
James Colyar, P.E.
FHWA Office of Operations
Weather Responsive Traffic Management Workshop
Portland, OR
October 6, 2011
Why Analyze Traffic?

Analysis tools won’t tell us anything we don’t already know through engineering judgment!
Why Analyze Traffic?

Why waste time on analysis when the answer is obvious… add more lanes!
Why Analyze Traffic?

Why use analysis when we know the road is congested now and will be more congested in 20 years?!
Motivation for Using Analysis Tools

- Multi-million dollar decisions are being made
- Transportation budgets are very tight
- Solutions are increasingly complex
  - HOV/HOT lanes
  - ITS Solutions
  - Complex merges/weaves
  - Complex signal timing
- Increasing need to operate well under all conditions, such as adverse weather
Role of Traffic Analysis Tools

● Evaluate and prioritize alternatives
● Minimize disruptions to traffic
● Communicate to stakeholders
● Improve the decision making process
  ● Design of infrastructure improvements
  ● Operations of existing infrastructure
Spillover Effects: A Design and Operations Issue
Traffic Analysis Can Improve Design and Operations

Simulation with varying Left Turn Lane Length

- 25 ft
- 50 ft
- 75 ft
- 125 ft
Categories of Traffic Analysis Tools

1. Sketch-Planning
2. Analytical/deterministic (HCM-based)
3. Travel Demand Models
4. Traffic Signal Optimization
5. Macroscopic Simulation
6. Mesoscopic Simulation
7. Microscopic Simulation
How Can Traffic Analysis Help Road Weather Management?

1. **Design** of infrastructure improvements
   - Current practice is to design for perfect weather. Is this appropriate?

2. **Operations** of existing infrastructure
   - Various road weather management strategies can be applied to operate system during weather.

Traffic analysis can help evaluate road weather impacts and strategies in both of these cases...
Should We Be Designing for Ideal Weather?

Example:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Intensity</th>
<th>Probability</th>
<th>Capacity Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain</td>
<td>0.10&lt; R &lt; 0.25 in/hr</td>
<td>19.7%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>R &gt; 0.25 in/hr</td>
<td>0.0%</td>
<td>14%</td>
</tr>
<tr>
<td>Snow</td>
<td>0.05&lt;S&lt;0.50 in/hr</td>
<td>0.0%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>S &gt; 0.50 in/hr</td>
<td>0.0%</td>
<td>22%</td>
</tr>
<tr>
<td>Cold</td>
<td>&lt; -4° F</td>
<td>0.0%</td>
<td>8%</td>
</tr>
<tr>
<td>Visibility</td>
<td>&lt; 1.00 miles</td>
<td>7.4%</td>
<td>10%</td>
</tr>
<tr>
<td>Clear</td>
<td></td>
<td>80.3%</td>
<td>n/a</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100.0%</td>
<td>Avg. = 7.8%</td>
</tr>
</tbody>
</table>

Should We Be Designing for Ideal Weather?

“According to Kyte et al. (2001), the National Weather Service provides records of rain days for 284 sites in the United States for at least 10 years; these records show that nearly 1/3 of the sites have rainy days that occur about 34% of the year and 15% of the sites have rainy days occurring 41% of the year.”

- Traffic Analysis Toolbox Volume XI: Weather and Traffic Analysis, Modeling and Simulation
# Weather Responsive Strategies: Advisory

<table>
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<tr>
<th>Strategy</th>
<th>Example Uses of Traffic Analysis</th>
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<tbody>
<tr>
<td>Advisory: Pre-trip and en-route travel information on prevailing and predicted conditions (DMS, 511, HAR, web, mobile apps)</td>
<td>- Provide baseline travel time and delay information of weather event with no advisory strategies</td>
</tr>
<tr>
<td></td>
<td>- Estimate traffic diversion impacts of providing route guidance</td>
</tr>
<tr>
<td></td>
<td>- Real-time modeling capability for estimating predicted travel conditions</td>
</tr>
</tbody>
</table>

Source: Traffic Analysis Toolbox Volume XI: Weather and Traffic Analysis, Modeling and Simulation
Weather Responsive Strategies: Control

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</thead>
</table>
| Control: Signal control & timing, Variable speed limits, Ramp metering, Road/lane closures, ATM | - Develop optimal signal timing plans for various weather scenarios.  
- Estimate delay and level of service impacts of variable speed limits, road/lane closures, ATM.  
- Quantify benefits of various control strategies applied concurrently. |

Source: Traffic Analysis Toolbox Volume XI: Weather and Traffic Analysis, Modeling and Simulation
Weather Responsive Strategies: Treatment

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</table>
| Treatment: Plowing and application of sand, salt, and chemicals during snow and ice | - Evaluate delays associated with lack of traction at traffic signals  
- Quantify benefits of improved traffic flow with treatment strategies (justify a treatment program) |
Emerging Analytical Tools/Processes

- ATDM Analysis Guidebook
- ICM Analysis, Modeling, and Simulation Guide
- Dynamic Traffic Assignment Tools

...all allow for more robust modeling of weather impacts and strategies.
Additional Resources

- FHWA Traffic Analysis Toolbox
  
  http://www.ops.fhwa.dot.gov/trafficanalysistools/index.htm

  Volumes:
  1. Traffic Analysis Primer
  2. Decision Support Methodology
  3. Simulation Guidelines
  4. CORSIM Guidelines
  5. Case Studies
  6. MOE Study
  7. Predicting Performance
  8. Work Zone Analysis: Decision-Makers
  9. Work Zone Analysis: Analysts
  10. Bottleneck Analysis
  11. **Weather Analysis**
Thank you!

james.colyar@dot.gov