IOWA STATE FREIGHT PLAN

FAST ACT UPDATE

IOWA DOT

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IOWA IN MOTION

planning ahead 2040

Iowa State Freight Plan

2017

Amended 2018 (July LIFTS Program project awards)

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Table of contents

List of figures and tables iii

List of acronyms viii

1. Introduction 1

1.1 Purpose and need for a plan 2

1.2 Relationship to the state transportation plan 2

1.3 Relationship to the Fixing America's Surface Transportation (FAST) Act 3

1.4 Relationship to other state freight initiatives 5

2. Strategic goals 7

2.1 National freight goals 7

2.2 Iowa in Motion – Planning Ahead 2040 goals 8

2.3 FAC goal 10

3. Economic context of freight transportation planning 11

3.1 Iowa's diverse economy 11

3.2 Multimodal freight transportation helps sustain and grow the economy 16

3.3 Freight-dependent industries are a key part of economic growth 18

3.4 Supply chains rely on the multimodal freight transportation system 28

4. Trends and issues 40

4.1 Modal trends 40

4.2 Freight issues 53

5. Forecasts 62

5.1 Commodity movement 62

6. Freight transportation assets 82

6.1 Mode comparison 82

6.2 Air 85

6.3 Highway 88

6.4 Pipeline 92
6.5 Railroad 95
6.6 Waterway 98
6.7 Freight-generating facilities 101
6.8 Iowa Multimodal Freight Network (IMFN) 106
6.9 National freight networks 108
7. Conditions and performance of the freight transportation system 113
7.1 Conditions of the freight transportation system 113
7.2 Performance measures 148
8. Iowa's decision-making process 152
8.1 Stakeholder and public engagement 152
8.2 Decision-making tools 158
8.3 Coordination with states, freight-related groups, and institutions 161
8.4 Funding mechanisms 166
9. Freight improvement strategy 170
9.1 Iowa's freight strategies 170
9.2 Iowa's freight improvements 187
9.3 Freight investment plan 210
Appendix 1 214
Appendix 2 216
Freight Advisory Council identified issues 216
Freight Advisory Council (FAC) strategic solutions 218
Appendix 3 229
Inventory of freight facilities 229
Appendix 4 234
Priority corridors 234

List of figures and tables

Figure 1.1: Iowa freight-related initiatives timeline 5
Figure 1.2: Relationship between elements of the planning and programming process 6
Table 2.1: Linkage between Iowa in Motion – Planning Ahead 2040 goals and national freight goals 9
Figure 3.1: Iowa gross domestic product, 2000-2014 12
Figure 3.2: Iowa population, 1980-2040 13
Figure 3.3: Iowa employment, 1980-2040 14
Figure 3.4: Iowa per capita income, 1980-2014 15
Figure 3.5: Transportation and the economy 16
Table 3.1: Goods-dependent and service industries 19
Figure 3.6: Iowa gross domestic product by industry, 2014 ($ millions) 20
Figure 3.7: Iowa employment by sector, 1980-2040 21
Figure 3.8: Iowa employment by industry, 2000-2014 22
Figure 3.9: Top commodities originating and terminating in Iowa by weight, 2012 23
Table 3.2: Top commodities originating and terminating in Iowa by weight, 2012 24
Figure 3.10: Top commodities originating and terminating in Iowa by value, 2012 25
Table 3.3: Top commodities originating and terminating in Iowa by value, 2012 26
Table 3.4: Top commodities moving within Iowa, 2012 27
Figure 3.11: Iowa's exports and imports, 2010-2014 28
Figure 3.12: Basic supply chain diagram 29
Figure 3.13: Harvested acres of corn, 2014 30
Figure 3.14: Corn supply chain 31
Figure 3.15: Ethanol supply chain 32
Figure 3.16: Harvested acres of soybeans, 2014 33
Figure 3.17: Soybean supply chain 34
Figure 3.18: Tractors and agricultural machinery supply chain 35
Figure 3.19: Inventory of hogs and pigs, 2012 36
Figure 3.20: Pork supply chain 37
Figure 3.21: Annual egg production by state, 2013 (millions) 38
Figure 3.22: Egg supply chain 39
Figure 4.1: Iowa reported air cargo, 2006-2015 41
Figure 4.2: Iowa large truck vehicle-miles traveled by jurisdiction, 2015 43
Figure 4.3: Iowa large truck vehicle-miles traveled by jurisdiction, 1980-2040 43
Figure 4.4: Iowa crossing Safety Program, 2010-2012 46

Figure 4.5: Iowa crossing Surface Program, 2013-2015 46
Figure 4.6: Average delays for Iowa Mississippi River locks, 1995-2014 47
Figure 5.1: Iowa freight movement, 2012 62
Table 5.1: Commodity flow into and out of Iowa, 2012-2040 63
Figure 5.2: Commodity flow, 2012-2040 (millions of tons) 63
Figure 5.3: Commodity flow, 2012-2040 ($ millions) 63
Figure 5.4: Commodity flow trends, 2012 to 2040 (weight) 64
Figure 5.5: Commodity flow trends, 2012 to 2040 (value) 64
Figure 5.6: Iowa freight tonnage by mode, 2012 (millions of tons) 66
Figure 5.7: Iowa freight value by mode, 2012 ($ millions) 66
Table 5.2: Tonnage by mode, 2012-2040 (millions of tons) 67
Table 5.3: Value by mode, 2012-2040 ($ millions) 67
Figure 5.8: Average daily long-haul traffic on the National Highway System, 2011 68
Figure 5.9: Average daily long-haul traffic on the National Highway System, 2040 69
Figure 5.10: Commodity weight, 2012-2040 (millions) 70
Figure 5.11: Commodity value, 2012-2040 ($ millions) 70
Table 5.4: Top commodities by weight, 2012 (millions of tons) 71
Table 5.5: Top commodities by weight, 2040 (millions of tons) 71
Table 5.6: Top Commodities by value, 2012 ($ millions) 72
Table 5.7: Top Commodities by value, 2040 ($ millions) 72
Figure 5.12: Regional trading partners 73
Figure 5.13: Iowa utility generation by source, 2000-2014 74
Table 5.8: Commodity origin region moving from Iowa, 2012-2040 75
Table 5.9: Commodity destination region moving to Iowa, 2012-2040 75
Table 5.10: Top domestic trading partners – imports to Iowa, 2012 76
Table 5.11: Top domestic trading partners – imports to Iowa, 2040 76
Table 5.12: Top domestic trading partners – exports from Iowa, 2012 77
Table 5.13: Top domestic trading partners – exports from Iowa, 2040 77
Figure 5.14: Top commodities by value exported internationally, 2014 ($ millions) 78
Table 5.14: Top international trading partners by value exported, 2014 ($ millions) 79
Figure 5.15: Top international trading partners, 2014 79
Figure 5.16: Top commodities by value imported internationally, 2014 ($ millions) 80
Table 5.15: Top international trading partners by value imported, 2014 ($ millions) 81
Figure 5.17: Top international trading partners, 2014 81

Figure 6.1: Iowa freight transportation system 82
Figure 6.2: Iowa freight price comparisons 83
Figure 6.3: Iowa freight tonnage comparisons 84
Table 6.1: Number of Iowa airports by service type 86
Figure 6.4: Iowa airports by service type 87
Table 6.2: Iowa intermodal connectors 90
Figure 6.5: Iowa's primary highways 91
Table 6.3: Pipeline miles by commodity, 2011 93
Table 6.4: Major pipelines in Iowa, 2014 93
Figure 6.6: Iowa pipelines 94
Table 6.5: Rail miles operated in Iowa by railroad, 2014 96
Figure 6.7: Iowa railroads 97
Table 6.6: Iowa Mississippi River locks summary 99
Figure 6.8: Iowa navigable waterways 100
Figure 6.9: Intermodal facilities 101
Figure 6.10: Example of transload process 102
Figure 6.11: Example of cross-docking process 103
Figure 6.12: Freight-generating facilities 105
Figure 6.13: Iowa Multimodal Freight Network 107
Figure 6.14: National Highway Freight Network, statewide 109
Figure 6.15: National Highway Freight Network, metro areas 110
Table 6.7: Critical urban and critical rural freight corridors 111
Figure 6.16: National Multimodal Freight Network (non-highway) 112
Figure 7.1: Total air cargo at Des Moines International Airport and Eastern Iowa Airport, 2005-2014 115
Table 7.1: Total air cargo at Iowa's commercial airports, 2005-2014 (pounds) 115
Figure 7.2: Infrastructure Condition Evaluation rating, divided primary roads, 2014 117
Figure 7.3: Infrastructure Condition Evaluation rating, nondivided primary roads, 2014 118
Table 7.2: Highway conditions by Infrastructure Condition Evaluation rating, 2014 119
Figure 7.4: Truck traffic, 2014 120
Figure 7.5: Oversize/overweight truck permits per year, 2014 121
Figure 7.6: Highway freight-related crashes, 2010-2014 122
Figure 7.7: Highway freight-related fatalities, 2010-2014 122
Table 7.3: Highway freight-related crashes and fatalities, 2010-2014 123
Figure 7.8: Life of a bottleneck by speed and time 124

Figure 7.9: Highway freight bottlenecks, statewide 125
Figure 7.10: Highway freight bottlenecks, metro areas 126
Table 7.4: Highway freight bottlenecks 127
Figure 7.11: Performance of rail operations in Iowa, 1985-2014 130
Figure 7.12: Iowa rail maintenance costs, 1987-2014 131
Figure 7.13: Railroad traffic density, 2014 (gross ton-miles per mile) 132
Figure 7.14: Railroad freight-related crashes and derailments, 2010-2014 133
Figure 7.15: Railroad freight-related injuries and fatalities, 2010-2014 133
Figure 7.16: Railroad freight bottlenecks 135
Table 7.5: Railroad freight bottlenecks 136
Figure 7.17: Rail line segments incapable of handling 286,000–pound rail car weights 139
Table 7.6: Percent of vessels delayed and average delay time by lock, 1995-2014 140
Figure 7.18: Annual unavailability at locks 9-19, 1994-2014 141
Figure 7.19: Number of barges passing through Iowa locks, 2014 142
Figure 7.20: Waterway freight-related injuries, 2010-2014 143
Figure 7.21: Waterway freight-related allisions, collisions, and groundings, 2010-2014 143
Figure 7.22: Waterway freight bottlenecks 145
Table 7.7: Waterway freight bottlenecks 146
Table 7.8: Operational and regulatory freight bottlenecks 147
Table 7.9: Freight performance measures' alignment with national freight goals 149
Figure 8.1: Stakeholder and public engagement 152
Table 9.1: Alignment of freight strategies and national freight goals 184
Figure 9.1: Des Moines International Airport property 188
Figure 9.2: Des Moines International Airport future cargo capacity 189
Figure 9.3: Highway freight priority locations 193
Figure 9.4: Highway freight priority locations, metro areas 194
Table 9.2: Freight highway priorities 195
Table 9.3: Freight railroad improvements 201
Figure 9.5: Schedule of major rehabilitations on the Upper Mississippi River, Rock Island District 207
Figure 9.6: Proposed 1200-foot locks in the Upper Midwest 208
Table 9.4: National Highway Freight Program funding allocation – Iowa, 2016-2020 210
Table 9.5: Iowa freight investment plan, 2016-2020 (funding in 1,000s) 212
Table 9.6: FY 2017 LIFTS Grant Program awards 212
Table A.1: Fixing America's Surface Transportation Act state freight plan requirements 214

Table A.2: Transload facilities 229
Table A.3: Public/contract warehouses 231
Table A.4: Distribution centers 233

List of acronyms

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
BSNP	Bank Stabilization and Navigation Project
CAC	Citizen Advisory Committee
CFIRE	National Center for Freight & Infrastructure Research & Education
CID	Eastern Iowa Airport (Cedar Rapids)
CIN	Commercial and Industrial Network
CNG	compressed natural gas
COFC	container-on-flatcar
CRFC	Critical Rural Freight Corridor
CUFC	Critical Urban Freight Corridor
C-STEP	County-State Traffic Engineering Program
DDGs	dried distillers grains
DNR	Iowa Department of Natural Resources
DOT	Department of Transportation
DSM	Des Moines International Airport
EFM	Economic Feasibility Measurement
FAC	Freight Advisory Council
FAF	Freight Analysis Framework
FAST	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
GDP	gross domestic product
GLRTOC	Great Lakes Regional Transportation Operations Coalition
GTM/M	gross ton-miles per mile
HLSC	High Leverage Stakeholder Committee
IAPS	Iowa Automated Permit System
ICAAP	Iowa's Clean Air Attainment Program
ICE	Infrastructure Condition Evaluation
IEDA	Iowa Economic Development Authority
IMFN	Iowa Multimodal Freight Network
IMTA	Iowa Motor Truck Association
InTrans	Institute for Transportation
IRI	International Roughness Index
iTRAM	Iowa Travel Analysis Model
ITS	intelligent transportation systems
LIFTS	Linking Iowa's Freight Transportation System
LNG	liquefied natural gas
MAASTO	Mid America Association of State Transportation Officials
MAFC	Mid-America Freight Coalition
MAP	million annual passengers
MAP-21	Moving Ahead for Progress in the 21st Century Act

MP	mile post
MPO	metropolitan planning organization
MTC	Midwest Transportation Center
NASCO	North American Strategy for Competitiveness
NESP	Navigation and Ecosystem Sustainment Program
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NHS	National Highway System
NMFN	National Multimodal Freight Network
O&M	operations and maintenance
OS/OW	oversize/overweight
PCI	Pavement Condition Index
PHA	polyhydroxyalkanoates
PHFS	Primary Highway Freight System
RAC	Rail Advisory Committee
RER	Rehabilitation Evaluation Report
RISE	Revitalize Iowa's Sound Economy
RITA	Research and Innovative Technology Administration
RPA	regional planning affiliation
RRLG	Railroad Revolving Loan and Grant Program
RUTF	Road Use Tax Fund
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SCTG	Standard Classification of Transportation Goods
SIA	Structure Inventory and Appraisal
SIMRA	State Interagency Missouri River Authority
SIREPA	Southeast Iowa Regional and Economic Port Authority
State Freight Plan	Iowa State Freight Plan
TEAP	Traffic Engineering Assistance Program
TOFC	trailer-on-flatcar
TWIC	Transportation Worker Identification Credential
UAS	unmanned aircraft systems
UMRBA	Upper Mississippi River Basin Association
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
U-STEP	Urban-State Traffic Engineering Program
VCAP	Value, Condition, and Performance
VHT	vehicle-hours traveled
VMT	vehicle-miles traveled

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1. Introduction

Iowa's central geographic location and abundance of transportation options make it a major player in the global marketplace. The transport of goods and services is the backbone of the economy and investments in basic infrastructure components such as airports, highways, pipelines, railroads, and waterways secure and strengthen the economic vitality of the state. A safe, efficient, and convenient freight transportation system is a necessity not only for Iowa, but the nation as a whole.

The Iowa Department of Transportation recognizes the need to further incorporate freight considerations into the statewide transportation planning and programming process. As a result, Iowa DOT has developed a multimodal freight plan that will address each of the five modes of the freight transportation system: air, truck, pipeline, rail, and water. The Iowa State Freight Plan (State Freight Plan) will serve as a platform for safe, efficient, and convenient freight transportation in the state. This plan will also:

- Align with the state transportation plan: Iowa in Motion – Planning Ahead 2040.
- Meet the requirements of the Fixing America's Surface Transportation (FAST) Act.
- Support national freight goals.

1.1 Purpose and need for a plan

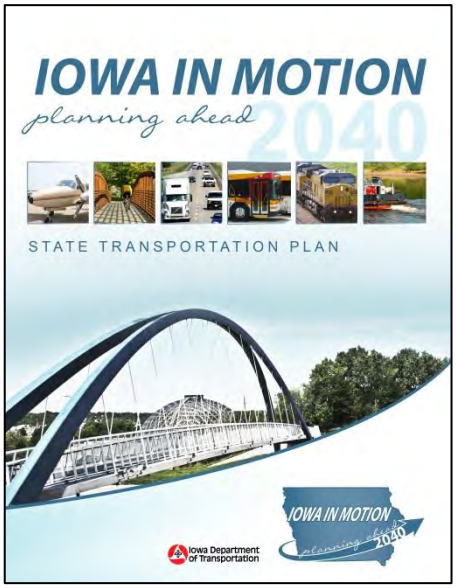
It is a necessity for the state to provide a safe, efficient, and convenient freight transportation system to Iowans. In recent years, the Iowa DOT has embarked on numerous freight planning activities to help achieve this objective, many of which are detailed in this document. The State Freight Plan is a way to connect all of these initiatives and allow them to move forward toward a common goal of optimal freight transportation in the state. In addition, the State Freight Plan will guide Iowa DOT's investment decisions to maintain and improve the freight transportation system, and ultimately leading to a stronger state economy and higher quality of life for its citizens.

The Iowa State Freight Plan is a way to connect all of these initiatives and allow them to move forward toward a common goal of optimal freight transportation in the state.

1.2 Relationship to the state transportation plan

In order to support a renewed emphasis on the stewardship of our existing transportation system, a strong theme noted throughout the state transportation plan, three broad-based and far-reaching goals were identified:

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



These goals serve as the pillars for future decision-making and guide investments covering all modal areas. The state transportation plan emphasizes preserving what infrastructure and services we currently have, while adding capacity only where demand levels warrant.

A well-maintained transportation system that has consistent design characteristics and fosters modal interactions is essential for Iowa's continued success. Iowans have a strong desire to have a system that is also sensitive to elements of the environment, such as clean air and water, protected wildlife and vegetation, low noise levels, and well-conceived land use plans. Chapter 2, Strategic goals, will explain in more detail how the State Freight Plan is consistent with these goals.

1.3 Relationship to the Fixing America's Surface Transportation (FAST) Act

The state transportation plan discussed in the previous section was developed under the guidance and requirements of the federal transportation legislation known as Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Since the adoption of Iowa in Motion – Planning Ahead 2040, two transportation authorizations have been enacted: Moving Ahead for Progress in the 21st Century (MAP-21) and the FAST Act. Both of these pieces of legislation, which govern current funding and program requirements, impact the development and implementation of the State Freight Plan and future updates.

MAP-21 is the previous authorization act and did not require states to develop a freight plan; however, freight projects were required to be identified in a state plan to qualify for an increased federal funding share. Signed into law on July 6, 2012, the law encouraged states to develop comprehensive freight plans to guide state investments and requires a national freight strategic plan to be developed in cooperation with states and other stakeholders.

The FAST Act, signed on Dec. 4, 2015, builds on the freight initiatives that began under MAP-21. With this new authorization, state freight plans that show a comprehensive plan for the immediate and long-range planning activities and investments of the state with respect to freight are required to be developed by states that receive funds under 23 U.S.C. 167 and must be updated every five years. In addition, the FAST Act created a National Multimodal Freight Network with the intent of strengthening the contribution of this network to the economic competitiveness of the country. It also requires the development of a National Freight Strategic Plan and encourages states to create and utilize state freight advisory committees.

Section 167 is the National Highway Freight Program, which creates a formula program funded at $1.15 billion to $1.5 billion per year. Each state receives funds in proportion to the amount of funds a state receives compared to other states under all formula-apportioned programs. These funds may be spent on the National Highway Freight Network, which consists of the Primary Highway Freight System (PHFS), Critical Rural Freight Corridors (CRFCs), Critical Urban Freight Corridors (CUFCs), and the remainder of the Interstate Highway System not already designated as part of the PHFS.

Effective two years after the date of enactment of the FAST Act, a state may not obligate these funds unless the state has developed a freight plan in accordance with 49 U.S.C. 70202 of the FAST Act. State freight plan requirements under this section include:

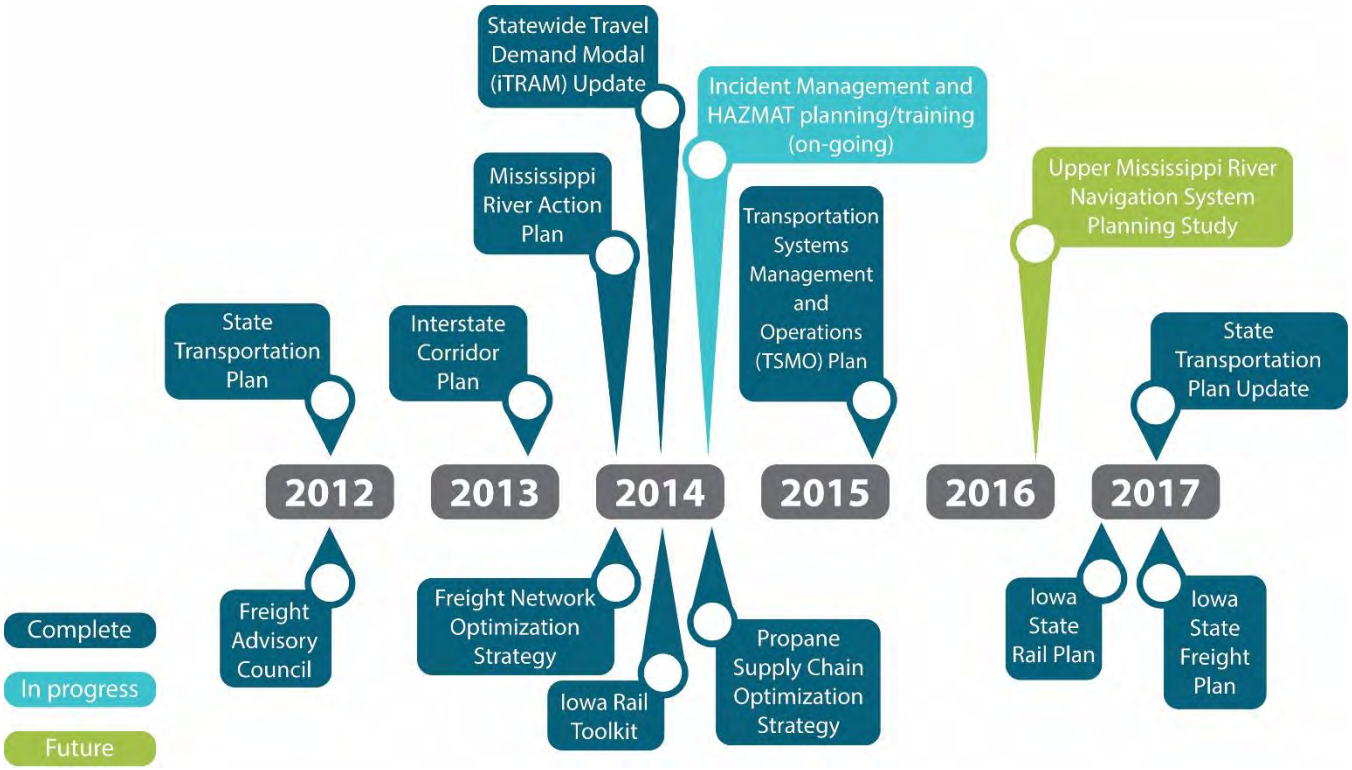
1. An identification of significant freight system trends, needs, and issues with respect to the state.
2. A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state.
3. When applicable, a listing of:
    a. Multimodal critical rural freight facilities and corridors designated within the state under 49 U.S.C. 70103 (National Multimodal Freight Network).
    b. CRFCs and CUFCs designated within the state under 23 U.S.C. 167 (National Highway Freight Program).
4. A description of how the plan will improve the ability of the state to meet the national multimodal freight policy goals described in 49 U.S.C. 70101(b) and the national highway freight program goals described in 23 U.S.C. 167.
5. A description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of the freight movement, were considered.
6. In the case of roadways on which travel by heavy vehicles, including mining, agricultural, energy cargo or equipment, and timber vehicles, is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration.
7. An inventory of facilities with freight mobility issues, such as bottlenecks, within the state, and for those facilities that are state owned or operated, a description of the strategies the state is employing to address those freight mobility issues.
8. Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay.
9. A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched.
10. Consultation with the State Freight Advisory Committee, if applicable.

Appendix 1 identifies the location(s) where each requirement is addressed in the State Freight Plan.

1.4 Relationship to other state freight initiatives

In addition to the development of the State Freight Plan, a number of other freight initiatives have been completed or are in progress at the Iowa DOT. These, and future freight initiatives, will be used to implement the State Freight Plan. As shown in Figure 1.1, Iowa has been active in freight, including establishment of a Freight Advisory Council, development of a number of multimodal studies and plans, and creation of tools, all of which are utilized to improve the state's freight transportation system. These are described in more detail in Chapter 8, Iowa's decision-making process.

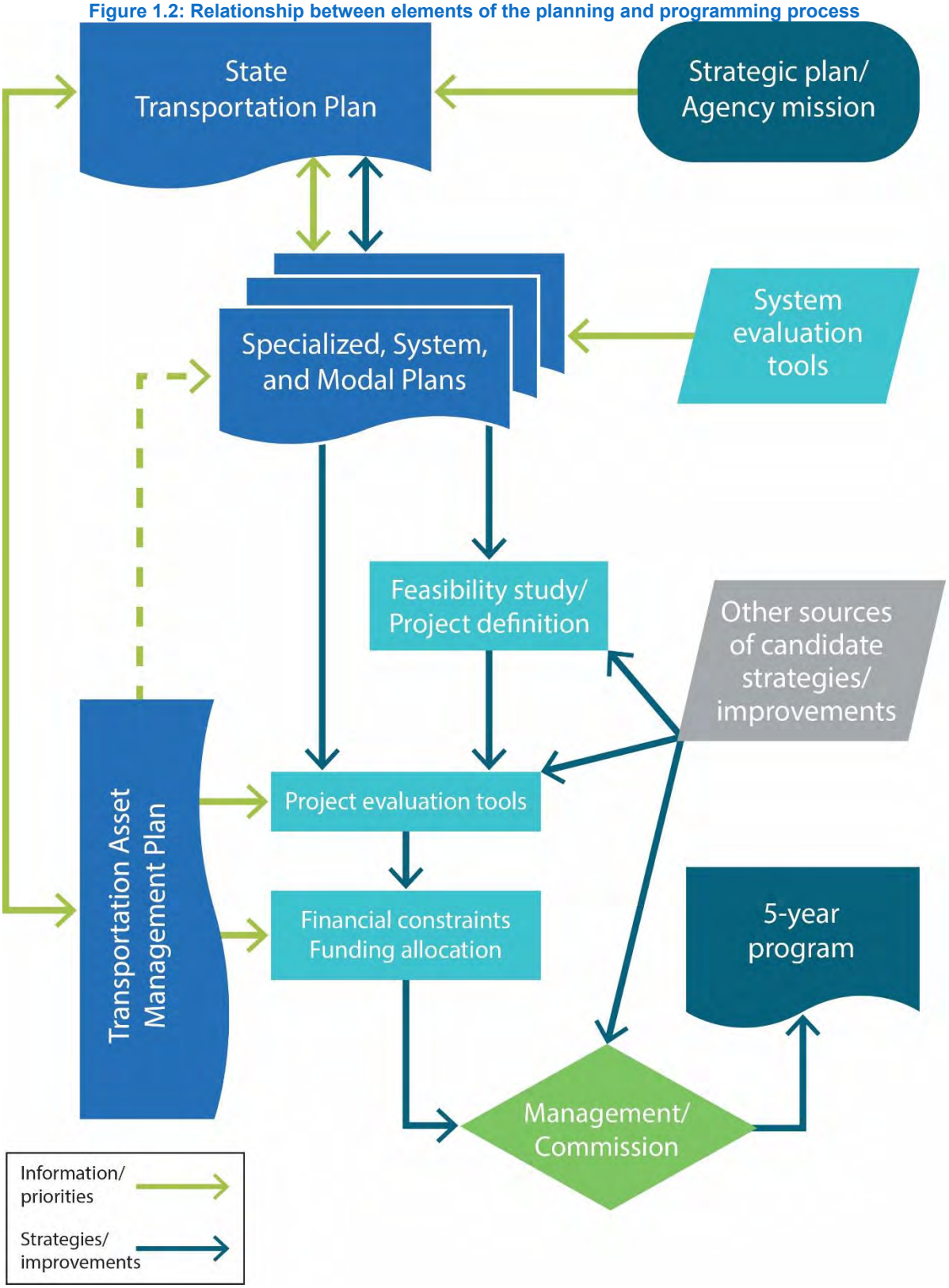
Figure 1.1: Iowa freight-related initiatives timeline



Source: Iowa Department of Transportation

Each of the initiatives shown above plays a role in a collaborative planning and programming process. The tools and studies are utilized to develop system/modal plans, such as the State Freight Plan, which are consistent with the state transportation plan. Projects are then identified, studied, and programmed based on the findings and recommendations provided from each of these initiatives. Figure 1.2 shows the relationship between the tools, system/modal plans, state transportation plan, and the overall planning and programming process.

Figure 1.2: Relationship between elements of the planning and programming process



Source: Iowa Department of Transportation

2. Strategic goals

The State Freight Plan is consistent with the national freight goals defined in the Fixing America's Surface Transportation (FAST) Act, the goals contained in Iowa in Motion – Planning Ahead 2040, and the mission of the Freight Advisory Council (FAC). This consistency will help the Iowa Department of Transportation focus on strategies and improvements to benefit the movement of freight safely, efficiently, and conveniently.

2.1 National freight goals

The FAST Act requires a state freight plan to include a description of how the plan will improve the ability of the State to meet the national multimodal freight policy goals described in 49 U.S.C. 70101(b) and the national highway freight program goals described in 23 U.S.C. 167. The national multimodal freight policy goals and the national highway freight program goals were combined into a single list in order to show alignment with the State Freight Plan.

In addition to these goals, the Iowa DOT will consider the potential regulatory impact of all initiatives and how these could act as hindrances to freight movement. Chapter 9, Freight improvement strategy, will identify Iowa DOT's strategies for addressing freight mobility issues and improving the overall freight transportation network. Each of these strategies will align with one or more of the national freight goals.

The national freight goals are:

1. To identify and invest in infrastructure improvements, policies, and operational innovations that:
    a. Strengthen the contribution of the National Multimodal Freight Network (NMFN) to the economic competitiveness of the United States.
    b. Reduce congestion and eliminate bottlenecks on the NMFN.
    c. Increase productivity, particularly for domestic industries and businesses that create high-value jobs.
    d. Reduce the cost of freight transportation.
    e. Improve the year-round reliability of freight transportation.
2. To improve the safety, security, efficiency, and resiliency of multimodal freight transportation.
3. To achieve, maintain, and improve the state of good repair on the NMFN.

4. To use innovation and advanced technology to improve the safety, efficiency, and reliability of the NMFN.
5. To improve the economic efficiency and productivity of the NMFN.
6. To improve the reliability of freight transportation.
7. To improve the short- and long-distance movement of goods that:
    a. Travel across rural areas between population centers.
    b. Travel between rural areas and population centers.
    c. Travel from the nation's ports, airports, and gateways to the NMFN.
8. To improve the flexibility of states to support multi-state corridor planning and the creation of multi-State organizations to increase the ability of states to address multimodal freight connectivity.
9. To reduce the adverse environmental impacts of freight movement on the NMFN.
10. To pursue the goals described in this subsection in a manner that is not burdensome to state and local governments.

Chapter 6, Freight transportation assets, identifies the NMFN in Iowa.

2.2 Iowa in Motion – Planning Ahead 2040 goals

As mentioned in the introduction to this document, the three goals of Iowa in Motion – Planning Ahead 2040 are identified as safety, efficiency, and quality of life.

Safety

Transportation safety and security continue to be a primary concern and an integral element in the planning and programming processes. Increased transportation safety through the reduction of crashes is the foremost element in an effective transportation system, and safety is an inherent component in the design of all facilities.

Efficiency

Transportation efficiency is a system wide theme, which at its core implies the best use of available funding and a reduction in financial costs. Effective use of resources enhances Iowa's ability to

compete economically. As noted in the state transportation plan, many evaluation tools are available and will be used to achieve optimal investment decisions.

Quality of life

One of Iowa's greatest resources is the quality of life that exists within its borders, which is directly supported by the state's transportation services. Iowans value the ability to travel with ease, and the mobility provided by Iowa's transportation services supports its residents and economy while being sensitive to the environment.

Table 2.1 shows how the three goals of Iowa in Motion relate to the national freight goals.

Table 2.1: Linkage between Iowa in Motion – Planning Ahead 2040 goals and national freight goals

		Iowa in Motion - Planning Ahead 2040 goals		
	National freight goals	Safety	Efficiency	Quality of life
1	To identify and invest in infrastructure improvements, policies, and operational innovations	X	X	X
2	To improve safety, security, efficiency, and resiliency	X	X	X
3	To achieve, maintain, and improve the state of good repair	X	X	X
4	To use innovation and advanced technology to improve the safety, efficiency, and reliability	X	X	X
5	To improve economic efficiency and productivity		X	X
6	To improve reliability	X	X	X
7	To improve the short- and long-distance movement of goods		X	X
8	To improve the flexibility of states to support multi-state corridor planning and the creation of multi-state organizations		X	
9	To reduce the adverse environmental impacts of freight movement	X		X
10	To pursue the goals described in this subsection in a manner that is not burdensome to state and local governments		X	X

Source: Iowa Department of Transportation and U.S. Department of Transportation

2.3 FAC goal

The FAC was created as a forum to assist the Iowa DOT in better understanding the complexities associated with freight movements in order to more effectively guide public investment in the transportation system. The mission and overall goal of the FAC are summarized as follows.

- **Mission:** To guide the Iowa DOT in fostering a safe, efficient, and convenient multimodal freight transportation system to enhance the competitiveness of Iowa's business and industry.
- **Goal:** Through education, discussion, and review, the FAC will assist and advise the Iowa DOT on freight mobility policies, programs, and investments.

The group meets on a quarterly basis and includes representatives from the rail, trucking, barge, distribution, energy, and agribusiness industries. Regional marketing groups, metropolitan planning organizations, regional planning affiliations, and a variety of state and federal agencies are also represented at the meetings.

More information on the FAC is available in Chapter 8, Iowa's decision-making process.

3. Economic context of freight transportation planning

Having a safe, efficient, and reliable freight transportation network is essential for the future economic health of the state. High-performing highways, railroads, barge terminals, pipelines, and airports allow Iowa businesses and consumers to trade and purchase goods in a global market. Improvements to our freight system will lower costs for users and make Iowa more attractive in a highly competitive market for jobs and industry. Failure to maintain our freight system will most likely result in the loss of opportunities for jobs and economic development.

The following trends and observations show the linkage between freight transportation and the vitality of the state, national, and global economies. This information will lay the groundwork for understanding Iowa's primary drivers for economic growth and potential opportunities to expand by exploring the overall economy, freight-dependent industries, and essential supply chains.

3.1 Iowa's diverse economy

While categorized by many as simply an "agricultural state," in reality the economic landscape of Iowa is much more complex. The state has transformed its agricultural economy over the past 50 years to a diversified one covering a wide range of industries, including manufacturing, food processing, financial services, and biotechnology. As a result, Iowans enjoy a strong economy and numerous business opportunities in a variety of industry segments.

As recognized in a recent economic study by Battelle Technology Partnership Practice,[1] Iowa has made substantial economic progress in recent years despite the Great Recession (December 2007 to June 2009) and slow national recovery. The state has outpaced the nation in both gross domestic product (GDP) gains and total job gains in the last five years, and now exceeds its prerecession levels in both economic output and total employment. A large driver of this increase is the growth in Iowa's major industry clusters, which will be discussed later in this chapter.

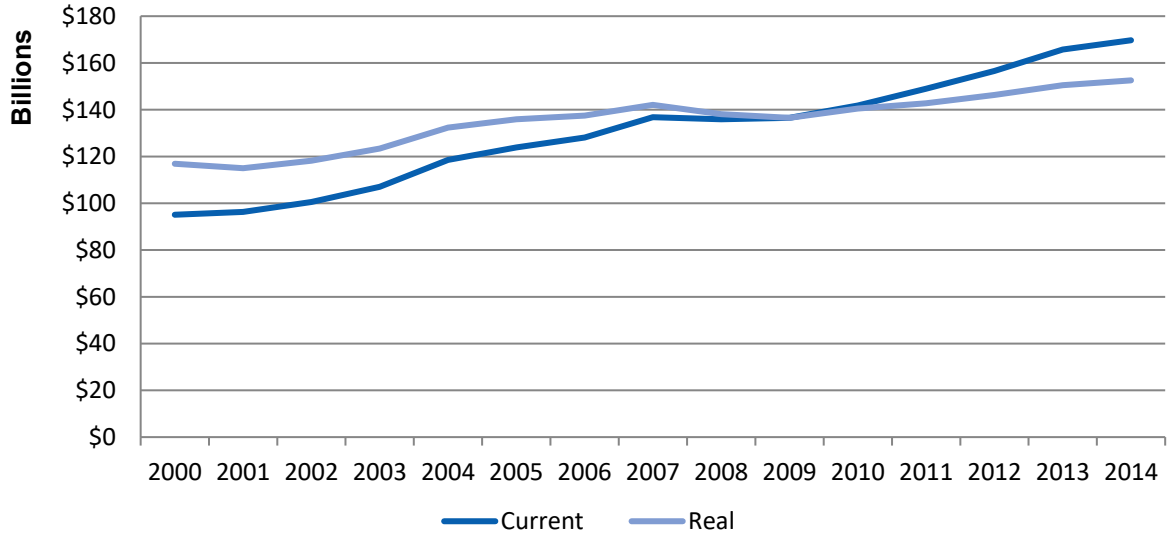
[1] "Iowa's Re-Envisioned Economic Development Roadmap." Battelle Technology Partnership Practice. Iowa Economic Development Authority. <http://www.iowaeconomicdevelopment.com/Resources/battelle>.

GDP

The GDP is the total market value of everything – goods and services – produced in the economy. It is calculated in current dollars as well as real dollars. The word "real" refers to the adjusted total that serves to remove the effects of inflation. Since 2000, Iowa's current and real GDP have continued to grow, as shown in Figure 3.1.

In 2000, Iowa's GDP in current dollars equaled $95.1 billion. In 2014, Iowa's current-dollar GDP had grown by 78.5 percent to $169.7 billion and ranked 30th in the United States. Iowa's real GDP in 2014 totaled $152.6 billion compared to $116.9 billion in 2000, a 30.5 percent increase. During this same time period, the U.S. economy increased by 27.1 percent in real GDP. Section 3.3 provides more detail about the specific industry sectors contributing to the state's GDP.

Figure 3.1: Iowa gross domestic product, 2000-2014



Sources: U.S. Bureau of Economic Analysis

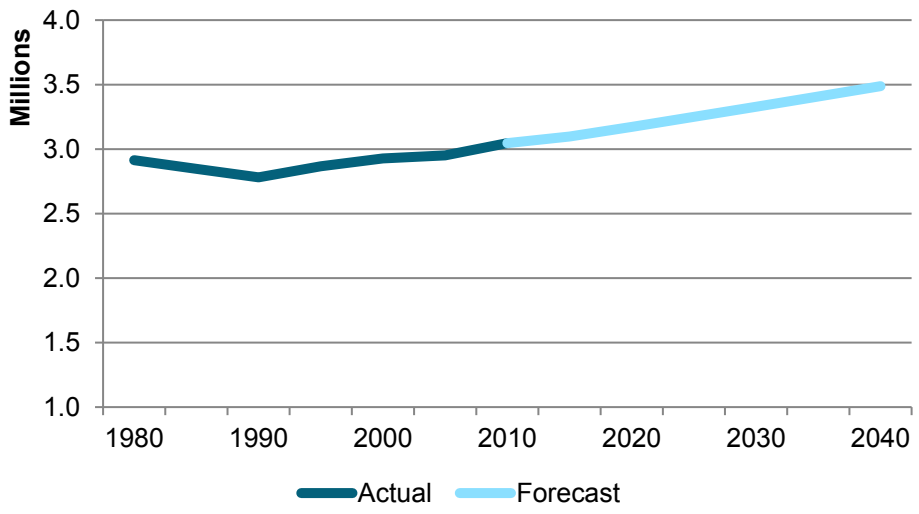
Iowa policy makers have plans and strategies to ensure this growth in economic output continues in the future. A major key to continuing the positive trend will be having the necessary transportation infrastructure in place for businesses and shippers.

Population

Freight demand in Iowa is driven not only by overall economic growth, but also by population growth, population distribution patterns, and income changes in the state. Population growth and density are important for understanding economic and social well-being. Much like the U.S. total population, Iowa's population has continued to shift from rural to urban areas. These shifts in the number and location of people can affect the freight transportation network by changing delivery patterns and product demand.

The state's population has remained relatively stable since 1980, growing 4.6 percent over the past 30 years. It is projected that Iowa's population will increase from 3 million in 2010 to approximately 3.5 million in 2040, as shown in Figure 3.2. Iowa's population growth from 2000 to 2010 was slower than the national growth rate, but was fairly consistent with the Midwest[2] region. According to the 2010 Census, Iowa's population grew 4.1 percent from 2000 to 2010, compared to 3.9 percent in the Midwest region and 9.7 percent nationally.

Figure 3.2: Iowa population, 1980-2040



Sources: U.S. Census Bureau, Woods and Poole Economics Inc.

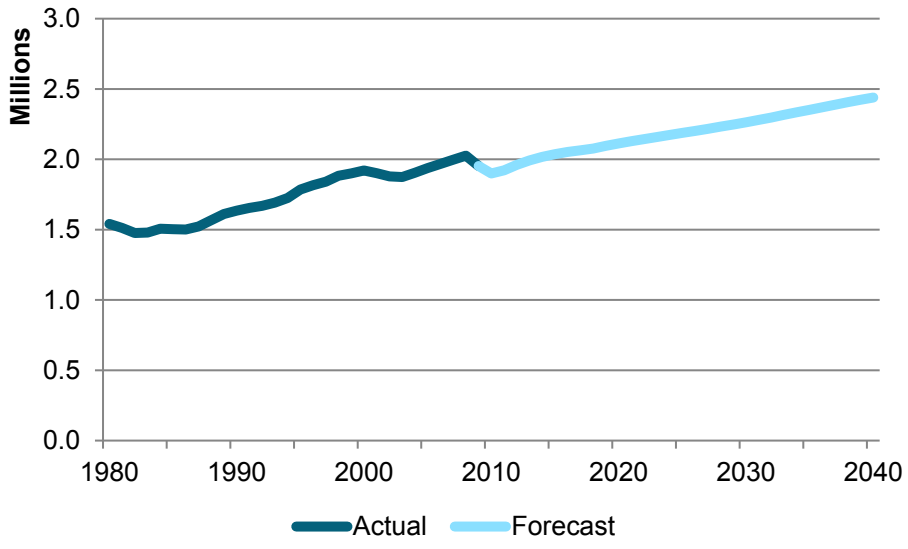
Population growth is fundamental to freight demand. The resulting rise in the consumption of goods and services increases the need for freight transportation. The projected population growth in Iowa will drive the demand for regional and national products and services, requiring additional freight transportation capacity throughout the state.

[2] The U.S. Census Bureau defines this region as the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

Employment

Population is also considered an indicator of workforce availability – a critical factor for the state's economic development and growth. Iowa is among the leading states in terms of low unemployment rates. Currently, the 3.8 percent unemployment rate is more than 33 percent below the national average. In the past 30 years, total employment in Iowa has increased, growing about 32.2 percent from 1980 to 2014. From 2000 to 2014, total employment went from roughly 1.9 million to 2.1 million, a 6.2 percent increase. This was less than the national gain of 12.4 percent. Iowa employment numbers are expected to continue increasing by roughly 28 percent by 2040. Figure 3.3 charts the actual and projected total employment in Iowa from 1980-2040.

Figure 3.3: Iowa employment, 1980-2040



Sources: U.S. Bureau of Economic Analysis, REMI Economic Models Inc.

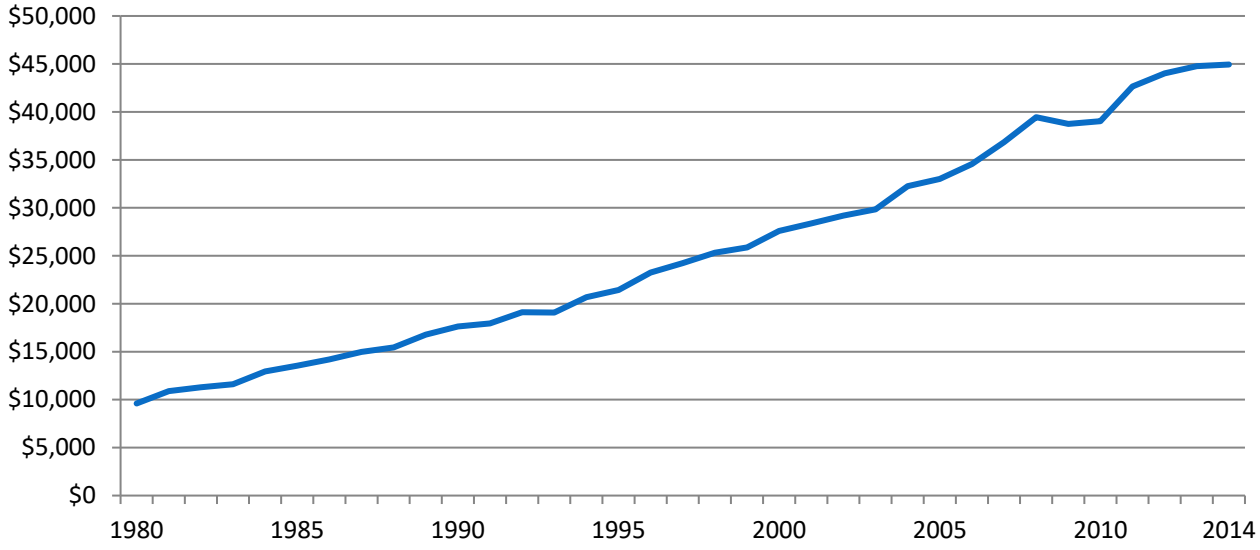
Much of this growth can be attributed to an increase in middle- and high-skilled positions throughout the state. At the same time, the number of low-skill jobs has declined as both employers and employees transition to a more skilled workforce. For freight in the state of Iowa, this means increasing automation and improving worker productivity.

Per capita income

While growth of Iowa's population and employment since 2000 trailed national gains, the increase in per capita personal income has outpaced U.S. trends. Per capita income is the income per person in the last 12 months, therefore showing the general economic well-being and the quality of life of people in a given area or region. Typically, the general well-being of an area reflects the amount of capital going into the economy. This dictates the demand for goods and services, which in turn affects demand for freight transportation.

Per capita income in Iowa was $9,603 per person in 1980. This total has steadily increased over time and rose to $44,937 in 2014, ranking 24th in the nation. Since 2000, per capita income in the state has increased 62.9 percent, while the U.S. increase was just 50.6 percent. Over the same time period, Iowa's nonfarm personal income grew 68.9 percent, which is just below the 69.9 percent increase experienced by the nation. Figure 3.4 shows the overall trend of per capita income in the state since 1980.

Figure 3.4: Iowa per capita income, 1980-2014



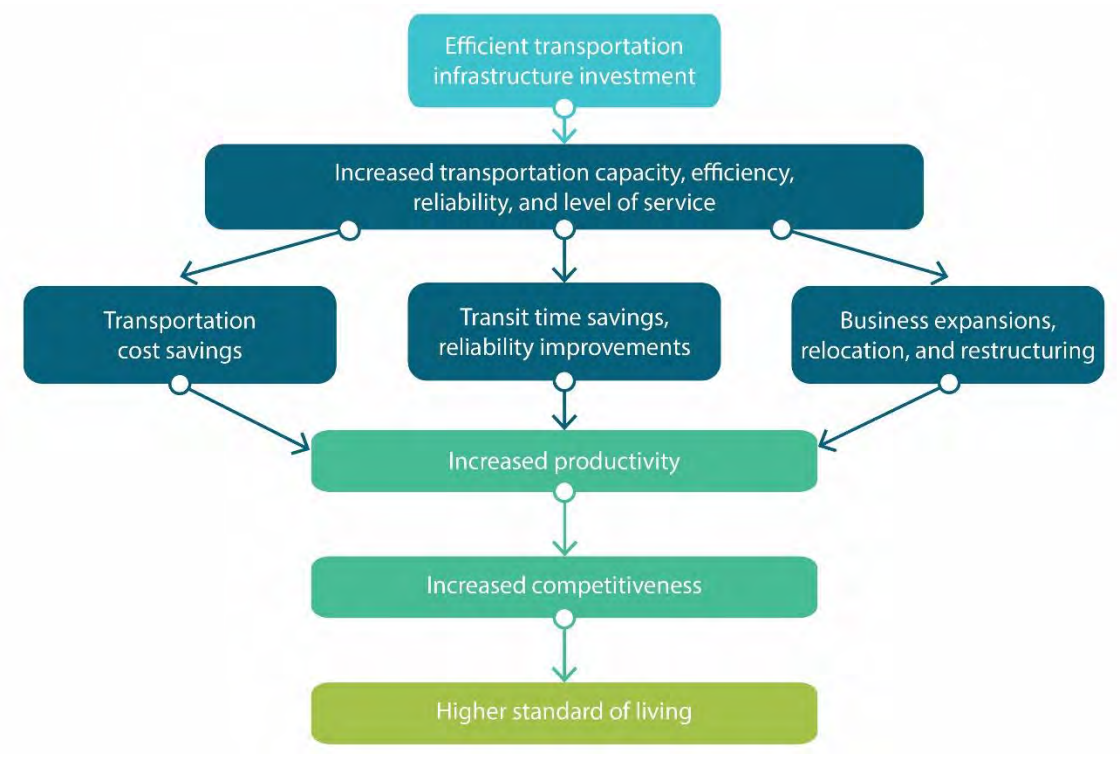
Sources: U.S. Bureau of Economic Analysis

3.2 Multimodal freight transportation helps sustain and grow the economy

Transportation powers the creation of wealth in the state and nation, unleashing the opportunity for economic activity. The state's economy is dependent on a robust and diverse transportation system to move products to a global marketplace. This system has long been a competitive advantage for businesses in Iowa, and remains so today as the state continues to be a major player in the global economy.

The performance of the freight transportation system affects economic productivity in several ways. Changes in the cost and the quality of freight movement affect both the amount of freight transport that firms buy and the ways in which they use it. At the most basic level, a drop in the cost of goods movement means firms will buy more, which will most likely take the form of shipping products and obtaining inputs, materials, and intermediate products from longer distances. This increases the market that can be served from a given facility by providing access to lower-cost inputs. Figure 3.5 traces the links from an improvement in freight transport to a higher standard of living.

Figure 3.5: Transportation and the economy



Source: ICF Consulting, 2010 and Beyond: A Vision of America's Transportation Future

As the figure shows, improvements in the quality of transportation (i.e., capacity, efficiency, and reliability) result in reduced transit times and greater reliability of delivery times. Both of these effects, and especially the latter, impact the way in which firms design their logistics systems. These improvements also open the door for transportation cost savings, as well as potential business expansions and restructuring. Lower transit times increase the "reach" of facilities such as factories and distribution centers; if these facilities can be more widely spaced, a given market area can be served with fewer facilities. Since fewer facilities for a given flow of goods means more volume per facility, operating costs, as well as investment costs, may be reduced. Thus, when firms consider their logistics arrangements and the design of their distribution systems, they will take into account improved freight transport to develop lower-cost systems. The result is more productivity, increased competitiveness with other businesses, and in turn, a higher standard of living for the area as more capital is invested in the region.

Iowa's vibrant transportation system not only adds to the state's economic vitality, but also supports the national economy.

