Shameless Plug

IHEEP 2018

Hosted by Nebraska DOT
IHEEP 2018 President – Jon Starr
23-27 September 2018
North Carolina Department of Transportation

Asset Management, Polices and Tools for Bridges
The N.C. Department of Transportation (NCDOT) is responsible for all modes of transportation in North Carolina, including highways, rail, aviation, ferries, public transit and bicycle and pedestrian transportation. It also includes the state’s Division of Motor Vehicles (DMV), which oversees driver license issuance and vehicle registration along with other operations related to motor vehicles in our state, and the Governor’s Highway Safety Program, which promotes safety awareness to reduce roadway crashes and fatalities. In addition, NCDOT also helps expand economic growth opportunities through oversight of the State Ports, the N.C. Global TransPark and N.C. Turnpike Authority.
one of the largest state-maintained highway systems in the nation with nearly 80,000 miles of road

more than 13,500 bridges
Inspectors check about 9,000 of these bridges and culverts each year.

nearly 15,000 miles of primary highways (Interstate, US and NC routes)
nearly 65,000 miles of secondary roads

Every year, more than 56 million passengers fly to and from North Carolina and over 1.3 billion pounds of cargo pass through the state’s airports.

nearly 3,300 miles of mainline railroad track and 6,218 total at-grade railroad crossings in North Carolina

2nd largest state-operated ferry system and the largest on the East Coast

21 ferries that serve 7 routes
about 2 million passengers rely on this service

more than 5,000 miles of regional or statewide bicycle and pedestrian routes planned
funding sources and allocation

NCDOT has an annual budget of about $4.7 billion to build, operate and maintain the state’s diverse transportation network.

Highway Fund (Operations and Maintenance)
- 60% Total State Revenues
  - 71% Motor Fuel Tax
  - 29% Trust Fund
  - 30% DMV Fees
  - 20% Highway Use Tax

Trust Fund (Capital Projects)
- 40% Total State Revenues
  - 70% Motor Fuel Tax
  - 10% Fees
  - 20% General Fund

State Funding
- 75% Overall
  - Actual: $4,279,664,228
  - Forecast: $4,735,000,000
  - Total: $5,548,982,009

Federal Funding
- 25% Overall
  - Actual: $1,269,317,781

2018 HEEP AREA V / TEM meeting
May 28-30
Prague, Czech Republic
expenses

**Maintenance** Actual: $1,411,365,816
- Primarily supports projects that help take care of the state’s existing transportation system. This includes resurfacing highways, replacing bridges and paving unpaved secondary roads. Funds are distributed across North Carolina based on need.
- 25%

**Modes** Actual: $357,175,513
- The Highway Fund also supports the Powell Bill Program, which provides state aid to municipalities for pedestrian, bicycle and road improvements.
- 8%

**Administrative** Actual: $738,002,444
- 17%

Forecast: $5,171,000,000
Total: $5,285,722,504

**Construction** Actual: $2,779,178,730
- Primarily funds new construction and expansion projects across all modes of transportation. Funding is allocated on local, regional and statewide levels based on data and input from local planning organizations and NCDOT divisions. Federal funding accounts for about 45 percent of NCDOT’s available funding for these types of projects.
- 50%
NCDOT is responsible for the second largest state-maintained road network in the United States and continues to grow its asset portfolio. North Carolina’s highway assets have a value of roughly $575 billion and the Department is responsible for ensuring this value is retained for future generations. Figure 4 below summarizes the quantity of major assets being managed and their value:

**Figure 4: Highway Asset Portfolio**

<table>
<thead>
<tr>
<th>Highway Asset Type</th>
<th>Approximate Quantity</th>
<th>Estimated Asset Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridges (number)</td>
<td>13,500</td>
<td>$60 billion</td>
</tr>
<tr>
<td>Pavement (lane miles)</td>
<td>163,000</td>
<td>$62 billion</td>
</tr>
<tr>
<td>Other Roadway Assets (centerline miles)</td>
<td>80,000</td>
<td>$446 billion</td>
</tr>
<tr>
<td>Large Pipes and Culverts (each)</td>
<td>27,000</td>
<td>$7 billion</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>NA</strong></td>
<td><strong>$575 billion</strong></td>
</tr>
</tbody>
</table>

Much of the system is growing and the committed portion, or the first 5 years of the 2016-2025 State Transportation Improvement Plan (STIP) will add roughly 1,200 lane miles of new capacity and 170 new bridges to the system, which in turn entail growing maintenance and operations responsibilities. This growth is further increased by the vast and growing subdivision routes that DOH also maintains. This growing portfolio underlines the importance of a robust and effective maintenance and operations program.
Most of the bridges on the state system were designed for a useful life between 50-60 years.

**Structurally Deficient Bridges by Age**

- **<40 years**: 6,313, 25%
- **40-49 years**: 2,032, 31%
- **50-59 years**: 3,077, 21%
- **60-69 years**: 1,405, 31%
- **>70 years**: 657, 21%

Legend:
- Blue: Number of Bridges
- Orange: Percent SD
North Carolina’s bridge portfolio consists of approximately 13,500 bridges statewide of which 13% are considered SD.

