IOWA DOT

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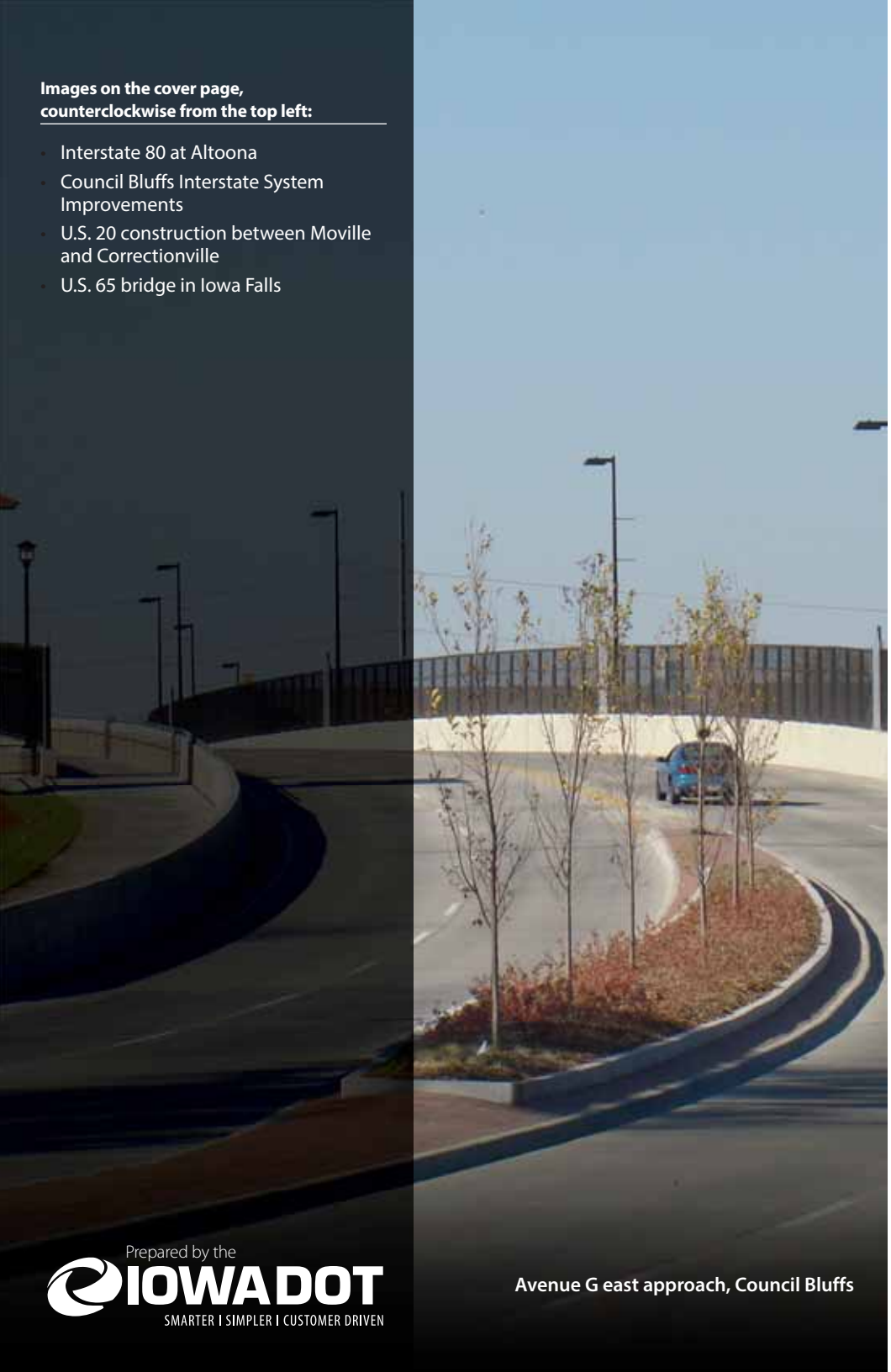
TRANSPORTATION ASSET MANAGEMENT PLAN

NOVEMBER 2016

Images on the cover page, counterclockwise from the top left:

- Interstate 80 at Altoona
- Council Bluffs Interstate System Improvements
- U.S. 20 construction between Moville and Correctionville
- U.S. 65 bridge in Iowa Falls



Avenue G east approach, Council Bluffs

Prepared by the IOWA DOT
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I-35 Raccoon River bridge, 2013

INTRODUCTION

What is Transportation Asset Management?

Transportation asset management is a strategic approach to managing transportation infrastructure. It embodies a philosophy that is comprehensive, proactive, and long term. The overall goals of asset management are to minimize long-term costs, extend the life of the transportation system, and improve the transportation system's performance.

The Iowa Department of Transportation's (DOT's) guiding principles for transportation asset management are the following:

- **Asset management is policy driven.** Funding decisions reflect Iowa DOT's vision for how the transportation system should look in the future.
- **Asset management is performance based.** Iowa DOT understands the condition of its assets, defines performance targets, and makes decisions that support these targets.
- **Asset management involves making trade-offs.** Iowa DOT has options for how to allocate transportation funding. It evaluates these options and makes informed decisions regarding the best path forward.
- **Asset management relies on quality information.** Iowa DOT uses data and analytical tools to support its decisions.
- **Asset management requires transparency and accountability.** Iowa DOT documents how funding decisions are made. It monitors performance, tracks progress towards performance targets, and reports on results.

Why choose transportation asset management?

Iowa DOT began its move toward transportation asset management in the spring of 2011. Previously, Iowa DOT had used a combination of preventive maintenance and worst-first approaches to manage its bridges and roads. In a worst-first approach, agencies rank their assets from worst to best condition and then work down the list repairing assets until they exhaust available funds. Often, the assets in the worst condition require expensive reconstruction. This approach is costly and leaves limited resources for preserving and maintaining other parts of the network.

Asset management provides an alternative approach in which agencies strike a balance between reconstructing poor assets and preserving good assets so that they do not become poor. Over the past decade, transportation agencies throughout the United States have found that this balanced approach extends the useful lives of their assets and is more cost-effective in the long run.

In 2011, faced with budgetary constraints and an overwhelming need for investment in infrastructure, Iowa DOT's executive leadership determined that transportation asset management was necessary for the successful long-term operation of Iowa's transportation system. Since then, Iowa DOT has been committed to transportation asset management.

Consistent with best practices nationally, Iowa DOT's asset management goals are to:

- Build, preserve, operate, maintain, upgrade, and expand the transportation system more cost-effectively throughout its whole life
- Improve performance of the transportation system
- Deliver to Iowa DOT's customers the best value for every dollar spent
- Enhance Iowa DOT's credibility and accountability in its stewardship of transportation assets

What is the purpose of this transportation asset management plan?

In July 2012, the U.S. Congress passed a transportation bill referred to as Moving Ahead for Progress in the 21st Century (MAP-21). This legislation requires every state DOT to develop a risk-based transportation asset management plan (TAMP). This document meets these requirements.

This document, Iowa DOT's initial TAMP, describes how Iowa DOT manages its bridges and pavements throughout their lives. It also provides a framework that will guide funding decisions across Iowa DOT districts, divisions, bureaus, and offices.

In addition to meeting the requirements of MAP-21, Iowa DOT's TAMP meets the following objectives:

- Defines clear links among agency goals, objectives, and decisions
- Defines the relationship between proposed funding levels and expected results
- Develops a long-term outlook for asset performance
- Documents how decisions are supported by sound information
- Develops a feedback loop from observed performance to subsequent planning and programming decisions
- Improves accountability for decision making
- Unifies existing data, business practices, and divisions to achieve Iowa DOT's asset management goals

The TAMP is organized as follows:

- Section 2 describes how Iowa DOT manages its bridges.
- Section 3 describes how Iowa DOT manages its pavements.
- Section 4 provides a financial plan for funding Iowa DOT's bridge and pavement programs over the next 10 years.
- Section 5 addresses the risks associated with asset management.
- Section 6 presents a series of investment strategies that will help Iowa DOT achieve its asset management objectives.
- Section 7 describes how Iowa DOT will further improve its asset management practices.

Iowa DOT's TAMP is not a fix for an emergency. It represents a way of doing business. When used effectively, the TAMP will assist Iowa DOT in preventing major problems by prolonging the life of Iowa's most critical assets and by planning for future replacements.

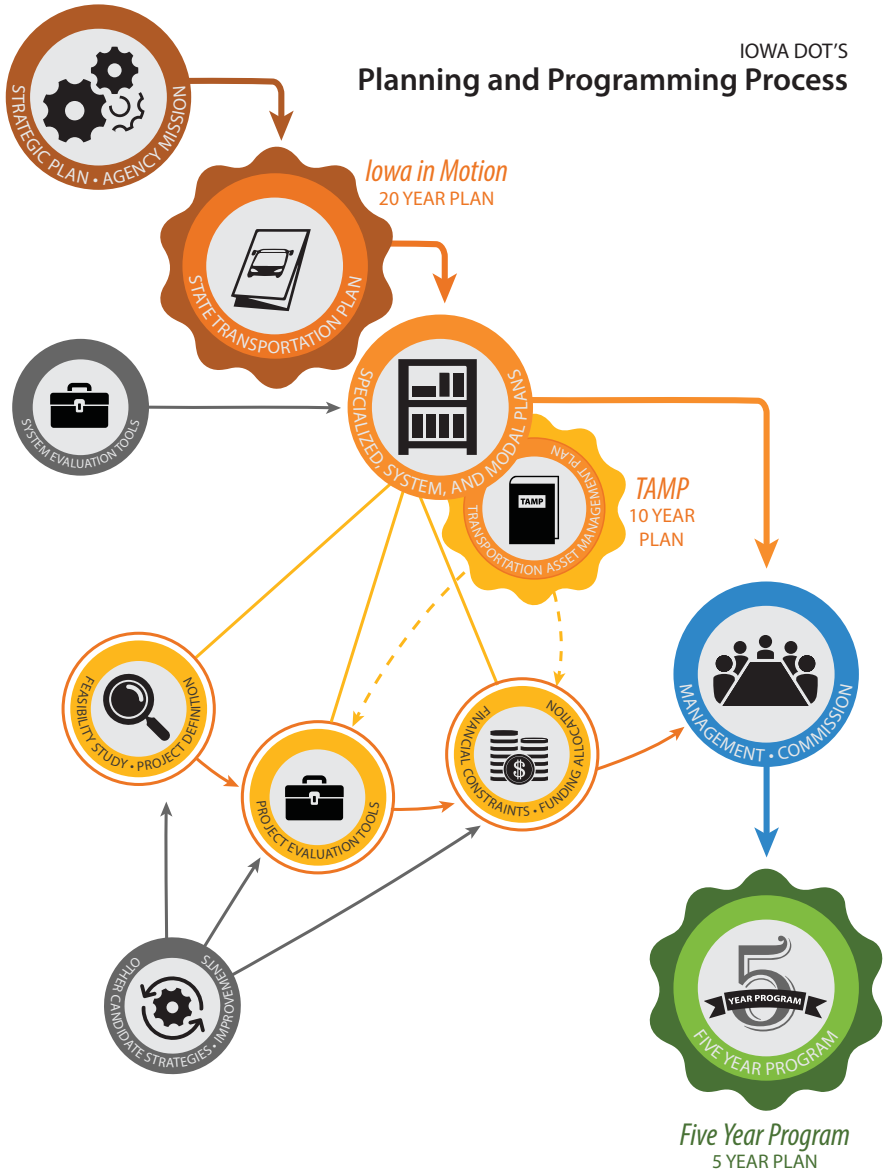
How does the TAMP relate to Iowa DOT's other planning documents?

Iowa DOT's statewide transportation plan, called ***Iowa in Motion,*** established a guiding principle for Iowa DOT: "Safely moving people and goods through investments that strengthen our economic vitality."[1] The plan emphasizes stewardship of the existing transportation system and defines the following three goals:

- **Safety** – to make Iowa a safer place to travel
- **Efficiency** – to make the best use of resources
- **Quality of Life** – to make Iowa a better place to live, work, and travel

This TAMP describes how Iowa DOT manages the existing highway system. Preserving and improving this system is critical for achieving these three goals. The TAMP also connects ***Iowa in Motion*** to Iowa DOT's Five-Year Transportation Improvement Program (Five-Year Program) and system/modal plans. ***Iowa in Motion*** defines a vision for the transportation system over the next 20 years, while the Five-Year Program identifies specific investments over the next five years. The TAMP has a 10 year planning horizon and helps ensure that investments in the Five-Year Program are consistent with Iowa DOT's longer-term vision.

[1] Iowa DOT, *Iowa in Motion,* http://www.iowadot.gov/iowainmotion/index.html.

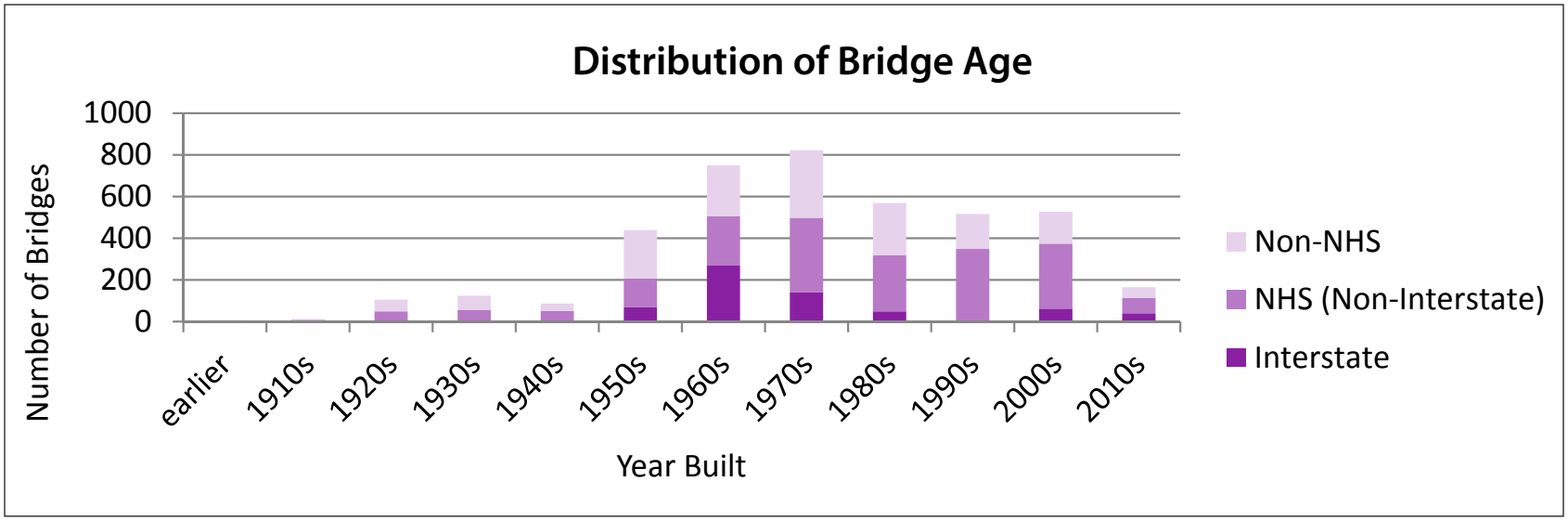


How many bridges does Iowa DOT own and maintain?

Iowa has more than 24,760 bridges. Iowa DOT is responsible for maintaining 4,122 of these bridges, including bridges on interstates, the National Highway System (NHS), and state highways. Local governments throughout the state maintain the remaining bridges.

