

CHAPTER 5: Preserve and Maintain Wisconsin's Transportation System

► **POLICIES IN THIS CHAPTER FOR PROMOTING PRESERVATION AND MAINTENANCE:**

- › *Implement cost-effective maintenance activities on Wisconsin's state trunk highway system infrastructure*
- › *Preserve Wisconsin's state trunk highway system infrastructure*
- › *Preserve Wisconsin's airport system infrastructure*

WisDOT's vision for preservation and maintenance is a Wisconsin where transportation system investment benefits are maximized through cost-effective strategies that foster:

- » Ongoing routine maintenance
- » Long-term preservation
- » Continued availability of transportation services statewide

Ongoing routine maintenance refers to the daily activities that help maintain and preserve the system so that it provides a satisfactory level of service. Maintenance activities typically focus on system parts such as roadway shoulders, pavement markings, bridge railings, pavement cracks, transit vehicles and traffic signals.

Examples of maintenance activities include:

- » Patching potholes on roadways or bicycle trails
- » Maintaining and repairing publicly owned rail lines (see Chapter 7, *Foster Wisconsin's Economic Growth*, for more information)
- » Repairing and restoring facilities after crashes, natural disasters or vandalism

- » Maintaining traffic signals
- » Repairing dock walls (see Chapter 7, *Foster Wisconsin's Economic Growth*, for more information about harbor programs)
- » Routinely inspecting bridges
- » Repairing damaged bridges

While maintenance activities help address immediate system needs, eventually they are insufficient to address underlying infrastructure deterioration. At that point, preservation strategies are used to appreciably extend the infrastructure's useful life. Preservation requires cost-effective strategies that enhance the long-term performance of the system while improving safety and striving to meet user expectations. These activities may include:



▲ *Figure 5-1: Wisconsin's existing transportation system includes extensive infrastructure and services, such as highways and local roads.*



- » Rehabilitating bridges and structures
- » Resurfacing or reconstructing highways, local roads and airport runways
- » Dredging harbors and shipping channels
- » Replacing sidewalks and bicycle accommodations during roadway reconstruction

State preservation activities, such as retaining current passenger and freight services, also ensure continued availability of critical transportation options. The availability of transportation options to move people and goods enhances Wisconsin's quality of life and economic well-being. Examples of related preservation activities include:

- » Preserving rail corridors, including rights of way, for freight and passenger service (see Chapter 7, *Foster Wisconsin's Economic Growth*)
- » Retaining public, human services and specialized transit services (see Chapter 8, *Provide Mobility and Transportation Choice*)
- » Retaining and enhancing intercity passenger services such as intercity bus, passenger rail and air travel (see Chapter 8, *Provide Mobility and Transportation Choice*)

Challenges

Wisconsin's existing transportation system was developed over many decades using both private and

public investment. It includes extensive infrastructure and services ranging from highways, local roads and airports, to railways, harbors, sidewalks and transit systems. The existing transportation system is the foundation on which future investments will be made. However, this foundation faces several challenges:

- » Aging system infrastructure
- » Limited available funding
- » Increasing costs
- » Increasing user demand
- » Increasing requests to accommodate heavier truck and trailer loads
- » Reduced availability of transportation options

Much of Wisconsin's Interstate highway system was constructed in the 1950s and 1960s, and bridges on the state trunk highway system (which includes the Interstate highway system) can date back to the 1930s and 1940s. Since then, user demands have increased, and in some cases designs that were applied to address anticipated travel demands are now outdated. In response, WisDOT's efforts continue to focus on maintaining and preserving the system, along with addressing safety deficiencies, traffic flow concerns and critical design features. If pavement replacement continues over the typical lifespan of the infrastructure, roads can last up to 60 years (prior to complete reconstruction), and bridges can last up to 75 years. However, keeping pace with both emerging and existing needs remains a challenge.

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▲ *Figure 5-2: By 2030, statewide vehicle miles traveled is forecast to increase 34 percent, with truck traffic forecast to account for 10.5 billion miles, an increase of 64 percent.*

Challenges with funding and increasing costs

Financing Wisconsin's wide range of transportation needs continues to be a challenge. As the system ages, maintenance and preservation activities typically change. Costs tend to increase – particularly those related to real estate, energy and construction materials. This has had an impact on both WisDOT's and local governments' abilities to maintain and preserve existing infrastructure. In some cases, lack of adequate funding to address all needs has resulted in deferred preservation and maintenance activities.

When maintenance and preservation activities are delayed, system deterioration can progress to the point of requiring potentially more extensive and expensive work, such as full reconstruction, sooner than it might otherwise have been needed.

Without increases in funding to maintain and, where possible, increase purchasing power, WisDOT and local governments cannot keep pace with maintenance and preservation needs. This will result in a growing backlog of necessary but uncompleted work. The larger the backlog gets, the longer preservation projects will

be delayed, resulting in probable project cost increases that will exacerbate already strained budgets.

Increased user demand also presents challenges. By 2030, statewide vehicle miles traveled (VMT) is forecast to increase 34 percent, from 59.5 billion miles in 2007 to 80 billion miles in 2030. Freight traffic will also place increased pressure on the state's transportation system. In 2007, truck traffic accounted for 6.4 billion miles; by 2030, truck traffic is forecast to account for 10.5 billion miles, an increase of 64 percent.

In some cases, state and local roadways are not designed to handle the number of trucks or the heavy loads associated with truck shipping. As a result, the timing required to address pavement deterioration and system capacity issues may be accelerated.

Reduced availability of transportation options

As stated in Chapter 8, *Provide Mobility and Transportation Choice*, an accessible, affordable and integrated transportation system is critical to maintaining mobility. A key factor in maintaining mobility is the preservation of existing passenger and

EVERY YEAR, BILLIONS OF MILES of travel and continuous natural wear create a need for ongoing maintenance of the highway system. In addition, Wisconsin's highway infrastructure is aging, requiring increased levels of maintenance to preserve existing levels of service.

freight services. In recent years, Wisconsin residents and businesses have experienced losses of intercity bus and freight services on several corridors. The policies outlined in Chapter 8, *Provide Mobility and Transportation Choice*, offer strategies and future direction to address continued service needs and provide more mobility options.

Each of these issues – aging system infrastructure, limited funding, increasing costs, increasing demand and reduced availability of transportation options – further challenges the department's efforts to address system preservation, modernization and capacity issues (see Chapter 9, *Promote Transportation Efficiencies*, for information). Funding activities that address preservation, modernization and capacity issues will be expensive.

