North Jersey Regional Transportation Model- Enhanced
Training for Transportation Planners
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Agenda

- **Day 1**
  - General Overview of Modeling
  - Typical Applications of Models
  - Using the Tool Appropriately
  - The Model as Part of a Toolbox
  - Data Behind the Model
  - Navigating the Model

- **Day 2**
  - Case Studies
    - Developing Alternatives
    - Data Sources to Support Alternative Development

- **Day 3**
  - Case Studies
    - Translating Model Outputs to Recommendations
Day 1- Understanding the Model

“What’s this thing all about?”
General Overview of Modeling

- Types of Models
  - Simple Trend
  - Macroscopic Models (such as the NJRTME)
  - Operational Models
NJTPA Region Study Area

- 6.5 million residents, 3.6 million jobs in Northern New Jersey
- 15.3 million people in adjoining areas
- 23,000 miles of roads
- 250 bus routes, 12 rail lines
The Basics

- **Trip Generation- Who and Why Should I Go**
  - Considers the location of people and destination potential
  - Households, employment, land use, activity centers

- **Trip Distribution- Where to Go**
  - Considers the choices available to travelers and why they go to one vs. another
  - Where is it and how much does it cost me to go to one vs. another?

- **Mode Choice- By What Means to Go**
  - Considers the relative attractiveness of choices for various types of trip making
  - To go from home to work, should I drive, walk, take the bus, take the train, etc

- **Assignment- By What Route to Go**
  - Considers the best and alternate routes between the selected origin location and destination location now that I’ve selected a mode
Traffic Analysis Zones

- A TAZ is a Unit of Geography Used to Forecast Trip Making
  - Should be consistent (nested inside) network boundaries
  - Should be consistent with model application

- Considerations
  - Fine Enough to Forecast Traffic
  - Course Enough to Get Data On

- Boundaries Typically Respect
  - Manmade Features (Roads, RR, etc)
  - Natural Features (Rivers, etc)
  - Political Features (census, city, county, state)
Standard Four-step Demand Forecasting Model

- Highway Network
  - Highway Path Building and Toll Estimation
- Socioeconomic Data
  - Trip Generation
- Transit Network
  - Transit Path Building and Fare Estimation

- Trip Distribution
- Mode Split
- Highway Assignment

Feedback to Convergence
NJRTM-E Specific Examples

- Who & Where are They- Zonal Data
- Where to Go- Trip Ends, Travel Time and Cost Matrices
- By What Means to Travel- Mode Choice Model, Costs and Congestion, Roadway Network, Transit Network
- Which Route to Take- Traffic Assignment, Transit Assignment, Feedback Loop
Simple Trip Chain

<table>
<thead>
<tr>
<th>TRIP PURPOSE</th>
<th>ZONE A</th>
<th>ZONE B</th>
<th>ZONE C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. HB WORK</td>
<td>ZONE A</td>
<td>ZONE B</td>
<td></td>
</tr>
<tr>
<td>2. NHB</td>
<td>ZONE B</td>
<td>ZONE C</td>
<td></td>
</tr>
<tr>
<td>3. HB SHOP</td>
<td>ZONE A</td>
<td>ZONE C</td>
<td></td>
</tr>
</tbody>
</table>
Simple Cross-Classification Technique
NJRTM-E Trip Generation

- Cross-classification
  - Household Lifecycle Groups (3)
    - With Retirees (at least 1)
    - With Children
    - Without Retirees or Children
  - Household Income Groups (5)
    - 0-15K
    - 15-35K
    - 35-75K
    - 75-150K
    - 150K+
  - Workers Per Household (4)
    - 0 Worker
    - 1 Worker
    - 2 Workers
    - 3+Workers
  - Persons Per Household (6)
    - 1 to 6+ Persons

An example of NJRTM-E trip rates
NJRTM-E Trip Purposes

- Trips are Classified Based on Whether they are Oriented Toward Home or Work:
  - Home-Based Work Direct (from home to work)
  - Home-Based Work Strategic (e.g., drop off kids, pick up coffee on the way)
  - Home-Based Shopping
  - Home-Based Other (e.g., leisure, visit family)
  - Home-Based University
  - Work-Based Other (e.g., to lunch, shopping)
  - Non-Home Non-Work (all the rest - e.g., from a store to school)
  - Trucks
I. Trip Generation Estimates

<table>
<thead>
<tr>
<th>Zone</th>
<th>Production</th>
<th>Attraction</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>300</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>600</td>
<td>600</td>
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</tbody>
</table>

II. Trip Distribution (Zones)

Zone 1
100 Production, 250 Attraction
- 30 Trips, 15 Minutes
- 20 Trips, 5 Minutes
- 50 Trips remain as Intrazonal Trips

Zone 2
300 Attraction
- 30 Trips, 15 Minutes

Zone 3
50 Attraction
NJRTM-E Distribution

- Direction and Magnitude of Travel
Modes and Choices in NJRTM-E
Assignment

- Given the Number of Trips by Mode have been Calculated, Assignment Puts those trips on Specific Routes (road, transit)
- Transit Assignment is a Function of the Best Choice
- Highway Assignment is a Function of the Best Choice
  - Travel Time
  - Toll Cost
  - Congestion
NJRTM-E Assignment

- **Highway Assignment**
  - Four Periods (AM/PM Peak Periods, Midday, Night)
  - Route Choice Assigns Nine Vehicle Type/Path Conditions:
    - SOV, HOV, Truck
    - NonToll, Cash Toll, ETC Toll
    - Sensitive to Directional Toll biases
  - Assignment Options:
    - Standard BPR
    - 2000 HCM & Simple Queuing
    - Akcelik Method
    - Detailed HCM Method
24,000 vehicles in AM peak hour
Results for Modes, Lines or Stops

Information Available About
- Ridership
- Revenues
- Passenger Miles of Travel
- Vehicle Fleet Requirements

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<th></th>
<th>Base</th>
<th>Scenario 3A</th>
<th>Ratio</th>
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<td>1,086</td>
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<td>Bradley Beach</td>
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<td>294</td>
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<td>Elberon</td>
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<td><strong>SUBTOTAL</strong></td>
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<tr>
<td>Avenal</td>
<td>486</td>
<td>489</td>
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<td><strong>SUBTOTAL</strong></td>
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<tr>
<td>GRAND TOTAL</td>
<td>66,757</td>
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NJTRM-E “FLOWCHART”
New Model Features & Capabilities

- Incorporation of NJ Transit Mode Choice Model
  - Nested Logit Structure
    - 6 Line-haul Modes / 2 access modes
    - Geographic Market Segmentation
      - Area / Density Related
    - Mode Choice by Purpose segmented into Peak and Off-Peak
NJRTM-E Airport Submodel