Iowa's freight transportation system boasts a central geographic location and an abundance of transportation options. As a producer-state, meaning one that ships more goods than it receives, and a relatively rural state, this transportation flexibility provides shippers and businesses a strong comparative advantage. This fosters the ability to efficiently and competitively serve domestic and global markets via a single or multiple modes of transportation. Iowa's network of interstates, rail infrastructure, and barge routes combine to provide cost-competitive transportation choices to serve and access markets outside the state. In addition, CNBC's annual business survey[3] consistently names Iowa as one of the lowest cost domestic locations for manufacturing in the country. Combining manufacturing output with the massive volume of agricultural products places a surprisingly large demand for cost-competitive multimodal and intermodal systems. Iowa's vibrant transportation system not only adds to the state's economic vitality, but also supports the national economy.

Chapter 6, Freight transportation assets, provides an in-depth inventory of the state's freight transportation network. By continuing to maintain and invest in the freight transportation system, public and private transportation providers can increase competitiveness for Iowa businesses, strengthen the economy, and raise the quality of life for Iowa citizens.

[3] "America's Top States For Business 2014." CNBC. <http://www.cnbc.com/2014/06/24/americas-top-states-for-business.html>.

3.3 Freight-dependent industries are a key part of economic growth

Without a safe, efficient, and convenient freight transportation system, farmers would not be able to get their goods to market, retailers would have empty shelves, and manufacturers would be unable to ship their products. American farms use cost-competitive transportation to compete against their counterparts around the world. Domestic manufacturers rely on remote sources of raw materials to produce goods. Wholesalers and retailers depend on fast and reliable transportation to obtain cost-competitive or specialized goods. In the expanding world of e-commerce, households and small businesses increasingly depend on freight transportation to deliver purchases directly to them. Service providers, public utilities, construction companies, and government agencies rely on freight transportation to obtain needed equipment and supplies from distant sources.

Iowa's major industries and supply chains are dependent on the freight transportation system and act as the primary drivers of demand. The major industry sectors and businesses that make up any given economy drive the freight transportation demand by consuming and producing materials and goods that must be shipped to and from their locations. Industries and businesses can be divided into two groups according to their dependence on freight transportation: goods-dependent and services.

Goods-dependent industries are made up of businesses that rely on transportation to receive raw supplies and manufactured goods and to send their refined/finished product to market. Service industries are not as dependent on movement of raw or manufactured materials, but rely on smaller shipments of materials, office products, or supplies. Table 3.1 shows which industries are included in the goods-dependent and service categories.

Table 3.1: Goods-dependent and service industries[4]

Goods-dependent industries	Service industries
Agriculture and related	Information
Mining	Finance, insurance, and real estate
Utilities	Professional and business services
Construction	Educational, health care, and social assistance
Manufacturing	Arts, entertainment, recreation, and food services
Wholesale trade	Other services
Retail trade	Government
Transportation and warehousing	

Source: U.S. Bureau of Economic Analysis

The goods-dependent industries are heavily dependent on highways, railroads, ports, and airports to receive materials from suppliers and deliver goods to customers. The growth of these freight-related sectors is directly related to the quality of the state's freight transportation system.

Historically, Iowa's economy and transportation system has been heavily influenced by grain production and its associated food and agricultural products. Iowa continues to have a robust agricultural industry with the now added transportation demands of a greatly expanded value-added agricultural products sector, including such products as ethanol, biofuels, and their byproducts. Additionally, Iowa has a diverse and geographically dispersed industrial base that includes large industrial sectors of manufacturing, trade, construction, transportation, and warehousing.

Analyzing these industries in different ways help provide a clearer picture of which sectors have the greatest impact on Iowa's economy. The following sections examine major industry sectors by GDP contribution, employment, and commodity flows. Furthermore, the importance of domestic and foreign trade, as well as the complexity of supply chains contributing to the economy, will be explored.

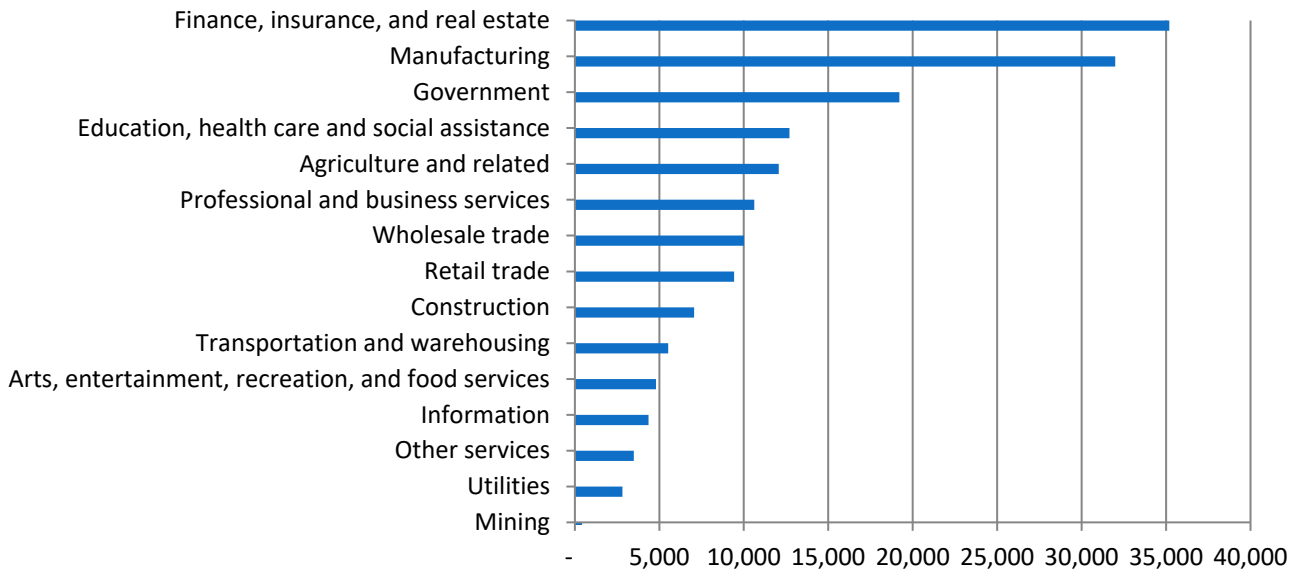
[4] "Guide to Industry Classifications for International Surveys, 2012." U.S. Department of Commerce's Bureau of Economic Analysis. <http://www.bea.gov/industry/pdf/2012_industry_code_guide.pdf>.

Key industries based on GDP

Economic growth in Iowa is driven by the economic performance of major industry clusters in the state. Finance, insurance, and real estate led all industry sectors in contributions to the State of Iowa's GDP in 2013 at $35.2 billion representing 20.7 percent of the total, with the manufacturing sector following at $32 billion representing 18.8 percent. Government accounted for 11.3 percent of the economic output with a contribution of $19.2 billion. The fourth and fifth largest sectors in the state were education, health care and social assistance at $12.7 billion and agriculture and related at $12.1 billion, respectively.

The eight goods-dependent industry sectors contributed $79.3 billion in GDP to Iowa's economy (46.7 percent), while the service industry sectors contributed $90.4 billion (53.3 percent). Figure 3.6 shows the amount of economic output that each industry sector contributed to the state's GDP in 2014.

Figure 3.6: Iowa gross domestic product by industry, 2014 ($ millions)



Sources: U.S. Bureau of Economic Analysis

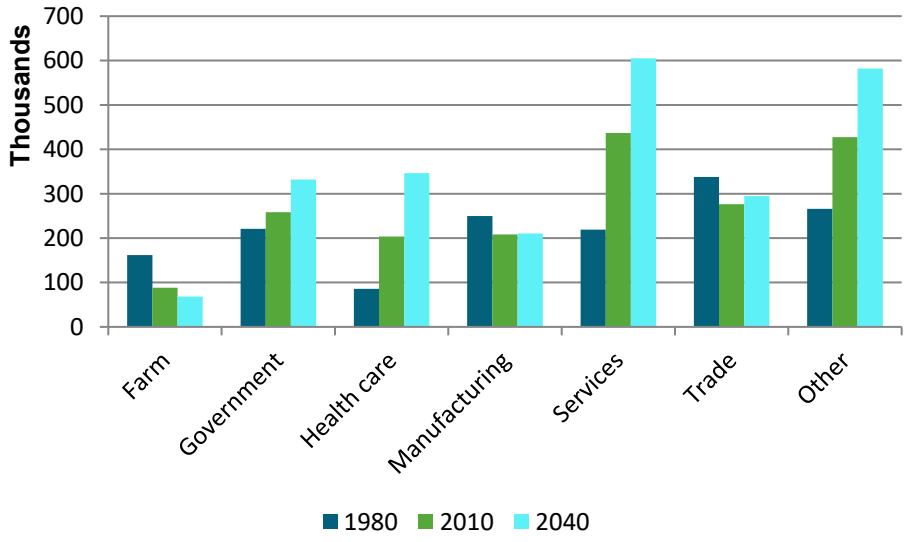
Although the service industries make up the majority of economic output, the eight goods-dependent sectors place more demand on the freight transportation network. Iowa's major manufactured products and agricultural goods, which will be explored later in this chapter, are part of larger supply chains that take advantage of the highways, railroads, and waterways. This reinforces the need for an efficient freight system to drive economic growth.

Key industries based on employment

Traditionally, farming and manufacturing have been two of the primary employment sectors in Iowa. Technological advancements and economic diversification have changed this in recent years. Since 1980, the farm sector has decreased by about 73,000 jobs, which represents a decline of nearly 45 percent in total farm employment in Iowa. The number of family-operated farms is becoming smaller with more and more farms becoming corporate in nature, meaning they are owned by large corporations or companies.[5] This trend is expected to continue with a projected decline of an additional 19,800 jobs through 2040. There has also been a significant decrease in manufacturing employment since 1980 with about 41,700, or 17 percent, fewer jobs than there were 30 years ago. In the future, manufacturing jobs in Iowa are expected to remain nearly flat, growing an estimated 1 percent over the next 30 years.

The largest employment gain from 1980 to 2010 was in the health care and social assistance sector, which grew 138 percent, or nearly 118,000 jobs. The second-largest gain was in the services sector, growing by 99 percent, or about 217,000 jobs, between 1980 and 2010. Figure 3.7 shows employment by sector in 1980, 2010, and projections for 2040.

Figure 3.7: Iowa employment by sector, 1980-2040



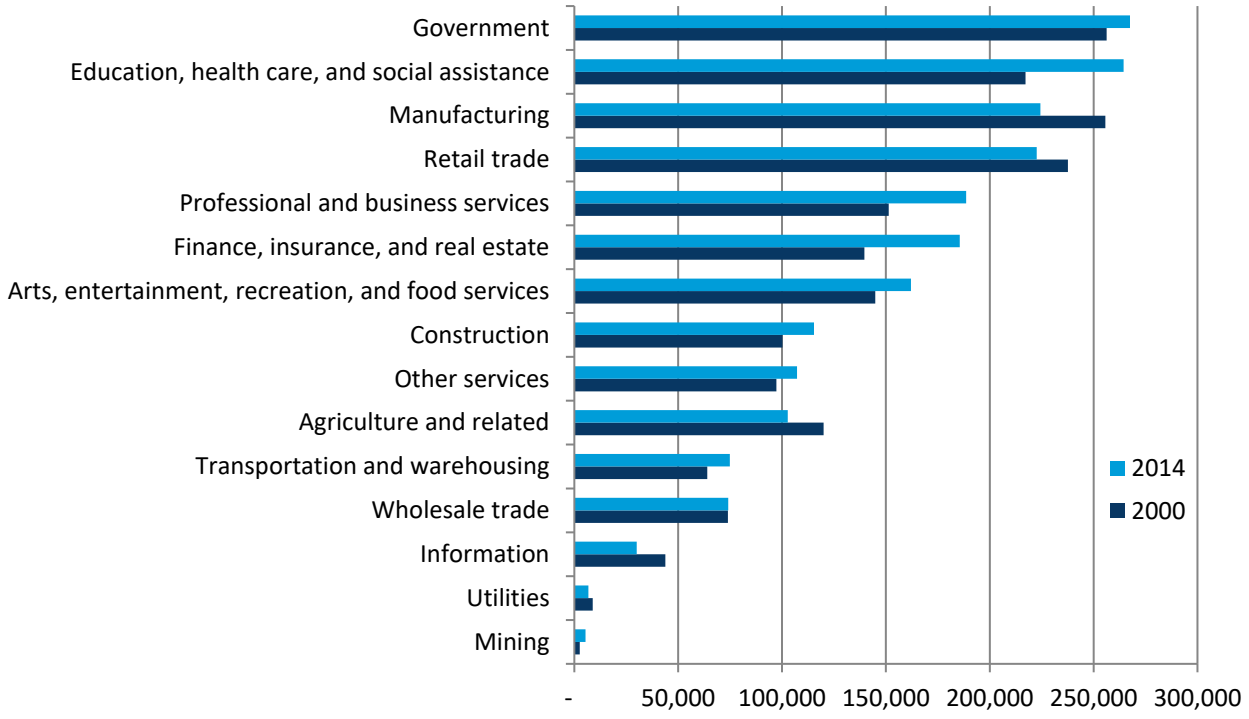
Source: U.S. Bureau of Economic Analysis, REMI Economic Models Inc.

[5] Eller, Donnelle. "Corporate Ownership of Iowa Farms Jumps 11% in 5 Years." Des Moines Register. 2 May 2014. <http://www.desmoinesregister.com/story/money/agriculture/2014/05/03/corporate-ownership-iowa-farms-increases/8650297/?from=global&sessionKey=&autologin=>.

Recent trends show the largest employment gains since 2000 have been in the service industry sectors. The education, healthcare, and social assistance sector and finance, insurance, and real estate sector each added 47,210 and 45,891 new jobs, respectively, with the professional and business services sector following with an increase in 37,329 jobs. Mining saw the largest increase based on percentage rising a total of 107.2 percent, but added only 2,779 jobs.

Other goods-dependent industries showing growth were transportation and warehousing (16.9 percent), construction (15.1 percent), and wholesale trade (0.2 percent). Retail trade, agriculture, manufacturing, and utilities have all lost jobs since the turn of the century. Figure 3.8 shows employment by industry in 2014 compared to that of 2000.

Figure 3.8: Iowa employment by industry, 2000-2014



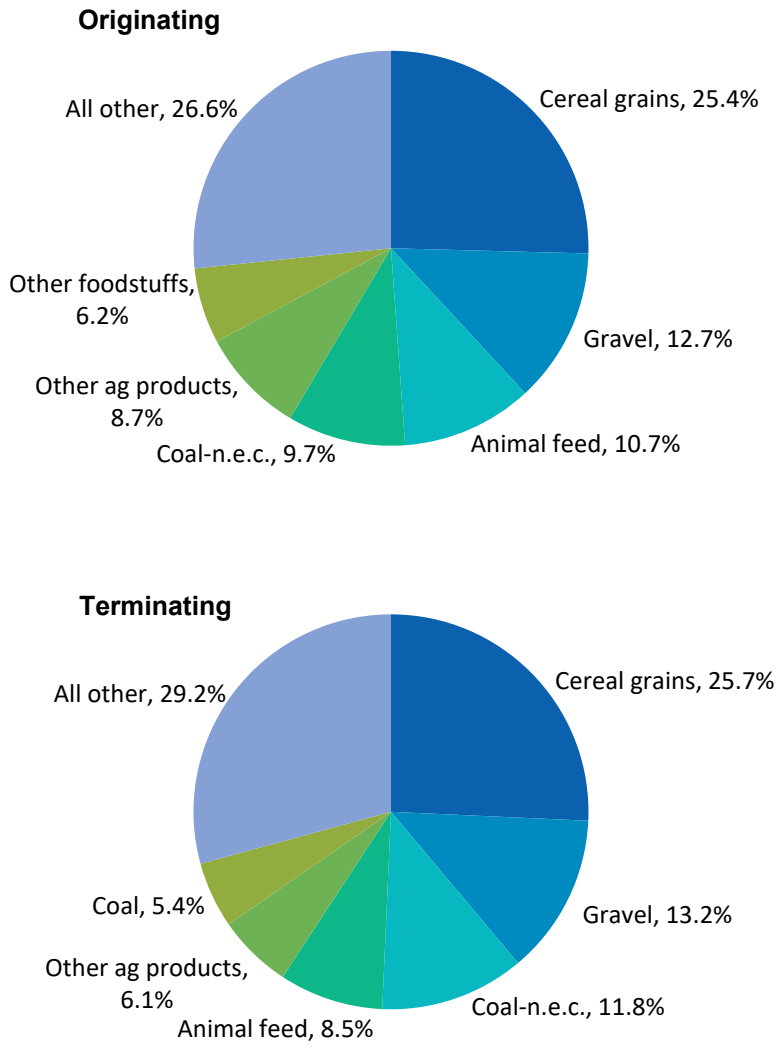
Source: U.S. Bureau of Economic Analysis

Key industries based on freight flows

Interstate movements

Although there has been a large drop in agricultural jobs over the past years, agricultural productivity has greatly increased. According to the Federal Highway Administration's Freight Analysis Framework, many of the commodities moving to, from, and within Iowa are related to the agricultural industry. Figure 3.9 shows the percentage that each of the top six commodities account for by weight originating and terminating in Iowa. These commodities are typically high-weight but low-value bulk shipments. Intrastate commodity movement will be discussed later in this section.

Figure 3.9: Top commodities originating and terminating in Iowa by weight, 2012



Source: Federal Highway Administration's Freight Analysis Framework

Iowa is one of the leading states in the production of corn, soybeans, eggs, pork, and beef each year. However, cereal grains (includes corn, oats, and wheat) in terms of weight account for 101 million tons originating in the state and 97.1 million tons terminating in the state, far more than any other commodity. As the result of being the nation's leading corn-producing state, cereal grains make up nearly 25.4 percent of the total commodities shipped from Iowa, as well as 25.7 percent of the total commodities received into the state (for processing and transport to export terminals).

The remaining top commodities originating in Iowa include gravel at 12.7 percent, animal feed (includes eggs) at 10.7 percent, coal-n.e.c. (includes natural gas and propane) at 9.7 percent, other agricultural products (includes soybeans) at 8.7 percent, and other food stuffs at 6.2 percent. All other commodities[6] account for 26.6 percent of the total, or 105.8 million tons of the overall 397.3 million tons exported from the state in 2012. The remaining top commodities terminating in Iowa include gravel at 13.2 percent, coal-n.e.c. at 11.8 percent, animal feed at 8.5 percent, other agricultural products at 6.1 percent, and coal at 20.4 percent. All other commodities account for 31.2 percent. Table 3.2 shows the top commodities originating and terminating in Iowa by total tonnage.

Table 3.2: Top commodities originating and terminating in Iowa by weight, 2012

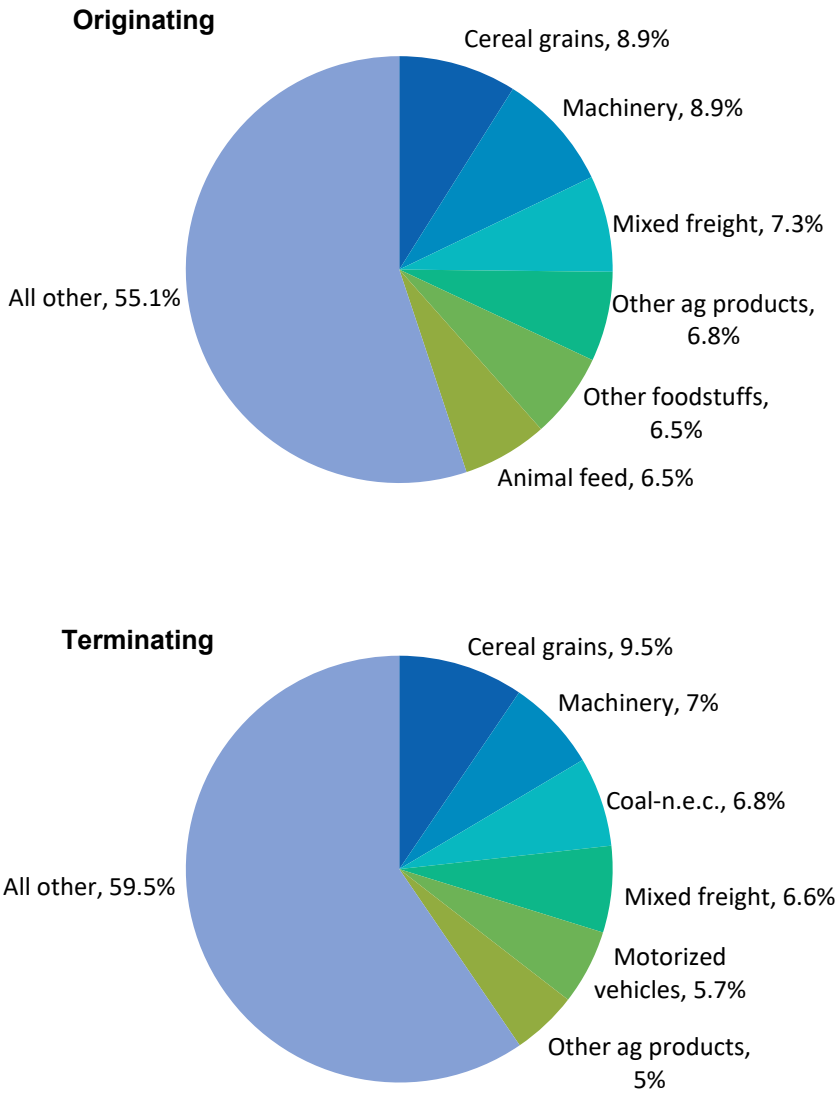
ORIGINATING		TERMINATING	
Commodity	Millions of tons	Commodity	Millions of tons
Total	**397.3**	**Total**	**377.6**
Cereal grains	101.0	Cereal grains	97.1
Gravel	50.4	Gravel	49.7
Animal feed	42.7	Coal-n.e.c.	44.7
Coal-n.e.c.	38.4	Animal feed	32.2
Other ag products	34.4	Other ag products	23.1
Other foodstuffs	24.6	Coal	20.4
All other	105.8	All other	110.4

Source: Federal Highway Administration's Freight Analysis Framework

[6] See the 2012 Commodity Flow Survey Standard Classification of Transported Goods (SCTG) document for more information: <https://bhs.econ.census.gov/bhs/cfs/Commodity%20Code%20Manual%20%28CFS-1200%29.pdf>

The majority of commodities originating and terminating in the state in terms of value are also attributed to the agricultural industry, as well as the manufacturing sector. This includes the two most valuable commodities originating and terminating in Iowa: cereal grains and machinery. The main types of machinery manufactured are for agriculture, which are sold both domestically and internationally. Motorized vehicles, including tractors, are also a major export. Figure 3.10 shows the percentage accounted for by each of the top six commodities by value originating and terminating in Iowa.

Figure 3.10: Top commodities originating and terminating in Iowa by value, 2012



Source: Federal Highway Administration's Freight Analysis Framework

Following cereal grains and machinery, the next most valuable commodities originating in Iowa are mixed freight, other agricultural products, other foodstuffs (includes dairy products), and animal feed. All other commodities originating in the state account for 55.1 percent of the total value or $132.9 billion.

The list for commodities terminating in Iowa in terms of value is very similar. After cereal grains and machinery, the list includes coal-n.e.c., mixed freight, motorized vehicles (includes tractors), and other agricultural products. All other commodities terminating in the state account for 59.5 percent of the total value or $135.1 billion. Table 3.3 shows the top commodities originating and terminating in Iowa by total value.

Table 3.3: Top commodities originating and terminating in Iowa by value, 2012

ORIGINATING		TERMINATING	
Commodity	Value ($ millions)	Commodity	Value ($ millions)
Total	**$241,115**	**Total**	**$226,863**
Cereal grains	$21,556	Cereal grains	$21,519
Machinery	$21,513	Machinery	$15,814
Mixed freight	$17,613	Coal-n.e.c.	$15,403
Other ag	$16,410	Mixed freight	$14,872
Other foodstuffs	$15,588	Motorized	$12,887
Animal feed	$15,570	Other ag	$11,282
All other	$132,866	All other	$135,086

Source: Federal Highway Administration's Freight Analysis Framework

Intrastate movements

The commodities moving within Iowa have just as significant of an impact on the freight transportation system, if not more, as the imported and exported commodities discussed. For the commodities that both originate and terminate within the state, cereal grains lead in tonnage and value, accounting for 80.5 million tons and $17 billion. That is 33.1 percent of the total tonnage and 17.8 percent of the total value. In terms of tonnage, cereal grains are followed by gravel, animal feed, other agricultural products, and nonmetal mineral products. All other commodities account for 46.2 million tons or 19 percent of the total. In terms of value, cereal grains are followed by animal feed, other agricultural products, live animals/fish, mixed freight, and machinery. All other commodities account for $40 billion or 42 percent. Table 3.4 shows the top commodities moving within Iowa by tonnage and value.

Table 3.4: Top commodities moving within Iowa, 2012

Commodity	Millions of tons	Commodity	Value ($ millions)
Total	**243.2**	**Total**	**$95,335**
Cereal grains	80.5	Cereal grains	$16,966
Gravel	47.7	Animal feed	$9,093
Animal feed	29.1	Other ag products	$8,816
Other ag products	18.9	Live animals/fish	$8,568
Nonmetal mineral products	14.2	Mixed freight	$7,098
Other foodstuffs	6.5	Machinery	$4,769
All other	46.2	All other	$40,024

Source: Federal Highway Administration's Freight Analysis Framework

3.4 Supply chains rely on the multimodal freight transportation system

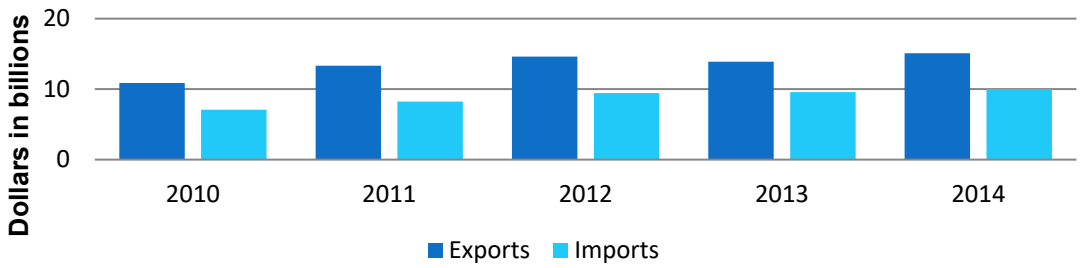
Trade with other countries

Globalization and the increasing interdependence of the world's economies have had an instrumental effect on the magnitude and distribution of global freight activities. As previously stated, Iowa is a producer state and receives more goods than it ships. Transportation costs, on average, account for 5 to 6 percent of total corporate sales across all industries.[7]

In some of the major industries in Iowa, such as agriculture and heavy machinery, transportation costs are estimated to be much higher – from 15 to 40 percent of total landed costs[8] – because the commodities are heavier and shipped in high transportation volume in those industries. Using these figures, a low-end estimate of $900 million to $1.08 billion was expended transporting goods from Iowa to destinations in 2012. Reducing transportation costs for companies exporting products from Iowa is a vitally important goal of supply chain planning and optimization in the private sector.

Since 2010, Iowa exports and imports to and from other countries have steadily increased each year, except for a slight decrease in 2013. In 2010, Iowa exported $10.8 billion in goods to other countries, which increased to $15.1 billion in 2014. Iowa's imports in 2014 totaled $10 billion compared to $7.1 billion in 2010. On average, Iowa exports are 50 to 60 percent higher than the value of Iowa imports, as shown in Figure 3.11.

Figure 3.11: Iowa's exports and imports, 2010-2014



Source: U.S. Census Bureau

[7] MacroSys Research and Technology. "Logistics Costs and U.S. Gross Domestic Product." Freight Management and Operations. Federal Highway Administration, Aug. 2005. <http://www.ops.fhwa.dot.gov/freight/freight_analysis/econ_methods/lcdp_rep/index.htm>.

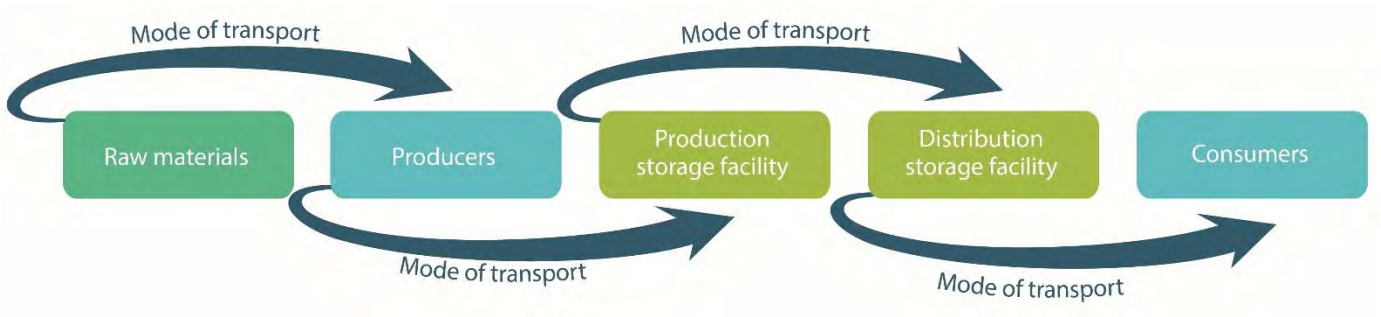
[8] Total landed cost is the total cost of a product once it is delivered at the customer's door. It includes the costs of manufacturing, all brokerage and logistics fees, complete shipping costs, customs duties, tariffs, taxes, insurance, currency conversion, crating costs, and handling fees.

Major supply chains in the state

Although Iowa has a diverse economy made up of many service and goods-dependent industries, agribusiness-related products dominate the state's imports and exports. Whether it is grain, products made from grain, farm machinery, meat, animal health products, or agricultural chemicals, the products moving on the freight transportation system are closely tied to the agricultural industry.

The movement of these commodities from origin to destination is reliant on efficient and profitable supply chains. Supply chains encompass the myriad of multiple transportation legs and logistics functions associated with the complete process of bringing commodities from production to market. They incorporate a network of individuals, processes, and physical entities involved in producing, handling, and/or distributing a specific commodity, all of which are linked together by information and transportation infrastructure. Figure 3.12 shows a basic example of a supply chain that goes from the production of a commodity through various stops and using multiple modes of transportation before reaching the market and ultimately consumers.

Figure 3.12: Basic supply chain diagram



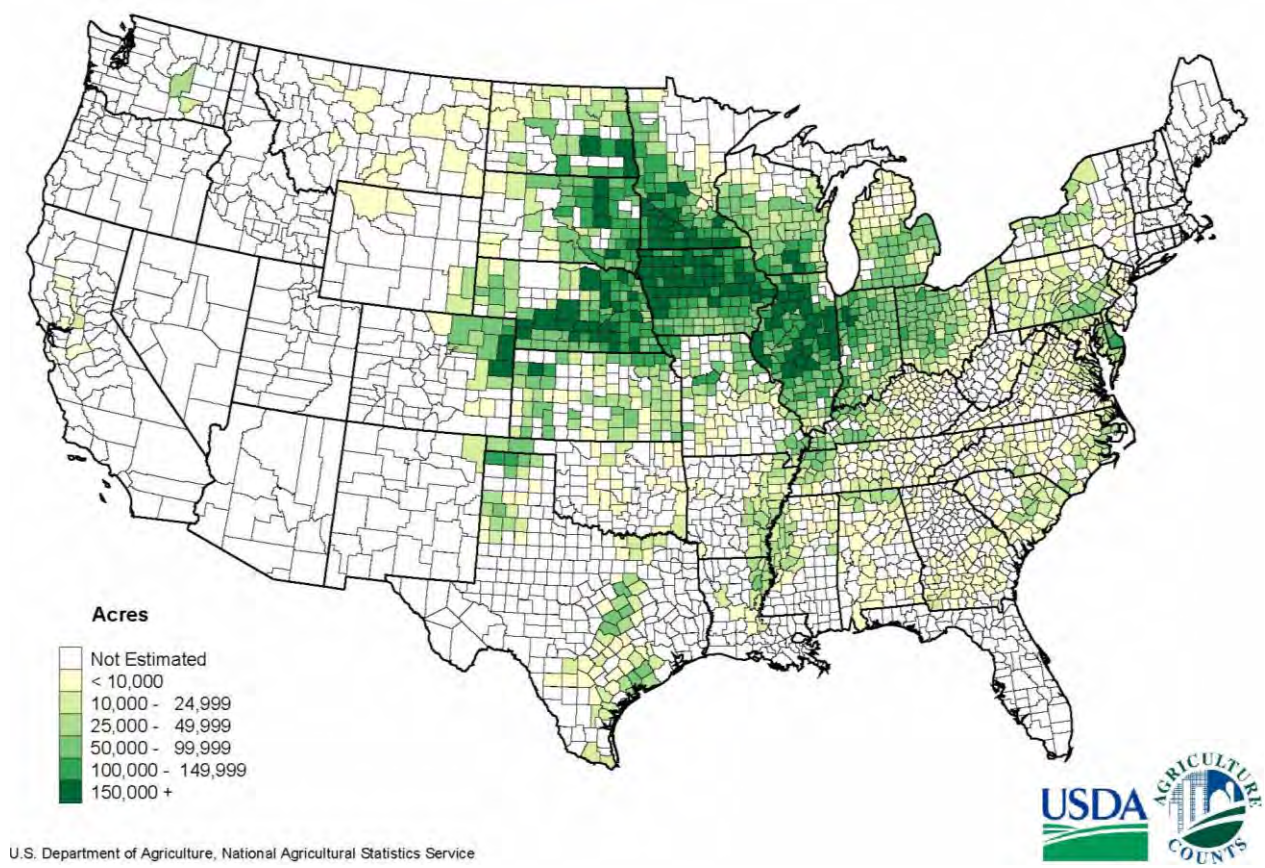
Source: Iowa Department of Transportation

Iowa is fortunate to have transportation infrastructure that has long provided Iowa producers and businesses with a strong comparative advantage, fostering the ability to efficiently and competitively serve domestic and global markets. As a producer-state, it is extremely valuable to have transportation flexibility that includes an advanced highway network, well-developed rail system, and two navigable rivers that open the door to multiple options for producers and businesses to optimize their supply chains. This section will provide an overview for a few of the major supply chains in Iowa. These commodities are not the exhaustive list of important commodities in the state, but are major imports and exports by weight as well as value, and have a large impact on the freight transportation system.

Corn

Iowa corn farmers produced almost 2.4 billion bushels of corn on 13.3 million acres of land in 2014, according to the U.S. Department of Agriculture (USDA). That accounts for 16.7 percent of the total U.S. corn production. This is a consistent trend as the state has produced the largest corn crop of any state each year for almost two decades. Figure 3.13 shows the number of acres of corn harvested in each U.S. county in 2014. The darkest green, representing the most acres, is concentrated in and around Iowa.

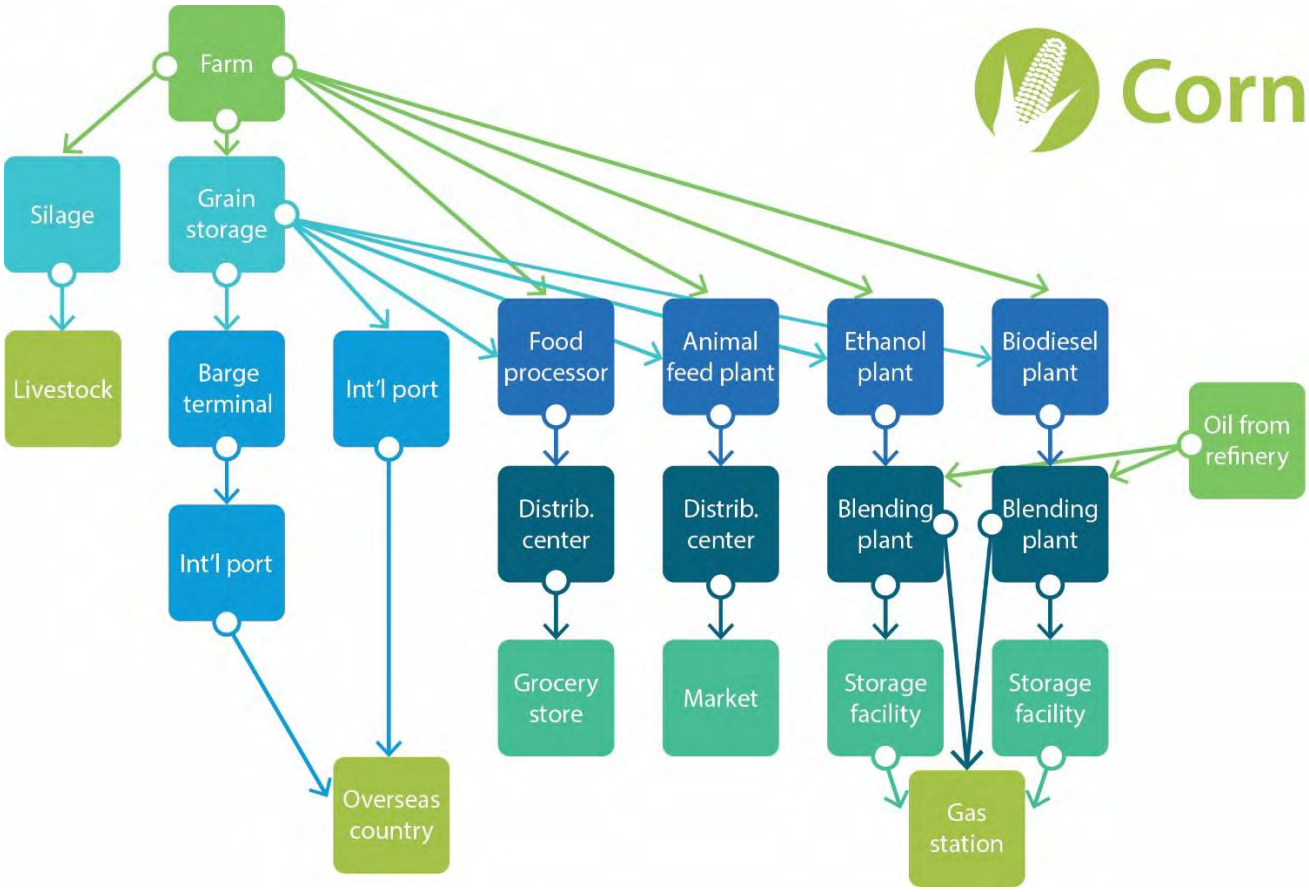
Figure 3.13: Harvested acres of corn, 2014



Source: U.S. Department of Agriculture

With the help of constant innovation over the years, Iowa corn is used to produce countless products in the state and around the world, including food, fuel, pharmaceuticals, oils, sweeteners, starches, and plastics. However, the majority is dedicated to food and fuel. Of the 2014 corn crop, 43 percent was used for ethanol, 15 percent resulted in dried distillers grains (DDGs), 15 percent livestock feed, 9 percent exports, 6 percent residential use, and 12 percent other processing, according to the Iowa Corn Growers Association. Figure 3.14 shows a basic supply chain for Iowa corn.

Figure 3.14: Corn supply chain



Source: Iowa Department of Transportation

Figure 3.14 shows only a fraction of the entire corn supply chain. There are countless other products and byproducts that come from the grain on top of those shown. One-third of the corn that goes into producing ethanol comes out as DDGs – a byproduct of the process that is a high-value feed grain for livestock. In fact, one bushel of corn, which weighs about 56 pounds, can yield three gallons of ethanol and 18 pounds of DDGs. It is estimated that 69.8 million bushels (or 2 million tons) are consumed by Iowa livestock annually, mainly hogs, cattle, and poultry. Another byproduct of corn production is corn stover, the above-ground part of the corn plant remaining after the grain is harvested. This is also used for ethanol production - 1 ton produces about 75 gallons. Two cellulosic ethanol plants began turning stover into ethanol at the beginning of 2014. Stover can also be used for cattle feed, livestock bedding, and building materials.[9]

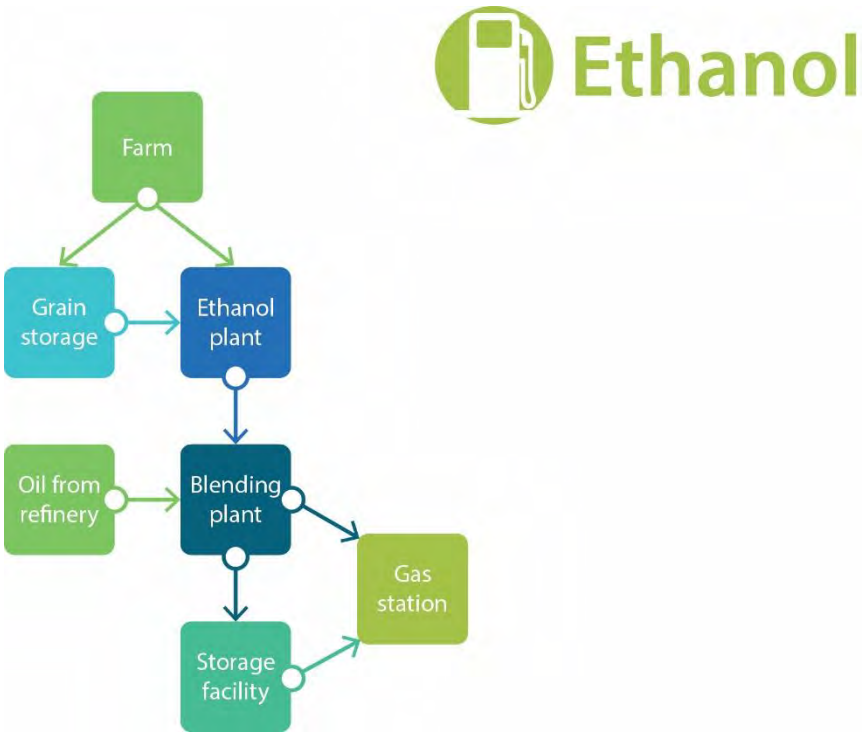
[9] "Infographics." Corn Education. Iowa Corn Growers Association. <http://www.iowacorn.org/en/corn_use_education/infographics/>.

In addition to being the nation's top corn, ethanol, and DDG producer, the readily available grain and its byproducts for consumption by livestock has helped Iowa consistently be a national leader in the production of eggs (first), hogs (first), and cattle (fourth), all of which are major Iowa and U.S. exports to top markets such as Japan, Mexico, and China. Roughly 26 percent of U.S. pork and 13 percent of U.S. beef is exported annually, which is the equivalent of about 450 million bushels of corn being indirectly exported through the livestock.

Ethanol

The state's overall ethanol production continued a trend of steady increase in 2014 producing more than 3.8 billion gallons. Iowa has been the leading producer since 2005, contributing roughly 28 percent of the nation's total ethanol production. Of the 2.4 billion bushels of corn produced in the state, about 43 percent is used in ethanol plants. Figure 3.15 shows a basic supply chain for Iowa ethanol.

Figure 3.15: Ethanol supply chain



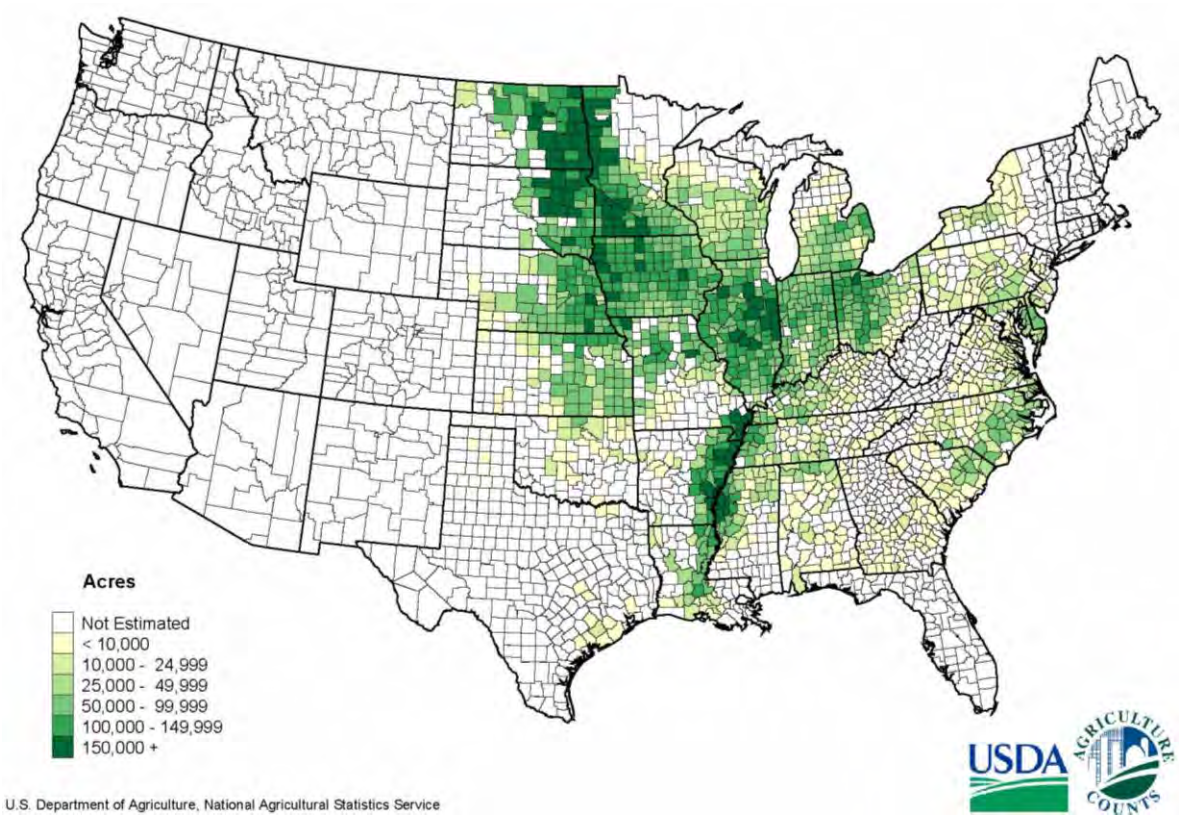
Source: Iowa Department of Transportation

Local grain elevators ship nearly 26 percent of their corn to ethanol plants by truck with an average haul distance of 14 miles in Iowa.[10] For ethanol transported out of state, roughly 60 percent of shippers use rail and the remaining 40 percent use truck. Surrounding states are the primary end users of Iowa's ethanol; however, 23 percent is sold to western states such as Arizona, California, Nevada, and Utah.

Soybeans

Iowa is also a leading state in the production of soybeans, consistently ranking in the top three in the nation each year. Farmers in the state produced nearly 499 million bushels on 9.77 million acres in 2014 with a value of about $530 million. This translates to 12.5 percent of the nation's soybean production. Figure 3.16 shows the number of acres of soybeans harvested in each U.S. county in 2014. Much like harvested acres of corn, the darkest green on the map below, representing the most acres, is concentrated in and around Iowa.

Figure 3.16: Harvested acres of soybeans, 2014

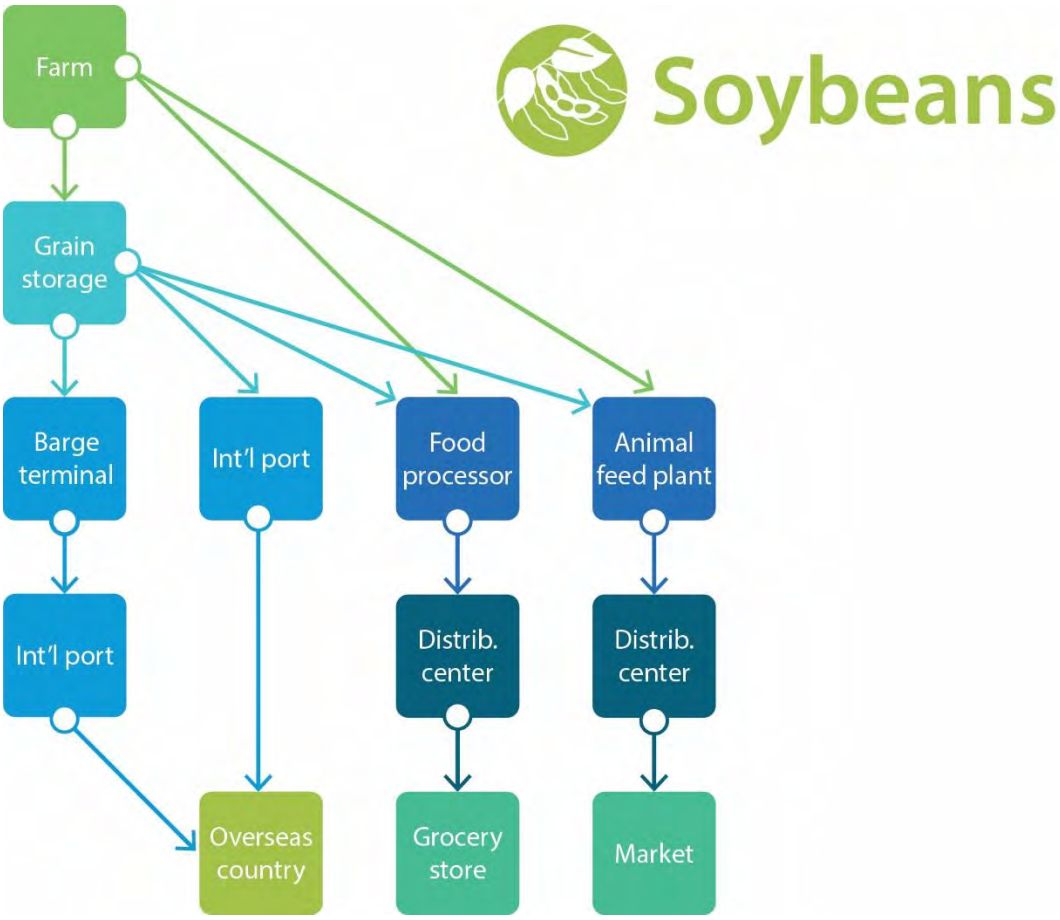


Source: U.S. Department of Agriculture

[10] Gallagher, Paul W., Winnie C. Yee, and Harry S. Baumes. "2015 Energy Balance for the Corn-Ethanol Industry." U.S. Department of Agriculture. Feb. 2016. <http://www.usda.gov/oce/reports/energy/2015EnergyBalanceCornEthanol.pdf>

Soybeans are processed into numerous forms, including soy meal and soybean oil that are used to make valuable products consumed domestically and internationally, according to the Iowa Soybean Association. Soy meal is a major ingredient in animal feed and makes up roughly 75 percent of soybean production. Soybean oil, the second most consumed oil in the world, is used to produce food products such as margarine, salad dressings, and cooking oils, as well as industrial products like plastics and biodiesel fuel. Figure 3.17 shows a basic supply chain for Iowa soybeans.

