U.S. Department of Transportation
Federal Highway Administration

Illinois Division

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Springfield, IL 62703
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August 29, 2019

In Reply Refer To:
HDA-IL

Mr. Omer Osman
Acting Secretary of Transportation
Illinois Department of Transportation
2300 South Dirksen Parkway
Springfield, IL 62764

Subject: Transportation Asset Management Plan (TAMP) Annual Consistency Determination

Dear Acting Secretary Osman:

This letter is to inform you that the Federal Highway Administration (FHWA) Illinois Division Office has determined the Illinois Department of Transportation (IDOT) has developed and implemented a TAMP that is consistent with the requirements established by 23 U.S.C. 119 and 23 CFR part 515.

IDOT's most recent TAMP and its implementation documentation was dated and received by the Division Office on August 26, 2019. Based on the most recent TAMP, as well as the documentation that demonstrates TAMP implementation, FHWA has determined your TAMP complies with the following minimum requirements set forth in 23 CFR 515.13(b)(1):

- Developed with FHWA-certified TAMP processes;
- Includes the required TAMP content; and
- Consistent with other applicable requirements in 23 U.S.C 119 and 23 CFR Part 515.

We also determined IDOT implemented its TAMP per 23 CFR 515.13(b)(2).

We would like to commend you and your staff for the broad participation in development and implementation of the TAMP, a risk-based asset management plan, in accordance with 23 U.S.C. 119. We look forward to working with IDOT as you implement the TAMP to achieve and sustain a state of good repair over the life cycle of both pavement and bridge assets and to improve or preserve the overall condition of the National Highway System (NHS).

Should you have any questions, please contact Dennis Bachman (dennis.bachman@dot.gov) at 217-492-4283.

Sincerely,

Arlene K. Kocher

Arlene K. Kocher, P.E.
Division Administrator

ecc: Ms. Kristin Williams, Office of the Secretary, IDOT
Mr. Matt Magalis, Chief of Staff, IDOT
Mr. Douglas House, Deputy Secretary, IDOT
Mr. Paul Loete, Director, Office of Highways and Project Implementation, IDOT
Ms. Holly Ostdick, Bureau of Planning, IDOT
Ms. Tracinda Sisk, Bureau of Programming, IDOT
Ms. LaDonna Rowden, Bureau of Research, IDOT
Mr. Stephane B. Seck-Birhame, Bureau of Local Roads and Streets, IDOT
Mr. Carl Puzey, Bureau of Bridges and Structures, IDOT
Mr. Jack Elston Bureau of Design & Environment, IDOT
Ms. Cynthia Watters, Bureau of Safety Programs and Engineering, IDOT
Mr. Brian Pfeifer, Bureau of Materials, IDOT
Ms. Amy Eller, Bureau of Operations, IDOT
Mr. Tim Kell, Bureau of Construction, IDOT
Mr. Anthony Quigley, Region 1 Engineer, IDOT
Mr. Masood Ahmad, Region 2 Engineer, IDOT
Mr. Kensil Garnett, Region 3 Engineer, IDOT
Mr. Jeffrey Myers Region 4 Engineer, IDOT
Mr. Keith Roberts Acting- Region 5 Engineer, IDOT
Ms. Joanne Woodworth, Office of Finance and Administration, IDOT
Mr. Guy Tridgell, Director, Office of Communications, IDOT

Illinois Department of Transportation

Office of the Secretary
2300 South Dirksen Parkway / Springfield, Illinois / 62764
Telephone 217/782-6149

June 28, 2019

Ms. Arlene Kocher
Illinois Division Administrator
Federal Highway Administrator
3520 Executive Drive
Springfield, Illinois 62703

Dear Ms. Kocher:

This letter serves as a formal request to the Federal Highway Administration for an annual consistency determination, which is an evaluation to determine whether the Illinois Department of Transportation (IDOT) has developed and implemented a Transportation Asset Management Plan (TAMP) that is consistent with the requirements established by 23 U.S.C. 119 and 23 CFR part 515.

Attached are the most recent IDOT-approved TAMP and supporting documents to demonstrate implementation of the TAMP as required by 23 CFR 515.13(b).

If you have any questions or need additional information, please contact Mr. Matthew Magalis, Acting Director, located at 2300 South Dirksen Parkway, Springfield, Illinois 62764, by telephone (217) 782-0692.

Sincerely,

Omer M. Osman, P.E.
Acting Secretary

Enclosures

bcc: Acting Secretary Osman
Duputy Secretary Doug House
Matthew Magalis
Paul Loete
Traci Sisk

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State of Illinois
Illinois Department of Transportation

TRANSPORTATION ASSET MANAGEMENT PLAN

JUNE 2019

RAISING the BAR

Updated August 2019

Illinois Department of Transportation

Printed by authority of the State of Illinois, 0020-20, 08/19, 20

Executive Summary

Background

The Moving Ahead for Progress in the 21st Century (MAP-21) law was signed by the President of the United States on July 6, 2012. This law specified the implementation of risk-based transportation asset management plans (TAMPs) by all State Departments of Transportation (DOTs). The TAMPs must be used to manage all National Highway System (NHS) pavements and bridges. Additionally, the law created the National Highway Performance Program (NHPP), a methodology for assessing highway conditions consistently across the country. The NHPP established national goals for safety, infrastructure condition (specifically pavements and bridges), congestion reduction, system reliability, freight movement and economic vitality, and environmental sustainability. The TAMPs are to include targets for the infrastructure condition component of the NHPP. The current federal legislation, Fixing America's Surface Transportation (FAST) Act, was signed into law on December 4, 2015 and continues the requirements for TAMPs and the NHPP.

The Federal Highway Administration (FHWA) established rules in late 2016 and early 2017 for the implementation of the asset management plan and NHPP laws, and set several dates related to the implementation of both:

- April 20, 2018: submit the initial TAMP describing processes for developing the asset management plan, including a summary listing of assets with a description of asset condition; asset management measures and targets; performance gap analysis; life-cycle planning; risk analysis; financial plan; and investment strategies.
- October 1, 2018: submit targets and baseline performance period report for the pavement and bridge condition measures for the NHPP.
- June 30, 2019: submit the final TAMP, including the results of all analyses outlined in the initial TAMP as well as the performance targets for the NHS pavements and bridges as part of the NHPP.
- June 30, 2019: submit the FY 2019 implementation documentation for the FHWA consistency review. The FY 2019 program will be compared to the investment strategy submitted as part of the initial TAMP in 2018 to demonstrate that the investment strategy has been implemented.

The initial TAMP was submitted to the FHWA in April 2018 and certified by the FHWA on November 1, 2018. The pavement and bridge condition measures targets were submitted to the FHWA on October 1, 2018. This document constitutes the third bullet point, the final TAMP for the State of Illinois. A

summary of the steps taken to date to ensure compliance with the laws is included here.

Asset Management Plan Development

The Illinois Department of Transportation (IDOT) began taking steps to develop and implement an asset management plan in early 2017. IDOT established new targets representing acceptable conditions for all of its pavements and bridges based on system hierarchy in the following order: Interstate and other NHS routes (non-interstate), non-NHS marked routes, and non-NHS unmarked routes. The State of Acceptable Condition for pavements represents a Condition Rating Survey (CRS) value of 5.5 or higher for Interstates and 5.0 for other NHS and non-NHS routes. The State of Acceptable Condition for bridges is set to a minimum National Bridge Inventory (NBI) rating of 5 for all primary components (deck, superstructure, substructure, or culvert) for all bridges, regardless of system. These values were chosen as the State of Acceptable Condition because they represent the lowest values for which preservation activities are effective in extending the life of assets.

IDOT set performance targets at 90 percent of the Interstate mileage and other NHS route mileage, 75 percent of the marked route mileage, and 50 percent of unmarked route mileage equal to or above the State of Acceptable Condition. The performance targets for bridges are set at 93 percent of the NHS bridge deck area and 90 percent of the non-NHS bridge deck area at or above acceptable conditions. These performance targets for pavements and bridges are shown in Figures ES-1 and ES-2, respectively.

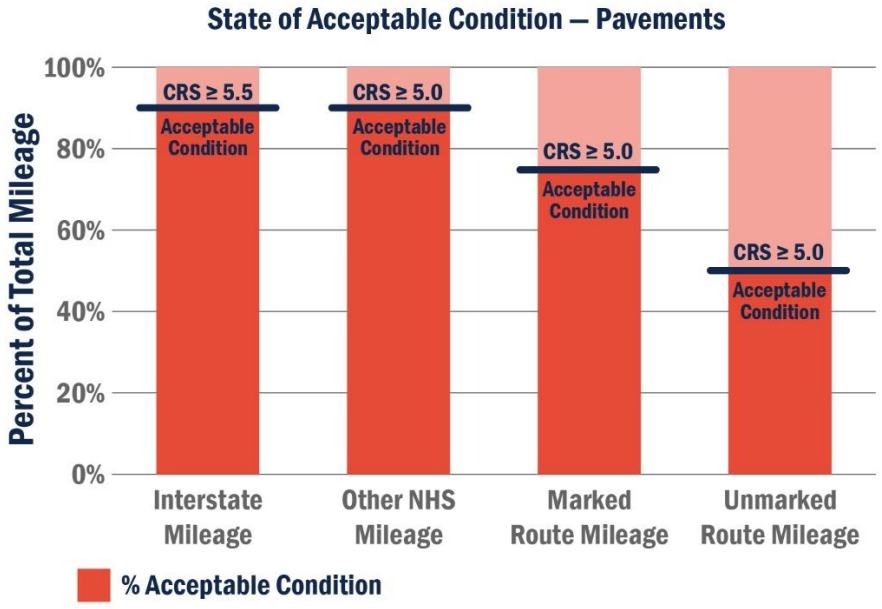


Figure ES-1. State of Acceptable Condition targets for pavements.

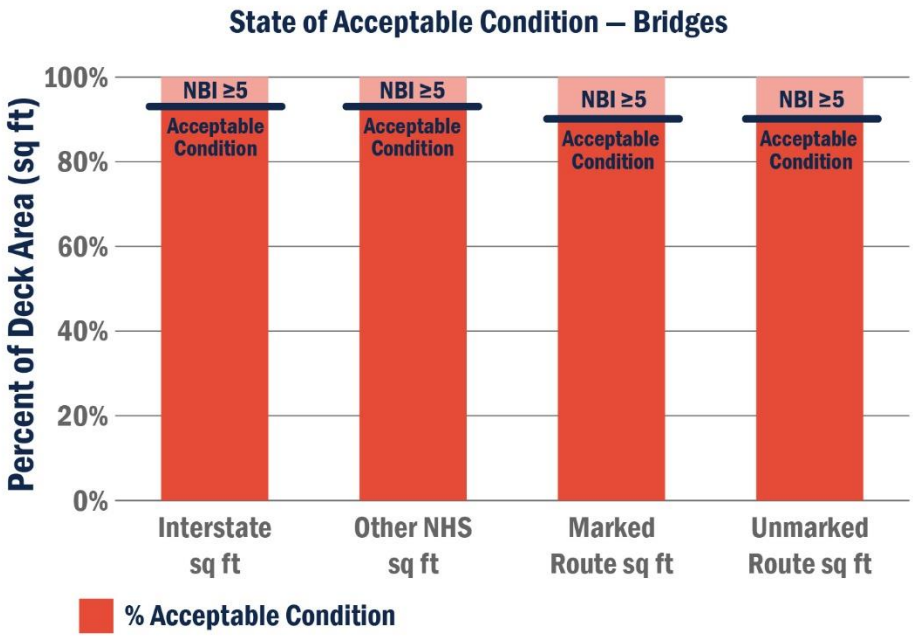


Figure ES-2. State of Acceptable Condition targets for bridges.

IDOT conducted an analysis of the best way to select treatments throughout an asset's life cycle: the process in place at the time, which consisted of programming the assets in worst condition first, or programming appropriate treatments throughout the lives of the assets. The analysis showed that programming appropriate treatments throughout the lives of the assets will lead to higher performance of the highway system as a whole. As a result of this analysis, IDOT began programming projects in the following five categories: initial construction, maintenance, preservation, rehabilitation, and reconstruction/replacement.

A risk assessment was conducted to determine the risks with both the highest likelihood of occurring and the greatest consequences if they were to occur. Once the risks were identified, mitigation strategies were developed for each risk. IDOT also examined the recently-completed All-Hazards Asset Vulnerability Assessment and determined the assessment's findings should be incorporated into IDOT's programming process to further reduce potential risks. The Bureau of Planning will retain responsibility for reviewing the risk register at least annually and will take the lead on implementing the All-Hazards Vulnerability Assessment findings.

The Bureau of Programming worked with the Office of Finance and Administration to develop a financial plan for the next 10 years. Using the financial plan, the current condition of the assets, the mix of treatments recommended by the life-cycle analysis, and the results of the risk analysis, an investment strategy was developed to maximize the condition of NHS pavements and bridges as top priority, and the non-NHS system as funding permits.

A performance gap analysis was conducted based on the results of the financial plan and investment strategy. Current funding is insufficient to achieve most of the State of Acceptable Condition targets on the State-maintained and local NHS systems over the 10 years analyzed. Using the funding allocation recommended by the investment strategy, the targets could be met in 10 years if funding were immediately increased by $6.0 billion, from $10.3 billion to $16.3 billion. The changes in condition of pavements and bridges under various funding scenarios are depicted in Figures ES-3 and ES-4, respectively.

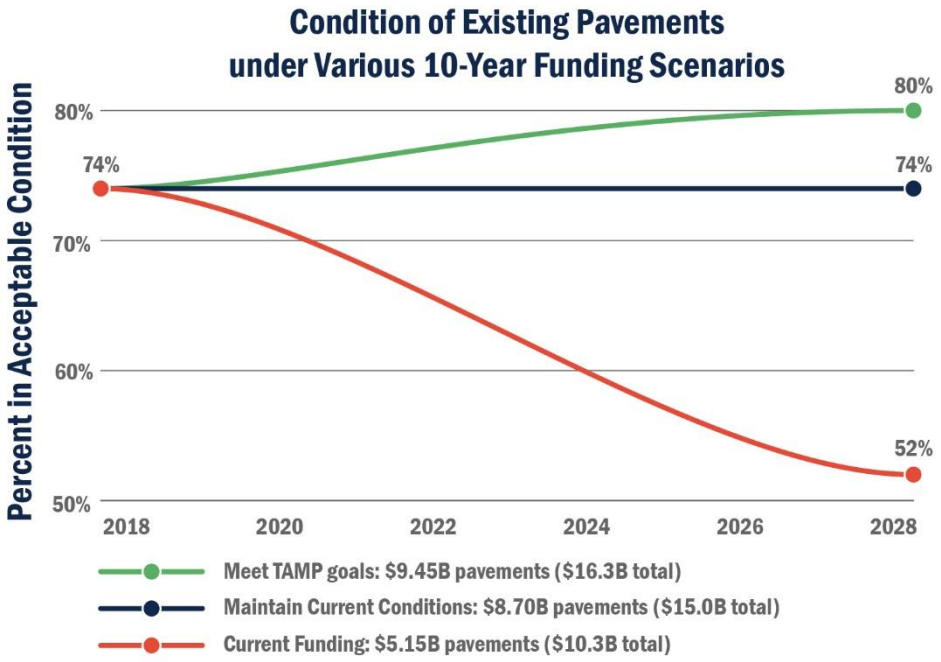


Figure ES-3. Changes in pavement condition over 10 years with various funding scenarios.

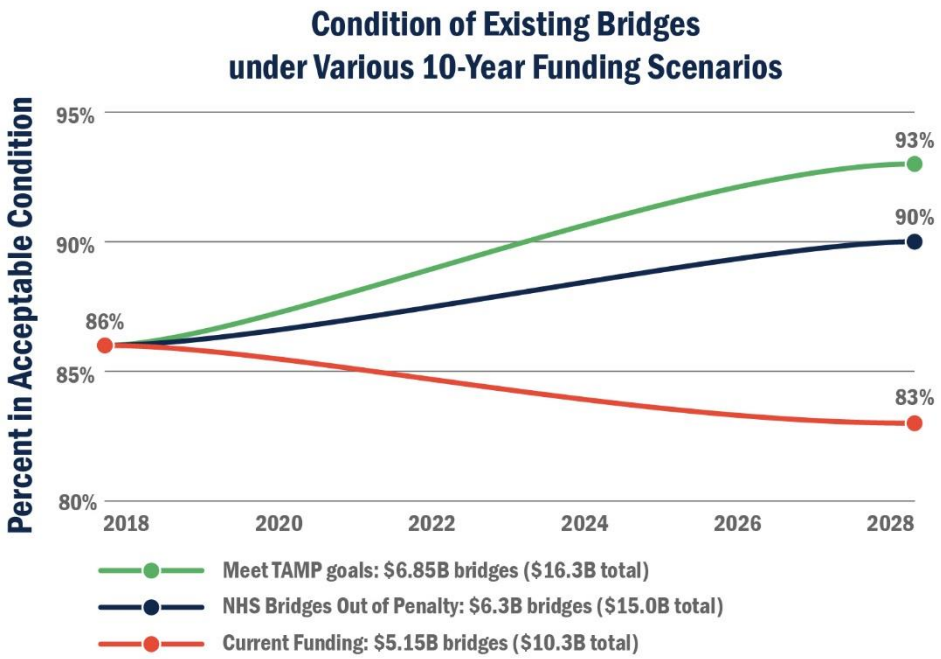


Figure ES-4. Changes in bridge condition over 10 years with various funding scenarios.

If an increase in funding does not begin until after the 10-year period, the gap at that point will be $9.1 billion, as the condition of the highway system will continue to decline in the interim. *These costs do not include ancillary items such as drainage and lighting, nor any adjustment for inflation, nor any costs for expanding the current system. If the ancillary items were to be included in the analysis, the total need would be $13.5 to $15 billion.*

A capital construction plan was passed by the Illinois General Assembly on June 1, 2019. Once the Governor signs the bills authorizing the capital construction plan, the impacts to funding and projected asset conditions will be assessed and the TAMP will be fully revised.

Implementation Accomplishments

IDOT determined early in the TAMP development process that the TAMP should not be a stand-alone process but should rather become part of the fabric of IDOT. To that end, the development of the TAMP and the implementation of asset management practices has been guided by a Steering Committee made up of representatives at the executive management level from across the Department. A Project Management Team was also created that consisted of mid-level management for each of the areas involved in asset management. These team members additionally headed up working groups for each of the areas within the Department that have the expertise needed to develop and implement the TAMP.

IDOT is now programming maintenance and preservation treatments early in an asset's life, to keep the asset functioning at a high level and extending the life of the asset, with the goal of maximizing the overall condition of all assets. IDOT has also modified its tracking procedures, so that it can easily report on funds spent throughout the life cycle: initial construction, maintenance, preservation, rehabilitation, and reconstruction.

To begin to implement the new changes, existing tools were enhanced and new tools created to assist the districts. The treatment criteria developed by the Pavement Policy Working Group and the Bridge Working Group were provided to the districts. Additionally, the Bureau of Bridges and Structures developed a Bridge Preservation Manual, which is close to being finalized. The manual will provide guidance on activities to perform that will maximize the life of IDOT's bridges.

Pavement performance models were updated, and the districts were given pavement condition predictions for 10 years and the currently-recommended treatments for each pavement section. Bridge prediction models were developed by the Bureau of Bridges and Structures, and bridge condition predictions for 10 years and recommended treatments were given to the districts. The life cycle and investment strategies were used to develop ideal mixes of investments for each district to use in developing their Multi-Year Programs. Once the districts had the new tools in place, the Bureau of Programming began conducting a more focused review of the districts' programming recommendations to ensure consistency with the TAMP guidelines.

In addition to maximizing the performance of IDOT's highway system with the limited resources available, having the TAMP tools in place has allowed the Department to quantify pavement and bridge needs over the next 10 years, and to project resulting asset conditions under various hypothetical funding scenarios. This allows for a data-driven decision-making process from the top down within IDOT.

Planned Enhancements

There are still further steps to be taken to ensure the full and successful implementation of the asset management philosophy and goals. Some of the planned enhancements are as follows:

- IDOT is in the process of selecting an Enterprise Asset Management System (EAMS) and expects to have a contractor in place by October 2019. The implementation of the EAMS is projected to take 18 to 36 months from the time of the selection.

- The Department will continue to review and revise the treatment selection guidelines, as well as incorporate the guidelines into existing manuals to further institutionalize the process.
- Additional training will be provided to the districts as needed to assure consistent implementation of TAMP throughout the Department.
- Communication and coordination regarding the management of NHS routes under local agency jurisdiction will continue to be improved.
- A process for consideration of repetitive damage in project programming will be implemented with the cooperation of districts and Central Bureaus of Operations, District Programming Engineers, and the Bureau of Programming.

Illinois is **third in the nation** in the number of miles of Interstates. The 2,185 miles of the State's Interstate system comprise 1.49 percent of all roads in the State, but carry 32 percent of all traffic.

Illinois is also **third in the nation** in terms of the number of bridges.

Illinois Travel Statistics, 2018

In addition to Interstates, the State has

- **166** miles of other freeways
- **5,250** miles of principal arterials
- **8,924** miles of other arterials
- **22,753** miles of collectors
- **107,749** miles of local roads

Illinois Travel Statistics, 2018

Chapter 1: Introduction

Illinois' Transportation System

The State of Illinois boasts one of the largest, most effective multimodal transportation systems in the nation. As the home to Chicago and O'Hare International Airport, Illinois also features the second largest public transportation system, the second largest rail system, the third largest Interstate system, and the fourth largest highway system in the country. The State's residents, businesses, and visitors rely on this transportation system to provide travel options, to build the state's economy, and to support local communities. The Illinois Department of Transportation (IDOT) has statutory responsibility for the planning, construction, operation, and maintenance of this transportation network, with the exception of the Chicago Skyway, a toll facility owned by the Chicago Department of Transportation and maintained by the Skyway Concession Company, LLC; and facilities constructed, maintained, and operated by the Illinois State Toll Highway Authority (Illinois Tollway). IDOT's facilities include highways and bridges, public transit, airports, and rail freight/passenger systems. IDOT meets its responsibilities in ways that enhance the quality of life, promote economic prosperity, and demonstrate respect for the environment; always keeping in mind its multimodal transportation vision.

This transportation system represents a significant investment of public resources. For that reason, IDOT places a high priority on the preservation and maintenance of the system infrastructure through ongoing investments to improve the safety and efficiency of the system, while adapting the system to meet the evolving needs of both today's travelers and future generations. IDOT is committed to being accountable to the public for its work and being transparent in the way it operates. IDOT also serves as an advocate and trusted advisor to state, local, and federal governments, and other community agencies and partners in providing transportation access and services for all of Illinois.

To manage the highway network, IDOT divides the state into five transportation regions consisting of nine district offices, as shown in figure 1-1, with its central headquarters located in Springfield. The central bureaus within the Office of Planning and Programming and the Office of Highways Project Implementation work together to develop, maintain, and operate IDOT's highway system. These bureaus develop policies, procedures, standards, and guidelines to accomplish the improvement objectives for the network. In addition, the Bureau of Programming is responsible for coordinating the collection, analysis, and management of the asset inventory and condition data. The guidelines provided by the Bureau of Programming are used by the district offices to identify, select, and prioritize asset

IDOT is ... RAISING the BAR

With On-Going Enhancements to Support Performance-Based Decisions:

- ☑ New project selection process to evaluate the benefits of expansion and congestion mitigation projects
- ☑ Acquisition of pavement and bridge analysis tools to evaluate investment options
- ☑ Increased investments in pavement and bridge preservation to extend service life

improvements in accordance with specific objectives given to each district depending on their current pavement and bridge conditions in relation to statewide performance objectives. In addition, the central bureaus monitor the programs administered by the nine districts to ensure statewide uniformity of policy interpretation and compliance, and to ensure program coordination with other stakeholders at the federal, state, and local levels.

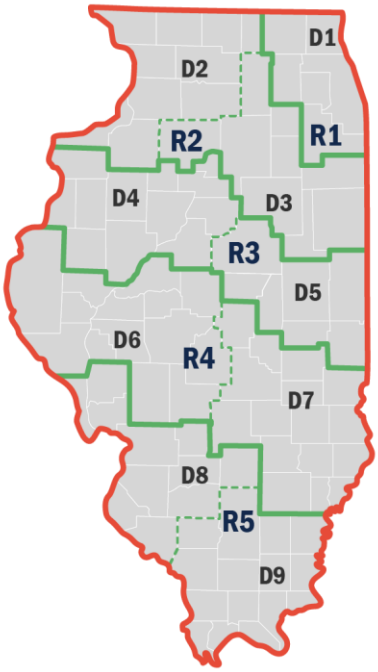


Figure 1-1. IDOT's transportation regions and districts.

IDOT's Focus on Asset Management

Today, IDOT is at a crossroads. IDOT does not currently have enough resources to maintain the existing state-maintained system[1] of roads and bridges at the State of Acceptable Condition. Without additional revenue, asset conditions will continue to deteriorate and desired performance objectives will not be met. The *FY 2018-2023 Proposed Highway Improvement Program*[2] *(MYP)* reports that by 2023, 40 percent of the state-maintained highways, and almost 15 percent of state-maintained bridges, will be in unacceptable condition. This situation demands that future investments in IDOT's highway system are strategic, addressing agency priorities that balance system preservation with external emphasis on quality of life and economic growth. The proposed MYP places a priority on improving the condition of the more than 7,000 miles of roads and 4,143 bridges on the National Highway System (NHS) that are maintained by IDOT. The focus of the proposed plan is in large part due to new federal performance rules that establish minimum conditions for Interstate pavements and NHS bridges, and promote the use of federal funds to achieve state and federal performance objectives.

To ensure that available funds are used as effectively as possible, IDOT has introduced several initiatives to enhance its ability to make performance-based, data-driven investment decisions. For example, IDOT is working to develop a value-driven project selection process that evaluates the expected

[1] Throughout this document, references to the state-maintained system exclude the Chicago Skyway and the Illinois Tollway, but include the local NHS system.
[2] http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/OP&P/HIP/2018-2023/Summary.pdf

benefits of each potential congestion mitigation and expansion project. In addition, IDOT is in the process of acquiring new analytical tools that will help prioritize future improvements to existing pavements and bridges. These asset management systems, which are required under the new federal asset management rules, use asset condition data to predict the impact of different improvement strategies on future network conditions. Changes to the way IDOT manages its pavements and bridges are also underway, shifting the agency towards planned, proactive investments in preservation activities that will slow the rate of pavement and bridge deterioration so these assets last as long as possible. As a result of these improved tools and project selection strategies, IDOT will be better able to make on-going investments in the highway system that support performance objectives and help ensure that limited resources are used wisely.

IDOT's plan to better use performance data to drive investment decisions aligns with national initiatives to promote a transportation asset management (TAM) framework at the state level that:

- Supports the use of strategic performance objectives.
- Introduces a systematic process that links investments to performance objectives.
- Emphasizes the use of preservation treatments that extend the life of the highway system at a minimum practicable cost.
- Considers agency risks or exposure in setting investment priorities.
- Uses asset inventory information, asset condition data, and analysis tools to evaluate options for allocating resources and strategically selecting projects.

TAMP Requirements

Current federal legislation requires all state DOTs to develop a risk-based Transportation Asset Management Plan (TAMP) that describes how the state's roads and bridges on the NHS "will be managed to achieve system performance effectiveness and state DOT targets for asset condition, while managing the risks in a financially responsible manner, at a minimum practicable cost over the life cycle of its assets." (23 CFR 515.7) The requirement to develop a TAMP was first established in federal legislation passed in 2012, commonly known as the Moving Ahead for Progress in the 21st Century (MAP-21) Act. The TAMP requirement was retained in the current federal legislation, commonly known as the Fixing America's Surface Transportation (FAST) Act, which also includes requirements for performance-based management. The Federal Highway Administration (FHWA) established the rules that govern the processes that must be used to develop the TAMP, the minimum requirements that apply, the penalties for failure to develop and implement a TAMP, and the minimum standards for tools to support the TAMP

MINIMUM TAMP CONTENT TO SATISFY FEDERAL REQUIREMENTS INCLUDES

- Asset management objectives
- Asset management measures and State DOT targets for asset condition
- A summary description of asset conditions
- Performance gap identification
- Life-cycle planning
- Risk management analysis
- Financial plan
- Investment strategies

Figure 1-2. Minimum TAMP requirements.

development. IDOT's initial TAMP, which was submitted to FHWA for certification on April 30, 2018, was certified on November 1, 2018. The initial TAMP certified that the processes contained in the TAMP met federal requirements. This version of the TAMP will be reviewed by FHWA to verify that the certified processes were used to conduct the required analyses.

It is recognized that portions of the NHS included in the TAMP are owned and operated by agencies other than the state DOT. 23 CFR 515.7(f) recognizes that the state DOT may collect information from other NHS owners "in a collaborative and coordinated effort." IDOT has coordinated with the Illinois Tollway to determine the most effective means to share information related to Illinois Tollway assets and how they are managed. Since the Illinois Tollway prepares extensive asset management documentation under its Trust Indenture, reporting on those portions of the NHS is limited in this narrative, but can be referenced in the Illinois State Toll Highway Authority's Official Statement[3]. IDOT established a similar collaborative and coordinated effort with the Chicago Skyway.

IDOT currently collects pavement and bridge condition information on the entire NHS in Illinois, regardless of whether the assets are managed by the state or by local partners. Recently IDOT has taken steps to improve collaboration with its local and regional partners to help ensure that federal funds are used as effectively as possible. These activities are discussed in further detail later in the TAMP.

In accordance with the federal rules, the TAMP is required to include the information shown in figure 1-2.

In addition to the minimum requirements for the TAMP, there are several other key requirements outlined in the federal legislation and/or the final rules that impact the way pavements and bridges are managed now and in the future. Several of these requirements are summarized below.

- Minimum standards are established for developing and operating bridge and pavement management systems (23 CFR 515.17).
- Each state DOT is required to conduct periodic self-assessments of the agency's capabilities to conduct asset management, as well as its current efforts in implementing the TAMP (23 CFR 515.19).
- Each state, through its DOT, is required to conduct statewide evaluations to determine if there are reasonable repair or reconstruction alternatives to roads, highways, and bridges that have required repair and

[3] https://www.illinoistollway.com/documents/20184/86265/Series+2017A+Official+Statement.pdf/fca1fe1c-2bf5-446e-8a73-84ad3040ad42?version=1.0

reconstruction activities on two or more occasions due to emergency events declared by either the President of the United States or the Governor of the state (23 CFR 667.1).

- No more than 5 percent of the Interstate system lane miles may be in poor condition, using performance measures established by FHWA, without penalty (23 CFR 490.315).
- No more than 10 percent of the bridge deck area on the NHS may be considered Structurally Deficient, using performance measures established by the FHWA, without penalty (23 CFR 490.411).
- Each state DOT shall develop and utilize a Data Quality Management Program, approved by FHWA, that addresses the quality of all data collected to report pavement condition metrics to the FHWA (23 CFR 490.319). IDOT's Data Quality Management Plan was approved by FHWA in October 2018.

IDOT is in the process of satisfying these and other requirements outlined in the federal legislation, but since it typically takes several years for projects to be identified, programmed, and constructed, the results of the wholesale changes IDOT is making to its planning and programming processes will not be fully realized for three to five years. Other activities that are underway to meet federal requirements, such as the acquisition and implementation of pavement and bridge management software programs as part of an Enterprise Asset Management System (EAMS), are expected to take 18 to 36 months to complete. More immediate changes will be realized as the agency finalizes its updated guidance on treatment selection to support its new preservation-based investment strategies enacted during the 2019 fiscal year.

The completion of this document represents IDOT's best faith effort to meet the requirements for developing a fully-compliant risk-based TAMP. Subsequent updates to the TAMP will be submitted in accordance with the minimum four-year cycle required under legislation.

TAMP Content

IDOT's TAMP exceeds the FHWA's minimum requirements for developing a TAMP since the agency elected to expand the content beyond just the NHS pavements and bridges to include all state-maintained pavements and bridges. Future TAMPs may expand the number of assets included as information from the EAMS software becomes available.

The processes used to develop a risk-based 10-year investment strategy for pavements and bridges are captured in the following eight chapters.

