Creative Forecasting for a Complex Project

CTS Research Conference
Wednesday, May 22, 2013
I-35W North Corridor

- I-35W North recommended as a Tier 2 MnPASS corridor in the 2010 MnPASS Study II
Study Goals and Objectives:

- Better utilize existing and future infrastructure investments.
- Increase transit ridership and the use of high occupancy vehicles by providing travel time advantages.
- Provide a choice for commuters during the peak periods.
- Reduce congestion and improve safety along the corridor.
Corridor Segments

Segment 1
~2 miles

Segment 2
~2.5 miles

Segment 3
~3.8 miles

Segment 4
~3.3 miles

Segment 5
~13.7 miles
Number of Through Lanes

Segment 1: 6 Lanes
Segment 2: 6 Lanes
Segment 3: 6 Lanes
Segment 4: 6 Lanes
Segment 5: 4 Lanes
Directional Split

Segment 1
AM: 65/35
PM: 55/45

Segment 2
AM: 70/30
PM: 60/40

Segment 3
AM: 75/25
PM: 60/40

Segment 4
AM: 75/25
PM: 65/35

Segment 5
AM: 75/25
PM: 70/30
I-35W North study utilized the Twin Cities Regional Travel Demand Model

Key Features

- Household and employment land use inputs
- Existing and year 2030
- Highway network
- Transit network
- Programmed Improvements
Year 2030 Traffic Forecasts

Map showing road segments with labels:
- Segment 1
- Segment 2
- Segment 3
- Segment 4
- Segment 5

Bar chart showing traffic forecasts for each segment:
- Segment 5: 85%, 5%, 10%
- Segment 4: 70%, 10%, 20%
- Segment 3: 50%, 15%, 35%
- Segment 2: 25%, 30%, 45%
- Segment 1: 40%, 25%, 65%

Legend:
- North of Downtown
- Downtown
- South of Downtown

Graph indicates traffic forecasts for different segments and localities.
Year 2030 Traffic Forecasts

- **SOV**
- **HOV**
- **Transit**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Existing</th>
<th>Year 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SOV, HOV</td>
<td>SOV, HOV</td>
</tr>
<tr>
<td>2</td>
<td>SOV, HOV</td>
<td>SOV, HOV</td>
</tr>
<tr>
<td>3</td>
<td>SOV, HOV</td>
<td>SOV, HOV</td>
</tr>
<tr>
<td>4</td>
<td>SOV, HOV</td>
<td>SOV, HOV</td>
</tr>
<tr>
<td>5</td>
<td>SOV, HOV</td>
<td>SOV, HOV</td>
</tr>
</tbody>
</table>

**Daily Person Trips**

- 0
- 50,000
- 100,000
- 150,000
- 200,000

- Year 2030
- Existing

**Segments**

- Segment 1
- Segment 2
- Segment 3
- Segment 4
- Segment 5
Managed Lane Traffic Forecasts
Managed Lane Traffic Forecasts

• Comparison of existing model to observed counts on existing MnPASS lanes*
  – Peak hour lane utilization
  – HOV vs. SOV toll-paying mode shares
• Identified modeled managed lane volumes and HOV share exceeding counts

Aggregate Results:
Average MnPASS Error: +49%
Average SOV Toll Error: –97%
Average MnPASS HOV Error: +133%

*Source: MnDOT RTMC I-394 and I-35W HOV Reports
Managed Lane Traffic Forecasts

Managed Lane User Groups:
- Formal HOV
- Informal HOV
- Toll-paying SOV

Travel Patterns of Managed Lane Users – WITHOUT Managed Lanes

- Formal HOV
- Informal HOV
Managed Lane Traffic Forecasts

- Modifications applied to traffic assignment
  - Time penalty for access links to/from managed lane
  - Only informal HOV trips within managed lane corridor allowed access to managed lanes
- Resulted in calibrated assignment consistent with observed counts

Aggregate Results:
Average MnPASS Error: +7%
Average SOV Toll Error: +3%
Average MnPASS HOV Error: +10%
Managed Lane Base Alternative

- Managed lanes between University Avenue and Lexington Avenue

**Characteristics**
- Eligibility consistent with existing MnPASS lanes (HOV free, SOV toll)
- Access restrictions and dynamic pricing operates 24 hours per day
Year 2030 Traffic Forecasts