Figure 3.17: Soybean supply chain



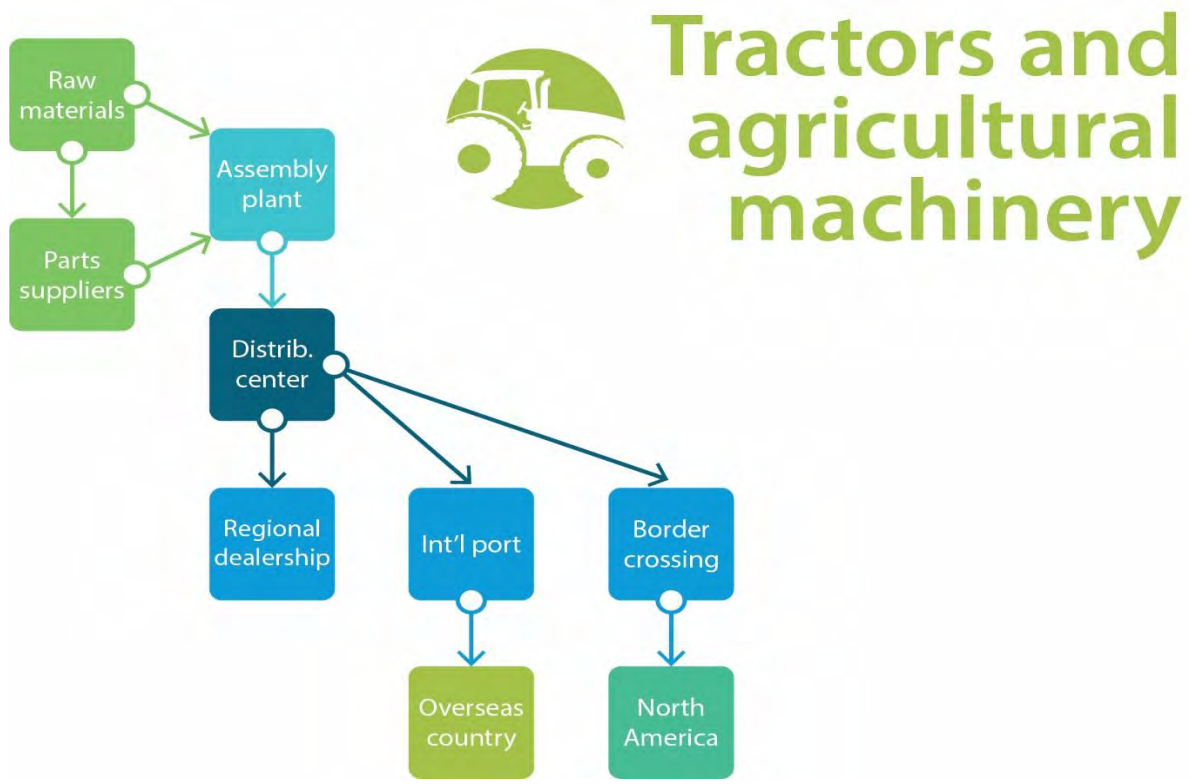
Source: Iowa Department of Transportation

Like corn, soybeans are a major Iowa and U.S. export to countries around the world. The U.S. exported nearly 1.7 billion bushels of soybeans and soy products in 2013, or the equivalent of 1.3 billion bushels (35.4 million tons) of soybeans, meal from 454 million bushels (12.4 million tons), and oil from 186 million bushels (5.1million tons). This was just over half of the total soybean production. Top buyers of soybeans include China, Mexico, and Japan; top markets of soy meal are Mexico, Philippines, and Canada; and the top destinations for soybean oil are China, Mexico, and India.

Tractors and agricultural machinery

To produce record numbers of corn and soybeans, Iowa farmers need the appropriate equipment. The manufacturing of tractors and agricultural/construction machinery is a natural fit for a major agriculture-producing area like Iowa, and has continually developed over the years. These products are now the state's leading manufactured commodities in terms of value. Tractors are Iowa's top manufactured export totaling $966 million in 2014. An additional $277 million in other agricultural machinery was exported.[11] Figure 3.18 shows a basic supply chain for Iowa tractors and agricultural machinery.

Figure 3.18: Tractors and agricultural machinery supply chain



Source: Iowa Department of Transportation

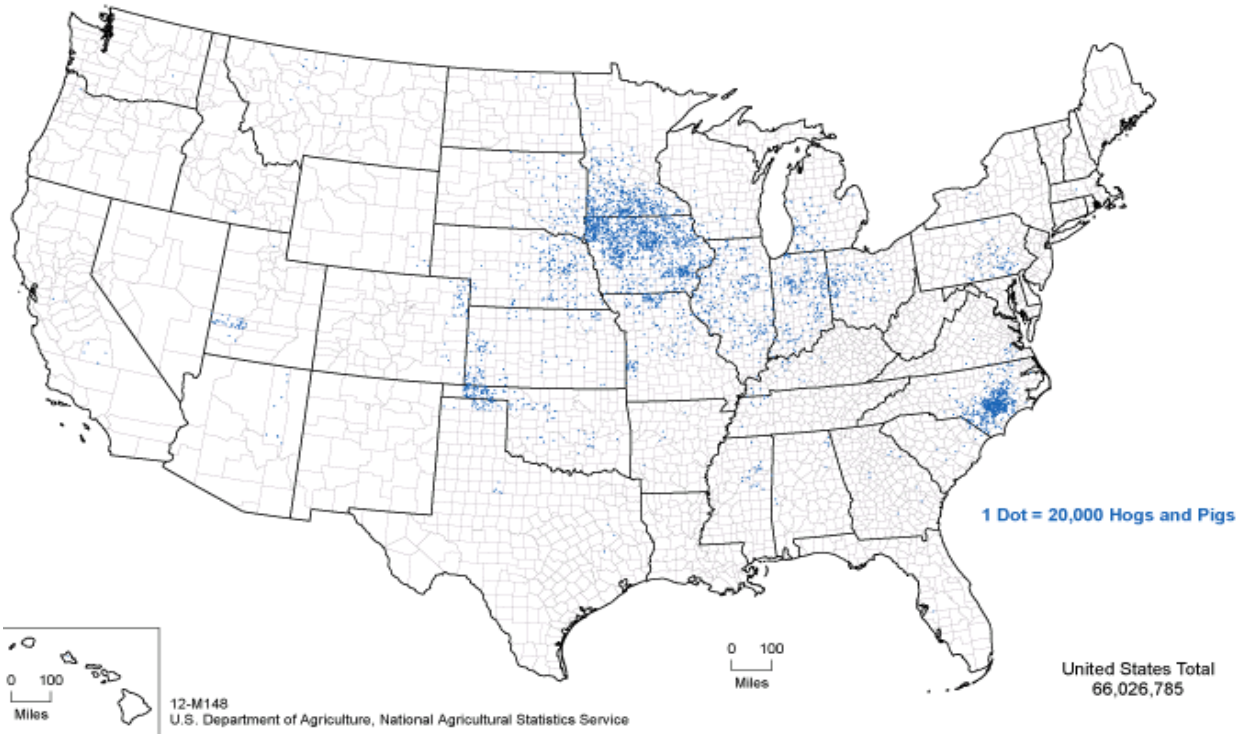
The state is a major manufacturing center for agricultural machinery giants John Deere, Caterpillar Inc., Kinze Manufacturing, Vermeer®, Danfoss, CNH Industrial (CASE, New Holland), Bridgestone/Firestone Agricultural Tire, and Hagie Manufacturing. This leads to Iowa having eight times the concentration of agricultural/construction equipment manufacturing compared to the rest of the nation, resulting in sales of nearly $12 billion per year.

[11] "State Exports from Iowa." Foreign Trade. U.S. Census Bureau, 2016. <https://www.census.gov/foreign-trade/statistics/state/data/ia.html>.

Pork

Iowa is the nation's leading pork producing state in numerous USDA categories, including all hogs and pigs inventory; all hogs and pigs value; pig crop;[12] and pork export value.[13] The state raises nearly one-third of the nation's hogs with 6,266 operations and a total inventory of 20.5 million animals.[14] From this inventory, Iowa produced 10.4 billion pounds of pork with a value of more than $7 billion in 2012. Figure 3.19 shows the total inventory of hogs and pigs by U.S. county in 2012.

Figure 3.19: Inventory of hogs and pigs, 2012

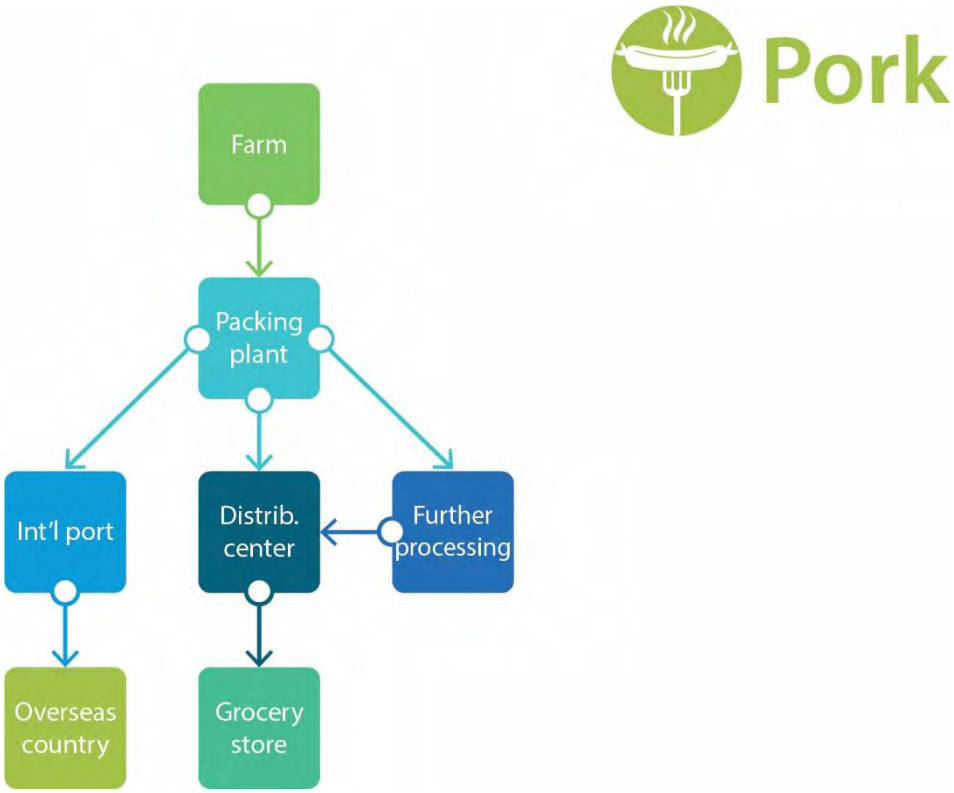


Source: U.S. Department of Agriculture

One hog consumes approximately 9 to 10 bushels of corn from birth to a market weight of 275 pounds. With assets of corn, soybeans, and packing plant capacity, Iowa is an ideal location for pork production. The abundance of materials and capacity within the state lowers the cost of transportation and feed for Iowa farmers. Figure 3.20 shows a basic supply chain for Iowa pork.

[12] Pig crop is the number of pigs weaned or produced from sows that farrowed in the state.
[13] "Iowa's Ranks in U.S. Agriculture." Iowa Corn. Iowa Corn Growers Association. <http://www.iowacorn.org/documents/filelibrary/education/corn_fact_sheets/Iowa_Ranks_in_US_Ag_DC60E1F193D56.pdf>.
[14] "Pork Stats 2014." Iowa Pork Producers Association. Pork Checkoff. <http://www.iowapork.org/wp-content/uploads/2015/06/pork_quickfacts_stats_2014.pdf>.

Figure 3.20: Pork supply chain



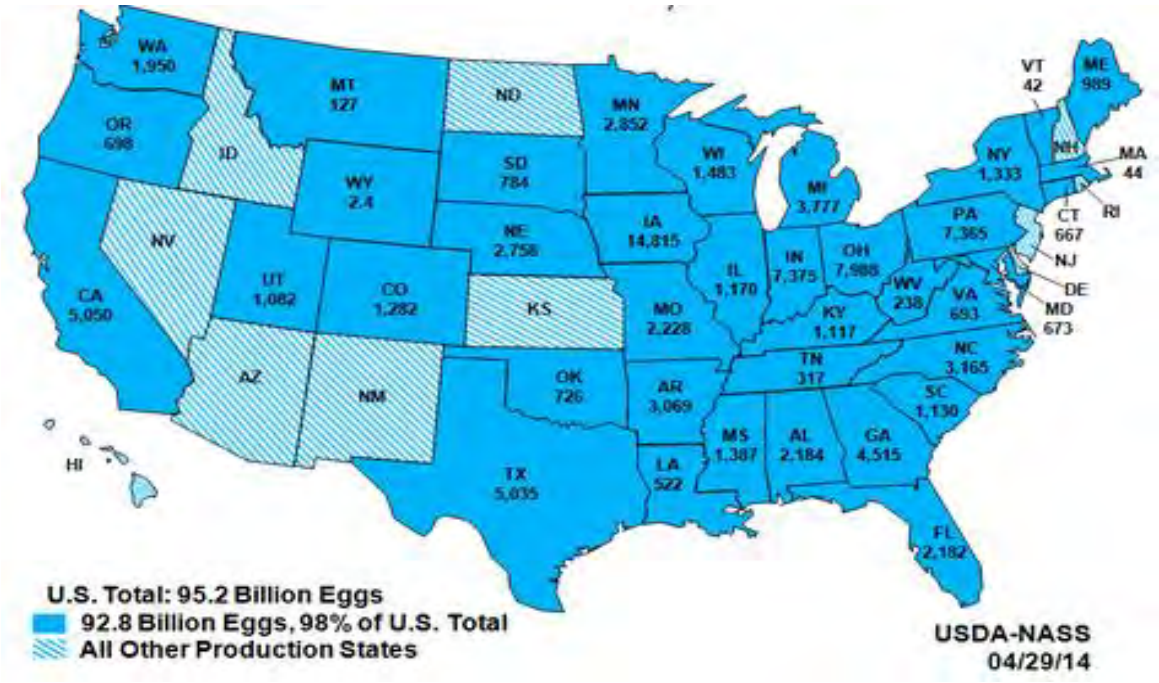
Source: Iowa Department of Transportation

Hogs provide a wide range of products in addition to meat. Many hog byproducts are used in drugs and medical products such as insulin hormones and heart valves for transplants, as well as chemicals used in manufacturing to make glue, upholstery, pet food, lubricants, and cement. In addition to these, one major byproduct from hogs is a necessity for Iowa's corn and soybean farmers: manure to be used as fertilizer for cropland. According to the Iowa Pork Producers Association, 10 pigs from weaning to market provide the nutrient needs of an acre of cropland on a semiannual basis. This helps to enrich the soil for strong corn and soybean yields.

Eggs

Iowa led the nation in egg production in 2014, producing more than the second and third largest producing states combined. This trend has continued for over a decade as the state increased egg output by 150 percent between 1997 and 2006, taking advantage of a growing population and rising egg product consumption in the country. Production in Iowa has steadied since then, and now with about 60 million laying hens, nearly 16.5 billion eggs are produced in the state each year. Figure 3.21 shows annual egg production by state in 2013.

Figure 3.21: Annual egg production by state, 2013 (millions)



Source: U.S. Department of Agriculture

A significant reason for Iowa leading the nation in egg production is the competitive advantage the state has with affordable and abundant feed, which makes up about 67 percent of egg production costs. The laying hens alone consume more than 50 million bushels of corn and more than 450,000 tons of soybean meal each year. Iowa egg producers do not have the large additional cost of transporting feed like many other states. Iowa also has a feed price advantage due to its extensive feed-grain production and will likely maintain that advantage for the foreseeable future.[15] Figure 3.22 shows a basic supply chain for Iowa eggs.

[15] Otto, Dan, Maro Ibarburu, and Lee Schulz. "Economic Importance of the Iowa Egg Industry." (2014). Iowa State University. <http://store.extension.iastate.edu/Product/Economic-Importance-of-the-Iowa-Egg-Industry-2014-Update>.

Figure 3.22: Egg supply chain

Source: Iowa Department of Transportation

The Iowa egg industry is an important value-added activity, contributing $2 billion in total sales annually and providing nearly 8,000 jobs across the state. As long as Iowa can maintain its competitive production and transportation advantage, in addition to adapting and utilizing new technologies, the state will remain a leading egg producer for the foreseeable future.

Summary

The crucial link between transportation and economic development is complex with a multitude of factors playing a part. Iowa's industries drive economic growth, businesses in each industry sector rely on efficient supply chains to be profitable, and supply chains rely on the freight transportation system to deliver goods and materials safely, efficiently, and reliably. Improvements to this freight system will only increase the economic viability of the state and the quality of life for Iowans. The opportunity to strengthen the freight network and economy requires the commitment of policies and investments to strategically coordinate and direct growth.

4. Trends and issues

The advancement of globalization leads to constantly shifting market variables. This makes adapting and evolving a challenge for all involved parties, including manufacturers, shippers, and government agencies. To be proactive in addressing developing patterns and overcoming new obstacles, it is necessary to identify current trends and issues and attempt to forecast the changes that will come. This chapter will begin to investigate modal trends that show indicators of each mode's status relative to freight movement.

4.1 Modal trends

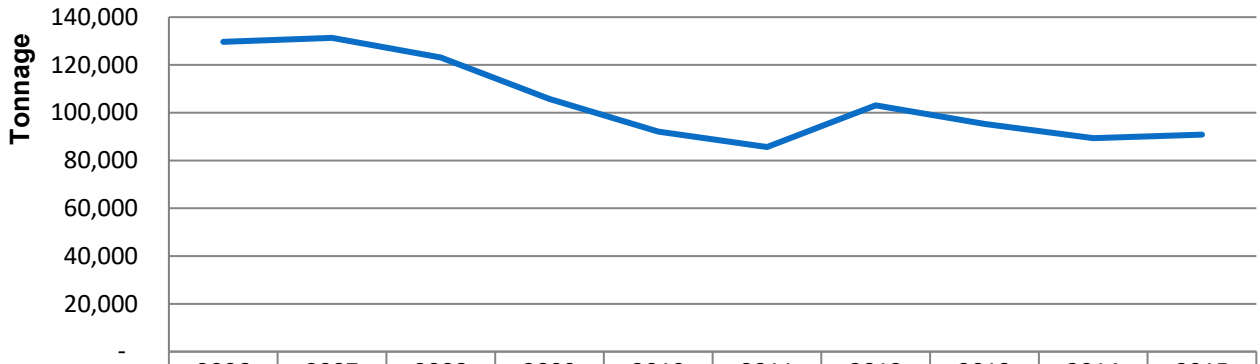
Like many other states, the majority of freight in, out, and around Iowa is moved by truck and rail, both of which have experienced steady growth over the past two decades. Iowa has the advantage of a vast network of highways and railroads to serve these movements. Freight is also moved in the state via air and water. Over the past 10 years, air cargo movements have declined as trucking has been integrated into delivery systems lessening the demand for air service. Iowa's two major waterways, the Mississippi and Missouri rivers, move primarily grain and other bulk commodities to and from Iowa and provide access to the nation's extensive network of inland waterways. The following are trends that apply to each of the freight modes: air, highway, railroad, and waterway.

Air

Cargo moved by air has been variable

In the last decade, the aviation industry has experienced positive and negative changes related to security, the economy, the cost of aircraft operation, and changes in aircraft and navigational options. Declines in enplanements and cargo transport reflect these changes. In addition, the primary air cargo users in the state, FedEx and UPS Inc., have reduced their use of the mode and moved cargo to truck. As shown in Figure 4.1, the total amount of reported air freight moved through airports in Iowa has decreased from 129,685 to 90,794 tons in the last 10 years. The largest decrease took place between 2007 and 2011, with relatively steady tonnage since.

Figure 4.1: Iowa reported air cargo, 2006-2015



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cargo (tons)	129,685	131,324	123,132	105,737	92,120	85,634	103,099	95,289	89,340	90,794

Source: Iowa Department of Transportation, Office of Aviation

The lack of growth in air cargo can be attributed to a number of factors. Some of the existing barriers to growth include:

- Iowa has excellent surface transportation (i.e., highways, railroads, and waterways) infrastructure as well as a terrain that makes it the overwhelming choice for cargo movement.
- The state is bordered by large cargo airports in Minneapolis, Minnesota; Rockford, Illinois; and Kansas City, Missouri. The current business model involves trucking cargo to these larger air cargo hubs.
- The price of aircraft fuel, in recent years, has made surface transportation a more affordable choice.
- A looming pilot shortage makes it challenging for airlines to stay fully staffed.
- Current airline business models include using regional jets with less room for cargo.

Other developing trends may impact aviation

Additional trends that will be monitored for potentially significant impacts to the Iowa aviation system include changes related to the economy, new technologies, security, and regulatory impacts. General aviation has seen changes in recent years that include increased levels of business aviation, helicopter emergency medical services, and aerial application. A new industry is emerging in unmanned aircraft systems (UAS) and a continued increase in commercial UAS applications is expected to be significant in the coming years. At the same time, pilot flight training and recreational flying has decreased.

Increases in business aviation and growth in the UAS sector could influence the facilities and services needed at airports in the future. Additional trends that will be monitored for potential impacts to Iowa's aviation system will include the transition to the Federal Aviation Administration's NextGen air traffic control system and the implementation of required Automated Dependence System-Broadcasting in all aircraft by 2020.

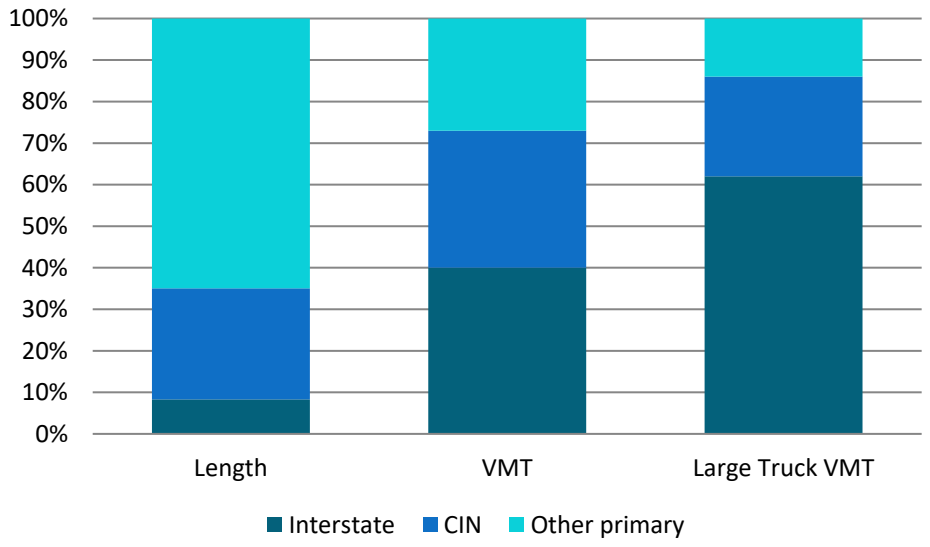
Highway

Goods moving by truck are steadily increasing after a brief decline

Trucks continue to be the dominant mode for freight movement in the state. Following some recent declines due to a variety of economic factors, statewide travel is again trending upward. Iowans are commuting longer distances and more goods are moving through the state by truck. While traffic continues to increase, crash statistics have remained relatively steady or declined in most cases.

Commodity movement by truck in Iowa is heavily concentrated on the Interstate and Commercial and Industrial Network (CIN), which comprise the majority of the National Highway System in the state. The interstates carried 62 percent of the state's large truck traffic (combination units) in 2015, the CIN 24 percent, and the rest of primary system carried the remaining 14 percent. Figure 4.2 shows the share of total length, total vehicle-miles travelled (VMT), and large truck VMT on the Primary Highway System.

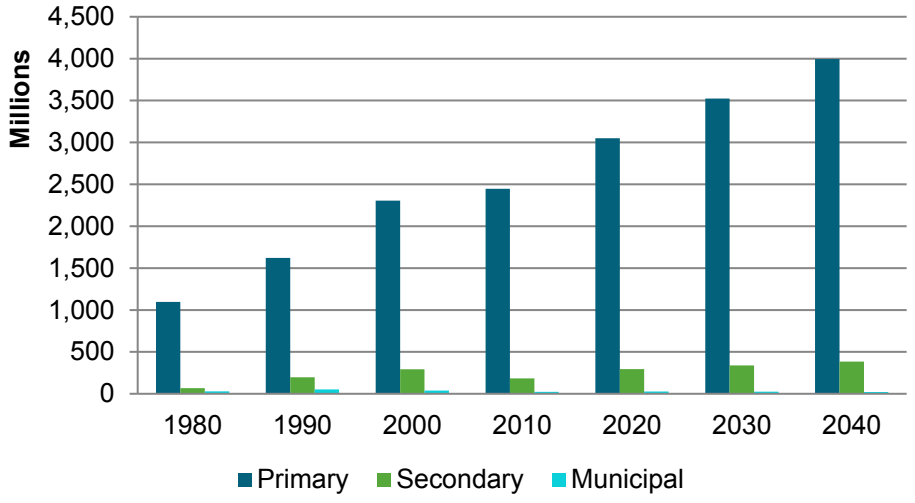
Figure 4.2: Iowa large truck vehicle-miles traveled by jurisdiction, 2015



Source: Iowa Department of Transportation

Figure 4.3 shows the growth in large truck VMT by jurisdiction from 1980 to the present, and projected to 2040. Primary highways include interstates, U.S. routes, and Iowa routes. Secondary roads include county routes. Municipal roads include city routes.

Figure 4.3: Iowa large truck vehicle-miles traveled by jurisdiction, 1980-2040



Source: Iowa Department of Transportation

Over the past 30 years, large truck traffic on Iowa's primary roads showed an increase of 123 percent, with the highest truck activity on Interstate 80 in eastern Iowa. During this same period, truck traffic on secondary roads also increased substantially, while truck traffic on municipal roads has remained relatively stable. If these trends continue, large truck traffic will grow approximately 66 percent between now and 2040, which will impact Iowa's highways through increased congestion and deteriorating pavement conditions.

Evolving and increasing oversize/overweight (OS/OW) movements

Iowa experiences multiple challenges related to truck size and weight. As lowering transportation costs continues to be a top priority for freight movement, the exploration and testing of different axle and wheel configurations has taken place. The intent is to decrease the number of trips taken by trucks to make transportation more efficient for businesses. Although some research has shown there is an economic benefit to allowing heavier loads, future analysis should evaluate the balance of economic burden and travel demand on public roads. Studies such as the U.S. Department of Transportation's *Comprehensive Truck Size and Weight Limits Study* can provide value when planning for future investment decisions.

The size and dimensions of OS/OW loads, such as wind components or mining/drilling equipment, continue to grow. Not only is it difficult to find efficient routes to accommodate the loads, but these movements also lead to accelerated damage of roadways and bridge structures. The routing of OS/OW trucks on a system that was designed without the ability to predict the future complexities of load sizes and dimensions limits the number of available primary highway routes for these movements. Planning for OS/OW transportation needs and providing safe and efficient routing is an ever-increasing challenge that requires considerable time and resources. With an increase in permitting to accommodate the movement of oversized loads, many state transportation departments are studying the impacts on their highway systems, specifically infrastructure, safety, and operational efficiencies.

The routing of OS/OW trucks on a system that was designed without the ability to predict the future complexities of load sizes and dimension limits the number of available primary highway routes for these movements.

In addition, drivers of these loads are often challenged by inconsistent rules and regulations across states. Most states have different size and weight restrictions (in addition to federal restrictions), making the process of moving through multiple states with an OS/OW load very complex. Harmonizing regulations across the Midwestern states has been identified as a potential solution to regulatory bottlenecks that impact the trucking industry.

Railroad

Network has steadily decreased in miles

Over the past 25 years, the state's rail network has shrunk in terms of mileage but is being operated by roughly the same number of railroad companies. Total rail mileage peaked in 1915 at approximately 10,500 miles and has since decreased to 3,825 miles. This system is operated by a total of 18 rail companies: six Class I, one Class II, and 11 Class III.[16] The network and operating companies will be described in detail in Chapter 6, Freight transportation assets.

Rail freight is increasing with larger rail cars and longer trains

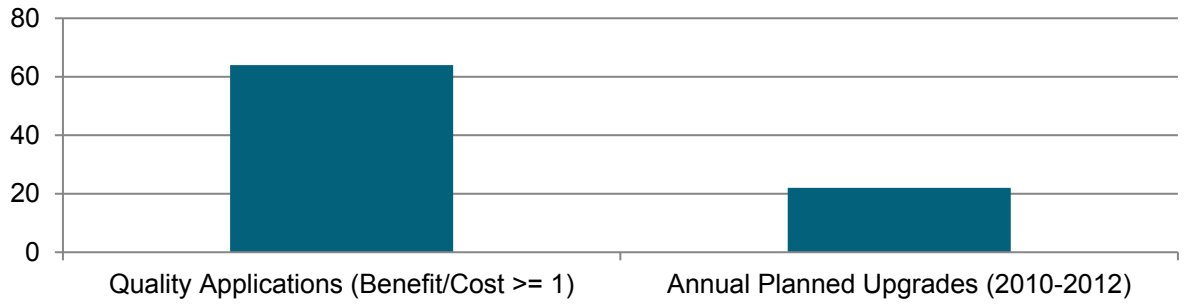
Although today's rail network consists of less mileage, the total amount of tonnage handled annually has slowly increased with a few variable years. Since 1985, near the time when railroads were privatized, total rail movements have increased by roughly 23 million tons. Recent growth in freight demand has impacted rail service and equipment needs, yet a variety of issues, including financial constraints, have limited the ability to expand capacity. As a result of this growing demand and changes in the rail freight industry, rail cars are growing in size and trains are getting longer. Improvements are necessary to meet these capacity needs as nearly 20 percent of Iowa's rail miles are not able to carry the industry-standard 286,000-pound cars.

Increased emphasis on safety is yielding positive results

Safety on Iowa's railroad system appears to be improving as the state is seeing fewer train derailments and highway-railroad grade crossing crashes, despite growth in both rail and highway traffic. Although Iowa continues to improve its highway railroad crossings, the number of crossings funded for safety and surface improvements each year lags far behind the number of crossing improvement applications (see Figures 4.4 and 4.5). Effective Aug. 27, 2010, Iowa was one of 10 states that were required by the Federal Railroad Administration to write a five-year highway/rail grade crossing safety action plan due to the fact that the state's collision experience ranked in the top 10 for the years 2006 through 2008. This plan was to focus on crossings with multiple crashes, or those that are "at risk" and identify specific solutions, including closure and consolidation of at-grade crossings. The State of Iowa Highway-Rail Grade Crossing Safety Action Plan was completed in 2012 with an implementation period between calendar years 2012 and 2016. Also worth noting is that the Fixing America's Surface Transportation Act (FAST) requires all states to develop safety action plans.

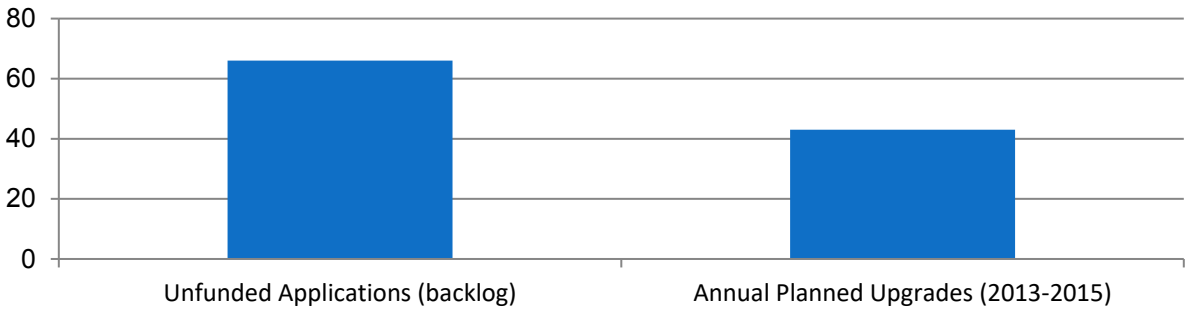
[16] Railroad classes are determined by operating revenue of each company. Class I railroads have the highest revenue.

Figure 4.4: Iowa crossing Safety Program, 2010-2012



Source: Iowa Department of Transportation, Office of Rail Transportation

Figure 4.5: Iowa crossing Surface Program, 2013-2015



Source: Iowa Department of Transportation, Office of Rail Transportation

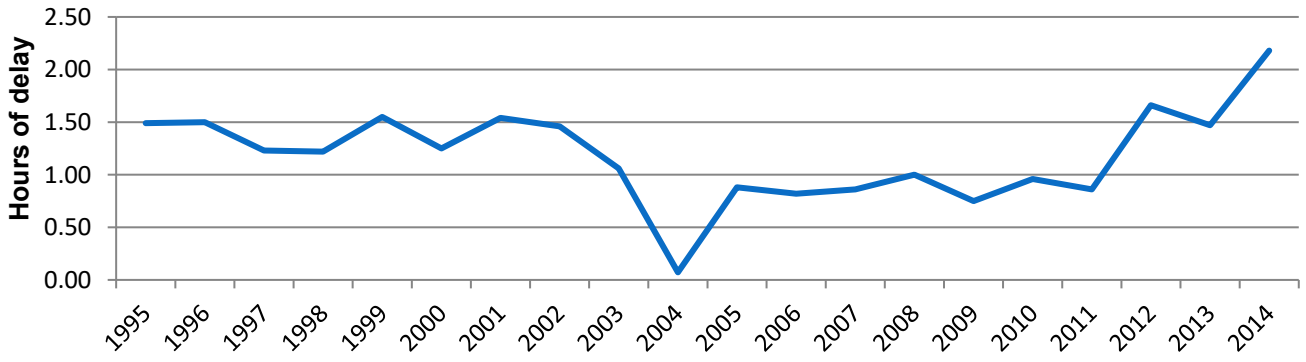
The transport of crude oil by rail has been a developing trend due to the drastic increase in production from the Bakken oil fields in North Dakota. The best option for moving this volatile commodity, as well as other hazardous materials, is very controversial. The most common debate is whether it should be moved by pipeline under ground or on the rail network. With the increase in crude-by-rail traffic, safety regulations and training have been ramped up significantly following a small number of highly publicized derailments. Although rare, derailments and spills involving the transfer of crude oil have the potential to have a large impact. Iowa DOT recently competed a Crude Oil and Biofuels Rail Transportation Study available at: http://www.iowadot.gov/iowarail/safety/crudeoilbiofuels.htm.

Waterway

Lock and dam infrastructure is aging and deteriorating

Most of the 11 Mississippi River locks along Iowa's border were constructed in the late 1930s (these structures are almost 80 years old) and the majority have original miter gates[17] and mechanical and electrical systems. In addition to aging, the average delay at the locks along Iowa's border is approximately two hours (see Figure 4.6), which limits the efficiency of barge transport. This is due to multiple factors such as lock maintenance, use of locks by noncommercial traffic, unexpected closures, and other vessels disassembling tows of barges that exceed the length of the smaller locks in order to fit through in two separate lockages. It can take days to make the entire journey from Iowa to the Gulf of Mexico when delays at each lock and transit time between locations are calculated.

Figure 4.6: Average delays for Iowa Mississippi River locks, 1995-2014



Source: U.S. Army Corps of Engineers

Contributing to the continual deterioration is the chronic underfunding of the inland waterway system. According to the U.S. Army Corps of Engineers, operations and maintenance needs of the locks and dams are currently only 35 to 40 percent funded, rehabilitation projects are overdue, and small- and large-scale improvements to the system are behind due to lack of construction funds.

[17] Miter gates are used to close off the entrance and exit of a navigation lock to allow the passage of vessels between different water levels in a canal or river system. A miter gate has two leaves that provide a closure at one end of the lock. Source: U.S. Army Corps of Engineers.

Freight movement remains steady on the Mississippi River but demand is declining on the Missouri River

Demand for shipping on the Mississippi River has remained stable, primarily consisting of bulk materials. This includes grain going down the river to be exported and fertilizer, sand, and salt being brought up the river.

The Missouri River, on the other hand, has experienced a continual drop in freight tonnages, partly due to inconsistent water releases from upriver dams and controversy over water usage for all Upper Missouri River basin states. Today, barge traffic typically goes only as far north as Omaha-Council Bluffs on the Missouri, although a few trips were made to Sioux City in 2014 for the first time in 11 years. These were shipments of equipment for the construction of a fertilizer plant, and most likely will not result in ongoing trips.

Other freight trends

Expansion of the Panama Canal is expected to create economic opportunity for Iowa

The Panama Canal is a crucial connection between the Pacific Ocean and Gulf of Mexico for international trade. It has provided an option and opportunity for East Coast and Gulf Coast ports in the United States as they are able to ship to and from Asian markets faster and more cost-effective than sailing around South America or through the Suez Canal in Egypt. With an aggressive expansion project just completed in mid-2016, the canal's annual capacity is more than 75 percent larger allowing accommodation of much bigger cargo ships.

This has the potential to create opportunities for Iowa producers and shippers. Expansion may decrease overall transit times to Midwest destinations, incentivize the export of grains and agricultural products to Asia via Gulf Coast ports, promote greater containerization of agricultural products, and decrease the total energy costs of transportation. Taking advantage of this opportunity depends heavily on the reliability of the inland waterway system. The nation's locks and dams are well beyond their design life and are suffering from deterioration, congestion, and unscheduled closures. These will be further investigated in Chapter 6, Freight transportation assets, and Chapter 7, Conditions and performance of the freight transportation system.

Expansion may decrease overall transit times to Midwest destinations, incentivize the export of grains and agricultural products to Asia via Gulf Coast ports, promote greater containerization of agricultural products, and decrease the total energy costs of transportation.

Record agricultural production and changing practices mean reanalyzing the freight network

Iowa's imports and exports are dominated by agriculture-related products. In recent decades, the landscape of Iowa agriculture has shifted as small farms continue to be consolidated into fewer larger farms that are more corporate[18] in nature and produce more products that need to be shipped. In addition, the state has been fortunate to experience record corn and soybean harvests in recent years, as well as a boom in ethanol and biodiesel production. The latter is significant as the majority of Iowa corn now stays in the state to be used for biofuels and livestock feed, rather than being exported outside of the state.

Producers (i.e., farmers and/or farming corporations) can achieve transportation economies of scale by transporting their own products using their own or for-hire truck equipment. Iowa farmers are now shipping more outputs directly via truck compared to the previous pattern where they would focus on moves to local consolidation points and rail terminals. Class I railroads are also continuing the trend toward unit trains that are larger and typically include 100-plus cars. These require large grain and consolidation facilities. The shift toward increased truck freight may provide the ability to bypass local grain elevators and railroads and haul directly, albeit over a longer distance, to the processor, to another railroad, or to terminals along the Mississippi and Missouri rivers. This could lead to the need for reanalyzing the freight transportation network as it relates to farm products.

Growth in United States energy production

Energy production in the United States has been growing significantly since the turn of the century. One of the largest growing sectors, and perhaps the one with the largest impact on the freight network, is hydraulic fracturing of rock or "fracking." This process allows for the recovery of deep sources of gas and petroleum products. Fracking has resulted in large amounts of gas and oil being extracted in the Midwest and Upper Great Plains, particularly the Bakken region of North Dakota, Montana, and parts of Canada. This has produced greater freight traffic in two ways: product being shipped from the region and materials used for fracking (i.e., sand and chemicals) being shipped to the region.

Much of these freight movements to and from the area are by rail due to production increasing at a rate that exceeds the capacity and availability of the nation's pipelines. The products are then moved by truck within the area. Of all the oil produced in the Bakken region, roughly 63 percent is shipped by rail with a portion of that traveling through Iowa. Since 2008, oil shipments carried by two Class I railroads in Iowa have increased by nearly 3 million tons. Destinations include oil refineries on the East Coast (Philadelphia, Delaware) and Gulf Coast (Louisiana, Texas). Additionally, ethanol and biodiesel fuels

[18] Corporate farming is the term used to describe when companies own or influence farms and agricultural practices on a large scale. This is different than traditional family farming where a single family owns and operates the land.

have become significant value-added products for Iowa's agricultural economy over the past few decades. Iowa produced 28 percent of the nation's fuel ethanol in 2014, more than any other state. Nationally, 70 percent of all ethanol produced is transported by rail.

Continuation of intermodalism/containerization

With the growing need for more reliability in supply chains, many shippers have looked to utilizing public or private multimodal (such as transloads) and intermodal facilities to transfer shipments on multiple modes. These operations can load/unload airplanes, trucks, railcars, barges, and/or cargo ships, and allow the shipper to take advantage of the cost savings, speed, and capabilities of more than one mode of transportation.

Containerization specifically uses intermodal containers that fit on the axles or decks of multiple modes and can be transferred from one to another relatively quickly. Transport using intermodal containers works for many different commodities and minimizes the handling of the freight itself, which improves security and reduces loss. The majority of intermodal operations is coordinated by truckload carriers, intermodal marketing companies, or third-party logistics providers, and can be both domestic and international.

E-commerce is growing and impacting market trends and freight movement

Continuous technological advancements have led to a large growth in electronic commerce, or e-commerce, in recent years. E-commerce is the purchase of goods or services by a customer online rather than at a store. With the popularity of online ordering expanding, many companies are working to optimize their delivery supply chains in order to get the products or services to the consumer as quickly and efficiently as possible.

This attempt has resulted in new distribution centers being built in additional locations near large populations so the product can be shipped from the closest distribution site as soon as an order is placed. This leads to the importance of the last mile portion of delivery due to the increase in parcel delivery vehicles into city streets and neighborhoods, ultimately contributing to congestion and roadway deterioration.

Connected/automated/self-driving vehicles

The idea of having self-driving vehicles has been around for some time and seems to be getting closer to becoming reality. This concept may result in numerous benefits like fewer traffic incidents, increased reliability, reduced congestion, and more efficient use of the roadway system. Commercial vehicles could likely be the first to take advantage of the new technologies. To shippers and customers, cost, reliability, and efficiency are of the greatest importance. Automated vehicles should help reduce costs

and increase reliability and efficiency. In addition, it would provide a potential solution to the increasing driver shortage in the country. These advantages will most likely lead to the commercial vehicle sector adopting automated vehicles before the passenger sector.[19]

New forecasts will need to be developed based on automated vehicles being part of the freight and passenger vehicle fleets. It will be necessary to explore how this change in transportation will impact the rest of the freight system, economy, and land uses. Proactive planning is needed to determine how this will affect Iowa freight movement and how to prepare for it.

These advantages will most likely lead to the commercial vehicle sector adopting automated vehicles before the passenger sector.

Growth of Iowa's biorenewable chemical industry

The biorenewable chemical industry is undergoing rapid transformation and growth. Due to Iowa's abundance of feedstock, technical workforce, and biorenewable and plant genetic research, the state has the opportunity to be a major player in this growth industry. Iowa's proposed renewable chemical production tax credits add to the transformation. The emergence of biofeedstock and biobased commodity polymers production, in tandem with concerns about fossil fuels, new environmental regulations, and consumer trends toward eco-friendly products, have ushered in a new era of renewable chemical commercialization. However, factors such as economic viability, product quality/performance, and scale of operation will still play important roles in determining the commercialization potential.

The renewable chemicals industry is estimated to grow 11.5 percent annually in the next five years, mainly due to uncertainty in oil prices and production levels, requirements for environmentally friendly feedstock, and low production cost of biobased chemicals. Among the major renewable chemicals, biofuels are only the beginning. In the biopolymers segment, starch plastics holds maximum share (around 48 percent), whereas polyhydroxyalkanoates (PHA)[20] is expected to grow at more than 27.7 percent during the next five years.[21]

The worldwide renewable chemical industry is expected to exceed $80 billion by 2018; major renewable chemicals such as alcohols, polymers, ketones, and acids; along with the major applications

[19] Hedden, Chris. "5 Things Planners Need to Know about Self Driving Vehicles." SlideShare. LinkedIn, 25 Aug. 2015. <http://www.slideshare.net/ChrisHedden/5-things-planners-need-to-know-about-self-driving-vehicles>.
[20] PHA is one of the main building blocks for the development of biorenewable chemicals and bioplastics.
[21] "Renewable Chemicals Market Worth 84.3 Billion USD by 2020." Press releases. Markets and Markets. <http://www.marketsandmarkets.com/PressReleases/renewable-chemical.asp>.

of renewable paints, plastics, and industrial chemicals. Many of the leaders of the renewable chemical industry have established connections in Iowa.

Natural gas as a transportation fuel

When used as transportation fuel, natural gas comes in the form of either compressed natural gas (CNG) or liquefied natural gas (LNG). Both forms are being explored and adopted by the trucking and railroad industries. The use of natural gas as a fuel in the trucking industry has increased substantially since 2012.[22] Despite the lower cost of diesel fuel in recent years, the price of natural gas remains even lower. CNG is a legitimate option for investment as future projections show prices remaining steady. Typically, trucking companies will add CNG vehicles to their fleet allowing for greater diversification and the ability to switch between diesel and natural gas for higher-mileage routes depending on the lower cost option.

CNG fuel also has environmental benefits such as 25 percent lower greenhouse gas emissions. Some of the other reasons for CNG investment are branding opportunities for a greener fleet, greater stability over fuel prices, and possible competitive advantages with businesses, customers, and/or suppliers that favor natural gas fleets. However, making the move to natural gas requires companies to invest more up-front. The return on that investment comes from the savings on the fuel cost. Additionally, creating the infrastructure needed for long-haul trucking is another challenge deterring the adoption of CNG.

Railroads are also beginning to adopt technology that will allow locomotives to run on natural gas in addition to diesel, primarily LNG rather than CNG. Retrofitting existing machines to burn a mix of diesel and natural gas is the quickest and easiest way to adopt the new technology, and will offer advantages to using natural gas alone. The diesel can provide the spark needed to ignite natural gas without redesigning engines, and the diesel helps provide horsepower.[23] Advantages include reducing emissions and reducing fuel costs for the railroads.

[22] Lilly, B. (2015, October 1). Use of Natural Gas as a Transportation Fuel Continues to Expand. Transport Topics, A11-A12.
[23] Funk, J. (2014, January 23). Why trains may switch to natural gas instead of diesel. Associated Press. <http://www.csmonitor.com/Environment/2014/0123/Why-trains-may-switch-to-natural-gas-instead-of-diesel>

4.2 Freight issues

Just as the complexities of freight movement result in constantly changing trends, the same holds true for broader freight-related issues.

Freight Advisory Council (FAC) issues

During the FAC's first meeting, members identified 48 specific issues (see *Appendix 2*) that were perceived to be roadblocks to efficient and competitive freight movement. Realizing the difficulty of researching, validating, and prioritizing all of the issues, they were sorted into seven categories, with some falling into more than one category. Council members and government personnel were divided into subgroups to write reports to further define and gain a common understanding of the issues relating to each category. The following sections provide a summary of the seven categories.

Financial

The state of Iowa is fortunate to have a strong multimodal freight transportation system that facilitates the safe and efficient movement of goods. However, with this success comes the challenge to maintain and improve the multimodal system in light of deteriorating conditions, diminishing buying power, and growing demands. A well-maintained freight system reduces transportation costs and provides consistent and reliable services, all of which are factors critical in the evaluation companies undertake when deciding where to expand or how to disperse their goods and products. Without maintaining and improving our state's freight infrastructure, Iowa's economy will be weakened.

Iowa's FAC identified the following as possible options to explore to assist in financing a healthy, more efficient freight transportation system:

Without maintaining and improving our state's freight infrastructure, Iowa's economy will be weakened.

- Consider increasing the state's fuel tax rates by legislature.
- Consider fuel tax indexing opportunities for legislature.
- Evaluate all freight modes, financial needs, resources, and impacts.
- Propose a funding mechanism that applies to alternatively fueled vehicles.
- Consider fairness and equity across all modes with any new revenue-generating models.
- Consider other funding sources besides the Road Use Tax Fund (RUTF) (e.g., rail property taxes, barge fuel tax, pipeline fees).

Actions have already been taken to begin addressing Iowa's current infrastructure financing model through the Iowa Department of Transportation's 2011 RUTF study, the State Transportation Plan, and the Governor's Transportation 2020 Citizen Advisory Committee (CAC). Additionally, the CAC recommended increasing the state fuel tax by 10 cents per gallon. This increase was approved and took effect on March 1, 2015, providing an estimated $200 million of additional revenue to the RUTF annually, which will be distributed to the Iowa DOT, counties, and cities.

Infrastructure challenges

Many of Iowa's roads, bridges, railways, barge terminals, and other infrastructure critical to the movement of freight are in need of significant structural improvements. In a study done by Transportation for America in 2013, Iowa's bridges ranked the third-worst nationally in terms of the overall percentage of structurally deficient bridges. This is just one critical need the state of Iowa and many other states are currently facing.

In order to remedy this situation, it will take cooperation from all areas of the freight industry, coupled with new policies and large investments. Much of the state's freight industry, including local jurisdictions having to do more with less, are running out of options in order to keep up with the needed maintenance of the transportation system. With transportation needs outpacing revenues, Iowa's multimodal freight system will be subject to more widespread deterioration, which may eventually lead to loss of access to needed services and goods. An adequate level of revenue is necessary to support the state's current and future freight system and to keep Iowa competitive in an ever-changing economy.

In 2011, the Iowa DOT completed a RUTF study, which assessed the 20-year needs of the public roadway system. The study found a $1.6 billion total annual funding shortfall, with a $215 million annual funding shortfall for the most critical system needs. These shortfalls can be attributed to several factors, including increases in fuel efficiency and the loss of buying power over time.

The FAC identified the following as possible options to explore this issue in further detail.

- Secure funding to address the present and future needs of Iowa's freight infrastructure by exploring all revenue generating mechanisms.
- The need for coordinated, multimodal prioritization between all entities and modes.
- Make Iowa's freight infrastructure more relevant to today and tomorrow's industries.
- Evaluate what other states are currently doing to address this issue.
- Focus on infrastructure challenges of all freight modes.
- Evaluate where Iowa's funds are currently generated and where they are being spent.

Labor and driver shortages

The state of Iowa and the United States in general, are encountering a shrinking pool of qualified drivers and laborers in the commercial trucking industry. Iowa has approximately 1,800 open positions for truck drivers. Not only is the state in need of truck drivers, it is in need of experienced drivers, and Iowa employers are paying more to retain them. If not addressed, this issue could lead to delayed freight movement, unacceptable working conditions for freight haulers, a continued shrinking of the qualified driver pool, and, ultimately, an unwanted drag on the economy.

The FAC identified a "lack of new, quality drivers to pursue this career path" as the basic problem. Although there are other variables, the root causes are:

- The age gap between when prospective drivers are choosing a career and when they are old enough for licensing.
- Insurance company restraints (i.e., age requirements).
- Quality of life – balancing a job on the road with life at home.
- Appeal – raise the esteem of the trucking industry so that potential employees see it as a desirable career choice.

Operations

Throughout Iowa's history, the state has endeavored to create and maintain a substantial transportation network for the movement of agricultural products and other freight. Over recent decades, the business methods by which these products have been generated have changed significantly. The development of large-scale farming and the increase in mass manufactured products and large indivisible loads (e.g., ethanol, wind energy components, etc.) has increased the size and number of trucks and trains needed to efficiently move Iowa's exports.

The FAC identified freight operation considerations as a key issue that may constrain efficient freight movements, and ultimately hinder the state's ability to compete on a global level. The FAC identified the following as possible options to explore this issue in further detail.

- Design considerations: Both roadway design and prioritization are issues. The locations with high truck traffic are consolidating into massive shipping terminals, each serving hundreds of trucks every day. More consideration may need to be given at these locations to build turning lanes, increase turning radii, and improve safety for the trucks and traveling public.
- Maintenance considerations: At all levels, more consideration may be needed on how and when maintenance is performed on freight routes. This may include working with local manufacturers to determine which freight movements occur during the day. This may be helpful in scheduling small maintenance functions as well as prioritizing snow and ice removal. On major routes, this may include shortening construction zones where truck percentages are higher.
- Policy considerations: There is a need to review fuel education and policies. With the development of fracking sand and other new markets in nearby states, consideration is needed for the possible increases in diesel fuel demand and price. There may also be considerations for the use of alternative fuels, such as CNG, that may increase axle loads.
- Consideration for changes in farming: The movement to large-scale farming and increases in production changed the amount of agricultural freight on our transportation network. In addition, the move from tractors to semitrucks and changes in hours of service for these delivery systems has impacted how agriculture needs to be considered in the overall management of Iowa's freight network.