### Percent SD Bridges Comparison, 2013 vs. Current (2016)

<table>
<thead>
<tr>
<th>System / Year</th>
<th>2013</th>
<th>Current (2016)</th>
<th>Impact / Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate</td>
<td>6%</td>
<td>4%</td>
<td>-2%</td>
</tr>
<tr>
<td>Primary</td>
<td>11%</td>
<td>9%</td>
<td>-2%</td>
</tr>
<tr>
<td>Secondary</td>
<td>24%</td>
<td>17%</td>
<td>-7%</td>
</tr>
<tr>
<td>Statewide (weighted average)</td>
<td>19%</td>
<td>13%</td>
<td>-6%</td>
</tr>
</tbody>
</table>
Section Summary – Bridges

This section describes the BMIP – the planning process, work performed by Divisions, and funding implications. A summary of key observations are provided below:

- State funding of $250 million annually meets the need for structurally deficient bridge improvement.
- However, to mitigate risks, managing deterioration of “high value” bridges is important
  - There are 185 high value bridges each with an estimated replacement cost between $20 million and $300 million.
  - If allowed, continued deterioration will require replacement of these bridges.
  - The number of substantially deficient bridges will increase and Bridge Program funding would be consumed at a faster pace, resulting in an inability to meet established SD targets by 2030.
  - High value bridge preservation of $30 million annually can significantly extend the service life – preventing them from becoming structurally deficient and in need of replacement.
The Department performs a safety inspection on each of its bridges and NBIS culverts every 24 months. Through this process, maintenance needs are identified and prioritized by the Structures Management Unit. In addition, division bridge maintenance offices perform annual reviews of each bridge to identify maintenance needs. These bridge maintenance needs are categorized into the following priorities:

- **Critical Finds** – Needs that require immediate response to ensure safety, or restore necessary weight limits.
- **Priority Maintenance** – Needs that may result in a safety concern or reduce the posted weight limit in the near term.
- **Planned and Routine Maintenance** – Needs, that if addressed, will slow deterioration and reduce future lifecycle costs and unplanned service disruptions.

Division bridge maintenance crews are responsible for addressing these needs with their GMR allocation.
What are our Service Levels (bridge.  

<table>
<thead>
<tr>
<th>Target</th>
<th>Condition Element</th>
<th>Performance Measure</th>
<th>Interstate</th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIDGES AND OTHER STRUCTURES</td>
<td>Percent of SD Bridges</td>
<td>Percent of structurally deficient bridges by system and statewide target of 10% by 2030</td>
<td>4</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>NBIS Culverts</td>
<td>Condition Rating &gt;= 6</td>
<td></td>
<td>85</td>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>Non-NBIS Culverts</td>
<td>Condition Rating = Good</td>
<td></td>
<td>99</td>
<td>98</td>
<td>97</td>
</tr>
<tr>
<td>Overhead Sign Structures</td>
<td>Condition Rating = Good</td>
<td></td>
<td>90</td>
<td>90</td>
<td>N/A</td>
</tr>
</tbody>
</table>

How were they established?  

**Carefully** – Trial and Error
Do you make cost-benefit Analysis when establishing service levels in Maintenance- to decide what should be the service level and how it influence lifetime value of the asset? How do you measure this service level?

Not Really
Do you IT tools to support the processes of performance measurement?

**BMS** – Bridge Management System Agile Assets module

**BDS** – Bridge Design System

**Wiggins** – Bridge Inspection, Inventory and Prompt Action system

**MMS** – Maintenance Management System

**CARS** – Citizen Action Request

**SAP** – Financial System
Do you have more – Output service levels & KPIs (quantity of work i.e. km maintained, # of culverts cleared).

**Transitioning to.** NCDOT is more concerned with Level of Service i.e. # signs replaced, miles paved etc.

Or more outcome service levels & KPIs (so results i.e. m^2 of deficient pavement, % of culverts plugged)

Rather report what is working rather than amount that isn’t

Do you use life cycle planning to support asset management (as stated in the FHWA document from November 2017?)

**Transitioning to** Slowly
Recent allocations have been sufficient to address Critical Finds, Priority Maintenance, and emergency pipe replacements, but most planned and routine maintenance needs have lacked attention because of their relative low priority.

The **RMIP** (Routine Maintenance Improvement Plan) was established in 2016 as a planning and communication tool for Divisions to identify production goals and allocate funding based on targets and objectives.
Key objectives of the RMIP are outlined below:

The RMIP holds divisions accountable to their budget allocation.

Each Division allocates 75% of their GMR funds to specific planned and reactionary activities in their plan. In addition, Divisions also commit to meeting their production goals expending their allocation by the end of the fiscal year. This unplanned allocation provides divisions with flexibility to support reactionary needs that cannot be anticipated during development of plans at the beginning of each year.

The RMIP verifies that divisions are allocating funds to planned activities.

