Indiana
Department of Transportation

TRANSPORTATION ASSET MANAGEMENT PLAN

JUNE 2019

CONTENTS

Indiana Department of Transportation

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June 2019

Images from the top:

- Damage to Rockville Road Bridge over I-465 in Indianapolis
- Paving train working along Indiana 65 in Clark County
- Construction of added travel lanes during I-65 Major Moves 2020 project in Tippecanoe County
- (Cover) Lewis & Clark Bridge over the Ohio River, on Indiana 265 near Utica

I-69 Section 5 project from Bloomington to Martinsville

Approval

The Indiana Department of Transportation (INDOT) has developed a strategic, systematic, and disciplined business process for operating, maintaining, and improving physical assets. This process focuses on engineering and economic analysis based on quality information. It identifies a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement of infrastructure. The goal is to achieve and sustain a desired state of good repair over the life cycle of the assets at a practical cost.

This Transportation Asset Management Plan (TAMP) outlines INDOT's asset management policies and practices.

Approval:

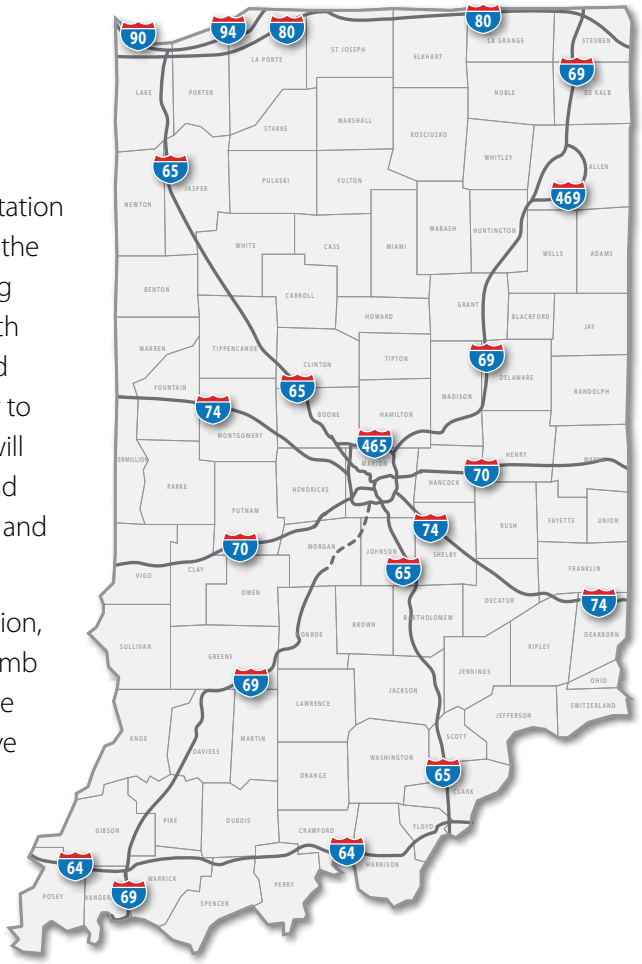
I do fully approve INDOT's Transportation Asset Management Plan

Joe McGuinness, Commissioner

June 25, 2019
Amended August 27, 2019

SR 62, Seymour District

Overview of the TAMP



The Indiana Department of Transportation (INDOT) is responsible for managing the state's transportation assets, including bridges and roads. INDOT has set both short-term and long-term bridge and pavement condition targets. In order to meet the long-term targets, INDOT will need to continue to plan, budget, and adjust projects on the state's bridges and roads to reach these standards

The state's Next Level Indiana legislation, championed by Governor Eric Holcomb and passed in April 2017, provides the funding needed for INDOT to improve the conditions of its bridges and roads over the next 20 years. The 20-year Next Level Indiana plan will support steady and consistent improvement in bridge and pavement quality, improve safety along the transportation system, and increase mobility as INDOT invests in projects to ease congestion, eliminate delays, and foster economic growth. **The 20-year plan will fully fund the asset management plan for bridges and roads maintained by INDOT.**

This Transportation Asset Management Plan (TAMP) is a management tool that brings together all related business processes, as well as internal and external stakeholders, to achieve a common understanding and commitment to improve the state's bridges and roads over the next 10 years.

What is a Transportation Asset Management Plan?

The Indiana Department of Transportation (INDOT) is responsible for managing the state's transportation assets, including bridges and roads. INDOT has developed both short- and long-term targets to improve bridge and pavement conditions. The state's Next Level Indiana legislation, championed by Governor Eric Holcomb and passed in April 2017, provides the funding needed for INDOT to improve the long-term conditions of its bridges and roads over the next 20 years.

This Transportation Asset Management Plan (TAMP) is a management tool that brings together all related business processes, as well as internal and external stakeholders, to achieve a common understanding and commitment to improve the state's bridges and roads over the next 10 years. The TAMP describes INDOT's current asset management practices and identifies planned enhancements. The TAMP also describes existing conditions of the transportation network and provides a 10-year plan for managing the state highway system, including goals, performance targets, funding levels, and investment strategies.

INDOT's asset management program provides a framework for making decisions that will optimize, sustain, and modernize infrastructure performance. INDOT collects and synthesizes information about its facilities to help it make rational and well-informed investment decisions. In addition, INDOT has recently linked its asset management system with its capital programming process, resulting in a new Asset Management/Capital Program Management process that includes: needs identification, ranking, selection, and project portfolio development.

INDOT has established the following core principles for transportation asset management:

- **Asset management is policy-driven.** INDOT decides how to allocate resources based on a well-defined set of goals and objectives.
- **Asset management is performance based.** INDOT translates its policy objectives into performance measures that support day-to-day and strategic management.
- **Asset management involves analysis of options and trade-offs.** INDOT analyzes the impact that different funding allocations would have on system performance to support decisions regarding how to allocate funds within and across different types of investments.
- **Asset management relies on quality information.** INDOT has processes in place to collect and manage accurate and complete asset data.
- **Asset management provides clear accountability and feedback.** INDOT monitors and reports performance results to identify their impact and the effectiveness of the National Highway System (NHS) in providing safe and efficient movement of people and goods.

Why develop a TAMP?

Transportation asset management is a strategic, systematic, and disciplined business process for operating, maintaining, and improving physical assets. Management decisions incorporate engineering and economic analyses that draw from the best available data. These analyses ultimately produce a structured plan for prioritizing infrastructure maintenance, preservation, repair, rehabilitation, and replacement actions that meet short- and long-term goals at a practical life-cycle cost.

The U.S. Congress passed the Moving Ahead for Progress in the 21st Century (MAP-21) transportation bill in July 2012. MAP-21 requires every state department of transportation (DOT) to develop a risk-based TAMP. The Federal Highway Administration (FHWA) issued a final TAMP rule in the Federal Register on October 2016 to establish guidelines for state DOTs to develop TAMPs. INDOT's TAMP meets the requirements outlined in MAP-21 and the Federal Register.

This TAMP describes management and decision-making processes for INDOT's bridge and pavement assets. Bridge and pavement preservation activities aim to prevent, delay, or mitigate deterioration. In addition, this document discusses the activities performed by private concessionaires to maintain the Indiana Toll Road (ITR) and the Ohio River Bridges (ORB).

INDOT's TAMP helps to answer questions such as:

- What is the current state of INDOT's physical assets?
- What are the required levels of service and performance delivery?
- What are the best investment strategies for operations, maintenance, replacements, and improvement?
- What is the best long-term funding strategy?
- What are our risks, and how do we manage them?
- How are we doing?

The TAMP documents INDOT's objectives of:

- Achieving and sustaining a desired state of good repair
- Improving or preserving asset condition and the performance of the NHS relating to physical assets
- Achieving INDOT's targets for asset condition and performance of the NHS in accordance with 23 United States Code (U.S.C.) 150(d)
- Achieving the national goals identified in 23 U.S.C. 150(b)[1]

In conjunction with developing the TAMP, INDOT must establish 2-year and 4-year targets for the following performance measures:

- Percent of deck area of NHS bridges classified in good condition
- Percent of deck area of NHS bridges classified in poor condition

The minimum threshold for Interstate pavement condition is the level set by USDOT. No more than 5.0 percent of Interstate lane-miles of pavements in Poor condition or missing, invalid, or unresolved data.

INDOT must also establish 2-year targets for non-Interstate NHS pavements and 4-year targets for all NHS pavements for the following performance measures:

- Percent of Interstate pavements in good condition
- Percent of Interstate pavements in poor condition
- Percent of non-Interstate NHS pavements in good condition
- Percent of non-Interstate NHS pavements in poor condition

For NHS bridges, the minimum threshold for condition is to have no more than 10 percent of total NHS bridge deck area on structurally deficient bridges.

[1] These goals include improving safety conditions on all public roads, maintaining infrastructure in a state of good repair, reducing congestion on the NHS, improving efficiency of the transportation system, improving accessibility of trade markets and supporting regional economic development, protecting and enhancing the environment, and reducing delays associated with project completion.

What is in this TAMP?

INDOT's TAMP represents a way of doing business. When used effectively, the TAMP will assist INDOT in preventing major problems, prolonging the life of Indiana's most critical assets, planning for future replacements, and minimizing the long-term costs of ownership.

This TAMP addresses all INDOT bridges and pavements, the ITR, border bridges,[2] and the bridges and pavements maintained by local agencies on the NHS.

The TAMP is organized as follows:

- Section 2 describes how INDOT manages its bridges.
- Section 3 explains how the ORB are managed.
- Section 4 explains how INDOT manages its pavements.
- Section 5 discusses how the ITR is managed.
- Section 6 provides a financial plan for funding INDOT's bridges and pavement over the next 10 to 20 years.[3]
- Section 7 addresses the risks associated with asset management.
- Section 8 describes how INDOT will identify opportunities to improve its asset management practices

[2] Border bridges are bridges that enter into a bordering state. INDOT shares a portion of the cost for maintenance and preservation of the border bridges.

[3] The TAMP includes funding levels for the next 10 years based on the 20-year funding outlined in Indiana's Next Level Roads initiative from House Enabled Act 1002.

Deck pouring

Who is involved in developing and updating the TAMP?

INDOT has two groups involved in developing and updating the TAMP: (1) the Program Management Group (PMG); and (2) the Asset Management Teams.

The PMG is supported by the Executive Funds Team and the Commissioner of INDOT. The PMG consists of senior managers and technical leaders who oversee the Asset Management Teams. The PMG meets regularly to review proposed changes and quarterly to discuss issues in asset management. The PMG provides overall guidance on development of all program prioritized project lists, and evaluates the performance of assets in relation to available funding. The PMG aims to:

- Promote asset management
- Influence change within INDOT's culture
- Establish performance standards and metrics
- Approve business rules
- Review the ***INDOT Construction Plan*** and report on:
  - Key performance indicators (KPIs)
  - Trade-off/cross asset analysis
  - State of asset management
  - Contingency offset plans
  - Change management and re-prioritization
- Research and benchmark best practices
- Oversee the development of the TAMP
- Conduct gap analysis at the agency-level
- Report to the Front Office on special topics
- Answer questions on funding and effects on KPIs
- Balance capital and preservation funding levels
- Recommend changes to the program, as required

In coordination with the PMG, Asset Management Teams consider issues related to traffic mobility, roadway/pavement, bridge, and traffic safety. Each team consists of a committee chair, vice-chair, and systems assessment or district representatives from each district. The teams meet every month to:

- Evaluate the merit of proposed projects
- Perform quality assurance on proposed projects
- Ensure that all proposed projects report accurate data
- Develop scoring systems to prioritize projects
- Establish statewide project rankings

Specific activities of each team are as follows:

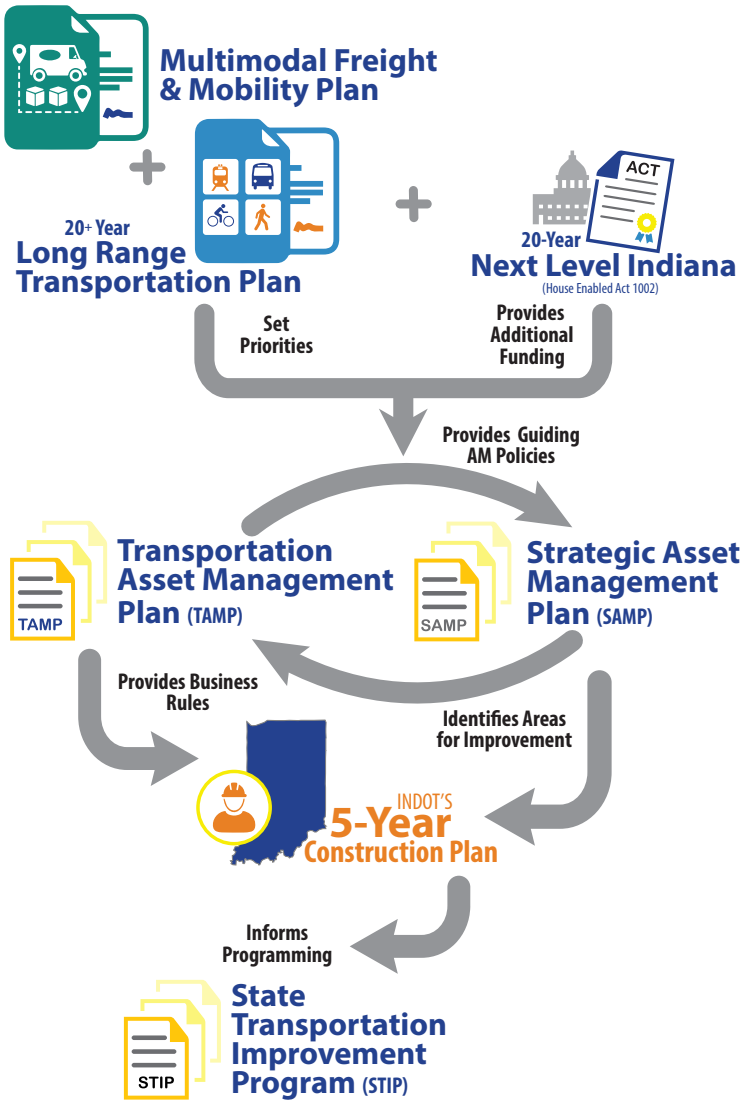
- **Traffic Mobility Team:** analyzes traffic data to identify congested corridors and intersections and recommend added capacity projects to improve mobility.
- **Roadway/Pavement Team:** assesses, scores, and prioritizes the merit of pavement-related candidate projects functioning to preserve or modernize road geometrics and pavement.
- **Bridge Team:** makes judgment on bridge priorities to maintain and enhance/modernize existing bridges and small structures.
- **Traffic Safety Team:** assesses, prioritizes, and makes recommendations for funding of infrastructure and non-infrastructure projects to improve safety performance on INDOT roads.

How does the TAMP relate to INDOT's other planning documents and initiatives?

INDOT uses several planning documents and initiatives to help make decisions about transportation funding and asset management. This TAMP aligns with the Next Level Indiana legislation and governs the decisions that result in development of the ***INDOT 5-Year Construction Plan,*** and the ***State Transportation Improvement Program.***

These planning documents and initiatives are linked as follows:

- Indiana General Assembly passed House Enabled Act 1002, also known as Next Level Indiana. The legislation funds preservation and construction projects for Indiana's transportation system over the next 20 years.
- The legislation provides the basis for the financial plan outlined in the TAMP (see Section 5).
- The 20+ Year Long Range Transportation Plan and Multimodal Freight and Mobility Plan set out INDOT's long-term objectives. INDOT's long-term objectives provide guidance for the overall development of the TAMP.
- The TAMP describes the responsibilities of the Asset Management Teams that develop the bridge and pavement business rules.
- The TAMP also provides the guiding asset management principles that feed into the Strategic Asset Management Plan (SAMP).
- The SAMP provides a means to identify areas for improvement within the TAMP.
- The business rules define the decision-making process used to develop the ***INDOT 5-Year Construction Plan.***
- The ***INDOT 5-Year Construction Plan*** provides the foundation for projects included in the ***State Transportation Improvement Program.***



How do the TAMP and SAMP relate to each other?

In coordination with the TAMP, INDOT is developing a SAMP. While the SAMP is guided by the policies established in the TAMP, the SAMP will govern a larger grouping of assets beyond the scope of the National Highway System. Additionally, the SAMP provides strategic guidance for implementing the policies of the TAMP. The SAMP and TAMP are aligned with a common set of imperatives and principles which guide asset management at INDOT.

OUR FOUR IMPERATIVES

Safety First

We will always ensure safe and sustainable asset utilization, protecting our customers and staff.

21st Century Workforce

We will develop our workforce and align our employees around INDOT's Mission.

Great Service

We will deliver great service, balancing the needs of our customers with available funding.

Our Investment Strategy

We will align our asset-related decision making to ensure effective delivery of our 20 Year Road and Bridge Plan.

INDOT'S ASSET MANAGEMENT PRINCIPLES

Forward-Looking and Sustainable

We will incorporate social, legislative, environmental and financial considerations into decisions, taking into account present and future service commitments and giving due attention to the long-term stewardship of assets.

Continually Improving

We will make continual improvement a key part of our asset management approach, with a focus on driving innovation through the development of tools, techniques and solutions.

Making Robust, Repeatable & Transparent Decisions

We will utilize a formal, but scalable, consistent, and repeatable approach to manage infrastructure assets - enabling services to be provided in the most efficient and cost effective manner. We will collect, collate, control and circulate the right asset information, at the right time, informing the right asset management decisions.

Life-Cycle Cost Perspective

We will take an integrated "big picture" approach to asset management that considers the combined impact of all aspects of the asset life-cycle within the control of INDOT - acquiring, operating, maintaining, renewing and retiring assets. New assets will not be constructed/acquired without considering future operating and maintenance costs.

Risk-Based and Optimal

We will direct resources & expenditures to achieve agreed service outcomes & benefits, balancing the needs of stakeholders and customers with available funding - at an acceptable level of risk. We will manage our assets in terms of their role and value within their full system context, promoting reliability of the transportation system, as opposed to managing individual assets and business processes in isolation.

People-Focused (Customers & Staff)

We will adopt a customer-focused approach to managing our assets, only accommodating additional demand for services when considering the impacts to our current Levels of Service. We will recruit, train and retain the right staff and work with our university and trade school partners to ensure we develop the best workforce.

How does INDOT incorporate the Metropolitan Planning Organizations in the TAMP process?

Good transportation asset management is a continuously improving process and starts with proper coordination.

INDOT has developed the TAMP in cooperation with our 14 Metropolitan Planning Organization (MPO) partners. Each month the representatives from the 14 MPOs, which make up the MPO Council, meet in Indianapolis to discuss transportation and planning issues affecting their areas. INDOT collaborates with the MPOs through a series of monthly working group meetings that take place either after each MPO Council meeting or via web conference. The meetings were set up to discuss INDOT's system assessment tools and capabilities, refinements to our NHS to reduce non-state owned roadway assets, data, work flow processes, goals, and target setting for bridge and pavement assets.

Federal regulations allow MPOs to establish their own condition targets for pavements and bridges. MPOs are given six months for the establishment of state condition targets to complete the necessary analysis and provide documentation to INDOT. INDOT has discussed this opportunity with our MPO partners.

The key to good transportation asset management is strengthening regional and state coordination; increasing transparency of information sharing; and addressing the need for better data, software tools, and reporting. INDOT will continue to coordinate with our MPO partners through routine semi-annual meetings during the spring and fall seasons. These meetings will be used to cover bridge and pavement system assessment impact analysis, gather feedback into funding tradeoff decisions, discuss performance gaps, successes, agree upon any adjustments to performance targets, discuss and document refinements to business rules/processes, weigh in on major changes to Transportation Improvement Programs (TIPs)/STIP; and to allow for MPO feedback for continuous improvement.

INDOT is also implementing new STIP and TIP tracking software to automate data exchanges between INDOT and MPOs; to ensure decisions and program changes are properly coordinated; and to ensure reporting consistency for INDOT and all 14-MPOs.

What is the timeframe for TAMP development?

INDOT prepared an initial TAMP which included the performance measures for bridge and pavement conditions established under 23 Code of Federal Regulations (CFR) Part 490. FHWA reviewed the initial TAMP in a two-step process that included a process certification decision and a review of how the initial TAMP aligns with regulatory requirements. Through the process certification decision, FHWA determined the development methodologies described in the initial TAMP met applicable requirements. Following the review, FHWA provided feedback to INDOT to incorporate when developing the final TAMP (this document).

INDOT will continually update its TAMP development processes and prepare a new TAMP every four years.

Construction of added travel lanes during I-65 Major Moves 2020 project in Tippecanoe County

How many bridges does INDOT own and maintain and how many NHS bridges are in Indiana?

INDOT owns and maintains 5,738 bridges in the state of Indiana (see **Table 1**). There are an additional 264 bridges in Indiana on the NHS, including ITR bridges, the Ohio River Bridges, and bridges owned by local entities (see **Table 2**). Every month, the owners of Indiana's other 264 bridges update inventory and condition data in the Bridge Inspection Application System (BIAS) for the bridges that were inspected during that month.[4] Further details regarding the inspection schedule are outlined in the next section.

BIAS creates and maintains a current and complete inventory of all NHS bridges regardless of ownership, in addition to non-NHS bridges owned by INDOT. During the project selection process, all inventory and condition data contained in BIAS is field verified for accuracy to ensure the **best available data** are used. Field verification provides INDOT with the opportunity to ensure consistency in data collection and to identify issues with the data collection process. If INDOT identifies issues, staff is retrained as necessary. The inventory data in **Tables 1**, **2**, and **3** on the next page have been updated since the Initial TAMP due to revisions to the BIAS database that improve clarity. All data are up to date as of May 2019. INDOT has also entered into an agreement with United Bridge Partners to construct the Cline Avenue Bridge. This bridge is estimated to complete construction in 2020, so it is not included in the current inventory.

2014 Milton-Madison Steel Truss Bridge project—carrying U.S. 421 into place over the Ohio River

[4] BIAS is the software system that stores inventory, condition, and inspection schedule information on bridges.

Table 1: Bridge Inventory, Owned by INDOT

Highway System	Number of Bridges	Deck Area (Square Feet)
Interstate	1,442	17,809,309
Non Interstate NHS[5]	1,343	12,176,156
Non NHS	2,932	19,198,669
Border Bridges[6] - NHS	14	2,196,836
Border Bridges[6] - Non-NHS	7	675,486
Total	**5,738**	**51,380,969**

Table 2: Bridge Inventory, NHS Bridges Owned by Others

Agency	Number of Bridges	Deck Area (Square Feet)
Indiana Toll Road	242	3,165,675
Ohio River Bridges	12	716,372
Allen County	2	12,317
Hendricks County	5	61,476
Lake County	1	24,962
Marion County	1	14,596
Private	1	17,441
Total	**264**	**4,012,839**

Table 3: NHS Bridge Inventory and Condition Summary*

Agency	Number Bridges	Deck Area (SFT)	% Good	% Fair	% Poor
INDOT - Interstate	1,442	17,809,309	56%	43%	2%
INDOT - Non Interstate NHS[5]	1,343	12,176,156	46%	53%	1%
INDOT - Border Bridges[6] - NHS	14	2,196,836	17%	66%	17%
Indiana Toll Road - NHS	242	3,165,675	34%	64%	2%
Ohio River Bridges - NHS	12	716,372	99%	1%	0%
Allen County - NHS	2	12,317	14%	86%	0%
Hendricks County - NHS	5	61,476	82%	18%	0%
Lake County - NHS	1	24,962	0%	100%	0%
Marion County - NHS	1	14,596	0%	100%	0%
Private - NHS	1	17,441	0%	100%	0%

*Condition measured using the FHWA condition metrics.

[5] This includes 4 bridges that cross the Indiana Toll Road. These bridges are owned by ITR but maintained by INDOT.
[6] INDOT is lead state on 7 border bridges, of which 3 are NHS and 4 are non-NHS.

How does INDOT assess the condition of its bridges?

INDOT uses the bridge rating scale from the FHWA Recording and Coding Guide for the structure and Appraisal of the Nation's Bridges (Coding Guide) to determine the condition of the bridge.[7] The inspection team rates the deck, superstructure, and substructure of the bridge (see **Figure 1**) from 0 (failed) to 9 (excellent), as shown in **Table 4**. Bridges are inspected by inspection crews every 24 months (or 48 months if approved by FHWA). If a bridge is determined to be in critical condition, inspections may take place annually or more frequently depending upon the condition. Bridges owned by other entities are inspected on the same schedule. INDOT owns the inspection contract for those bridges.