Policy support and communication

The State of Iowa has a long history of developing and supporting competitive access to a global marketplace, through Iowa DOT programs that support infrastructure investments in highways, bridges, and railroads, and through economic development programs administered by the Iowa Economic Development Authority. However, long-standing practices that prioritize “low-hanging fruit” have not addressed some of the more difficult or sensitive issues. In particular, the perception of the FAC is that the state has not kept pace with developing competitive access for shippers in the areas of shipping terminals, providing a comprehensive location for information, and freight policy decision-making. These gaps have resulted in a loss of market share in the global economy.

The FAC identified policy support and communications as specific areas that will aid in the development of guiding principles for freight policy. Opportunities include:

- Assessing the strengths and weaknesses within Iowa’s freight transportation system.
- A compilation of information on freight terminal locations for all modes.
- A comparative analysis (delivery times, environmental impacts, economic efficiencies, security, etc.) of the different modes.
- Studying future needs for growth industries.
- A better conduit for input and discussion for policy development.
- Creation of a single resource to link and communicate all of the above.

Regulation

To ensure the safe movement of freight throughout Iowa, a wide array of regulations at all levels, federal, state, and local has been put into place. These regulations affect, first hand, those doing business in Iowa and around our borders. A better understanding of these regulations and their impacts will assist the state in recognizing ways to better coordinate with those agencies responsible for the various elements that make up freight regulations.

Many shippers in Iowa are currently encountering regulatory obstacles that hinder the movement of freight among all modes of transportation. If not addressed, these issues may lead to delayed freight movement, increased congestion, a decrease in safe travel operations, and an unwanted drag on the economy.

The FAC identified differences in state regulations as a major obstacle for the efficient movement of freight. Since freight movements are often multistate and multijurisdictional, there is a need for better and clearer reciprocity between states regarding issues not standardized at a federal level, including fuel, trip, and registration regulations. The changes that need to be made to our current system of regulations include, but are not limited to:

Many shippers in Iowa are currently encountering regulatory obstacles that hinder the movement of freight among all modes of transportation.

- Streamline the permitting process – the current processes are confusing and cumbersome to shippers and truckers.
- Provide easier access to information regarding Iowa's trucking regulations.
- Better coordination and education of multiple agencies, including border states, regarding these processes and other regulations.

Transload and intermodal terminals

For many years, freight producers in the state of Iowa have experienced a continuing trend of increasing difficulty and costs related to the shipment of export products out of the state. Long-haul carriers can move products by rail, truck, and barge. When producers have a choice of modes and can combine modes for the most efficient transportation, costs can be lowered and efficiency raised. A significant factor causing concern in Iowa is the rising drayage costs in connecting manufacturers and producers with the railroads for long-haul shipments. If not addressed, this will continue to increase costs of Iowa export goods, inhibit economic development, and impair the state's position in both foreign and domestic markets.

Contributing to the growing problem in Iowa is the increase in marketable exports, the development by railroads of large intermodal centers in Chicago and other Midwestern metro areas outside of Iowa, and the closure of smaller more geographically diverse intermodal facilities within Iowa. A factor that also impacts Iowa is that Iowa produces more products shipped via container than it receives causing a large imbalance of containers, estimated to be between a three-to-one imbalance and an eight-to-one imbalance. Although these and many other factors may have contributed to current conditions, the FAC identified three opportunities for further examination.

- Examine strategies that provide more local rail connections, cross-dock, transload, or intermodal centers to decrease the distance exports must be trucked to get to a transload or intermodal facility.
- Evaluate ways to make it feasible and cost-effective to invest in rail transfer facilities within Iowa to reduce transportation costs for Iowa's producers and receivers of goods.
- Investigate ways to address the container imbalance, which creates added transportation costs due to the need to haul empty containers into Iowa.

The FAC also developed a number of solutions to the issues presented in this section. These are described more in depth in *Appendix 2*.

Freight association defined issues

Nationally, there are a wide variety of freight issues impacting all modes of transportation. The trucking, pipeline, rail, and barge industries each have their own unique challenges to overcome. Most of these stem from funding shortages, infrastructure deterioration, and regulation compliance. The following identifies several critical issues according to national stakeholder groups. This list is not exhaustive but covers the major freight transportation industries.

American Trucking Associations (Top 10)[24]

1. Hours of service
2. Compliance, safety, and accountability
3. Driver shortage
4. Economy
5. Electronic logging device mandate
6. Truck parking
7. Driver retention
8. Fuel supply/fuel prices
9. Infrastructure/congestion funding
10. Driver health and wellness

Interstate Natural Gas Association of America[25]

- Gas-electric integration
- Prudent natural gas development
- LNG exports

Association of Oil Pipelines[26]

- Model state one-call/damage prevention law recommendations
- Damage prevention and encroachment
- Economic regulation

[24] Brewster, Rebecca. "Hours-of-Service Back As Top Concern in Annual Trucking Industry Survey." Surveys. American Transportation Research Institute, 21 Oct. 2013. <http://atri-online.org/2013/10/21/hours-of-service-back-as-top-concern-in-annual-trucking-industry-survey/>.
[25] "INGAA on the Issues." Interstate Natural Gas Association of America. <http://www.ingaa.org/18025.aspx>.
[26] News & Public Policy. Association of Oil Pipe Lines. <http://www.aopl.org/news-public-policy/>.

Association of American Railroads[27]

- Rail safety
- Economic regulation
- Positive Train Control
- Truck size and weight
- Federal transportation policy
- Passenger rail
- Tax policy

American Waterway Operators[28]

- Federal authority over vessel operations
- Jones Act
- Towing vessel inspection
- Transportation Worker Identification Credential (TWIC)[29]
- Vessel discharges
- Waterway infrastructure needs

Waterways Council Inc.[30]

- Advance waterways improvement legislation
- Fourth R: Support higher funding levels for river infrastructure
- Maintain Mississippi River navigation during drought
- Improve system reliability through infrastructure maintenance

[27] "Policy Issues." Association of American Railroads. <https://www.aar.org/policy>.
[28] "Issues & Advocacy." American Waterways Operators. <http://www.americanwaterways.com/issues>.
[29] TWIC is required by the Maritime Transportation Security Act for workers who need access to secure areas of the nation's maritime facilities and vessels. Source: Transportation Security Administration.
[30] "Key Issues." Waterways Council Inc. <http://waterwayscouncil.org/key-issues/>.

5. Forecasts

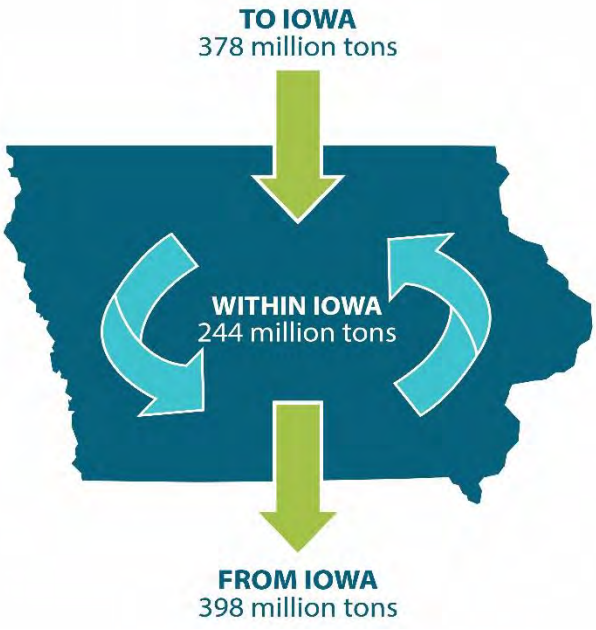
According to the Federal Highway Administration's Freight Analysis Framework (FAF) tool, freight transportation in the United States will double by the year 2040. This growth will be reflected in Iowa and seemingly will not be uniform across all modes. If this becomes reality, it will prove to be a sizable challenge for the overall freight transportation system. This section builds on the freight trends outlined in the previous chapter and provides current Iowa commodity flow data and forecasts out to the year 2040. Understanding these changes is a crucial piece in any proactive planning approach.

5.1 Commodity movement

When considering freight movements in an area, it is important to look at both current and projected volumes. The projections in this section include intrastate, inbound, and outbound freight, as well as the modes used to transport the freight and the origins and destinations of the goods. All of these show the weight and value of the goods being moved. Understanding the flow of freight by weight provides insights into the infrastructure needs in Iowa, while understanding the flow of freight by value provides insights into the economic impact it has on the area. In order to provide this understanding, the Iowa Department of Transportation used FHWA's FAF tool.

The FAF integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas. With data from the 2012 Commodity Flow Survey and additional sources, the FAF estimates tonnage, value, and domestic ton-miles by region of origin and destination, commodity type, and mode for 2012 (the most recent year available) and forecasts through 2040.

Figure 5.1: Iowa freight movement, 2012



Source: Federal Highway Administration's Freight Analysis Framework

Iowa's freight is expected to steadily increase through the year 2040

Iowa's transportation system facilitated the movement of approximately 1.1 billion tons of freight with an estimated value exceeding $563 billion to, from, and within the state in 2012. Table 5.1, Figure 5.2, and Figure 5.3 illustrate the tonnage and value for freight movements in 2012, 2020, 2030, and 2040. The total weight of goods imported into and exported out of Iowa is expected to grow from 774 million tons in 2012 to 1.1 billion tons (a growth of 35.6 percent) in 2040. The total value of goods imported into and exported out of Iowa is expected to grow from $468 billion in 2012 to $715 billion (a growth of 52.6 percent) in 2040. Freight that has both an origin and destination in the state is expected to grow by 27.8 percent in weight and 30.5 percent in value from 2012 to 2040.

Table 5.1: Commodity flow into and out of Iowa, 2012-2040

	2012		2020		2030		2040	
	Tons (millions)	Value ($ millions)	Tons (millions)	Value ($ millions)	Tons (millions)	Value ($ millions)	Tons (millions)	Value ($ millions)
Total	**1018.1**	**$563,313**	**1181.3**	**$656,952**	**1279.7**	**$740,262**	**1361.3**	**$838,457**
Within Iowa	243.2	$95,335	277.2	$108,407	297.2	$116,511	310.7	$124,380
From Iowa	397.3	$241,115	480.0	$286,210	537.1	$333,513	592.7	$392,457
To Iowa	377.6	$226,863	424.2	$262,335	445.4	$290,237	457.9	$321,619

Source: Federal Highway Administration's Freight Analysis Framework

Figure 5.2: Commodity flow, 2012-2040 (millions of tons)

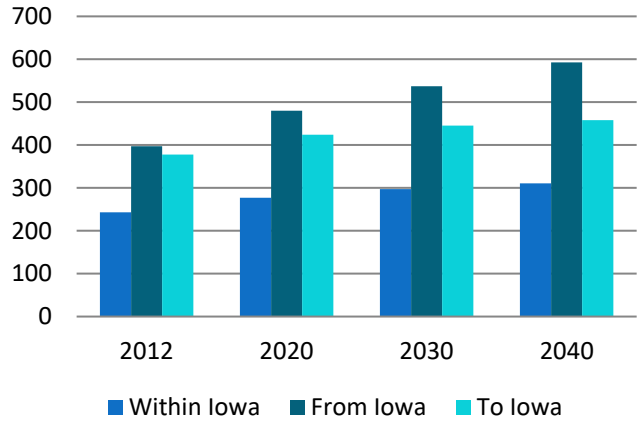
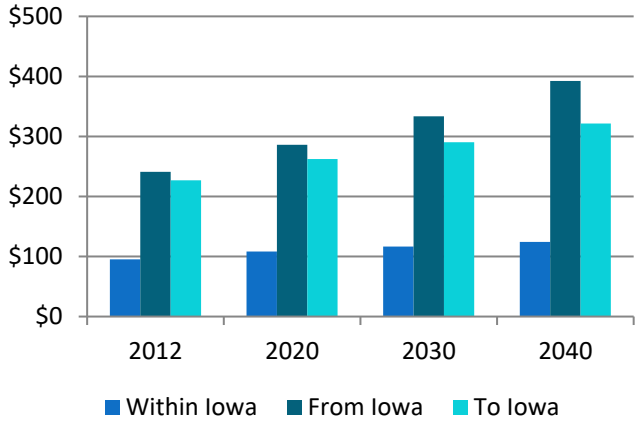


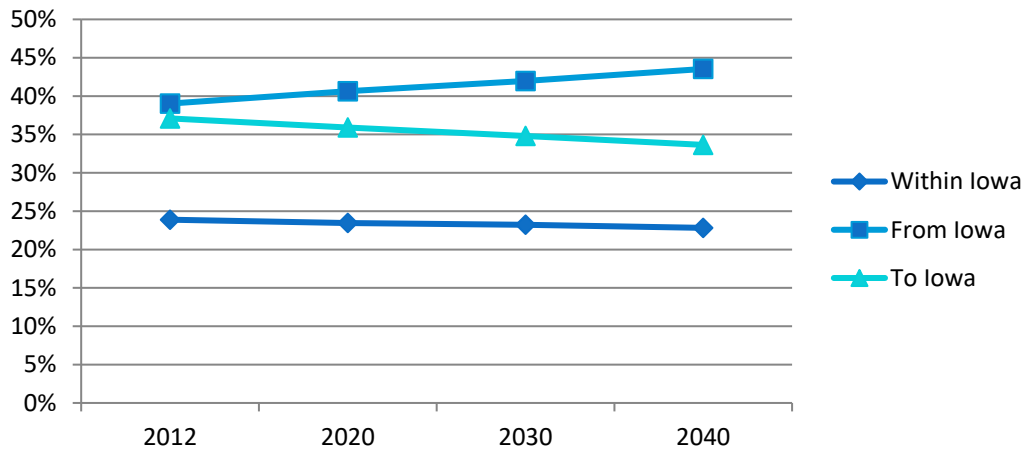
Figure 5.3: Commodity flow, 2012-2040 ($ millions)



Source: Federal Highway Administration's Freight Analysis Framework

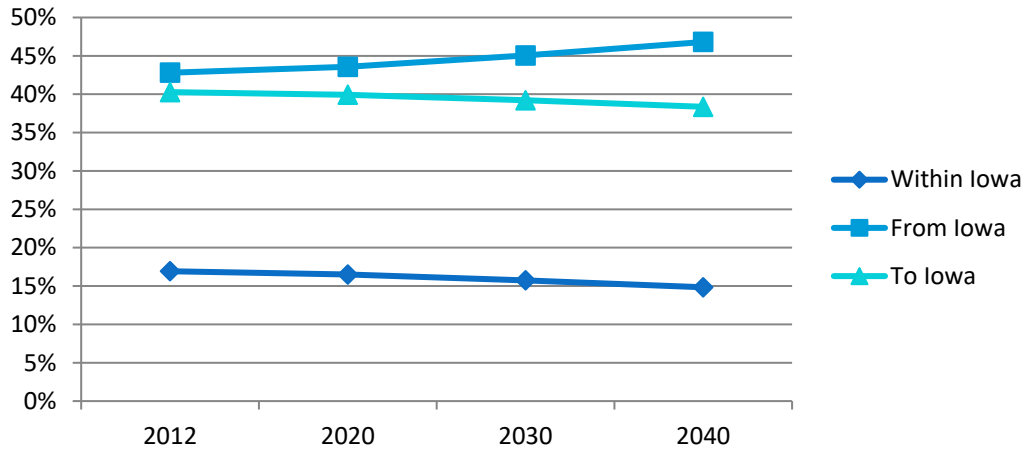
Figure 5.4 shows the distribution of freight tonnage from 2012 to 2040, and Figure 5.5 shows the distribution of freight value during the same time period. In terms of weight of goods, Iowa freight leaving the state is expected to increase from 39 to 43.5 percent, freight entering Iowa is expected to decline from 37.1 to 33.6 percent, and freight within the state is expected to decline from 23.9 to 22.8 percent. As for the value of goods, freight movement moving to Iowa is expected to decrease from 40.3 to 38.4 percent and within from 16.9 to 14.8 percent. Freight moving from Iowa is poised to grow from 42.8 to 46.8 percent.

Figure 5.4: Commodity flow trends, 2012 to 2040 (weight)



Source: Federal Highway Administration's Freight Analysis Framework

Figure 5.5: Commodity flow trends, 2012 to 2040 (value)



Source: Federal Highway Administration's Freight Analysis Framework

The majority of Iowa's freight will continue to be moved by truck and rail

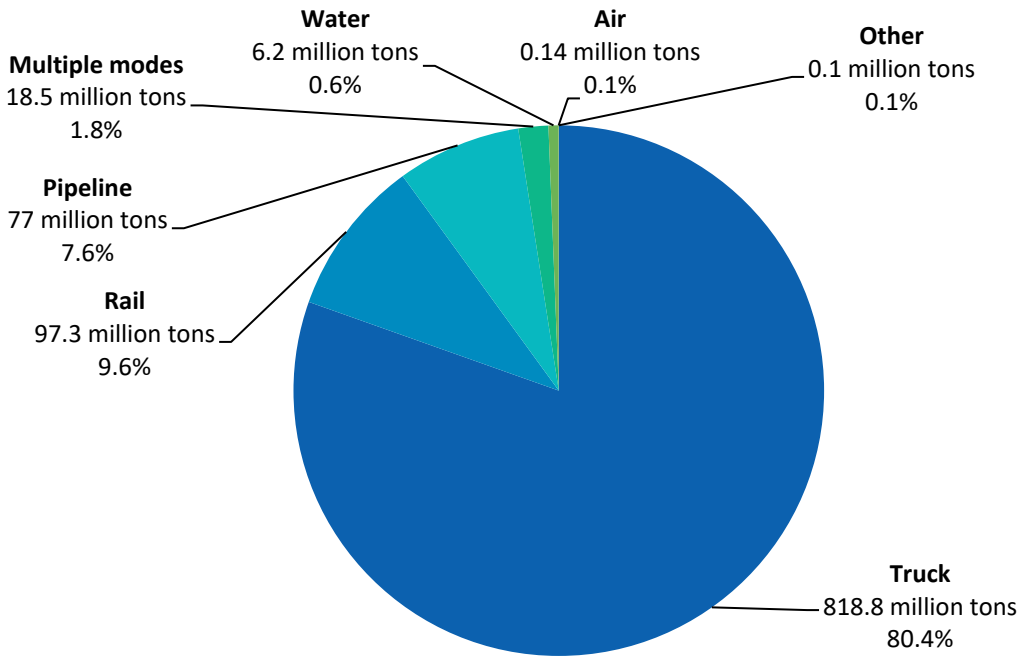
The FAF identifies seven different modes for transporting freight.

- Truck
- Rail
- Water
- Pipeline
- Air: Includes shipments weighing more than 100 pounds moved by air or by air and truck.
- Multiple modes and mail: Includes all other shipments transported by more than one mode, such as bulk products moved by rail and water and mixed cargo hauled by truck and rail. Also includes small shipments sent via postal and courier services.
- Other and unknown: Primarily unidentified modes but includes miscellaneous categories, such as aircraft deliveries to customers and shipments through foreign trade zones.

Figure 5.6 shows Iowa's freight tonnage by mode in 2012. Truck and rail are the dominant modes for transporting freight to, from, and within the state. The two modes account for 90 percent of Iowa's freight and are projected to remain the most popular modes through the year 2040.

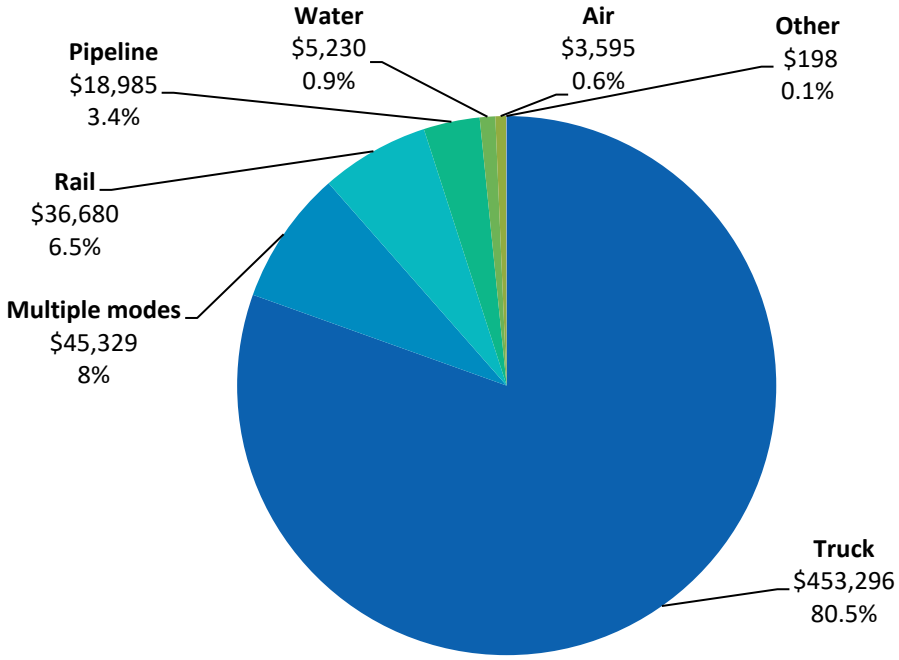
Figure 5.7 shows Iowa's freight value by mode in 2012. Truck is once again the dominant mode in terms of value; however, multiple modes/mail handles the second highest amount of freight value followed by rail. This trend is expected to continue through 2040.

Figure 5.6: Iowa freight tonnage by mode, 2012 (millions of tons)



Source: Federal Highway Administration's Freight Analysis Framework

Figure 5.7: Iowa freight value by mode, 2012 ($ millions)



Source: Federal Highway Administration's Freight Analysis Framework

Iowa freight will increase but will not be uniform across all modes

Table 5.2 shows tonnage projections from 2012 to 2040 by mode. In terms of the mode used for shipping goods, truck continues to dominate by weight and is projected to remain about 80 percent of the total from 2012 to 2040. Rail is expected to continue to carry the second highest amount through 2040. Tonnage is projected to increase on the waterways and in pipelines, as well.

Table 5.2: Tonnage by mode, 2012-2040 (millions of tons)

	2012	2020	2030	2040	Percent change
Total	**1018.1**	**1181.3**	**1279.7**	**1361.3**	**33.7**
Truck	818.8	943.6	1022.5	1083.9	32.4
Rail	97.3	102.3	110.9	123.1	26.5
Pipeline	77.0	103.5	105.8	103.0	33.7
Multiple modes and mail	18.6	23.9	29.9	37.3	100.8
Water	6.2	7.7	10.4	13.7	119.8
Air (include truck-air)	0.1	0.1	0.2	0.2	163.9
Other and unknown	0.0	0.0	0.1	0.1	271.7

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.3 shows the value by mode from 2012 to 2040. Truck, multiple modes/mail, and rail are projected to remain as the top three modes through 2040. There is a projected increase of 42 percent in goods moved via truck, 76 percent in goods moved via multiple modes/mail, and 60.8 percent in goods moved via rail.

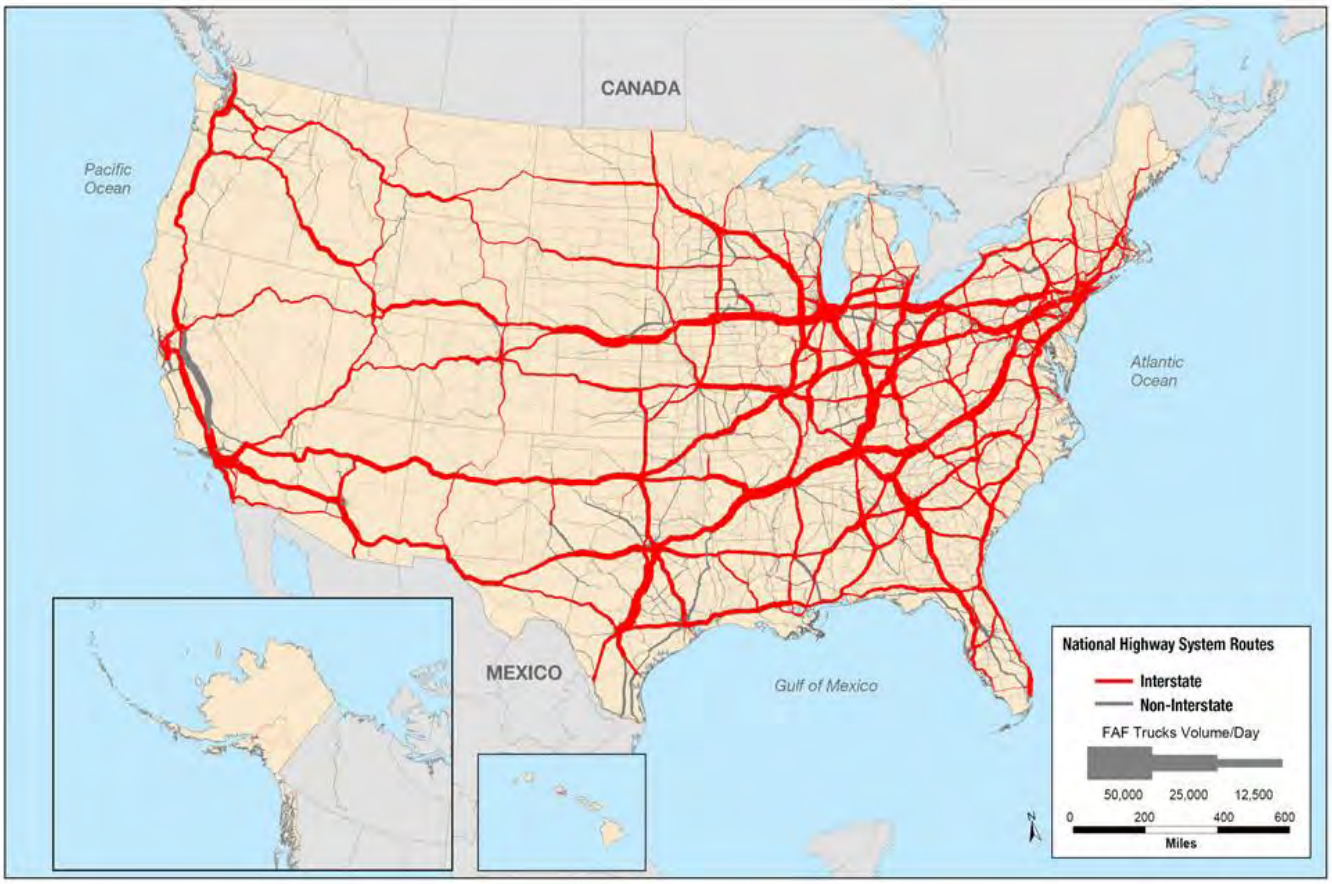
Table 5.3: Value by mode, 2012-2040 ($ millions)

	2012	2020	2030	2040	Percent change
Total	**$563,313**	**$656,952**	**$740,262**	**$838,457**	**48.8**
Truck	$453,296	$521,726	$579,095	$643,508	42.0
Multiple modes and mail	$45,329	$53,774	$65,290	$79,719	75.9
Rail	$36,680	$43,114	$50,206	$58,971	60.8
Pipeline	$18,985	$25,375	$25,921	$25,147	32.5
Water	$5,230	$7,425	$11,069	$16,648	218.3
Air (include truck-air)	$3,595	$5,180	$8,126	$13,574	277.6
Other and unknown	$198	$359	$556	$890	348.6

Source: Federal Highway Administration's Freight Analysis Framework

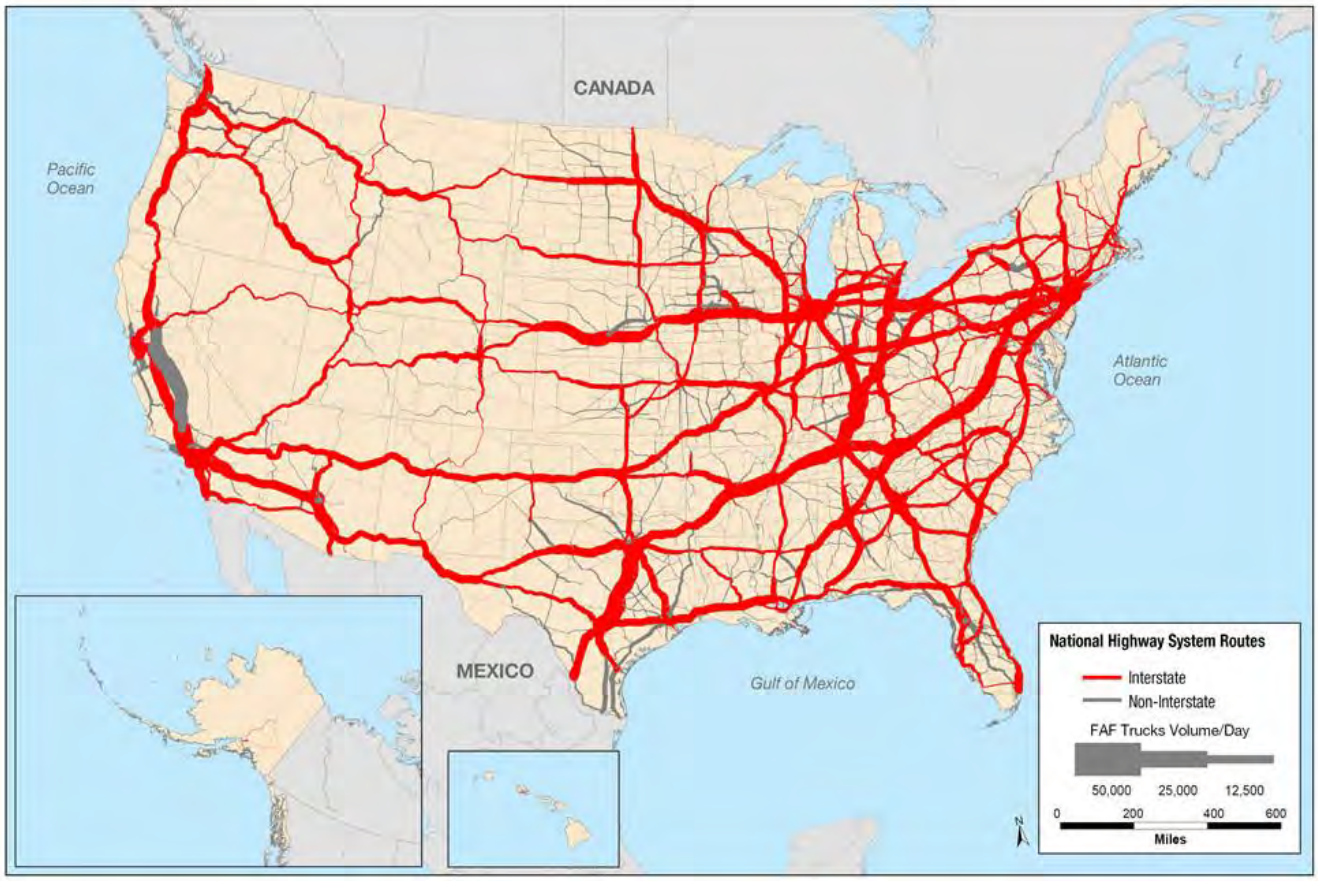
The expected growth of Iowa truck traffic by 32.4 percent will have a large impact on the state's highway system. It will result in increased congestion and faster deterioration of pavement and structures on roadways shared by trucks and passenger vehicles. This reinforces the need to explore transferring larger shares of freight to other modes. Figure 5.8 and Figure 5.9 show the expected increase in truck traffic on major U.S. roadways from 2011 to 2040.

Figure 5.8: Average daily long-haul traffic on the National Highway System, 2011



Source: Federal Highway Administration's Freight Analysis Framework

Figure 5.9: Average daily long-haul traffic on the National Highway System, 2040



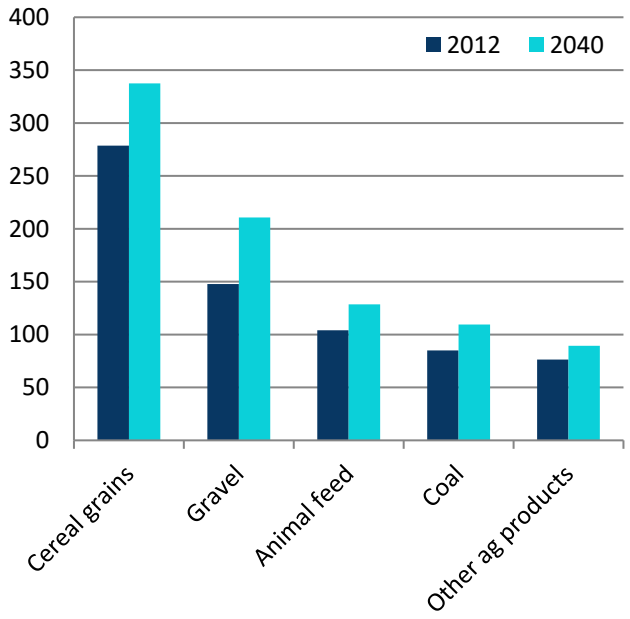
Source: Federal Highway Administration's Freight Analysis Framework

Commodity movement in the state is dominated by agriculture-related products

As mentioned in Chapter 3, Economic context of freight transportation planning, Iowa is a major agricultural state, which means most of the commodities moving to, from, and within the state are related to the agricultural industry. When ranked by weight and value, the top commodities in the state vary, but each is projected to increase and remain near the top through 2040.

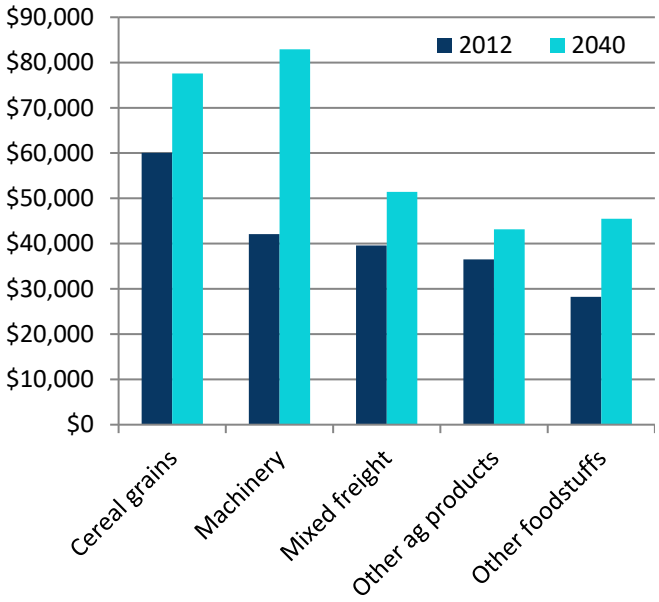
Figure 5.10 shows Iowa's top five commodities by weight. These commodities are typically high-weight but low-value bulk shipments. Figure 5.11 shows Iowa's top five commodities by value. With the exception of cereal grains, these commodities are typically high value, but lower weight. The numbers in both figures include a combination of the freight moving to, from, and within the state.

Figure 5.10: Commodity weight, 2012-2040 (millions)



Source: Federal Highway Administration's Freight Analysis Framework

Figure 5.11: Commodity value, 2012-2040 ($ millions)



Source: Federal Highway Administration's Freight Analysis Framework

Cereal grains will remain the top commodity moving to, from, and within the state

On the basis of weight, cereal grains were the top commodity to move to, from, and within Iowa in 2012 and are projected to remain there through 2040. Gravel is the second largest commodity group and is projected to remain. The third largest commodity group in 2012 varied between animal feed (within Iowa and from Iowa) and coal (to Iowa). Tables 5.4 and 5.5 show the top commodities by weight within, from, and to Iowa in 2012 and the projected top commodities for 2040.

Table 5.4: Top commodities by weight, 2012 (millions of tons)

Within Iowa		From Iowa		To Iowa	
Total	**190.6**	**Total**	**266.9**	**Total**	**246.8**
Cereal grains	80.5	Cereal grains	101.0	Cereal grains	97.1
Gravel	47.7	Gravel	50.4	Gravel	49.7
Animal feed	29.1	Animal feed	42.7	Coal	44.7
Other ag products[31]	18.9	Coal	38.4	Animal feed	32.2
Nonmetal mineral products[32]	14.2	Other ag products	34.4	Other ag products	23.1

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.5: Top commodities by weight, 2040 (millions of tons)

Within Iowa		From Iowa		To Iowa	
Total	**236.72**	**Total**	**381.46**	**Total**	**294.51**
Cereal grains	92.8	Cereal grains	136.9	Cereal grains	107.9
Gravel	67.8	Gravel	72.3	Gravel	70.5
Animal feed	32.0	Animal feed	62.4	Coal	47.3
Nonmetal mineral products	25.6	Coal	60.7	Nonmetal mineral products	34.6
Other ag products	18.5	Other ag products	49.1	Animal feed	34.2

Source: Federal Highway Administration's Freight Analysis Framework

Understanding the difference in moving these commodity types is a significant part of planning for the future. The total weight of these commodities is being transported by airplanes, trucks, rail cars, and/or barges. Therefore, it is crucial to not only analyze the total tonnages, but also understand the difference in hauling these commodity types for each mode. For example, 1 million tons of gravel will take more trucks than hauling 1 million tons of cereal grains. The volumes per truck would be different.

[31] Other Agriculture Products include soybeans, vegetables, fruits, nuts, and seeds.
[32] Nonmetallic mineral products include hydraulic cements, ceramic products, glass, and other types of building products.

Cereal grains and machinery will be the top commodities transported by value

In 2012, cereal grains represented the top commodity shipped within the state in terms of value. However, it is projected that machinery will take its place at the top of freight moving to and from Iowa by 2040. Machinery is second behind cereal grains in what is moved to and from Iowa in 2012. Tables 5.6 and 5.7 show the top commodities by value moved within, from, and to Iowa in 2012 and the projected top commodities for 2040.

Table 5.6: Top Commodities by value, 2012 ($ millions)

Within Iowa		From Iowa		To Iowa	
Total	**$50,541**	**Total**	**$92,679**	**Total**	**$80,495**
Cereal grains	$16,966	Cereal grains	$21,556	Cereal grains	$21,519
Animal feed	$9,093	Machinery	$21,513	Machinery	$15,814
Other ag products	$8,816	Mixed freight	$17,613	Coal	$15,403
Live animals/fish	$8,568	Other ag products	$16,410	Mixed freight	$14,872
Mixed freight	$7,098	Other foodstuffs	$15,588	Motorized vehicles	$12,887

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.7: Top Commodities by value, 2040 ($ millions)

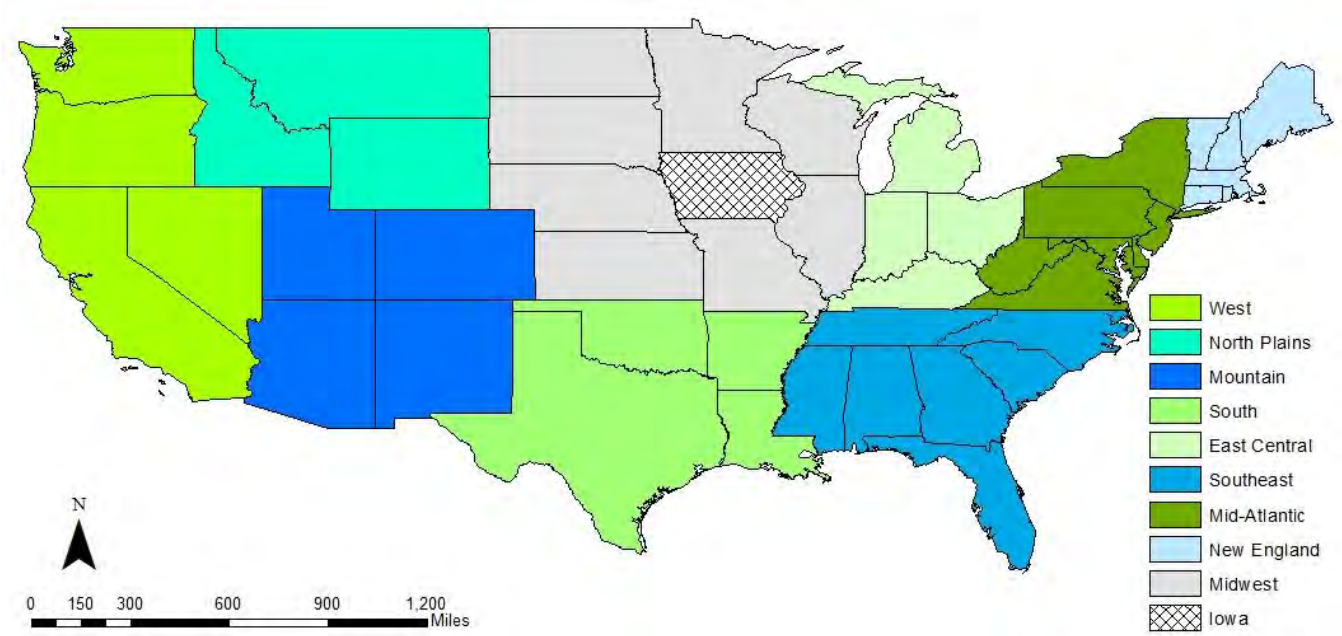
Within Iowa		From Iowa		To Iowa	
Total	**$57,231**	**Total**	**$150,170**	**Total**	**$112,449**
Cereal grains	$19,539	Machinery	$40,460	Machinery	$33,371
Animal feed	$9,983	Cereal grains	$34,314	Cereal grains	$23,716
Live animals/fish	$9,671	Other foodstuffs	$25,936	Mixed freight	$20,219
Machinery	$9,078	Animal feed	$25,501	Electronics	$17,664
Mixed freight	$8,960	Other ag products	$23,959	Motorized vehicles	$17,479

Source: Federal Highway Administration's Freight Analysis Framework

Iowa will continue to trade primarily with the Midwestern states

Iowa's regional trading partners, shown in Figure 5.12, provide markets for its producing industries and serve as suppliers to Iowa's consuming industries.

Figure 5.12: Regional trading partners

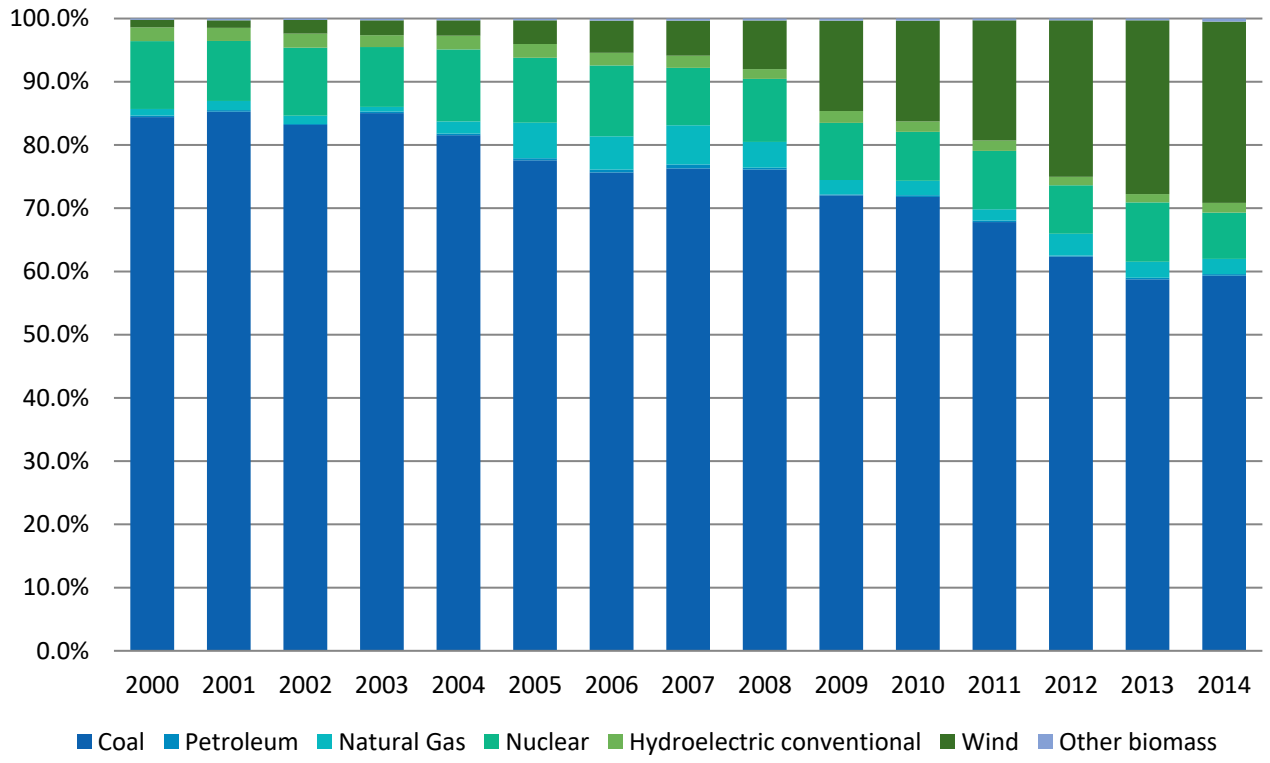


Source: Iowa Department of Transportation

In 2012, 65 percent (100.2 million tons) of the freight tonnage leaving Iowa went to states in the Midwest, and about 71.4 percent (96 million tons) of the freight tonnage coming into Iowa was from Midwestern states. This trend is projected to continue through 2040.

The South region received the second highest amount of freight tonnage (20.2 million tons) from Iowa in 2012, while the North Plains region sent the second highest amount of freight tonnage (20.8 million tons) to Iowa. A large portion of this tonnage from the North Plains is coal being delivered from Wyoming for utility generation in the state. The North Plains and South regions are projected to remain as the second largest origin and destination for Iowa freight, respectively, even though the amount of tonnage coming from the North Plains is expected to decrease roughly 50 percent by 2040. This is most likely due to the fact that Iowa is currently using other resources like wind turbines and natural gas to generate power (see Figure 5.13).

Figure 5.13: Iowa utility generation by source, 2000-2014



Source: U.S. Department of Energy

In terms of value in 2012, about 48.1 percent ($70.1 billion) of freight from Iowa went to Midwestern states, followed by 11.9 percent going to the South region. The majority of freight by value coming into the state is also from Midwestern states ($79.3 billion), followed by about 9 percent coming from the East Central ($10.7 billion) region and 7.2 percent from the South ($9.5 billion) region. In 2040, the Midwest region will still be the largest destination and origin for Iowa freight by value with the South and East Central regions following. This can be attributed to industrial products, such as motor vehicles, textiles, machinery, plastics, and electronics. Tables 5.8 and 5.9 show the outbound and inbound freight tonnage and value moving between Iowa and each region in the United States.

Table 5.8: Commodity origin region moving from Iowa, 2012-2040

	2012		2040		Percent change	
Region	Weight (millions)	Value ($ millions)	Weight (millions)	Value ($ millions)	Weight	Value
Total	**154.1**	**$145,781**	**282.0**	**$268,077**	**82.9**	**83.9**
Midwest	100.2	$70,162	172.1	$118,705	71.9	69.2
South	20.2	$17,387	46.2	$35,502	128.3	104.2
Mid-Atlantic	9.6	$13,914	19.0	$31,256	96.9	124.6
Southeast	7.8	$11,799	13.1	$20,197	67.4	71.2
West	6.5	$11,942	13.7	$25,200	110.7	111.0
East Central	5.1	$13,352	10.3	$25,678	100.0	92.3
Mountain	2.9	$4,070	4.6	$6,330	62.4	55.5
New England	1.0	$1,981	1.8	$3,505	75.6	76.9
North Plains	0.8	$1,173	1.2	$1,703	51.8	45.1

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.9: Commodity destination region moving to Iowa, 2012-2040

	2012		2040		Percent change	
Region	Weight (millions)	Value ($ millions)	Weight (millions)	Value ($ millions)	Weight	Value
Total	**134.4**	**$131,528**	**147.3**	**$197,238**	**9.5**	**50.0**
Midwest	96.0	$79,274.25	110.1	$109,096.75	14.7	37.6
North Plains	20.8	$896.95	10.2	$1,167.94	-50.8	30.2
South	5.3	$9,436.93	7.8	$17,694.94	47.7	87.5
East Central	4.9	$11,783.72	7.9	$19,193.01	61.7	62.9
Southeast	3.3	$8,714.06	4.1	$12,806.27	21.5	47.0
Mid-Atlantic	1.9	$9,952.57	2.9	$16,885.61	56.4	69.7
West	1.2	$6,859.35	2.7	$13,495.60	115.3	96.7
Mountain	0.8	$1,948.41	1.3	$2,939.35	56.8	50.9
New England	0.3	$2,661.58	0.3	$3,958.96	21.8	48.7

Source: Federal Highway Administration's Freight Analysis Framework

Illinois and Minnesota will continue to be Iowa's largest domestic trading partners

Minnesota currently sends the most tonnage to Iowa and Illinois sends the most in terms of value. Both trends are projected to continue through 2040. Iowa exports the most to Illinois in tonnage and value, followed by Minnesota. This is expected to be the case in 2040 as well. Other major domestic trading partners include Nebraska, Missouri, Texas, and California.

Table 5.10 shows Iowa's top domestic trading partners in terms of imports for 2012, and Table 5.11 shows the projected top trading partners for 2040. Table 5.12 shows Iowa's top domestic trading partners in terms of exports for 2012, and Table 5.13 shows the projected top trading partners for the year 2040.

