Chapter 3

ASSET MANAGEMENT PERFORMANCE MEASURES AND TARGETS
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ASSET MANAGEMENT PERFORMANCE MEASURES AND TARGETS

Overview

MnDOT has used a performance-based approach to managing its transportation assets since the mid-1990s and made it a formal part of its business process in 2003. The ongoing measurement and review process allows MnDOT to evaluate the efficiency of service delivery and to assess the effectiveness of program activities. This objective-based approach increases transparency and encourages innovation by keeping the focus on outcomes.

Existing Performance Measures and Targets

MnDOT’s performance-based approach to asset management relies on performance measures to assess system performance, identify needs, and develop investment priorities. Historically, these measures have included state highway ride quality and bridge condition. Additional performance measures, tracking things like culvert and stormwater tunnel condition, have been monitored and used internally for managing asset-specific programs; however, they have not been used at the system level for establishing budget requirements. Figure 3-1 lists MnDOT’s performance measures as of the 2013 adoption of the State Highway Investment Plan (MnSHIP), by asset category. Short descriptions of each measure’s rating scale and criteria are also included, along with MnSHIP targets, where applicable. Targets are the subject of the final two sections of this chapter. Visual representations of the performance rating scales can be found in Figure 4-5, Figure 4-6, Figure 4-7, and Figure 4-8 in the next chapter.

As part of its pavement and bridge management activities, MnDOT regularly conducts condition surveys in order to identify deficiencies in need of addressing. For pavements, MnDOT uses a specialized van that collects data regarding the amount of cracking present and the smoothness of the ride. This information is used to determine a Surface Condition Rating and a Ride Quality Index, the latter of which defines whether a road is in Good, Fair, or Poor condition. A Pavement Quality Index, which combines surface condition and ride quality ratings, is also calculated for reporting statewide conditions and to determine if other agency performance requirements are met (see discussion of GASB 34, below). Information regarding pavement condition on the National Highway System (NHS) is reported to the Federal Highway Administration (FHWA) each year.
Most bridges are inspected on two-year intervals; results are reported to the FHWA. Bridge inspections assess the condition of the decks, superstructures, substructures, and culverts using a standardized, national survey procedure. Inspection results are used to determine which bridges are in Good, Satisfactory, Fair, or Poor structural condition. Bridges in Good, Satisfactory or Fair condition generally require only maintenance or preservation activities, while bridges in Poor condition may require major capital investments.

Inspections of other assets are typically performed less frequently. For highway culverts, a MnDOT-developed statewide geographic information application – known as HydInfra – is used to manage the inventory, as well as inspections and maintenance activities. During inspections, a condition rating is assigned to each culvert. The ratings range from 1 to 4, with 1 representing a feature in Like New condition and 4 representing a feature in Very Poor condition with serious deterioration. In addition to reporting the feature condition, the HydInfra rating is used to set the inspection frequency. For instance, pipes with an overall rating of 4 (Very Poor) may be inspected annually or every two years, while a pipe with a rating of 1 or 2 (Like New or Fair) may be inspected as infrequently as once every six years. Deep stormwater tunnel inspection and reporting protocols are currently being updated to align with those of highway culverts.

Overhead sign structures were recently inspected by an independent consultant hired by MnDOT. Efforts are underway to develop a standardized inspection procedure for overhead sign structures. An inspection process for high-mast light tower structures was developed in 2001 and recently updated.

### Figure 3-1: Performance Measures by Asset Type

<table>
<thead>
<tr>
<th>ASSET TYPE</th>
<th>PERFORMANCE MEASURE</th>
<th>EXPLANATION</th>
<th>TARGET</th>
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<tbody>
<tr>
<td>Pavements</td>
<td>Share of system lane miles with Poor ride quality</td>
<td>Ride quality is assessed using MnDOT’s Ride Quality Index, which is a measure of pavement smoothness as perceived by the typical driver. Pavement rated Poor can still be driven on, but the ride is sufficiently rough that most people would find it uncomfortable and may decrease their speed.</td>
<td>≤ 2% (NHS)  ≤ 3% (Non-NHS)</td>
</tr>
<tr>
<td>Bridges</td>
<td>NHS bridges in Poor condition as a percent of total NHS bridge deck area</td>
<td>Bridge condition is calculated from the results of inspections on all state highway bridges. The ratings combine deck, superstructure, and substructure evaluations. Bridges rated Poor are safe to drive on but are reaching a point where it is necessary to either replace the bridge or extend its service life through significant investment.</td>
<td>≤ 2% (NHS)  ≤ 8% (Non-NHS)</td>
</tr>
<tr>
<td>Highway Culverts</td>
<td>Share of culverts in Poor or Very Poor condition</td>
<td>Highway culvert condition is assigned during inspections. Culverts in Poor condition display cracks or joint separation, while those in Very Poor condition exhibit holes and more significant joint separation resulting in a loss of surrounding (road bed) material.</td>
<td>NA</td>
</tr>
<tr>
<td>ASSET TYPE</td>
<td>PERFORMANCE MEASURE</td>
<td>EXPLANATION</td>
<td>TARGET</td>
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<tr>
<td>Deep Stormwater Tunnels</td>
<td>Tunnels in Poor and Very Poor condition, measured as a percent of total tunnel system length</td>
<td>Deep stormwater tunnel condition is assigned during inspections. Inspections identify and measure cracks, fractures, and voids behind the tunnel liners. Tunnels in Poor condition have significant cracks and voids behind the unreinforced tunnel liner. Tunnels in Very Poor condition display defects that require timely corrective action.</td>
<td>NA</td>
</tr>
<tr>
<td>Overhead Sign Structures</td>
<td>Share of overhead sign structures in Poor or Very Poor condition</td>
<td>Overhead sign structure condition is assigned during inspections. Poor and Very Poor condition is dependent on a number of criteria, including the number of untightened nuts per structure or the need to remove grout, re-grade footing, replace welds, or replace the foundation.</td>
<td>NA</td>
</tr>
<tr>
<td>High-Mast Light Tower Structures</td>
<td>Share of High-Mast Light Tower Structures in Poor or Very Poor condition</td>
<td>High-mast light tower structures are not currently assigned an overall condition rating; rather each individual element (e.g. foundation, anchor rods, base plate, towers, power/luminares, winch/cables) is given a condition rating. As a result, MnDOT is in the process of redefining the criteria and rating protocols to be able to assign an overall condition structure rating. For the purposes of this TAMP, asset experts used engineering judgment to assign overall condition ratings based on individual element conditions (identified in Chapter 4).</td>
<td>NA</td>
</tr>
</tbody>
</table>

