Memphis MPO
Performance Measures
Engineering and Technical Committee (ETC)
Online Workshop
Tuesday, October 2, 2018
Agenda

- Welcome and Introductions
- PM1 (Safety) Overview
- PM2 (Infrastructure) Overview
  - TDOT + MDOT
  - MPO
- PM3 (System Performance) Overview
  - TDOT + MDOT
  - MPO
- Q&A/Discussion
PM: Target Setting - Overview

PM1: Safety (ROUND 2 UNDERWAY)

PM2: Infrastructure Condition (UNDERWAY)

PM3: System Performance (UNDERWAY)
PM1: Safety
PM1: Safety

- **Area** – Individual State Targets for all public roads in the state developed and adopted annually

- **Data** – Highway Performance Monitoring System (HPMS) and Fatality Analysis Reporting System (FARS)

- **Performance Measures** –
  - Number of Serious Injuries
  - Rate of Serious Injuries per 100 Million VMTs
  - Number of Fatalities
  - Rate of Fatalities per 100 Million VMTs
  - Number of Non-motorized Fatalities and Serious Injuries

- **Calculation** –
  - 5-Year Rolling Average of 5 individual, consecutive points of data.
    - Number Targets – Arithmetic average, rounded to tenths place
    - Rate Targets – Average, rounded to the thousandths place
### PM1: Tennessee

<table>
<thead>
<tr>
<th>Safety Performance Measure</th>
<th>Round 1</th>
<th>Round 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Fatalities</td>
<td>995.6</td>
<td>1021.4</td>
</tr>
<tr>
<td>Fatality Rate</td>
<td>1.358</td>
<td>1.337</td>
</tr>
<tr>
<td>Number of Serious Injuries</td>
<td>7319.4</td>
<td>7630.8</td>
</tr>
<tr>
<td>Rate of Serious Injuries</td>
<td>9.976</td>
<td>9.982</td>
</tr>
<tr>
<td>Number of Non-Motorized Fatalities and Serious Injuries</td>
<td>434.6</td>
<td>493.2</td>
</tr>
<tr>
<td>Safety Performance Measure</td>
<td>Round 1</td>
<td>Round 2</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Number of Fatalities</td>
<td>633.8</td>
<td>677.8</td>
</tr>
<tr>
<td>Fatality Rate</td>
<td>1.606</td>
<td>1.668</td>
</tr>
<tr>
<td>Number of Serious Injuries</td>
<td>567.6</td>
<td>574.4</td>
</tr>
<tr>
<td>Rate of Serious Injuries</td>
<td>1.439</td>
<td>1.425</td>
</tr>
<tr>
<td>Number of Non-Motorized Fatalities and Serious Injuries</td>
<td>111.8</td>
<td>119.8</td>
</tr>
</tbody>
</table>
## PM1: TN-MS Comparison (Round 2)

<table>
<thead>
<tr>
<th>Safety Performance Measure</th>
<th>Tennessee Baseline</th>
<th>Tennessee Target</th>
<th>Mississippi Baseline</th>
<th>Mississippi Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Fatalities</td>
<td>1000.6</td>
<td>1022.0</td>
<td>655.4</td>
<td>697.3</td>
</tr>
<tr>
<td>Fatality Rate</td>
<td>1.329</td>
<td>1.291</td>
<td>1.640</td>
<td>1.706</td>
</tr>
<tr>
<td>Number of Serious Injuries</td>
<td>7227.6</td>
<td>7374.6</td>
<td>550.2</td>
<td>555.5</td>
</tr>
<tr>
<td>Rate of Serious Injuries</td>
<td>9.594</td>
<td>9.324</td>
<td>1.378</td>
<td>1.356</td>
</tr>
<tr>
<td>Number of Non-Motorized Fatalities and Serious Injuries</td>
<td>467.7</td>
<td>546.8</td>
<td>116.0</td>
<td>131.4</td>
</tr>
</tbody>
</table>
PM2: Pavement & Bridge Condition
PM2: Performance Measures

Subpart C: Pavement Condition
State DOT Due Date: May 20, 2018
MPO Due Date: Nov. 16, 2018

- Percentage of Pavement in Good Condition (Interstate)
- Percentage of Pavement in Poor Condition (Interstate)
- Percentage of Pavement in Good Condition (Non-Interstate NHS)
- Percentage of Pavement in Poor Condition (Non-Interstate NHS)

Subpart D: Bridge Conditions
State DOT Due Date: May 20, 2018
MPO Due Date: Nov. 16, 2018

- Percentage of Bridges in Good Condition (NHS)
- Percentage of Bridges in Poor Condition (NHS)
PM2: Pavement Condition

