



NCAMPO Conference - May 2016 NCDOT State of the Practice Update: Models, Data, Statistics, and Uses

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#### **Presentation Goals**

Compare and contrast different information

Provide a snap shot of current tools

General use of items in practice

• "Mile wide and half an inch deep"



#### Disclaimer

- This is a generalized set of slides.
- The general process must be adopted to the specific area and project.
- It is incorrect to draw conclusions about a specific process based on this set of slides without more information and expertise.

Every process is unique, like every game of chess is unique. Same rules, different permutations.



#### Agenda

- Data vs. Statistics
- •Types Volume Information
- •Overview of Travel Demand Models in NC
- •Current Practices (State of practice? NCHRP 716 and 765?)



#### Data vs. Statistics



#### Data vs. Statistics: Definitions

Data – facts or information used usually to calculate, analyze, or plan something

Statistic – a number that represents a piece of information; a collection of quantitative data

Definitions courtesy of M-W.com



# Data vs. Statistics: Differences

In general, a statistic provides information about data or a set of data.

Transportation planning frequently reports statistics.

- Examples of statistics:
- •AADT
- Model volumes
- Forecast volumes



#### Data vs. Statistics: General Notes

Statistics are only as accurate as the data they are based on.

Data is very hard to gather with 100% accuracy.

Inherent limits to accuracy of data and statistics.



# Types of Volume Information



# *Types of Volume Information: AADT Data*

AADT is Average Annual Daily Traffic

Represents and average day not just an average weekday

Based on count and seasonal adjustment factors or continuous count stations

Good starting point and for comparisons between facilities



# *Types of Volume Information: AAWT Data*

AAWT is Average Annual Weekday Traffic

Represents and average weekday (excludes weekends)

Based on count and seasonal adjustment factors or continuous count stations

Good starting point and for comparisons between facilities

May be higher or lower than AADT depending on land uses



# *Types of Volume Information: Link Based Model Data*

- Link Based model data generally represents a daily volume
- Be wary of peak period model information
- Can be AADT or AAWTCheck documentation (frequently AWDT)
- Useful for comparing multiple scenarios
- Not to be used for absolute data
  Calibration occurs at the network level not the link level

Models provide planning level data



## *Types of Volume Information: System Model Data*

System model data generally represents a daily volumeBe wary of peak period model information

Can be AADT or AAWT

Check documentation

System data is the sum of the link based data

Useful for absolute data

Calibration occurs at the network level

Can also be used to compare scenarios

Models provide planning level data



# *Types of Volume Information: Long Range Plan/CTP Projections*

Begins with system AADT data

Typically applies generalized growth rates:

- Rough percentage
- Unadjusted model growth trends

20 to 30 year horizon

Not as precise as forecasts or estimates

Good for identifying potential deficiencies

Not for decisions beyond lane callsEven lane call decisions should be verified later



*Types of Volume Information: SPOT Future Year Volume Information* 

10 year projection of volume

Starts with AADT or count data

Data shifted to peak month conditions (PADT)

Growth from county averages from the NCSTM

Good for comparing projects to one another

Not consistent with other traffic projectionsMixes link and system data

Not to be used in place of a traffic forecast/estimate



# *Types of Volume Information: Traffic Estimate*

Traffic Estimates quickly ground truth model information with readily available data

Readily available data includes:

- AADT Data
- Previously collected count data

20 to 30 year horizon

Less detailed than a forecast

Excellent for:

- Lane calls
- Alternative screenings
- General intersection/interchange treatments
- Cost estimation developments or refinements



# *Types of Volume Information: Traffic Forecast*

Traffic Forecasts provide detailed project specific information based on recently collected field data and scrutinized growth projections

Based on field collected data

20 to 30 year horizon

In depth analysis of micro and macro growth trends

Information gathered from numerous sources:

- Travel Demand Models
- State agencies
- Local planners
- Local land owners

Only product sufficient to ensure a quality design



# Overview of Travel Demand Models in NC



#### **Planning for the Future**

#### **Transportation Planning**

The process of defining future policies, goals, investments and designs to prepare for future needs to move people and goods to destinations.



