Highway/Bridge White Paper

The Michigan Department of Transportation (MDOT) 2010-2035 *MI Transportation Plan Highway/Bridge White Paper* presented a brief overview of Michigan's trunkline roadway system. It included information on the inventory of system assets, condition and performance. This white paper provides an update of the inventory statistics, system condition reports and system performance data.

Trunkline System Inventory

a. MDOT has jurisdictional responsibility for 9,668 route miles of state trunkline highways, which consist of all I, M, and US-numbered routes, and 4,451 bridges.
b. Michigan's system of state trunkline highways, county roads, and city streets totals 121,209 route miles. The state trunkline system, managed by MDOT, comprises 8 percent (9,668 miles) of Michigan's roadway network and carries 53 percent of total statewide traffic. County roads and city streets together consist of 92 percent (111,541 miles) of Michigan's roadway system, but carry less than half of the statewide traffic.
c. MDOT has jurisdictional responsibility for 4,451 trunkline bridges that have more than 48 million square feet of bridge deck area. Approximately 1,700 (38 percent) of MDOT's bridges are on major freeways: I-75, I-94, I-96 or I-69. MDOT bridges are much larger and carry more traffic than local jurisdiction bridges. MDOT is responsible for 41 percent of all Michigan's bridges, which accounts for 73 percent of the bridge deck area of all Michigan roadway bridges.
d. Highway non-pavement infrastructure includes signs, pavement marking, guardrails, signals, drainage structures, weigh stations, nonmotorized facilities, lighting, pump stations, carpool parking lots, rest areas, and noise abatement barriers. Below are statistics regarding some of this infrastructure:
    - There are 245 carpool parking lots (CPLs) spread across the state, several of which are public-private partnerships. MDOT also has 17 lots created through an agreement with the Meijer Corp.
    - MDOT owns and operates 165 pump stations, of which 138 are located in Oakland, Macomb and Wayne counties. Pump stations play an integral role in maintaining highway operations. They prevent flooding and in turn mitigate lane closures, traffic slowdowns, and traffic accidents, and contribute to the overall health of the roadway.
    - MDOT has a statewide system of approximately 70 miles of noise barriers. These 70 miles are made up of 249 individual noise barriers located along MDOT's trunkline system. They are in the southern half of the Lower Peninsula, primarily in five counties (Wayne, Washtenaw, Macomb, Oakland, and Kalamazoo). Noise barriers are also located in the cities of Grand Rapids, Flint, and Lansing.
    - There are 78 rest areas in the state, 14 of which are Welcome Centers, serving approximately 40 million visitors annually, with 40 percent serving 500,000 or more visitors.
    - MDOT provides 15 weigh stations and 38 virtual sites that are operated by the Michigan State Police Commercial Vehicle Enforcement Division (MSP/CVED).

Trunkline System Condition

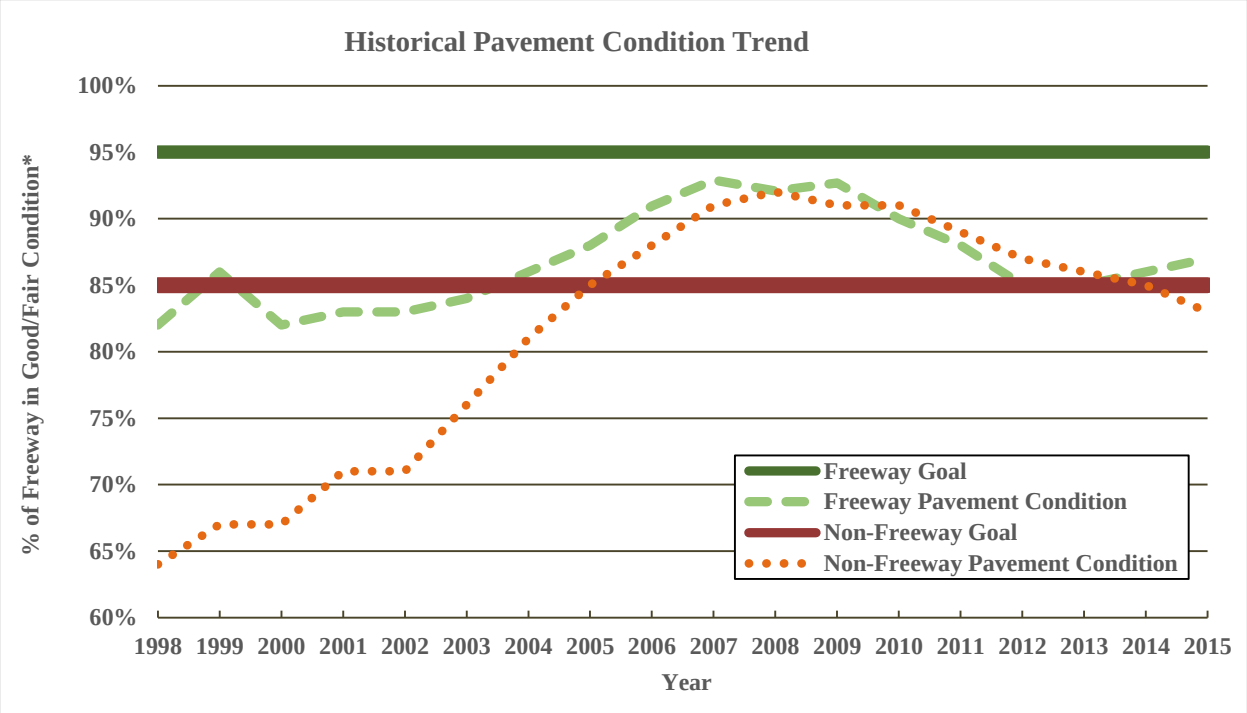
The overall condition of the system can be displayed in terms of pavement, bridge, and non-pavement infrastructure condition. Below is a summary of the two largest infrastructure types: pavement and bridge.

