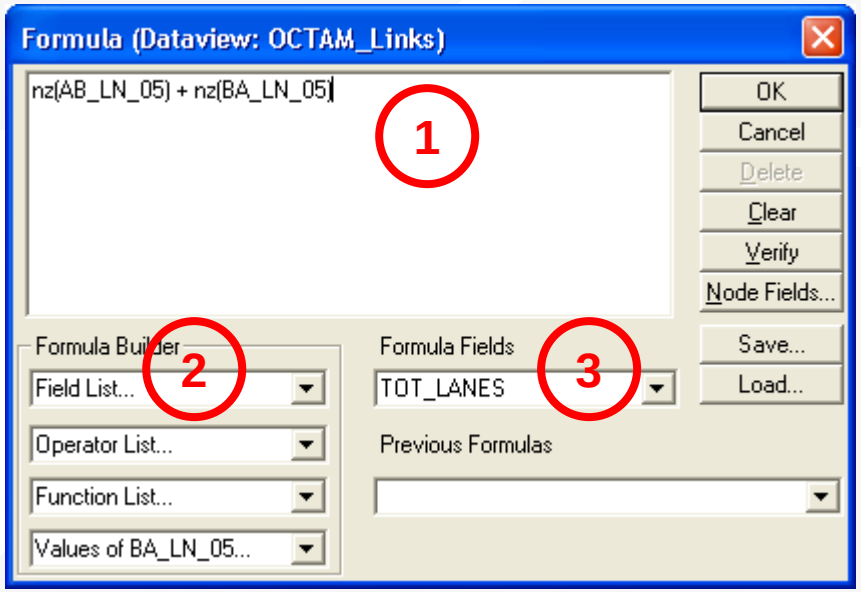
- Open a dataview for any existing layer (  )
- Open a standalone table with File → Open
- Add/Remove fields with Dataview → Modify Table
  - (or  )
  - Be careful: Changes are permanent once you click “OK”
- Data can be edited directly in the dataview
  - Be careful: Changes are saved as you go
- Create formula fields with 
- Right-Click on a column header for more options
  - Including a formula Fill

# Working with Dataviews

- Formula ***Field*** ***vs.*** Add Field & Formula ***Fill***
  - » Formula ***Fill*** adds new data and saves values in the table
  - » Formula ***Fields*** are updated when other values change, but are not stored in the data table
    - Formula fields are stored in a map, dataview (*.dvw), or workspace (*wrk)

1. Enter a formula
2. Use the Field List to find field names
3. Name the formula field

*Tip: nz([Field]) converts null values to zero values*



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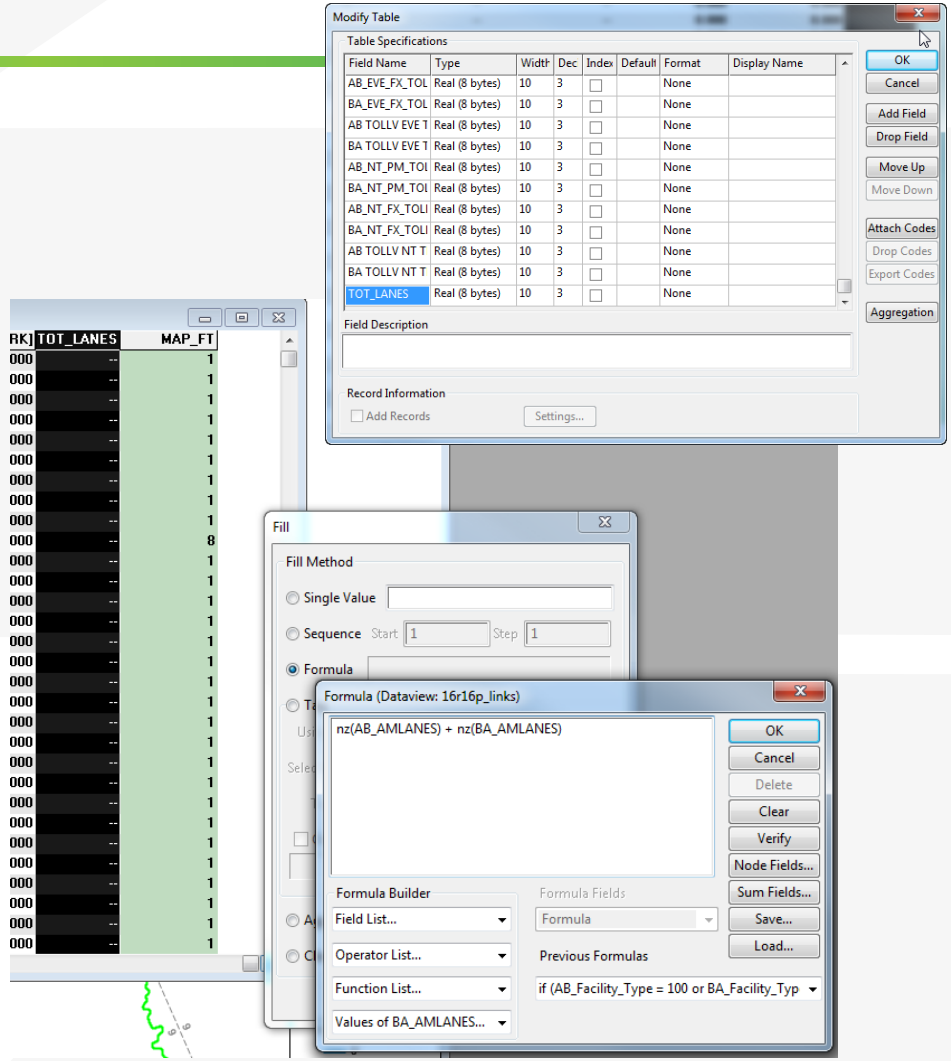
# **Practice 4:** Add total number of lanes in a **NEW FIELD**

- Start with the results from Practice 3
  - ✓ Open the saved map if needed

1. On the top ribbon, click  will open the links layer daataview table

2. Use Dataview → Modify Table or click 
   - ✓ Click ‘Add Field’
   - ✓ Name the field “TOT_LANES”
   - ✓ You can move the field position using Move Up and Move Down buttons to the right
   - ✓ Click ‘OK’

3. Go to ‘Dataview’ window
   - ✓ Right click the top part of the ‘TOT_LANES’ field
   - ✓ Select ‘Fill’
   - ✓ Select the ‘Formula’ in the fill method options
   - ✓ Type: nz(AB_AMLANES) + nz(BA_BALANES)
   - ✓ Alternatively you can use the formula builder
   - ✓ Click ‘OK’ button.
   - ✓ This fills in two-way number of lanes




**Bonus:** Try this example using a formula field instead!



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# Selection Sets

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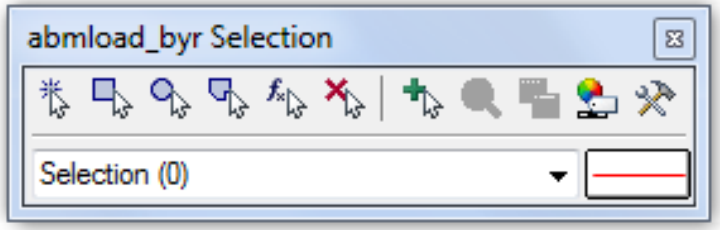
# Selection Sets

- Add additional formatting capability
- Useful for analysis and data processing
- Use the Selection Set Toolbox
  - Select items with a query
  - Select items by pointing
  - View the Selection Settings




- One map can contain many selection sets
  - Show or hide selected items
  - Format selected items with different colors, styles, and labels



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# Joining Data

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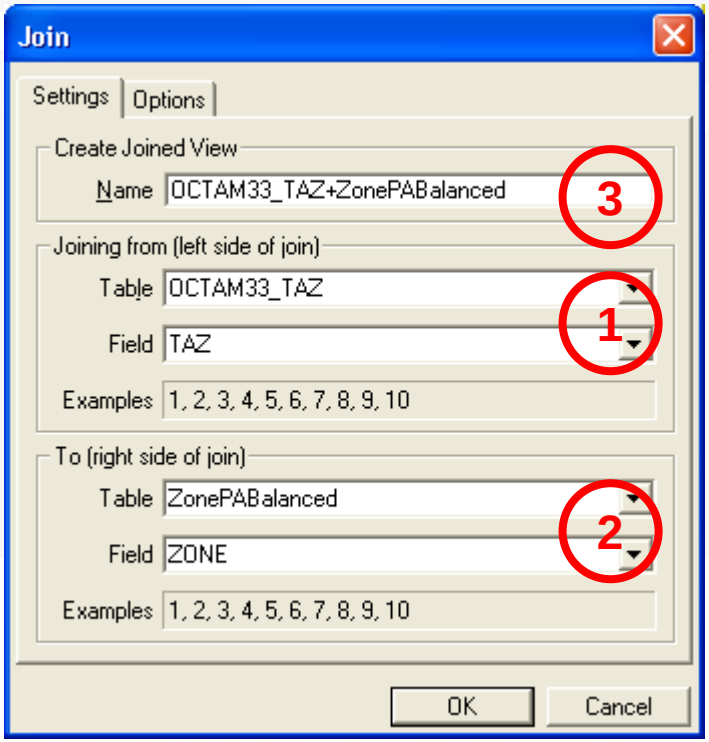
# Joining Data

