Iowa DOT Pavement and Bridge Performance Measures: Status Update and 4-Year Target Adjustments

September 30, 2024

Required Performance Measures

Through the Moving Ahead for Progress in the 21st Century (MAP-21) Act, Congress required the establishment of measures to assess performance in several areas, including pavement condition of the Interstate and non-Interstate National Highway System (NHS), codified in 23 CFR 490.307, and bridge condition of the NHS, codified in 23 CFR 490.407. Departments of Transportation (DOTs), as well as Metropolitan Planning Organizations (MPOs) with applicable roadways within their metropolitan planning areas, set targets for the following performance measures, known as "PM2."

- Percentage of pavements of the Interstate System in Good condition
- Percentage of pavements of the Interstate System in Poor condition
- Percentage of pavements of the non-Interstate NHS in Good condition
- Percentage of pavements of the non-Interstate NHS in Poor condition
- Percentage of NHS bridges classified as in Good condition
- Percentage of NHS bridges classified as in Poor condition

Targets are set for all roadways on the applicable system within a state or MPO, regardless of ownership. Target setting occurs for 4-year periods, with the first targets having been established in 2018 for the performance period of calendar year (CY) 2018-2021. On October 1, 2022, states set 2- and 4-year targets for the second reporting period of CY 2022-2025. MPOs then had 180 days to take action to either support the state's 4-year targets or set their own.

Mid-Performance Period Progress Report

State DOTs are required to submit a Mid-Performance Period Progress Report (MPPPR) to the Federal Highway Administration (FHWA) by October 1, 2024. The MPPPR includes information on the effectiveness of investment strategies and progress towards 2-year targets. The MPPPR also provides an opportunity for states to adjust their 4-year targets. If a state adjusts any 4-year targets, any MPOs that supported the state's 4-year targets then have 180 days to reaffirm support for the adjusted target or set their own 4-year target.

Iowa DOT is adjusting the 4-year target for three of the PM2 measures:

- Percentage of pavements of the Interstate System in Good condition
- Percentage of pavements of the non-Interstate NHS in Good condition
- Percentage of NHS bridges classified as in Good condition

The remainder of this memo will outline the current status and target adjustments.

Pavements

Iowa has more than 240,000 lane-miles of roadway across state, county, and municipal systems. Iowa DOT is responsible for maintaining 23,825 lane-miles of highways, including highways on the Interstate System, the majority of the NHS, and other state highways. Local governments maintain the remaining pavements. Table 1 shows the number of lane-miles of Interstate highways and non-Interstate NHS highways in Iowa, which are the systems that targets are set for.

Table 1: Lane-miles of Interstates and non-Interstate NHS highways in Iowa

Highway system	Lane-miles
Interstate	**3,479**
Non-Interstate NHS (DOT + Local)	**12,867**
DOT NHS (Non-Interstate)	12,426
Local NHS	441

Iowa DOT collects pavement data on Interstates every year, the remainder of the NHS and Iowa DOT highways every two years, and all other paved roads in the state every four years. Local jurisdictions can choose to fund participation in more frequent collection than every four years if desired. Data from these inspections form the basis for determining condition levels and help owners determine pavement maintenance needs. More information about NHS pavements and how they are managed can be found in Iowa's Transportation Asset Management Plan (TAMP).

Target Setting Requirements

Targets are required to be set based on 0.1-mile sections of the through travel lanes of mainline highways on the applicable highway systems. As shown in Figure 1, the FHWA definitions of good, fair, and poor for pavement are determined based on the condition of three attributes – the pavement section's International Roughness Index (IRI), the pavement's cracking condition, and the pavement's rutting rating (concrete) or faulting rating (asphalt). Per FHWA's definitions, a pavement section is considered "good" if all three ratings are good. A pavement section is considered "poor" if two of these three ratings are poor. Otherwise, it is considered "fair." Pavement that is part of a bridge deck is excluded from metric calculations. Missing, invalid, or unresolved data is also excluded from the calculations and is not to exceed five percent of the system's mileage. The good and poor measures are determined by summing the total lane-miles of good or poor highway segments and dividing by the total lane-miles of all highway segments on the applicable system.