Table 5.10: Top domestic trading partners – imports to Iowa, 2012

Tons (millions)			Value ($ millions)		
	Number	Percent		Number	Percent
Total	**377.6**	**100**	**Total**	**$226,863**	**100**
Minnesota	46.0	12.2	Illinois	$23,508	10.4
Nebraska	22.7	6.0	Minnesota	$22,556	9.9
Wyoming	20.0	5.3	Nebraska	$11,918	5.3
Illinois	10.6	2.8	Missouri	$7,520	3.3
Missouri	7.3	1.9	Wisconsin	$7,372	3.2

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.11: Top domestic trading partners – imports to Iowa, 2040

Tons (millions)			Value ($ millions)		
	Number	Percent		Number	Percent
Total	**457.9**	**100**	**Total**	**$321,619**	**100**
Minnesota	52.1	11.4	Illinois	$33,959	10.6
Nebraska	24.2	5.3	Minnesota	$29,639	9.2
Illinois	12.0	2.6	Nebraska	$15,383	4.8
Wyoming	9.0	2.0	Texas	$12,342	3.8
Missouri	7.5	1.6	California	$10,563	3.3

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.12: Top domestic trading partners – exports from Iowa, 2012

Tons (millions)			Value ($ millions)		
	Number	Percent		Number	Percent
Total	**397.3**	**100**	**Total**	**$241,115**	**100**
Illinois	41.6	10.5	Illinois	$23,621	9.8
Minnesota	27.7	7.0	Minnesota	$13,621	5.6
Nebraska	14.0	3.5	Wisconsin	$10,483	4.3
Texas	11.7	3.0	Texas	$10,291	4.3
Louisiana	7.1	1.8	Missouri	$7,918	3.3

Source: Federal Highway Administration's Freight Analysis Framework

Table 5.13: Top domestic trading partners – exports from Iowa, 2040

Tons (millions)			Value ($ millions)		
	Number	Percent		Number	Percent
Total	**592.7**	**100**	**Total**	**$392,457**	**100**
Illinois	69.9	11.8	Illinois	$41,587	10.6
Minnesota	50.9	8.6	Minnesota	$23,635	6.0
Louisiana	21.8	3.7	Texas	$19,319	4.9
Nebraska	21.0	3.5	Nebraska	$15,891	4.0
Texas	20.7	3.5	California	$15,481	3.9

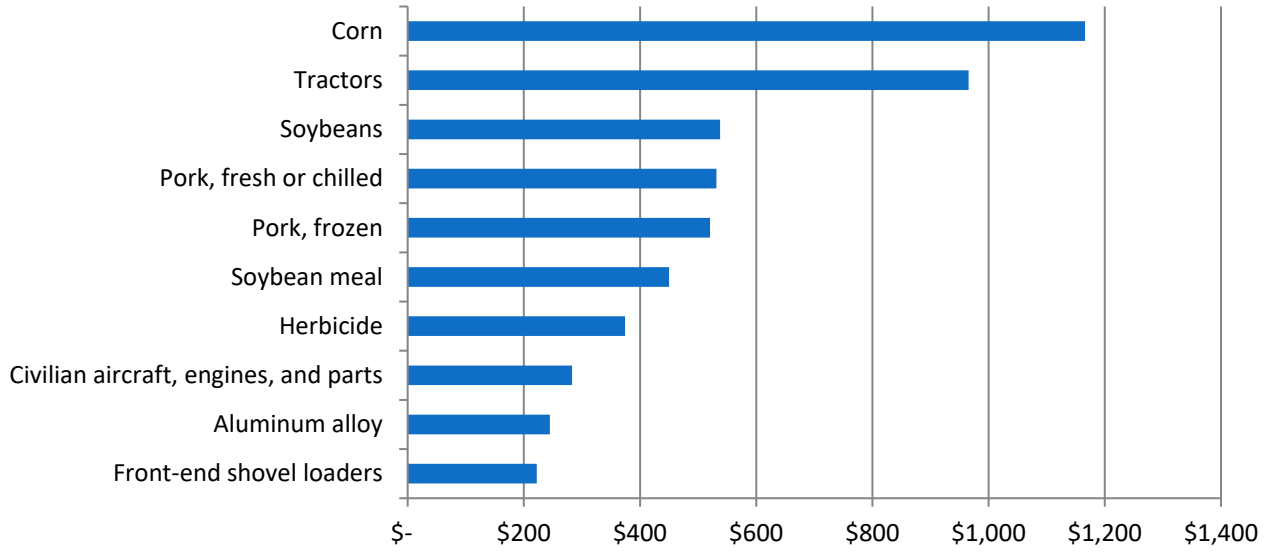
Source: Federal Highway Administration's Freight Analysis Framework

The Iowa DOT believes that with a large majority of Iowa's inbound and outbound freight involving states in the immediate vicinity, the coordination of network identification, regulation, infrastructure projects, and freight-related initiatives is crucial to economic growth and prosperity in the region.

Canada and Mexico are Iowa's largest international trading partners

The state of Iowa exported roughly $15.1 billion in goods in 2014, which is about a 1 percent share of the entire U.S. export market. Corn was the top exported commodity by value at approximately $1.2 billion, increasing from $540 million in the previous year. Tractors were the second largest commodity group exported in terms of value at $966 million, followed by soybeans at $538 million. Other top exports include pork (chilled and frozen), soybean meal, herbicides, and machinery parts. Figure 5.14 shows the top 10 internationally exported commodities by value in 2014.

Figure 5.14: Top commodities by value exported internationally, 2014 ($ millions)



Source: U.S. Census Bureau, Foreign Trade Division

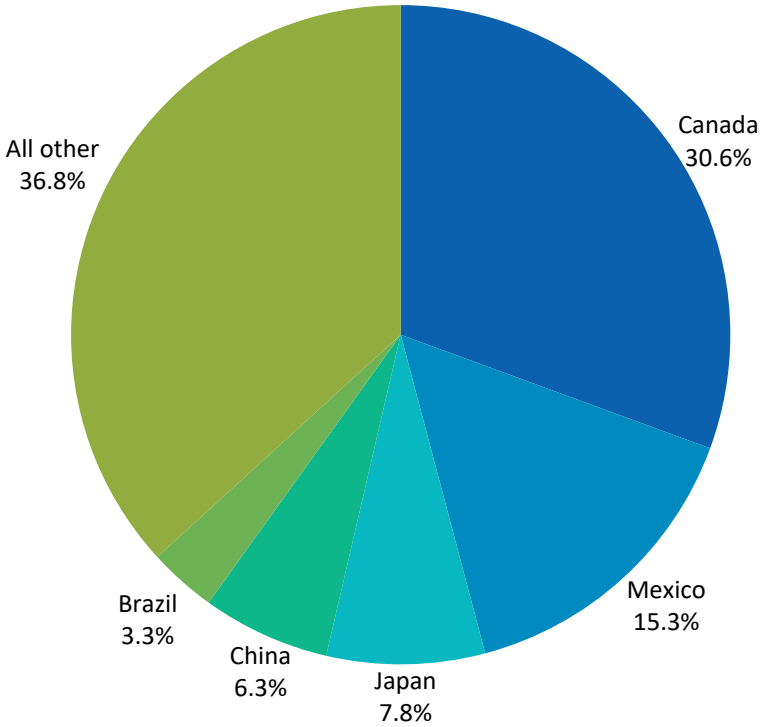
In 2014, Iowa's top international trading partner was Canada with exports valued at $4.6 billion. Other notable countries by value of exports include Mexico, Japan, China, and Brazil. Table 5.14 and Figure 5.15 show the breakdown of Iowa's exports to foreign countries.

Table 5.14: Top international trading partners by value exported, 2014 ($ millions)

Country	Value	Percent
Total	**15,092**	**100**
Canada	4,618	30.6
Mexico	2,305	15.3
Japan	1,171	7.8
China	946	6.3
Brazil	502	3.3
All other	5,550	36.8

Source: U.S. Census Bureau, Foreign Trade Division

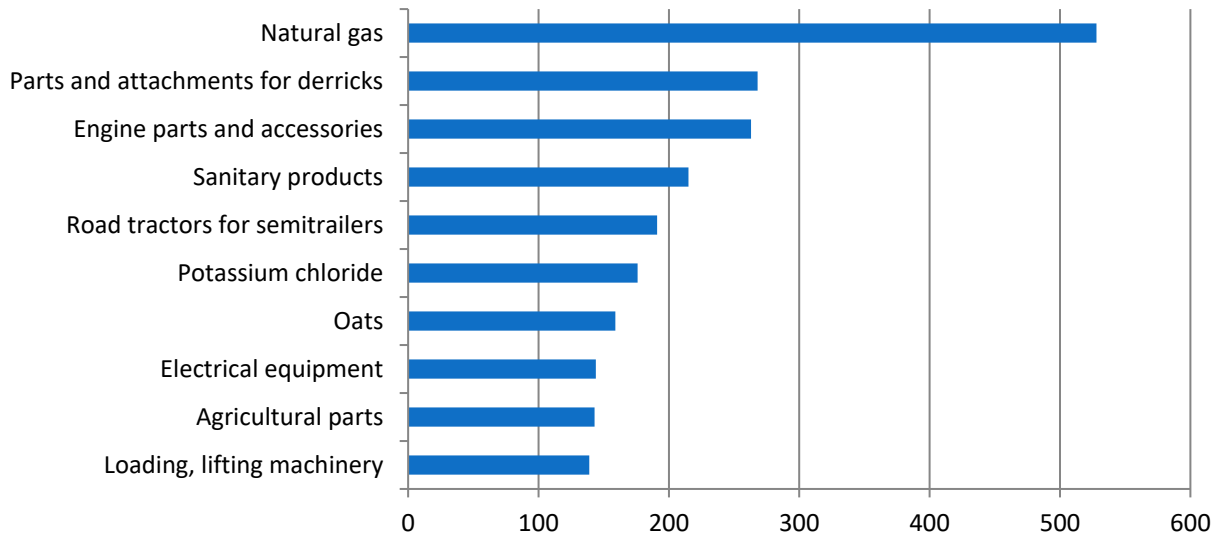
Figure 5.15: Top international trading partners, 2014



Source: U.S. Census Bureau, Foreign Trade Division

Similar to the domestic import/export climate, Iowa's import totals from foreign countries are much less than those of exports. In 2014, Iowa's total foreign imports were approximately $10 billion, contributing about a 0.4 percent share of the U.S. total foreign import market. Natural gas was by far the largest imported commodity by value at $528 million, followed by parts and attachments for derricks at $268 million. Others in the top 10 commodities include engine parts and accessories, sanitary products, road tractors, potassium chloride, oats, electrical equipment, agricultural parts, and loading/lifting machinery. Figure 5.16 highlights these numbers.

Figure 5.16: Top commodities by value imported internationally, 2014 ($ millions)



Source: U.S. Census Bureau, Foreign Trade Division

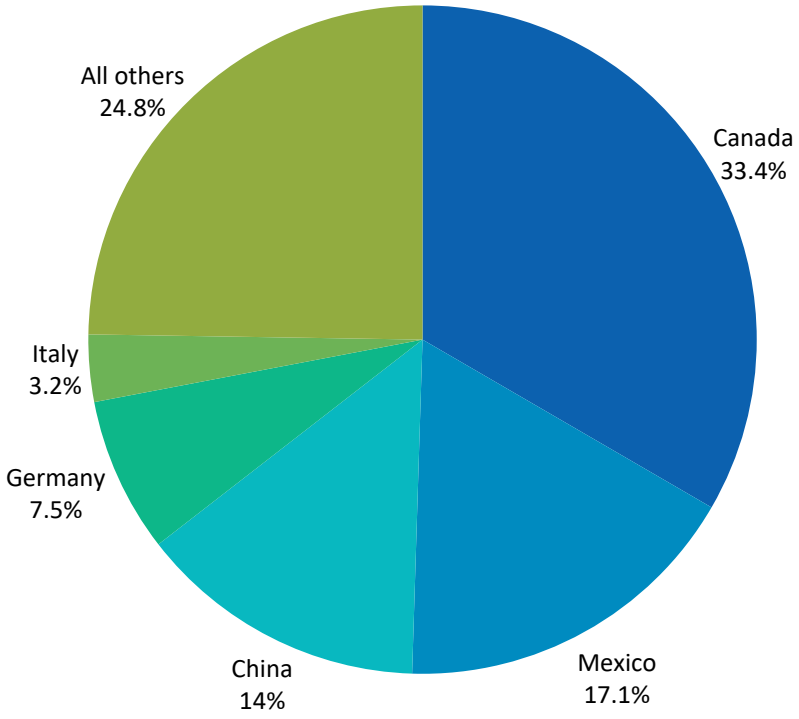
In 2014, Canada was also a leader in Iowa's foreign import trade market with imports valued at $3.4 billion or 33.4 percent market share. Other notable countries include Mexico, China, Germany, and Italy, making up approximately 75 percent of total imports to Iowa. Table 5.15 and Figure 5.17 show the breakdown of Iowa's imports from foreign countries.

Table 5.15: Top international trading partners by value imported, 2014 ($ millions)

Country	Value	Percent
Total	**10,081**	**100**
Canada	3,364	33.4
Mexico	1,726	17.1
China	1,412	14.0
Germany	756	7.5
Italy	327	3.2
All others	2,495	24.7

Source: U.S. Census Bureau, Foreign Trade Division

Figure 5.17: Top international trading partners, 2014



Source: U.S. Census Bureau, Foreign Trade Division

6. Freight transportation assets

Iowa's 160,000-mile multimodal freight transportation system is comprised of multiple air cargo facilities, a well-developed highway system, an extensive rail network, a large web of pipelines, two bordering navigable waterways, and hundreds of freight-related facilities to assist in the movement of commodities. The following section will provide an inventory of the infrastructure and facilities that make up this system and how they interact to increase the efficiency of goods movement through the state and region.

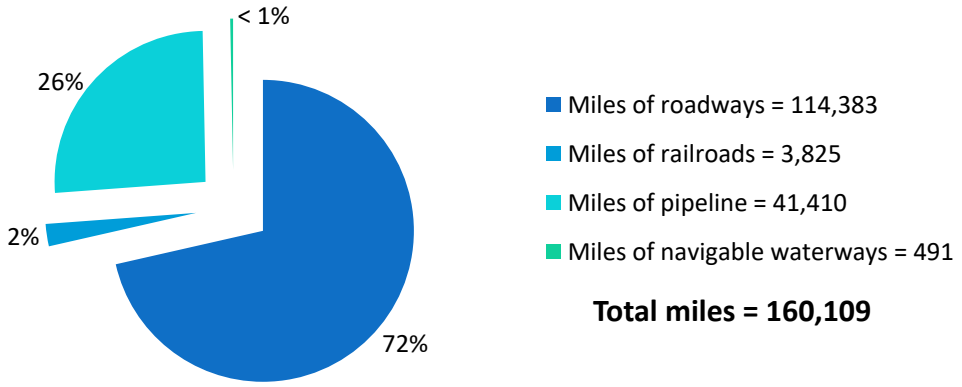
6.1 Mode comparison

Freight shippers have the convenience of multiple modal options for moving goods and material in the state of Iowa. This is highlighted by the following.

- Eight commercial and 100 general publicly owned aviation airports.
- Crossroads of the nation's surface transportation system, with transcontinental interstates 35 and 80 traversing the state and meeting in Des Moines.
- Nation's busiest freight rail route crosses through the center of the state.
- Bordered by two navigable waterways: Missouri and Mississippi rivers.

Figure 6.1 shows the mileage breakdown of Iowa's surface freight transportation system.

Figure 6.1: Iowa freight transportation system

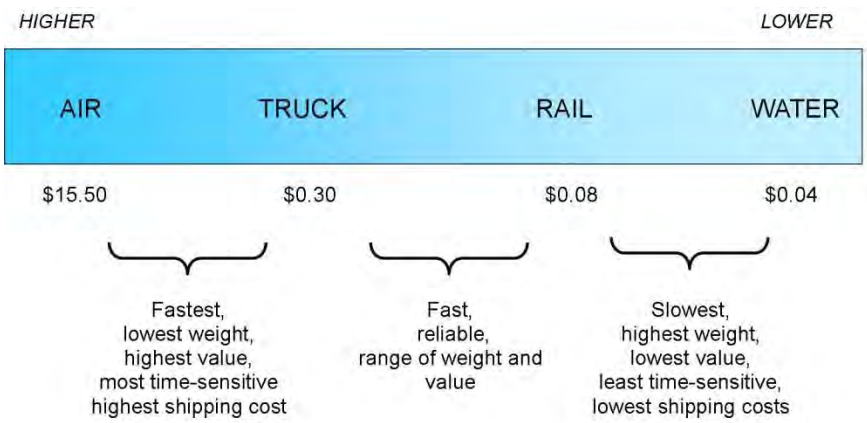


Source: Iowa Department of Transportation

Transportation costs play a large role in the decisions of Iowa shippers. Having various transportation options is important to these companies as it allows for cost savings and opportunities to optimize their supply chains. The different transportation modes all play a crucial part in the overall freight transportation system, each having different strengths and weaknesses. The characteristics of each option may make the efficient transport of different commodities ideal for one mode but not another.

Figure 6.2 shows the per-pound value of freight moved in Iowa by mode for total freight movements (originating, terminating, intrastate, and through).[33] The value of freight per pound is substantially higher for air, which is the fastest way to ship. Air handles the most time-sensitive cargo and has the highest shipping costs. Truck and rail carry much lower values per pound and handle higher weights at lower shipping costs. The lowest cost per pound is handled by water, which is also the slowest mode with the lowest shipping cost. These comparisons help explain which mode can handle a certain type of commodity most efficiently.

Figure 6.2: Iowa freight price comparisons



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, Commodity Flow Survey 2007

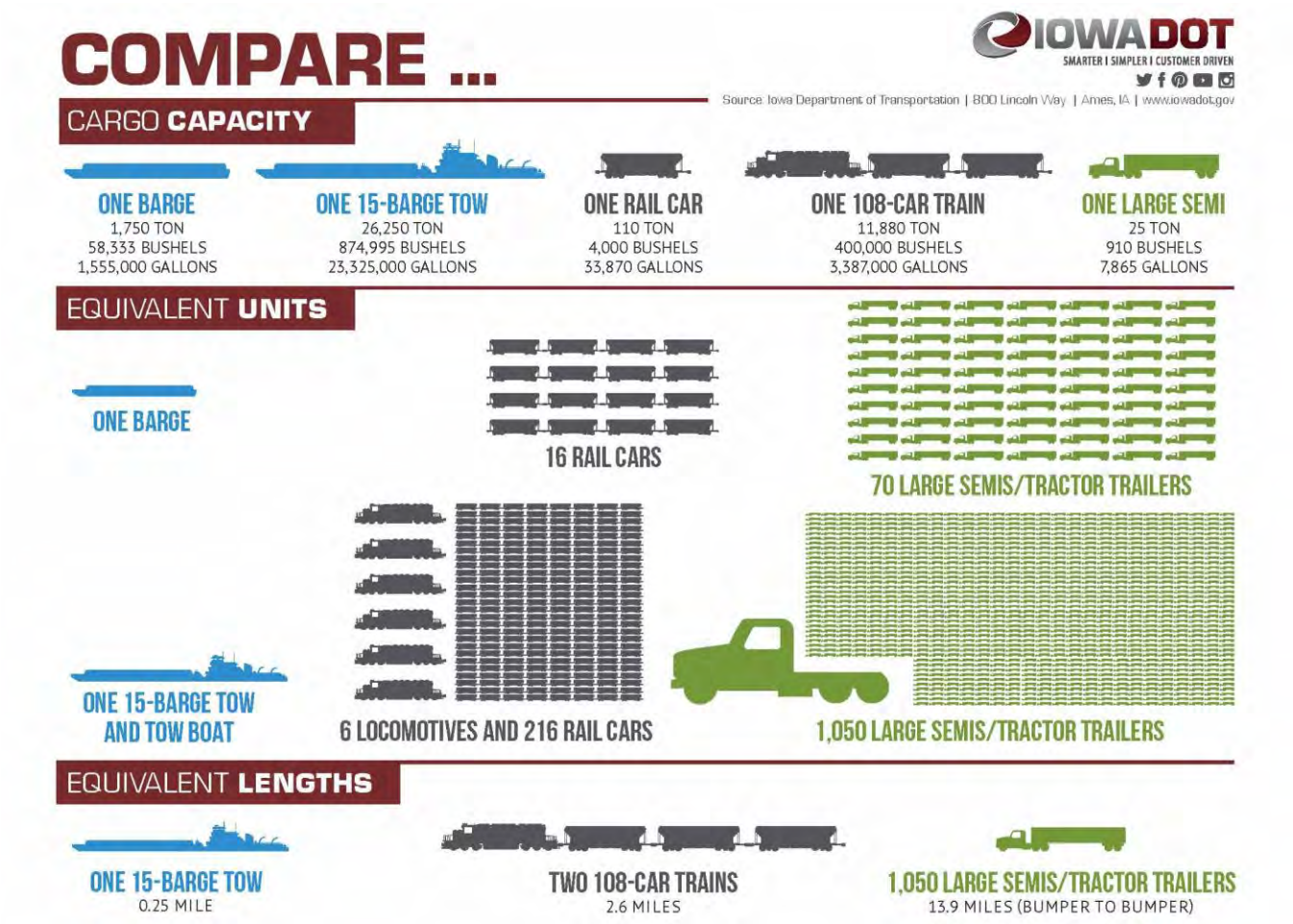
Currently, the majority of freight in Iowa is carried by truck, train, and barge. Although trucking is the most expensive per pound, it is the also the most flexible. Trucking companies provide various services to shippers. Full truckload service providers move products from one customer to another using a variety of equipment, including dry van, flatbed, hopper, and refrigerated. Trucks can move small amounts of a few hundred pounds all the way up to 50,000 pounds per shipment (see Figure 6.3).

[33] Freight shipping costs shift regularly. Figure 6.2 is meant to show general costs based on results of the 2007 Commodity Flow Survey. Absolute shipping prices are difficult to represent in this context.

Rail is less expensive than trucking and more fuel-efficient, but is more restricted by the privately owned networks the trains move on. This mode is well suited for moving large volumes of freight between two shipping points and, like trucks, uses dry car, flatbed, hopper, and refrigerated equipment.

Transporting commodities via waterway is the slowest and least flexible of the three modes. However, it is the most fuel-efficient, the cheapest, and can handle the largest volumes per trip. Figure 6.3 compares these three modes by the amount of freight each can carry at a time. This comparison shows that one barge can handle as much as 70 trucks or more than 16 rail cars.

Figure 6.3: Iowa freight tonnage comparisons



Source: Iowa Department of Transportation

Each of the freight transportation options in Iowa has its own strengths that play a critical role in the state's freight transportation network. These options enable Iowa to be a major player in the global economy. The following sections identify and describe each of these modes in more detail.

6.2 Air

SYSTEM HIGHLIGHTS

- **108 publicly owned airports**
- **More than 4,000 registered aircraft**
- **5,550 active licensed pilots**
- **More than 300 licensed aerial applicators**

Air cargo service in Iowa plays an important role by providing fast and reliable movement of time-sensitive freight to regional, national, and international destinations. Nearly all air freight to and from the state is moved by scheduled commercial air passenger carriers and dedicated air cargo carriers. Although most airports in the state will handle air cargo shipments to some extent, more than 99 percent of the reported tonnage moves through the Des Moines International Airport (DSM) and The Eastern Iowa Airport (CID) in Cedar Rapids. Two of the largest national air freight carriers, UPS Inc. and FedEx, maintain operations at both airports.

Airports in the state serve varying types of users and levels of demand. An airport's role in the aviation system depends on the type of facilities and services provided, as well as the aviation demand. As such, airports are categorized by one of five roles that are defined[34] by a set of related criteria. Facility and service targets have been determined for each airport role that will ensure the system is able to meet the needs of users. Table 6.1 identifies the number of airports in Iowa by service type. Of the 117 airports in Iowa, 108 are publicly owned.

[34] Roles are defined by the Iowa DOT's Office of Aviation in the *Iowa Aviation System Plan*.

Table 6.1: Number of Iowa airports by service type

Service type	Number
Total	**117**
Commercial service	8
Enhanced service	15
General service	31
Basic service	19
Local service	44

Source: Iowa Department of Transportation, Office of Aviation

Commercial service: Airports that provide regularly scheduled commercial airline service and have the infrastructure and services to support a full range of general aviation activity. There are eight Iowa airports that meet these criteria.

Enhanced service: Airports with a 5,000-foot or greater paved runway that have facilities and services to support most general aviation aircraft, including business jets, and have weather observation equipment. Enhanced service airports serve business aviation and are regional transportation centers. There are 15 Iowa airports that meet these criteria.

General service: Airports with a 4,000-foot or greater paved runway that have facilities and services to support twin- and single-engine general aviation aircraft, as well as some business jets. There are 31 Iowa airports that meet these criteria.

Basic service: Airports with a 3,000-foot or greater paved runway that have facilities and services to support single-engine aircraft, as well as some smaller twin-engine aircraft, and provide fuel. There are 19 Iowa airports that meet these criteria.

Local service: Airports with runways less than 3,000 feet, many of which are turf runways, and have little or no airport services. There are 44 Iowa airports that do not meet the criteria for any other roles and fall into this category.

Figure 6.4 shows the location of the five different types of airports.

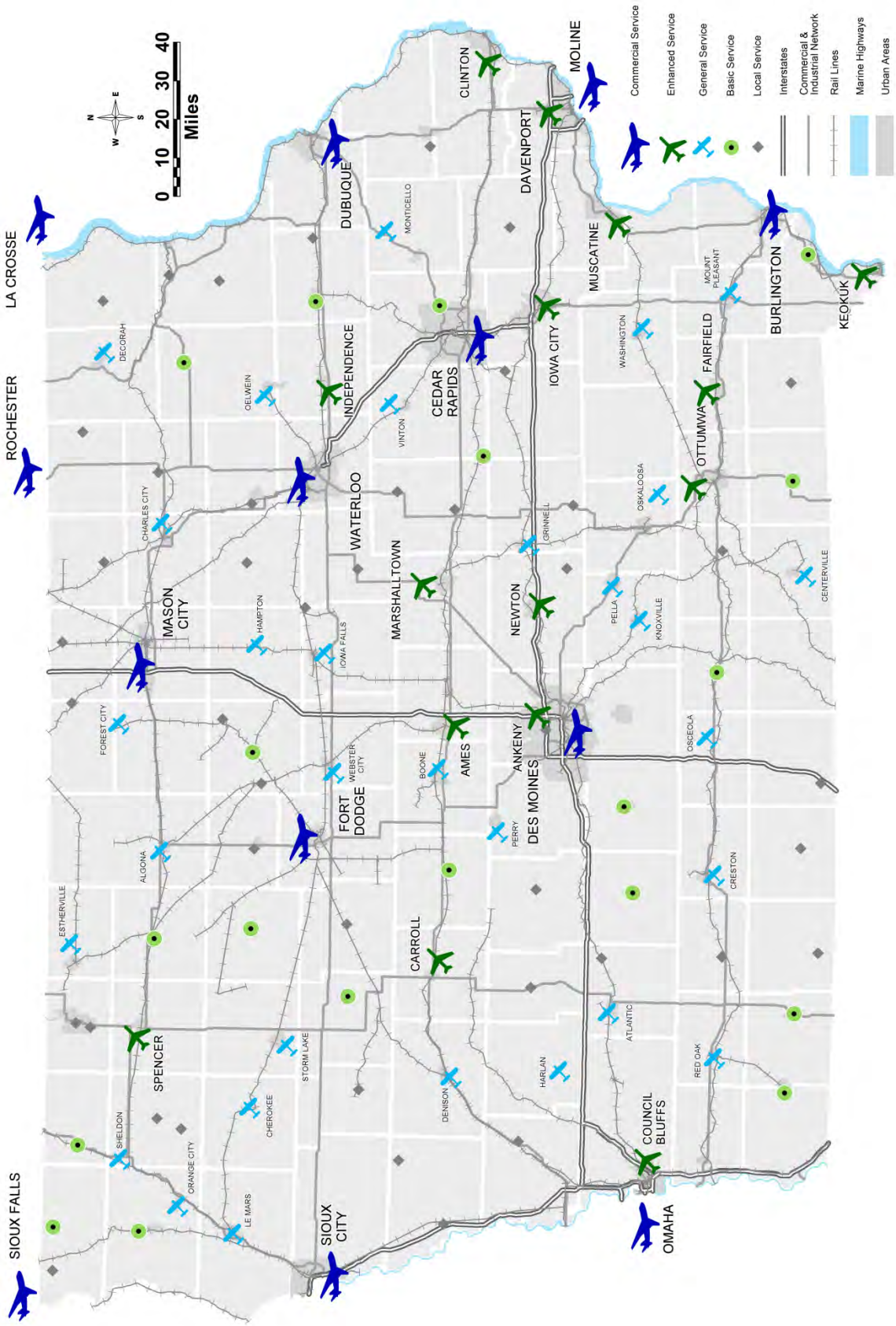


Figure 6.4: Iowa airports by service type

Source: Iowa Department of Transportation, Office of Aviation

6.3 Highway

SYSTEM HIGHLIGHTS

- **114,383 miles of roadways**
- **9,420-mile Primary Highway System**
- **2,391-mile Commercial and Industrial Network**
- **Two transcontinental interstate highways**
- **Over 25,000 bridge structures**
- **Nearly 20,000 trucking companies operating in Iowa**

Public roads are the backbone of Iowa's transportation system and provide service to all areas of the state. Iowa's roadways range from six-lane interstates, four-lane divided facilities, and multilane urban streets, to paved secondary roads, gravel roads, and municipal streets. The bridges that are part of this system provide crossings of thousands of streams, rivers, railroads, trails, and other roadways. These bridges range from 10-foot structures to multispan major river crossings. This combination of roadways and bridge structures has created an extremely accessible network that provides a high level of mobility for freight movement.

The state's public roadway system is comprised of more than 114,000 miles with approximately 25,000 bridge structures. While the size of the state's roadway system has not increased considerably in recent years, the infrastructure burden remains significant. Iowa ranks fifth nationally in number of bridges and 13th in miles of roadway, yet the state ranks just 38th in population density according to the 2010 Census. In addition to the roadways, Iowa has abundant truck parking spaces located at rest areas, weigh stations, and alternative service locations (e.g., truck stops) around the state.

According to the Iowa Code, Iowa's Primary Highway System is defined as "those roads and streets both inside and outside the boundaries of municipalities which are under the Iowa Department of Transportation's jurisdiction." This system makes up 9,400 miles of the 114,000-mile public system and is divided into five classifications according to priority. These include:

1. **Interstate**: Comprised of 782 centerline miles, the Interstate Highway System provides connections to the national transportation network and major metropolitan areas. Iowa is uniquely positioned at the crossroads of two major interstates: I-35 and I-80.
2. **Commercial and Industrial Network (CIN):** Comprised of 2,391 centerline miles, the CIN provides connections for Iowa cities with populations more than 20,000 to major metropolitan areas, and was identified by the state legislature to enhance opportunities for the development and diversification of the state's economy.

Other primary highways comprise the remaining 6,109 miles, and include:

3. **Area development**: Provide connections for cities with populations of more than 5,000 to the CIN and major commercial and industrial centers.
4. **Access routes**: Provide connections for cities with populations of more than 1,000 to employment, shopping, health care, and education facilities.
5. **Local Service**: Provide connections for cities with fewer than 1,000 population to local commercial and public services.

Since the majority of freight movement in Iowa is by truck, the state's roadways are the most critical element in the overall freight system. The 782-mile interstate system and the 2,391-mile CIN, both of which are part of the National Highway System (NHS), carry the vast majority of freight in all parts of the state. The NHS consists of roadways important to the nation's economy, defense, and mobility. This system includes the entire interstate network, principal arterials in rural and urban areas, intermodal connectors, and major strategic highway network connectors. In Iowa, the NHS consists of approximately 5,625 miles of roadway.

Most of the freight movements by air, rail, and water are intermodal, usually beginning and/or ending with a truck movement. These intermodal connections are critical to Iowa's competitive edge in the marketplace. Table 6.2 identifies locations where roadway connectors provide access between major intermodal facilities and the NHS. The connectors were designated using criteria set forth in 23 U.S.C. 470. The primary criteria are based on annual passenger volumes, annual freight volumes, or daily vehicular traffic on one or more principal routes that serve an intermodal facility.

Table 6.2: Iowa intermodal connectors

Facility	Type	Connector	Ownership
AGRI Grain Marketing, McGregor	Port terminal	Iowa 76, B St between terminal and U.S. 18	State
Amoco Pipeline Distribution Center, Council Bluffs	Truck/Pipeline terminal	U.S. 275 (eastern ramp termini I-29 to South Expressway), north to westbound ramp terminus of I-29/80.	State
Big Soo Terminal, Sioux City	Port terminal	Harbor Dr and Industrial Rd between terminal and I-29	Local
Continental Grain Co., Dubuque	Port terminal	Kerper Blvd, E. 16th St, E. 11th St, E. Ninth St, Ninth-11th W. Conn, between terminal and U.S. 61/151	Local
Des Moines International Airport	Airport	Fleur Dr between ML King Jr. Parkway and relocated Iowa 5	Local
Des Moines International Airport	Airport	Park Ave (63rd to Fleur Dr)	Local
Determann Industries, Camanche	Port terminal	Washington Blvd, U.S. 67 between terminal and U.S. 30	State
Harvest States Peavey, Davenport	Port terminal	Iowa 22 between terminal and I-280	State
Harvest States Peavey, Dubuque	Port terminal	E. Seventh St, Central Ave and White St between terminal and Commercial	Local
Quad Cities Container Terminal, Davenport[35]	Truck/Rail facility	S. Rolff St, Rockingham Rd (Iowa 22), between terminal and I-280	Local
The Eastern Iowa Airport, Cedar Rapids	Airport	Wright Brothers Blvd between I-380 and Cherry Valley Rd	Local
Vandalia Rd Pipeline, Des Moines (Pleasant Hill)	Truck/Pipeline terminal	E. 30th St/Vandalia Rd (Iowa 163 to U.S. 65)	Local
Williams Pipeline Co., Sioux City	Truck/Pipeline terminal	41st St and 46th St and Business U.S. 75 (Lewis Blvd) between terminal and U.S. 75	State

Source: Federal Highway Administration's Intermodal Connector Assessment Tool

Figure 6.5 shows the location of Iowa's Primary Highway System and truck parking facilities.

[35] The Quad Cities Container Terminal in Davenport is now closed, but the route is still designated as an intermodal connector.

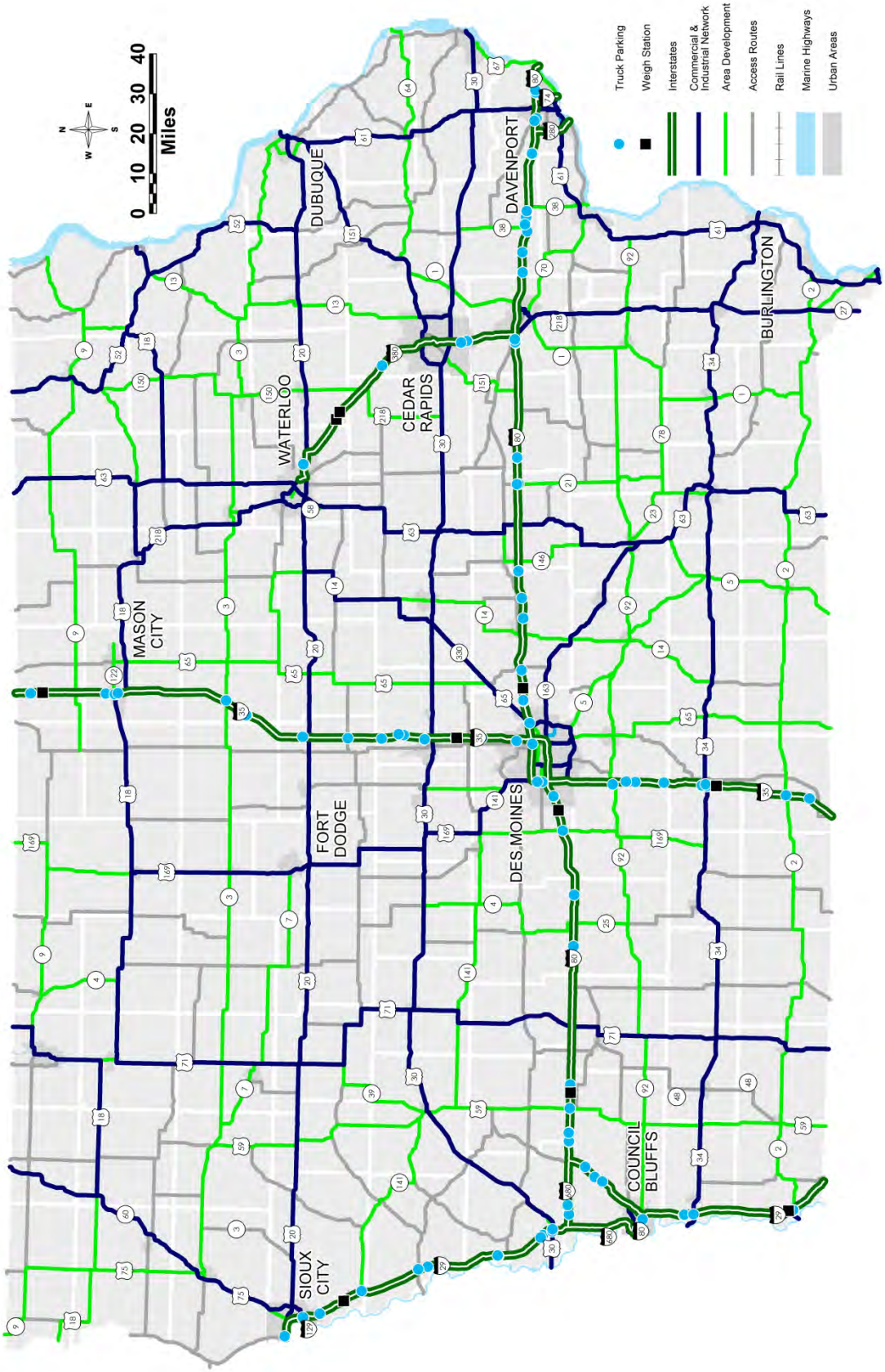


Figure 6.5: Iowa's primary highways

Source: Iowa Department of Transportation

6.4 Pipeline

SYSTEM HIGHLIGHTS

- **41,410 miles of pipelines**
- **84 pipeline operators**
- **Carry liquid petroleum, natural gas, anhydrous ammonia, crude oil, and highly volatile liquids**

There are 41,410 miles of hazardous liquid and natural gas pipelines in Iowa. This network supplies natural gas, liquefied petroleum/gas products, and anhydrous ammonia for residential and industrial consumption. Nearly all natural gas is delivered by pipeline directly to consumers. Liquefied petroleum/gas and anhydrous ammonia are usually delivered to above ground terminals where the product is shipped by truck to the final point of consumption. Iowa ranks fifth in the nation in consumption of liquefied gas in the form of propane, due primarily to the use in drying crops after harvest.

The pipelines comprising the network include large diameter lines carrying energy products to population centers, as well as small diameter lines that deliver natural gas to businesses and households. The energy products carried in pipelines fuel everyday life in the state and nation. They heat homes, power the industrial base, dry crops, and enable our daily commutes. Pipelines are typically labeled as one of the safest modes for transporting energy products because they are usually underground and away from the general public. Total pipeline miles by commodity and major pipeline companies in the state are shown in Tables 6.3 and 6.4. Figure 6.6 shows Iowa's current pipeline network.

The construction of an additional pipeline has been proposed that would travel from the Bakken oil fields in North Dakota to Patoka, Illinois, by way of Iowa. The suggested route would cut diagonally 343 miles through 18 counties from the northwest corner to the southeast, carrying crude oil. At the time this document was completed, the construction of this pipeline was still pending.

Table 6.3: Pipeline miles by commodity, 2011

		Mileage	Percent of total mileage
Transmission	Natural gas	8,401	27
	Refined products	1,632	5
	Liquefied petroleum gas	1,295	4
	Natural gas liquids	841	3
	Anhydrous ammonia	664	2
	Crude oil	336	1
	Empty liquid	199	1
	Other gas	2	< 1
	Subtotal	13,367	43
Gas distribution		17,693	57
Total		**31,060**[36]	

Source: U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration

Table 6.4: Major pipelines in Iowa, 2014

Type	Company
Crude oil	BP Pipeline, Koch Pipeline
Petroleum products	Midstream Partners, Nustar, Buckeye Partners
Liquefied petroleum gases	Kinder Morgan, Enterprise Products, Nustar, ONEOK
Interstate natural gas	Alliance Pipeline Co., ANR Pipeline Co., Natural Gas Pipeline Co. of America, Northern Border Pipeline Co., Northern Natural Gas Co.

Source: Iowa State Energy Profile, U.S. Energy Information Administration

[36] This total does not include smaller natural gas pipelines that deliver directly to consumers.

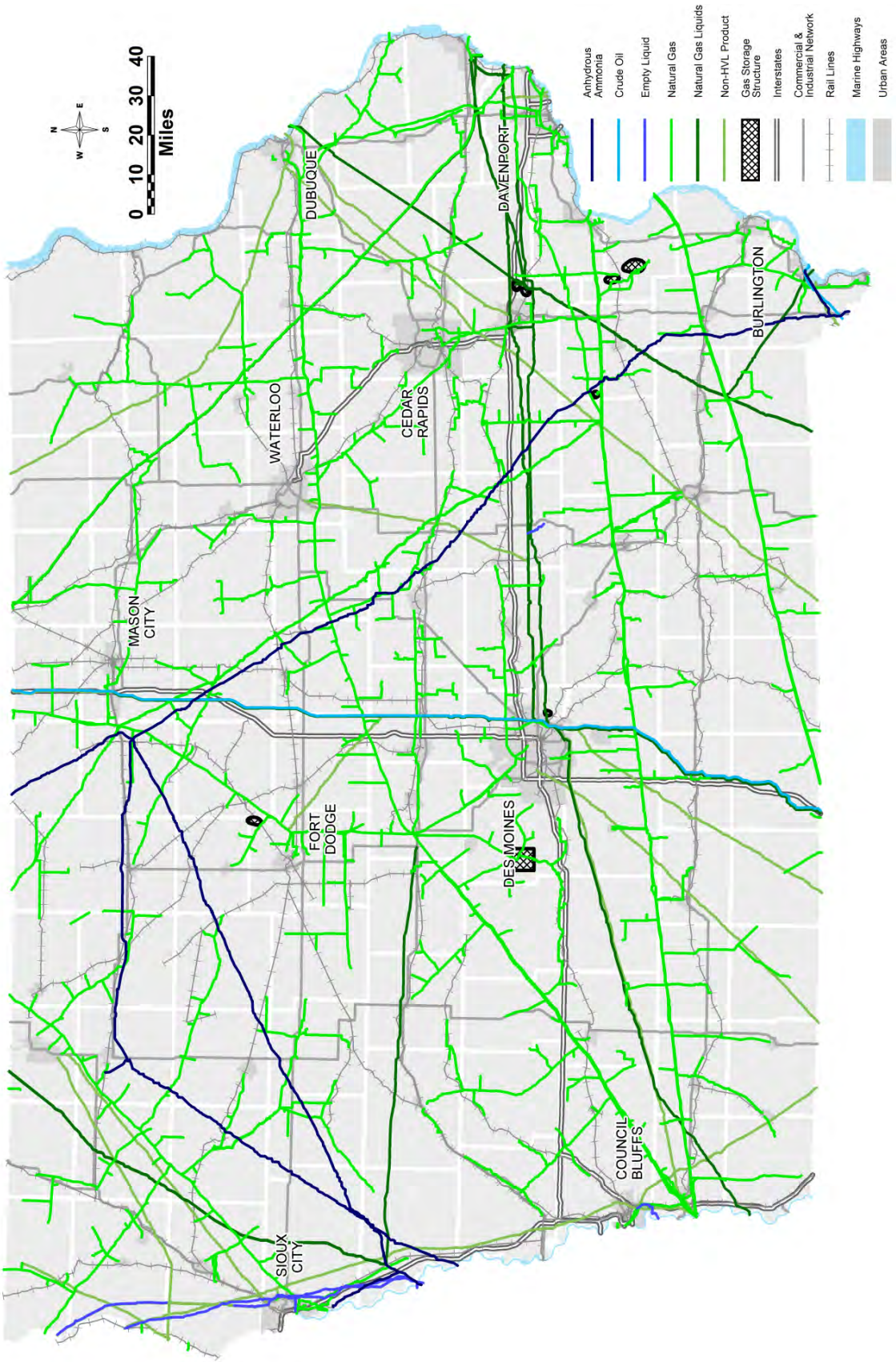


Figure 6.6: Iowa pipelines

Source: Iowa Department of Transportation, Iowa Utilities Board

6.5 Railroad

SYSTEM HIGHLIGHTS

- **3,825 miles of railroads**
- **18 railroad companies, including:**
  - **six Class I, one Class II, and 11 Class III**
- **Rail service in 90 of the 99 Iowa counties**

Iowa has an extensive rail transportation system that acts as a vital piece of the overall freight system by transporting goods throughout the state, nation, and to foreign markets. The ability of rail transportation to haul large volumes of freight in a safe, energy-efficient, and environmentally sound manner makes it a major factor in Iowa's economy.

While rail competes with air, highway, and waterway, it also cooperates with those modes to provide intermodal services to Iowans. The railroad network performs an important role in moving bulk commodities produced and consumed in the state to local processors, livestock feeders, and river terminals for foreign export.

Rail service in Iowa is dominated by six Class I carriers. Of the six, the Union Pacific Railroad and the BNSF Railway carry the largest volume of traffic in the state, operating more than 1,900 miles of track combined, including double tracks running east to west across the state. The Class I carriers operate the vast majority of tracks and accrue most of the freight revenues in Iowa. Class II and III railroads often provide feeder service to the Class I carriers. The only Class II railway in the state, Iowa Interstate Railroad, maintains 305 miles of track serving as another major east-to-west corridor traveling from Omaha-Council Bluffs to the Chicago area. Class III railroads consist of two separate operating categories – line haul and switching. Switching railroads operate in urban areas and facilitate the interchange of rail shipments. These switch operators are typically associated with Class I railroads and are common practices within Class III operations.

Table 6.5 shows a breakdown of the rail miles operated by each railroad in the state. Figure 6.7 shows Iowa's rail network by primary operator. This map does not show the location of trackage or haulage rights.

Table 6.5: Rail miles operated in Iowa by railroad, 2014

Class	Railroad company	Carrier code	Miles owned	Percent of total	Under contract	Trackage rights	Haulage rights	Total operated
I	BNSF Railway	BNSF	631	16.4	33	42	0	706
	Canadian National Railway[37]	CN	605	15.7	0	3	0	608
	Canadian Pacific Railway[38]	CP	654	17.0	0	12	0	666
	Kansas City Southern Railway	KCS	0	0.0	0	0	55	55
	Norfolk Southern Railway	NS	44	1.1	4	0	386	395[39]
	Union Pacific Railroad	UP	1,291	33.5	0	95	126	1,512
	Class I subtotal		**3,225**	**83.7**				
II	Iowa Interstate Railroad	IAIS	298	7.7	6	21	0	325
	Class II subtotal		**298**	**7.7**				
III	Appanoose County Community Railroad	APNC	35	0.9	0	0	0	35
	Boone & Scenic Valley Railroad	BSV	2	0.1	0	0	0	2
	Burlington Junction Railway	BJRY	6	0.2	0	0	0	6
	CBEC Railway[40]	CBEC	6	0.2	0	0	0	6
	Cedar Rapids & Iowa City Railway	CIC	57	1.5	0	0	0	57
	D&I Railroad	DAIR	0	0.0	35[41]	7	0	42
	D&W Railroad[42]	DWRV	22	0.6	0	6	0	28
	Iowa Northern Railway	IANR	117	3.0	50	60	0	227
	Iowa River Railroad	IARR	9	0.2	0	0	0	9
	Iowa Traction Railway	IATR	10	0.3	0	0	0	10
	Keokuk Junction Railway	KJRY	1	0.0	0	3	0	4
	Class III subtotal		**265**	**6.9**				
	North Central Iowa Rail Corridor[43]	NCIRC	28	0.7	0	0	0	28
	State of South Dakota[44]	SD	35	0.9	0	0	0	35
	Nonoperating owners subtotal		**63**	**1.6**				
	Iowa Rail Network total		**3,851**	**100**				

Source: Iowa Department of Transportation, railroad annual reports, Iowa railroad companies

[37] CN operates in Iowa via subsidiaries Chicago Central & Pacific (CCP) and Cedar River Railroad (CEDR).
[38] CP operates in Iowa via subsidiary Dakota, Minnesota & Eastern (DME).
[39] NS presently operates on 9 miles in Iowa – 5 miles of NS trackage at Des Moines and 4 miles of BNSF trackage at Des Moines operated under contract. The remainder of the NS-owned trackage in Iowa has been leased to BNSF and IAIS for operations. Total miles operated figure represents miles in Iowa over which NS operates through ownership, under contract, and via haulage rights only.
[40] CBEC is operated by IAIS.
[41] State of South Dakota owned trackage in Iowa is operated by DAIR.
[42] DWRV is operated by IANR.
[43] NCIRC is trackage is operated by IANR.
[44] SD trackage is operated by DAIR.

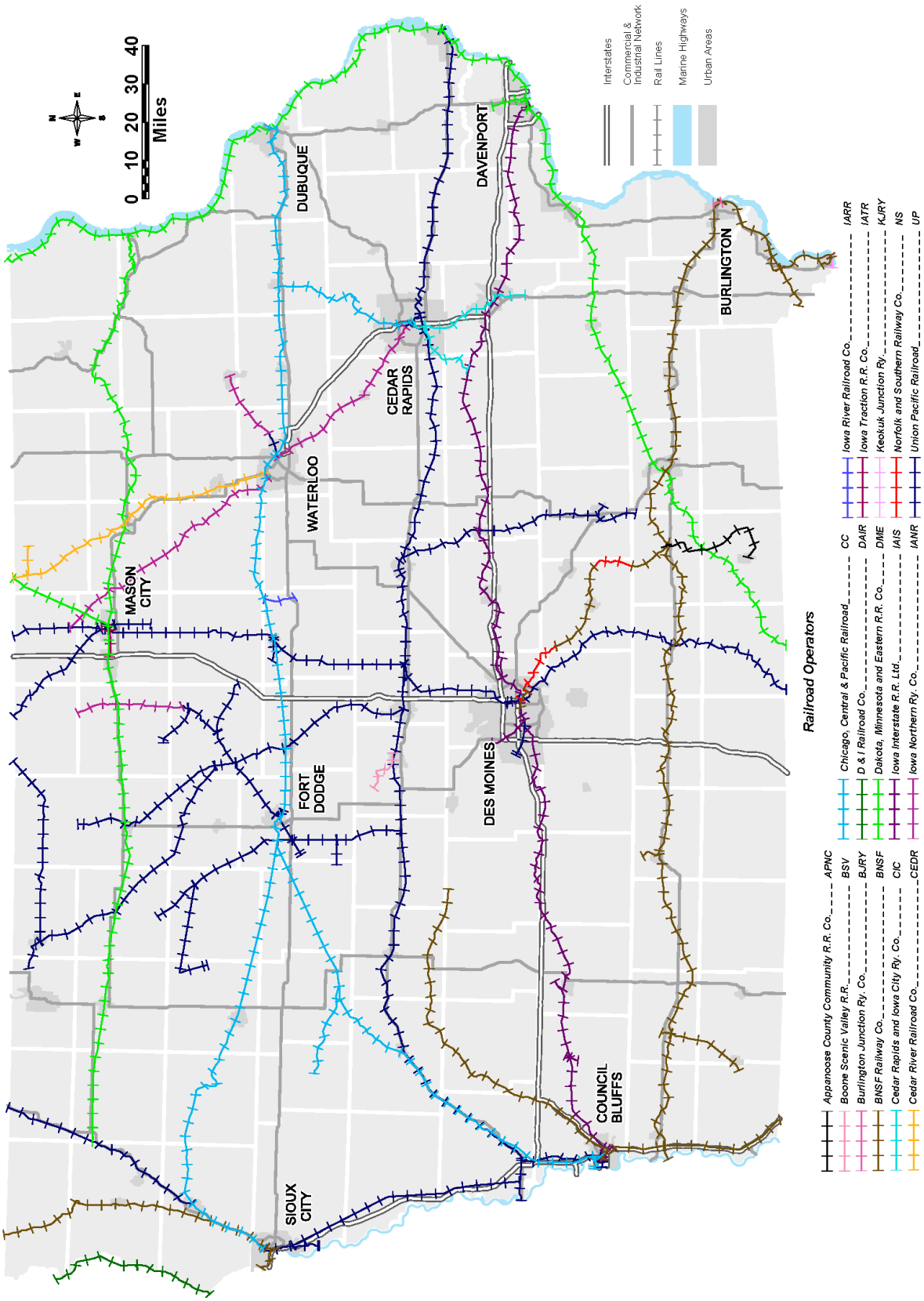


Figure 6.7: Iowa railroads

Source: Iowa Department of Transportation, railroad annual reports

6.6 Waterway

SYSTEM HIGHLIGHTS

- Bordered by two marine highways
- 491 miles of navigable waterways
- 60 barge terminals
- 11 Mississippi River locks and dams on the border, five of which (10, 11, 12, 14, and 19) are on the Iowa side
- Keokuk, Iowa, is the northernmost port on the Mississippi River that is open to barge traffic year-round

System characteristics

Iowa is bordered by two navigable rivers that provide an economical option for moving bulk products to and from the state. The Missouri River (M-29 Marine Highway Connector) on the west and the Mississippi River (M-35 Marine Highway Corridor) on the east connect to an extensive national inland waterway system and international deep sea ocean port facilities on the Gulf Coast. Located along these rivers are 60 barge terminals (55 on the Mississippi, five on the Missouri) owned and operated by private companies. These terminals transfer commodities between barge, rail, and truck. Freight moving through these facilities on the waterways in Iowa is primarily on the Mississippi River.