- Focused on Predicting Trips to Newark International Airport
- Four Purposes:
  - Business Trip from Residents
  - Business Trip from Non-Residents
  - Non-Business Trip from Residents
  - Non-Business Trip from Non-Residents
- Model Estimated using NJT trip tables derived from Survey Data
- Structured as linear equation trips using the following variables:
  - Population and Employment
  - Income
  - Distance to Newark Airport
  - Distance to nearest competing Airport (JFK, Laguardia, Philadelphia, Lehigh Valley)
- $R^2$ Ranges between 0.75 and 0.84
Types of Demand Models

- Gaming/Visioning
- Direct Demand
- Simple Four-step
- Complex Four-step
- Complex Four-step with Feedback (NJRTME)
- Activity-based
- Integrated Transport/Land Use Models
Typical Applications of Models

- Long-Range Transportation Plans
- Air Quality Analysis
- Impact Analysis
- Local Traffic Studies
- AA/EIS
Using the Tool Appropriately

- Understanding the Character of a Macroscopic Model
- Understanding the Limitations of Each Type of Model
  - Trend
  - Macroscopic/Demand
  - Microscopic/Operational
- Understanding the Causes of Model “Error”
  - Averages
  - Error Terms
- Compensating for Errors and Unknowns
The NJRTM-E as Part of a Toolbox

- Finding the Most Appropriate Tool to Answer the Question
- Typical “Short-range” Planning Tools
- Typical “Long-range” Planning Tools
Caveats

- The NJRTM-E Model Is A Tool
  - Based on Average Human Behavioral Characteristics and Responses and the Transport System’s Characteristics
  - Remember, the AVERAGE family has 2.5 kids (none do)
  - For Every Average (mean), there is a standard deviation
  - The NJRTM-E is Built Upon the Most Recent AVAILABLE Data (some data are dated and some data are not available locally)

- Detailed Studies (FTA New Starts, Corridor Studies, Impact Assessment, etc) Should ALWAYS review the Model Data, Assumptions and Results and TAILOR the Tool to Fit the Conditions/Needs of the Study

- The NJRTM-E is now being reviewed by NJ Transit and has not yet been approved for use with project-level planning studies in the high-density urbanized areas.
Data Behind the NJRTM-E

- **Socio-economic**
  - Households by Lifestyle, Income and Persons
  - Employment by Type
  - Truck Terminals
  - University Enrollment
  - Special Generators
  - Etc.

- **Network**
  - Facility Type
  - Lanes
  - Transit Services
  - Etc.

- **Behavioral**
  - Parameters, rates, coefficients, etc.
Navigating the NJRTM-E

- Starting Up Cube
- Basic Navigation of the Desktop
- Running the Model
- Finding Results
Translating Model Outputs to Recommendations

- Understanding Model Results
  - Land Use / Trip Generation
  - Distribution
  - Mode Choice
  - Highway Assignment
  - Transit Assignment

- Taking Raw Model Outputs to Final Numbers
  - Smoothing Techniques
  - Level of Service

- Presenting Model Results
  - Tabular Summaries
  - Charts, Figures and Graphical Summaries
  - Mapping Summaries
Cube Base: build, edit, run, present

A common user interface for all Citilabs libraries. Learn this once and you can use all existing and future libraries.

**Application Manager** - Flowchart provides extremely easy to use model interface for building, running and documentation.

**Cube Graphics** - Provides unlimited layering, signing, intersection coding and analysis, network editing and analysis, charting, links to digital media.

**Scenario Manager** - Makes creating, managing and running scenarios very easy to do.
Network Editing: Add Links

- Browse and open a network
- View Center on Node 8482 with Scale ~0.15
- Select Post, All Nodes from Main Menu
- Select Link, Add Two-Way from Main Menu
- Position cross-hair over node, click then drag to the node 7304
- Hit the ESC key and select the new link to view/edit its attributes
Network Editing: Add Links

- Right click on link 8482-7304 and select delete
- Add link 8482-7304 again using Copy and Paste
- Copy from link 26961-8482
- When you select Paste the cross-hair will appear.
- Position cross-hair over node 8482. Click, drag and release over node 7304. New Link is Pasted.
- Hit the ESC key and select the new link to view/edit its attributes
Network Editing: Adding Attributes and Calculations

- Select Link, Attribute, Add from the Main Menu

- Add a link attribute called: TEST

- Type is Numeric

- Select Link, Compute from Main Menu
Visual Comparisons

- Saving a common View
- Restore a common view across multiple networks
Network Editing: Adding Attributes and Calculations

- In computation area Right Click and select Insert
- Enter equation TEST=CAPACITY*1.1 and select OK
- Accept other defaults and select Apply
- Browse link attributes to verify computations
- Computation Sets
Network Editing: Adding Attributes and Calculations

- Using Conditions with Calculations
- Select Link, Compute again
- Double click your equation to edit and set TEST=0
- Right click in the blank Condition box and set up a condition to apply the calculation only for Centroids (_CENTROID=1)
- Select Apply
- Browse link attributes to verify computations
Network Editing: Polygons

- Select Polygon, New from the Main Menu and draw a Polygon by point-and-click.
- Select Polygon, Save, 1= from the Menu and name this Polygon ‘Area 51’
- Add link attributes ORIGCAP and DIFF
- Compute ORIGCAP=CAPACITY
- Subtract 700 from CAPACITY for all links within the polygon
- Check and validate that it has worked:
  - Compute DIFF=CAPACITY-ORIGCAP
  - Post DIFF
Desire Lines

- Close all open files. Open c:\newmod\newmod1.cat
- Double click on the NJRTM Enhanced Model in the Applications area
- Double click on the HBWDMSA Trip Table
- Window back to the application and Double Click on the HW Intersections
- Select Node, Link to Matrix and add the matrix from the Available to Current Linkage
- Select Post, Desire lines. Display trips from Table 4, Zone 1156 to all other zones (1-2553)
Node Charts

- Select Post, Clear All Postings
- Select Post, Node/Point Chart and Node Chart dialog settings as show on the next page
- Select Ok to view.
- Select View, Legend to see the Link and Node Legend
The image shows a portion of a document page with a screenshot of a software interface titled "Highway Layer Node Chart Settings." The interface includes various settings and attributes such as color settings for different attributes, a selection criteria, and scale ranges. The screenshot includes options for attributes like "M1.T1.P_SUM.HBWD" and "M1.T1.P_SUM.HBWD > 100." The interface also has buttons for OK, Cancel, and Save Configuration.
Path Building, Display & Analysis

- Opening the Path from Assignment
- Selected Zone Display
- Selected Link Display
- Multi-stop routing Display and Analysis
- On screen path building and display
- Isochrone display
On Screen Paths

- Select Path, Build from the Main menu to open the Path Cost Calculation dialog box
On Screen Paths

- **COST** - Measure of any attribute along the path between the origin and destination.
- Cube finds the least “COST” path
- Attributes can be functions of or combinations of link attributes
  - Distance
  - Time
  - Impacted Population
- Penalties, Prohibitions and other Restrictions are considered
On Screen Paths