- **Area** – Individual State 2 & 4 Year Targets for the Non-Interstate NHS and 4 Year Target for Interstate (MPO: 4 Year Target Only)
- **Data** – Highway Performance Monitoring System (HPMS)
- **Performance Measures** –
  - % of Interstate Pavements in Good and Poor Condition
  - % of non-Interstate NHS Pavements in Good and Poor Condition
- **Calculation** –
  - Good and Poor Condition Rating Areas: International Roughness Index (IRI), Cracking, Rutting (Asphalt pavements), and Faulting (Concrete pavements)
## PM2: Pavement Condition - TN

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Shelby + Fayette (Baseline)</th>
<th>Tennessee (Baseline)</th>
<th>Tennessee (4-Year Target)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of Pavement in Good Condition (Interstate)</td>
<td>73.1%</td>
<td>75.6%</td>
<td>60.0%</td>
</tr>
<tr>
<td>Percent of Pavement in Poor Condition (Interstate)</td>
<td>~0.1%</td>
<td>0.14%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Percent of Pavement in Good Condition (Non-Interstate NHS)</td>
<td>13.8%</td>
<td>72.7%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Percent of Pavement in Poor Condition (Non-Interstate NHS)</td>
<td>17.5%</td>
<td>6.7%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>
## PM2: Pavement Condition - MS

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>DeSoto + Marshall (Baseline)</th>
<th>Mississippi (Baseline)</th>
<th>Mississippi (4-Year Target)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of Pavement in Good Condition (Interstate)</td>
<td>52.2%</td>
<td>75.0%</td>
<td>55.0%</td>
</tr>
<tr>
<td>Percent of Pavement in Poor Condition (Interstate)</td>
<td>0%</td>
<td>0.99%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Percent of Pavement in Good Condition (Non-Interstate NHS)</td>
<td>17.5%</td>
<td>62.5%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Percent of Pavement in Poor Condition (Non-Interstate NHS)</td>
<td>4.1%</td>
<td>9.3%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
PM2: Bridge Condition

- **Area** – Individual State 2 & 4 Year Targets for all bridges carrying the NHS, including on- and off- ramps (MPO: 4 Year Target Only)
- **Data** – National Bridge Inspection Standards (NBIS)
- **Performance Measures** –
  - % of NHS Bridges by deck area classified as in Good or Poor Condition
- **Calculation** –
  - Good and Poor Condition Rating Areas: Deck, Superstructure, Substructure, and Culvert
## PM2: Bridge Condition - TN

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Shelby + Fayette (Baseline)</th>
<th>Tennessee (Baseline)</th>
<th>Tennessee (4-Year Target)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of Bridges in Good Condition</td>
<td>29.6%</td>
<td>39.5%</td>
<td>36.0%</td>
</tr>
<tr>
<td>Percent of Bridges in Poor Condition</td>
<td>3.9%</td>
<td>3.5%</td>
<td>6.0%</td>
</tr>
</tbody>
</table>
## PM2: Bridge Condition - MS

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>DeSoto + Marshall (Baseline)</th>
<th>Mississippi (Baseline)</th>
<th>Mississippi (4-Year Target)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of Bridges in Good Condition</td>
<td>48.2%</td>
<td>61.7%</td>
<td>60.0%</td>
</tr>
<tr>
<td>Percent of Bridges in Poor Condition</td>
<td>0.6%</td>
<td>2.1%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
PM3: System Performance
Performance Measures

Subpart G: Traffic Congestion
- Annual Hours of Peak-Hour Excessive Delay
- Percentage of Non-Single Occupancy Vehicle Travel

Subpart H: Total Emissions Reduction
- Total Emissions Reductions (VOC) kg/day
- Total Emissions Reductions (CO) kg/day
- Total Emissions Reductions (NOx) kg/day

Subpart E: Travel Time Reliability
- Percentage of Person Miles Traveled that are Reliable (Interstate)
- Percentage of Person Miles Traveled that are Reliable (Non-Interstate NHS)

Subpart F: Freight Reliability
- Truck Travel Time Reliability Index
PM3: On-Road Mobile Source Emissions

- **Area** – Individual State 2 & 4-Year Targets (Applies to Memphis & Knoxville)
- **Data** – FHWA CMAQ Public Access System (UPACS)
- **Performance Measure** –
  - Total Emissions Reduction
- **Calculation** –ul
  - Cumulative 2 and 4-Year Emissions Reduction for CMAQ funded projects of reduced emissions for:
    - Nitrogen Oxides (NOx)
    - Volatile Organic Compounds (VOCs)
    - Carbon Monoxide (CO)
      - Not applicable to Mississippi state target
### PM3: Emissions Targets – TN