Notes: MnDOT uses multiple measures to evaluate the effectiveness of its pavement and bridge management activities. The measures listed here are those used to calculate MnDOT’s performance-based investment needs. For a more comprehensive listing of MnDOT’s pavement performance measures, see the 2013 Pavement Condition Annual Report. Additional bridge measures can be found in MnDOT’s Annual Transportation Performance Report.

The targets in the figure above represent desired outcomes. MnDOT sets targets based on assessments of traveler expectations and the agency’s stewardship responsibilities. As a communication tool, targets allow MnDOT to contrast current and anticipated performance with outcomes representing the achievement of strategic goals. These targets, which MnSHIP refers to as “aspirational”, also serve as the basis for MnDOT’s unconstrained investment need. Of the $30 billion 20-year need reported in MnSHIP, $16 billion (53 percent) reflects the cost to meet MnDOT’s ride quality and bridge condition targets.

TARGETS REPORTED IN MNSHIP

In 2012 MnDOT began to develop the concept of constrained targets to help manage system performance within the confines of available resources. The first constrained target MnDOT established directed the agency to maintain the share of all state highways with Poor ride quality between five and nine percent. While less than desirable, this range represents an achievable level of service that MnDOT believes is acceptable to the public and sufficient to mitigate risks associated with asset deterioration. The concept of constrained targets was carried forward into MnSHIP, where it was used to respond to federal and state performance requirements.
When MAP-21 was signed into law in 2012, it streamlined the federal highway program through a restructuring that directs the majority of funding to the NHS. It also required states to demonstrate progress toward seven national goal areas using a limited number of national performance measures. The US Department of Transportation is developing performance measures relating to fatalities, serious injuries, asset condition, system reliability, congestion reduction, on-road mobile source emissions, and freight movement. In terms of asset condition, MAP-21 specifies that national performance measures cover pavement condition on the Interstate System, pavement condition on the NHS (excluding Interstate highways), and NHS bridge condition.

At the state level, Minnesota has adopted the Government Accounting Standards Board Statement Number 34 (GASB 34) financial reporting requirements for establishing the value of its major infrastructure assets. As part of this process, MnDOT set minimum performance thresholds for the condition of state highway pavement and bridges. MnDOT must maintain pavement and bridge assets at or above GASB 34 thresholds to avoid a potential downgrade of the state’s bond rating. The thresholds are presented below.

- **Pavements**
  - Average PQI of 3.0 or higher on NHS routes (MnDOT estimates that an NHS with an average PQI of 3.0 or higher is likely to have Poor ride quality on no more than 10 percent of its roadways miles.)
  - Average PQI of 2.8 or higher on non-NHS routes (MnDOT estimates that a non-NHS with an average PQI of 2.8 or higher is likely to have Poor ride quality on no more than 13 percent of its roadways miles.)

- **Bridges**
  - At least 92 percent of NHS bridges in Fair to Good condition (i.e. no more than 8 percent in Poor condition)
  - At least 80 percent of the Non-NHS bridges in Fair to Good condition (i.e. no more than 20 percent in Poor condition)