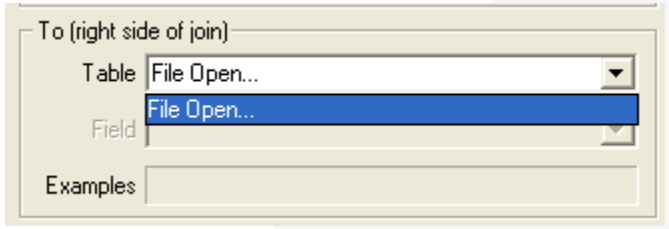
- Layers have an associated data table (  )
- Data can be joined (  ) to other tables
  - Roadway Network + Traffic Assignment results
  - TAZ layer + Land Use Data
  - Roadway Network + Lookup Table
  - More…
- This is how traffic assignment results are viewed in TransCAD

# Joining Data




1. Select the Primary join table
   - » *Be careful: Check the Field*
2. Select the secondary join table
   - » *Be careful: Check the Field*
3. Create a name for the view, or use the default

*Tip: You can open a file from the join dialog box*



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# Color Theme

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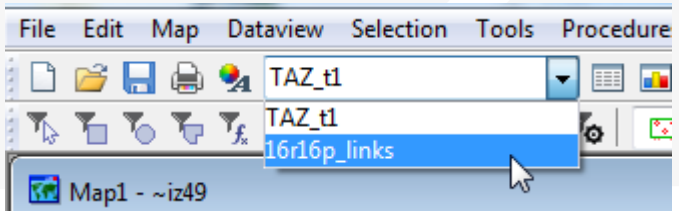
# Creating Maps

- Create a new map by opening a Geographic File (*.dbd)
- Add more layers if desired
  - »  then 
- Choose the active layer
  - » Use the dropdown selector
  - » Or use the display manager




- Change the “default” styles for the layers
  - »  then  , or  , or use the display manager
- Hide or show layers
  - »  or the display manager



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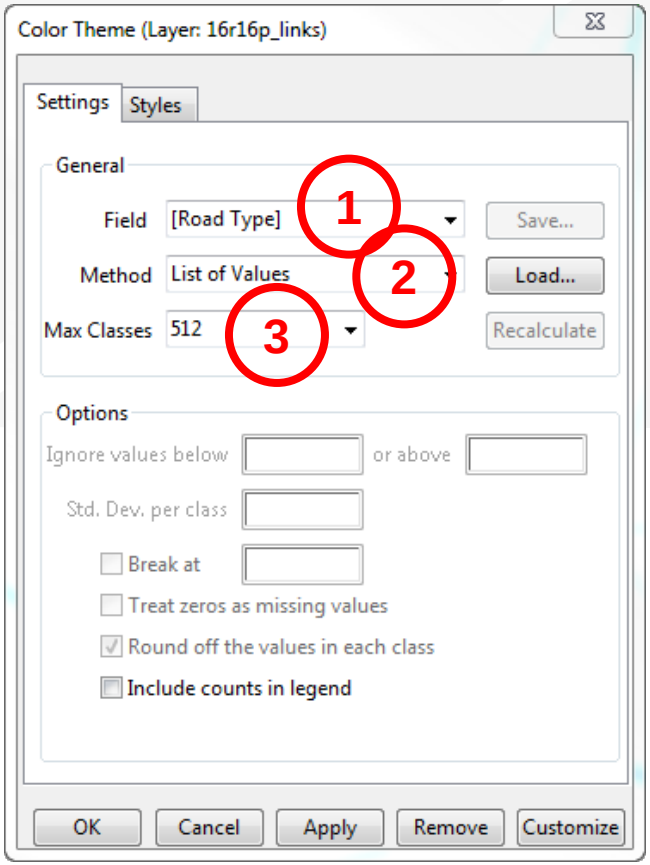
# Color and Pattern Themes

- Set feature colors and styles based on attributes
  - Color Themes (  ) are often used to display facility type on a roadway network
  - Pattern Themes (Map → Pattern Theme…) is sometimes used to display number of lanes on a roadway network

# Color and Pattern Themes

## The Settings Tab




1. Choose a field to represent
2. Choose a method to create categories and number of classes

* Use the Load and Save buttons to store and recall settings
  - » *This is a huge time-saver!*



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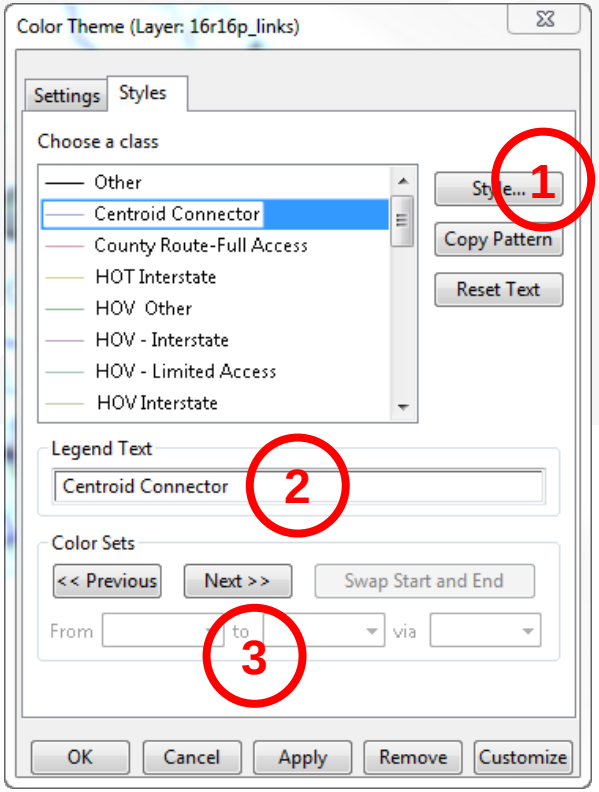
# Color and Pattern Themes

## The Styles Tab




1. Choose a style for each class
2. Select a legend text for each class
3. Choose from pre-defined color settings if desired

# Labels

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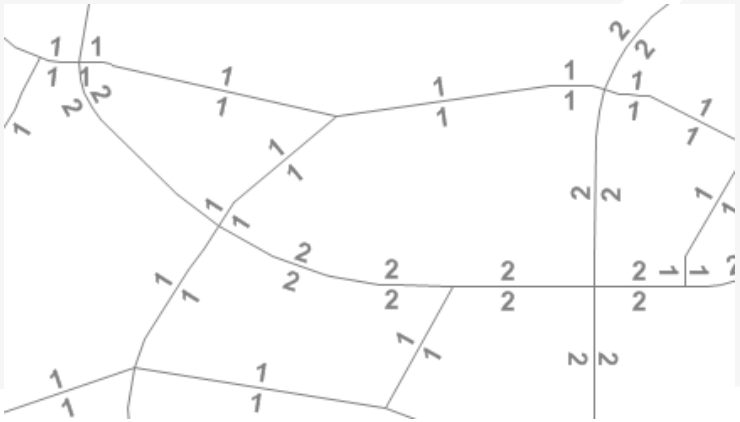
# Automatic Labels

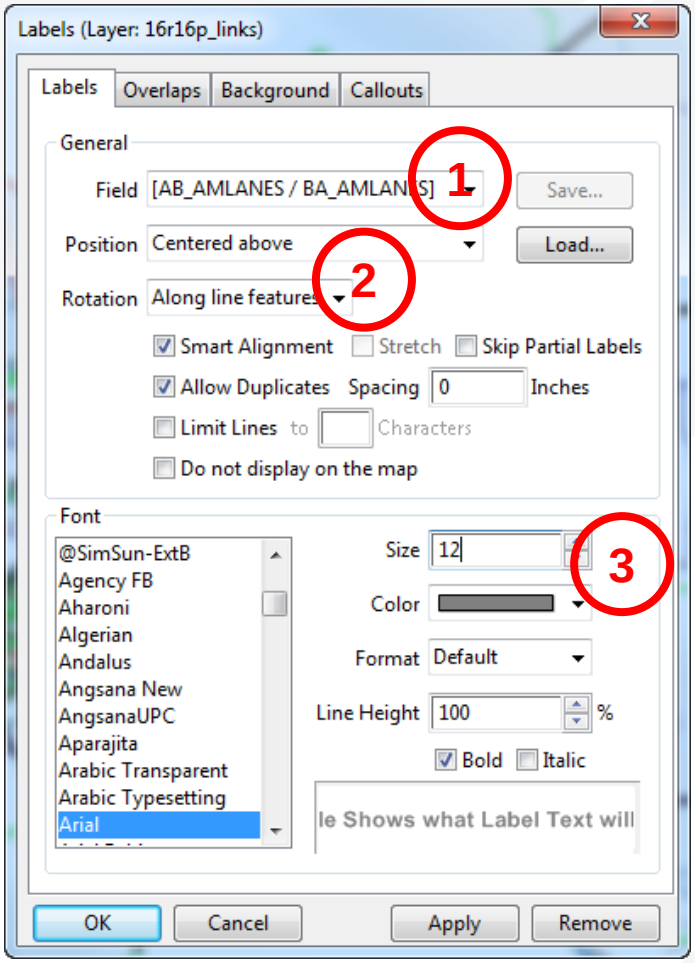
- Labels ( ) can be used to show things including:
  - Traffic Volumes
  - Number of Lanes
  - Centroid Numbers
  - SED/Land Use Data