<table>
<thead>
<tr>
<th>Total Emissions Reduction Performance Measures</th>
<th>Baseline (FY 14-17)</th>
<th>2-Year Target (FY 18-19)</th>
<th>4-Year Target (FY 18-21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Emissions Reductions (VOC) kg/day</td>
<td>230.025</td>
<td>30.698</td>
<td>61.396</td>
</tr>
<tr>
<td>Total Emissions Reductions (CO) kg/day</td>
<td>530.282</td>
<td>75.000</td>
<td>150.000</td>
</tr>
<tr>
<td>Total Emissions Reductions (NOx) kg/day</td>
<td>363.399</td>
<td>62.840</td>
<td>125.680</td>
</tr>
</tbody>
</table>
## PM3: Emissions Targets - MS

<table>
<thead>
<tr>
<th>Total Emissions Reduction Performance Measures</th>
<th>Baseline (FY 14-17)</th>
<th>2-Year Target (FY 18-19)</th>
<th>4-Year Target (FY 18-21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Emissions Reductions (VOC) kg/day</td>
<td>28.000</td>
<td>&gt; 0</td>
<td>&gt; 0</td>
</tr>
<tr>
<td>Total Emissions Reductions (CO) kg/day</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Emissions Reductions (NOx) kg/day</td>
<td>85.000</td>
<td>&gt; 0</td>
<td>&gt; 0</td>
</tr>
</tbody>
</table>
PM3: Travel Time Reliability

- **Area** – Individual State 2 & 4 Year Targets for Interstate and 4 Year Target for Non-Interstate (MPO: 4 Year Target Only)
- **Data** – National Performance Management Research Data Set (NPMRDS) & Highway Performance Monitoring System (HPMS)
- **Performance Measures** –
  - Percent of the Person Miles Traveled on the **Interstate** that are reliable
  - Percent of the Person Miles Traveled on the **Non-Interstate NHS** that are reliable
- **Calculation** –
  - \[ \text{Level of Travel Time Reliability} = \frac{80\text{th Percentile Travel Time}}{50\text{th Percentile Travel Time}} \]
    - Level of Travel Time Reliability (LOTTR) for the reporting segment must be less than 1.50 to be considered reliable
PM3: Travel Time Reliability

- **Calculation** –
  - **Level of Travel Time Reliability (Step 1)**
    - Level of Travel Time Reliability (LOTTR) for the reporting segment must be less than 1.50 to be considered reliable.
    
  - **Level of Travel Time Reliability (Step 2)**
    
    \[
    \text{Level of Travel Time Reliability (Step 2)} = \frac{\sum_{i=1}^{R} SL_i \times AV_i \times OF_j}{\sum_{i=1}^{T} SL_i \times AV_i \times OF_j}
    \]

- **R** = Total number of Interstate (or Non-Interstate NHS) System reporting segments that are exhibiting an LOTTR below 1.50 during all of the time periods.
- **SL** = Length, to the nearest thousandth of a mile, of Interstate System reporting segment “i”;
- **AV** = Total annual traffic volume to the nearest single vehicle, of the Interstate System reporting segment “i”;
- **J** = Geographic area in which the reporting segment “i” is located where a unique occupancy factor has been determined;
- **OF** = Occupancy factor for vehicles on the NHS within a specified geographic area within the State/Metropolitan planning area; and
- **T** = Total number of Interstate System reporting segments.
PM3: Travel Time Reliability

Example Calculation

Example

Annual Volume: 31M 32M 41M 25M
Length: 0.331 0.567 0.414 1.780

LOTTR (4 periods):
- 1.45 1.52 1.32 1.71
- 1.33 1.71 1.17 1.80
- 1.03 1.71 1.03 1.45
- 1.12 1.45 1.21 1.51

Travel Time Reliability Measure = \frac{(0.331 \times 31 \times 1.1) + (0.414 \times 41 \times 1.1)}{(0.331 \times 31 \times 1.1) + (0.567 \times 32 \times 1.1) + (0.414 \times 41 \times 1.1) + (1.780 \times 25 \times 1.1)}
= \frac{11.287 + 18.671}{11.287 + 19.958 + 18.671 + 48.950}
= \frac{29.958}{98.866}
= 30.3\%
% of Interstate Providing for Reliable Travel Times (2014-2017) Baseline Data

% of Non-Interstate NHS Providing for Reliable Travel Times (2014-2017) Baseline Data

## PM3: Travel Time Reliability Targets

<table>
<thead>
<tr>
<th>Travel Time Reliability Performance Measures</th>
<th>Tennessee (TDOT)</th>
<th>Mississippi (MDOT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (2017)</td>
<td>4-Year Target (2021)</td>
</tr>
<tr>
<td>Percentage of Person Miles Traveled that are Reliable (Interstate)</td>
<td>87.7%</td>
<td>83.0%</td>
</tr>
<tr>
<td>Percentage of Person Miles Traveled that are Reliable (Non-Interstate NHS)</td>
<td>N/A</td>
<td>87.5%</td>
</tr>
</tbody>
</table>
PM3: Freight Movement