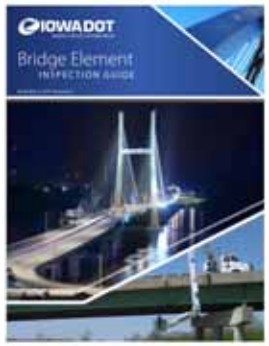
Highway System	Number of Bridges	Deck Area (Square Feet)
Interstate	639	9,467,629
NHS (Non-Interstate)	1,890	21,084,295
Non-NHS	1,593	11,436,056
Total	**4,122**	**41,987,980**

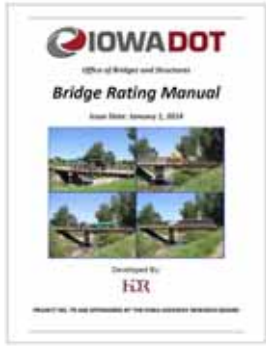
The average age of Iowa DOT's bridges is 38 years. About 25 percent of the bridges are over 50 years old, and the average age of bridge structures is going up. In 15 years, almost half of the bridges on the state highway system will be over 50 years old. In comparison, a typical bridge lasts about 75 years.



How does Iowa DOT assess the condition of its bridges?

Iowa DOT inspects its bridges every 24 months using practices consistent with national standards.





Iowa DOT uses this data to assess the condition of its bridges using the following performance measures.

Structural Deficiency. Structurally deficient (SD) is a term used in the National Bridge Inventory (NBI) program. As part of the NBI program, Iowa DOT rates the condition of each bridge's deck, superstructure, and substructure using a scale of one to nine. A bridge is considered SD if one of these three ratings is less than five.

SD bridges require additional monitoring, maintenance, or repair to ensure safety and continued service. However, the fact that a bridge is deficient does not immediately imply that it is likely to collapse or that it is unsafe.

Bridge Condition Index (BCI). Iowa DOT developed the BCI to aid in the prioritization of bridges for replacement and maintenance. The BCI is based on data collected as part of the NBI inspections. The index combines a bridge's condition, its ability to provide adequate service, and how essential it is for the traveling public into a single index. The BCI is reported on a 100-point scale.

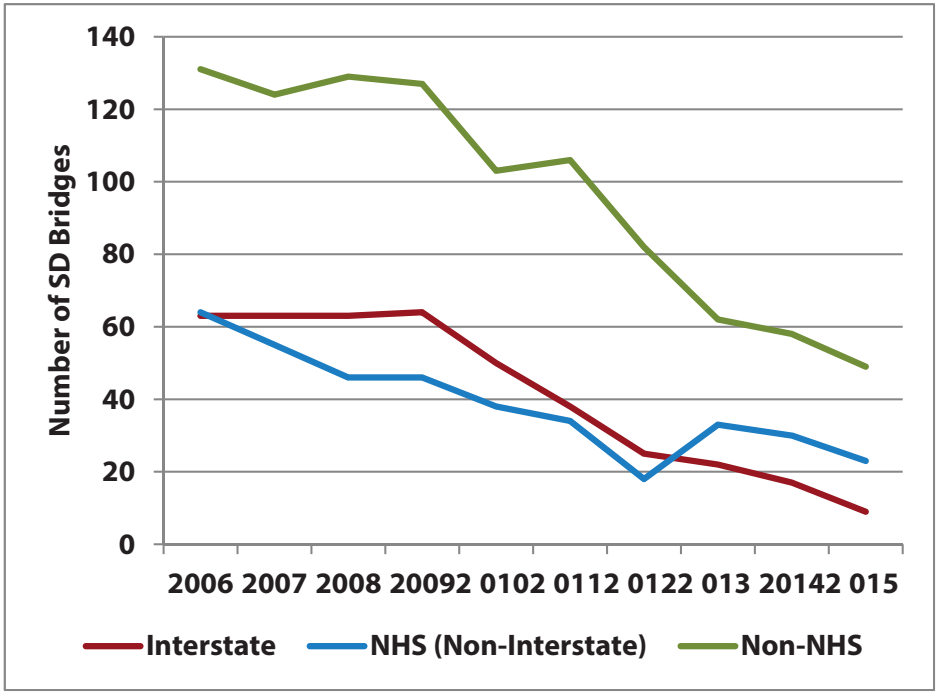
Iowa DOT classifies bridges as good, fair, or poor using the following BCI thresholds.

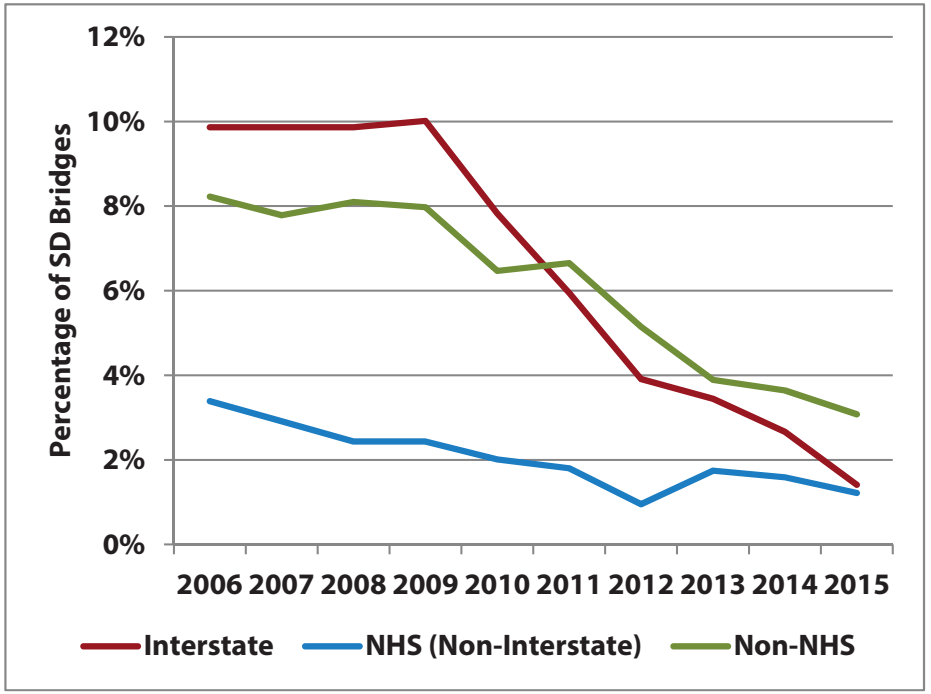
	BCI Threshold
Good	≥ 70
Fair	between 37.5 and 70
Poor	≤ 37.5

These thresholds reflect Iowa DOT's engineering judgment. The threshold for poor bridges straddles the spectrum of SD bridges. Therefore, some SD bridges are classified as fair and some as poor.

What is the condition of Iowa DOT's bridges?

Iowa DOT's bridges are in relatively good condition overall. Although the number of SD bridges has been going down over the past decade, the cost of addressing all current SD bridges exceeds the available funding. In addition, many structures are coming to the end of their designed service life. This means that they will need major rehabilitation or even replacement at some point in the near to mid-term future.





The following charts show the allocation of good, fair, and poor bridges over the past 10 years. Trends show that conditions have been fairly stable, although they do fluctuate from year to year. Overall, interstate bridges have been trending behind bridges on other parts of the roadway system. This is partially because Iowa DOT is working to develop a few large interstate reconstruction projects. Although these projects are focused primarily on addressing capacity and safety needs, they will also address existing condition needs.

What does Iowa DOT want to accomplish with its bridge program?

Iowa DOT has established the following desired bridge program outcomes:

- Preserve bridges so that they do not have to be replaced for condition-based reasons before traffic volume needs require the replacement or before the end of their designed service life
- Minimize the number of structurally deficient (SD) bridges
- Manage the increasing number bridges reaching the end of their service life
- Reduce risks associated with scour-critical bridges (Scour critical bridges are susceptible to damage by water.)
- Reduce risk associated with bridges that have low vertical clearance over state highways
- Reduce impacts on commerce and mobility caused by load-restricted bridges

What types of activities does Iowa DOT perform in order to meet these outcomes?

Asset management focuses on prolonging the service life of Iowa's bridges. This approach is the most cost-effective way to achieve desired outcomes. To this end, Iowa DOT performs the following types of ***maintenance*** activities that are aimed at impeding deterioration:

STEEL GIRDER BRIDGES

- **Painted steel** – Routine painting is needed every 25 to 30 years.
- **Weathering steel** – Washing is needed on a regular basis, ranging from annually to every 10 years depending on exposure to deicing materials.
- **Expansion joints**
  - Sliding plate joints need replacement when the bridge is over 40 years old.
  - Finger joints require drain troughs that need cleaning on an annual basis.
  - Modular joints need maintenance every 10 years to replace springs, bearings, and glands.
  - Strip seal joints need gland replacement every five to 10 years. Annual washing can prolong the joint life.
- **Decks**
  - Overlay of decks with uncoated reinforcing can be done twice in most cases; rarely will a deck be able to be overlaid a third time.
  - Epoxy injection of delaminated areas is needed where the overlay has debonded or concrete at the reinforcing layer has cracked.
  - Deck patching of the deck is needed when spalling occurs or epoxy injection of delamination is no longer effective.

PRE-STRESSED CONCRETE GIRDER BRIDGES

- **Beam ends** – Beam ends under joints require sealing or cathodic protection. Either option needs to be redone on a regular basis.
- **Expansion joints**
  - Sliding plate joints need replacement when the bridge is over 40 years old.
  - Strip seal joints need gland replacement every five to 10 years. Annual washing can prolong the joint life.
- **Decks**
  - Overlay of decks with uncoated reinforcing can be done twice in most cases. Rarely will a deck be able to be overlaid a third time.
  - Epoxy injection of delaminated areas is needed where the overlay has debonded or concrete at the reinforcing layer has cracked.
  - Patching of the deck is needed when spalling occurs or epoxy injection of delamination is no longer effective.

CONCRETE SLAB BRIDGES

- Slabs with black reinforcing bars need to be overlaid to prevent early corrosion of the reinforcing bars.
- Slabs with epoxy-coated reinforcing bars may need an overlay at 40 years of age to slow down the corrosion of the reinforcing bars.
- Epoxy injection of delaminated areas is needed where the overlay has debonded or concrete at the reinforcing layer has cracked.
- Patching of the deck is needed when spalling occurs or epoxy injection of delamination is no longer effective.

Although these activities are cost-effective, it is not possible to manage Iowa DOT's bridges by conducting only maintenance activities. More expensive bridge rehabilitation and reconstruction activities are required when conditions deteriorate significantly, or because of overloading, overuse, or increases in legal truck weights.

How does Iowa DOT determine what work to conduct on a bridge?

Iowa DOT's Bridge Maintenance and Inspection Unit recommends bridge maintenance activities based on the results of the bridge inspections described previously. This information is then forwarded to a bridge engineer, who is responsible for making rehabilitation and reconstruction recommendations and developing cost estimates.

The Office of Bridges and Structures (OBS) compiles the rehabilitation and reconstruction recommendations and prioritizes them based on their urgency. Urgency is evaluated on a scale of one to four, where one means "implement a project as soon as practical," and four means "hold as a future candidate for the Five-Year Program."

Each year, OBS discusses the priorities with each District. At this annual meeting, OBS reviews all newly recommended projects from the past year to determine if they should be candidates for the Five-Year Program. A bridge may have up to three work items recommended at any one time. If more than one work type is proposed, each recommendation is given an importance rating of high, medium, or low.

After meetings with Districts, OBS reviews all priority one candidates to determine if the current Five-Year Program needs to be adjusted to accommodate them earlier in the program. OBS also determines which projects can be developed for construction in the final year of the upcoming Five-Year Program.

If costs of priority one candidates exceed available budgets, OBS prioritizes them using a process that considers bridge condition index (BCI), project cost, development time, and public needs. If all priority one candidates are programmed, priority two and three candidates are then considered. This process continues until funding is exhausted. (Refer to Section 4 for discussion of how Iowa DOT establishes the overall bridge budget.)

The process described above focuses on the condition of Iowa's bridges. In addition, Iowa DOT replaces a few bridges each year to accommodate capacity needs, and major urban interstate reconstruction projects often include replacing bridges that might not have been candidates otherwise.

Iowa DOT typically allocates 70 to 74 percent of bridge funding for replacements, nine to 23 percent for rehabilitation, and seven to 17 percent for maintenance. However, no formal funding targets exist.

How does this approach help to minimize whole life costs?

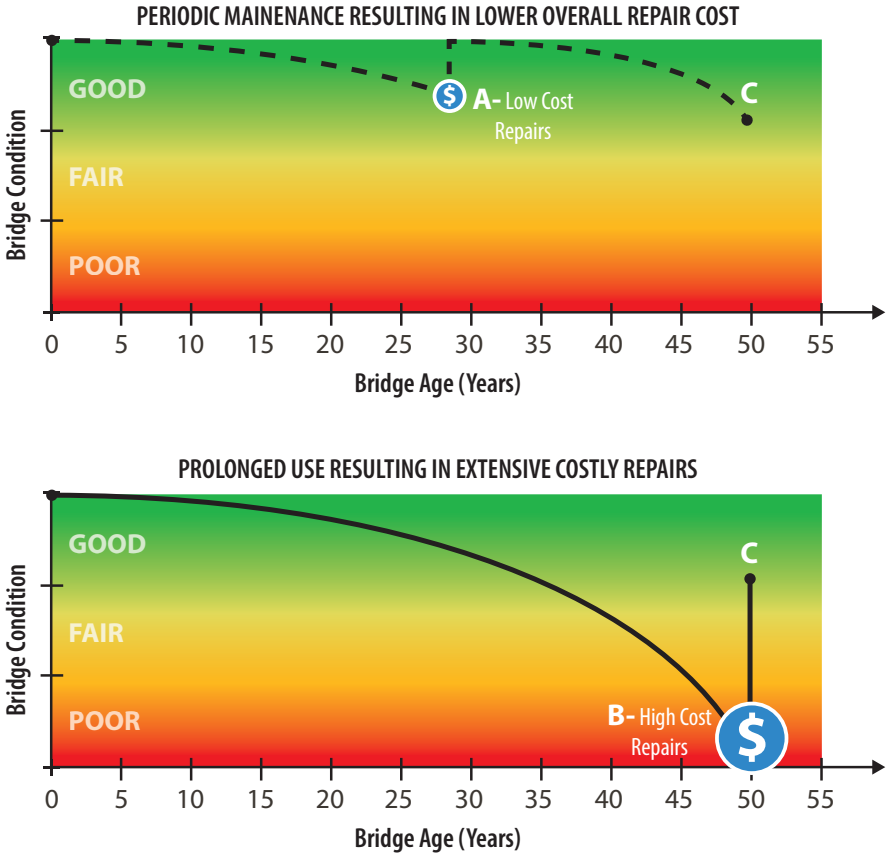
Whole life costs represent the costs of managing an asset from inception through disposal. Historically, state DOTs have used a worst-first approach to bridge management. This approach focuses on replacing the poorest bridges. A more cost-effective approach considers treatments that slow down deterioration and prolong bridge life. This strategy is typically cheaper than letting a bridge deteriorate to the point of needing replacement.

This figure illustrates the two approaches. The solid line represents an asset that is built and deteriorates to point B before any work is performed. Once work is performed, the condition improves to point C. The dashed line shows work being done at point A. The asset's condition improves, and then eventually deteriorates to point C. The cost of performing work at point A can be significantly lower than waiting until point B. However, the final condition of both assets is the same.