Activities

With a vision for and commitment to system preservation, WisDOT will continue to perform several key activities to address these challenges:

- » Implement cost-effective maintenance activities on Wisconsin's state trunk highway system infrastructure
- » Preserve Wisconsin's state trunk highway system infrastructure
- » Preserve Wisconsin's airport system infrastructure

While this chapter discusses the state trunk highway and state airport systems, WisDOT's preservation

focus is not limited to these transportation modes. The department has identified specific policies and actions for maintaining and preserving all modes of transportation, but WisDOT's role varies depending on the transportation mode. The department has primary responsibility for maintaining and preserving the state trunk highway system and some segments of publicly owned rail.

For the remainder of the transportation system, WisDOT manages available federal and state funding, and provides technical assistance and appropriate data resources, but the infrastructure and facilities belong either to private entities or local governments. For details about maintenance and preservation actions related to other modes, refer to:

- » Chapter 7, *Foster Wisconsin's Economic Growth*, for actions related to freight rail, local roads and harbors, and additional actions related to airports
- » Chapter 8, *Provide Mobility and Transportation Choice*, for actions related to bicycle and pedestrian accommodations, transit and intercity passenger travel, and additional actions related to airports

Each of the activities in this chapter offers strategic direction through the year 2030. These activities may be implemented with other activities throughout the plan to better leverage limited resources. For example, a road preservation project may offer opportunities to consider and incorporate the scheduling of utility work, such as sewer upgrades, or to add or upgrade bicycle and pedestrian facilities.

► **POLICY:**
Implement cost-effective maintenance activities on Wisconsin's state trunk highway system infrastructure

To effectively maintain state trunk highway system infrastructure, WisDOT will:

- » Initiate a formal, ongoing preventive maintenance process
- » Promote and implement sound environmental practices for all highway maintenance activities
- » Implement proven maintenance management practices

Background

Highway maintenance activities focus on the infrastructure along the highway right of way, including, but not limited to, roadway pavement and shoulders, bridges, rest areas, signs, drainage and pavement markings. WisDOT maintains nearly 12,000 miles of highway infrastructure, approximately 4,900 bridges and more than 150,000 acres of roadside adjacent to state trunk highways.

Every year, billions of miles of travel and continuous natural wear create a need for ongoing maintenance of the highway system. In addition, Wisconsin's highway infrastructure is aging, requiring increased levels of maintenance to preserve existing levels of service. Growing freight markets and heavier trucks and loads traveling on Wisconsin's highways are expected to impact preservation needs through 2030.

Meanwhile, funding levels for highway maintenance have not kept pace with growing demands. As a result, the backlog of maintenance needs continues to increase.

Initiate a formal, ongoing preventive maintenance process

Preventive maintenance is the periodic application of relatively inexpensive roadway treatments (for



Highway maintenance is closely associated with highway operations. Both seek to maximize the reliability of the highway system. Highway maintenance activities focus on the infrastructure along the highway right of way, while operations activities focus on the flow of traffic on and across the infrastructure. See Chapter 9, *Promote Transportation Efficiencies*, for more information on highway operations.

Highway maintenance activities

- › Pavement and bridge spot treatments
- › Shoulder repair
- › Repair and replacement of signs and pavement markings*
- › Roadside vegetation control
- › Repair and restoration of state trunk highway facilities and structures after crashes, natural disasters and vandalism
- › Maintenance of rest areas, waysides and some park and ride lots

** Historically, repair and replacement of signing and markings have been grouped with highway operations functions. However, they are maintenance activities.*





▲ Figure 5-3: Heavier trucks and loads on Wisconsin's highways may have a significant impact on highway deterioration.

UNLIKE OTHER state departments of transportation, WisDOT contracts with the state's 72 counties to perform maintenance activities on the state trunk highway system. Routine Maintenance Agreements outline costs and standards requirements.

example, filling the pavement cracks on roadways) that help extend the life of the system by delaying deterioration. Postponing preventive maintenance ultimately results in larger repair projects that take longer to complete and, as a result, can cause such consequences as greater disruption to traffic flow. An effective preventive maintenance process includes:

- » Monitoring existing state trunk highway conditions, identifying deficiencies and setting priorities
- » Developing a plan to carry out maintenance activities and address deficiencies

Monitoring existing state trunk highway system conditions, identifying deficiencies and setting priorities

WisDOT will continue to address the most critical maintenance needs of the state trunk highway system infrastructure, including (not in order of priority):

- » Repair needs of bridges and other structures
- » Pavement and shoulders
- » Pavement cracks
- » Signs and markings
- » Guardrails and other roadside safety features
- » Drainage elements such as culverts, including restoration and replacement
- » Traffic signals and other traffic management devices

In addition, WisDOT will continue to perform numerous other preventive maintenance activities, including:

- » Keeping shoulders in good condition and free of debris
- » Ensuring visibility at intersections by mowing and using plant growth retardants
- » Controlling woody plants within the clear zone using herbicides and mowers
- » Keeping rest facilities clean and in good repair
- » Providing highway lighting where necessary

To monitor system performance and address deficiencies throughout the year, WisDOT will work with the Federal Highway Administration to implement a Maintenance and Operations Decision Support System (an extension of the current Maintenance Decision Support System that focuses on winter operations). A decision support system is a computerized information system that supports

organizational decision-making activities and is intended to help decision makers compile useful information from raw data, documents, personal knowledge and/or business models to identify and solve problems and make decisions. This system will help highway maintenance staff identify and recommend specific treatments and timing strategies to complete necessary maintenance work. Moreover, WisDOT's regional maintenance field staff will continue to monitor county performance, specifically in the areas of establishing work plans, setting priorities and assuring compliance with maintenance standards.

This effort continues WisDOT's current work with counties and developers. One example of this coordination is when plans indicate traffic signal placement on corridors. WisDOT will also develop reporting tools to document when fieldwork is completed. This information will help WisDOT benchmark performance and identify best practices.

WisDOT is developing a more robust asset management program for structures and bridges. The program will include defined inspection cycles and replacement and maintenance strategies.