- **Chapter 1: Introduction** – This chapter introduces the IDOT highway system, explains IDOT's commitment to TAM, describes the minimum requirements for a TAMP, and introduces the content of this document.
- **Chapter 2: Asset Management Objectives** – This section introduces IDOT's asset management objectives and summarizes IDOT's current and planned initiatives to support asset management.
- **Chapter 3: Asset Inventory and Conditions** – This chapter summarizes the number and type of pavement and bridge assets that are included in the system, describes the processes used to monitor conditions, presents historical trends in performance, and reports the value of the existing pavements and bridges maintained by IDOT.
- **Chapter 4: Life-Cycle Planning** – This section of the TAMP introduces the concept of life-cycle planning and explains its effectiveness at reducing the long-term costs of system preservation. Typical life-cycle strategies used by IDOT, the Illinois Tollway, the Chicago Skyway, and local agencies to manage Illinois' pavements and bridges are also discussed in this section.
- **Chapter 5: Risk Management** – The risk chapter introduces the concept of risk management, explains how risks are used in setting investment priorities, and summarizes the most significant risks impacting the implementation of this TAMP. This chapter also describes IDOT's recent All-Hazard Asset Vulnerability Assessment and introduces a new process that IDOT has developed for managing assets that are routinely impacted by emergency events.
- **Chapter 6: Financial Plan and 10-Year Investment Strategies** – This chapter summarizes the expected funding levels over the next 10 years and the level of investment that will be made in pavement and bridge work activities to achieve performance objectives.
- **Chapter 7: Performance Gap Analysis** – This chapter summarizes IDOT's State of Acceptable Condition and the impact the planned 10-year investment strategies will have on achieving these conditions.
- **Chapter 8: Planned Enhancements** – The final chapter identifies the steps that IDOT is taking to meet the federal requirements and to further strengthen its use of performance-based, data-driven investment decisions.

There are also three appendices. Appendix A provides a summary of the local owners of portions of the NHS network. Appendix B presents the two- and four-year performance targets established by the Metropolitan Planning Organizations (MPOs) that allocate funds to locally-owned portions of the NHS, and Appendix C includes the current treatment selection guidelines for pavements and bridges.

Chapter 2: Asset Management Objectives

Overview

In the past, IDOT primarily has focused its highway investments on addressing the most pressing needs, such as congestion in the Chicago area, economic development demands in a particular region, or deteriorated pavement and bridge needs across the state. Historically, IDOT's pavement and bridge condition assessment procedures, which are discussed further in the next chapter, have been used to report necessary pavement and bridge improvements in terms of both Backlog and Accruing. This focus on Backlog, which represents deteriorated pavements and bridges in need of significant repair, tended to drive investments towards projects that were in unacceptable condition. This focus on deteriorated pavements and bridges represented a "worst first" strategy that required substantial funding levels each year. Since the required annual funding level was not available to address all Backlog needs, network conditions declined and desired conditions were known as "aspirational goals" since they were unachievable. According to the Long Range Transportation Plan (LRTP) Introduction[4], IDOT's funding levels have historically been insufficient to support the existing network of roads and bridges, making it difficult to address the growing transportation needs across the state.

With this TAMP, IDOT has established constrained performance goals that better estimate the pavement and bridge conditions that can actually be achieved with the funding available. The current focus is on achieving a *State of Acceptable Condition* with the funding levels available. In addition, two- and four-year performance targets were established on October 1, 2018 for pavements and bridges on the NHS to meet federal requirements.

Other initiatives will allow IDOT to better evaluate investment options so the agency can more effectively communicate funding needs with the state legislature and other stakeholders while also taking steps to increase the amount of preservation treatments performed to slow the rate of asset deterioration and defer the need for costly repairs. These changes, which are supported by federal legislation, provide IDOT with an opportunity to take advantage of new technology, new ways of doing business, and improved transparency and accountability that will help ensure the continued vitality of the highway system today and into the future. IDOT is also engaged in

RAISING the BAR

IDOT's Asset Management Activities Are Raising the Bar by Taking Advantage Of:

- ☑ New technology
- ☑ New ways of doing business
- ☑ Improved transparency and accountability

[4] http://www.idot.illinois.gov/Assets/uploads/files/About-IDOT/Misc/Planning/IDOT_LRTP_1_Introduction4119df.pdf

promoting asset management among other NHS owners and industry partners, presenting information on the TAMP and how it is changing the overall project-selection philosophy at conferences, meetings, and other transportation forums. In addition, IDOT is making use of social media and other public outreach efforts to promote the advantages of its asset management practices.

Asset Management Objectives

The state-maintained highway system is critical to the growth and development of both state and national economies, providing a crucial link between the east and west coasts, as well as serving as the center of the nation's freight network. To meet the continuing demand on the system, IDOT is committed to making the best use of available funding to support system needs and priorities. However, federal and state revenues have not kept up with the needs of the system. As a result, the LRTP, which establishes the strategic direction for the Illinois transportation system, presents new ways for IDOT to be effective stewards of public funds through the use of asset management planning and the implementation of performance-based project selection tools to best leverage existing funds to provide a transportation system that meets both the state's and the nation's needs.

The development of the LRTP is the result of a collaborative process that included the input of a variety of stakeholders from throughout the state. The results of the process led to five broad goals for the agency's investments, as shown in the call-out box to the left.

To accomplish the stewardship goal, IDOT has identified several potential strategies for increasing revenues and managing costs. To manage costs, IDOT has adopted an asset management strategy that is helping the agency achieve the four objectives listed below for its asset management program[5].

1. Create a culture through training and communication where Transportation Asset Management (TAM) is viewed as a way of doing business.
2. Move towards a more performance-based approach to TAM decision making.
3. Find a sustainable balance between proactive, preservation treatments and rehabilitation/reconstruction activities that reduce long-term systemwide preservation costs.

IDOT's Investment Goals

- **Economy** — Improve Illinois' economy by providing transportation infrastructure that supports the efficient movement of people and goods
- **Livability** — Enhance the quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options, and preserve the environment
- **Mobility** — Support all modes of transportation to improve accessibility and safety by improving connections between all modes of transportation
- **Resiliency** — Proactively assess, plan, and invest in the state's transportation system to ensure that our infrastructure is prepared to sustain and recover from extreme events and other disruptions
- **Stewardship** — Safeguard existing funding and increase revenues to support system maintenance, modernization, and strategic growth of Illinois' transportation system

[5] Illinois DOT Transportation Asset Management Gap Analysis and Implementation Plan, August 2015.

4. Provide IDOT staff with improved access to accurate, timely, consistent, and complete asset data and information.

The changes IDOT is making to its business processes have been initiated to achieve these asset management objectives. The changes emphasize investments in improvements to existing assets within a transparent project selection and prioritization process that is guided by sound data and performance-based processes. The new investment strategies that IDOT is implementing promote the use of preservation treatments to slow the rate of deterioration and a more strategic approach to project selection that optimizes the use of available funding. These changes are outlined in more detail in the following sections.

Changes to Performance Measures and Targets

Previously, IDOT had performance targets for asset conditions that were based in large part on highway functional classification and traffic volumes. Moving forward, IDOT has set asset targets that *raised the bar* for asset conditions on the entire highway network. State of Acceptable Condition levels were set for the Interstate system and for all other state highways. The selected condition levels represent the condition at which preservation treatments are considered viable.[6] In the absence of funding constraints, IDOT would maintain system conditions so that at least 90 percent of its pavements and 93 percent of its bridges remain in acceptable condition. However, funding levels are not adequate to achieve IDOT's acceptable condition across the network.

Therefore, IDOT has established new targets representing State of Acceptable Condition levels for all of the pavements and bridges based on system hierarchy in the following order: Interstate and other NHS routes (non-interstate), non-NHS marked routes, and non-NHS unmarked routes. Moving forward, IDOT's emphasis will continue to focus on preserving the NHS, which tends to be of regional significance and carries higher traffic volumes. IDOT set performance targets at 90 percent of the Interstate miles and other NHS routes, 75 percent of the marked routes, and 50 percent of unmarked routes equal to or above the State of Acceptable Condition. The performance targets for bridges are set at 93 percent of the NHS bridge deck area and 90 percent of the non-NHS bridge deck area at or above acceptable conditions. These performance targets for pavements are shown in figure 2-1. The State of

[6] As discussed in Chapter 3, acceptable pavement conditions are set at a CRS value of 5.5 or higher for Interstate pavements and 5.0 or higher for all other state highways. For bridge elements, the primary NBI rating is set at 5 or higher. These conditions represent the point at which low-cost preservation treatments are effective.

Acceptable Condition targets for pavements are based on Condition Rating Survey (CRS) scores[7].

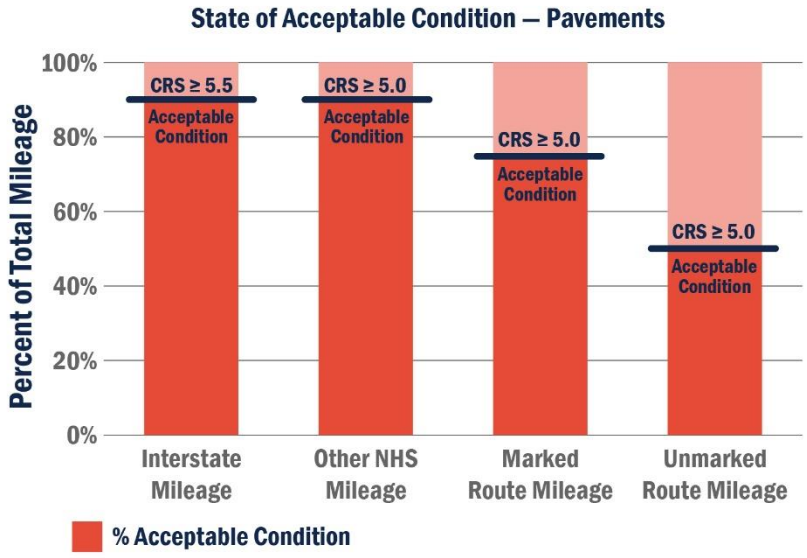


Figure 2-1. State of Acceptable Condition targets for pavements.

The performance targets for bridges are shown in figure 2-2. The targets are based on National Bridge Inventory (NBI) ratings.

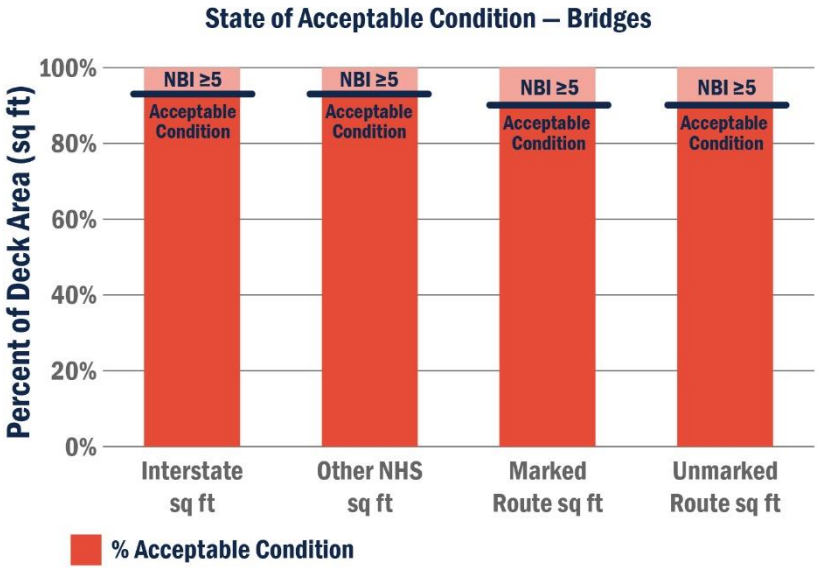


Figure 2-2. State of Acceptable Condition targets for bridges[8].

[7] The CRS procedures are described in Chapter 3.
[8] The NBI inspection procedures are described in Chapter 3.

by using performance data to drive investment decisions that promote sound asset management practices.

by **extending** the useful lives of existing assets while **reducing** long-term preservation costs.

Improved, Data-Driven Investment Strategies

In addition to establishing realistic asset condition targets, IDOT has made a commitment to increased expenditures in pavement and bridge preservation to slow the rate of deterioration and postpone the need for more expensive treatments. This asset management philosophy is reflected in the FHWA's definition for asset management:

> *Asset management is a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the life cycle of the assets at minimum practicable cost.*[9]

The TAMP outlines IDOT's strategies to shift towards a more data-driven decision process that supports the use of analysis tools and life cycle strategies to reduce the rate of system deterioration as cost-effectively as possible. To implement its asset management philosophy, IDOT has adopted a TAM framework that:

- Supports the use of strategic performance objectives that are linked to investments.
- Introduces a systematic process for determining pavement and bridge needs over the life of an asset.
- Emphasizes the use of preservation treatments that economically extend the life of the highway system.
- Considers agency risks or exposure in setting investment priorities.
- Uses asset inventory information, asset condition data, and analysis tools to evaluate options for allocating resources and selecting projects.

For managing pavements and bridges, this means:

- Pavement management system acquisition and implementation.
- Bridge management system acquisition and implementation.
- Revisions to pavement data collection deliverables to meet FHWA performance measures.

[9] 23 CFR 515.5

- Improved coordination between district and Central Office planning and programming activities.

Additional Business Processes Supporting Asset Management

In addition to setting the strategic direction for system investments, the LRTP serves as the overarching framework for IDOT programs and specific modal plans, providing policies to guide system development rather than specific improvements. Planned improvements are programmed separately from the LRTP and released annually as the Multi-Year Proposed Highway Improvement Program and the Multi-Year Multimodal Improvement Program.

Long-Range Transportation Plan

As discussed earlier, the LRTP is designed to act as the parent policy umbrella for other relevant policy and mode-specific plans developed by IDOT as a suite of plans. As shown in figure 2-3, the suite includes interrelated plans such as the State Highway Safety Plan, the Transit Plan, the Rail Plan, the Freight Plan, the Bike Plan, the Marine Plan, the Aviation Plan, the ITS Architecture Plan, and this TAMP.

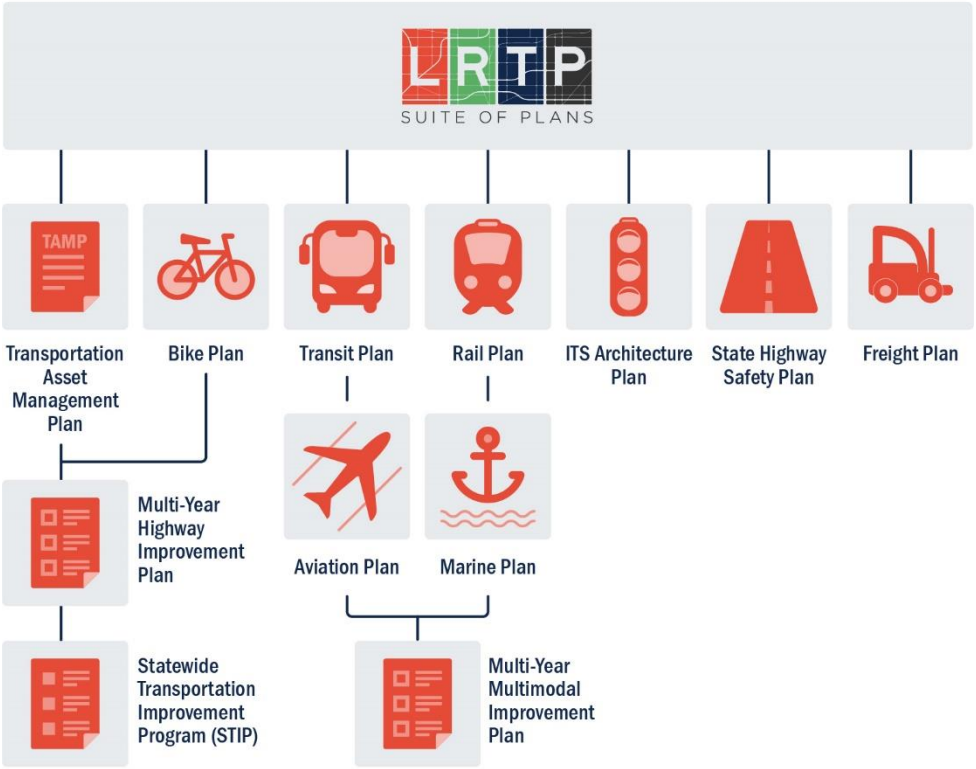


Figure 2-3. Long-range transportation suite of plans.

The LRTP is developed through a collaborative process that includes the input of a variety of stakeholders from throughout the state. The results of the process establish the broad, long-range agency goals that drive the agency's short-term investments.

Multi-Year Proposed Highway Improvement Program (MYP)

Each year, IDOT develops a MYP that weighs the need to preserve the existing system in a state of good repair with the need to enhance or expand the highway network to address congestion and economic development demands. Before being included in the Highway Program, improvements are evaluated by the Office of Planning and Programming based on goals, needs, and available resources. IDOT's TAMP provides the link between the LRTP and its shorter-term (6-year) bridge and pavement programs in the MYP.

For the MYP, IDOT uses a mix of federal transportation funds, state motor fuel tax and vehicle registration fees, bonds, and miscellaneous revenue sources to build, operate, and maintain the roads and bridges under its jurisdiction.

Once investment levels are established, the Office of Planning and Programming works with the districts to select projects that will enable IDOT to meet its statewide performance objectives. In the absence of pavement and bridge management systems, IDOT has developed a spreadsheet tool that allows the Office of Planning and Programming to evaluate the impacts of different investment options for both pavements and bridges. The tool facilitates the analysis of programming funds for preservation, rehabilitation, and reconstruction at both the state and district levels using deterioration rates and treatment costs. Once the Office of Planning and Programming and the districts have agreed to the amount of preservation, rehabilitation, and reconstruction work that will be done during the multi-year period, the districts use pavement and bridge condition information and established guidelines to select the projects that best match the intended investments. The final list of projects is incorporated into the Statewide Transportation Improvement Program (STIP). The published MYP is presented to the General Assembly and made public each spring.

For the portions of the NHS owned and operated by the Illinois Tollway, a comprehensive $14 billion Capital Program Plan was adopted by the Illinois

Tollway Board of Directors[10]. The Illinois Tollway prepares extensive asset management documentation in support of its program in its Official Statement[11].

Asset Management Improvement Plan

In 2015, an asset management gap analysis was conducted that led to the development of an Asset Management Implementation Plan that outlines the seven initiatives listed below to advance the use of asset management principles.

- Initiative 1: Develop a TAM strategic plan.
- Initiative 2: Develop an initial TAMP.
- Initiative 3: Enhance the ability to analyze pavements and bridges.
- Initiative 4: Establish performance targets and incorporate them into the budgeting process.
- Initiative 5: Improve asset management communication and documentation.
- Initiative 6: Improve data access, sharing, and mapping.
- Initiative 7: Integrate risk management into the asset management process.

Since the completion of the gap analysis, IDOT has been enacting the work plan and focusing on the development of this TAMP (Initiative 2). The TAMP development process has enabled IDOT to better incorporate performance data into the budgeting process (Initiative 4) and led to the development of processes that consider both risks and life-cycle needs (Initiative 7).

To accomplish Initiative 3, IDOT is in the process of acquiring new analysis tools, such as pavement and bridge management systems, that can be used to inform decision-making and help IDOT better identify the optimal balance between addressing deficient assets and slowing the rate at which assets become deficient through system preservation. These tools are also expected to help accomplish Initiative 6, providing improved data integration and access.

IDOT's plans to increase the use of pavement preservation treatments, as outlined in this TAMP, illustrate one of the enhanced management practices the agency is adopting to help control costs and extend the useful lives of existing transportation assets. The investment strategies outlined in this

[10] https://www.illinoistollway.com/projects/capital-programs
[11] https://www.illinoistollway.com/documents/20184/86265/Series+2017A+Official+Statement.pdf/fca1fe1c-2bf5-446e-8a73-84ad3040ad42?version=1.0

TAMP represent a concerted effort to identify the preservation needs of its more than 16,000-mile state highway system and bridge network to extend the useful lives of these existing assets while reducing the long-term preservation costs.

In addition, as part of the stewardship initiatives outlined in the LRTP, IDOT is establishing a performance-based project selection process for expansion projects included in the MYP. The process, and the supporting analysis tool, identify projects that provide the state with the highest return on investment after consideration of economic development, livability, mobility, and other benefits to each project (a data-driven process).

Chapter 3: Asset Inventory and Performance

Overview

IDOT maintains a large highway system that represents the nation's third-largest Interstate system and the fourth-largest highway system. According to IDOT's *2017 Freight Plan*, 1.23 billion tons of freight at a value of $3 billion were moved to, from, or within Illinois, with approximately 54 percent of that tonnage using the state's highways[12]. Managing a network of this size and importance requires a good understanding of system conditions and needs. As the basis for this understanding, IDOT collects and maintains inventory and condition information on its pavements, bridges and some ancillary assets to estimate needs. This chapter summarizes IDOT's pavement and bridge inventory and its current conditions.

Highway System and Owners

Owner Roles and Responsibilities

There are nearly 150,000 centerline miles of roads in Illinois. IDOT is responsible for nearly 16,000 of those miles. The roads under IDOT's jurisdiction are comprised of Interstates, U.S. highways, marked state routes, and unmarked routes on the state system. The remaining miles are managed by the Illinois Tollway, the Chicago Skyway, or local agencies within the state. In addition to the responsibility of maintaining the road surface, transportation agencies are responsible for managing the bridges, tunnels, culverts, guardrail, signs, signals, and other appurtenances required for safety and mobility.

IDOT'S RESPONSIBILITIES

IDOT is responsible for maintaining 1,892 of the 2,195 centerline miles of Interstate highway pavement in the state as well as 1,856 structures totaling 32.0 million square feet carrying Interstates. In addition to the Interstate highways, which are part of the NHS, IDOT is responsible for maintaining most of the other NHS routes, as well as most marked routes in the state. This includes 15,911 centerline miles of pavement, 7,856 bridges totaling 85.9 million square feet, and three tunnels.

Interstate Highways make up a network of controlled-access highways that cross the country, connecting large cities. They are designated by the U.S. Department of Transportation.

US Highways are part of an older national highway system without restricted access that is maintained by state and local governments. These highways are numbered by the U.S. Department of Transportation.

State Routes are highways that are not part of the Interstate or U.S. Numbered Highway System. These highways are numbered and maintained by IDOT.

The **State System** also includes other supplemental roads, such as Unmarked Routes.

The **National Highway System** (NHS) is a network of strategic highways identified by the U.S. Department of Transportation and approved by the United States Congress. All Interstate Highways, some U.S. and State Highways, as well as a small number of unmarked routes, are part of the NHS. NHS routes must comply with applicable Federal regulations.

[12] http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/OP&P/ILFreightPlan_FINAL.pdf

ILLINOIS TOLLWAY'S RESPONSIBILITIES

The Illinois Tollway was created by legislation in 1967 "to promote the public welfare and to facilitate vehicular traffic by providing convenient, safe, modern, and limited access highways." Under the direction of the Illinois Tollway Board of Directors, the Illinois Tollway builds, operates, and maintains the roads under its jurisdiction. The Illinois Tollway is authorized to issue bonds to expand and make capital improvements to its system and to collect tolls to fund its operations and to repay bonds. The Illinois Tollway is required by the Amended Trust Indenture to maintain the system in good repair. As an agency, the Illinois Tollway receives consistently high ratings with Fitch, Moody's, and Standards & Poors due to the strong debt to service coverage, which extensively relates to the ability to manage and invest in Illinois Tollway assets in a responsible manner for the long term. The Illinois Tollway is responsible for 295 miles of pavement and 447 bridges representing 7.6 million square feet of bridge deck, the majority of which are located in the Chicago metropolitan area.

CHICAGO SKYWAY'S RESPONSIBILITIES

The Chicago Skyway was constructed by the City of Chicago in 1958. In 2005, the Skyway Concession Company, LLC. began operating the Skyway under a 99-year lease. The Skyway is nearly 8 miles long, about a third of which (60 bridges or approximately 1.2 million square feet) is bridge deck.

LOCAL AGENCIES' RESPONSIBILITIES

Collectively, the counties, townships, and municipalities in Illinois are responsible for the operation and maintenance of over 130,000 miles of roads[13] and the associated structures and appurtenances. Locally-maintained networks include some of the U.S. highways in urban areas and all of the local roads within their jurisdiction. These local agencies use a mix of federal transportation funds, state motor fuel tax funds, and locally-generated funds to address the needs of the roads and bridges under their jurisdictions. IDOT partners with local agencies in a number of ways, including the establishment of highway design standards; policies and procedures for the distribution and expenditure of funds; as well as assistance in planning, financing, design, construction, and maintenance of local agency programs and projects.

The locally-maintained NHS consists of 474 miles of pavement and 236 structures totaling 5.3 million square feet of bridge deck. Although IDOT

[13] Illinois Travel Statistics 2018, Table C-1, April 2018.

provides federal funding to local agencies, it has never set specific requirements on how this funding should be utilized.

Under the current asset management requirements, IDOT is required to report on the condition of the total NHS, regardless of who maintains it. IDOT has assumed responsibility for collecting the pavement condition information for all NHS pavements, regardless of jurisdiction. The local agencies are required to conduct their own NHS bridge inspections and share the results with IDOT. IDOT will annually provide the local agencies a list of all their NHS pavements and bridges, along with their most recent pavement conditions. IDOT has asked that all agencies follow the guidelines in the TAMP for their NHS pavements and bridges. IDOT has established a Local Roads Technical Working Group within the asset management framework to ensure strong coordination with the local agencies on their NHS pavements and bridges.

Table 3-1 shows the number of local agencies and the total number of miles and bridge deck area by county, municipality, and township owners. In total, 12 Metropolitan Planning Organizations (MPOs) are represented. A more detailed list showing the number of miles and bridge deck area by agency is provided in Appendix A.

Table 3-1. Local agency NHS asset inventory by owner.*

Roads		
Owner	**Number of Agencies**	**Number of Miles**
Counties	13	269.64
Municipalities	66	202.66
Townships	5	2.19
Other (Private / Federal)	2	0.92
Total Roads	**86**	**474.41**
Bridges		
Owner	**Number of Bridges**	**Square Feet (in thousands)**
Counties	80	838
Municipalities	152	4,344
Townships	0	0
Other (Private / Adjacent State)	4	111
Total Bridges	**236**	**5,293**

* Skyway numbers not included in municipalities

The Department is working to ensure all local agencies are aware of the requirements under the MAP-21 and FAST Acts regarding asset management, as well as providing them with data on the condition of those NHS assets under their maintenance. This is accomplished through circular notifications, specific letters to those who have NHS assets, and presentations at various meetings throughout the state (including Illinois Municipal League, County Engineers, and MPO meetings). This includes education on the allocation of federal funding under the National Highway Performance Program (NHPP) for use on the NHS.

In the future, it may be necessary for IDOT to require the locals to comply with meeting statewide NHS goals. This could be accomplished by restricting the use of some funding. Currently, IDOT gives local agencies Surface Trasportation Program (STP) funds instead of a combination of STP and NHPP funds[14]. A potential approach could reduce STP funding to agencies with deficient NHS assets and replace the funding with NHPP funds. Since NHPP funding has certain requirements associated with it, this change would require NHPP funds to be used to address NHS roads and bridges.

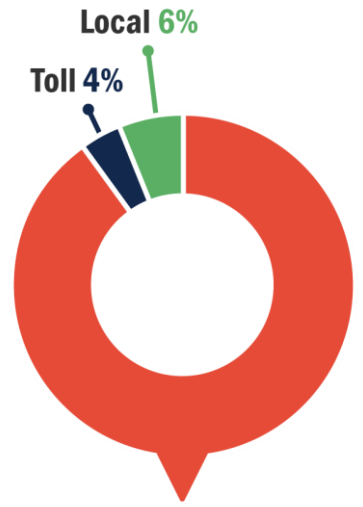
These changes will be considered in the next few years as IDOT continues to monitor the condition of the NHS. IDOT will continue to provide the locals with updated condition information to make more informed decisions about where their local federal funds should be utilized. In addition, IDOT will periodically evaluate whether portions of the NHS should be removed and/or if it makes better sense for the state to maintain this portion of the system. This exercise was most recently performed in 2018, and accounts for most of the changes in local NHS mileage/square footage since the initial TAMP was certified.

Systems

For reporting and managing system conditions and needs, IDOT classifies its pavements and bridges using the definitions listed below.

- National Highway System (NHS) – On a national level, certain highways are designated as part of the NHS, making them eligible for federal funding under the NHPP. All Interstate and some non-Interstate U.S. and state highways, regardless of ownership, are included on the NHS based on their importance to the nation's economy, defense, and mobility. IDOT is required to provide certain types of information to the FHWA related to the NHS on a regular basis.

[14] STP funds are provided through the Surface Transportation Program and NHPP funds are provided through the National Highway Performance Program. These programs are described in more detail in Chapter 6, *Financial Plan and 10-Year Investment Strategies*.



90% of the NHS in Illinois is maintained by IDOT

- **Interstate Highways** – These are highways designated by the U.S. Secretary of Transportation and designed to national standards as limited-access freeways. All Interstate highways are included in the NHS. Interstate highways are further divided by ownership, as described below.
  - » State-maintained – Highways operated and managed by IDOT.
  - » Toll Roads – Highways operated and managed by the Illinois Tollway and the Skyway. The Elgin-O'Hare Expressway (IL 390) is included in the Illinois Tollway mileage on the Interstate system, as it is designed to Interstate standards.
- **Other NHS Routes** – This classification includes non-Interstate highways that are included on the NHS. Most pavements and bridges in this classification are managed by IDOT, but a portion of the system is maintained by local agencies. Because the Skyway is included as an Interstate highway, it is not included in this mileage even though a local agency has jurisdiction.
- **Non-NHS Routes** – The remainder of the state-maintained system is classified as non-NHS routes, which includes both U.S. and state highways. This category is further broken down into the following two subcategories:
  - » Marked routes –This category includes non-NHS highways that are signed as U.S. or state marked routes.
  - » Unmarked routes – This category includes any supplemental highways that are included in the jurisdictional responsibility of the state.

Asset Inventory

Pavements

INVENTORY

Using the highway classifications defined earlier, table 3-2 summarizes the centerline miles of pavement in each category from the 2018 year-end file. It is important to note that IDOT reports pavement inventory in terms of centerline miles. The actual number of lane miles maintained is much higher. For example, a one-mile stretch of highway with two lanes in each direction would count as one centerline mile, but four lane miles.

Table 3-2. Pavement centerline miles by system.[15]

	System	Jurisdiction	Total Centerline Miles	Total (miles)	Total State-Maintained Centerline Miles
NHS	Interstates	IDOT	1,892	7,752	6,975
		Illinois Tollway	295		
		Chicago Skyway	8		
	Non-Interstate NHS	IDOT	5,083		
		Local	474		
Non-NHS	Marked Routes	IDOT	6,571	8,936	8,936
	Unmarked Routes	IDOT	2,365		
	NHS and Non-NHS Pavements			16,688	15,911

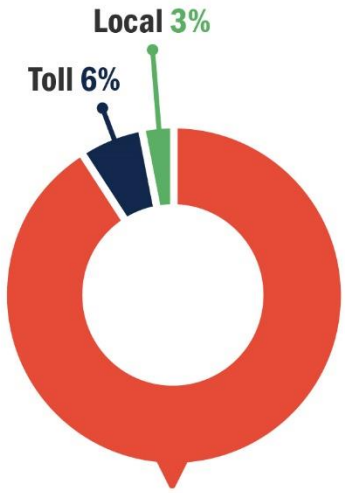
AGE

Due to limited funding for addressing pavement needs over the past several years, the average time before a pavement receives an improvement is increasing. This means that, on average, more vehicles on the state-maintained system are traveling on deteriorated roads each year. On a system-wide basis, the statistics indicate that nearly 91 percent of the state-maintained network is more than 40 years old, based on the original construction year, which exceeds the typical pavement's service life of 30 years. The statewide pavement age statistics are summarized in table 3-3.

Table 3-3. Age of the state-maintained road system (as of 2018).[16]

Age Category	Percent of NHS Interstate Miles	Percent of Non-Interstate NHS Miles	Percent of Non-NHS Marked Routes	Percent of Non-NHS Unmarked Routes	Total Percentage
New	0.1%	0.0%	0.0%	0.0%	0.0%
1-10 Years	1.2%	1.3%	0.4%	0.7%	0.8%
11-20 Years	2.2%	2.3%	0.5%	0.5%	1.2%
21-40 Years	16.0%	8.5%	2.3%	6.7%	6.6%
>40 Years	80.5%	87.7%	96.4%	90.4%	90.9%
Unknown	0.0%	0.2%	0.4%	1.7%	0.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

[15] FHWA approved NHS miles as of 2-28-19.
[16] Data provided by the Bureau of Programming, Planning & Systems Section, March 2019.



91% of the total number of bridges included in the TAMP are maintained by IDOT

Bridges

INVENTORY

A summary of the number and size of bridges maintained by IDOT, the Illinois Tollway, the Skyway, and local agencies is presented in table 3-4. In addition to bridges, the inventory includes large culverts (those greater than 20 feet in length). The summary contains bridges included in IDOT's 2019 National Bridge Inventory (NBI) submittal as well as new bridges that are open to traffic but whose initial inspections were not included in the 2019 NBI submittal (status 8 bridges).

IDOT also has a number of other structures it is responsible for, including railroad bridges over highways, pedestrian/bicycle crossings, tunnels, small bridges and culverts, and pipeline structures. These structures are not included in the TAMP.