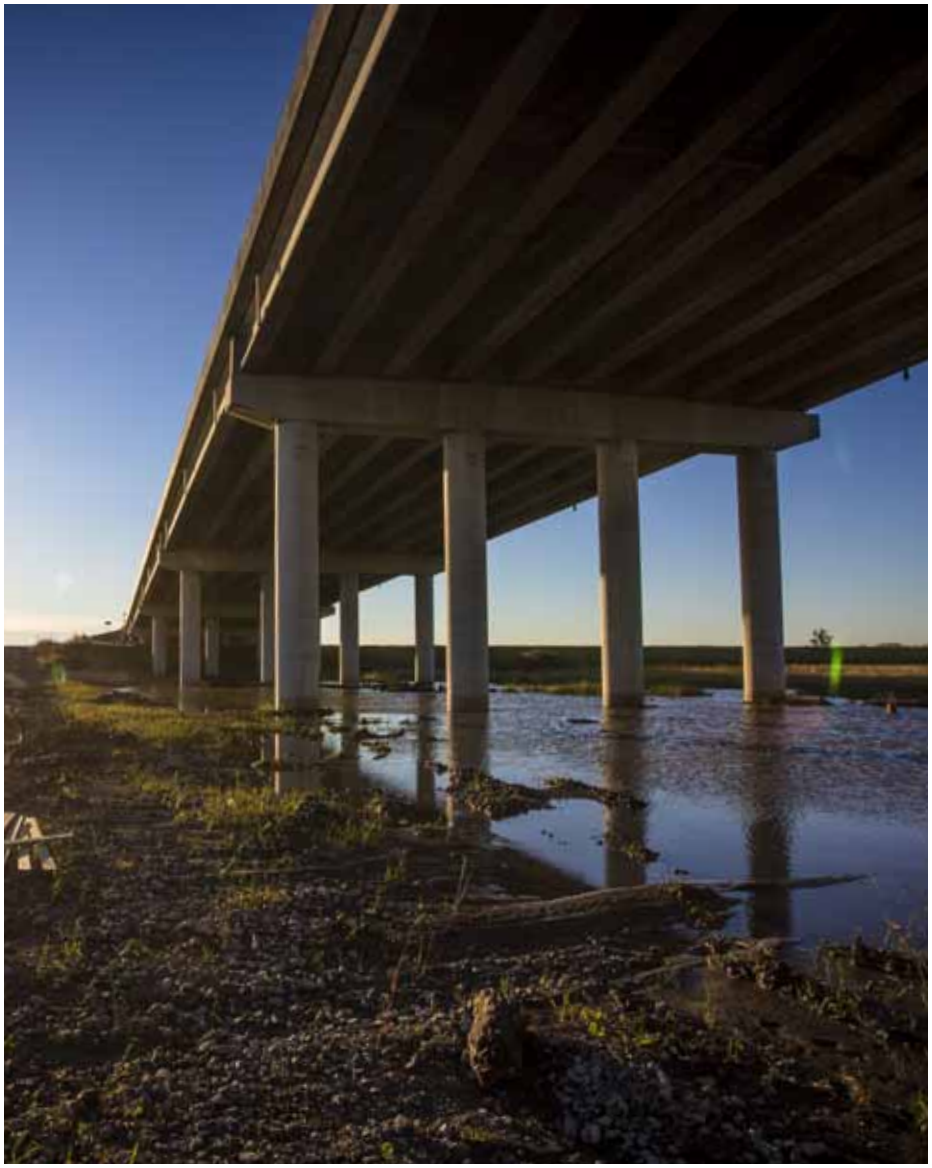
Iowa DOT considers whole life costs informally when evaluating and prioritizing bridge projects. Its goal is to transition to a more formal, quantifiable approach. This approach will be possible once Iowa DOT implements a state-of-the-art bridge management software program. This type of program will enable Iowa DOT to model bridge deterioration and develop optimal work strategies for maximizing bridge conditions and minimizing whole life costs.

In the meantime, Iowa DOT is working to implement a bridge management program that predicts bridge maintenance and replacement needs. Although the interim bridge program cannot currently determine what types of work should be done, it can predict when a bridge will require some type of work. This capability will enable Iowa DOT to consider whole life costs when selecting projects, establishing performance targets, and allocating funds to the bridge program.

IOWA DOT
BRIDGE MANAGEMENT
Whole Life Costs



What does Iowa DOT expect its bridges to look like in the future?



Understanding the impact of funding levels and potential work strategies on future conditions is an important aspect of asset management planning. Iowa DOT is evaluating the use of its interim bridge program for analyzing future bridge conditions and needs. The program is designed to use historic and current National Bridge Inventory (NBI) data to model bridge deterioration rates and predict needed work. Iowa DOT is exploring options for using the resulting recommendations in concert with the prioritization of work items identified at the annual District meetings to predict future funding needs.

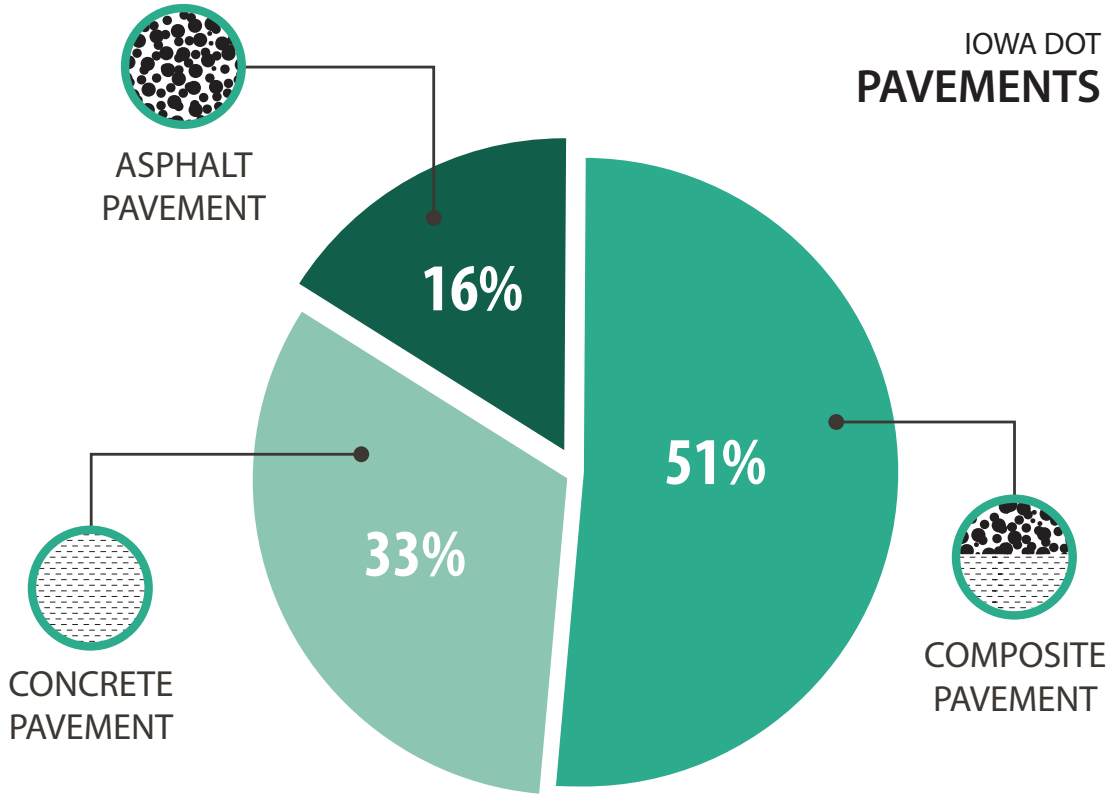
In addition to the NBI data, Iowa DOT also collects more detailed, element-level data during its biennial bridge inspections. With these data, Iowa DOT will have the option to use a bridge management software program being developed by the American Association of State Highway and Transportation Officials (AASHTO). Once this system is completed, Iowa DOT plans to use it to evaluate its bridges, predict future conditions, and support project selection. Using the AASHTO option is a longer term solution because Iowa DOT expects it will need several cycles of inspection data before this program can accurately predict conditions and needs.

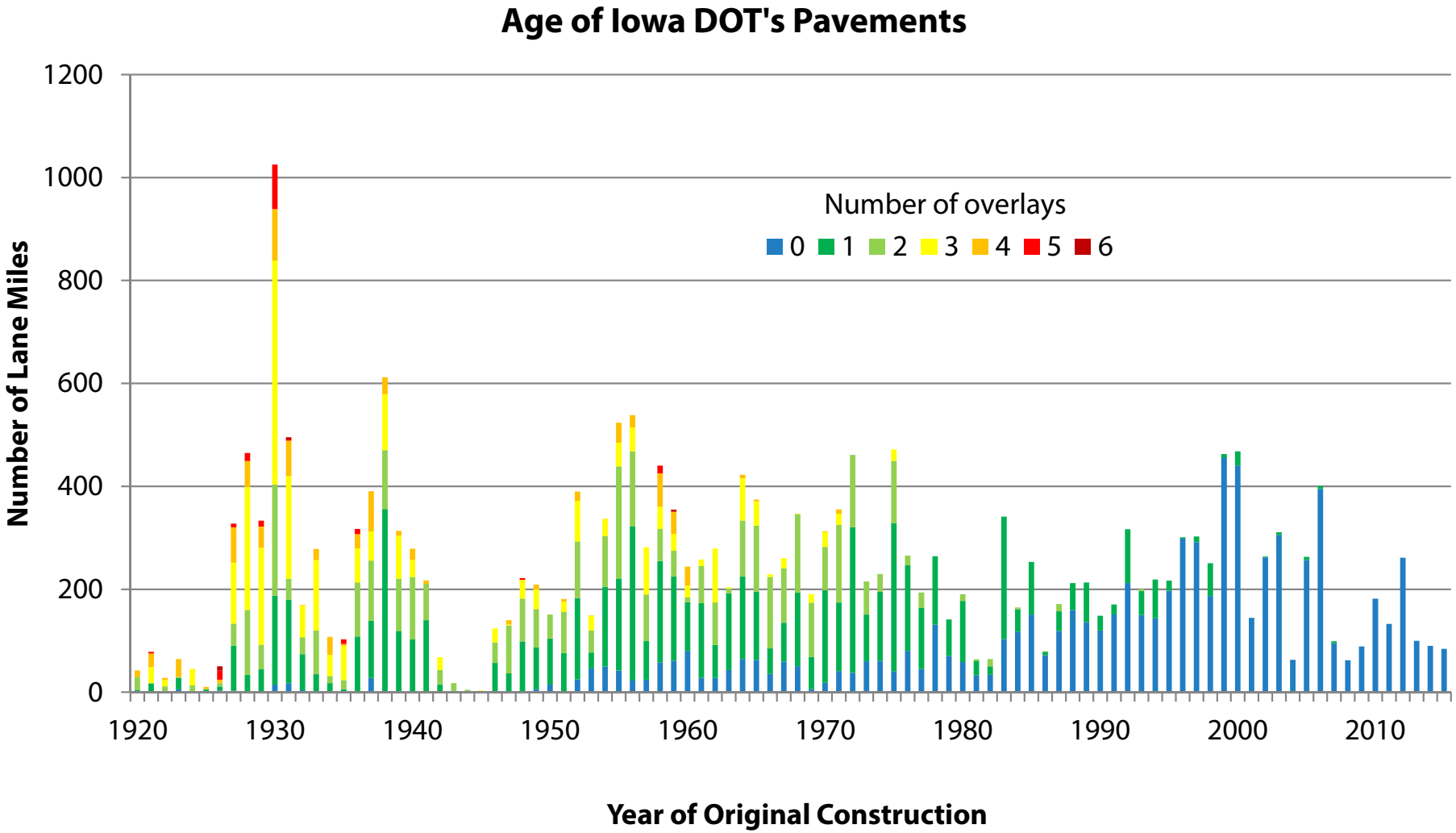
How much pavement does Iowa DOT own and maintain?

Iowa's roadway system includes interstates, the National Highway System (NHS), state highways, county roads, and city streets. The system is designed to enhance mobility for Iowa's citizens and to move goods for the social and economic vitality of Iowa. Overall, Iowa's roadway system includes over 240,000 lane miles of roadway. Iowa DOT is responsible 22,805 of these lane miles. Iowa DOT's pavement inventory is expected to grow over the next decade as it expands the system to further improve mobility and support economic growth.

Highway System	Lane Miles
Interstate	3,305
NHS (Non-Interstate)	12,369
NHS	7,131
Total	**22,805**

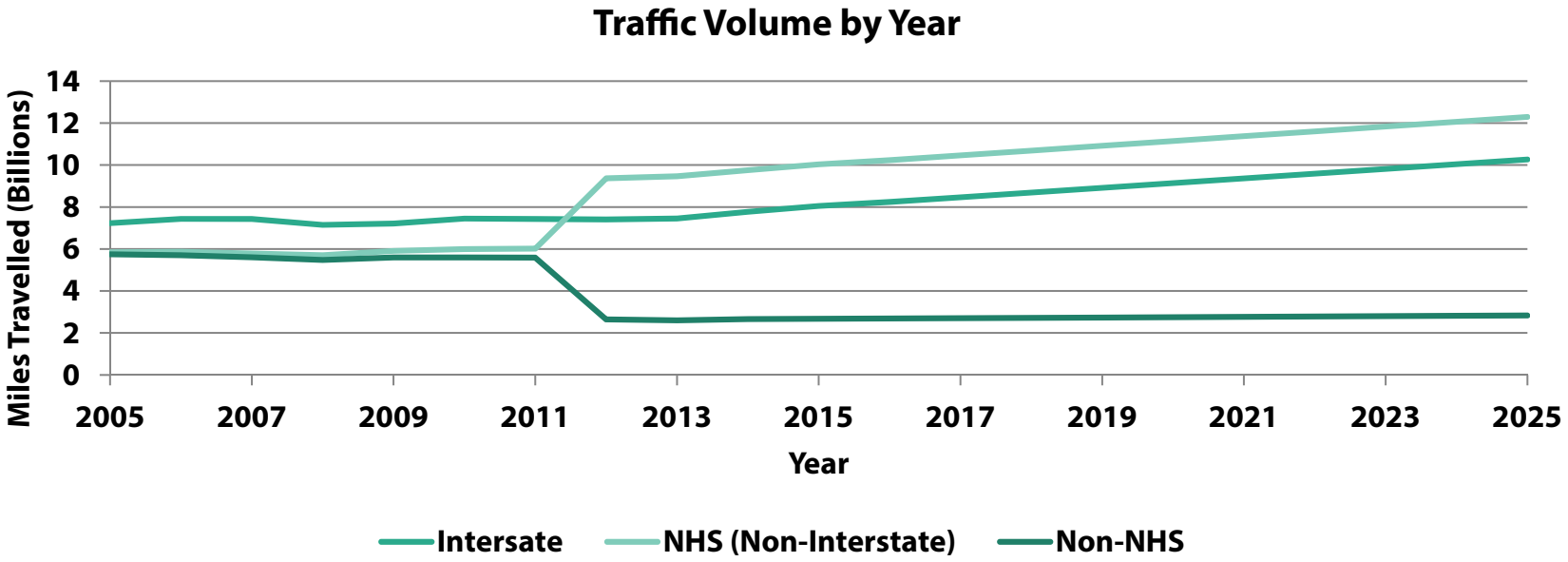
Iowa DOT's pavements represent a mixture of asphalt pavement, concrete pavement, and composite. Just over half of the network is composite pavement.





This figure shows the original construction year of Iowa DOT's pavements. The colors on the chart indicate the number of times that the pavement has received an overlay. Over half of Iowa DOT's pavements were constructed before 1957.

How much traffic uses Iowa DOT's roads?



An important consideration in the asset management planning process is the amount of traffic that Iowa's roadways serve. The figure above shows actual traffic volumes in Iowa from 2005 through 2015, and projected volumes from 2016 through 2025. (The major shift from the non-NHS category to the NHS (non-interstate) category in 2012 occurred because Iowa DOT redefined the NHS in 2012.)

Truck traffic, in particular, is hard on pavements. Iowa DOT projects a 66 percent growth in truck traffic over the next 20 years. This level of projected traffic growth is an indication of increased economic activity. As traffic volumes increase, the importance of maintaining existing roadways increases. At the same time, wear and tear on roadways increases, and there is more pressure to allocate money to capacity expansion projects. These trends further strengthen the need for Iowa DOT to implement asset management.