Figure 1: FHWA pavement condition metric thresholds

Metric	Good	Fair	Poor
IRI (inches/mile)	<95	95-170	>170
Rutting (inches)	<0.20	0.20-0.40	>0.40
Cracking (%)			
-Asphalt	<5	5-20	>20
-Jointed Concrete	<5	5-15	>15
-Continuously Reinforced Concrete	<5	5-10	>10
Faulting (inches)	<0.10	0.10-0.15	>0.15

Target Setting Methodology

To develop targets in alignment with the FHWA definitions of good and poor, Iowa DOT's pavement management team reviewed historical condition data and used a pavement management tool to forecast the metrics. The tool can provide a recommended program of pavement projects based on condition information, treatment options and decision trees, benefits and costs, and projected budgets for pavement work. The tool also provides forecasted condition based on the FHWA good/fair/poor definitions. The forecasts were reviewed and the estimated performance for the 4-year period was used to set targets. Targets were adjusted up or down as appropriate to allow for a conservative approach, given the current uncertainty related to construction cost inflation and ongoing supply chain issues and how that may impact projects planned during the performance period. The 2- and 4-year targets were held constant, with the intent of reviewing the 4-year targets at the midpoint of the performance period and adjusting them if appropriate.

Target Adjustments

Figure 2 shows data for Interstate pavement condition, including historical performance, the 2- and 4-year targets set in 2022, and the adjustment to one of the 4-year targets. Figure 3 shows similar pavement condition data for the non-Interstate NHS. Table 2 provides an overview of the pavement targets and adjustments.

Review of the historical pavement data shows a decline in the percent good and a stable trend in the percent poor for both the Interstate and non-Interstate NHS. For both systems, the percent good is expected to continue to decline slightly before stabilizing. The target adjustments will provide a buffer to account for any unanticipated challenges, such as natural disasters, the timing of pavement data collection relative to pavement work, and continued inflation and supply chain challenges.

It is important to note that this pavement metric is defined by FHWA. It does not equate to the Pavement Condition Index (PCI) and pavement management sections that Iowa DOT uses in managing the state highway system. The change of a pavement from good to fair can be the result of a minor change in one component's condition, which does not necessarily mean a corresponding change in its PCI. In other words, while the decreasing percent good is not ideal, it also does not tell the whole story. The stable trend in percent poor also indicates that asset management activities are proving effective.

Figure 2: Interstate pavement historical condition, prior targets, and target adjustment

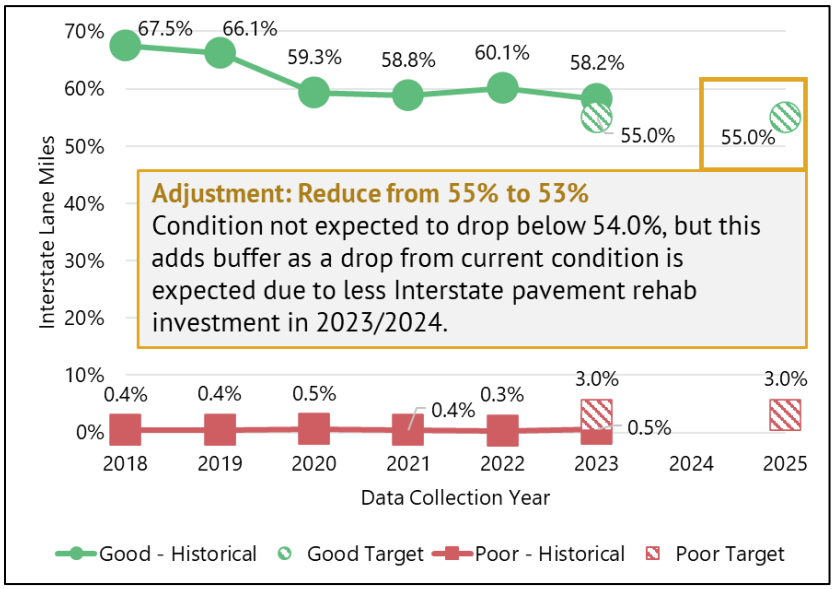

Figure 3: Non-Interstate NHS pavement historical condition, prior targets, and target adjustment