- **Area** – Individual State 2- and 4-Year Targets (MPO: 4 Year Target Only)
- **Data** – National Performance Management Research Data Set (NPMRDS)
- **Performance Measure** –
  - Percent of the Interstate System Mileage providing for Reliable Truck Travel Times (Truck Travel Time Reliability Index)
- **Calculation** –
  
  \[
  \text{Truck Travel Time Reliability} = \frac{95\text{th Percentile Truck Travel Time}}{50\text{th Percentile Truck Travel Time}}
  \]
PM3: Freight Movement

- **Calculation** –

  - *Truck Travel Time Reliability* (Step 1) = \( \frac{95\text{th Percentile Truck Travel Time}}{50\text{th Percentile Truck Travel Time}} \)

  - *Truck Travel Time Reliability* (Step 2) = \( \frac{\sum_{i=1}^{T}(SL_i \times maxTTTR_i)}{\sum_{i=1}^{T}(SL_i)} \)

  - \( i = \) An Interstate System reporting segment;
  - \( maxTTTR_i = \) The maximum TTTR of the five time periods in paragraphs \( SL_i = \) Segment length, to the nearest thousandth of a mile, of Interstate System reporting segment “i”; and
  - \( T = \) A total number of Interstate System reporting segments.
PM3: Freight Movement

Example Calculation

\[
TTTR = \frac{(1.70 \times 1.562) + (2.10 \times 2.572) + (1.71 \times 1.843) + (2.30 \times 3.171)}{(1.562 + 2.572 + 1.843 + 3.171)}
\]

\[
= \frac{2.655 + 5.401 + 3.152 + 7.293}{9.148}
\]

\[
= 2.022
\]
Truck Travel Time Reliability Index (TTTR) Baseline Data


- Memphis MPO MPA
- Mississippi
- Tennessee

TDOT 2 Year Target: 1.35
TDOT 4 Year Target: 1.33
MDOT 2 & 4 Year Target: 1.5
## PM3: Freight Reliability Targets

<table>
<thead>
<tr>
<th>Freight Reliability Performance Measures</th>
<th>Tennessee (TDOT)</th>
<th>Mississippi (MDOT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (2017)</td>
<td>4-Year Target (2021)</td>
</tr>
<tr>
<td>Truck Travel Time Reliability (TTTR) Index</td>
<td>1.35</td>
<td>1.33</td>
</tr>
</tbody>
</table>
PM: Target Setting - Timeline

- **PM1: Safety**
- **PM2: Infrastructure**
  - Pavement & Bridge
- **PM3: System Performance**
  - System Performance, Freight, & CMAQ
- **TAM: Transit**

- **MPO Action Required**
Next Steps

- MPO Deadline November 16, 2018 (PM2 & PM3)
- MPO Deadline February 27, 2019 (PM1)
- ETC/TPB Meetings
  - Recommended Action – Support State (TDOT/MDOT) Targets
    - ETC Meeting November 1, 2018
    - TPB Meeting November 15, 2018
- Regular Review of Targets
Transportation Performance Management

Focusing on Performance for Safe, Reliable Journeys

The Federal Highway Administration defines Transportation Performance Management (TPM) as a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals.

Investment Decisions
Using goals, measures, and data to make better informed decisions about how to invest transportation funding.

Aimed at a Better Performing Transportation System
Setting targets, developing plans, reporting results, and being accountable for performance.

For Connected and Productive Communities
Focusing on the efficient delivery of goods and safe, reliable journeys to work, to school, to shopping, to community activities.

FHWA’s Transportation Performance Management Website

www fhwa dot gov tpm
Performance-Based Planning and Programming

The United States’ Department of Transportation recognizes that it is important to continuously monitor the performance of the nation’s transportation improvements and programs to determine if the nation is achieving its national goals and objectives related to transportation. Under current federal surface transportation legislation, states and metropolitan planning organizations (MPOs) will “transition to a performance-driven, outcome based program.”

Performance based-planning and programming’s implementation is done within the Transportation Performance Management (TPM) framework, which provides key system information to determine the progress towards achieving these goals and objectives and prioritizes investment and policy decisions. TPM also gives transportation agencies a better ability to identify and mitigate issues with their respective transportation networks and improve communication between partner agencies through data and objective information.

Moving Ahead for Progress in the 21st Century Act (MAP-21)

Memphis MPO’s Performance Measures Webpages

http://memphismpo.org/resources/trends/performance-measures
Questions/Discussion

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