- Labels can be set differently for different selection sets

# Automatic Labels

## The Labels Tab




1. Select the field to use for labels
2. Set label placement options
   - » *Note the "Allow Duplicates" checkbox*
3. Set the label style options



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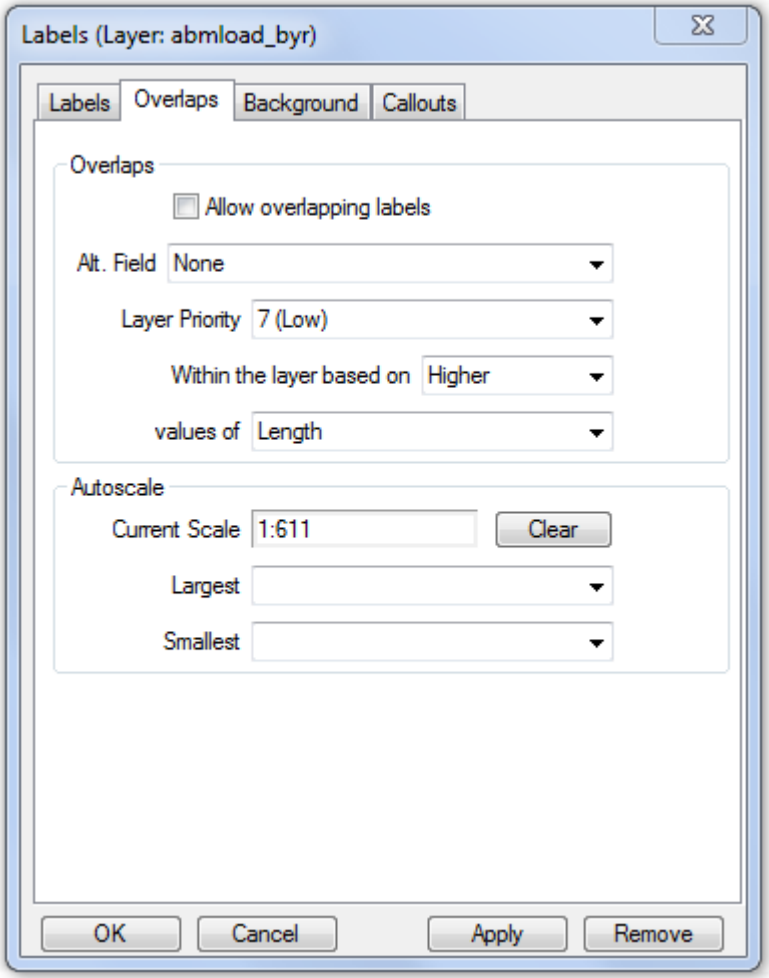
# Automatic Labels

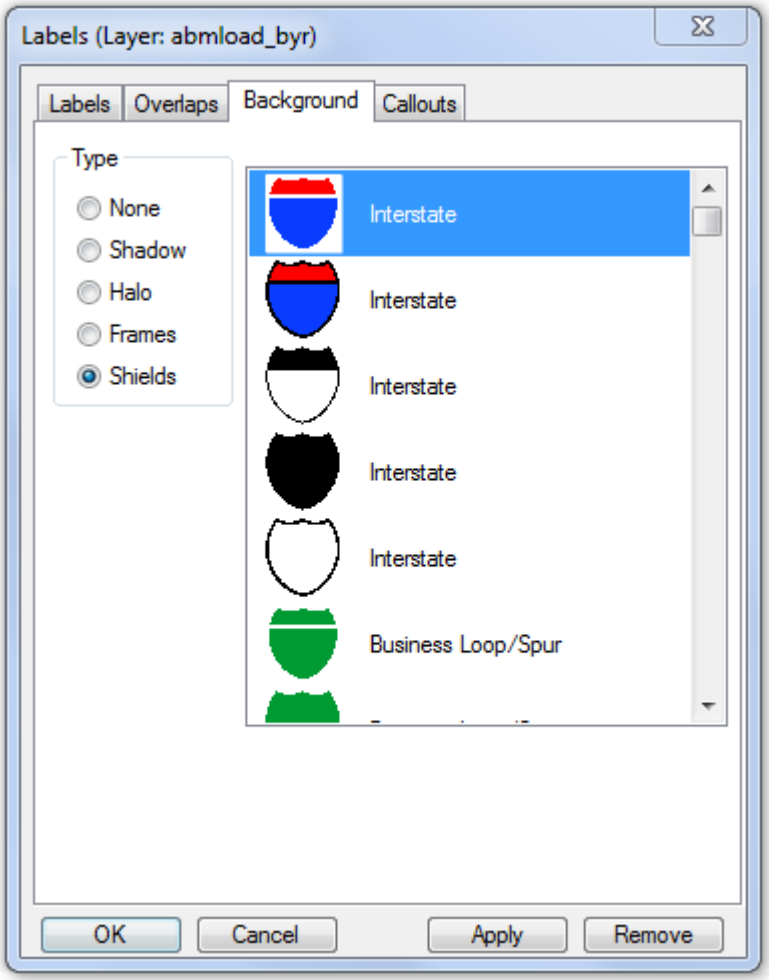
## The Overlaps Tab




- Overlapping labels can be allowed if desired
- Different layers can have different priorities
- Autoscale can turn labels on and off automatically

# Automatic Labels

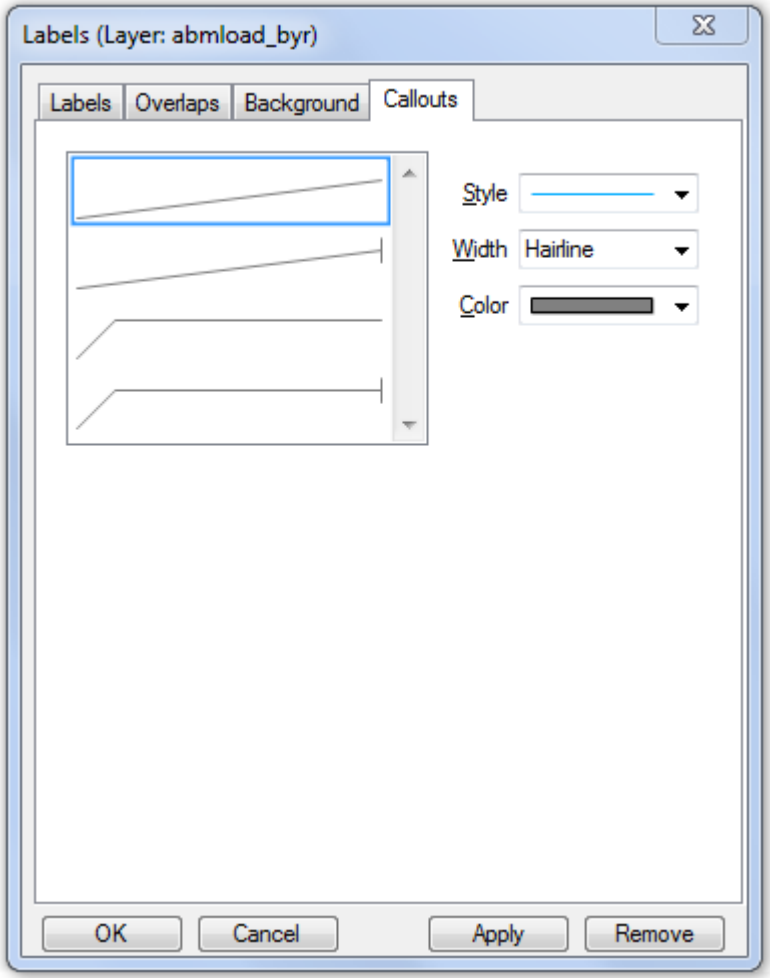
## The Background Tab




- Shadows, halos, frames, or shields can be added to labels to create better looking and more informative maps

