Comm. Ave Analysis and Public Outreach

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Work Zone Safety Conference

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Outline

- Study Goals and Background
- FREEVAL Calibration and Results
- Post-Mortem Analysis
- Lessons Learned
Study Goals

- Quick turnaround assessment of work zone-induced congestion impacts on I-90
- Analysis of 24-hour performance and impacts from lane closure scenarios
- Evaluation of work zone staging options for weekdays and weekends
- Decision for work zone staging within 6 weeks

2018 Innovation & Mobility Exchange
Study Approach

- Obtain Data
- Build FREEVAL Base Facility
- Calibrate Facility
- Analyze Work Zone Scenarios
- Conduct Volume Diversion Sensitivity
- Post Mortem Analysis

Weekday

Weekend
FREEVAL Analysis and Results

Focus on Eastbound Direction
FREEVAL - Implementation of HCM 6 Freeway Facilities Method
FREEVAL Calibration Example - EB Speed Contours

- 24-hour travel times obtained from probe data sources
- Model calibration to match facility travel times and congestion patterns
- Sensitive to unique features like the old toll plaza and tunnel sections

FREEVAL Results - Spring 2017 Calibrated

Field Data - Spring 2017 Speed Contours
Eastbound Calibration - Travel Times

- Calibrated to match free-flow speed (off-peak), maximum travel times (peak periods), and travel time profile over 24-hours
WZ Scenario 1 (three-lanes open - red)
- Increase AM peak travel times from 24 to 35 minutes (a 47% increase)
- Increase PM peak travel times from 20 to 43 minutes (a 110% increase)

WZ Scenario 2 (two lanes open - green)
- Increase AM peak travel times to close to 80 minutes!
Eastbound Speed Contours - Base, WZ1, WZ2

Eastbound Speed Contours - Calibrated Base File - 4AM to 4AM

Eastbound Speed Contours - WZ1 (3-Lane Pattern) - 4AM to 4AM

Eastbound Speed Contours - WZ2 (2-Lane Pattern) - 4AM to 4AM

Work Zone

Work Zone

Kittel & Associates
massDOT
Massachusetts Department of Transportation
Eastbound - Diversion Sensitivity (WZ1)

- No Diversion
- 10% Diversion
- 20% Diversion
- 30% Diversion
- 40% Diversion
- 50% Diversion
Summary of WZ1 Results - Eastbound

**Work Zone configuration 1 is expected to result in significant delays**
- 47% increase in EB AM peak travel times from 24 to 35 minutes
- 110% increase in EB PM peak travel times from 20 to 43 minutes
- 30% diversion EB maintains base congestion levels

**Work Zone configuration 2 is expected to result in severe delays**
- Travel time increase AM and PM peak travel times to close to 80 minutes without diversion
- 40-50% diversion EB needed to avoid queue spilling back to I-95
Post-Mortem Analysis
EB Volumes through Work Zone

- August 2017 (non WZ) volumes down 25% compared to 2016
- During construction, traffic metered with volumes down 75% in AM peak
- 24-hour volume down 65% during worst parts of the construction
- Traffic volumes highly sensitive to construction scenarios (EB work Mo-We, vs. WB Th-Sa)
- Traffic metered at 2,500-3,000 vehicles across two lanes, suggests queuing most of the day, and per-lane capacity around 1,300-1,500 veh/h/ln
Eastbound Speed Contours

Aug 2017 non-WZ

Aug 2017 WZ
Eastbound Travel Times (average) vs. FREEVAL

- AM Peak Travel Time overestimated by FREEVAL (50% vs 75% diversion)
- PM travel times match field estimates
- Onset and duration of congestion predicted correctly
Eastbound Travel Times (day by day) vs. FREEVAL

- FREEVAL estimate matches congestion better on Tuesday and Wednesday of construction week
- Travel times on facility improved on Thursday and Friday during the week
Post-Mortem Analysis – Part 2
WB Volumes through Work Zone

- August 2017 similar to 2016
- During construction, traffic volumes down 42% in PM peak
- 24-hour volume down 28% during worst parts of the construction
- Traffic volumes highly sensitive to construction scenarios (EB work Mo-We, vs. WB Th-Sa)
- Traffic metered at 3,000 vehicles across two lanes, suggests queuing most of the day, and per-lane capacity around 1,500 veh/h/ln
Westbound Speed Contours

Aug 2017 non-WZ  Aug 2017 WZ
Westbound Speed Contours vs. FREEVAL

Aug 2017 WZ

Aug 2017 FREEVAL (WZ 2 40% Diversion)
Westbound Travel Times (average) vs. FREEVAL

- AM and PM Peak Travel Time slightly overpredicted by FREEVAL
- Diversion results and FREEVAL volumes closer than WB
- Onset and duration of congestion predicted correctly
Westbound Travel Times (day by day) vs. FREEVAL

- FREEVAL estimate matches AM and PM peak congestion
- Travel times on facility worse on Thursday and Friday as construction shifts WB
Lessons Learned
What we learned from the data

- Volumes down significantly during construction
  - Sensor volumes down due to bottleneck and queuing
  - Total demand dropped drastically over 24 hours
  - Eastbound impacts more severe than westbound (in our study scope)
- Travel times increased
  - Max travel times match FREEVAL predictions with correct diversion numbers!
  - FREEVAL accurately predicted onset of congestion
Implications for Future Analysis

- FREEVAL adequate tool to estimate maximum travel times
- Diversion sensitivity and estimate is critical for correct results
- Useful quick-response analysis to inform work zone planning and public outreach
- Travelers highly responsive to changing conditions (even day-by-day)
- HCM work zone capacities appear to match field observations (~1,500 veh/h/ln)
- Availability of point sensors (volumes) and probe data (speed, travel times) key for monitoring work zone and post mortem analysis
Questions and Comments?

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