Developing a plan to carry out maintenance activities and address deficiencies

To more effectively manage statewide maintenance work, the department will complete three activities:

- » Finalize the department's policy regarding highway infrastructure ownership and maintenance responsibilities
- » Develop long-term investment plans and corridor-level roadside management plans for state trunk highway facilities, such as rest areas, waysides, scenic overlooks, welcome centers and safety and weight enforcement facilities
- » Develop a system for identifying maintenance costs associated with new and existing highways and bridges. This will enable department staff and decision-makers to better understand the maintenance costs associated with new construction, as well as the costs associated with the maintenance of the existing state trunk highway system. This goal is further described under the "Preserve Wisconsin's state trunk highway system infrastructure" policy



▲ Figure 5-4: WisDOT maintains nearly 12,000 miles of highway infrastructure, including, but not limited to, roadway pavement and shoulders, bridges and rest areas.

Promote and implement sound environmental practices for all highway maintenance activities

As with all highway projects, WisDOT considers the potential impacts of roadway maintenance activities on natural plant and animal communities and works to avoid, minimize and mitigate these impacts (see Chapter 10, *Preserve Wisconsin's Quality of Life*, for more information). The department uses – and will continue to use through 2030 – a number of minimization and mitigation practices to help address potential impacts (Table 5-1).

In addition to the activities identified in Table 5-1, WisDOT will also establish more robust programs related to:

- » Invasive, non-native species
- » High priority plant communities

Non-native invasive species continue to be a statewide challenge; efforts to minimize and eradicate their presence are ongoing. To respond to this challenge, Governor Jim Doyle established the Council on Invasive Species. WisDOT will track the decisions of the Council and respond accordingly, implementing best management practices as appropriate. Also, through ongoing collaboration with the Wisconsin Department of Natural Resources, WisDOT will

implement a program of “early detection, rapid response” for invasive species. The department will take mitigating actions to address noxious weeds as required under Wisconsin State Statute 66.0407, and will seek the necessary resources to manage this effort. For more information, refer to Chapter 10, *Preserve Wisconsin's Quality of Life*.

As part of its efforts to identify high-priority plant communities, such as native prairie remnants, WisDOT will develop a new program aimed at preserving and restoring high-priority prairie, where feasible.

Implement proven maintenance management practices

WisDOT will continue to:

- » Improve the department’s existing maintenance management tools
- » Research and evaluate new, cost-effective highway maintenance technologies
- » Implement work zone and lane-closure management strategies and tools to maintain safety and minimize impacts on travelers
- » Emphasize cost-effective strategies in county maintenance contracts

Table 5-1: Continuing department minimization and mitigation practices

Maintenance area	Activity
Wildlife/domestic animal crossings	<ul style="list-style-type: none">• Continue to maintain wildlife/domestic animal crossings
Scenic easements	<ul style="list-style-type: none">• Continue to identify and maintain existing scenic easement agreements• Continue to clarify scenic easement policy including issues such as urban growth area impacts on scenic easements
Community sensitive design	<ul style="list-style-type: none">• Consider aesthetic elements in planning and projects• For more information, refer to the “Continue Community Sensitive Design Efforts” policy in Chapter 10, <i>Preserve Wisconsin's Quality of Life</i>
Erosion control and water management	<ul style="list-style-type: none">• Continue to use tools and techniques for effective erosion control, water quality management and drainage
All-terrain vehicles (ATVs) (use on roadways, shoulders and roadsides can damage vegetation, cause rutting and slope erosion, displace shoulder gravel, prematurely wear pavement markings and disturb adjacent landowners through noise and exhaust fumes)	<ul style="list-style-type: none">• Continue to monitor legislation concerning ATVs• It is not in the public interest to accommodate ATVs within state trunk highway right of way; exceptions to this ‘no accommodation’ policy will be very rare

WisDOT will continue to expand and refine its existing management system tools, including the Compass program. Compass is a decision-making tool that helps establish work priorities and allocate resources. A critical input for this program is an annual condition assessment of the state trunk highway system. The assessment provides condition information about shoulders, drainage, roadsides, traffic devices, bridges and winter operations. Over the long term, WisDOT will continue to work toward developing and implementing a comprehensive maintenance management system for all highway assets.

In addition to improving existing tools, WisDOT will research and evaluate new, cost-effective highway maintenance technologies and will identify best management practices that leverage existing resources and maximize efficiencies. Emphasis will also be placed on developing tools that not only pinpoint specific areas that need preventive maintenance, but prioritize the identified needs.

For example, innovative technology for pavement crack filling may be evaluated. From a capital improvement standpoint, other technologies that can be incorporated into the routine replacement of pavements include those that use new pavement additives that resist wear and lengthen pavement life. New technology can be used in replacing or improving traffic signs and pavement marking materials so they are more durable and visible, particularly in wet weather.

WisDOT will continue to emphasize cost effectiveness in managing contracts with Wisconsin's counties. The department will create and track appropriate benchmarks and service delivery outcomes. The department will also continue working with the counties as they define and provide a comprehensive suite of services.

Conducting highway maintenance activities sometimes disrupts traffic flow. Work zone management strategies help minimize disruption and maintain state trunk highway system reliability. Oftentimes, work zone management requires creativity and flexibility. In response, WisDOT will

Compass

Compass is WisDOT's highway operations quality assurance and asset management program. Launched in 2001, it plays a critical role in educating and communicating maintenance needs to WisDOT stakeholders.

Compass uses existing WisDOT data and statistical sampling to gather information on existing highway conditions and to explain the relationship between those conditions and the maintenance budget. It puts the expertise of highway operations workers into a format easily understood by laypeople and decision-makers.

Annual Compass reports provide information about the conditions of shoulders, drainage, roadsides, selected traffic devices, traveled ways, bridges and winter maintenance.

Compass also works with operations managers to set annual targets for highway operations conditions under current budget levels.

Compass will complement the Maintenance and Operations Decision Support System. While the system will help optimize decisions about specific treatment types and the timing for completion of the work, the Compass program will provide information about the extent of work needed and will help WisDOT consider trade-offs among various work priorities.

perform more of its maintenance work during non-peak traffic hours, including nighttime hours when traffic volumes are typically lower.

In addition, WisDOT will ensure that ongoing training on work zone traffic control and safety is available to department staff. Refer to Chapter 9, *Promote Transportation Efficiencies*, for more information.