Table 4: Condition Ratings (Deck, Superstructure, and Substructure)

9	Excellent
8	Very Good
7	Good
6	Satisfactory
5	Fair
4	Poor
3	Serious
2	Critical
1	Imminent Failure
0	Failed

These ratings are consistent with the national performance management measures from 23 CFR Part 490 Subpart D regarding bridge condition. According to the national performance management measures, a structurally deficient bridge or culvert is one with any component condition rating less than or equal to 4. State DOTs are accountable for ensuring that no more than 10 percent of the deck area of their NHS bridges, including on- and off-ramps connected to the NHS, is classified as structurally deficient in a given year.

[7] INDOT, Proposed Key Performance Indicator, September 2016.

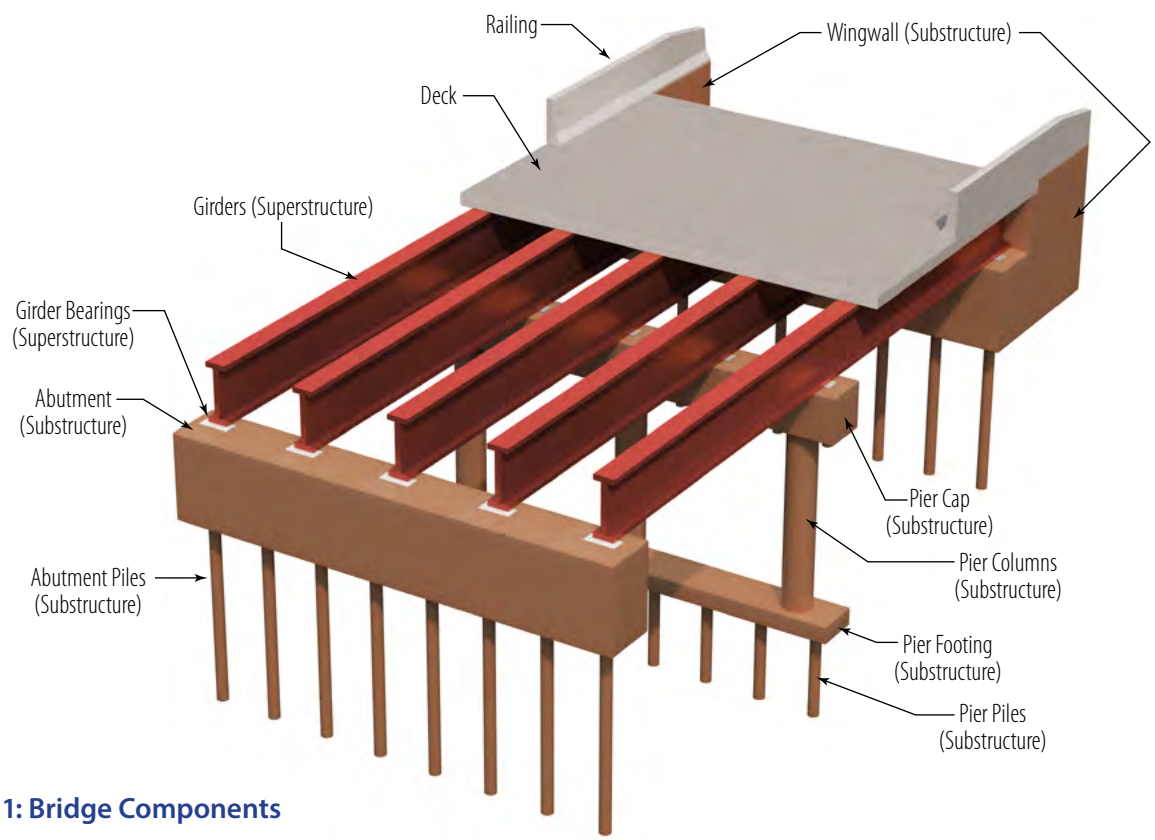
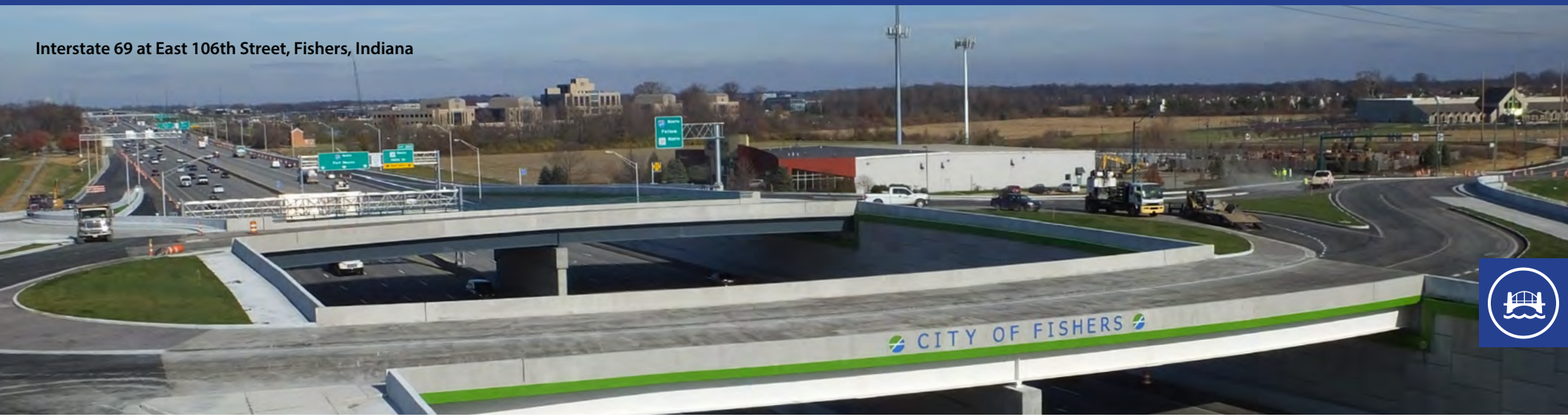


Figure 1: Bridge Components



Interstate 69 at East 106th Street, Fishers, Indiana

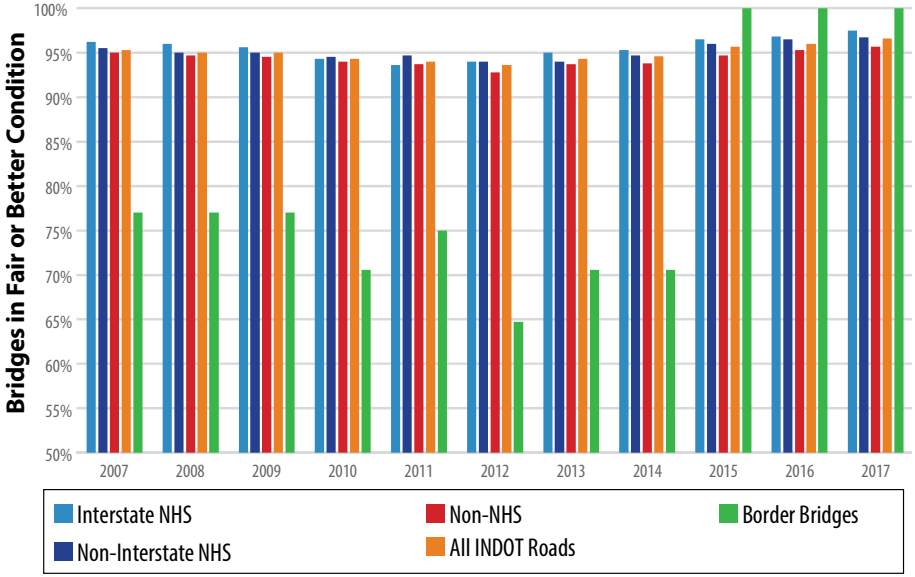
What are the current conditions of INDOT's bridges?

INDOT assesses the condition of bridges in the following categories: Interstate NHS, non-Interstate NHS, non-NHS, all INDOT roads,[8] and border bridges. **Figure 2** shows the condition of INDOT's bridges. Overall, 97 percent of INDOT's bridges were in fair or better condition in 2017.

Over the past 10 years, INDOT's bridges have remained in a consistently well-maintained condition. The largest improvement in condition lies with the border bridges, which have seen significant improvement in condition since 2014, from 71 percent in fair or better condition to a full 100 percent in fair or better condition.

[8] All INDOT roads includes interstate on the NHS, non-Interstate NHS, and non-NHS.

Figure 2: Condition of INDOT's Bridges*



* The condition ratings for 2007 to 2017 were developed using INDOT's system which is based on the condition of four bridge components (wearing surface, deck, superstructure, substructure). Starting in 2018, INDOT will also use the FHWA bridge condition ratings system based on three components (deck, superstructure, substructure) by deck area percentage. Using the FHWA system, 97.3 percent of INDOT's bridges are in fair or better condition in 2018.

How do current bridge conditions compare to INDOT's targets?

Lewis & Clark Bridge over the Ohio River, on Indiana 265 near Utica

INDOT evaluates the current condition of its assets against the condition targets it sets to determine if performance gaps exist. INDOT maintains two steps for adopting condition measures[9] and targets:

1. Planning processes that include a formal public comment period; and
2. An internal review and approval by the PMG. When adopting or modifying condition measures and targets, INDOT carefully considers existing commitments, relative priorities, and trade-offs among all resources.

During the planning process, INDOT determined that different condition targets for urban and rural bridges are not appropriate.

After completing the process, INDOT set a condition target of 96.1 percent of its bridges in fair or better condition by 2028. This target is based on the NHS established in 2018 and may change as INDOT updates the NHS routes. INDOT's bridges are currently meeting the condition target. Additionally, with the preservation funding outlined in Section 5 of the TAMP, INDOT anticipates that it will continue to meet the condition target for bridges. INDOT's bridges are considered to be in a state of good repair when the condition target is met.

INDOT has also established condition targets based on FHWA's condition rating system which were submitted to FHWA in October 2018. These targets are as follows:

- 2-Year NHS Bridge Target: 48.3 percent good, 2.6 percent poor
- 4-Year NHS Bridge Target: 48.3 percent good, 2.6 percent poor

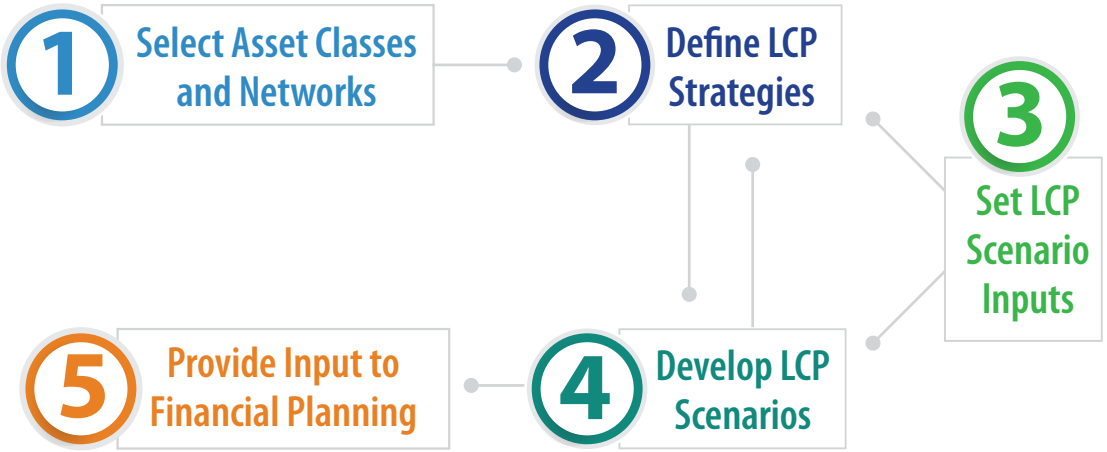
[9] Condition measures are the metric used to establish targets and to assess progress toward achieving the established targets.

What is the Process for Conducting Network-Level Life Cycle Planning?

FHWA has outlined a five-step process for conducting network-level life cycle planning for transportation assets. The five step process is described in FHWA's Using an LCP (Life Cycle Planning) Process to Support Transportation Asset Management: A Handbook on Putting the Federal Guidance into Practice. **Figure 3** outlines the five steps. Throughout the TAMP, each step of the LCP process is identified with the number corresponding to the step in the process.

Throughout the remainder of the Managing Bridges section and the later Managing Pavement section, the 1-5 numbers from **Figure 3** will be found to indicate where in the TAMP each step of the LCP process is explained. The numbers will be in the same format as they appear in **Figure 3**.

Figure 3: Five-Step Process for LCP from FHWA



How does INDOT consider bridge life-cycle costs?

The Bridge Management Section within the Asset Management Division at INDOT is responsible for developing and implementing a management system for all INDOT-owned bridges. INDOT uses the Deighton Total Infrastructure Management System (dTIMS) software to perform life cycle cost analyses of its bridge network.[10] In accordance with 23 CFR 515.17,[11] the dTIMS software collects, processes, and stores condition and inventory data from BIAS as well as future committed projects in Scheduling Project Management System (SPMS) to forecast expected deterioration for each asset. dTIMS models only INDOT's highway bridges. It excludes bridges such ① as pedestrian bridges, parks, and railroads.

The dTIMS model incorporates deterioration forecasts and generates future treatment strategies[12] that optimize conditions for any budget scenario This allows INDOT to allocate sufficient funding to ensure it meets its bridge condition targets, as well as balances budgetary needs between bridge and pavement assets.

Since INDOT considers its bridges to be in a state of good repair when the condition targets are met, the treatments identified by dTIMS reflect deficiencies that hinder progress toward achieving a desired state of good repair. INDOT has different treatment strategies defined by decision trees that are triggered by different types and levels of deterioration. An overview of the trigger rules and treatment strategies is found in Appendix B. ② These strategies are determined based on the condition information that INDOT inputs into the dTIMS software to allow the analysis to take place. ③

With this information stored in the system, dTIMS evaluates treatment strategies by year over a 20 year analysis period to determine which treatment strategy should be applied to a given asset and in what year the treatment strategy should be applied. The software determines an initial treatment strategy and then resets the affected analysis variables for the asset to determine if a subsequent treatment strategy is recommended in the future. The initial treatment strategy determines the needs for the short-term and the subsequent treatment strategy determines the long-term needs.

Figure 4: 25-Year Life Cycle Plan

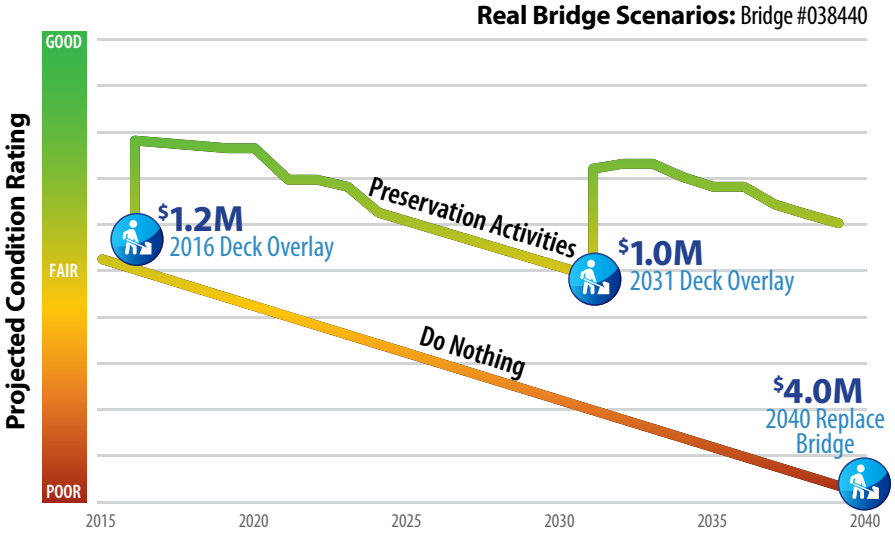


Figure 4 provides an example of the type of analysis dTIMS conducts for individual bridges. ④ This example shows a scenario for a single bridge that involves deck preservation activities in 2016 and 2031 at a total cost of $2.2 million. The condition of the bridge would improve as a result of the preservation activities. The alternative scenario is the cost of replacing the entire bridge in 2040 if no preservation activities are performed. This cost is $4 million, considerably more than the preservation scenario.

Table 5: Unit Cost by dTIMS Treatment Type ③

Bridge Treatment	Unit Cost (per square foot)		
	Up to 7,500 sq ft	Up to 32,000 sq ft	Up to 60,000 sq ft
Bridge Painting (Interstate)	$ 14	$ 26	$ 30
Bridge Painting (Non-Interstate)	$ 19	$ 11	$ 9
Thin Deck Overlay	$ 12	$ 7	$ 6
Deck Overlay	$ 66	$ 42	$ 34
Deck Replacement	$ 108	$ 74	$ 63
Superstructure Replacement	$ 167	$ 117	$ 100
Bridge Replacement	$ 236	$ 143	$ 115

⑤ **Figure 14** within the Financial Plan section of the TAMP provides another example of the LCP process. **Figure 14** provides the results of the network-level analysis of four scenarios: Bridge Preservation, Current Plan-Status Quo, Unlimited, and a Do Nothing Baseline scenario.

Once all assets in the system have been analyzed, the software calculates the costs and benefits of the strategies. The costs for treatments are based on historical costs of similar treatments from the previous 4 years. Unit costs, as provided in **Table 5**, are verified and updated annually based on historical expenditures. The benefits of the treatments are determined by the Bridge Quality Index (BQI). The BQI is a composite score between 0 and100 primarily based on the condition of the four main bridge components: wearing surface, deck, superstructure, and substructure.

The purpose of the life-cycle cost analysis process is to minimize life cycle costs while achieving condition targets. In order to do this, the dTIMS software recommends strategies for the entire network of bridges with the highest benefits constrained within a budget scenario defined by INDOT. The result is an optimized list of recommended projects, along with a recommended schedule for performing the treatments. Based on an analysis of funding needs performed prior to the TAMP development, INDOT has determined that it is fully funded for preservation activities. This determination is dependent upon actual revenue meeting forecasted levels as discussed in the Risk Management section.

Bridge engineers with local knowledge of the assets approve, reject, and, if needed, add to the projects recommended by the dTIMS analysis. The software is limited to providing recommendations based on the condition data, so the engineers provide additional knowledge of the performance of the assets not addressed by the conditions.

The engineers spend the majority of their time in the field collecting information on the assets, so they are aware of any safety, congestion, reliability, or other issues with the assets that are not reflected in the condition data analyzed by the dTIMS software.

dTIMS is also restricted to include all projects that are already programmed. Therefore, when running a new analysis with dTIMS, the software will take into consideration the projects that have been committed which increases the reliability of the recommended projects list.

The recommended projects are then scored as described in the bridge business rules presented in the next section. Once scored, the projects are analyzed again to determine the effect of the projects on the overall network bridge conditions.

[10] dTIMS software is commercially available software that performs life cycle cost analysis for asset management. The software has multiple modules. INDOT uses the bridge module to serve as the bridge management system (BMS).

[11] Minimum standards for developing and operating bridge and pavement management systems.

[12] Potential treatment strategies include deck overlay, deck replacement, and superstructure replacement, among others.

How does INDOT develop its overall bridge investment strategy?

③ INDOT's Bridge Asset Management Office, which is in the Asset Management Division, develops and analyzes bridge data to identify cost-effective projects for improving Indiana's bridges. Inside this office, the Bridge Asset Management Team (BAMT) has developed bridge business rules that describe the methods to use when assigning scores to potential projects.[13] The scoring system ranks the projects recommended during the life cycle planning analysis process to determine the best allocation of resources according to the scoring factors outlined in **Table 6**, **Table 7,** and **Table 8.**

Other projects fall into the category known as exceptions to the rules, which includes projects complying with the guidelines set out in the Bridge and Culvert Preventative Maintenance Agreement (**BCPMA**).[14] These projects are automatically given a 100-point score. Other exceptions to the rules include border bridges, fracture critical, special and underwater inspections, larger culvert replacements, and grade separation bridge projects.

[13] INDOT, Project Scoring Guidelines and Business Rules for Bridge and Large Culvert Asset Program, July 2017.

[14] Projects that involve preservation and maintenance activities.

Table 6: Bridge Rehabilitation and Major Reconstruction Scoring Factors and Weights

Scoring Factor Number	Bridge Scoring Factor Description	Score	Weights (100-Point Scale)	Maximum Weighted Score
#1	Condition	0–10	5	50
#2	Cost-Effectiveness	0–10	3	30
#3	Functional Classification Priority	0–10	1	10
#4	AADT* Impacts	0–10	1	10
			Subtotal	**100**
Supplementary Factor	Earmarks, Other Contributions	0–5	7	35
			Grand Total	**135**

* AADT = annual average daily traffic

Table 7: Large Culvert Scoring Factors and Weights

Scoring Factor Number	Bridge Scoring Factor Description	Score	Weights (100-Point Scale)	Maximum Weighted Score
#1	Overall Culvert Condition	0–10	5	50
#2	Cost-Effectiveness	0–10	3	30
#3	Functional Classification Priority	0–10	1	10
#4	AADT* Impacts	0–10	1	10
			Subtotal	**100**
Supplementary Factor	Earmarks, Other Contributions	0–5	7	35
			Grand Total	**135**

* AADT = annual average daily traffic

Table 8: Maintenance and Preservation Project Scoring System

Scoring Factor Number	Bridge Scoring Factor Description	Score	Weights (100-Point Scale)	Maximum Weighted Score
N/A	Project Meeting (BCPMA*) Condition	0–5	20	100
			Total	**100**

*BCPMA = Bridge and Culvert Preservation Maintenance Agreement

How are projects prioritized?

INDOT's goal is to implement a strategic, long-term program of identifying, programming, budgeting, and completing bridge and culvert preservation projects to improve the statewide condition of these assets at the lowest possible cost to taxpayers.

Based on the type of work and the required time to develop a proposed project, INDOT has three different programs for bridges and large culverts:[15]

1. **Long-Term Call Program:** The projects proposed for this program normally involve bridge replacement and major bridge component rehabilitation and reconstruction. The development time for this program is 5 to 7 years.
2. **Short-Term Placeholder Program:** The projects proposed for this program are projects that typically do not require right-of-way or railroad permits, or utility relocation, but may require some environmental permits. They typically involve work types such as deck overlays, deck replacements, bridge painting, and culvert lining. The development time for this program is typically 2 to 3 years.
3. **Bridge and Culvert Preventive Maintenance Agreement (BCPMA) Program:** The projects involved in this program involve primarily preservation and preventive maintenance activities such as deck patching, joint replacement, thin deck overlay, scour protection, railing repair, and culvert repair. The development time for this program is typically 18 to 24 months.

[15] Culverts are tunnel-like structures that allow running water to pass under a roadway or railway.

Interstate 70 bridge reconstruction project over State Road 121 in Wayne County

What are the steps to determining project priorities? ⑤

The Long-Term Call and Short-Term Placeholder Programs involve the following steps, culminating in funding for the overall program:

1. The INDOT Central Office BAMT analyzes the entire INDOT network of bridges with its BMS software for a set funding level, initially established by the PMG. The software produces a summary of recommended projects based on benefit-cost ratios.
2. The list of projects is provided to the six INDOT District Bridge Asset Engineers (BAE) for review.
3. The BAEs review the recommended lists with District personnel to develop a final list of proposed structures and treatments based on the recommendations of the software, local knowledge of bridge performance, and engineering judgment.
4. The BAEs use the bridge and culvert scoring systems shown previously in **Table 6**, **Table 7**, and **Table 8** to rank each of the proposed projects on their list and provide this prioritized list to the Central Office BAMT along with estimated costs and project scopes.
5. The Central Office BAMT compiles the individual District lists and determines whether information is missing, projects are duplicated, or clarification is needed.
6. The Central Office BAMT, including the BAE, gathers to discuss the proposed projects and to confirm or modify the provided scores.[16]
7. After deliberations, the Central Office BAMT provides the final prioritized list of proposed projects with "Team Adjusted Scores" to the PMG and Executive Funds Team (EFT) for their review.
8. After final project approval, the Districts are notified to input their approved and funded projects in the SPMS, where they become active projects.

The BCPMA Program follows a different process. These projects have a set yearly sum of funds available that is equally distributed to each District. Because these projects are preservation-focused, to be eligible for funding, all projects are given high priority and a 100-point score. The project must meet only candidate criteria from the 2016 INDOT BCPMA document and eligibility criteria outlined in the **INDOT design manual**, Chapter 412.