Pavement Condition Goal:

The performance measure used for Michigan trunkline pavement is remaining service life (RSL). RSL is the forecast estimate of time until reconstruction or a major rehabilitation treatment will most likely be more cost-effective than preventive maintenance for a segment of pavement. Pavements that have a RSL of zero to two years are in poor condition; three to seven years are in fair condition; and eight or more years are in good condition. MDOT's current pavement condition goals are to maintain 95 percent of pavement in good or fair condition on the freeway system and 85 percent good or fair on the non-freeway system. Currently, MDOT is at 87 percent good or fair condition on the freeway and 82 percent good or fair condition on the non-freeway.

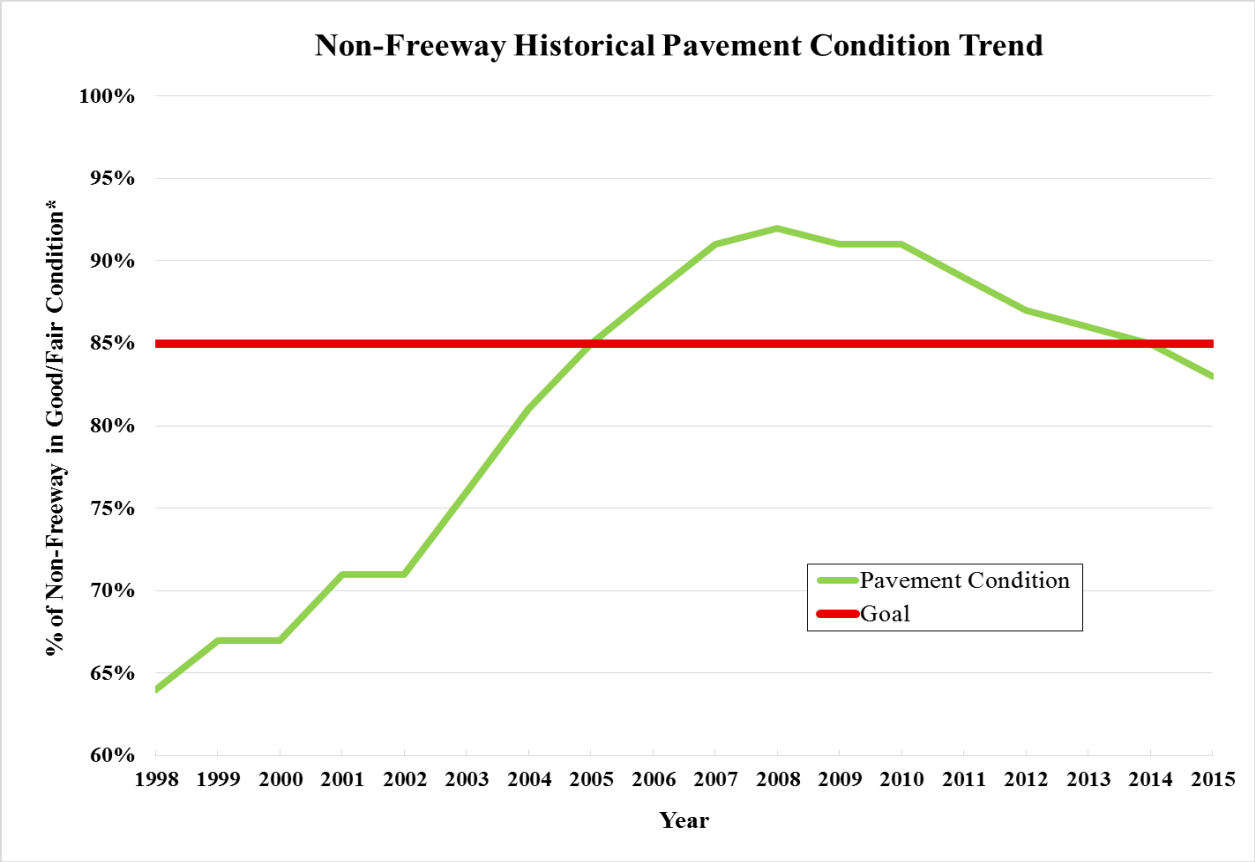
a. The freeway system pavement condition peaked at 93 percent good and fair in 2007, not meeting the 95 percent goal. (Figure 1).
b. Unlike the freeway system, the non-freeway reached the 85 percent goal in 2005 and remained above goal until 2015 (Figure 2).