- Cube allows for interactive path building and display with user defined cost specifications
- Cost specifications can be built using available network attributes, Turning restrictions or penalties, and incremental cost values
- Right click in the blank Specifications area and select Distance
- Path Building dialog opens with zone one pre-selected
On Screen Paths

- Set Origin to 1 and Destination to 1501, minimum distance path is built and displayed
- Check List Path Traces and click Display
- Continue to click additional destinations for multiple paths
- Select Clear and Close
On Screen Paths:
Example-Minimum Population Exposure

- Example: Minimum Population Exposure
- Set up a link color set to display the link attribute AreaType
  - Make sure the centroids can be identified
- Add a new link attribute: POPULATION
- Compute a value for POPULATION based on Area type
  - 1=10000 persons per mile
  - 2=1000 persons per mile
  - 3=100 persons per mile
- POPULATION=DISTANCE*100 (for AreaType=3)
On Screen Paths:
Example-Minimum Population Exposure

- Now build Minimum Population Paths with Distance as the additional Trace attribute
- Select Origin as 1 and Destination as 17
- Select List Path Traces and Display
- The path that minimizes exposure to population is displayed along with the total population and distance on the path
- Close Path Building dialog
Network Editing: Polygons

- Save and Restore
- Show selected Nodes/Links
- SubArea Extraction
- Calculate Area and Centroid
- Copy from Boundary Layer
- Export to CubeDyansim
Network Editing: Viewing Data

- Customized Data Views simplify editing
- From Edit Menu select Options
- Adjust display size settings and view
- Adjust Default colors and styles and view
- Adjust Parameters and view
Network Editing: Viewing Data

- Define Color Specification for the Highway Layer
- Select the Link/Line Color Icon
- On the Specification Dialog menu click on Insert 5 times
- Select the Color Palette: road-rand mcnally
- Use the Color/Style, Size and Criteria settings to display links by FUNC_CLASS
Network Editing: Viewing Data

- Posting Values and Saving Posting Sets
- Post zone numbers on the screen
- Post FUNC_CLASS, SPEED and WALKCOST on all links except zone centroid connectors
- Select Fix Color for each Posting and set rounding for WALKCOST to 0.1
- Name the Posting Set CLASS
- Zoom to view project area
Network Editing: Link Updating

- Automatic link attribute updating with point-and-click
- Select Link, Compute
- Select an unused Set Number
- NAME=SETCLASS3
- Insert 3 expressions: FUNC_CLASS=3, NUMLANES=2, CAP=1800
- Applies To = When items changed
- Check Auto Calculation On and Apply
- Select Link Update
- Update a CLASS 5 corridor to CLASS 3 by point & click with the Update pointer
- Save file as Project Def 1.net
Day 2- How to Build Alternatives

“What do I do before I even turn on the computer?”
Objectives

- When to Use a Model
- Preparing for the Use of the Model
- Applying the Model
- Evaluating the Results
- Summarizing / Communicating Findings
Model Utilization Criteria

Governed by Several Conditions
- Level of Analysis
  - Appropriate Tool for Analysis Scale?
  - Adequate Resources / Schedule?
- Model Structure
  - Sensitive to Policy Issues
  - Calibration Status
  - “Forecast-able” Variables?
- Number of Alternatives
  - Efficiency vs. Cost
- Regulatory Requirements
Preparing to Use the Model

- Does the Model Adequately Reflect Existing Travel Patterns?
- How Will the Model Reflect the Proposed Scenario?
  - Network parameters
  - Socio-economic data
  - Behavioral Assumptions (unlikely but possible)
- What Horizon Year is Appropriate?
- What are the Model’s Data/Conditions for that Year?
- What Plans or Specifications are Available?
  - Specific development plans
  - Committed Infrastructure Improvements
- What Agencies Have Jurisdiction?
Applying the Model

- Does the scenario explore immediate or long-term impacts?
  - Immediate Impacts - Use “Fixed Distribution” Option
  - Long Term Impacts - Use Full Feedback Model

- Fixed Distribution Process
  - Holds Trip Distribution Patterns Constants
  - Permits variation in Mode Choice
  - Permits variation in Highway/Transit Assignments

- Full Feedback Model
  - Assumes that trip distribution can change in response to network/service modifications
Evaluating Results

- Was the model reaction expected?
  - Reasonable Sensitivity
  - Reasonable Influence Area

- Investigation of Counterintuitive Results
  - What is the model trying to indicate?
  - First Order / Second Order impacts?
  - Minor / Acceptable Variation?

- Model Adjustments / Further Analysis
  - Applying Constraints
  - Other Refinements
Summarizing Results

- Characteristics of Target Audience
  - Public Officials / Stakeholders?
  - Detailed Technical Review?
- Proper Mix of Graphical and Numerical Summaries
- Documentation Formats
  - Internal Summaries
    - Project Team (Client / Consultants)
    - Controlled Release
  - Public Documents
    - Client and Public
    - Unrestricted Release
Case Study Design

- Step 1 - Project Description / Analysis Issues
- Step 2- Edit and Execute Model
- Step 3- Evaluate / Summarize Outputs
Case Study Criteria

- **Hypothetical Examples**
  - Similar to Potential Projects

- **Relevant to NJTPA Region**
  - Consistent with typical assignments
    - Development / Redevelopment Situations
    - Transportation Network
    - Refinements/Optimization
    - Not Large Infrastructure Scenarios

- **Provide Variety of Editing Tasks**
  - Both Network and Socioeconomic Data
  - Variety of Adjustments
Data Sources to Support Alternative Development

- Local
  - Local Land Use Plans
  - Traffic Studies
  - Traffic Counts

- Regional
  - Traffic Counts / Trends
  - Transit Ridership

- State
  - Highway and Transit Plans
  - Traffic Counts

- National
  - Institute of Transportation Engineers (ITE) Trip Generation Handbook
  - Highway Capacity Manual (HCM)
Case Study #1- “Smart Growth”

- Approach to Alternative Development- Discussion
- Implementation
Scenario General Description

- Location - JFK Blvd in Bayonne
- Nature of Proposed Development
  - Redevelopment
  - Change from Residential Only to Mixed Land Use
  - Increase in Density
  - Proposed Infrastructure Changes
    - Increase Transit Services
    - Pedestrian “Friendly” Design
    - Lanes Reduction on JFK Boulevard
    - On-street Parking
- Goal of Project is Economic Redevelopment and a “Green” community
Considerations

- Does the MPO model reflect this development already?
- What is planned precisely? How much development?
- What types of households and businesses will be in the development?
- When is this proposed to be built? Is there staging?
- What model year data sets are available? Interpolation?
- If this area gets new households and jobs, where might they be coming from? Will they add to the regional total or reallocate it?
- What transit services are already available in the area?
- What parking policies are reflected in the MPO model? On the ground?
- How does this proposed development fit into the current plans for the area—city, county, MPO, DOT, NJT, etc.?
- Are there other such developments in NJ that can be examined for data, results?
Potential Data Sources