Water transport fills an important role in freight movement as it has the ability to carry the most weight while offering the lowest shipping cost per ton of commodity. Although truck and rail are relied upon to deliver goods, private barge terminals on the Mississippi and Missouri rivers are key parts of grain and commodity movement for products moving into and out of the state. The Iowa DOT maintains a *River* Barge Terminal Directory that contains key information about these terminals. The directory can be accessed online: www.iowadot.gov/barge.htm.

Both rivers are part of America's Marine Highway Program that is dedicated to expanding the use of the nation's navigable waterways in order to relieve landside congestion, reduce air emissions, and generate other public benefits by increasing the efficiency of the surface transportation system. The M-29 Marine Highway Connector runs from Kansas City, Missouri, to Sioux City, Iowa. The M-35 Marine Highway Corridor runs from Grafton, Illinois, to St. Paul, Minnesota.

A system of locks and dams on the upper Mississippi River, operated by the U.S. Army Corps of Engineers (USACE), helps to maintain adequate water levels for barge operations. To achieve a 9-foot channel in the upper Mississippi River, the construction of these navigation locks and dams was authorized in 1930. Dams are built on rivers to hold back water and form deeper navigation pools, allowing river vessels to use a series of locks to "step" up or down the river from one water level to another. Iowa's locks and dams are aging. Most of the Mississippi River locks along Iowa's border are almost 80 years old, while the intended useful life span was 50 years. The USACE maintains and improves the rivers and locks and dams to allow for safe and secure navigation for freight movement and recreational activities. Table 6.6 provides a summary of the 11 locks and dams bordering Iowa.

Table 6.6: Iowa Mississippi River locks summary

Lock	Location	Chamber	River/ Mile	Year open	Length (feet)	Width (feet)	Owner/ Operator	Gate type
9	Harpers Ferry, Iowa	Main	647.9	1938	600	110	Corps	Miter
10	Guttenberg, Iowa	Main	615.1	1936	600	110	Corps	Miter
11	Dubuque, Iowa	Main	583	1937	600	110	Corps	Miter
12	Bellevue, Iowa	Main	556.7	1939	600	110	Corps	Miter
13	Clinton, Iowa	Main	522.5	1938	600	110	Corps	Miter
14	Le Claire, Iowa	Main	493	1922	600	110	Corps	Miter
14	Le Claire, Iowa	Aux 1	493	1939	320	80	Corps	Miter
15	Rock Island, Illinois	Aux 1	482.9	1934	360	110	Corps	Miter
15	Rock Island, Illinois	Main	482.9	1934	600	110	Corps	Miter
16	Muscatine, Iowa	Main	457.2	1937	600	110	Corps	Miter
17	New Boston, Illinois	Main	437.1	1939	600	110	Corps	Miter
18	Gladstone, Illinois	Main	410.5	1937	600	110	Corps	Miter
19	Keokuk, Iowa	Main	364.3	1957	1,200	110	Corps	Vertical

Source: U.S. Army Corps of Engineers

Figure 6.8 shows the location of Iowa's two marine highways, 11 locks and dams, and 60 barge terminals.

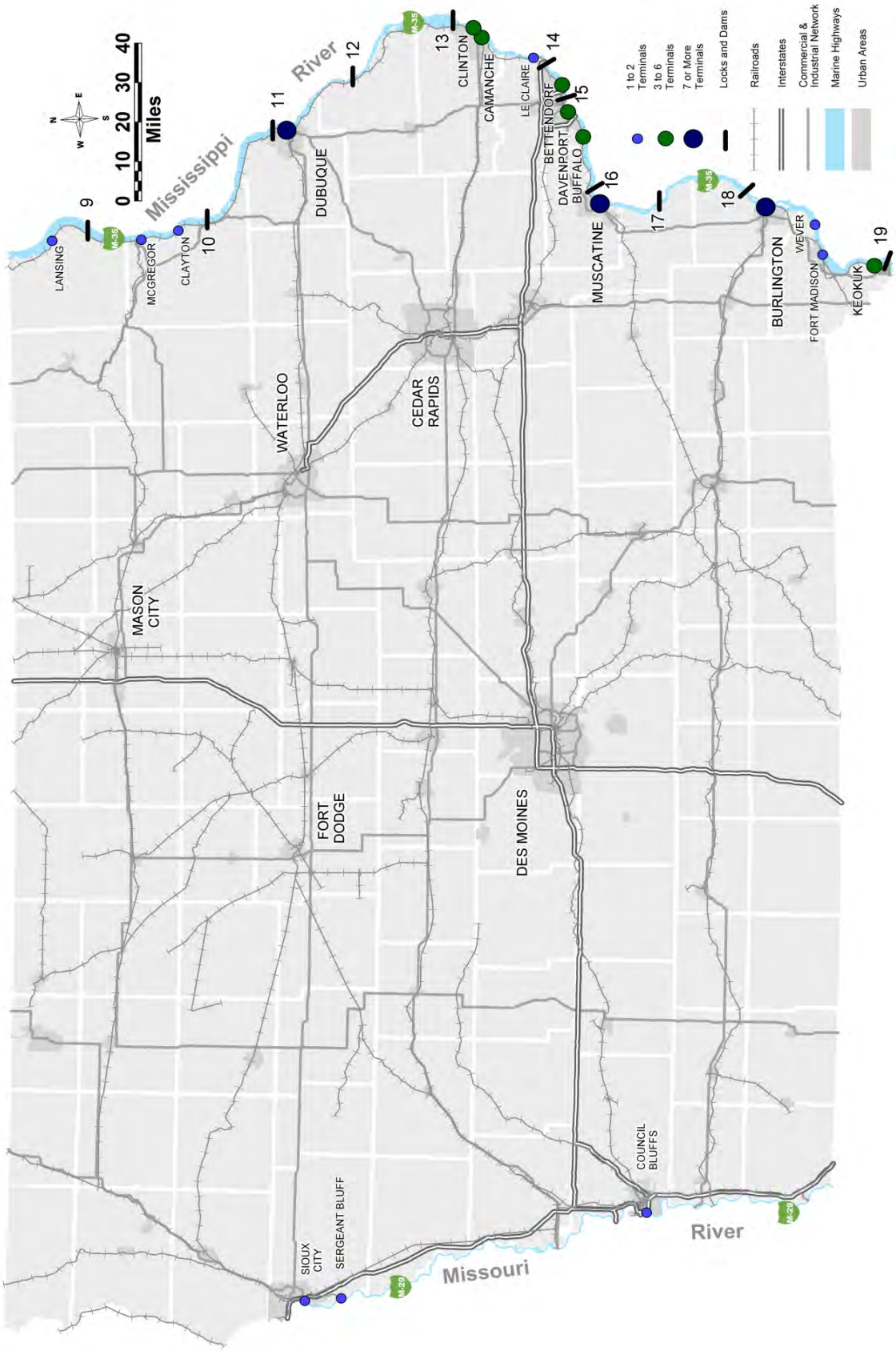


Figure 6.8: Iowa navigable waterways

Source: Iowa Department of Transportation, U.S. Army Corps of Engineers

6.7 Freight-generating facilities

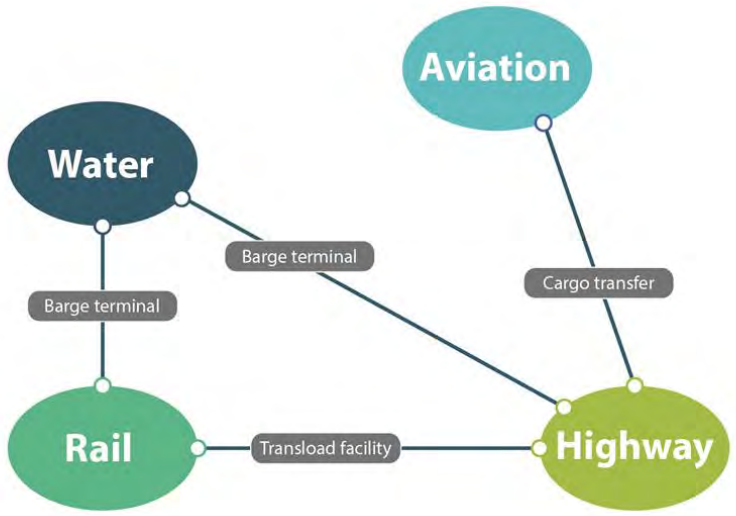
Iowa's freight system also includes a number of facilities that enable the smooth transfer of goods from one mode to another. These allow shippers to take advantage of the cost, speed, and capabilities of more than one mode.

SYSTEM HIGHLIGHTS

- One trailer-on-flat car/container facility
- 15 biodiesel producers
- 30 coal burning facilities
- 44 ethanol producers
- 60 barge terminals
- 811 licensed grain elevators

The terms "intermodal" and "multimodal" are often used interchangeably, yet they can have entirely different meanings. Multimodal focuses on the different modal options that could be utilized to move goods from one place to another. Intermodal focuses on how two or more of these modes can connect at what typically amounts to a transfer point, such as an intermodal container facility or transload location. To put it another way, multimodal options provide the links in the transportation system, while intermodal connections are the nodes. These intermodal transfer facilities are identified in the planning process as vital parts to the state's rail and water freight networks because they rely on trucking for pickup and delivery, which can produce significant freight traffic flowing to and from these locations. Figure 6.9 highlights some examples of intermodal facilities commonly found in the state of Iowa. These connections or facilities are an integral part of the freight transportation network. Each provides the opportunity for seamless transitions from one mode to another.

Figure 6.9: Intermodal facilities



Source: Iowa Department of Transportation

Intermodal container facilities

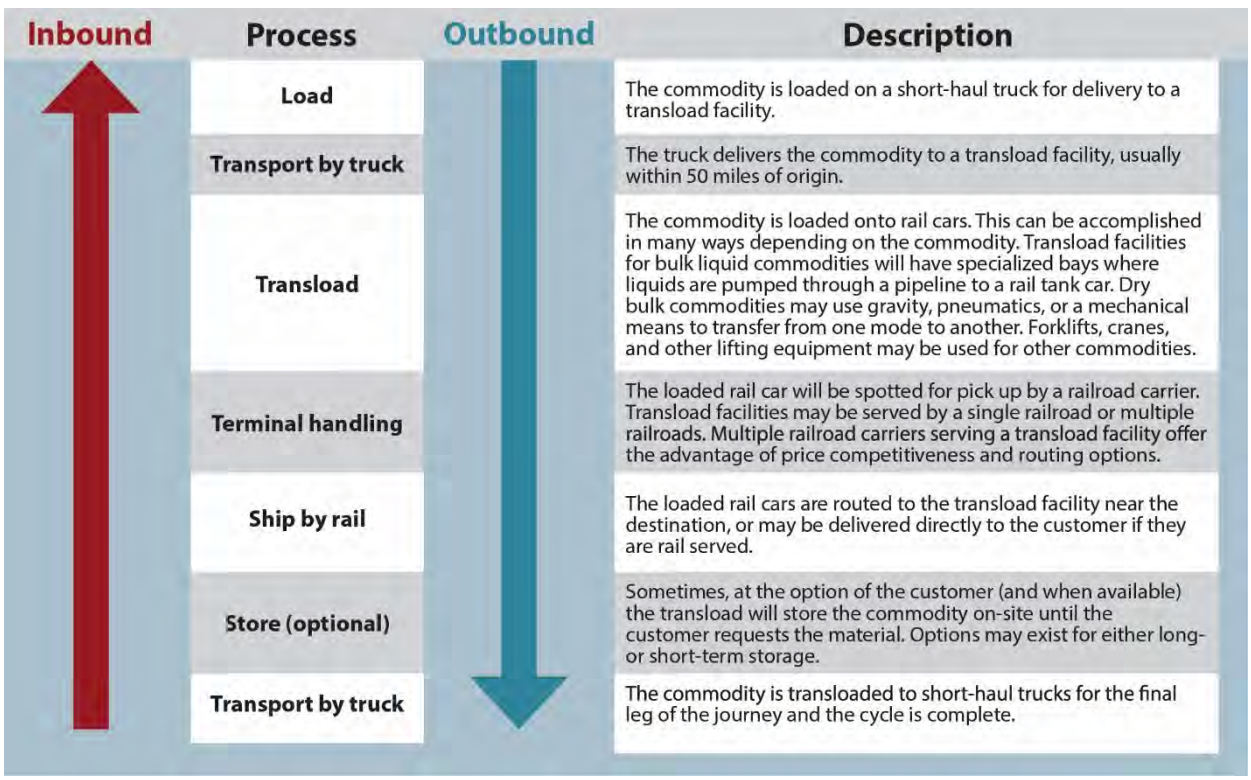
An **intermodal container facility** refers to the transfer of freight using an intermodal container or trailer through multiple modes of transportation (rail, barge, and/or truck) without the handling of the freight itself when changing modes. This method improves security and transportation speed while reducing the damage and loss of goods. This service is provided in Iowa through one container transfer facility.

- **Container transfer facilities** handle rail-to-truck and truck-to-rail transfers in sealed units such as trailer-on-flatcar (TOFC) or container-on-flatcar (COFC). There is only one TOFC/COFC located in Iowa at Council Bluffs. Other options are outside the state at facilities in Kansas City, Missouri; Minneapolis, Minnesota; St. Louis, Missouri; and Rochelle, Illinois.

Transload facilities

A **transload facility** refers to the transfer of freight shipments, typically bulk, from the vehicle/container of one mode to that of another at a terminal interchange point. Transloading works for a variety of commodities, including finished and unfinished goods, fresh food, lumber, bulk goods, etc. Figure 6.10 shows a simple example of the transloading process with a facility at both ends of the movement.

Figure 6.10: Example of transload process

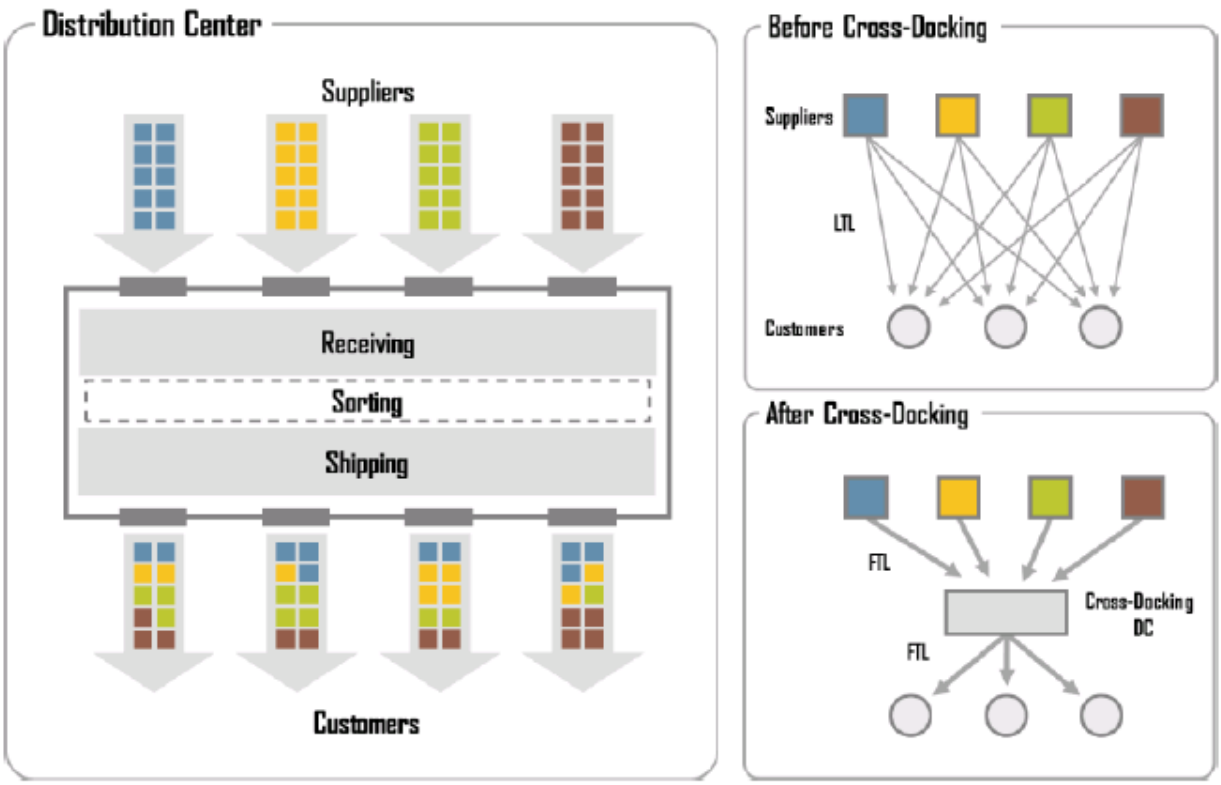


Source: Iowa Department of Transportation, Iowa Rail Toolkit

- A **team track** is the most basic and common type of transload facility in Iowa. It is a simple siding or spur track where railcars are placed and available for use to load and unload freight. Once the cars are loaded, the railroad is notified to pick them up. Team tracks can be owned by a railroad or a business served by the railroad such as an industrial park, public agency, or freight terminal operator.
- At a **cross-dock** transload facility, cargo is unloaded from an incoming truck or rail car and is reloaded directly into outbound trucks, trailers, containers, or rail cars. A cross-dock typically allows level loading between modes. This process improves the efficiency of commodity movement by utilizing as much of a container/vehicle as possible. Figure 6.11 shows a simple example of the cross-docking process.

See Appendix 3 for a list of transload facilities in the state.

Figure 6.11: Example of cross-docking process



Source: Hofstra University

- **Coal-burning facilities** are locations in the state that utilize coal as a power source. A large amount of Iowa electricity is generated by coal. These facilities are significant in that they typically receive and distribute great quantities of coal by train and/or truck.

- **Barge terminals** are locations where commodities are transferred from barges to trucks and/or rail cars. These terminals are a staple of industries moving bulk products by river or inland waterway. Barges can be loaded and unloaded much more rapidly than packaging a bulk product and putting it in a truck, and can handle a larger amount of freight than both truck and rail. Iowa has a total of 60 barge terminals located along the Mississippi (55) and Missouri (5) rivers to transfer goods between truck, rail, and barge.
- **Biodiesel and ethanol plants** are production facilities for renewable fuels made with corn and the byproducts of corn production. These locations typically receive raw materials by truck and ship finished biodiesel/ethanol by truck and/or rail. The opportunity to shift from one mode to another qualifies these locations as transloads.
- **Grain elevators** are facilities that collect grain from farmers by tractor or truck. The grain is then stored and shipped to market via truck and/or rail. Iowa has a vast network of grain elevators to handle the large production of corn and soybeans each year before being transported. As is the case with biodiesel and ethanol plants, the multiple transportation options qualify these locations as transloads.

Other freight-generating facilities

The multimodal options within Iowa include a number of warehouses and distribution centers that collect and distribute freight. These locations can generate many truck trips from the shipping and receiving of commodities, which makes the facilities an important part of the planning process.

- **Warehouse** refers to a commercial building for storage of goods, which can include any raw materials, packing materials, spare parts, components, or finished goods associated with agriculture, manufacturing, and production. Warehouses are used by manufacturers, importers, exporters, wholesalers, transport businesses, etc. and some warehouses include transloading capabilities to offer short- and long-term storage and handling of goods.
- A **distribution center** is a warehouse or other specialized building often with refrigeration or air conditioning that is stocked with products to be redistributed to retailers, wholesalers, or directly to consumers. A distribution center can also be called a warehouse and serve as the foundation of a supply network as it equips a single location with a large variety of goods.

See Appendix 3 for lists of public warehouses and distribution centers in the state.

The preceding summary of intermodal, transload, and other freight-generating facilities is not exhaustive but gives a glimpse of the major nodes and connecting points that make up the multimodal freight transportation network. Figure 6.12 shows the location of Iowa's freight-generating facilities.

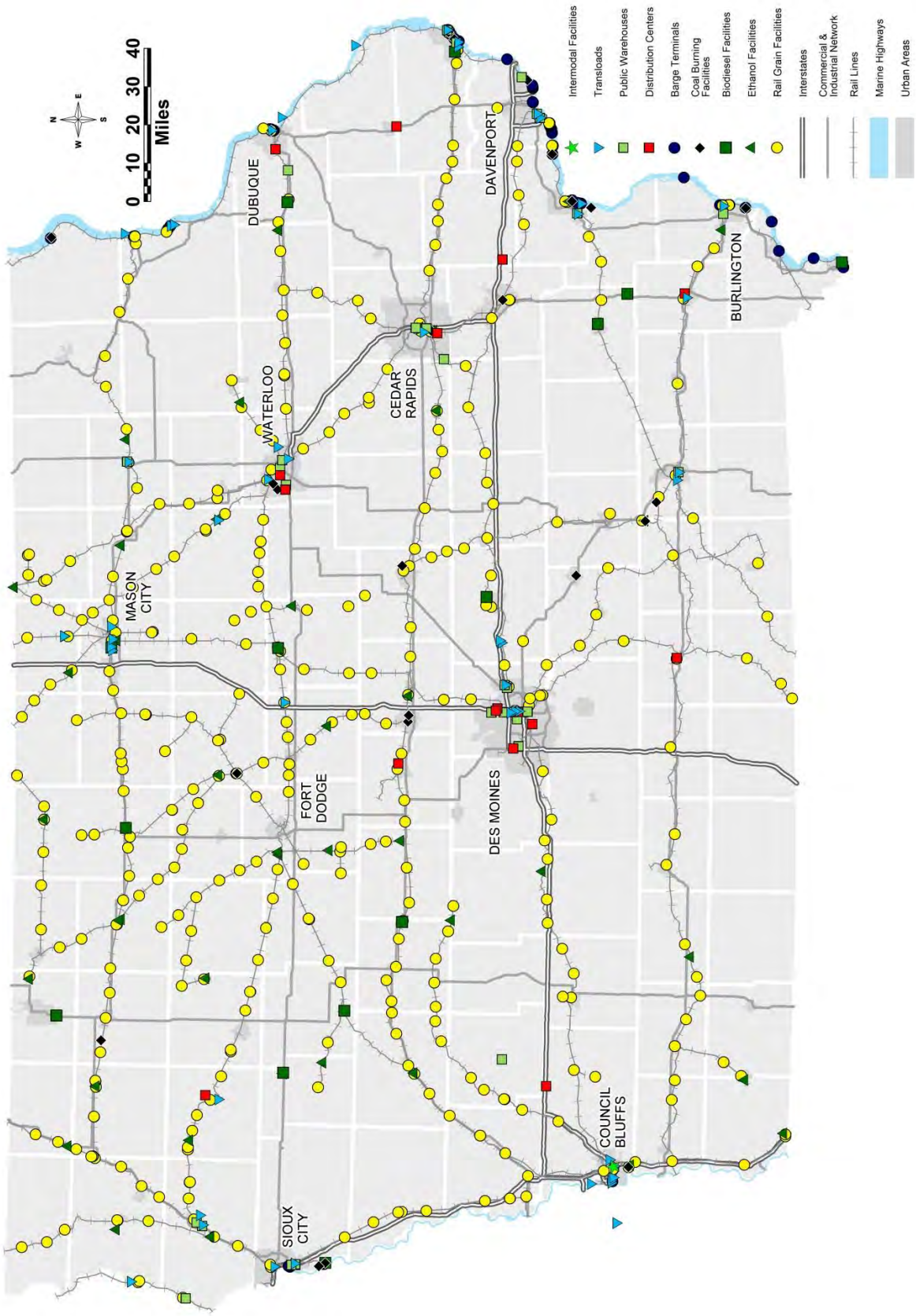


Figure 6.12: Freight-generating facilities

Source: Iowa Department of Transportation, Leonard's Guide, Rail Companies, U.S. Army Corps of Engineers

6.8 Iowa Multimodal Freight Network (IMFN)

As part of the Iowa State Freight Plan development process, the Iowa DOT identified and established the IMFN. This network will be the target of several freight strategies and improvements identified in Chapter 9, Freight improvement strategy.

Benefits of this network include:

- Recognition of corridors to protect and enhance for improved freight movement.
- Developing department policies for these corridors related to design and use.
- Assisting in programming decisions regarding where to invest in the overall transportation system.

Identification criteria used for each mode are listed below and the final network is shown in Figure 6.13.

Air

Two commercial airports (DSM and CID) were included in the Multimodal Freight Network as they handle more than 99 percent of Iowa's air cargo and are forecasted to continue handling the vast majority.

Highway

Total truck traffic and oversize/overweight (OS/OW) vehicle use thresholds were used to identify the highway portion of the Multimodal Freight Network. Primary highway corridors were included if they had 30 percent total truck traffic, 1,000 or greater total truck annual average daily traffic, or were issued 1,000 or more OS/OW permits in the previous year. Some highway segments were added and removed in order to improve connectivity and continuity.

Railroad

After internal discussions with the Iowa DOT's Office of Rail Transportation, a tonnage threshold of 5 million tons per mile or greater was established for rail lines to be included in the Multimodal Freight Network. An additional rail line, Iowa Interstate Railroad from Des Moines to Council Bluffs, was also included for improved connectivity to Iowa's only intermodal container facility.

Waterway

Both of Iowa's marine highways (M-35 and M-29) were included in the Multimodal Freight Network due to their importance for strengthening the economy, relieving landside congestion, and reducing air emissions. These routes are also significant for moving Iowa's agriculture-related goods to and from the state.

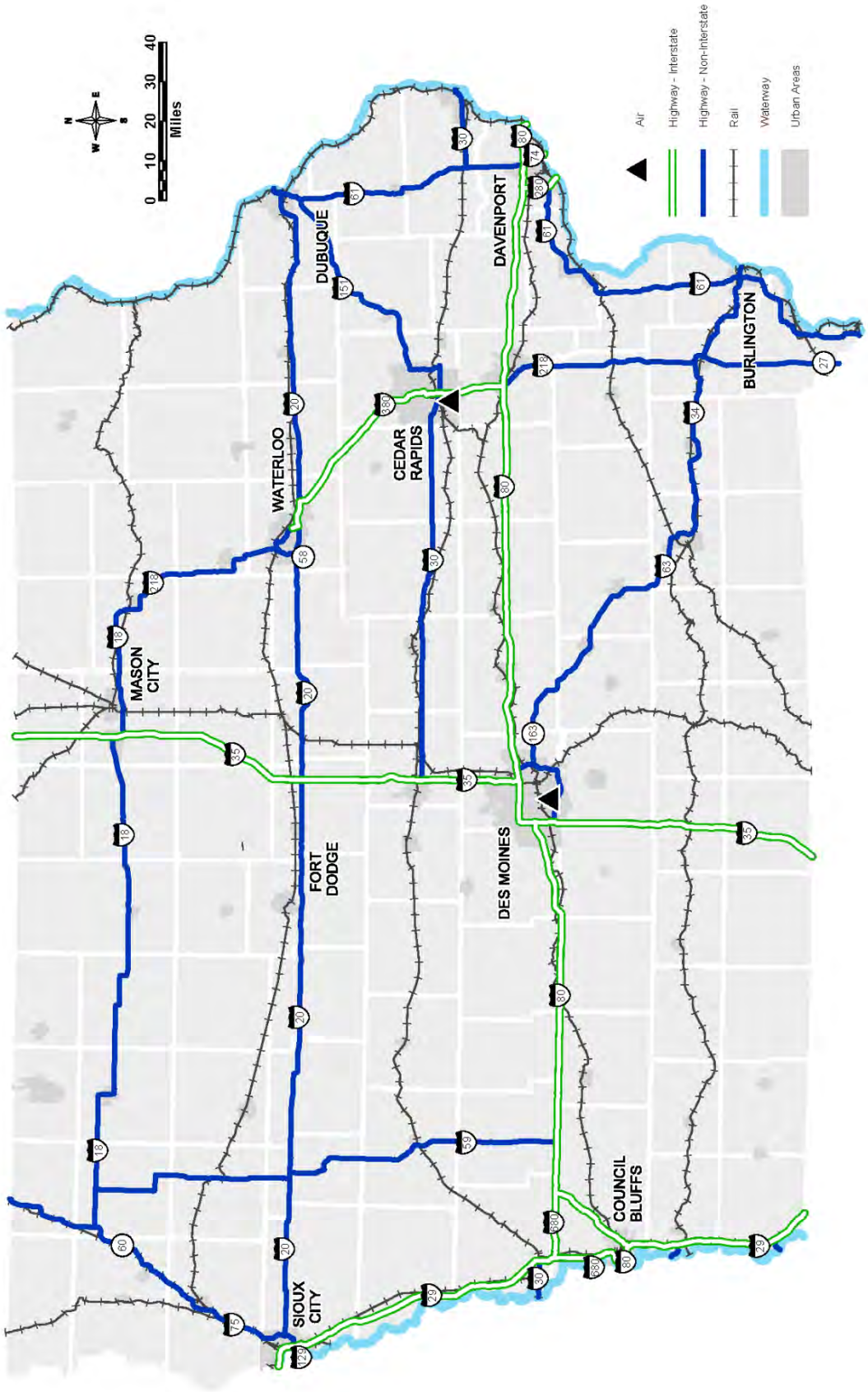


Figure 6.13: Iowa Multimodal Freight Network

Source: Iowa Department of Transportation

6.9 National freight networks

National Highway Freight Network

The Fixing America's Surface Transportation (FAST) Act formed the National Highway Freight Program, which created a formula program funded at $1.15 billion to $1.5 billion per year. Each state receives funds in proportion to the amount of funds a state receives compared to other states under all formula-apportioned programs. These funds may be spent on the National Highway Freight Network (NHFN) in accordance with 23 U.S.C. 167. The NHFN includes:

- Primary Highway Freight System (PHFS)
- Critical Rural Freight Corridors (CRFC)
- Critical Urban Freight Corridors (CUFC)
- Portions of the Interstate Highway System not designated as part of the PHFS

The PHFS was designated at the federal level, while CRFCs and CUFCs were designated at the state level. The Iowa DOT worked with the state's nine metropolitan planning organizations to develop recommendations for CUFCs, or urban routes important to freight movement in the region. The Iowa DOT then designated noninterstate rural highway corridors with the highest truck traffic levels as CRFCs. Figures 6.14 and 6.15 show the NHFN. A total of 125.7 of the available 150 CRFC miles and 71.1 of the available 75 CUFC miles were designated. These corridors are shown in Table 6.7.

National Multimodal Freight Network

The FAST Act also formed a National Multimodal Freight Network (NMFN) with the intent of strengthening the contribution of this network to the economic competitiveness of the country. The purposes outlined in the FAST Act are:

1. To assist states in strategically directing resources toward improved system performance for the efficient movement of freight.
2. To inform freight transportation planning.
3. To assist in the prioritization of federal investment.
4. To assess and support federal investments to achieve the national freight goals.

In Iowa, this network includes the DSM, the NHFN, 3,324 miles of Class I railroads, and the M-29 and M-35 marine highways. Figure 6.16 shows the nonhighway components of the NMFN.

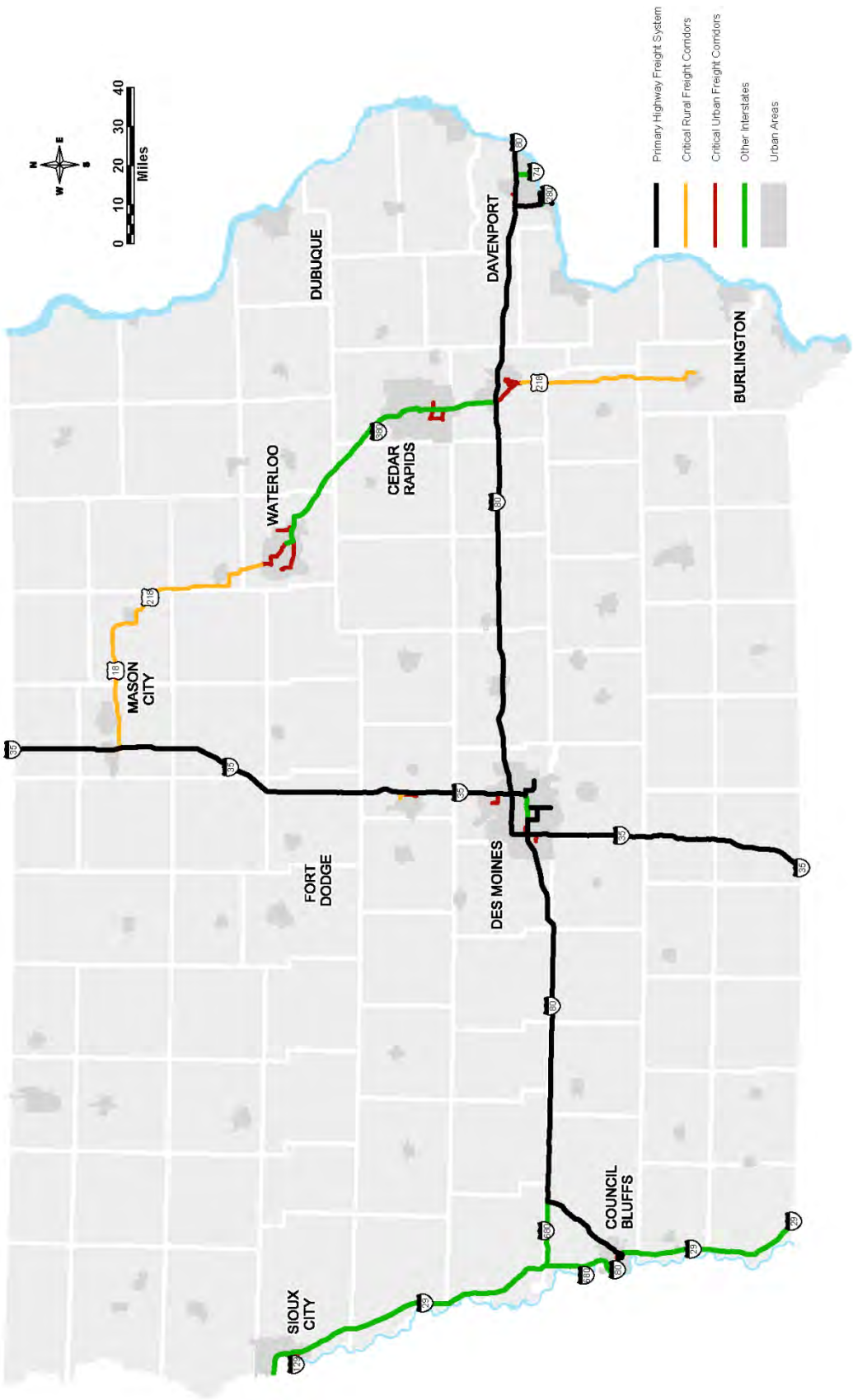


Figure 6.14: National Highway Freight Network, statewide

Source: Iowa Department of Transportation

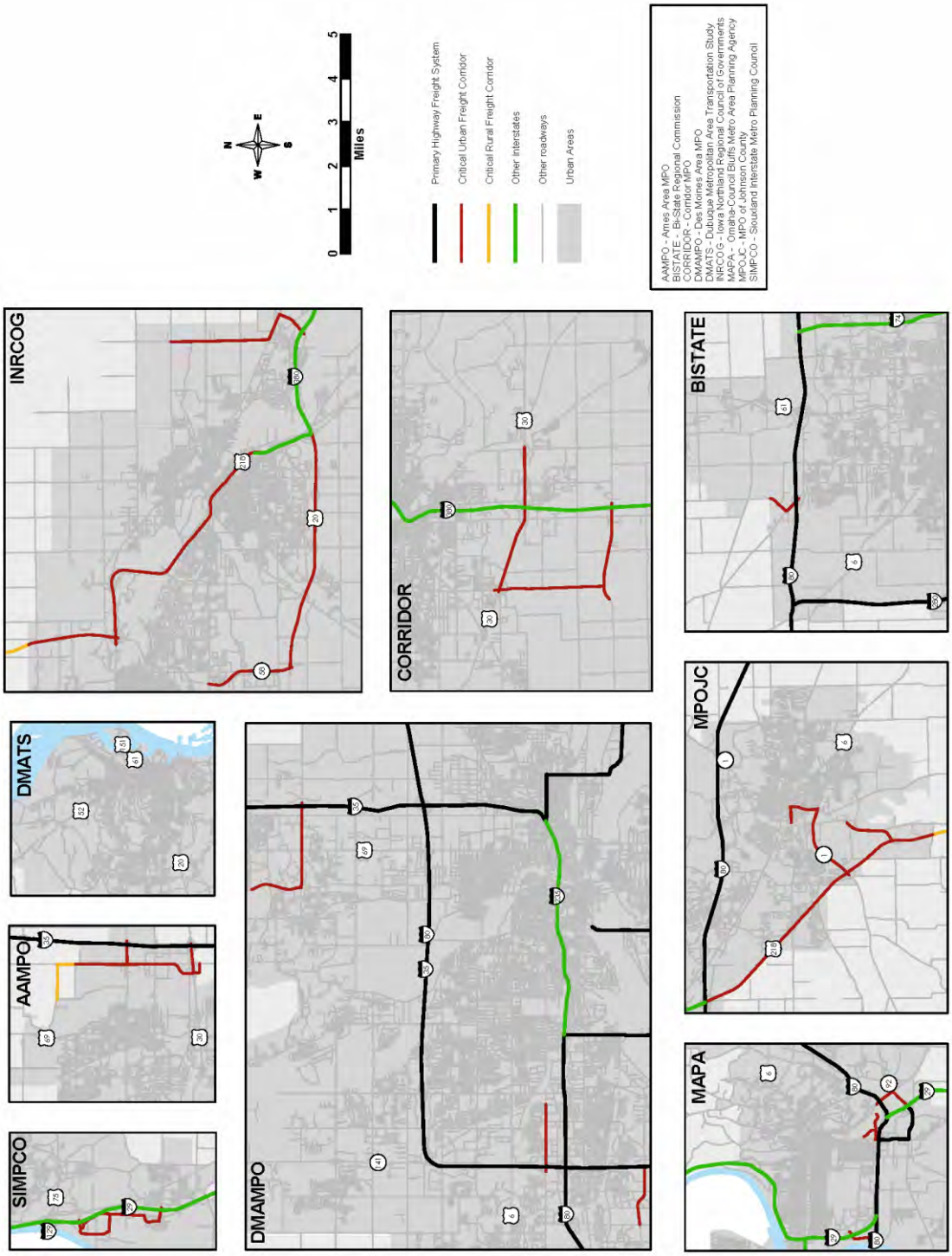


Figure 6.15: National Highway Freight Network, metro areas

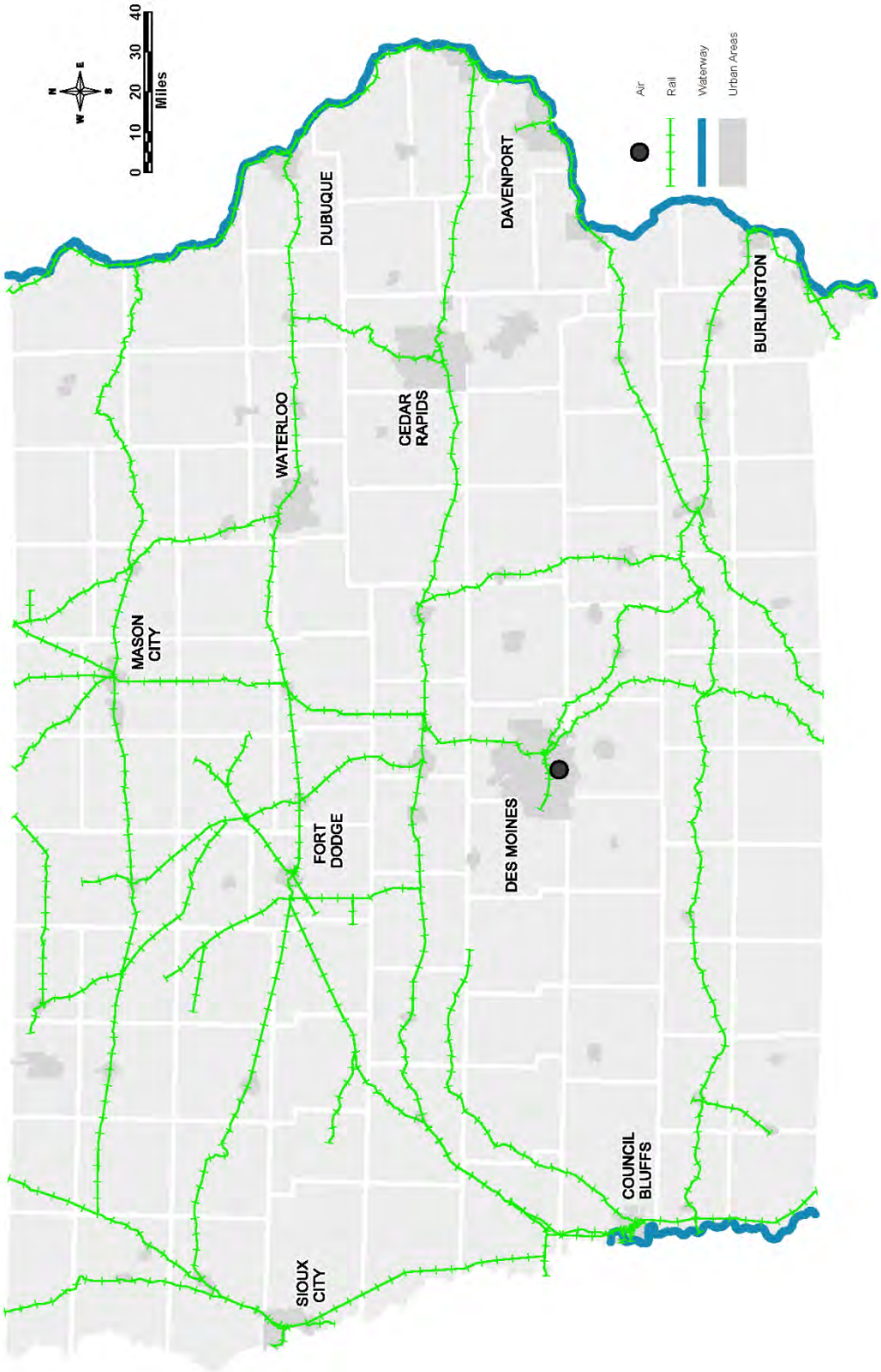
Source: Iowa Department of Transportation

Table 6.7: Critical urban and critical rural freight corridors

MPO	Route	Start point	End point	Miles
SIMPCO	S. Patton St	Blvd of Champions	I-29	1.2
SIMPCO	Blvd of Champions	S. Patton St	Harbor Dr	0.5
SIMPCO	Harbor Dr.	Discovery Blvd	S. Patton St	2.1
SIMPCO	Discovery Blvd	Aviation Blvd	Harbor Dr	0.6
SIMPCO	Aviation Blvd	Discovery Blvd	I-29	0.4
MAPA	Iowa 92, Harry Langdon Blvd, South Ave	I-29	IAIS intermodal yard	1.3
MAPA	Nebraska Ave, River Rd	Cargill AG Horizons	I-29	0.7
MAPA	S. Expressway, 29th Ave, 23rd Ave	I-29/I-80	Bartlett Grain and Hansen-Mueller Grain elevators	1.4
AAMPO	U.S. 30, S. Dayton Ave, SE 18th St	S. Dayton Ave	I-35	1.3
AAMPO	Dayton Ave	U.S. 30	E. 13th St	2.0
AAMPO	E. 13th St, N. Dayton Ave	I-35	Old Bloomington Rd	2.2
DMAMPO	SE Oralabor Rd, SW State St	SW Ordnance Rd	I-35	3.9
DMAMPO	University Ave	I-35/I-80	NW 90th St/28th St	1.9
DMAMPO	Mills Civic Parkway	Jordan Creek Pkwy	I-35	1.8
INRCOG	U.S. 218	I-380	Waterloo urbanized area boundary	10.7
INRCOG	U.S. 20, Iowa 58	Greenhill Rd	I-380	9.4
INRCOG	Plaza Dr, Dubuque Rd, Elk Run Rd	I-380	Newell St	4.6
CORRIDOR	Wright Bros Blvd SW	Cessna Pl SW	I-380	2.8
CORRIDOR	U.S. 30	Edgewood Rd SW	C Street SW	4.3
CORRIDOR	Edgewood Rd SW	Wright Bros Blvd SW	U.S. 30	3.2
MPOJC	U.S. 218	Poweshiek St	I-80	8.5
MPOJC	Old Highway 218 S	U.S. 218	Gringer Ag	1.5
MPOJC	Iowa 1, U.S. 6, Gilbert St, Court St	U.S. 218	Front St	3.7
BISTATE	Iowa 130, Hillandale Rd, Enterprise Way	I-80	Davenport Transload Facility	1.1
			CUFC Total =	**71.1**
-	U.S. 218	Poweshiek St	U.S. 34	45.7
-	U.S. 18, U.S. 218	Waterloo urbanized area boundary	I-35	78.5
-	N. Dayton Ave, Riverside Rd	Old Bloomington Rd	Stagecoach Rd	1.5
			CRFC Total =	**125.7**

Source: Iowa Department of Transportation

Figure 6.16: National Multimodal Freight Network (non-highway)



Source: Iowa Department of Transportation

7. Conditions and performance of the freight transportation system

Iowa's economy is dependent upon an efficient and reliable freight transportation system. This complex network is relied on by shippers to move products to markets and has direct implications for the productivity of the U.S. economy, the costs of goods and services, and the global competitiveness of our industries. Freight transportation reliability is often as important as and sometimes more important than delivery speed. Iowa's transportation infrastructure has long provided Iowa shippers with a strong competitive advantage, a trend the Iowa Department of Transportation is striving to continue.

7.1 Conditions of the freight transportation system

The Iowa DOT carried out the Freight Mobility Issues Survey, which included inquiries and analysis to gauge the overall condition of the freight transportation system and identify physical air, highway, railroad, and waterway bottlenecks in the state. These include any locations with freight mobility issues such as insufficient clearances, constrained capacity, interchange constraints, lack of freight-related facilities, or any other infrastructure-related problems. In addition to the physical constraints, operational and regulatory hurdles to freight transportation were also identified. These are any nonphysical limitations that are perceived as "roadblocks" to efficient and competitive freight movement.

Air

Approximately 200 million pounds of air cargo is moved through airports in Iowa every year. From larger air freight facilities at commercial airports in Des Moines (DSM) and Cedar Rapids (CID) to point deliveries by smaller aircraft at airports throughout Iowa, air freight services are used primarily for the timely transportation of cargo into and out of Iowa. DSM and CID account for the vast majority of Iowa's air cargo operations and tonnage.

Express carriers such as FedEx and UPS Inc. hold the major air freight presence in Iowa. To a large degree, the movement of air cargo is contingent upon the business decisions of these private carriers. In recent years, increased fuel expenses and changes in business models have resulted in reduced air freight activity in Iowa. The total amount of air freight moved through airports in Iowa has decreased from 258 million pounds in 2006 to 182 million pounds in 2014.

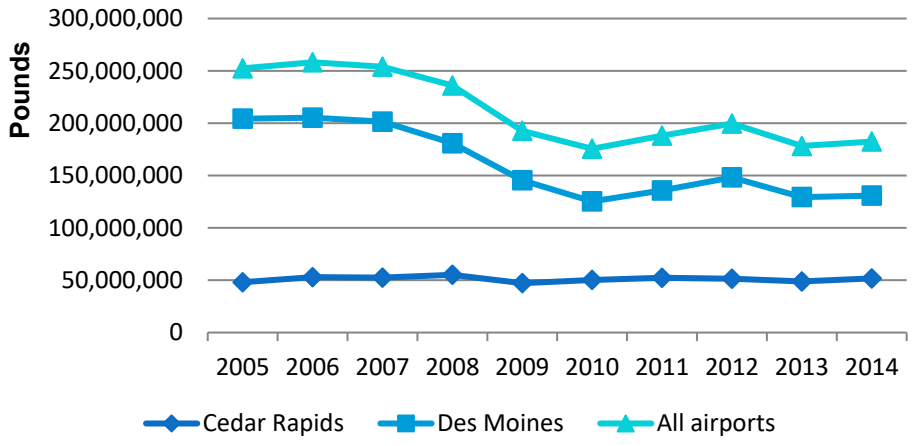
A report released by the Iowa DOT in 2009, entitled *The Uses and Benefits of Aviation in Iowa,* summarized the use of air freight by Iowa businesses that participated in an Iowa DOT survey. It reported that:

- 80 percent of Iowa businesses participating in the survey rely on air cargo or express shipping on a regular basis to support their activities and increase their productivity.
- 60 percent ship documents weighing less than 2 pounds, which includes mostly overnight mail.
- 50 percent ship parcels weighing between 2 and 70 pounds to support just-in-time supply chain, inventory, and parts management.
- 20 percent use air cargo to ship freight weighing more than 70 pounds.
- 8 percent indicated they have used chartered aircraft, and 5 percent indicated they have used company-owned aircraft to ship or receive air cargo.

Utilization

More than 99 percent of Iowa's air cargo travels through two commercial airports (DSM and CID), with DSM being responsible for more than 70 percent of this total. The remaining six commercial airports (Burlington, Dubuque, Fort Dodge, Mason City, Sioux City, and Waterloo) share the remaining 1 percent. Figure 7.1 shows the total pounds of air cargo going through DSM and CID compared to the total air cargo amount in the state.

Figure 7.1: Total air cargo at Des Moines International Airport and Eastern Iowa Airport, 2005-2014



Source: Iowa Department of Transportation, Office of Aviation

Table 7.1 shows the total weight of air cargo at all commercial airports in Iowa since 2005.

Table 7.1: Total air cargo at Iowa's commercial airports, 2005-2014 (pounds)

	Burlington	Cedar Rapids	Des Moines	Dubuque	Fort Dodge	Mason City	Sioux City	Waterloo
2005	5,817	48,040,279	204,369,161	9,191	7,823	9,960	48,586	30,484
2006	12,486	52,931,428	205,274,902	256,399	7,215	5,816	46,005	12,372
2007	2,100	52,474,469	201,526,176	58,453	4,494	5,557	24,167	19,215
2008	1,564	55,161,500	180,882,388	4,648	3,994	8,883	29,405	17,176
2009	2,388	47,191,324	145,494,828	1,595	5,024	6,493	10,240	8,139
2010	119	50,287,805	125,300,470	11,363	17,988	5,135	3,349	0
2011	0	52,321,653	135,797,823	100,948	47,499	4,733	0	0
2012	0	51,434,903	148,241,365	74,741	7,763	2,768	369	300
2013	0	48,812,039	129,470,911	73,788	1,016	1,155	2,421	2,453
2014	0	51,698,793	130,790,339	2,712	0	32	1,596	850

Source: Iowa Department of Transportation, Office of Aviation

Bottlenecks

According to the Iowa DOT's Office of Aviation, air freight coming into and out of Iowa is not limited by the capacity of any Iowa airports. Even at its peak in 2006, there were no capacity issues in the state. Private companies have been willing to make investments as needed in landside facilities to accommodate ground operations related to air freight, and airports have been willing to work with these companies to develop ramps and facilities to support freight operations. Significant air transportation system capacity exists to accommodate growth of air freight in Iowa. Therefore, no specific bottlenecks have been identified.