Figure 1: Freeway Historical Pavement Condition Trend



*Good/fair condition based on RSL performance measure
Source: Michigan Department of Transportation, Road Quality Forecasting System

Figure 2: Non-Freeway Historical Pavement Condition Trend



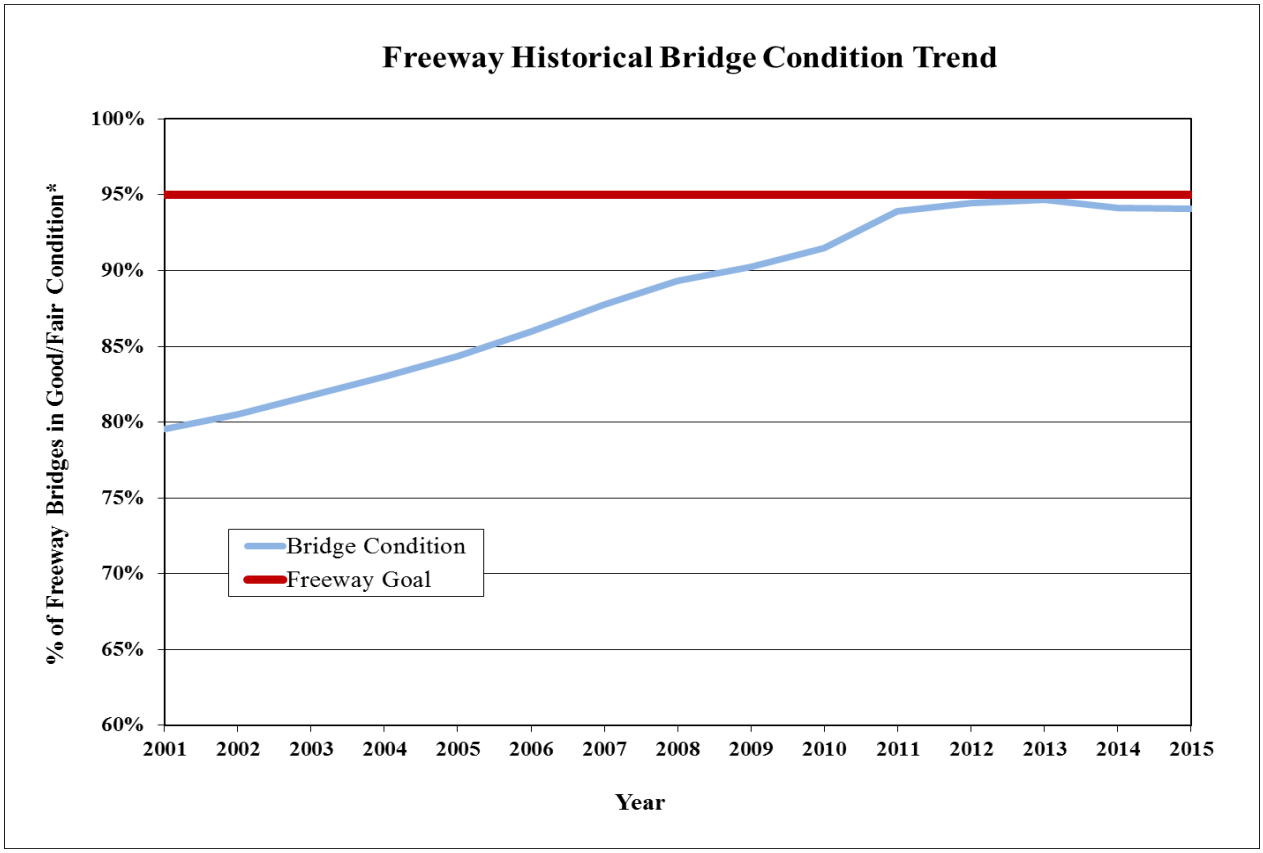
*Good/fair condition based on RSL performance measure
Source: Michigan Department of Transportation, Road Quality Forecasting System