Table 3-4. Number and square feet of bridges by system.[17]

	System	Jurisdiction	Total Number of Bridges	Total sq ft Deck Area (millions)	Totals (sq ft in millions)	State Maintained Totals (sq ft in millions)
NHS	Interstates	IDOT	1,856	31.999	4,810 bridges 73.598 sq ft	4,067 bridges 59.396 sq ft
		Illinois Tollway	447	7.619		
		Chicago Skyway	60	1.290		
	Non-Interstate NHS	IDOT	2,211	27.397		
		Local	236	5.293		
Non-NHS	Marked Routes	IDOT	2,197	12.133	3,789 bridges 26.511 sq ft	3,789 bridges 26.511 sq ft
	Unmarked Routes	IDOT	1,592	14.378		
	NHS and Non NHS Structures				8,599 bridges 100.109 sq ft	7,856 bridges 85.907 sq ft

Border Bridges

Included in the bridge inventory are several border bridges that begin in Illinois but cross over major rivers and end in other states. The management of these bridges is shared with Iowa, Missouri, Kentucky, or Indiana, depending on the location of the bridge. This shared responsibility requires a close partnership with the neighboring states and coordination in terms of

[17] Data provided by the Bureau of Programming, Planning & Systems Section, March 2019.

the timing and cost sharing of improvements, increasing the overall complexity required to manage them effectively.

There are 39 bridges that fall into this category, crossing the three major rivers that make up 71 percent of the State's boundaries – the Mississippi, the Ohio, and the Wabash.

Major Bridges

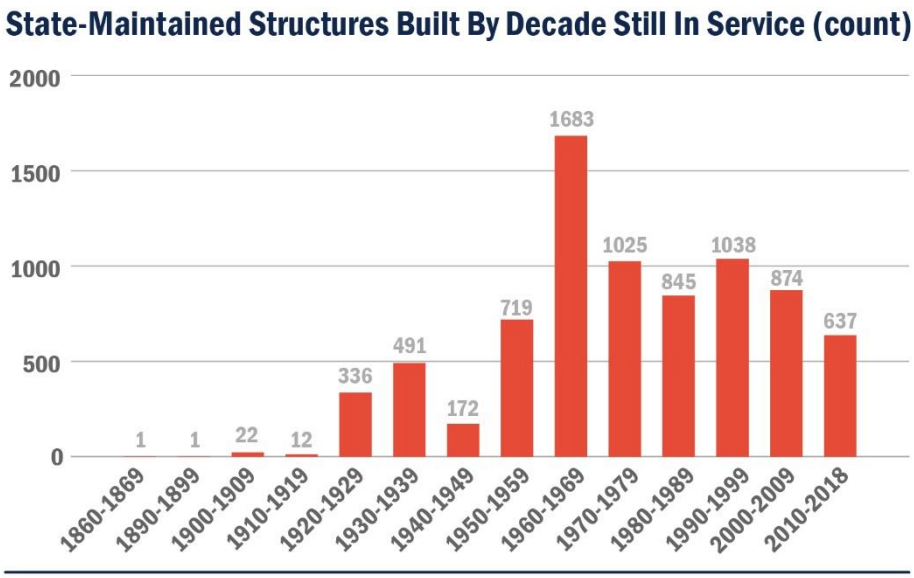
The bridge inventory also includes 183 bridges with a total length greater than or equal to 1,000 feet that are classified as Major Bridges (some of which are also Border Bridges). In addition, 54 additional structures were added to the classification due to their complexity and high cost for maintenance, repair, and replacement. The combined total of 237 bridges considered to be Major Bridges represents 23.6 million square feet of bridge deck area, representing a substantial portion of the state-maintained bridge deck area. Because of the size and complexity of these bridges, their rehabilitation and replacement consume a significant portion of the available budget.

AGE

As with pavements, the funding needed to address all of the identified bridge needs has been inadequate over the last decade. The aging of the state-maintained bridge inventory is reflected in figure 3-1. It shows that approximately 44 percent of IDOT's bridges still in service are more than 48 years old, representing a significant level of deferred investment.

Factors Impacting Asset Performance

The age of the pavement and bridge networks is a key factor influencing performance. As pavements and bridges age, they typically require more frequent, and expensive, maintenance and rehabilitation in order to continue to provide acceptable levels of performance. In addition, pavement and bridge conditions are influenced by many other factors.



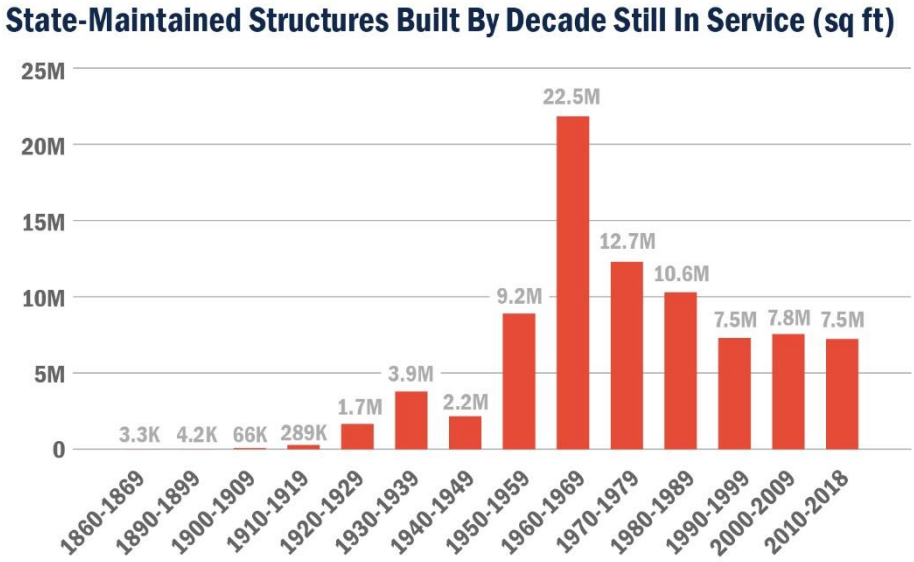


Figure 3-1. Number and square feet of state-maintained bridges built, by decade.

Factors Impacting Both Pavements and Bridges

There are a number of factors that influence the performance of both pavements and bridges, including:

- Available funding.
- Increased traffic volumes and weights.
- Increased truck percentages.
- The age of the current system.

- Weather, including the frequency and duration of freeze-thaw cycles.
- The availability of maintenance personnel and funding to perform preservation work when it is most effective.
- The addition of new traffic lanes or bridges to the system without a corresponding increase in maintenance funding.
- Changes in design specifications that exceed the standards that were in place when many of the pavements and bridges were originally designed.
- Approximately 10 percent of NHS pavements and 9 percent of NHS bridges are outside of IDOT's control, with limited opportunities to influence the treatments used.

Additional Factors Impacting Pavement Performance

In addition to the factors that impact both pavements and bridges, pavement conditions are also influenced by the following:

- The condition of underlying layers.
- Material properties.
- Premature failures due to inadequate drainage.
- Moisture infiltration into the underlying pavement layers.
- Funding limitations that have led to resurfacing as the predominant repair – over time, each resurfacing has a shorter service life than the one before it. This is an unsustainable solution.

Additional Factors Impacting Bridge Performance

There are also several factors that have a significant impact on bridge conditions, as listed below.

- Lack of maintenance funding to prevent premature deterioration.
- IDOT's heavy use of de-icing chemicals has led to premature deterioration.
- IDOT's inability to fully control the timing of repairs for bridges shared with other states.

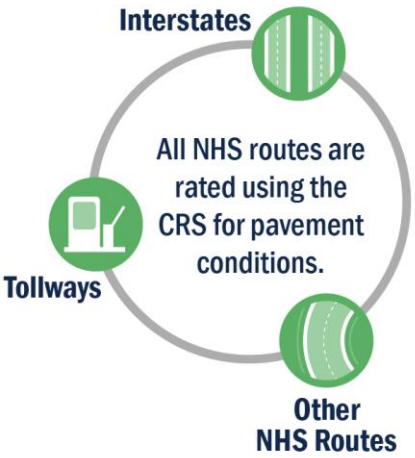
Monitoring and Reporting Asset Conditions

Pavements

PAVEMENT CONDITION ASSESSMENT

IDOT collects condition data on Interstate pavements annually, and collects data on non-Interstate pavements on a two-year cycle. The data is collected and processed by a vendor using an automated data collection vehicle, such as the vehicle shown in figure 3-2.

Figure 3-2. Automated data collection vehicle.



Pavement condition surveys are performed in each travel direction on divided highways and in one direction on all other routes. Downward-facing cameras are used to record pavement condition information and panoramic cameras provide visual references that are useful when viewing the images. In addition, lasers are used to collect sensor data to determine rutting, roughness, and faulting measures. Personnel from the Bureau of Programming and each of the districts view the digital images of the pavement surface at workstations to identify predominant distresses, based on distress type, amount, and severity. The sensor data and distress data are combined to determine a Condition Rating Survey (CRS) value ranging from 1.0 to 9.0, with a 9.0 representing a newly constructed or resurfaced pavement and a 1.0 representing a failed pavement. In addition to collecting CRS ratings on the state-maintained system, IDOT also inspects any locally-maintained roadways on the NHS on a two-year cycle.

The Illinois Tollway also uses the CRS procedure to rate the condition of its pavement network. The Illinois Tollway contracts with a vendor to conduct CRS inspections annually. The Illinois Tollway utilizes this information as

supporting documentation for a comprehensive Pavement Management Plan that is used to program pavement maintenance, rehabilitation, repair, and replacement programs. The Pavement Management Plan is updated biennially to incorporate inspection results and construction projects.

IDOT is required to report pavement condition information to the FHWA on the NHS each year as part of the FHWA's Highway Performance Monitoring System (HPMS). IDOT recognizes that not all local units of government have the resources to collect and report the federally-required NHS pavement performance metrics. With this in mind, IDOT has assumed the responsibility for collecting the federal performance metrics on all NHS pavements, regardless of jurisdication.

The pavement condition information required by the FHWA differs from the CRS procedure in terms of the types of distress rated and the way the information is used to report pavement conditions. Fortunately, IDOT's automated data collection process provides sufficient information to allow the Department to extract the HPMS data in addition to the CRS ratings. IDOT is currently working with the vendor to improve methods for processing the data in accordance with the HPMS data format for the required submittals.

PAVEMENT PERFORMANCE METRICS

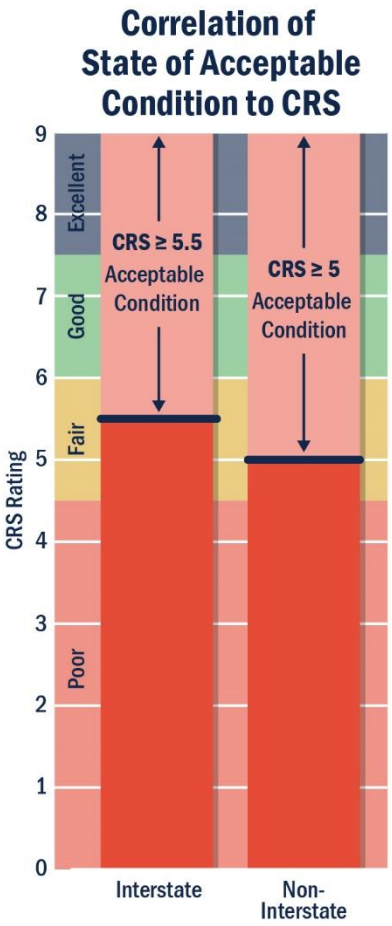
IDOT's Pavement Performance Metrics

IDOT is in the process of changing the way CRS ratings are used to monitor pavement performance and identify investment needs. In the past, the CRS was evaluated in conjunction with other data, such as average daily traffic and the roadway functional classification, to determine the greatest repair needs. Based on this information, each roadway segment was determined to be in "Acceptable" condition or in need of repair. Roadway segments in Acceptable condition were further divided into either "Accruing" or "Adequate" condition. Accruing segments were those anticipated to deteriorate to the point that they would need improvement within six years of the evaluation, while adequate segments were those expected to need little or no improvement within those same six years.

If the roadway segment was determined to have "Needs," it was classified in terms of "Critical Backlog" or "Other Backlog." Critical Backlog included roadway segments that had deteriorated to a very poor or unacceptable condition in which extensive patching and base repair were required before resurfacing. Road segments classified as Other Backlog had deteriorated to the point that an improvement was needed immediately and the cost of repairs was expected to increase significantly if the improvement was

delayed. Together, roadway segments in these categories were commonly referred to as the "Backlog" of needs.

The classification of roadway segments in Backlog condition varied based on the functional classification and traffic levels. In general, roadway segments on high-volume facilities, such as Interstates, were maintained at a higher level than low volume, rural routes where traffic generally travels at lower speeds. In recognition of the differences in maintenance, Backlog needs were set at a higher condition level on high-volume facilities than on low-volume facilites.



IDOT recently initiated changes to its pavement performance metrics that shifted the focus from Backlog needs to a more proactive approach that recognizes the importance of preservation activities before pavements deteriorate to a Backlog condition. The new approach uses CRS values to determine the percentage of the highway system that is in a "State of Acceptable Condition," representing a CRS value of 5.5 or higher for Interstates and 5.0 for other NHS and non-NHS routes. These CRS values were selected because they represent the lowest condition at which preservation treatments are considered viable. As shown in the graphic to the left, only pavements in *Excellent*, *Good*, and a portion of *Fair* fall within the range of acceptable conditions that are good candidates for cost-effective applications of preservation treatments.

Illinois Tollway's Pavement Performance Metrics

The Illinois Tollway classifies its roadway conditions using slightly different performance measures, as shown in table 3-5.

These performance metrics are used to report pavement conditions and in turn influence the type and timing of maintenance, preservation, and rehabilitation activities.

Table 3-5. Summary of pavement condition criteria for the Illinois Tollway.

Condition Rating Survey (CRS)	Pavement Condition Category
7.5–9.0	Excellent
6.6–7.4	Good
6.0–6.5	Transitional
4.5–5.9	Fair
1.0–4.4	Poor

Chicago Skyway's Pavement Performance Metrics

The Chicago Skyway classifies its pavement condition similar to the Illinois Tollway, as shown in table 3-6. Repair recommendations are categorized as High, Medium, and Low priority following annual inspections using the metrics.

Table 3-6. Summary of pavement condition criteria for the Chicago Skyway.

Condition Rating	Pavement Condition
5	Excellent
4	Good
3	Fair
2	Poor
1	Failed

Bridges

BRIDGE CONDITION ASSESSMENT

To enable IDOT to manage the nearly 8,000 bridges on the state highway system, the agency conducts Safety and Element Level bridge inspections on a regular cycle in accordance with the National Bridge Inspection Standards (NBIS), the American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation (MBE) and the AASHTO Manual for Bridge Element Inspections (MBEI). NBIS inspections are conducted to ensure the safety of the public and to catalog accurate data reflecting each bridge's physical attributes and current conditions. The standards outline the requirements for inspection procedures, frequency, and inspector qualifications for all bridges (and structures) with a total span length greater than 20 feet. The inspections are performed by a combination of state, local, and consultant personnel, all of whom have been trained in accordance with the NBIS procedures. In general, IDOT's district bridge inspectors inspect state-maintained bridges, with the exception of major river bridges, which are inspected by Bureau of Bridges and Structures' inspection crews. Local agencies or consultants inspect locally-maintained bridges.

During the inspections, each of the major bridge components is evaluated, including decks (consisting of the deck wearing surface, joints, and parapets), superstructures (consisting of beams, diaphragms, stiffeners, and bearings), substructures (consisting of piers, abutments, foundations, slopes, crash walls, and piling), and culverts using the NBI rating scale that ranges from 0 for a failed structural element to 9 for a structural element in excellent condition. A description of each NBI rating is provided in table 3-7. A primary

NBI rating is assigned to the bridge equal to the lowest rating from the deck, superstructure, and substructure individual ratings.

In addition, element level inspections, conducted according to the IDOT Bridge Element Inspection Manual, assign quantities of deterioration to one of four condition states for each bridge element using a more detailed breakdown of elements within a bridge. This element level inspection information will form the basis of a Bridge Management System (BMS). Currently the Department is evaluating the AASHTOWare BrM bridge management software. It is anticipated that the output of the BMS will help shape the funding program by identifying structures that need maintenance and repair.

Bridges throughout the system receive a routine visual inspection at least every two years, except for some in good condition that are inspected on a four-year cycle. Underwater inspections are performed every five years. Other inspections may be conducted following incidents that threaten bridge stability (e.g., collisions or floods), to monitor special situations, or following new construction.

Table 3-7. NBI bridge condition rating descriptions.

Code	Description
N	Not applicable.
9	Excellent condition.
8	Very good condition — no problems noted.
7	Good condition — some minor problems.
6	Satisfactory condition — structural elements show some minor deterioration.
5	Fair condition — all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	Poor condition — advanced section loss, deterioration, spalling, or scour.
3	Serious condition — loss of section, deterioration, spalling, or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	Critical condition — advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support.
1	"Imminent" failure condition — major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement is affecting structure stability. (Bridge is closed to traffic, but may be put back in service with corrective action).
0	Failed condition — out of service — beyond corrective action.

The Illinois Tollway conducts routine bridge inspections each year and the resulting "Structure Inspection Field Reports" are reviewed by the Illinois Tollway's Consulting Engineer. Culverts that meet the FHWA classification of bridges (greater than 20 ft) are also inspected every two years at a minimum as part of the bridge inspections and are assigned a condition rating similar to that of the bridges. As part of the inspection of bridges and culverts, an NBI rating of 0 to 9 is assigned to the structure using the same process that IDOT follows. These ratings are used to document the condition of the deck, superstructure, and substructure. The inspection data is submitted to IDOT for submittal to the FHWA. As described in the next section, the Illinois Tollway also uses the inspection results to determine an overall Health Index.

BRIDGE PERFORMANCE METRICS

IDOT's Metrics

The processes being used to report bridge conditions and to identify, select, and prioritize bridge needs are undergoing similar changes to those described earlier for pavements. In the past, bridge investment priorities were identified using a program called BAMS (Bridge Analysis and Monitoring System), which is a program planning tool that categorizes bridges into a hierarchy of deficiency levels. BAMS used 16 categories for bridge condition, with nine representing Backlog condition issues and the remaining seven categories used to identify bridges that would accrue to a Backlog condition in the future. As with pavements, bridges in Backlog condition had deteriorated to the point where an improvement was needed as soon as practical. Those bridges classified to be in Accruing condition were expected to need improvements during or subsequent to the current MYP timeframe.

Today, IDOT is increasing its focus on programming a range of treatments, detailed in FHWA's Bridge Preservation Guide over a bridge's life span, which focuses on meeting targets for State of Acceptable Condition, rather than focusing exclusively on Backlog bridges. Bridges are considered to be in a State of Acceptable Condition if they have an NBI condition rating of 5 or greater.

Illinois Tollway Metrics

In addition to the NBI rating, the Illinois Tollway calculates a Health Index for each bridge based on a weighting of the deck, superstructure, and substructure ratings from the inspection. The Health Index is intended to provide an overall indication of the structural integrity of a bridge, with a higher weight placed on the deck since it tends to deteriorate faster than the other bridge components. The Health Index is a number on a 0 to 100 scale, with 100 being the best rating, as shown in table 3-8.

Table 3-8. Illinois Tollway's bridge Health Index number descriptions.

Bridge Health Index	Description
≥ 90	No problems or some minor problems noted. No action required.
80–89	Some areas of minor deterioration. Minor repair by Maintenance or Contract would prevent additional deterioration.
70–79	Structural elements are sound but exhibit minor section loss or deterioration. Repair Contract likely needed within 5 years.
60–69	Advanced section loss. Repair Contract should be initiated within 2 years.
< 60	Advanced loss of section and deterioration. Local failures possible. Immediate attention needed.

Chicago Skyway Metrics

The Chicago Skyway also uses the NBI rating scale to evaluate its bridges. Additionally, repair recommendations are categorized as High, Medium, and Low priority following annual inspections. Higher risk elements (fracture critical bridge elements, for example) are typically more highly prioritized.

Ensuring Data Collection Quality

IDOT has instituted several processes to ensure the quality of the asset condition data used to support its programming activities. As required under the FHWA Transportation Performance Management Rule, the Department has developed a Data Quality Management Plan (DQMP) that was approved by FHWA in October 2018. The DQMP outlines the quality control steps in place for pavement data collection to ensure the quality of the condition information used by the Department. For pavements, the data collection vendor is required to have a Data Quality Control Plan in place that identifies the steps the contractor will take to ensure quality data prior to the start of data collection, as the data is being collected, and during the processing of the data. Pavement distress data is assessed by IDOT raters who have participated in both classroom and field instruction.

For bridges, all inspection personnel receive rigorous training and are qualified as bridge inspectors. Only qualified personnel can inspect bridges in Illinois and the Illinois Structures Information System will not allow the entry of inspection results from a non-qualified inspector. After inspections are completed, the reports are reviewed for accuracy and approved by the responsible Program

Manager. Random quality assurance reviews are also conducted in the field and in the office on state and local bridge inspection results to ensure high quality inspections are being performed. Manuals and guidelines are provided to all inspection personnel to aid them during the rating activities.

For both pavements and bridges, the condition information is compared to prior years' data as a reasonableness check. Any pavement sections or bridges with unusual rates of deterioration are flagged for further review.

Performance Trends (Historical, Current, and Projected)

Pavements

IDOT'S PAVEMENT CONDITIONS

Historically, IDOT's pavement performance has been reported in terms of the number of miles of Backlog pavement, representing pavements needing rehabilitation. As shown in figure 3-3, there was a significant increase in the number of Backlog miles after 2010. In response to this increase, which reflected inadequate funding levels to reach targets, IDOT lowered its Backlog criteria to reflect the deteriorating conditions. Going forward, IDOT has adopted transformational business processes that no longer accept lowered conditions. IDOT's new processes are committed to *Raising the Bar* through its emphasis on preservation strategies and its new targets for State of Acceptable Condition.

RAISING the BAR

IDOT's transformative processes will help achieve improved conditions over the long term.

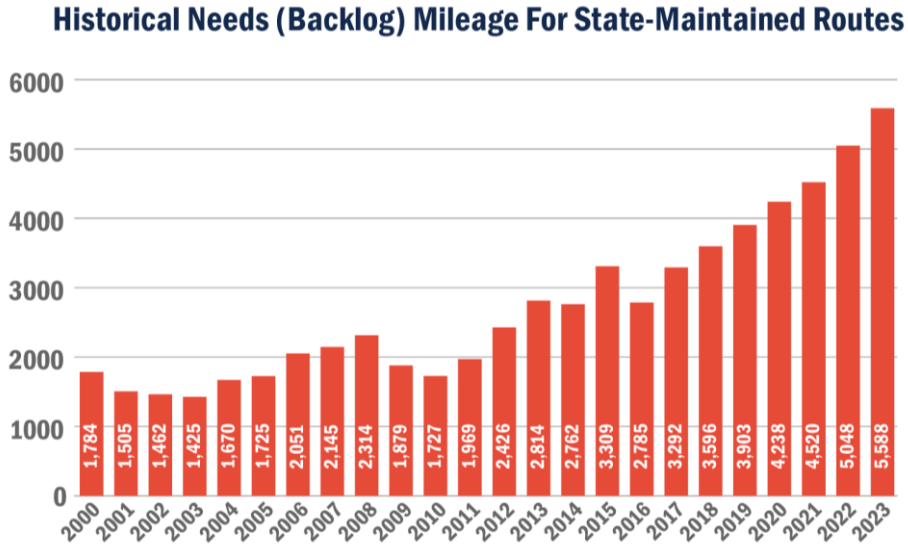


Figure 3-3. Historical summary of actual and projected backlog conditions on routes maintained by IDOT.[18]

[18] As noted in the TAMP, the criteria for determining needs are being revised.

As shown in figure 3-4, the largest number of miles in Backlog condition was on the marked routes, which include both non-Interstate NHS and non-NHS marked routes.

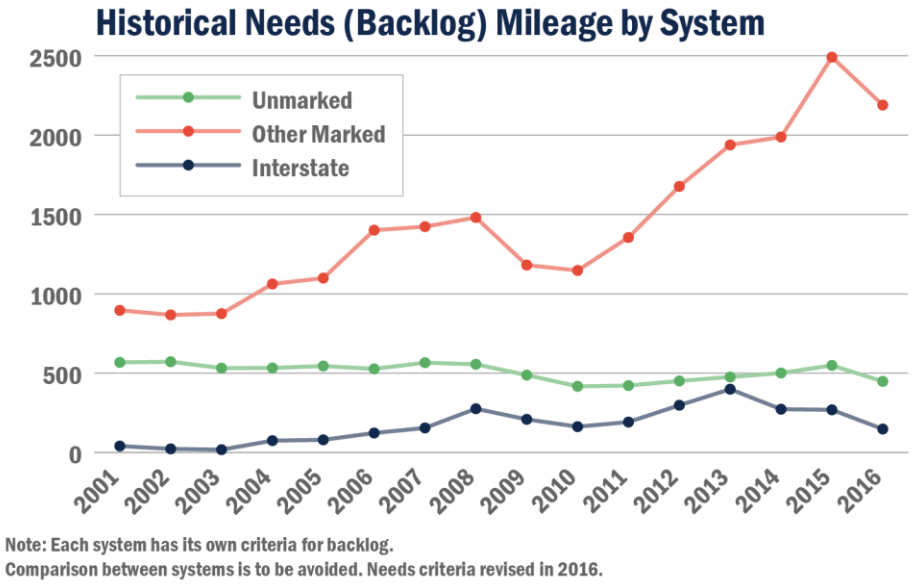


Figure 3-4. Historical backlog mileage by system.

In 2016, 17.5 percent of the total system was reported to be in Backlog condition and 27.8 percent was expected to accrue to a Backlog condition within six years if no rehabilitation was scheduled. These conditions are represented in figures 3-5 and 3-6, both of which represent the pavement metrics IDOT used historically rather than the new metrics introduced in the TAMP.

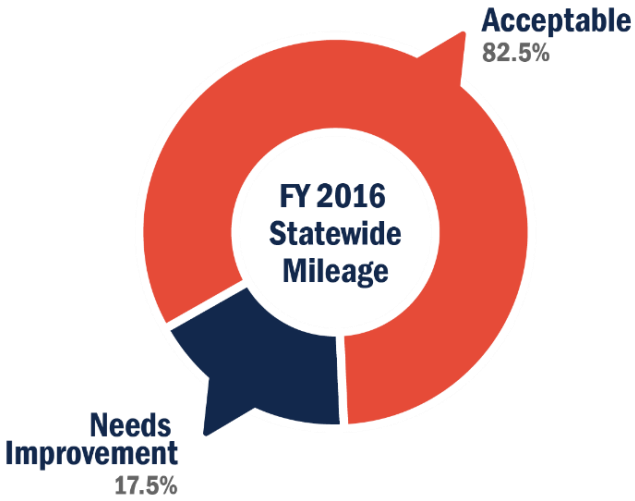


Figure 3-5. 2016 statewide pavement conditions using IDOT's historical metrics.

IDOT is ... RAISING the BAR

by moving from Backlog to State of Acceptable Condition.

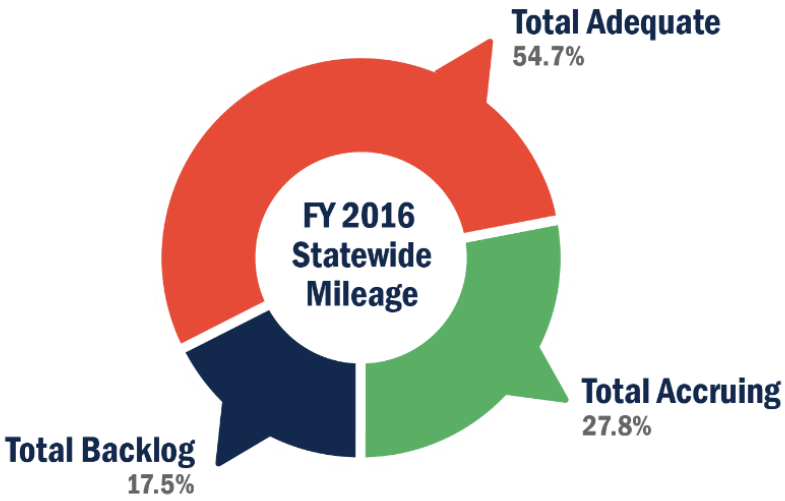


Figure 3-6. 2016 statewide pavement condition by category (using IDOT's historical performance metrics).

For the FY 2019-2024 MYP, IDOT implemented new processes that end its use of Backlog as a pavement performance metric and replace it with State of Acceptable Condition, which represent a CRS value greater than 5.5 for Interstate pavements and 5.0 for non-Interstate NHS and non-NHS pavements. Pavements in this condition category are considered to be in Fair or Better condition, which means that they can be preserved using low-cost preservation treatments. Using the new metric with 2018 CRS data, approximately 73 percent of the total system is currently in a State of Acceptable Condition, as is 80 percent of the total NHS. IDOT has placed a priority on maintaining Interstate conditions, which is r eflected in the fact that 89 percent of the Interstate system is considered to be in the State of Acceptable Condition. Only slightly more than 202 centerline miles of Interstate pavement fall below the State of Acceptable Condition. These statistics are reflected in figures 3-7, 3-8, and 3-9, which show system conditions, NHS conditions, and Interstate conditions, respectively, with the new performance metrics.

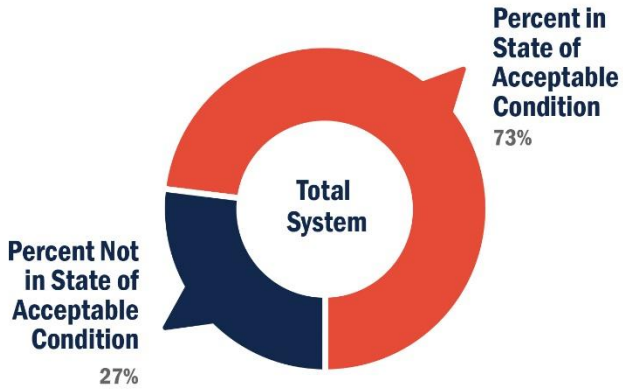


Figure 3-7. Percent of the total pavement centerline mileage meeting the State of Acceptable Condition in 2018 using IDOT's new pavement performance metrics.

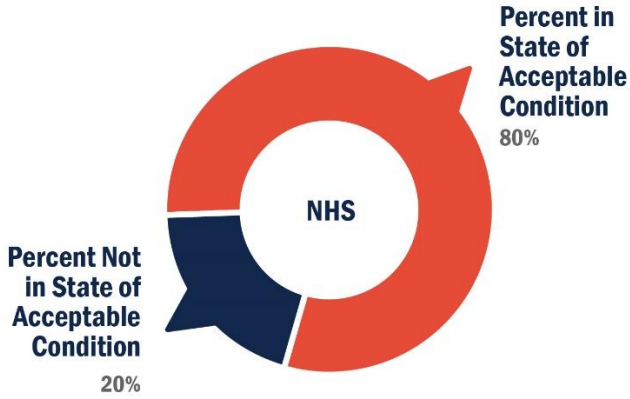


Figure 3-8. Percent of the total NHS centerline mileage meeting the State of Acceptable Condition in 2018 using IDOT's new pavement performance metrics.

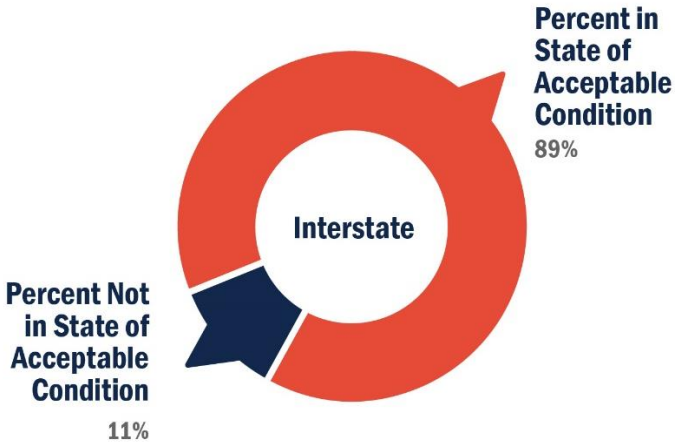


Figure 3-9. Percent of the Interstate centerline mileage meeting the State of Acceptable Condition in 2018 using IDOT's new pavement performance metrics.

Factors Impacting the Weight of Pavement Deterioration Prediction Rates

Functional Classification
Interstate
Non-Interstate

Geographic Region
Nothern (Districts 1–4)
Southern (Districts 5–9)

Surface Type
Bare Concrete
Hot-Mix Asphalt
Composite

Pavement Structure
SMART
Preservation Treatment
D-Cracking
Asphalt Overlay

Current CRS
High (Excellent & Good CRS)
Low (Fair & Poor CRS)

As the state highway system continues to age, and with funding levels unable to address expected needs, it has become increasingly important to develop a proactive and predictive approach to plan highway investments. IDOT uses pavement performance models to support the analyses needed to implement this approach. IDOT's models are based on the historical performance of individual pavement sections over time. The average rate of change in condition over the life of a pavement section is calculated and combined with data from other pavement sections that have similar construction (which are referred to as a "family"). The average rate of change for the entire family is used to predict the future condition of all pavement sections that meet the family criteria. IDOT has refined its models over the years, with the most recent update having taken place in 2018. The pavement performance models are expected to be incorporated into IDOT's new pavement management software once it is implemented.