- **Existing Conditions**
  - Existing Traffic Counts (Car, Pedestrian, Transit)
  - Current Land Use Inventory - Property Appraiser
  - Field Review

- **Plans**
  - Developers’ Plans
  - TIP/LRTP
  - County Master Plans

- **Comparisons**
  - NJRTM-E Model Data
  - ITE Trip Generation
  - New Jersey Office and Planning and Growth
  - ULI
  - HCM
  - Other Local/State Case Studies/Examples of Similar Development
Model Inputs- Technical Specs

- **Demographics**
  - **Zone 644**
    - Households=1000
      - Average Income of $100,000
      - 50% No Children, 40% Retirees, 10% Working w/Children
    - Population 2112
    - 2500 Employees- All retail
  - **Zone 646**
    - Households=3500
      - Average Income of $80,000
      - 45% No Children, 25% Retirees, 30% Working w/Children
    - Population- 8,000
    - 800 Employees- All Office
Model Inputs- Technical Specs (continued)

- **Demographics**
  - Zone 649
    - Households=500
      - Average Income of $50,000
      - 100% Retirees
    - Population- 700
    - 500 Employees- All Medical
  - Zone 654
    - Households=500
      - Average Income of $150,000
      - 25% WNC, 50% Retirees, 25% WWC
    - Population- 1172
    - 800 Employees- 50% Retail, 50% Government
Model Inputs- Technical Specs (continued)

- **Infrastructure Changes**
  - Roadway Changes JFK Blvd from the Turnpike Extension to NJ440
    - Subtract a lane (Change LANESAM, LANESPM, LANESOP Variable to 1)
    - Permit Parking (Change PARK Variable on Network to 1)
    - Change Facility Type (Change FT Variable on Network to 7)
  - Transit Changes- Revise Headway on JFK Routes
    - Route SAP12- No Changes
  - Pedestrian Changes- None for this test
How to Implement

- Model Inputs Effected
  - NJSEVA00.DBF
  - HWYBU.NET
  - BUSLINES.DAT

- Interactive Exercises to Update Model Inputs

- Start Cube
  - Click “Cancel” On Intro Screen
  - Click “FILE/OPEN”, change the type to Catalog *.CAT
  - Browse to and Open c:\newmod\NEWMOD1.CAT
How to Implement (continued)

- Copy c:\newmod\modeldata\20VAN directory to c:\newmode\modeldata\20SMARTN
- Copy c:\newmod\modeldata\20VAZ directory to c:\newmode\modeldata\20SMARTZ
- Create “SMART20” scenario in Scenario Manager under “BASE”
- Select the Network (N) and Zonal Data (Z) directories for the smart growth scenario in the Scenario Manager dialog box
- Now it is time to edit the inputs!!!
Editing Zonal Data Attributes

- Double-click on the NJRTM Enhanced Model Application in the “Applications” Pane
- Drill down through TRIP GENERATION and SOCIOECONOMIC data
- Double-click on the SE DATA input to box 2
- Make Changes
- Double-click on the LKUP LIFECYCLE input to box 2
- Make Changes
Editing Highway Network Attributes

- Double-click on the HIGHWAY NETWORK box
- Double-click on the GRAPHICS box
- Click Center on Node (Icon or Node Menu)
  - Enter 644
  - Enter 0.07 for scale
- Post NAME and LANESAM
  - Update J.F. Kennedy Blvd attributes from node 9890 to 9891
    - FT
    - LANESAM
    - LANESPM
    - LANESOP
    - PARK
Editing Transit Network Attributes

- Make the TRANSIT LAYER the working (top most) layer
- Click anywhere inside the polygon on Kennedy Blvd and select RT99A1
- Update Headways
- Repeat for RT33A1 and SAP12
- Go to TRANSIT/TRANSIT LINE MANAGER in menu and save edits back to file
Running the Model

- Normally you would click on the Scenario Manager pane, select the scenario and then run it.
- We’re going to do a TV version of cooking and look at the results tomorrow
Case Study #2- Impact Assessment

- Approach to Alternative Development- Discussion
- Implementation
Scenario General Description

- Location- Far Hills Shopping and Office Complex
- Nature of Proposed Development
  - New Development
  - Shopping Complex and Office Park
  - Proposed Infrastructure Changes
    - Integrated Transit Services w/ PnR and Access to Rail Service
    - Reroute Express Busses to PnR
    - Add New Rail Line
    - Changes in Roadway Access
  - Developer to Pay “Fair Share” of Necessary Improvements
Additional Considerations from Previous Case Study

- What types of businesses and number of employees will be in the development?
- What local access/site circulation plan has been proposed by the developer?
- What additional local access/network coding is needed to best meet the needs of this development?
- What other facilities will the traffic from this development impact? How can these be mitigated?
- How should transit services be realigned to service this area?
- What are the characteristics of the PnR to be added?
- How do we assess the cost to the developer?
Potential Data Sources

- Existing Conditions
  - Existing Traffic Counts (Car, Pedestrian, Transit)
  - Current LOS/CMS
  - Current Land Use Inventory
  - Field Review

- Plans
  - Developers’ Plans
  - TIP/LRTP
  - County Master Plans

- Comparisons
  - NJRTM-E Model Data
  - ITE Trip Generation
  - HCM
Model Inputs - Technical Specs

- Demographics
  - Zone 1610, Add 300 Retail Jobs and 1000 Office Employees

- Infrastructure Changes
  - Roadway - local widenings
    - Add 1 lane to Peapack to nearest intersections
    - Add 1 lane to Mine Brook/Main to nearest intersections
  - Transit
    - Add New “Far Hills” Rail Line - Copy from GLD01 but truncate at node 20248 with a frequency of 15/30
    - Reroute Express Bus TB1A1 and TB3A1 to stop in the expanded PnR lot
    - Update Park and Ride Lot with 500 new spaces and define catchment area
  - Pedestrian - no changes
Case Study #3a- Major Infrastructure Changes

- Approach to Alternative Development - Discussion
- Implementation
Scenario General Description

- Location- Raritan River Bridge Reconstruction
- Nature of Proposed Project
  - Reduce Lanes on Garden State Parkway to Reflect Reconstruction of Bridge Spanning the Raritan River
  - Use NJ35 and US9 as Relief Routes
  - Optimize Transit Service During Peak Periods
  - Consider TDM Strategies- Toll Increases
Additional Considerations from Previous Case Study

- Peak Period Traffic Flows (k/d)
- Reliever Routes
- Traffic Diversion
- Number of Lanes and Lane Width Alternatives
- Transit can Provide some Relief via Increased Service Frequency
- TDM Possibilities- HOV Options, Toll Options
Potential Data Sources

- **Existing Conditions**
  - Existing Traffic Counts by 15 minute increment
  - Transit Capacity Utilization
  - Current LOS/CMS
  - Speed Study
  - Toll Data
  - Field Review
  - Roadway Geometrics

