Montgomery County Travel/4 Model Travel Demand Forecast Model Development – Challenges and Lessons Learns
Acknowledgements

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Montgomery County, Maryland

- Population 1 Million
- 1/6 of the Regional Population
- Median Household Income $97,181 (4th highest in region)
- Education
  - 31% College Degree
  - 31% Graduate Degree
- 362,000 Households
- 510,000 Jobs
  - 60% Office, 15% Retail
- Commuting - 50% of Trips Within County & 30% Trips Into DC
Maryland National Capital Park and Planning Commission (M-NCPPC)

- Maryland National Capital Park and Planning Commission
- Formed in 1927
- Bi-County Agency - Montgomery County & Prince George’s County
- Administration Combined
- Counties Operate as Separate Organizations
- Montgomery County Planning Board Appointed by the County Council
- Responsible for Planning
- Make Zoning Recommendations to the County Council
Project Objective

Migrate/Update the Department’s regional travel forecasting model from a County-focused adaptation of the MWCOG’s Version 2.1d#50 (i.e., “Travel/3”) to a County-focused adaptation of the MWCOG’s Version 2.3, Build 52 travel demand forecast model (i.e., “Travel/4”).
MoCo Travel Demand Forecasting

- **Travel/1**
  - Developed in the late 1980’s
  - Michael Replogle Director of Planning
  - EMME/2 on UNIX Platform
  - PM Peak Period

- **Travel/2**
  - Finished in July 2000
  - Calibration and Validation – 1998 Base Year
  - 1994 Household Travel Survey & 1990 CTPP
  - Support of the County’s Transportation and Policy Review Study
  - EMME/2 software
  - PM Peak Period
Regional Travel Demand Forecast Model

- Metropolitan Washington Council of Governments (MWCOG)
- National Capital Transportation Planning Board (TPB)
- Travel Demand Forecasting Group
  - Applications
  - Development
  - Maintain the Regional Travel Demand Forecast Model
- Software
  - MinUTP
  - CUBE/Voyager
- Daily Trip End Model
Travel/3

- Mid-2005 Update Travel/2

- Challenges
  - Time-of-Day Application (PM)
  - Software
  - Resources

- M-NCPPC Adopts MWCOG Version 2.1D #50 Travel Demand Forecast Model

- Additional TAZ’s and Highway Network

- Validate Highway Assignment - County Focus
MWCOG/TPB Version 2.3 Model

- Still Trip Based Model
- Household Travel Survey
- Trip Purposes (NHB & Truck)
- Mode Choice Model
- Time Periods
- TAZ's
- Traffic Assignment
- Transit Assignment
**TAZ Structure**

- **V2.1D #50**
  - 2191 TAZ’s Total
  - 308 TAZ’s Montgomery County

- **Travel/3**
  - 2191 TAZ’s Total
  - 318 TAZ’s Montgomery County

- **Version 2.3.52**
  - 3722 TAZ’s Total
  - 376 TAZ’s Montgomery County
District Level Aggregation
Number of TAZ’s by District

- Bethesda
- Silver Spring
- Potomac
- North Bethesda
- Wheaton
- White Oak
- Rockville
- Aspen Hill
- Clarksburg
- Poolesville
- Olney
- Clovery

TPB  Travel/3
Trip Generation

- Focus on HBW, HBS, & HBO
- Travel/3
  Productions
  - HBW 8% Greater
  - HBS 20% Greater
  - HBO 40% Greater
  - Total 25% Greater

Attractions
  - HBW 6% Less
  - HBS 22% Greater
  - HBO 30% Greater

- Productions & Attractions
- Activities (time of day specific)
Trip Generation

HBW Productions by Montgomery County District

- Bethesda
- Silver Spring
- Potomac
- North Bethesda
- Wheaton
- White Oak
- Rockville
- Aspen Hill
- Clarksburg
- Poolesville
- Olney
- Clovery

TPB  Travel/3
Trip Generation

Total Productions by Montgomery County District
Trip Distribution

- HBW Longest Distance Trips
- Focus on MWCOG Jurisdictions
- Most HBW Trips Stay in County
  - Travel/3 - 54% Remain in County
  - TPB Version 2.3 - 48% Remain in County
- DC Core
  - Travel/3 - 22% Productions
  - TPB Version 2.3 - 19% Productions
Trip Distribution

Montgomery County HBW Attractions by Jurisdiction
Trip Distribution

Montgomery County ALL Productions by Jurisdiction

[Bar chart showing production distribution by jurisdiction in Montgomery County]
Trip Distribution

Montgomery County ALL Attractions by Jurisdiction
Mode Choice

- Home-Based Work Highest Non-SOV Mode Share
- Central Core Highest Transit Mode Shares
- DC Core
  - TPB Version 2.3.52 – 58% Transit Mode Share
  - Travel/3 – 48% Transit Mode Share
- Arlington Core
  - TPB Version 2.3.52 – 56% Transit Mode Share
  - Travel/3 – 47% Transit Mode Share
- All Trips Productions Montgomery County
  - TPB Version 2.3.52 – 8% Transit Mode Share
  - Travel/3 – 4% Transit Mode Share
Mode Choice

Montgomery County HBW Transit Productions by Jurisdiction

[Graph showing transit productions by jurisdiction with bars for DC Core, DC Non-Core, Montgomery, Prince Georges, Arlington Core, Arlington Non-Core, Alexandria, Fairfax, Loudoun, Prince William, and Frederick. The y-axis represents the number of productions ranging from 0 to 90,000. The x-axis lists the jurisdictions.]
Mode Choice