#### **Planning for the Future**



# "The best way to predict your future is to create it."

#### – <u>Abraham Lincoln</u>



#### Why Travel Demand Model?



#### Planning for the Future

Travel Demand Model building involves understanding trip characteristics of the region.

#### **Trip characteristics**?

- ✓Trip Purpose
- Temporal distribution
- ✓ Spatial distribution
- ✓Modal splits

Models are created based on the these characteristics to analyze different "What if" scenarios



#### Travel Demand Model – Mechanism & Components





#### Travel Demand Model – Components





Overview of Travel Demand Models in NC: Land Use Models

Land Use Models help allocate growth

Inputs are growth totals and land availability

Growth is allocated based on attractiveness/suitability

These are not developed by NCDOT



#### Travel Demand Model – Components





- ✓ Statewide Model
- ✓ Regional models
- ✓MPO and Small area models





The Statewide model provides the tool to evaluate the entire state transportation system in unified framework.

- ✓ Independent of regional & local models
- ✓ Focusses on major transportation facilities
- ✓ Uses NHTS data

#### **Applications:**

- Statewide Planning
- □Local Planning
- Long distance trips and Freight Planning
- Support for Local and Regional Models





#### **Regional Models**

□NC has 3 regional Models: Metrolina, Piedmont-Triad & Triangle

- Regional Models consist of multiple MPOs
- Separate Household survey conducted
- Methodology follows the traditional four step model
- The steps are more sophisticated
- Housed with Model Custodians





Consists of MPOs boundaries spanning a few counties to non-MPO urban areas at the county/city level

Some have separate Household survey conducted or some are borrowed

- Methodology: Four step model
- The steps are (relatively) simpler compared to the regional models
- Several models in this category share model framework
- Model custodian: NCDOT



#### What Makes a Good Travel Demand Model?



Any model that can answer the **relevant questions** 

Relevance is more important that sophistication.

Sophisticated doesn't necessarily mean better

Tailor-made to answer questions unique to the issues faced by that region.





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Household Trip Characteristics : Based on Household Survey

≻Network Capacity Methodology: Link-Based

➤Additional Network Features: Tolls, Managed Lanes &Transit

- >Land-use Features: Major Urban Area
- ►<u>Mode Choice:</u> gfghfh
- ► <u>Model Custodian:</u> Piedmont Authority for Regional Transportation



#### **Triangle**

➢ Geographic Boundary: 3 Full and 7 Partial Counties

- ► Models consists of: 2 MPOs
- ≻Household Trip Characteristics : Based on Household Survey

≻Network Capacity Methodology: Linkbased

➤<u>Additional Network Features:</u> Tolls, Managed Lanes &Transit

Land-use Features: Major Urban Area

≻Mode Choice: gfghfh

►<u>Model Custodian:</u> Institute of Transportation Research and Education

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#### MPO Models



#### **Fayetteville**

Geographic Boundary: 1 Full & 2 Partial Counties

▶ Models consists of: 1 MPO

►<u>Household Trip Characteristics</u>: Based on Household Survey

- ><u>Network Capacity Methodology:</u> Link-based
- ➢Additional Network Features: Transit

Land-use Features: Includes a major military base

➢<u>Mode Choice:</u> gfghfh

➢ Model Custodian: NCDOT

# NEW HANOVER

#### <u>Wilmington</u>

► <u>Geographic Boundary:</u> 1 Full & 2 Partial Counties

➢ Models consists of: 1 MPO

≻Household Trip Characteristics: Based on NHTS data from analogous area

- ▶ <u>Network Capacity Methodology:</u> Link-based
- Additional Network Features: Transit
- >Land-use Features: Major tourist destination
- ➢<u>Mode Choice:</u> gfghfh
- ➢ Model Custodian: NCDOT