Managed lanes along I-35W between University Avenue and Lexington Avenue

Traffic Pattern Shifts:

- I-35W General Purpose: 60-80%
- I-35E (including TH 10/I-694): 10%
- TH 610/TH 252/I-94: 10%
- Parallel arterial routes: <5%
### Year 2030 Managed Lane Traffic Forecasts

<table>
<thead>
<tr>
<th>Segment</th>
<th>Daily Managed Lane Volume</th>
<th>General Purpose Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4,500 -6,000</td>
<td>60%</td>
</tr>
<tr>
<td>4</td>
<td>7,500 – 8,000</td>
<td>70%</td>
</tr>
<tr>
<td>3</td>
<td>7,000 – 7,500</td>
<td>80%</td>
</tr>
<tr>
<td>2</td>
<td>6,500 – 7,000</td>
<td>70%</td>
</tr>
<tr>
<td>1</td>
<td>6,500 – 7,000</td>
<td>65%</td>
</tr>
</tbody>
</table>
Peak Hour Traffic Forecasts

Segment 1
Managed Lane Volumes based on existing demand

<table>
<thead>
<tr>
<th>Peak Hour (Direction)</th>
<th>HOV Volume*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM (SB)</td>
<td>750-900</td>
</tr>
<tr>
<td>PM (NB)</td>
<td>1,000-1,125</td>
</tr>
</tbody>
</table>

*Excess capacity may be sold to toll-paying SOV trips

Daily Managed Lane Travel Patterns

Start/end of managed lane

HOV Trips
SOV Toll Trips
Peak Hour Traffic Forecasts

Segment 2
Managed Lane Volumes based on existing demand

<table>
<thead>
<tr>
<th>Peak Hour (Direction)</th>
<th>HOV Volume*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM (SB)</td>
<td>900-1,000</td>
</tr>
<tr>
<td>PM (NB)</td>
<td>1,100-1,225</td>
</tr>
</tbody>
</table>

*Excess capacity may be sold to toll-paying SOV trips
**Peak Hour Traffic Forecasts**

**Segment 3**

Managed Lane Volumes based on existing demand

<table>
<thead>
<tr>
<th>Peak Hour (Direction)</th>
<th>HOV Volume*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM (SB)</td>
<td>1,100-1,225</td>
</tr>
<tr>
<td>PM (NB)</td>
<td>1,200-1,275</td>
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</tbody>
</table>

*Excess capacity may be sold to toll-paying SOV trips*
Peak Hour Traffic Forecasts

Segment 4
Managed Lane Volumes based on existing demand

<table>
<thead>
<tr>
<th>Peak Hour (Direction)</th>
<th>HOV Volume*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM (SB)</td>
<td>1,100-1,225</td>
</tr>
<tr>
<td>PM (NB)</td>
<td>1,225-1,300</td>
</tr>
</tbody>
</table>

*Excess capacity may be sold to toll-paying SOV trips

Daily Managed Lane Travel Patterns
Peak Hour Traffic Forecasts

Segment 5
Managed Lane Volumes based on existing demand

<table>
<thead>
<tr>
<th>Peak Hour (Direction)</th>
<th>HOV Volume*</th>
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</thead>
<tbody>
<tr>
<td>AM (SB)</td>
<td>400-950</td>
</tr>
<tr>
<td>PM (NB)</td>
<td>775-1,025</td>
</tr>
</tbody>
</table>

*Excess capacity may be sold to toll-paying SOV trips

![Daily Managed Lane Travel Patterns]

Start/end of managed lane
Revenue Estimation
Step 1: Define Tolling Zones

North of I-694

South of I-694
Managed Lane Revenue Calculations

Step 2: Trip Patterns from Origin-Destination Table

• Determine number of trips within each tolling zone
Managed Lane Revenue Calculations

Step 3: Identify max V/C within tolling zone

• Lookup dynamic toll for max V/C ratio

• Multiply toll by all trips within tolling zone

Annual Revenue Estimate
$775,000
Transit Evaluation
Existing Transit Routes
Managed lanes can provide transit travel time advantages

- Bus-only shoulders limited to 15 mph faster than adjacent traffic when ambient speeds fall below 35 mph
- Managed lanes guarantee free-flow travel speeds