► **SUMMARY OF POLICY ACTION ITEMS:**
Implement cost-effective maintenance activities on Wisconsin's state trunk highway system infrastructure

Short-term (2008 – 2013)

- Complete long-term investment plan for state trunk highway facilities.
 - Finalize policy for highway infrastructure ownership and maintenance.
 - Partner with the Federal Highway Administration to develop and implement a Maintenance and Operations Decision Support System.
 - Develop a more robust program related to the restoration and preservation of high-priority plant communities.
 - Continue to develop and implement a web-based lane closure planning system.
-

Mid-term (2014 – 2019)

- Develop and implement corridor-level roadside management plans for the state trunk highway system.
 - Develop a system for identifying maintenance costs for new and existing state trunk highways and bridges.
 - Cooperate with the Wisconsin Department of Natural Resources to develop and implement a rapid-detection and early response program to better control non-native invasive species.
 - Evaluate new technologies that can pinpoint and prioritize areas with preventive maintenance needs.
-

Long-term (2020 – 2030)

- Continue to research and evaluate new, cost-effective maintenance technologies and prioritize needs including research, development, testing and implementation of new pavement additives that are resistant to wear and would lengthen the life of the pavement.
 - Develop and fully implement a comprehensive maintenance management system for all highway assets (including bridges and structures).
-

Entire planning period (2008 – 2030)

- Continue to address the most critical highway maintenance needs.
 - Continue to perform preventive maintenance activities (keeping rest facilities clean and in good repair, for example).
 - Continue to monitor county performance and develop reporting tools to document when fieldwork is completed.
 - Expand and refine existing management system tools, including the Compass program.
 - Continue to implement work zone management strategies to maintain safety and minimize traveler impacts, including ensuring WisDOT staff receive ongoing training on work zone traffic control and safety, and perform more maintenance work during off-peak travel times, including nighttime hours, where feasible.
 - Continue to emphasize cost effectiveness in managing contracts with counties.
 - Continue to work with Wisconsin's counties to define a comprehensive suite of services that the counties will provide.
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► **POLICY:**
*Preserve Wisconsin's state trunk
 highway system infrastructure*

WisDOT will continue to preserve the existing state trunk highway system infrastructure. To accomplish this policy, WisDOT will:

- » Continue using a performance-based approach to identify state trunk highway system preservation needs, including development of a bridge asset management system
- » Refine and expand a state-of-the-art process for prioritizing needs and identifying cost-effective state trunk highway construction alternatives
- » Pursue sufficient funding to address state trunk highway system preservation needs

Background

Wisconsin's state trunk highway system includes approximately 11,800 miles of two-lane and multi-lane highways and approximately 4,900 bridges. The state trunk highway system includes all Interstate highways, U.S. highways and state highways.

The majority of the state trunk highway system was built in the 1950s and 1960s. Preventive maintenance, resurfacing and reconditioning strategies have extended the useful life of the system. However, infrastructure deterioration – due to increased traffic volumes, freight movements and typical wear and tear – has resulted in the need for significant improvements, including reconstruction and replacement. Ensuring the continuation of system preservation is critical to maintaining the safety and quality of the state's roadways.

While all state trunk highways are important, a key component requiring immediate attention is the Southeast Freeway System. This 270-mile system includes both Interstate and non-Interstate freeways crossing seven southeastern Wisconsin counties in and

Highway preservation activities include:

- **Resurfacing** – Placing a new surface on existing pavement to provide a better riding surface and to extend or renew pavement life. Generally requires no capacity increase or change in roadway characteristics (such as width, curves or slope).
- **Replacement** – Removing all existing pavement layers and replacing with new pavement. Occurs when deterioration is severe. Generally, no capacity or roadway characteristic changes are made.
- **Reconditioning** – Work done in addition to resurfacing or replacing pavement. Minor work may include pavement widening and shoulder paving. Major work involves improvement to site-specific roadway character deficiencies, such as isolated grade, curve, or safety issues related to sight distance problems.
- **Reconstructing** – Total rebuilding of an existing highway to improve maintainability, road characteristics, and traffic safety. Usually completed on existing alignment. Normally requires some right of way acquisition.

around Milwaukee. Because the southeast freeways are also some of the primary gateways into and out of Wisconsin, they are some of the state's most heavily traveled roadways. Truck volumes are particularly high because these routes provide access to markets in the Chicago area and regions to the east and south. Freeways in southeastern Wisconsin also serve freight traffic moving not only to and from the Milwaukee metropolitan area, but also Chicago, Madison and the Fox River Valley.

Similar to other state highways, many of Wisconsin's southeast freeways were constructed in the 1950s and 1960s. In addition to pavement deterioration concerns, design standards that were appropriate at the time of construction are now inadequate to handle increased



Southeast Freeway System

There are 270 miles of freeways serving seven counties in southeast Wisconsin, with each carrying thousands of cars and trucks every day. The Southeast Freeway System is the economic lifeline not only for the region, but for the entire state. Manufacturers in Milwaukee, tourism destinations in Door County, and commuters in Washington and other southeastern Wisconsin counties depend on safe and efficient freeway connections.

The system also includes several freeway-to-freeway interchanges, providing access from one freeway to another. In Milwaukee County, four major interchanges serve as the hubs of the Southeast Freeway System:

- › The Marquette Interchange, linking I-43, I-94 and I-794 in downtown Milwaukee
- › The Zoo Interchange, connecting I-94, I-894 and US 45 in western Milwaukee County
- › The Hale Interchange, connecting I-43, I-894 and US 45 near Hales Corners
- › The Mitchell Interchange, linking I-43, I-94 and I-894 near General Mitchell International Airport in Milwaukee

~ www.dot.wisconsin.gov/projects/seffreeways/index.htm

traffic and truck volumes. Some Southeast Freeway System characteristics that no longer serve current traffic demand include left-side on- and off- ramps and “scissor” ramps. These and other characteristics present design and safety concerns. As a result, much of the system needs to be reconstructed and updated.

If the Southeast Freeway System is not reconstructed, it will need extensive and continual repaving and reconditioning increasing long-term costs. In addition, simply continuing to rehabilitate the system would not address unsafe highways and interchanges, outdated designs, lane-closure issues or weight restrictions.

In addition to prioritizing infrastructure needs in southeastern Wisconsin, WisDOT also focuses on preserving the quality of the highway network and ensuring the state’s connection to local, regional and national systems.

The *Corridors 2020* plan, first published in 1988 and most recently updated in 2000 (as part of the *Wisconsin State Highway Plan 2020*), divided the state trunk highway network into *Corridors 2020* routes and all remaining routes. The *Corridors 2020* network, which included “Backbone” and “Connector” routes, served as a component of, and provided links to, the National Highway System.

The Backbone System includes the highest value multi-lane (or planned multi-lane) divided highways, which connect all regions and major economic centers in the state and are tied to the national transportation network. The Connector System includes high-quality two- and four-lane highways that connect all other significant economic and tourism centers to the Backbone System.