Each District submits its list to the Central Office BAMT, which verifies the eligibility of the individual projects and then submits the list to the PMG for final approval. Once approved, the Districts are notified to input their approved and funded projects into SPMS.

[16] If the BAE determines that the project scoring system does not account for a specific or unique situation that would lead to a higher project score, the BAE can formally discuss the case to request a vote by the BAMT for approval of a higher score.

What are the Ohio River Bridges?

The Louisville-Southern Indiana Ohio River Bridges Project (Project) consisted of two separate design and construction contracts under one National Environmental Policy Act (NEPA) document. The Downtown Crossing (DTC) contract was procured and executed by Kentucky Transportation Cabinet (KYTC), including all Project work in Indiana along I-65. The East End Crossing (EEC) contract was a P3 contract procured and executed by the Indiana Finance Authority (IFA) with the support of INDOT, and included all Project work in Kentucky along KY 841. The Project constructed two new Ohio River bridges: the Abraham Lincoln for I-65 NB at the DTC and the Lewis and Clark Bridge for KY 841 at the EEC. The DTC contract also rehabilitated the John F Kennedy Bridge, which now carries I-65 SB across the Ohio River. The purpose of the Project was to increase cross-river mobility by improving safety, alleviating traffic congestion and connecting highways between Kentucky and Indiana. The Lewis and Clark Bridge is located along IN 265 and KY 841 over the Ohio River.

In addition to the Lewis and Clark Bridge, the EEC included 16 additional new bridge structures, 13 of which fall under the Operations and Maintenance Phase of the P3 contract for a term of 35 years after Substantial Completion on December 18, 2016. The full list of all EEC bridges is found in **Table 9**.

KYTC took the lead to finance, design, and construct the Downtown Crossing, while INDOT oversaw finance, design, and construction of the East End Crossing. Because the Abraham Lincoln Bridge is the responsibility of the State of Kentucky, the information in this section of the TAMP is in reference to the Lewis and Clark Bridge at the East End Crossing and the 13 additional bridges constructed as part of the EEC. The East End Crossing is maintained and operated by WVB East End Partners (WVB).

Table 9: Ohio River Bridges

NBI	Name	Location
080663	Lewis and Clark	SR-265 over Ohio River
079900		Port Rd over SR 265 NB & SB (LSIORB Section 6)
079902		Port Rd over ramp from SR62 to SB SR265 (Ramp IR-9) (LSIORB Section 6)
080659		SR 265 SB over Lentzier Creek & Brookhollow Way (LSIORB Section 6)
080660		SR 265 NB over Lentzier Creek & Brookhollow Way
070610		SR 265 WB ramp (Ramp IR-1) from SR 62 over C&O RR (LSIORB Section 6)
070590		SR 265 SB over C&O RR (LSIORB Section 6)
070600		SR 265 NB over C&O RR (LSIORB Section 6)
070650		SR 265 NB over SR 62 (LSIORB Section 6)
070640		SR 265 SB over SR 62 (LSIORB Section 6)
080655		SR 265 SB over Utica-Charlestown Rd & UNT to Lentzier Creek (LSIORB Section 6)
080656		SR 265 NB over Utica-Charlestown Rd & UNT to Lentzier Creek (LSIORB Section 6)
080657		SR 265 NB over UNT to Lentzier Creek (LSIORB Section 6)
080658		SR 265 SB over UNT to Lentzier Creek (LSIORB Section 6)

What is WVB East End Partners and its responsibilities?

WVB consists of three entities: the investment division of the Walsh family, (Walsh Investors LLC) the private sector company with a public-private partnership focus (VINCI Concessions), and an infrastructure investment company (BBGI). WVB holds a 35-year operations and maintenance contract with the Indiana Finance Authority. The contract between WVB and the Indiana Finance Authority, Public-Private Agreement The East End Crossing (Louisville-Southern Indiana Ohio River Bridges Project) between Indiana Finance Authority and WVB East End Partners, outlines WVB's responsibilities for the East End Crossing.

Specifically, the Public-Private Agreement (PPA) details the roadway and bridges asset handback criteria. For instance, pavement and curbs and gutters must have 10 years of useful life remaining at handback. All handback criteria are outlined in Table 23-1 within Addendum 6 of the PPA.

Handback provisions for various elements are found in Section 23 of the **Technical Provisions** document. The performance measures for the ITR are found in Table 22-1 of the **Technical Provision Attachments.** For example, if a 300 foot section of roadway exceeds an IRI of 160, the roadway will be remedied within 8 months. A pothole that is greater than 0.5 feet deep will be mitigated within 24 hours, temporarily repaired within 28 days, and permanently repaired within 8 months

How does WVB East End Partners perform asset management?

WVB is fully responsible for all operating and maintenance (O&M) work for the East End Crossing according to the Public-Private Agreement. The East End Crossing (Louisville-Southern Indiana Ohio River Bridges Project) between Indiana Finance Authority and WVB East End Partners, LLC. WVB carries out all O&M work in accordance with Good Industry Practice, the requirements, terms, and conditions set forth in the Public-Private Agreement, all laws, the requirements, terms, and conditions set forth in all governmental approvals, the approved Project Management Plan, the approved Operations and Maintenance Plan, the approved Maintenance Plan, Best Management Practices, Safety Compliances, the Safety Plan and Safety Standards, and all other applicable safety, environmental and other requirements.

WVB must follow specific Technical Provisions for conducting general inspections, specialist inspections, and performance inspections of the East End Crossing. The results of the inspections guide development and updates to the Rehabilitation Work Schedule, maintaining asset condition and service levels, and to develop maintenance and rehabilitation work programs.

For all operations and maintenance work, WVB either performs the work itself or enters into an O&M contract with another firm to perform the work. Specific requirements for the contractor in terms of expertise, qualifications, experience, competence, skills, and know-how are outlined in the Public-Private Agreement.


Ohio River Bridges, East End Crossing

How is performance evaluated on the ORB?

Table 22-1 within Book 2, the Technical Provisions of the PPA, outlines the performance and measurements for the ORB. For instance, flexible pavement must have a smooth surface course with adequate skid resistance and be free from defects. The inspection and measurement method to identify cracks on flexible pavement is through an automated condition distress survey; whereas, potholes are identified by visual inspection.

What are the current conditions of the ORB?

Bridge and pavement condition for the ORB are reported based on INDOT's condition rating system as well as FHWA's condition rating system. Based on INDOT's condition rating system, 90 percent of the bridges are in good or fair condition and 90.5 percent of the pavement is in good or fair condition. When calculating the condition rating based on the FHWA system, 100 percent of the bridges and pavement are in good or fair condition.

Table 10: ORB Bridge Condition Data

INDOT Condition Rating ORB I-265		
Condition	**# Bridges**	**Percent**
Good	11	91.7%
Fair	1	8.3%
Poor	0	0.0%
Grand Total	**12**	

FHWA Condition Rating ORB I-265		
Condition	**Deck Area**	**Percent**
Good	706,288	98.6%
Fair	10,084	1.4%
Poor	0	0.0%
Grand Total	**716,372**	

Table 11: ORB Pavement Condition Data

INDOT Condition Rating ORB I-265		
Condition	**Miles**	**Percent**
Good	2	100.00%
Fair	0	0.00%
Poor	0	0.00%
Grand Total	**2**	

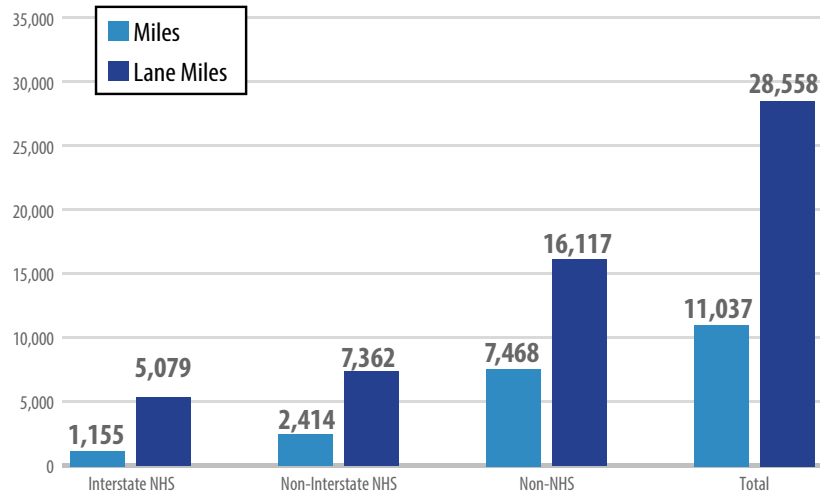
FHWA Condition Rating ORB I-265		
Condition	**Miles**	**Percent**
Good	2	100.00%
Fair	0	0.00%
Poor	0	0.00%
Grand Total	**2**	

How much pavement does INDOT own and maintain and how much NHS pavement is in Indiana?

INDOT owns 11,037 miles, representing 28,558 lane-miles, of pavement in Indiana, as shown in **Figure 5.** The pavement on roadways owned by INDOT consists of both concrete and asphalt, as shown in **Figure 6.** There are 194 additional miles, representing 779 lane-miles, of NHS pavement owned by local government entities, as shown in **Figure 7.** The pavement inventory numbers have changed from the Initial TAMP to this Final TAMP because I-69 S 5 was converted to an interstate in 2018.

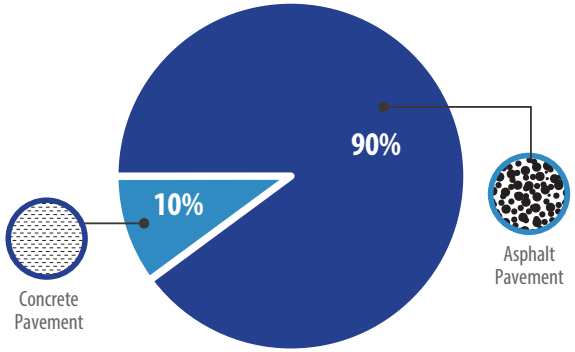
INDOT hires the Pathway Services team to conduct inspections of all NHS roads, regardless of ownership. On an annual basis, the Pathway Services team provides the condition and inventory data to INDOT. INDOT is then able to update the condition and inventory data stored in the ESRI Roads and Highways program.

Figure 5: Inventory of Pavement Owned by INDOT



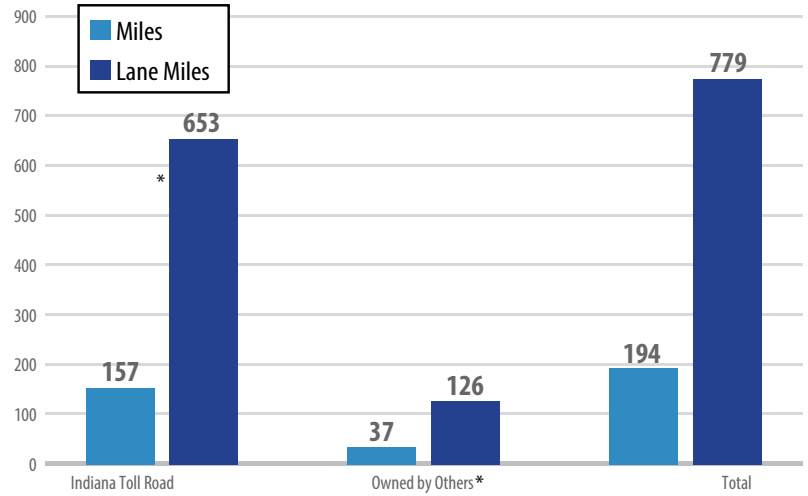
The Roads and Highways program maintains a current and complete inventory of all NHS pavement, regardless of ownership, outlined in **Table 12**.

Figure 6: Pavement Type of Indiana Roads



A quality assurance process is conducted prior to inputting the data into the Roads and Highways software. The quality assurance process ensures there are no duplicate records, ensures the sum of the segment lengths match the certified mileage for each system, re-establishes State Log and County Log measures, and identifies gaps in segmentation.

Figure 7: Inventory of NHS Pavement Not Owned by INDOT*



*Other includes Allen County, City of Fort Wayne, Hendricks County, Town of Avon, Town of Brownsburg, Town of Plainfield, Jennings County, City of North Vernon, Johnson County, City of East Chicago, City of Gary, City of Indianapolis, City of Evansville, and City of Terre Haute.

By conducting the quality assurance process, INDOT ensures it is using the **best available data**. INDOT also performs field verification of the data collection process. Field verification provides INDOT with the opportunity to ensure consistency in data collection and to identify issues with the data collection process. If INDOT identifies issues, staff is retrained as necessary.

Table 12: NHS Pavement Inventory and Condition Summary*

Jurisdiction	Center Miles	Lane Miles	% Good	% Fair	% Poor
INDOT - Interstate NHS	1,155	5,079	48%	51%	1%
INDOT - Non Interstate NHS	2,414	7,362	40%	58%	2%
Indiana Toll Road - NHS	157	653	N/A	N/A	N/A
Ohio River Bridges - NHS	2	8	100%	0%	0%
Allen County - NHS	4	15	N/A	N/A	N/A
City of Fort Wayne - NHS	2	6	N/A	N/A	N/A
Hendricks County - NHS	3	8	N/A	N/A	N/A
Town of Avon - NHS	4	16	N/A	N/A	N/A
Town of Brownsburg - NHS	3	14	N/A	N/A	N/A
Town of Plainfield - NHS	4	16	N/A	N/A	N/A
Jennings County - NHS	2	5	N/A	N/A	N/A
City of North Vernon - NHS	3	6	N/A	N/A	N/A
Johnson County - NHS	1	1	N/A	N/A	N/A
City of East Chicago - NHS	1	6	N/A	N/A	N/A
City of Gary - NHS	1	2	N/A	N/A	N/A
City of Indianapolis - NHS	2	10	N/A	N/A	N/A
City of Evansville - NHS	1	3	N/A	N/A	N/A
City of Terre Haute - NHS	5	19	N/A	N/A	N/A

*INDOT is working to collect pavement condition data on non-INDOT owned NHS pavement, but this data is not available prior to submission of the final TAMP.

**Condition measured using the FHWA condition metrics.

INDOT employees filling roadway cracks (at top as part of INDOT's highway maintenance program. U.S. 50 near North Vernon, Indiana (above).

How does INDOT assess the condition of its pavements?

INDOT assesses the condition of its pavement for three pavement networks: interstate NHS, non-interstate NHS, and non-NHS. INDOT collects roadway condition on all state-maintained highways on an annual basis. Data are collected on the following performance measures to determine the condition of INDOT's pavement:

- **International Roughness Index (IRI):** the roughness of the pavement.
- **Rutting (RUT):** a depression or groove in the roadway.
- **Faulting:** displacement of pavement at joints or cracks along the roadway.
- **Cracking:** roadway distress that can lead to development of potholes.

For each performance measure, condition data are collected for six zones of evaluation including the right (RWP) and left wheel path (LWP) zones, two non-wheel path zones (NWP), outside pavement edge zone, and the outside shoulder zone of the roadway. These six zones cover the entire roadway to provide INDOT with a complete account of the condition of the roadway.

The performance measures are categorized as good, fair, and poor as outlined in **Table 13**. For Asphalt and Jointed Concrete Pavement (JCP), IRI, cracking, and RUT/faulting must all be rated as "good" to be considered "good" overall. For Continuously Reinforced Concrete Pavement (CRCP), both IRI and cracking must be rated as "good" to be considered "good" overall. Poor asphalt and JCP have at least 2 metrics rated as "poor," and CRCP has both metrics rated as "poor." All other combinations result in a "fair" condition assessment for asphalt, JCP and CRCP.

Table 13: Pavement Condition Thresholds

Performance Measure	Good	Fair	Poor
IRI (inches/mile)	<95	95–170	>170
RUT (inches)	<0.20	0.20–0.40	>0.40
Faulting (inches)	<0.10	0.10–0.15	>0.15
Cracking (percent)	<5	5–20 (asphalt) 5–15 (JCP) 5–10 (CRCP)	>20 (asphalt) >15 (JCP) >10 (CRCP)

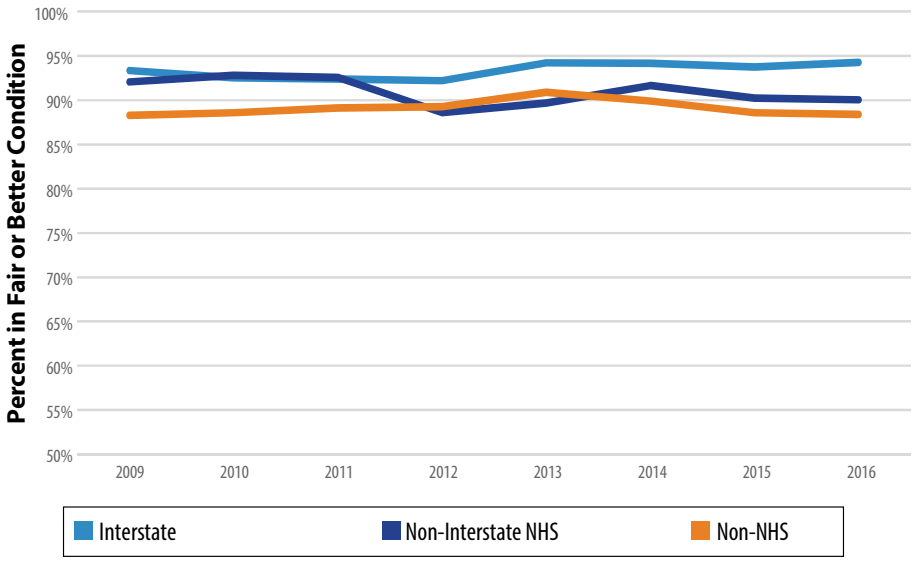
What are the current conditions of INDOT's pavements?

The condition of INDOT's interstate pavement has improved slightly between 2009 and 2016 to 94 percent in fair or better condition, as shown in **Figure 8**. Meanwhile, the condition of the non-interstate NHS declined between 2009 and 2012, from 92 percent to 89 percent in fair or better condition, and has remained fairly steady since 2012 at 90 percent in fair or better condition. Non-NHS pavement owned by INDOT has remained at 88 percent in fair or better condition from 2009 to 2016, with a slight improvement in 2013 to 91 percent.

INDOT also breaks down the IRI measurement by the average IRI and the IRI of the RWP. IRI measures the roughness of roadway pavement in order to track how poor pavement affects roadway users. **Figure 9** shows the percent of miles of all INDOT roads that are in fair or better condition based on the average IRI and the IRI RWP from 2009 to 2016.

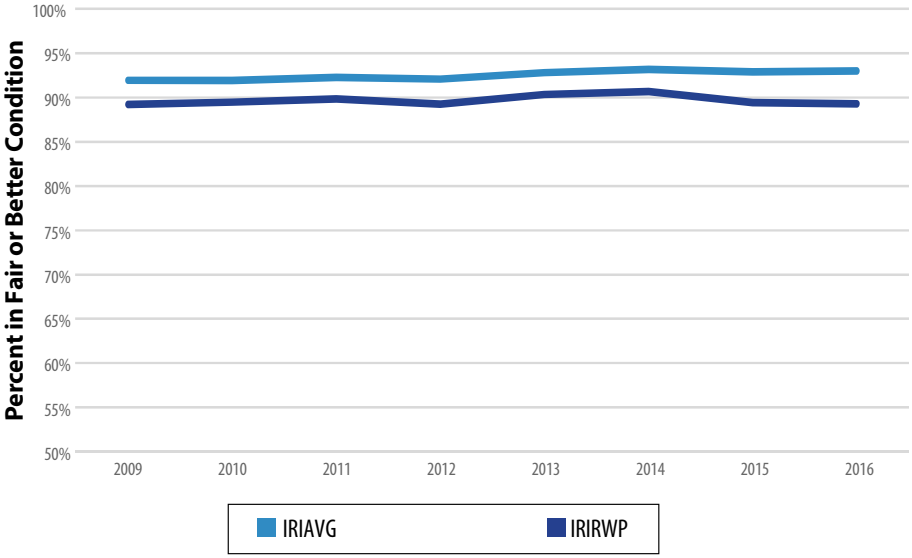
In terms of average IRI, the conditions have improved slightly since 2009, while the conditions of IRI RWP have remained fairly constant over time.

Figure 8: Pavement Condition History*



*These condition ratings are based on the INDOT rating system, which uses the IRI left wheel path. FHWA has a condition rating system, which results in 0.8 percent of INDOT's interstate and 3.1 percent of INDOT's non-interstate pavement in poor condition.

Figure 9: Condition of Pavement, IRIAVG and IRIRWP



Paving Train

How do current pavement conditions compare to INDOT's targets?

INDOT has set a condition target for all pavement to determine how well pavement is being maintained. INDOT follows two steps for adopting condition measures and targets: (1) planning processes that include a formal public comment period; and (2) an internal review and approval by a designated asset management group. When adopting or modifying condition measures and targets, INDOT carefully considers existing commitments, relative priorities, and trade-offs among assets. During the planning process, INDOT determined that having different condition targets for urban and rural pavement is not appropriate.

Following this process, INDOT set a pavement condition target of 96.1 percent of its interstate NHS pavement and 93.1 percent of its non-Interstate NHS pavement in fair or better condition by 2028. This target is based on the NHS established in 2018 and may change as INDOT updates the NHS routes. INDOT's pavement is not currently meeting the condition target. However, based on the funding levels to support asset management practices, described in Section 5 of the TAMP, INDOT anticipates meeting its condition targets. INDOT's pavement is considered to be in a state of good repair when the condition target is met.

In addition to the condition targets established for the TAMP based on INDOT's condition rating system, INDOT has also established condition targets based on FHWA's condition rating system. The condition targets were submitted to FHWA in October 2018, as follows:

- 4-Year Interstate Target: 84.2 percent good, 0.8 percent poor
- 2-Year Non-Interstate Target: 78.7 percent good, 3.1 percent poor
- 4-Year Non-Interstate Target: 78.7 percent good, 3.1 percent poor

INDOT may revise these targets based on further review of the pavement condition ratings using the FHWA condition rating system.

How does INDOT account for pavement life cycle costs?

INDOT's Pavement Management Section within the Asset Management Division is responsible for developing and implementing a pavement management system for INDOT's roads. INDOT uses the dTIMS software to perform life cycle cost analyses of its roadway network.[17] In accordance with 23 CFR 515.17,[18] the dTIMS software collects, processes, and stores condition and inventory data from Roads and Highways and committed projects from SPMS to forecast expected deterioration of each asset given its current condition. All of INDOT's mainline highways are included when conducting life cycle cost analysis. (1)

The dTIMS model incorporates deterioration forecasts and generates future treatment strategies that optimize conditions for any budget scenario. This allows INDOT to allocate sufficient funding to ensure it meets its road condition targets, as well as balance budgetary needs between bridge and pavement assets.

Since INDOT considers its pavement to be in a state of good repair when the condition targets are met, the treatments identified by dTIMS reflect deficiencies that hinder progress toward achieving a desired state of good repair.

The dTIMS software is imbedded with trigger rules that determine which treatment strategies apply to different types and levels of deterioration. The trigger rules, treatment strategies, and reset conditions are outlined in Appendix B. (2) In order for the analysis to take place to determine the appropriate treatment strategies, INDOT inputs condition information of the roadway into the dTIMS software. (3)

With this information stored in the system, dTIMS evaluates treatment strategies[19] in each year of analysis to determine which treatment strategy should be applied to a given roadway and in what year the treatment strategy should be applied. The software determines an initial treatment strategy and then resets the affected analysis variables for the roadway to determine if a subsequent treatment strategy is recommended in the future. The initial treatment strategy determines the needs for the short-term and the subsequent treatment strategy determines the long-term needs.

Figure 10 provides an example of the type of analysis dTIMS conducts for an individual pavement section. (4) In this analysis, the dTIMS software determined a preventive maintenance (PM) overlay project would be needed in 2018 for $1.5 million cost. Then, to improve the condition level back to the target, a structural overlay would be needed in 2028 for $10.3 million. This cost is much lower than the $120 million cost to replace the entire section of pavement in 2034.

