5. CHOOSING OUR PATH

The prior chapters have helped lay the foundation of what issues face Iowa's multimodal transportation system. Data on the existing system, input from the public and stakeholders, various planning considerations, and key issues must all be considered as the Iowa Department of Transportation (DOT) and Iowa Transportation Commission (Commission) determine what investment actions to take to help shape the transportation system needed over the coming decades. This information has helped shape the vision for Iowa's transportation system. This chapter outlines the investment areas, strategies, and improvement needs the Iowa DOT plans to pursue to help achieve that vision.

5.1 Vision

Iowa's multimodal transportation system is one of the foundations of Iowa's economy. The decisions made today regarding funding allocations and specific improvements will significantly affect what the transportation system looks like for decades to come. This requires having an overall vision for how the current and future transportation system should be managed and operated. The vision of the Iowa DOT and Commission is:

A safe and efficient multimodal transportation system that enables the social and economic wellbeing of all Iowans, provides enhanced access and mobility for people and freight, and accommodates the unique needs of urban and rural areas in an environmentally conscious manner.

This vision was crafted to meet several criteria. It is all-encompassing, capturing the overall intent of what the Iowa DOT is aiming to provide its customers, the traveling public. It also captures elements woven throughout strategies and improvement needs and across passenger and freight modes, such as safety and quality of life. It is strategic, and meant to be specific enough to help target funding, because financial resources are limited. Finally, the vision is flexible, because change is inevitable and can occur quickly, especially when it comes to technology. The vision and this Plan are an adaptable framework.

5.2 Investment areas

The way the system vision will be realized is through the investment decisions made by the Iowa DOT and Commission. To help translate this vision into meaningful actions, an overall structure has been set up with the following components.

- A broad **vision statement** that captures the overall vision for Iowa's future transportation system.
- Overarching **investment areas** within which actions will be defined to implement the system vision.
- A fiscally responsible **action plan** that defines how the vision will be implemented, through two broad categories.
  - Specific **strategies** that will be utilized by the department that fit within one or more of the investment areas.
  - Where appropriate, specific **improvement needs** the department feels are necessary to help achieve the overall system vision.

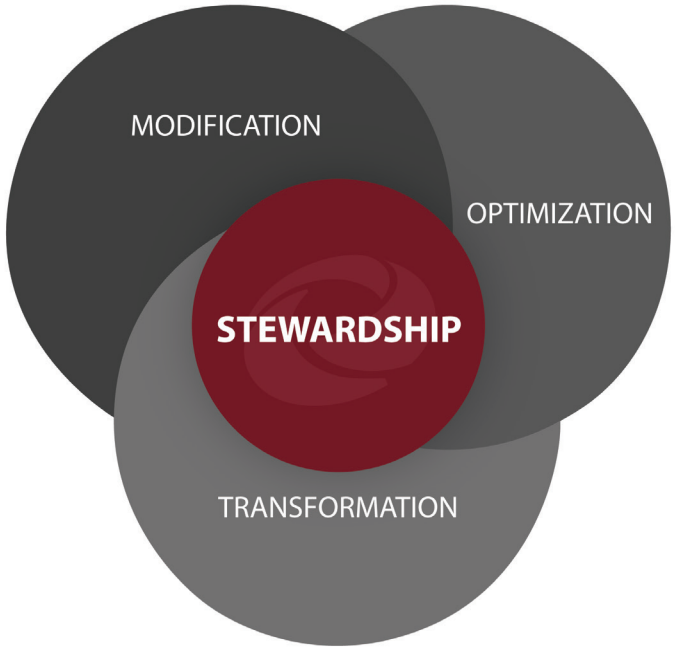
Ultimately, each identified strategy and improvement need relates back to one or more investment areas and the overall vision.

Vision → **Investment Areas** → **Strategies/Improvement Needs**

Four principal investment areas were identified to help achieve the system vision:

- ***Stewardship*** through maintaining a state of good repair
- ***Modification*** through rightsizing the system
- ***Optimization*** through improving operational efficiency and resiliency
- ***Transformation*** through increasing mobility and travel choices

Each of these investment areas are supported by specific strategies and improvement types, which are summarized in the following section and detailed in the action plan. The investment areas are not mutually exclusive categories. For example, safety is implied throughout all investment areas, and strategies and improvement types may align with more than one investment area. Together these four investment areas encompass the range of strategies and improvement types to be utilized to ensure the Iowa DOT and Commission continue to create, manage, and operate the transportation system Iowa needs.



Stewardship – maintaining a state of good repair

The bulk of the existing multimodal transportation system will likely need to be managed and maintained similarly to how it is today, though there may be some changes to the composition of the system because of anticipated social, economic, and technological trends. Part of maintaining a state of good repair involves applying appropriate asset management techniques to keep transportation infrastructure in adequate condition. This includes recognizing that it can be more cost-effective in the long run to invest in assets before they wear out completely – in other words, avoiding a worst-first approach to system maintenance and modernization. This also means replacing assets such as roads, guardrails, transit vehicles, and snowplows when they have exceeded their useful lives. Maintaining the system also involves operational maintenance, such as plowing snow and grading shoulders, and making needed investments to address specific issues, such as safety enhancements, Americans with Disabilities Act compliance improvements, and access modifications. The aim of stewardship is to ensure that the system Iowa needs is maintained in a condition that enables safe, efficient passenger and freight movements.

Modification – rightsizing the system

The multimodal transportation system as it exists today has developed over many decades, and reflects the progression of population and employment growth and advances in transportation. Rightsizing the system and the service it provides means ensuring that the decisions we make today regarding transportation investments are done with the social, economic, and technological patterns of the future in mind. Our role is not to continually rebuild the system as it was built decades ago, but rather to implement a system that will meet the needs of the 21st century. This will require significant investment in stewardship, some focused capacity expansion as resources allow, and perhaps even some contraction of the system. Future capacity expansion should be limited, strategic, and prioritized. Nontraditional capacity improvements should be considered where appropriate, including managed lanes (high-occupancy vehicle, bus, truck-only), operations improvements such as intelligent transportation systems (ITS) components, and highway design elements that help improve roadway operation, such as turning lanes, passing/climbing lanes, access modifications, and geometric improvements.

Optimization – improving operational efficiency and resiliency

In addition to building and maintaining the multimodal transportation system, it is also important to work continually to improve the system and how it is utilized by passenger and freight traffic. The answers to decreasing commute times, routing freight more efficiently, or improving system reliability may lie in optimizing the existing system rather than in additional pavement. This means investing in efforts such as utilizing ever-increasing amounts of complex data to monitor the system, improving response efforts when managing incidents to lessen the disruption to traffic, and enhancing the two-way communication between the department and system users.

Transformation – increasing mobility and travel choices

Iowa is changing in a number of ways. Overall, its population is growing older, becoming more diverse, and is increasingly urbanized. City centers with mixed land use and complete streets are developing, but suburbs also continue to expand and small towns remain vital to the state. While the number of individual farms is decreasing, the value of Iowa agriculture to the economy continues to increase. In order to provide a multimodal transportation system that accommodates all aspects of Iowa's population and development patterns, it is important to have a diverse menu of travel choices enabling mobility across different demographics and land uses. This can involve investments beyond the typical highway system that target moving people by other modes of transportation, such as public transit, bicycle, pedestrian, air, and rail. It can also include investments aimed at decreasing single-occupant vehicles.

Public input on investment areas

In February 2016, public input was sought on the four investment areas identified for the Plan, as well as a number of draft strategies. The input helped reinforce the concept of the four investment areas as primary focus areas for the Plan. Also, there were a number of key takeaways from the input that helped shape the action plan.

- The dominant theme among responses was interest in maintaining an appropriately sized system that meets the needs of all users and grows when and where it is necessary.
- It was preferred that the Iowa DOT focus on maintaining the current system and ensure expansion is only done when there is significant need.
- There was interest in increasing the efficiency of the department and increasing communication between the Iowa DOT and the public and stakeholder groups.
- There was interest in the Iowa DOT ensuring the appropriate materials are used and the right repairs are done the first time for projects to reduce costs associated with future improvements and ensure the system lasts longer.
- Support was expressed for alternative modes of transportation as a way to reduce the need to increase capacity and ensure everyone has the ability to travel within the state.

Fixing America's Surface Transportation (FAST) Act

The current federal surface transportation bill is the FAST Act. Being compliant with the FAST Act is an important consideration in the transportation planning process. The vision and four investment areas identified above are tied very closely to the 10 FAST Act planning factors, which are the following.

1. Support economic vitality, especially by enabling global competitiveness, productivity, and efficiency.
2. Increase the safety of the transportation system for motorized and nonmotorized users.
3. Increase the security of the transportation system for motorized and nonmotorized users.
4. Increase the accessibility and mobility of people and for freight.
5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns.
6. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
7. Promote efficient system management and operation.
8. Emphasize the preservation of the existing transportation system.
9. Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation.
10. Enhance travel and tourism.

The relationships between the Plan's investment areas and the FAST Act planning factors are outlined in Table 5.1.

Table 5.1: Relationship between Plan investment areas and FAST Act planning factors

	Stewardship	Modification	Optimization	Transformation
Economic vitality	X	X	X	X
Safety	X	X	X	X
Security	X		X	
Accessibility and mobility	X	X	X	X
Environment, energy, quality of life, and consistency	X		X	X
Connectivity	X			X
Efficient system management and operation	X		X	
System preservation	X		X	
Resiliency and reliability	X		X	
Travel and tourism	X			X

Source: Iowa DOT

5.3 Action plan

The strategies and improvement needs identified through this action plan are ways the department will take actions to implement the system vision. To help determine improvement needs that exist across the multimodal transportation system, a multi-pronged approach was developed. For highway needs, a seven-layer analysis was conducted to analyze multiple types of needs. Needs were identified in different ways for the other modes – aviation, bicycle/pedestrian, public transit, rail, and water. Most of the needs were derived from existing system plans for those modes and, in a couple cases, updated analysis was conducted. This action plan discusses the analysis and sources of improvement needs for each mode, then delves into strategies the Iowa DOT and Commission will pursue to help address those needs and meet the system vision.

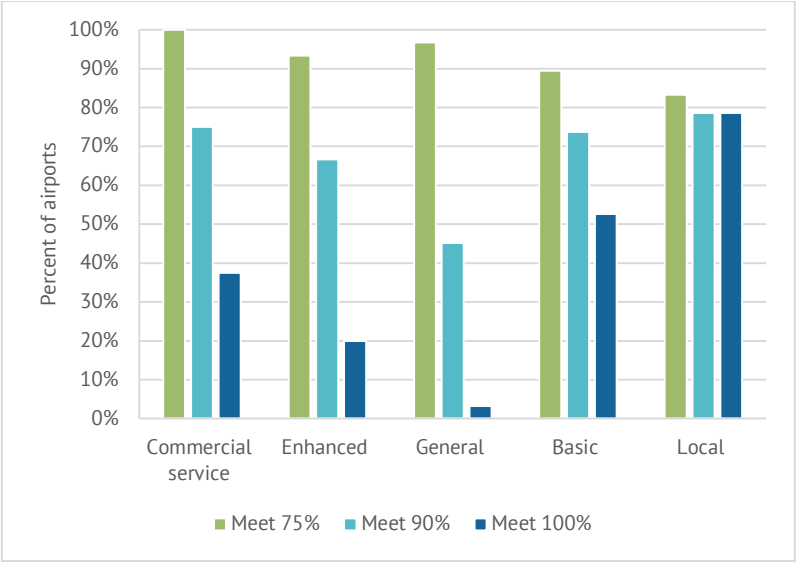
Aviation needs

Needs for the aviation system in Iowa are outlined in the 2010-2030 Iowa Aviation System Plan (IASP), which provides a detailed overview of the Iowa aviation system. It evaluates existing conditions and makes recommendations for future development of the air transportation system to meet the needs of users. The IASP can be used by federal, state, and local decision-makers as a guide for future investment and activity decisions to maintain and develop, as necessary, airports in the state of Iowa.

Airports that have adequate infrastructure and services are necessary for the aviation system to effectively support the demands of users. Measuring how well the system is meeting this goal depends on defined infrastructure conditions and levels of services at each airport. As outlined in the IASP, facility and service targets have been established for each airport role (see Figure 4.1) to reflect what is desirable for airports to effectively meet the aviation system goals and user needs. Targets for each role vary based on facilities and services beneficial for airports to meet the needs of aviation users for that role. For example, the enhanced service airports have more targets because they need to meet the service and facility needs of a wide range of aviation users, including larger business aircraft and corporate jets. There are fewer targets for local service airports because they serve users with fewer operational requirements.

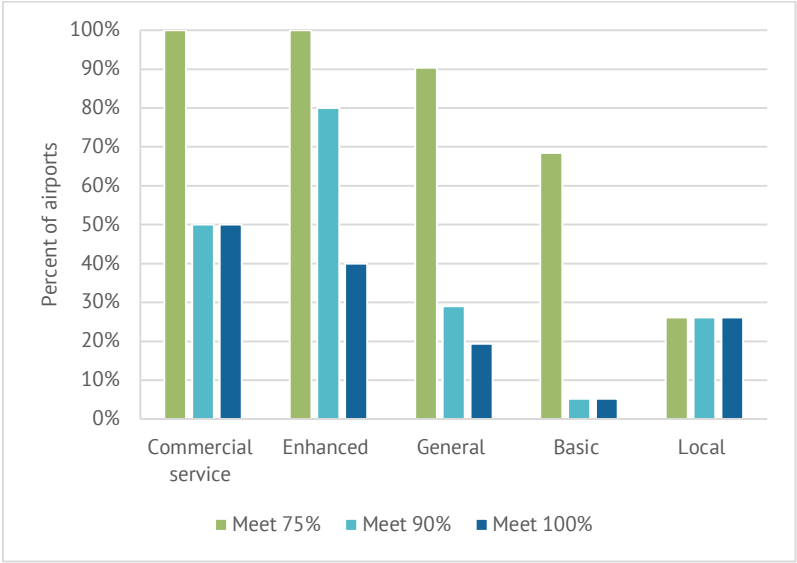
Figures 5.1 and 5.2 show the percentage of airports meeting facility and service targets by airport role. Facility targets focus on the physical infrastructure of the airport. Facility target categories include primary runway length, primary runway width, runway lighting, taxiway lighting, covered aircraft storage, and terminal parking. Service targets reflect the types of services necessary to meet typical user needs. Service target categories include fuel type and hours of availability; weather reporting; airport staffing; flight training; aircraft maintenance; availability of ground transportation; snow removal; and features available to airport users, such as concessions, restrooms, and internet. While not all airports are meeting 100 percent of targets, this does not equate to the airports being substandard. In some cases, long-range projects may be underway to address targets, and some targets involve factors beyond the control of the airports.

Figure 5.1: Percent of facility targets met by airport role



Source: Iowa DOT

Figure 5.2: Percent of service targets met by airport role



Source: Iowa DOT

Bicycle and pedestrian needs

The Iowa DOT has been updating its bicycle and pedestrian plan, and anticipates completing the plan following the completion of Iowa in Motion 2045. As part of that plan development, an initial needs assessment has been conducted for the entire Primary Highway System, excluding interstates. Segment ratings of good, moderate, or poor for bicycling were determined using different methodologies for rural and urban roadways. For rural roadways, segment ratings were based on factors such as total annual average daily traffic (AADT), percent truck traffic, total pavement width, and percent where passing is not allowed. Treatment types were recommended based on these factors and the needs of a typical rural bicyclist who would have experience and confidence riding with higher speed traffic. Table 5.2 shows a generalized version of this system, based on roadway width and traffic.

Table 5.2: Generalized rural roadway conditions and bikeway treatment recommendations

Annual Average Daily Traffic	Existing paved roadway width: ⩽22’	23’ - 24’	25’ - 28’	29’ - 30’ (may include 4’ paved shoulders)	⩾31’ (may include 5-6’ paved shoulders)	Any width (with adjacent path)
Less than 1,000	Suitable as is	Suitable as is	Suitable as is	Suitable as is	Suitable as is	Suitable as is
1,000 to 1,500	3’ paved shoulder on higher use corridors	3’ paved shoulder on higher use corridors	3’ paved shoulder (add or widen existing) on higher use corridors	Suitable as is	Suitable as is	Suitable as is
1,500 to 2,000	3’ paved shoulder	3’ paved shoulder	3’ paved shoulder (add or widen existing	Suitable as is	Suitable as is	Suitable as is
2,000 to 3,000	4’ paved shoulder	4’ paved shoulder	4’ paved shoulder (add or widen existing)	4’ paved shoulder (widen existing)	Suitable as is	Suitable as is
3,000 to 5,000	4’ paved shoulder	4’ paved shoulder	4’ paved shoulder (add or widen existing)	4’ paved shoulder (widen existing)	4’ paved shoulder (widen existing)	Suitable as is
5,000 to 6,500	6’ paved shoulder	6’ paved shoulder	6’ paved shoulder (add or widen existing)	6’ paved shoulder (widen existing)	6’ paved shoulder (widen existing)	Suitable as is
Over 6,500	10’ paved shoulder	10’ paved shoulder	10’ paved shoulder (add or widen existing) or separate path	10’ paved shoulder (add or widen existing) or separate path	10’ paved shoulder (add or widen existing) or separate path	Suitable as is

Good | Moderate | Poor

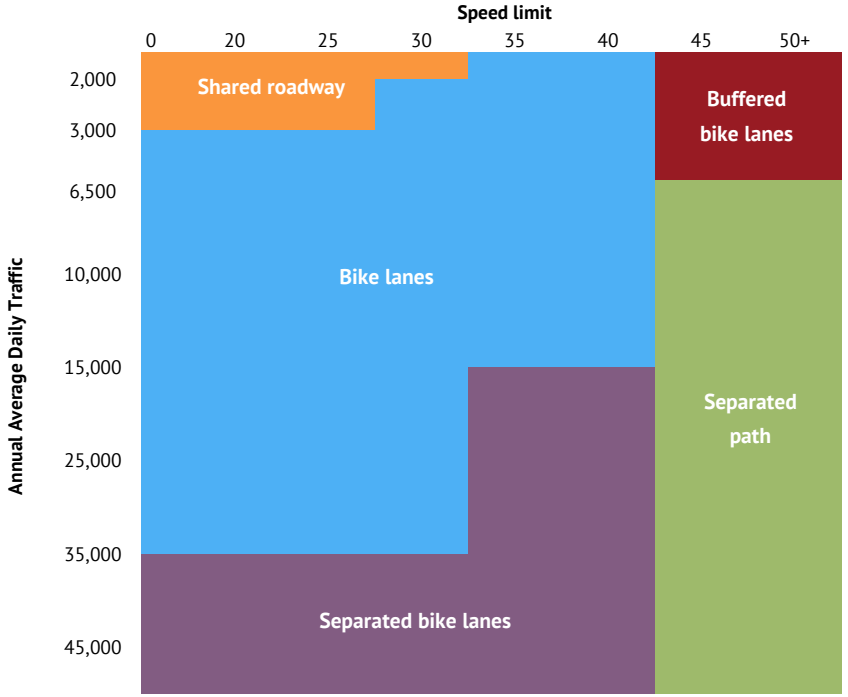
Note: All recommended paved shoulder widths are exclusive of rumble strips.

Source: Toole Design Group

For urban roadways, bicycle needs were determined based on AADT and speed limits. In general, additional separation is recommended for bicyclists as traffic volumes and speeds increase. Treatment types were recommended based on these factors and the needs of a typical urban bicyclist, who would be confident interacting with low-speed, low-volume traffic but prefers separation from higher-speed and higher-volume traffic. Table 5.3 shows a generalized version of recommended treatments in urban areas.

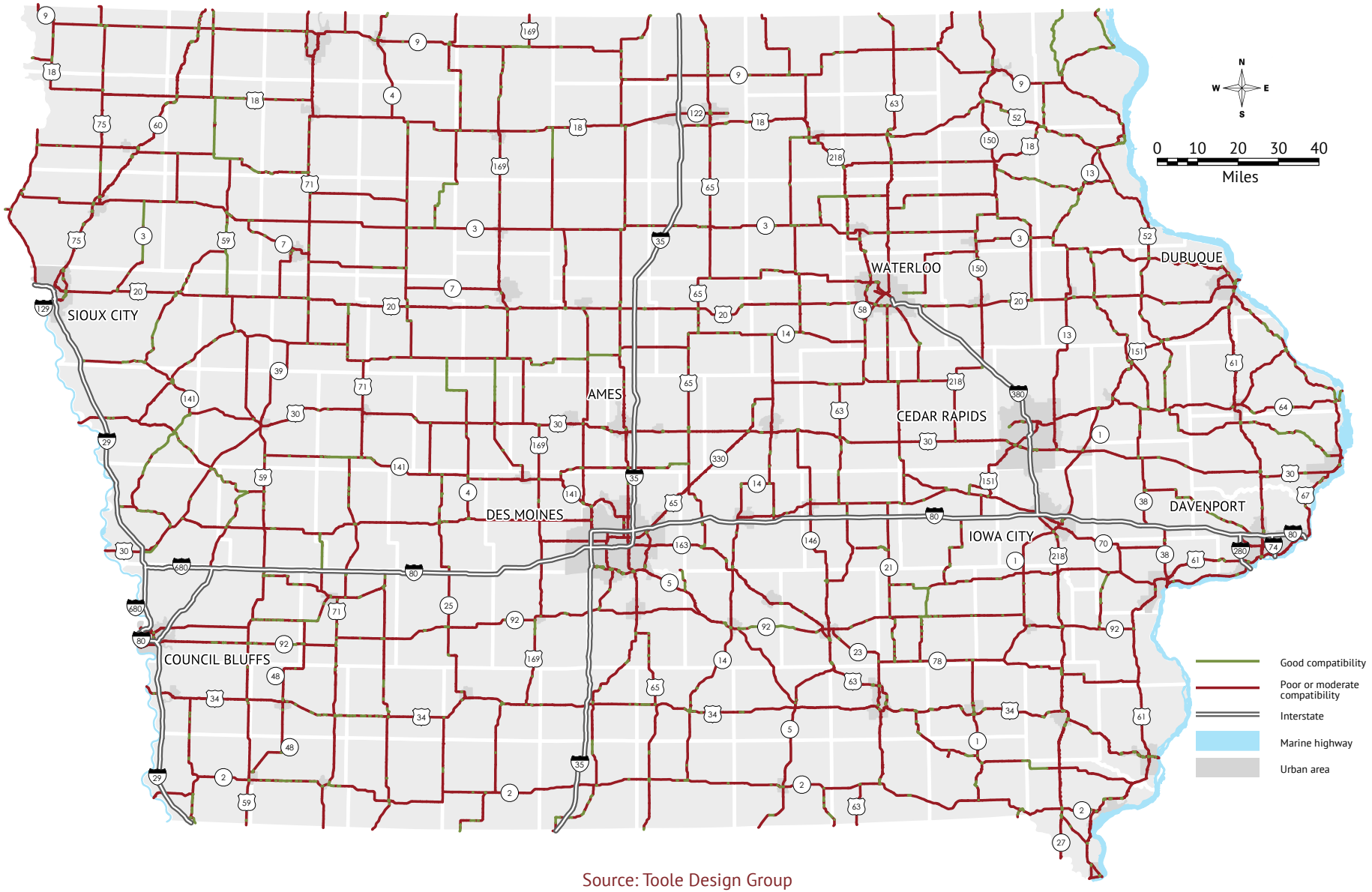
Figure 5.3 shows highway segments based on whether they were rated good, moderate, or poor for bicycling through the analysis. This analysis complements the development of the network proposed in the statewide trails vision (see Figure 4.3).