A key focus of the highway proposals in the *Wisconsin State Highway Plan 2020* was the completion of planned *Corridors 2020* multi-lane Backbone routes. Completion meant that all Backbone routes would be multi-lane by the year 2020. Completion of the existing *Corridors 2020* Backbone routes is expected to occur in the short-term outlined by *Connections 2030*.

To reflect this ongoing priority and to enhance the quality of the *Corridors 2020* system, WisDOT has updated the system to *Corridors 2030* as part of this long-range transportation plan (Map 5-1).

Like the *Corridors 2020* system, designated *Corridors 2030* routes:

- » Provide multimodal system linkages
- » Provide safe, dependable access to and from Wisconsin communities
- » Encourage regional and statewide economic development

The *Corridors 2030* update makes minor adjustments to the network, including:

- » Two new Backbone routes:
 - US 45 from US 10 to US 41
 - US 14 from I-90 to I-43
- » Eight new Connector routes:
 - US 63 from WIS 64 to the Wisconsin-Minnesota state line
 - US 14 from US 12/US 18 to I-90
 - WIS 16 from WIS 26 to I-94
 - WIS 33 from US 151 to US 41
 - US 151 from US 41 to WIS 23
 - WIS 57 from US 10 to I-43
 - WIS 310 from I-43 to WIS 42
 - WIS 47 from WIS 29 to US 41

The vision for all *Corridors 2030* Backbone routes is that they will continue to provide high-quality multi-lane divided highways.

Over the long term, completion of the *Corridors 2030* Backbone system will occur through proposed future activities. Additional analyses, including environmental documentation, will be conducted before any of the projects or activities are completed. The *Corridors 2030* plan adds about 30 miles of new *Corridors 2030* Backbone routes.



▲ Figure 5-5: The Marquette Interchange serves as a hub of the Southeast Freeway System.

WisDOT envisions that *Corridors 2030* Connector routes will continue to be high-quality two- and four-lane routes. Of the approximately 250 miles of newly designated Connector routes, about 40 miles are planned to be multi-lane and 90 miles are planned to have passing lanes.

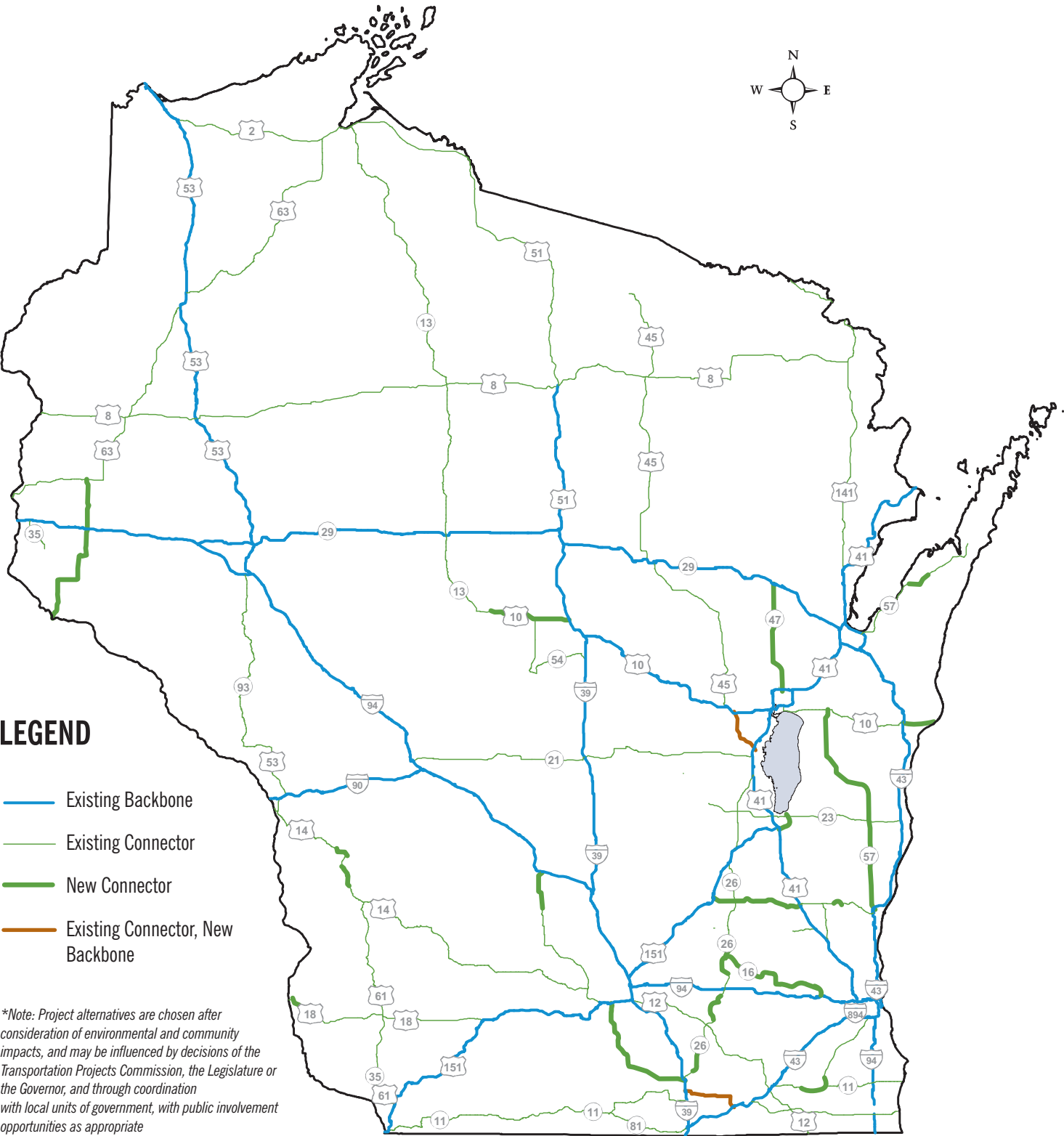
Updating the *Corridors 2020* highway network

Corridors 2020 was developed to provide essential links to key employment and population centers throughout the state. First established in 1988, the network identifies a system of two-lane and multi-lane highways consisting of two subsystems:

- › Backbone system: A network of multi-lane highways connecting all major population and economic regions of the state.
- › Connector system: A network of high-quality two- and four-lane highways directly linking significant economic and tourism centers to the Backbone system.