Figure 10: Pavement Life Cycle Plan

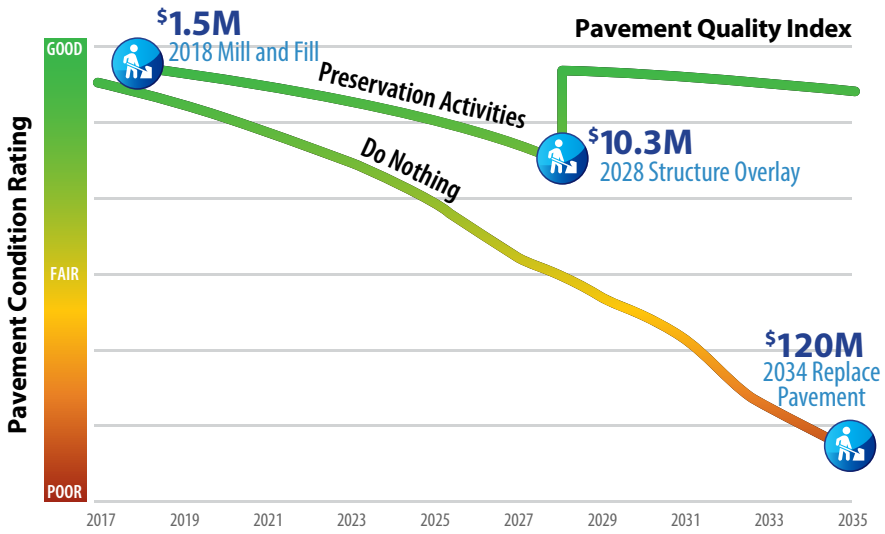


Table 14: Unit Costs by dTIMS Treatment Type ③

Pavement Treatment	Unit Cost (per lane mile)		
	Up to 5 lane miles	Up to 20 lane miles	Up to 40 lane miles
Thin Overlay – Rural	$ 69,582	$ 51,721	$ 44,610
Thin Overlay – Urban	$ 93,357	$ 57,833	$ 45,545
PM Mill and Fill (Non-Interstate, Rural)	$ 106,741	$ 95,692	$ 90,785
PM Mill and Fill (Non-Interstate, Low Traffic)	$ 140,046	$ 86,602	$ 68,205

⑤ **Figure 15** within the Financial Plan section of the TAMP provides another example of the LCP process. **Figure 15** provides the results of the network-level analysis of four scenarios: Pavement Preservation, Current Plan-Status Quo, Unlimited, and a Do Nothing Baseline scenario.

Once all roadways in the system have been analyzed, the software utilizes an optimization approach to calculate the costs and benefits of the strategies. The costs for treatments are based on historical costs of similar treatments from 2013 to 2017. Unit costs, as provided in **Table 14**, are verified and updated annually based on historical expenditures. The treatment benefits are based on the Pavement Quality Index (PQI) which is calculated based on the four condition factors of International Roughness Index (IRI), rutting (RUT), Functional Index (FI), and Structural Index (SI). The PQI score is between 0 and 100.

The purpose of the life cycle cost analysis process is to minimize life cycle costs while achieving condition targets. In order to do this, the dTIMS software recommends the treatment strategies of the entire roadway network that provide the highest benefit based on a budget scenario defined by INDOT. The result is an optimized list of recommended projects, along with the recommended schedule for performing the treatments, which are constrained to the input budget scenario. Based on an analysis of funding needs performed prior to the TAMP development, INDOT has determined that it is fully funded for preservation activities. This determination is dependent upon actual revenue meeting forecasted levels as discussed in the Risk Management section.

Roadway engineers with local knowledge of the assets then approve or reject the recommended projects output by the dTIMS analysis. The software is limited to provide recommendations based on the condition data, so the engineers provide additional knowledge of the performance of the assets not addressed by the conditions. The engineers spend the majority of their time in the field collecting information on the assets, so they are aware of any safety, congestion, reliability, or other issues with the assets that are not reflected in the condition data analyzed by the dTIMS software.

dTIMS is also restricted to include all projects that are already programmed. Therefore, when running a new analysis with dTIMS, the software will take into consideration the projects that have been committed which increases the reliability of the recommended projects list. INDOT's Roadway Asset Management Team (RAMT) is also continuously reviewing the system to implement updates as needed.

The recommended projects are then scored as described in the next section. Once scored, the projects are analyzed again to determine the effect of the projects on the condition of the roadway.

[17] dTIMS software includes multiple modules. INDOT uses the pavement module as its pavement management system (PMS) to calculate pavement life cycle costs

[18] Minimum standards for developing and operating bridge and pavement management systems.

[19] Potential treatment strategies include mill and fill, grinding up and installing new asphalt, or a structural overlay.

How does INDOT develop its overall pavement investment strategies? ③

INDOT's strategy for investing in maintenance and capital preservation on its roadways is to achieve an acceptable level of performance for the lowest cost while accounting for the pavement's functionality. The RAMT has developed pavement business rules that describe the methods for scoring the proposed projects recommended by the management system.[20] The scoring system ranks the projects recommended during the life cycle planning analysis process to determine the best allocation of resources.

The project scoring system uses project-level data on condition and traffic. The data are assessed based on the pavement material and treatment category.

The two pavement materials considered are hot mix asphalt (HMA) and portland cement concrete pavement (PCCP). For HMA, the work treatment options include preventative maintenance overlay, minor structural, and structural. PCCP work treatment options include pavement preservation, pavement restoration, and pavement replacement.

Projects are scored based on a condition factor that takes into account cracking, roughness, rutting, roadway category, and cost effectiveness.

After the preliminary scoring, a statewide supplementary review is conducted and a candidate list is produced to evaluate and prioritize projects based on other available data concerning fiscal earmarks, other financial contributions by external means, and unique, project-specific factors in order to account for the value of the non-traditional or external revenue contributed to the project's total cost.

Based on the score of each project, the Roadway Asset Team creates a list of projects to recommend for programming.

I-69 South

[20] INDOT, Roadway Asset Team Operation Policy, October 2017

INDOT employees applying anti-icing material in preparation for winter season

How does INDOT determine project priorities? ⑤

The Long-Term Call and Short-Term Placeholder Programs involve the following steps, culminating in funding for the overall program:

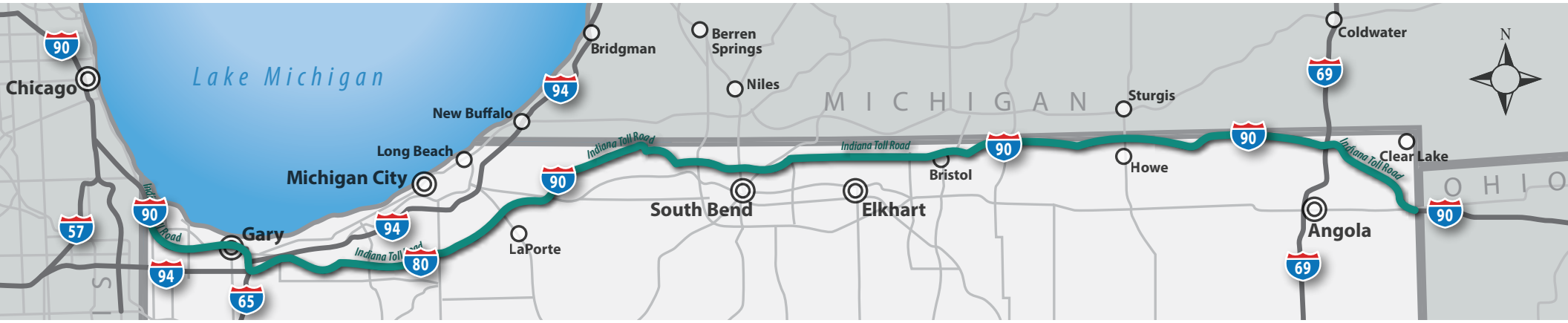
1. The INDOT Central Office RAMT analyzes the entire INDOT network of pavement with its PMS model for a set funding level, initially established by the PMG. The model produces a summary of recommended projects based on benefit-cost ratios.
2. The list of projects is provided to the six INDOT District Pavement Asset Engineers (PAE) for review.
3. The PAEs review the recommended lists with District personnel to develop a final list of proposed roads and treatments based on the recommendations of the model, pavement testing data (cores, geotech, FWD), local knowledge of pavement performance, and engineering judgment.
4. The PAEs use the roadway scoring system discussed previously to rank each of the proposed projects on their list and provide this prioritized list to the Central Office RAMT along with estimated costs and project scopes.
5. The Central Office RAMT compiles the individual District lists and determines whether information is missing, projects are duplicated, or clarification is needed.
6. The Central Office RAMT, including the PAE, gathers to discuss the proposed projects and to confirm or modify the provided scores.
7. After deliberations, the Central Office RAMT provides the final prioritized list of proposed projects with "Team Adjusted Scores" to the PMG and Executive Funds Team (EFT) for their review.
8. After final project approval, the Districts are notified to input their approved and funded projects in the SPMS, where they become active projects.

What is the Indiana Toll Road?

In keeping with Indiana's role as the Crossroads of America, the Indiana Toll Road (ITR) serves as a critical transportation link between highways leading to major East Coast cities and northern Indiana, the City of Chicago, and the western United States. As shown in **Figure 11**, the ITR crosses northern Indiana to connect Ohio and Illinois. The ITR has been in existence since 1956 and consists of 333 bridges and 156.9 miles of roadway.[21]

[21] Indiana Toll Road Concession Company, 2016–2027 Capital Improvement Program Report, January 2018.

Figure 11: Indiana Toll Road Map



What is the Indiana Toll Road Concession Company and its responsibilities?

The ITR Concession Company, LLC (ITRCC) is the concessionaire responsible for the ITR. ITRCC was established in 2006. In the same year, ITRCC entered into an agreement with the Indiana Finance Authority (IFA), the government body that oversees state-related debt issuance. The ***Concession and Lease Agreement for the Indiana Toll Road*** provided ITRCC with the rights to operate, maintain, and collect tolls on the ITR for the next 75 years at a cost of $3.85 billion.

ITRCC is responsible for maintaining the ITR bridges and pavement in good condition throughout the lifetime of the ***Concession and Lease Agreement for the Indiana Toll Road.*** INDOT and IFA have a Memorandum of Understanding. INDOT is the agency used to oversee that ITRCC is in compliance of the lease.

To ensure that ITRCC is maintaining its assets according to the requirements of the agreement, ITRCC provides INDOT with a comprehensive report detailing the planned rehabilitation, replacement, and reconstruction capital improvement work scheduled over a 10-year period. This Capital Improvement Program Report is completed annually. Projects included in the report are planned based on inspection and condition report findings.

I-80/I-90 westbound Indiana Toll Road, near Exit 77 at Roseland

How does ITRCC perform asset management?

Under the ***Concession and Lease Agreement for the Indiana Toll Road,*** ITRCC is required to maintain its facilities in accordance with established standards.[22] All ITR bridge inspection information is stored in BIAS. **Table 15** outlines the activities that ITRCC performs to maintain the bridges and structures, and the frequency of such activities.

Table 15: Maintenance Activity and Frequency

Activity to be Performed	Minimum Frequency
Bridge and structure cleaning: • Bridges • Overhead and bridge-mounted signs • Retaining walls and other structures	Once yearly, when no further winter chemicals will be applied, but no later than May 31
Inspections and reports:	
• All bridge structures	Once every 2 years
• Filing of INDOT Inventory/ Appraisal Forms	Once every 5 years
• Fracture critical structures and members	Annually
• Underwater inspection	Once every 5 years

ITRCC is responsible for hiring a structure inspection team comprised of a project manager, structure inspection team leader, fracture critical member inspection team leader, underwater structure inspection team leader, roadway inspection team leader, facility inspection team leader (by discipline), inspection team members, and a structure evaluation rating engineer to conduct inspections annually. ITRCC's consultant for inspections is HW Lochner.
The ITRCC roadway inspection team evaluates the condition of the roadway system components, including the pavements, signage, guardrails, pavement markings, fencing, and lighting for the mainline and ramps.

The facilities inspection evaluates the condition of the ITR's building and operating system components, including power supply, heating and cooling systems, ventilation, washroom facilities, pumps, and architectural and structural components. All ITR facilities are divided into four groups for purposes of inspections (Group A, B, C, and D). Each year, the inspection team evaluates one of the four groups so that each group is inspected every 4 years.

Environmental inspections cover the current state of environmental records, wastewater treatment, water treatment, hazardous material management, response to hazardous substance emergencies, underground storage tanks, air, herbicides and pesticides, storm water management, community right-to-know forms, materials management, regulatory compliance, and various additional initiatives.

ITRCC regularly prepares reports on asset conditions, but each asset follows a different schedule. For example, the Capital Improvement Program Report and a Fracture Critical Member Report are prepared annually. In contrast, a Facilities Condition Report is prepared once every 4 years. More information is contained in the ***Concession and Lease Agreement for the Indiana Toll Road.***[23]

[22] The bridge and structure inspections are governed by the Concession and Lease Agreement for the Indiana Toll Road, Volume II of III, Operations and Procedures Manual, Chapter J: Annual State of the ITR and Capital Improvement Program Reports.

[23] Indiana Finance Authority, Concession and Lease Agreement for the Indiana Toll Road, Volume II of III, Operations and Procedures Manual.

How is performance evaluated on the ITR?

ITRCC implements a variety of approaches to evaluating asset condition and performance.

Bridges on the ITR are inspected by an expert engineer. The engineer uses best judgment to assess the condition of the bridge, as detailed in **Table 16.**

Pavement conditions on the mainline, toll plaza ramps, and travel plaza parking lots are assessed using the pavement quality indicator (PQI) scoring method also described in **Table 16.**

ITRCC also performs visual assessments for facilities inspections based on the acceptance criteria outlined in the Concession and Lease Agreement for the Indiana Toll Road. Environmental inspections document the state of environmental records, wastewater treatment, water treatment, and hazardous material management, among other initiatives.

Table 17 lists the current condition targets for the ITR. The ITR bridges are currently in 34 percent good, 64 percent fair, and 2 percent poor. INDOT is currently working with ITRCC to obtain condition data for the ITR pavement, but this information is not available prior to submission of this TAMP.

Table 16: Condition Assessment Approach, ITR

Asset	Approach	Description
Bridges and Structure	Performance Index (PI) and Sufficiency Rating	Inspections are consistent with the National Bridge Inspections Standard (NBIS) as required by FHWA. The PI scoring system rates the condition of the deck, superstructure, and substructure from 0 to 9 (failure to excellent). A composite score of each bridge component is calculated according to a formula provided by FHWA to determine the overall bridge sufficiency rating. ITR then attributes the following condition labels based on the sufficiency rating (percent) of the bridge: • Excellent: 90–100 • Good: 80–90 • Fair: 70–80 • Marginal: 60–70 • Poor: <60
Pavement	Pavement Quality Indicator (PQI)	For the mainline pavement, PQI is a composite score of pavement condition rating, the IRI, and the rutting depth. Toll plaza ramp pavement and travel plaza parking lot pavement condition are assessed qualitatively by an engineer who applies an approximate corresponding PQI score. The score is from 0 to 100: • Excellent: 90–100 • Good: 80–90 • Fair: 70–80 • Poor: <70

Table 17: Condition Targets, ITR

Asset	Condition Target
Bridges and Structure	Average sufficiency rating of 80
Pavement	Mainline: Average PQI of 80; No more than 10 percent in poor condition Toll Plaza Ramp: 90 percent of pavement in good condition Travel Plaza Parking Lot: 90 percent of pavement in good condition

What are the current conditions of the Indiana Toll Road?

ITRCC reports condition ratings for all 333 bridges,[24] including decks, superstructures, substructures, and an overall sufficiency rating. ITRCC's 80/90 PUSH Project is making improvements to 53 of the ITR bridges and did not report the ratings for these bridges in 2017.[25] ITRCC reported ratings for the other 280 bridges in the ***2017 Capital Improvement Report.***

The average sufficiency rating for ITR bridges in 2017 is 87.4 percent. Based on the sufficiency rating, 246 of the 280 ITR bridges have maintained their condition between 2015 and 2017. Meanwhile, 14 of the bridges improved in condition and 20 bridges declined in condition.

From 2015 to 2017, the PQI of the ITR mainline pavement decreased from 93.3 to 92.1 on average. Although the value has decreased, the 92.1 rating is still above the goal of a PQI above 80. Additionally, the 92.1 average PQI does not include the 292 lane miles of pavement reconstructed in the 80/90 PUSH Project, which is described later. In the future, INDOT will be obtaining pavement data from the ITRCC that is consistent with the data for INDOT's other NHS pavements

For bridge condition information on the ITR, please refer back to **Table 3** in Section 2.

[24] 242 of these bridges are on the NHS.

[25] ITRCC's 80/90 PUSH project was a major project to improve customer safety, improve the condition of 53 bridges and 73 miles of pavement, and reduce the level of maintenance work required in the future.

What capital improvement work is scheduled and planned?

ITRCC updates its Capital Improvement Program Report annually. The Capital Improvement Program Report provides a 10-year forecast for recommended projects and the funding needed to complete the projects. The findings from the condition inspections are important considerations in developing the report.

The Capital Improvement Program Report provides budgetary estimates in the year of expenditure for projects ITRCC has planned for the next 10 years. This report also identifies the decisions that ITRCC made to select improvement projects necessary to maintain the ITR in a state of good repair.

Currently, one major project is included in the Capital Improvement Program related to pavement and bridge improvements:

- **80/90 PUSH Project:** A major rehabilitation and upgrade of a 73 mile section of the ITR delivered during the 2016 and 2017 construction season. The bridge portion of the 80/90 PUSH Project included rehabilitation of 53 bridges.
  The pavement portion of the 80/90 PUSH Project included rehabilitation of more than 70 miles of pavement. The mainline pavements were cracked and seated with a new asphalt overlay. All shoulders were milled 1.5 inches and filled to meet the new mainline grade. Various pavement rehabilitation activities were employed at all interchanges within the project limits.

First toll booth west of the Indiana-Ohio border, along I-90 westbound

What is the financial plan for the Indiana Toll Road?

ITRCC has entered into a performance-based contract with INDOT and must meet the condition targets outlined in the ***Concession and Lease Agreement for the Indiana Toll Road.*** ITRCC outlines its financial plan to maintain the ITR according to the agreed upon condition targets listed in the Capital Improvement Program Report. The Capital Improvement Program Report provides information on all capital improvement projects planned for the next 10 years on the ITR. As part of the agreement to lease the ITR, ITRCC's projects are fully funded by toll revenue and not eligible for state or federal funding. INDOT's financial plan outlined in the next section does not include ITR-related projects.

ITRCC has planned spending of $57,369,000 from 2016 to 2020 for building/roadway/lighting projects. Of that total, $40,296,000 will be spent on roadway assets.

There is $22,124,618 allotted for capital improvement projects on bridge assets from 2018 to 2027.

What is the value of INDOT's bridges and pavements?

Based on an analysis of historical data, INDOT estimates that it would cost $220 per square foot to replace an interstate bridge or $200 per square foot to replace a non-interstate or non-NHS bridge. INDOT also estimates it would cost $220 per square foot to replace the border bridges that cross into surrounding states. However, there are seven bridges that cross over the Ohio River that would require an estimated $800 million to replace. The higher cost is due to the large size of these bridges. These seven bridges include the I-64, I-265, I-275 bridges, two bridges along US 41, and two bridges along I-65.

In order for INDOT to rebuild all of its bridges, it would cost approximately $15.4 billion. When including bridges on the NHS that are not owned by INDOT, this figure increases to $16.9 billion.

INDOT performed a similar analysis to calculate the cost of rebuilding a roadway and estimates that the cost to build a lane-mile of highway can be $1 million. Assuming this cost per lane-mile, INDOT would require $28.6 billion to rebuild its highway system of 28,558 lane-miles of pavement. The cost increases by $779 million when including NHS pavement owned by entities other than INDOT.

Table 18 shows the results of both analyses. This large cost is not feasible for the State of Indiana to pay if all bridges and pavement were to deteriorate and need to be replaced. This reinforces the need for asset management practices to preserve the condition and performance of bridges and pavement.

Table 18: Cost to Replace Bridges and Pavement (Billions)

Asset	Owned by INDOT				Owned by Others*	Replacement Costs
	Interstate	NHS (Non-Interstate)	Non-NHS	Border Bridge	NHS	
Bridge	$3.9	$ 2.4	$3.8	$5.2	$1.6	$16.9
Pavement**	$5.1	$7.4	$16.1	N/A	$0.8	$29.3
					Total	**$46.2**

* For bridges, includes Indiana Toll Road, other state agencies, local, and private. For pavement, includes Indiana Toll Road and others.

** Cost to replace pavement owned by INDOT totals $28.4 billion in table due to rounding.

SR 9 Grant Company pouring a thin concrete overlay

Where does INDOT's funding come from, and how can INDOT spend these funds?

INDOT's existing funding comes from a variety of sources, as described in the STIP.[26] These sources are described below.

Federal-Aid Funds

State Federal-Aid FHWA Funds National Highway Performance Program (NHPP)

- **Goal:** Authorized to support the condition and performance of the NHS, for the construction of new facilities on the NHS, and to ensure that investments of federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in an asset management plan of a state for the NHS.
- **Eligibility:** Projects on the NHS are eligible for this type of funding.
- **Allocation:** This funding is apportioned as a lump sum for each state with the total divided among apportioned programs. Two percent of a state's NHPP funding is set aside for State Planning and Research (SPR).

Surface Transportation Block Grant Program (STPBG)

- **Goal:** Promotes flexibility in state and local transportation decisions, and provides flexible funding to best address state and local transportation needs.
- **Eligibility:** Projects on and off the NHS are eligible for this type of funding.
- **Allocation:** This funding is apportioned as a lump sum for each state. The total is divided among apportioned programs. Two percent of a state's STPBG funding is set aside for SPR.

Highway Safety Improvement Program (HSIP)

- **Goal:** A core federal-aid program with the purpose of achieving a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned roads and roads on tribal land.
- **Eligibility:** HSIP funds are designated for safety projects that correct or improve a hazardous road location or feature, or address a highway safety problem. Funds can also be used for workforce development, training, and education activities.
- **Allocation:** This funding is apportioned as a lump sum for each state with the total divided among apportioned programs. Two percent of a state's HSIP funding is set aside for SPR.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

- **Goal:** Provides a flexible funding source to state and local governments for projects and programs to help meet the requirements of the Clean Air Act.
- **Eligibility:** Funds may be used for a transportation project or program intended to help an area meet the National Ambient Air Quality Standards, or to maintain adherence to the National Ambient Air Quality Standards.
- **Allocation:** This funding is apportioned as a lump sum for each state with the total divided among apportioned programs. Two percent of the funds must be used for SPR. A state with $PM_{2.5}$ (fine particulate matter) areas must use a portion of its funds to address $PM_{2.5}$ emissions in such areas.[27]

Federal Lands Highway Program (FLHP)

- **Goal:** A unified program for federal lands transportation facilities, federal lands access transportation facilities, and tribal transportation facilities.
- **Allocation:** The majority of funding is allocated to the National Park Service, U.S. Fish and Wildlife Service, and U.S. Department of Agriculture Forest Service.

Emergency Relief Program (ER)

- **Goal:** A program that assists federal, state, tribal, and local governments with the expense of repairing serious damage to federal-aid,

tribal, and federal lands highways resulting from natural disasters or catastrophic failures.

- **Eligibility:** INDOT must file a notice of intent to request ER funds with the FHWA Division Office within the state to initiate the ER application process. The application must be submitted within 2 calendar years of the date of the disaster.

State Earmarks, and Local Federal-Aid FHWA Earmarks

- Provisions that have directed funds for specific transportation-related projects as identified by Congress.

Local Federal-Aid FHWA Funds

- **Allocation:** Local public agencies must match all funds. In order to proceed with projects, the local public agencies must work with INDOT.
- **Eligibility:** Funds provided by INDOT to the local public agencies for federally eligible projects.

State Funds

State Highway Funds

- **Allocation:** These funds come from fuel taxes on gasoline, permits, federal reimbursement, the motor vehicle highway fund, and the local road and street fund.
- **Eligibility:** This provides funding for the Highway Maintenance Work Program, Highway Capital Improvement Program, Highway Planning and Research Program, Crossroads 2000 Program, and Joint Major Moves Construction.

State Highway Road Construction and Improvement Fund

- **Goal:** A fund established for construction and reconstruction projects on state highways.
- **Allocation:** This funding comes from legislation raising the gas tax by 2 cents, which provides INDOT the funding to meet the debt service on the related bonds issue by the IFA.

Crossroads Funds

- **Goal:** Continue to improve the condition of state-owned bridges and pavement.
- **Allocation:** This funding comes from an increase in vehicle license fees from legislation passed by the General Assembly in 2016.