- **Plans**
  - MoTP
  - Design Plans
  - Signal Timing Plans
Model Inputs- Technical Specs

- **Demographics**
  - None

- **Infrastructure Changes**
  - **Roadway- Northbound**
    - 5223-26446, ADD 1 TO LANEAM, SUBTRACT 1 from LANEPM and LANEOP
    - Lane Width reduces to 10’, shoulder becomes substandard (0)
  - **Roadway- Southbound**
    - 26492-5224, SUBTRACT 1 FROM LANEAM AND LANEOP, ADD 1 TO LANEPM
    - Lane Width reduces to 10’, shoulder becomes substandard (0)
  - **Transit**
    - Decrease AM Headway on Route 131A1 to 10 Minutes
    - Decrease MD Headway on Route 137C2 to 20 Minutes
  - **Pedestrian- no changes**
Case Study #3b- Minor Infrastructure Changes

- Approach to Alternative Development - Discussion
- Implementation
Scenario General Description

- **Location- Princeton**
- **Nature of Proposed Project**
  - Build the “little dig”- bury US206 through Princeton Borough, 6 lane controlled access
  - Project limits are from US1 to North of CR518
  - Remove Local Access Points, only arterial connections
  - Brand New Shiny Green Space for the Lovely Coeds to throw Frisbees on during the Warm Summer Months
Additional Considerations from Previous Case Study

- Development will be green space- no new business/households allowed
- New facility will likely carry more traffic than current facility but should operate at a better LOS
- Coeds must play frisbee at least twice a week during commuting hours
Potential Data Sources

- **Existing Conditions**
  - Existing Traffic Counts (Car, Pedestrian, Transit)
  - Current LOS/CMS
  - Current Land Use Inventory
  - Field Review

- **Plans**
  - TIP/LRTP
  - County Master Plans

- **Comparisons**
  - This is a whole new one baby- fantasy project!
Model Inputs- Technical Specs

- **Demographics**
  - None

- **Infrastructure Changes**
  - Roadway- facility upgrade and intersection removal
    - Add a new Facility Type 2 within project limits= node 8109 southern terminus, node 8069 northern terminus, 6 lanes
    - Downgrade existing RT206 within project limits to transit only- TCODEAM=9, TCODEOP=9- only busses can use those abandoned facilities
  - Transit
    - No changes except the highway coding
  - Pedestrian- no changes
Day 3- Hands-on Case Studies

“Let’s see what happened”
Analysis, Findings and Recommendations

- Case Study 1- Smart Growth
- Case Study 2- Impact Assessment
- Case Study 3- Infrastructure Rehabilitation
Case Studies

- Objective- Understanding Model-Based Planning Analysis
- Development- Utilizing the Model as part of the Analysis
- Application- Summarizing and Evaluating Model Results
Types and Varieties of Outputs

- Translating Model Outputs to Meaningful Decision Making Results
- Summaries
  - Tabular
  - Graphical
  - Map
Summarizing Land Use Input/Outputs

- **Thematic Maps**
  - Tell a story with pictures and colors
  - Commonly produced using GIS data
Summarizing Land Use Inputs/Outputs

- **Pie Charts**
  - Typically show things as shares
  - Can be scaled based on the size of the whole

![Cubetown Transportation Model Trip Productions by Purpose](image1)

![Cubetown Transportation Model Work Trips and Employment Centers](image2)
Summarizing Land Use Inputs/Outputs

- **Histograms**
  - Great for showing side by side comparisons of magnitude
  - Commonly used for trip length
Summarizing Land Use Inputs/Outputs

- Tables
  - Convey Details with Rows/Columns of Data
  - Useful for absolute magnitudes

### Transit Ridership Summary

<table>
<thead>
<tr>
<th>Rail/Ferry Services</th>
<th>Observed</th>
<th>Estimated</th>
<th>Diff</th>
<th>% Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main/Bergen/Port Jervis Line</td>
<td>22,380</td>
<td>26,192</td>
<td>3,812</td>
<td>17.0%</td>
</tr>
<tr>
<td>Pascack Valley Line</td>
<td>7,018</td>
<td>3,352</td>
<td>-3,666</td>
<td>-52.2%</td>
</tr>
<tr>
<td>Boonton Line</td>
<td>9,824</td>
<td>14,620</td>
<td>4,796</td>
<td>48.8%</td>
</tr>
<tr>
<td>Morris/Essex Line</td>
<td>40,250</td>
<td>30,904</td>
<td>-9,346</td>
<td>-23.2%</td>
</tr>
<tr>
<td>Raritan Valley Line</td>
<td>18,070</td>
<td>16,556</td>
<td>-1,514</td>
<td>-8.4%</td>
</tr>
<tr>
<td>North Jersey Coastline/Northeast Corridor Line</td>
<td>106,052</td>
<td>94,154</td>
<td>-11,898</td>
<td>-11.2%</td>
</tr>
<tr>
<td>Metro North Trips from West of Hudson Locations</td>
<td>5,248</td>
<td>3,224</td>
<td>-2,024</td>
<td>-38.6%</td>
</tr>
<tr>
<td>Total Rail Service</td>
<td>208,842</td>
<td>189,002</td>
<td>-19,840</td>
<td>-9.5%</td>
</tr>
<tr>
<td>PATH</td>
<td>500,532</td>
<td>519,082</td>
<td>18,550</td>
<td>3.7%</td>
</tr>
<tr>
<td>Newark City Subway Line</td>
<td>36,232</td>
<td>30,385</td>
<td>-5,847</td>
<td>-16.1%</td>
</tr>
<tr>
<td>Hudson-Bergen LRT</td>
<td>22,000</td>
<td>31,838</td>
<td>17,838</td>
<td>123.3%</td>
</tr>
<tr>
<td>NJ Ferry Service</td>
<td>23,097</td>
<td>14,838</td>
<td>-8,259</td>
<td>-35.8%</td>
</tr>
<tr>
<td>Total</td>
<td>790,703</td>
<td>785,145</td>
<td>-5,558</td>
<td>-0.7%</td>
</tr>
</tbody>
</table>
Presenting Trip Distribution Results

- **Thematic Map**
  - Useful for One Origin/Destination to Many
  - Color Ranges Should Make Sense / Have a Logic
    - Magnitudes
    - Standard Deviations
    - Outliers
  - Great for QA/QC

*Destinations, Color by Trips Attracted from a Zone*
Presenting Trip Distribution Results

- **Desire Lines**
  - Useful for One Origin/Destination to Many
  - Show Directionality and Magnitude
  - Great for QA/QC

*Destinations, Trips Attracted to/from a Zone*
Presenting Trip Distribution Results

- District-to-district Tables
  - Provide Technical Detail in an Understandable Format
  - Useful for Area-to-area Flows