How does Iowa DOT assess the condition of its pavements?

Iowa DOT collects pavement condition data on half of its pavements every year. Inspectors drive vans equipped with sensors that monitor pavement smoothness and pavement defects, such as cracking, faulting, and rutting.[2]

In addition, Iowa DOT periodically conducts the following more detailed condition assessments:

- Assessment of structural capacity using a falling weight deflectometer: five-year cycle and upon request
- Assessment of pavement subsurface using ground-penetrating radar: five-year cycle and upon request
- Assessment of pavement friction: five-year cycle

Iowa DOT stores all inspection data in a pavement management system, and uses these data to assess the condition of its pavements. Iowa DOT reports pavement condition using a Pavement Condition Index (PCI).

PCI is a metric developed by Iowa DOT that accounts for a pavement's ride quality and the amount of cracking, faulting, and rutting on it. Iowa DOT uses PCI thresholds for good, fair, and poor that differ by roadway type.

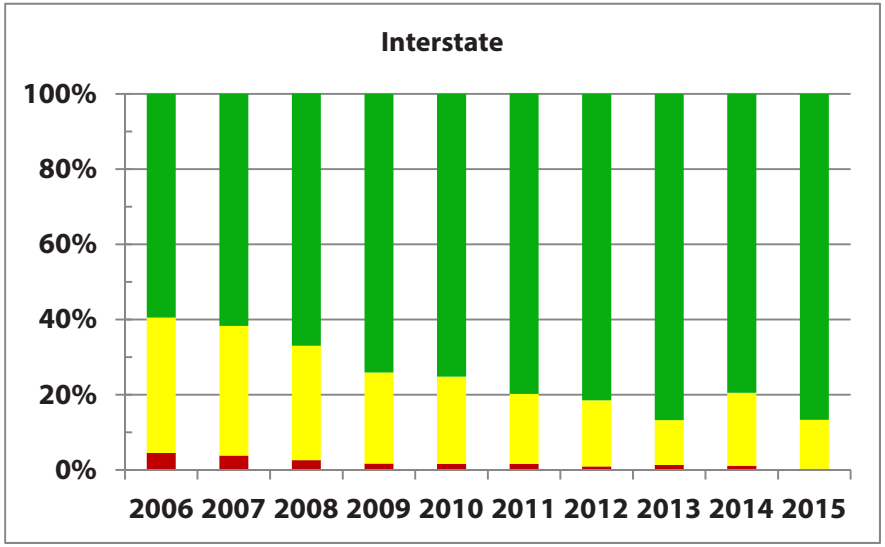
Iowa DOT uses the good, fair, and poor categories to track and communicate the overall condition of its pavements. It uses the more detailed, underlying condition data when evaluating and prioritizing specific pavement projects.

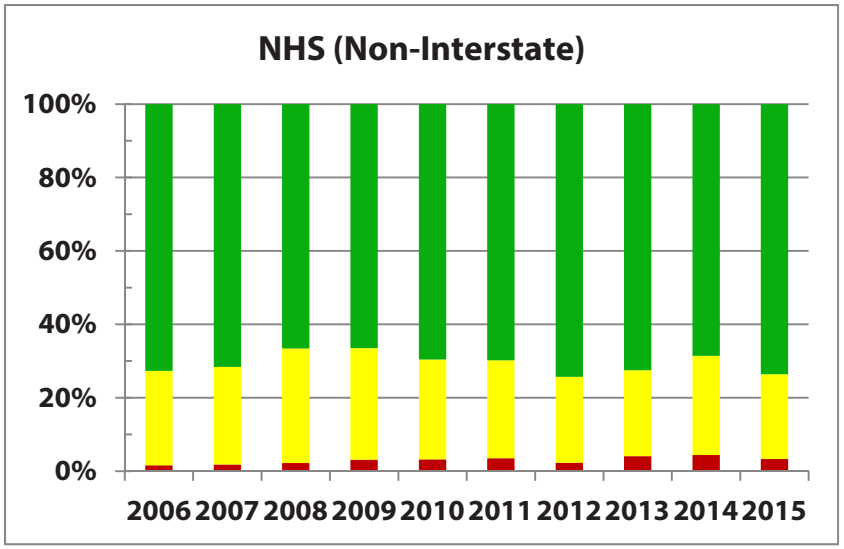
Category	PCI Thresholds		
	Interstate	NHS (Non-Interstate)	Non-NHS
Good	76–100	71–100	71–100
Fair	51–75	46–70	41–70
Fair	0–50	0–45	0–40

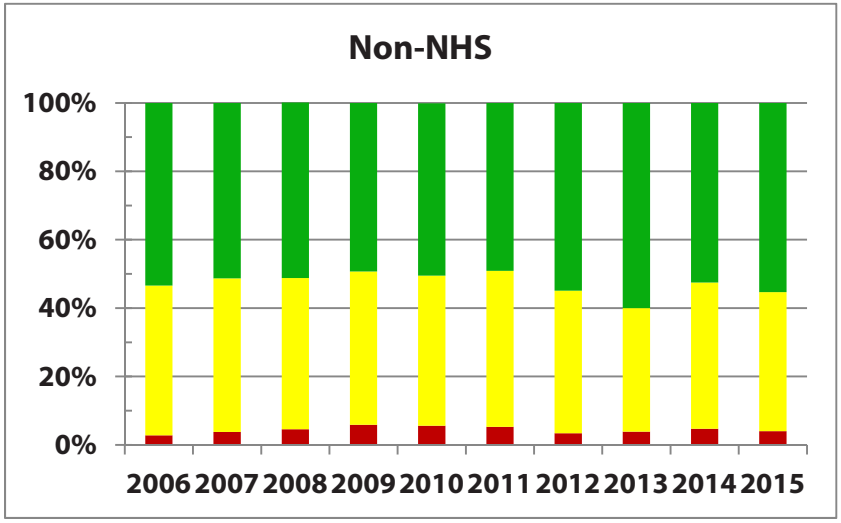
[2] Iowa DOT periodically updates its inspection process to take advantage of new data collection technologies.

What is the condition of Iowa DOT's pavements?

The following charts show the distribution of good, fair, and poor pavements in terms of PCI over the past decade. The condition of the Interstate Highway System has improved significantly over that time. Conditions on the other parts of the network have fluctuated from year to year, but have remained relatively stable overall.







Good Fair Poor

What does Iowa DOT want to achieve with its pavement program?

Iowa DOT strives to provide a safe, serviceable, and sustainable roadway system through its pavement program. Iowa DOT will establish more specific pavement performance targets once its asset management governance structure has been institutionalized.

What types of activities does Iowa DOT perform in order to meet these objectives?

Consistent with the principles of asset management, Iowa DOT conducts a wide range of pavement activities. These activities differ by roadway type, as follows:

- For interstates and high-volume roadways, work activities include treatments ranging from preventive maintenance to reconstruction.
- For medium-volume roadways, work activities include treatments ranging from preventive maintenance to minor rehabilitation.
- For low-volume roadways, work activities focus primarily on thin surface treatments.

The most commonly used preventative maintenance strategies for mainline pavements are crack filling, crack sealing, and microsurfacing. In addition, Iowa DOT occasionally uses fog sealing for shoulders. Crack filling or sealing typically costs about $3,000 per lane mile. A standard microsurfacing project averages around $30,000 per lane mile.

The timing of these treatments is not on a set interval. Each District chooses when and where to apply preventive maintenance activities based on its experience, knowledge of local conditions, and engineering judgment. Often crack filling or sealing is performed within a couple of years of a pavement rehabilitation project. However, these treatments may be needed earlier for composite pavements, which contain both asphalt and concrete.

How does Iowa DOT determine what type of work to perform on a pavement?

Iowa DOT has two processes for evaluating and prioritizing pavement projects, one for interstates and one for non-interstates. Iowa DOT prioritizes interstate pavement projects centrally. All interstate projects compete against each other for funding, regardless of where they are located. Iowa DOT manages the interstates centrally to maintain consistency across the state. In addition, the Interstate Highway System is more easily managed centrally because it is a relatively small and homogeneous system.

Iowa DOT prioritizes interstate pavement rehabilitation projects based on traffic volumes and pavement conditions. Iowa DOT addresses additional issues during project development. Examples include safety- and capacity-related issues, and repairs or upgrades to other asset classes, such as culverts.

Iowa DOT distributes funding for non-interstate pavements by formula to the Districts. The formula provides an equal distribution to each of the six Districts, and includes adjustments for pavement condition and traffic volumes (but not mileage). The process used to select pavement projects varies by District. Typically, the process includes analyzing pavement condition data and traffic volumes, reviewing historic maintenance needs, and conducting a road review.

Although Iowa DOT has a pavement management system capable of recommending optimal pavement projects, the system does not yet significantly influence project selection. Iowa DOT is working to enhance the models underlying this system so it can better inform the project selection process. Ultimately, Iowa DOT anticipates a larger role for forecasting tools like the pavement management system in influencing both funding distribution and project selection.

How does this approach help to minimize whole life costs?

"Whole life costs" represent the costs of managing an asset from inception through disposal. The benefits of an asset management approach in terms of minimizing whole life costs are explained on page 7 of this TAMP.

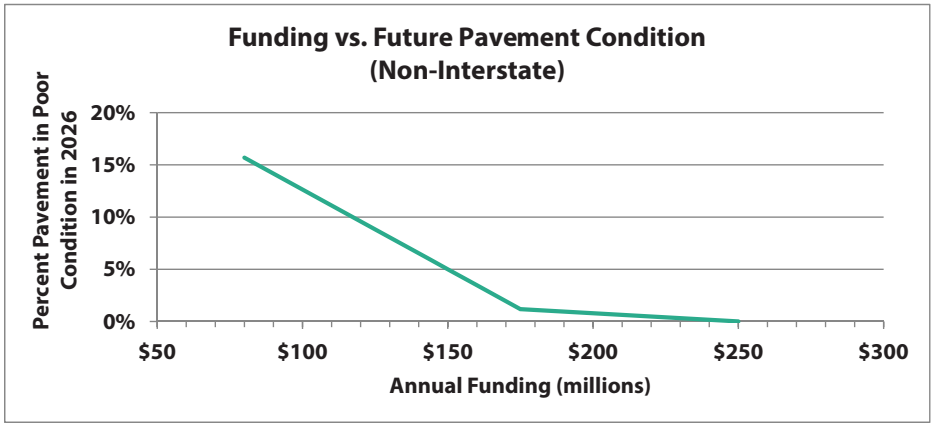
Iowa DOT does not explicitly consider whole life costs when prioritizing pavement rehabilitation projects. However, whole life costs are considered implicitly through engineering judgment and experience, which provide some confidence that pavements are flagged for rehabilitation at the appropriate time.

As Iowa DOT continues to enhance and implement its pavement management software program, it will be able to estimate the remaining service life of its pavements and identify optimal pavement strategies that maximize pavement conditions and minimize whole life costs. Iowa DOT also is working to institutionalize an Asset Management Governance Structure. Once complete, a group of subject matter experts will be charged with incorporating Iowa DOT's pavement management system into the project identification and prioritization process.

What does Iowa DOT expect its pavement to look like in the future?

As discussed above, Iowa DOT is working to customize its pavement management software program so that it can better understand the relationship between funding and future conditions. Until this tool is available for use, Iowa DOT is using an interim pavement model for planning purposes. Iowa DOT has used this model to assess generalized impacts of various funding scenarios. Based on this analysis, Iowa DOT expects that with current funding levels, 30 percent of non-Interstate pavements will be in poor condition in 20 years. This is a significant increase in percent poor compared to the current value of less than 10 percent. Iowa DOT will review and update these projections once its pavement management software program becomes available.

The chart below illustrates the types of graphs Iowa DOT is working to develop for bridges and pavements. This graph is based on Iowa DOT's interim pavement model. It shows the relationship between annual funding and the condition of non-interstate pavements in 2026. As Iowa DOT implements its pavement and bridge management software programs it will develop refined versions of this graph, and use the information to inform the target setting process.



What is the value of Iowa DOT's bridges and pavements?

Iowa DOT estimates that it would cost over $26 billion to replace its bridges and pavements.[3] This cost is significant and reinforces the need for Iowa DOT to maintain its existing assets effectively in order to minimize expensive reconstruction activities.

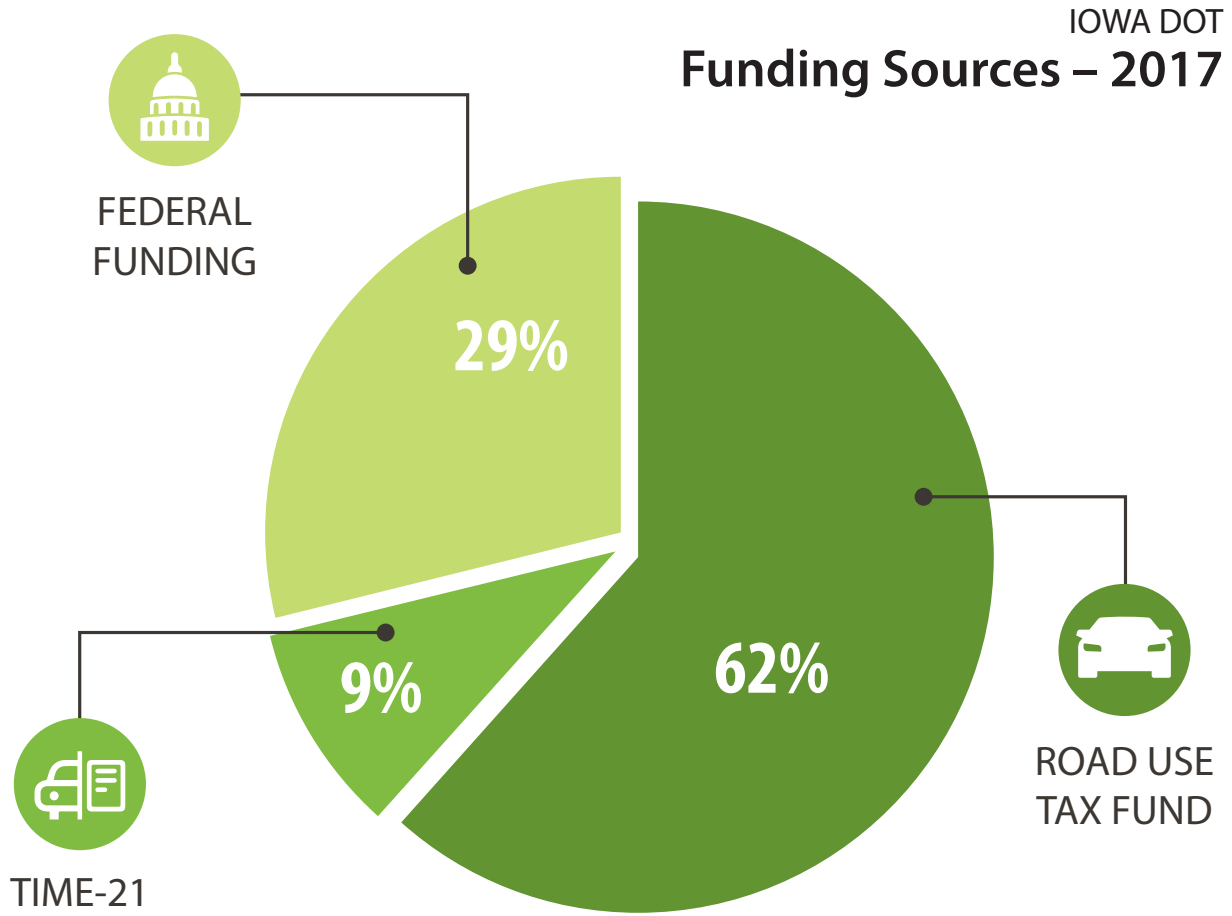
Asset	Basis for Unit Costs	Average Unit Cost to Reconstruct			Replacement Costs
		Interstate	NHS (Non-Interstate)	Non-NHS	
Bridge	Each bridge	$3,067,000	$1,642,000	$2,120,000	$11,990,000,000
Pavement	Lane mile	$750,000	$600,000	$600,000	$14,178,750,000
				Total	**$26,168,750,000**

[3] These costs reflect the costs of rebuilding Iowa DOT's bridges and pavements as they are today, without making any improvements to them, such as widening them. These costs do not include the cost to replace other roadside assets such as signs, guardrails, and sidewalks.