# Automatic Labels

## The Callouts Tab




- Set the default callout style to use when labels are manually re-positioned



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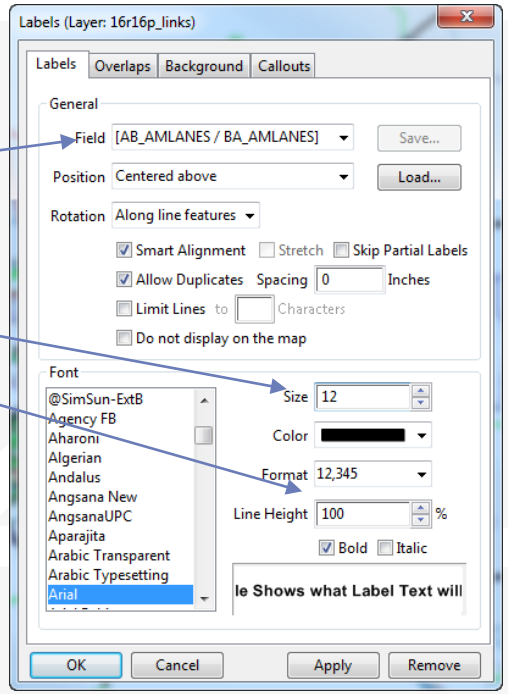
# **Practice 2:** Add number of lanes labels

**TIP**
Right click on the gray area of the layout and print to pdf.

1. Start with the results from Practice 1
   - ✓ Open the saved map if needed
2. Use the and zoom-in tool ( ) to zoom in to the area of interest
3. On the top ribbon, click the labels icon ( )
   - ✓ Select the [AB_AMLANES/BA_AMLANES] field
   - ✓ Change the size and color to match your preference
   - ✓ Change the format to have numbers by comma separated
   - ✓ Click ‘OK’ button




**In training, save the map for future use**



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# Scaled Symbol Theme

(also known as bandwidth map)

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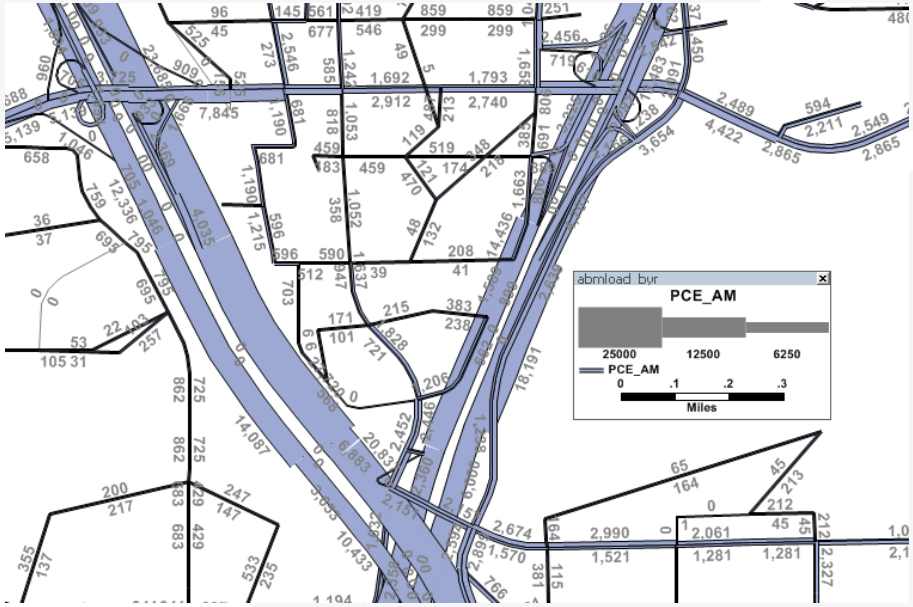
# Scaled Symbol Themes

- Scaled Symbol Themes (  ) are often used to:
  - Display traffic volumes
  - Display results of a select link or node analysis



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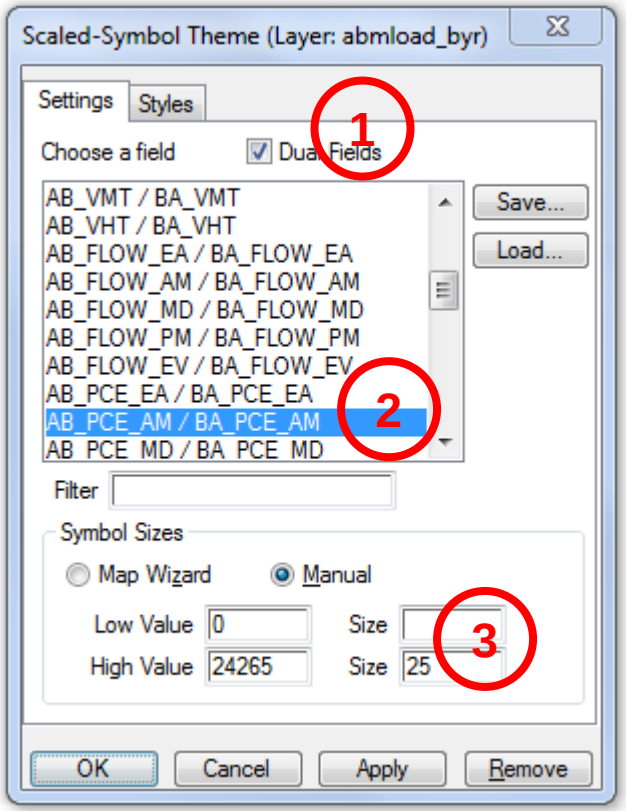
# Scaled Symbol Themes

## The Settings Tab




- Show directional fields only, or all fields
- Select a field to use
- Specify a scale, or let TransCAD specify one automatically

# Flow Map Utility

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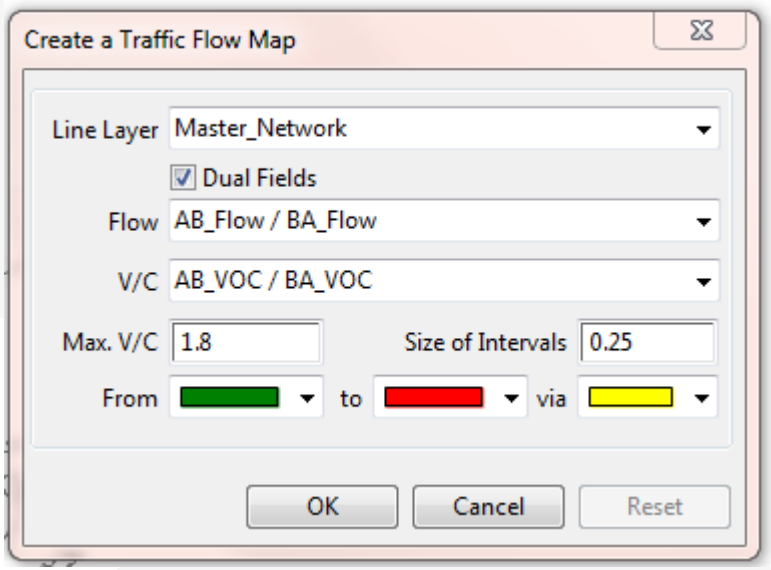
# Creating Flow Map

- Make sure your assigned volumes are joined to the network
- Go to Planning – Assignment utilities- Create flow map
- Select fields corresponding to volume and V/C ratios



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# Importing Shapefiles

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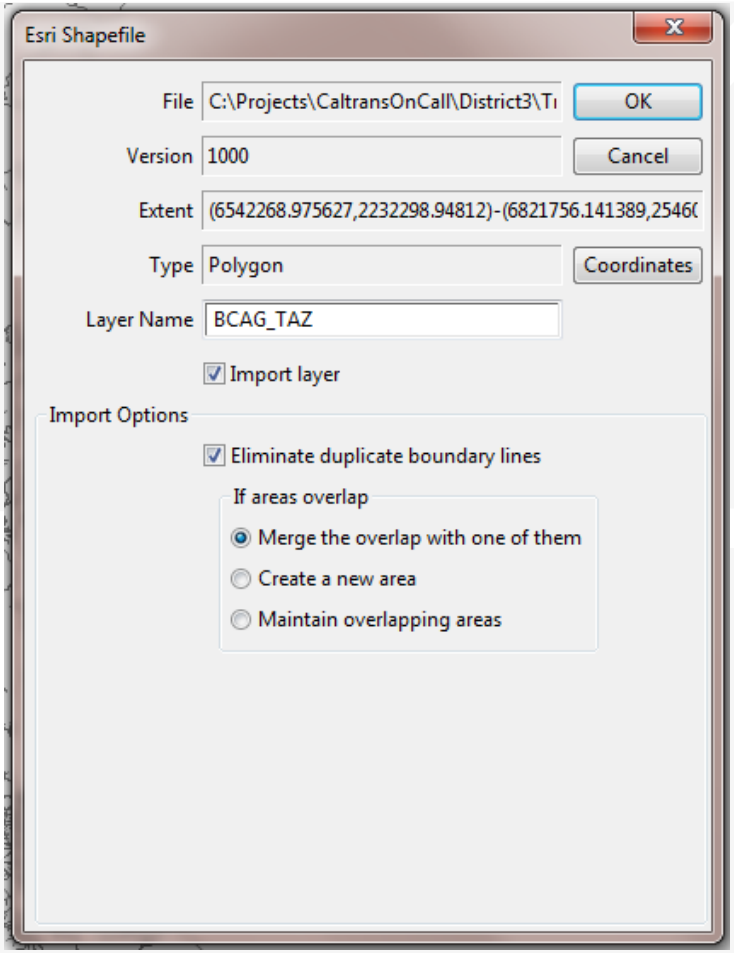
# Importing Shapefiles