Corridors 2020 supports Wisconsin's economic development by helping create a positive and safe traveling environment allowing business, industry, agriculture, and tourism to expand in the state. *Connections 2030* recognizes the importance of the *Corridors 2020* network, and updates the network to *Corridors 2030*.





▲ Map 5-1: The updated Corridors 2030 routes include two new Backbone routes and eight new Connector routes

The total length of the *Corridors 2030* system is approximately 3,750 miles; of this, approximately 1,450 miles are Backbone routes and approximately 2,300 miles are Connector routes.

Continue using a performance-based approach to identify preservation needs on the state trunk highway system, including development of a bridge asset management system

WisDOT will continue to use a comprehensive asset management approach to identify and address state trunk highway system needs. An asset management approach allows WisDOT staff to analyze preservation needs using data based on physical condition, safety, operation, function and connectivity. It also allows WisDOT staff to consider a range of funding and road construction alternatives, which results in a systematic and objective approach to cost-effective state trunk highway system preservation.

This policy divides state trunk highway system preservation activities into three categories:

- » Structures and bridges
- » Pavements
- » Interchanges (discussed in Chapter 9, *Promote Transportation Efficiencies*)

Structures and bridges

The state trunk highway system includes approximately 4,900 bridges and similar structures, as well as a variety of ancillary structures such as retaining walls, culverts, sign structures, noise barriers and high-mast light structures.

Most bridges are designed to have a life expectancy of up to 75 years. To achieve this, bridge decks, girders, trusses and substructures must be regularly maintained. WisDOT performs regular inspections on all bridges, and stores the inspection data in the department's Bridge Management System. Bridge inspections are key to helping the department decide whether future bridge construction or repair is needed.



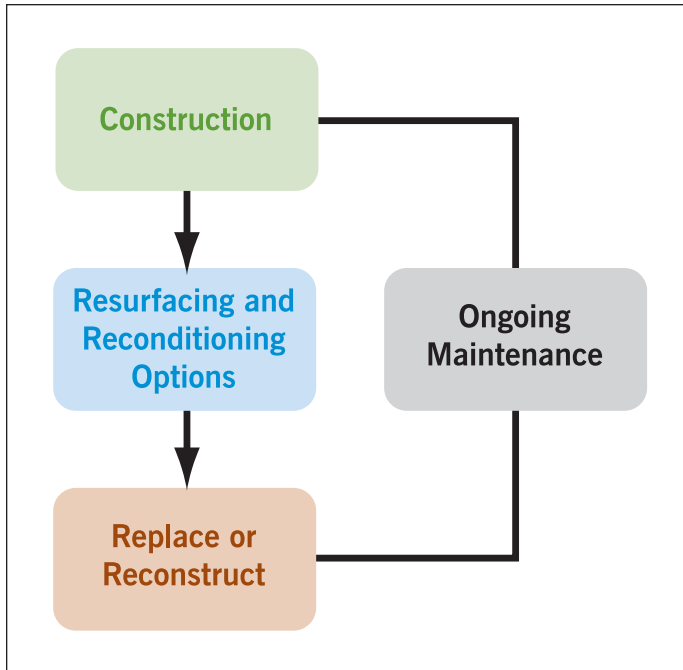
To ensure the continued safety and connectivity of the system, bridge preservation is WisDOT's highest priority preservation activity.

WisDOT continually monitors and applies emerging technologies to further complement the department's strong asset management philosophy. This enables the department to continually analyze bridge data, monitor bridge conditions, identify potential future problems and recommend preservation activities.

For planning purposes, WisDOT measures bridge performance using three ratings:

- » Deck condition – evaluates the riding surface and other deck components on a scale of 0 to 9. A lower score indicates a need for ongoing maintenance and eventual deck replacement.





▲ Figure 5-6: Following the pavement preservation steps shown above can lead to a 50- to 60-year roadway life before complete replacement is needed.

- » Sufficiency rating – rates a bridge’s sufficiency (or capability). Factors include the bridge’s adequacy, safety, serviceability and functional obsolescence, as well as how essential the bridge is for public use. Ratings range from 0 to 100. Lower scores indicate a deficiency; the federal government uses the sufficiency rating to determine eligibility for federal funds.
- » Rate score – measures the quality of a bridge’s structure and load-carrying capacity. All bridges start with a score of 100. Lower scores indicate problems such as cracks, rust and inadequate bridge width. These bridges typically require more substantial work.

WisDOT developed performance thresholds to rate bridges and structures regarding deck condition, infrastructure quality and load-carrying capacity. WisDOT uses these performance measures to identify bridges that need preservation or maintenance improvements. The department also uses these performance measures to supplement bridge

inspection reports. Both bridge inspections and the performance measures help extend the useful life of the facility and delay structural deterioration that may result in the need for weight limits.

Bridge preservation needs will continue to grow throughout the *Connections 2030* planning period. Using existing thresholds, WisDOT forecasts the following bridge needs by 2030:

- » 2,900 bridges will need deck overlays
- » 550 bridges will need deck replacements
- » 700 bridges will need to be replaced

WisDOT is also developing a more robust asset management program for structures. The program will include defined inspection cycles, and replacement and maintenance strategies.

Pavements

Pavement preservation activities usually follow a standard process (Figure 5-6). Assuming timely preservation improvements, state highways are designed to last 50 to 60 years before they need to be reconstructed. However, several factors influence pavement life, such as the timing and type of maintenance and preservation activities, weather, traffic volumes, vehicle weight and soil conditions.

To achieve a 50- to 60-year roadway life, resurfacing or reconditioning activities are typically necessary 15 to 25 years after initial construction and several more times before the end of the 50- to 60-year time span. It is at this point that a roadway will likely need complete replacement.

WisDOT uses a Pavement Management System to continually monitor and update data on state trunk highway system pavement conditions. WisDOT uses the information to identify potential pavement problems as well as to determine the type of treatment needed to achieve or extend the pavement life expectancy.

WisDOT monitors pavement performance using a combination of three measures:

- » Pavement distress index (PDI) – measures the structural adequacy of pavements on a scale of 0 to 100, with 0 indicating pavement with no distress and 100 indicating the worst possible conditions
- » Pavement serviceability index (PSI) – measures the pavement roughness and ride quality on a scale of 0 to 5, in which 0 is the worst ride quality, and 5 is the best
- » Rutting (RUT) – measures the inches of vehicle track depressions in each lane, which are typically caused by problems in the underlying pavement structure

WisDOT pavement thresholds are used to help determine needs on the state trunk highway system at a planning level. The department has developed minimum performance thresholds for each of the three pavement measures. An “ideal” system would have no pavements below minimum thresholds. Because of the importance of *Corridors 2030* Backbone and Connector routes to the overall state trunk highway system, the thresholds for these routes are higher than for other roads.