Plans drive performance and communicate where Divisions will spend their funds. The RMIP will also identify the type of activity (i.e. planned or reactive), and focus on defining and reducing unit cost. These plans will be developed by the Divisions and County Engineers relying on local/ historical knowledge to ensure work is being performed on routes and assets that will better the system condition.
Few closing observations:

• Know who your audience is.

• Remember there are no magic numbers.

• Just because you have the money doesn’t mean you have the means.

• Use common sense and listen to your staff.
Highway Performance Profile:
INFRASTRUCTURE HEALTH CONDITION SCORES

BRIDGE HEALTH INDEX (% GOOD)

<table>
<thead>
<tr>
<th>Division</th>
<th>Interstate</th>
<th>Primary</th>
<th>Secondary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100.0</td>
<td>87.1</td>
<td>76.0</td>
<td>73.1</td>
</tr>
<tr>
<td>2</td>
<td>N/A</td>
<td>87.1</td>
<td>68.0</td>
<td>72.2</td>
</tr>
<tr>
<td>3</td>
<td>100.0</td>
<td>85.3</td>
<td>64.3</td>
<td>75.2</td>
</tr>
<tr>
<td>4</td>
<td>97.4</td>
<td>85.5</td>
<td>66.9</td>
<td>78.0</td>
</tr>
<tr>
<td>5</td>
<td>97.1</td>
<td>85.9</td>
<td>76.4</td>
<td>82.8</td>
</tr>
<tr>
<td>6</td>
<td>75.0</td>
<td>83.9</td>
<td>70.6</td>
<td>76.4</td>
</tr>
<tr>
<td>7</td>
<td>92.1</td>
<td>70.6</td>
<td>67.1</td>
<td>72.2</td>
</tr>
<tr>
<td>8</td>
<td>87.5</td>
<td>83.0</td>
<td>68.8</td>
<td>74.7</td>
</tr>
<tr>
<td>9</td>
<td>94.9</td>
<td>67.0</td>
<td>78.6</td>
<td>75.7</td>
</tr>
<tr>
<td>10</td>
<td>90.7</td>
<td>79.5</td>
<td>74.7</td>
<td>79.0</td>
</tr>
<tr>
<td>11</td>
<td>94.3</td>
<td>79.2</td>
<td>58.2</td>
<td>62.3</td>
</tr>
<tr>
<td>12</td>
<td>71.8</td>
<td>83.6</td>
<td>72.8</td>
<td>75.8</td>
</tr>
<tr>
<td>13</td>
<td>85.4</td>
<td>78.6</td>
<td>69.2</td>
<td>72.3</td>
</tr>
<tr>
<td>14</td>
<td>71.1</td>
<td>84.6</td>
<td>66.1</td>
<td>69.7</td>
</tr>
<tr>
<td>Statewide</td>
<td>89.5</td>
<td>81.3</td>
<td>68.3</td>
<td>73.9</td>
</tr>
</tbody>
</table>

Notes:
1. Bridge Condition is defined as the percentage of bridges rated in good condition as of June 30, 2017.
2. Division 2 does not maintain any Interstate mileage.

2016–17 performance scorecard

<table>
<thead>
<tr>
<th>Goal: PERFORMANCE MEASURE</th>
<th>Previous Result</th>
<th>Current Result</th>
<th>Target Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make transportation safer: FATALITY RATE</td>
<td>1.26</td>
<td>1.21</td>
<td>✓</td>
</tr>
<tr>
<td>Provide GREAT customer service: CUSTOMER SURVEY SCORE</td>
<td>84.4%</td>
<td>84.4%</td>
<td>×</td>
</tr>
<tr>
<td>Deliver and maintain our infrastructure effectively and efficiently: COMBINED INFRASTRUCTURE HEALTH SCORE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achieve an infrastructure health composite index of 75 percent or greater</td>
<td>74%</td>
<td>74%</td>
<td>✓</td>
</tr>
<tr>
<td>Improve the reliability and connectivity of the transportation system: HIGHWAY TRAVEL TIME INDEX</td>
<td>0.99</td>
<td>1.00</td>
<td>✓</td>
</tr>
<tr>
<td>Improve the reliability and connectivity of the transportation system: PUBLISHED SCHEDULE SUCCESS RATE (ON-TIME PERFORMANCE OF FERRY AND PASSENGER RAIL SERVICE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase the percentage of time when trips with published schedules are met to 80 percent or greater</td>
<td>75%</td>
<td>74%</td>
<td>×</td>
</tr>
<tr>
<td>Promote economic growth through better use of our infrastructure: ECONOMIC INDICATORS</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Make our organization a great place to work: EMPLOYEE SURVEY</td>
<td>5.50</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1 Although no specific performance measure was targeted, the department has made strides in promoting economic growth.
2 The employee engagement survey is only conducted every other year.
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

2017 annual report
PERFORMANCE
Any Questions, Comments or Derogatory Statements?
at either of the following addresses

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randerobinson@gmail.com
Hope to see everyone at the 60th annual International Highway Engineering Exchange Program Conference in Lincoln, Nebraska

23-27 September 2018
Final Shameless Plug

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