Where does Iowa DOT's funding come from?

Iowa DOT's budget comes from three primary sources of funding:

- **Road Use Tax Fund.** A significant portion of Iowa DOT's funding is provided through the Iowa Road Use Tax Fund (RUTF). The RUTF consists mostly of revenue from state fuel taxes and motor vehicle registration fees. These funds are allocated by law to Iowa DOT and Iowa's cities and counties. In 2017, Iowa DOT anticipates receiving $728 million in funding from the RUTF.
- **TIME-21.** In 2008, the Iowa Legislature increased transportation funding by increasing registration fees for motor vehicles and trailers. These funds are also allocated to Iowa DOT and Iowa's cities and counties. In 2017, Iowa DOT anticipates receiving $107 million in TIME-21 funding.
- **Federal Funding.** The Federal Government collects transportation funding and disperses it to the states through its Highway Trust Fund. The Highway Trust Fund is funded primarily by a motor fuel tax, and fees charged to heavy vehicles. In 2017, Iowa DOT anticipates receiving $336 million in federal highway funding.



How does Iowa DOT decide what activities to fund?

Iowa DOT does not have full flexibility to spend federal funds. For example, it is required to spend a portion of these funds on activities related to rail crossings and recreational trails. Once these and other requirements are accounted for, Iowa DOT allocated **$336 million** in federal funds to its Highway Improvement Program in 2017.

The allocation of state funding is similarly constrained. The figure on the following page shows how state funds are allocated. After accounting for all state funding sources and allocations, **$460 million** in state funding was available for Iowa DOT's Highway Improvement Program in 2017.

The total budget for the Highway Improvement Program in 2017 is **$796 million**. This program funds construction projects on Iowa DOT's bridges and pavements, and represents the bulk of the funds available for asset management activities.

An additional **$245 million** is available for Iowa DOT's highway operations. These funds cover employee salaries, day-to-day activities, and maintenance activities. Some maintenance activities play an important role in preserving roadway conditions and extending pavement life. Examples include crack filling, crack sealing, and microsurfacing.

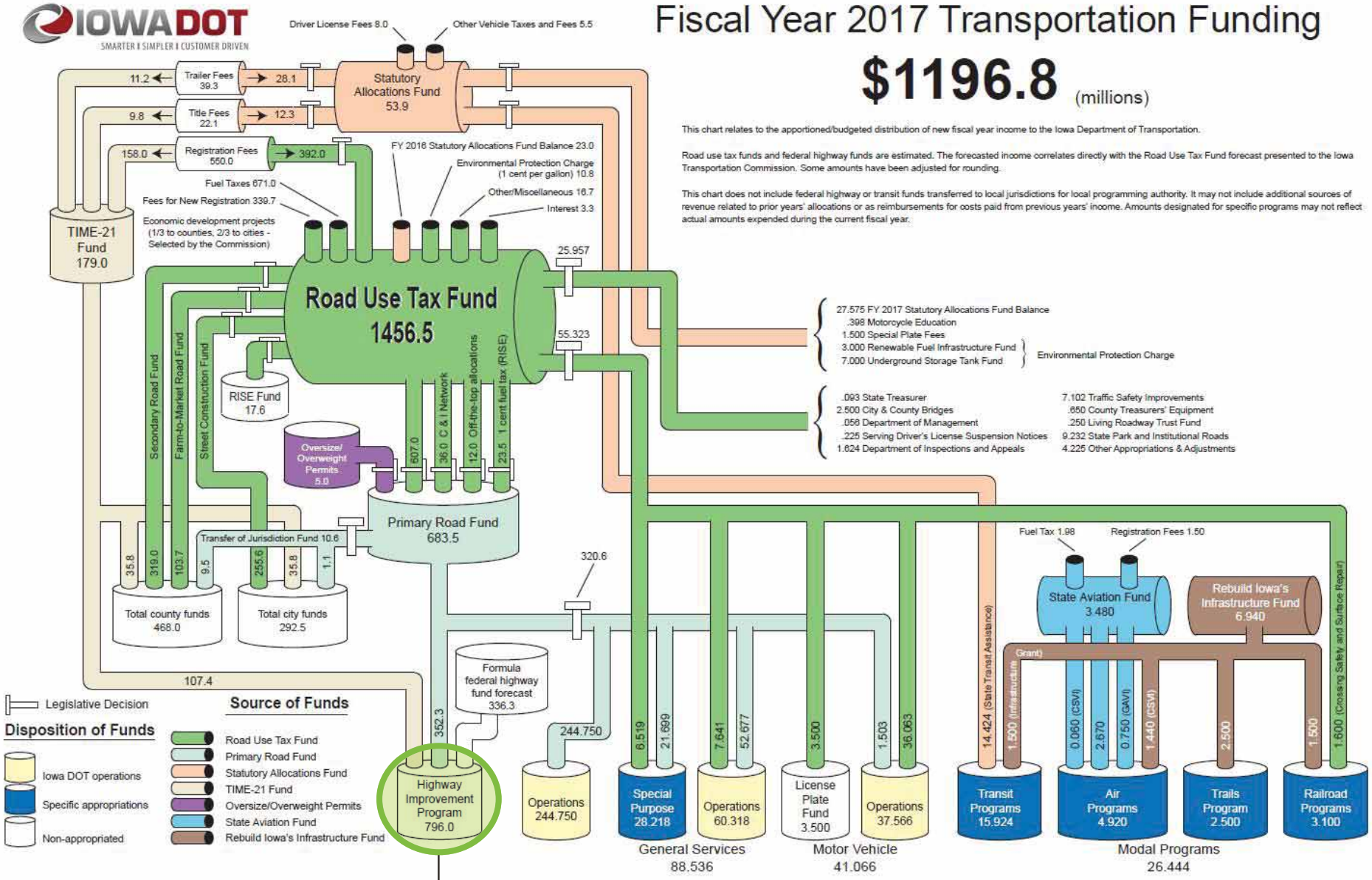
Fiscal Year 2017 Transportation Funding

$1196.8 (millions)

This chart relates to the apportioned/budgeted distribution of new fiscal year income to the Iowa Department of Transportation.

Road use tax funds and federal highway funds are estimated. The forecasted income correlates directly with the Road Use Tax Fund forecast presented to the Iowa Transportation Commission. Some amounts have been adjusted for rounding.

This chart does not include federal highway or transit funds transferred to local jurisdictions for local programming authority. It may not include additional sources of revenue related to prior years' allocations or as reimbursements for costs paid from previous years' income. Amounts designated for specific programs may not reflect actual amounts expended during the current fiscal year.



This is the portion of the budget that Iowa DOT can allocate to bridges and pavements.

How does Iowa DOT set funding levels for its major investment categories?

The Iowa Transportation Commission (Commission) determines how to allocate the funding available through Iowa DOT's Highway Program. The Commission establishes funding levels for the following six major investment categories:

- Stewardship categories
  - Interstate pavement and bridge
  - Non-interstate pavement
  - Non-interstate bridge
  - Safety-specific
- Capacity categories
  - Major interstate
  - Non-interstate

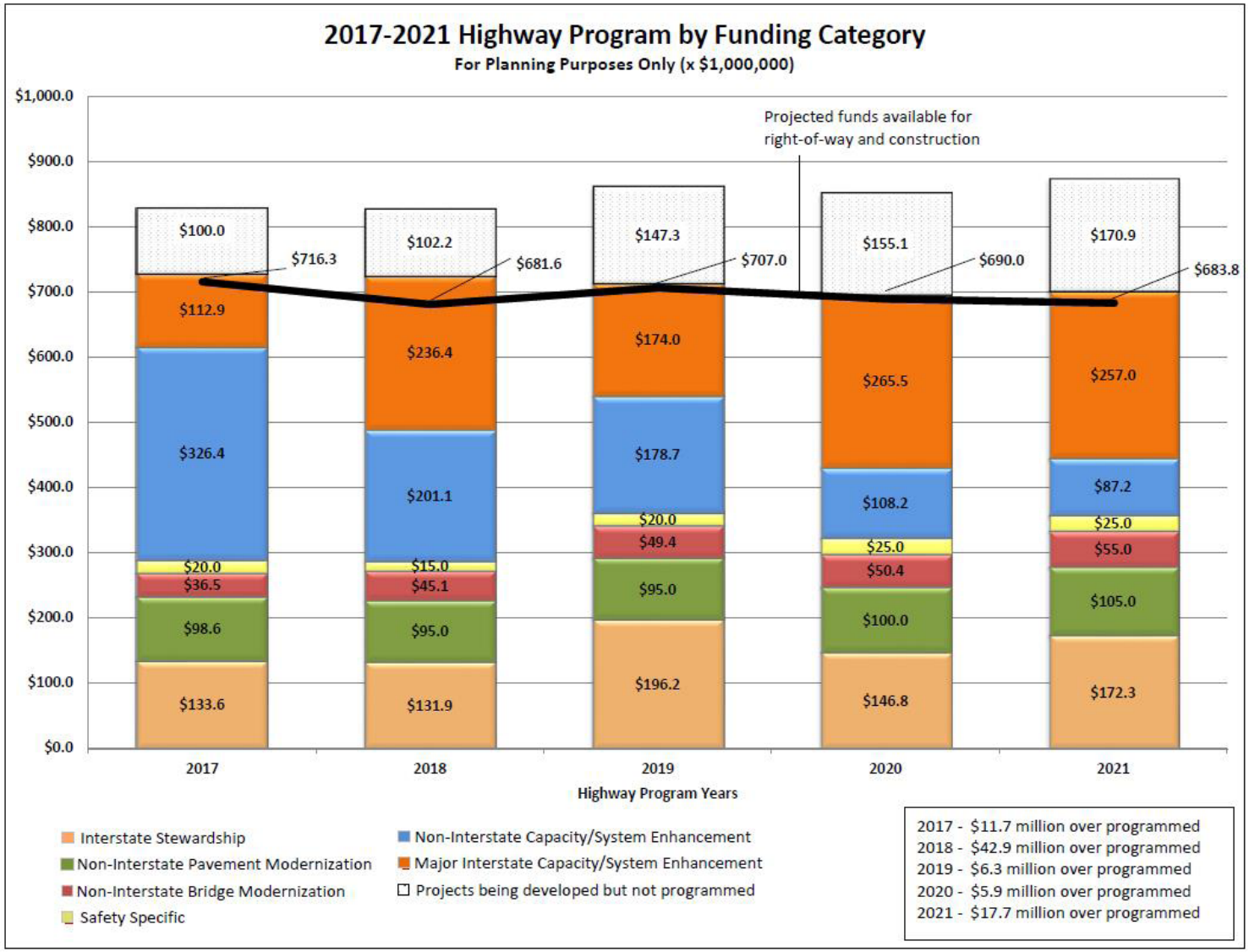
In recent years, the Commission has incorporated recommendations from Iowa DOT staff for the appropriate funding levels for the four stewardship categories, and then allocated the remaining funds to the two capacity categories. Iowa DOT recommendations for stewardship funding levels are primarily based on historical funding trends. In the future, Iowa DOT plans to use bridge and pavement management systems and other resources to better link asset performance with funding levels, as well as to evaluate risk and whole-life cost. As these tools improve, Iowa DOT will be better able to inform the Commission and other stakeholders of the relationship between funding and future performance levels. In the past, Iowa DOT has used similar tools for specific asset classes, but rarely in a general fashion to describe investment trade-offs across assets and programs.

The Commission approves the Five-Year Highway Program in June of each year. The transportation programming process is a continuous, year-round effort. Once the Commission approves the funding for these categories, Iowa DOT allocates the funds to specific projects using the processes described in the Managing Bridges and Managing Pavement sections of this TAMP.

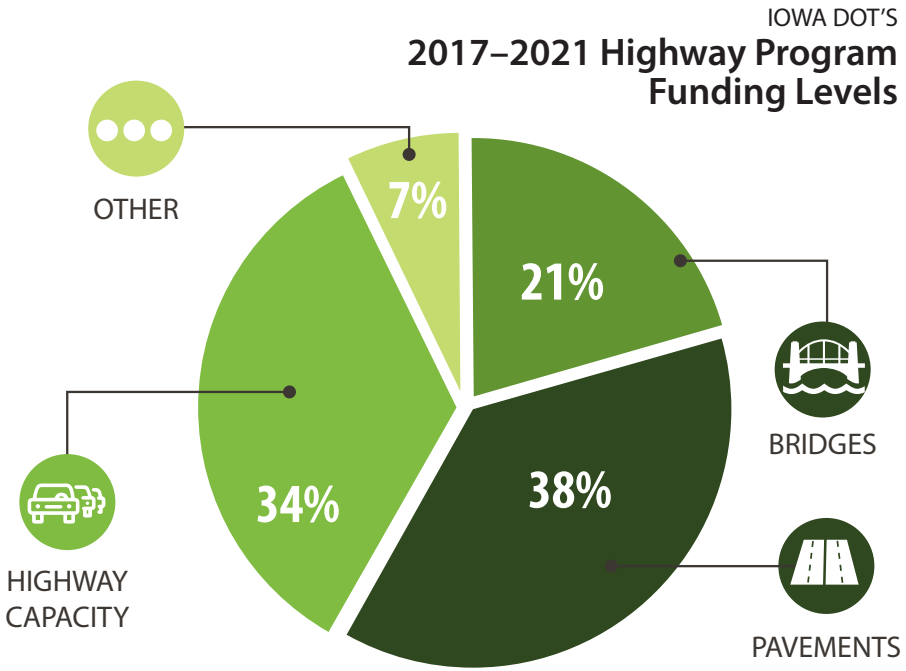
How much money is expected to be available for asset management over the next 10 years?

Iowa DOT forecasts state and federal revenue annually in preparation for the development of its Highway Program. State revenue sources have proven to be stable over time, and actual receipts typically track very closely to forecasted amounts. Iowa DOT estimates future federal funds based on existing funding identified in federal authorization bills. The current bill runs for four years. The absence of timely reauthorizations and the use of bill extensions lead to uncertainty in forecasting federal funding. Iowa DOT, therefore, uses a more conservative approach for forecasting federal funds than for forecasting state funds.

This chart shows the funding levels that Iowa DOT expects to be available for its Highway Program through 2021. It also shows how Iowa DOT plans to allocate these funds based on the process described above.