- Open the desired .shp file
- Select “Import layer” checkbox
- Most common option is to merge the overlapping polygons



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# Creating Districts

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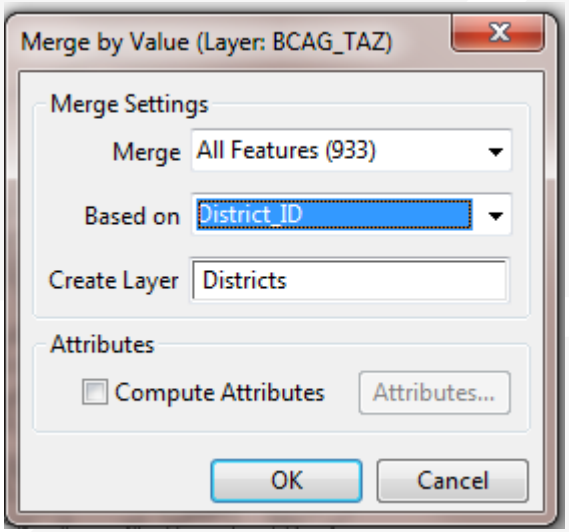
# Merging TAZs into Districts

- Use Tools- Geographic Analysis- Merge by Value
- Create Districts layer based on District_ID attribute
- Can compute attributes by adding them, copying them etc.



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# Calculating VMT by District

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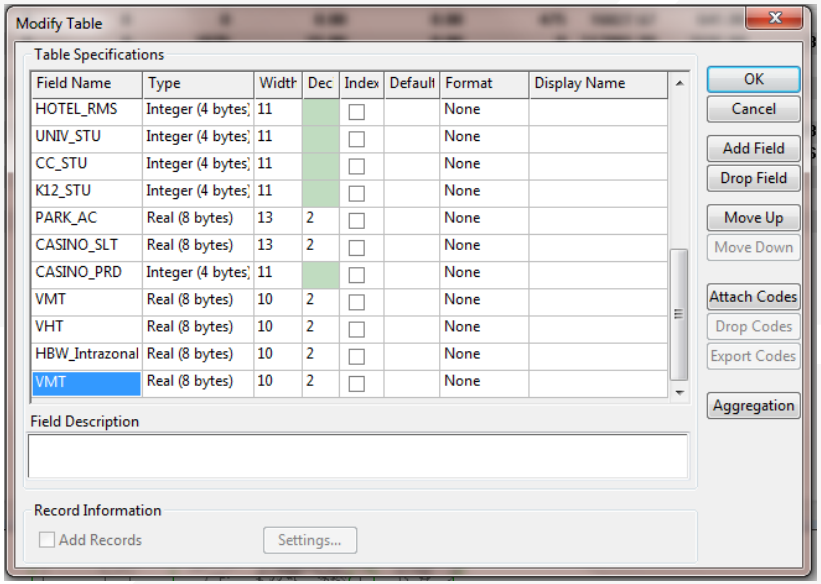
# Calculating VMT by District

- Open District layer and add a VMT column by using Dataview- Modify Table
- Make the new VMT field “Real”



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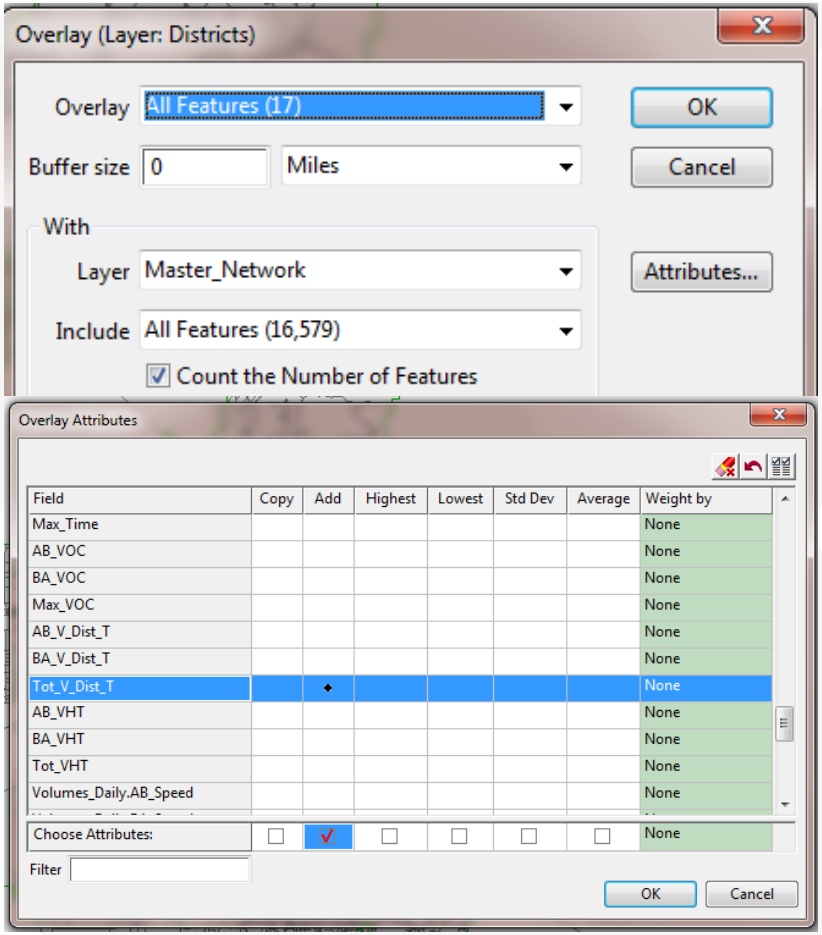
# Calculating VMT by District 2

- With Districts as your active layer, use Tools- Geographic Analysis- Overlay
- Under attributes select Add Tot_V_Dist_T



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# Desire Lines

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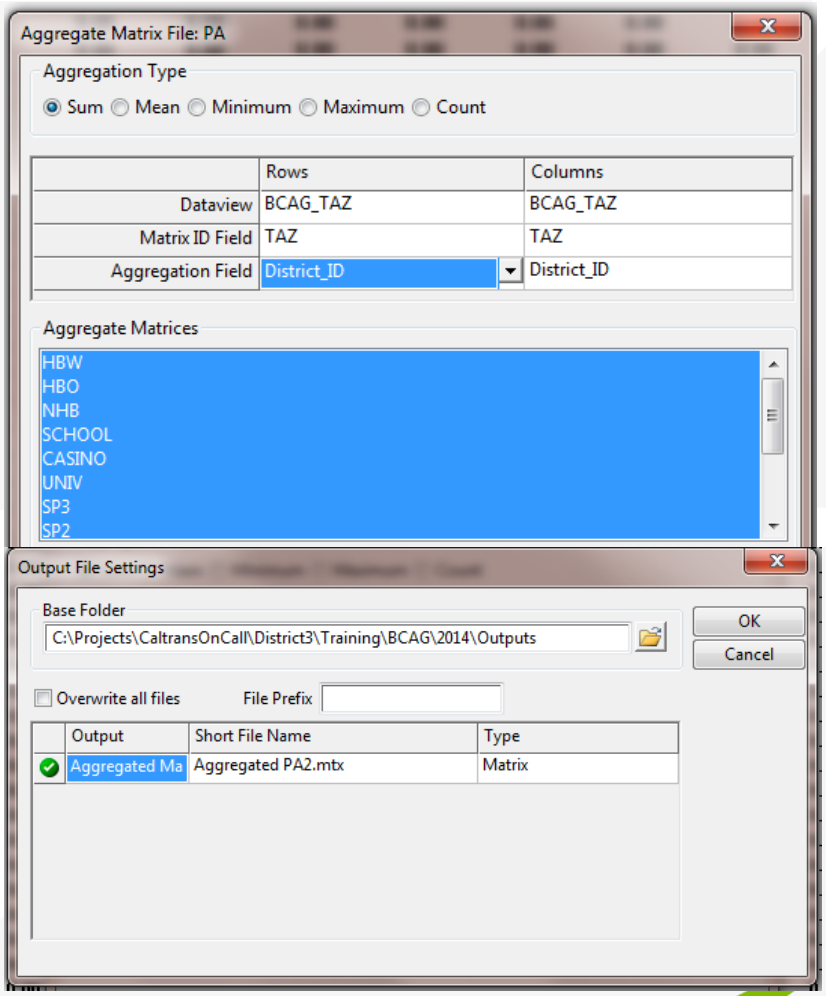
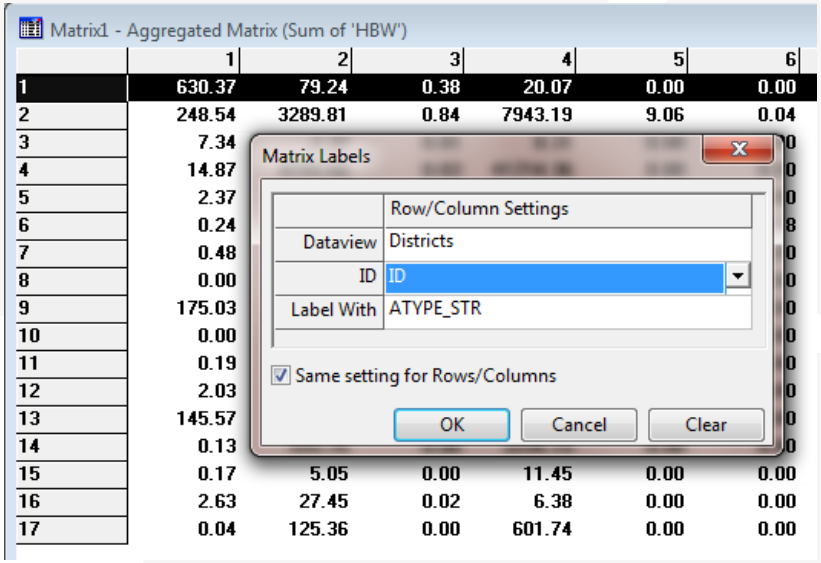
# Creating Desire Lines