Toll Road Lease Proceeds

- **Allocation:** Funding from Governor Daniels' request of the General Assembly in 2006 to authorize the lease of the ITR for 75 years. The state received $3.85 billion up front for the lease.

Next Level Indiana Trust Fund

Of the $3.85 billion received for the lease of the ITR, $500 million was placed in the Next Generation Trust Fund and invested by the Treasurer of State. INDOT receives the net investment income every 5 years. The first distribution was in 2011.

During the 2017 legislative session, the General Assembly modified the terms of the Next Generation Trust Fund. The name was changed to the "Next Level Indiana Trust Fund," and one-half of the $500 million original investment was placed under management by the Indiana Economic Development Corporation to be invested in Indiana economic development initiatives. INDOT continues to receive distribution of all net investment income every 5 years.

Preventive maintenance activities and treatments, and corrective maintenance treatments for INDOT's bridges are eligible for federal funding.

Next Level Indiana

In April 2017, the Indiana General Assembly passed House Enrolled Act 1002, also known as Next Level Indiana.[28]

The sources of funding for Next Level Indiana include the following:

- Fuel tax increase on gasoline
- Increase of special fuel tax
- Increase of motor carrier surcharge tax
- Transportation improvement fee for all motor vehicle registrations
- Supplemental registration fee for electric vehicles
- Redirecting a larger portion of the sales tax collected on fuel from the state general fund to dedicated highway funds

[26] INDOT, *INDOT STIP 2018–2021*

[27] $PM_{2.5}$ areas were last reported in 2017. At that time, Indiana had $PM_{2.5}$ areas near the Chicago-Gary-Lake County, IL-IN, Indianapolis, Evansville, IN, Louisville, KY-IN, and Cincinnati-Hamilton, OH-KY-IN metropolitan areas. The map can be found on the EPA's historical website: ***https://www3.epa.gov/pm/designations/1997standards/final/statemaps/Indiana.htm***

[28] House Enrolled Act 1002, ***https://iga.in.gov/legislative/2017/bills/house/1002#digest-heading***

What Types of Bridge and Pavement Treatment Activities Does INDOT Perform?

INDOT has developed a crosswalk of activities from the Scheduling Project Management System (SPMS) that correspond to the five work types defined by FHWA in **Table 19**. An exhaustive list can be found in Appendix C.

Table 19: FHWA Work Type to INDOT Treatment Crosswalk

FHWA Work Type	INDOT Pavement Treatment	INDOT Bridge Treatment
Maintenance	Minor, corrective actions, including: • Patching (partial and full depth); and • Spot Paving.	Minor, corrective actions, including: • Bridge Deck Patching; • Replacing Joints; • Straightening Beams; and • Channel Realigning and Reshaping.
Preservation	Minor treatments intended to preserve the life and condition of a road, including: • Crack Sealing; • Chip sealing; and • Resurfacing (single lift).	Minor treatments intended to preserve the life and condition of a bridge, including: • Deck Overlay (thin and rigid); • Deck Sealing and Resealing Activities; • Deck Cleaning; and • Scour Protection.
Rehabilitation	Intermediate level treatments intended to restore functionality and structure, including: • Structural and Minor Structural Overlay; and • Slide Correction.	Intermediate level treatments intended to restore functionality and structure, including: • Bridge Rehabilitation or Repair; • Bridge Deck Reconstruction or Replacement; and • Bridge Widening.
Reconstruction	Replacement or substantial reconstruction of an existing road, including: • Pavement Replacement; • Rubblizing; • Full Depth Reclamation; • Storm Sewer Repair or Replacement; and • Sewer/Curb/Gutter Construction or Reconstruction.	Replacement or substantial reconstruction of an existing bridge, including: • Bridge Replacement; • Small Structures & Drains Construction; and • Small Structure Replacement.
Construction	Any Mobility Project, including: • New Road; • Added Travel Lanes; • Truck/Auxillary Lane Construction; • Sewer/Curb/Gutter Construction; and • Pumping/Lift Stations.	Any Mobility Project, including: • New Bridge; and • New Small Structure.

How does INDOT set funding levels for its major investment categories?

INDOT's funding process begins when the Asset Management Teams create a prioritized list of projects based on the investment strategies discussed earlier in the TAMP. The prioritized project list includes the cost to complete the projects.

Budget estimates are then developed by the CPFM Team, which projects federal and state revenue for the next 5 years.

The prioritized list and the budget estimates are provided to the PMG, which is responsible for assigning funding to each asset category. With the prioritized list of projects and the funding levels, the PMG accepts projects on the list in order of priority until the cost of the projects reaches the funding limit. These projects are then formally included in scheduling.

Tables 20, 21, 22, and **23** provide a breakdown of funding for INDOT's investment strategies over the next ten years, these tables have been updated from the Initial TAMP to reflect the five work types identified by FHWA.

Table 20: Capital Investment by FHWA Work Type NHS and non-NHS (Millions)

Work Type	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Construction	$446.4	$177.4	$293.9	$303.5	$388.5	$565.5	$224.5	$228.5	$232.7	$237.7
Maintenance	$15.4	$115.0	$19.1	$5.5	$0.6	$18.2	$27.2	$27.6	$28.2	$28.8
Preservation	$386.3	$474.2	$554.0	$561.1	$521.9	$488.8	$412.7	$420.0	$427.9	$437.0
Reconstruction	$91.0	$84.4	$124.6	$115.5	$249.2	$217.8	$142.4	$145.0	$147.7	$150.8
Rehabilitation	$357.6	$248.9	$403.8	$376.9	$361.0	$242.2	$251.9	$256.4	$261.2	$266.8

Table 21: In-House Maintenance and Preservation Investment by FHWA Work Type NHS Only (Millions)

Work Type	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Maintenance	$6.10	$6.26	$6.41	$6.57	$6.74	$6.91	$7.08	$7.26	$7.44	$7.62
Preservation	$4.25	$4.09	$4.19	$4.29	$4.40	$4.51	$4.62	$4.74	$4.86	$4.98

Table 22: Total Investment by FHWA Work Type Percent NHS and non-NHS

Work Type	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Construction	34%	16%	21%	22%	25%	37%	21%	21%	21%	21%
Maintenance	2%	11%	2%	1%	0%	2%	3%	3%	3%	3%
Preservation	30%	43%	40%	41%	34%	32%	39%	39%	39%	39%
Reconstruction	7%	8%	9%	8%	16%	14%	13%	13%	13%	13%
Rehabilitation	27%	22%	29%	27%	24%	16%	24%	24%	24%	24%

Table 23: Estimated Funding for NHS only (Millions)

Work Type	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Construction	$152	$75	$100	$108	$125	$184	$114	$116	$118	$120
Maintenance	$5	$49	$7	$2	$0	$6	$16	$17	$17	$17
Preservation	$132	$202	$189	$199	$168	$159	$211	$215	$219	$224
Reconstruction	$31	$36	$43	$41	$80	$71	$70	$72	$73	$75
Rehabilitation	$122	$106	$138	$134	$116	$79	$130	$132	$135	$138

How much money is expected for pavement and bridge projects over the next 10 years?

With passage of the Next Level Indiana legislation in April 2017, INDOT is expecting available revenue to steadily increase over the next 10 years, which would support investments in bridge and pavement projects.

The expected funding outlined in **Table 24** includes only state and federal revenue and does not include income from the Next Level Indiana Trust Fund. To estimate the amount of state revenue available over the next 10 years, INDOT's financial team uses calculations from the Next Level Indiana legislation.[29]

The INDOT Finance Department is continuously improving its forecasting methods and will adjust estimates as new information becomes available. Appendix D outlines the changes made to the financial plan from the Initial TAMP to the Final TAMP. All funding values have been inflated using a projected rate from Global Insight software.[30]

Table 24: Available Federal and State Funding FY2018–FY2027 NHS and non-NHS (Billions)

Year	FY Funding
2018	$1.8
2019	$1.9
2020	$1.9
2021	$2.1
2022	$2.2
2023	$2.3
2024	$2.4
2025	$2.5
2026	$2.6
2027	$2.6

The process to determine the amount of funding available for bridge and pavement projects begins with INDOT allocating funds to operating expenses and debt service, as shown in **Figure 12**. Once these activities are funded, the remainder of the budget is allocated to bridge and pavement projects. Other owners of NHS assets in Indiana may affect these targets or performance gaps; however, INDOT does not anticipate other assets impacting the overall conditions of pavement and bridges. INDOT carefully oversees all of its asset owners' operations.

The estimated funding remaining for pavement and bridges projects over the next ten years is outlined in **Table 25**. **Table 26** provides the estimated funding for bridges and pavement on the NHS. These values have been calculated based on the percent of lane miles for pavement and percent of deck area for bridges that are on the NHS. Note that INDOT manages the entire Federal Aid highway system in Indiana in a consistent manner, regardless of whether individual segments are part of the NHS or not. Other owners of NHS pavement in Indiana collectively plan to spend approximately $14 million over the next two years on asset management-related activities.

[29] Table 24 differs from the funding outlined in the STIP because INDOT has performed independent forecasting analysis of TAMP-relevant data. The STIP is modified on a monthly basis, and future modifications will take into consideration the analyses performed for the TAMP.

[30] Global Insight is a commercially available product that tracks economic activity. INDOT uses the software to analyze the commodities relevant to INDOT's assets, such as steel, oil, gas, to provide inflation rate forecasts.

Table 25: Estimated Funding for Pavement and Bridges NHS and non-NHS (Millions)

Year	Pavement	Bridges
2018	$432.7	$421.8
2019	$457.8	$446.3
2020	$466.7	$455.0
2021	$473.0	$461.2
2022	$480.6	$468.5
2023	$489.3	$477.1
2024	$498.2	$560.5
2025	$507.1	$570.5
2026	$516.5	$581.1
2027	$527.6	$593.6

Table 26: Estimated Funding for Pavement and Bridges on the NHS (Millions)

Year	Pavement	Bridges
2018	$258.0	$183.8
2019	$273.0	$194.4
2020	$278.3	$198.2
2021	$282.1	$201.0
2022	$286.6	$204.1
2023	$291.8	$207.8
2024	$297.1	$244.2
2025	$302.4	$248.5
2026	$308.0	$253.2
2027	$314.6	$258.6

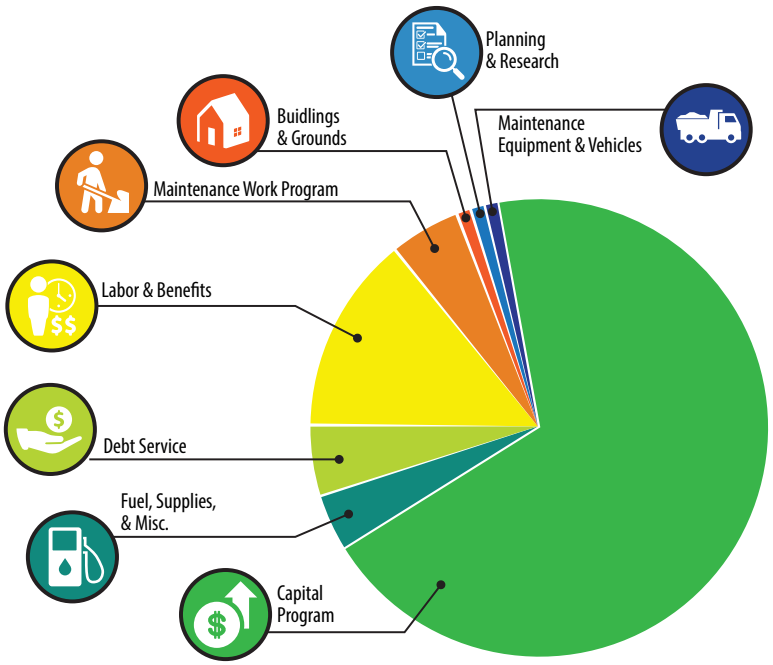


Figure 12: TransportationBudget Allocation

What conditions can INDOT achieve with these funding levels?

As the Crossroads of America, Indiana's roads are strategically important not just to Hoosiers, but to travelers from all over the United States. INDOT knows how important it is for travelers to enjoy a smooth, comfortable drive over Indiana's bridges and highways, which is why INDOT has committed to improving the condition of its bridges and roadways.

INDOT set condition targets to have 97 percent of bridges in fair or better condition and 95 percent of pavement in fair or better condition by 2038.

To achieve these targets, INDOT has identified annual spending of $400 million for its bridge preservation plan and $390 million for its pavement preservation plan.[31] INDOT determined these funding levels by modeling expected deterioration of each asset and various treatment plans.[32] These funding levels achieve the treatment plan that provides the state with improving assets at the lowest cost over the longest period of time. The analysis INDOT undertook to determine asset management funding needs resulted in a tax increase (Next Level Indiana) that will ensure that these funding levels are available for the next 20 years.

As shown in **Figure 13** and **Figure 14**, INDOT also modeled three other funding levels:

- **Unlimited:** assumes $1 billion expenditure each year

Figure 13: Bridge Funding Analysis ④

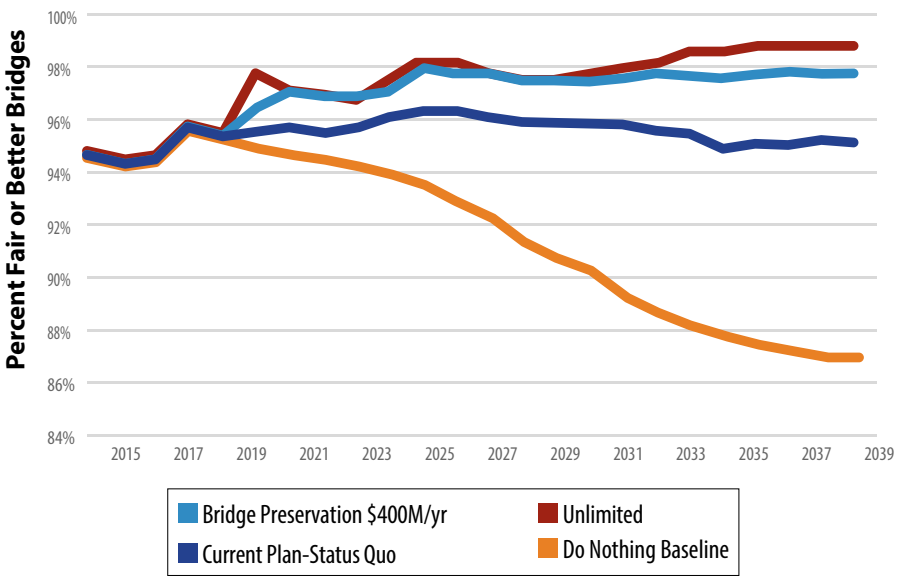
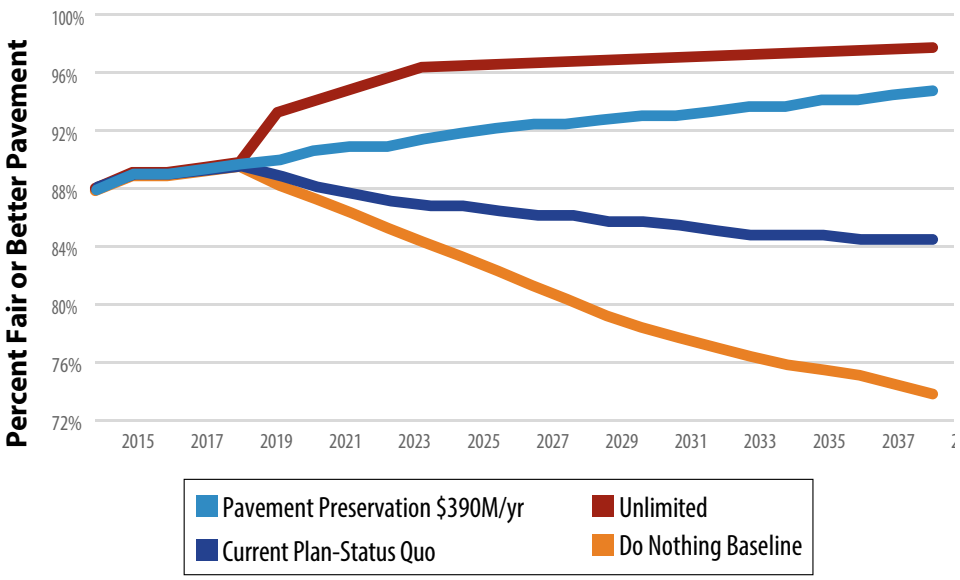


Figure 14: Pavement Funding Analysis ④



- **Current Plan-Status Quo:** assumes spending for committed projects from FY2016 to FY2019 and $130 million per year for bridges thereafter and $350 million per year for pavement
- **Do Nothing Baseline:** assumes spending for committed projects from FY2016 to FY2019 and then no funding in future years

INDOT anticipates achieving its condition targets for bridges and pavement with its current funding levels. When performing the analysis to determine the funding levels needed to reach the condition targets, INDOT included only bridges and pavement that it owns and operates.

[31] These funding levels are in 2016 dollars and will be adjusted for inflation each year.

[32] INDOT uses dTIMS software to model funding needs to optimize condition levels at a practical cost.

How do INDOT's investment strategies meet the national goals?

In order to maintain the performance and conditions of its assets, INDOT has developed this long-term financial plan which supports its long-term asset management strategies. The bridge and pavement asset management processes described in sections 2 and 4 develop multiple strategies that will most efficiently sustain or improve the condition of the asset given a specified budget. The investment strategies in this chapter support progress in achieving the national goals in 23 USC 150(b) National Goals and Performance Management Measures. **Table 27** shows these strategies and how each goal will be addressed.

Table 27: National Performance Goals and TAMP Strategies

National Performance Goal	Strategies to Achieve Goal
1. Safety. To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.	The Transportation Asset Management Plan (TAMP) strategies support the goals and objectives of the Highway Safety Improvement Program (HSIP). INDOT's Safety Asset Team monitors crash data and plans projects to improve safety. Implementing these plans will reduce traffic fatalities and serious injuries.
2. Infrastructure condition. To maintain the highway infrastructure asset system in a state of good repair.	The strategies in the TAMP are integrated with the STIP and constrained by available funding to maintain highway assets as funding permits. A state of good repair will be promoted by implementing the TAMP through the STIP.
3. Congestion reduction. To achieve a significant reduction in congestion on the National Highway System.	INDOT's Mobility Asset Team monitors travel time using National Performance Management Research Data Set (NPMRDS) data, and plans projects to improve mobility and add capacity. Implementing these plans will reduce congestion on the NHS.
4. System reliability. To improve the efficiency of the surface transportation system.	Weather events, congestion and traffic incidents are the main contributors to system unreliability on our transportation system. INDOT's Mobility Asset team monitors travel time using NPMRDS data and has developed a Major Expansion Priority List. Implementation of these plans will improve system reliability.
5. Freight movement and economic vitality. To improve the National Highway Freight Network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.	The TAMP strategies support the State Freight Plan. INDOT's Mobility Asset Team monitors truck travel time using NPMRDS data, and plans projects to improve mobility. Implementing these plans will improve freight movement and economic vitality.
6. Environmental sustainability. To enhance the performance of the transportation system while protecting and enhancing the natural environment.	TAMP strategies are designed to support existing environmental, project development, and STIP processes that protect the natural environment. Implementing the TAMP and these other processes will help sustain the environment.
7. Reduced project delivery delays. To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and 'improving agencies' work practices.	INDOT's capital program is geared to a 5 year program (project identification to project letting). This helps ensure projects are able to be delivered, accounting for permitting, utilities, right of way, and development time. INDOT also has a very defined "change management" process, where high risk projects are tracked and any potential changes (scope, budget, etc) are identified and approved early in the 5 year development window. These processes will reduce project delivery delays and allow transparency of our project development process.

Is the transportation system financially sustainable?

In 2015, INDOT conducted a study to assess its transportation funding needs and potential funding sources.[33] INDOT determined that the available funds over the next 20 years would not be sufficient to meet state and local transportation needs. The study indicated that Indiana's transportation funding would decrease over the 20 years as a result of inflation and increased fuel efficiency.

Since this study, the Indiana General Assembly has passed the legislation known as Next Level Indiana (see earlier description of funding sources). As part of a push to preserve Indiana's transportation assets, the legislation provides sufficient asset management funding for state-maintained bridges and roads over the next 20 years. This bill also provides the necessary funding for a small set of other priority projects. Over the next ten years, INDOT expects to add an estimated 250 lane miles of pavement and 350,000 square feet of deck area to its roadway network. INDOT's existing asset management financial plan takes into consideration these additional assets.

[33] INDOT, *Study of Indiana Transportation Infrastructure Funding Mechanisms,* October 15, 2015.

Hydraulic rollers

What are risks and how do they relate to asset management?

Risk is defined as "the positive or negative effects of uncertainty or variability upon agency objectives."[34] Risk management is "the processes and framework for managing potential risks."[35]

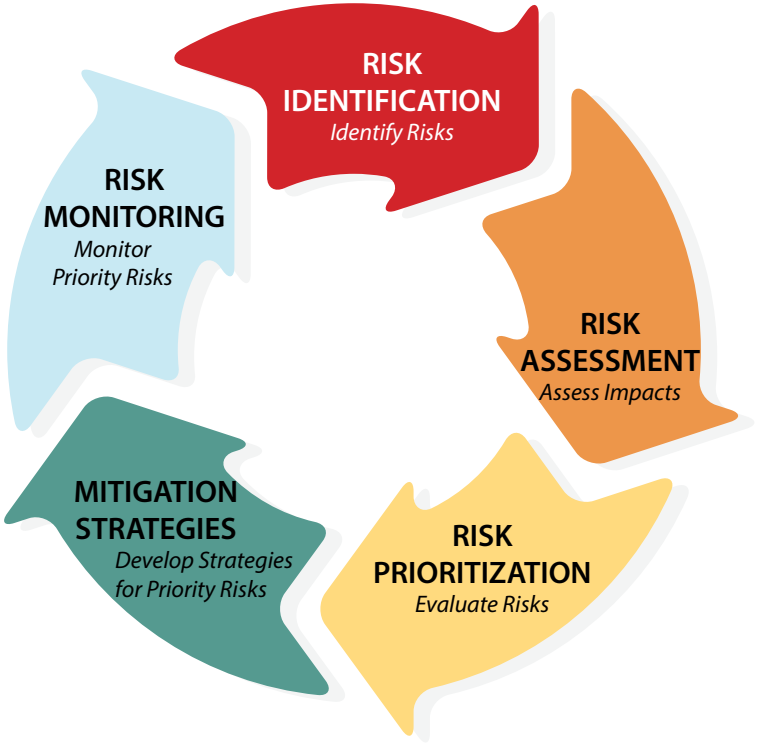
A key part of the asset management planning process is identifying and mitigating risks associated with implementing the TAMP. Types of risks that can affect NHS pavement and bridge condition, as well as performance of the NHS, include environmental risks such as flooding, tornados, or earthquakes, or issues related to climate change. Other risk categories can include, but are not limited to, financial risks such as uncertainty regarding available future budget, operational risks such as failure of the asset, and institutional, risks related to changes in agency leadership and the corresponding changes in priorities. INDOT also focused on whether any assets would be subject to repeated emergency events and require repair and reconstruction on a regular basis.

INDOT is managing its asset management risks by implementing a process consisting of the following elements:

- **Risk identification:** Identify risks that can affect the condition and performance of INDOT's pavement and bridges.
- **Risk assessment:** Assess each identified risk in terms of the likelihood of occurrence and impact and consequence if the risk occurs.
- **Risk prioritization:** Evaluate and prioritize the identified risks.
- **Mitigation strategies:** Develop a mitigation plan for addressing the top priority risks.
- **Risk monitoring:** Develop an approach to monitor the top priority risks.

Formalizing a risk management plan is helping INDOT achieve its condition targets over the next 10 to 20 years by reducing the uncertainty these risks pose on bridge and pavement assets. With a proactive plan to monitor identified risks, INDOT will be able to ensure appropriate resources are available for asset management.

[34] Federal Register, Asset Management Plan, Final Rule, October 24, 2016.
[35] Ibid.



How will INDOT identify, assess, and prioritize asset management risks?

Risk Identification

As part of the risk management plan, INDOT conducted a formal risk analysis workshop and solicited feedback from its staff and FHWA representatives to identify asset management risks. Prior to the risk workshop, INDOT distributed a survey to its staff asking the respondents to identify significant risks that could heighten or inhibit INDOT's ability to manage its bridges and pavement. The staff also reviewed historical data on the assets in order to identify potential risks.

