Incorporating Asset Management and Resiliency With Transportation Planning in North Central Texas

Presented by: Jeffrey C. Neal – North Central Texas Council of Governments (NCTCOG)
Context for Asset Management/Resiliency Coordination

Mobility 2045 Plan – Establishing Investment Priorities

Maximize Existing System
- Infrastructure Maintenance
  - Maintain & Operate Existing Facilities
  - Bridge Replacements
  - $37.5
- Management, Operations and Technology
  - Improve Efficiency & Remove Trips from System
  - Traffic Signals & Bicycle/Pedestrian Improvements
  - $9.5
- Growth, Development, and Land Use Strategies
  - More Efficient Land Use & Transportation Balance
  - $3.2

Strategic Infrastructure Investment
- Rail and Bus
  - Induce Switch to Transit
  - $33.3
- HOV/Managed Lanes
  - Increase Auto Occupancy
  - $52.0
- Freeways/Tollways and Arterials
  - Additional Roadway Capacity

Total Expenditures
- $135.4

Notes:
1. Actual dollars, in billions. Values may not sum due to independent rounding.
2. Balances to reasonably expected revenue, demonstrating financial constraint.
Context for Asset Management/Resiliency Coordination (cont.)

FAST Act – Performance Measures and Target Setting

<table>
<thead>
<tr>
<th>Complete</th>
<th>Rulemaking</th>
<th>Number of Measures</th>
<th>MPO Target Setting Deadline</th>
<th>Reporting Period</th>
<th>Reporting Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>Transit Asset Management</td>
<td>4</td>
<td>12/27/2017</td>
<td>Annually</td>
<td>Annually</td>
</tr>
<tr>
<td>✓</td>
<td>Safety (PM1)</td>
<td>5</td>
<td>2/27/2018</td>
<td>Annually</td>
<td>Annually</td>
</tr>
<tr>
<td>✓</td>
<td>Pavement/Bridge (PM2)</td>
<td>6</td>
<td>11/15/2018</td>
<td>Four-Year Performance Periods (starting 2018-2022)</td>
<td>Biennially (beginning, middle, and end of performance periods)</td>
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<tr>
<td>✓</td>
<td>System Performance (PM3)</td>
<td>6</td>
<td>11/15/2018</td>
<td>Four-Year Performance Periods (starting 2018-2022)</td>
<td>Biennially (beginning, middle, and end of performance periods)</td>
</tr>
</tbody>
</table>
### FAST Act Performance Measures/Targets

#### Breakdown of NHS Pavement Good/Poor Condition Targets

<table>
<thead>
<tr>
<th>NHS ROADWAY CATEGORIES</th>
<th>TOTAL NETWORK</th>
<th>2018 BASELINE</th>
<th>2022 TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Good Pavement Condition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interstate National Highway System (NHS)</td>
<td>19.19%</td>
<td>66.80%</td>
<td>66.40%</td>
</tr>
<tr>
<td>Non-Interstate National Highway System (NHS)</td>
<td>80.81%</td>
<td>54.40%</td>
<td>52.30%</td>
</tr>
<tr>
<td><strong>Poor Pavement Condition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interstate National Highway System (NHS)</td>
<td>19.19%</td>
<td>0.30%</td>
<td>0.30%</td>
</tr>
<tr>
<td>Non-Interstate National Highway System (NHS)</td>
<td>80.81%</td>
<td>13.80%</td>
<td>14.30%</td>
</tr>
</tbody>
</table>

**North Central Texas Region**

<table>
<thead>
<tr>
<th>NHS ROADWAY CATEGORIES</th>
<th>TOTAL NETWORK</th>
<th>2018 BASELINE</th>
<th>2022 TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstates (On-system) *</td>
<td>25.90% **</td>
<td>5.81% ***</td>
<td>7.99% ***</td>
</tr>
<tr>
<td>Non-Interstate Freeway (On-system) *</td>
<td>13.40% **</td>
<td>6.76% ***</td>
<td>8.93% ***</td>
</tr>
<tr>
<td>Toll Roads (Off-system)</td>
<td>6.70% **</td>
<td>8.43% ***</td>
<td>9.32% ***</td>
</tr>
<tr>
<td>Arterials (On-system) *</td>
<td>30.30% **</td>
<td>18.52% ***</td>
<td>18.39% ***</td>
</tr>
<tr>
<td>Arterials (Off-system)</td>
<td>23.80% **</td>
<td>73.66% ***</td>
<td>69.82% ***</td>
</tr>
</tbody>
</table>

*“On-system” refers to the TxDOT System; **Mobility 2045 Plan – 2018 Baseline Network Lane Miles; ***Based on 5-year moving average*
FAST Act Performance Measures/Targets (cont.)