Table 5.3: Generalized urban roadway conditions and bikeway treatment recommendations



Source: Toole Design Group

Figure 5.3: Bicycle compatibility rating of Primary Highway System

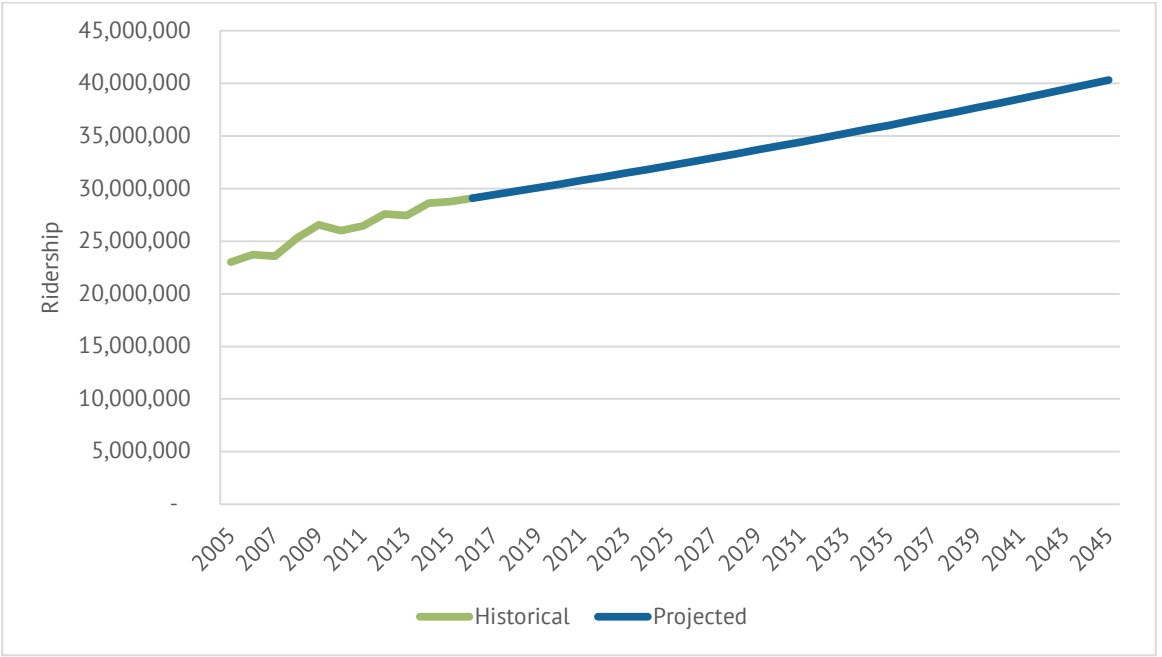


Source: Toole Design Group

Public transit needs

Needs for the public transit system in Iowa are expected to grow substantially between now and 2045 and fall under several categories. Service needs are based on what will be required to provide the level of public transit service needed in the state. The 2009 Iowa Passenger Transportation Funding Study reviewed demand versus ridership to gauge whether needs were being met. The study found that to meet baseline demand, defined as the level of travel reflective of the needs of Iowans that are transit dependent, ridership across the state's transit systems would need to increase by 54 percent, or an additional 38,000 trips per day. Despite the gap in meeting baseline demand, ridership among the state's large urban, small urban, and regional systems (see Figure 4.13) has grown steadily and is anticipated to continue to grow. Ridership projections show growth from 28.77 million trips in 2015 to 40.33 million trips in 2045, an increase of 40 percent (see Figure 5.4).

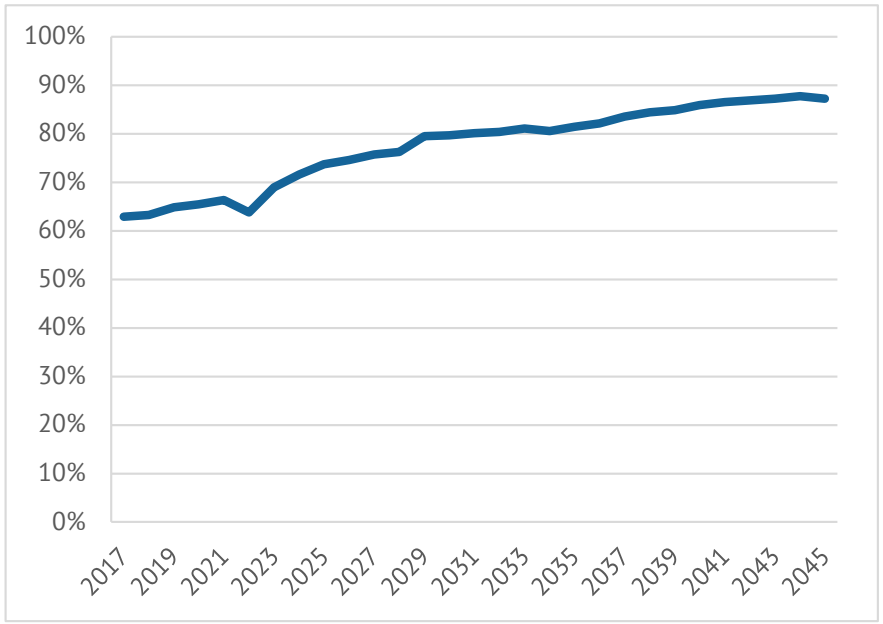
Figure 5.4: Statewide transit ridership, 2005-2045



Source: Iowa DOT

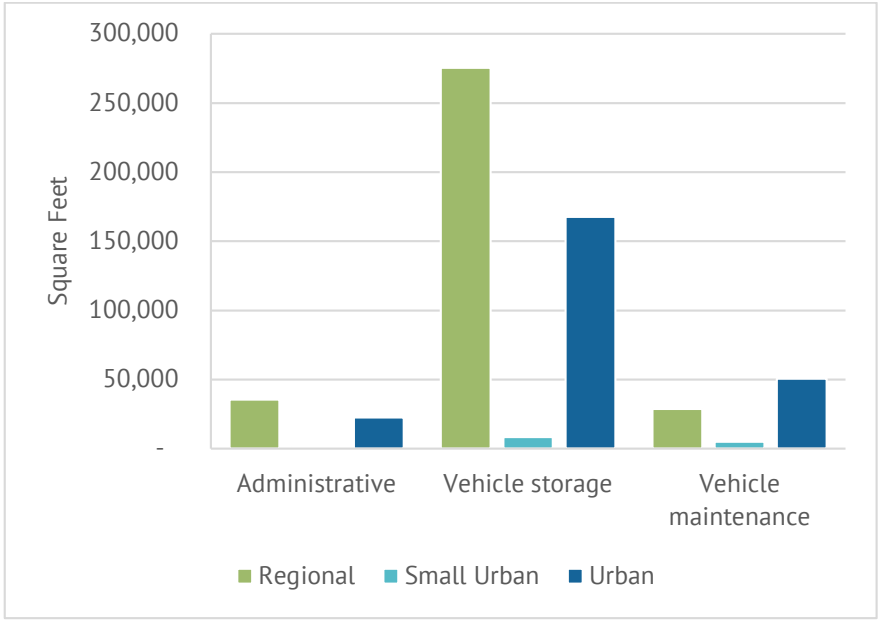
The combination of growing ridership with existing needs for vehicle replacement and facilities underscores the importance of public transit funding. In Iowa, 63 percent of all public transit revenue vehicles in the state currently exceed their useful life thresholds. If funding stays static, this number would quickly grow to 80 percent by 2030, and will be approaching 90 percent by 2045 (see Figure 5.5). In addition to vehicles, transit agencies have needs related to facilities, including administrative space, vehicle storage space, and vehicle maintenance space. Agencies were surveyed in fall 2016 and asked about needs for additional square footage in these categories by 2045. Figure 5.6 shows the survey results, presented by type of space needed and the type of transit system.

Figure 5.5: Percent of statewide fleet that would exceed useful life based on current annual funding levels, 2017-2045



Source: Iowa DOT

Figure 5.6: Additional space needed by public transit agencies by 2045



Source: Iowa DOT

Rail needs

The Iowa State Rail Plan (ISRP) completed in 2017 outlines specific potential future projects and initiatives Iowa might consider proposing to improve existing intercity services (see Figure 4.16) in the state. This includes possible future railroad improvements and investments that could address passenger rail, freight rail, and rail safety needs of Iowa, as identified through railroad company and stakeholder outreach and internal Iowa DOT coordination during development of the ISRP.

The ISRP identifies, describes, and prioritizes specific potential future rail projects for short-term and long-term implementation. Types of freight rail projects identified include:

- Enhancements to the capacity of the state's rail network (22 projects).
- Enhancement of existing transload facilities or construction of new transload facilities (15 projects).
- Enhancement of existing rail access or development of new rail access for shippers/receivers (nine projects).
- Development of new intermodal facilities (four projects).
- Improvements to bridge infrastructure (four projects).
- Improvements to track infrastructure (four projects).
- Improvements to flood mitigation measures (three projects).
- Grade separation of highway/rail grade crossings (two projects).
- Improve traffic congestion and enhance safety in urban rail corridors (one project).

Projects identified for passenger rail include:

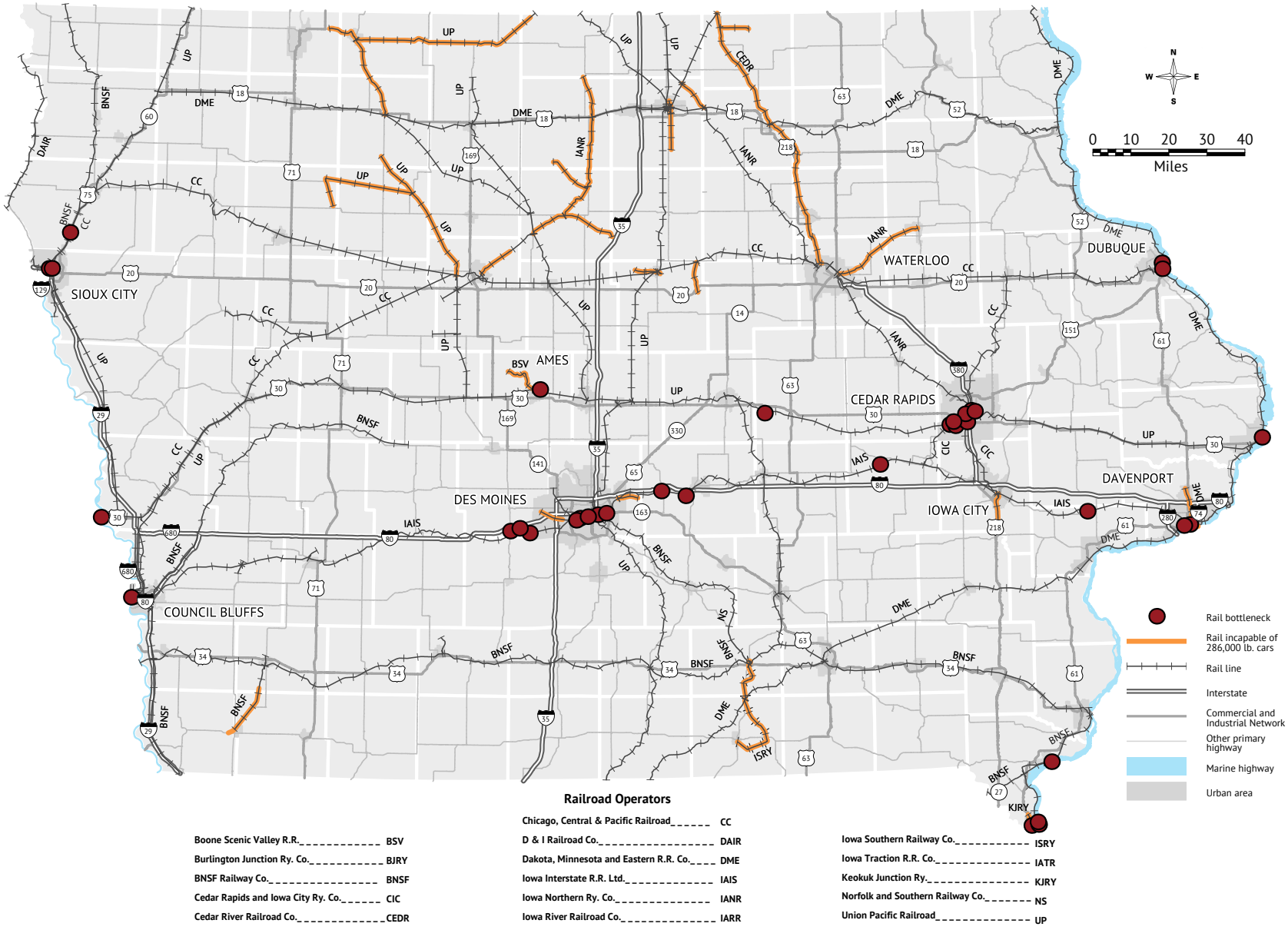
- Implementation of a bus service connecting the Chicago - Quad Cities intercity passenger rail service to Iowa City once the State of Illinois fully implements the Chicago - Quad Cities service.
- Implementation of intercity passenger rail service between the Quad Cities and Iowa City.
- Advancement of the proposed phased implementation of intercity passenger rail service in the Chicago-Omaha corridor from Iowa City west to Des Moines and Council Bluffs.
- Improvements to stations and facilities at existing Amtrak stations in Iowa, including Creston, Osceola, and Fort Madison.
- Implementation of intercity passenger rail service between Council Bluffs and Omaha.
- Implementation of intercity passenger rail services in the Chicago-Dubuque and the Minneapolis/St. Paul-Des Moines-Kansas City corridors.
- Implementation of commuter rail services in the Des Moines area and in the Iowa City-Cedar Rapids area.

In addition to projects identified in the ISRP, two specific types of issues to be addressed across the rail system include rail bottlenecks and rail lines with weight limitations (see Figure 5.7). Rail bottlenecks were identified in the State Freight Plan, and were based on input from rail companies, the Iowa Rail Advisory Committee, metropolitan planning organizations (MPOs), regional planning affiliations (RPAs), and Iowa DOT districts. Types of bottlenecks identified included the following.

- Track congestion and delays
- Size and capacity limitations of rail lines
- Lack of passing and siding opportunities
- Flood prone areas
- Bridge restrictions
- Limited speed areas
- Lack of rail yard capacity

Along with freight bottlenecks, Iowa has several rail lines that are unable to carry 286,000 pounds of railroad equipment, which is the current industry standard for rail car weight (commodities and rail car combined). This is a challenge for Iowa's rail service, as railroads continue to focus their attention on heavier axle-load freight equipment and longer, heavier trains to lower costs. Using larger rail cars in 100-plus car unit trains allows the greatest savings and economic benefits, as well as keeping would-be truck traffic off the highways.

Figure 5.7: Rail bottlenecks and rail lines incapable of handling 286,000-pound rail car weights



Source: Iowa DOT

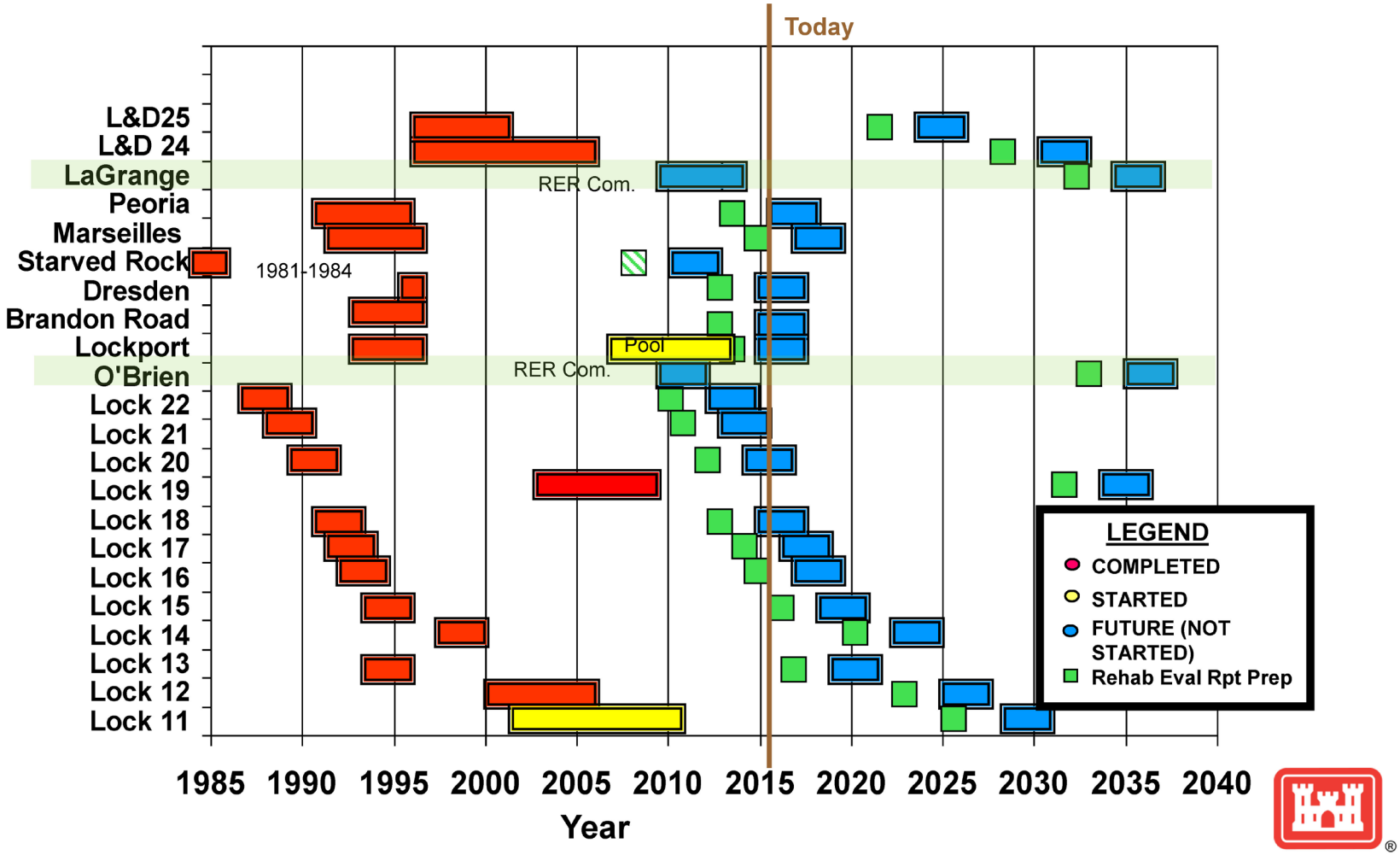
Water needs

The 2016 Iowa State Freight Plan outlines needed waterway freight improvements, as provided to the Iowa DOT by the U.S. Army Corps of Engineers (USACE), which is responsible for all inland waterway navigation projects in the United States. Types of infrastructure priorities include operations and maintenance, major rehabilitation, and improvements (small- and large-scale). Completing tasks in these three areas depends on whether or not funding is allocated by Congress. The status of the three types of navigation projects in the USACE, Rock Island District, which is responsible for locks and dams 11-19 in Iowa (see Figure 4.21), is outlined below.

- Operations and maintenance: Currently funded at 35 to 40 percent of what is needed each year, which has led to nearly $1 billion of unfunded maintenance requirements.
- Major rehabilitation: Currently, 14 major rehabilitation projects are behind schedule across the 20 lock and dams that fall within the Rock Island District. These require construction funding that is tied to the Inland Waterway Trust Fund, which has not been allocated for the last 15 years.
- Improvements (small- and large-scale): The authorization for improvements is the Navigation and Ecosystem Sustainment Program, which was authorized in 2007. No construction funds have been appropriated to date. Several small-scale measures, which would improve river traffic efficiency, are ready to construct.

The 14 major rehabilitation projects that are yet to be started on the Mississippi River are shown in Figure 5.8. Most of the locks bordering Iowa (locks 11 through 19) are currently in the Rehabilitation Evaluation Report (RER) preparation stage and are set to begin in the near future. An RER must be completed and approved prior to funding a project for construction. This spells out the cost, scope, urgency, and objectives of the rehabilitation project. Currently, none of the Iowa locks' RERs have been funded. Rehabilitation was recently started on Lock and Dam 11, but the project was not funded to completion.

Figure 5.8: Schedule of major rehabilitations on the Upper Mississippi River, Rock Island District



Source: U.S. Army Corps of Engineers, Rock Island District

Additional information regarding recent focal points for the USACE districts on waterways bordering Iowa can be found in the freight plan. The plan also discusses efforts to expand locks between Iowa and St. Louis from 600 to 1,200 feet, which would have impacts on Iowa waterway shipping.