ILLINOIS TOLLWAY PAVEMENT CONDITIONS

A summary of system conditions and planned investments is published annually in the Illinois Tollway's Consultant Engineer's report[19]. The 2018 report indicated that no miles were in *Poor* Condition, and only 2.2 percent were in *Fair* condition. The remainder of the Tollway system was in Transitional or better condition, or was not rated due to construction activities at the time of condition rating.

The Illinois Tollway has developed its own performance models to predict pavement conditions as part of a 2013 study. The Illinois Tollway models also predict CRS over time, but incorporate additional data, such as traffic volumes, pavement thickness, and construction history.

CHICAGO SKYWAY PAVEMENT CONDITIONS

As of the 2018 inspection, 70 percent of the Skyway's pavements are in better than *Fair* condition, and 100 percent are in better than *Poor* condition, using the metrics described above.

Bridges

IDOT'S BRIDGE CONDITIONS

For the FY 2019-2024 MYP, the performance metric for bridges was also changed and the definition for State of Acceptable Condition was set at an NBI rating of 5 or better, representing a bridge that could be preserved using maintenance or preservation treatments. Using this metric, system conditions are presented in figures 3-10, 3-11, and 3-12 using the NBI data submitted

[19] https://www.illinoistollway.com/documents/20184/86242/RP_WSP_NWS_9975-AnnualConsultingEngineersReport2018_03142019.pdf/67079ac9-1e9e-4a28-8393-5ace709db433

in March 2019. Figure 3-10 shows the percentage of total bridge deck area in the State of Acceptable Condition, figure 3-11 shows the same for the NHS, and figure 3-12 presents the information for Interstate bridges only. As the figures show, most of the bridge deck area currently meets the State of Acceptable Condition, regardless of the system.

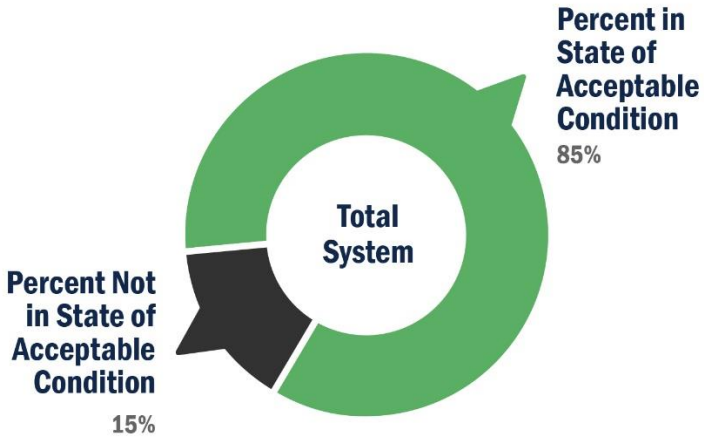


Figure 3-10. Percent of total bridge deck area meeting the State of Acceptable Condition in 2018 using the new bridge performance metrics.

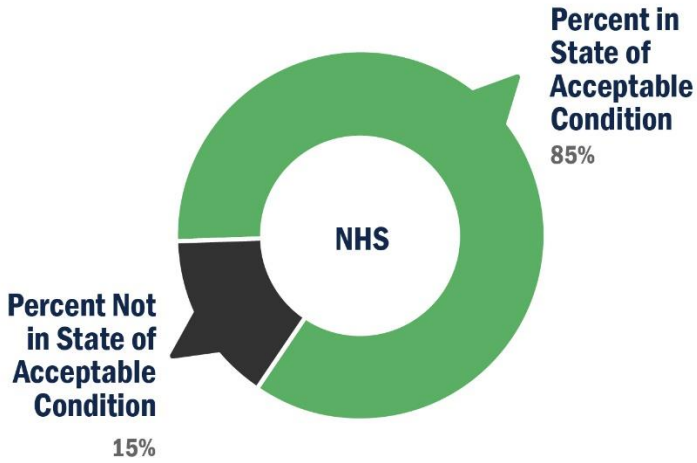


Figure 3-11. Percent of NHS bridge deck area meeting the State of Acceptable Condition in 2018 using the new bridge performance metrics.

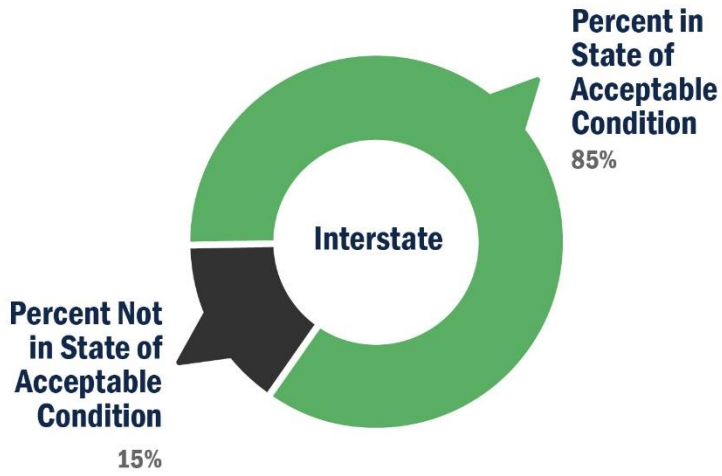


Figure 3-12. Percent of Interstate bridge deck area meeting the State of Acceptable Condition in 2018 using the new bridge performance metrics.

In the past, IDOT had developed average primary NBI rates of change in bridge conditions to identify expected changes in terms of the Accruing and Backlog bridge conditions for its use in developing the MYP. In 2018, deterioration curves were developed for deck, superstructure, substructure, and culverts based on 20 years of historical inspection data to predict future conditions that will support IDOT's Bridge Management System. Future revisions to the deterioration models will include customizing the models based upon bridge types and the climatic conditions to which each bridge is exposed. In addition, IDOT is in the process of acquiring and will implement new asset managment software that will have enhanced bridge condition prediction capabilities, including the ability to develop up-to-date deterioration models based on the information and factors mentioned above.

ILLINOIS TOLLWAY BRIDGE CONDITIONS

The Illinois Tollway rates the condition of all bridges on a two-year cycle. The 2018 Illinois Tollway's Consultant Engineer's report referenced in the Pavement Condition section indicated that no bridges in the 2017-2018 rating cycle had a health index less than 60 using the 0 to 100 scale.

The Illinois Tollway has also established models to predict bridge deterioration rates. The Illinois Tollway models look up tables of life cycle based on bridge type for the general bridge component (such as joint, deck, and substructure).

CHICAGO SKYWAY BRIDGE CONDITIONS

As of the 2018 inspection, 87 percent of bridges maintained by the Chicago Skyway are in better than *Fair* condition and 100 percent are better than *Poor* condition, using the NBI rating scale defined above.

Performance Targets

To manage its program and monitor progress, IDOT uses two different sets of performance targets. For the statewide pavement and bridge networks IDOT is using performance targets based on its new performance metric of State of Acceptable Condition for tracking and reporting progress, both internally and to outside stakeholders. State of Acceptable Condition targets are also driving investment decisions, supporting IDOT's increased use of preservation treatments to slow the rate of pavement and bridge deterioration.

In addition to its internal targets, IDOT is required to set two- and four-year performance targets for pavements and bridges on the NHS using performance measures established by FHWA, as described in Appendix B.

IDOT's current internal targets, in terms of State of Acceptable Condition, and its two-and four-year federal targets are provided. While the internal targets are used primarily to drive pavement and bridge investment decisions on a statewide basis, the federal targets play an important role in prioritizing investments on the NHS.

IDOT Internal Targets

Using current and predicted CRS values in conjunction with anticipated funding levels, the initial pavement performance targets shown in table 3-9 were established as the State of Acceptable Condition used in the Performance Gap Analysis described in Chapter 7.

Table 3-9. IDOT's State of Acceptable Condition targets for pavements.

System	Acceptable Condition (CRS)	System Acceptable Condition Target (Percent)
Interstate	5.5 or greater	90%
Other NHS	5.0 or greater	90%
Non-NHS Marked Routes	5.0 or greater	75%
Non-NHS Unmarked Routes	5.0 or greater	50%

IDOT is ... RAISING the BAR

by establishing new State of Acceptable Condition Targets for Pavements

- Interstates: 90 percent of the network with a CRS ≥ 5.5
- Other NHS routes: 90 percent of the network with a CRS ≥ 5.0
- Non-NHS Marked routes: 75 percent of the network with a CRS ≥ 5.0
- Non-NHS Unmarked routes: 50 percent of the network with a CRS ≥ 5.0

IDOT is ...
RAISING the BAR

by establishing new State of Acceptable Condition Targets for Bridges

- Interstate and all other NHS bridges: 93 percent at or above a primary NBI rating of 5 or better
- All other bridges: 90 percent at or above a primary NBI rating of 5 or better

For bridges, the State of Acceptable Condition targets were established based on current and projected conditions, as well as anticipated levels of bridge funding. The resulting bridge targets, based on the primary NBI condition rating, are presented in table 3-10.

Table 3-10. IDOT's State of Acceptable Condition targets for bridges (based on primary NBI rating).

System	Acceptable Condition (NBI Value)	System Acceptable Condition Target (Percent)
Interstate	5 or greater	93%
Other NHS	5 or greater	93%
Bridges on Non-NHS Marked Routes	5 or greater	90%
Bridges on Non-NHS Unmarked Routes	5 or greater	90%

Federal Targets

As described in Appendix B, IDOT submitted its Baseline Performance Period Report to FHWA with the two- and four-year targets presented in table 3-11 (pavements) and 3-12 (bridges) in October 2018. The Mid-Performance Period Progress Report, showing progress toward the four-year targets, will be submitted to FHWA by October 1, 2020.

Table 3-11. IDOT's 2- and 4-year pavement targets for federal reporting.

Performance Measure	Baseline Value	2020 Target (%)	2022 Target (%)
Percent Interstate Pavement in Good condition	Not required in 2018	Not required in 2018	65
Percent Interstate Pavement in Poor condition	Not required in 2018	Not required in 2018	4.9
Percent Non-Interstate NHS Pavement in Good condition	37.6	27	27
Percent Non-Interstate NHS Pavement in Poor condition	19.4	6	6

Table 3-12. IDOT's 2- and 4-year bridge targets for federal reporting.

Performance Measure	Baseline Value (%)	2020 Target (%)	2022 Target (%)
Percent NHS Bridges in Good condition	29	28	27
Percent NHS Bridges in Poor condition	11.6	13	14

Asset Valuation

Since its inception, IDOT has made significant, on-going investments in its pavements and bridges. If the existing pavements and bridges on the NHS were replaced today, they would require an investment of approximately $55 billion, as shown in table 3-13. Nearly $50 billion of the total value is under IDOT's jurisdiction, while the remaining $5 billion is under the jurisdiction of the Illinois Tollway, Chicago Skyway, and local agencies.

The replacement value shown in table 3-13 is different than the value of the state-maintained system reported on IDOT's financial statements for two very important reasons. First, table 3-13 represents only the pavements and bridges on the NHS, so a significant number of pavement and bridge assets, as well as many ancillary assets (such as lighting, signs, and drainage culverts) are not represented in the table. Second, IDOT's financial statements use a depreciation approach to represent asset value, which decreases the value each year based on the expected life of the asset. As a result, a pavement or bridge that has exceeded its design life would be totally depreciated, resulting in a book value of $0. Since all of IDOT's pavements and bridges, especially those on the NHS, have a significant value to the traveling public, the replacement value of estimating asset value was determined to be more representative than the book value for purposes of developing this TAMP. No changes are being made to the way asset value is being reported on IDOT's financial statements.

To preserve the $50 billion investment in its pavements and bridges, IDOT continues to invest in maintenance and rehabilitation activities that preserve system conditions and keep the system operating safely. Without additional funding beyond that outlined in the TAMP, IDOT anticipates that the current value of its system is likely to decrease as the number of years between pavement treatments and the average age of the bridges increase. To minimize the impact on the travelling public, the TAMP investments prioritize repairs on the NHS pavements and bridges, which preserves the value on the portion of the network that serves the greatest number of users.

Table 3-13. NHS pavement and bridge value calculations.[20]

System	Centerline Miles	Unit Replacement Cost ($ Per Centerline Mile)	Estimated Replacement Value
IDOT Interstate	1,892	$5,000,000	$9,460,000,000
Illinois Tollway	295	$6,500,000	$1,917,500,000
Chicago Skyway	8	$4,350,000	$34,800,000
Other NHS	5,557	$3,124,150	$17,360,901,550
Total Pavements	**7,752**		**$28,773,201,550**
System	**Deck Area in Square Feet**	**Unit Replacement Cost ($ Per sq ft)**	**Estimated Replacement Value**
IDOT Interstate	31,998,779	$376	$12,031,540,904
Illinois Tollway	7,618,881	$312	$2,377,090,872
Chicago Skyway	1,290,428	$376	$485,200,928
Other NHS	32,689,179	$345	$11,277,766,755
Total Bridges	**73,597,267**		**$26,171,599,459**
Total Value — Pavements and Bridges			**$54,944,801,009**

[20] IDOT's replacement costs used in calculating value include pre-construction activities.

Chapter 4: Life-Cycle Planning

Overview

Many factors impact the condition of infrastructure assets, including traffic loads, weather conditions, and material properties. IDOT uses a variety of maintenance and rehabilitation treatments to preserve system performance and to keep the system operating as efficiently as possible. These activities help to offset the factors that lead to system deterioration. Through a planned, strategic approach to managing its assets effectively over their life cycle, IDOT can delay the need for costly repairs and keep the system in a State of Acceptable Condition for as long as possible.

Managing the Asset Life Cycle

Managing transportation assets is similar to taking care of a home or car. By conducting routine maintenance activities, such as changing the oil or rotating tires, for example, car owners can keep their cars in good condition and avoid the costly repairs associated with engine failure or leaks (see figure 4-1). Pavements and bridges require similar preventive strategies to keep them operating in the best possible condition for as long as possible. Through regular, ongoing investments in low-cost treatments such as crack sealing a pavement or washing a bridge, these assets can achieve their expected design life and help reduce the likelihood that unexpected, more costly repairs will be needed due to accelerated deterioration.

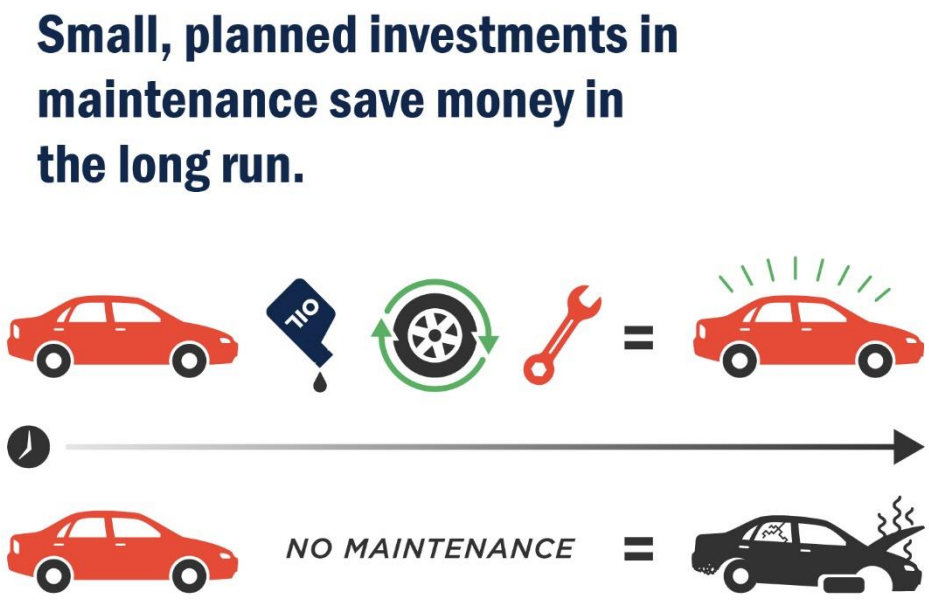


Figure 4-1. Importance of maintenance to keep assets operational.

It is not easy to apply these concepts to the transportation system because a) funding levels are not constant and are not known well in advance, b) needs are greater than available funding, so short-term fixes are often used to keep assets operational, c) there are unexpected events (risks) that impact performance, and d) there are many competing demands for the same funding, forcing IDOT to choose between investments that preserve system conditions and those that reduce congestion or improve safety. Even so, IDOT recognizes the benefits of applying treatments that preserve system conditions and has included investment strategies in this TAMP that increase the spending on these types of treatments. In addition, IDOT is in the process of developing new business processes that will help to ensure that the districts adopt the system preservation activities outlined in the TAMP.

As discussed earlier in this TAMP, the new business processes represent a significant departure from the way IDOT has invested in its pavements and bridges in the past. Under the previous approach, the implementation of the program varied among the districts, funding was minimal, and there was little verification that preservation funds were being used as intended. The revised strategies outlined in this TAMP address those concerns by placing a greater emphasis on the use of improved guidance ensuring that preservation techniques are applied to pavements and bridges before significant deterioration occurs. This is expected to reduce the overall cost of preserving IDOT's pavements and bridges and slow the overall rate of network deterioration.

by developing improved guidance for using preservation treatments.

Picking the Right Treatment at the Right Time

The key to managing assets over their life is knowing the condition and the rate at which the assets are deteriorating so the right treatments can be identified on a timely basis. Different treatments address different types of deterioration, so knowing the cause and severity of distress is important. As shown in figure 4-2, there are different categories of work that are applied throughout an asset's life cycle. By applying preservation treatments when assets are still in a State of Acceptable Condition, the useful life of the assets is extended and system conditions are preserved very cost-effectively. Agencies that defer needed maintenance often find that their pavements and bridges don't last as long as expected, which results in higher funding needs than originally planned. IDOT has developed pavement and bridge treatment selection matrices that encourage the timely application of preservation treatments as shown in Appendix C.

The previous chapter described the pavement survey and bridge inspection data that IDOT uses as the basis for determining the types of defects present and the types of repairs that are appropriate. IDOT has also established deterioration models for managing its pavements and bridges that enable the

agency to predict the future conditions of these assets so that appropriate treatments can be anticipated and planned. In the next 18 to 36 months, IDOT expects to have developed element-level deterioration models for all bridge types and climatic conditions to further improve its ability to manage these important assets as part of its EAMS implementation.

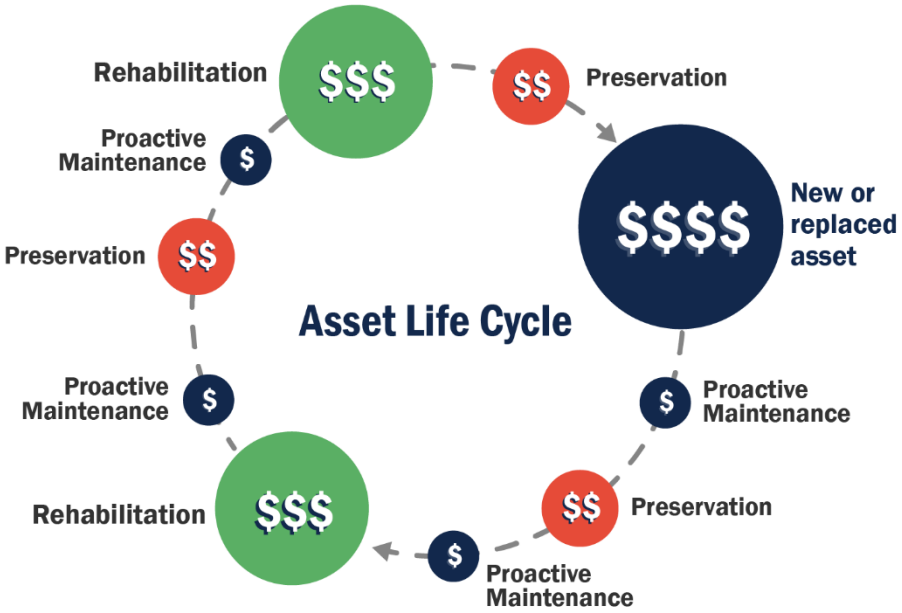


Figure 4-2. Typical asset life-cycle treatment needs and relative costs.

TYPES OF PAVEMENT IMPROVEMENTS

Depending on the condition of the pavement, type of deterioration present, type of road, and typical traffic levels, one of the following types of improvements may be programmed. Improvement costs increase based on the amount of deterioration present, as shown in the graphic. All costs listed below are statewide averages that include both pre-construction and construction items.

- Construction/Reconstruction – This category involves total replacement of the pavement, including the base layers. This category also includes unbonded concrete overlays and asphalt pavement over rubblized concrete. Treatments in this category cost between $2.6 million and $5 million per centerline mile.
- Major and Minor Rehabilitation – Structural overlays (both asphalt and concrete), standard asphalt overlays, bonded concrete overlays, and structural cold-in-place recycling fall in this category. Treatments in this category typically cost between $0.6 million to $2.2 million per centerline mile.

Treatment costs vary based on the amount of deterioration present

- **Preservation** – These are lower-cost treatments than the first two categories that are designed to be applied to pavements in Good or Fair condition to slow the rate of deterioration. This category includes a variety of treatments, including Surface Maintenance at the Right Time (SMART) overlays of 1.5 to 1.75 inches, hot-in-place recycling, load transfer restoration, full-depth repairs, and various types of surface treatments. Treatments in this category typically cost between $0.3 million to $1.6 million per centerline mile.
- **Maintenance** – Maintenance includes treatments such as crack and joint filling/sealing, fog seal, cold/micro-milling, and diamond grinding/grooving. These treatments generally cost between $25,000 to $50,000 per centerline mile.

For Interstate pavements, maintenance is applied when pavements have CRS values above 6.0, preservation treatments are applied to pavements with CRS values between 7.5 and 5.5, minor and major rehabilitation are recommended for pavements with CRS values between 5.4 and 4.0, and construction/reconstruction is recommended for pavements with CRS values lower than 4.0. Similar types of treatment guidelines were also developed for the other NHS and non-NHS pavements, for consideration in life-cycle planning (LCP).

TYPES OF BRIDGE IMPROVEMENTS

Depending on the type of bridge, condition of the bridge, type of deterioration present, and typical traffic levels, one of the following types of improvements may be programmed. Improvement costs increase based on the amount of deterioration present, as shown in the graphic to the left. All costs listed below are statewide averages that include both pre-construction and construction items.

- **Construction/Reconstruction** – This category involves complete replacement of a bridge. Replacement typically ranges in price from $300 to $375 per square foot of deck area.
- **Rehabilitation** – This category includes rehabilitation to, or replacement of, one or more of the major bridge elements, such as deck replacement, superstructure replacement, or substructure rehabilitation. Treatments in this category typically range in price from $185 to $233 per square foot of deck area.
- **Preservation** – This category includes low-cost treatments applied to bridges in relatively good condition to slow their rate of deterioration, including washing, deck sealing, concrete substructure sealing, and painting. Preservation treatments generally cost between $5 to $50 per square foot of deck area.

- **Maintenance** – Maintenance includes planned activities to a specific bridge component, such as expansion joint replacement, bearing replacement, steel repair, concrete repair, deck patching, and overlays. The average cost of these maintenance treatments is $30 per square foot of deck area.

Planned Activities to Improve Life-Cycle Planning

IDOT has initiated a process to acquire and implement new pavement and bridge management software. The software will allow the agency to use deterioration models, including element-level deterioration models that will be developed for bridges, and network policies to analyze different investment scenarios to improve life-cycle planning. The new software will enable IDOT to better anticipate its needs, evaluate different investment options, and convey the long-term consequences of different investment strategies.

IDOT Life-Cycle Planning

In the current absence of asset management systems capable of analyzing various life-cycle scenarios, IDOT has developed a spreadsheet tool to simulate changes in network conditions associated with different levels of investment. The spreadsheet enables IDOT to:

- Link CRS or NBI ratings to an associated type of treatment based on desired practices. A range of treatments are considered, including maintenance, preservation, rehabilitation, and construction/ reconstruction.
- Establish costs for different levels of repair.
- Define the inventory in terms of the current condition based on the results of the most recent CRS surveys and NBI inspections. For example, the pavement and bridge inventories were defined in terms of Interstate, other NHS, marked routes, and unmarked routes. For each system, CRS condition ratings and NBI ratings were defined for each type of repair. The number of miles (for pavements) and square feet (for bridges) at each condition rating were then linked to a level of repair, as discussed earlier.
- Establish deterioration rates for each system and condition category based on the number of years a pavement or bridge was expected to stay in that category without additional treatment. The models were then used to predict changes in condition over the 10-year analysis period. It should be noted that the bridge deterioration rates developed in 2018, while not available for the development of IDOT's initial TAMP, were used to update all analyses in this final TAMP.

- Set acceptable condition levels in terms of the percent of the network reaching targeted condition levels. For instance, the State of Acceptable Condition for Interstate pavements is 90 percent with a CRS value of 5.5 or higher, and for bridges, the State of Acceptable Condition is 93 percent of the bridge deck area with an NBI rating of 5 or higher.
- Enter expected funding levels over a 10-year analysis period.
- Set funding distributions for pavements and bridges based on the expected funding levels.
- Distribute the available funding by work type. For instance, one scenario could be run with 50 percent of all available funding going to construction/reconstruction and 50 percent to rehabilitation while an alternate scenario could distribute 20 percent of the funding to maintenance, 20 percent to preservation, 30 percent to rehabilitation, and 30 percent to construction/reconstruction.
- Generate outputs showing the resulting impact on system conditions after 10 years of spending in accordance with each scenario. The resulting outputs summarized the amount of work conducted in each category, the total amount spent, and the actual percent of the system that satisfies the acceptable condition targets.

This analysis tool was used both for life-cycle planning and developing the investment strategies for the 10-year financial plan in Chapter 6, *Financial Plan and 10-Year Investment Strategies*. To support the implementation of these investment strategies, IDOT provided the districts with enhanced asset data and TAMP treatment selection criteria for identifying projects to include in the FY 2019-2024 MYP. In the future, IDOT plans to use the tool at the district level to assist the district programming engineers with the development of their MYP to help ensure consistency with the TAMP. This tool is expected to be replaced with pavement and bridge management software tools in the next several years, as outlined in Chapter 8, *Planned Enhancements*.

Life-Cycle Plan Analysis

Using the investment spreadsheet tool, IDOT analyzed the long-term impact of several different life cycle plan strategies on network conditions. Two of the strategies considered are documented here. Both strategies used the same amount of funding, but the distribution of that money by treatment category varied. In the first strategy, $1 billion was considered, with 51 percent of the funding going to pavements and 49 percent to bridges.

STRATEGY 1 – WORST-FIRST STRATEGY

The first strategy represents an investment approach that is similar to the approach IDOT has historically used, with an emphasis on rehabilitation and

construction/reconstruction activites to address the backlog of pavements and bridges. To represent this scenario, 50 percent of the funds available for pavements were allocated to rehabilitation and the remaining 50 percent to construction/reconstruction, as shown in table 4-1. For bridges, most of the money was allocated to rehabilitation since IDOT does not have sufficient funds to completely replace many bridges each year; however, an exception was made for Interstate bridges in *Poor* condition, with 10 percent of the funding allocated for Interstate bridge replacement. The distribution of funding under this strategy is provided in table 4-2. Because there is no planned investment in preservation or maintenance, this strategy is considered to be a worst-first strategy in which the pavements and bridges in the worst condition are the highest priority for funding. This strategy is not applicable to the Illinois Tollway or Skyway facilities, which have a user-based revenue stream to cover life-cycle costs.

Table 4-1. Distribution of funding for pavements under a worst-first strategy.

Pavement Class Category	Pavement Class	Percent Class Budget by Pavement Condition Category					
		Acceptable (No Work)	Acceptable (Proactive Maintenance / Low Preservation)	Acceptable (High Preservation)	Not Acceptable (Minor Rehabilitation)	Not Acceptable (Major Rehabilitation)	Not Acceptable (Reconstruction)
NHS	Interstates	0%	0%	0%	0%	50%	50%
	Other NHS (Includes Local NHS)	0%	0%	0%	0%	50%	50%
Non-NHS	Marked Routes	0%	0%	0%	0%	50%	50%
	Unmarked Routes	0%	0%	0%	0%	50%	50%

Table 4-2. Distribution of funding for bridges under a worst-first strategy.

Bridge Class Category	Bridge Class	Percent Class Budget by Bridge Condition Category					
		Acceptable (No Work)	Acceptable (Maintenance)	Acceptable (Low Cost Preservation)	Not Acceptable (High Cost Preservation)	Not Acceptable (Major Rehabilitation)	Not Acceptable (Replacement)
NHS	Interstates	0%	0%	0%	0%	90%	10%
	Other NHS (Includes Local NHS)	0%	0%	0%	0%	100%	0%
Non-NHS	Marked Routes	0%	0%	0%	0%	100%	0%
	Unmarked Routes	0%	0%	0%	0%	100%	0%

The outputs from this strategy are presented in tables 4-3 (pavements) and 4-4 (bridges). As shown in the last three columns, over the 10-year period considered in the analysis, none of the targeted pavement conditions would

be met and some significant deterioration of the system would take place between the initial year (year 0) and year 10. Overall, conditions under this scenario deteriorate from 73 percent of the network in a State of Acceptable Condition to only 41 percent at the end of the 10-year period.

The change in conditions for the bridges is less dramatic, largely because bridges deteriorate at a slower rate than pavements. As a result, the cumulative impact of a worst-first strategy is not as apparent. Under this strategy, none of the systems meet the State of Acceptable Condition targets. The condition of the bridges is projected to decrease, from 85 percent to 72 percent of the bridge deck area in a State of Acceptable Condition over the 10-year period.

Table 4-3. Pavement results for worst-first strategy.

Pavement Class Category	Pavement Class	Total Pavement Miles	Number of Acceptable Miles		% Acceptable Miles		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	1,892.53	1,690.31	1,641.43	89%	90%	87%
	Other NHS (Includes Local NHS)	5,559.42	4,335.03	3,072.77	78%	90%	55%
Non-NHS	Marked Routes	6,569.04	4,449.11	1,510.93	68%	75%	23%
	Unmarked Routes	2,351.43	1,551.12	463.51	66%	50%	20%
Statewide Totals		**16,372.42**	**12,025.57**	**6,688.64**	**73%**		**41%**

Table 4-4. Bridge results for worst-first strategy.

Bridge Class Category	Bridge Class	Total Bridge Square Feet	Number of Acceptable Square Feet		% Acceptable Square Feet		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	31,998,779	27,041,650	23,939,411	85%	93%	75%
	Other NHS (Includes Local NHS)	32,689,179	27,563,689	25,957,078	84%	93%	79%
Non-NHS	Marked Routes	12,132,921	10,515,835	7,270,933	87%	90%	60%
	Unmarked Routes	14,378,041	12,564,543	8,113,191	87%	90%	56%
Statewide Totals		**91,198,920**	**77,685,717**	**65,280,613**	**85%**		**72%**

STRATEGY 2 – INCREASED PRESERVATION PROGRAM

A second strategy was evaluated using the spreadsheet tool to compare the impact of using maintenance and preservation in combination with rehabilitation and construction/reconstruction. Under this strategy, funds were distributed between each of the treatment categories as shown in tables 4-5 (pavements) and 4-6 (bridges). This strategy is considered to be much closer to the investment strategies that IDOT is moving towards with the investment strategies presented in this TAMP; however, it will take time for IDOT to transition to a program that increases the amount of preservation work substantially.

Table 4-5. Funding distribution for pavements under the increased preservation program.

Pavement Class Category	Pavement Class	Percent Class Budget by Pavement Condition Category					
		Acceptable (No Work)	Acceptable (Proactive Maintenance / Low Preservation)	Acceptable (High Preservation)	Not Acceptable (Minor Rehabilitation)	Not Acceptable (Major Rehabilitation)	Not Acceptable (Reconstruction)
NHS	Interstates	0%	5%	10%	20%	55%	10%
	Other NHS (Includes Local NHS)	0%	5%	10%	40%	40%	5%
Non-NHS	Marked Routes	0%	5%	10%	40%	40%	5%
	Unmarked Routes	0%	5%	10%	40%	40%	5%

Table 4-6. Funding distribution for bridges under the increased preservation program.

Bridge Class Category	Bridge Class	Percent Class Budget by Bridge Condition Category					
		Acceptable (No Work)	Acceptable (Maintenance)	Acceptable (Low Cost Preservation)	Not Acceptable (High Cost Preservation)	Not Acceptable (Major Rehabilitation)	Not Acceptable (Replacement)
NHS	Interstates	0%	2%	15%	15%	25%	43%
	Other NHS (Includes Local NHS)	0%	2%	10%	11%	32%	45%
Non-NHS	Marked Routes	0%	2%	10%	13%	30%	45%
	Unmarked Routes	0%	2%	10%	11%	32%	45%

The results of the analysis are presented in tables 4-7 (pavements) and 4-8 (bridges). For pavements, the overall percentage of pavements in a State of Acceptable Condition decreases from 73 percent to 62 percent for the same level of funding used in the first strategy. Although this strategy still shows a decrease in overall conditions, it is less severe than in the previous strategy and the NHS pavements are able to achieve the State of Acceptable Condition.