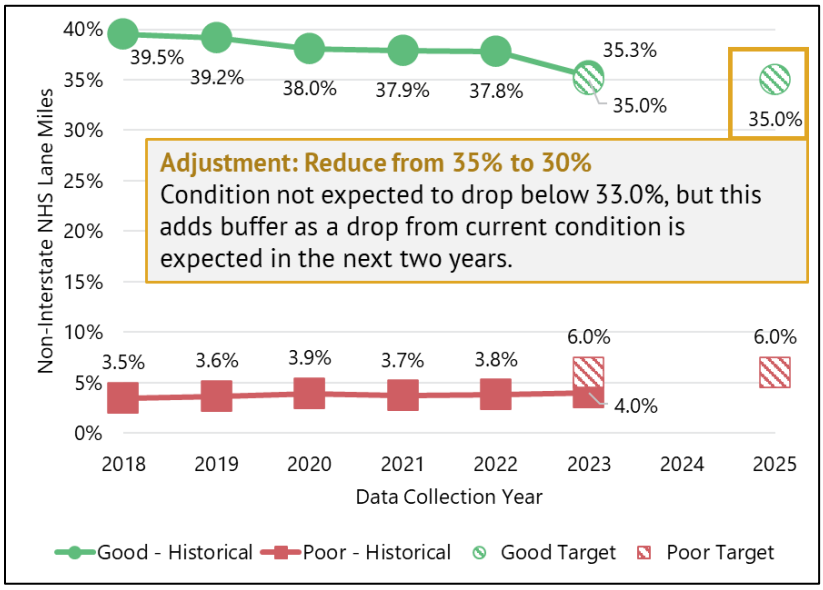

Table 2: Iowa DOT PM2 pavement performance for 2022-2025

	2021 Baseline	2023 2-Year Target	2023 2-Year Actual	2025 *Prior 4-Year Target*	2025 4-Year Target
Interstate % Good	58.8%	55.0%	58.2%	*55.0%*	53.0%
Interstate % Poor	0.4%	3.0%	0.5%	*3.0%*	3.0% *(No change)*
Non-Interstate NHS % Good	37.9%	35.0%	35.3%	*35.0%*	30.0%
Non-Interstate NHS % Poor	3.7%	6.0%	4.0%	*6.0%*	6.0% *(No change)*

Note: the years represent the calendar year in which data was collected. Data is reported through the Highway Performance Monitoring System (HPMS) the following year; e.g., the baseline data of CY 2021 was reported to the HPMS in CY 2022.

Bridges

Iowa has more than 24,000 bridges across state, county, and municipal systems. Iowa DOT is responsible for maintaining 4,195 of these bridges, including bridges on Interstate System, the majority of the NHS, and other state highways. Local governments maintain the remaining bridges. Table 3 shows the number of bridges and deck area of NHS bridges in Iowa, which is the system that targets are being set for.

Table 3: NHS bridges in Iowa

Highway system	Number of bridges	Deck area (ft^2)
NHS – Iowa DOT owned	2,600	34,081,466
NHS – Locally owned	48	984,324
Total NHS	**2,648**	**35,065,790**

Bridge owners are required to inspect bridges at least every 24 months. Data from these inspections form the basis for determining condition levels and help owners determine bridge maintenance needs. More information about NHS bridges and how they are managed can be found in Iowa's TAMP.

Target Setting Requirements

As part of the National Bridge Inventory (NBI) program, condition is rated for each bridge's deck, superstructure, and substructure using a scale of zero to nine. Per FHWA's definitions, a bridge is considered "poor" if one of these three ratings is less than or equal to four. A bridge is considered "good" if all the three ratings are greater than or equal to seven, and otherwise it is considered "fair." The performance measures are calculated based on the deck area for all bridges carrying the NHS, including highway bridges on ramps connected to the NHS and bridges that cross state borders. Bridges on state borders count toward both states' totals. The good and poor measures are determined by summing the total deck area of good or poor NHS bridges and dividing by the total deck area of the NHS.

Target Setting Methodology

Iowa DOT models bridge deterioration and projects future conditions using a tool called Asset Optimizer, developed by IDS Consulting. The Asset Optimizer predicts future condition of each bridge in the network, estimates the impact of bridge treatment alternatives, and prioritizes treatments subject to a budget constraint. Certain bridges are excluded from the Asset Optimizer analysis, and their needs are handled outside the system. These include locally owned NHS bridges as well as complex structures that are not easily modeled, including selected "big bridges" with unique design characteristics. There are 34 such big bridges, 18 of which are on the NHS. For each of these bridges, Iowa DOT establishes specific maintenance and preservation activities; these bridges are typically maintained in a higher condition due to their importance and expense. These bridges include large river bridges over Iowa's eastern and western borders, which are managed through coordination with the neighboring states.