Highway needs

Several layers of needs (shown to the right) were examined as part of the highway improvement needs analysis conducted for the Plan. Each layer involved using various Iowa DOT plans and tools to analyze different types of needs from a systemwide perspective. Most layers identified needs at the corridor level, with only freight and bridge improvement needs being identified for specific locations.

This analysis was conducted to build a comprehensive understanding of various types of needs across the Primary Highway System. While specific locations have been identified for each layer of analysis, this process does not define the types of treatments to be implemented or identify specific projects or alternatives. It also does not mean that needs identified here will subsequently become funded projects, as additional factors help determine when and how a project proceeds. However, this analysis does help provide a corridor level perspective that will be an important consideration as individual projects are developed, and will help ensure identified needs are taken into account during the project scoping process.

Statewide capacity analysis

Capacity needs at the statewide level were evaluated based on current conditions and anticipated future traffic. For both timeframes, a volume-to-capacity (V/C) ratio was used, which estimates how much capacity remains on a roadway based on how much traffic it carries and how much traffic it could carry. A roadway's capacity varies based on factors such as the number of lanes, classification of the roadway, number and frequency of accesses, and surrounding land use. The V/C ratio is an indicator of highway capacity sufficiency, where it is estimated that a facility is congesting as V/C approaches a value of 1.0. Values above 0.7 were considered to be approaching capacity, and values greater than 1.0 were considered over capacity.

Current V/C conditions were derived from the Infrastructure Condition Evaluation (ICE) tool. The ICE tool combines seven traffic and condition criteria to develop a composite score for each segment of the Primary Highway System. One of those seven elements is a congestion index based on the V/C ratio. The traffic volume data used within the ratio was based on observed and estimated traffic count information from the year 2014.

Overall, the analysis showed there are some primary highway segments with V/C ratios above 0.7, most of which are located in urban areas. Of the primary highways examined, few congested areas were located outside of urban areas, and overall the higher V/C ratios among rural corridors are on interstates or within close proximity to urban areas. In addition to the prevalence of urban corridors, interurban commuter corridors such as I-35 from Des Moines to Ames and I-380 from Iowa City to Cedar Rapids showed higher than average V/C ratios. Also, much of I-80 east of Des Moines had a V/C ratio above 0.5.

Future V/C conditions were forecast with the Iowa Travel Analysis Model (iTRAM), which is a statewide travel demand model utilizing existing socioeconomic data (e.g., employment, households, population information) to estimate travel activity. The goal is to calibrate a base-year model so estimated traffic volumes match observed traffic count information. Once a travel demand model is calibrated to a reasonable level, the input socioeconomic data can be forecast for future years to estimate what the effect of future employment, household, and population growth would be on the transportation system, particularly the Primary Highway System in Iowa. The iTRAM model includes the future year 2040, and estimates traffic conditions for 2040 based on the location and amount of forecast employment, household, and population information. The trips generated by this activity are allocated to a highway network that includes the existing highway network plus projects currently programmed in the Iowa DOT Five-Year Program. This enables an analysis of what traffic would be like in 2040 if no additional improvements were made beyond those currently funded.

Similar to the ICE V/C analysis for current conditions, the iTRAM V/C analysis for future conditions shows that the majority of congestion is forecast to worsen in urban areas including Des Moines, Iowa City, Cedar Rapids, and Davenport, with more isolated congestion occurring in some of the state's other urban areas. The forecast year also shows I-80 as approaching, at, or over capacity from west of Des Moines to Iowa City, and entirely at or over capacity from Iowa City to Davenport. In addition to I-80 east of Des Moines, two interurban corridors are highlighted. I-35 from Des Moines to Ames is forecast to be approaching capacity. I-380 from Iowa City to Cedar Rapids is forecast to be at or over the capacity threshold. These results are consistent with the base-year analysis and show that interurban commuter corridors and urban corridors will continue to show higher congestion ratios than the rest of the primary system.

Overall, the results from both analyses were consistent in showing there is limited congestion on Iowa's primary network as a whole. For both current conditions in 2014 and forecast conditions in 2040, locations showing V/C ratios that are approaching or over capacity are primarily within urban areas or are key interurban interstate corridors. Output from this analysis was combined with a more detailed analysis of urban area congestion.

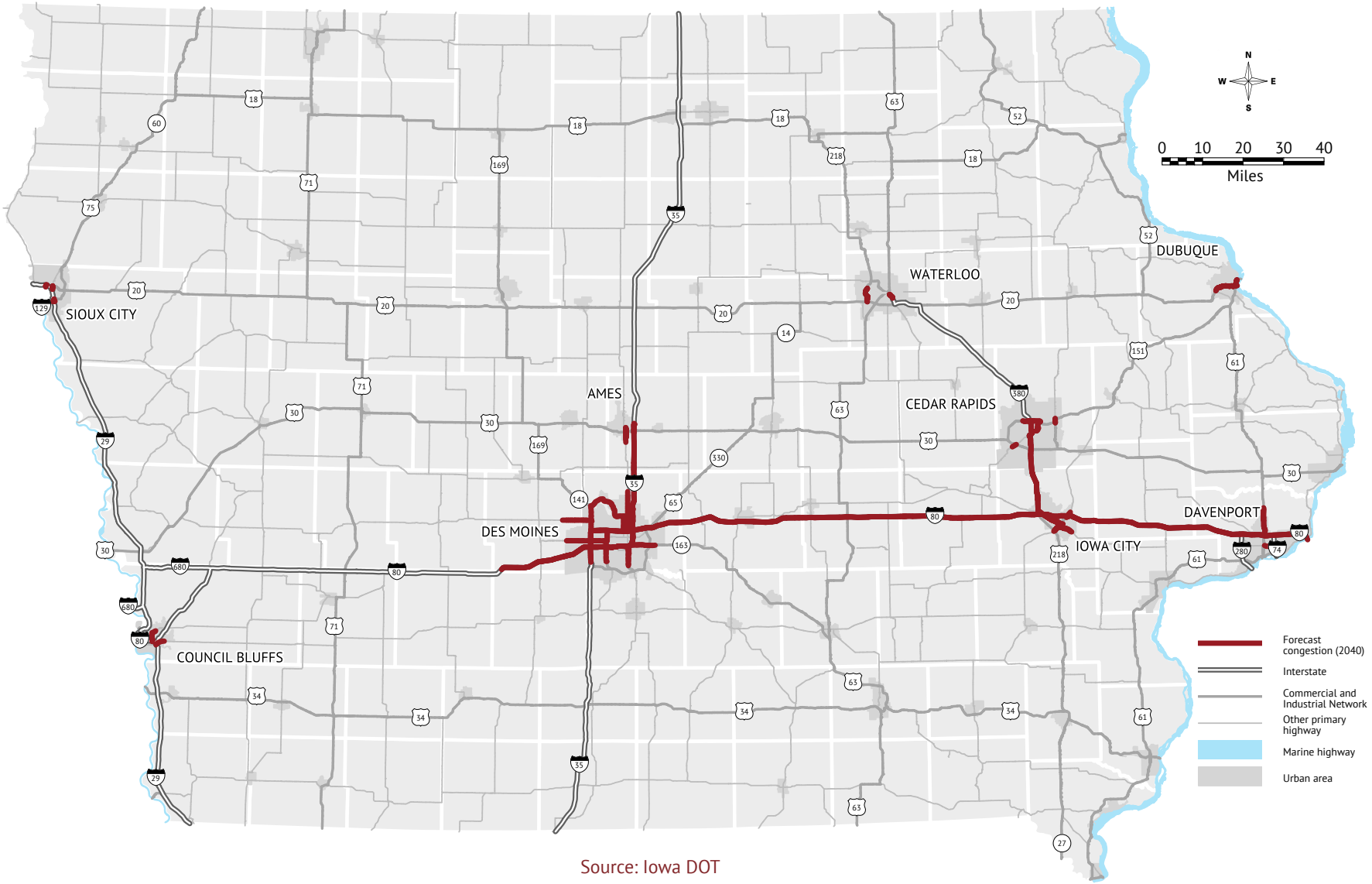
Urban capacity analysis

All of Iowa's MPOs have their own travel demand models. The models operate in a similar manner to iTRAM, but utilize more granular socioeconomic data and road networks for their metropolitan areas. MPOs also develop their own socioeconomic forecasts for their long-range plans, which may vary from the estimates developed from the statewide perspective of iTRAM. Thus, the nine MPO models were used to supplement iTRAM to analyze forecast congestion in urban areas in order to incorporate metropolitan socioeconomic forecasts and provide additional refinement to the V/C analysis for urban corridors.

The MPO models had variations in terms of base and forecast years, and in the nuances of how they were built. Thus, the analysis of urban capacity needs began by determining a standard analysis process to provide consistency across the nine MPO models and with the statewide analysis done previously. The future models used geographic highway networks that included projects currently programmed in the Iowa DOT Five-Year Program for primary routes, and each MPO's committed and planned projects included in their long-range transportation plan for nonprimary routes. This enabled review of needs on the primary system in urban areas if planned projects off the primary system are completed.

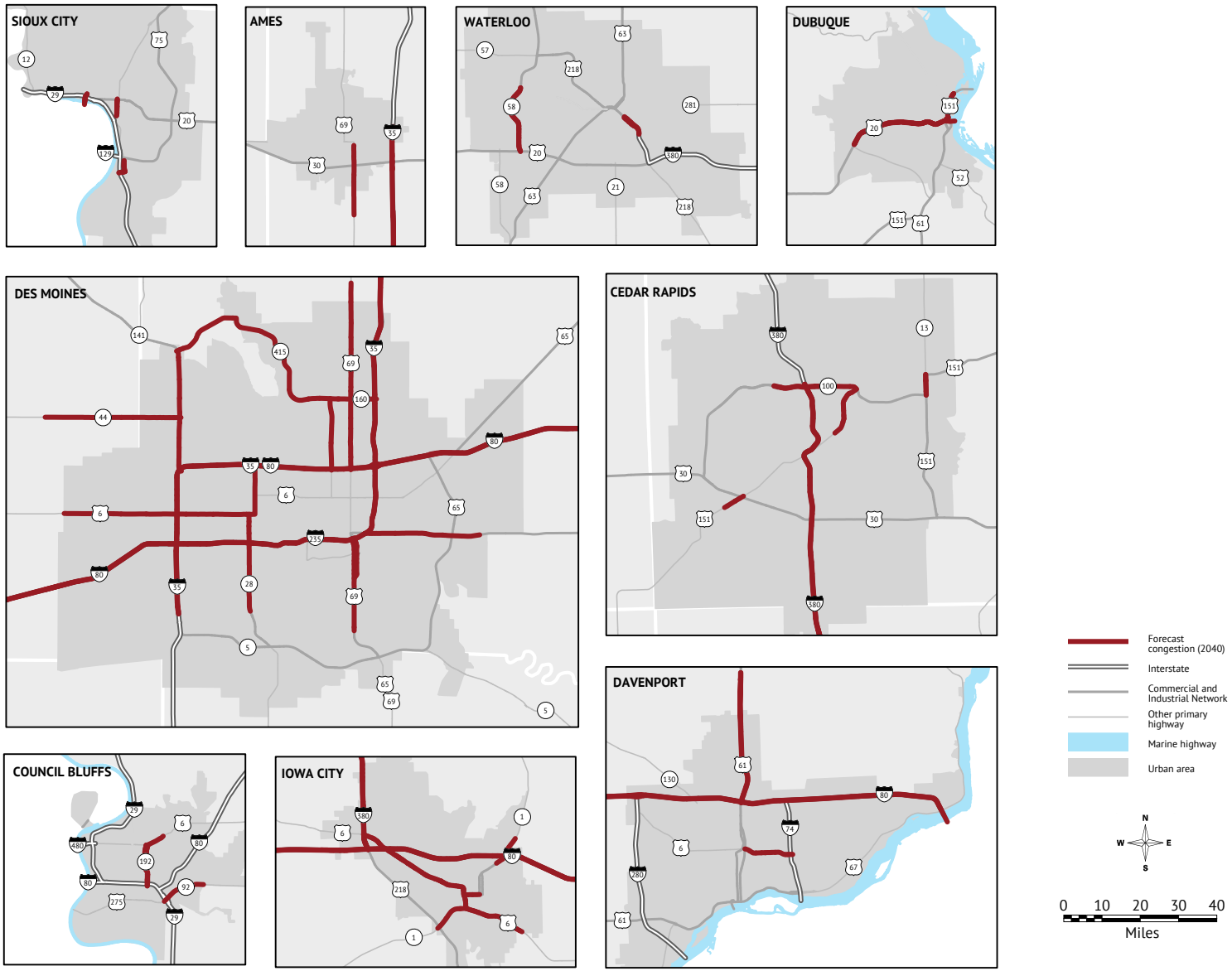
The V/C results for each urban area were reviewed to identify corridors where traffic volumes in 2040 were forecast to be approaching, at, or over capacity. Corridors where the year 2040 V/C was congesting or congested were delineated, with beginning and ending termini determined based on continuity of V/C concerns, major intersecting routes, and connectivity to other areas with V/C values over the defined thresholds. Spot locations, generally defined as areas less than 0.5 mile in length, were not included as corridors. Figures 5.9 and 5.10 show the urban corridors along with the interstate corridors identified through the statewide capacity analysis.

Figure 5.9: Statewide and urban corridors projected to be approaching or over capacity in 2040



Source: Iowa DOT

Figure 5.10: Urban insets, statewide and urban corridors projected to be approaching or over capacity in 2040



Source: Iowa DOT

Mobility and safety analysis

The objective of this layer of analysis was to provide a data-driven recommendation for mobility and safety improvements to Primary Highway System corridors. These improvements would enhance the operation of the network in particular corridors where capacity expansion needs were not identified, and would serve as a complimentary network to the state's multilane highway network.

The statewide and urban capacity analysis showed a lack of current and future capacity needs on the majority of the Primary Highway System. There were not current or forecast corridor-level capacity needs identified in rural areas outside of the three interstate corridors previously identified. However, there is a desire to continue to improve the statewide system's operation by addressing mobility and safety needs on the two-lane Primary Highway System. Over time, these enhanced corridors would effectively serve as a network of two-lane highways that provide improved statewide mobility and complement the existing and committed multilane network.

As part of the 1997 Iowa in Motion State Transportation Plan, the Iowa DOT introduced the idea of Super-2 style roadways with the basic goals of maximizing the benefits of two-lane roadways through improved roadway safety, capacity, and mobility, while reinforcing the growing importance of lowering construction and maintenance costs. Super-2 improvements serve as alternatives to four-lane capacity expansion projects and can aid in uninterrupted flow of traffic and the accommodation for slower traffic when necessary. Specific examples of Super-2 design elements include wider paved shoulders, limited access, geometric improvements, left- and right-turn lanes, acceleration lanes, and climbing/passing lanes. The improvements targeted through this analysis would be a more relaxed application of the Super-2 design, with the appropriate mix of elements being implemented on a corridor when work is being done for safety or condition improvements.

An analysis of two corridors where Super-2 style improvements were constructed during 2008-2011 showed significant safety benefits.

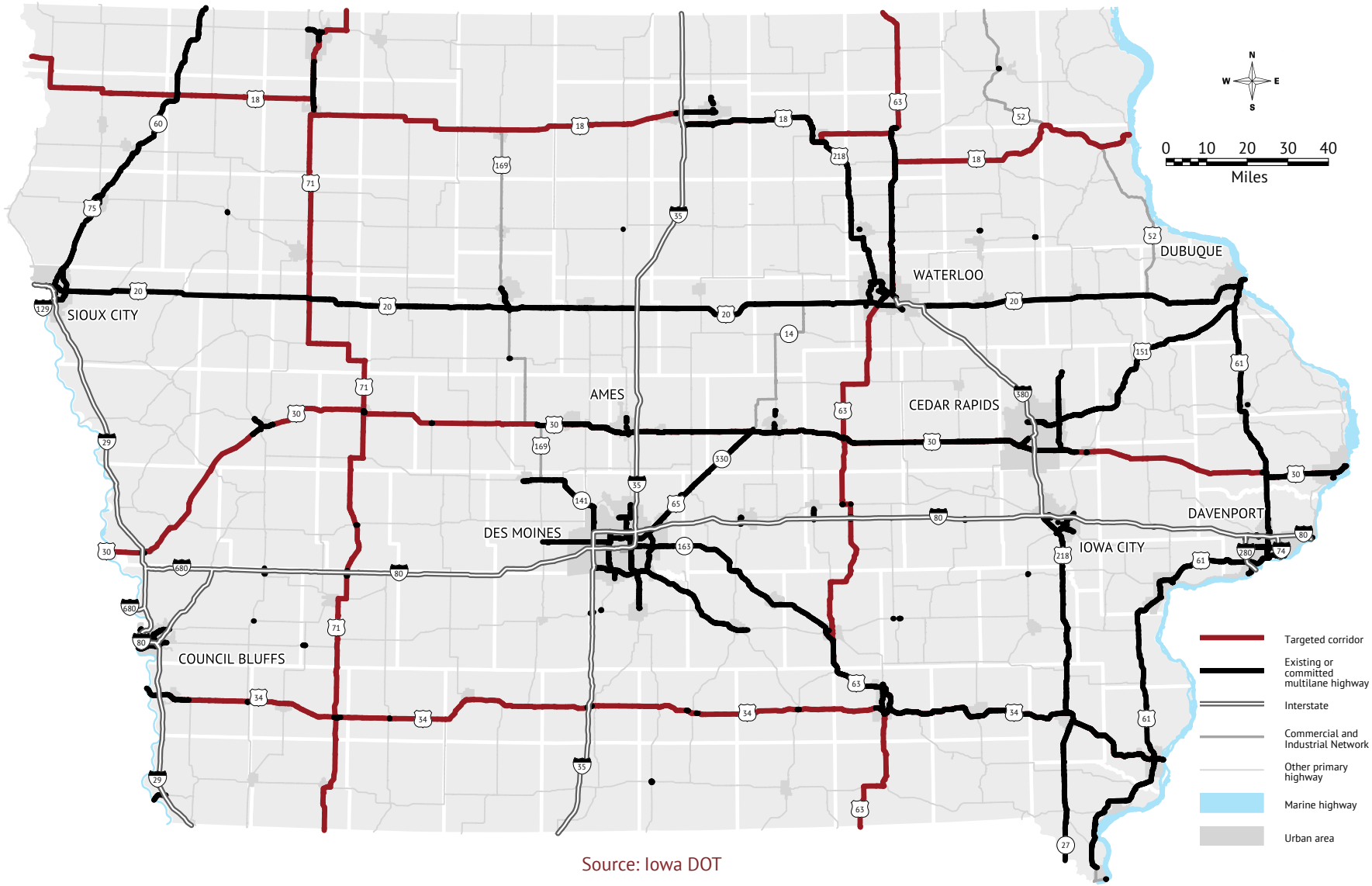
The types of improvements added include wider paved shoulders, the addition of turn lanes and passing lanes, and access and geometric modifications. The analysis reviewed crashes in the several years prior to construction and after construction. With animal crashes excluded, the analysis showed a 67 percent reduction in crashes on US 169 from Fort Dodge to Humboldt, and a 49 percent reduction in crashes on US 63 from Oskaloosa to New Sharon.

In order to analyze needs across the network and help target corridors for improvement, the following attributes were evaluated.

- Identification of existing climbing lanes/passing lanes
- Crash statistics from 2010-2014
- Roadway grade
- 2014 Annual Average Daily Traffic (AADT) and percent truck traffic
- Average trip length on corridors

Information from each of the five datasets was merged to form a database of potential candidate locations on the two-lane highway network. Initially, the data was evaluated to see if a rough network would emerge from the combined datasets. However, the data distribution lacked obvious patterns or consistency on a statewide level, which necessitated further filtering. The filtering process emphasized statewide connectivity and geographic access, while considering existing network designations. This led to a proposed network of corridor-level mobility and safety improvements. Over time, these corridors would effectively serve as an enhanced network of two-lane highways providing improved statewide mobility and complementing the existing and committed multilane network. Figure 5.11 shows the corridors targeted for mobility and safety improvements, which include US 18, 30, 34, 63, and 71.

Figure 5.11: Corridors targeted for mobility and safety improvements



Source: Iowa DOT

Freight analysis

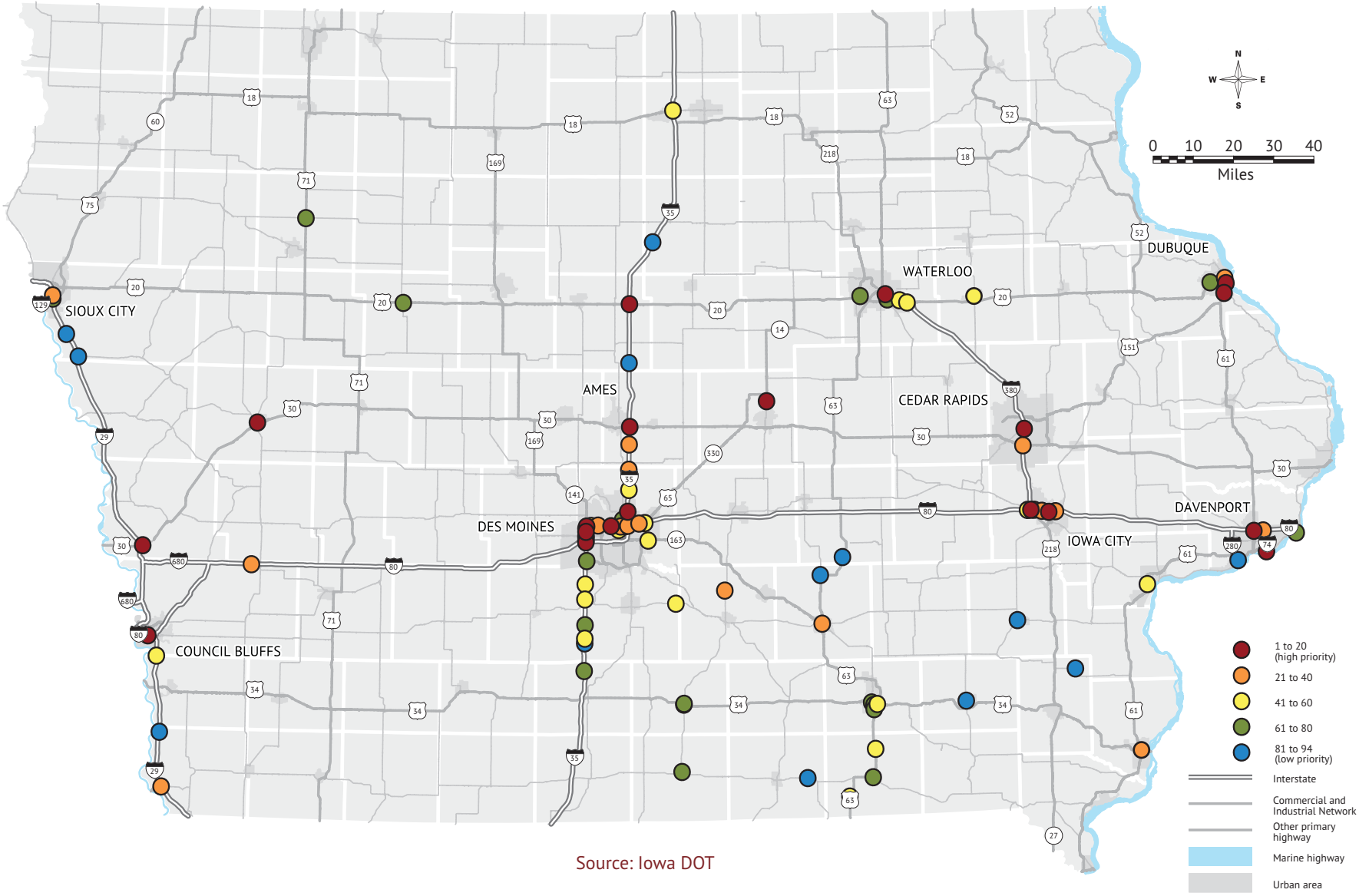
The Iowa State Freight Plan was finalized in 2016. The planning effort involved an analysis called VCAP, which stands for value, condition, and performance, to evaluate and prioritize freight bottlenecks on the Primary Highway System. This analysis and its results were incorporated into the highway analysis for this Plan. The results represent locations on the highway system where freight movement may be hindered and improvements to facilitate more efficient freight flow should be considered.