Montgomery County HBW Transit Attractions by Jurisdiction
Mode Choice

Montgomery County Percent HBW Transit Productions by Jurisdiction
Montgomery County Percent HBW Transit Attractions by Jurisdiction

- DC Core
- DC Non-Core
- Montgomery
- Prince Georges
- Arlington Core
- Arlington Non-Core
- Alexandria
- Fairfax
- Loudoun
- Prince William
- Frederick

Legend:
- TPB
- Travel/3
Observations

- Models Produced Different Results
- Travel/4 Less Motorized Travel
- Travel/4 Higher Non-SOV Mode Shares
- Impact on Policies
Travel/4 Development

- Adoption of the MWCOG/TPB Version 2.3.52 Model Set
- Focus County Level
- Add Zones
- Add Network
- Recode Transit
- Review of the Calibration
- Validation Effort
Network Edits

- Added New Zones Total 466 Zones

- Drivers
  - New Barriers (e.g., Freeways)
  - Transit Representation
  - Highway Network Additions
    DOT Required

- Added +300 Miles of Highway

- Iterative Process
Validation Targets

**Standard**
- County wide: 10% of CTPP Work Trips
- 25% of MWCOG Survey for Non-work Trips
- County Planning District Level Interchanges: 25% of CTPP Work Trips
- 25% of MWCOG Survey for Non-work Trips
- County wide Transit, HOV, SOV Mode Share: 20% of CTPP Work Trips
- 20% of MWCOG Survey for Non-work Trips
- County Screenlines Volumes within 15% of Observed Volume
  - Compare Volumes by Functional Class for the County:
    - Freeway 7%
    - Principal Arterial 10%
    - Minor Arterial 15%
    - Other Roads 25%
  - Transit Boardings by Corridor & Screenline within 20%

**Travel/4 Goal**
- County wide: 5% of CTPP Work Trips
- 7% of MWCOG Survey for Non-work Trips
- County Planning District Level Interchanges: 20% of CTPP Work Trips
- 20% of MWCOG Survey for Non-work Trips
- County Planning District Level Interchanges: 0.89 Ratio Estimated to Observed Home End
- 0.82 Ratio Estimated to Observed Non-work
- County Screenlines:
  - 10% Difference Estimated to Observed
  - 3% Major North-South Estimated to Observed
  - Metrorail Estimated to Observed at County Station 0.9 Entering and 0.85 Exiting
Challenges

- 2007/2008 Household Travel Survey 13,000 Households
- TAZ CTPP Data – Disaggregation Data Issues
- Aggregated Super Districts
- Evaluation District and Super District Levels
## Trip Generation

### 1st Run

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### Final Run

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Trip Distribution (HBW)

Trip Distribution Results for Home Base Work Productions Inner Super District

- Inner District
- Middle District
- Outer District
- DC Core District
- DC NonCore District
- PG District
- Frederick District
- Howard District
- Arl/Alex District
- FFX District

- Model
- Observed
Trip Distribution (HBW)

Trip Distribution Results for Home Base Work Attractions Inner Super District

- Inner
- Middle
- Outer
- DC Core
- DC NonCore
- PG
- Frederick
- Howard
- Ari/Alex
- FFX

Districts

Trips

Model
Observed
Trip Distribution (HBW)

Trip Distribution Results for Home Base Work Productions Super District

- Inner
- Middle
- Outer
- DC Core
- DC NonCore
- PG
- Frederick
- Howard
- Arl/Alex
- FFX

Districts:
- Inner Model
- Inner Observed
- Middle Model
- Middle Observed
- Outer Model
- Outer Observed
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Mode Share

HBW Productions Transit Mode Share

- Bethesda
- Silver Spring
- Potomac
- North Bethesda
- Wheaton
- White Oak
- Rockville
- Aspen Hill
- Clarksburg
- Poolesville
- Olney
- Cloverly
- Montgomery Cnty

Observed vs. Model
Mode Share

HBW Attractions Transit Mode Share

- Bethesda
- Silver Spring
- Potomac
- North Bethesda
- Wheaton
- White Oak
- Rockville
- Aspen Hill
- Clarksburg
- Poolesville
- Olney
- Cloverly
- Montgomery Cnty

Observed vs. Model
Assignment Highway Screenlines

[Map showing districts and cities with numerals indicating different zones.]
Assignment (On-Going)

- Compare Transit and Highway Volumes

- Aggregate Level (Countywide)
  - VMT by Facility Type
    - All Highways ± 5%
    - Freeways ± <10%
    - Major Arterials ± <20%
  - Transit Boardings by Mode
    - Segmented Beltway
    - CBD & TOD Areas

- Disaggregate Level
  - Screenlines RMSE
    - Total Work Trips ± 15%
  - Cutlines match Standard for Deviation in NCHRP 765
✓ Good Use of Regional Resources

✓ County Application Linked to Regional Model Feasible

✓ Good Starting Point for Model Development

✓ Understand Client’s Needs

✓ Client’s Objectives and Goals

✓ Focus on Tool’s Required Applications
Next Steps

- Data Collection and Support – County HTS
- Linkage to Sector Plans Needs
- Increase Area and Facility Types
- Population Synthesizer
Questions