Risk Identification consisted of reviewing and validating the preliminarily identified risks and further brainstorming and validating of other uncertainties and risks facing the TAMP. This included filling in the information on the risk register that characterizes each risk, including:

- Defining the risk as a threat or opportunity.[36]
- Giving the risk a concise name to identify it.
- Developing a risk description that encompasses the Specific, Measurable, Attributable, Relevant, and Time-bound (SMART) characteristics of the risk.

Risk Assessment and Prioritization

Qualitative risk assessment was performed by defining probabilities and impacts using a 5x5 range of Very Low to Very High. Risks were assessed based on qualitative data and severity profiles were calculated that consider the combination of qualitative probability and impact ratings.

Figure 15 shows how INDOT combined the likelihood and consequence ratings to determine the relative priority of each risk. Given that risks include both the positive and negative effects of uncertainty or variability, separate heat maps were developed.

Figure 15: Threat and Opportunity Risk Matrices

Threats						
Probability	VH	0.2	0.4	0.6	0.8	1
	H	0.16	0.32	0.48	0.64	0.8
	M	0.12	0.24	0.36	0.48	0.6
	L	0.08	0.16	0.24	0.32	0.4
	VL	0.04	0.08	0.12	0.16	0.2
		VL	L	M	H	VH
Impact						

Opportuntiies						
Probability	VH	0.2	0.4	0.6	0.8	1
	H	0.16	0.32	0.48	0.64	0.8
	M	0.12	0.24	0.36	0.48	0.6
	L	0.08	0.16	0.24	0.32	0.4
	VL	0.04	0.08	0.12	0.16	0.2
		VL	L	M	H	VH
Impact						

[36] A threat is a risk that would have a negative impact if it were to occur. An opportunity is a risk that would have a positive affect if it were to happen.

How is INDOT addressing and monitoring asset management risks?

Mitigation Strategies

INDOT has developed response strategies for each of the risks identified during the previous phases.

Response strategies for risks with negative impacts include:

- Avoid
- Transfer
- Mitigate
- Accept

Response strategies for risks with positive impacts include:

- Exploit
- Share
- Enhance
- Accept

INDOT developed risk action plans (i.e., statements of planned actions) for each risk. Each plan suggests a list of activities INDOT will undertake to address the identified risks. Each risk action plan is summarized in the TAMP Risk Register. INDOT has designated a Director of Asset Management to oversee and direct their Asset Management Program. The Director will be assigned ownership of all risks. Accordingly, all risk action plans will be implemented through this department with delegated responsibility to others as appropriate.

Risk Monitoring

INDOT is taking the next steps to implement the risk action plans, monitor the identified risks over time, and periodically update the risk register.

The risk monitoring activities include an annual review of all risks with the Program Management Group (PMG). In addition to the annual risk review, INDOT will conduct a new risk workshop every four years.

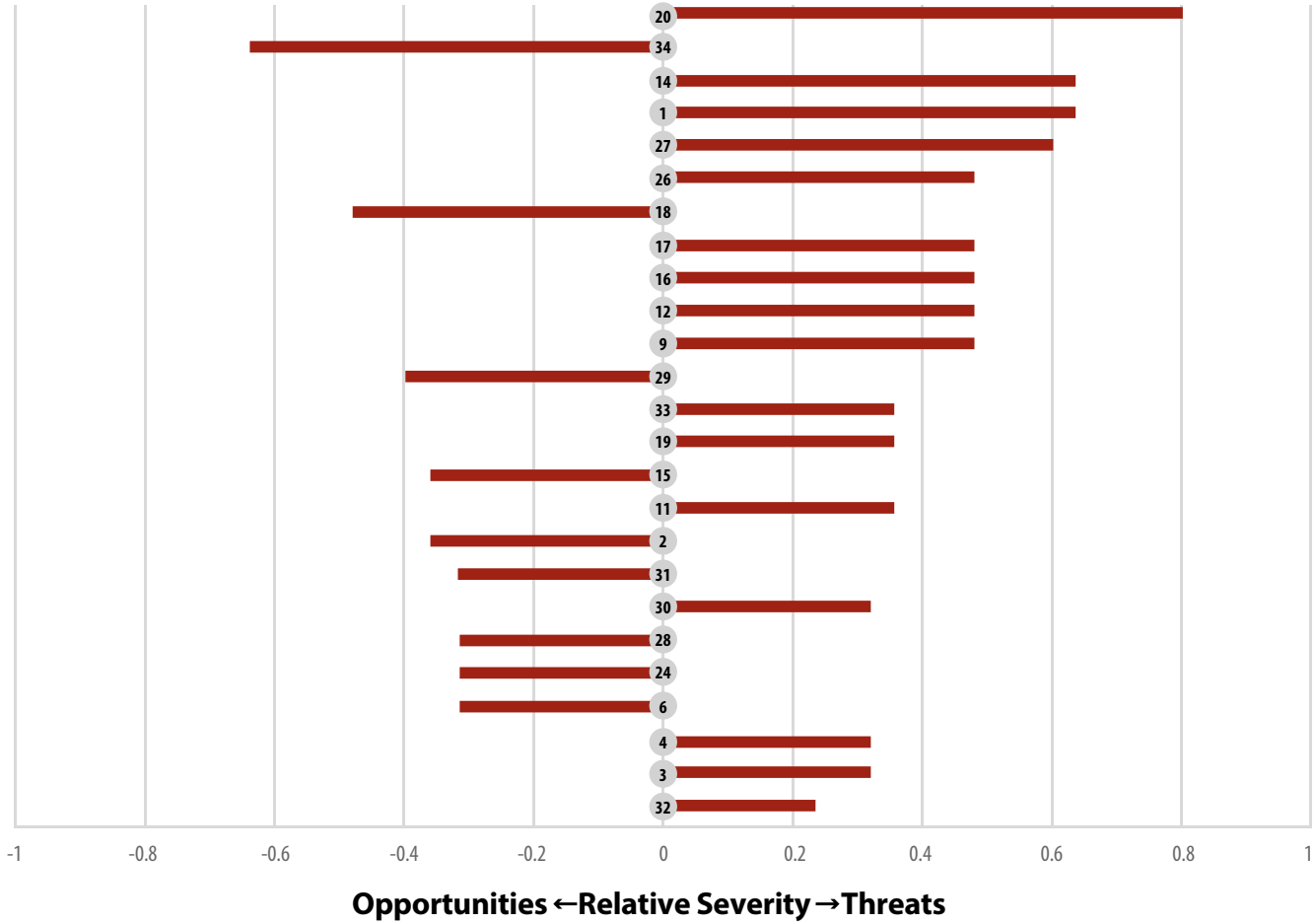
During the workshop, INDOT will review and evaluate the efficacy of the risk action plans from the previous risk register. This includes updating the risk status as active, dormant, or retired, as well as updating the progression of each risk throughout the life cycle of the TAMP. The risk register will be updated and provided along with the updated TAMP. Careful consideration will also be taken for major catastrophic events, even if the likelihood of such an event is minimal.

What are INDOT's highest priority risks?

From the risk workshop, INDOT identified the top 25 risks. Sixteen of these risks represent threats, while nine represent opportunities as shown in **Figure 16**.

The red lines on the diagram indicate the priority rating of the risk on a scale of 1 to -1.

Figure 16: Top 25 Risks by Priority



20 - Staffing Resources
34 - Communication with Customers
14 - Preservation Treatment Performance
1 - Federal & State Administration Changes
27 - State Revenue for TAMP Funding
26 - Federal Revenue for TAMP Funding
18 - Mobility & Safety Projects
17 - Additional Assets Included in TAMP
16 - Routine Maintenance Not Performed
12 - Right of Way Availability
9 - Cost Estimate Accuracy
29 - State Revenue for TAMP Funding
33 - State Legislation Impacts TAMP Funding
19 - Regulatory Requirements Changes
15 - Changes in Material Technology
11 - Construction Industry Capacity / Availability
2 - Federal and State Administrative Changes
31 - Federal Discretionary Grant Programs
30 - Federal Discretionary Grant Programs
28 - Federal Revenue for TAMP Funding
24 - Over-sized / Over-weight Vehicle Permitting
6 - Process Documentation & Formulization
4 - Staff Changeover and Institutional Knowledge Loss
3 - Federal Legislation Changes
32 - State Highway Funding Non-TAMP Projects

What are INDOT's action plans for addressing TAMP risks?

The risk register below summarizes all of the risks that were identified, their respective assessment, assumed risk response strategy, and action plan. The risk register will be continually updated to monitor INDOT's highest priority risks. The colors in the Risk Priority column of Table 28 correspond to the colors identified in Figure 15.

Table 28: Asset Management Risk Register

Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T. Risk Description	Probability	Impact	Risk Priority	Risk Response Strategy	Action Plan
1	Threat	Federal and State Administration Changes	New administration may change assumed priorities relative to plan goals for condition achievements, funding allocations, staffing, project-selections (mobility vs. preservation), and other infrastructure improvements. House Act 1002 sets certain funding measures that may not be as subject to administration impacts.	High	High	0.640	Mitigate	Communicate priorities, assumptions, and condition results of TAMP to new administration. Cross-training of internal DOT staff.
2	Opportunity	Federal and State Administration Changes	New administration may change assumed priorities relative to plan goals for condition achievements, funding allocations, staffing, project-selections (mobility vs. preservation), and other infrastructure improvements. House Act 1002 sets certain funding measures that may not be as subject to administration impacts.	Medium	Medium	-0.360	Exploit	Communicate priorities, assumptions, and condition results of TAMP to new administration. Cross-training of internal DOT staff.
3	Threat	Federal Legislation Changes	TAMP guidelines are based upon existing federal legislation. New bills may modify the requirements for the TAMP. Assumption is that new legislation is likely, but the amount of change to the current TAMP assumptions is low.	High	Low	0.320	Accept	Monitor federal legislation changes.
4	Threat	Staff Changeover and Institutional Knowledge Loss	TAMP relies on good data collection and interpretation to make informed decisions. Loss of staff that have a specialized role to provide this information could disrupt the timeliness and accuracy of the decision making. Impacts ability to forecast future conditions and efficacy of TAMP as a planning document. INDOT has developed a dedicated group for asset management.	High	Low	0.320	Mitigate	Improve documentation and formal guidance for asset management. Perform cross-training of staff on data collection and interpretation as it relates to AM objectives and decisions.
5	Threat	INDOT Leadership Acceptance of TAMP	The TAMP includes assumptions and formulizing responsibilities for the asset management policies based on Federal guidelines. INDOT leadership may not understand and buy-in to the policies being assumed. This can impact the ability of plan implementation and resourcing. Includes potential that District management aligns with Central Office.	Low	Low	0.160	Mitigate	Ensure proper documentation and information outreach regarding plan objectives, policies, and procedures.

(Continued on page 7-6)

Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T. Risk Description	Probability	Impact	Risk Priority	Risk Response Strategy	Action Plan
6	Opportunity	Process Documentation and Formulization	INDOT has a history of asset management and proactive scheduled maintenance programs. The TAMP provides an opportunity to formulize the policies and align multiple departments and stakeholders into a cohesive plan.	High	Low	-0.320	Enhance	Improve documentation and formal guidance for asset management. Perform cross-training of staff on TAMP policies and procedures.
7	Threat	Generalized Modeling in Asset Management System	TAMP has made certain assumptions based on the asset management system modeled at a high-level. Project-specific scope may differ from treatments modeled in the asset management system. Limitations of the model. TAMP includes both initial modeling, asset management team selection of projects, and remodeling based upon project selections. Impact may be more of an issue for roadway projects than bridge projects.	Low	Medium	0.240	Accept	Continue to engage asset management teams to verify asset management system assumptions and adjust the model accordingly.
8	Threat	Data Information Accuracy	Asset management projections and assumptions are currently based upon automated and visual inspection and BIAS data. More in-depth inspections may modify plan assumptions. Network numbers of constructed assets (i.e. lane miles of pavement type) may not match actuals in the field. Bridge information is limited due to lack of accuracy in the condition assessment. The quality of the information ties directly into the design of the treatments selected.	Medium	Low	0.240	Mitigate	Adjust the inventory information using actual survey information. Track award costs and feed back into DTIMS. Perform additional testing to supplement condition assessment inspections currently used for TAMP.
9	Threat	Cost Estimate Accuracy	Initial estimates for projects are developed based upon high-level of information and scope assumptions. Further project development can change the assumptions and result in estimate modifications. For example, early estimates for maintenance of traffic (MOT) may not accurately reflect the costs that will eventually be required once MOT plans are developed. Cost assumptions for standardized treatments in the TAMP may not accurately reflect average costs in the field. Area cost factors vary across the state.	High	Medium	0.480	Mitigate	Review actual in-place construction costs compared to planning estimates to verify accuracy and adjust accordingly.
10	Threat	Commodity Prices	Fluctuations in commodity prices for key elements and material availability could impact total program costs. INDOT purchases data on global insights to model the trends in primary commodities. These are used to inform the active project estimates and adjust accordingly.	Low	Medium	0.240	Accept	Monitor price fluctuations using Global Insight during estimate updates.

(Continued on page 7-7)

Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T. Risk Description	Probability	Impact	Risk Priority	Risk Response Strategy	Action Plan
11	Threat	Construction Industry Capacity / Availability	The availability of contractors and skilled labor and their capacity/ interest to take on preservation work may impact the number of bidders and bid prices. Lack of competition amongst the construction industry may result in overall higher program costs.	Medium	Medium	0.360	Mitigate	Contractor outreach and provide information of program opportunities. Program incentives to attract contractors. Work with contractors to recruit quality staffing.
12	Threat	Right of Way Availability	TAMP assumes that ROW is available. There are potential disconnects in the ROW needed to accomplish projects and what is actually owned by the Department. Acquisition of additional ROW can impact both costs and schedule of projects.	High	Medium	0.480	Mitigate	Improve documentation of available ROW and asset management project needs. Tie ROW into the asset management system database.
13	Opportunity	Inform Staff Resourcing Needs	The TAMP could be used to inform the resourcing needs of the Department based upon the project informational and project delivery needs.	Medium	Low	-0.240	Exploit	Use TAMP as informational resource to employee staffing needs.
14	Threat	Preservation Treatment Performance	TAMP has assumed certain life cycle for given treatments. Risk is that the assets do not have the life assumed due to the ineffectiveness of the treatment technology or that the treatment did not have the life that was assumed. This is reliant on quality and appropriateness of the design and quality control of construction activities. Risk is that the treatments do not have the life assumed.	High	High	0.640	Mitigate	Staff training and authority to correct quality issues in the field, construction training and resources, enhanced technology for inspections to verify construction. Support for quality control decisions.
15	Opportunity	Changes in Material Technology	Material technology continues to improve leading to better resiliency of the assets.	Medium	Medium	-0.360	Exploit	Openness to new technologies, develop specifications to allow new technologies, develop testing protocols to prove effectiveness.
16	Threat	Routine Maintenance Not Performed	TAMP assumes certain routine maintenance activities will be performed in order to meet projections for deterioration and life expectancies. Risk is that these activities (crack sealing, minor patching, deck cleaning and flushing, etc.) are not performed at the levels of regularity needed. Risk is also that the funding for maintenance needs is not provided.	Medium	High	0.480	Mitigate	Document routine maintenance activities expected, Monitor routine maintenance program. Prepare business case for the need for maintenance funding in order to meet asset management condition goals.

(Continued on page 7-8)

Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T. Risk Description	Probability	Impact	Risk Priority	Risk Response Strategy	Action Plan
17	Threat	Additional Assets Included In TAMP	TAMP originally included only pavement and bridges. There is potential that certain additional elements such as culverts and slope stability walls are assumed significant enough to be included in the TAMP and would be covered by the program funds.	High	Medium	0.480	Accept	Inventory all major assets, determine condition and need for being included in TAMP
18	Opportunity	Mobility & Safety Projects	TAMP does not include the improvements made to the assets performed as part of separate Mobility and Safety Projects. These projects often result in pavement improvements that would then not be subject to rehab as part of TAMP funding.	High	Medium	-0.480	Share	Coordinate with Mobility and Safety Projects and incorporate into Asset Management System Database.
19	Threat	Regulatory Requirements Changes	Potential that projects will be subject to different regulatory requirements than what is currently assumed. This could result in increased costs to the program to meet the new requirements. Examples include new environmental and ADA requirements.	Medium	Medium	0.360	Accept	Monitor plan against potential regulatory requirement changes.
20	Threat	Staffing Resources	Implementation of the TAMP assumes certain levels and capabilities of staffing resources, all heavily reliant on the personnel implementing the program. If these resources are not readily available or the skills needed are not provided, the execution of the plan may be impacted through reduced quality, less efficiency, and potential errors and missed opportunities.	High	Very High	0.800	Mitigate	Communicate and document the staffing requirements needed to effectively execute the plan. Develop employee attraction and retention programs. Ensure training of staff relative to program history and objectives. Acquire and utilize technology to assist staffing resources.
21	Threat	Equipment Limitations	Executing the TAMP requires certain equipment to perform the data collection and install treatments. Limitations in the availability of this equipment can result in needing additional staff, delayed maintenance, and increased deterioration of the assets.	Low	Medium	0.240	Accept	Document and communicate the equipment needs for effectively executing the TAMP.
22	Threat	Transportation Technology Changes	As technology changes, there may be changes relative to the use of autonomous vehicles, truck platooning, or other transportation technologies that change the design criteria, staffing needs, and ITS/ technology infrastructure. Information on what these changes will be is not currently available. This risk is assumed to be low priority within the 10 year timeframe of the TAMP, but greater potential over the longer term.	Low	Low	0.160	Accept	Monitor technology developments. Adjust design criteria and requirements accordingly.

(Continued on page 7-9)

Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T. Risk Description	Probability	Impact	Risk Priority	Risk Response Strategy	Action Plan
23	Opportunity	Transportation Technology Changes	As technology changes, there may be changes relative to the use of autonomous vehicles, truck platooning, or other transportation technologies that change the design criteria, staffing needs, and ITS/ technology infrastructure. Information on what these changes will be is not currently available. This risk is assumed to be low priority within the 10 year timeframe of the TAMP, but greater potential over the longer term.	Low	Low	-0.160	Accept	Monitor technology developments. Adjust design criteria and requirements accordingly.
24	Opportunity	Over-sized / Over-weight Vehicle Permitting	INDOT is currently evaluating the damage inflicted due to over-sized or over-weight vehicles and adjusting the fees paid accordingly. This could provide an additional funding source for the TAMP.	Low	High	-0.320	Accept	Evaluate revenue potential from permit fee modifications as source of TAMP revenue. Increase enforcement resources.
25	Opportunity	Fuel Price Fluctuations	Fuel prices have been relatively low recently. Rising fuel price can result in fewer traffic volumes, resulting in less deterioration of the assets. This is somewhat offset by the potential reduction in gas tax revenue.	Low	Medium	-0.240	Accept	Monitor fuel prices on plan objectives and modify plan accordingly.
26	Threat	Federal Revenue for TAMP Funding	Potential that the revenue provided by Federal Government to INDOT is less than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to Continuing Resolutions, Highway Trust Fund solvency, and less revenue from fuel taxes.	Medium	High	0.480	Mitigate	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.
27	Threat	State Revenue for TAMP Funding	Potential that revenue provided by State Government to INDOT is less than estimated amounts over the life of the TAMP. Minimum match with Federal funds must be met first. Fluctuations in revenue can be attributed to the economy and sales taxes, gas tax revenue, and tolling.	Medium	Very High	0.600	Mitigate	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.
28	Opportunity	Federal Revenue for TAMP Funding	Potential that the revenue provided by Federal Government to INDOT is more than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to Continuing Resolutions, Highway Trust Fund solvency, and less revenue from gas taxes.	Low	High	-0.320	Enhance	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.

(Continued on page 7-10)

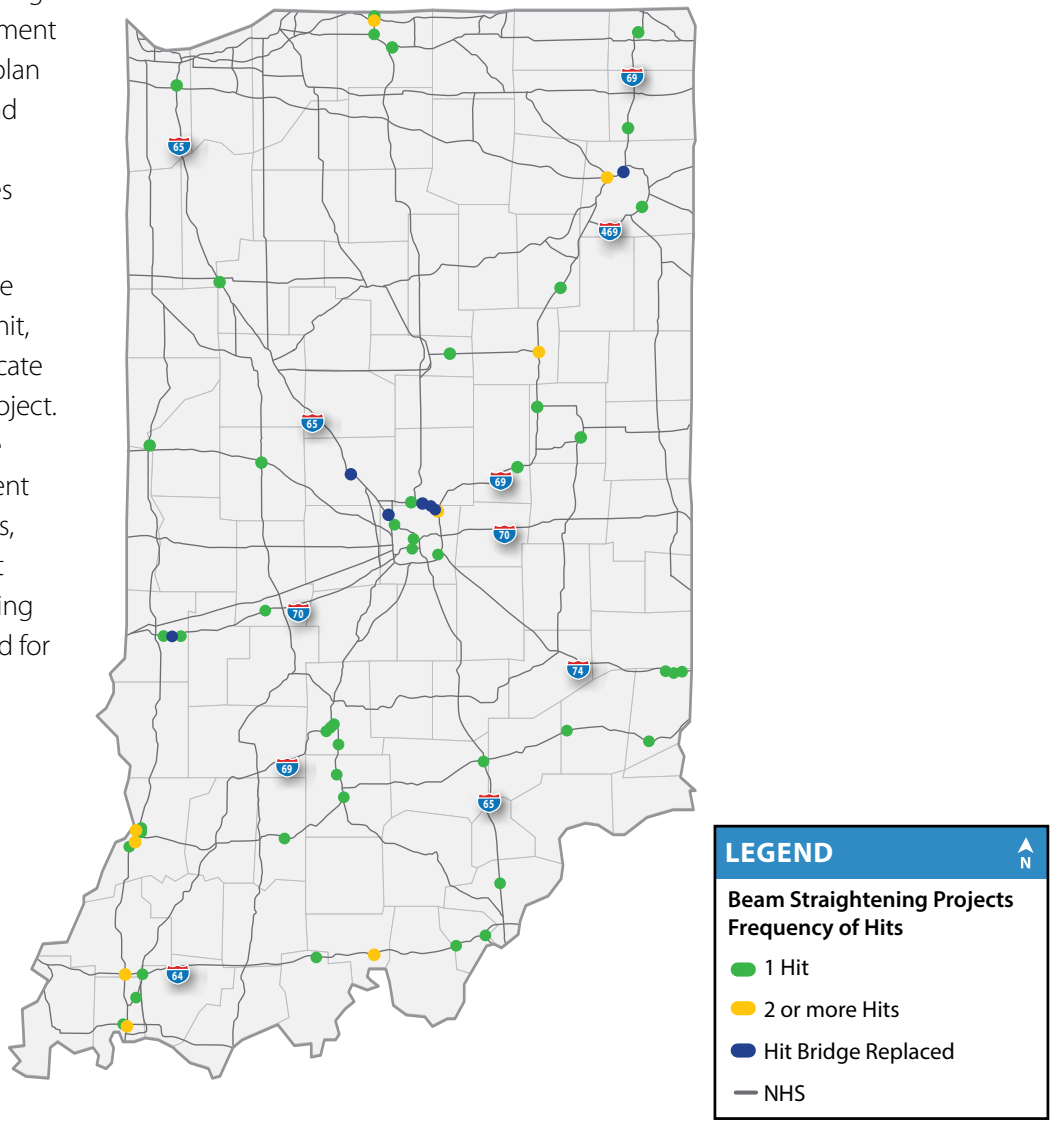
Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T. Risk Description	Probability	Impact	Risk Priority	Risk Response Strategy	Action Plan
29	Opportunity	State Revenue for TAMP Funding	Potential that revenue provided by State Government to INDOT is more than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to the economy and sales taxes, gas tax revenue, and tolling.	Low	Very High	-0.400	Enhance	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.
30	Threat	Federal Discretionary Grant Programs	Federal Discretionary Grant Programs may reduce available funding from the Federal Government for TAMP projects. Grant Programs may have specific restrictions and guidelines that would also result in less funding control by the State to select which projects are funded.	Low	High	0.320	Mitigate	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability.
31	Opportunity	Federal Discretionary Grant Programs	Federal Discretionary Grant Programs may provide additional funding from the Federal Government for TAMP projects.	Low	High	-0.320	Enhance	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability.
32	Threat	State Highway Funding Non-TAMP Projects	Potential that other projects are funded from the State Highway Fund that reduce the availability of funding for TAMP projects. Correlates with Federal and State Administration Changes risk.	Low	Medium	0.240	Mitigate	Use TAMP as informational resource to inform benefits and needs for pavement and bridge preservation projects.
33	Threat	State Legislation Impacts TAMP Funding	State Highway Fund availability may be limited by legislative changes to the revenue that is used to feed the fund.	Medium	Medium	0.360	Mitigate	Use TAMP as informational resource to inform benefits and needs for pavement and bridge preservation projects.
34	Opportunity	Communication with Customers	The TAMP provides an opportunity and a means for establishing communication with customers, stakeholders, decision makers, advocacy groups, and the general public on the benefits of asset management projects and the needs for funding the program.	High	High	-0.640	Exploit	Develop outreach protocols, presentations, and stakeholder input opportunities to inform TAMP.
35	Opportunity	Stakeholder and MPO Involvement	Opportunity for stakeholders and MPOs to provide input into the development of the TAMP to better inform the decisions and priorities for the TAMP. MPOs have a relatively low amount of total ownership of INDOT assets, thus this is assumed to be a low risk for the TAMP.	Low	Very Low	-0.080	Exploit	Develop outreach protocols, presentations, and stakeholder input opportunities to inform TAMP.
36	Threat	Traffic Demand Model	TAMP currently does not include traffic demand models in the projections of possible condition impacts related to traffic volumes. Potential that the condition assumptions will be worse than assumed based upon higher truck traffic volumes than are currently assumed.	Low	Low	0.160	Exploit	Opportunity is to use available traffic demand models to better inform the TAMP projections on asset conditions.