The VCAP analysis takes advantage of multiple tools available at the Iowa DOT and includes the following steps.

- A Freight Mobility Issues Survey populated the initial list of locations based on INRIX traffic data and input from the Freight Advisory Council, Iowa DOT districts, and planning agencies. The traffic data allowed the identification of highway segments that had recurring slowed speeds throughout the year and significant truck volumes. The input from stakeholders helped expand this list to include other locations of concern.
- iTRAM was used to provide a measure of value for each location based on how much it improves the efficiency of the statewide network. This value was provided by comparing how truck traffic typically moves on the roadway network to how truck traffic moves on the roadway network if each particular location cannot be used, and traffic has to reroute. A larger decrease in efficiency, measured by truck travel time across the network, means a higher value for the location.
- The ICE tool provided the condition measurement for each location based on ICE's composite rating of seven condition and traffic criteria. The ICE composite rating was based on a weighted average of the highway segments making up each location, with a poorer condition score meaning a higher ranking for the location.
- The INRIX bottleneck ranking tool provided the performance component of each location based on how often bottlenecks occur. Bottlenecks are flagged based on speeds being below a particular threshold for more than five minutes, with a higher number of bottlenecks meaning a higher ranking for the location.

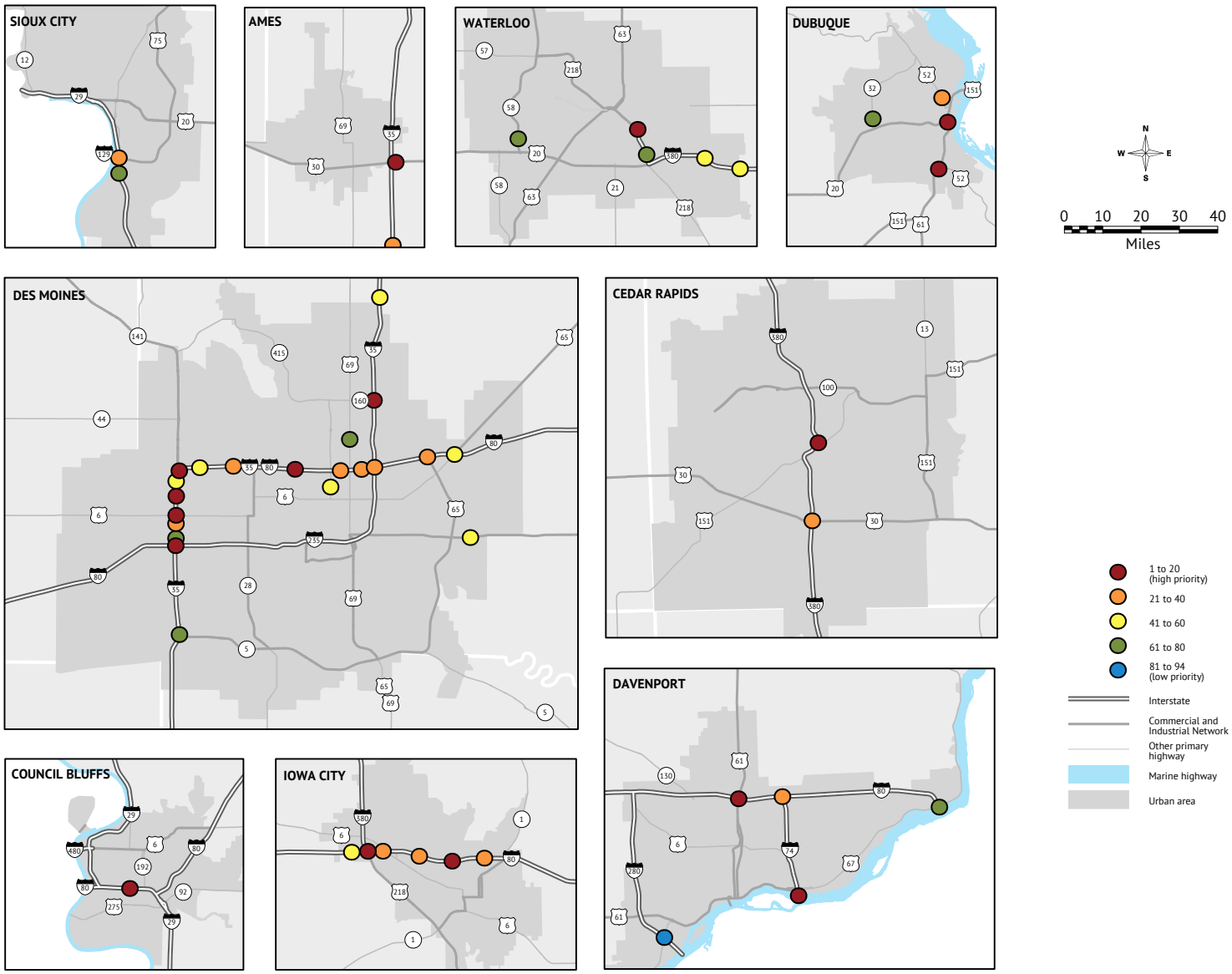
For each VCAP category, all candidate locations were ordered and ranked based on their values for that attribute. Then, the average of these three rankings was calculated and the candidate locations were assigned an overall priority rank. If two locations had the same average ranking, the annual average daily truck traffic (AADTT) at the locations was used as a tiebreaker. Figures 5.12 and 5.13 show the location and priority ranking of freight bottleneck locations.

Figure 5.12: Freight bottleneck locations on the Primary Highway System



Source: Iowa DOT

Figure 5.13: Urban insets, freight bottleneck locations on the Primary Highway System



Source: Iowa DOT

Condition analysis

The primary basis for the condition analysis was the Infrastructure Condition Evaluation (ICE) tool, which was developed to aid in the evaluation of the state's Primary Highway System by using a composite rating calculated from seven different criteria. The tool offers the ability to evaluate the overall structural and service condition of roadway segments with this single composite rating. The following criteria are used in the composite rating.

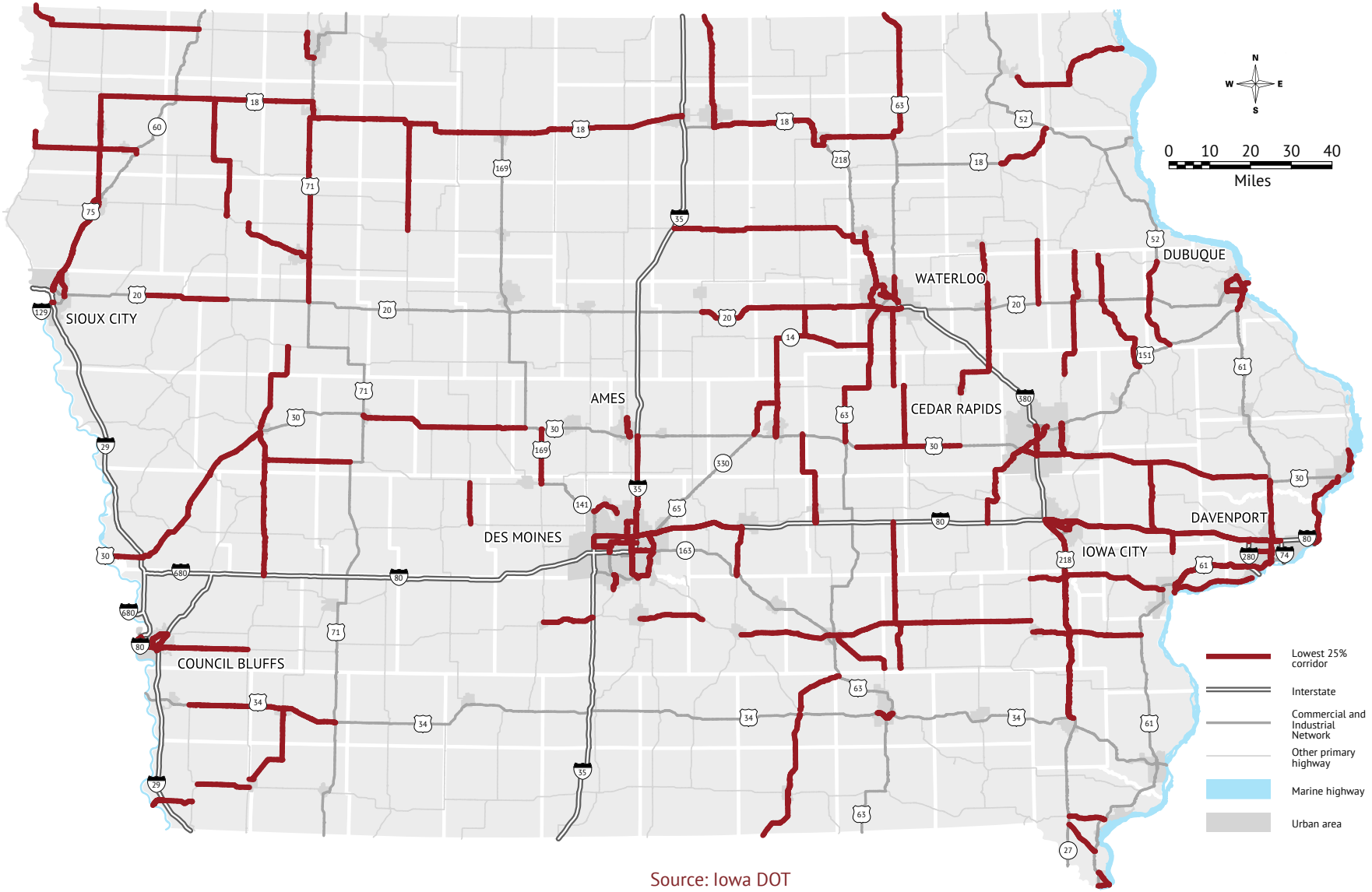
- Pavement Condition Index (PCI) rating (25 percent)
- International Roughness Index (IRI) value (15 percent)
- Structure Inventory and Appraisal (SIA) sufficiency rating (25 percent)
- AADT, combination truck count (15 percent)
- AADT, single-unit truck count (5 percent)
- AADT, passenger count (5 percent)
- Congestion Index value (10 percent)

The primary system is comprised of a total of 27,141 segments that were analyzed. For each segment, the value for each criterion was normalized. Then the seven normalized values were weighted by a formula and added together to determine a composite rating for the segment. The normalization and weighting values and process were determined by input from internal stakeholders during the development of the ICE tool.

To make analysis more manageable, the thousands of segments were aggregated into 464 analysis corridors, with termini based on major road crossings, geographic features, and incorporated boundaries. Each corridor was assigned a composite ICE rating based on a weighted average of the composite ratings for the individual segments within it. To identify a subset of corridors to represent condition improvement candidates in this Plan, the 464 corridors were sorted based on their overall composite rating. Corridors making up the lowest-rated 25 percent of the system by mileage were selected. This threshold was based on an assumed pavement design life of 20-40 years, depending on the surface material. Using 20 years as a conservative basis means approximately 5 percent of the system's surface would need to be improved in some fashion each year to keep up with deterioration. Since this Plan is updated every five years, applying this annual 5 percent figure to the five-year life of the Plan results in the 25 percent calculation.

Since condition information is aggregated, there may be corridors identified in the bottom 25 percent of the system that have segments in good condition within them, and vice versa. Identification of these corridors also does not mean they will automatically be targeted for improvement, as asset management strategies and other elements factor into when projects proceed. Figure 5.14 shows the bottom 25 percent of primary highway corridors based on the ICE analysis.

Figure 5.14: Bottom 25 percent of primary highway corridors based on ICE composite rating



Source: Iowa DOT

Operations analysis

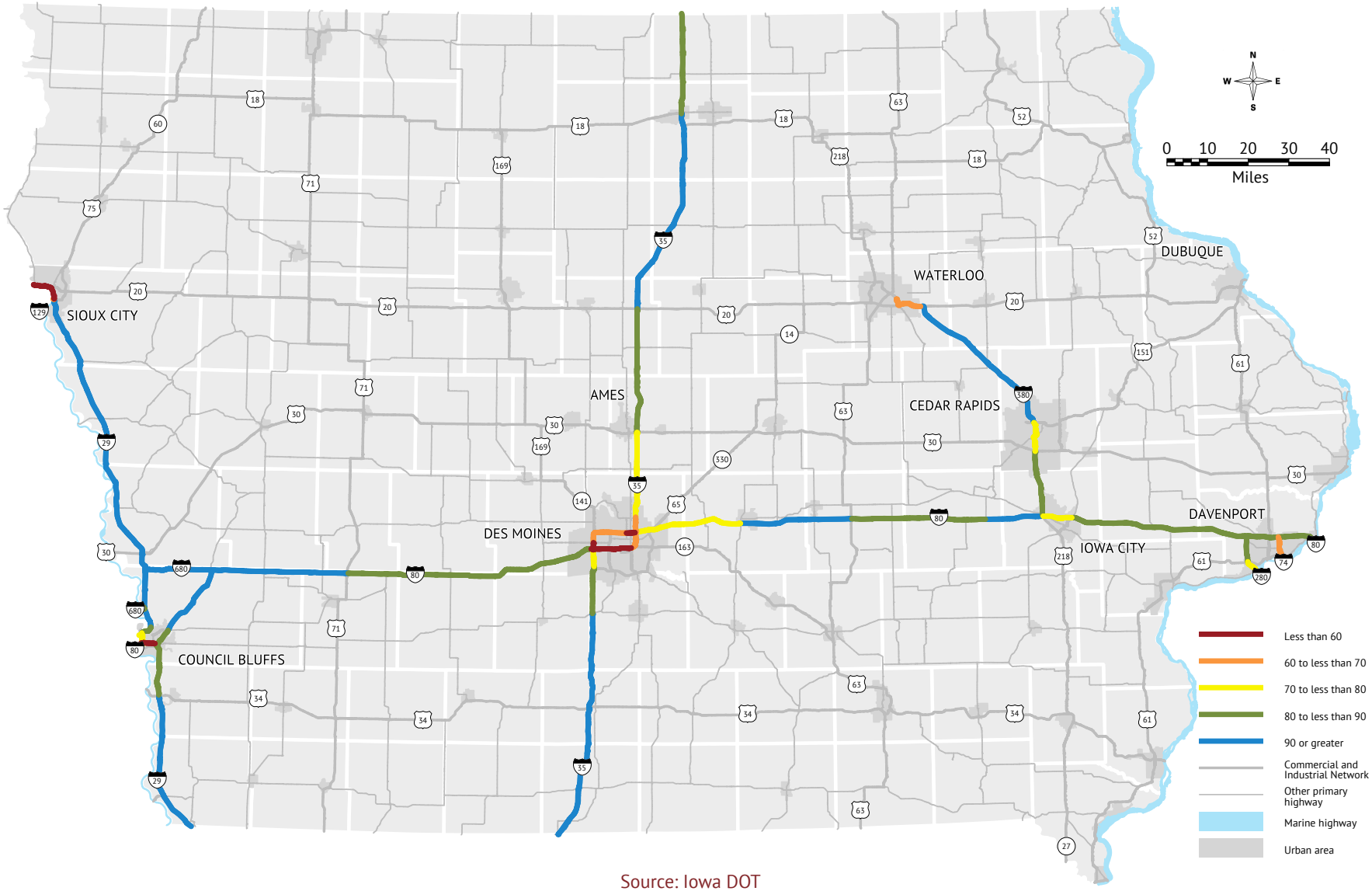
The operations analysis for the highway system was conducted for the interstate system, with the Infrastructure Condition Evaluation-Operations (ICE-OPS) tool used to evaluate and rank 54 interstate corridors from an operations perspective. Much of the data used in ICE-OPS is only reliable for the interstate system, and becomes less reliable or non-existent for much of the remainder of the primary system. Thus, operations for the noninterstate primary system are addressed at a programmatic rather than corridor level, and the action plan identifies several system-level transportation system management and operations (TSMO) strategies derived from the TSMO plan.

The ICE-OPS tool has a similar structure as the original ICE tool, but with an operations focus. It uses the following nine operations-oriented criteria to rank highway segments.

- All bottleneck occurrences per mile (10 percent)
- Freight bottleneck occurrences per mile (10 percent)
- Traffic incident frequency per mile (15 percent)
- Crash rate (15 percent)
- Reliability index (10 percent)
- Event center buffer index (5 percent)
- Weather-sensitive corridor mileage (10 percent)
- AADT (20 percent)
- ICE rating (5 percent)

Each element is assigned a normalized value (1-10 scale) based on the range of observed values, and a composite score is calculated after applying weighting to each normalized value. Overall, corridors ranking higher (lower scores) through this analysis are generally in metropolitan areas. The analysis helps identify corridors where strategies related to improving the operation of the system may be most beneficial. Figure 5.15 shows the results of the ICE-OPS analysis.

Figure 5.15: ICE-OPS composite ratings for the interstate system



Source: Iowa DOT

Bridge analysis

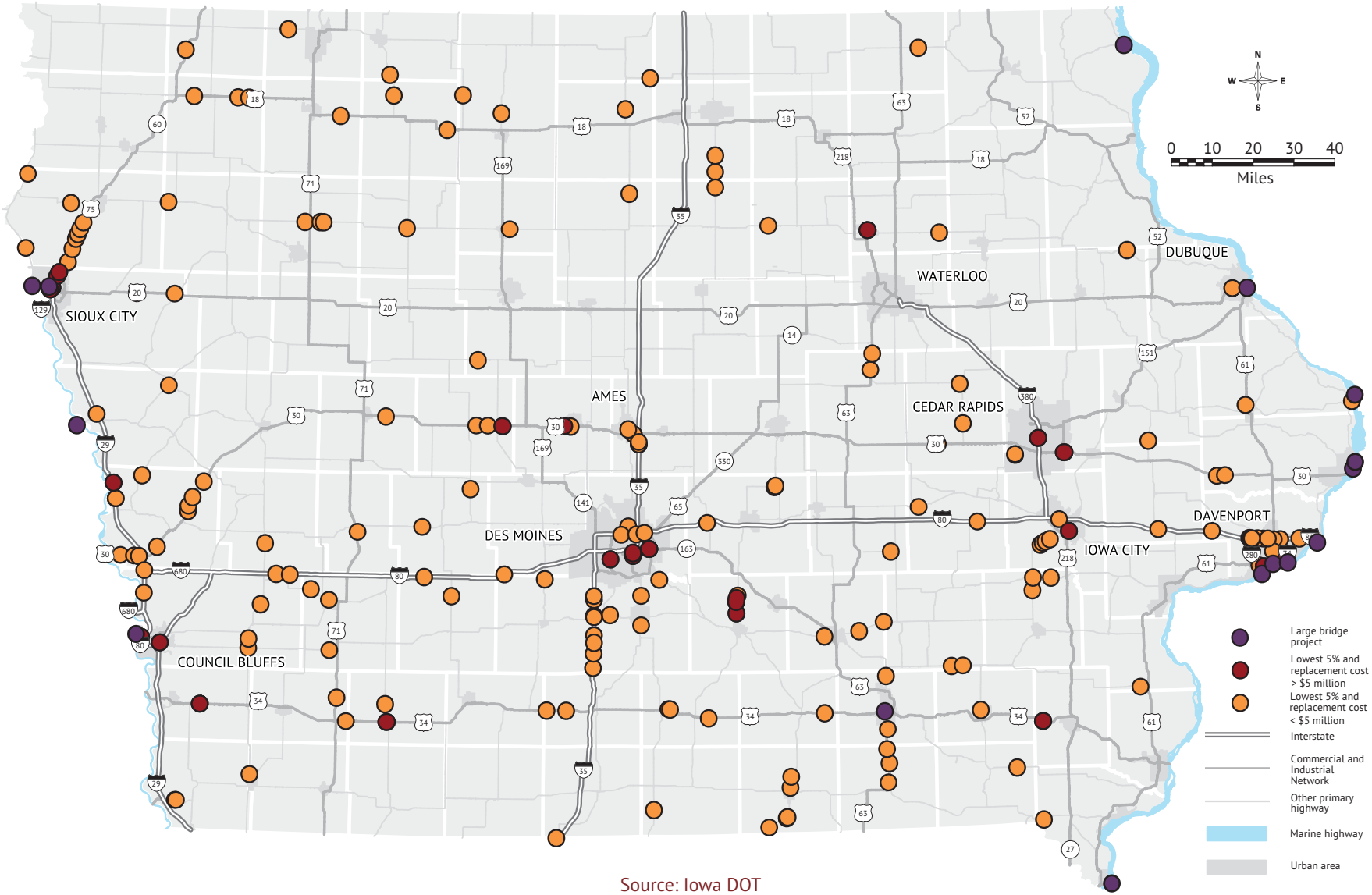
The bridge analysis and addressing bridge needs were approached in multiple ways. There are several major bridge projects that have been identified by the department as needing to occur over the next couple of decades. These projects, most of which are border river crossings, can be very expensive projects that require significant resources and coordination among states. These projects include the following.