<table>
<thead>
<tr>
<th>State</th>
<th>New Jersey</th>
<th>New York</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Jersey</td>
<td>1,000,000</td>
<td>250,000</td>
</tr>
<tr>
<td>New York</td>
<td>100,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>
Understanding Mode Choice Results

- Thematic Map of Low Income HH
- Map of Transit Trip Ends

Low-income Transit Population Centers
Understanding Mode Choice Results

- **Pie Charts and Histograms**
  - Use Cube or ARCGIS for Spatial Placement
  - Use Cube Reports or Excel for Single Chart

### New Development

- **LOV Trips**: 80%
- **HOV Trips**: 20%

Number of Trip Productions: Size
Share by Mode: Red=LOV, Green=HOV
Understanding Mode Choice Results

- District-to-district Tables by Mode

<table>
<thead>
<tr>
<th>HBWSOV</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>72.95</td>
<td>771.07</td>
<td>8.38</td>
<td>5.46</td>
<td>6.37</td>
</tr>
<tr>
<td>2</td>
<td>198.31</td>
<td>7582.2</td>
<td>260.38</td>
<td>5.99</td>
<td>7.75</td>
</tr>
<tr>
<td>3</td>
<td>33.88</td>
<td>1773.96</td>
<td>123.5</td>
<td>3.01</td>
<td>3.23</td>
</tr>
<tr>
<td>4</td>
<td>18.68</td>
<td>77.56</td>
<td>6.73</td>
<td>303.91</td>
<td>107.3</td>
</tr>
<tr>
<td>5</td>
<td>38.29</td>
<td>150.6</td>
<td>13.22</td>
<td>197.49</td>
<td>299.17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HBWHOV</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.21</td>
<td>36.58</td>
<td>0.39</td>
<td>0.33</td>
<td>0.36</td>
</tr>
<tr>
<td>2</td>
<td>9.44</td>
<td>328.74</td>
<td>11.95</td>
<td>0.38</td>
<td>0.46</td>
</tr>
<tr>
<td>3</td>
<td>1.59</td>
<td>80.64</td>
<td>5.52</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>4</td>
<td>1.13</td>
<td>4.88</td>
<td>0.45</td>
<td>13.52</td>
<td>4.82</td>
</tr>
<tr>
<td>5</td>
<td>2.19</td>
<td>8.93</td>
<td>0.83</td>
<td>8.86</td>
<td>13.11</td>
</tr>
</tbody>
</table>
Understanding Mode Choice Results

- Percent Walk Access Tables/Maps

Mountainside Twp.
(Zone 1784)
Understanding Mode Choice Results

- Thematic Map of Trip Ends Served by Transit
Understanding Mode Choice Results

- **FTA SUMMIT Application**
  - Convert Model Outputs to Summit-ready Inputs
  - Executes Fixed Trip Table Mode Choice for Work and Non-work Trips
  - Allows Mode Results to be Sent to SUMMIT Program for FTA Project Funding Requests
Presenting Transit Assignment

- Simple Tables of Boardings, Passenger Miles and other statistics by line/mode/operator

<table>
<thead>
<tr>
<th>Station Name</th>
<th>Base</th>
<th>Scenario 3B</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trenton</td>
<td>13,127</td>
<td>13,130</td>
<td>1.00</td>
</tr>
<tr>
<td>Hamiton</td>
<td>8,779</td>
<td>8,822</td>
<td>1.00</td>
</tr>
<tr>
<td>Princeton Junction</td>
<td>16,716</td>
<td>17,165</td>
<td>1.03</td>
</tr>
<tr>
<td>Jersey Ave</td>
<td>5,343</td>
<td>5,307</td>
<td>0.99</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>13,059</td>
<td>12,845</td>
<td>0.98</td>
</tr>
<tr>
<td>Edison</td>
<td>6,369</td>
<td>6,391</td>
<td>1.00</td>
</tr>
<tr>
<td>Metuchen</td>
<td>4,802</td>
<td>4,779</td>
<td>1.00</td>
</tr>
<tr>
<td>Metropark</td>
<td>12,369</td>
<td>12,427</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>80,564</td>
<td>80,866</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Presenting Transit Assignment

- Boardings and Alightings
Presenting Highway Assignment

- Simple Bandwidths of volume
  - Convey Major Flows
  - Can be Annotated With Volumes
  - Can be Combined with Other Information (speed, V/C, etc)
Presenting Highway Assignment

- Complex Bandwidths by SOV, HOV & Truck

How Will Travelers Respond to Different Solutions?
Presenting Highway Assignment

Select-Link for I-78 Just West of I-287
Presenting Highway Assignment

- Simple Systemwide Indicator Tables
  - VMT
  - VHT
  - Hours of Delay
  - Lane Miles by FT, Congestion, Travel Speed, etc
Other Output Display Options

- Beyond the Graphical Display Features in CUBE 5.0, users can:
  - Use of CUBE “Reports” Component to Summarize Data
  - Convert Networks to Shape Files for Display in ARC Software
  - Export Tabular Summary Data to EXCEL
### Scenario 1 Summary Tables

<table>
<thead>
<tr>
<th></th>
<th>Existing Development</th>
<th>Redevelopment Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 2020 Base</td>
<td>Scenario 1</td>
</tr>
<tr>
<td><strong>Total Productions</strong></td>
<td>46,659</td>
<td>82,189</td>
</tr>
<tr>
<td><strong>Non-Motorized</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trips</td>
<td>7,820</td>
<td>17,860</td>
</tr>
<tr>
<td>%</td>
<td>16.8%</td>
<td>21.7%</td>
</tr>
<tr>
<td><strong>Motorized</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productions</td>
<td>38,857</td>
<td>64,139</td>
</tr>
<tr>
<td>Attractions</td>
<td>33,317</td>
<td>104,884</td>
</tr>
<tr>
<td>Trips</td>
<td>12,186</td>
<td>28,662</td>
</tr>
<tr>
<td>%</td>
<td>26.1%</td>
<td>34.9%</td>
</tr>
<tr>
<td><strong>Intra-Zonal (All Modes)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Skim</td>
<td>5.43</td>
<td>5.60</td>
</tr>
<tr>
<td>Off-Peak Skim</td>
<td>5.25</td>
<td>5.44</td>
</tr>
<tr>
<td>Avg Trip Length (prod)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Skim</td>
<td>11.11</td>
<td>13.00</td>
</tr>
<tr>
<td>Off-Peak Skim</td>
<td>10.45</td>
<td>12.29</td>
</tr>
<tr>
<td>Avg Trip Length (attr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Skim</td>
<td>7,986</td>
<td>11,598</td>
</tr>
<tr>
<td>%</td>
<td>17.1%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Attraction</td>
<td>1,712</td>
<td>6,839</td>
</tr>
<tr>
<td>%</td>
<td>3.7%</td>
<td>8.3%</td>
</tr>
<tr>
<td><strong>Transit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33A1</td>
<td>326</td>
<td>4,711</td>
</tr>
<tr>
<td>99A1</td>
<td>3,113</td>
<td>13,058</td>
</tr>
<tr>
<td>SAP12</td>
<td>14,752</td>
<td>14,329</td>
</tr>
<tr>
<td>Total</td>
<td>18,191</td>
<td>32,098</td>
</tr>
</tbody>
</table>