For bridges, the overall percentage of bridge deck area in a State of Acceptable Condition decreases from 85 percent to 78 percent for the same level of funding used in the worst-first strategy. The preservation program strategy still shows a decrease in overall conditions, but it is not as severe as the worst-first strategy since preservation treatments slow the rate of bridge deterioration.

Table 4-7. Pavement results for increased preservation program.

Pavement Class Category	Pavement Class	Total Pavement Miles	Number of Acceptable Miles		% Acceptable Miles		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	1,892.53	1,690.31	1,892.53	89%	90%	100%
	Other NHS (Includes Local NHS)	5,559.42	4,335.03	4,743.28	78%	90%	85%
Non-NHS	Marked Routes	6,569.04	4,449.11	2,712.24	68%	75%	41%
	Unmarked Routes	2,351.43	1,551.12	805.05	66%	50%	34%
Statewide Totals		**16,372.42**	**12,025.57**	**10,153.10**	**73%**		**62%**

Table 4-8. Bridge results for increased preservation program.

Bridge Class Category	Bridge Class	Total Bridge Square Feet	Number of Acceptable Square Feet		% Acceptable Square Feet		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	31,998,779	27,041,650	28,080,733	85%	93%	88%
	Other NHS (Includes Local NHS)	32,689,179	27,563,689	37,831,906	84%	93%	85%
Non-NHS	Marked Routes	12,132,921	10,515,835	7,362,928	87%	90%	61%
	Unmarked Routes	14,378,041	12,564,543	8,170,426	87%	90%	57%
Statewide Totals		**91,198,920**	**77,685,717**	**71,445,993**	**85%**		**78%**

Recommended Life-Cycle Planning Strategies

The results of the life-cycle planning analysis were useful to IDOT as the agency considered changes to the historical consideration of Backlog as the primary performance metric to trigger pavement and bridge improvements. As demonstrated by the two strategies considered in this chapter, IDOT can more effectively improve or preserve system conditions by implementing a proactive preservation program than focusing primarily on pavements and bridges in need of more major repairs, even with the risk of decreased funding. Therefore, the increased use of preservation was recommended for

consideration in developing the planned 10-year investments in Chapter 6, *Financial Plan and 10-Year Investment Strategies*, where other considerations (such as projected revenue, industry capacity, risks, and other system needs) were taken into account. However, it will take time to shift the way IDOT currently does business since it requires new analytical tools, district guidance on project selection, and training.

To support the implementation of the recommended strategies, IDOT initiated the development of pavement selection criteria to guide the choice of treatments by the districts. These selection criteria are aligned with the condition ranges used in the spreadsheet investment tool used in the LCP analysis and include additional detail regarding unacceptable distress, rut depth, and traffic levels. Criteria have also been established for bridges to help with programming work activities. The bridge criteria are also aligned with the assumptions built into the investment tool and include additional guidance regarding element conditions that make each treatment category viable. IDOT is in the process of developing its own Bridge Preservation Manual, which is in final draft form. The criteria are presented in Appendix C.

Going forward, IDOT intends to improve the analysis tools available for conducting life-cycle planning and to work with the districts to ensure the implementation of the investment strategies presented in Chapter 6, *Financial Plan and 10-Year Investment Strategies*. These plans are presented in more detail in Chapter 8, *Planned Enhancements*.

Illinois Tollway Life-Cycle Planning

The Illinois Tollway has a detailed asset management system in order to adhere to the Amended and Restated Trust Indenture, the Illinois State Toll Highway Authority to the First National Bank of Chicago, as Trustee, Effective March 31, 1999 (Trust Indenture). Section 712 of the Trust Indenture states: “The Authority shall at all times operate or cause to be operated the Tollway System properly and in a sound and economical manner and shall maintain, preserve, reconstruct and keep the same or cause the same to be so maintained, preserved, reconstructed and kept, with the appurtenances and every part and parcel thereof, in good repair, working order and condition, and shall from time to time make, or cause to be made, all necessary and proper repairs, replacements and renewals so that at all times the operation of the Tollway System may be properly and advantageously conducted.”

The asset management system begins with planning maintenance, preservation, rehabilitation and replacement activities of all the pavement. This 50-year plan was developed to economically maintain the pavement systemwide. Considering the Illinois Tollway has a fee-based funding system,

a priority is made to minimize impact to its customers. Subsequently, preservation cycles for bridges, walls, tolling equipment etc. are aligned with the pavement activities, when feasible. Additional consideration includes: projected revenue, industry capacity and risk.

The result of this analysis is the basis for the renewal and replacement deposit, which reserves sufficient funds necessary to maintain the assets of the Illinois Tollway in a state of good repair. System expansion and other enhancements are funded separately in conjunction with a Capital Program.

Chicago Skyway Life-Cycle Planning

The Skyway goal is early intervention with preservation and maintenance to extend the life of major elements as much as possible. This is facilitated by the Skyway's aggressive goal of maintaining pavement and bridges above *Fair* ratings.

For both pavements and bridges, the overall life-cycle strategy is to spend 60 percent of the annual budget on construction, reconstruction, and rehabilitation activities along with 20 percent on maintenance and 20 percent on preservation. If there are no pavements or bridges with a condition indicating higher level treatments, a greater percentage of the annual budget will be devoted to lower level treatments such as preservation.

Local Agencies' Life-Cycle Planning

As described in Chapter 3, *Asset Inventory and Performance*, there are almost 90 local agencies in addition to IDOT, Illinois Tollway, and Chicago Skyway, that are owners of pavements or bridges on the NHS system. Over 75 percent of these pavements and bridges are located in the Chicago area and therefore fall in the Chicago Metropolitan Agency for Planning (CMAP) region. CMAP has developed a comprehensive plan, *On to 2050*, which incorporates asset management concepts.[21] CMAP encourages the local agencies in their region to adopt transportation asset management, of which life-cycle planning is a part.

To promote the use of asset management practices by local agencies, IDOT has presented on asset management principles, including life-cycle planning, at several meetings and conferences targeted to local agencies and MPOs. IDOT continues to coordinate with local agencies and MPOs regarding management of the NHS and to encourage them all to incorporate sound life-cycle planning into their management practices.

[21] https://www.cmap.illinois.gov/2050/mobility/transportation-programming

Chapter 5: Risk Management

Overview

IDOT faces many uncertainties in managing its transportation system, including fluctuations in available funding, unanticipated weather events, changes in travel demand and patterns, and variability in asset performance due to material properties or traffic loadings. These uncertainties are considered to be risks that can have either a positive or negative impact on IDOT's ability to achieve its asset management objectives. Using a formal enterprise risk management process, IDOT identified and evaluated significant risks that could impact pavement and bridge performance. IDOT also recently completed an All-Hazard Vulnerability Assessment that further evaluated the potential risk to transportation assets that was prompted largely by the increase in extreme weather events around the United States in recent years. As a result of these efforts to evaluate risks, IDOT has a better understanding of the uncertainties associated with its TAMP objectives and the likely outcomes of actions that will be taken to mitigate these risks.

This chapter describes the risk management process that IDOT followed to identify and analyze risks that could impact the Department's ability to achieve its performance objectives. The chapter presents the results of the enterprise risk analysis and the mitigation steps that IDOT has incorporated into the 10-year investment strategies outlined in this TAMP. In addition, the chapter summarizes the activities conducted during the Department's All-Hazard Vulnerability Assessment and describes the way the results can be used in the future. Finally, this chapter lays out a process for addressing federal requirements for monitoring assets on the NHS that are frequently damaged during federally- or state-declared emergencies.

Enterprise Risk Management Process

To identify and evaluate enterprise risks, IDOT followed the risk management framework developed by the International Organization for Standardization. This framework, which is presented in figure 5-1, has also been included in risk management guidance developed by both FHWA and AASHTO. A brief explanation of the activities involved in each part of the process is provided.

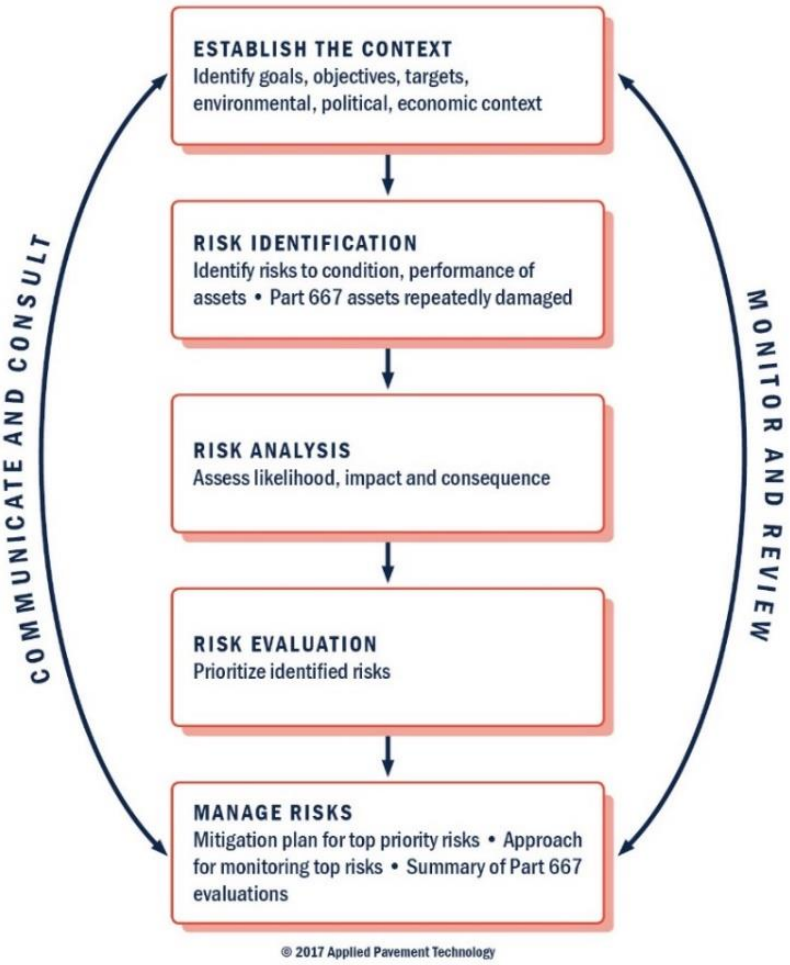


Figure 5-1. The risk management process.

Establish the Context

Prior to the development of the TAMP, IDOT had considered risks informally as part of the project development process. At the project level, the risk assessment was focused on each individual construction project, taking into account localized characteristics unique to that situation. The focus on one construction project at a time enabled IDOT to consider uncertainties such as climate, traffic patterns, and asset deterioration patterns in the selection and design of the appropriate fix. Additional risks that occur during the construction of the selected treatment could also be managed, such as weather delays that impact the construction schedule or unexpected soil properties that could lead to design revisions and cost overruns.

An asset-level vulnerability study was conducted in 2017 to assign a combined criticality and risk rating to assets based on their vulnerability to both manmade and naturally occurring extreme events. The results of the asset-level vulnerability assessment are presented later in this chapter.

As part of the TAMP development, IDOT initiated a more formal enterprise risk management process that laid the framework for considering risks at a system and/or program level. This involved identifying a diverse and representative team to be involved in the process. A Risk Technical Working Group (TWG) was established, with the following offices represented:

- Planning
- Programming
- Operations
- Design and Environment
- Bridges and Structures
- Local Roads and Streets
- Finance and Administration

The Risk TWG reported to the Project Management Team and their recommendations were reviewed and approved by the Steering Committee. In the future, the Bureau of Safety Programs and Engineering will be included in the TWG.

Once the team was established, IDOT conducted a risk workshop in which participants were briefed on the risk management requirements and introduced to the activities involved in identifying, evaluating, and managing risks. Following the workshop, the Risk TWG developed the rating scales that would be used to evaluate the likelihood and consequence of various risks. The resulting ratings are presented in table 5-1, shown in order from a low rating to a high rating.

Table 5-1. Risk likelihood and consequence ratings.

Likelihood Ratings	
Rating	Description
Rare	< 5% chance
Unlikely	5% to 20% chance
Possible	> 20% to 80% chance
Likely	> 80% to 95% chance
Almost Certain	> 95% chance

Consequence Ratings	
Rating	Description
Negligible	Won't impact objectives
Minor	Will meet objectives with slight difficulty
Major	Will barely meet objectives with significant difficulty
Critical	Will not adequately meet objectives
Catastrophic	Will prevent IDOT from achieving objectives

Identify Risks

At a separate workshop, the Risk TWG conducted a brainstorming session in which participants identified risks that had the potential to impact IDOT's ability to achieve its pavement and bridge performance objectives. Both short- and long-term risks were identified during this process. For each of the risks identified, primary impacts were identified and the information was put into a risk matrix. The impacts provided the team with an assessment of who would be affected by the event and how the program objectives would be impacted. This additional information was used during a later step when the Risk TWG identified and prioritized possible mitigation strategies.

The risks identified during this step were organized into the following groups:

- **Agency risks,** such as the possibility of reduced federal or state funding, unplanned changes in regulatory requirements, and loss of institutional knowledge due to retirements or other forms of staff reductions.
- **Program risks,** such as the potential decline in non-NHS pavement and bridge conditions due to the federal focus on the NHS, the ability to reliably forecast asset conditions and funding needs, and unexpected damage due to extreme weather events.

- **Asset risks,** such as unexpected increases in oversized/overweight vehicles, the use of non-compliant materials or poor construction practices, and the inability to assess small culvert needs due to a lack of inventory and condition information.

Analyze and Evaluate Risks

At a separate workshop, the Risk TWG assigned ratings to both the likelihood and potential consequence of each risk using the criteria presented earlier in table 5-1. The results were incorporated into a risk register and an overall risk rating was assigned using the heat map presented in figure 5-2. The overall risk rating was assigned based on the combination of likelihood and consequence for each risk. As shown in the figure, the overall risk rating increases as both the likelihood that the risk will occur and the resulting consequence increase. In figure 5-2, cells shaded in green represent low risk and minimal consequences while the darkest red cells indicate the highest risk and the most significant consequences.

Likelihood	Consequence				
	Negligible	Minor	Major	Critical	Catastrophic
Rare	Low	Low	Low	Low	Low
Unlikely	Low	Low	Low	Medium	Medium
Possible	Low	Low	Medium	High	High
Likely	Low	Medium	High	High	Critical
Almost Certain	Medium	Medium	High	Critical	Critical

Figure 5-2. IDOT risk matrix.

To determine the ratings for both likelihood and consequence, the Risk TWG used an online polling tool that allowed each individual to assign ratings using a 1 to represent a “rare” likelihood or a “negligible” consequence and a 5 to represent an “almost certain” likelihood or “catastrophic” consequence. The scores from each member of the Risk TWG were averaged in real time and an overall score was assigned. If the results indicated that there was significant variability in the scores, the TWG members discussed the risk in more detail and re-rated the likelihood and consequence scores based on the discussions.

The average scores were then used to assign the risk rating from the heat map. For instance, a risk with a likelihood rating of “likely” and a consequence score of “critical” would be classified as a “high” risk. The overall rating provided IDOT with a method of ranking the risks so the agency could focus on developing mitigation strategies for the highest-ranking risks.

Manage Risks

During the final workshop, the Risk TWG assigned mitigation strategies to each of the risks that received a "critical," "high," or "medium" rating. The group considered five different mitigation strategies for each risk, including treat, tolerate, terminate, transfer, or take advantage of. The mitigation strategies are defined in Table 5-2. In addition to identifying mitigation strategies, each mitigation strategy that required action was assigned to an office to oversee its implementation.

Table 5-2. Types of risk mitigation strategies.

Strategy	Definition
Treat	Seek to reduce the risk probability or impact by taking early action to reduce the occurrence of the risk to a feasible level. This enables the activity to continue, but with controls in place to maintain the risk at a tolerable level.
Tolerate	Take no additional steps other than the normal controls in the current business processes.
Terminate	Change the project plan to eliminate the risk or to protect the project objectives from its impact. Stop the activity, process, or program.
Transfer	Move the consequence of a risk together with ownership of the response to a third party. Pass the risk to an insurer, outsource it, or transfer to another entity. Transferring the risk does not eliminate it.
Take Advantage of	Seek an opportunity to exploit a positive impact.

Monitor and Review

Going forward, the Bureau of Planning will retain responsibility for reviewing the risk register at least annually, as part of the MYP development process. This was undertaken most recently in March 2019 and minor revisions were made. As part of the review process, asset managers or other stakeholders will be consulted to determine changes that have taken place in the prior year to help determine whether risk priorities have changed, whether there are new risks that need to be added to the risk register or whether the overall risk rating has lessened in severity due to changes in conditions and/or actions taken by IDOT. A more formal risk review, which involves repeating the process outlined in this section of the TAMP, will be undertaken every four years as part of the TAMP update process.

Enterprise Risk Analysis Results

The results of the risk assessment were documented in a comprehensive risk register that is managed by the Office of Planning and Programming. The portion of the risk register related to high risks is presented in tables 5-3, 5-4,

and 5-5, which reflect the results for agency, program, and asset risks, respectively. There were no risks that received an overall rating of "critical."

All-Hazard Asset Vulnerability Assessment

In addition to the evaluation of risks from the enterprise risk assessment, IDOT recently completed a 3-year study to evaluate the vulnerability of the transportation system to a variety of manmade events (such as explosives and cyber-attacks) and naturally-occurring extreme events caused by:

- Precipitation.
- Temperature.
- Wind.
- Geologic factors.

The assets included in the study centered on assets primarily maintained by IDOT (such as highways and bridges) that contribute significantly to regional and/or national public transportation, including transportation corridors and hubs (such as stations and ports).

Vulnerabilities were evaluated by measuring the interaction between how:

- Critical an asset is to the transportation network.
- Exposed an asset would be to a defined hazard.
- Sensitive an asset is to each hazard.

The measurements of criticality, exposure, and sensitivity were used to generate a Vulnerability Index for each asset. Risks were also assessed to identify threats that could produce immediate and permanent harm to the infrastructure. Together, the assessment of criticality, risks, and vulnerability provided IDOT with the first comprehensive assessment of the statewide resources managed by IDOT. The methodology established in the study provides a foundation for future studies and the results serve as an important consideration to assist IDOT and other transportation agencies in prioritizing transportation system investments. The work also produced a large asset database and an interactive map to help give visualization to the work. More information on the assessment can be found in the All-Hazards Executive Summary[22].

[22] http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/OP&P/All%20Hazards_Executive%20Summary_HiRes.pdf

Table 5-3. Risk register for high agency risks.

Risk Event	Primary Impacts	Likelihood	Impact	Risk Rating	Mitigation Strategies
Agency Risks					
Reduced levels of federal funding	• Not allow IDOT to invest sufficiently to meet performance targets (safety, pavement and bridge condition, system performance) • Reduces the asset Level of Service (LOS)	Possible	Critical	High	Tolerate
Decrease in the level of state revenue available	• Not allow IDOT to invest sufficiently to meet performance targets • Reduces the asset LOS and the program size • Difficulty in meeting federal match	Likely	Critical	High	Tolerate
Shifts in modes of transportation from cars to transit and bicycles	• Reduced funding from the gas tax reduces the amount of state revenue available for asset preservation • May improve IDOT's ability to meet performance targets	Possible	Critical	High	Take Advantage of / Treat – with mode shifts, capacity enhancements are needed less so funds previously used on capacity enhancements can be used on maintaining existing assets and meeting performance targets
Unplanned changes in regulatory laws by FHWA or other government agencies	• Shifts how funds are distributed, which can potentially impact funding • Adds additional requirements without associated funding • May have an effect on IDOT's ability to meet performance targets • May require additional reporting resulting in additional work without additional staff	Almost Certain	Major	High	Tolerate
Ineffective or missing internal communication	• Results in inefficient use of manpower, which may lead to duplicating efforts • Inconsistent evaluation of needs • Increased cost due to lack of understanding regarding the impact of decisions • May impact the ability to meet performance targets	Almost Certain	Major	High	Treat – IT enhancements, intra-agency communication enhancements; data coordination; data warehouse development; breaking down silos; better documentation of data sources; data governance
Decreased staffing due to impending retirements or staffing losses	• The agency loses institutional knowledge that can decrease the ability to manage assets • May impede the ability to meet performance targets • Staffing levels are not adequate to move projects forward so projects fall behind and impact asset LOS	Almost Certain	Major	High	Treat – cross train; increase headcount; incentivize staying within section / bureau; make non-union positions attractive to union members
Opportunities provided by emerging technologies (and materials) are not utilized and current technologies are not maintained	• Productivity and organizational advancement are limited • May impede the ability to meet performance targets	Almost Certain	Major	High	Treat – educate management on ability to accomplish new technologies; act timely on new products; enhance and streamline IT processes to allow for innovative development / purchases; include training and / or support in any emerging technology
Employee salaries and benefits do not keep pace with industry	• Productivity and quality suffer, errors increase • May impede the ability to meet performance targets	Almost Certain	Major	High	Treat – conduct compensation study and implement. Consider cost to the agency if not implemented. Make non-union positions attractive to union members

Table 5-4. Risk register for high program risks.

Risk Event	Primary Impacts	Likelihood	Impact	Risk Rating	Mitigation Strategies
Program Risks					
The federal focus on the NHS will impact IDOT's flexibility in using federal funds	• The LOS for non-NHS assets could deteriorate further • Political pressure for project selection could increase • Increase the ability to meet the pavement and bridge and system performance targets (except total emission and non-SOV travel targets)	Almost Certain	Major	High	Tolerate / Take Advantage of — use the opportunity to prioritize maintenance to external partners. Enhance freight movement
Data accuracy and consistency issues	• The wrong solution could be recommended or recommended at the wrong time • May impede the ability to meet the performance targets	Likely	Critical	High	Treat — data governance; data management; use and review data quality management plan; enhance training; add quality control
Costs and benefits associated with new policies and specifications are not considered	• Individual project costs may increase, which leads to a smaller program • May result in a poor rate of return or the inefficient use of limited funds • May impede the ability to meet the performance targets	Likely	Major	High	Treat — identify new materials / products / treatments / strategies that cost less with higher benefits; complete cost / benefit analysis to prioritize projects; consider true cost — consider productivity, material, and other existential costs
Inability to demonstrate consistency with TAMP investment strategies and goals	• Federal reimbursement levels will be reduced, resulting in a smaller program • May decrease ability to meet performance targets	Possible	Critical	High	Treat — prioritize programming consistent with TAMP investment strategies and allocate the required resources
IDOT is not prepared to respond if unexpected funding is made available because not enough projects are ready to be constructed	• Fluctuations in the funding make it difficult to develop a planned program • IDOT may miss opportunities for additional funding • May impede the ability to meet the performance targets	Likely	Critical	High	Treat — educate policy makers on time needed for project development; streamline project development process; strategically prioritize projects to complete pre-construction activities without having construction funding identified
Preservation activities are not performed on a timely basis	• The expected service life of an asset is not achieved • Repair costs increase due to a lack of maintenance • May impede the ability to meet the performance targets	Almost Certain	Major	High	Treat — review and enhance guidance on preservation; increase investment in preservation
Increases in illegal or oversized/overweight vehicles	• The rate of pavement and bridge deterioration increases, leading to the need for more frequent treatments or repairs • The expected life of an asset is not achieved, increasing the overall cost of preserving the system • May impede the ability to meet the performance targets	Likely	Major	High	Transfer — increase enforcement; Treat — identify priority corridors for oversized/overweight vehicles; increase permit fees

Table 5-5. Risk register for high asset risks.

Risk Event	Primary Impacts	Likelihood	Impact	Risk Rating	Mitigation Strategies
Asset Risks					
Preservation activities are not performed on a timely basis	• The expected service life of an asset is not achieved • Repair costs increase due to a lack of maintenance • May impede the ability to meet the performance targets	Almost Certain	Major	High	Treat – review and enhance guidance on preservation; increase investment in preservation
Increases in illegal or oversized/overweight vehicles	• The rate of pavement and bridge deterioration increases, leading to the need for more frequent treatments or repairs • The expected life of an asset is not achieved, increasing the overall cost of preserving the system • May impede the ability to meet the performance targets	Likely	Major	High	Transfer – increase enforcement; Treat – identify priority corridors for oversized/overweight vehicles; increase permit fees

Consideration of Risks in the Development of Investment Strategies

The mitigation strategies that resulted from the enterprise risk analysis focus primarily on improving guidance, conducting training, streamlining existing processes, and enhancing IT capabilities. The specific activities that will be undertaken to improve data, processes, and analysis capabilities related to the investment strategies identified in the TAMP are described in Chapter 8, *Planned Enhancements*. The findings from the All-Hazard Asset Vulnerability Assessment are expected to be incorporated into IDOT's programming processes in the near future. An internal committee is being formed to develop recommendations for using the results to help prioritize needed investments.

Special Requirements for Periodic Evaluation of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events

One of the requirements under 23 CFR Part 667, *Periodic Evaluation of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events*, involves a periodic statewide evaluation of the state's existing roads, highways, and bridges that have required repair or reconstruction on two or more occasions from emergency events declared by the Governor or the President of the United States. The requirements instruct state DOTs to complete an evaluation of any repair and reconstruction events to pavements and bridges that have occurred due to emergency events since January 1, 1997. In addition, the rules require that a process be established to continue the periodic reviews into the future.

Existing Process

IDOT may respond to natural disaster emergency events (including tornados, floods, and storms) with technical and highway maintenance personnel from any designated location from across Illinois. If it is determined that the response requires resources from district highway personnel, and could potentially result in FHWA Emergency Relief reimbursement dollars for resources, then special considerations are given to capturing this information.

A special project number for the emergency event is created by the Central Bureau of Operations and those geographical locations (i.e. district, team section) affected are required to track allocated resources (including labor, equipment and materials) by work activity code in response to the event using this special project number. This data is entered into IDOT's Asset Management Program (AMP). Since July 1, 2018, AMP has been the system of record for all statewide highway maintenance activities and for producing cost reports for labor, equipment, and material allocated to these special events or projects. The availability of this information will allow IDOT to have the records needed to assess assets that have been damaged by one or more prior emergency events, as discussed below.

Assessment of Prior Emergency Events

In 2018, IDOT conducted an evaluation of the data available to assess its responses to emergency events declared by either the U.S. President or the Governor of Illinois. Information was extracted from the Fiscal Management Information System (FMIS) to summarize the applicable emergency events that have occurred in the state and evaluate repairs and costs to pavement and bridge assets. Over 350 data items were evaluated and the results were categorized by project description, event year, and location site by county. The emergency responses were found to be primarily caused by severe storms that resulted in flood damage, slope failures, and scour incidents. Specific incidents were also discussed with district personnel to discern details for projects fitting the criteria. Based on the available data, IDOT was able to determine that most of the damaged sites were concentrated in counties near the Mississippi, Illinois, and Ohio Rivers.

The FMIS records and information from IDOT personnel were used to investigate whether there has been recurring damage to NHS pavements or bridges due to multiple emergency events that occurred at the same location since January 1, 1997. The investigation found that a generic program code was used for all projects until the early 2000s. During that period, very basic program descriptions were provided to determine project location. The FMIS report covering the period since January 1, 1997 included 16 different

program codes that total a little over $40 million in federal obligations. The FMIS report does not differentiate between disasters declared by the President or Governor and non-declared emergencies. Additionally, the information identifies a general project location description, but no information on the specific key route location or assets that were repaired. Even so, IDOT was able to determine that no individual site yielded more than one documented event. Furthermore, only two sites were located on the NHS. The first of the two sites was repaired prior to the start of the analysis period covered under 23 CFR Part 667. The second site required repairs due to damage caused by a collision and subsequent fire to the superstructure of a bridge on I-74. Although the latter event was classified as a disaster due to the magnitude of repairs required, the damage was caused by an accident rather than an environmental event or asset deterioration resulting from the way the bridge was maintained. The data accumulated during this analysis is currently being reevaluated to ensure all prior emergency events were captured.

As described in the next section, IDOT is taking steps to modify its record-keeping going forward to satisfy the 23 CFR Part 667 requirements.

Future Assessment of Repair or Reconstruction Due to Emergency Events

Moving forward, IDOT has developed a process for capturing emergency response data related to facilities requiring repair and/or reconstruction due to emergency events as required under 23 CFR Part 667.

When an emergency is declared by either the Governor of Illinois or the President of the United States, the declaration will be forwarded to the Regional Engineer, Operations Engineer, and Local Roads Engineer of the affected districts and a Disaster Number will be established by the FHWA. In addition, a special project number will be created for tracking purposes by the Central Bureau of Operations. The Regional Engineer will be responsible to ensure that appropriate district staff receive the declaration. The district Local Roads engineer will be responsible for ensuring the affected local agency staff receive the declaration.

Districts and/or local agencies will be responsible for collecting the data related to each repair or reconstruction for the impacted facilities including:

- Emergency event code.
- Asset type.
- Description of work activity, including labor, equipment and materials.

- Location.
- Date(s) of the repair.
- Total cost (includes emergency repair and permanent repair categories).
- Pictures of damage to site (preferred but not required).

When expenditures exceed or are anticipated to exceed $5,000 per site, the district Operations Engineer will notify the Central Bureau of Operations Transportation Infrastructure Security Section Supervisor to document cumulative expenditures to evaluate for federal reimbursement based on minimum thresholds. If an event qualifies under FHWA's Emergency Relief (ER) Program, a Letter of Intent will be submitted to the FHWA Illinois Division Administrator and District Operations and Local Roads Engineers will be notified. A Detailed Damage Inspection Report for each site will be completed by district Bureau of Operations and/or district Local Roads engineer, submitted to the FHWA for concurrence, and copied for distribution to the IDOT Central Bureau of Operations Transportation Infrastructure Security Section Supervisor.

Upon FHWA approval, IDOT's Central Bureau of Operations will update the Statewide Emergency Site GIS map with the approved locations.

Upon completion of the emergency response, the district will be responsible for providing the following information:

- Root cause.
- Risk rating matrix.
- Vulnerability assessment.
- Critical infrastructure.

In addition, the district will develop a recommended plan of action for:

- Mitigation.
- Partial mitigation.
- No mitigation.

The requested information will be submitted to the district Programming engineer or district Local Roads engineer.

Under these requirements, as each project on the NHS is being developed, it must be evaluated for prior use of ER funding, starting from January 1, 1997. The Central Bureau of Operations will provide the statewide GIS map showing locations, along with available descriptions and costs of repairs, for this

analysis. Presently, NHS route locations with one or more repairs will be displayed on the map and will be required to be evaluated. Beginning November 23, 2020, all other eligible routes (as described in the ER manual) must be evaluated. The manual, along with all the requirements, can be found at https://www.fhwa.dot.gov/reports/erm/er.pdf. The ER program description along with other links can be found at https://www.fhwa.dot.gov/programadmin/erelief.cfm.

When any project is being programmed, the district Programming engineer will be responsible for verifying if the facility has been damaged due to a prior emergency event. For identified sites, districts will complete:

- A risk assessment.
- An evaluation of treatment alternatives.
- A recommended treatment, if necessary, into the scope of the project before the project is included in the multi-year plan.

The required evaluation will be retained by the district. The emergency event evaluation process will be incorporated into the next update of the Office of Planning and Programming, Programming Guidelines.

This process will ensure that IDOT is considering reasonable alternatives that could reduce the need for federal funds, better protect the natural environment, as well as public health and safety, and meet transportation needs.

Chapter 6: Financial Plan and 10-Year Investment Strategies

Overview

Most of the revenue available to IDOT for addressing system needs is derived from Motor Vehicle Registration (MVR) Fees, Motor Fuel Tax (MFT), reimbursements from the Federal Highway Trust Fund, and reimbursements from local governments. These funds are first used to address general and administrative expenses (such as debt service and IDOT operations) as well as ongoing construction projects from prior years' programs. The remainder of the funds are used to develop a MYP to sustain the condition of the existing infrastructure through investments in safety, roads, bridges, and other projects that improve the economic competitiveness and the overall quality of life for Illinoisans. This chapter summarizes the amount and sources of revenue anticipated over the next 10 years and presents IDOT's planned investments in its pavements and bridges during that time. IDOT used the best information available at the time this document was written to prepare this information, but recognizes that both anticipated revenue and funding needs could vary considerably over the next several years. The first six years of the planned investments presented in the TAMP are based on information in the current MYP, and the last four years are estimated based on predicted conditions. Actual fluctuations in either revenue or funding needs will be reflected in updated versions of the TAMP.

Revenue Sources

IDOT

In FY 2019, IDOT projects a total of $3.519 billion in revenue from two primary sources: reimbursements from the Federal Highway Trust Fund and state revenue (comprised primarily of Motor Vehicle Registrations and Motor Fuel Taxes). The balance of IDOT's revenue came from local government reimbursements. The distribution of these revenue sources is shown in figure 6-1.