- I-74 over the Mississippi River – replacement
- I-80 over the Mississippi River – replacement
- IA 9 over the Mississippi River – replacement
- US 67 over the Mississippi River – replacement
- I-280 over the Mississippi River – deck replacement
- I-129 over the Missouri River – deck overlay
- IA 12 Gordon Drive viaduct, Sioux City – replacement
- IA 175 over the Missouri River – replacement
- US 20 over the Mississippi River – replacement
- US 30 over the Mississippi River – replacement
- US 63 Ottumwa viaduct, Ottumwa – replacement

In addition to awareness of these significant bridge needs, a condition analysis was conducted for bridges, similar to the condition analysis completed for highway corridors. For this analysis, the bridge condition index for the 4,355 structures on the primary system was reviewed, and bridges making up the lowest-rated 5 percent of the system's bridges were selected. This threshold was based on an assumed bridge design life of 100 years, which would mean that approximately 1 percent of the system's bridges would need to be improved in some fashion each year to keep up with deterioration. Since this Plan is updated every five years, applying this annual 1 percent figure to the five-year life of the Plan results in the 5 percent calculation.

Within this set of lowest-ranking bridges, those that would cost more than $5 million to replace are also highlighted. Multiple projects of this magnitude can quickly use up the funding available for bridge replacements in a given year. Identification of these bridges does not mean they will automatically be targeted for improvement, as asset management strategies and other elements factor into when projects proceed. Figure 5.16 shows the major bridge projects listed above and the bottom 5 percent of bridges by condition across the system.

Figure 5.16: Major bridge needs and bottom five percent of bridges by condition



Source: Iowa DOT

Highway improvements matrix

In order to provide a comprehensive view of all analysis layers for the entire primary system, a highway improvements matrix was developed. Roadways are divided into interstate, US, and Iowa routes. Corridors are shown from west to east or south to north for each route. The corridor termini were based on the ICE corridors used in several analysis layers. Several items should be kept in mind when reviewing the matrix.

- Duplicate routes are represented once in the table. Generally, they are in the grouping for the highest route classification or in the lowest highway number if classifications are the same.
- Improvement needs are noted with solid red if they were identified for that corridor through the analysis discussed in this chapter.
- Some capacity improvement needs were confined to smaller termini than the corridor represented on the matrix. These locations include an asterisk, and mean that the capacity improvement need was not identified across the full-length of the corridor.
- The operations column only appears for interstates, and the number refers to that corridor's ranking out of 54 interstate corridors.
- The mobility and safety column only appears for the US route grouping, as the targeted corridors for this improvement need are all US routes. Current four-lane corridors are noted, as the mobility and safety improvements would be targeted toward two-lane portions of the route.
- In the bridge and freight columns, the numbers represent the ranking of the bridge improvement(s) (out of 216) and the freight improvement(s) (out of 94) within that corridor.
- Bridge numbers represent one structure. Numbers appearing in parentheses mean that the two structures are at the same location (e.g., the northbound and southbound lanes of an interstate).
- Corridors that did not have specific improvement needs identified for them through the analysis are targeted for stewardship.

Table 5.4: Highway improvements matrix, interstates

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Operations (out of 54)	Bridge (out of 216)
I-29	Fremont	MO border to IA 2		29		51	
	Fremont, Mills	IA 2 to US 34		94, 29		54	
	Mills, Pottawattamie	US 34 to I-80		54		37	
	Pottawattamie	I-80 to I-480/US 6				17	
	Pottawattamie	I-480/US 6 to IA 192				30	
	Pottawattamie	IA 192 to I-680		81		49	56
	Harrison, Monona	US 30 to IA 175				52	23, (104, 212),160
	Monona, Woodbury	IA 175 to US 20/I-129		38, 63, 92, 85		43	90
	Woodbury	US 20/I-129 to SD border		38		5	55
I-35	Decatur, Clarke	MO border to US 34				48	
	Clarke, Warren	US 34 to IA 92		80, 58, 83, 72		45	22, 117, 175, 182, 198
	Warren, Polk	IA 92 to IA 5		60, 57, 67		35	177, 186
	Polk	IA 5 to I-80/I-235		13, 70		15	
	Polk	I-80/I-235 to IA 160		10, 22		9	
	Polk, Story	IA 160 to US 30		17, 23, 25, 44, 10		17	(129, 140), 203
	Story, Hamilton	US 30 to US 20	*	8, 87, 17		27	
	Hamilton, Wright, Franklin	US 20 to IA 3		90, 8		39	
	Franklin, Cerro Gordo	IA 3 to US 18		51		53	
	Cerro Gordo, Worth	US 18 to MN border		51		35	
I-35/80	Polk	W mixmaster to US 6		13, 70, 35, 19		2	
	Polk	US 6 to IA 141		19, 9, 42, 4		13	
	Polk	IA 141 to IA 28		4, 53, 24		8	
	Polk	IA 28 to IA 415		18		11	42
	Polk	IA 415 to E mixmaster		33, 34, 22		6	178
I-74	Scott	IL border to I-80		30, 3		11	46, 50, 103, 148, 191

Table 5.4: Highway improvements matrix, interstates *(continued)*

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Operations (out of 54)	Bridge (out of 216)
I-80	Pottawattamie	NE border to E jct of I-29		1		4	
	Pottawattamie	I-29 to US 6				24	97
	Pottawattamie	US 6 to US 59		36		45	
	Pottawattamie, Cass	US 59 to US 6/US 71				47	77, 190
	Cass, Adair, Madison, Dallas	US 6/US 71 to US 169	*			31	113, 142
	Dallas, Polk	US 169 to W mixmaster		13		31	
	Polk, Jasper	E mixmaster to IA 14		22, 28, 43		16	84
	Jasper, Poweshiek	IA 14 to US 63				39	
	Poweshiek, Iowa	US 63 to US 151				31	91
	Iowa, Johnson	US 151 to I-380		48, 7		42	
	Johnson	I-380 to IA 1		7, 32, 27, 20, 26		22	170
	Johnson, Cedar	IA 1 to US 6				28	
	Cedar, Scott	US 6 to I-280				25	197
	Scott	I-280 to I-74		12, 30		25	76, 80, 95, 128, 153, 171
	Scott	I-74 to IL border		30, 62		34	86
I-129	Woodbury	NE border to I-29		38		7	192
I-235	Polk	W mixmaster to IA 28		13		3	
	Polk	IA 28 to US 69				1	
	Polk	US 69 to E mixmaster		22		10	
I-280	Scott	IL border to US 61/IA 146		82		21	215
	Scott	US 61/IA 146 to I-80				28	106
I-380	Johnson, Linn	I-80 to US 30		37, 7		23	
	Linn	US 30 to IA 100		5, 37		20	75
	Linn, Benton	IA 100 to IA 150				43	
	Benton, Buchanan, Black Hawk	IA 150 to US 20				49	
	Black Hawk	US 20 to end of route		14, 78, 61, 59, 52		14	
I-480	Pottawattamie	NE border to I-29				19	8, 163, 179
I-680	Pottawattamie	NE border to I-29				37	
	Pottawattamie	I-29 to I-80				39	

Source: Iowa DOT

Table 5.5: Highway improvements matrix, US routes

Route	Counties	Corridor	Capacity	Mobility and safety	Freight (out of 94)	Condition	Bridge (out of 216)
US 6	Pottawattamie	IA 192 to I-80	*				
	Pottawattamie	I-80 to US 59	Corridor targeted for stewardship				
	Pottawattamie, Cass	US 59 to US 71	Corridor targeted for stewardship				
	Dallas, Polk	US 169 to I-35/80	*		19		
	Polk	I-35/80 to IA 28			19		
	Polk	IA 28 to US 69					
	Polk	US 69 to I-235					
	Polk	I-235 to I-80			43		
	Jasper, Poweshiek	I-80 to IA 146	Corridor targeted for stewardship				
	Poweshiek, Iowa	IA 146 to US 151					87
	Iowa, Johnson	US 151 to IA 965	*		32		
	Johnson	IA 965 to IA 1					
	Johnson, Muscatine	IA 1 to IA 70	*				187
	Muscatine	IA 70 to IA 38	Corridor targeted for stewardship				
	Muscatine, Cedar	IA 38 to I-80					
	Scott	I-280 to IA 461					
	Scott	IA 461 to I-74					
US 18	Lyon, Sioux	SD border to US 75					
	Sioux, O'Brien	US 75 to IA 60					
	O'Brien, Clay	IA 60 to US 71					7, 13, 169
	Clay, Palo Alto, Kossuth	US 71 to US 169					48, 199
	Kossuth, Hancock, Cerro Gordo	US 169 to I-35			51		
	Cerro Gordo	I-35 to US 65		current 4-lane corridor			
	Cerro Gordo, Floyd	US 65 to US 218		current 4-lane corridor			
	Floyd, Chickasaw	IA 14 to US 63					
	Chickasaw, Fayette	US 63 to IA 150					
	Fayette, Clayton, Allamakee	IA 150 to US 52					
	Allamakee, Clayton	US 52 to IA 76					

Table 5.5: Highway improvements matrix, US routes *(continued)*

Route	Counties	Corridor	Capacity	Mobility and safety	Freight (out of 94)	Condition	Bridge (out of 216)
US 20	Woodbury	I-29 to US 75			38		
	Woodbury	US 75 to IA 140	Corridor targeted for stewardship				
	Woodbury, Ida	IA 140 to US 59					16, 141
	Ida, Sac	US 59 to US 71	Corridor targeted for stewardship				
	Sac, Calhoun, Webster	US 71 to US 169			75		
	Webster, Hamilton	US 169 to I-35			8		
	Hamilton, Hardin	I-35 to US 65			8		
	Hardin, Grundy	US 65 to IA 14					
	Grundy, Black Hawk	IA 14 to IA 27					
	Black Hawk	IA 27 to US 218			61		
	Black Hawk, Buchanan	I-380 to IA 150	Corridor targeted for stewardship				
	Buchanan, Delaware	IA 150 to IA 13	Corridor targeted for stewardship				
	Delaware, Dubuque	IA 13 to IA 136	Corridor targeted for stewardship				
	Dubuque	IA 136 to IA 32	*				
	Dubuque	IA 32 to IL border			15		19, 176
US 30	Harrison	NE border to I-29					36, 120, 200
	Harrison, Crawford	I-29 to US 59			6, 11		9, 15, 39, 144, 189
	Crawford, Carroll	US 59 to US 71			11		
	Carroll, Greene, Boone	US 71 to US 169					14, 66, 72, 119
	Boone	US 169 to IA 930		current 4-lane corridor			114, (154, 201)
	Boone, Story	IA 930 to I-35		current 4-lane corridor	17		(139, 180)
	Story, Marshall	I-35 to IA 14		current 4-lane corridor	17		
	Marshall, Tama	IA 14 to 3.3 mi E of US 63		current 4-lane corridor			
	Tama, Benton	3.3 mi E of US 63 to US 218		committed 4-lane corridor			29
	Benton, Linn	US 218 to IA 922		current 4-lane corridor			
	Linn	IA 922 to I-380		current 4-lane corridor	37		
	Linn	I-380 to 2.4 mi W of IA 1		current 4-lane corridor	37		136
	Linn, Cedar, Clinton	2.4 mi W of IA 1 to US 61					27, 118
	Clinton	US 61 to IL border		current 4-lane corridor			30

Table 5.5: Highway improvements matrix, US routes *(continued)*

Route	Counties	Corridor	Capacity	Mobility and safety	Freight (out of 94)	Condition	Bridge (out of 216)
US 34	Mills	NE border to I-29		current 4-lane corridor			
	Mills	I-29 to 0.8 mi W of US 275		current 4-lane corridor			
	Mills	0.8 mi W of US 275 to US 59					17
	Mills, Montgomery	US 59 to US 71					
	Montgomery, Adams, Union	US 71 to IA 25					126, 208
	Union, Clarke	IA 25 to I-35					172, 173
	Clarke, Lucas	I-35 to US 65					
	Lucas, Monroe	US 65 to IA 5			79		21, 78, 145
	Monroe, Wapello	IA 5 to Ottumwa W CL					121
	Wapello	Ottumwa W CL to US 63		current 4-lane corridor	71, 66, 55		
	Wapello, Jefferson	US 63 to IA 1		current 4-lane corridor			
	Jefferson, Henry	IA 1 to US 218		current 4-lane corridor			74
	Henry, Des Moines	US 218 to US 61		current 4-lane corridor	21		
	Des Moines	US 61 to IL border		current 4-lane corridor	21		
US 52	Jackson, Dubuque	IL border to US 20					3, 20
	Dubuque	US 151 to US 20			2		
	Dubuque	IA 32 to IA 3/IA 136		Corridor targeted for stewardship			
	Dubuque, Clayton	IA 3/IA 136 to US 18		Corridor targeted for stewardship			
	Allamakee, Winneshiek	US 18 to IA 9		Corridor targeted for stewardship			
	Winneshiek	IA 9 to MN border		Corridor targeted for stewardship			
US 59	Fremont, Page	MO border to IA 2		Corridor targeted for stewardship			
	Fremont, Page, Mills	IA 2 to US 34					47
	Mills, Pottawattamie	US 34 to I-80					125, 184, 213
	Pottawattamie, Shelby, Crawford	I-80 to US 30			11		130
	Crawford, Ida	US 30 to US 20			11		
	Ida, Cherokee	US 20 to IA 3		Corridor targeted for stewardship			
	Cherokee, O'Brien	IA 3 to US 18					
	O'Brien, Osceola	US 18 to MN border		Corridor targeted for stewardship			

Table 5.5: Highway improvements matrix, US routes *(continued)*

Route	Counties	Corridor	Capacity	Mobility and safety	Freight (out of 94)	Condition	Bridge (out of 216)
US 61	Lee	MO border to US 218	Corridor targeted for stewardship				
	Lee	US 218 to IA 2	Corridor targeted for stewardship				
	Lee, Des Moines	IA 2 to Burlington N CL			21		
	Des Moines, Louisa	Burlington N CL to IA 92	Corridor targeted for stewardship				
	Louisa, Muscatine	IA 92 to IA 38			49		
	Muscatine, Scott	IA 38 to I-280					
	Scott, Clinton	I-80 to US 30	*		12		
	Clinton, Jackson	US 30 to IA 64	Corridor targeted for stewardship				
	Jackson, Dubuque	IA 64 to US 151					205
	Dubuque	US 20 to WI border	*				
US 63	Davis, Wapello	MO border to US 34			66, 69, 46, 64, 47		33, 34, 68, 174
	Wapello	US 34 to IA 149		current 4-lane corridor			
	Wapello, Mahaska	IA 149 to IA 92		current 4-lane corridor	31		
	Mahaska, Poweshiek	IA 92 to I-80			88, 91, 31		
	Poweshiek, Tama	I-80 to US 30					
	Tama, Black Hawk	US 30 to US 20					67, 71
	Black Hawk	US 20 to US 218		current 4-lane corridor			
	Black Hawk	US 218 to Waterloo N CL		current 4-lane corridor			
	Black Hawk, Bremer	Waterloo N CL to IA 3		current 4-lane corridor			
	Bremer, Chickasaw	IA 3 to US 18		current 4-lane corridor			
	Chickasaw, Howard	US 18 to MN border					
US 65	Wayne, Lucas	MO border to US 34					194
	Lucas, Warren	US 34 to IA 92					167
	Warren	IA 92 to IA 5					155
	Warren, Polk	IA 5 to IA 163					
	Polk	IA 163 to I-80			28		
	Polk, Jasper	I-80 to IA 330			43		
	Jasper, Story	IA 330 to US 30	Corridor targeted for stewardship				
	Story, Hardin	US 30 to US 20	Corridor targeted for stewardship				
	Hardin, Franklin	US 20 to IA 3	Corridor targeted for stewardship				
	Franklin, Cerro Gordo	IA 3 to US 18					101, 107, 122
	Cerro Gordo	US 18 to Mason City N CL					
	Cerro Gordo, Worth	Mason City N CL to MN border					

Table 5.5: Highway improvements matrix, US routes *(continued)*

Route	Counties	Corridor	Capacity	Mobility and safety	Freight (out of 94)	Condition	Bridge (out of 216)
US 67	Scott	US 61 to I-74			3		2, 214
	Scott	I-74 to I-80			3, 62		
	Scott, Clinton	I-80 to US 30			62		
	Clinton	US 30 to Clinton N CL					
	Clinton, Jackson	Clinton N CL to US 52	Corridor targeted for stewardship				
US 69	Decatur, Clarke	MO border to US 34					161
	Clarke, Warren	US 34 to US 65	Corridor targeted for stewardship				
	Warren, Polk	IA 5 to I-235	*				52, 166
	Polk	I-235 to I-35/80					
	Polk	I-35/80 to Ankeny N CL			68		
	Polk, Story	Ankeny N CL to US 30	*				
	Story	US 30 to Ames N CL	*				159
	Story, Hamilton	Ames N CL to US 20	Corridor targeted for stewardship				
	Hamilton, Wright	US 20 to IA 3	Corridor targeted for stewardship				
	Wright, Hancock	IA 3 to US 18					210
	Hancock, Winnebago, Worth	US 18 to MN border					195
US 71	Page, Montgomery	MO border to US 34					
	Montgomery, Cass	US 34 to I-80					70
	Cass, Audubon, Carroll	I-80 to US 30					111
	Carroll, Sac	US 30 to US 20					
	Sac, Buena Vista	US 20 to IA 3					
	Buena Vista, Clay	IA 3 to US 18			65		
	Clay, Dickinson	US 18 to IA 86		current 4-lane corridor			
	Dickinson	IA 86 to MN border					
US 75	Woodbury, Plymouth	US 20 to IA 60					44, 54, 110, 116, 162, 188
	Plymouth, Sioux	IA 60 to US 18					
	Sioux, Lyon	US 18 to MN border	Corridor targeted for stewardship				
US 77	Woodbury	NE border to I-29					
US 136	Lee	US 61 to IL border					147
US 151	Iowa, Benton, Linn	I-80 to US 30	*				57, 135
	Linn	US 30 to IA 13	*				
	Linn, Jones, Dubuque	IA 13 to US 61	Corridor targeted for stewardship				

Table 5.5: Highway improvements matrix, US routes *(continued)*

Route	Counties	Corridor	Capacity	Mobility and safety	Freight (out of 94)	Condition	Bridge (out of 216)
	Ringgold, Union	MO border to US 34	Corridor targeted for stewardship				
	Union, Madison	US 34 to IA 92	Corridor targeted for stewardship				
	Madison, Dallas	IA 92 to I-80					25
	Dallas	I-80 to IA 141	Corridor targeted for stewardship				
US 169	Dallas, Boone	IA 141 to US 30					
	Boone, Webster	US 30 to US 20	Corridor targeted for stewardship				
	Webster, Humboldt	US 20 to IA 3	Corridor targeted for stewardship				
	Humboldt, Kossuth	IA 3 to US 18	Corridor targeted for stewardship				
	Kossuth	US 18 to MN border					156
	Lee	US 61 to IA 27					
	Lee, Henry	IA 27 to US 34	Corridor targeted for stewardship				
	Henry, Washington	US 34 to IA 92					
	Washington, Johnson	IA 92 to IA 1					
	Johnson	IA 1 to I-80			7		
US 218	Benton	US 30 to IA 150					98
	Benton, Black Hawk	IA 150 to I-380			61		99
	Black Hawk	I-380 terminus to IA 27	*		14		
	Black Hawk, Bremer	IA 57 to IA 3					
	Bremer, Chickasaw, Floyd	IA 3 to US 18	Corridor targeted for stewardship				
	Floyd, Mitchell	US 18 to MN border	Corridor targeted for stewardship				
US 275	Fremont, Mills	MO border to US 34	Corridor targeted for stewardship				
	Pottawattamie	I-29 to NE border	Corridor targeted for stewardship				

Source: Iowa DOT

Table 5.6: Highway improvements matrix, Iowa routes

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 1	Van Buren, Jefferson	IA 2 to US 34		Corridor targeted for stewardship		
	Jefferson, Keokuk, Washington	US 34 to IA 92		84		133
	Washington, Johnson	IA 92 to Iowa City S CL		89		49, 58, 88, 102, 196
	Johnson	Iowa City S CL to US 6				
	Johnson	US 6 to I-80	*			
	Johnson, Linn	I-80 to US 30	*			
	Linn, Jones	US 30 to US 151		Corridor targeted for stewardship		
IA 2	Fremont	NE border to I-29				
	Fremont	I-29 to US 59		29		138, 211
	Fremont, Page	US 59 to US 71		Corridor targeted for stewardship		
	Page, Taylor, Ringgold	US 71 to US 169		Corridor targeted for stewardship		
	Ringgold, Decatur	US 169 to I-35		Corridor targeted for stewardship		
	Decatur, Wayne	I-35 to US 65		Corridor targeted for stewardship		
	Wayne, Appanoose	US 65 to IA 5		Corridor targeted for stewardship		
	Appanoose, Davis	IA 5 to US 63		86		
	Davis, Van Buren, Lee	US 63 to US 218				35
	Lee	US 218 to US 61				
IA 3	Plymouth	NE border to US 75				149
	Plymouth, Cherokee	US 75 to US 59				181
	Cherokee, Buena Vista	US 59 to US 71		65		202
	Buena Vista, Pocahontas, Humboldt	US 71 to US 169		65		51, 89, 108
	Humboldt, Wright, Franklin	US 169 to I-35				82
	Franklin	I-35 to US 65				
	Franklin, Butler, Bremer	US 65 to US 218				209
	Bremer	US 218 to US 63				10
	Bremer, Fayette	US 63 to IA 150				124
	Fayette, Clayton, Delaware	IA 150 to IA 13		Corridor targeted for stewardship		
	Delaware, Dubuque	IA 13 to IA 136				157