The relationship between funding levels in Iowa DOT's Highway Program and asset management activities is shown in the pie chart below. In addition to the stewardship programs, a portion of the modernization and capacity programs will also impact bridge and pavement conditions. For example, when Iowa DOT widens a section of highway, it replaces the existing pavement.[4]



The table below shows a more detailed breakdown of Iowa DOT's anticipated funding levels. It shows the amount of funding that Iowa DOT expects to allocate to each of the asset groups described in this TAMP. In addition, it shows the amount included in Iowa DOT's 2017–2021 Highway Program, and the projected amount for 2022–2026.[5]

ANTICIPATED FUNDING BY ASSET CATEGORY—2017–2026

	FY 2017–2021	FY 2022–2026	Total
Bridge Stewardship			
Interstate	$500,704,000	$600,000,000	$1,100,704
NHS (Non-Interstate)	$71,560,000	$100,000,000	$171,560
Non-NHS	$157,154,000	$230,000,000	$387,154
Subtotal	**$729,418,000**	**$930,000,000**	**$1,659,418,000**
Pavement Stewardship			
Interstate	$551,313,000	$600,000,000	$1,151,313,000
NHS (Non-Interstate)	$586,654,000	$600,000,000	$1,186,654,000
Non-NHS	$214,064,000	$320,000,000	$534,064,000
Subtotal	$1,352,031,000	$1,520,000,000	$2,872,031,000
Total	**$2,081,449,000**	**$2,450,000,000**	**$4,531,449,000**

[4] Iowa DOT used the following assumptions to create this chart: 1) Grading work that accompanies paving work is considered "pavements"; 2) Grading work by itself is considered "other"; 3) "Other" also includes signs, guardrail, right-of-way, erosion control, grading, rest areas, and other roadside assets; 4) 50% of the cost of Major Interstate Capacity/System Enhancement projects is assumed to impact existing bridge and pavement conditions.

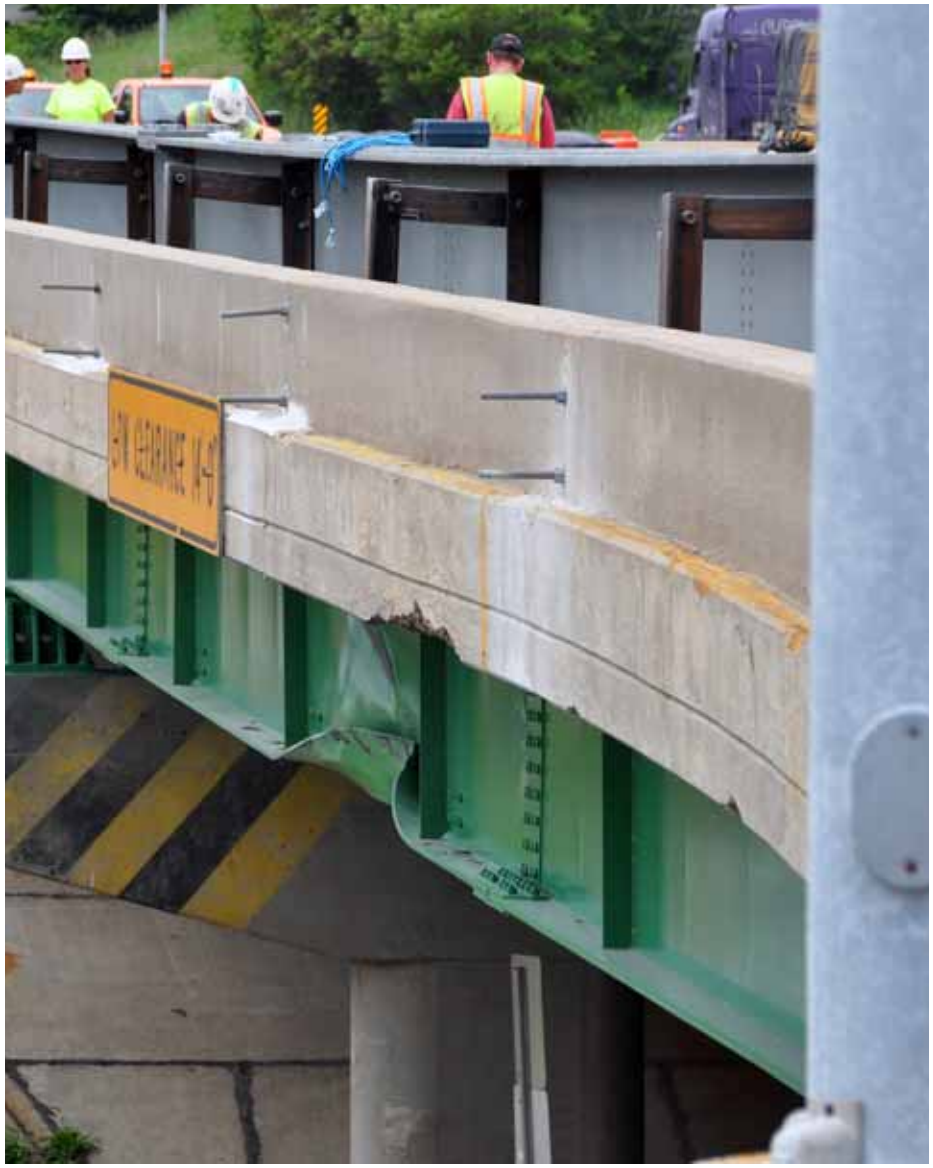
[5] Iowa DOT developed this table by translating the program structure used by the Commission to the six asset categories used throughout this document. For the first 5 years, this translation is based on actual projects in the 2017-2021 Highway Program and the assumptions listed in the footnote on the previous page. The second 5 years are based on projections for how funding may increase over time, and is contingent upon future revenue projections and future Commission direction and approvals.

What conditions can Iowa DOT achieve with these funding levels?

Iowa DOT expects that the overall condition of its bridges and pavements will get worse over next 10 years based on projected funding levels. Iowa DOT will revisit these projections once its bridge and pavement management software programs are complete.

In the past, Iowa DOT has been able to periodically increase planned bridge and pavement funding levels. Increasing the funding levels could enable Iowa DOT to slow down or even stop the projected decline in asset conditions. However, future opportunities to make these types of adjustments have not yet been identified and may not be possible.

An important part of the asset management planning process is to identify a performance gap. Iowa DOT defines the performance gap as the difference between performance targets and expected performance. Iowa DOT is working to develop specific performance targets for bridges and pavements. Once this process is complete, Iowa DOT will compare these target values to the expected values, and define a performance gap. It will also estimate the amount of additional funds required to close this gap. Based on its initial analysis described above, Iowa DOT expects that it will have a performance gap over the next 10 years.



Is the transportation system financially sustainable?

As bridges and pavements deteriorate, work is required to fix them. As the backlog of required work increases, the value of the assets decreases. This decrease is further impacted by inflation, which increases the cost of the required work. This loss of value can be offset by investing in the assets. Over the long term, if the investment levels keep up with the loss of value due to deterioration, then a transportation system is considered financially sustainable. If, however, the system loses value over time, it is unsustainable. Because bridge and pavement conditions are expected to deteriorate over the next 10 years, Iowa DOT considers its highway system to be financially unsustainable.

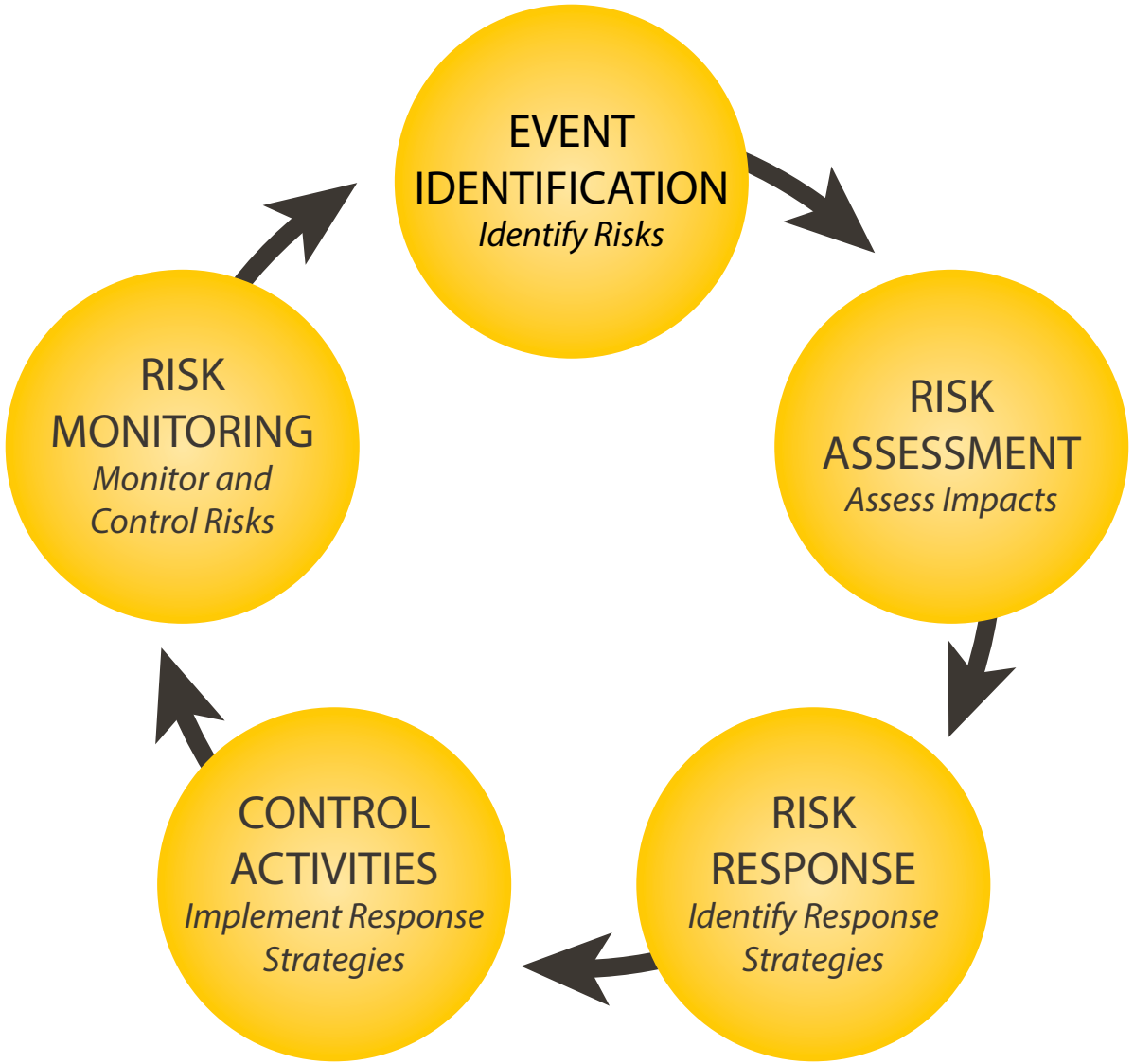
Iowa DOT is working to develop a more detailed approach for assessing financial sustainability. The goal of this effort is to better understand and communicate the long-term financial implications of the expected budget levels.

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."[6] Risk management is "the processes and framework for managing potential risks."[7]

A key part of the asset management planning process is identifying and mitigating risks associated with implementing the TAMP. The iterative process that Iowa DOT uses to manage its asset management risks consists of the following elements:

- **Event Identification.** Identify events that could impact Iowa DOT's ability to effectively manage its bridges and pavements.
- **Risk Assessment.** Assess the likelihood of an event happening and the consequences if it were to happen.
- **Risk Response.** Identify a strategy for responding to each of the priority risks.
- **Control Activities.** Implement the risk response strategies.
- **Risk Monitoring.** Monitor and respond to possible events, and evaluate the response strategies.



[6] Federal Register, Asset Management Plan, Notice of Proposed Rule Making, February 20, 2015.

[7] Ibid.

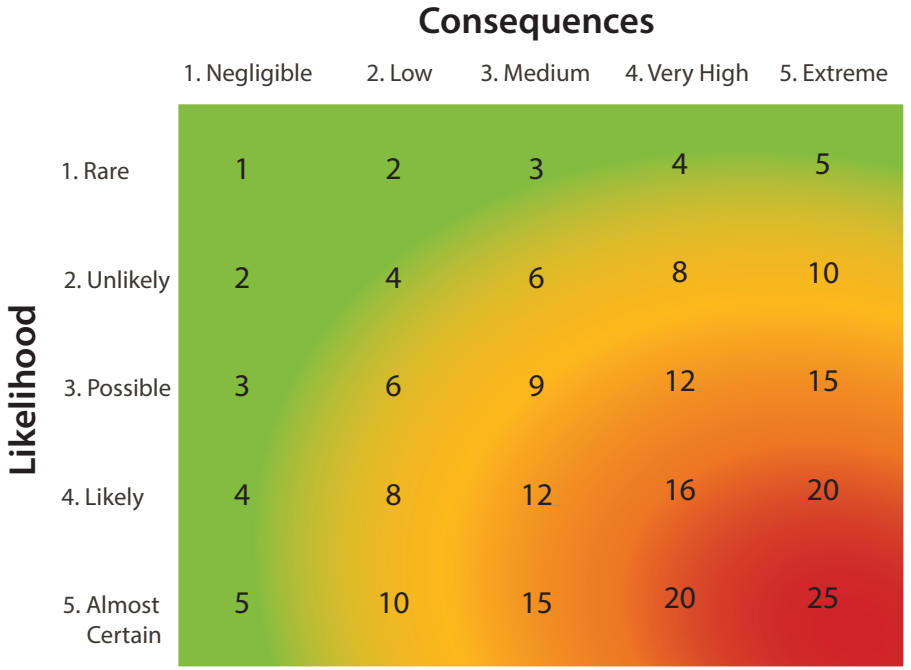
How does Iowa DOT identify and assess asset management risks?

To begin the risk identification process, Iowa DOT distributed an online survey to agency staff. The survey asked respondents to identify significant risks that could enhance or constrain Iowa DOT's ability to manage its bridges and pavements.

Iowa DOT compiled the results of the online survey, combined similar risk statements, and presented them for refinement at an asset management risk workshop. The workshop participants refined the risk statements, and then they assessed the likelihood and consequences of each risk, as follows:

- **Risk likelihood.** Workshop participants cast votes to reflect their assessment of risk likelihood on a scale of one (rare) to five (almost certain). Iowa DOT averaged the votes to determine the overall likelihood score.
- **Risk consequence.** Workshop participants also cast votes to reflect their assessment of risk consequences on a scale of one (negligible) to five (extreme). Iowa DOT averaged the votes to determine the overall consequences score.

The figure below illustrates how Iowa DOT combined the likelihood score and the consequences score to determine the relative priority of the risk. Using this approach, the highest priority risk would be almost certain to occur and would have extreme consequences. The lowest priority risk would be rare and would have negligible consequences.



How does Iowa DOT respond to potential asset management risks?

After assessing and prioritizing the risks at the risk workshop, participants defined a response strategy for each risk. The following are Iowa DOT's potential risk response strategies:

- Strategies for responding to risks with ***negative*** impacts:
  - Avoid
  - Transfer
  - Mitigate
  - Accept
- Strategies for responding to risks with ***positive*** impacts:
  - Exploit
  - Share
  - Enhance
  - Accept

The workshop participants also developed a more specific risk action plan for each priority risk. This plan consists of specific activities that Iowa DOT will implement. The results are summarized in Iowa DOT's initial risk register, which is provided on the following pages.

Iowa DOT's risk management process does not stop with the development of this initial risk register. The next steps in the process are to implement the risk action plan, monitor the risks over time, and periodically update the risk register. Through its Asset Management Governance Structure, Iowa DOT also will identify an owner for each risk. The owners will be responsible for implementing the risk action plans and reporting progress quarterly to Iowa DOT's management team. Iowa DOT will update its risk register every two years. As Iowa DOT implements the risk action plans, it is anticipated that, over time, some risks will fall off the priority list. These risks will be replaced with new priorities.

What are Iowa DOT's highest priority risks?

The following risk register defines Iowa DOT's priority risks related to asset management.