- Desire lines can show aggregate flows between areas
- Open TAZ layer
  - » Should have District_ID
- Open PA.mtx trip table
- Aggregate based on TAZ layer to District_ID
- Save as Aggregated matrix



# Creating Desire Lines 2

- To label with district name instead of ID, create matrix view and label with ATYPE_STR from the district dataview



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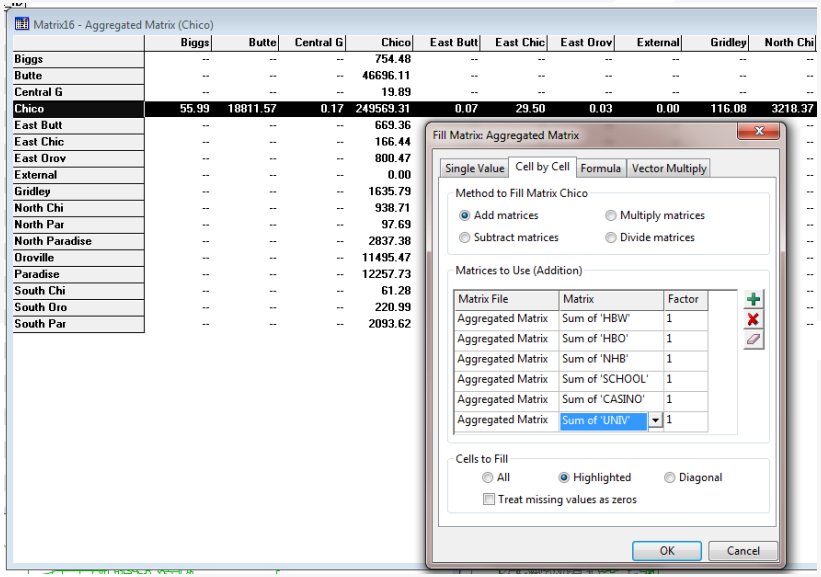
# Creating Desire Lines 3

- To create flows from and to Chico, go to Matrix- Contents and add “Chico”
- Then Select the Chico row and click “Fill”
- Add all other matrices and fill only Highlighted cells
- Do the same for Chico column



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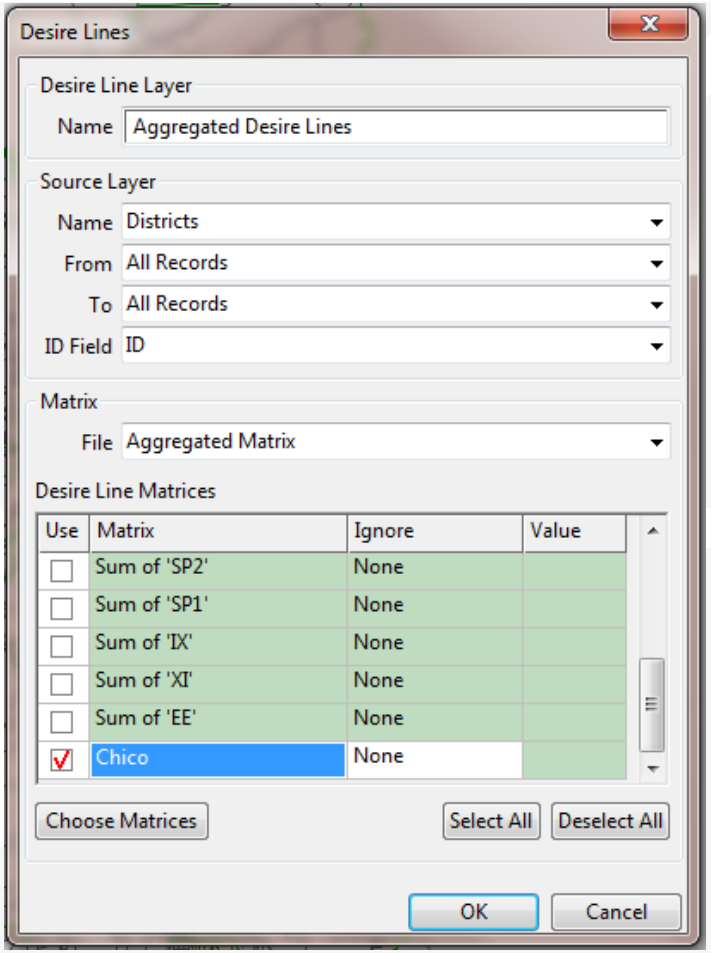
# Creating Desire Lines 4

- Go to Tools- Geographic Analysis- Desire Lines
- Save as a geographic file
- Display the volumes using Scaled Symbol Theme



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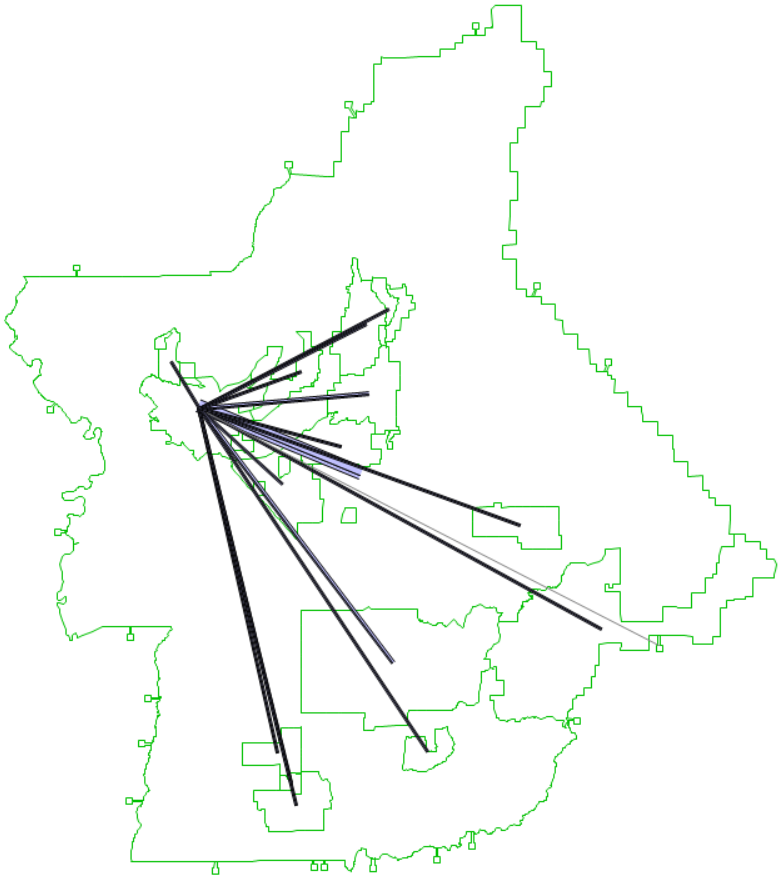
# Creating Desire Lines 5



# Creating Networks

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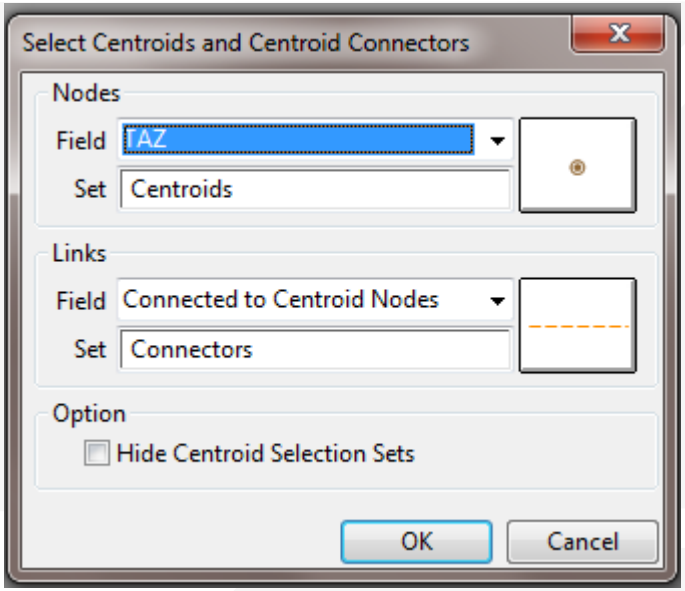
# Creating Networks