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 4	Guthrie	IA 44 to IA 141				143
	Guthrie, Greene	IA 141 to US 30		Corridor targeted for stewardship		
	Greene, Calhoun	US 30 to US 20		75		
	Calhoun, Pocahontas	US 20 to IA 3		75		
	Pocahontas, Palo Alto	IA 3 to US 18				
	Palo Alto, Emmet	US 18 to IA 9				53, 207
	Emmet	IA 9 to MN border		Corridor targeted for stewardship		
IA 5	Appanoose	MO border to IA 2				60, 63, 164
	Appanoose, Monroe	IA 2 to US 34				38, 193
	Monroe, Marion	US 34 to E jct of IA 92		Corridor targeted for stewardship		
	Marion	E jct of IA 92 to W jct of IA 92		Corridor targeted for stewardship		
	Marion, Warren, Polk	W jct of IA 92 to US 65				79
	Warren, Polk	US 65 to IA 28		Corridor targeted for stewardship		
	Polk	IA 28 to I-35		67		
IA 7	Cherokee, Buena Vista	IA 3 to US 71				
	Buena Vista, Pocahontas, Calhoun, Webster	US 71 to US 169		Corridor targeted for stewardship		
IA 8	Tama, Benton	US 63 to US 218		Corridor targeted for stewardship		
IA 9	Lyon, Osceola	SD border to IA 60				
	Osceola, Dickinson	IA 60 to US 71				109
	Dickinson, Emmet, Kossuth	US 71 to US 169		Corridor targeted for stewardship		
	Kossuth, Winnebago, Worth	US 169 to I-35				94
	Worth, Mitchell, Howard	I-35 to US 63		Corridor targeted for stewardship		
	Howard, Winneshiek	US 63 to Decorah E CL				45
	Winneshiek, Allamakee	Decorah E CL to IL border				
IA 10	Sioux	NE border to IA 60				
	Sioux, O'Brien, Clay	IA 60 to US 71		Corridor targeted for stewardship		
	Buena Vista, Pocahontas	US 71 to IA 4		Corridor targeted for stewardship		
IA 12	Woodbury	US 20/US 75 to I-29				1
	Woodbury	I-29 to Sioux City N CL		Corridor targeted for stewardship		
	Plymouth, Sioux	Sioux City N CL to IA 10				132, 151

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 13	Linn	US 151 to E16		Corridor targeted for stewardship		
	Linn, Delaware	E16 to US 20				
	Delaware	US 20 to IA 3				
	Clayton	IA 3 to US 52		Corridor targeted for stewardship		
IA 14	Wayne, Lucas	IA 2 to US 34		74		
	Lucas, Marion	US 34 to IA 5		77		
	Marion, Jasper	IA 5 to IA 163		39		43, 115, 123
	Jasper	IA 163 to I-80				
	Jasper, Marshall	US 6 to US 30				62, 81
	Marshall, Grundy	US 30 to US 20		16		
	Grundy, Butler	US 20 to IA 3		Corridor targeted for stewardship		
	Butler, Floyd	IA 3 to US 18		Corridor targeted for stewardship		
IA 15	Pocahontas, Humboldt, Kossuth	IA 3 to US 18		Corridor targeted for stewardship		
	Kossuth, Emmet	US 18 to MN border				137
IA 16	Lee	US 61 to US 218		Corridor targeted for stewardship		
	Lee, Van Buren, Davis, Wapello	US 218 to US 34				131
IA 17	Polk, Dallas, Boone	IA 141 to US 30		Corridor targeted for stewardship		
	Boone, Hamilton	US 30 to US 20		Corridor targeted for stewardship		
	Hamilton, Wright	US 20 to IA 3		Corridor targeted for stewardship		
	Wright, Hancock	IA 3 to US 18		Corridor targeted for stewardship		
IA 21	Keokuk	IA 78 to IA 92				
	Keokuk, Poweshiek	IA 92 to I-80				
	Poweshiek, Iowa, Benton	I-80 to US 30		Corridor targeted for stewardship		
	Benton, Tama, Black Hawk	US 30 to US 20				
IA 22	Keokuk, Washington	IA 21 to IA 1		Corridor targeted for stewardship		
	Washington	IA 1 to US 218				24, 152
	Washington, Johnson, Muscatine	US 218 to IA 70				
	Muscatine	IA 70 to US 61				
	Muscatine, Scott	IA 38 to Buffalo E CL				
	Scott	Buffalo E CL to US 61		82		
IA 23	Keokuk, Mahaska	IA 149 to IA 92				
IA 24	Chickasaw, Winneshiek	US 63 to US 52		Corridor targeted for stewardship		

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 25	Ringgold, Union	IA 2 to US 34		Corridor targeted for stewardship		
	Union, Adair	US 34 to I-80				61
	Adair, Guthrie, Greene	I-80 to US 30		Corridor targeted for stewardship		
IA 26	Allamakee	IA 9 to MN border				18
IA 27	Lee	MO border to US 218		Corridor targeted for stewardship		
	Black Hawk	US 20 to US 218	*	76		
IA 28	Warren	IA 92 to Norwalk S CL		Corridor targeted for stewardship		
	Warren, Polk	Norwalk S CL to IA 5				
	Polk	IA 5 to I-235	*			69
	Polk	I-235 to US 6				
	Polk	US 6 to I-35/80				
IA 31	Woodbury	IA 141 to US 20		Corridor targeted for stewardship		
	Woodbury, Ida, Cherokee	US 20 to US 59		Corridor targeted for stewardship		
IA 37	Shelby, Harrison	US 59 to US 30		Corridor targeted for stewardship		
	Harrison, Crawford, Monona	US 30 to IA 175		Corridor targeted for stewardship		
IA 38	Muscatine	IL border to US 61				
	Muscatine	US 61 to US 6		Corridor targeted for stewardship		
	Cedar	I-80 to US 30				4
	Cedar, Jones	US 30 to US 151				206
	Jones, Delaware	US 151 to US 20				
	Delaware	US 20 to IA 3				
IA 39	Crawford, Sac	US 59 to IA 175				
IA 44	Harrison, Shelby	US 30 to US 59		Corridor targeted for stewardship		
	Shelby, Audubon	US 59 to US 71		Corridor targeted for stewardship		
	Audubon, Guthrie, Dallas	US 71 to US 169				11
	Dallas, Polk	US 169 to IA 141	*			
IA 48	Page, Montgomery	US 59 to US 34				
	Montgomery, Cass	US 34 to US 6		Corridor targeted for stewardship		
IA 51	Allamakee	US 18 to IA 9		Corridor targeted for stewardship		
IA 56	Fayette, Clayton	IA 150 to IA 13		Corridor targeted for stewardship		

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 57	Hardin, Butler, Grundy, Black Hawk	US 65 to Cedar Falls W CL		Corridor targeted for stewardship		
	Black Hawk	Cedar Falls W CL to US 218		Corridor targeted for stewardship		
IA 58	Black Hawk	US 63 to US 20		Corridor targeted for stewardship		
IA 60	Plymouth, Sioux, O'Brien	US 75 to US 18		Corridor targeted for stewardship		
	O'Brien, Osceola	US 18 to MN border				204
IA 62	Jackson	IA 64 to US 52		Corridor targeted for stewardship		
IA 64	Jones, Jackson	US 151 to US 61		Corridor targeted for stewardship		
	Jackson	US 61 to US 67		Corridor targeted for stewardship		
IA 70	Louisa, Muscatine	IA 92 to IA 22		Corridor targeted for stewardship		
	Muscatine	IA 22 to US 6		Corridor targeted for stewardship		
IA 76	Clayton	W jct of US 18 to S jct of IA 9		Corridor targeted for stewardship		
	Clayton, Allamakee	N jct of IA 9 to MN border		Corridor targeted for stewardship		
IA 78	Keokuk	IA 149 to IA 1				28, 105
	Washington, Jefferson, Henry	IA 1 to US 218		Corridor targeted for stewardship		
	Henry, Louisa	US 218 to US 61		93		64
IA 81	Van Buren	MO border to IA 2		Corridor targeted for stewardship		
IA 83	Pottawattamie, Cass	US 59 to IA 148				112, 185
IA 85	Poweshiek	Montezuma E CL to IA 21				37
IA 86	Dickinson	US 71 to IA 9				
	Dickinson	IA 9 to MN border		Corridor targeted for stewardship		
IA 92	Pottawattamie	I-29 to US 59	*			
	Pottawattamie, Cass	US 59 to US 71				127
	Cass, Adair, Madison	US 71 to US 169		Corridor targeted for stewardship		
	Madison, Warren	US 169 to I-35				93
	Warren	I-35 to US 65				134
	Warren, Marion	US 65 to IA 5		45		
	Marion, Mahaska	IA 5 to US 63		31		146
	Mahaska, Keokuk, Washington	US 63 to IA 1		31		40, 65
	Washington	IA 1 to US 218				
	Washington, Louisa	US 218 to US 61				
IA 93	Bremer, Fayette	US 63 to IA 150		Corridor targeted for stewardship		

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 96	Marshall, Tama	IA 14 to US 63		Corridor targeted for stewardship		
IA 100	Linn	1.4 mi W of I-380 to I-380				
	Linn	I-380 to US 151	*			
IA 110	Sac, Buena Vista	US 20 to IA 7		Corridor targeted for stewardship		
IA 116	Bremer	US 218 to IA 3				
IA 117	Jasper	IA 163 to I-80		Corridor targeted for stewardship		
	Jasper	I-80 to US 65				158
IA 122	Cerro Gordo	I-35 to Mason City W CL		51		
	Cerro Gordo	Mason City W CL to Mason City E CL		Corridor targeted for stewardship		
IA 127	Harrison	I-29 to US 30		Corridor targeted for stewardship		
IA 128	Clayton	IA 13 to US 52		Corridor targeted for stewardship		
IA 130	Cedar, Scott	IA 38 to I-80				150
IA 136	Clinton	IL border to US 67				26
	Clinton	US 67 to US 61		Corridor targeted for stewardship		
	Clinton, Jones, Dubuque	US 61 to US 151		Corridor targeted for stewardship		
	Dubuque	US 151 to US 20				
	Dubuque	US 20 to US 52				
IA 137	Monroe, Wapello	IA 5 to US 63				
IA 139	Winneshiek	IA 9 to MN border		Corridor targeted for stewardship		
IA 140	Woodbury, Plymouth	US 20 to IA 3		Corridor targeted for stewardship		
IA 141	Woodbury, Monona, Crawford	I-29 to US 59		85		
	Crawford, Carroll	US 59 to US 71				
	Carroll, Guthrie	US 71 to IA 4		Corridor targeted for stewardship		
	Guthrie, Dallas	IA 4 to IA 144		Corridor targeted for stewardship		
	Dallas	IA 144 to US 169		Corridor targeted for stewardship		
	Dallas, Polk	US 169 to I-35/80	*	4		
IA 143	Cherokee, O'Brien	IA 3 to IA 10		Corridor targeted for stewardship		
IA 144	Dallas, Boone, Greene	IA 141 to US 30		Corridor targeted for stewardship		
	Greene, Webster	US 30 to IA 175		Corridor targeted for stewardship		

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 146	Mahaska, Poweshiek	US 63 to I-80		91		
	Poweshiek, Tama, Marshall	I-80 to US 30				
IA 148	Taylor, Adams	MO border to US 34		Corridor targeted for stewardship		
	Adams, Cass	US 34 to I-80				96
IA 149	Wapello	US 34 to US 63		71		216
	Wapello, Keokuk	US 63 to IA 92				32
	Keokuk, Iowa	IA 92 to I-80		Corridor targeted for stewardship		
IA 150	Benton	US 218 to I-380				
	Benton, Buchanan	I-380 to US 20				
	Buchanan, Fayette	US 20 to IA 3		41		
	Fayette	IA 3 to US 18		Corridor targeted for stewardship		
	Fayette, Winneshiek	US 18 to US 52		Corridor targeted for stewardship		
IA 160	Polk	IA 415 to I-35		10		
IA 163	Polk	US 69 to US 65				59, 85
	Polk, Jasper	US 65 to IA 14	*	56		
	Marion, Mahaska	IA 14 to US 63		Corridor targeted for stewardship		
IA 173	Cass, Shelby, Audubon	IA 83 to IA 44		Corridor targeted for stewardship		
IA 175	Monona, Woodbury, Ida	NE border to US 59				5, 168
	Ida, Sac	US 59 to US 71		Corridor targeted for stewardship		
	Sac, Calhoun, Webster	US 71 to US 169				100
	Webster, Hamilton	US 169 to I-35		Corridor targeted for stewardship		
	Hamilton, Hardin, Grundy	I-35 to IA 14		Corridor targeted for stewardship		
	Grundy, Black Hawk	IA 14 to US 63				
IA 182	Lyon	US 18 to IA 9		Corridor targeted for stewardship		
IA 183	Harrison, Monona	IA 127 to IA 141				73
IA 187	Buchanan, Fayette	US 20 to IA 3				
	Fayette	IA 3 to IA 150		Corridor targeted for stewardship		
IA 188	Butler, Bremer	IA 3 to US 218		Corridor targeted for stewardship		
	Bremer	US 218 to US 63		Corridor targeted for stewardship		
IA 191	Pottawattamie, Harrison, Shelby	I-680 to IA 37		Corridor targeted for stewardship		

Table 5.6: Highway improvements matrix, Iowa routes (*continued*)

Route	Counties	Corridor	Capacity	Freight (out of 94)	Condition	Bridge (out of 216)
IA 192	Pottawattamie	I-80 to US 6				
IA 196	Sac	US 71 to US 20	Corridor targeted for stewardship			
IA 202	Davis, Appanoose	MO border to IA 2	Corridor targeted for stewardship			
IA 210	Dallas, Boone, Story	IA 141 to I-35	Corridor targeted for stewardship			
	Story	I-35 to US 65	Corridor targeted for stewardship			
IA 212	Iowa	IA 21 to US 6	Corridor targeted for stewardship			
IA 220	Iowa	US 6 to US 151	Corridor targeted for stewardship			
IA 224	Jasper	I-80 to IA 14	Corridor targeted for stewardship			
IA 281	Black Hawk, Buchanan	Waterloo E CL to IA 150	Corridor targeted for stewardship			
IA 316	Polk, Warren, Marion	Runnells E CL to IA 5	Corridor targeted for stewardship			
IA 330	Jasper, Story, Marshall	US 65 to US 30	Corridor targeted for stewardship			
	Marshall	US 30 to IA 14				
IA 346	Chickasaw	US 218 to US 63	Corridor targeted for stewardship			
IA 376	Woodbury	I-29 to IA 12	*	63		
	Woodbury	IA 12 to US 75				6, 92
IA 404	Plymouth	IA 3 to US 75				
IA 415	Polk	IA 141 to Ankeny W CL				
	Polk	Ankeny W CL to IA 160				
	Polk	IA 160 to I-35/80				12
	Polk	I-35/80 to US 6		50		
IA 461	Scott	I-280 to US 67				31, 41
	Scott	US 67 to US 6				(83, 183)
	Scott	US 6 to I-80		12		165
IA 922	Linn	US 30 to I-380				
	Linn	I-380 to IA 100				
IA 930	Boone	US 30 to 1.1 mi E of US 30	Corridor targeted for stewardship			
IA 946	Dubuque	US 52 to US 61	*	15		
IA 965	Johnson	US 6 to I-80	Corridor targeted for stewardship			

Source: Iowa DOT

Feasibility Studies – Linking Planning and the National Environmental Policy Act (NEPA)

In addition to the improvement needs identified for the highway system, another category of planning related to needs analysis is linking planning and NEPA through feasibility studies. This linkage enables environmental resource and regulatory agencies, as well as the general public, to become effective players in the transportation decision-making process. This process allows all parties the opportunity to the get involved in the early stages of planning to help shape transportation projects, and minimizes duplication of work in the planning and NEPA processes for the large projects.

During the environmental review process, known environmental constraints are identified and potential and known impacts are (to the extent practicable) quantified and avoided, minimized, or mitigated so that a project can proceed towards further development. Within this process, feasibility studies can be used to outline the environmental setting and define the vision, goals, and strategies for a study area. Analysis at this stage of planning can include a range of possible engineering solutions, traffic analysis, cost analysis, and a review of potential project-stopping issues within the human and natural environment.

Feasibility studies provide the benefit of allowing planning-level decisions to be made for a larger study area and subsequently adopted into the NEPA process for smaller projects within the study area as those needs arise. However, for these planning-level decisions to be used in the NEPA process, the planning study must include public input and (among other conditions) be approved or validated no more than five years prior to the date on which the information is adopted.

In order to maintain these planning-level decisions, the Iowa DOT intends to review and update/reaffirm active feasibility studies in conjunction with the state transportation plan update, which is on a five-year cycle. This section serves as documentation of active feasibility studies that have been vetted through this review process. In addition, this section enhances public transparency into the department's planning and environmental review processes.

Active feasibility studies include:

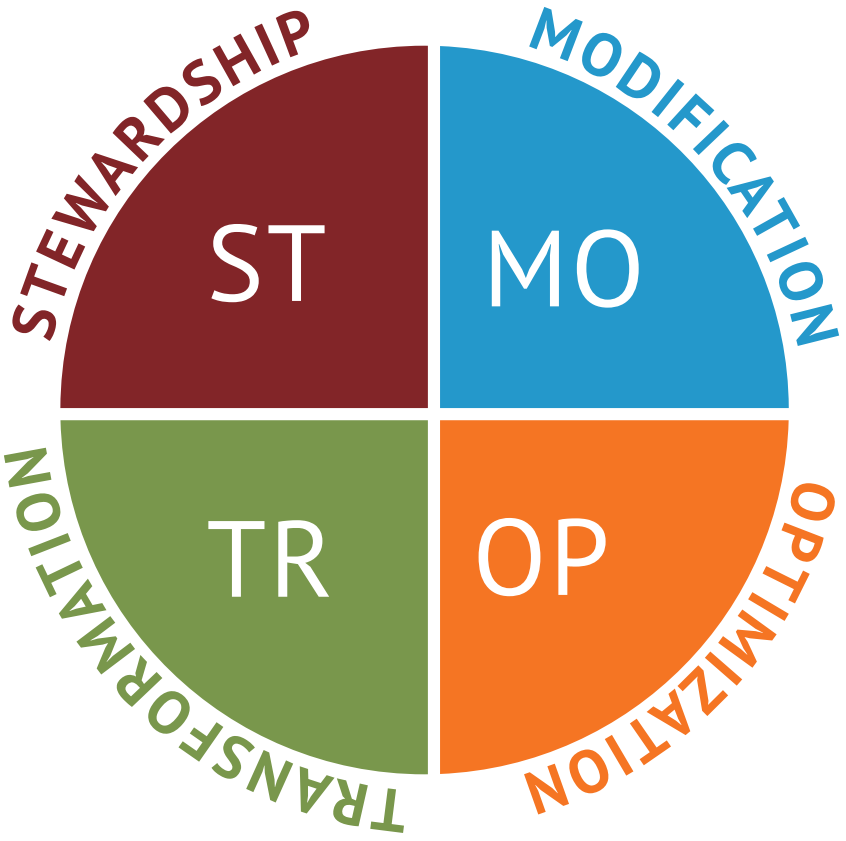
- I-80 – rural portions statewide
- I-380 – from south of Cedar Rapids to just north of the I-80/380 system interchange

Strategies

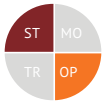
In order to achieve the vision for the transportation system, and address the improvement needs identified across the various modes and the highway system, the Iowa DOT will employ a wide range of strategies. The strategies listed in this section were derived from a variety of sources, including ongoing activities, existing plans, and stakeholder and public input. Strategies are presented by mode or topic area, and fall into the following categories.

- Asset management
- Aviation
- Bicycle/pedestrian
- Bridge
- Energy
- Freight
- Highway
- Public transit
- Rail
- Safety
- Technology
- Transportation system management and operation (TSMO)

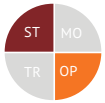
Each strategy maps back to one or more of the four investment areas (stewardship, modification, optimization, and transformation), and a graphic notes which area(s) the strategy falls under. The strategies consist of an action statement and an explanation of what the strategy entails or how it will be carried out. A summary table of all strategies is provided at the end of the chapter. These strategies will help guide future actions and financial investments across the system.



Asset Management

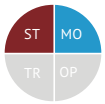


1. Develop an asset management governance structure to improve the effectiveness and transparency of the project selection process. Systematic delivery of sub-optimal pavement and bridge projects leads to deteriorating conditions and increases future costs. A governance structure that defines an effective process around the appropriate subject matter experts and state of the art management systems will improve project selection.

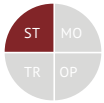


2. Improve the efficiency and accuracy of data collection and access to enhance data available for decision-making. This will be achieved by continuing to implement data collection enhancements, developing a plan for data and system coordination/integration, exploring opportunities for enhanced data analytics, and institutionalizing the asset management governance structure.

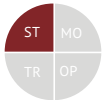
3. Adequately communicate the benefits of asset management to ensure the Iowa DOT's program is sufficiently funded and properly implemented. Communications will be enhanced through the development of a communications plan that defines the targeted audiences, message, and delivery mechanism. In addition, the department will continue efforts to educate the Commission about the topic, and consider developing an internal training plan.



4. Continue to advance targeted capacity improvement projects on key Interstate Highway System corridors. Delayed capacity improvement projects on the Interstate Highway System will further exacerbate overall condition deficiencies on this system. Associated corridor studies should identify how asset management and capacity improvement projects will be coordinated.

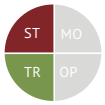


5. Ensure asset management and other program delivery functions can be properly implemented regardless of staffing constraints. The development of an asset management-staffing plan will address contingencies related to decreased staffing levels. Such contingencies could include reassigning existing staff and exploring contracting opportunities.