Highway

Efficiently moving cargo across the highway system is a vital link in the overall freight supply chain. The overwhelming majority (80 percent) of freight tonnage in Iowa is moved by truck. With these high rates of traffic, it is crucial for the state's roadways to be in adequate condition to accommodate the commodity movements. In addition, the first and last miles of almost all commodity supply chains are carried by truck, further increasing the importance of the network.

The Infrastructure Condition Evaluation (ICE) tool was developed by the Iowa DOT to aid in the evaluation of the state's Primary Highway System by using a composite rating calculated from seven different criteria. These criteria are listed below.

- Annual average daily traffic (AADT), combination truck count.
- AADT, passenger count.
- AADT, single-unit truck count.
- Congestion Index value.
- International Roughness Index (IRI) value.
- Pavement Condition Index (PCI) rating.
- Structure Inventory and Appraisal (SIA) sufficiency rating.

While each of these individual criteria indicates a different component, the collective offers the ability to evaluate the service and structural condition of roadway segments with a single composite rating. This composite rating was calculated for each road segment by applying normalization and weighting processes.[45] This tool was used to evaluate the Primary Highway System in the state, including the heavily traveled freight corridors. Figure 7.2 and 7.3 show the 2014 composite ICE rating for divided and nondivided primary roadways in the state.

[45] More information on the ICE tool and process is available at: http://iowadot.maps.arcgis.com/apps/webappviewer/index.html?id=23c9e6c132c8498bab6cb2e85b21ec7e

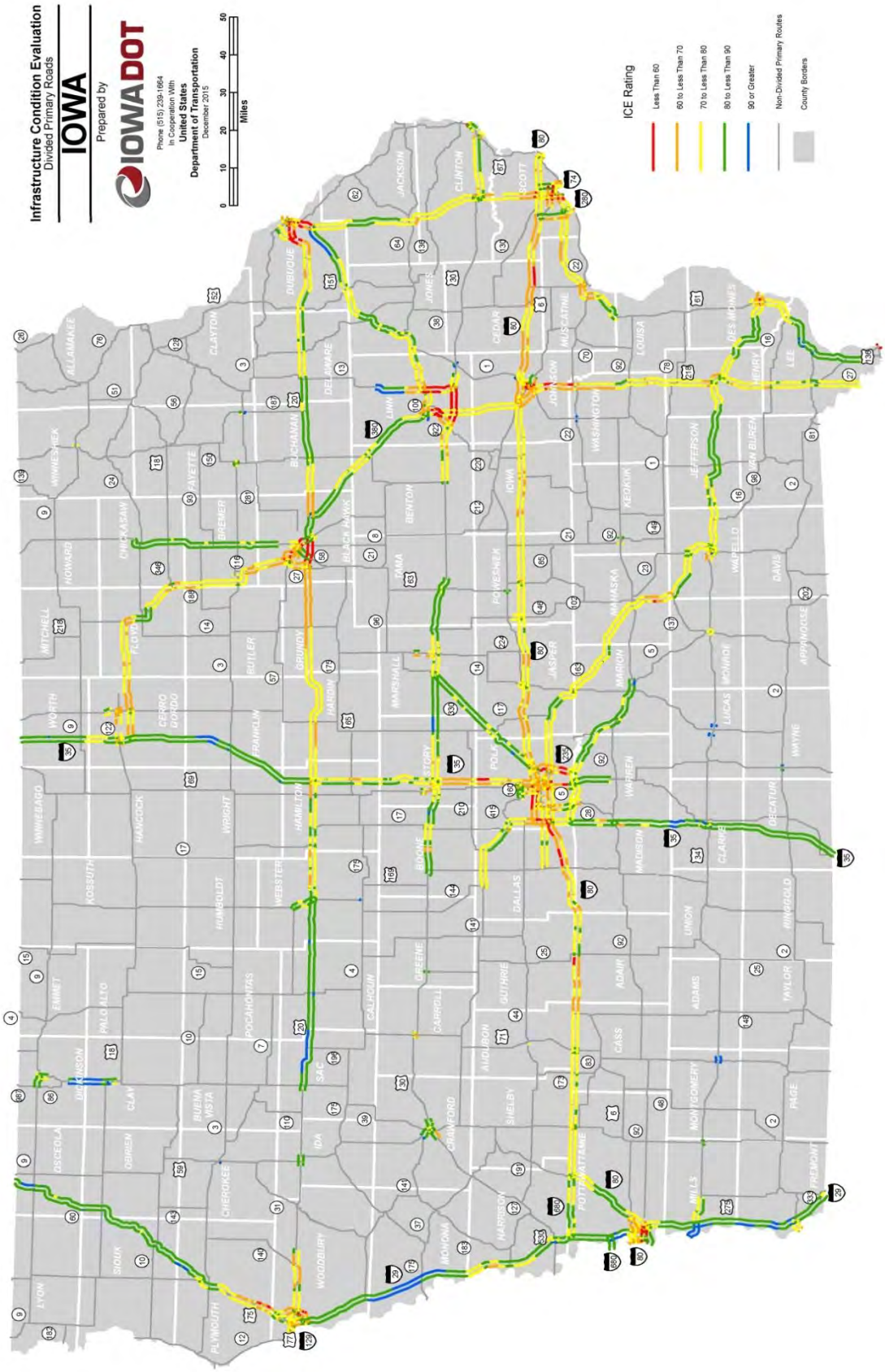


Figure 7.2: Infrastructure Condition Evaluation rating, divided primary roads, 2014

Source: Iowa Department of Transportation

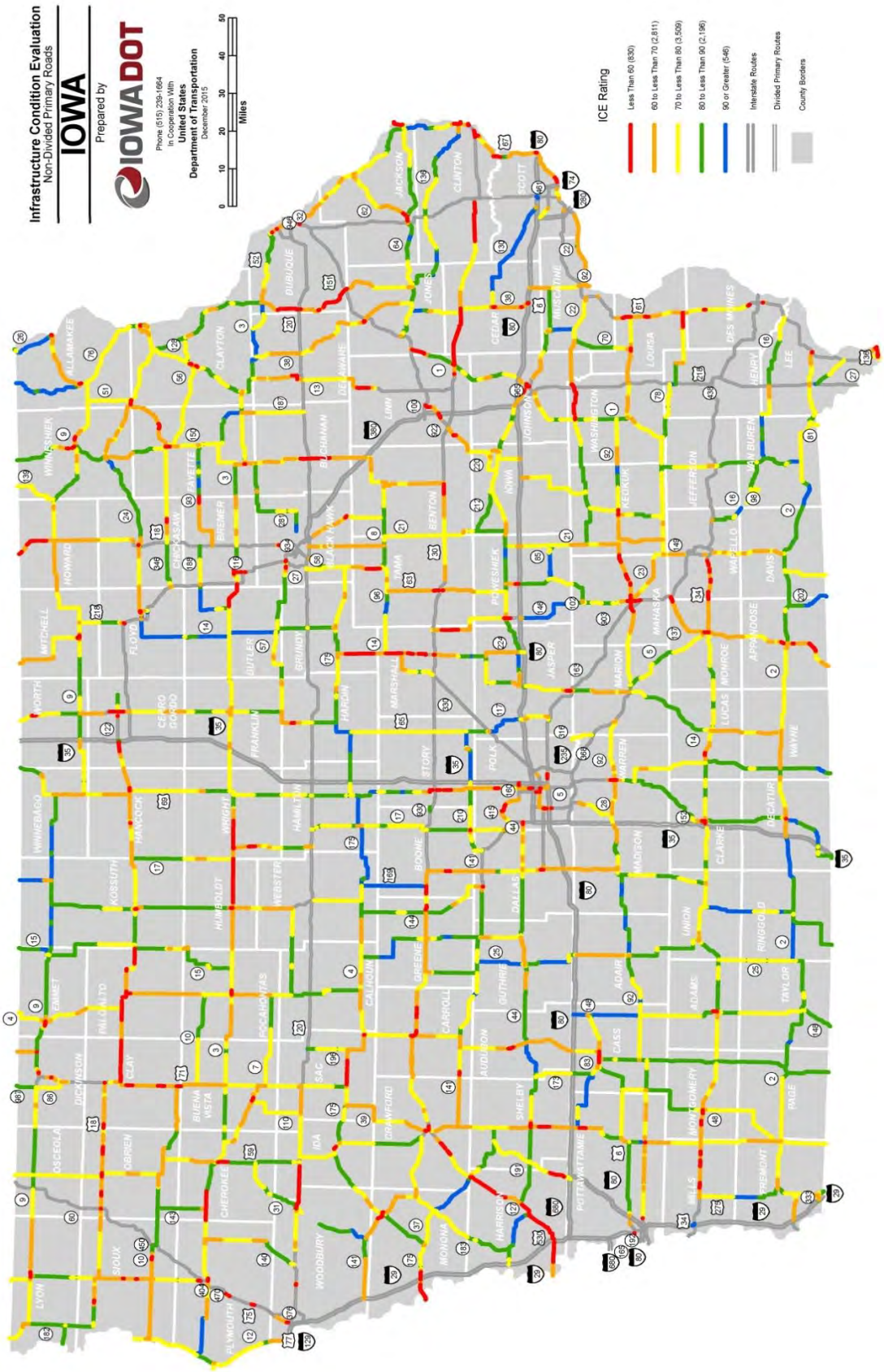


Figure 7.3: Infrastructure Condition Evaluation rating, nondivided primary roads, 2014

Source: Iowa Department of Transportation

Table 7.2 shows the percentage of Iowa roadways that make up the different highway systems that fit into each ICE rating category. This includes the Interstate Highway System, National Highway System (NHS), Commercial and Industrial Network (CIN), and the overall Primary Highway System.[46] ICE ratings across the primary system range from a low of 45 to a high of 100, with a system average of 75.

Table 7.2: Highway conditions by Infrastructure Condition Evaluation rating, 2014

		Percent of network by ICE rating				
Network	Percent of total system	< 60	60-70	70 - 80	80 - 90	> 90
Interstates	14	3	15	39	39	4
NHS	51	7	22	41	28	3
Divided	25	3	15	44	34	3
Nondivided	25	10	29	37	21	3
CIN	35	7	20	42	28	2
Divided	23	3	14	46	34	3
Nondivided	12	14	33	34	18	1
Primary Highway System	100	4	19	40	31	6

Source: Iowa Department of Transportation

Utilization

Truck traffic in the state is primarily concentrated on the interstates and CIN, with the heaviest being on I-80 between Iowa City and Davenport, I-35/80 through the Des Moines metro area, and I-29/80 through Council Bluffs. Due to their overall size and weight, trucks have more of an impact on the condition of the roadways and these numbers must be monitored so solutions can be considered as traffic counts increase. Figure 7.4 shows Iowa's total truck traffic throughout the state, which includes single-unit and combination trucks.

According to the Iowa Automated Permit System (IAPS), the State of Iowa issued more than 120,000 oversize/overweight (OS/OW) single trip permits in 2014. This traffic in Iowa is mostly concentrated across the interstate system as well, with the heaviest being on I-80. One of the major noninterstate OS/OW routes in the state is U.S. 59 that runs north/south in western Iowa. This is the result of a number of height restricting overhead structures on I-29, which forces larger loads to reroute to U.S. 59, a road with few overhead structures. Figure 7.5 shows Iowa's major OS/OW routes identified using data from IAPS. Also shown are locations with height restrictions (16-foot clearance or less).

[46] These networks do overlap so the sum of the percentages will not equal 100 percent. For example, portions of the CIN are on the NHS and all of the NHS is part of the Primary Highway System. Percentages are shown for lane miles.

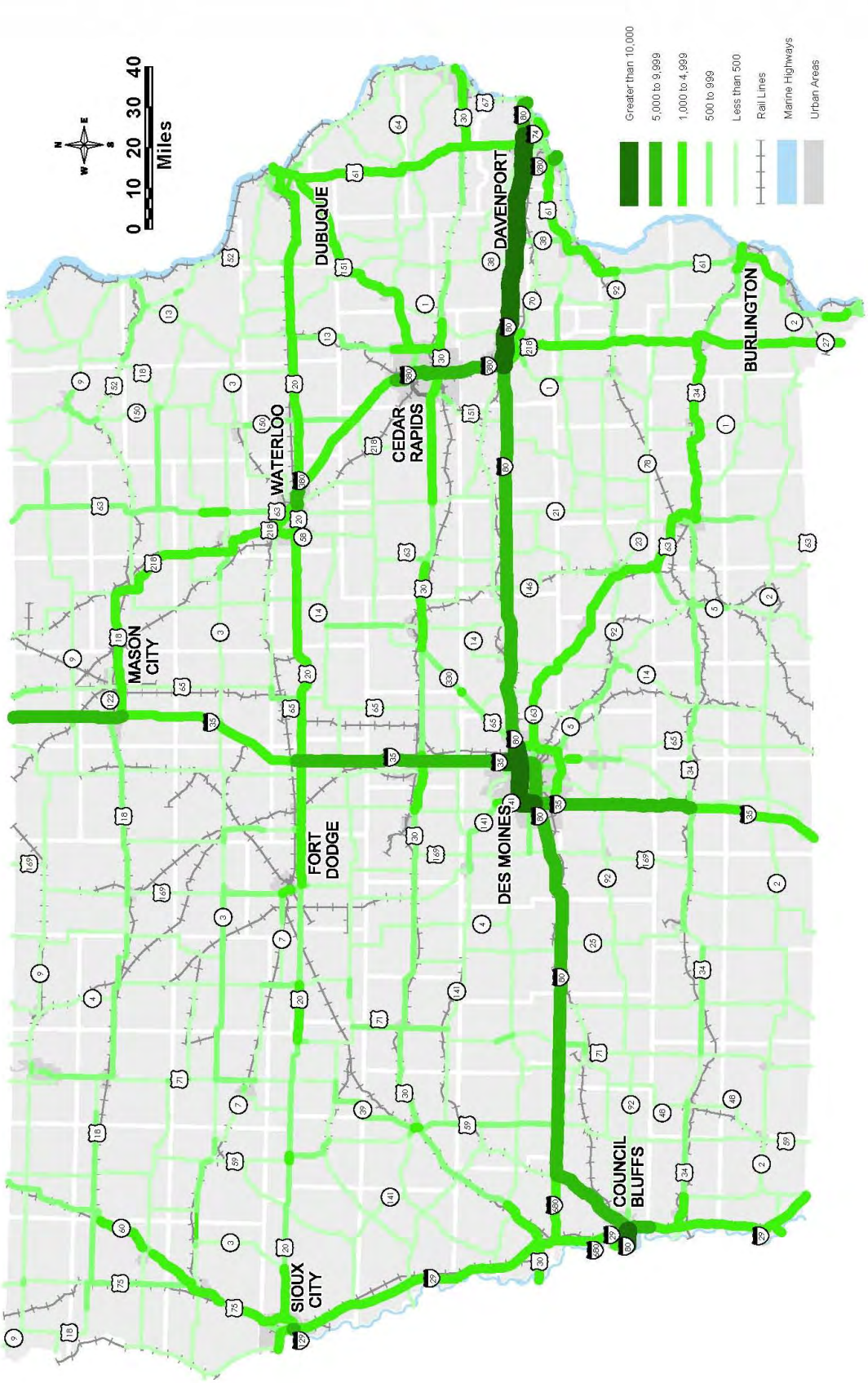


Figure 7.4: Truck traffic, 2014

Source: Iowa Department of Transportation's traffic count data

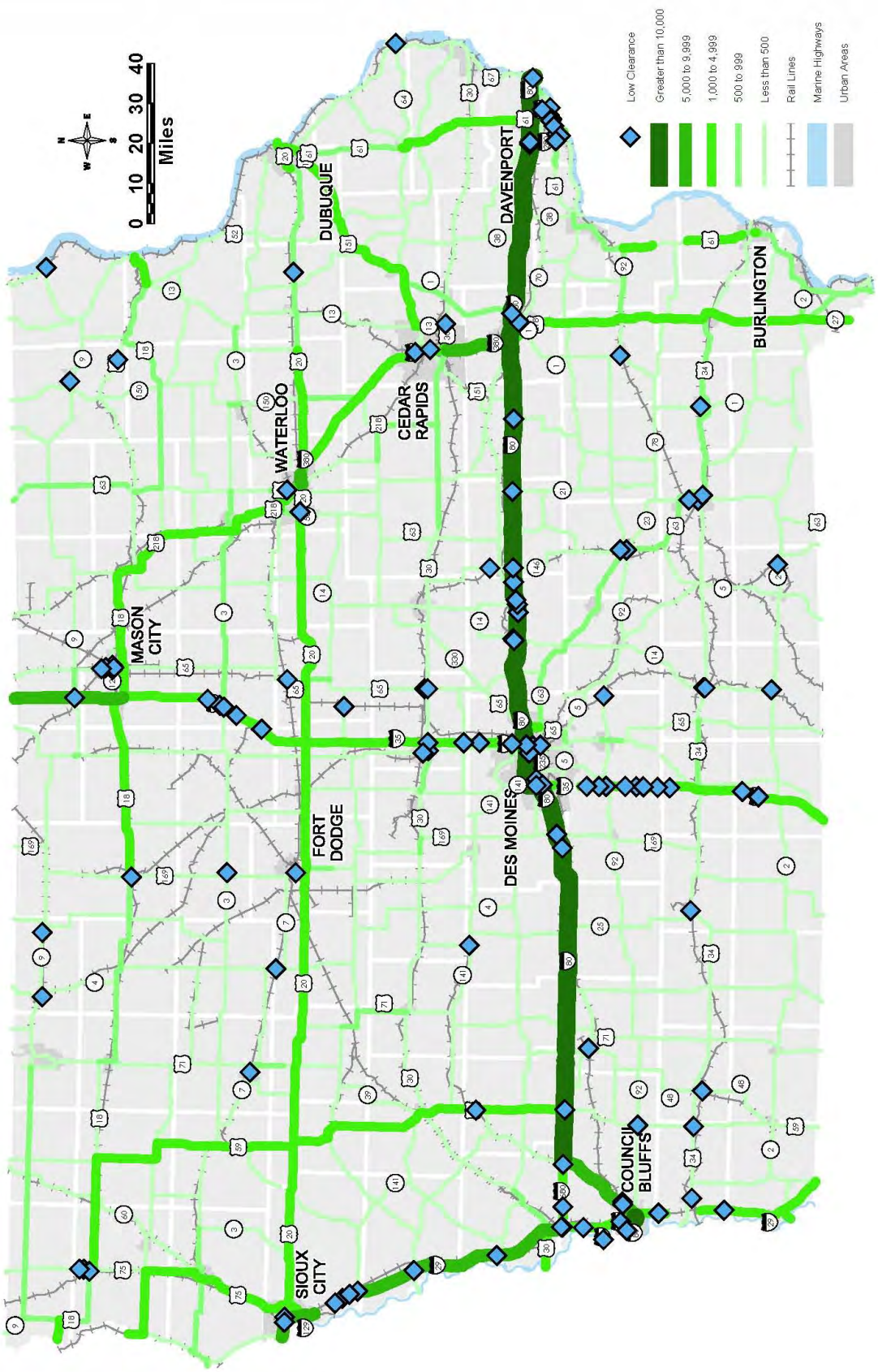


Figure 7.5: Oversize/overweight truck permits per year, 2014

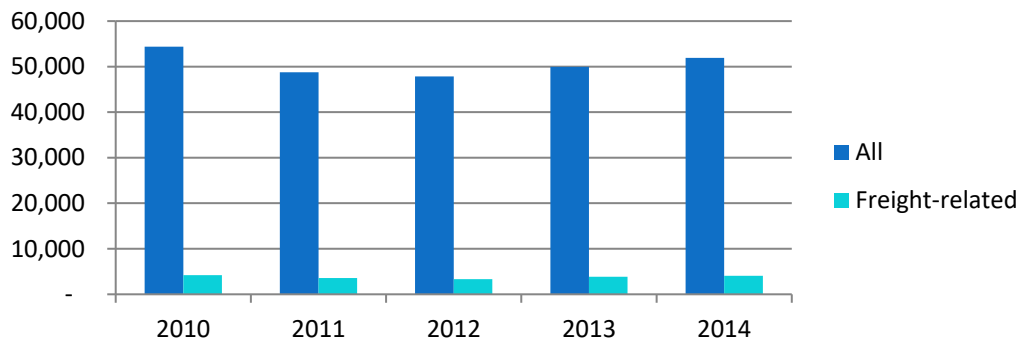
Source: Iowa Department of Transportation, Iowa Automated Permit System

Safety

As acknowledged in both the Iowa DOT's goals and national freight goals, safety is emphasized in all efforts, including enforcement, education, engineering, and emergency response. The overriding goal for all aspects of transportation safety is to prevent fatalities, thereby preventing personal and economic losses experienced by families, employers, and communities, and improving Iowa's quality of life.

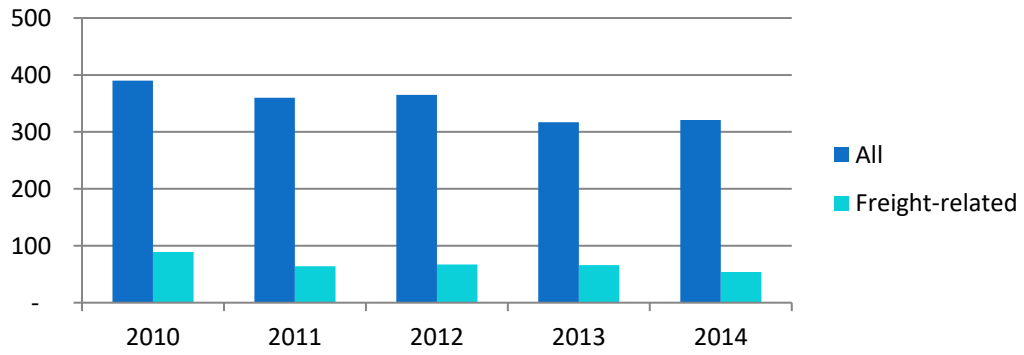
For highways, freight-related crashes include those that involve single-unit trucks, combination trucks, and/or trains. Figures 7.6 and 7.7 show Iowa's freight-related crashes and fatalities from 2010 to 2014. In that time period, freight-related crashes have represented roughly the same proportion of the overall crashes taking place in the state, staying between 7 and 8 percent of the total for all five years. Freight-related fatalities have been steadily decreasing since 2010, with the exception of 2012 when fatalities increased by three.

Figure 7.6: Highway freight-related crashes, 2010-2014



Source: Iowa Department of Transportation crash data

Figure 7.7: Highway freight-related fatalities, 2010-2014



Source: Iowa Department of Transportation crash data

The interstates in Iowa carry the vast majority of Iowa's truck traffic (see Figure 7.4). However, from 2010 to 2014 the CIN has had roughly 15,000 more crashes and about 120 more fatalities than the interstates, most likely due to the interstates being completely access-controlled. Table 7.3 shows the total number of crashes and fatalities on different portions of the state highway network during this time. Out of the total freight-related crashes on all roadways in the state, the majority involved combination trucks (11,863), followed by single-unit trucks (7,403) and trains (194). The same is true for freight-related fatalities on all roadways in the state with the majority being combination trucks (237), followed by single-unit trucks (97) and trains (16).[47]

Table 7.3: Highway freight-related crashes and fatalities, 2010-2014

	All		Freight-related		Percent freight-related	
System	Crashes	Fatalities	Crashes	Fatalities	Crashes	Fatalities
All roadways in the state	252,892	1,753	19,057	340	7.5	19.4
Interstates	25,574	203	5,080	72	19.9	35.5
CIN	41,156	325	4,145	88	10.1	27.1
Primary Highway System	78,698	658	6,789	169	8.6	25.7

Source: Iowa Department of Transportation crash data

Incidents involving farm equipment are not included in these figures but are still significant due to Iowa's major agriculture industry. There were a total of 925 such crashes resulting in 39 fatalities from 2010 to 2014. There were also 117 crashes with zero fatalities involving OS/OW vehicles during that time frame.

Bottlenecks

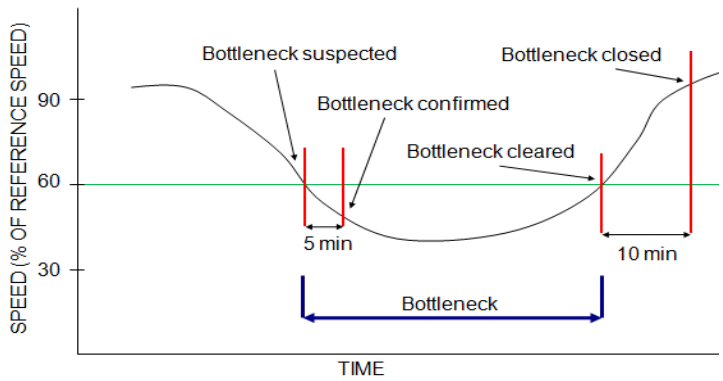
INRIX traffic data and Iowa DOT traffic counts were used to identify highway freight bottlenecks. INRIX has a Bottleneck Ranking tool that uses recorded speeds, acquired by tracking cell phone and global positioning systems data, to determine if a section of roadway is indeed a bottleneck. The following paragraph and Figure 7.8 describe how INRIX identifies bottleneck conditions.

> *Bottleneck conditions are determined by comparing the current reported speed to the reference speed for each segment of road. Reference speed values are provided to us for each segment and represent the 85th percentile observed speed for all time periods with a maximum value of*

[47] Some crashes may involve more than one type of freight-related vehicle; therefore the total freight-related crashes may not match the total crashes after adding up the totals of each freight-related vehicle type. For example, if a crash involved one combination truck and one single-unit truck, it is considered a combination truck crash and a single-unit truck crash, but only one freight-related crash.

65 mph. If the reported speed falls below 60 percent of the reference, the road segment is flagged as a potential bottleneck. If the reported speed stays below 60 percent for five minutes, the segment is confirmed as a bottleneck location. Adjacent road segments meeting this condition are joined together to form the bottleneck queue. When reported speeds on every segment associated with a bottleneck queue have returned to values greater than 60 percent of their reference values and remained that way for 10 minutes, the bottleneck is considered cleared. The total duration of a bottleneck is the difference between the time when the congestion condition was first noticed (prior to the 5-minute lead in) and the time when the congestion condition recovered (prior to the 10-minute lead out). Bottlenecks whose total queue length, determined by adding the length of each road segment associated with the bottleneck, is less than 0.3 mile are ignored.

Figure 7.8: Life of a bottleneck by speed and time



Source: INRIX

Once the list of INRIX highway bottlenecks was identified, the results were overlaid on the Iowa DOT's truck AADT data using geographic information systems to determine if the reported locations were true "freight bottlenecks." Locations were considered freight bottlenecks if they were identified by INRIX and also had at least 30 percent truck traffic or 5,000 trucks per day. These locations were presented to the Freight Advisory Council (FAC) for review and prioritization. The bottleneck list was then sent via email to all Iowa DOT's district offices, metropolitan planning organizations (MPOs), and regional planning affiliations (RPAs) for review. The final list of highway freight bottlenecks is shown in Figures 7.9 and 7.10 and Table 7.4. The numbers on Figures 7.9 and 7.10 correspond to the "ID" numbers in Table 7.4. "Identified" refers to how the location was identified (D = 2014 INRIX data, S = survey, DS = 2013 data and survey). "Occurred" refers to the number of times a bottleneck occurred at that location throughout the year (2014) according to INRIX.

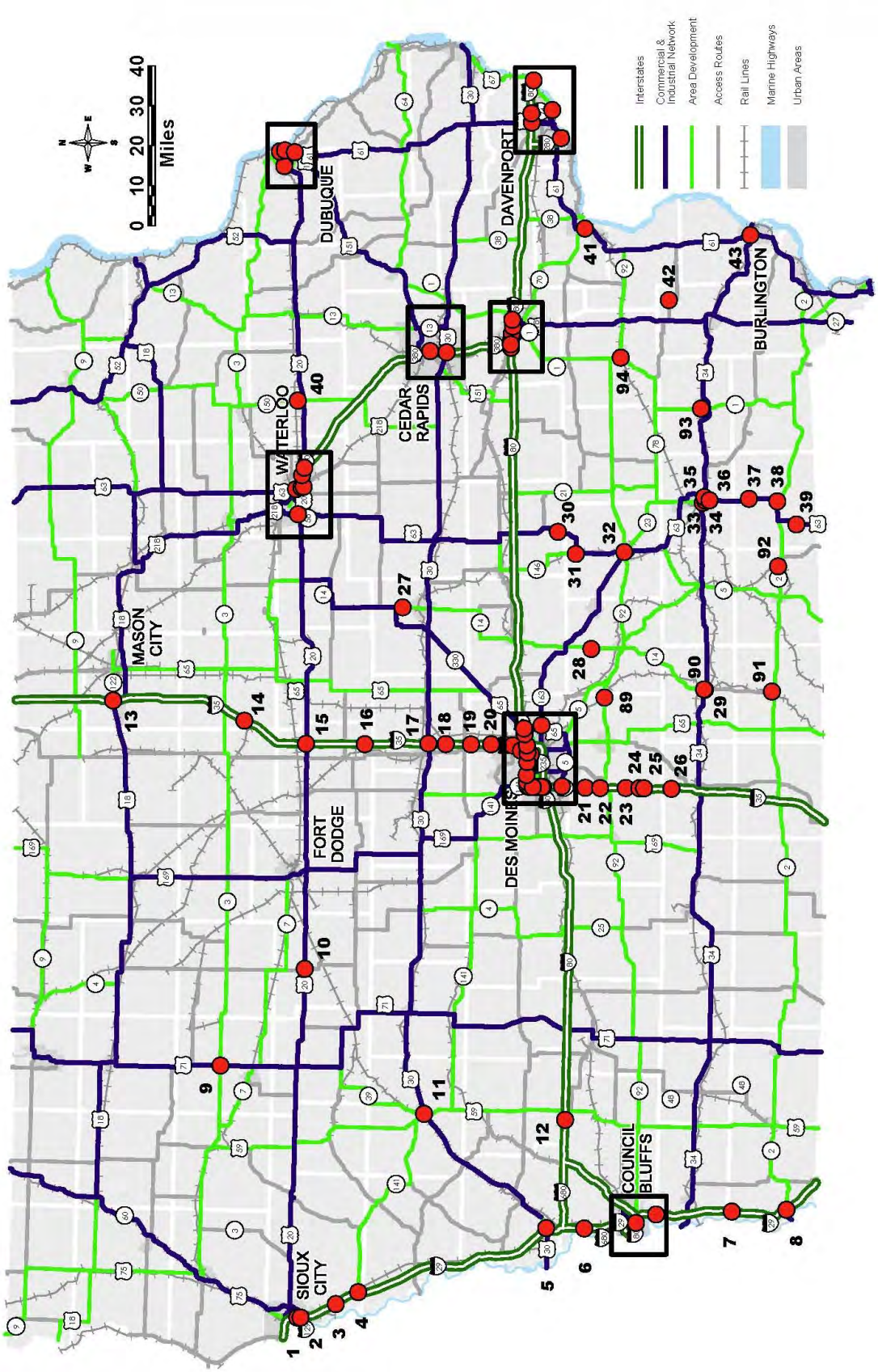


Figure 7.9: Highway freight bottlenecks, statewide

Source: Freight Advisory Council, metropolitan planning organizations, regional planning affiliations, Iowa Department of Transportation districts, INRIX

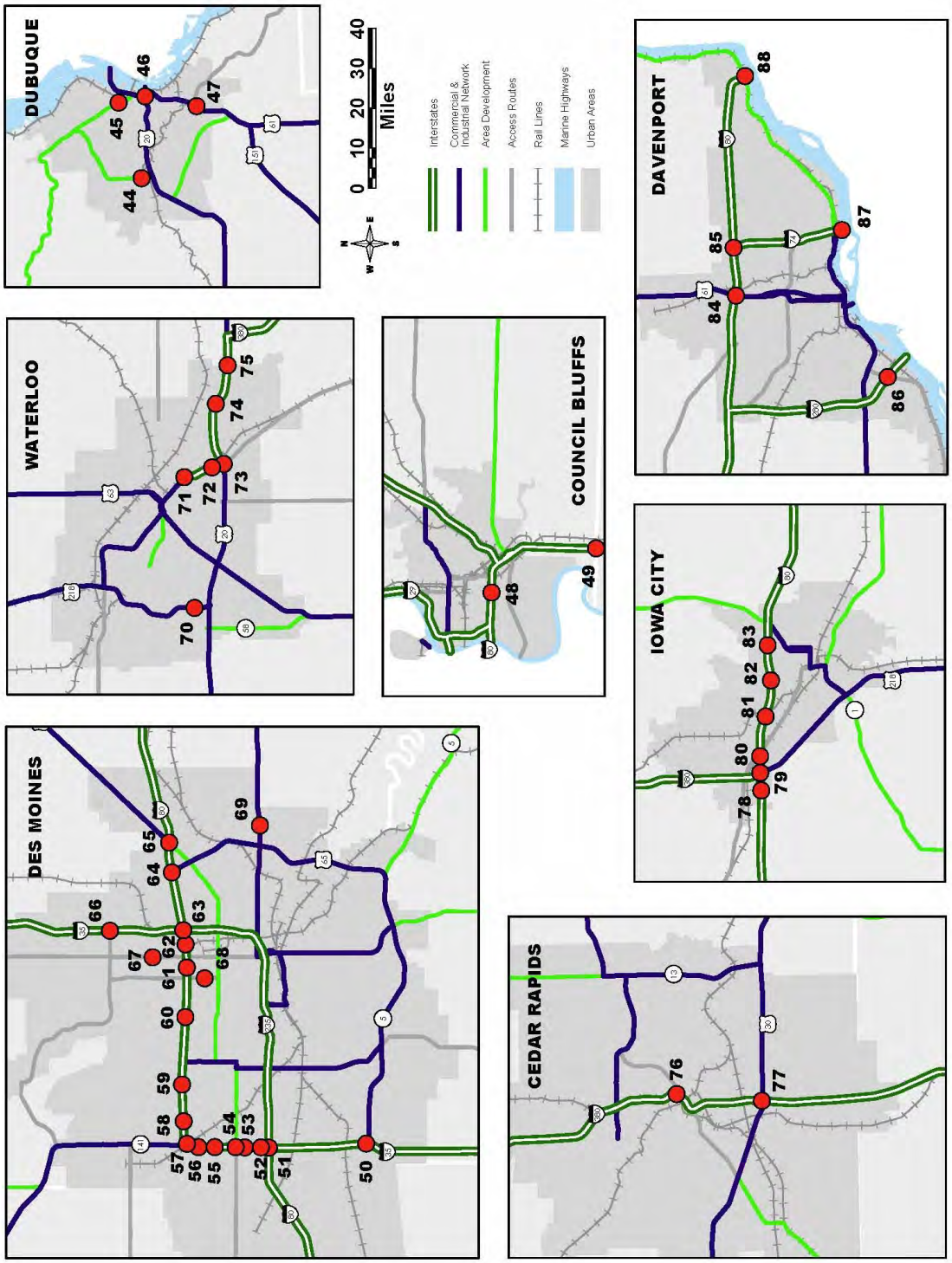


Figure 7.10: Highway freight bottlenecks, metro areas

Source: Freight Advisory Council, metropolitan planning organizations, regional planning affiliations, Iowa Department of Transportation districts, INRIX

Table 7.4: Highway freight bottlenecks

ID	Location	Identified	Occurred
1	I-29 N/S @ I-129/U.S. 20/U.S. 75/exit 144	D	756
2	I-29 N/S @ Old Iowa 75/Industrial Rd/exit 143	D	815
3	I-29 N/S @ exit 134	S	35
4	I-29 N/S @ Iowa 141/exit 127	S	10
5	U.S. 30 E/W through Missouri Valley	S	1563
6	I-29/680 N/S @ Rosewood Rd	DS	49
7	I-29 N @ County Road L-31/exit 24	DS	14
8	Iowa 2 W @ County Road L-31/195th Ave and I-29 N/S @ Iowa 2/exit 10	D	1256
9	Iowa 3 W @ U.S. 71/130th St	DS	0
10	Iowa-4 S @ U.S. 20/270th St	DS	169
11	U.S. 30 E/W @ U.S. 59/Iowa 141	S	387
12	I-80 W @ 385th St	DS	14
13	I-35 N @ U.S. 18/exit 194	D	89
14	I-35 N @ County Road C-47/exit 159	DS	31
15	I-35 N/S @ U.S. 20/exit 142 and U.S. 20 E/W @ I-35/exit 153	D	420
16	I-35 S @ County Road D-65/exit 128	DS	17
17	I-35 N/S @ U.S. 30/exit 111 and U.S. 30 E/W @ I-35/exit 151	D	336
18	I-35 N/S from Iowa 210 to U.S. 30	S	0
19	I-35 N/S from Northeast 126th Ave to Iowa 210	S	0
20	I-35 N/S from 36th St to Northeast 126th Ave	S	0
21	I-35 N/S @ Fillmore St (MP 61.5)	S	0
22	I-35 N/S @ Hoover St (MP 58.5)	S	0
23	I-35 N/S @ G-50/exit 52	S	68
24	I-35 N @ Quaker St (MP 49.1)	S	0
25	I-35 N/S @ G-64/exit 47	S	90
26	I-35 N/S @ Robin St (MP 40.8)	S	0
27	Iowa 4 N/S from Marshalltown north city limits to Iowa 330	S	576
28	Iowa 14 N/S @ Des Moines River	S	88
29	U.S. 34 E/W @ Iowa 14	S	167
30	U.S. 63 N/S from Iowa 146 to Iowa 85	S	0
31	U.S. 63 N/S @ Iowa 146	S	0
32	U.S. 63 N/S through Oskaloosa	S	143
33	U.S. 34 E/W from Quincy Ave to roundabout	S	14
34	U.S. 34 E/W @ U.S. 63 (roundabout)	S	580
35	U.S. 34 E/W from roundabout to U.S. 34/U.S. 63	S	580
36	U.S. 63 N/S @ 0.9 miles south of U.S. 34	S	0
37	U.S. 63 N/S from Ottumwa south city limits to Iowa 2	S	103
38	U.S. 63 N/S @ Iowa 2	S	548
39	Us 63 N/S from Iowa 2 to Missouri state line	S	331
40	Iowa 150 N/S through Independence	S	0
41	U.S. 61 S @ Iowa 92/Grandview Ave	D	114

ID	Location	Identified	Occurred
42	Iowa 78 E/W @ 2 miles west of W-66	S	0
43	U.S. 61 N/S through Burlington	S	172
44	Iowa 32 N/S @ Chavenelle Rd	S	0
45	U.S. 52 N/S @ Iowa 3	S	303
46	U.S. 20 E/W @ Iowa 946	S	79
47	U.S. 151 N/S @ Maquoketa Dr	S	1040
48	I-80/29 N/S through Council Bluffs	D	374
49	I-29 N @ Mills/Pottawattamie County line and I-29 N/S @ Iowa 370	DS	40
50	I-35 S @ Iowa 5/Army Post Rd/exit 68	D	49
51	I-80/I-35/I-235 N/S, E/W @ southwest mixmaster	D	365
52	I-35/80 N/S, E/W from southwest mixmaster to University Ave	S	18
53	I-35/80 N/S, E/W from University Ave to U.S. 6/Hickman Rd	S	97
54	I-35/80 N/S @ U.S. 6/Hickman	S	61
55	I-35/80 N/S @ Douglas Ave	D	116
56	I-35/80 N/S, E/W from Douglas Ave to Iowa 141	S	0
57	I-35/80 N/S, E/W @ Iowa 141	D	2036
58	I-35/80 N/S, E/W from Iowa 141 to Northwest 86th St	S	0
59	I-35/80 N/S, E/W from Northwest 86th St to Merle Hay Rd	D	45
60	I-35/80 N/S, E/W from Merle Hay Rd to Iowa 415	D	30
61	I-35/80 N/S, E/W from Iowa 415 to U.S. 69	S	33
62	I-35/80 N/S, E/W from U.S. 69 to northeast mixmaster	S	0
63	I-35 N/I-235 W @ I-80/I-235/exit 87; I-80 E/W @ I-235/I-35/exit 137	D	226
64	I-80 E/W @ U.S. 65/exit 141	D	147
65	U.S. 6 E @ I-80 (east) and U.S. 65 N/S @ I-80/U.S. 6/Northeast Hubbell Ave/exit 142	D	9375
66	Iowa 160 E/W @ I-35 and I-35 N/S @ Iowa 160/exit 90	S	114
67	U.S. 69 N/S from I-35/80 to Ankeny south city limits	S	88
68	Iowa 415 N/S @ 0.6 miles south of I-35/80 (railroad bridge)	S	329
69	Iowa 163 E/W through Pleasant Hill	S	72
70	Iowa 58 from U.S. 20 to Greenhill Rd	S	0
71	I-380/U.S. 218 N/S from San Marnan Dr to W. Ninth St	S	1764
72	I-380/U.S. 218 N/S from U.S. 20 to San Marnan Dr	S	88
73	I-380 S @ U.S. 20/Iowa 27 and U.S. 20 E @ I-380/U.S. 218/exit 71	D	108
74	I-380 N/S @ Evansdale Dr/exit 68	S	95
75	I-380 N/S @ Iowa 297/exit 66	D	51
76	I-380 N/S through Cedar Rapids	D	123
77	I-380 N/S @ U.S. 30/exit 16	D	110
78	I-80 E/W from Ireland Ave Northwest to I-380	S	32
79	I-380 N/S @ I-80/exit 0 and I-80 E/W @ I-380/exit 239	D	250
80	I-80 E/W from I-380 to Iowa 65	S	0
81	I-80 E/W from Iowa 965 to First Ave	S	26
82	I-80 E/W from First Ave to Dubuque St	S	27

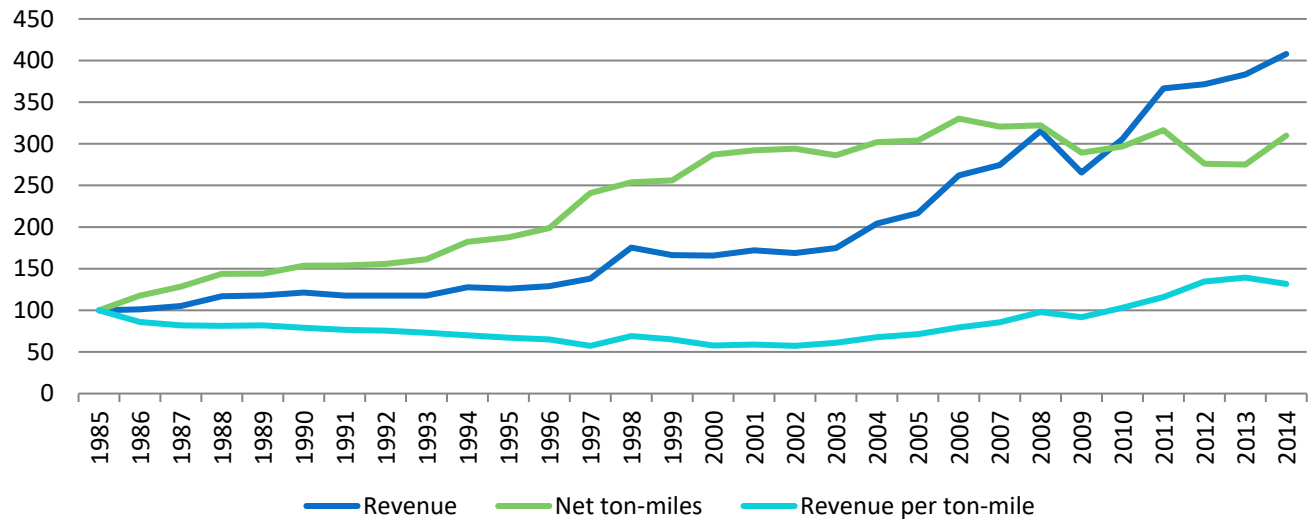
ID	Location	Identified	Occurred
83	I-80 E/W from Dubuque St to Iowa 1	S	0
84	U.S. 61 N/S @ I-80/exit 123 and I-80 E @ U.S. 61/Brady St/exit 295	D	368
85	I-80 E/W @ I-74/exit 298	D	144
86	I-280 N @ Iowa 22/Rockingham Rd/exit 8	DS	26
87	I-74 @ Mississippi River	S	706
88	I-80 E/W @ U.S. 67/exit 306	DS	34
89	Railroad bridge over Iowa 92 east of Sandyville	S	192
90	Railroad bridge over Iowa 14 @ Chariton	S	0
91	Railroad bridge over Iowa 14 @ Corydon	S	287
92	Railroad bridge over Iowa 2 east of Centerville	S	0
93	Railroad bridge over Iowa 1 @ Fairfield	S	32
94	Railroad bridge over Iowa 1/Iowa 92 @ Washington	S	84

Source: Freight Advisory Council, metropolitan planning organizations, regional planning affiliations, Iowa Department of Transportation districts, INRIX

Railroad

Operating revenues and overall net ton-miles of the railroads are an indicator of the condition and performance of the rail system. In 2014, operating revenues earned from all railroads in Iowa totaled $2.2 billion, up from $550 million in 1985. Net ton-miles, defined as the movement of a net ton (2,000 pounds) of freight 1 mile, totaled $64.6 billion, up from $20.8 billion in 1985. Revenue per ton-mile declined from 2.64 cents in 1985 to 1.52 cents in 2002 in current dollars. Since 2002, revenue per ton-mile has increased to 3.48 cents. Figure 7.11 uses values from revenues, net ton-miles, and revenue per ton-mile to calculate a trend index in which values in 1985 are all 100. This allows for showing increases and decreases by the three categories from the same point in time.

Figure 7.11: Performance of rail operations in Iowa, 1985-2014



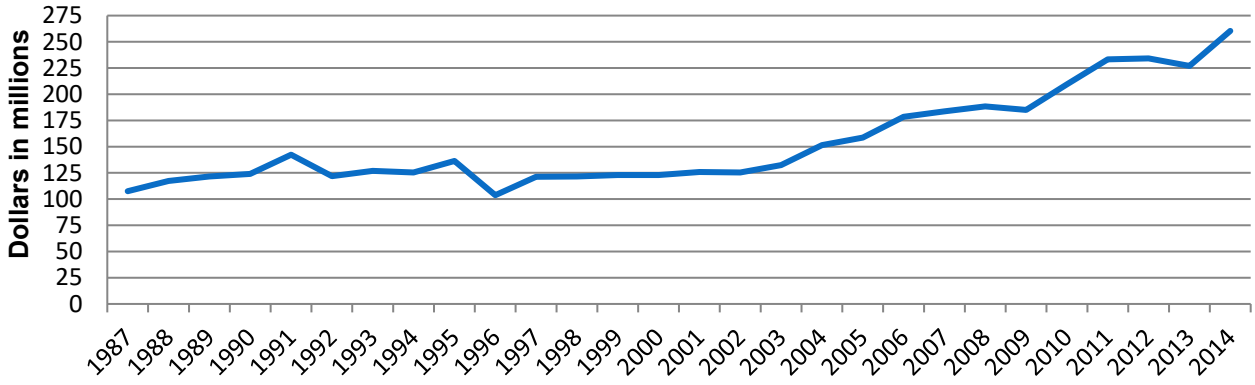
Source: Iowa Department of Transportation, railroad annual reports

According to the railroad annual reports,[48] railroads in Iowa have been steadily increasing the amount of funds spent on maintenance and improvements of rail infrastructure in the state, as shown in Figure 7.12. These costs make up an estimated 11 percent of total operating expenses. Railroads in Iowa spent an estimated $260.4 million in 2014 to maintain and improve their Iowa rail infrastructure. The average cost of maintenance per mile in Iowa was $68,078 in 2014, a relatively large increase over the previous five years.

[48] Railroad annual reports are surveys completed and submitted to the Iowa DOT by the railroad companies that operate in the state. These reports request information related to mileage, tonnage, commodities handled, revenues, expenses, etc.

The cost for maintenance and track rehabilitation has been steadily increasing over the past quarter century. In 1987, maintenance costs per mile were about $23,441, which is about $36,000 less than it is presently. Due to their higher mileage totals, Class I railroads accounted for the largest amount of these expenditures with $251.5 million or 96 percent of the total statewide.

Figure 7.12: Iowa rail maintenance costs, 1987-2014



Source: Iowa Department of Transportation, railroad annual reports

Utilization

Rail service in Iowa is dominated by the six Class I carriers that operate 83 percent of the rail mileage in the state, generate 91 percent of the ton-miles, and earn 94 percent of the revenues. Iowa's two busiest rail lines are Union Pacific Railroad's Overland Route, an east-west double-track route passing through the center of Iowa (Clinton to Council Bluffs), and the BNSF Railway's line in southern Iowa, an east-west route that is partially double tracked (Burlington to west of Pacific Junction). The Class II and III railroads often provide feeder service to the Class I carriers, which results in smaller allocations of mileage, ton-miles and revenue. In 2013, the Class II railroad operated 8 percent of the mileage contributing 2 percent of the ton-miles and 3 percent of revenues in Iowa. The 11 Class III carriers operated 10 percent of the mileage, generating 1 percent of the ton-miles and 3 percent of revenues.

The activity on individual rail lines is measured in terms of density or gross ton-miles per mile (gtm/m). Gross ton-miles are defined as the total weight of all freight traveling on the rail line including the weight of freight-train cars and locomotives. While Iowa's rail miles have decreased slightly, the amount of gross tonnage moving over the network has been increasing. Between 1985 and 2014, gross ton-miles increased by approximately 135 percent while rail miles fell by 18 percent. Average rail line density has nearly tripled over the last 26 years, primarily as a result of the increased through traffic moving on Iowa's main lines. The average rail line density in Iowa was 29.6 gtm/m in 2014. Figure 7.13 shows Iowa's rail traffic density.