Bridge Condition Goal:

The performance measure used for Michigan trunkline bridges is the National Bridge Inventory (NBI) rating scale. The NBI rating scale is a method for determining the bridge condition (good, fair or poor) based on a rating scale of 0-9. MDOT's bridge condition goals are to maintain 95 percent of the bridges in good or fair condition on the freeway system and 85 percent on the non-freeway system. Currently, the freeway and non-freeway bridges are at 94 percent good or fair condition.

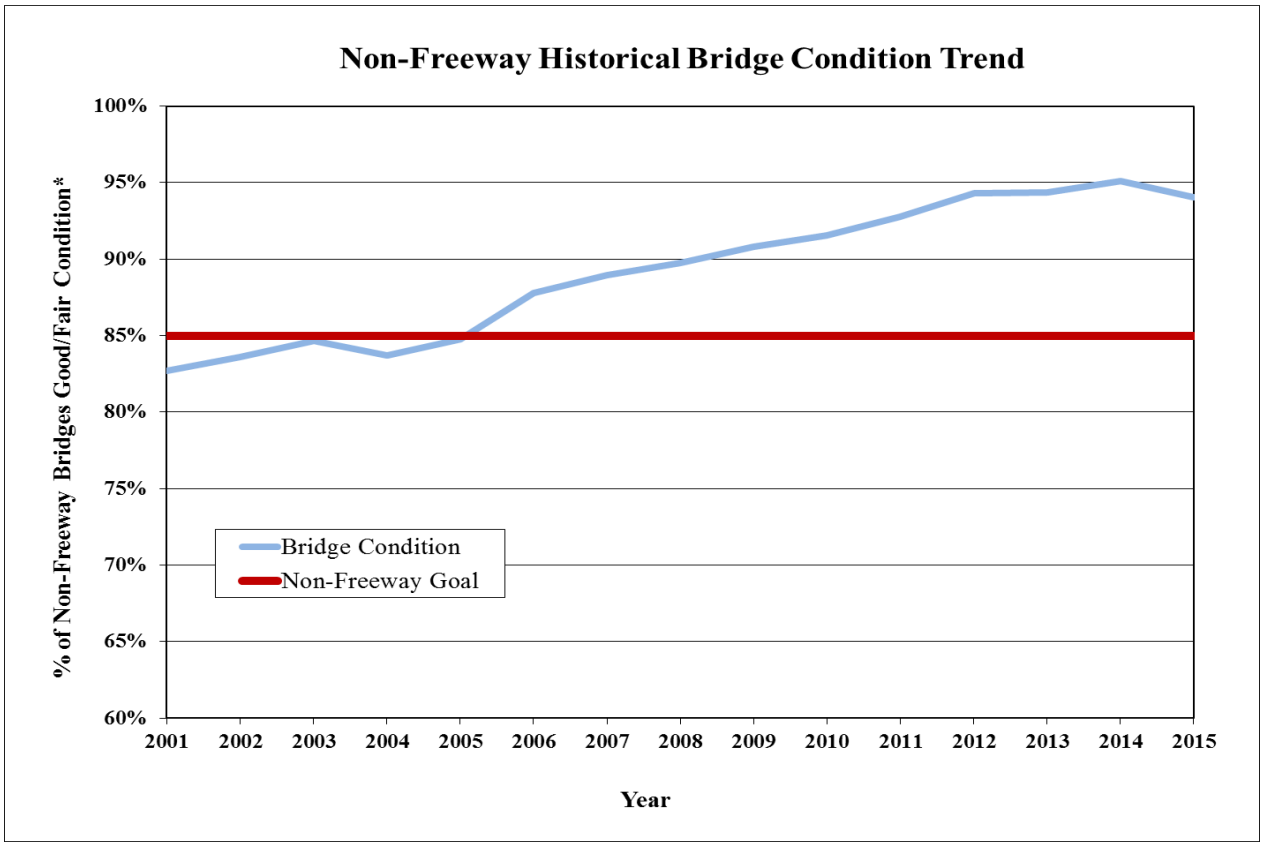
a. Freeway bridge condition peaked at approximately 94 percent good or fair in 2013, after which the condition declined (Figure 3).
b. MDOT has been able to maintain the goal of 85 percent bridges in good or fair condition on the non-freeway system (Figure 4).