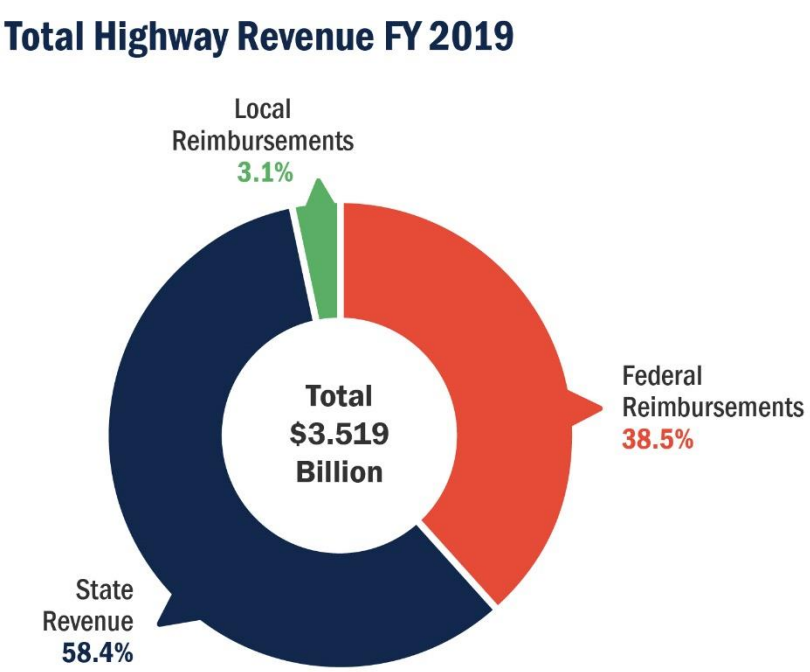


Figure 6-1. FY 2019 Total highway revenue sources and amount.

Each of the major funding sources is described in more detail in the following sections.

FEDERAL HIGHWAY TRUST FUND

Federal programs provide funding for transportation projects through the Highway Trust Fund (HTF), which is supported by the revenue collected from federal fuel taxes and a variety of tire and truck sales taxes. The taxes credited to the HTF are to be used for transportation spending and are split between the Highway Account and the Transit Account. Federal funding has been expanded to encompass not only highway projects, but also transit and environmental projects. In recent years, the HTF has required large and growing transfers from U.S. Treasury general funds to keep payments flowing to states under the various multi-year highway programs (such as the FAST Act). HTF support is available to all states. The amount of various apportionments (the purposes for which federal funds can be spent) are dependent on a number of factors, including the revenue contributions attributable to each individual state, while the amount of obligation limitation (the authority to draw cash from the HTF) that is awarded to each state is based on annual federal appropriations.

A “fair share” of federal funds for local governments is determined by the federal funds authorized in the federal bill and the amounts that have been determined to be an equitable allocation among state and local programs.

The allocation is based on a percentage that was developed many years ago in previous federal highway bills, and it is currently approximately 19 percent.

MOTOR VEHICLE REGISTRATIONS (MVR)

Vehicle registrations and related fees are administered by the Secretary of State under the provisions of the Illinois Vehicle Code (625 ILCS). The Vehicle Code covers registration requirements that include everything from motorcycles, mopeds, and motorized bicycles to 80,000-pound tractor-trailer rigs and everything in between. The state participates in the international compact governing the registration of trucks operating in Interstate commerce through the International Registration Program. Unlike the MFT, MVRs and related fees are not deposited into a single fund. Rather, the money is distributed into various funds as it is received in accordance with state law.

A significant portion of the revenue received from this source is used to support road and bridge projects. MVRs are the single-largest source of state revenue for Illinois' highway program. However, in recent years, there has been a growing trend to use motor-vehicle-related fees to support other, non-transportation purposes, such as the state's main operating fund, the State Police Vehicle Fund, and the Department of Natural Resources.

MOTOR FUEL TAXES (MFT)

The Illinois MFT is derived from a tax on the privilege of operating motor vehicles on public highways and recreational watercraft on the waters in Illinois. The tax is a flat rate based on the amount of motor fuel purchased. The rates for Illinois MFT that are deposited in the MFT Fund are:

- 19.0 cents per gallon on all fuel (including gasoline, gasohol, and diesel)
- 2.5 cents per gallon on diesel fuel in addition to the tax above

Illinois' MFT is administered by the Department of Revenue. The tax is passed along to consumers through the pump price but is actually collected from wholesalers and distributors whenever fuel is delivered as a way to encourage compliance and minimize collection costs. Illinois' share of MFT on Interstate truckers is collected according to the International Fuel Tax Agreement (IFTA). Motor fuel is also subject to the state sales tax, but that revenue is used to support general state operating expenses and not the highway program. Tax collections are deposited into the MFT Fund by the Department of Revenue. The Department of Transportation allocates these monies monthly according to the provisions outlined in the MFT distribution statute (35 ILCS 505/8) and initiates the process for distribution of motor fuel tax revenue to the counties, townships, and municipalities. Net revenue

from the MFT (after various deductions such as the cost of collection and IFTA payments to other states) is split between the state and local governments, with the state receiving 45.6 percent of the net proceeds and local agencies receiving 54.4 percent. This is the only source of state revenue sharing with local governments specifically for transportation-related purposes.

Each month, the net proceeds designated for local governments are apportioned on the basis of statutory formulas. Most counties receive a share of the revenue based on the level of motor vehicle registration activity recorded in those counties, while municipal apportionments are based on relative levels of municipal population, and townships/road district apportionments are based on a combination of miles under their jurisdiction plus tax effort. Monthly apportionments are posted on the Department's website and are paid out subject to appropriation by the General Assembly.

LOCAL MATCH/LOCAL REIMBURSEMENTS

Local funds are appropriated when the project is paid for in conjunction with federal and/or state funds. In Illinois, most local projects are awarded through state lettings, and the local share of the project is initially paid with state funds. Afterwards, local agencies reimburse their share of project costs back to the state, where by law they are deposited in the Road Fund.

State grants to local governments are based on need, growth, population, MFT collections, and other factors. The budget for the combination of all of these programs is approximately $50.8 million for FY 2019 and is comprised of grants from the Road Fund, as shown to the left.

FY 2019 Road Fund Grants to Local Agencies

Consolidated counties: **$21.8M**
Needy townships: **$10.0M**
High-growth cities: **$4.0M**
Township bridges: **$15.0M**

Total: **$50.8M**

Illinois Tollway

The primary source of operating revenue for the Illinois Tollway is toll revenue from both commercial and passenger vehicle traffic. In 2016, toll revenue generated approximately $1.3 billion. Revenue bonds are also issued to fund the capital program.

Chicago Skyway

The primary source of operating revenue for the Skway is also toll revenue. Because the Skyway is operated privately, the expected revenues are confidential.

Revenue Projections

IDOT

Projecting revenues involves estimating all federal project reimbursements (for both existing projects and future funding assumptions), state tax sources (including both MVR and MFT), and local project reimbursements. Over the 10-year period from FY 2019 to FY 2028, IDOT's revenue from the previously described sources is expected to remain relatively constant, as shown in table 6-1.

Table 6-1. IDOT's FY 2019-FY 2028 revenue estimate (in millions).

Revenue	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Federal Reimbursements	1,356	1,800	1,827	1,669	1,672	1,635	1,642	1,627	1,624	1,630
State Revenue	2,056	2,062	2,061	2,054	2,049	2,038	2,044	2,043	2,037	2,028
Local Reimbursements	107	124	123	125	121	114	112	107	105	103
Total	**3,519**	**3,986**	**4,011**	**3,848**	**3,842**	**3,787**	**3,798**	**3,777**	**3,766**	**3,761**

A "transportation lockbox" passed overwhelmingly by public vote in November 2016 is intended to ensure that the taxes and fees paid at the fuel pump, and on licenses, vehicle registration, and other transportation-related purchases go toward improving Illinois' infrastructure. Exactly how the lockbox will impact the funding available for transportation will be determined over time. As for the lockbox impact today, IDOT cannot currently assume a significant inflow of capital. In passing the lockbox amendment, the people of Illinois voted clearly in favor of transportation investment and the importance of funds raised for transportation being invested in transportation.

A capital construction plan was passed by the Illinois General Assembly on June 1, 2019. Once the Governor signs the bills authorizing the capital construction plan, the impacts to funding and projected asset conditions will be assessed and the TAMP will be fully revised.

Illinois Tollway

Since Illinois Tollway revenue is primarily generated by tolls, forecasted revenue is largely based on changes in toll rates and projected traffic levels. In 2018, an annual Consumer Price Index adjustment began to be applied to commercial vehicles, which is expected to result in additional revenue in future years. The Illinois Tollway is projecting $1.49 billion in estimated total revenue in 2019.

The Illinois Tollway provides an estimate of expected toll revenue in October of each year for the budget process. The estimate is based on actual data for the first eight months and estimates for the last four months of the year. A month-by-month estimate of toll revenues for the following year is also provided. The short-term forecasts are based on several key variables, including recent trends, construction activities, weather-related events, land-use developments, and so on.

The Illinois Tollway is required by statute to file a capital plan every ten years. The last one was filed in 2011 and extended through 2026.[23] No updates will be available until the next capital plan is filed in 2021. For this reason, the cashflow documentation that the Illinois Tollway provided only projects revenue through 2026, as shown in table 6-2.

Table 6-2. Illinois Tollway 2019-2026 projected cashflow (in millions).

Revenues	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Total Revenues	1,487	1,545	1,589	1,635	1,678	1,712	1,751	1,873
Operating Expenses	366	382	396	411	428	444	463	485
Net Operating Revenues	1,120	1,163	1,193	1,224	1,250	1,269	1,289	1,389
Debt Service*	423	423	423	423	423	423	436	481
Net Operating Revenue less Debt Service	698	740	770	801	828	846	852	908
Capital Expenditures	**1,312**	**1,093**	**836**	**926**	**728**	**1,565**	**1,434**	**611**

*Debt Service is debt service on all outstanding Tollway bonds including its most recent issuance, Series 2017A, on Dec 6, 2017. It does not include debt service on projected future bond issuance. The Authority's projected future bond issuance to finance a portion of its current capital program, the *Move Illinois* Program, is $2.9 billion.

Chicago Skyway

Because the Skyway is operated privately, the expected revenues are confidential.

Anticipated Expenditures

IDOT

Projected expenditures for FY 2019 to FY 2028 are summarized in table 6-3, which details the general and administration expenses expected over that period. General and administrative costs, which may include debt service transfers, IDOT Operations, and other agency expenditures, represent the total expenditures in the table. In addition, IDOT must address

[23] http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1746&ChapterID=45

multi-year payouts for projects with available cash balances at the end of each fiscal year. IDOT determines its program size each year by maximizing the available balances during that period. Therefore, in years where expenditures are greater than revenues, IDOT spends down a higher cash balance, maximizing its resources while maintaining a fiscally-constrained program. The new program appropriation, shown in table 6-4, is the program size available for new programs or appropriations. The program size is updated annually, as necessary, depending on cash balances, revenue, and expenditures.

The financially feasible six-year program element size is provided to the Bureau of Programming once these adjustments have been made. The distribution of the expenditures in FY 2019 is provided in figure 6-2.

Table 6-3. Projected FY 2019 to FY 2028 estimated expenditures (in millions).

Expenditures	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Highway Construction	1,736	2,299	2,141	1,980	1,974	1,954	1,941	1,915	1,909	1,906
Highway Maintenance and Management	723	819	853	875	901	927	953	981	1,010	1,041
Grants and Highway Safety	145	143	147	150	155	160	165	171	177	183
Debt Service	342	344	343	337	320	297	286	259	259	261
IDOT Administration	97	110	114	117	120	124	127	131	135	139
Other State Agencies	152	198	206	214	223	232	242	251	262	272
Transfers to GRF/Other	346	341	343	343	343	334	325	325	325	325
Total Expenditures	**3,541**	**4,254**	**4,147**	**4,016**	**4,036**	**4,028**	**4,039**	**4,034**	**4,077**	**4,127**
Available Balance	**1,182**	**915**	**780**	**611**	**416**	**174**	**-67**	**-324**	**-636**	**-1,003**

Table 6.4. Projected FY 2019 to FY 2028 new program appropriations.

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
New Program Appr.	2,200	1,800	1,770	1,785	1,845	1,890	1,845	1,830	1,830	1,830

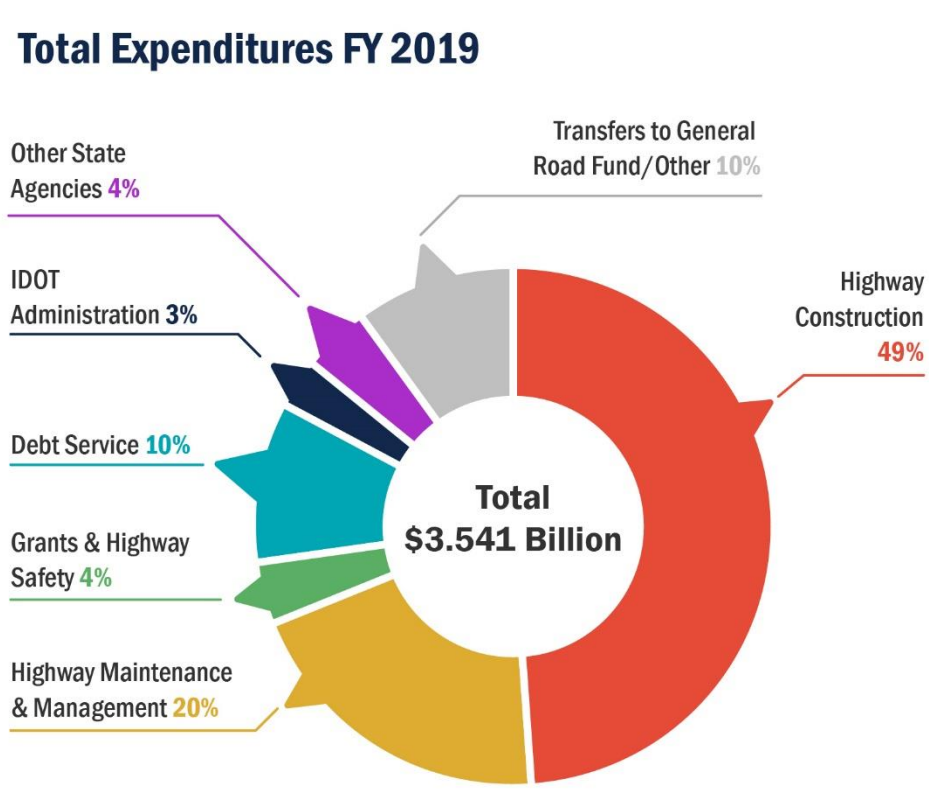


Figure 6-2. FY 2019 distribution of expenditures.

The anticipated distribution of funds available for the maintenance, repair, rehabilitation, and reconstruction of IDOT's pavements and bridges is provided in table 6-5. The numbers provided in the last row represent the funding levels used in developing the 10-year investment strategies outlined later in this chapter.

*Table 6-5. Funding available for pavement and bridge asset management activities in FY 2019-FY 2028 (in millions). **

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Highway Program Amount	2,200	1,800	1,770	1,785	1,845	1,890	1,845	1,830	1,830	1,830
Minus Safety/ Other, ROW, Local Roads "Off System" State Force Maintenance	(1,038)	(915)	(1,011)	(939)	(860)	(884)	(840)	(740)	(740)	(740)
Add Local Roads "On System" and Statewide Preservation	37.5	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Funds Available for Pavement and Bridge Investment	1,199.50	925.00	799.00	886.00	1,025.00	1,046.00	1,045.00	1,130.00	1,130.00	1,130.00

*The amount deducted from the total highway program includes $100 million each year for new construction that is reflected in the planned expenditures presented in tables 6-13 and 6-14.

Illinois Tollway

The Illinois Tollway's 2019 budget allocates $1,312 million for capital expenditures. This represents approximately 88 percent of total revenue for the year.

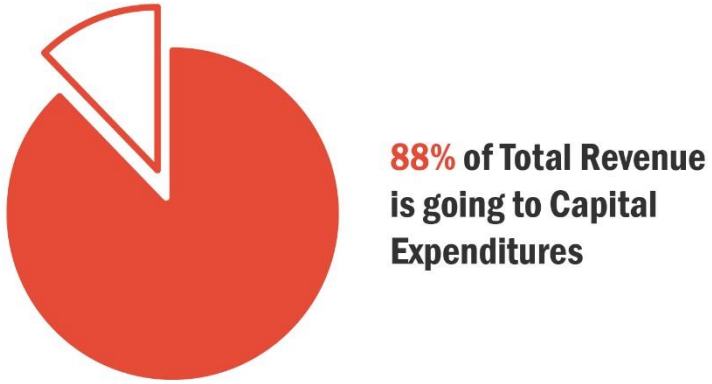


Figure 6-3. 2019 capital program expenditures for the Illinois Tollway.

Chicago Skyway

Anticipated expenditures for the Chicago Skyway are not available due to the private operation of the facility.

Planned Investment Strategies

Using the spreadsheet tool discussed in Chapter 4, IDOT analyzed different investment strategies using the expected funding levels presented in table 6-

5. IDOT analyzed investment scenarios in which NHS bridge conditions were improved to attain 90 percent of square footage at or above the State of Acceptable Condition, while maintaining NHS pavements at as high a level as possible, and incrementally changing the historic distribution of pavement and bridge funding.

IDOT

PLANNED PAVEMENT INVESTMENT STRATEGY

For pavements, an investment strategy was developed that recognized existing project commitments, but would gradually transition to the strategy recommended based on life-cycle planning. This strategy first allocated funds based on pavement class (using current condition distributions) and then allocated funding within each class to different pavement condition categories representing categories of repair. The amount of the budget allocated to each pavement class and condition category was varied to reflect current project commitments and satisfy the State of Acceptable Condition established for the network (as shown in table 6-6) as much as possible. An iterative process was used to maximize the percent of the network that met the State of Acceptable Condition, with the higher-volume facilities established as the highest priority. The first objective was to meet the Interstate targets and then allocate funds to the other NHS routes, marked and unmarked routes, where funding was inadequate to achieve the State of Acceptable Condition.

Table 6-6. State of Acceptable Condition for pavements.

Pavement Class Category	Pavement Class	Acceptable Condition Level	
		Acceptable CRS Value	Target % Miles Acceptable
NHS	Interstates	5.5	90%
	Other NHS (Includes Local NHS)	5.0	90%
Non-NHS	Marked Routes	5.0	75%
	Unmarked Routes	5.0	50%

The final recommended pavement strategy invests heavily in minor and major rehabilitation with the remaining funding allocated to preservation and reconstruction activities. Over time, IDOT intends to shift more funding towards preservation and maintenance once the supporting business processes are in place.

A summary of the recommended distribution of pavement funding is presented in table 6-7. The projected pavement conditions in 2028 from

following this allocation strategy are presented in table 6-8. As shown, the State of Acceptable Condition under this strategy is nearly achieved on Interstates, at 88 percent. The remainder of the system does not meet the State of Acceptable Condition at this level of funding.

Table 6-7. Pavement funding allocation.

Pavement Class Category	Pavement Class	% Budget by Class	Percent Class Budget by Pavement Condition Category					
			Acceptable (No Work)	Acceptable (Proactive Maint./Low Preservation)	Acceptable (High Preservation)	Not Acceptable (Minor Rehabilitation)	Not Acceptable (Major Rehabilitation)	Not Acceptable (Reconstruction)
NHS	Interstates	28%	0%	0%	8%	83%	4%	5%
	Other NHS (Includes Local NHS)	46%	0%	0%	8%	40%	47%	5%
Non-NHS	Marked Routes	22%	0%	0%	8%	72%	15%	5%
	Unmarked Routes	4%	0%	0%	8%	77%	15%	0%

Table 6-8. Resulting pavement conditions in 2028 with the recommended investment strategy.

Pavement Class Category	Pavement Class	Total Pavement Miles	Number of Acceptable Miles		% Acceptable Miles		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable
NHS	Interstates	1,892.53	1,690.31	1,656.38	89%	90%	88%
	Other NHS (Includes Local NHS)	5,559.42	4,335.03	3,937.50	78%	90%	71%
Non-NHS	Marked Routes	6,569.04	4,449.11	2,070.61	68%	75%	32%
	Unmarked Routes	2,351.43	1,551.12	674.70	66%	50%	29%
Statewide Totals		**16,372.42**	**12,025.57**	**8,339.19**	**74%**		**51%**

PLANNED BRIDGE INVESTMENT STRATEGY

A similar approach was used to determine the optimal allocation of available funding to maximize the percent of bridge deck area that met the State of Acceptable Condition targets presented in table 6-9. As with pavements, Interstate and NHS bridges were the highest priority to achieve targets under a constrained funding scenario. The distribution of funding that resulted in the highest percentage of bridge deck area in the State of Acceptable Condition is presented in table 6-10. The resulting conditions in 2028 under this scenario are presented in table 6-11. As shown in the table, Interstate and other NHS bridges bridges nearly achieve the State of Acceptable Condition, but funding is inadequate to achieve the non-NHS targets.

Table 6-9. State of Acceptable Condition for bridges.

Bridge Class Category	Bridge Class	Acceptable Condition Level	
		Acceptable NBI Value	Target % Sq Ft of Deck Area Acceptable
NHS	Interstates	5	93%
	Other NHS (Includes Local NHS)	5	93%
Non-NHS	Marked Routes	5	90%
	Unmarked Routes	5	90%

Table 6-10. Bridge funding allocation.

Bridge Class Category	Bridge Class	% Budget by Class	Percent Class Budget by Bridge Condition Category					
			Acceptable (No Work)	Acceptable (Maintenance)	Acceptable (Low Cost Preservation)	Not Acceptable (High Cost Preservation)	Not Acceptable (Major Rehabilitation)	Not Acceptable (Replacement)
NHS	Interstates	48%	0%	0%	9%	17%	50%	24%
	Other NHS (Includes Local NHS)	44%	0%	0%	9%	14%	60%	17%
Non-NHS	Marked Routes	3%	0%	0%	9%	14%	32%	45%
	Unmarked Routes	5%	0%	0%	9%	14%	32%	45%

Table 6-11. Resulting bridge conditions in 2028 with the recommended investment strategy.

Bridge Class Category	Bridge Class	Total Bridge Square Feet	Number of Acceptable Square Feet		% Acceptable Square Feet		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	31,998,779	27,041,650	29,028,517	85%	93%	91%
	Other NHS (Includes Local NHS)	32,689,179	27,563,689	29,246,440	84%	93%	89%
Non-NHS	Marked Routes	12,132,921	10,515,835	7,408,822	87%	90%	61%
	Unmarked Routes	14,378,041	12,564,543	8,325,160	87%	90%	58%
Statewide Totals		**91,198,920**	**77,685,717**	**74,008,939**	**85%**		**81%**

Illinois Tollway

The Illinois Tollway uses a comprehensive capital planning process that identifies opportunities to increase system efficiency and to analyze and evaluate the investments required to address needed improvements. Projects are evaluated through a rigorous prioritization process that is based on several criteria, including (Illinois State Toll Highway Authority 2017 Budget):

- The condition of the existing roadway network and facilities.
- Benefits in terms of congestion relief and improved operations.
- Accident reduction and improved traffic flow and response time.
- The timing of the project to minimize commuter disruption.
- Anticipated local and regional growth.
- Impact on revenue and future maintenance/operating costs.
- Estimated project cost and risk.
- Assessment of right-of-way needs and environmental resources.
- Consideration of external agency projects and initiatives.

The Illinois Tollway's Capital Budget is comprised of two major programs, including an ongoing program called *Move Illinois: The Illinois Tollway Driving the Future*, and a recently-completed Congestion-Relief Program that began in 2005. The *Move Illinois* Program is targeted at completing the rebuilding of the Illinois Tollway system and improving mobility, relieving congestion, reducing pollution, and linking economies across northern Illinois.

The capital budget process is conducted each year, beginning in the summer. The budget division works with each department to compile a comprehensive list of capital needs, which is used to identify new projects recommended for funding. The proposed pavement and bridge projects are evaluated by the Illinois Tollway's Project Management Office and General Engineering Consultant using the inspection reports prepared by the inspection teams, which identify asset conditions and repair recommendations. The information is used to help the Illinois Tollway establish priorities and investment strategies. Then, a thorough cost-benefit analysis is performed to justify the proposed capital expenditures and impacts to the operating budget. The final proposed project list is reviewed with department chiefs, approved by the Executive Director, and presented to the Board of Directors in October for approval. Changes to the projects are made and public hearings are held in November. Once final changes are made, a final budget is presented to the Board of Directors for adoption at its December meeting.

Future projects are evaluated through a transparent process that includes collaboration with IDOT, transit agencies, and local/regional transportation and planning agencies to help identify projects that will significantly reduce congestion, expand economic opportunities, improve the region's transportation infrastructure, and foster environmental responsibility and sustainability.

The planned Illinois Tollway eight-year investment levels are presented in table 6-12. This level of funding for pavements and bridges will enable the Illinois Tollway to achieve its Desired State of Good Repair, which consists of 100 percent of pavements and bridges in *Good* condition.

Table 6-12. Illinois Tollway's planned 2019-2026 investment levels (in millions).

Expected Funding for the NHS	2019	2020	2021	2022	2023	2024	2025	2026	8-Year Total
Planned Investments	1,311.6	1,092.6	835.6	926.3	727.5	1,565.1	1,433.9	611.1	8,503.7
Percent Pavements at Desired State of Good Repair	100%	100%	100%	100%	100%	100%	100%	100%	100%
Percent Bridges in State of Good Repair	100%	100%	100%	100%	100%	100%	100%	100%	100%

Chicago Skyway

The Skyway goal is early intervention with preservation and maintenance to extend the life of major elements as much as possible. This is facilitated by the Skyway's aggressive goal of maintaining pavement and bridges above *Fair* ratings. Repair recommendations are categorized as High, Medium, and Low priority following annual inspections. Higher risk elements (fracture critical bridge elements, for example) are typically more highly prioritized.

Over the next 10 years, the Skyway anticipates bridge spending to be 86 percent on maintenance and 14 percent on preservation. Additionally, the Skyway anticipates pavement spending to be 95 percent on major and minor rehabilitation and 5 percent on preservation.

No pavement reconstruction or bridge replacement activities are planned in the next 10 years.

Summary of IDOT's Planned 10-Year Investments

Using the information presented earlier, tables 6-13 and 6-14 show the planned investments for pavements and bridges for FY 2019 to FY 2028, respectively, in accordance with the federal requirements for reporting this information. These tables summarize the level of investment in five different

work types: maintenance, preservation, rehabilitation, reconstruction, and new construction. Since IDOT does not currently have mechanisms in place to separate out maintenance and preservation, they are combined into a single preservation category for reporting purposes.

The information is presented for both the NHS and non-NHS pavements and bridges that IDOT maintains. Note that since the federal requirements specify that new construction projects are included in the table, the amount allocated for new construction and/or system expansion was estimated at 50 percent of the available funding for new construction to pavements and 50 percent to bridges. The funding level for new construction in the MYP is based on $100 million total, resulting in an estimate of $50 million each for pavements and bridges every year. The percentages for pavements and bridges may shift slightly from year to year. The funding for new construction was included in the funds deducted from total available revenue in table 6-5 (since new construction funding is not considered funding available for asset management activities).

Table 6-13. IDOT's planned pavement investments by work type for FY 2019-FY 2028 (in millions).

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	10-Year Totals
Planned Investments — NHS Pavements											
Maintenance and Preservation	35.5	27.4	23.7	26.2	30.3	31.0	30.9	33.5	33.5	33.5	305.4
Rehabilitation	386.1	297.8	257.2	285.2	329.9	336.7	336.4	363.7	363.7	363.7	3,320.6
Reconstruction	22.2	17.1	14.8	16.4	19.0	19.3	19.3	20.9	20.9	20.9	190.8
New Construction (assumed 50% of available funds)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	500.0
Subtotal	**493.8**	**392.2**	**345.6**	**377.8**	**429.2**	**437.0**	**436.6**	**468.1**	**468.1**	**468.1**	**4,316.7**
Planned Investments — Non-NHS Pavements											
Maintenance and Preservation	12.5	9.6	8.3	9.2	10.7	10.9	10.9	11.8	11.8	11.8	107.3
Rehabilitation	136.9	105.5	91.2	101.1	117.0	119.4	119.2	128.9	128.9	128.9	1,177.0
Reconstruction	6.6	5.1	4.4	4.9	5.6	5.7	5.7	6.2	6.2	6.2	56.7
New Construction (Assumed 0% of available funds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	**155.9**	**120.2**	**103.9**	**115.2**	**133.2**	**136.0**	**135.8**	**146.9**	**146.9**	**146.9**	**1,341.0**
Total Planned Investments — Pavements											
Totals	**649.7**	**512.5**	**449.5**	**493.0**	**562.5**	**573.0**	**572.5**	**615.0**	**615.0**	**615.0**	**5,657.7**

Table 6-14. IDOT's Planned bridge investments by work type for FY 2019-FY 2028 (in millions).

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	10-Year Totals
Planned Investments — NHS Bridges											
Maintenance and Preservation	135.5	104.5	90.3	100.1	115.8	118.2	118.1	127.7	127.7	127.7	1,165.7
Rehabilitation	302.3	233.1	201.3	223.3	258.3	263.6	263.3	284.8	284.8	284.8	2,599.5
Reconstruction	114.0	87.9	75.9	84.2	97.4	99.4	99.3	107.3	107.3	107.3	980.0
New Construction (assumed 50% of available funds)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	500.0
Subtotal	**601.8**	**475.5**	**417.5**	**457.6**	**521.5**	**531.2**	**530.7**	**569.8**	**569.8**	**569.8**	**5,245.1**
Planned Investments — Non-NHS Bridges											
Maintenance and Preservation	11.0	8.5	7.4	8.2	9.4	9.6	9.6	10.4	10.4	10.4	94.9
Rehabilitation	15.4	11.8	10.2	11.3	13.1	13.4	13.4	14.5	14.5	14.5	132.0
Reconstruction	21.6	16.6	14.4	15.9	18.4	18.8	18.8	20.3	20.3	20.3	185.7
New Construction (Assumed 0% of available funds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	**48.0**	**37.0**	**32.0**	**35.4**	**41.0**	**41.8**	**41.8**	**45.2**	**45.2**	**45.2**	**412.6**
Total Planned Investments — Bridges											
Totals	**649.7**	**512.5**	**449.5**	**493.0**	**562.5**	**573.0**	**572.5**	**615.0**	**615.0**	**615.0**	**5,657.7**

Summary of Planned Illinois Tollway 8-Year Investments

A summary of the Illinois Tollway's planned eight-year investments by work type is provided in table 6-15. This table combines the planned investments for pavements and bridges on the NHS highways that are maintained by the Illinois Tollway. It also combines Proactive Maintenance and Preservation into a single work type.

Table 6-15. Illinois Tollway's planned pavement and bridge investments by work type for FY 2019-FY 2026 (in millions).

Planned Investments	2019	2020	2021	2022	2023	2024	2025	2026	8-Year Totals
Maintenance & Preservation	311.71	235.05	193.54	173.94	211.88	302.54	238.04	305.53	1,972.23
Rehabilitation	236.42	64.81	7.04	1.67	13.70	8.13	15.62	148.70	496.09
Reconstruction	408.79	433.14	370.24	409.20	295.07	1,034.80	1,053.52	116.06	4,120.82
New Construction	354.70	359.63	264.79	341.53	206.84	219.63	126.72	40.82	1,914.66
Subtotal	**1,311.6**	**1,092.6**	**835.6**	**926.3**	**727.5**	**1,565.1**	**1,433.9**	**611.1**	**8,503.8**

IDOT's Implementation of the Recommended Investment Strategies

Once the amount of funding for pavement and bridges is determined, the Bureau of Programming works with the districts to develop Annual and Multi-Year Programs that reflect the planned investments.

Past Practices

In the past, funding was allocated to the districts based on 11 criteria, including truck percentages, backlog and accruing miles, backlog bridges, congestion, and safety. These allocation formulas directed approximately 45 percent of the available funds to District 1.

Transition in Developing FY 2019 – FY 2024 MYP

To assist with the development of the FY 2019–FY 2024 MYP in 2018, the nine highway districts were issued funding targets and technical guidance to use in developing, prioritizing, and submitting projects. For example, districts were instructed by the Bureau of Programming to use at least 5 percent of their unrestricted funds on bridge and pavement preservation, although they still retained considerable flexibility in how those funds would actually be used. Districts were also provided with the number of pavement miles or square feet of bridges that needed to be addressed to meet the statewide targets in place at that time. In addition, the districts were told which system to prioritize, based on systemwide conditions. However, the funding provided was generally inadequate to achieve the intended targets.