Regional Transportation Council (RTC) Action – Pavements

NCTCOG **Supports** TxDOT Statewide 2022 “Poor Condition” NHS Pavement Targets

- **Good**
  - NCTCOG **Supports** TxDOT Statewide 2022 “Good Condition” NHS Pavement Targets
  - Analysis of TxDOT Data for NCTCOG Region Indicates General Compatibility Across All NHS Roadway Categories

- **Poor**
  - NCTCOG **Supports** TxDOT Statewide 2022 “Poor Condition” NHS Pavement Targets
  - Collaboration to Plan/Program Projects Contributing Toward Accomplishment of Pavement Goals Will Also Include the Following Action:
    - NCTCOG Will Work With Local Governments to Expedite Improvements for NHS Off-System Arterials in “Poor Condition”
FAST Act Performance Measures/Targets (cont.)

Breakdown of NHS Bridge Good/Poor Condition Targets

<table>
<thead>
<tr>
<th>NHS ROADWAY CATEGORIES</th>
<th>2018 BASELINE</th>
<th>2022 TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State of Texas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good Bridge Condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All NHS Facilities*</td>
<td>50.63%</td>
<td>50.42%</td>
</tr>
<tr>
<td>Poor Bridge Condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All NHS Facilities*</td>
<td>0.88%</td>
<td>0.80%</td>
</tr>
<tr>
<td><strong>North Central Texas Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good Bridge Condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All NHS Facilities*</td>
<td>55.60%</td>
<td>61.30%**</td>
</tr>
<tr>
<td>Poor Bridge Condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All NHS Facilities*</td>
<td>2.00%</td>
<td>3.40%**</td>
</tr>
</tbody>
</table>

* Based on total deck area; ** Based on trend analysis
FAST Act Performance Measures/Targets (cont.)
Regional Transportation Council (RTC) Action – Bridges

- **NCTCOG Supports** TxDOT Statewide 2022 “Good Condition” NHS Bridge Targets
- Analysis of TxDOT Data for NCTCOG Region Indicates General Compatibility Across All NHS Roadway Categories

- **NCTCOG Supports** TxDOT Statewide 2022 “Poor Condition” NHS Bridge Targets
- Collaboration to Plan/Program Projects Contributing Toward Accomplishment of Bridge Goals Will Also Include the Following Action:
  - NCTCOG Will Work With TxDOT & Local Governments to Expedite Improvements for NHS Bridges in “Poor Condition”

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<table>
<thead>
<tr>
<th>Facility Carried</th>
<th>Feature(s) Crossed</th>
<th>County</th>
<th>NHS Category</th>
<th>Under Construction?</th>
<th>TIP?</th>
<th>UTP?</th>
<th>MTP?</th>
</tr>
</thead>
<tbody>
<tr>
<td>IH 345 SB</td>
<td>IH 30, US 75, &amp; DART Rail</td>
<td>Dallas</td>
<td>Interstate</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IH 345 NB</td>
<td>IH 30, US 75, &amp; DART Rail</td>
<td>Dallas</td>
<td>Interstate</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SH 310</td>
<td>S. Lamar Street, Budd Street, &amp; UP R/R</td>
<td>Dallas</td>
<td>On-System Arterial</td>
<td>No</td>
<td>Yes</td>
<td>Yes (CAT 6)</td>
<td>Yes</td>
</tr>
<tr>
<td>Belt Line Rd</td>
<td>Goff Branch</td>
<td>Dallas</td>
<td>Off-System Arterial</td>
<td>No</td>
<td>No</td>
<td>Yes (CAT 6)</td>
<td>Yes</td>
</tr>
<tr>
<td>Loop 12 NB to IH 35E NB</td>
<td>IH 35E SB</td>
<td>Dallas</td>
<td>Non-IH Freeway</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>IH 30 EB</td>
<td>FM 2642</td>
<td>Hunt</td>
<td>Interstate</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>IH 30 WB</td>
<td>FM 1903</td>
<td>Hunt</td>
<td>Interstate</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IH 30 EB</td>
<td>FM 1903</td>
<td>Hunt</td>
<td>Interstate</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>IH 30</td>
<td>FM 1565 O-P</td>
<td>Hunt</td>
<td>Interstate</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>IH 35W SB</td>
<td>IH 35W SB Alvarado Exit</td>
<td>Johnson</td>
<td>Interstate</td>
<td>No</td>
<td>No</td>
<td>Yes (CAT 6)</td>
<td>Yes</td>
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<tr>
<td>US 80 EB</td>
<td>E FK TRIN REL 1 &amp; SRV RD</td>
<td>Kaufman</td>
<td>Non-IH Freeway</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>US 80 EB</td>
<td>East Fork Trinity River</td>
<td>Kaufman</td>
<td>Non-IH Freeway</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>US 80 WB</td>
<td>Buffalo Creek Relief</td>
<td>Kaufman</td>
<td>Non-IH Freeway</td>
<td>No</td>
<td>No</td>
<td>Yes (CAT 6)</td>
<td>Yes</td>
</tr>
<tr>
<td>US 287 WB</td>
<td>Carey Street</td>
<td>Tarrant</td>
<td>Non-IH Freeway</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Ongoing Asset Management Efforts – Local Monitoring of Capital Improvement Program (CIP) Initiatives