6. Monitor continued population shift toward the state's urban areas and associated implications for the level of funding available for statewide asset management activities. If Iowa's population continues to shift to urban areas, then additional capacity needs in these areas may arise creating additional investment demands. The highway system should be continually evaluated to identify rural assets that should be a priority if asset management funding were to decrease.

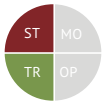
Aviation



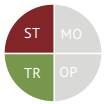
7. Maintain adequate accessibility to airports with an appropriate range of services. The Iowa aviation system ranges from grass strips to busy commercial service airports with multiple paved runways. Similarly, there are a wide variety of aviation system users who require an adequate level of facilities and services to meet their diverse needs. These needs include access to commercial airline service, current weather reporting, instrument approach procedures, access for agricultural aircraft, access for emergency medical service aircraft, cargo handling infrastructure, and many more. The Iowa DOT's Office of Aviation, in conjunction with the Federal Aviation Administration and Iowa's airport owners and operators, will continue to work to maintain a safe, efficient, and effective aviation system accessible to users. The Iowa Aviation System Plan, in addition to other studies and planning efforts, provides systems guidance to meet users' needs.

8. Encourage airport planning. Airports of all sizes are encouraged to undertake planning efforts to help improve airport operations. Planning efforts could include developing airport layout plans, airport master plans, business plans, strategic plans, and other planning initiatives. In addition to conducting its own ongoing statewide planning efforts, the Iowa DOT supports these and other planning efforts at airports of all levels.

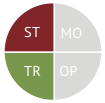
9. Promote the implementation of compatible land use guidelines near airports. Preservation of airports from the possible encroachment of incompatible land use is an important goal for protection of local, state, and federal investments. Incompatible land uses present a real and significant threat to airports today, causing concerns for public safety and potential conflicts between and within communities. The Iowa DOT developed the Iowa Airport Land Use Guidebook and encourages airports to implement comprehensive land use planning.



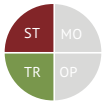
10. Maintain and enhance airside facilities. The runway, taxiway, and apron infrastructure of an airport is the connection between an airport and the rest of the air transportation system. Many airports were originally designed and constructed prior to the 1970s with modifications made as aircraft fleet mix, design standards, and local demand for air transportation have changed. These changes will only continue with new aircraft and new technologies being developed. The Iowa DOT works to stay at the forefront of airside needs at Iowa airports, and the Office of Aviation closely collaborates with interested stakeholders to ensure that the programs and services offered match future airside needs.



11. Maintain and enhance aviation vertical infrastructure needs. Airport terminal buildings and hangars are the gateway to many communities, and the first and last impressions for air travelers. Improvements to these costly assets are typically challenging to fund from federal and local sources. In addition to age, security changes, building systems, technology, heating, ventilation, and air conditioning system changes have caused many of the original structures at Iowa airports to become outdated and costly to operate.



12. Improve runway approaches through obstruction removal and mitigation funding. Clear approaches to an airport runway are essential for public use. Over time, natural and man-made obstructions can develop that severely impact the usability of a runway and ultimately the viability of the airport. In conjunction with sound land-use planning that limits obstructions in critical surrounding areas, airports should develop and implement obstruction management plans to routinely inspect and prevent or remove any approach penetrations. The Iowa DOT will continue to provide support of obstruction removal and prevention.



13. Maintain and enhance the statewide network of aviation weather observing systems. The Iowa DOT provides for 43 automated weather observing stations located strategically throughout the state that, in conjunction with the federal airport weather reporting stations, provide for a statewide network of accurate, timely, and reliable weather information for aircraft utilizing Iowa airports. The Iowa DOT will continue to provide ongoing maintenance to ensure reliability.

14. Promote and assist in active wildlife management at airports. Wildlife is a significant safety concern that exists at public-use airports. The airport environment is attractive to a variety of mammals and birds. Airport sponsors should take a proactive role to mitigate wildlife concerns to the extent possible. The Iowa DOT supports local airport efforts with a supplemental agreement with the U.S. Department of Agriculture's Wildlife Services to conduct spot mitigation as needed, as well as to assist in the development of wildlife mitigation plans for airports with mitigation needs.

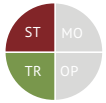
15. Evaluate implementation of new and emerging aviation technologies. New technologies continually transform the way the air transportation system operates. Web-based platforms, the implementation of the new NextGen satellite-based navigation system, and the significant growth of unmanned aircraft systems are some examples of new technologies that will continue to change the air transportation system in Iowa. These new technologies should continue to be closely monitored to ensure Iowa is realizing the full benefit to users of this system.

Bicycle and pedestrian

16. Complete a comprehensive bicycle and pedestrian plan for the state. The Iowa DOT is committed to expanding opportunities and improving conditions for bicycling and walking across the state. A bicycle and pedestrian plan would have, at a minimum, three key objectives, including improving policies and practices for development of this system; expanding the system and prioritizing the completion of segments of national and statewide significance; and facilitating implementation through encouraging enhanced design practices and directed funding.

17. Adopt and implement a complete streets policy that applies to all Iowa DOT projects. The Iowa DOT recognizes complete streets is a process, not a specific outcome, and is therefore sensitive to the context in which the project occurs. A complete streets policy to encourage consideration of all roadway users in project design should be adopted as part of a bicycle and pedestrian plan that applies to projects on Iowa DOT roadways. Iowa's MPOs, RPAs, counties, and municipalities that have not adopted their own policies would be encouraged to consider the Iowa DOT policy as a basis.

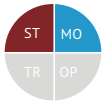
18. Increase the quality and consistency of the design of bicycle and pedestrian accommodations across the state. The Iowa DOT's Office of Design and Office of Bridges and Structures should modify the Iowa DOT's Design Manual and Bridge Design Manual to reflect national best practices regarding the design of bicycle and pedestrian accommodations in order to provide clear and thorough standards and guidance for Iowa DOT's districts' use. Best practice resources would include the American Association of State Highway Transportation Officials' (AASHTO) Guide for the Development of Bicycle Facilities and the National Association of City Transportation Officials' (NACTO) Urban Street Design Guide. The Iowa DOT's Paved Shoulder Policy and the Statewide Urban Design and Specifications (SUDAS) manual — the local equivalent of the Iowa DOT Design Manual — should also be updated to coordinate with the Iowa DOT's Design Manual.



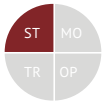
19. Consider same-source funding to build bicycle and pedestrian accommodations as part of road projects. In conjunction with a complete streets policy, the Iowa DOT should consider funding bicycle and pedestrian accommodations that are built as incidental parts of road projects from the same funding source as the rest of the road project. In addition, when Iowa DOT grant program funds are used to construct or reconstruct roads, opportunities for bicycle and pedestrian improvements should be considered and funded from the same source if accommodations are warranted and eligible.

20. Evaluate key safety challenges pertaining to bicycling and walking and develop crash reduction strategies. The development and implementation of Iowa's Strategic Highway Safety Plan (SHSP) is the state's primary method for identifying, quantifying, and developing countermeasures for safety problems on Iowa roads. In the past this document has not explicitly considered the safety of bicyclists, pedestrians, and other vulnerable users. With future updates, the SHSP should include an analysis of crashes involving such users, as well as strategies for reducing and ultimately eliminating these crashes.

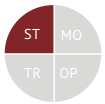
Bridge



21. Secure additional funding and develop more refined management systems to address the approaching wave of bridge replacement needs. Overall, state-owned bridges are in relatively good condition. However, a large number of bridges were constructed in the 1960s and 70s, which will be nearing the end of their service life. The average age of state-owned bridges is nearly 40 years, and a decade from now nearly half the state's bridges will be more than 50 years old. Additional resources must be secured in order to "flatten" the coming wave of bridge replacement needs and avoid compromising the Iowa DOT's ability to manage the system effectively.

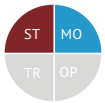


22. Consider creative financing as part of coordinated planning and programming efforts to address future large bridge projects. The Iowa DOT has targeted nearly a dozen large bridge projects, primarily border bridges, for replacement within the next 20 years. Most of these projects are estimated to cost well over $50 million. Along with these large projects, there are additional bridge replacement projects that are more than $5 million each, which are challenging from a program management perspective. Due to budget limitations, a few bridge projects of this magnitude can severely limit funding available for improvements on the overall highway system. To help address these projects, early multistate coordination is critical for border bridges, and other financing options, including targeting federal discretionary funds, should be considered.

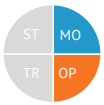


23. Target investment to address bridges with condition needs. Candidate condition improvement locations were identified primarily using the bridge condition index (BCI). The BCI is calculated for all bridges in the state's inventory, based on data collected for the National Bridge Inventory (NBI). For the purposes of this plan, the BCI was used to identify bridges that comprise the lowest-rated 5 percent of the system's structures. These locations, in conjunction with other bridge and asset management tools, will be used by the Iowa DOT to focus its consideration of condition improvements.

Energy

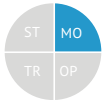


24. Support the safe rail transport of crude oil and biofuels. With the completion of the Iowa Crude Oil and Biofuels Rail Transportation Study, the Iowa DOT and other stakeholders should move forward with implementation of the action steps identified. Priority action steps include working with local emergency managers to better develop response plans, working with emergency response personnel to ensure adequate training, and reducing conflict points by eliminating redundant at-grade railroad-highway crossings.



25. Optimize the propane supply chain to better predict and proactively respond to propane shortages. The Iowa DOT and other stakeholders will implement the recommendations and action steps from the study Optimizing the Propane Supply Chain in the State of Iowa. Initial implementation activities will be addressed through a joint working group of state agencies and industry participants to encourage ongoing knowledge sharing and communication. Additional activities will include identifying solutions at bulk terminals to ease long wait times to fill transports, and encouraging users to fill storage during the summer prior to the heavy grain drying and heating seasons. Other activities include encouraging transport companies to run multiple driver shifts rather than extending hours of service, and implementing systemic monitoring and use of performance metrics that indicate the need for action.

26. Support the expanded use of alternative fuel vehicles in Iowa. The Iowa DOT will coordinate with the Iowa Economic Development Authority (IEDA) on a detailed plan for the development of alternative vehicle fueling corridors along interstate highways. This would enable alternative fuel vehicle owners, both residents and those traveling through Iowa, to charge/refuel their vehicles more quickly and facilitate longer distance travel. This strategy would relate to other efforts involving alternative fuel infrastructure incentives.

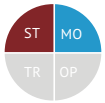


27. Explore incentives for alternative vehicle fueling infrastructure. Building upon the success of the Iowa Renewable Fuels Infrastructure Program, and recognizing the importance of alternative fuel vehicles to Iowa, the Iowa DOT should coordinate with the IEDA to investigate a financial incentive for businesses and individuals to offset a portion of equipment and installation costs for electric vehicle charging stations, compressed natural gas stations, and liquefied propane stations. The financial incentive could be in the form of a tax credit or a rebate.

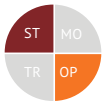
28. Optimize the passenger transportation system to provide more opportunities and improve mobility. The Iowa DOT will partner with other state agencies, public transit agencies, and stakeholders to identify and implement initiatives to provide passenger transportation options that reduce single-occupant vehicle travel. Ongoing and new initiatives will include making federal Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds available for public transit; coordinating transportation services through the Iowa Transportation Coordination Council; operating a new web-based statewide rideshare program (iowarideshare.org); seeking opportunities to address commuting needs along heavily traveled corridors to reduce the need for highway investments and mitigate traffic challenges during construction; developing a new bicycle and pedestrian plan to support improved accommodations along the Primary Highway System; and establishing a task force to ensure Iowa is prepared for the shift in how passengers travel with the advent of connected and automated vehicles and new models for accessing transportation services.

Freight

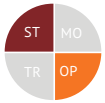
29. Target investment on the interstate system at a level that reflects the importance of this system for moving people and freight. Iowa's interstate system consists of 782 centerline miles and 271 miles of ramps, supporting nearly 8 billion vehicle-miles traveled (VMT) annually. While the interstate system comprises just eight percent of the length of Iowa's Primary Highway System, it carries 40 percent of total VMT and 62 percent of large truck VMT. Both the Iowa Interstate Corridor Plan and Iowa State Freight Plan emphasized the importance of the interstate system. In order to ensure that the interstate system can continue to support growing demand, future investment must be focused accordingly.



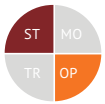
30. Advance a 21st century Farm-to-Market System that moves products seamlessly across road, rail, and water to global marketplaces. This Farm-to-Market System is currently comprised of approximately 30,500 miles that are part of a nearly 90,000-mile Secondary Road System, which is the result of the 1-mile by 1-mile sectioning of land in the state. Roads were created around these sections to provide access to farmland. The nature of this system was last evaluated through a 2002 effort by Iowa's Road Use Tax Fund Committee. Given the rapidly changing agricultural landscape and the diminishing buying power of existing transportation resources, the size of the Farm-to-Market System demands that this issue be re-examined with interested stakeholders.



31. Optimize the freight transportation network to minimize cost and travel time, improve supply chain efficiency, and reduce energy use. The vision of the department's report Development of Iowa Statewide Freight Transportation Network Optimization Strategy is to effectively identify and prioritize investment opportunities for an optimized freight transportation network to lower transportation costs for Iowa businesses and promote business growth in Iowa. To achieve this, the department must analyze network demand and capacity to identify constraints, design optimization strategies based on quantitative and qualitative analysis of costs and benefits, prioritize investment opportunities and develop short- and long-term financial models, and develop business cases to reduce transportation costs.

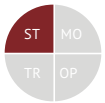


32. Continue to advance efforts on the M-35 Marine Highway Corridor. The states of Iowa, Illinois, Minnesota, Missouri, and Wisconsin have a vision of a modern, reliable, and cost-effective M-35 Marine Highway that connects seamlessly into the existing Midwest and national transportation networks, generates regional and national economic growth, and sustains the Mississippi River's multiple uses. The states are working on numerous initiatives, such as promoting the value of the river, advocating for infrastructure investments, facilitating regional dialogue, marketing current services, and seeking out new tools. These efforts will improve the economic competitiveness of the Midwest and nation, relieve landside congestion on highways and railroads, reduce air emissions, and increase the efficiency of other surface transportation modes.

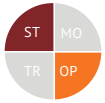


33. Promote freight movement on the M-29 Marine Highway Connector. The M-29 Marine Highway Connector is designated on the Missouri River from Kansas City, Mo. to Sioux City, Iowa. Although commodity movement is relatively low, the M-29 serves as a viable shipping alternative to other freight transportation modes and provides a valuable link to the rest of the marine highway system. The Iowa DOT will continue to work with stakeholders to make the M-29 a more reliable waterway and promote the corridor for freight movement. Much like the M-35, strengthening the M-29 will improve economic competitiveness of the region, relieve landside congestion on highways and railroads, reduce air emissions, and increase the efficiency of other surface transportation modes.

34. Leverage and disseminate real-time information on system conditions to support improved mobility. Iowa's transportation system is in demand 24/7, regardless of the weather or other factors affecting the condition of the system. Transportation information has become as important as the transportation infrastructure itself, which represents a shift in how state transportation departments view their core responsibilities. Providing real-time information on system conditions will become increasingly important, and such information should be made directly available to personal devices and vehicles. In addition, social media provides the opportunity for users to have a direct role in providing information regarding the transportation system, and state transportation departments should consider more actively absorbing and utilizing social media information in addition to more traditional sources.

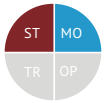


35. Provide measured, clear, nontechnical performance results for the transportation system. The Moving Ahead for Progress in the 21st Century (MAP-21) Act and the Fixing America's Surface Transportation (FAST) Act placed an increased emphasis on performance measurement, requiring the establishment of national performance measures for which states are to develop targets. While these national measures will help the Iowa DOT evaluate the effectiveness of transportation investments, there may be other measures that better communicate the performance of Iowa's transportation system to the public. For public communications, the department should develop performance measures that are both clear and nontechnical.



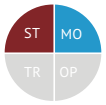
36. Streamline and align freight-related regulations and minimize unintended consequences. Since freight movements are often multistate in nature, there is a need for improved reciprocity between states regarding issues not standardized at the federal level. These include regulations related to items such as fuel, trips, vehicle registration, etc. Potential short-term changes could include streamlining the permitting process; providing easier access to information regarding Iowa's trucking regulations; and improving coordination and education among the interested parties, including neighboring states, regarding these regulations. The Iowa DOT should also work with other state departments to attempt to minimize any unintended consequences of regulation that may hinder freight movement and/or discourage businesses from investing in the state.

Highway

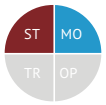


37. Rightsize the highway system and apply cost-effective solutions to locations with existing and anticipated issues. The existing highway system has taken shape over several decades and, while forecast demand was considered, it was largely built to suit the needs of the time. Over the years, those needs have evolved, along with technology, the economy, and the traveling public. As a result, the Iowa DOT's role is not to rebuild the system as it was built decades ago, but rather to implement a system that will meet the demands of the 21st century. This will require significant investment in stewardship, prudent capacity expansion as resources allow, and some contraction of the system. Examples of contraction activities include evaluating the necessity of interstate overhead bridges and rest areas as they need replaced, and strategies such as four- to three-lane conversions.

38. Target investment to address capacity needs at locations with forecast congestion issues. Candidate capacity improvement locations were identified through a statewide volume-to-capacity (V/C) analysis. Future statewide V/C conditions were measured using a combination of iTRAM and each of the state's nine MPO travel demand models. The analysis showed that a majority of congestion is forecast to occur in urban areas and along three key interstate corridors. The Iowa DOT will focus its consideration of capacity expansion alternatives at these locations. Operational improvements will also be considered as an alternative to capacity expansion when appropriate.

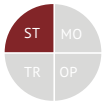


39. Consider targeted anticipatory investments at locations with potential congestion issues beyond the planning horizon. While the consideration of capacity expansion alternatives will be focused at locations with forecast congestion, anticipatory investments should be evaluated in light of long-term implications for corridors where congestion is likely beyond the planning horizon. Anticipatory investments could include strategies such as right of way preservation, grading, construction of full-depth shoulders, and increased bridge capacity. Such investments should be considered along corridors that may indicate future congestion and a need for route-level continuity of service, such as I-80 west of Dallas County.



40. Target investment to address mobility and safety needs on critical two-lane routes. The statewide V/C analysis showed a lack of forecast congestion on a majority of the Primary Highway System. However, overall operation of the system can be improved by addressing mobility and safety needs on critical two-lane routes through a more conservative application of the Super-2 concept. Elements of this concept that could be applied in a targeted and opportunistic fashion include wider paved shoulders, left- and right-turn lanes, acceleration lanes, climbing/passing lanes, limited access, and geometric improvements. This strategy will balance mobility needs with revenue limitations and the need to rightsize the system, while also having more favorable long-term asset management implications. The Iowa DOT will focus its consideration of such corridor-level enhancements on five targeted US highways, which would serve as a compliment to the multilane highway network. While specific corridors will be targeted, this does not preclude the use of these types of treatments in other spot locations to address mobility and safety needs.

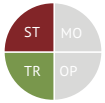
41. Target investment to address freight needs at locations with measured mobility issues. Candidate freight improvement locations identified in the Iowa State Freight Plan have been incorporated into this Plan, and investments that target the elimination or reduction of freight mobility issues are a key element of the Iowa DOT's freight improvement strategy. This includes addressing capacity and operational needs and increasing connectivity of modes through transload and intermodal facilities. It is also important to acknowledge that congestion in surrounding areas outside of the state's borders may have an effect on Iowa freight movement. Collaboration with other states is critical to maximize the effectiveness of investments made within Iowa. The Iowa DOT will focus its consideration of freight mobility improvements at these locations.



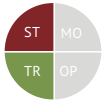
42. Target investment to address condition needs at locations with measured structural and service issues. Candidate condition improvement locations were identified primarily using the ICE tool. This tool, which is based on seven individual criteria, provides the ability to evaluate the overall structural and service condition of primary highway segments with a single composite rating. For the purposes of this plan, the composite rating was used to identify corridors that comprise the lowest-rated 25 percent of the system by mileage. These locations, in conjunction with other pavement and asset management tools, will be used by the Iowa DOT to focus its consideration of condition improvements.

43. Prioritize active operations management of the interstate highways, followed by primary municipal highways, primary rural highways, and border bridges. According to TSMO's roadway facility hierarchy, interstate highways are the most important facilities to actively manage due to the large volumes of traffic that they carry. The hierarchy defined in the TSMO Program Plan will help drive TSMO-related decisions ranging from real-time traffic management strategies to resource planning. Within the interstate system, the ICE-OPS tool prioritized 54 corridors that comprise this system, which will be used by the Iowa DOT to further focus its consideration of TSMO strategies.

Public transit



44. Replace aging public transit vehicles. The Iowa DOT's Office of Public Transit maintains an extensive inventory of all public transit vehicles in the state, and prioritizes statewide vehicle replacement and rehabilitation projects annually based on age and mileage of public transit vehicles compared to useful life standards. Currently, only 37 percent of Iowa's approximately 1,600 public transit vehicles are within the Federal Transit Administration's federal useful life standards, and it is estimated to cost more than $140 million to bring all vehicles within these standards. The Commission recognized the public transit agencies' need for replacement vehicles, and in fiscal year 2013 began committing $3 million annually in Congestion Mitigation Air Quality (CMAQ) funding for bus replacement. To further prioritize the replacement of vehicles, the Iowa DOT will work closely with public transit agencies to develop a Transit Asset Management Plan.



45. Improve public transit infrastructure. Adequate transit facilities are necessary to deliver reliable, safe, and efficient public transit services. The Iowa DOT funds improvement of vertical infrastructure through the Public Transit Infrastructure Grant Program, making approximately $1.5 million available annually to public transit agencies for these types of projects. Additionally, the Iowa Statewide Transit Facility Needs Analysis was completed in 2008, which reviewed existing facilities, developed transit facility standards and design criteria, and outlined a list of facility needs. The Iowa DOT will update this analysis to assist local jurisdictions in making transit facility investment decisions.

46. Support affordable passenger transit service. Passenger transit must be affordable, particularly for people who are transit dependent. This includes seniors, low-income individuals, and persons with disabilities that rely on passenger transit in order to access work, health care, education, shopping, and other quality of life activities. There are multiple federal, state, and local funding sources available to support public transit; however, these resources are often not enough. The Iowa DOT will provide public transit agencies with tools and support to better coordinate affordable passenger transportation services, such as volunteer transportation programs and carpool and vanpool programs, in order to increase the efficiency and effectiveness of the passenger transportation system.