- Open a geographic file
- Select centroids based on field TAZ



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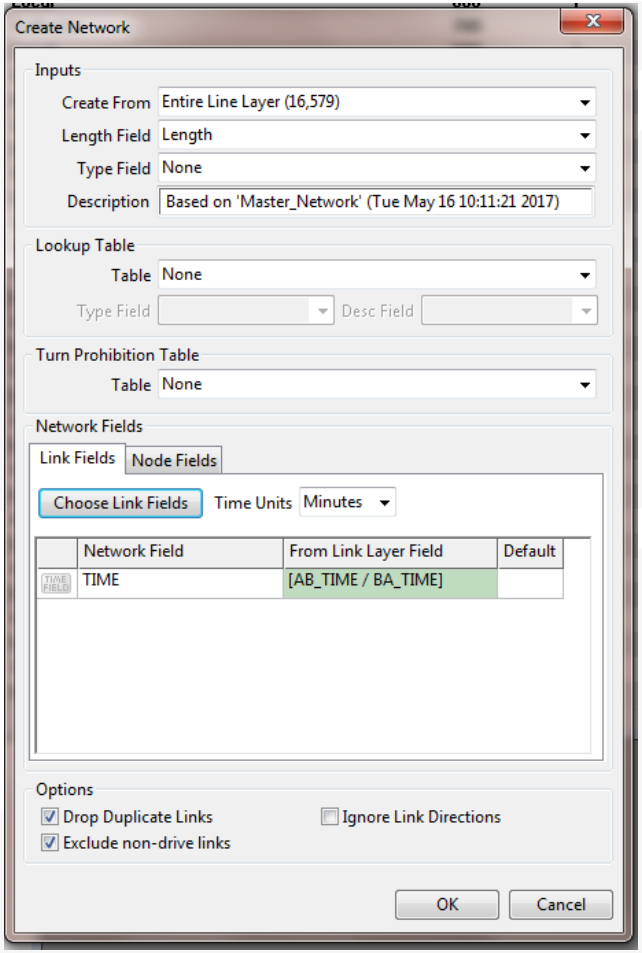
# Creating Networks 2

- Go to Networks/Paths- Create Network
- Use the entire line layer
- Use length field
- Add time field
- For traffic assignment will also need capacity, alpha and beta fields
- Save as network file



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# Shortest Paths

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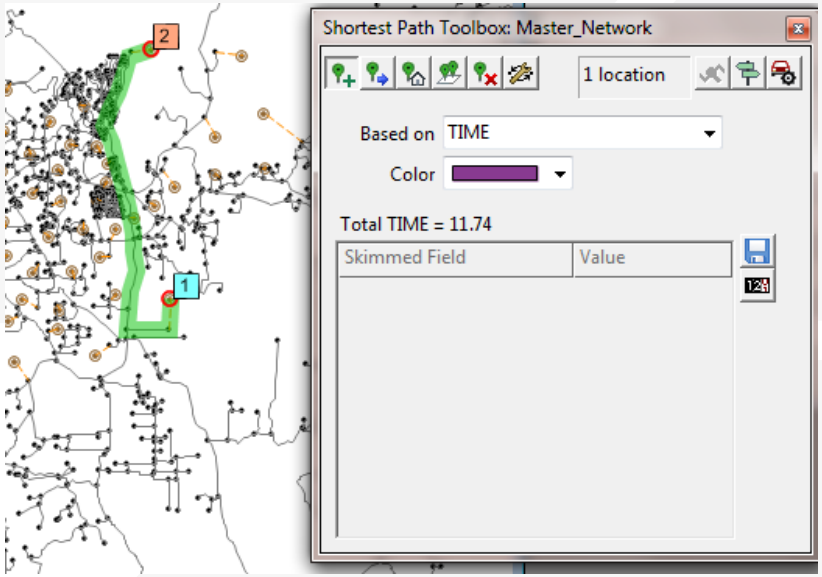
# Shortest Paths

- Make sure the network file is open
- Go to Networks/Paths-Shortest Path
- Select the shortest path based on TIME attribute
- Click on any origin and destination nodes to get the shortest path



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# Highway Skims

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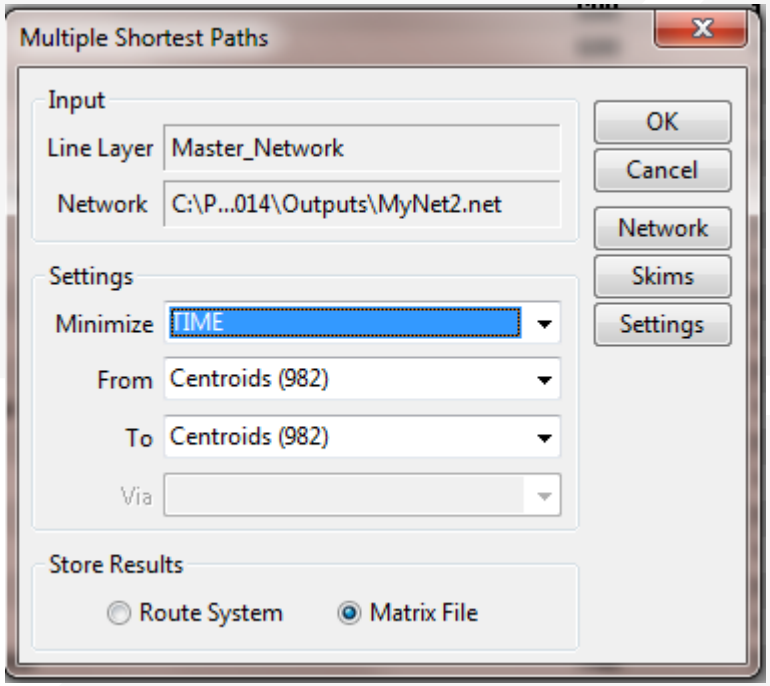
# Calculating Highway Skims

- Skims are travel time/distances between all pairs of origins and destinations
- Make sure the network file is open
- Go to Networks/Paths-Multiple Paths
- Minimize TIME attribute and build skims from and to Centroids



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# Traffic Assignment

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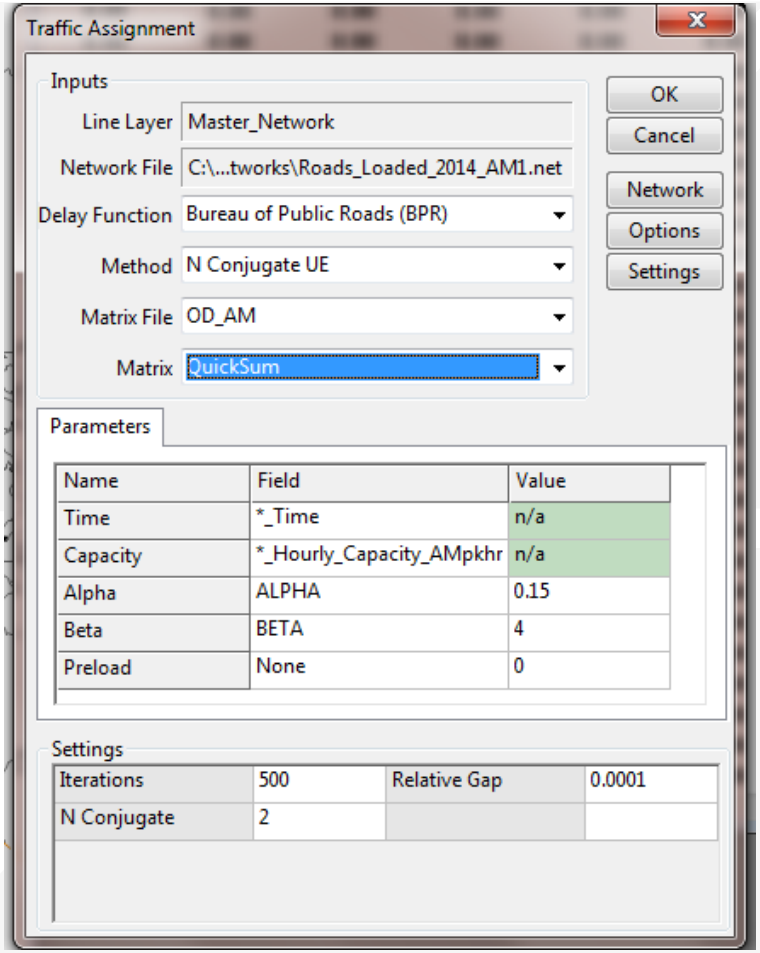
# Traffic Assignment