#	Risk	Impact Type	Likelihood	Consequences	Severity Level	Risk Response	
						Risk Response Strategy	Risk Action Plan
1	***If*** efficiency and accuracy of data collection and access significantly improve, then improved data may be available for decision making.	Positive	Likely/ Almost Certain	Medium/ Very High	Orange	Enhance	1.1 Continue to implement data collection enhancements. 1.2 Develop a plan for data and system coordination and integration. 1.3 Explore opportunities for enhanced data analytics. 1.4 Continue to form and institutionalize the Asset Management Governance Structure.
2	***If*** Iowa DOT is unable to adequately communicate the how and why of asset management (AM), then the program may not be adequately funded or properly implemented.	Negative	Possible/Likely	Very High	Orange	Mitigate	2.1 Develop a communication plan that defines who to communicate with, what to communicate to them, and how to communicate to them. 2.2 Address AM in the statewide transportation plan. 2.3 Continue efforts to educate the Iowa Transportation Commission about AM. 2.4 Develop an AM training plan.
3	***If*** capacity improvement projects on the Interstate Highway System are delayed, then some condition deficiencies on the system may not be addressed.	Negative	Likely	Medium/ Very High	Orange	Mitigate	3.1 Continue to advance the interstate capacity improvement projects. 3.2 Develop corridor plans that identify how AM and capacity improvement projects will be coordinated.
4	***If*** staffing is constrained due to reductions or lack of training, then AM may not be properly implemented.	Negative	Likely	Medium	Orange	Mitigate	4.1 Develop an AM staffing plan, and include contingency plans in case staffing levels decrease. Examples include reallocating staff or exploring contracting alternatives.

#	Risk	Impact Type	Likelihood	Consequences	Severity Level	Risk Response	
						Risk Response Strategy	Risk Action Plan
5	***If*** population continues to shift to urban areas, then additional funds may be allocated to non-AM needs, decreasing AM funding statewide.	Negative	Possible/Likely	Medium	Orange	Mitigate	5.1 Evaluate the highway system, and identify priority rural assets that should take precedence if AM funding decreases.
6	***If*** the Iowa Transportation Commission approves future increases to planned stewardship expenditures, ***then*** Iowa DOT may be able to maintain existing bridge and pavement conditions..	Positive	Possible	Medium/High	Orange	Enhance	6.1 Communicate with the Iowa Transportation Commission to understand the implications of current funding levels. 6.2 Improve the ability to forecast funding levels and look for sustainable funding options. 6.3 Advocate that unused funding from the capacity program or new revenue be allocated to stewardship.
7	***If*** freeze/thaw cycles occur more frequently, then pavements may deteriorate faster.	Negative	Possible	Medium	Yellow	Mitigate	7.1 Conduct research to determine if this is an issue, and if so, identify cost-effective strategies to mitigate it. Example strategies include collecting additional condition data, updating deterioration models in the pavement management system, and crack sealing pavements more frequently.
8	***If*** Iowa DOT systematically delivers sub optimal bridge and pavement projects, then AM costs may increase and conditions may decrease.	Negative	Unlikely/Possible	Very High	Yellow	Mitigate	8.1 Iowa DOT's Asset Management Governance Structure will charge subject matter experts with improving the project selection process. 8.2 Fully implement state-of-the-art bridge and pavement management software programs.
9	***If*** flooding emergencies occur more often, then the costs of managing the transportation system may increase.	Negative	Possible/Likely	Medium	Yellow	Mitigate	9.1 Continue ongoing resiliency efforts, in which Iowa DOT identifies potential flooding issues and evaluates mitigation strategies.

#	Risk	Impact Type	Likelihood	Consequences	Severity Level	Risk Response	
						Risk Response Strategy	Risk Action Plan
10	***If*** Iowa DOT can treat bridges and pavements during the winter with cost-effective, less corrosive materials, then deterioration rates may decrease.	Positive	Possible	Medium/ Very High	Yellow	Accept	10.1 Conduct research to quantify the cost implications of Iowa DOT's current winter strategies, and determine if there are opportunities to improve.
11	***If*** Iowa DOT is unable to institutionalize the use of its bridge and pavement management systems, then it may be difficult to identify optimal AM strategies, leading to increased costs and worsening conditions.	Negative	Unlikely/Possible	Medium/ Very High	Yellow	Mitigate	11.1 Iowa DOT's Asset Management Governance Structure will charge subject matter experts with improving confidence in the bridge and pavement management systems' models and recommendations. 11.2 Communicate the importance of the bridge and pavement management software programs to the Districts, and generate buy-in for them. 11.3 Integrate the bridge and pavement management software programs into the project selection process. 11.4 Once the bridge and pavement management software programs are implemented, develop a tracking process to assess the degree to which the construction program is consistent with system recommendations.
12	***If*** asset repairs perform worse than intended, then deterioration rates may increase.	Negative	Unlikely/Possible	Medium/ Very High	Yellow	Mitigate	12.1 Conduct research to determine if this is happening, and if needed, identify strategies to mitigate this issue. Examples include staff training and updated QA/QC processes.
13	***If*** there are advances in vehicle technology, then Iowa DOT's AM costs may decrease over the next 10 years.	Positive	Possible	Medium	Yellow	Enhance	13.1 Continue to proactively develop partnerships with universities and other researchers to further the advancement of autonomous vehicles.
14	***If*** funding increases by more than 15 percent, then Iowa DOT may be able to implement additional AM projects.	Positive	Unlikely/Possible	Medium/ Very High	Yellow	Enhance	14.1 Communicate AM needs and the benefits of increasing AM funds. 14.2 Develop and maintain a list of AM projects that can be implemented quickly if new funds become available.

#	Risk	Impact Type	Likelihood	Consequences	Severity Level	Risk Response	
						Risk Response Strategy	Risk Action Plan
15	***If*** new state or federal regulations are passed, then the cost of AM projects may increase.	Negative	Unlikely/Possible	Medium	Yellow	Mitigate	15.1 Communicate with regulators and legislators to help them understand the impact of potential regulations on AM.
16	***If*** the Legislature mandates earmarks into Iowa DOT's 5 year Highway Improvement Program, then AM funding may be reduced.	Negative	Unlikely/Possible	Medium	Yellow	Mitigate	16.1 Communicate with legislators to help them understand the impact of potential earmarks on the condition of the highway system.
17	***If*** funding decreases by more than 15 percent, then Iowa DOT may implement fewer AM projects.	Negative	Unlikely	Very High	Yellow	Mitigate	17.1 Communicate with legislators to help them understand the impact of decreased funding on the condition of the highway system. 17.2 Develop a contingency plan that identifies priorities if the AM budget is cut. (Coordinate with item 5.1.)

INVESTMENT STRATEGIES

How will Iowa DOT achieve its desired asset management outcomes at a minimum cost while managing risks?

Iowa DOT will implement asset management investment strategies to achieve its desired asset management outcomes at a minimum practicable cost while managing risks. These strategies reflect a combination of the following:

- **Funding levels.** Section 4, Financial Plan, describes how Iowa DOT evaluates trade-offs among competing needs and allocates funds to the various parts of the system. The funding levels presented in the Financial Plan reflect Iowa DOT's priorities and the needs of its assets.
- **Programming process.** Section 2, Managing Bridges, and Section 3, Managing Pavements, describe how Iowa DOT identifies, evaluates, and prioritizes specific bridge and pavement projects. These processes reflect a variety of considerations, including current conditions, whole life costs, and public needs. The result of these processes is a list of projects that Iowa DOT funds with the available budget.
- **Risk response activities.** Section 5, Risk Management, presents Iowa DOT's asset management risk register. The risk register identifies risks that could impact Iowa DOT's ability to achieve its desired asset management outcomes. It also defines how Iowa DOT will respond to these risks—mitigating the negative risks and enhancing the likelihood and impact of positive risks.

Taken collectively, the financial plan, programming process, and risk response activities presented in this TAMP will enable Iowa DOT to manage the decline of bridge and pavement conditions over the next 10 years.

Who is responsible for asset management at Iowa DOT?

Iowa DOT has established a two-phase approach for its transportation asset management AM efforts. The initial phase was led by an asset management steering committee. A governance committee will direct the second phase.

The steering committee's role has been to provide direction in the development of the initial TAMP. It is also responsible for ensuring that the various elements move forward in a coordinated manner.

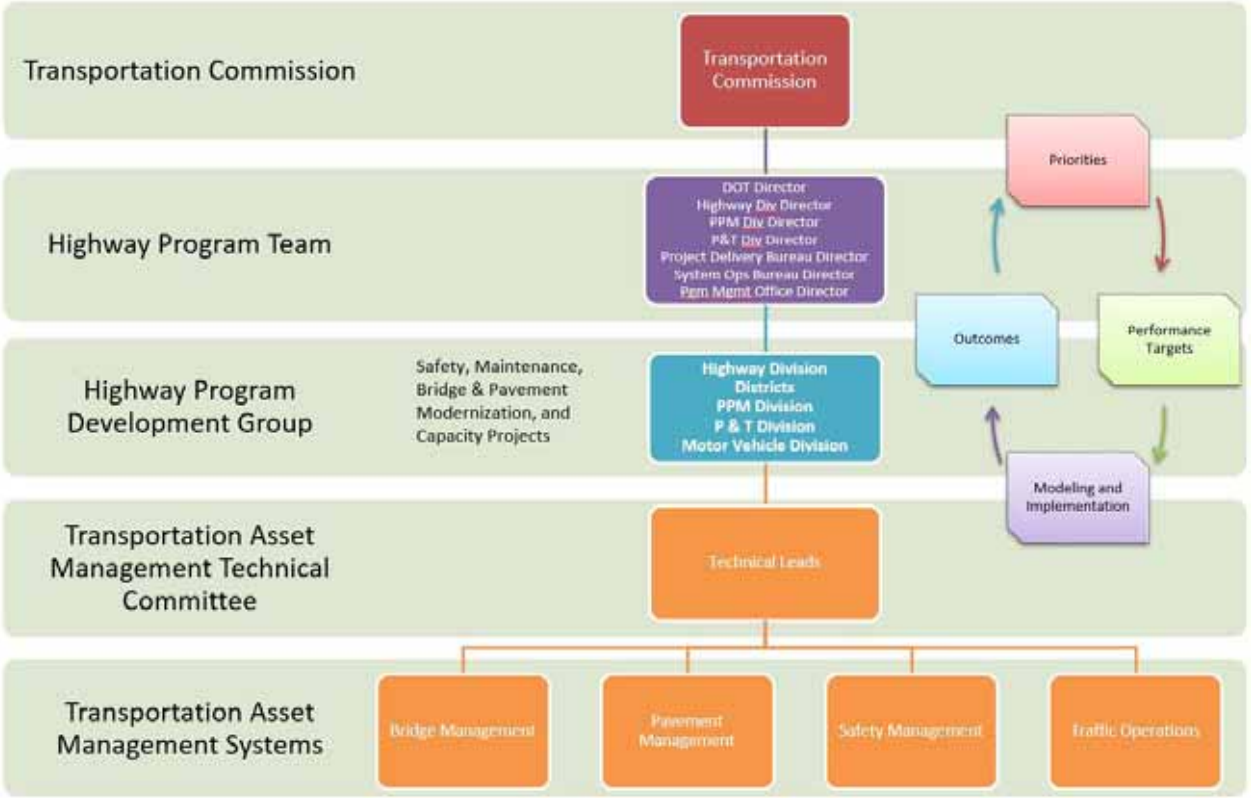
The members of Iowa DOT's Asset Management Steering Committee are listed in the following table.

Role	Name	Organizational Unit	Dates of Service
Asset Management Champion	John Selmer	Performance & Technology Division	June 2014 to present
Project Manager	Matthew Haubrich	Organizational Improvement	June 2014 to present
Committee Members	Stuart Anderson	Planning, Programming & Modal Division	June 2014 to present
	Mitch Dillavou	Highway Division	June 2014 to present
	Troy Jerman	District 4 Office	June 2014 to April 2016
	Peggi Knight	Office of Research & Analytics	May 2016 to present
	Craig Markley	Office of Systems Planning	June 2014 to present
	Scott Marler	Office of Traffic Operations	June 2016 to present
	Tammy Nicholson	Office of Location and Environment	June 2016 to present
	Charlie Purcell	Project Delivery Bureau	March 2016 to present
	E. Jon Ranney	District 2 Office	June 2014 to present
	Jim Rost	Office of Location and Environment	June 2014 to November 2015
	Don Tebben	Office of Program Management	June 2014 to present
Liaisons	Andrea Henry	Office of Strategic Communications	June 2014 to present
	Darla James	Office of Systems Planning	June 2014 to present
	Lisa McDaniel	Federal Highway Administration	June 2014 to present

The governance committee's role is to design a process and governance structure that will do the following:

- Add transparency to the programming process, align associated tools and plans, and incorporate appropriate stakeholders
- Define roles and responsibilities of the associated stakeholders
- Create a process that is adaptable over time as technology, initiatives, and priorities change
- Oversee the incorporation of risk management into the prioritization process
- Provide input to critical plan development efforts, including the TAMP and long-range transportation plan
- Propose performance targets, propose funding levels to achieve those performance targets, and coordinate the associated monitoring and reporting

IOWA DOT'S Highway TAM Governance Structure



The Governance Committee is comprised of staff involved with the highway program.

The members are listed in the following table.

Role	Name	Organizational Unit
Project Sponsors	Stuart Anderson	Planning, Programming & Modal Division
	Mitch Dillavou	Highway Division
	John Selmer	Performance & Technology Division
Project Members	Matt Haubrich	Organizational Improvement
	Peggi Knight	Office of Research & Analytics
	Scott Marler	Office of Traffic Operations
	Tammy Nicholson	Office of Location and Environment
	Garrett Pedersen	Office of Systems Planning
	Don Tebben	Office of Program Management

How will Iowa DOT improve its asset management practices?

This TAMP describes Iowa DOT's existing asset management practices. With an eye toward the future, Iowa DOT recently conducted an asset management self assessment and identified a series of initiatives for enhancing asset management.

The self assessment effort consisted of the following activities:

- **Step 1. Gap analysis survey.** Over 30 Iowa DOT staff members completed an online gap analysis survey based on one provided in the American Association of State Highway and Transportation Officials' (AASHTO's) Transportation Asset Management Guide, Volume I. Participants were asked to rate the degree to which Iowa DOT practices align with the state-of-the-art in asset management.
- **Step 2. In-depth interviews.** Several staff members participated in a series of face-to-face interviews. The objective of these interviews was to discuss existing practices in more detail.
- **Step 3. Self-assessment workshop.** The objective of this workshop was to discuss and prioritize the gaps, and to discuss options for addressing them. The workshop was an all-day event in which senior staff discussed Iowa DOT's asset management vision and goals, and identified initiatives for asset management improvement.
- **Step 4. Development of an implementation plan.** The results of the assessment are documented in an Asset Management Implementation Plan. The plan identifies the following initiatives:
  1. Implement an asset management governance structure. Iowa DOT has already made progress on this item as described above.
  2. Develop an asset management communications plan that describes how Iowa DOT will communicate with key stakeholders regarding asset management. The plan, which is already under development, will address the strengths, weaknesses, opportunities, and threats to implementing transportation asset management.
  3. Develop an asset management training plan that identifies who needs asset management training and defines a training strategy for each group.
  4. Develop asset management procedures for each asset class. The goal of this initiative is to advance each asset class into a mature state so that Iowa DOT can eventually incorporate all assets into its performance-based planning framework.
  5. Develop a maintenance quality assurance program that can be applied to the assets managed by Iowa DOT's Districts. This effort focuses on assets that go beyond bridges and pavements. The goal of the effort is to understand the performance of Iowa DOT's maintenance operations and relate outcomes to expenditures.
  6. Develop an asset management data governance strategy that identifies the data and analytical capabilities required to support asset management practices, and that defines an approach to meet these needs in the most efficient and effective manner.
  7. Develop a formal risk management process that enables Iowa DOT to formally consider risks in investment decisions.
  8. Develop procedures for managing bridges and pavements throughout their whole life, and for incorporating whole life costs into Iowa DOT's decision-making process.
  9. Develop a method for performing risk-based trade-offs between investments in bridges and pavements in order to optimize budget allocations.