Most highway segments on the state trunk highway system will show some level of pavement need prior to 2030. As of 2007, approximately 2,860 miles (20 percent) of the state trunk highway network was identified as deficient in terms of at least one of the minimum pavement performance thresholds.

WisDOT will continue to use these pavement performance thresholds and pavement condition data to identify state trunk highway segments that need attention. This data will help WisDOT identify preservation treatments as well as the most appropriate times to apply them. This process will continue to help extend the useful life of pavements and reduce structural deterioration that requires more costly rehabilitation and reconstruction.

For *Corridors 2030* Backbone pavements, WisDOT uses a value-based program that selects improvement alternatives that provide pavement service life extension at the lowest cost per year of life extension.

As of 2007, approximately 20 percent of the state trunk highway network was identified as deficient in terms of at least one of the minimum pavement performance thresholds.

WisDOT's pavement management system

The development of a pavement management system in Wisconsin began in 1987. Wisconsin has a geographic information system-based system that provides spatial and mapping capabilities.

The pavement management system uses pavement inventory data and a decision support system to develop preservation and maintenance programs. The system also provides a database for complex pavement modeling efforts and statewide planning efforts.

Pavement sections with identified needs are aggregated into improvement sections (a section whose length is generally more typical of preservation or maintenance projects), with low-, nominal- and high-level treatment strategies recommended for the entire section.

The final treatment selected is based on the relative impacts of five factors: improvement in ride, improvement in distress rating, user inconvenience, initial cost, and life cycle cost. The final product is WisDOT's Six-Year Highway Improvement Program.



Wisconsin's highway network

Wisconsin has more than 114,000 miles of public roads, from Interstate highways to city and village streets. The highway improvement program covers only the 11,773-mile state trunk highway system, which is administered and maintained by WisDOT. The other 102,712 miles of roadways are improved and maintained by the cities, towns, counties and villages in which they are located.

The state trunk highway system consists of 743 miles of Interstate highways and 11,030 miles of state and U.S. highways. While the 11,773 miles of state trunk highways represent only 10.3 percent of all public road mileage in Wisconsin, they carry over 35 billion vehicle miles of travel a year, or about 59.2 percent of the total annual statewide highway travel.

Each wisely invested dollar returns benefits in terms of time savings, fewer accidents and decreased vehicle operating costs. Poor roads mean more accidents and deaths, higher insurance costs, more wear and tear on vehicles, more time on the road and less efficient and competitive commerce.

~ www.dot.wisconsin.gov/projects/state/sixyear/index.htm

Determining when to schedule preservation or maintenance work is a complex task. WisDOT analyzes pavement condition data to determine where and when repairs are needed, and to determine viable alternatives. In addition, the department assesses the metropolitan planning organization recommendations published in each organization's long-range transportation plan when assessing priority needs.

The corridor maps described in Chapter 13, *Implementing Connections 2030*, show reconstruction activities identified in the Six-Year Highway Improvement Program as well as reconstruction activities identified in metropolitan planning organization long-range transportation plans. Preservation activities such as preventive maintenance, resurfacing and reconditioning are identified as ongoing system needs throughout the planning period.

Refine and expand a state-of-the-art process to prioritize needs and identify cost-effective state trunk highway construction alternatives

As stated earlier, WisDOT will continue to use pavement condition data and performance thresholds to identify highway segments that need reconditioning, rehabilitation or reconstruction. WisDOT continues to enhance its prioritization methods using asset management tools such as the Meta-Manager Management System Database. This prioritization process will include using thresholds for pavement, bridges, safety (for more information, see Chapter 6, *Promote Transportation Safety*, and

Meta-Manager management system database

Meta-Manager, a comprehensive data repository for WisDOT, was developed by the Division of Transportation Investment Management's Bureau of State Highway Programs to meet the data requirements for a variety of needs and performance analyses. The Meta-Manager database is an excellent resource for assessing system condition, analyzing need and performance and supporting project development. It geographically integrates a variety of data, including pavement information, system deficiencies, safety, congestion and other information. The database also includes future projections of physical condition data.



▲ *Figure 5-7: WisDOT will continue to use pavement condition data and performance thresholds to identify highway segments that need reconditioning, rehabilitation or reconstruction.*

Chapter 9, *Promote Transportation Efficiencies*) and traffic movement (see Chapter 9, *Promote Transportation Efficiencies*).

As mentioned previously, the department's maintenance and preservation efforts address system needs and help extend the system's life. Wisconsin's state trunk highway system needs exceed available funding, requiring WisDOT to prioritize transportation infrastructure investments.

Wisconsin's highest preservation priority continues to be the structural preservation of bridges. For this reason, structural bridge needs will continue to receive priority funding.

For the remaining state trunk highway system, WisDOT will prioritize preservation needs using state-of-the-art methods. The process applied will include a dual-priority approach that selects

projects based on both the cost effectiveness of the preservation strategy and the importance of the roadway to overall system function. Establishing a functional priority will enable WisDOT to better prioritize needs.

Pursue sufficient funding to address state trunk highway system preservation needs

While system preservation continues to be a department priority, many funding challenges remain:

- » Increasing magnitude of needs due to aging infrastructure
- » Limited funding and increasing costs
- » Decreasing purchasing power
- » Economic analysis of maintenance costs for new roads

Typically, WisDOT uses an incremental investment approach to infrastructure preservation. This approach uses a combination of low cost and best value repairs to extend the useful life of the facility.

WisDOT's purchasing power has been reduced in the past several years, primarily due to biennial budgets not keeping pace with inflationary increases associated with the rising costs of real estate, energy and construction materials. While recent data show that the number of deficient state trunk highway miles has remained steady for the past two years, any additional loss in purchasing power will increase the number of deficient miles.

If needed repairs cannot be made at appropriate times over the life of the infrastructure, conditions will deteriorate to a point when preservation treatments are no longer cost effective. The result will be more frequent and more costly maintenance and rehabilitation efforts, increased safety concerns, and lower levels of service on deficient highway segments, which may create increased user delays. Ultimately, this will negatively impact the state's mobility and economic development.