- Need line layer, network and OD matrix
- Open network file and check network attributes to make sure they include free-flow time, capacity, alpha, and beta
- Open OD matrix and check that matrix index corresponds to node ID
- If it does not, it is necessary to add a matrix index based on the nodes layer with TAZ as the original ID and ID as the new ID

# Traffic Assignment 2

- Go to Planning-Static Traffic Assignment
- Assign the PM1 trip table to the network
- N-conjugate user equilibrium with $10^{-4}$ relative gap and max 500 iterations



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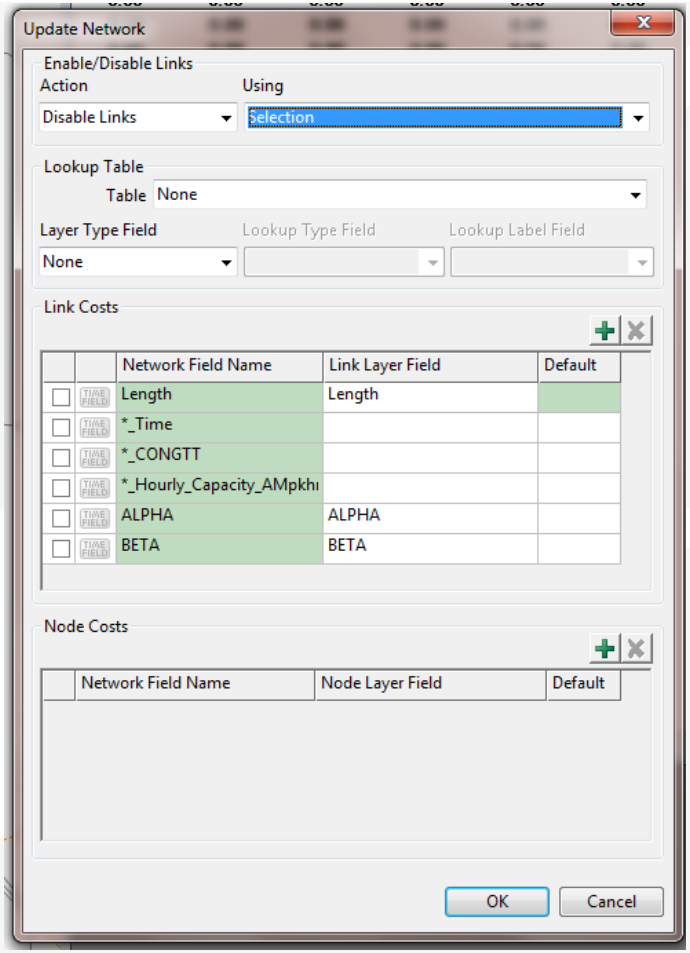
# Exercise: Removing a Link

- Select the link you would like to disable using Select by pointing tool
- Go to Network- Settings- Update
- Select Disable Links and choose selection set
- Run assignment with new network



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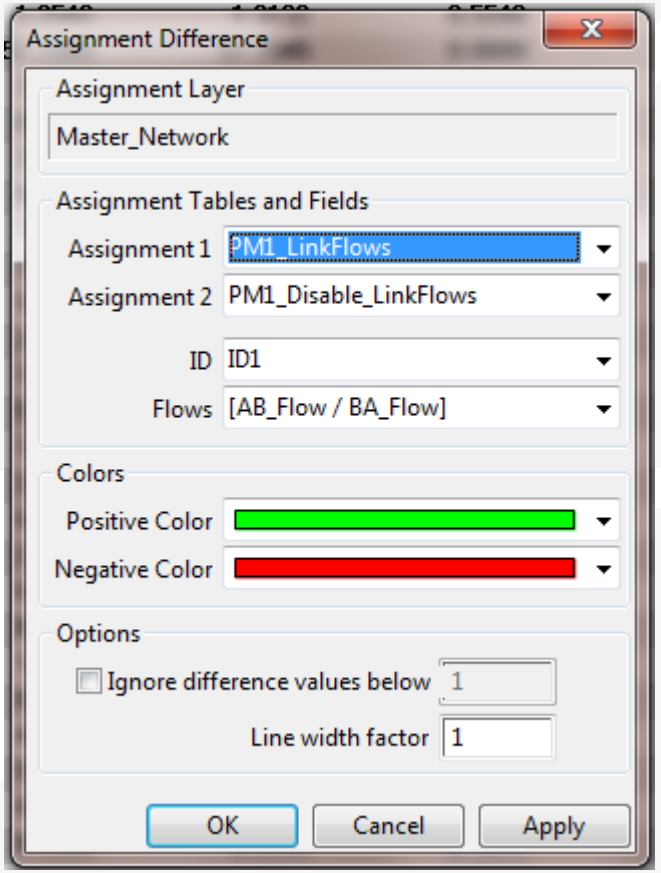
# Exercise Continued

- Once the traffic assignment run is complete, open the original PM1 flow table and the new flow table
- Go to Planning-Assignment Utilities-Assignment Difference



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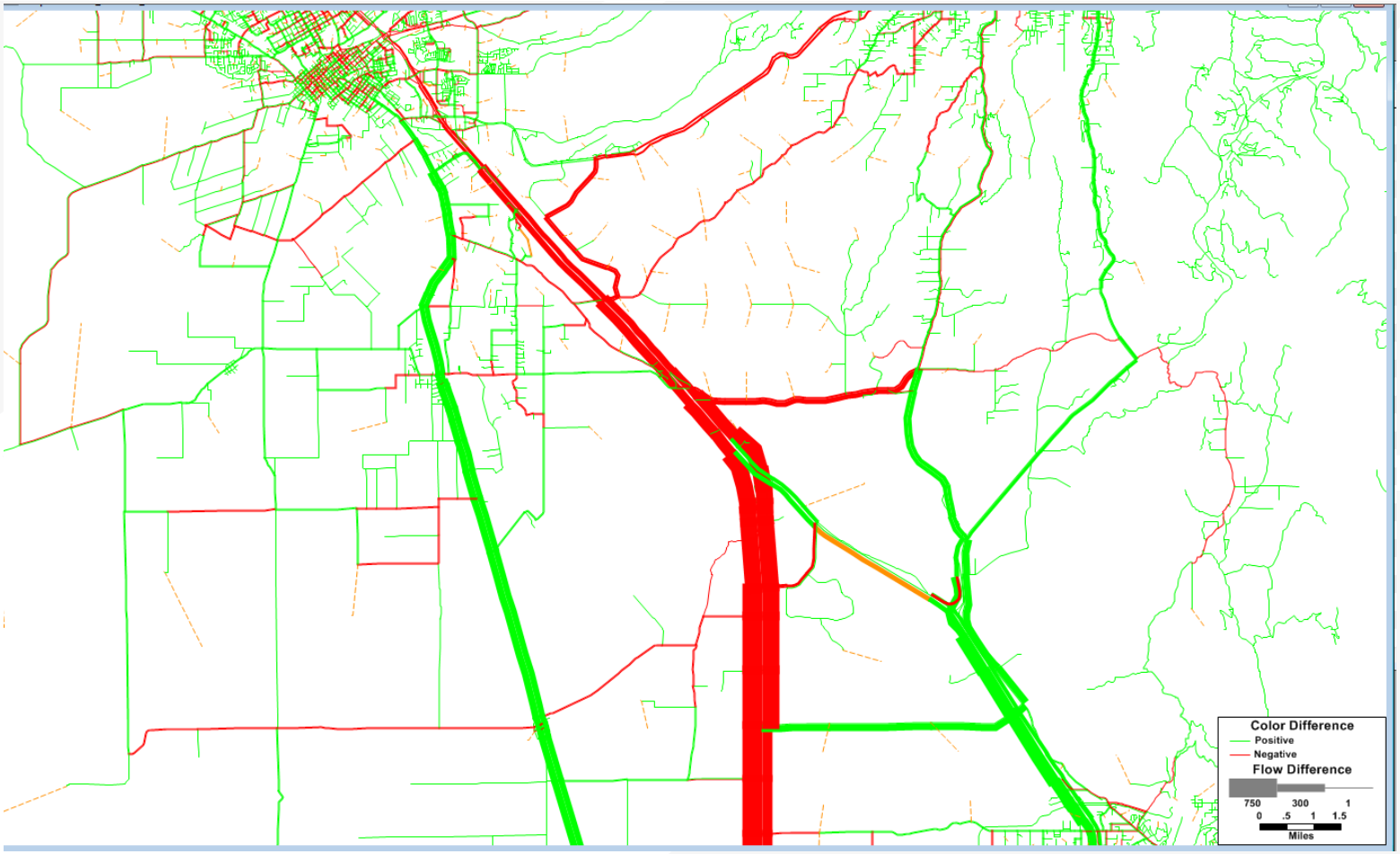
# Exercise Continued



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