Improved Asset Management Procedures

In the past two years, the Bureau of Programming began modifying the process used to develop future MYPs by conducting a more focused review of

RAISING the BAR

The Office of Planning and Programming is Raising the Bar with its plan to use improved analysis tools to ensure investments focus on high-priority objectives

the districts' recommendations. Using spreadsheet tools, the Bureau of Programming ran analyses based on the recommendations and worked with the districts to make necessary changes.

As the initial TAMP was being developed, further changes to the MYP process were initiated to improve IDOT's asset management procedures. For instance, the spreadsheet tool that was described in the life-cycle planning chapter, and used to generate the recommended investment strategies, is being used by the Bureau of Programming during the development of the MYP to identify a more balanced approach to asset management that follows the investment strategies recommended on a statewide basis. This increased involvement by the Bureau of Programming in the program development process is expected to help IDOT focus investments on high-priority objectives, such as reducing agency risks. In addition, it will help to ensure that the Statewide Transportation Improvement Program (STIP) is consistent with the TAMP recommendations.

Under the new approach to system preservation, CRS and element level bridge data are being linked to improved guidance on treatment selection that has been developed for both pavements and bridges (as shown in Appendix C). This improved guidance shifts the emphasis from addressing mostly Backlog conditions to the use of planned maintenance and preservation strategies to keep pavements and bridges in serviceable condition for as long as possible. New pavement and bridge management programs are also being acquired to further assist in project and treatment selection.

Additionally, the work done as part of the All-Hazards Vulnerability Assessment, discussed in the Asset Level Analysis section of Chapter 5, has received a grant of $340,000 to implement Phase 2 of the assessment. Phase 2 will update data for 11,000 structures to be modeled against future weather scenarios. As part of this work, an internal committee will be formed to identify how the assessment findings can be incorporated into the programming process to further reduce potential risks.

A summary of the steps that will be taken to develop the MYP is shown in figure 6-4. It establishes the important link between available revenues, system needs, and performance targets that help to ensure that investment decisions are aligned on a statewide basis to achieve acceptable conditions. IDOT will continue to improve this process over the next several years to further strengthen these important links.

Figure 6-4. IDOT's process for developing its FY 2020-2025 MYP.

IDOT's Planned Investment Strategies' Support of National Goals

One of the requirements for a state's TAMP is a discussion of the affect that the investment strategies will have on the ability of the state to support the national goals identified in 23 U.S.C. 150(b). The seven national goals are as follows:

- Safety.
- Infrastructure Condition.
- Congestion Reduction.
- System Reliability.
- Freight Movement and Economic Vitality.
- Environmental Sustainability.
- Reduced Project Delivery Delays.

The planned investment strategies' support of the seven goals are described in this section.

Safety

Safety is an overarching initiative throughout IDOT. The TAMP strategies support the goals and objectives of the Highway Safety Improvement Program (HSIP) by setting aside those funds as not available for programming general highway and bridge needs. There are several statewide line items targeted specifically to safety that are also set aside in the budgeting process as not available for programming general highway needs. Some of these include

work zone safety, cable barriers, pavement markings and raised reflective pavement markers, and homeland security. These programs are reflected in table 6-5 in the row entitled "Minus Safety/Other, ROW, Local Roads "Off-System", State Force Maintenance". Additionally, safety factors such as high-accident locations and ADA ramps are considered in the programming process for pavement and bridge projects. Implementing the HSIP and TAMP will reduce traffic fatalities and serious injuries.

Infrastructure Condition

The investment strategies in the TAMP are an integral part of the programming process that is used to develop the STIP. The investment strategies are aligned to meet the federal pavement and bridge performance targets IDOT reported to FHWA, which are used in conjunction with IDOT's State of Acceptable Condition targets to maintain the highway infrastructure system in a state of good repair. More information on the infrastructure condition performance measures is contained in Chapter 7, *Performance Gap Analysis* and in Appendix B, *Federal Performance Measures*.

Congestion Reduction

The TAMP investment strategies set aside $100 million per year for congestion reduction. This can be seen in the New Construction component of the investment strategies in tables 6-13 and 6-14. IDOT is working to develop a value-driven project selection process that evaluates the benefits of each potential congestion reduction project. Implementation of the TAMP strategies will aid in reducing congestion on the NHS.

System Reliability

The Highway Maintenance and Management category in table 6-3, Projected FY 2019 to FY 2028 Estimated Expenditures, comprises 20% of IDOT's FY 2019 expenditures and contains many programs designed to enhance system reliability. Some of the programs include aggressive anti-icing and added snow plowing capabilities in the winter months and emergency patrols in the Chicago and East St. Louis areas to aid stranded motorists, thereby reducing delays. Additionally, the Grants and Highway Safety category in table 6-3 includes the Illinois Tranportation Enhancement Program (ITEP) that funds transportation alternatives such as bicycle lanes. These and other programs combine to improve efficiency of the surface transportation system.

Freight Movement and Economic Vitality

IDOT has developed a freight investment plan to improve freight mobility throughout Illinois. Some of the projects selected under the freight investment plan use funds specifically dedicated to freight movement while

other projects are funded as part of the congestion reduction program or in district regular programs. The projects are selected to improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.

Environmental Sustainability

Environmental sustainability is considered in numerous programs throughout IDOT. Environmental considerations are evaluated as part of every pavement and bridge project included in the STIP. There are several statewide line items in the budget that are included in table 6-3 under the Highway Maintenance and Management and Grants and Highway Safety categories specifically to protect the environment. A few examples include the mowing policy to protect habitats for pollinators and funding for archeological surveys. Implementing the TAMP investment strategies along with continuing these other programs will enhance the performance of the transportation system while protecting and enhancing the natural environment.

Reduced Project Delivery Delays

IDOT uses many methods to streamline and improve project delivery. The NEPA/404 Merger Process simplifies, standardizes, and condenses the process by which projects are coordinated with environmental resource agencies. A Memorandum of Understanding facilitates the coordination of projects with federally-recognized tribes with interests in lands in Illinois. A Programmatic Agreement (PA) on Section 106 of the National Historic Preservation Act significantly increases the number of projects that can be cleared for cultural resources internally and reduces overall coordination time. A PA for Categorical Exclusions (CE's) simplifies and clarifies the process and allows more state-approved CE's.

IDOT is ... RAISING the BAR

by setting State of Acceptable Condition targets at the level where preservation treatments are viable.

Chapter 7: Performance Gap Analysis

Overview

While construction and maintenance costs continue to rise, IDOT faces flat or declining revenues, in part due to the effects of the reduction in vehicle miles traveled and improved vehicle fuel efficiency on fuel taxes. Because revenue has not kept pace with system needs, Illinois has become reliant on a series of capital bills approximately every 10 years to improve infrastructure.

Recognizing the reality of inadequate funding, the Bureau of Programming initiated changes to the project identification and selection process to control costs and extend the useful lives of existing transportation assets. The result will lead to a gradual shift in the way projects are programmed, moving away from the historical focus on Backlog and Accruing needs to a life cycle approach that includes strategic investments in preserving system conditions, delaying the need for rehabilitation, and extending the service life. As part of the shift in approaches, the Bureau of Programming worked with the Bureau of Research, the Bureau of Materials, the Bureau of Design and Environment, the Bureau of Bridges and Structures, and the districts to develop improved guidance for project and treatment selection based on pavement survey and bridge inspection results that were piloted during the development of the FY 2019-2024 MYP, and further improved for the development of the FY 2020-2025 MYP.

Although the planned changes allow IDOT to maximize pavement and bridge conditions as much as possible, most of the State of Acceptable Condition targets are not anticipated to be met in the next 10 years under the current funding scenarios. This chapter discusses the expected performance gap and the funding needed to eliminate the gap. The costs provided here apply only to the TAMP-related pavements and bridges themselves, and do not include ancillary assets (such as lighting, signs, and drainage culverts) nor do they include local roads that are not on the NHS.

Note that the impacts of the capital construction plan passed by the Illinois General Assembly on June 1, 2019 have not been assessed at this time. The asset management plan will be fully revised after the Governor signs the related bills.

IDOT is ... RAISING the BAR

by establishing new State of Acceptable Condition Targets for pavements

- Interstates: 90 percent of the network with a CRS ≥ 5.5
- Other NHS routes: 90 percent of the network with a CRS ≥ 5.0
- Non-NHS Marked routes: 75 percent of the network with a CRS ≥ 5.0
- Non-NHS Unmarked routes: 50 percent of the network with a CRS ≥ 5.0

IDOT is ... RAISING the BAR

by establishing new State of Acceptable Condition Targets for bridges

- Interstate and all other NHS bridges: 93 percent at or above a primary NBI rating of 5 or better
- All other bridges: 90 percent at or above a primary NBI rating of 5 or better

Gaps in State of Acceptable Condition Targets

As discussed in Chapter 3, IDOT established new pavement performance metrics beginning in 2017 to shift the focus from Backlog needs to a more proactive approach that recognizes the importance of preservation activities before assets deteriorate to a Backlog condition. For pavements, the new approach uses CRS values to determine the percentage of the highway system in a State of Acceptable Condition at 5.5 or higher for Interstate pavements and 5.0 for all other systems. These CRS values were selected because they represent the range of conditions at which preservation treatments are considered viable.

Using current and predicted CRS values in conjunction with anticipated funding levels, the initial targets shown on the left were established for pavements.

For bridges, the performance metric also changed and the definition for State of Acceptable Condition was set at a primary NBI element rating of 5 or better, representing a bridge element that could be preserved using maintenance or preservation treatments. The initial targets established for bridge conditions are also listed to the left.

Performance Gaps

As discussed in Chapter 6, the planned investment strategies were developed to help IDOT achieve the State of Acceptable Condition for its pavement and bridge networks. Unfortunately, funding is not sufficient to achieve the acceptable conditions on all systems, so there are gaps between the acceptable and actual conditions in some instances. For pavements, funding is adequate to achieve the State of Acceptable Condition for the Illinois Tollway and Chicago Skyway only and to nearly achieve the State of Acceptable Condition for the Interstate system; however, a more significant performance gap exists for the remainder of the pavement network. For bridges, the NHS bridges approach the State of Acceptable Condition, but the non-NHS bridges have larger performance gaps. Figure 7-1 illustrates the performance gap for pavements and figure 7-2 presents the performance gap for bridges.

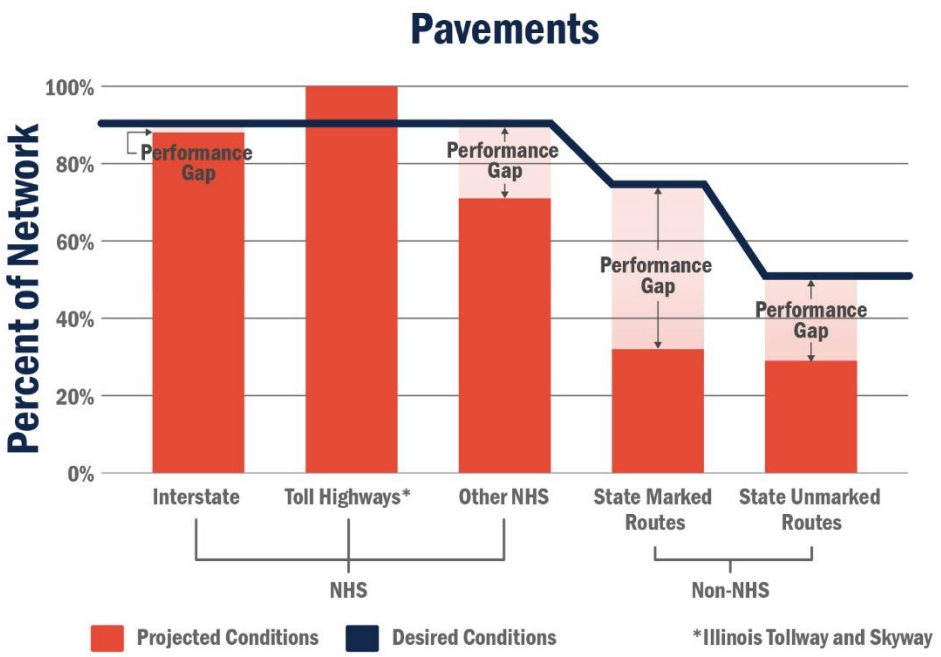


Figure 7-1. Pavement performance gap.

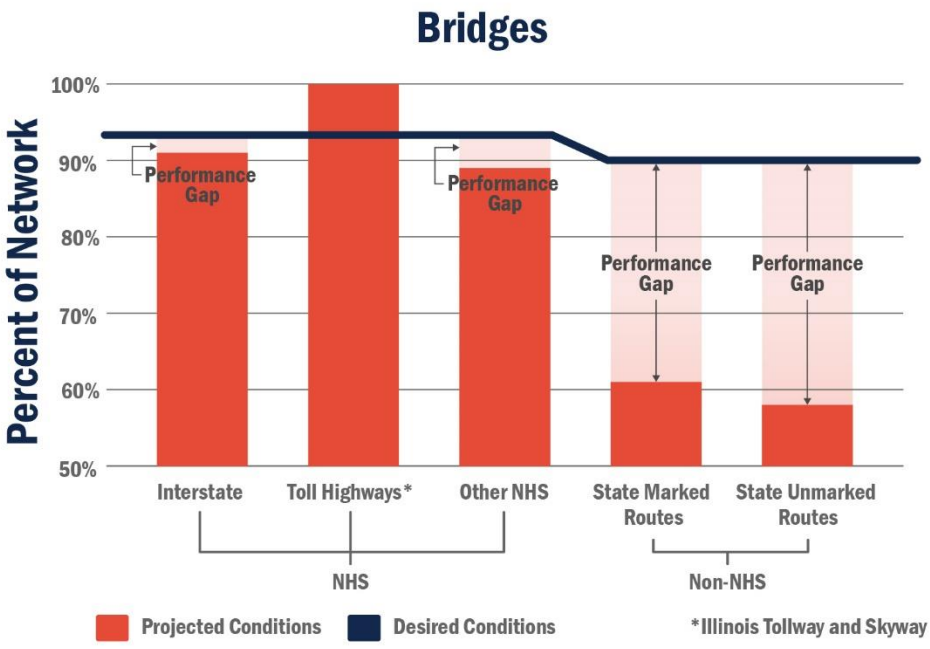


Figure 7-2. Bridge performance gap.

An analysis was conducted to determine the additional funding that would be needed to eliminate both the pavement and bridge performance gaps in the year 2028. The analysis used the same investment strategy recommended in this TAMP. Table 7-1 shows the number of miles needed to address and the associated costs to meet the State of Acceptable Condition targets on all pavements.

Table 7-1. Needs to address the state-maintained pavement performance gap (in millions).

	System	Total Miles to Address	Total Cost to Address (millions)
NHS	Interstates	47	$100.6
	Other NHS	1066	$1,206.9
Non-NHS	Marked Routes	2856	$5,207.3
	Unmarked Routes	501	$332.8
	Statewide Totals	**4470**	**$6,847.6**

The same type of analysis was conducted for bridges. Table 7-2 includes the results of the analysis for bridges.

Table 7-2. Needs to address the state-maintained bridge performance gap (in millions).

	System	Total Square Feet to Address	Total Cost to Address (millions)
NHS	Interstates	730,347	$173.1
	Other NHS	1,154,496	$261.7
Non-NHS	Marked Routes	3,510,807	$838.6
	Unmarked Routes	4,615,077	$991.6
	Statewide Totals	**10,010,728**	**$2,265.0**

If funding is not increased at any point between 2019 and 2028, an additional $9.112 billion will be needed to close the performance gap that exists at the end of 2028. The costs included to close the performance gaps only include the actual rehabilitation or reconstruction/replacement costs of pavements and bridges. Other ancillary costs such as drainage, lighting, signs, etc., are not included in the costs. Inflation is also not considered in the calculation of the needed funding to address the performance gaps. *If the ancillary costs and an inflation index were included, the need would amount to $13.5 to $15 billion.*

Strategies to Address the Condition Gaps

Without additional funding, IDOT recognizes that it would be difficult to eliminate the pavement and bridge performance gaps discussed in this chapter. Therefore, it will be important for IDOT to be strategic in making sure that available funds are used as wisely as possible. The new project and treatment selection process that is described in this TAMP will help ensure

that pavement and bridge lives are extended as much as possible using preservation strategies, which will slow the overall rate of deterioration. This process, in conjunction with the availability of improved guidance for the districts to ensure the right treatments are being used, is expected to go a long way toward improving pavement and bridge conditions in the state, even without new revenue.

In addition, IDOT will work with elected officials and other stakeholders to look to increase the amount of funding available for pavement and bridge preservation so that acceptable conditions can be achieved. Figures 7-3, for pavements, and 7-4, for bridges, demonstrate the conditions achieved under three different scenarios: 1) current funding levels (orange), 2) funding needed to maintain current conditions on pavements while increasing NHS bridge funding to achieve 90 percent above the State of Acceptable Condition (blue), and 3) funding to meet the State of Acceptable Condition on all pavements and bridges on all systems (green).

It can be seen that, if increased funding were to start in 2019, an additional $6.0 billion would be needed to close the performance gap on both pavements and bridges (the difference between the orange line and the green line). However, if funding is not increased until the end of the 10-year period and the conditions continue to deteriorate, the gap analysis showed in Tables 7-1 and 7-2 that it would take $9.1 billion more funding to close the gap starting in 2028. Again, these estimates only include the pavement and bridge costs, not ancillary items such as drainage and lighting, and also do not include any costs for expanding the current system.

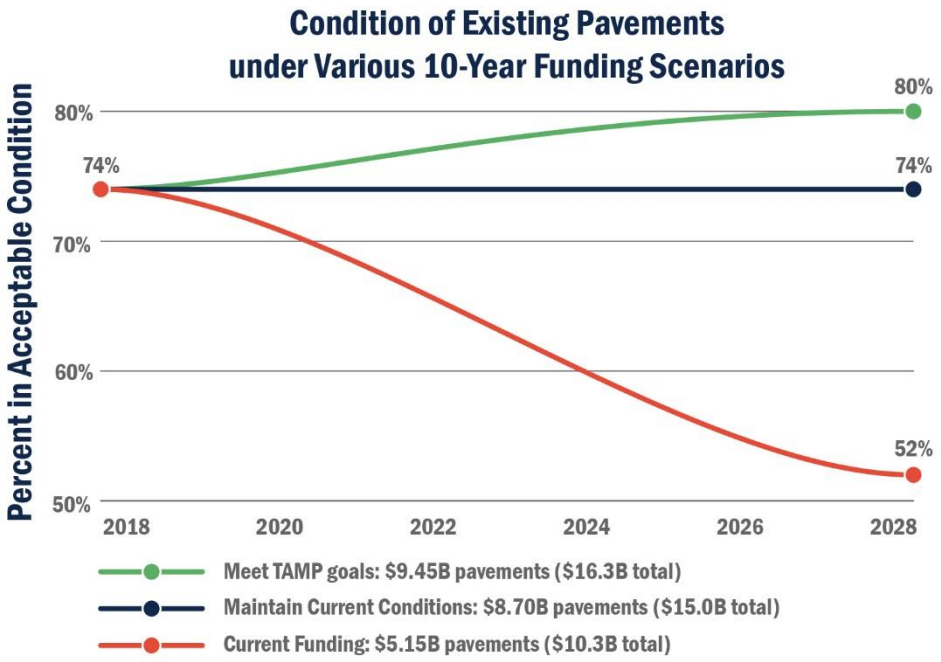


Figure 7-3. Changes in pavement condition over 10 years with various funding scenarios

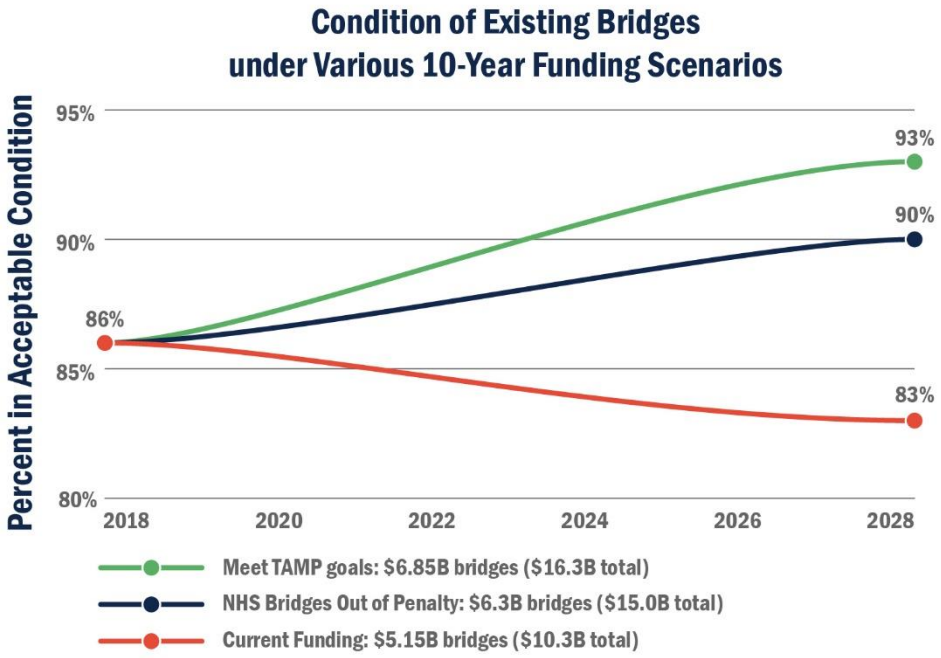


Figure 7-4. Changes in bridge condition over 10 years with various funding scenarios

Federal Performance Measures and Minimum Condition Requirements for the NHS

In addition to the metrics that IDOT uses to manage its pavements and bridges, the FHWA has established performance management measures for pavements and bridges for national reporting of pavement and bridge conditions. For pavements, IDOT modified its pavement condition survey reporting procedure for the NHS to be able to meet the requirements. The bridge inspection procedures already collect the information required for federal reporting. Using these performance measures, two- and four-year targets for NHS pavements and bridges have been established and reported to the FHWA. The pavement and bridge performance targets established by IDOT to satisfy federal transportation performance management requirements were presented in Chapter 3. More information on the federal performance measures is provided in Appendix B.

Two of the MPOs in Illinois chose to set different targets for their NHS pavements and bridges. The MPOs are the Chicago Metropolitan Agency for Planning (CMAP) and the East-West Gateway Council of Governments (E-W Gateway), which covers the St. Louis metropolitan area. Their targets are included in Appendix B.

The legislation also introduced minimum condition requirements for Interstate pavements and NHS bridge deck area. The legislation requires that if more than 5 percent of the Interstate miles are in *Poor* condition using definitions provided by FHWA (which differ from the CRS), some flexibility in funding will be lost. For bridges, legislation states that some flexibility in funding will be lost if more than 10 percent of the NHS bridge deck area is classified as Structurally Deficient in accordance with the NBI definitions.

While baseline pavement conditions were not required to be reported when targets were set, IDOT's 2018 HPMS submittal shows only 0.4 percent of Interstate miles were in *Poor* condition using the federal performance measures. Even with constrained funding, the Department is confident that no more than 4.9 percent of the Interstate miles will be classified as being in *Poor* condition at the end of the 4-year performance period. Although IDOT uses different reporting methods to analyze the pavement condition, the Department has been collecting the necessary performance data for several years and is in the process of developing analysis methods based on the federal performance measure criteria. The 4-year pavement targets that are in effect as of June 30, 2019 may be adjusted as of October 1, 2020, as part of the Mid-Performance Period Progress Report.

For the investment analysis of bridges, IDOT determined that bridges constructed prior to 1988 can be assumed to have an average life of 65 years while bridges constructed in 1988 or later can be assumed to have an average life of 80 years. The primary reason for the longer average life was the change to using all epoxy-coated reinforcement in bridges, which is less likely to corrode. Based on this assumption, and using the new models developed for predicting bridge conditions discussed in Chapter 3, IDOT projects that approximately 9.9 percent of the NHS bridge deck area will be in *Poor* condition at the end of the 10-year analysis period. This is within the minimum performance requirements established by the federal government. It should be noted that two- and four-year performance targets for bridges using the federal performance measures were established prior to the completion of this TAMP. Changes were made to the investment strategy to shift more funding to bridges, thereby decreasing the percentage of bridges in *Poor* condition by the end of the 10-year TAMP analysis period. It is anticipated that the four-year targets may be adjusted as part of the Mid-Performance Period Progress Report to reflect this shift in funding.

To improve its confidence in predicting future bridge conditions, Chapter 8 discusses the steps IDOT is taking to develop bridge performance models and increase the use of bridge preservation treatments. Together, these steps will help IDOT better manage its bridges to ensure that the minimum condition requirements for NHS bridge deck area are not exceeded during the 10-year analysis period and beyond.

Other Performance Factors Impacting the Condition Gaps

States DOTs are required to initiate processes for identifying gaps in the performance of the NHS beyond asset condition. IDOT recognizes the need to achieve a balance between system performance goals related to improving safety, addressing capacity needs, and fostering economic development by preserving asset conditions. Asset management processes need to support a healthy, overall transportation system by focusing on both condition and other performance goals. Moving forward, IDOT will monitor impacts caused by the implementation of the goals addressed in the Long Range Transportation Plan; Highway, Freight, Transit, and Safety Plans; and other efforts to support the state's economic vitality and to provide an intelligent transportation system. The recommendations identified in these plans will be evaluated and prioritized based on the overall system performance goals. For instance, IDOT's Freight Plan forecasts a 40 percent increase in freight tonnage by 2045 and 70 percent of this increase is expected to be carried by trucks. To address the impact to the roadway system, the plan identified objectives to encourage mode shift and to establish multimodal alternatives. Also in the plan, freight bottlenecks were identified and a follow-up study will be conducted to determine the cause of these bottlenecks. As discussed in Chapter 5, IDOT

recently completed an All-Hazards study that analyzed the potential impacts of climate change and extreme weather on the infrastructure. The results from the study are being used to evaluate options to manage the performance gaps based on asset criticality, risks, and vulnerability.

Other factors identified during the performance gap analysis include the overall age of the system and the significant cost of replacing structurally deficient major river crossing bridges. The analysis described in the chapter on Asset Inventory and Performance determined that 44 percent of existing structures are greater than 48 years old and 91 percent of existing pavements are more than 40 years old. Because a large portion of the network is nearing the end of its service life, this could limit IDOT's ability to maintain and improve overall system conditions. To address these numbers, IDOT has begun the process of applying LCP strategies to pavements and bridges to extend their service life in the most cost-effective manner.

Recognizing the challenge of acomplishing high-dollar bridge projects, IDOT has a separate Illinois Special Bridge Program that specifically targets deficient highway bridge projects that exceed replacement or rehabilitation costs of $7.5 million for state bridges and $1.0 million for local bridges. The Illinois Special Bridge Program provides federal NHPP funds and/or STP funds for up to 90 percent of eligible costs for projects on the Interstate system and up to 80 percent of eligible costs for projects off the Interstate system.

Chapter 8: Planned Enhancements

Overview

As described in this TAMP, IDOT is committed to ensuring the success of its asset management initiatives as a way to improve system conditions while managing the network through strategic, cost-effective improvements. IDOT recognizes that asset management is not a static process; rather, it requires continual evaluation of the process to identify possible changes that could be made to agency policies and practices that will help improve efficiency, reduce risks, and address agency priorities. This chapter outlines the framework that IDOT has established to support asset management and the planned enhancements that will be implemented within the next several years to further enhance IDOT's asset management practices.

Asset Management Framework

IDOT's Asset Management program resides in the Bureau of Programming within the Office of Planning and Programming. It is championed by the Secretary of Transportation, directed by a Steering Committee, and supported by an Asset Management Project Management Team and Technical Working Groups.

The development of the TAMP and IDOT's implementation of asset management practices is guided by a Steering Committee made up of representatives at the executive management level. The Steering Committee is expected to remain active as IDOT transitions from its historical focus on Backlog conditions to the new life cycle strategy presented in this TAMP. IDOT considers the next few years to be critical in terms of adopting the new strategy and the support provided at the executive level is critically important to the agency's success at making this transition. The Asset Management Project Management Team will report to the Steering Committee on a regular basis and provide updates on actual versus planned progress towards the enhancements described later in this chapter.

The Project Management Team and the various Technical Working Groups that were created to support the development of the TAMP are expected to remain in place, although they may occasionally be dormant until they are needed to address activities identified by the Steering Committee. Membership in these groups is expected to change to account for job changes that may occur over the next few years.

The Bureau of Programming hired a permanent Asset Management Engineer in October 2018 who is responsible for reporting to the Steering Committee on a

regular basis, coordinating the efforts of the Project Management Team and the Technical Work Groups, and updating the TAMP at least every four years. The individual in this position coordinated the development of this fully compliant TAMP.

Planned Enhancements

There are several specific enhancements that IDOT will make to existing business processes and analysis tools within the next several years to meet federal requirements and improve IDOT's ability to effectively manage its pavements and bridges. The most significant of these enhancements are detailed below.

Impact of Capital Construction Plan

As noted in Chapter 6, a capital construction plan was passed by the Illinois General Assembly on June 1, 2019. Once the Governor signs the bills authorizing the capital construction plan, the impacts to funding and projected asset conditions will be assessed and the TAMP will be fully revised.

Acquisition and Implementation of Improved Analysis Tools

IDOT recognizes that it currently does not have pavement and bridge management systems that meet the minimum requirements outlined by the federal requirements. Therefore, one of the most important enhancements that will occur is the acquisition and implementation of a new Enterprise Asset Management System (EAMS) that contains software that will give IDOT the ability to evaluate the long-term impacts and cost-effectiveness of different pavement and bridge treatment strategies. The Bureau of Programming is responsible for the EAMS implementation. The current status of the procurement is as follows:

- The RFP was advertised January 24, 2019, with bids due March 8, 2019.
- The vendor selection process is on-going, with a goal to have a contract in place by December 2019.

The EAMS implementation is expected to take 18 to 36 months from the contract date.

Once the contract is in place with the selected vendor, the Bureau of Programming will establish an implementation timeline that accelerates, as much as possible, the availability of the new analysis tools to support the development of future MYPs and TAMPs.

During the implementation of the software, the Bureau of Bridges and Structures will work with the selected vendor to identify critical data elements and develop bridge element deterioration models, in addition to the deterioration models that were developed in the past year. These models will enable IDOT to better predict changes in bridge conditions over time. IDOT currently anticipates that its existing pavement deterioration models will be entered directly into the pavement management software. Crucial pavement data elements for the EAMS will be coordinated between the Bureau of Programming and the Bureau of Research.

Development of Improved Project and Treatment Selection Guidance

IDOT has made significant progress toward the development of changes to the guidance available to districts to help them select projects and treatments. General guidance for the category of repair associated with each CRS and NBI rating was established during the development of the investment spreadsheet described earlier in the TAMP. In addition, the Pavement Technical Working Group has been working with other stakeholders to provide more specific guidance for pavement treatment selection using characteristics such as traffic levels, distress types, and amount of rutting. These selection criteria are being finalized and will be programmed into the pavement management software as part of the EAMS implemetation process. In the future, the guidance will be integrated into existing manuals to further institutionalize the process.

The Bridge Technical Working Group is working to enhance the guidance provided to the districts to select bridge improvements. The Bridge office will continue to review projects recommended by the districts to ensure that statewide bridge targets are met. The final guidance will be input into the EAMS and used to evaluate future investment decisions.

In addition to finalizing the project and treatment selection guidance, the Bureau of Programming will work with the districts to establish new accountability criteria that can be used to drive district investment decisions and to help ensure that IDOT's statewide strategies are being followed. The Bureau of Programming will also continue to evaluate whether changes are needed to the current process for distributing funds to the districts to better support the proposed investment strategies.

Finally, the Bureau of Programming will be responsible for evaluating the results of the new strategy on an annual basis and communicating the results throughout IDOT.

IDOT is ... RAISING the BAR

With On-Going Enhancements to Support Performance-Based Decisions:

- ☑ New project selection process to evaluate the benefits of expansion and congestion mitigation projects
- ☑ Acquisition of pavement and bridge analysis tools to evaluate investment options
- ☑ Increased investments in pavement and bridge preservation to extend service life

District Training

The districts have a significant role in the successful implementation of the planned investment strategies due to their responsibilities for identifying and recommending projects and appropriate treatments. The investment strategies presented in this TAMP represent a significant change in the approach IDOT uses for programming projects, which is being presented to the districts through training that addresses the reasons for the changes and how the new guidance will be implemented. This training will continue over the next several years.

The new guidelines were used by the Bureau of Programming and the districts during the development of the FY 2020-2025 MYP. The selection criteria will be finalized and formal guidance documents issued to the districts prior to development of the FY 2021-2026 MYP. Additionally, the Bureau of Programming will coordinate with the districts regularly to ensure that the guidelines are being followed.