How has INDOT addressed the Part 667 Requirement?

INDOT must account for emergency situations that include roadway flooding and washouts, oversize vehicles hitting overhead bridges, and road settlement due to underlying soil instability. While emergency events are difficult to plan for, INDOT has performed a comprehensive evaluation of its pavement and bridges to identify such facilities that have been damaged by emergency events, as per 23 CFR Part 667. Specifically, INDOT closely monitors facilities that have been repeatedly damaged.

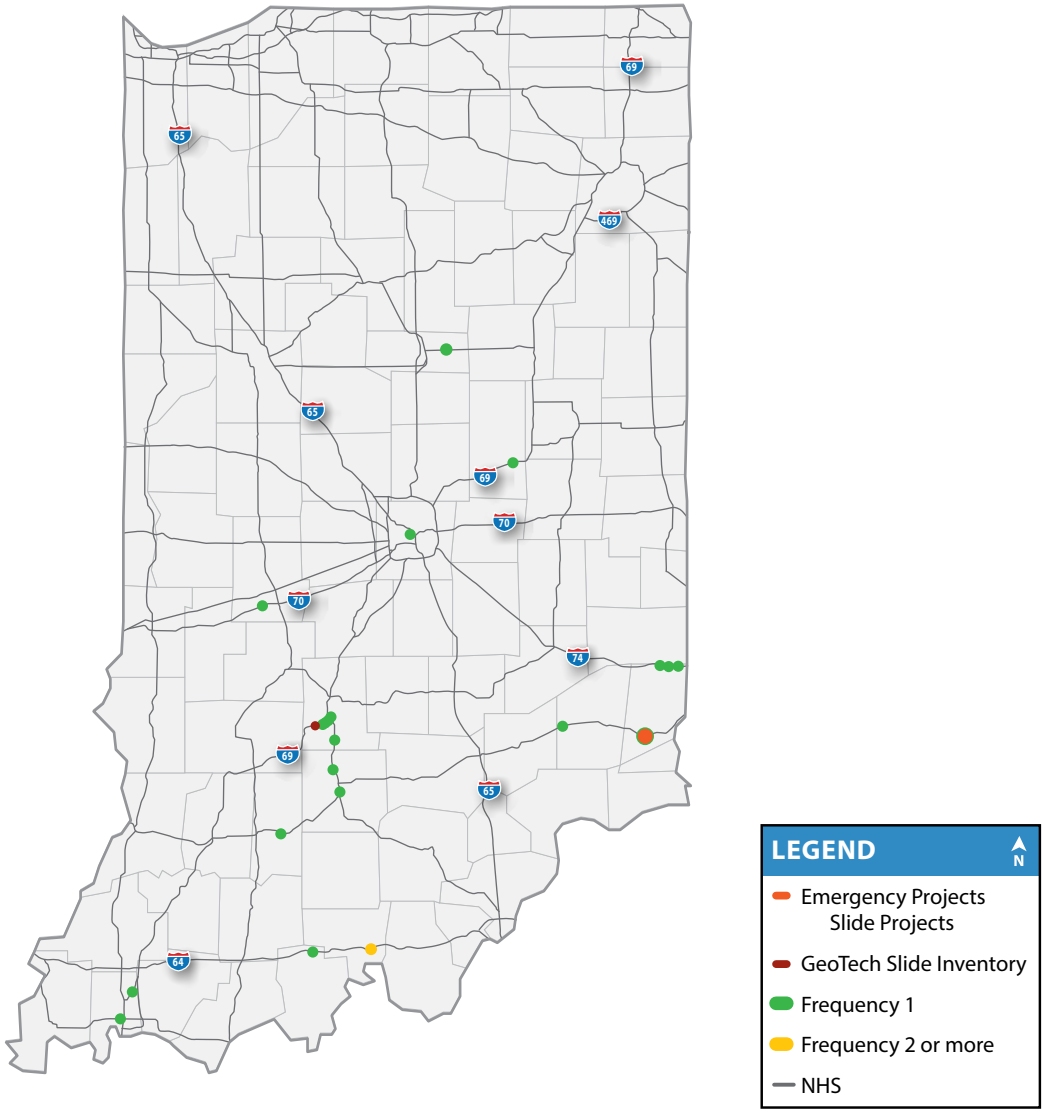
As shown in **Figure 17**, INDOT has identified bridges on the NHS that have required emergency repair due to being hit since 1998. When a bridge is hit, INDOT considers a beam straightening repair project. The green dots indicate bridges that have been hit once and repaired by a beam straightening project. The bridges represented by yellow dots have experienced more than one bridge hit. INDOT has deemed a beam straightening repair project sufficient to repair these bridges. However, when a bridge is subject to repeated hits, INDOT considers replacing and raising the bridge. INDOT determined that the bridges indicated by the blue dots required a full replacement, including raising the bridge, due to repeat hits. Emergency Relief funding is not used for projects to repair bridges after a hit.

Figure 17: NHS Bridge Hits



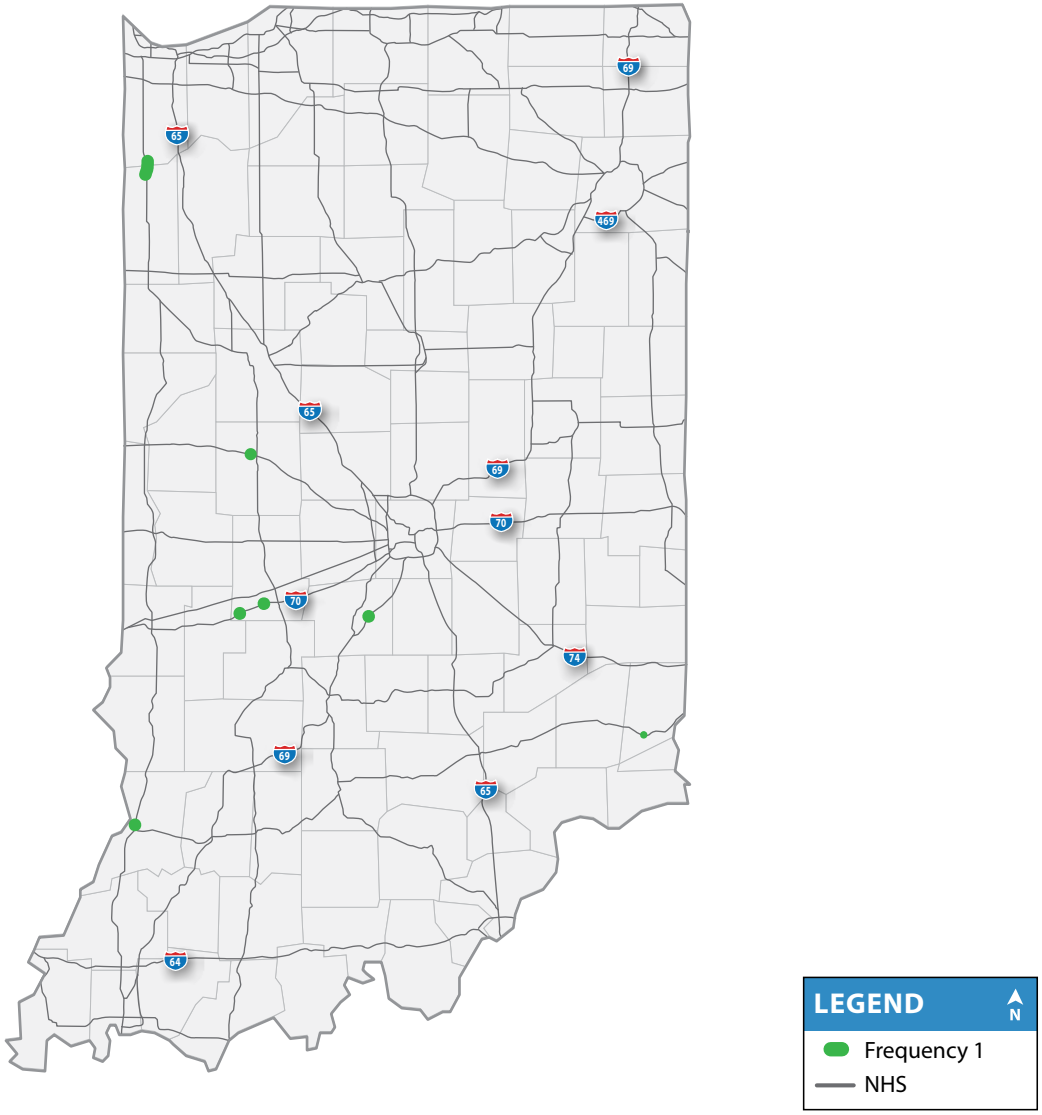
INDOT also analyzes repairs or reconstruction required for slide events. The Geotechnical Services Office of INDOT maintains an inventory of roadway slides and monitors the locations regularly. **Figure 18** shows INDOT's history of slide events on the NHS since 1998. The orange dots on the figure indicate slide correction projects for which Emergency Relief funding was used. The red dots indicate slides that have not required correction yet, but INDOT is monitoring these slides. The green dots represent slides that have required one correction project. And the yellow dots indicate a slide that has required more than one correction project. As shown on the figure, only one location along Interstate 64 has required repeated repair. In this instance, INDOT has performed a more substantial and permanent repair. Emergency Relief funding is only used for slide correction projects indicated with an orange circle.

Figure 18: NHS Slide Map



Other emergency repairs are those for which INDOT has received FHWA Emergency Relief (ER) funding. **Figure 19** shows the analysis INDOT completed to identify locations requiring emergency repairs since 1996. The green dots on the map indicate a location which has required ER funding on one occasion. All but one of these emergency repairs occurred since 2008 when Indiana experienced major flooding prompting the need for ER funding. Indiana does not have any locations along the NHS that have required ER funding for repeated emergency repairs.

Figure 19: NHS Emergency Relief Projects



Who is responsible for asset management at INDOT?

INDOT's Program Management Group (PMG) and Asset Management Teams are responsible for overseeing the asset management implementation process. Each Asset Management Team is overseen by the PMG as shown in **Figure 20**.

Figure 20: PMG and Asset Management Team Organizational Chart

The PMG is a select, diverse group of management from throughout INDOT who are involved with providing overall guidance and direction on the development and implementation of the Asset Management Program. The PMG is responsible for the following:

- Ensures that adequate funding and resources are available for Asset Management Program implementation and overall Asset Management Program development.
- Coordinates between Asset Teams to analyze trade-offs while developing investment strategies.
- Plays an active role in the key decision making, stakeholder management, risk management and issue resolution, removing obstacles and providing direction pertaining to the Asset Management strategy where necessary.
- Takes any action necessary to ensure the smooth integration of tactics and strategies within and between projects.
- Provides support and direction for Asset Management practices at the District-level.
- Monitors progress and performance of the plans for Asset Management Program development & implementation.
- Ensures consistency of asset management approaches across the Districts.

The PMG initially sets the budget for each asset team. On an annual basis, the Asset Management teams will use the pavement and bridge models to analyze the current and future conditions and compare those conditions to the planned conditions. If there are trends identified that affect an asset class in a positive or negative way, the PMG and Asset Management team leadership will adjust funding levels accordingly to meet and maintain goals.

Over the next 10 years, INDOT expects to add up to 250 additional lane miles of new pavement and up to 350,000 square feet of new bridge deck. Some of these additional assets will be offset by relinquishing some existing inventory. INDOT's projected funding and asset management practices will accommodate the addition of these new assets, as our financial plan accounts for these additional assets, while maintaining its existing roads and bridges in a state of good repair.

The PMG, with input from the Asset Teams, determines which projects in order of ranking are able to be completed based on the cost of the project and the available funding. The PMG then analyzes the entire program for final approval using the following variables:

a. Safety
b. Congestion
c. Environment sustainability
d. System reliability
e. Regional and state economic vitality
f. Potential intermodal connectivity
g. Total cost of ownership

By considering these variables during the project prioritization process, the PMG ensures projects make progress toward achieving the national goals outlined in USC 150(b). These goals include improving safety conditions on all public roads, maintaining infrastructure in a state of good repair, reducing congestion on the NHS, improving efficiency of the transportation system, improving accessibility of trade markets and supporting regional economic development, protecting and enhancing the environment, and reducing delays associated with project completion.

The PMG and Asset Management Team roles are listed in **Table 29**.

In addition to the voting members in **Table 29**, the PMG includes support members with responsibilities ranging from public involvement, to maintenance and operations, to real estate. Certain stakeholder partners also act as supporting members, such as Conexus Indiana, FHWA, MPOs, RPOs, and legislative affairs.

Table 29: Asset Management Roles

Role	Organizational Unit
Chair	Program Management Group
Vice-Chair	Program Management Group
District Rep., Executive Leadership	Program Management Group
District Rep, Technical Services	Program Management Group
District Rep, Capital Program Management	Program Management Group
Capital Program Management	Program Management Group
Capital Funds Management	Program Management Group
Bridge Assets	Program Management Group
Road & Pavements Assets	Program Management Group
Traffic Engineering	Program Management Group
Director	Asset Planning & Management Division
Bridge Asset Team Chair	Bridge Asset Management Team
Mobility Asset Team Chair	Mobility Asset Management Team
Roadway Asset Team Chair	Roadway Asset Management Team
Safety Asset Team Chair	Safety Asset Management Team

How will INDOT continue to improve its asset management practices?

In an effort to continually improve processes and practices, INDOT has conducted an asset management capability-maturity assessment, which led INDOT to develop its Strategic Asset Management Plan (SAMP) among other identified near-term improvement initiatives. Initiatives to improve asset management practices include:

- **Develop an asset management training program.** The program will be focused on training INDOT staff on asset management good practice across transportation and other industries. The training program will go beyond the tactical elements of asset management to provide a broader view of the end-to-end asset management process.
- **Define high priority business processes.** Each business process will be developed with specific working group teams who will provide guidance.
- **Implement a communication and change management plan.** INDOT will focus on developing content for the internal INDOT asset management webpage and the external asset management webpage.
- **Write a district-specific asset management plan for each of INDOT's six districts.** The district asset management plans fall under the purview of the SAMP and will contribute to furthering asset management practices throughout the state.
- **Revise the bridge and pavement asset life cycle strategies.** Better asset life cycle strategies will further optimize how the dTIMS software incorporates data and determines appropriate treatments for assets.
- **Outline an asset information strategy and data collection plan**. The goal of this plan is to create a more standardized approach for data collection.
- **Continue development of the asset-level risk management processes.** Continual improvements to asset-level risk management practices are critical to the success of the asset management program.

While INDOT has initially identified these seven initiatives to improve its asset management program, INDOT will continue to assess its asset management practices for additional ways to improve.

State Road 62 roundabouts at State Road 265, west of Lewis and Clark bridge in Clark County

Federal TAMP Development Processes Certification Guidance

The following table illustrates how INDOT has addressed the TAMP development processes required for certification by FHWA.

Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
TAMP Approved by Head of State DOT (23 CFR 515.9(k))	Does the TAMP bear the signature of the head of the State DOT?	Approval page with Commissioner's signature.	**Bridges & Pavement:** II
State DOT has Developed its TAMP Using Certified Processes (23 CFR 515.13(b))	Do the process descriptions align with the FHWA-certified processes for the State DOT? [If the process descriptions do not align with the FHWA-certified processes, the State DOT must request recertification of the new processes as amendments unless the changes are minor technical corrections or revisions with no foreseeable material impact on the accuracy and validity of the processes, analyses, or investment strategies. State DOTs must request recertification of TAMP development processes at least 30 days prior to the deadline for the next FHWA TAMP consistency determination as provided in 23 CFR 515.13(c).]	Processes are described throughout the entire TAMP.	**Entire TAMP**
	Do the TAMP analyses appear to have been prepared using the certified processes?	Processes are described throughout the entire TAMP.	**Entire TAMP**

(Continued on page A-2)

Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
TAMP includes the required content as described in 23 CFR 515.9(a)-(g) (23 CFR515.13(b))	Does the TAMP include a summary listing of NHS pavement and bridge assets, regardless of ownership?	Inventory of all bridges and pavement owned by INDOT and bridges and pavement on the NHS owned by other entities.	**Bridges:** 2-1 to 2-2 **Pavement:** 4-1 to 4-2
	Does the TAMP include a discussion of State DOT asset management objectives that meets requirements?	INDOT established five core principles for transportation asset management.	**Bridges & Pavement:** 1-1
	Does the TAMP include a discussion of State DOT measures and targets for asset condition, including those established pursuant to 23 U.S.C. 150, for NHS pavements and bridges, that meets requirements?	INDOT has 10 year asset management condition targets and 2 and 4-year condition targets based on FHWA condition rating system for bridges and pavement.	**Bridges:** 2-4 **Pavement:** 4-4
	Does the TAMP include a summary description of the condition of NHS pavements and bridges, regardless of ownership, that meets requirements?	Condition of bridges and pavement provided both graphically and explained in text.	**Bridges:** 2-5 **Pavement:** 4-5
	Does the TAMP identify and discuss performance gaps?	Performance gaps are identified as bridges or pavement not meeting the condition targets. These pages discuss how INDOT's current bridge and pavement conditions compare to the condition targets.	**Bridges:** 2-6 **Pavement:** 4-6
	Does the TAMP include a discussion of the life- cycle planning that meets requirements, including results?	Lifecycle planning (LCP) process is described for bridges and pavement. Five steps of the LCP process from FHWA guidance are indicated throughout the LCP discussion.	**Bridges:** 2-6 to 2-11 **Pavement:** 4-6 to 4-9 **Bridges & Pavement:** 6-8 to 6-9
	Does the TAMP include a discussion of the risk management analysis that meets requirements?	This section details the risk workshop that INDOT set up, how risks relate to asset management, how INDOT is identifying, assessing, and prioritizing asset management risks, as well as how INDOT is addressing and monitoring asset management risks. INDOT has identified its highest priority risks and included the entire risk register from the workshop.	**Bridges & Pavement:** 7-1 to 7-13
	Does the TAMP include the results of the evaluations of NHS pavements and bridges pursuant to 23 CFR part 667?	INDOT has identified bridge hits along the NHS, slide correction projects along the NHS, and projects requiring Emergency Relief (ER) funding.	**Bridges & Pavement:** 7-11 to 7-13
	Does the TAMP include a discussion of a 10- year Financial Plan to fund improvements to NHS pavements and bridges?	INDOT has portioned bridge and pavement treatments according to FHWA's 5 work types. The capital investment by FHWA work type and in-house maintenance and preservation investment by FHWA work type are provided. INDOT also includes the percent breakdown by work type of the total investment amount.	**Bridges & Pavement:** 6-4 to 6-9
	Does the TAMP identify and discuss investment strategies the State intends to use for their NHS pavements and bridges?	Investment strategies based on the bridge business rules and pavement business rules are outlined in the TAMP.	**Bridges:** 2-9 **Pavement:** 4-8

(Continued on page A-3)

Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
TAMP Includes the Required Content as Described in 23 CFR 515.9(a)-(g) (23 CFR515.13(b))	Does the TAMP include a discussion as to how the investment strategies make or support progress toward achieving and sustaining a desired state of good repair over the life cycle of the assets?	The investment strategies support the project prioritization process where INDOT ensures projects make progress toward achieving the national goals in accordance with 23 USC 150(d). One of the goals that INDOT places an emphasis on is maintaining its infrastructure in a state of good repair.	**Bridges:** 2-9 to 2-11 **Pavement:** 4-8 to 4-9
	Does the TAMP include a discussion as to how the investment strategies make or support progress toward achieving the State's targets for asset condition and performance of the NHS in accordance with 23 USC 150(d)?	The investment strategies support the project prioritization process where INDOT ensures projects make progress toward achieving the national goals in accordance with 23 USC 150(d).	**Pavement:** 4-7 to 4-9
	Does the TAMP include a discussion as to how the investment strategies make or support progress toward achieving the national goals identified in 23 USC 150(b)?	Project prioritization processes include a discussion of how INDOT ensures projects make progress toward achieving the national goals.	**Bridges:** 2-10 **Pavement:** 4-9
	Does the TAMP include a discussion as to how the TAMP's life-cycle planning, performance gap analysis, and risk analysis support the State DOT's TAMP investment strategies?	The TAMP discusses the lifecycle planning process, how performance gaps are identified, and how INDOT has analyzed risks related to asset management. All of these activities feed into the project prioritization process to ensure that the investment strategies take these activities into account.	**Bridges:** 2-6 to 2-7 **Bridges:** 2-11 **Pavement:** 4-6 to 4-7 **Pavement:** 4-9 **Bridges & Pavement:** 7-3

(Continued on page A-4)

Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
Inclusion of Other Assets in the TAMP in 23 CFR 515.9 (I) (continued)	If applicable, does the TAMP include a summary listing of other assets,[40] including a description of asset condition?	N/A	N/A
	If applicable, does the TAMP identify measures and State DOT targets for the condition of other assets?	N/A	N/A
	If applicable, does the TAMP include a performance gap analysis for other assets?	N/A	N/A
	If applicable, does the TAMP include a discussion of life cycle planning for other assets?	N/A	N/A
	If applicable, does the TAMP include a discussion of a risk analysis for other assets that meets requirements in 23 CFR 515.9(I)(5)?	N/A	N/A
	If applicable, does the TAMP include a financial plan to fund improvements of other assets?	N/A	N/A
	If applicable, does the TAMP include investment strategies for other assets?	N/A	N/A
Integration of TAMP into Transportation Planning Processes that Lead to the Statewide Transportation Improvement Program (STIP) (23 CFR 515.9(h))	Do State DOT planning documents or records of planning activities show that the TAMP was integrated into its transportation planning processes that lead to the STIP?	Not within TAMP, Consistency Determination Documentation submitted separately.	N/A

[40] If the State DOT wants to address other assets without subjecting those assets to section 515.7 or 515.9(I) analyses, the State DOT can group such assets and identify them as assets outside the TAMP (e.g., "other assets", "non-TAMP assets", "other safety related assets", etc.). State DOTs may identify these other types of assets with their respective funding needs in a separate table or general discussion, but should clearly note that the TAMP framework was not used to arrive at the estimated funding needs/allocations for those non-TAMP assets.