Figure 3: Freeway Historical Bridge Condition Trend



*Good/fair condition based on NBI performance measure
Source: Michigan Department of Transportation, Bridge Condition Forecasting System

Figure 4: Non-Freeway Historical Bridge Condition Trend



*Good/fair condition based on NBI performance measure
Source: Michigan Department of Transportation, Bridge Condition Forecasting System

Trunkline System Performance

Since 2010, Michigan's economy has slowly began to improve. Traffic and congestion are now beginning to rise, but at a very moderate rate. The 2014 vehicle miles traveled (VMT) totals (used as a base) are slightly higher than the 2011 totals used as a base for the 2035 MITP. The Corridors and International Borders White Paper show those specific comparisons.

New traffic estimates project 2040 VMT on the trunkline system to be higher than traffic levels forecasted in the 2035 MITP. This includes 2040 commercial vehicle miles traveled (CVMT). CVMT is forecast to be higher than previous projections. Congestion levels (both congested and approaching congested) for 2040 also are significantly increased. Overall, traffic volumes on the trunkline system from 2014 to 2040 are projected to increase. This is not enough to make up for the losses over the last decade. In general, the projections are higher than the 2035 MITP, which came immediately following the recession of 2008, but are still lower than the original 2005-2030 MITP, which preceded the recession.

In 2040, 5.5 percent of urban freeway VMT will be considered congested and 33 percent will be approaching congested. Previous 2035 estimates showed 5 percent and 30 percent, respectively. This also is consistent with what is projected for urban non-freeway VMT. For 2040, it is

estimated that 23 percent of the VMT will be congested and 16 percent will be approaching congested. Previous estimates showed 18 percent and 14 percent, respectively, in 2035.

Since the 2005-2030 MITP was originally issued, several resources have been made available to examine congestion and include methods to address these problems:

- As stated in the *Goals, Objectives, and Performance Measures White Paper*, the *Transportation System Condition Report* has been developed to provide data on the condition and performance of Michigan's publicly owned transportation system.
- *A Michigan Toolbox for Mitigating Traffic Congestion* is a guide intended to be both a useful desk reference for practitioners and an educational tool for elected officials acting through public policy boards. The congestion mitigation strategies documented and presented within the guide will ultimately provide physical benefits to the users of Michigan's roadway network. Through the use of this toolbox, and good judgment by the practitioner through the review and approval of the appropriate policy board members, the traveling public will benefit.
- *Where Are We Going? Current and Future Pavement and Bridge Conditions, Safety and Congestion Levels of Michigan's Roadways and the Impact on Michigan Households, Based on Investment Levels over the Next Decade*, produced by TRIP, a Washington, D.C., transportation group, identifies the cost related to pavement, bridge, safety, and congestion.

Issues and Challenges

Special issues and considerations for highway and bridge planning include:

a. A significant amount of pavement is in fair condition. Even with the recent passage of increased state and federal transportation revenue, many of these pavements, if not addressed soon, will fall into poor condition. Once pavements deteriorate into the poor category, it is more costly to bring them back into good condition.
b. Scour critical bridges are bridges that may be compromised by rapidly flowing water during flood events. MDOT has more than 400 structures identified as scour critical bridges and has emphasized addressing scour critical bridges carrying the interstate. Mitigating or replacing these bridges for potential flood and high water events contributes significantly to the cost of Michigan's overall highway needs.
c. Because geometric standards (such as bridge under-clearance, minimum shoulder distances, etc.) have changed since many of Michigan's bridges were constructed, the expense of bridge rehabilitation and replacement projects must take into account today's standards. Similarly, a number of good or fair condition bridges must be replaced to bring road corridors up to standard. This contributes to the increased financial need for bridge improvements.
d. Pavement deterioration, congestion, crashes, and a lack of connectivity to activities and other modes are all potential performance barriers for the highway and bridge system. These barriers threaten the performance of not only highways and bridges, but also other components of the system that depend on safe, sustainable, and reliable roadway connections.