Modifications to Pavement Performance Measures for Federal Reporting

As noted in the TAMP, specific pavement performance measures have been established by the FHWA for reporting each state's pavement conditions on the NHS. The federally-mandated performance measures are key to preserving federal funding distributions to IDOT and maintaining flexibility in how those funds can be used. Historically, IDOT has used CRS to manage its pavement network and the information provided by the CRS surveys continues to provide valuable information for pavement project and treatment selection; however, the distress data considered in calculating the CRS differ from what is required for federal reporting on the NHS. To address these differences, IDOT initiated changes with its data collection vendor in FY 2017 to supplement the CRS surveys with additional detail that will allow the agency to report NHS pavement conditions in accordance with the federal pavement performance measures. In the future, IDOT will continue to satisfy federal reporting requirements while concurrently using the CRS as the basis for decisions regarding pavement improvements, as documented in this TAMP.

IDOT developed two- and four-year pavement performance targets for the NHS pavements using the federal performance measures, using a process that reflects anticipated system needs and expectations, funding levels, and projected pavement conditions. To help develop the process, IDOT analyzed its historical CRS and HPMS performance data to evaluate data trends that would influence the short-term targets. In addition, IDOT participated in national conferences, web meetings, and peer exchanges to identify best

practices being used by other state DOTs to develop federally-required pavement performance targets from investment plans based on their agencies' historical measures. The information obtained from the historical data trend analysis, the additional data provided by the data collection vendor beginning in FY 2017, and the information obtained from the various peer interactions were all used to develop the baseline targets reported to the FHWA in October 2018. Information on the federal targets are presented in Appendix B. Going forward, IDOT will investigate improved methods of forecasting the federal performance measures within the pavement and bridge management systems being implemented under EAMS.

Improved Coordination with Local and Regional Transportation Partners

IDOT currently complies with federal requirements to provide information on the NHS, regardless of whether the assets are managed by the state or by local partners. IDOT has been able to satisfy this requirement because of its decision to collect asset condition data for the entire NHS. However, IDOT recognizes the importance of working with its local and regional transportation partners to help ensure that all federal funds are used effectively to meet short- and long-term performance targets. The coordination efforts will be the responsibility of the Bureau of Programming. IDOT recently formed an internal Local Agency Technical Working Group to ensure local agency coordination and communication is consistent across the State. Additionally, the Bureau of Programming has presented on the new TAMP at several meetings and conferences targeted to local agencies.

IDOT provided funding to CMAP to conduct a program where CMAP will provide technical assistance to MPO municipalities in collecting, storing, and analyzing asset conditions. This will assist CMAP in planning for improvements, prioritizing funding, and setting targets.

Consideration of Repetitive Damage in Project Programming

As noted in Chapter 5, state DOTs are required to establish processes to consider alternate treatment strategies on assets that have been damaged two or more times due to emergency events declared by the Governor of the State or the President of the United States. IDOT has established a process that will collect, compile, and track the required information and will incorporate a review of emergency repairs into Bureau of Programming Program Development Section's programming processes beginning with the FY 2021-2026 MYP. The new process will be reviewed and adjusted, if necessary.

Moving Forward

As documented in this TAMP, IDOT has made a strong commitment to *Raising the Bar* through improved asset management practices that make use of new performance metrics to emphasize the importance of preservation treatments, enhanced analytical tools to predict funding needs, stronger guidance to support project and treatment selection, and improved coordination with regional transportation partners. These efforts will continue as IDOT moves forward with implementing its new project and treatment selection procedures to enable the Department to achieve the goals set forth over the coming decade.

Appendix A: List of NHS Mileage and Bridge Deck Area Managed by Local Agencies

Agencies	Pavements	Bridges	
	Number of Miles	Number of Bridges	Square Feet
Counties			
Champaign	0.24	0	0
Cook	56.54	10	198,800
DuPage	56.71	9	61,358
Kane	48.35	16	394,772
Kankakee	1.44	0	0
Lake	2.42	0	0
Madison	8.81	3	18,394
McHenry	15.67	7	23,548
Peoria	0.73	0	0
Rock Island	2.90	1	16,856
St. Clair	5.12	4	20,103
Will	51.70	22	69,916
Winnebago	18.01	8	33,951
Total County Miles	**268.64**	**80**	**837,698**
Municipalities			
Aurora	6.35	6	122,501
Bartlett	2.23	0	0
Bedford Park	3.41	0	0
Bensenville	0.30	0	0
Bolingbrook	1.85	1	6,048
Calumet City	1.01	0	0
Campton Hills	1.71	0	0
Carol Stream	2.24	0	0
Champaign	9.47	2	6,223
Cherry Valley	0.50	1	2,493
Chicago	70.52	102	3,751,938
Creve Coeur	0.23	0	0
Crystal Lake	1.19	0	0
Danville	1.06	0	0
Decatur	2.11	1	1,847
Deerfield	0.06	1	10,816
DeKalb	1.61	0	0
Downers Grove	0.52	0	0
Dupo	0.16	0	0
East St. Louis	3.56	0	0
Elgin	1.83	0	0
Elmhurst	0.55	0	0
Elwood	2.40	0	0
Franklin Park	1.87	0	0
Galesburg	2.00	0	0
Geneva	0.12	0	0
Glen Ellyn	1.00	0	0
Glenview	0.35	1	4,683
Grayslake	0.29	0	0
Hanover Park	1.17	0	0
Harvey	2.07	0	0
Highland Park	0.89	0	0
Hodgkins	2.32	0	0

Agencies	Pavements	Bridges	
	Number of Miles	Number of Bridges	Square Feet
Hometown	0.62	0	0
Lake Forest	1.52	0	0
Lincolnwood	0.00	1	9,969
Lisle	0.23	0	0
Lombard	1.87	0	0
Loves Park	3.74	5	46,107
Machesney Park	1.51	1	4,400
Matteson	0.54	0	0
Mattoon	0.10	0	0
Mokena	0.55	0	0
Monticello	1.54	0	0
Mount Vernon	2.16	0	0
Naperville	9.59	1	7,998
Northbrook	0.56	1	2,709
Northlake	0.18	0	0
Palatine	0.70	0	0
Pekin	3.73	0	0
Peoria	0.58	0	0
Plainfield	2.09	0	0
Rock Island	3.68	1	5,037
Rockford	25.13	20	281,307
Savoy	1.19	0	0
Schaumburg	0.35	0	0
Skokie	0.14	0	0
South Elgin	1.04	1	4,940
Springfield	3.08	2	45,723
St. Charles	1.58	0	0
Tinley Park	0.63	0	0
Troy	0.78	0	0
Urbana	3.66	3	20,882
Venice	0.45	0	0
Villa Park	1.27	1	7,738
Westmont	0.50	0	0
Wheaton	0.42	0	0
Total Municipality Miles	**202.66**	**152**	**4,343,359**
Townships			
Elgin	0.84	0	0
Plato	1.18	0	0
Somer	0.15	0	0
St Charles	0.01	0	0
Wayne	0.01	0	0
Total Township Miles	**2.19**	**0**	**0**
Other Agencies			
Other	0.92	4	111,466
Total Other Agency Miles	**0.92**	**4**	**111,466**
Total All Agencies			
Totals	**474.41**	**236**	**5,292,523**
Note: other pavement NHS owners include the federal government and one private entity. Other bridge NHS owners include 3 private entities and one other state.			

Appendix B: Federal Performance Measures

Federal performance measures have been established to assess performance/condition in carrying out performance-based Federal-aid highway programs.[24] Performance measures have been developed in the following three areas:

- Safety
- Infrastructure
- System Performance

IDOT submitted its Performance Management Form on October 1, 2018, which includes targets for the infrastructure and system performance measures. Additionally, IDOT issued a Performance Measures Report dated March 29, 2019 that documents IDOT's work in all three areas, including what each performance measure does, why it is important, the timeline for reporting targets to FHWA or other agencies, and the targets that were established in response to the measures set by the FHWA[25]. The report also outlines the steps IDOT is taking to improve performance in each area. The information contained in this appendix focuses on the Infrastructure component of the performance measures.

Pavement Performance

FHWA requires state DOTs to report the following performance measures for pavements:

- Percentage of Interstate pavements in *Good* condition.
- Percentage of Interstate pavements in *Poor* condition.
- Percentage of non-Interstate NHS pavements in *Good* condition.
- Percentage of non-Interstate NHS pavements in *Poor* condition.

To ensure consistency in how performance is reported by the states, the rules established the performance criteria shown in table B-1 for evaluating pavement conditions.

[24] https://www.fhwa.dot.gov/tpm/about/how.cfm
[25] http://www.idot.illinois.gov/Assets/uploads/files/About-IDOT/Misc/Planning/LRTP Appendix_F_TPM_Report.pdf

Table B-1. Federal pavement condition thresholds.

Rating	Good	Fair	Poor
International Roughness Index (IRI) (inches/mile)	< 95	95–170	> 170
Present serviceability rating (PSR) (only for routes with posted speed limit < 40 mph)	≥ 4.0	2.0–4.0	≤ 2.0
Cracking (%)*	< 5	CRCP: 5–10 Jointed: 5–15 Asphalt: 5–20	>10 > 15 >20
Rutting (inches) (HMA only)	< 0.20	0.20–0.40	> 0.40
Faulting (inches) (PCC only)	< 0.10	0.10–0.15	> 0.15

*Prior to 2017, the cracking percent was not calculated using the same automated tools used for IRI, rutting, and faulting; FHWA's Final Rules amended wheel path width used to calculate cracking percent. Therefore, a comparison of cracking percentages from prior years with the current year is not comparing similar data and impacts the ability to model a trend.

Pavement ratings are assigned to sections 0.1-mile in length. A pavement is classified as being in *Good* condition if all of the metrics shown in Table B-1 are *Good*. A pavement is classified in *Poor* condition if two or more metrics are evaluated as *Poor*. All other pavement setions are classifed as being in *Fair* condition.

In October 2018, IDOT submitted its Baseline Performance Period Report to the FHWA with the two- and four-year targets presented in Chapter 3. The Mid-Performance Period Progress Report, showing progress toward the four-year targets, will be submitted by October 1, 2020.

Two of the MPOs in Illinois chose not to adopt IDOT's targets and instead developed their own. The targets developed by the E-W Gateway are shown in Table B-2.

Table B-2. E-W Gateway's 2- and 4-year pavement targets for federal reporting.

Performance Measure	Baseline Value (%)	2020 Target (%)	2022 Target (%)
Percent Interstate Pavement in Good condition	54.94	Not required in 2018	56.00
Percent Interstate Pavement in Poor condition	0.40	Not required in 2018	1.00
Percent Non-Interstate NHS Pavement in Good condition	49.31	48.00	46.00
Percent Non-Interstate NHS Pavement in Poor condition	0.56	1.00	2.00

The CMAP developed its targets earlier than the federal requirement. Their four-year targets were set in 2017, making their four-year target year 2021 instead of 2022. They chose not to set two-year targets, as they were not required. The targets developed by CMAP are included in Table B-3.

Table B-3. CMAP's 4-year pavement targets for federal reporting.

Performance Measure	Baseline Value (%)	2021 Target (%)
Percent Interstate Pavement in Good condition	57.1	58.9
Percent Interstate Pavement in Poor condition	1.8	0.0
Percent Non-Interstate NHS Pavement in Good condition	15.2	17.7
Percent Non-Interstate NHS Pavement in Poor condition	31.0	28.5

Bridge Performance

FHWA requires the following performance measures for reporting bridge conditions:

- Percentage of NHS bridges classified in *Good* condition.
- Percentage of NHS bridges classified in *Poor* condition.

For bridges, performance is evaluated using the same National Bridge Inspection Standards used by IDOT to assess the condition of the deck, superstructure, and substructure. The FHWA rules define the bridge performance thresholds shown in Table B-4 for classifying bridge components in *Good*, *Fair*, and *Poor* condition.

Table B-4. Federal bridge component performance thresholds.

NBI Rating Scale	Good	Fair	Poor
Deck (Item 58)	≥ 7	5 or 6	≤ 4
Superstructure (Item 59)	≥ 7	5 or 6	≤ 4
Substructure (Item 60)	≥ 7	5 or 6	≤ 4
Culvert (Item 62)	≥ 7	5 or 6	≤ 4

Bridges are classified in *Good*, *Fair*, or *Poor* condition based on the most severe NBI component condition. For example, a bridge with a Deck and

Superstructure rated in *Fair* condition, but a Substructure in *Poor* condition, would be rated *Poor*.

IDOT's Baseline Performance Period Report to FHWA included the 2- and 4-year targets presented in Chapter 3. As with pavements, the Mid-Performance Period Progress Report, showing progress toward the 2-year targets, will be submitted by October 1, 2020.

Again, the E-W Gateway and CMAP MPOs developed their own performance measure targets for bridges. The E-W Gateway bridge targets are shown in Table B-5. The CMAP bridge targets are shown in Table B-6. The CMAP 4-year targets will be due in 2021 instead of 2022 because their targets were set in 2017.

Table B-5. E-W Gateway's 2- and 4-year bridge targets for federal reporting.

Performance Measure	Baseline Value (%)	2020 Target (%)	2022 Target (%)
Percent NHS Bridges in Good condition	39.62	40.00	40.00
Percent NHS Bridges in Poor condition	10.87	9.00	8.00

Table B-6. CMAP's 4-year bridge targets for federal reporting.

Performance Measure	Baseline Value (%)	2021 Target (%)
Percent NHS Bridges in Good condition	36.6	36.8
Percent NHS Bridges in Poor condition	8.6	8.3

Appendix C: Treatment Decision Criteria

Pavements

The current criteria used to select pavement treatments are shown in tables C-1 and C-2.

Table C-1. Interstate pavement treatment selection criteria.

Interstate TAMP Category Selection Criteria — Pavements

Category	Subcategory	Treatments	Service Life	CRS
Reconstruction[1]		Replacement of complete pavement structure, unbonded concrete overlay, HMA pavement over rubblized PCC	30–40	< 4.0
Rehabilitation	Major	Designed (structural) HMA overlay, structural PCC overlay (requires a design exception)[4]	10–15	4.0–4.5
	Minor	Standard HMA overlay, bonded PCC overlay	10–15	4.6–5.4
Preservation	High	SMART overlay, longitudinal joint partial-depth repair, ultra-thin bonded wearing course, load transfer restoration (transverse cracking)[4], cross-stitching (longitudinal cracking)[4]	7–12	5.5–6.5
	Low	Micro-surfacing	3–7	6.6–7.5
	Proactive maintenance	Crack and joint filling / sealing, fog seal[4], cold / micro-milling, diamond grinding / grooving	2–5	> 6.0
Maintenance	Reactive measures	See contract maintenance program guidelines[2]	Varies	< 5.5[3]

Notes:

1 Interstates with ADT < 15,000 may receive a major rehabilitation treatment in lieu of reconstruction.

2 Low preservation treatments may be used as a stop-gap measure. High preservation activities of full-depth repair and longitudinal joint partial-depth repair are allowed as reactive measures. HMA surface mill and replacement will be approved on a case-by-case basis.

3 For localized failures, any CRS value may be considered (patching, centerline failures, intermittent locations of surface repairs).

4 Treatment will require an experimental feature according to Construction Memo 02-2.

Table C-2. Non-Interstate pavement treatment selection criteria.

Non-Interstate TAMP Category Selection Criteria — Pavements

Category	Subcategory	Treatments	Service Life	CRS
Reconstruction[1]		Replacement of complete pavement structure, unbonded concrete overlay, HMA pavement over rubblized PCC	30–40	< 3.5
Rehabilitation	Major	Designed (structural) HMA overlay, structural PCC overlay (requires a design exception)[4]	10–15	3.5–4.3
	Minor	Standard HMA overlay, bonded PCC overlay, structural cold in-place recycling (requires a design exception)[4]	10–15	4.4–4.9
Preservation	High	SMART overlay, functional cold in-place recycling[4], hot in-place recycing[4], longitudinal joint partial-depth repair, ultra-thin bonded wearing course, load transfer restoration (transverse cracking)[4], cross-stitching (longitudinal cracking)[4]	7–12	5.0–6.5
	Low	Bituminous surface treatment (A–1, A–2, A–3), micro-surfacing, slurry seal, cape seal, half SMART	3–7	6.6–7.5
	Proactive maintenance	Crack and joint filling / sealing, fog seal[4], cold / micro-milling, diamond grinding / grooving	2–5	> 6.0
Contract maintenance	Reactive measures	See contract maintenance program guidelines[2]	Varies	< 5.0[3]

Notes:
1 Projects with ADT < 3,000 may receive a major rehabilitation treatment in lieu of reconstruction.
2 Low preservation treatments may be used as a stop-gap measure. High preservation activities of full-depth repairs and longitudinal joint partial-depth repair are allowed as reactive measures. HMA surface mill and replacement will be approved on a case-by-case basis.
3 For localized failures, any CRS value may be considered (patching, centerline failures, intermittent locations of surface repairs).
4 Treatment will require an experimental feature according to Construction Memo 02-2.

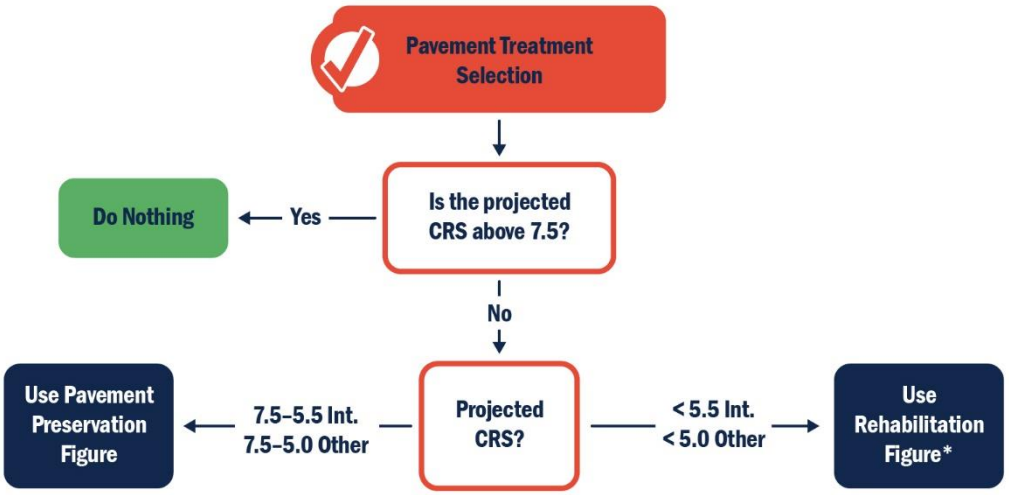


Figure C-1. Pavement category selection.

Table C-3. Asphalt-surfaced pavement preservation decision matrix — 500s pavement type.

Surface Type	CRS Range Int. | Non-Int.	Preservation Treatment[3]	Allowable Treatments for Interstates	Distresses Best Mitigated with Preservation Treatment													
				Alligator Cracking	Block Cracking		Rutting (Stable)		Transverse / Reflective Cracking		Longitudinal Crack		Oxidation / Weathering / Ravelling / Segregation		Longitudinal Joint Cracking[2]	
				Low (L1)	Low (M1, M2)	Medium (M3)	Low (≤0.13)	Medium (≤0.25)	Low (01–03)	Medium (04)	Low (Q1)	Medium (Q2, Q3)	Low (W1, W2)	Medium (W3)	Low (S1)	Medium (S2, S3)
Full-Depth HMA (500s)	>6.0 | >6.0	Crack filling / joint filling / joint sealing	×	×		×			×			×			×	
	7.5–6.6 | 7.5–6.6	Bituminious surface treatment (A-1, A-2, A-3)		×	×		×		×		×		×			
		Micro-surfacing[1]	×	×	×			×	×		×		×			
		Centerline / longitudinal joint micro-surfacing	×													×
		Cape seal		×	×		×		×		×			×		
		Half SMART		×	×		×		×		×			×		
	6.5–5.5 | 6.5–5.0	Longitudinal joint partial-depth repair	×													×
		Ultra-thin bonded wearing course	×	×		×		×	×		×			×		
		SMART overlay	×	×		×		×		×		×		×		
		Hot in-place recycling		×		×		×		×		×		×		
		Cold in-place recycling		×		×		×		×		×		×		

1 ADT ≤ 25,000 use 1-pass; ADT > 25,000 use 2-pass

2 If this is the only distress present, use indicated treatments. If other distresses are also present, use the treatment that addresses the distresses across the full lane.

3 Full-depth and partial-depth patching will only be allowed as a mitigating activity. A maximum of 0.50 percent will be allowed with any preservation treatment.

Table C-4. Asphalt-surfaced pavement preservation decision matrix – 600s pavement type.

Surface Type	CRS Range Int. | Non-Int.	Preservation Treatment[3]	Allowable Treatments for Interstates	Distresses Best Mitigated with Preservation Treatment											
				Alligator Cracking	Block Cracking		Rutting (Stable)		Transverse / Reflective Cracking		Longitudinal Crack		Oxidation / Weathering / Raveling / Segregation		Longitudinal Joint Cracking[2]	
				Low (L1)	Low (M1, M2)	Medium (M3)	Low (≤0.13)	Medium (≤0.25)	Low (01–03)	Medium (04)	Low (Q1)	Medium (Q2, Q3)	Low (W1, W2)	Medium (W3)	Low (S1)	Medium (S2, S3)
HMA Over Concrete (600s)	> 6.0 | > 6.0	Crack filling / joint filling / joint sealing	×	×		×			×			×			×	
	7.5–6.6 | 7.5–6.6	Bituminious surface treatment (A-1, A-2, A-3)		×	×		×		×		×		×			
		Micro-surfacing[1]	×	×	×		×		×		×		×			
		Centerline / longitudinal joint micro-surfacing	×													×
		Cape seal		×	×		×		×			×		×		
		Half SMART		×	×		×		×			×		×		
	6.5–5.5 | 6.5–5.0	Longitudinal joint partial-depth repair	×													×
		Ultra-thin bonded wearing course	×	×		×		×	×			×		×		
		SMART overlay	×	×		×		×	×			×		×		
		Hot in-place recycling		×		×		×	×			×		×		
		Cold in-place recycling		×		×		×		×		×		×		

1 ADT ≤ 25,000 use 1-pass; ADT > 25,000 use 2-pass

2 If this is the only distress present, use indicated treatments. If other distresses are also present, use the treatment that addresses the distresses across the full lane.

3 Full-depth and partial-depth patching will only be allowed as a mitigating activity. A maximum of 0.50 percent will be allowed with any preservation treatment.

Table C-5. Concrete-surfaced pavement preservation decision matrix — 700s Pavement Type.

Surface Type	CRS Range Int. | Non-Int.	Preservation Treatment[4]	Distresses Best Mitigated with Preservation Treatment									
			D-Cracking	Transverse Cracking		Trans. Joint Deterioration	Longitudinal Joint Deterioration	Longitudinal Cracking	Faulting	Map Cracking / Scaling	Popouts / High Steel	Permanent Patch Deterioration[2]
			Low (A1, A2)	Low (B2)	Medium (B3)	Medium (≤ C2)	Low (D1)	Medium (≤ E2)	Medium (≤ G3)	I1–I3	J1–J2	Low (K1)
PCC (700s)	> 6.0 | > 6.0	Crack and Joint Sealing	×		×	×	×	×				×
		Diamond Grinding[1]				×			×	×		
	6.5 – 5.5 | 6.5 – 5.0	Load Transfer Restoration				×			×			
		Cross-Stitching[3]						×				
		Ultra-Thin Bonded Wearing Course	×	×		×	×	×		×	×	×

Notes:

1 If intermittent bump grinding, no additional activity necessary. However, if large areas of > 100 ft in length, must also perform diamond grooving.
2 New patching cannot exceed 2 percent; and total (new and existing) patching cannot exceed 5 percent.
3 Requires an Experimental Feature.
4 Full-depth and partial-depth patching will only be allowed as a mitigating activity. A maximum of 0.50 percent will be allowed with any preservation treatment.

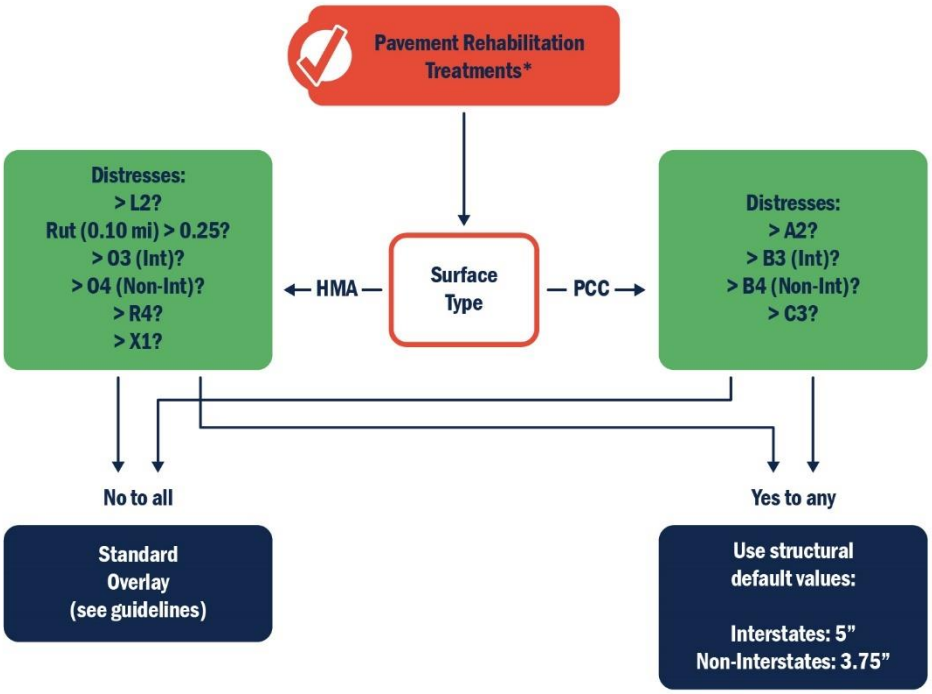


Figure C-2. Pavement rehabilitation project treatment selection FY 20–25 multi-year programming cycle.

Standard Overlay Policy

Background

When the predicted CRS and/or distresses on a project result in a rehabilitation strategy of Standard Overlay, the district may select either an HMA overlay or PCC overlay. The following policy shall be used to determine the overlay type, mixture types and overall thickness of the overlay.

HMA STANDARD OVERLAY OPTION

Milling

For HMA-surfaced pavements, the milling depth shall remove the entire existing surface lift, unless it is rated fair or better. When determining milling depth, avoid milling within 0.50 inch of a lift line whenever possible to eliminate scabbing.

If there are constraints such as curb and gutter or other profile limits, take pavement cores to better define milling depth and required HMA lift thickness.

Number of Lifts

Full-depth HMA pavements may use a single lift of 2.00 inches. All other pavement types will require the use of two lifts; however, a single 2.00-inch lift may be requested as a design exception.

Thickness

- The total thickness of the two-lift overlay shall be within the following ranges:
  - » Interstate highways: 3.00 to 4.25 inches
  - » Other State Maintained Highways: 2.00 to 2.75 inches
- The minimum thickness of each lift shall be according to the following table.

Table C-6. Minimum lift thicknesses for standard overlays.

Mixture Gradation	Type of Lift	Minimum Lift Thickness (in.)
IL–19.0	Binder only	2.25
IL–9.5	Surface or binder	1.50
IL–9.5FG	Surface or binder	1.25
IL–4.75	Binder only	0.75 – Over HMA surface 1.00 – Over PCC surface
SMA 12.5	Surface or binder	2.00
SMA 9.5	Surface or binder	1.50

PCC STANDARD OVERLAY OPTION — NON-INTERSTATE AND 15-YEAR TRAFFIC FACTOR ≤5.0

Milling

A PCC overlay will not be allowed on a bare PCC pavement. For HMA-surfaced pavements, a minimum of 2.50 inches of existing HMA shall remain in place. If the condition of the existing HMA warrants complete removal, a minimum of 2.50 inches of new HMA must be placed prior to placement of the PCC overlay.

Thickness

The PCC overlay thickness shall be according to the guidelines in Section 53–4.08 of the BDE Manual.

Designed Overlay Policy

Background

A process is being developed for investigations and overlay thickness design. When the predicted CRS and/or distresses on a project result in a rehabilitation strategy of Designed Overlay, the overlay shall use a default thickness as shown below, until the new design process is finalized.

HMA DESIGNED OVERLAY OPTION:

Milling

For HMA-surfaced pavements, the milling depth shall remove the entire existing surface lift, unless it is rated fair or better. When determining milling depth, avoid milling within 0.50 inch of a lift line whenever possible to eliminate scabbing.

If there are constraints such as curb and gutter or other profile limits, take pavement cores to better define the milling depth and required HMA lift thickness.

Number of lifts

All pavement types will require a minimum of two lifts.

Thickness

- Until a design process is finalized, the total thickness of the overlay shall meet the following default values:
  - » Interstate Highways: 5.00 inches
  - » Other State Maintained Highways: 3.75 inches
- The minimum thickness of each lift shall be according to the following table.

Table C-7. Minimum lift thicknesses for designed overlays.

Mixture Gradation	Type of Lift	Minimum Lift Thickness (in.)
IL-19.0	Binder only	2.25
IL-9.5	Surface or binder	1.50
IL-9.5FG	Surface or binder	1.25
IL-4.75	Binder only	0.75 – Over HMA surface 1.00 – Over PCC surface
SMA 12.5	Surface or binder	2.00
SMA 9.5	Surface or binder	1.50

PCC DESIGNED OVERLAY OPTION

All PCC Designed Overlays will require coordination with the Bureau of Research to determine the appropriate milling depth, interlayer selection, and thickness design. Also, this rehabilitation strategy will require an experimental feature according to Construction Memo 02-2.

Bridges

The treatment selection criteria for bridges are presented in table C-8.

Table C-8. Bridge treatment selection criteria.

Work Activities	Improvement Types	Culvert Condition	Deck Condition		Superstructure Condition		Substructure Condition	Age	Cost ($/sq.ft.)	Other Criteria	Recurrence (Years)
Construction	New Structure										
Reconstruction	Complete Replacement		≤ 4	or	≤ 4	&	≤ 4	Any	$225.00		100
			≤ 4		≤ 4		≥5	≥ 60			
		≤ 4						Any			
Rehabilitation	Deck Replacement		≤ 4	or	≤ 4	&	≥ 5	< 60	$150.00		50
	Superstructure Replacement										
	Major Substructure Rehabilitation		≥ 5		≥ 5		≤ 4		$75.00		50
	Bridge Widening (with/without adding beams) - includes super and/or sub widening										
Preservation	Washing		≥ 5		≥ 3		≥ 3		$2.00		1
	Deck Sealing		≥ 5		Any		Any				4
	Concrete Super/ Substructure Sealing		Any		≥ 5		≥ 5		$2.00		4
	Paint (cost not to be added to rehab. cost when coinciding with rehab.)		Any		≥ 5*		≥ 5		$30.00	Main or approach span material type = steel.	25
	Expansion Joint Replacement		≥ 5		≥ 5†		≥ 5†				10–15
	Bearing Replacement / Repair		≥ 5		≥ 5†		≥ 5†				25
	Overlay (includes deck patching if needed)		≥ 5		≥ 5†		≥ 5†				25
	Scour Mitigation		Any		Any		≥ 5			Provided the action is being taken to prevent scour from affecting an essentially good streambed and substructure units.	
	Drainage		≥ 5		Any		Any				
Maintenance	Bearing Replacement / Repair		Any		Any		Any		$30.00	Steel and concrete repair are considered maintenance when they are stand-alone activities. However, these can be included as minor work within a preservation project‡	
	Steel Repair										
	Concrete Repair										
	Deck Patching		Any		Any		Any			Considered maintenance if stand-alone activity with no overlay included. However, this can be included as minor work with a preservation project‡	
	Bridge Beam Replacement		Any		Any		Any				
	Expansion Joint Replacement		Any		Any		Any				
	Overlay (includes deck patching if necessary)		≤ 4	or	≤ 4	or	≤ 4				
	Scour Mitigation		Any		Any		≤ 4			If severe scour has already occurred, resulting in a low scour critical, and possibly low substructure condition, rating.	

* Painting can be allowed when a superstructure condition rating is 4 or below due to localized deterioration, but not when there is widespread deterioration. If painting is to be done when a superstructure condition rating is 4 or below, there must also be imminent plans to make repairs that will raise the superstructure condition rating to 5 or higher. Any project with a superstructure condition rating of 4 or below shall be reviewed by the Bureau of Bridges & Structures.

† Expansion joint replacement and/or bearing replacement/repair and/or overlays can be allowed when a superstructure and/or substructure condition rating is 4 or below due to localized deterioration, but not when there is widespread deterioration. If expansion joint replacement and/or bearing replacement/repair and/or overlay placement is to be done when a superstructure and/or substructure condition rating is 4 or below, there must also be repairs included in the project that will raise the condition ratings to 5 or higher. Any project with a superstructure and/or substructure condition rating of 4 or below shall be reviewed by the Bureau of Bridges & Structures.

‡ Preservation projects can include some repair work (that will raise NBI rating(s) from '4' to '5') on the same structure(s) as long as the preservation work is ≥ 60% of the cost. If repair work estimated at $250K or more is being done to a major bridge (≥ 1000' long), then this repair work is federally eligible.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