Federal Requirements Checklist

The following table illustrates how Iowa DOT has addressed the federal transportation asset management plan requirements developed as part of 23 CFR Part 515.

#	Section	Requirement	How this Requirement is Addressed in this Document	Requirement Addressed on these Pages
1	515.9 (a)	A State DOT shall develop and implement an asset management plan to improve or preserve the condition of the assets and improve the performance of the NHS in accordance with the requirements of this part.	This document defines how Iowa DOT will manage its NHS bridges and pavements over the next decade. Iowa DOT expects the condition of these assets to decline. However, the resulting conditions will be better than they would be if Iowa DOT did not apply asset management principles.	Entire document
2	515.9 (a)	Asset management plans must describe how the State DOT will carry out asset management as defined in § 515.5.	§515.5 defines asset management as "a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the life cycle of the assets at minimum practicable cost." Iowa DOT's definition of asset management is consistent with this definition. This document describes how Iowa DOT plans to implement this type of process over the next decade.	Entire document
3	515.9 (b)	An asset management plan shall include, at a minimum, a summary listing of NHS pavement and bridge assets, regardless of ownership.	This document addresses Iowa DOT owned bridges and pavements in the following categories: Interstate, non-Interstate NHS, and non-NHS. The Iowa DOT owns and maintains the vast majority of the NHS in Iowa. Local agencies in Iowa own and maintain 38 NHS bridges, totaling 602,669 sq. feet of deck area. Local agencies in Iowa own and maintain 364.4 lane miles of NHS pavement.	Entire document
4	515.9 (c)	In addition to the assets specified in paragraph (b) of this section, State DOTs are encouraged, but not required, to include all other NHS infrastructure assets within the right-of-way corridor and assets on other public roads. Examples of other NHS infrastructure assets include tunnels, ancillary structures, and signs. Examples of other public roads include non-NHS Federal-aid highways. If a State DOT decides to include other NHS assets in its asset management plan, or to include assets on other public roads, the State DOT, at a minimum, shall evaluate and manage those assets consistent with paragraph (I) of this section.	This document addresses all pavements and bridges owned by the Iowa DOT, not just those that are on the NHS.	Entire document

#	Section	Requirement	How this Requirement is Addressed in this Document	Requirement Addressed on these Pages
5	515.9 (d)	The minimum content for an asset management plan under this part includes a discussion of each element in this paragraph (d).	Refer to individual items in the next several rows.	Refer to the responses in the next several rows.
6	515.9 (d)	(1) Asset management objectives. The objectives should align with the State DOT's mission. The objectives must be consistent with the purpose of asset management, which is to achieve and sustain the desired state of good repair over the life cycle of the assets at a minimum practicable cost.	The TAMP defines the following objectives for Iowa DOT's bridge program: » Preserve bridges so that they do not have to be replaced for condition-based reasons before traffic volume needs require the replacement or before the end of their designed service life » Minimize the number of structurally deficient (SD) bridges » Manage the increasing number bridges reaching the end of their service life » Reduce the risks associated with scour-critical bridges (Scour critical bridges are susceptible to damage by water.) » Reduce the risk associated with bridges that have low vertical clearance over state highways » Reduce the impact on commerce and mobility caused by load-restricted bridges The TAMP defines the following objectives for Iowa DOT's pavement program: provide a safe, serviceable, and sustainable roadway system.	Bridge: pg. 10 Pavement: pg. 20
7	515.9 (d)	(2) Asset management measures and State DOT targets for asset condition, including those established pursuant to 23 U.S.C. 150, for NHS pavements and bridges. The plan must include measures and associated targets the State DOT can use in assessing the condition of the assets and performance of the highway system as it relates to those assets. The measures and targets must be consistent with the State DOT's asset management objectives. The State DOT must include the measures established under 23 U.S.C. 150(c)(3)(A)(ii)(I)-(III), once promulgated in 23 CFR part 490, for the condition of NHS pavements and bridges. The State DOT also must include the targets the State DOT has established for the measures required by 23 U.S.C. 50(c)(3)(A)(ii)(I)-(III), once promulgated, and report on such targets in accordance with 23 CFR part 490. The State DOT may include measures and targets for NHS pavements and bridges that the State DOT established through preexisting management efforts or develops through new efforts if the State DOT wishes to use such additional measures and targets to supplement information derived from the pavement and bridge measures and targets required under 23 U.S.C. 150.	This document defines a set of asset management measures for bridges and pavements that are based on Iowa DOT's pre-existing management efforts. Once the Federal performance measures are promulgated in 23 CFR part 490, Iowa DOT will update the TAMP to reflect the required measures. Iowa DOT will establish performance targets once its Asset Management Governance Structure has been institutionalized. Once federal requirements for targets are promulgated in 23 CFR part 490, Iowa DOT will update the TAMP to ensure consistency between its measures and targets.	Bridge: pg. 7 Pavement: pg. 18

#	Section	Requirement	How this Requirement is Addressed in this Document	Requirement Addressed on these Pages
8	515.9 (d)	(3) A summary description of the condition of NHS pavements and bridges, regardless of ownership. The summary must include a description of the condition of those assets based on the performance measures established under 23 U.S.C. 150(c)(3)(A)(ii) for condition, once promulgated. The description of condition should be informed by evaluations required under part 667 of this title of facilities repeated damaged by emergency events.	This document provides asset registers that summarize the Iowa DOT's bridge and pavement inventories. It also presents current and historic conditions using pre-existing performance measures. Once the measures established under 23 U.S.C. 150(c)(3)(A)(ii) are promulgated, Iowa DOT will update these registers to reflect the new measures. The small portion of the NHS that is not owned by Iowa DOT is addressed here: » Bridges › 38 NHS bridges › 602,669 sq. feet of deck area. › 7 of these bridges are classified as structurally deficient (SD), resulting in 19.7% of the deck area being on bridges that are classified as SD. » Pavement › 364.4 lane miles › Since these pavements are owned an maintained by local agencies, Iowa DOT does not have currently access to condition data on them. This document does not yet address damage by emergency events.	Bridge: pg. 6-9 Pavement: pg. 15-19
9	515.9 (d)	(4) Performance gap identification.	Iowa DOT is working to develop specific performance targets for bridges and pavements. Once this process is complete, Iowa DOT will compare these target values to current and expected values, and define a performance gap. It will also estimate the amount of additional funds required to close this gap. Based on its initial analysis described in this document, Iowa DOT expects that it will have a performance gap over the next 10 years.	Pg. 31
10	515.9 (d)	(5) Life-cycle planning.	This document explains how Iowa DOT informally incorporates whole life costs into the decision making process, and documents areas for improvement going forward. Iowa DOT will develop a more formal approach to life-cycle planning once its implements its bridge and pavement management systems.	Bridge: pg. 13 Pavement: pg. 22

#	Section	Requirement	How this Requirement is Addressed in this Document	Requirement Addressed on these Pages
11	515.9 (d)	(6) Risk management analysis, including the results for NHS pavements and bridges, of the periodic evaluations under part 667 of this title of facilities repeated damaged by emergency event.	This document describes Iowa DOT's risk management analysis process. It also provides a risk register that defines priority asset management risks, assesses them in terms of likelihood and consequences, and provides a risk response plan for each. Through its Asset Management Governance Structure, Iowa DOT will identify an owner for each risk. The owners will be responsible for implementing the risk action plans and reporting progress quarterly to Iowa DOT's management team. Iowa DOT will update its risk register every 2 years. This document does not yet address repeated damage caused by emergency events.	Pg. 33–39
12	515.9 (d)	(7) Financial plan.	This document provides a financial plan that describes the sources of asset management funding, the processes Iowa DOT uses to allocate these funds, the amount of funding expected to be available for asset management over the next 10 years, and the impact of these funding levels on system conditions. Iowa DOT will provide further detail on expected system conditions once it implements its bridge and pavement management systems.	Pg. 24–32
13	515.9 (d)	(8) Investment strategies.	This document defines investment strategies that enable Iowa DOT to work towards desired asset management outcomes at a minimal practical cost while managing risks.	Pg. 40
14	515.9 (e)	An asset management plan shall cover, at a minimum, a 10-year period.	This document covers a 10 year period.	Entire document
15	515.9 (f)	An asset management plan shall discuss how the plan's investment strategies collectively would make or support progress toward: (1) Achieving and sustaining a desired state of good repair over the life cycle of the assets, (2) Improving or preserving the condition of the assets and the performance of the NHS relating to physical assets, (3) Achieving the State DOT targets for asset condition and performance of the NHS in accordance with 23 U.S.C. 150(d), and (4) Achieving the national goals identified in 23 U.S.C. 150(b).	This document defines investment strategies to maximize the condition and performance of the NHS given available funding. Once Iowa DOT establishes targets as part of 23 U.S.C. 150(d), it will update its investment strategies as needed to ensure that it can make progress towards them. While the primary function of Iowa DOT's asset management investment strategies is to meet the objectives defined in this document, they will also support progress towards the national goals identified in 23 U.S.C. 150 (b).	Pg. 40
16	515.9 (g)	A State DOT must include in its plan a description of how the analyses required by State processes developed in accordance with § 515.7 (such as analyses pertaining to life cycle planning, risk management, and performance gaps) support the State DOT's asset management plan investment strategies.	Iowa DOT's investment strategies are based on whole life cost considerations incorporated into its programming process, its risk management process, and anticipated funding levels.	Pg. 40

#	Section	Requirement	How this Requirement is Addressed in this Document	Requirement Addressed on these Pages
17	515.9 (h)	A State DOT shall integrate its asset management plan into its transportation planning processes that lead to the STIP, to support its efforts to achieve the goals in paragraphs (f)(1) through (4) of this section.	This document defines Iowa DOT's process for identifying, evaluating, and prioritizing bridge and pavement activities, which are addressed in its STIP.	Bridge: pg. 12 Pavement: pg 21
18	515.9 (i)	A State DOT is required to make its asset management plan available to the public, and is encouraged to do so in a format that is easily accessible.	This document is designed to be accessible and understandable to the public. It describes Iowa DOT's asset management processes in clear and concise terms, and augments the text with easy to understand charts.	Entire document
19	515.9 (j)	Inclusion of performance measures and State DOT targets for NHS pavements and bridges established pursuant to 23 U.S.C. 150 in the asset management plan does not relieve the State DOT of any performance management requirements, including 23 U.S.C. 150(e) reporting, established in other parts of this title.	This document defines a set of asset management measures for bridges and pavements that are based on Iowa DOT's pre-existing management efforts. Once the Federal performance measures are established, Iowa DOT will update the TAMP to reflect the required measures.	Not yet applicable
20	515.9 (k)	The head of the State DOT shall approve the asset management plan.	Iowa DOT's Director will approve Iowa DOT's initial TAMP.	Not yet applicable
21	515.9(l)	If the State DOT elects to include other NHS infrastructure assets or other public roads assets in its asset management plan, the State at a minimum shall address the following, using a level of effort consistent with the State DOT's needs and resources: (1) Summary listing of assets, including a description of asset condition; (2) Asset management measures and State DOT targets for asset condition; (3) Performance gap analysis; (4) Life-cycle planning; (5) Risk analysis, including summaries of evaluations carried out under part 667 of this title for the assets, if available, and consideration of those evaluations; (6) Financial plan; and (7) Investment strategies.	This document addresses all of Iowa DOT's bridges and pavements, not just those on the NHS. All assets are handled consistently throughout this document.	Entire document
22	515.9(m)	The asset management plan of a State may include consideration of critical infrastructure from among those facilities in the State that are eligible under 23 U.S.C. 119(c).	This document addresses all of Iowa DOT's bridges and pavements.	Entire document

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515.11 Deadlines and phase-in of asset management plan development				
23	515.11 (a)	(1) Not later than April 30, 2018, the State DOT shall submit to FHWA a State-approved initial asset management plan meeting the requirements in paragraph (b) of this section. The FHWA will review the processes described in the initial plan and make a process certification decision provided in §515.13(a). (2) Not later than June 30, 2019, the State DOT shall submit a State-approved asset management plan meeting all the requirements of 23 U.S.C. 119 and this part, including paragraph (c) of this section, together with documentation demonstrating implementation of the asset management plan. The FWHA will determine whether the State DOT's plan and implementation meet the requirements of 23 U.S.C. 119 and this part as provided in §515.13(b).	Iowa DOT is following a phased approach to TAMP development. This document represents the first iteration. Iowa DOT does not consider this document to be its initial TAMP.	Entire document
24	515.11 (b)	The initial plan shall describe the State DOT's processes for developing its risk-based asset management plan, including the policies, procedures, documentation, and implementation approach that satisfy the requirements of this part.	This document describes Iowa DOT's asset management processes, policies and implementation approach.	Entire document
25	515.11 (b)	The plan also must contain measures and targets for assets covered by the plan. The investment strategies required by § 515.7(e) and 515.9((d)(8) must support progress toward the achievement of the national goals identified in 23 U.S.C. 150(b). The initial plan must include and address the State DOT's 23 U.S.C. 150(d) targets for NHS pavements and bridges only if the first target-setting deadline established in 23 CFR part 490 for NHS pavements and bridges is a date more than 6 months before the initial plan submission deadline in paragraph (a)(1).	This document defines a set of asset management measures for bridges and pavements that are based on Iowa DOT's pre-existing management efforts. Once the Federal performance measures are promulgated in 23 CFR part 490, Iowa DOT will update the TAMP to reflect the required measures. Iowa DOT will establish performance targets once its Asset Management Governance Structure has been institutionalized. Once federal requirements for targets are promulgated in 23 CFR part 490, Iowa DOT will update the TAMP to ensure consistency between its measures, targets, and investment strategies.	Bridge: pg. 7 Pavement: pg. 18
26	515.11 (b)	The initial asset management plan may exclude one or more of the necessary analyses with respect to the following required asset management processes: (1) Life-cycle planning required under § 515.7(a)(2); (2) The risk management analysis required under § 515.7(a)(3); and (3) Financial plan under § 515.7(a)(4).	As addressed earlier in this table, this document addresses life cycle planning, risk management, and financial planning. The document also defines how Iowa DOT will further enhance these processes prior to developing its initial TAMP.	Pg. 13, 22, 33 and 40

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27	515.11 (c)	The State-approved asset management plan submitted not later than June 30,2019, shall include all required analyses, performed using FHWA-certified processes, and the section 150 measures and State DOT targets for the NHS pavements and bridges. The plan must meet all requirements in §§ 515.7 and 515.9. This includes investment strategies that are developed based on the analyses from all processes required under § 515.7, and meet the requirements in 23 U.S.C. 119(e)(2).	Iowa DOT is following a phased approach to TAMP development. This document represents the first iteration, and describes additional enhancements that Iowa DOT will make to its asset management processes prior to development of the June 30, 2019 version.	Entire document
28	515.17	Pursuant to 23 U.S.C.150(c)(3)(A)(i), this section establishes the minimum standards States must use for developing and operating bridge and pavement management systems. State DOT bridge and pavement management systems are not subject to FHWA certification under § 515.13. Bridge and pavement management systems shall include, at a minimum, documented procedures for: (a) Collecting, processing, storing, and updating inventory and condition data for all NHS pavement and bridge assets. (b) Forecasting deterioration for all NHS pavement and bridge assets; (c) Determining the benefit-cost over the life cycle of assets to evaluate alternative actions (including no action decisions), for managing the condition of NHS pavement and bridge assets; (d) Identifying short- and long-term budget needs for managing the condition of all NHS pavement and bridge assets; (e) Determining the strategies for identifying potential NHS pavement and bridge projects that maximize overall program benefits within the financial constraints.; and (f) Recommending programs and implementation schedules to manage the condition of NHS pavement and bridge assets within policy and budget constraints.	Iowa DOT is work to fully implement a bridge management system and a pavement management system.	Bridge: pg. 14 Pavement: pg. 23