Note: Route SAP12 has no change to schedule.
Presenting Highway Assignment

- Raw Model Volumes Map
Scenario 1- Change in Traffic

Question Why is traffic reduced on JFK Blvd.?
Scenario 1- Change in Peak Transit Trips

Note large growth in transit trip ends.
Presenting Highway Assignment

- Turning Movement Diagrams
  - Show Total Volumes (Raw)
  - Show Volumes by Mode
## Scenario 2 Summary Tables

### Transit Ridership Comparison

<table>
<thead>
<tr>
<th>Train Stations</th>
<th>Base</th>
<th>Scenario 2</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1A1</td>
<td>290</td>
<td>221</td>
<td>0.76</td>
</tr>
<tr>
<td>TB3A1</td>
<td>374</td>
<td>286</td>
<td>0.76</td>
</tr>
<tr>
<td>Gladstone</td>
<td>1,675</td>
<td>1,462</td>
<td>0.87</td>
</tr>
<tr>
<td>Peapack</td>
<td>208</td>
<td>164</td>
<td>0.79</td>
</tr>
<tr>
<td>Far Hills</td>
<td>1,054</td>
<td>1,267</td>
<td>1.20</td>
</tr>
<tr>
<td>Bernardsville</td>
<td>953</td>
<td>1,194</td>
<td>1.25</td>
</tr>
<tr>
<td>Basking Ridge</td>
<td>483</td>
<td>562</td>
<td>1.16</td>
</tr>
<tr>
<td>Lyons</td>
<td>1,083</td>
<td>1,321</td>
<td>1.22</td>
</tr>
<tr>
<td>Millington</td>
<td>398</td>
<td>911</td>
<td>2.29</td>
</tr>
<tr>
<td>Stirling</td>
<td>439</td>
<td>554</td>
<td>1.26</td>
</tr>
<tr>
<td>Gilette</td>
<td>536</td>
<td>652</td>
<td>1.22</td>
</tr>
<tr>
<td>Berkeley Heights</td>
<td>1,774</td>
<td>2,206</td>
<td>1.24</td>
</tr>
<tr>
<td>Murray Hill</td>
<td>855</td>
<td>1,050</td>
<td>1.23</td>
</tr>
<tr>
<td>New Providence</td>
<td>1,736</td>
<td>2,066</td>
<td>1.19</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>11,858</td>
<td>13,916</td>
<td>1.17</td>
</tr>
</tbody>
</table>
Presenting Highway Assignment

- Raw Model Volumes Map
Scenario 2- Change in Traffic

Note that most roads have a gain in traffic!
Scenario 2- Change in AM Peak Speed

Question: If traffic has increased and speeds on adjacent roads are similar or better than the base case, what does that indicate about the proposed improvements?
Scenario 3A - Raritan River Screenline

Lane Reduction on the GSP Bridge
### Scenario 3A- Change in Traffic (Adjacent Bridges)

#### GSP

<table>
<thead>
<tr>
<th>SOV</th>
<th>AM Base</th>
<th>AM Scenario 3A</th>
<th>AM Ratio</th>
<th>PM Base</th>
<th>PM Scenario 3A</th>
<th>PM Ratio</th>
<th>OP Base</th>
<th>OP Scenario 3A</th>
<th>OP Ratio</th>
<th>TOTAL Base</th>
<th>TOTAL Scenario 3A</th>
<th>TOTAL Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>52,691</td>
<td>50,336</td>
<td>0.96</td>
<td>13,099</td>
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#### US 9

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**Question:** What can we say about lack of diversion to NJ 35 Bridge?
## Scenario 3A - Change in Traffic (Up Stream Bridges)

### NJTPK

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**Question:** Did we expect any changes on the bridges?
Case Study #3A- Change in Traffic
Scenario 3A- Change in Traffic (Inset)
Scenario 3A- Change in AM Peak Speed

Note:
AM peak speed reduced by 11 MPH for link with lane reduction.
## Scenario 3A Summary Tables

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<td>Bradley Beach</td>
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<td>1,804</td>
<td>1.00</td>
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<td>Allenhurst</td>
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<td>294</td>
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<td>Elberon</td>
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<tr>
<td>SUBTOTAL</td>
<td>13,145</td>
<td>13,162</td>
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<tr>
<td>Long Branch</td>
<td>4,592</td>
<td>4,598</td>
<td>1.00</td>
</tr>
<tr>
<td>Little Silver</td>
<td>4,615</td>
<td>4,603</td>
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</tr>
<tr>
<td>Red Bank</td>
<td>4,340</td>
<td>4,337</td>
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<td>Middletown</td>
<td>6,953</td>
<td>6,967</td>
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<tr>
<td>Hazlet</td>
<td>4,661</td>
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</tr>
<tr>
<td>Matawan</td>
<td>16,378</td>
<td>17,047</td>
<td>1.04</td>
</tr>
<tr>
<td>South Amboy</td>
<td>4,914</td>
<td>5,813</td>
<td>1.18</td>
</tr>
<tr>
<td>Perth Amboy</td>
<td>3,123</td>
<td>3,125</td>
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<td>Woodbridge</td>
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<tr>
<td>Avenal</td>
<td>486</td>
<td>489</td>
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</tr>
<tr>
<td>SUBTOTAL</td>
<td>53,612</td>
<td>55,231</td>
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</tr>
<tr>
<td>GRAND TOTAL</td>
<td>66,757</td>
<td>68,393</td>
<td>1.02</td>
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</table>
Scenario 3A- Change in Peak Transit Trips (Out)

Note gains in transit trip ends south of the Raritan River and served by NJT Coastline and Bus Routes.
Presenting Highway Assignment

- Raw Model Volumes Map
### Scenario 3B Summary Tables

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Scenario 3B</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>605A12R</td>
<td>55</td>
<td>51</td>
<td>0.93</td>
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<tr>
<td>605A12</td>
<td>51</td>
<td>43</td>
<td>0.84</td>
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<td>SUX8AK1</td>
<td>2,389</td>
<td>2,391</td>
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<td>SUX8AK2</td>
<td>270</td>
<td>282</td>
<td>1.04</td>
</tr>
<tr>
<td>606A12</td>
<td>1,921</td>
<td>1,999</td>
<td>1.04</td>
</tr>
<tr>
<td>606B12</td>
<td>723</td>
<td>742</td>
<td>1.03</td>
</tr>
<tr>
<td>606A12R</td>
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<td>980</td>
<td>0.96</td>
</tr>
<tr>
<td>606B12R</td>
<td>509</td>
<td>512</td>
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<tr>
<td>SU4B1</td>
<td>220</td>
<td>224</td>
<td>1.02</td>
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<tr>
<td>SU4D2</td>
<td>183</td>
<td>181</td>
<td>0.99</td>
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<tr>
<td>SUPTD2</td>
<td>904</td>
<td>902</td>
<td>1.00</td>
</tr>
<tr>
<td>SUPTD1</td>
<td>1,047</td>
<td>1,045</td>
<td>1.00</td>
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<tr>
<td>SUPTA1</td>
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<td>336</td>
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<tr>
<td><strong>Total</strong></td>
<td>9,623</td>
<td>9,688</td>
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</table>
## Scenario 3B Summary Tables