47. Pursue new funding opportunities for public transit. Maintaining and improving Iowa's public transit system relies heavily on available funding. Capital and operating expenses for public transit services have been increasing while much of Iowa's existing revenue stream has remained either unchanged or has slightly diminished. Exploring other funding mechanisms, or even creating new ones, would be extremely beneficial for public transit in Iowa. The Iowa DOT will support this effort by applying for federal discretionary funding as it becomes available to improve the public transit system's vehicles and facilities.

48. Improve interagency coordination between public transit agencies and human service providers. It is essential that public transit agencies and human service providers coordinate to maximize efficiency, reduce duplication of services, and provide clients with increased access to transportation. It is also important to coordinate land use decisions with passenger transit to avoid creating obstructions to passenger transportation services. The Iowa DOT is an important partner in improving interagency coordination. The Iowa DOT will continue its efforts in this area, including acting as chair of the Iowa Transportation Coordination Council (ITCC), overseeing the MPO and RPA Passenger Transportation Planning (PTP) process, providing support for mobility coordinators, sponsoring an annual Passenger Transportation Summit, and generally advocating for the benefits of coordination between public transit and various organizations.

49. Increase awareness of public transit through marketing and education. Robust marketing of passenger transit services is needed to retain existing riders, attract new riders, and secure financial support. A critical component of the marketing strategy is educating the public on available options and how passenger transit systems operate. The Iowa DOT will continue to provide funding assistance to public transit agencies for marketing and public education.

50. Improve efficiency, effectiveness, and quality of public transit service. Establishing passenger transit service that is easy to use, affordable, provides competitive travel times and desired connections, and achieves high customer satisfaction will result in increased transit ridership. Technology has opened the door to shared modes, which has led to increased mobility options. Public transit agencies should seize opportunities to improve mobility for all users through collaboration and public-private partnerships. The Iowa DOT will help transit agencies by providing support for Mobility Coordinators, converting fixed-route systems to General Transit Feed Specifications (GTFS), promoting LifeLong Links and Iowa Rideshare, assisting agencies with ITS applications, providing training opportunities, and conducting compliance reviews.

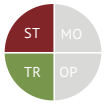
51. Continue to implement the Iowa Park and Ride System Plan through examination of the associated statewide candidate locations. The Iowa DOT district offices should continue to be consulted to identify available state-owned right of way in close proximity to candidate locations. If state-owned right of way is not available for park and ride functions, other public and private partnerships should be explored. In addition, park and ride system activities should be continually coordinated with Iowa Rideshare and other commuter services as appropriate.

52. Identify new public transit service and expansion opportunities. Identification and expansion of passenger transit services is essential to reduce the gap between services provided and services needed. However, startup costs are a major barrier to providing new service, and funding assistance is often necessary. The Iowa DOT will support continued State Transit Assistance (STA) Special Projects funding and Iowa's Clean Air Attainment Program funding, which are sources that can help agencies implement new passenger transit services.

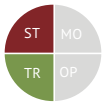
53. Improve the safety and security of the public transit system. In order to protect passengers, pedestrians, employees, and property, it is important that the Iowa DOT support transit agencies in taking a proactive approach to safety and security. Safety can be increased with driver trainings, drug and alcohol testing, adequate transit design measures for roadways and buildings, and proper maintenance of vehicles and equipment. Public transit agencies can improve security with vehicle security systems, lighting around transit assets, controlled access to facilities, and installation of emergency phones or help points.

54. Improve intercity bus service. Intercity bus service is a valuable transportation resource that allows Iowa residents to reach destinations across the country. Intercity bus providers are eligible to receive 15 percent of the state's FTA 5311 funding (approximately $2 million) as long as they include nonurbanized stops and connect to a nationwide network. In order to expand intercity bus ridership the Iowa DOT encourages intercity bus providers to develop targeted stops in rural locations and increase service frequency, and also advises local transit systems to provide feeder services to intercity bus lines.

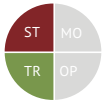
Rail



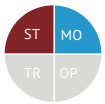
55. Enhance the safety and security of the rail system through crossing safety, monitoring, and promotional efforts. The Iowa DOT will improve crossing safety through crossing repair and upgrade programs, rehabilitation of crossing surfaces, encouraging closure of unnecessary crossings, and construction of grade separations where appropriate. Safety efforts will be enhanced through promotion of Operation Lifesaver, education and marketing, and coordination with law enforcement. Security will be enhanced through continued track inspection and hazardous materials monitoring programs.



56. Improve the physical infrastructure of the rail system. Infrastructure improvements will be pursued in partnership with Iowa's shippers and railroads. Such improvements include branch line rehabilitation and construction or improvement of spur tracks, transfer facilities, rail yards, terminals, sidings, connections, and passing tracks. In addition, the Iowa DOT will serve as a source of information and advocate for federal programs that benefit rail transportation.



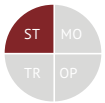
57. Preserve existing rail service. Equally important to improving physical infrastructure, the Iowa DOT will support activities seeking to preserve existing service provided by the rail system. Such activities include support for developments that are served by rail, acquisition of rail rights of way for future rail use, and advising communities and shippers of options when rail service is at risk.



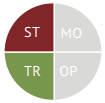
58. Enhance access and connectivity to freight rail service. The Iowa DOT will support activities that improve rail-shipping options for new and existing customers. Such activities include improving coordination between rail users and service providers, improving access to the national rail network via new or enhanced industrial leads and spurs, promoting research opportunities for intermodal and transload facilities, and providing tools to assist shippers in using railroads.

59. Enhance access and connectivity to passenger rail service. The Iowa DOT will support activities that improve passenger rail options for new and existing customers. Such activities include encouraging integration with other modes of travel, studying implementation of passenger rail service on intercity corridors, supporting federal funding programs for passenger rail initiatives, and continuing outreach with stakeholders.

60. Improve the efficiency of the rail system. Rail efficiency will benefit from safety and security enhancements, as well as specific efficiency-related activities. These include capacity improvements on short lines, promoting yard and interchange improvements, promoting new business opportunities, and providing tools that allow the railroads to be more efficient.

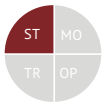


61. Encourage economic development in Iowa through investment in the rail system. The Iowa DOT will support activities that enhance economic competitiveness and development. Such activities include encouraging new and enhanced industrial spurs or industrial parks when suitable, supporting efforts that attract and sustain business in Iowa, and promoting rail as a viable transportation option. More broadly, the Iowa DOT will serve as a source of information and advocate regarding use of the rail system.

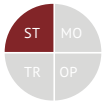


62. Reduce transportation-related congestion and emissions through investment in and use of the rail system. The Iowa DOT will promote the system efficiency and environmental benefits of rail transportation. Specific environment-related activities include promoting the use of emission reduction technologies, encouraging shippers to use more environmentally conscious transport when practical, and encouraging travelers to consider rail transportation when available.

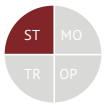
Safety



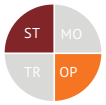
63. Sustain the multimedia Zero Fatalities program and identify new partners in each of the five safety emphasis areas. Given the success of the program, safety stakeholders have committed to maintaining Zero Fatalities and adding 10 new partners that are willing to share the campaign message. This will involve the development of new partner engagement materials, further distribution of engagement materials, and development and delivery of new safety messages.



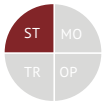
64. Support the enhancement of driver education programs and increase public outreach and education regarding unsafe driver behaviors. Safety stakeholders will seek to enhance driver education programs throughout the state by providing them with educational materials and offering them access to tools that track student progress. Additionally, driver education curriculum should be updated to include how drivers can navigate different types of roadway facilities such as roundabouts, specialized traffic signals, and bike lanes. Safety stakeholders also plan to enhance their public reach regarding the dangers of drowsy and distracted driving through expanded partnering and airing public service announcements about these unsafe behaviors.



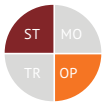
65. Support additional officer hours on roadways and encourage special enforcement campaigns. High-visibility enforcement strategies can effectively increase seat belt compliance, and present an opportunity to increase proper child passenger restraint. This may involve additional hours of high-visibility enforcement deployments, additional motor vehicle inspections, and ongoing annual special enforcement events targeting specific corridors and/or work zones.



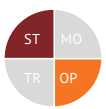
66. Support equipping law enforcement with state-of-the-art technology. Safety stakeholders remain committed to increasing the percentage of Iowa State Patrol and Iowa DOT enforcement vehicles with light detection and ranging (LIDAR) equipment. In addition, sustained support for the Iowa Department of Public Safety's Governor's Traffic Safety Bureau (GTSB) equipment upgrade program for cities and counties will allow for the purchase of critical enforcement units such as speed trailers, in-car cameras, preliminary breath testers, and impairment simulation goggles.



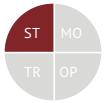
67. Support expanded law enforcement training to effectively identify impaired drivers. Training and certifying more enforcement officers through the appropriate impairment recognition programs, and ensuring that trained officers maintain those certifications, is a priority for safety stakeholders. In addition, support for 100 percent blood alcohol concentration and drug testing for individuals involved in fatality-related crashes will provide a clearer picture of the magnitude of impaired driving in the state.



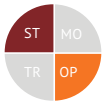
68. Support evidence-based decision-making and the installation of engineering countermeasures. Safety stakeholders support data-driven transportation planning and the incorporation of safety analysis into project development and prioritization. Pursuing such practices in combination with the installation of proven safety countermeasures, such as centerline and edgeline rumble strips, curve delineation, shoulder treatments, and median cable barrier, will bolster Iowa's strategic approach to making roadways safer.



69. Implement appropriate and cost-effective engineering solutions at intersections. Advances in design and traffic engineering have expanded the range of improvement alternatives to enhance safety for all users. Innovative intersection designs, traffic signal modifications, lighting modifications, and mode-specific improvements have increased the design options possible at both urban and rural intersections. To support the expanded use of such improvements, safety stakeholders will seek to identify an intersection evaluation tool for communities to use in project development.



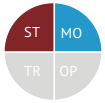
70. Inform and support legislation that enhances transportation safety. By providing research opportunities, educational programs, and support for national and state initiatives, safety stakeholders can inform lawmakers and the public about the benefits of safety-related legislation. This will include support for primary seat belt legislation for all positions, modification of Iowa law to include distracted driving as a primary offense, and a review of impaired driving tolerances and penalties.



71. Facilitate access to and track usage of traffic safety records data. Critical safety research and programming is reliant upon analyses that integrate multiple data areas. This requires standardized definitions, procedures, and fields that assist researchers with summarizing and analyzing information. To address this, safety stakeholders will facilitate access to crash records data and integration between the various entities involved in transportation safety, including justice, public health, public safety, engineering, licensing and registration, and education.

Technology

72. Plan for the transition to and implementation of connected and automated vehicle technology. The Iowa DOT, in partnership with the University of Iowa, Iowa State University, local jurisdictions, planning agencies, and the private sector, will develop an implementation-ready platform for connecting and guiding automated vehicles. This platform will be based on high-definition dynamic mapping, predictive travel modeling, and a cloud-based communication network. The effort will initially deploy technologies supporting autonomous vehicles regionally in the Iowa City-Cedar Rapids transportation network. Additional deployments are planned for the Des Moines-Ames metropolitan areas, as well as I-35 and I-80 across Iowa.



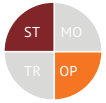
73. Incorporate pause points into the project development and programming processes to consider the evolving impacts of disruptive technologies. In addition to planning and implementation activities related to various new technologies, particularly connected and automated vehicles, the Iowa DOT will modify its internal project development and programming processes to consider technological disruptions and minimize risk. This will be achieved through a new governance structure that defines an effective program development process around the appropriate subject matter experts and state-of-the-art management systems. The incorporation of pause points into this process will allow the Iowa DOT to revisit a project at various points during development to ensure its scope is still appropriate within the context of these evolving technologies.

TSMO

74. Reduce the number of overall major crashes and the number of secondary crashes. Transportation system safety, reliability, and efficiency is improved by minimizing the frequency and severity of crashes. Secondary crashes also present a significant safety problem. Often these crashes can be more severe than the original incident, posing safety risks to incident responders, other travelers, and those involved in the initial incident. Rapid response and quick, safe clearance, as articulated in the National Unified Goal for Traffic Incident Management, support the Iowa DOT's traffic incident management objectives.

75. Increase the resilience of the transportation system to floods, winter weather, and other extreme weather events. System resiliency requires a proactive approach to extreme weather events and other large scale incidents that threaten the continuity of system operations. The Iowa DOT seeks to minimize the impact of extreme weather by intentionally designing and managing certain routes to be resistant to extreme weather, and to move people and goods throughout the state both during and after extreme weather events.

76. Implement critical emergency transportation operations (ETO) strategies as identified in the ETO Plan. The ETO Plan identified strategies to address all types of hazards and incidents that may seriously threaten or disrupt the operation and resiliency of the transportation system. Preparedness strategies represent efforts by Iowa ETO program partners to identify threats, determine vulnerabilities, and identify required resources, policies, and procedures. Response strategies represent efforts that address the direct, usually short-term effects of an event. Recovery strategies address the execution of restoration plans, evaluation and reporting of the event, and development of mitigation initiatives.



77. Maximize the use of existing roadway capacity. TSMO strategies support the Iowa DOT's ability to utilize existing roadway capacity more efficiently by actively managing traffic flow and identifying congestion hotspots for operational improvements. This increases system efficiency and reliability, reducing or postponing the need for major construction investments, and supporting targeted capacity improvements in critical corridors.

78. Work with special event generators to actively manage traffic during large scale events that impact the highway network. The state of Iowa hosts a significant number of special events that generate large volumes of traffic over a fairly brief duration. Such events can negatively affect system efficiency and reliability. By working with event coordinators in advance, the Iowa DOT can support active traffic management during the event, which also enhances traveler information accuracy before and during the event.

79. Coordinate responses to large scale traffic incidents with adjacent states. Regional planning for and response to large scale traffic incidents is an important component of interagency coordination and corridor management. Limited access points along interstates and major corridors, specifically where border bridge crossings are involved, require a coordinated response between state transportation agencies.

80. Use integration and big data mining strategies to improve decision making and performance management. As new and expanded sources of data become available, data sharing and data mining offer new opportunities for planning and TSMO strategies for actively managing the system. The Iowa DOT's integration of big data and expanded data analytics will improve decision support activities and performance management, which will enhance overall system operations. Future systems operations will also be enhanced through anticipatory infrastructure investments that would proactively enable "smart" highway corridors with data and communications capacity.

Table 5.7 provides a summary list of all strategies. The Iowa DOT's Internal Steering Committee for this Plan evaluated each strategy based on the anticipated level of impact it could have and the anticipated level of effort it would require to implement. The ranking of each strategy relative to the other strategies is listed. Rankings do not necessarily correlate to priority for implementation.

Table 5.7: Summary of strategies

Area	ID	Strategy	Impact rank (out of 80) *1 = highest impact 80 = lowest impact*	Effort rank (out of 80) *1 = lowest effort 80 = highest effort*
Asset Management	4	Continue to advance targeted capacity improvement projects on key Interstate Highway System corridors.	5	50
	1	Develop an asset management governance structure to improve the effectiveness and transparency of the project selection process.	21	48
	2	Improve the efficiency and accuracy of data collection and access to enhance data available for decision-making.	27	53
	3	Adequately communicate the benefits of asset management to ensure the Iowa DOT's program is sufficiently funded and properly implemented.	39	18
	6	Monitor continued population shift toward the state's urban areas and associated implications for the level of funding available for statewide asset management activities.	40	4
	5	Ensure asset management and other program delivery functions can be properly implemented regardless of staffing constraints.	41	32
Aviation	13	Maintain and enhance the statewide network of aviation weather observing systems.	23	22
	15	Evaluate implementation of new and emerging aviation technologies.	26	26
	7	Maintain adequate accessibility to airports with an appropriate range of services.	52	9
	9	Promote the implementation of compatible land use guidelines near airports.	69	2
	12	Improve runway approaches through obstruction removal and mitigation funding.	70	8
	8	Encourage airport planning.	71	1
	11	Maintain and enhance aviation vertical infrastructure needs.	75	57
	14	Promote and assist in active wildlife management at airports.	75	5
	10	Maintain and enhance airside facilities.	77	14
Bicycle and pedestrian	20	Evaluate key safety challenges pertaining to bicycling and walking and develop crash reduction strategies.	41	11
	17	Adopt and implement a complete streets policy that applies to all Iowa DOT projects.	48	40
	19	Consider same-source funding to build bicycle and pedestrian accommodations as part of road projects.	50	18
	16	Complete a comprehensive bicycle and pedestrian plan for the state.	52	12
	18	Increase the quality and consistency of the design of bicycle and pedestrian accommodations across the state.	61	23
Bridge	21	Secure additional funding and develop more refined management systems to address the approaching wave of bridge replacement needs.	5	75
	23	Target investment to address bridges with condition needs.	13	32
	22	Consider creative financing as part of coordinated planning and programming efforts to address future large bridge projects.	20	72
Energy	28	Optimize the passenger transportation system to provide more opportunities and improve mobility.	45	61
	26	Support the expanded use of alternative fuel vehicles in Iowa.	57	41
	24	Support the safe rail transport of crude oil and biofuels.	60	18
	27	Explore incentives for alternative vehicle fueling infrastructure.	61	36
	25	Optimize the propane supply chain to better predict and proactively respond to propane shortages.	63	26

Table 5.7: Summary of strategies *(continued)*

Area	ID	Strategy	Impact rank (out of 80) *1 = highest impact 80 = lowest impact*	Effort rank (out of 80) *1 = lowest effort 80 = highest effort*
Freight	29	Target investment on the interstate system at a level that reflects the importance of this system for moving people and freight.	3	50
	34	Leverage and disseminate real-time information on system conditions to support improved mobility.	13	56
	31	Optimize the freight transportation network to minimize cost and travel time, improve supply chain efficiency, and reduce energy use.	28	70
	32	Continue to advance efforts on the M-35 Marine Highway Corridor.	29	63
	30	Advance a 21st century Farm-to-Market System that moves products seamlessly across road, rail, and water to global marketplaces.	30	75
	36	Streamline and align freight-related regulations and minimize unintended consequences.	30	41
	35	Provide measured, clear, nontechnical performance results for the transportation system.	52	14
	33	Promote freight movement on the M-29 Marine Highway Connector.	80	35
Highway	38	Target investment to address capacity needs at locations with forecast congestion issues.	2	50
	37	Rightsize the highway system and apply cost-effective solutions to locations with existing and anticipated issues.	5	77
	40	Target investment to address mobility and safety needs on critical two-lane routes.	8	61
	42	Target investment to address condition needs at locations with measured structural and service issues.	16	46
	43	Prioritize active operations management of the interstate highways, followed by primary municipal highways, primary rural highways, and border bridges.	17	36
	41	Target investment to address freight needs at locations with measured mobility issues.	18	63
	39	Consider targeted anticipatory investments at locations with potential congestion issues beyond the planning horizon.	32	36
Public transit	44	Replace aging public transit vehicles.	44	65
	47	Pursue new funding opportunities for public transit.	45	57
	50	Improve efficiency, effectiveness, and quality of public transit service.	50	53
	48	Improve interagency coordination between public transit agencies and human service providers.	52	13
	52	Identify new public transit service and expansion opportunities.	57	32
	53	Improve the safety and security of the public transit system.	63	14
	46	Support affordable passenger transit service.	71	26
	51	Continue to implement the Iowa Park and Ride System Plan through examination of the associated statewide candidate locations.	71	3
	54	Improve intercity bus service.	71	18
	49	Increase awareness of public transit through marketing and education.	78	6
	45	Improve public transit infrastructure.	79	26

Table 5.7: Summary of strategies *(continued)*

Area	ID	Strategy	Impact rank (out of 80) *1 = highest impact 80 = lowest impact*	Effort rank (out of 80) *1 = lowest effort 80 = highest effort*
Rail	58	Enhance access and connectivity to freight rail service.	34	49
	57	Preserve existing rail service.	48	31
	55	Enhance the safety and security of the rail system through crossing safety, monitoring, and promotional efforts.	56	26
	61	Encourage economic development in Iowa through investment in the rail system.	57	24
	56	Improve the physical infrastructure of the rail system.	63	57
	62	Reduce transportation-related congestion and emissions through investment in and use of the rail system.	63	47
	59	Enhance access and connectivity to passenger rail service.	67	65
	60	Improve the efficiency of the rail system.	68	36
Safety	68	Support evidence-based decision-making and the installation of engineering countermeasures.	4	70
	69	Implement appropriate and cost-effective engineering solutions at intersections.	10	69
	70	Inform and support legislation that enhances transportation safety.	12	41
	63	Sustain the multimedia Zero Fatalities program and identify new partners in each of the five safety emphasis areas.	18	24
	64	Support the enhancement of driver education programs and increase public outreach and education regarding unsafe driver behaviors.	22	65
	65	Support additional officer hours on roadways and encourage special enforcement campaigns.	25	72
	67	Support expanded law enforcement training to effectively identify impaired drivers.	33	53
	71	Facilitate access to and track usage of traffic safety records data.	35	41
	66	Support equipping law enforcement with state-of-the-art technology.	41	57
Technology	72	Plan for the transition to and implementation of connected and automated vehicle technology.	13	78
	73	Incorporate pause points into the project development and programming processes to consider the evolving impacts of disruptive technologies.	35	7
TSMO	74	Reduce the number of overall major crashes and the number of secondary crashes.	1	79
	77	Maximize the use of existing roadway capacity.	9	74
	75	Increase the resilience of the transportation system to floods, winter weather, and other extreme weather events.	10	80
	76	Implement critical emergency transportation operations (ETO) strategies as identified in the ETO Plan.	23	68
	78	Work with special event generators to actively manage traffic during large scale events that impact the highway network.	35	17
	80	Use integration and big data mining strategies to improve decision making and performance management.	35	41
	79	Coordinate responses to large scale traffic incidents with adjacent states.	45	10

Source: Iowa DOT

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