- NCTCOG conducts routine local government requests for information on capacity, maintenance, and enhancement projects for roadways within the regional network:

- Current street improvement spending (via CIP or Bond Program) for largest DFW cities:
  - Dallas – $534 Million (2017)
  - Fort Worth – $262 Million (2018)
  - Arlington – $160 Million (2014)
  - Plano – $90 Million (2017)
  - Irving – $100 Million (2017)
  - Grand Prairie – $56 Million (2017)
  - Frisco – $125 Million (2015)
  - Mesquite – $125 Million (2015)

- While significant expenditures are allocated for lane-mile expansion to accommodate growth, increasing funds over time are directed toward preservation and rehabilitation.

- Expenditures not typically tracked in MPO documentation (MTP, TIP, CMP, etc...)

- Tracking is further complicated through “complete street” conversion processes.
Some local governments are reporting asset management status, needs, & goals for various purposes

Needs vastly outweigh resources and consistent goal attainability is difficult:
- City of Dallas (2019) – Pavements (11,775 lane-miles)
  - 2006 City Council goal – 87% overall satisfaction rate; > 80% all districts
  - November 2018 condition rating – 77%
  - FY 2019-23 Infrastructure Maintenance Program (IMP) – 63%
  - “Zero Degradation” – $1.66 Billion shortage over 10 years
- City of Irving (2017) – Pavements (1,440 lane-miles)
  - Average Pavement Condition Index (PCI) score – 72
  - > $800 Million/year to maintain PCI score

Multiple cities report that pavement deterioration rates are increasing over time.
Ongoing Asset Management Efforts – Local (cont.)
Climate/Weather Challenges to Mobility, Functionality, & Longevity
Eight of the top-10 warmest years in DFW have occurred after 1998:
- #1 – 2017; #2 – 2012; #3 – 2006; #4 – 2016
- Heat concerns at all hours of the day (high minimum temperatures also critical due to strong urban heat island effect)

Large DFW weather variations:
- 2011 Summer Heat = 72 days > 100° (average – 18 days)
- 2014 Annual Precipitation Total = 21.32 inches (fifth year of worst long-term drought since the 1950’s)
- 2015 Annual Precipitation Total = 62.61 inches (all-time record)
- 2017 Last Freeze – January 8th (average – March 12th)
- 2018 September/October Precipitation = 28.35 inches (all-time record for consecutive months; 21.58 inches above normal)
“Business-as-Usual” emissions scenario translates to substantial temperature increases and soil moisture reduction by year 2100:

- Mean temperature > 8°C compared to current average (extreme > 13°C)
- Lower annual rainfall, but punctuated by storms of greater intensity
- Infrastructure effects magnified due to large regional distribution of soils with high shrink-swell rates
Significant future temperature increases will accelerate pavement degradation and result in greater cracking/rutting, joint failures, and utility breaches.

Urbanization enhances regional heat island effect which amplifies moisture losses and structure destabilization rates.

Many critical roadway segments cross the 100-year floodplain, exist in flood-prone and/or poorly drained locations, or among predominately impervious surface areas.