### Train Ridership Comparison (Section of Northeast Corridor)

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<thead>
<tr>
<th>Station Name</th>
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<th>Ratio</th>
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<td>Trenton</td>
<td>13,127</td>
<td>13,130</td>
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<tr>
<td>Hamilton</td>
<td>8,779</td>
<td>8,822</td>
<td>1.00</td>
</tr>
<tr>
<td>Princeton Junction</td>
<td>16,716</td>
<td>17,165</td>
<td>1.03</td>
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<tr>
<td>Jersey Ave</td>
<td>5,343</td>
<td>5,307</td>
<td>0.99</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>13,059</td>
<td>12,845</td>
<td>0.98</td>
</tr>
<tr>
<td>Edison</td>
<td>6,369</td>
<td>6,391</td>
<td>1.00</td>
</tr>
<tr>
<td>Metuchen</td>
<td>4,802</td>
<td>4,779</td>
<td>1.00</td>
</tr>
<tr>
<td>Metropark</td>
<td>12,369</td>
<td>12,427</td>
<td>1.00</td>
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<td><strong>TOTAL</strong></td>
<td>80,564</td>
<td>80,866</td>
<td>1.00</td>
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</table>
## Scenario 3B Summary Tables

### Person Trips By Mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Daily Base</th>
<th>Scenario 3B</th>
<th>Ratio</th>
<th>Peak Base</th>
<th>Scenario 3B</th>
<th>Ratio</th>
<th>Off-Peak Base</th>
<th>Scenario 3B</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOV</td>
<td>18,447,056</td>
<td>18,446,151</td>
<td>100.0%</td>
<td>10,344,930</td>
<td>10,344,062</td>
<td>100.0%</td>
<td>8,102,126</td>
<td>8,102,089</td>
<td>100.0%</td>
</tr>
<tr>
<td>HOV2</td>
<td>7,932,813</td>
<td>7,932,308</td>
<td>100.0%</td>
<td>4,330,825</td>
<td>4,330,356</td>
<td>100.0%</td>
<td>3,601,987</td>
<td>3,601,952</td>
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</tr>
<tr>
<td>HOV3</td>
<td>2,784,673</td>
<td>2,785,080</td>
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<td>1,441,021</td>
<td>1,441,440</td>
<td>100.0%</td>
<td>1,343,653</td>
<td>1,343,640</td>
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</tr>
<tr>
<td>HOV4</td>
<td>2,190,333</td>
<td>2,190,633</td>
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<td>1,438,478</td>
<td>1,438,789</td>
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<td>751,855</td>
<td>751,844</td>
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<tr>
<td>Auto</td>
<td>31,354,875</td>
<td>31,354,172</td>
<td>100.0%</td>
<td>17,555,255</td>
<td>17,554,647</td>
<td>100.0%</td>
<td>13,799,620</td>
<td>13,799,525</td>
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</tr>
<tr>
<td>Wk-Rail</td>
<td>106,765</td>
<td>107,060</td>
<td>100.3%</td>
<td>77,420</td>
<td>77,708</td>
<td>100.4%</td>
<td>29,345</td>
<td>29,352</td>
<td>100.0%</td>
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<tr>
<td>Wk-PATH</td>
<td>217,315</td>
<td>217,817</td>
<td>100.2%</td>
<td>152,677</td>
<td>153,179</td>
<td>100.3%</td>
<td>64,638</td>
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</tr>
<tr>
<td>Wk-Bus</td>
<td>544,446</td>
<td>543,322</td>
<td>99.8%</td>
<td>350,686</td>
<td>349,564</td>
<td>99.7%</td>
<td>193,760</td>
<td>193,758</td>
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<tr>
<td>Wk-Ferry</td>
<td>157,872</td>
<td>158,115</td>
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<td>99,807</td>
<td>100,051</td>
<td>100.2%</td>
<td>58,065</td>
<td>58,065</td>
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</tr>
<tr>
<td>Wk-LRT</td>
<td>22,327</td>
<td>22,971</td>
<td>102.9%</td>
<td>16,954</td>
<td>17,598</td>
<td>103.8%</td>
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<tr>
<td>Wk-Long Ferry</td>
<td>154</td>
<td>154</td>
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<td>154</td>
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</tr>
<tr>
<td>Dr-Rail</td>
<td>260,320</td>
<td>261,535</td>
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<td>226,104</td>
<td>227,211</td>
<td>100.5%</td>
<td>34,216</td>
<td>34,324</td>
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<tr>
<td>Dr-PATH</td>
<td>56,436</td>
<td>54,909</td>
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<tr>
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<td>73,513</td>
<td>100.6%</td>
<td>39,462</td>
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<tr>
<td>Dr-Ferry</td>
<td>44,446</td>
<td>44,488</td>
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<tr>
<td>Dr-LRT</td>
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<td>5,443</td>
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<td>4,283</td>
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<td>1,160</td>
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<tr>
<td>Dr-Long Ferry</td>
<td>2,896</td>
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<tr>
<td>Transit</td>
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<td>1,066,615</td>
<td>100.1%</td>
<td>464,977</td>
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<tr>
<td>TOTAL</td>
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<td>18,621,262</td>
<td>100.0%</td>
<td>14,264,598</td>
<td>14,264,598</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Presenting Highway Assignment

- Raw Model Volumes Map
Scenario 3B- Change in Traffic
Scenario 3B - Difference In Travel Time

Note that the Princeton Tunnel saves more than 10 minutes vs. Harrison Avenue.
Further Analysis

- Creating Subarea For Extraction
  - Standard Support Application with Pre-defined Boundary Polygons by NJTPA Subregion
- Need to Add Area from Adjacent County
- Execute Assignment Procedures to Create Subarea Trip Tables
Standard Polygon for Middlesex County
Extended Polygon to Include Princeton
Group Discussion/Exercise

- How Can We Present this Information Differently
  - Scenario 1
  - Scenario 2
  - Scenario 3A
  - Scenario 3B

- Think About All of The Ways We Have Learned
  - What About Pie Charts?
  - What About Histograms?
  - What About Stacked Bars?
  - What About Thematic Maps?
  - Etc.
Access to Documentation

• Users Guide is now on the NJTPA Website which accessed via the following link:
  http://www.njtpa.org/DataMap/Perf/Model/default.aspx

• Model Development Report will be posted on the website when it is finalized.
Now it is Time for Q&A