MnSHIP responded to MAP-21 and GASB 34 requirements by establishing two sets of constrained targets for ride quality and bridge condition—one set of targets for the first 10 years of the planning horizon and one set of less official targets for the second 10 years. Constrained targets in the first 10 years are referred to in MnSHIP as either “MAP-21 targets” or “10-year anticipated outcomes” (see Figure 3-2). These targets/outcomes represent levels of service that MnDOT is committed to providing over the first 10 years of MnSHIP’s planning horizon in order to meet MAP-21 requirements.
<table>
<thead>
<tr>
<th>ASSET TYPE</th>
<th>PERFORMANCE MEASURE</th>
<th>TARGET</th>
<th>GASB 34 THRESHOLDS</th>
<th>10-YEAR ANTICIPATED OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavements</td>
<td>Share of system with Poor ride quality in travel lane</td>
<td>≤ 2% (NHS)</td>
<td>≤ 10% (NHS)</td>
<td>2% (NHS Interstate)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 3% (Non-NHS)</td>
<td>≤ 13% (Non-NHS)</td>
<td>4% (Other NHS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 10% (NHS)</td>
<td>2% (NHS)</td>
<td>12% (Non-NHS)</td>
</tr>
<tr>
<td>Bridges</td>
<td>NHS bridges in Poor condition as a percent of total NHS bridge deck area</td>
<td>≤ 2% (NHS)</td>
<td>≤ 8% (NHS)</td>
<td>2% (NHS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 8% (Non-NHS)</td>
<td>≤ 20% (Non-NHS)</td>
<td>6% (Non-NHS)</td>
</tr>
</tbody>
</table>

**TARGET TERMINALOGY IN THE TAMP**

Constrained targets are a useful tool for communicating and managing system performance in the face of severe resource limitations. Constrained targets have also helped to advance the use of risk assessments and risk management principles in MnDOT’s investment decision-making. This TAMP supports the practice of identifying achievable, fiscally constrained outcomes as part of MnDOT’s planning processes. However, it also clarifies MnDOT’s terminology around targets and other types of performance outcomes in order to avoid confusion about what MnDOT is ultimately trying to accomplish.

The following terms differentiate between desired outcomes, outcomes associated with a fiscally constrained plan or budget, and forecasted outcomes based on predictive modeling.

- **Targets** reflect desired outcomes. Meeting a target constitutes the achievement of a performance goal. The purpose of targets is to evaluate system performance, identify performance-based needs, and guide strategic planning decisions. MnDOT may plan to meet or not meet targets based on funding levels and tradeoff decisions.

Targets can be stated as fixed benchmarks against which MnDOT evaluates past, present and future performance. Fixed benchmarks are typically used to describe desired outcomes in performance areas where MnDOT has a high degree of control, such as ride quality or pavement condition. Targets can also be year specific. Year specific targets are trend-based and may change over time. They are typically used to evaluate the anticipated contribution of a program or set of planned investments.
• **Plan outcomes** describe future performance outcomes consistent with MnDOT’s financially constrained spending priorities. These outcomes, which are established in conjunction with plan updates, are used to allocate resources, develop programs, and plan specific investments. Plan outcomes are stated in terms of the year in which MnDOT plans to achieve them, typically at the completion of a plan’s time horizon.

The terms target and plan outcome are not mutually exclusive. MnDOT may choose to fully fund a target, in which case the target and plan outcome are the same. In performance areas where targets and plan outcomes diverge due to insufficient resources, MnDOT uses the target to communicate need, while managing its program and maintenance activities to the plan outcome.

• **Expected outcomes** reflect predictive modeling of future performance. All plan outcomes begin as expected outcomes. However, expected outcomes often diverge from plan outcomes as plans age and as new information becomes available. MnDOT contrasts expected outcomes with plan outcomes at regular intervals to evaluate how successfully it is executing its plans/budgets. These evaluations promote accountability. Evaluations that show a significant discrepancy between a planned and an expected outcome can trigger a course correction in the form of new spending priorities or a revised strategy.

This terminology replaces the language used in MnSHIP to describe performance outcomes. Going forward, MnDOT will use **target** to denote desired outcomes. The term **plan outcome** will be used to identify outcomes to which MnDOT is managing. As long as MnDOT is on pace to achieve plan outcomes, the gap between a target and an **expected outcome** will be used to demonstrate need; however, it will not be used as a justification for reallocating resources within existing constraints. **Figure 3-3** summarizes the key characteristics of targets, plan outcomes and expected outcomes, as explained above.
Figure 3-3: Types of Performance Outcomes – Key Characteristics

<table>
<thead>
<tr>
<th>TERM</th>
<th>MEANING</th>
<th>USE</th>
<th>HOW IS IT ESTABLISHED?</th>
<th>HOW OFTEN IS IT USED?</th>
</tr>
</thead>
</table>
| **Target**    | Outcome consistent with agency goals and traveler expectations | • Communicate desired outcome  
• Evaluate performance  
• Identify investment needs | Approved by senior leadership; guided by agency policies and public planning process | Less than once per planning cycle |
| **Plan Outcome** | Outcome consistent with fiscal constraint / spending priorities | • Communicate spending priorities  
• Develop / manage programs  
• Select investments | Established concurrently with the adoption of investment plans | Once per planning cycle |
| **Expected Outcome** | Forecasted outcome based on predictive modeling | • Monitor plan implementation  
• Promote accountability / initiate corrective action | Generated by expert offices based updated performance information and planned improvements | Annually |

Chapter 7 and Chapter 8 provide an expanded narrative on targets, plan outcomes and expected outcomes for each of the asset categories covered in this TAMP.
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