Substantial additional data required (elevation, materials, design, event detection/response plans, mitigation effects, etc.) to define overall vulnerability.
Expanding Asset Optimization Efforts
Identifying Local Asset Needs & Delivering Critical Services

- North Texas SHARE Program:
  - Determine needs/solutions through collaboration and cooperative purchasing programs through procured private vendors
  - Pavement Analysis Services (started in 2016):
    - Choice of four highly-qualified vendors
    - Continually mobile to reduce equipment fees and allows bulk-level purchasing efficiency
    - Digital imaging, budget estimates, ADA ramp placement, condition scoring/analysis, and training
    - Initial start-up for shared regional database (PM2 data for “off-system” NHS)

- Public Works Construction Standards:
  - NCTCOG Public Works Council (PWC) product
  - Promotion of “green infrastructure” plus increased asset/stormwater management emphasis and consistency in 5th Edition (2017)
Expanding Asset Optimization Efforts *(cont.)*

**Incorporation with Hazard Mitigation Planning Efforts**

- **Emergency Preparedness Coordination:**
  - Greater inclusion of transportation considerations within official city/county hazard mitigation plans
  - Pursuing Federal grant for Regional Data & Communications Hub building from 511DFW, Waze, & other architecture/distribution platforms

- **Texas State Flood Assessment (2018):**
  - Comprehensive review of existing programs, risks, and needs for floodplain management/mitigation
  - Resulted in January 2019 Interim Report to the 86th Texas Legislature from the House Committee on County Affairs:
    - Evaluate whether counties have necessary ordinance-making and enforcement authority to deal with flood risk in rural/suburban areas
    - Explore *regional* floodplain regulation approaches, allowing counties that share watersheds to adopt similar regulations, as allowed by the Texas State Water Code
Expanding Asset Optimization Efforts (cont.)

Infrastructure, Land Use, and Sustainability Management

- **Integrated Stormwater Management (iSWM):**
  - Incorporate effective, low-impact, uniform, and sustainable stormwater management strategies within site development practices and construction projects.
  - Guidance and tools aiding public/private sectors to:
    - Design/maintain infrastructure and development sites mindful of potential drainage impacts.
    - Address runoff effects to achieve short-term water quality protection and flood mitigation goals while also improving overall system resiliency.

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![Image of stormwater management examples](image_url)
Expanding Asset Optimization Efforts (cont.)

Integrated Regional Transportation & Stormwater Management Study

**WHY:** Comprehensive, collaborative planning will dissolve silos and improve delivery of consolidated, adaptive infrastructure *before* expected population growth, urban development distribution/intensity, and expected levels of service make addressing these issues more difficult and costly.
Expanding Asset Optimization Efforts (cont.)

Integrated Regional Transportation & Stormwater Management Study

**WHO:** A working group of partners and stakeholders to carry out a comprehensive planning effort across all/portions of Dallas, Denton, Ellis, Johnson, Parker, Tarrant, and Wise counties

**HOW:** Partner contributions are critical to making this possible; process to secure funds is underway (Project Funding Goal = $10 Million)
Expanding Asset Optimization Efforts (cont.)

Integrated Regional Transportation & Stormwater Management Study

**WHAT:** 2017 “Natural Hazard Mitigation Saves” Report by: National Institute of Building Sciences, Multi-Hazard Mitigation Council (MMC), directed by the U.S. Congress: **$5 – $7 return for every $1 invested to alleviate riverine flooding risks**

**Prevention vs. Response Measures:**

**Transportation Infrastructure**
- Structure Elevation / Culverts / Model Growth
- Transportation “LEED” Certification (Lake Ray Roberts / Lake Lewisville)
- “Green Parkway” Widths / Detention

**Safety**
- Technology / Routing
- Prioritization / Low-Lying Facilities

**Environmental Features**
- Tree Farms / Intentional Saturation
- Filtration / Recharge
- Wetland / Stream Mitigation Banks

**Stormwater**
- Minimize / Delay Downstream
- Tools, Data, Experts

**Stewardship as a Revenue Element**
- Horse Farms
- Eco-Tourism

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**Table 1. Benefit-Cost Ratio by Hazard and Mitigation Measure.**
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Transportation

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Emergency Preparedness

June 26, 2019

Panel Discussion – Addressing Resiliency in Regional Transportation Plans
TxDOT/Texas A&M TTI Workshop – Arlington, TX