**MPO Models** 



#### French Broad River

Geographic Boundary: 1 Full & 4 partial Counties

➢<u>Models consists of:</u> 1 MPO

≻Household Trip Characteristics: Based on Household Survey

≻Network Capacity Methodology: Link-based

>Additional Network Features: Transit & Recreational Vehicles

≻Land-use Features: Major tourist destination

➢<u>Mode Choice:</u> gfghfh

➢ Model Custodian: NCDOT



#### Greater Hickory

- ➢ Geographic Boundary: 4 Full Counties
- ➢<u>Models consists of:</u> 1 MPO
- ►<u>Household Trip Characteristics</u>: Based on Household Survey
- ><u>Network Capacity Methodology:</u> Link-based
- Additional Network Features: Transit
- Land-use Features: Major tourist destination
- ≻Mode Choice: gfghfh
- ➢<u>Model Custodian:</u> NCDOT



#### Other MPO Models

- Goldsboro
- Greenville
- Rocky Mount
- Jacksonville
- New Bern

#### Small Area models

- Based on North Carolina Small Area Model (NCSAM) Platform
- No Transit Component
- Combined Survey database
- Generally meant for smaller non-MPO urban areas



#### Future Model Enhancements

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"In an increasingly complex world, sometimes old questions require new answers."

- □ Tour based models: Better representation of travel patterns
- □ Freight component: Improved model of flow of goods
- Transferability: Don't have to reinvent the wheel. What can be used in one place can have applications in other places?
- □ Are there unique and different land-uses? Military bases? Tourist destinations?
- New Data Sources: Cell Phones, GPS, Blue-tooth?



#### Model Outputs

#### **Typical Model Outputs:**

- ✓Volume
- ✓Congested Speeds
- ✓Volume to Capacity ratio
- ✓Vehicle Miles Travelled
- ✓Vehicle Hours Travelled
- ✓Level of Service
- ✓Origin-Destination Data
- ✓Transit ridership

The outputs are numbers that describe the usage and level of congestion on the transportation system



#### Traffic Forecasting

Planners use these numbers to assess the system needs.... build a case for potential solutions....create a narrative...improve the transportation system.

Forecasting is one of the tools that provides this.



#### **Current Practices**



# Current Practices: Applications and Pitfalls

TDMs can be used to help inform:

- Policy and Network Analysis
- Conformity and MOVES
- •CTP
- •LRTP/MTP
- Corridor Planning
- Traffic Estimates
- Project Level Traffic Forecasting



# Current Practices: Policy and Network Analysis

Big picture questions can be answered

• Specifics need additional analysis or tools

Utilize network data:

- VMT
- VHT
- Travel pattern changes
- Relative travel times

Be mindful of data limitations

- Use planning level data for planning level decisions
- Avoid using absolute link information
- Can apply traffic estimate procedures on larger areas to help make conclusions



Current Practices: Conformity and MOVES

Similar to Policy questions

VMT and VHT statistics region wide should be used

What not to use the model for

Daily vs. Peak Period Info



#### Current Practices: CTP

Utilizes models to help identify capacity deficiencies.

Develops local goals and objectives.

Identifies solutions to address capacity deficiencies

Includes high level environmental avoidance

Not fiscally constrained



#### Current Practices: LRTP/MTP

Tests various development strategies

Further refines local goals beyond CTP

Identifies project list based on funding constraints

Lawsuit outcomes drive integration of planning and NEPA

NEPA practicitioners are having to revisit more planning decisions



# Current Practices: Traffic Estimates

Use to screen alternatives and verify purpose and need

Use to save time over a full forecast

Not sufficient for design

- Lacks design data
- Lacks intersection turning movements
- Less precise than a forecast

Can be useful for atypical situations

- Multiple period analysis
- Toll/express lane testing



# Current Practices: Project Level Traffic Forecasts

Multiple uses:

- Screen alternatives
- Inform operational analysis
- Document purpose and need
- Air and noise modeling

Highly precise

Can be overkill • Other products can inform decisions

Need for a forecast should include a risk assessment



# Current Practices: Corridor Planning

**TDM and Micro-sim Coordination** 

Our TDMs are not highly responsive to minor land use and network changes

- Similar network produce similar results
- Similar SE data produce similar results
- •This is consistent with driver behvior



# Summary/Conclusion