To develop targets, the Asset Optimizer was used to model future condition of Iowa DOT-owned bridges, excluding the big bridges mentioned previously. The output for the NHS portion of the future scenario was then combined with the condition of big bridges on the NHS and locally owned NHS bridges to account for them not being in the forecast.

Target Adjustment

The 2- and 4-year targets and the target adjustment are shown in Figure 4. Table 4 provides an overview of the bridge targets and adjustment.

Review of the historical bridge data shows stable trends in both percent good and percent poor. A target adjustment is being made for percent good, as the prior target was based on a forecast that was overly optimistic and did not account for inflation that has occurred. The target adjustment will provide a buffer to account for any unanticipated challenges, such as natural disasters, the timing of bridge data collection relative to bridge work, and continued inflation and supply chain challenges.

It is important to note that this bridge metric is defined by FHWA. It does not equate to the Bridge Condition Index (BCI) that Iowa DOT uses in managing the state highway system. The change of a bridge from good to fair can be the result of a minor change in one component's condition, which does not necessarily mean a corresponding change in its BCI. In other words, while falling short of the 2-year target for percent good is not ideal, it also does not tell the whole story. The stable trend in percent poor also indicates that asset management activities are proving effective.

Figure 4: NHS bridge historical condition, prior targets, and target adjustment

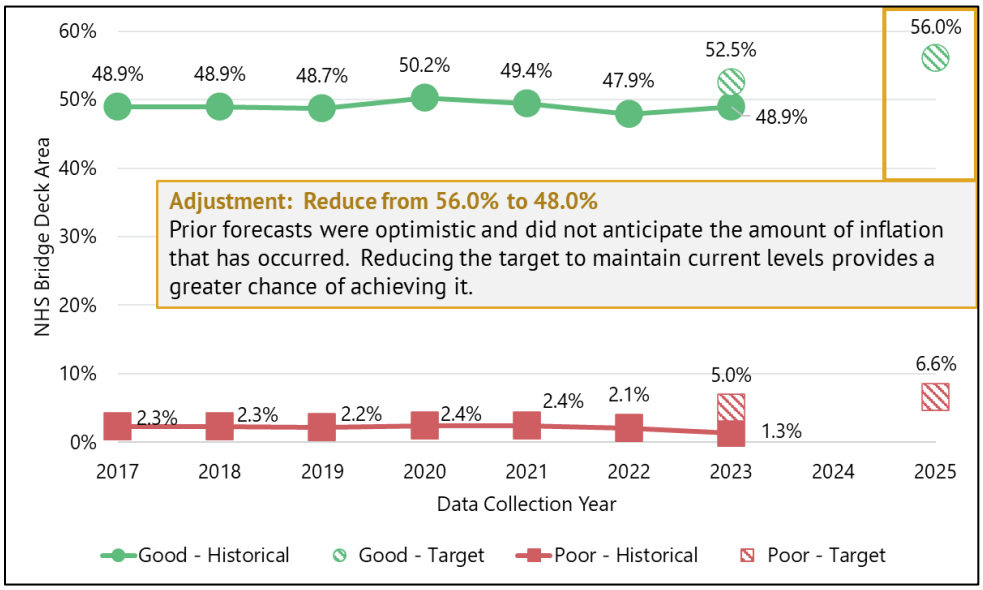

Table 4: Iowa DOT PM2 bridge targets for 2022-2025

	2021 Baseline	2023 2-Year Target	2023 2-Year Actual	2025 *Prior 4-Year Target*	2025 4-Year Target
NHS % Good	49.4%	52.5%	48.9%	*56.0%*	48.0%
NHS % Poor	2.4%	5.0%	1.3%	*6.6%*	6.6% *(No change)*

Note: the years represent the calendar year in which data was collected. Data is reported through the NBI the following year; e.g., the baseline data for CY 2021 was reported to the NBI in CY 2022.