(Continued on page A-5)

Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
TAMP Available to the Public (23 CFR 515.9(i))	Has the State DOT made its TAMP available to the public by posting on its website, or distributing in public meetings, or by some other means?	Final TAMP will replace Initial TAMP online.	N/A
State DOT Demonstrates Through Current and Verifiable Documentation that it has Implemented a TAMP Meeting Requirements of 23 U.S.C. 119 And 23 CFR Part 515 and that the State DOT is Following the Investment Strategies in the TAMP (23 CFR 515.13(b)(2))	Has the State DOT documented evidence that the State DOT is using the TAMP investment strategies? (23 CFR 515.13(b)(2)). The best evidence is that, for the 12 months preceding the consistency determination, there was alignment between the actual and planned levels of investment (in the TAMP) for various work types as defined in 23 CFR 515.5 (i.e., initial construction, maintenance, preservation, rehabilitation and reconstruction) (23 CFR 515.13(b)(2)(i))?	Not within TAMP, Consistency Determination Documentation submitted separately.	N/A
	If the State DOT deviated from the TAMP investment strategies, did they document reasons the deviation(s) were necessary due to extenuating circumstances beyond the State DOT's reasonable control[41] (23 CFR 515.13(b)(2)(ii)).	Not within TAMP, Consistency Determination Documentation submitted separately.	N/A

[41] The determination of whether there are extenuating circumstances is a case-by-case decision that is highly dependent on the facts. The State DOT must show the deviation from its TAMP investment strategies was the result of circumstances beyond its reasonable control. In cases where the State DOT believes extenuating circumstances have caused it to deviate from the investment strategies in its TAMP, the State DOT should provide an explanation of the extenuating circumstances, the impacts, the State DOT's efforts to avoid or offset the changes and impacts, and program changes

Bridge and Pavement Decision Trees

The tables below provide the triggers, treatments, and resets that comprise the decision trees within dTIMS. For example, an International Roughness Index (IRI) above 150 along with a rutting (RUT) score below 0.35 will trigger an HMA Pavement (PM) Overlay treatment in dTIMS. The HMA PM Overlay treatment will cost $130,000 and reset the section of pavement being analyzed to an IRI of 70, RUT and Functional Index (FI) of 0, and reset the Structural Index (SI) to 50 percent of its value prior to treatment.

Table B-1: HMA Pavement Triggers

Treatment	Trigger 1 (NON-IN)	Trigger 2	Trigger 3
Chip Seal	IRI < 120		
	Rut < 0.25		
	3 < FI > 65		
	SI < 5		
HMA Thin Overlay	IRI < 120		
	Rut < 0.20		
	15 < FI < 40		
	SI < 5		
HMA PM Overlay	IRI > 150	IRI = Any	Total % Poor IRI > 30% of limits
	Rut < 0.35	Rut < 0.35	Rut < 0.35
	FI = Any	FI > 50	FI = Any
	SI = Any	SI < 10	SI < 10

Treatment	Trigger 1 (NON-IN)	Trigger 2	Trigger 3
HMA Minor Structural Overlay	IRI = Any	IRI = Any	
	Rut = Any	Rut >= 0.4	
	FI = Any	FI = Any	
	10 < SI < 20	SI = Any	
HMA Major Structural	IRI = Any		
	Rut = Any		
	FI = Any		
	SI > 20		
Pavement Replacement	IRI = Any		
	Rut = Any		
	FI = Any		
	SI > 20		

Table B-2: HMA Pavement Treatments and Resets

Treatment	Description	Typical Cost/ Lane Mile	Condition	Reset
Chip Seal	Surface seal	$12,000	IRI	No Change
			Rut	No Change
			FI	35% of value at treatment
			SI	No Change
HMA Thin Overlay	3/4" thin layer of HMA	$75,000	IRI	70
			Rut	0
			FI	35% of value at treatment
			SI	No Change
HMA PM Overlay	1.5" single layer of HMA	$130,000	IRI	70
			Rut	0
			FI	0
			SI	50% of value at treatment
HMA Minor Structural Overlay	3-5" two layers of HMA	$300,000	IRI	70
			Rut	0
			FI	0
			SI	30% of value at treatment
HMA Major Structural	Three or more layers of HMA	$450,000	IRI	70
			Rut	0
			FI	0
			SI	10% of value at treatment
Pavement Replacement	Complete replacement of entire pavement structure	$1,500,000	IRI	70
			Rut	0
			FI	0
			SI	0

Table B-3: Concrete Pavement Triggers

Treatment	Trigger 1 (NON-IN)
Concrete Pavement Preservation	IRI < 130
	Faulting < 0.25
	FI < 5
	SI < 5
Concrete Pavement Restoration	IRI > 130
	Faulting < 0.25
	FI < 10
	5 < SI < 30
Concrete Overlay	IRI = Any
	Faulting = Any
	FI > 10
	SI < 30
Pavement Replacement	IRI > 200
	Faulting = Any
	FI > 10
	SI < 30

Table B-4: Concrete Pavement Treatments and Resets

Treatment	Description	Typical Cost/ Lane Mile	Condition	Reset
Concrete Pavement Preservation	Partial depth patching, joint resealing, profile grinding	$150,000	IRI	70
			Faulting	0
			FI	0
			SI	No Change
Concrete Pavement Restoration	Full depth patching, plus preservation treatments shown above	$250,000	IRI	70
			Faulting	0
			FI	0
			SI	0
Concrete Overlay	Overlay existing concrete pavement with HMA or concrete.	$450,000	IRI	70
			Faulting	0
			FI	0
			SI	0
Pavement Replacement	Complete replacement of entire pavement structure	$1,500,000	IRI	70
			Faulting	0
			FI	0
			SI	0

Table B-4: Concrete Pavement Treatments and Resets

Treatment	Description	Typical Cost/ Lane Mile	Condition	Reset
Thin Deck Overlay	A crack sealing epoxy and aggregate	Wearing Surface	Between 6.0 and 8.0	Hold condition for 5 years
		Deck	>= 5.6	Same
		Superstructure	> 4.0	Same
		Substructure	> 4.0	Same
Rigid Deck Overlay	Dense concrete overlay of existing bridge deck	Wearing Surface	Between 2.5 and 6.5	9
		Deck	>= 5.0	Same
		Superstructure	> 4.0	Same
		Substructure	> 4.0	Same
Deck Replacement	Total replacement of deck	Wearing Surface	Any	9
		Deck	< 5.5	9
		Superstructure	> 4.5	Same
		Substructure	> 4.5	Same

Treatment	Description	Typical Cost/ Lane Mile	Condition	Reset
Superstructure Replacement	Total replacement of superstructure and deck	Wearing Surface	Any	9
		Deck	Any	9
		Superstructure	< 5.5	9
		Substructure	> 4.5	Same
Bridge Replacement	Complete replacement of bridge	Wearing Surface	Any	9
		Deck	Any	9
		Superstructure	Any	9
		Substructure	<= 4.5 OR both Super and Sub < 5.5	9
Bridge Culvert Replacement		Culvert Rating	< 5.0	9

FHWA Work Types

FHWA has defined five work types as overarching categories of treatments: maintenance, preservation, rehabilitation, reconstruction, and construction. **Table C-1** provides a complete listing of all treatment types found in INDOT's Scheduling Project Management System (SPMS) for pavement and bridge projects that correspond with the five FHWA work t ype categories.

Table C-1: INDOT Treatment Type to FHWA Work Type Mapping

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Maintenance	Bridge Deck Patching	C112
Maintenance	Bridge Maintenance And Repair	C700
Maintenance	Repair Or Replace Joints	C711
Maintenance	Straighten Beam	C712
Maintenance	Railing Replace Or Repair	C713
Maintenance	Repairs To Approach Slab	C714
Maintenance	Repair/Replace Cathodic Protection	C720
Maintenance	Bridge Channel Correction	C800
Maintenance	Debris Removal From Channel	C811
Maintenance	Channel Clearing And Protection	C812
Maintenance	Channel Realign And Reshape	C813
Maintenance	Scour Protection (Erosion)	C814
Maintenance	District Wide Bridge Maintenance	C900
Maintenance	Patch And Rehab Pavement	J100
Maintenance	Patch And Rehab Bituminous Pavement	J110
Maintenance	Asphalt Patching	J111
Maintenance	Wedge And Level	J400
Maintenance	Culvert Clean And Repair	W113
Maintenance	Small Structure Maint and Repair	W130
Maintenance	Paved Side Ditch Repair	W213

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Preservation	Bridge Deck Overlay	C111
Preservation	Bridge Deck Sealing	C114
Preservation	Bridge Thin Deck Overlay	C116
Preservation	Bridge Deck Overlay and Widening	C212
Preservation	Bridge Painting	C500
Preservation	Bridge Cleaning	C716
Preservation	Crack Sealing	J113
Preservation	PCCP Patching	J121
Preservation	Profiling, PCCP	J123
Preservation	PCCP Cleaning and Sealing Joints	J124
Preservation	Undersealing	J125
Preservation	Retrofit Joint Load Transfer	J126
Preservation	Concrete Pavement Preservation (CPP)	J127
Preservation	Partial 3-R	J200
Preservation	Resurface over Asphalt Pavement	J210
Preservation	HMA Overlay, Preventive Maintenance	J211
Preservation	Surface Treatment, PM	J215
Preservation	Surface Treatment, Thin HMA Overlay	J216
Preservation	Surface Treatment, Chip Seal	J217
Preservation	Surface Treatment, Microsurface	J218

(Continued on page C-2)

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Preservation	Surface Treatment, Ultrathin Bonded Wearing Course	J219
Preservation	Concrete Pavement Restoration (CPR)	J225
Rehabilitation	Pavement Repair Or Rehabilitation	J000
Rehabilitation	Bridge Rehabilitation Or Repair	C000
Rehabilitation	Bridge Deck Reconstruction	C100
Rehabilitation	Bridge Deck Replacement	C113
Rehabilitation	Bridge Widening	C200
Rehabilitation	Bridge Deck Replacement & Widening	C211
Rehabilitation	Replace Superstructure	C300
Rehabilitation	Raise Bridge/Lower Pavement	C400
Rehabilitation	Raise Bridge	C410
Rehabilitation	Raise Bridge	C411
Rehabilitation	Substructure Repair And Rehabilitation	C600
Rehabilitation	Remove & Replace Beam	C715
Rehabilitation	Truss Reconstruction Or Repair	C717
Rehabilitation	Arch Reconstruction Or Repair	C718
Rehabilitation	Covered Bridge Rehabilitation	C719
Rehabilitation	Bridge Rehab-Pipe Lining	C815
Rehabilitation	Patch and Rehab PCC Pavement	J120
Rehabilitation	HMA Overlay, Structural	J212
Rehabilitation	HMA Overlay Minor Structural	J213
Rehabilitation	Resurface PCC Pavement (Partial 3/R Standards)	J220
Rehabilitation	Crack & Seat PCCP & HMA Overlay	J221
Rehabilitation	HMA Functional Overlay on PCCP	J226
Rehabilitation	PCC Thin Overlay	J227
Rehabilitation	Road Rehabilitation (3R/4R Standards)	J300
Rehabilitation	Road Reconstruction (3R/4R Standards)	J310
Rehabilitation	Crack & Seat Composite Pavement & HMA Overlay	J311

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Rehabilitation	Crack & Seat PCCP & HMA Overlay	J312
Rehabilitation	Repair PCCP & HMA Overlay	J313
Rehabilitation	PCCP on PCC Pavement	J315
Rehabilitation	Shoulder Rehabilitation And Repair	J600
Rehabilitation	Slide Correction	N200
Rehabilitation	Small Structure Pipe Lining	W115
Rehabilitation	Small Structure Paved Invert	W116
Rehabilitation	Drainage Ditch Correction	W200
Rehabilitation	Ditch Relocation	W211
Reconstruction	Full Depth Reclamation (FDR)	J228
Reconstruction	Pavement Replacement, Concrete	L100
Reconstruction	Bridge Replacement, Steel	E100
Reconstruction	Bridge Repl, Comp Steel Construction	E110
Reconstruction	Br Repl, Comp.Steel Beam (Simple Span)	E111
Reconstruction	Br Repl, Comp.Stl.Gdr.(Wld Plt,Smpl.Spn)	E112
Reconstruction	Br Repl, Comp.Cont.Steel Beam	E113
Reconstruction	Br Repl, Comp.Cont.Stl.Grdr(Wld Plate)	E114
Reconstruction	Br Repl, Comp.Cont.Steel Box Girder	E115
Reconstruction	Br Repl, Steel Truss	E120
Reconstruction	Br Repl, Steel Deck Truss	E121
Reconstruction	Br Repl, Steel Thru Truss	E122
Reconstruction	Br Repl, Steel Girder	E130
Reconstruction	Br Repl, Welded Girder Rigid Frame	E131
Reconstruction	Br Repl, Welded Steel Thru Girder	E132
Reconstruction	Bridge Replacement, Concrete	E200
Reconstruction	Br Repl, Comp. Cont. Conc. Construction	E210
Reconstruction	Br Repl, Comp.Cont.Pres.Conc.Box Beam	E211
Reconstruction	Br Repl, Comp.Cont.Pres.Conc. I-Beam	E212

(Continued on page C-3)

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Reconstruction	Br Repl, Comp.Cont.Pres.Conc.Bulb T-Beam	E213
Reconstruction	Br Repl, Comp.Cont.Precast Conc. Beam	E214
Reconstruction	Br Repl, Post Tension Conc. Construction	E220
Reconstruction	Br Repl, P.T.Comp.Cont.Pres.Conc.T-Bulb	E221
Reconstruction	Br Repl, P.T.Comp.Cont.Pres.Conc.I-Beam	E222
Reconstruction	Br Repl, P.T. Conc. Box Girder	E223
Reconstruction	Bridge Repl, P.T. Conc. Slab	E224
Reconstruction	Br Repl, Conc. Beam Construction	E230
Reconstruction	Br Repl, Pres.Conc.Box Beam(Smpl.Span)	E231
Reconstruction	Br Repl, Pres.Conc.I-Beam(Simple Span)	E232
Reconstruction	Br Repl, Cont. Pres. Conc. Box Beam	E233
Reconstruction	Br Repl, Cont, Pres. Conc. Blub T-Beam(SMPL)	E234
Reconstruction	Br Repl, Reinforced Conc. Construction	E240
Reconstruction	Br Repl, Rc Box - Under Fill	E241
Reconstruction	Br Repl, Cont. Rc Slab	E242
Reconstruction	Br Repl, Rc Slab (Simple Span)	E243
Reconstruction	Br Repl, Rc Slab - Under Fill	E244
Reconstruction	Bridge Replacement, Other Construction	E300
Reconstruction	Bridge Replacement, Pipe Arch Or Culvert	E310
Reconstruction	Br Repl, Cast In Place Box Culvert	E311
Reconstruction	Br Repl, Pipe Arch	E312
Reconstruction	Br Repl, Precast 3 Sided Culvert	E313
Reconstruction	Br Repl, Precast Box Culvert	E314
Reconstruction	Br Repl with a Small Structure	E315
Reconstruction	Bridge Replacement, Special	E400
Reconstruction	Br Repl, Covered Bridge	E411
Reconstruction	Br Repl, Timber Bridge	E412
Reconstruction	Bridge Replacement	E000

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Reconstruction	Rubblize PCCP & HMA Overlay	J314
Reconstruction	Rubblize Composit & HMA Overlay	J317
Reconstruction	Pavement Replacement	L110
Reconstruction	Pavement Replacement, New PCC	L111
Reconstruction	Pavement Replacement, HMA	L113
Reconstruction	Pavement Replacement, Composite	L114
Reconstruction	Pavement Replacement, Small Town	L310
Reconstruction	Pavement Replacement, Small Town, HMA	L311
Reconstruction	Pavement Replacement, Small Town, PCCP	L312
Reconstruction	Small Structures & Drains Construction	W000
Reconstruction	Small Structure Replacement	W110
Reconstruction	Box Culvert Replacement	W114
Reconstruction	Small Structure Replacement with Bridge	W120
Reconstruction	Paved Side Ditch Installation	W212
Reconstruction	Sewer / Curb / Gutter Const/Reconstr	W310
Reconstruction	Slotted Drain Or Inlet Replacement	W311
Reconstruction	Storm Sewer Repair Or Replacement	W312
Construction	New Bridge Construction	A000
Construction	New Bridge, Steel Construction	A100
Construction	New Br, Comp. Steel Construction	A110
Construction	New Br, Comp.Steel Beam-Simple Span	A111
Construction	New Br, Comp.Stl.Gdr.(Wld Plt,Smpl.Span)	A112
Construction	New Br, Comp.Cont.Steel Beam	A113
Construction	New Br, Comp. Cont.Stl.Grdr (Wld.Plate)	A114
Construction	New Br, Comp.Cont.Steel Box Girder	A115
Construction	New Br, Steel Truss	A120
Construction	New Br, Steel Deck Truss	A121
Construction	New Br, Steel Thru Truss	A122

(Continued on page C-4)

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Construction	New Br, Steel Girder	A130
Construction	New Br, Welded Girder Rigid Frame	A131
Construction	New Br, Welded Steel Thru Girder	A132
Construction	New Bridge, Concrete Construction	A200
Construction	New Br, Comp. Cont. Conc. Constr.	A210
Construction	New Br, Comp.Cont.Pres.Conc Box Beam	A211
Construction	New Br, Comp.Cont.Pres.Conc.I-Beam	A212
Construction	New Br, Comp.Cont.Pres.Conc.Bulb T-Beam	A213
Construction	New Br, Comp.Cont.Precast Conc.Beam	A214
Construction	New Br, Post Tension Conc. Construction	A220
Construction	New Br, P.T.Comp.Cont.Pres.Conc.Bulb T	A221
Construction	New Br, P.T.Comp.Cont.Pres.Conc.I-Beam	A222
Construction	New Br, P.T. Conc.Box Girder	A223
Construction	New Br, Conc Beam Construction	A230
Construction	New Br, Pres.Conc.Box Beam-Simple Span	A231
Construction	New Br, Pres.Conc. I-Beam (Simple Span)	A232
Construction	New Br, Cont.Pres.Conc.Box Beam	A233
Construction	New Br, Reinforced Concrete Construction	A240
Construction	New Br, Rc Box - Under Fill	A241
Construction	New Br, Cont. Rc Slab	A242
Construction	New Br, Rc Slab (Simple Span)	A243
Construction	New Br, Rc Slab - Under Fill	A244
Construction	New Bridge, Other Construction	A300
Construction	New Br, Pipe Arch Or Culvert	A310
Construction	New Br, Cast In Place Box Culvert	A311
Construction	New Br, Pipe Arch	A312
Construction	New Br, Precast 3 Sided Culvert	A313
Construction	New Br, Precast Box Culvert	A314

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Construction	New Br, Special	A400
Construction	New Bridge Special Construction	A410
Construction	New Br, Timber Bridge	A411
Construction	New Br, Covered Bridge	A412
Construction	New Bridge, Other	A413
Construction	New Road, Grading Only	G100
Construction	New Road, Paving Only	G200
Construction	New Road, PCCPaving Only	G211
Construction	New Road, HMA Paving Only	G212
Construction	New Road, Composite Paving Only	G213
Construction	New Road, Aggregate Paving Only	G214
Construction	New Road Construction	G300
Construction	New Road Construction, PCC	G311
Construction	New Road Construction, HMA	G312
Construction	New Road Construction, Composite	G313
Construction	New Road Construction, Aggregate	G314
Construction	Added Travel Lanes	G400
Construction	Added Travel Lanes, PCC	G411
Construction	Added Travel Lanes, HMA	G412
Construction	Added Travel Lanes, Composite	G413
Construction	Added Travel Lanes, Construct Turn Lanes	G414
Construction	Truck/Auxillary Lane Construction	G415
Construction	Dual Lane Existing Route	G500
Construction	Auxiliary Lane Construction	G600
Construction	Auxiliary Lanes	G610
Construction	Auxiliary Lanes, Passing	G611
Construction	Auxiliary Lanes, Accel & Decel or Turn Lanes	G612
Construction	Auxiliary Lanes, Two-way Left Turn Lanes	G613

(Continued on page C-5)

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Construction	Auxiliary Lanes, Truck Climbing Lanes	G614
Construction	Sight Distance Improvement	J500
Construction	Horizontal Sight Correction	J511
Construction	Vertical Sight Correction	J512
Construction	Curve Correction	J513
Construction	Intersection Improvement	P110
Construction	Radii Improvement	P111
Construction	Intersect. Improv. W/ Added Turn Lanes	P112
Construction	Intersect. Improv. W/ New Signals	P113
Construction	Other Intersection Improvement	P114
Construction	Intersection Improvement, Roundabout	P115
Construction	Intersection Improvement, Median U-Turn	P120
Construction	New Interchange Construction	R100
Construction	New Interchange, Multi-Level	R112
Construction	Interchange Modification	R200
Construction	Interchange Modification, Multi-Level	R212
Construction	Small Structure - New	W111
Construction	Sewer / Curb / Gutter Construction	W300
Construction	Other Sewer/Curb/Gutter Construction	W313
Construction	Pumping / Lift Stations	W314

In addition to the treatments found in the SPMS, INDOT conducts in-house maintenance and preservation activities. In Table C-2 below, INDOT has assigned these activities to either the maintenance or preservation FHWA work type.

Table C-2: INDOT Treatment Type to FHWA Work Type, In-House Maintenance and Preservation Activities

TAMP Work Type	INDOT Treatment Type
Maintenance	2010 - PERMANENT SHALLOW PATCHING (STN - SHORT TON)
Maintenance	2011 - TEMPORARY SHALLOW PATCHING (STN - SHORT TON)
Maintenance	2020 - DEEP PATCHING (STN - SHORT TON)
Maintenance	2030 - SPOT PAVING (STN - SHORT TON)
Maintenance	2450 - TEMPORARY BRIDGE DECKS PATCHING (SQF - SQUARE FT)
Maintenance	2451 - PERMANENT BRIDGE DECKS PATCHING (SQF - SQUARE FT)
Maintenance	2490 - OTHER BRIDGE MAINTENANCE (MHR - WORK HR)
Preservation	2040 - FULL WIDTH SHOULDER SEAL COAT (FTM - FEET MILE)
Preservation	2041 - SHOULDER FOG SEAL (FTM - FEET MILE)
Preservation	2050 - MAINLINE SEAL COAT (LNM - LANE MILE)
Preservation	2051 - MAINLINE FOG SEAL (LNM - LANE MILE)
Preservation	2070 - MAINLINE CRACK FILLING (LNM - LANE MILE)
Preservation	2071 - SHOULDER CRACK FILLING (FTM - FEET MILE)
Preservation	2095 - RESEAL CONCRETE PVMT JOINTS (LNM - LANE MILE)
Preservation	2410 - BRIDGE CLEANING (DCK - DECKS)
Preservation	2440 - BRIDGE FLUSHING (BRG - BRIDGES)
Preservation	2470 - BRIDGE DECK CRACK FILLING (SQF - SQUARE FT)
Preservation	2471 - BRIDGE DECK BROADCAST SEALING (SQF - SQUARE FT)

Changes in the Financial Plan from the Initial TAMP to Final TAMP

Between completion of the Initial TAMP and the Final TAMP, INDOT has updated its approach to developing the financial plan for the TAMP. In the Initial TAMP, INDOT portioned its bridge and pavement funding according to the following work type categories: Bridge Preservation, Bridge Replacement, Small Structures (Bridge), Preventative Maintenance (Pavement), and Corrective Maintenance (Pavement). In order to align with the work types defined by FHWA, INDOT developed a crosswalk to map its pavement and bridge treatment activities to each of the five FHWA work types. The full crosswalk can be found in Appendix C.

The exercise of developing a crosswalk of treatment activities to the FHWA work types resulted in INDOT updating its financial plan to reflect the FHWA work types. For the Initial TAMP, INDOT did not separately break out new construction or rehabilitation funding as unique work types. However, these types of funding have been considered in life cycle cost analysis and funding to maintain the total infrastructure. Tables D-1, D-2, and D-3 are the financial tables included in the Initial TAMP.

Table D-1: Work Type Investment Percent

Work Type	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Bridge – Bridge Preservation	30%	14%	54%	40%	13%	46%	26%	29%	25%	28%
Bridge – Bridge Replacement	8%	6%	6%	5%	34%	4%	11%	8%	13%	10%
Bridge – Small Structures	6%	13%	4%	6%	7%	9%	7%	7%	7%	7%
Pavement – Preventative Maintenance	54%	63%	35%	45%	43%	15%	50%	50%	50%	50%
Pavement – Corrective Maintenance	2%	4%	1%	4%	3%	26%	6%	5%	5%	5%

Table D-2: Available Federal and State Funding, FY2018-FY2027 (Billions)

Year	FY Funding (Billions)
2018	$1.8
2019	$1.9
2020	$1.9
2021	$2.1
2022	$2.2
2023	$2.3
2024	$2.4
2025	$2.5
2026	$2.6
2027	$2.6

Table D-3: Estimated Funding for Pavement and Bridges (Millions)

Year	Pavement	Bridges
2018	$389.9	$323.7
2019	$435.6	$355.8
2020	$473.9	$467.1
2021	$511.9	$490.1
2022	$444.1	$514.5
2023	$464.0	$475.0
2024	$475.0	$487.0
2025	$487.0	$500.0
2026	$499.0	$512.0
2027	$512.0	$525.0