In addition, roadway maintenance costs can be expensive over the life of a highway. These costs should be recognized before the roadway is constructed. As part of monitoring existing system conditions and setting priorities for new roadways, WisDOT will more fully develop a long-term investment plan (see the “Implement cost-effective maintenance activities on Wisconsin’s state trunk highway system infrastructure” policy in this chapter for more information).

WisDOT will also develop a report to better inform the Wisconsin Legislature and key decision-makers of the

department’s efforts to maintain and improve system performance and the way it has handled unmet needs. WisDOT will maintain its dual-priority programming approach of applying the most cost-effective strategies to serve the overall function of the system.

The department will also emphasize proactive pavement preservation actions to extend service life and minimize the life-cycle cost of other system needs. Increased purchasing power would help to expedite the programming of needed repairs to the system, specifically those for interchanges.

► **SUMMARY OF POLICY ACTION ITEMS:**
Preserve Wisconsin’s state trunk highway system infrastructure

Short-term (2008 – 2013)

- Develop and implement a more robust asset management system for state trunk highway system ancillary structures.
-

Mid-term to long-term (2014 – 2030)

- Develop a report to inform the legislature about preservation needs and efforts to address system performance.
-

Entire planning period (2008 – 2030)

- Continue to use a comprehensive asset management approach to identify and address state trunk highway system needs through existing tools (like the Bridge Management System and the Pavement Management System) and emerging technological solutions.
 - Continue to identify highway segments, bridges and structures not meeting performance thresholds, assess information gathered (e.g. in metropolitan planning organization plans) and determine if additional action is required (for example, pavement improvement, bridge improvement, safety improvement, etc.).
 - Refine and expand a state-of-the-art process to prioritize needs and identify cost-effective improvement alternatives. This process will include prioritizing bridge needs first, and then selecting projects based on cost-effectiveness and the importance of the roadway to overall system function.
 - Pursue sufficient funding to address state trunk highway system preservation needs, including more fully developing a long-term investment plan.
-

► **POLICY:**
*Preserve Wisconsin's airport
 system infrastructure*

WisDOT will preserve the functionality of the existing airport system through a focus on its infrastructure. Specifically, WisDOT will:

- » Continue to implement Airport Improvement Program preservation projects
- » Update the *State Airport System Plan* to identify long-term needs

Background

Airports, aviation and aviation-related industries play a significant role in the economic success of Wisconsin communities. A key component of the state's transportation system is its system of commercial service and general aviation airports.

In 2007:

- » More than 7.4 million individuals used passenger air service
- » More than 116 million pounds of cargo were shipped by air

WisDOT sets the direction of its programs and identifies system needs through the *State Airport System Plan*. Needs identified in the plan serve as the link to the Airport Improvement Program, which is the primary funding mechanism that preserves the State Airport System.



State Airport System

The State Airport System consists of all publicly owned public use airports. Privately owned public use airports are included only if the airport has been federally designated as an airport reliever. It is against state law to fund privately owned airports except those federally designated as relievers.

State Airport System Plan 2020

Airports, aviation and aviation-related industries play a significant role in the economic success of Wisconsin communities. The *Wisconsin State Airport System Plan 2020* provides a framework for the preservation and enhancement of a system of public-use airports adequate to meet Wisconsin's current and future aviation needs.

~ www.dot.wisconsin.gov/projects/state/air2020.htm



The Airport Improvement Program uses a combination of local, state and federal funds. Ninety-eight airports are part of the State Airport System and are eligible for state funding; 88 of those airports are also included in the *National Plan of Integrated Airport Systems*, allowing them to receive federal funds.

The *State Airport System Plan* classifies airports to establish the current and future role of each airport in the overall airport system. The plan also forecasts usage and investment needs to preserve and improve each airport so that it meets its defined role. WisDOT administers the Airport Improvement Program and acts as the agent for airport owners in securing federal grants. As program administrator, WisDOT participates in certain aspects of airport projects, such as planning, coordination, design, land acquisition and construction.

National Plan of Integrated Airport Systems

The *National Plan of Integrated Airport Systems* identifies more than 3,300 airports that are significant to national air transportation and thus eligible to receive federal grants under the Airport Improvement Program.

The plan also includes estimates of the amount of Airport Improvement Program money needed to fund infrastructure development projects that will bring these airports up to current design standards and to add capacity to congested airports.

~ www.faa.gov/airports_airtraffic/airports/planning_capacity/npias/



▲ Figure 5-8: General aviation projects are typically paid for with 60 percent federal funds, 20 percent state funds and 20 percent local funds.

Continue to implement Airport Improvement Program preservation projects

The program funds projects that maintain airport runways, taxiways and instrument approach capabilities. The program also funds airport improvement projects, which are discussed in Chapter 7, *Foster Wisconsin's Economic Growth*. The Airport Improvement Program schedules needed monthly preservation projects over a five-year planning period. Preservation projects fall primarily into two categories:

- » Pavement projects (includes pavement reconstruction and strengthening of runways, taxiways and aprons)
- » Instrument approach capability projects (includes air navigational landing aids and required land acquisition)

Preservation projects are ranked using the Pavement Condition Index. WisDOT uses established Pavement Condition Index thresholds for taxiways, aprons and

runways according to an airport's classification. Other factors used to prioritize preservation projects include safety, annual operations, service area population, local sponsor responsibility and the relative importance of the requested project.

WisDOT recognizes the financial contributions of local jurisdictions toward their air facilities and will continue to administer the Airport Improvement Program in cooperation with local airport authorities.

Update the State Airport System Plan to identify long-term needs

Current state funding levels will not complete all of the airport preservation and improvement projects needed on the system. WisDOT is updating the *State Airport System Plan* to identify preservation needs through the year 2030. The updated plan will include funding estimates for future airport preservation and improvements. WisDOT will prepare additional plan updates throughout the planning period. WisDOT will continue to work with stakeholders and the general public throughout the development of the updates.

► SUMMARY OF POLICY ACTION ITEMS: *Preserve Wisconsin's airport system infrastructure*

Short-term (2008 – 2013)

-
- Complete the *State Airport System Plan* update to identify long-term needs.
 - Implement Airport Improvement Program projects.
-

Entire planning period (2008 – 2030)

-
- Continue to implement Airport Improvement Program preservation projects (e.g. pavement reconstruction) in cooperation with local airport authorities.
 - Continue to work with stakeholders and the general public to evaluate and update the *State Airport System Plan*, as needed, throughout the planning period.
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