Express route 250 to 95th Avenue Park and Ride expected to increase by 15%
BRT Evaluation

Additional Routes and Stations Added to Existing/Planned Service

- 95th Ave PnR
- Co Rd J
- Co Rd H PnR
- Co Rd E2
- Co Rd C PnR
- Stinson Blvd
- Hennepin Ave

Legend:
- Existing/Planned Transit
- I-35W North BRT
- BRT Feeder Routes
- BRT Stations
Station Types

On-line

In-Line

Off-Line
### BRT Scenarios

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Sensitivity Test 2</th>
<th>Sensitivity Test 3</th>
<th>Sensitivity Test 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRT Stations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Online (On)</strong></td>
<td>95&lt;sup&gt;th&lt;/sup&gt;- Off Co Rd J-On Co Rd H-On Co Rd E2-On Co Rd C-On Stinson-On Hennepin-On</td>
<td>95&lt;sup&gt;th&lt;/sup&gt;- Off Co Rd J-Off Co Rd H-In Co Rd E2-In Co Rd C-Off Stinson-In</td>
<td>95&lt;sup&gt;th&lt;/sup&gt;- Off Co Rd J-Off Co Rd H-In Co Rd E2-In Co Rd C-Off Stinson-In</td>
<td>95&lt;sup&gt;th&lt;/sup&gt;- Off Co Rd J-On Co Rd H-On Co Rd E2-In Co Rd C-Off Stinson-In</td>
</tr>
<tr>
<td><strong>Inline (In)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Offline (Off)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Headway (peak/ off-peak [min])</strong></td>
<td>10/15</td>
<td>10/15</td>
<td>10/15</td>
<td>10/15</td>
</tr>
<tr>
<td><strong>Run Time (min)</strong></td>
<td>35.2</td>
<td>53.3</td>
<td>47.2</td>
<td>44.3</td>
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<tr>
<td><strong>Daily Ridership</strong></td>
<td>&gt;10,000</td>
<td>-17%</td>
<td>-9%</td>
<td>-10%</td>
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</table>
## BRT Scenarios

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Sensitivity Test 5</th>
<th>Sensitivity Test 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRT Stations</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Online(On)</strong></td>
<td>95th- Off</td>
<td>95th- Off</td>
<td>95th- Off</td>
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<tr>
<td></td>
<td>Co Rd J-On</td>
<td>Co Rd J-On</td>
<td>Co Rd J-On</td>
</tr>
<tr>
<td></td>
<td>Co Rd H-On</td>
<td>Co Rd H-On</td>
<td>Co Rd H-On</td>
</tr>
<tr>
<td></td>
<td>Co Rd E2-On</td>
<td>Co Rd E2-On</td>
<td>Co Rd E2-On</td>
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<tr>
<td></td>
<td>Co Rd C-On</td>
<td>Co Rd C-On</td>
<td>Co Rd C-On</td>
</tr>
<tr>
<td></td>
<td>Stinson-On</td>
<td>Stinson-On</td>
<td>Stinson-On</td>
</tr>
<tr>
<td></td>
<td>Hennepin-On</td>
<td>Hennepin-On</td>
<td>Hennepin-On</td>
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<tr>
<td><strong>Inline(In)</strong></td>
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</tr>
<tr>
<td><strong>Offline(Off)</strong></td>
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</tr>
<tr>
<td><strong>Headway (peak/off-peak [min])</strong></td>
<td>10/15</td>
<td>15/15</td>
<td>30/15</td>
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<tr>
<td><strong>Run Time (min)</strong></td>
<td>35.2</td>
<td>35.2</td>
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<tr>
<td><strong>Daily Ridership</strong></td>
<td>&gt;10,000</td>
<td>-18%</td>
<td>-35%</td>
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</table>
Conclusions

• Managed Lane Forecasting
  • Analysts need to take a close look at existing model performance and make adjustments if needed
  • Compare traffic and revenue forecast results to observed conditions to ensure reasonableness

• Transit Ridership
  • Managed lanes can improve express bus ridership
  • Managed lanes can serve as a backbone for BRT service
  • Travel time has a modest impact on BRT ridership
  • Frequency has a greater impact on BRT ridership
Questions?

Thank you!