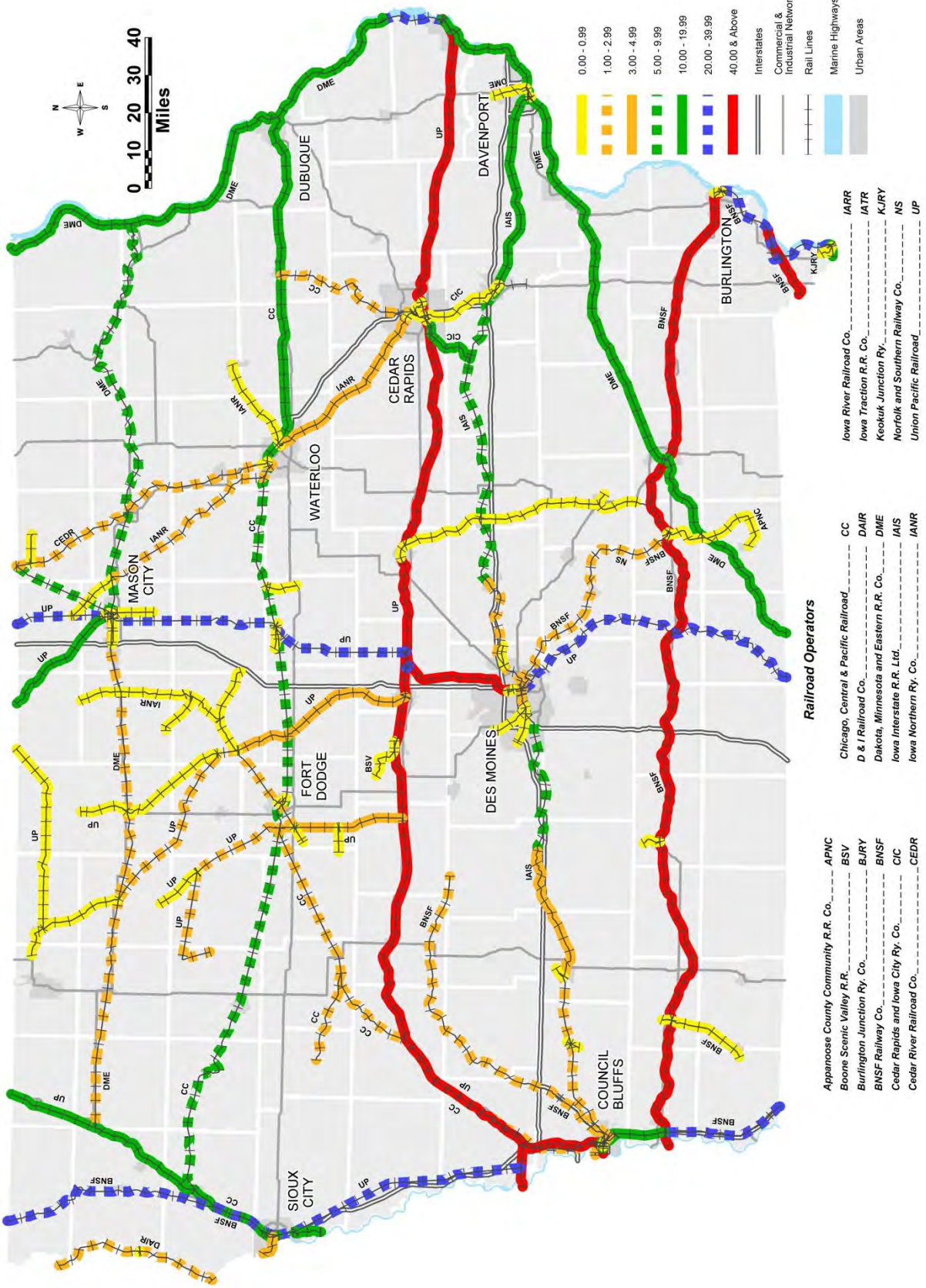


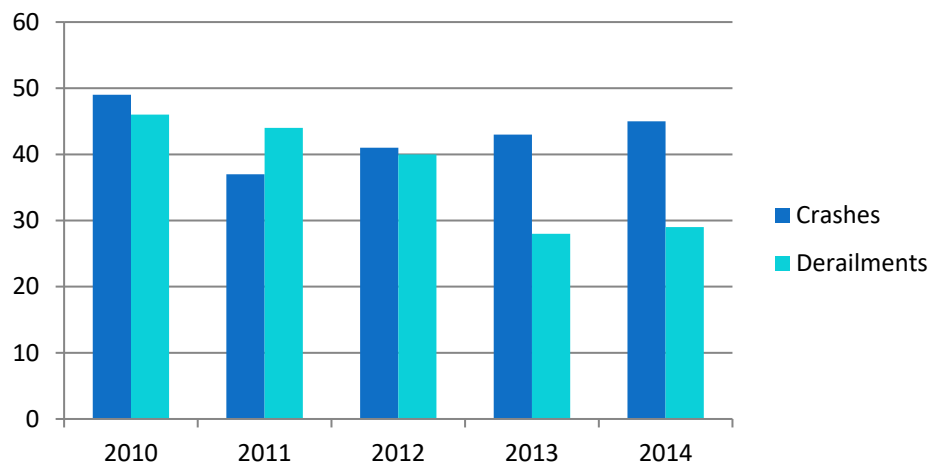
Figure 7.13: Railroad traffic density, 2014 (gross ton-miles per mile)

Source: Iowa Department of Transportation, railroad annual reports

Safety

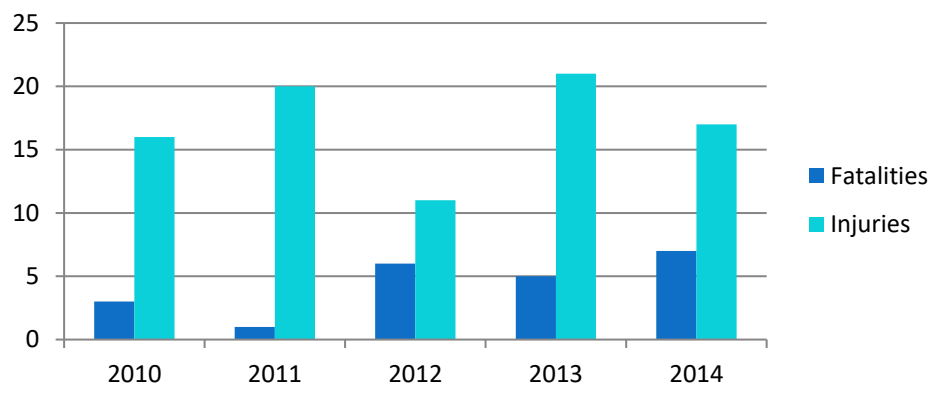
According to the Federal Railroad Administration, there were 215 crashes between highway and railroad traffic from 2010 to 2014, as well as 187 derailments. Over that time frame, crashes per year have remained relatively steady with the total number of derailments per year declining. Figure 7.14 shows the total number of highway/railroad crashes and derailments per year. There were a total of 85 injuries and 22 fatalities resulting from those crashes, both with inconsistent trends by year. Figure 7.15 shows the number of injuries and fatalities per year from highway-railroad crashes.

Figure 7.14: Railroad freight-related crashes and derailments, 2010-2014



Source: Federal Railroad Administration, Office of Safety Analysis

Figure 7.15: Railroad freight-related injuries and fatalities, 2010-2014



Source: Federal Railroad Administration, Office of Safety Analysis

Bottlenecks

Railroads carry the second highest amount of freight tonnage in Iowa, which makes identifying locations with freight mobility issues on rail lines extremely important. The importance is intensified by the fact that the efficient movement of products on railroads provides many economic benefits to the state.

These bottleneck locations were identified by communicating with knowledgeable stakeholders on four different occasions. First, a survey was sent out by the Iowa DOT's Office of Rail Transportation to each of the rail companies operating trackage in the state. The list of bottleneck locations received was then brought before the Iowa Rail Advisory Committee (RAC) for review and additions. This expanded list was then provided to the FAC. One railroad identified tracks in low-lying areas as potential bottlenecks when they become flooded due to heavy rains or high water levels. The Iowa DOT's Office of Rail Transportation then sent a follow-up email survey to railroads requesting additional locations that experience these issues. Finally, the list was sent out to MPOs, RPAs, and Iowa DOT's districts as part of the Freight Mobility Issues Survey. During each occasion, stakeholders were asked to identify the locations of bottlenecks and describe what type of freight mobility issue existed. After these input sessions, the following list of railroad bottlenecks was determined. Figure 7.16 and Table 7.5 show railroad freight bottlenecks in the state.

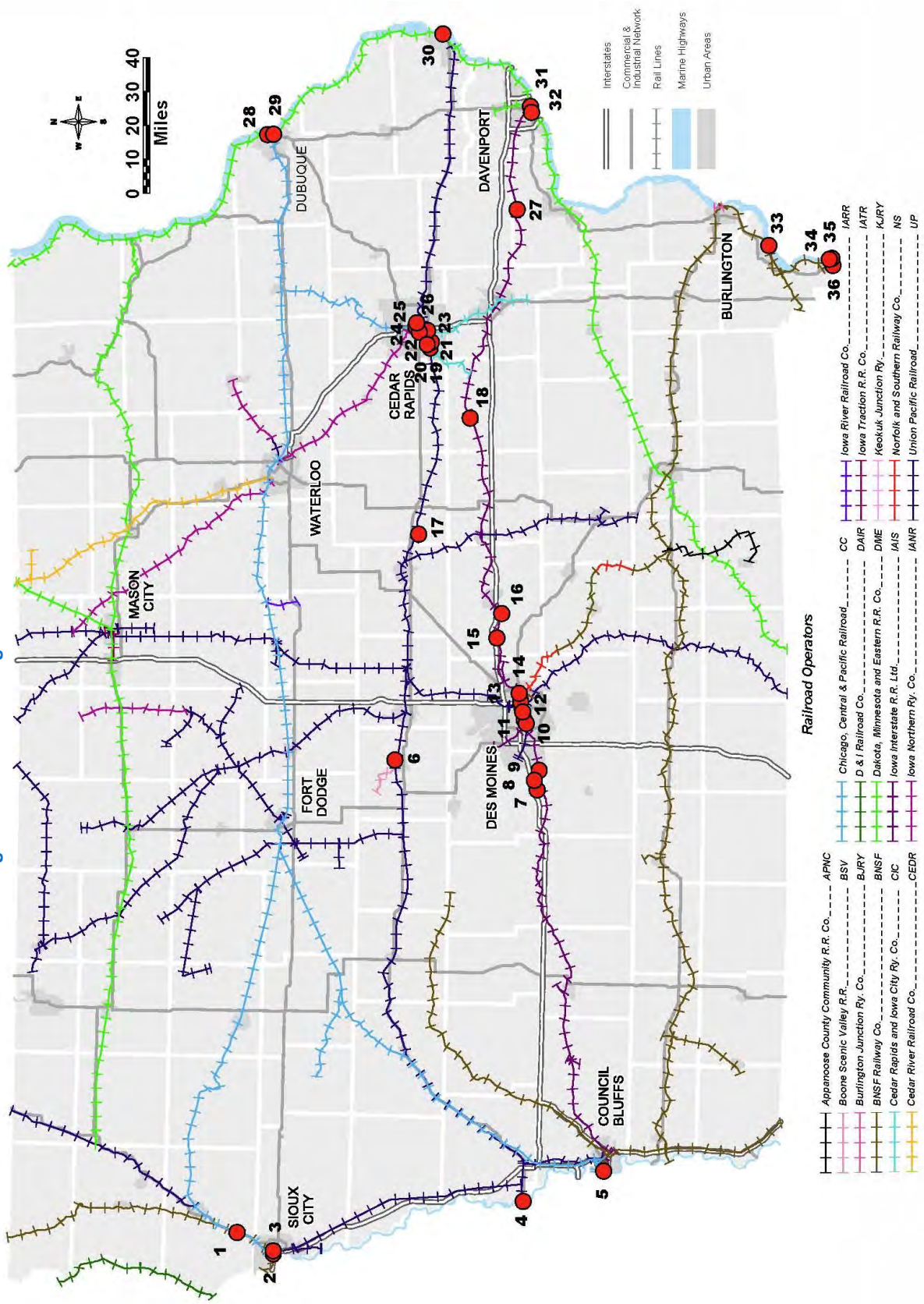


Figure 7.16: Railroad freight bottlenecks

Source: Iowa railroad companies, Rail Advisory Committee, Freight Advisory Council

Table 7.5: Railroad freight bottlenecks

ID	Railroad	Location	Freight Mobility Issue
1	CN and UP	Mainline between Sioux City and Le Mars, Iowa	**Track congestion,** From multiple rail companies operating over the same line.
2	DAIR, UP, CN, and BNSF	Interchange at Sioux City, Iowa	**Limited size and capacity**. The alignment of interchanges between all four railroads causes each railroad to access a busy BNSF main line to allow for certain interchange movements from one railroad to another. The alignment requires a very **unsafe "back-up and see-saw" movement** that causes delays to trains and vehicular traffic.
3	BNSF	Gordon Drive viaduct; Sioux City, Iowa	The Gordon Drive viaduct has a vertical clearance of 17' 6" above top of rail that **does not allow for the passage of double stack container trains**.
4	UP	West of Missouri Valley, Iowa, and south of Omaha, Nebraska	**Flood prone area**. Missouri River flooding in 2011 did not cause a shutdown, but traffic was reduced for a period of 10 days to raise the track in multiple locations above predicted crest elevations. The process was a costly undertaking.
5	CN	UP bridge over Missouri River in Council Bluffs, Iowa	CN uses a UP bridge at Council Bluffs, Iowa, to reach a customer in Omaha, Nebraska, which **causes some delay** waiting for UP trains. CN traffic between Council Bluffs and Omaha is limited.
6	BSV	Industrial park at Boone, Iowa	**Need to improve infrastructure with additional siding and storage**.
7	IAIS	Bridge 380.4 (near De Soto, Iowa)	This **bridge restricts the movement of high-wide loads** due to the truss construction. This affects movements between Des Moines and Council Bluffs, Iowa, and restricts movements from wind tower producers.
8	IAIS	Bridge 378.1 near Van Meter, Iowa	This **bridge restricts the movement of high-wide loads** due to the truss construction. This affects movements between Des Moines and Council Bluffs, Iowa, and restricts movements from wind tower producers.
9	IAIS	Bridge 373.0 (near Booneville, Iowa	This **bridge restricts the movement of high-wide loads** due to the truss construction. This affects movements between Des Moines and Council Bluffs, Iowa, and restricts movements from wind tower producers.
10	IAIS	Bridge 360.9 near West Des Moines, Iowa	This **bridge restricts the movement of high-wide loads** due to the truss construction. This affects movements between Des Moines and Council Bluffs, Iowa, and restricts movements from wind tower producers.
11	IAIS	Des Moines, Iowa, track conditions	**Rail, crossings, and bridge conditions** limit main track to FRA Class 1 and operations not exceeding 10 mph. Need improvements to meet FRA Class 2 track standards and an operating speed increase to 25 mph.
12	IAIS	Des Moines, Iowa	**Flood prone area.** Track from MP359.04 to MP362.25 near Edwards Avenue is at risk of flooding from the Raccoon River anytime the Fleur flood gates close.
13	IAIS	UP Short Line Yard in Des Moines, Iowa	UP-owned trackage and yard, **no dedicated through route** for IAIS. Need a dedicated separate track to allow through IAIS movements to pass without restriction.
14	IAIS	Pleasant Hill, Iowa	**Flood prone area.** MP352.25 to MP353 near Fairview Drive is at risk of flooding from Four Mile Creek.
15	IAIS	Colfax, Iowa	**Flood prone area.** MP334.25 to MP336 near Walnut Street is at risk of flooding from the Skunk River.

ID	Railroad	Location	Freight Mobility Issue
16	IAIS	Bridge 329.1 near Colfax, Iowa	This **bridge restricts the ability to carry high-wide loads** associated with wind towers. Need to replace structure with through plate girder bridge.
17	UP	Montour, Iowa	**Flood prone area.** Closed the line in 2014 due to a large rain event.
18	IAIS	Bridge 268.6 near Marengo, Iowa	This **bridge restricts the movement of high-wide loads** due to the truss construction. This affects movements between Newton and Davenport, Iowa, and restricts movements from wind tower producers.
19	CIC and UP	Fairfax 3 in Cedar Rapids, Iowa	UP **can only deliver one train at a time** at this location. Additional interchange track would alleviate the capacity issue.
20	UP	Cedar Rapids, Iowa	**Flood prone area.** Closed the mainline in 2014 due to a Prairie Creek watershed rain event that backed up drainage ditches. Water backup created flooding in UP Beverly Yard as well as the main line for multiple days.
21	CIC	IAIS interchange near Cedar Rapids, Iowa	There are **only two existing tracks for the interchange**. Additional track to accommodate ADM traffic growth via IAIS is warranted.
22	CIC	Edgewood Road - 26th Street reconfiguration in Cedar Rapids, Iowa	The **single line limits train traffic** between the UP and IAIS interchanges and Archer Daniels Midland. It also doesn't allow for car inspections. A second track, removing the S-curves, and adding an access road from ADM to the interchange yards would solve the issue.
23	CIC	Cedar Rapids bypass, Cedar Rapids, Iowa	**Rail traffic currently moves through the ADM plant** greatly affecting services. A new single line that bypasses ADM would allow trains to travel around the plant more efficiently and minimize potential operating conflicts between CIC trains.
24	CIC	OR bypass in Cedar Rapids, Iowa	**Insufficient capacity to accommodate the interchange space** for IANR and CN corn traffic while facilitating other yard switching activities. Bypass would provide additional capacity and efficiency of railroad operations.
25	CIC	Eighth Avenue curve in Cedar Rapids, Iowa	The **current 18-degree curve limits train size and motive power options for train operations**, increasing the number of trains and causing congestion (motor and rail) in downtown Cedar Rapids, Iowa.
26	UP	Cedar Rapids, Iowa	**Flood prone area.** Cedar River caused an entire industrial lead to be closed for the duration of a flood in 2008.
27	IAIS	Moscow, Iowa	**Flood prone area.** MP211.75 to MP 212.75 near Noble Avenue on the Cedar River.
28	CP	Garfield Avenue in Dubuque, Iowa	**Lack of rail yard capacity.**
29	CN	South Port, Dubuque, Iowa	**Lack of rail yard capacity.**
30	UP*	Swing-span bridge over Mississippi River at Clinton, Iowa	The **bridge closes for rail traffic to accommodate barge passage on the river during navigation season**. The time typically required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations cause major delays to UP.

ID	Railroad	Location	Freight Mobility Issue
31	IAIS, CP, and BNSF*	Government Bridge over Mississippi River at Davenport, Iowa	Existing **bridge restricts all rail traffic to 10 mph, rail traffic is restricted by barge movements during navigation season, and railcar capacity of structure is marginal for railcars with a maximum allowable gross weight of 286,000 lb**. Need to replace structure.
32	BNSF	Crescent Bridge over Mississippi River at Davenport, Iowa	Railroad bridge **functionally obsolete**; should be replaced.
33	BNSF*	Swing-span railroad bridge over the Mississippi River at Fort Madison, Iowa	The **bridge closes for rail traffic to accommodate barge passage on the river during navigation season**. The time typically required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations cause delays to BNSF and vehicular traffic that share the bridge.
34	KJRY	Between Keokuk, Iowa, and Hamilton, Illinois	**Flood prone area along the Mississippi River.** Flooding sometimes requires tracks to be shut down for periods of time (a 2008 flood event had the largest impact).
35	KJRY*	Swing-span bridge over Mississippi River at Keokuk, Iowa	The **bridge closes for rail traffic to accommodate barge passage on the river during navigation season**. The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations cause delays to KJRY.
36	KJRY	Twin Rivers Yard at Keokuk, Iowa	**Insufficient storage and switching capacity**, as well as the inability to block rail traffic properly exists at this location. In order to alleviate the bottleneck, an increase in yard capacity is necessary.

***This location is also listed as a waterway bottleneck.**

Source: Iowa railroad companies, Rail Advisory Committee, Freight Advisory Council

Additionally, 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. The industry standard for rail car weight, which includes the weight of commodities and the rail car combined, is 286,000 pounds. Iowa has rail lines that are unable to carry the sizes and weights of railroad equipment that meet this threshold, as shown in Figure 7.17.[49]

[49] The line between Plymouth and Nora Springs, Iowa, can accommodate 286,000 lb. car weights with approval from IANR.

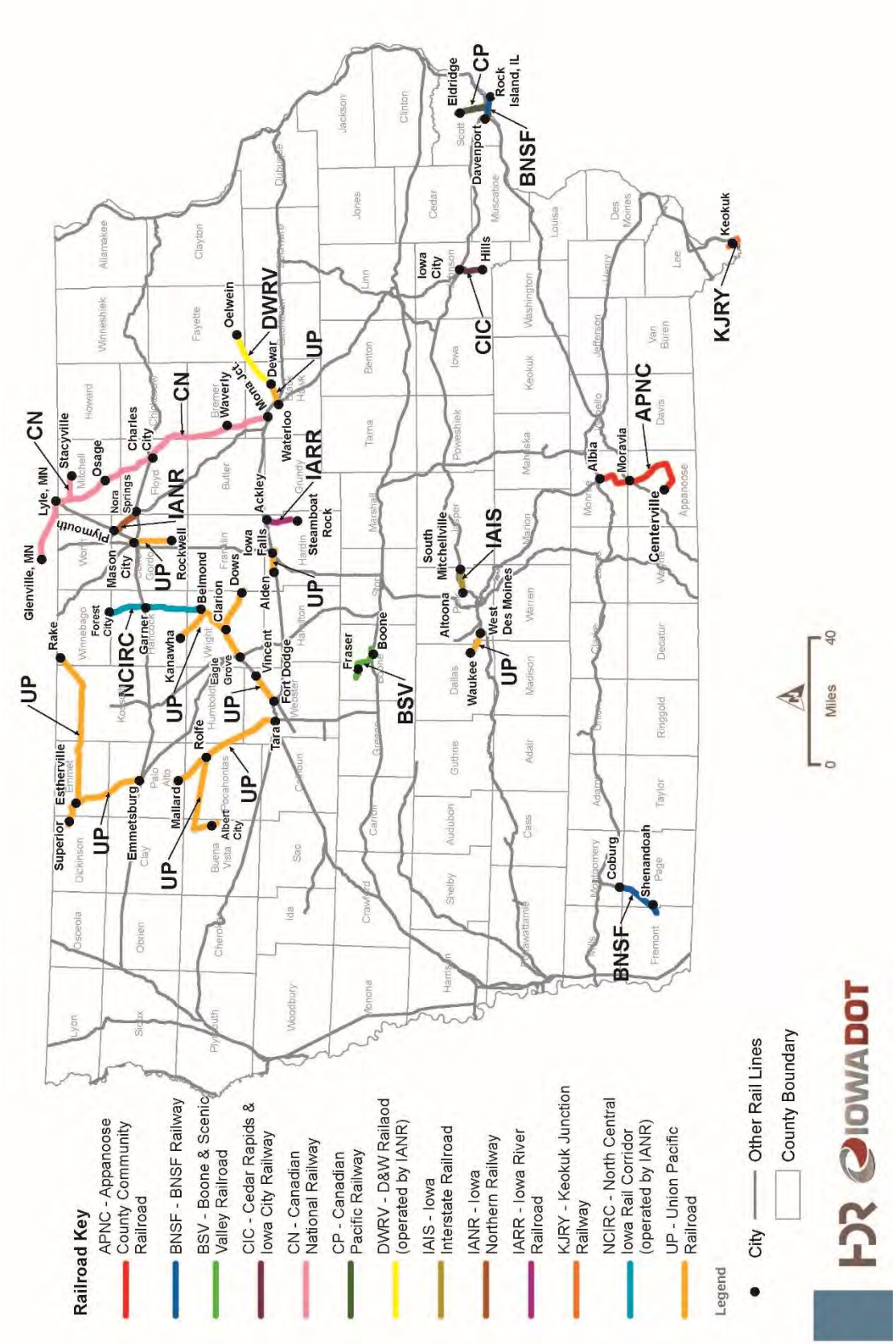


Figure 7.17: Rail line segments incapable of handling 286,000–pound rail car weights

Source: HDR, Iowa railroad companies

Waterway

In 2013, the American Society of Engineers' *Report Card for America's Infrastructure* gave the following grades for maritime infrastructure: ports, C; dams, D; levees, D-; and inland waterways, D-. These grades reflect the poor condition that much of the nation's system is in, raising concerns about the reliability of waterborne freight movement. With grain exports expected to increase and the expansion of the Panama Canal expected to shift the amount of goods that can be shipped to Asia via ports on the Gulf of Mexico, the State of Iowa has a strong interest in the condition of Iowa's inland waterway infrastructure.

Many of the country's locks and dams have reached or even far exceeded design life, resulting in infrastructure deteriorating faster than it's being replaced. In addition, the locks and dams bordering Iowa are undersized for modern Upper Mississippi tow lengths and are hindered by unexpected repairs.

The average age of these 11 locks and dams is nearly 80 years, close to 30 years past the design life. Only one lock bordering Iowa is long enough to accommodate a modern 1,200-foot barge tow. The remaining 10 are 600 feet long, which means barge operators must split the tow in half, lock through multiple times, and resecure the barges together before continuing. This creates major delays and congestion at each lock and dam, generating a ripple effect and longer delays throughout the rest of the system. Table 7.6 shows the percent of vessels delayed at Iowa's locks and the average delay time.

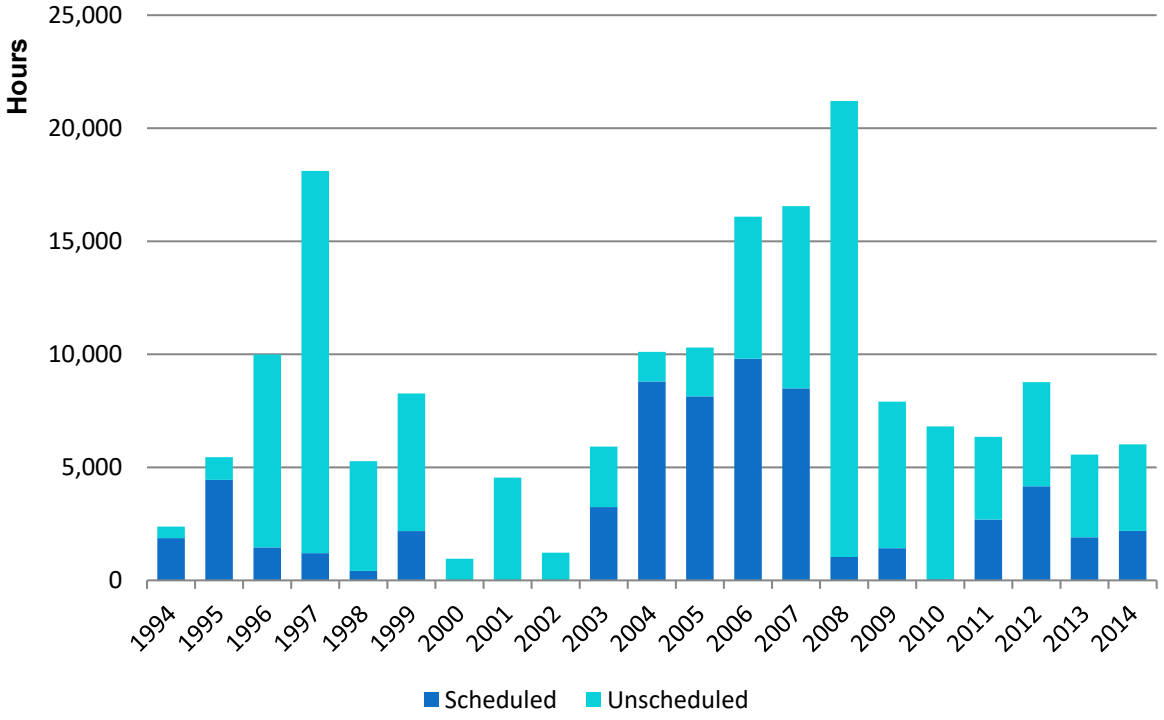
Table 7.6: Percent of vessels delayed and average delay time by lock, 1995-2014

Lock #	Location	Percent of vessels delayed	Average delay time (hours)
9	Harpers Ferry, Iowa	14.0	0.60
10	Guttenberg, Iowa	10.6	0.60
11	Dubuque, Iowa	18.3	0.98
12	Bellevue, Iowa	22.1	1.05
13	Clinton, Iowa	23.8	1.06
14	Le Claire, Iowa	24.1	2.06
15	Rock Island, Iowa	27.0	1.65
16	Muscatine, Iowa	45.3	1.21
17	New Boston, Illinois	49.4	1.76
18	Gladstone, Illinois	46.7	1.62
19	Keokuk, Iowa	44.1	0.87

Source: U.S. Army Corps of Engineers

Also contributing to delay times is lock unavailability, both scheduled and unscheduled. Due to the age and condition of the infrastructure, locks and dams often must be closed for maintenance and repairs. On average, unscheduled repairs account for more than 50 percent of lock closures. Delays, congestion, and unavailability due to closures are significant threats to efficient goods movement. Figure 7.18 shows the number of hours that locks 9 through 19 were unavailable from 1994 to 2014.

Figure 7.18: Annual unavailability[50] at locks 9-19, 1994-2014



Source: U.S. Army Corps of Engineers

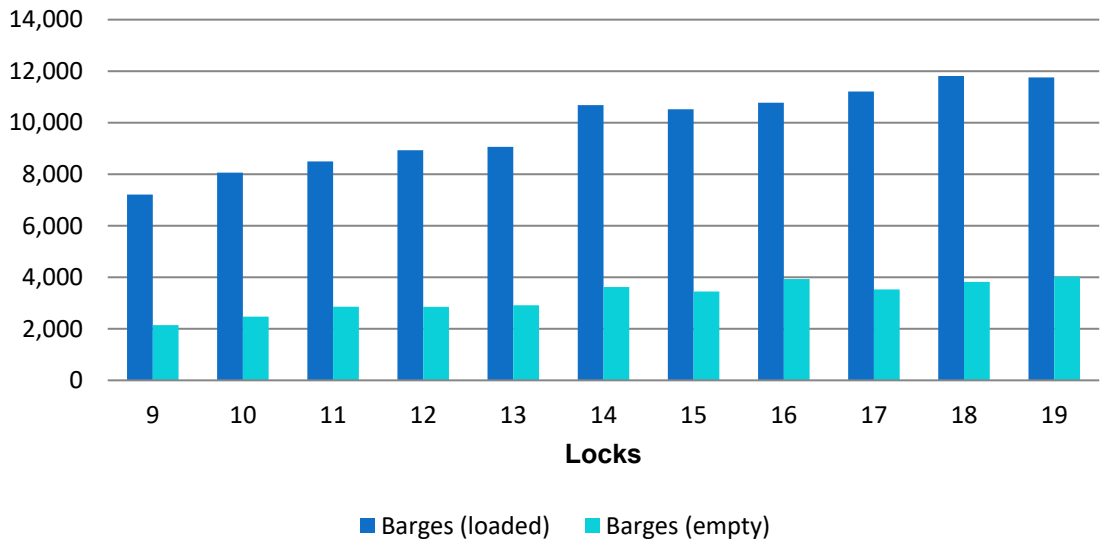
This system relies primarily on public investment and has suffered from chronic underfunding seriously affecting the nation's potential to participate in the highly competitive global market for exportable commodities. No long-term, sustainable funding source has been identified for the modernization of the inland waterway system to help keep Iowa and the United States competitive in the global economy. International competitiveness depends on being able to ship goods at low cost. If the inland waterway system continues to deteriorate and become less reliable, shippers will be forced to use other modes with increased transportation costs. An increase in costs means a decrease in competitive advantage.

[50] Unavailability hours can be higher due to maintenance on auxiliary locks. This means that the main lock could still be open when the auxiliary lock is unavailable.

Utilization

Iowa's navigable waterways are primarily utilized for moving bulk products such as grain, fertilizer, and coal, with most of the movements being exports out of the state and down the Mississippi River.[51] Barge traffic through Iowa's locks increases as the river flows from north to south. Most of traffic can be attributed to agricultural products being exported. These exports are shipped from Iowa barge terminals down the Mississippi River to the Gulf of Mexico where they are transloaded onto ocean vessels and shipped around the world. Figure 7.19 shows the total number of barges, loaded and empty, that passed through each of Iowa's 11 locks in 2014.

Figure 7.19: Number of barges passing through Iowa locks, 2014



Source: U.S. Army Corps of Engineers

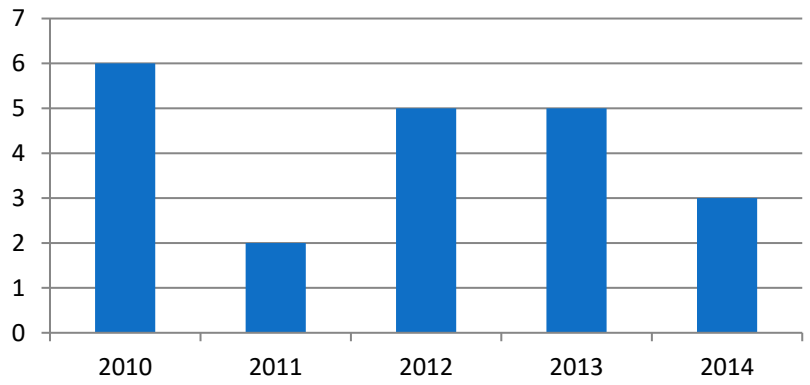
The Missouri River has experienced a continual drop in freight tonnages, partly due to inconsistent water releases from upriver dams and controversy over water usage for all Upper Missouri River basin states. Today, barge traffic typically goes only as far north as Omaha-Council Bluffs.

Safety

There were no fatalities or missing crewmembers aboard towing vessels or barges on the Mississippi or Missouri Rivers along Iowa's borders from 2010 to 2014 according to U.S. Coast Guard records. There were, however, 20 towing vessel crewmembers injured on the Mississippi River from 2010 to 2014, and one on the Missouri River in 2011. Figure 7.20 shows total injuries on the Mississippi and Missouri rivers from 2010 to 2014.

[51] Navigation Data Center. U.S. Army Corps of Engineers. <http://www.navigationdatacenter.us/>.

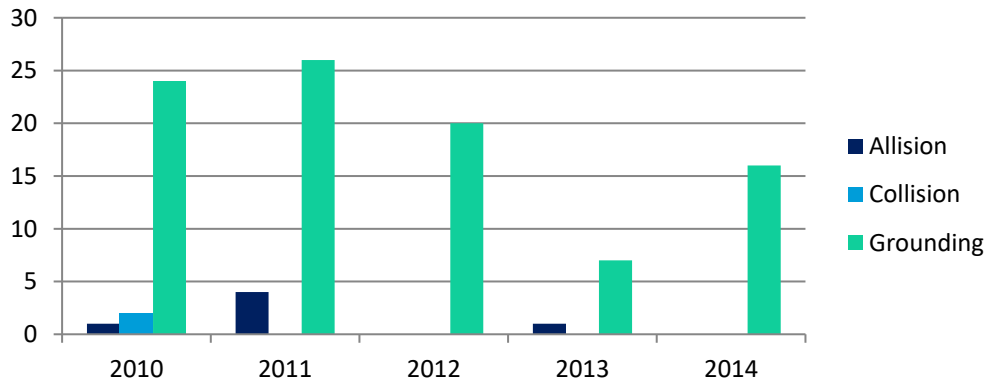
Figure 7.20: Waterway freight-related injuries, 2010-2014



Source: U.S. Coast Guard

There were a total of 101 freight-related allisions, collisions, and groundings on the Mississippi (99) and Missouri (two) rivers along Iowa's borders from 2010 to 2014 according to U.S. Coast Guard records. An allision is an event where a breakaway barge or navigating vessel makes contact with a stationary object (e.g., bridge, pier, dock, buoy, or moored vessel). A collision is an event where two objects underway or navigating vessels make contact. A grounding is an unintentional contact with the shore or bottom of the river, including unknown submerged objects. Figure 7.21 shows a breakdown of the 101 allisions, collisions, and groundings on the Mississippi and Missouri rivers from 2010 to 2014.

Figure 7.21: Waterway freight-related allisions, collisions, and groundings, 2010-2014



Source: U.S. Coast Guard

Bottlenecks

Given the condition, size, and average delay of the 11 locks bordering Iowa, all are considered freight bottlenecks. It is clear that a lack of repairs, maintenance, and modernization will continue to have a negative impact and the deterioration of the infrastructure will go on. Failure or closure of a lock could be catastrophic for the region. Commodities would still need to be transported, inadvertently leading to the long-term transport of goods shifting to highways and railroads. Deterioration of road and rail infrastructure would occur at an increased rate. Additionally, it would cause increased costs to shippers, resulting in decreased cost advantages to Midwestern producers and missed economic opportunities available through the expansion of the Panama Canal.

Seven swing-span bridges over the Mississippi River in Iowa are also considered bottlenecks. These bridges must "swing" open to allow for barge traffic to pass on the river before returning to the original placement for trains and vehicle traffic to cross. Although rail and highway traffic may not create an obstruction to marine traffic, delays can still occur due to rail operations.

Given the condition, size, and average delay of the 11 locks bordering Iowa, all are considered freight bottlenecks.

These bottlenecks were presented to the FAC and sent to the Iowa DOT's districts, MPOs, and RPAs for input. One additional bottleneck, the Iowa 9 bridge in Lansing, was added to the inventory list. Figure 7.22 and Table 7.7 show Iowa's waterway freight bottlenecks.

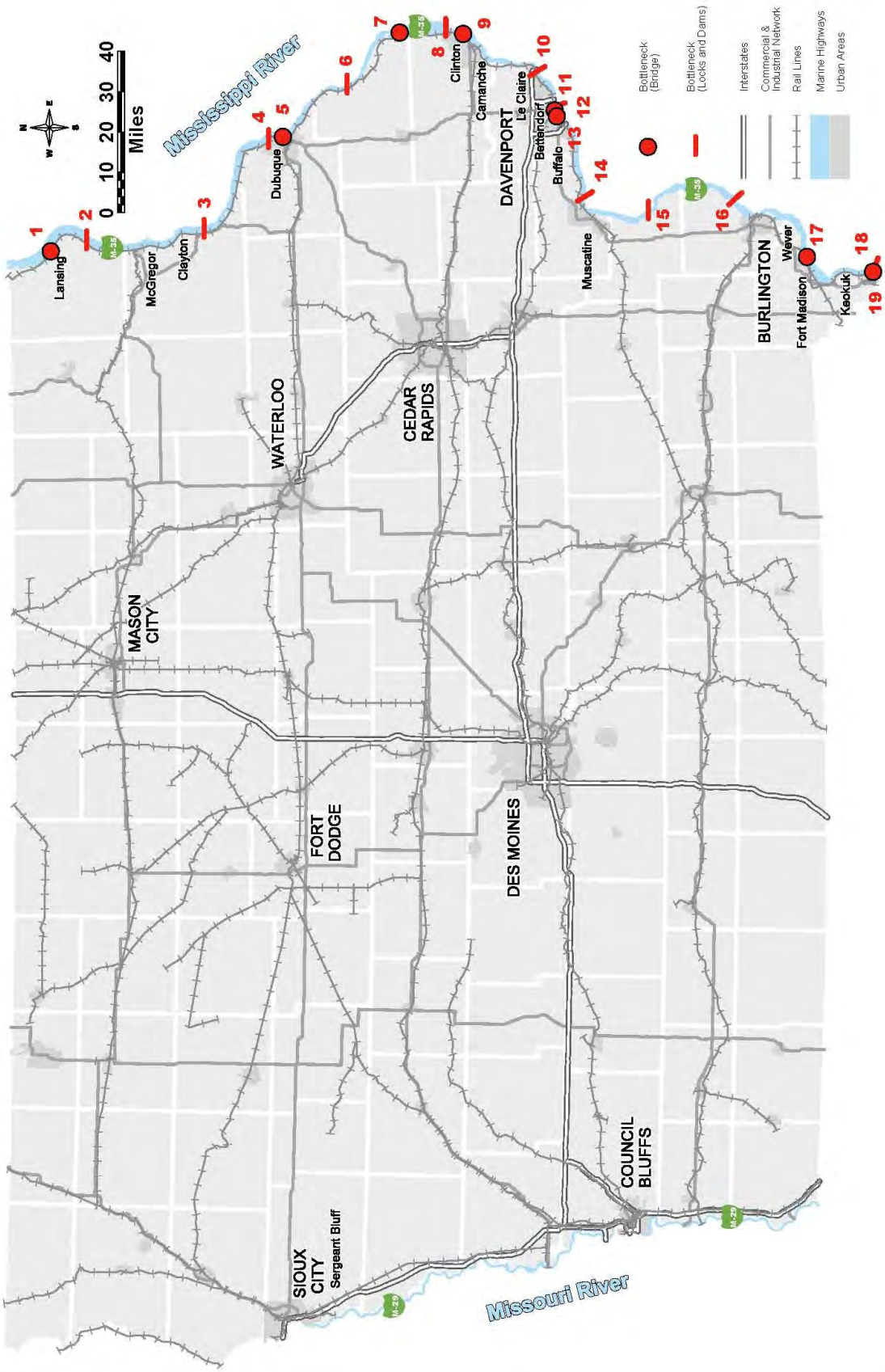


Figure 7.22: Waterway freight bottlenecks

Source: U.S. Army Corps of Engineers, Freight Advisory Council

Table 7.7: Waterway freight bottlenecks

ID	Description	Location	Freight mobility issue
1	Iowa 9 bridge	Lansing, Iowa	Curve of the river, dolphin protectors, and bridge piers cause barge delays.
2	Lock and Dam 9	Harpers Ferry, Iowa	Age (1938), chamber size (600 ft.), delay (0.5 hour), annual closures (10.1)
3	Lock and Dam 10	Guttenberg, Iowa	Age (1936), chamber size (600 ft.), delay (0.4 hour), annual closures (4.3)
4	Lock and Dam 11	Dubuque, Iowa	Age (1937), chamber size (600 ft.), delay (1 hour), annual closures (49)
5	Dubuque rail bridge	Dubuque, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic.
6	Lock and Dam 12	Bellevue, Iowa	Age (1939), chamber size (600 ft.), delay (1.1 hours), annual closures (93.7)
7	Sabula rail bridge	Sabula, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic
8	Lock and Dam 13	Clinton, Iowa	Age (1938), chamber size (600 ft.), delay (1.1 hours), annual closures (8.5)
9	UP rail bridge*	Clinton, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic.
10	Lock and Dam 14	Le Claire, Iowa	Age (1922), chamber size (600 ft.), delay (1.2 hours), annual closures (28.3)
11	Government Bridge*	Davenport, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic.
12	Lock and Dam 15	Rock Island, Illinois	Age (1934), chamber size (600 ft.), delay (1.3 hours), annual closures (98.7)
13	Crescent Bridge	Davenport, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic.
14	Lock and Dam 16	Muscatine, Iowa	Age (1937), chamber size (600 ft.), delay (0.9 hour), annual closures (30.4)
15	Lock and Dam 17	New Boston, Illinois	Age (1939), chamber size (600 ft.), delay (1.3 hours), annual closures (36)
16	Lock and Dam 18	Gladstone, Illinois	Age (1937), chamber size (600 ft.), delay (1.3 hours), annual closures (43.6)
17	BNSF rail bridge*	Fort Madison, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic
18	Lock and Dam 19	Keokuk, Iowa	Age (1957), delay (0.9 hours), annual closures (49.7)
19	Keokuk rail bridge*	Keokuk, Iowa	Swing-span rail bridge must be opened to accommodate barge traffic.

*This location is also listed as a railroad bottleneck.

Source: U.S. Army Corps of Engineers, Freight Advisory Council

Operational and regulatory conditions

Physical conditions and locations are not the only hindrances to efficient freight movement. The state of the economy or market can have a large effect, as can inefficient or unnecessary regulations. Table 7.8 lists the operational and regulatory bottlenecks that have been identified in the state of Iowa. This list was compiled after meeting with the FAC and RAC, reviewing issues identified by freight-related associations, and surveying MPOs, RPAs, and the Iowa DOT's district offices.

Table 7.8: Operational and regulatory freight bottlenecks

Freight mobility issue
Limited intermodal connections
Energy/Fuel costs and shortages
Labor shortage/quality
Container availability/imbalance
Vehicle weight limitations
Roadway geometry limiting oversize loads
Availability of real-time incident and weather information
Hours of service
Over-regulation/Lack of cross-jurisdictional reciprocity in regulation and permitting
Transportation funding
Truck parking availability
Addressing safety issues (e.g., trespassing on rail property, cars ignoring rail crossing barriers, etc.)
Intermodal conflicts (e.g., trains blocking businesses/truck freight movement)

Source: Freight Advisory Council, Rail Advisory Committee, metropolitan planning organizations, regional planning affiliations, Iowa Department of Transportation's districts

7.2 Performance measures

Without established national measures for freight conditions and performance, U.S. Department of Transportation recommends that states use the measures of condition and performance that they consider to be most reasonable and appropriate. USDOT also recommends that measures of conditions and performance reflect the state's freight transportation goals – for each goal, there would be at least one measure of condition or performance that indicates how well the freight transportation system is doing in achieving that goal.

The two primary sources for the performance measures identified in this section are the state transportation plan, Iowa in Motion – Planning Ahead 2040, and a set of conceptual measures (italicized) in Table 7.9. Note that specific information regarding the measures contained in the state transportation plan is available online at: www.iowadot.gov/iowainmotion/files/IowaInMotion_final.pdf.

Also note that benchmarks were not included for the conceptual measures as not all of the necessary data is currently available. All measures have been categorized by mode and are listed showing alignment with the national freight goals in Table 7.9. As recommended in the Fixing America's Surface Transportation Act, the Iowa DOT will pursue and align with the national freight goals in a manner that is not burdensome to state and local governments.

Table 7.9: Freight performance measures' alignment with national freight goals

		Improvements, policies, operational innovations	Safety, security, efficiency, resiliency	State of good repair	Innovation and advanced technology	Economic efficiency and productivity	Reliability	Short- and long-distance movement	Flexibility of states	Environmental impacts
Air	Percentage of airports that meet all facility targets for their role	x	x	x	x	x	x	x		x
	Percentage of airports that meet 75 percent of service targets for their role	x			x	x	x	x		x
	Percentage of airports with clear runway approaches	x	x		x	x	x	x		x
	Percentage of airports with a Pavement Condition Index of 70 or above on paved runways	x	x	x	x	x	x	x		
	Multifactor/labor productivity index	x			x	x	x	x	x	
Highway	Percentage of highway miles that meet or exceed a sufficiency rating of tolerable or above	x	x	x		x	x	x		
	Percentage of bridges on the Primary Highway System that are structurally deficient or functionally obsolete	x	x	x		x	x	x		
	Percentage of the Primary Highway System below pavement condition index (PCI) cutoff across all planning classes	x	x	x		x	x	x		
	Highway fuel use per vehicle-mile	x	x		x	x	x	x		x
	Percentage of Interstate Highway System operating at level of service 'C' or better	x	x	x		x	x	x		
	Overall crash rate	x	x				x			x
	Number of fatalities	x	x							x
	Overall annual percentage of all districts' A and B highway miles returned to a reasonable, near-normal surface condition within 24 hours after the end of a winter storm	x	x	x	x	x	x	x		x

		Improvements, policies, operational innovations	Safety, security, efficiency, resiliency	State of good repair	Innovation and advanced technology	Economic efficiency and productivity	Reliability	Short- and long-distance movement	Flexibility of states	Environmental impacts
	Average International Roughness Index (IRI) rating weighted by length on the Primary Highway System	X	X	X	X	X	X	X		
	Real cost per vehicle mile	X			X	X	X	X		
	BLS labor productivity index	X			X	X	X	X	X	
	Producer price index	X			X	X	X	X	X	
	Travel times along 25 "freight significant corridors"	X	X		X	X	X	X	X	X
Pipeline	Propane storage levels		X		X		X		X	X
	Delay at pipeline/truck terminals	X	X		X	X	X	X	X	X
Rail	Rail ton-miles per gallon of fuel	X	X		X	X	X	X		X
	Percentage of track-miles able to operate at 40 mph or higher	X	X	X	X	X	X	X		
	Percentage of track-miles able to handle 286,000-pound cars	X	X	X	X	X	X	X		X
	Total crashes at railroad-highway crossings		X				X			X
	Derailments per million ton-miles		X	X			X			
	Real cost per ton-mile	X	X		X	X	X	X		
	Multifactor/labor productivity index	X			X	X	X	X	X	
	Producer price index	X			X	X	X	X	X	
	Terminal dwell time	X	X			X		X		X
	Average speed	X	X	X	X	X	X	X		
	Rail defects per mile	X	X	X		X	X	X		

		Improvements, policies, operational innovations	Safety, security, efficiency, resiliency	State of good repair	Innovation and advanced technology	Economic efficiency and productivity	Reliability	Short- and long-distance movement	Flexibility of states	Environmental impacts
Water	Delays at locks	X	X	X	X	X	X	X	X	X
	Unscheduled lock closures	X	X	X	X	X	X	X	X	X
	Lock availability	X	X	X	X	X	X	X	X	X
	Producer price index	X			X	X	X	X	X	

Source: Iowa Department of Transportation

These performance measures will be used to assess how the freight transportation system is currently performing and whether or not it is meeting the initiatives of the national freight goals. Reviewing performance of the network is an important piece of implementation. As the gap between transportation maintenance needs and available funding continues to grow, it is increasingly important to spend resources in the most strategic and efficient way possible. These measures will be revisited and reevaluated in each future update cycle of the State Freight Plan.

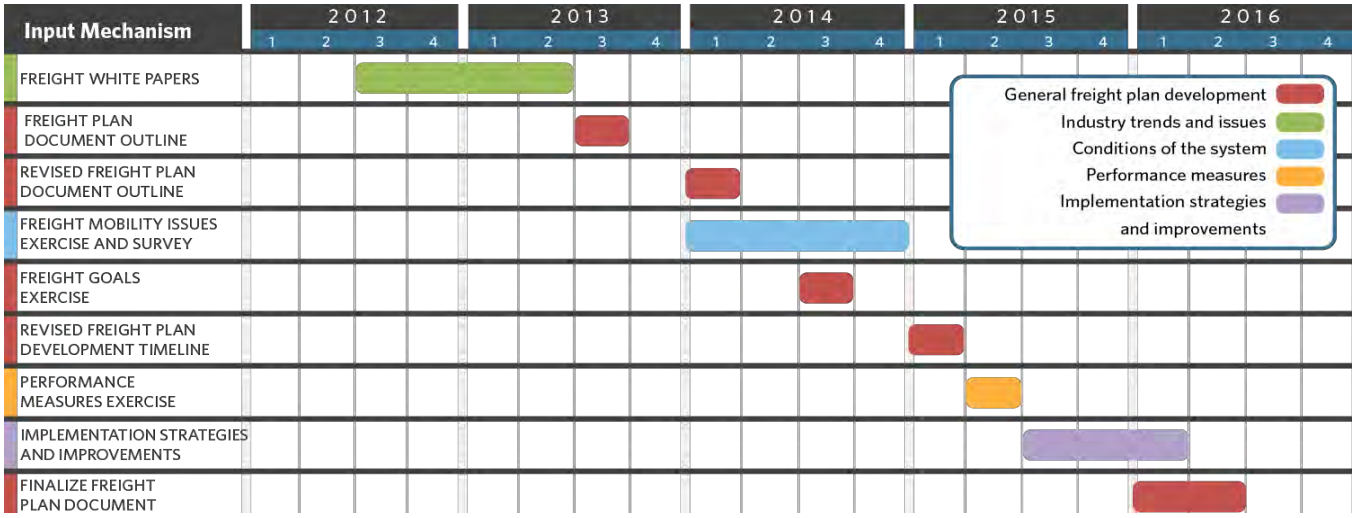
8. Iowa's decision-making process

Multiple factors and resources come into play when executing initiatives and making decisions regarding how to prioritize freight improvements in Iowa. Outreach, coordination, analysis, and various programs are all employed to identify solutions, strategies, and improvements considered essential for the continued efficient movement of freight in and through the state.

8.1 Stakeholder and public engagement

Utilizing input from freight stakeholders and the general public is crucial for the development of strong plans and implementation of successful strategies. The Iowa Department of Transportation engaged a number of public and private sector stakeholders, such as the Freight Advisory Council (FAC), in various ways throughout the process to gather input on plan development. This included face-to-face meetings and exercises, email correspondence, and online surveys. Figure 8.1 shows a timeline of major input gathering efforts preceding and throughout plan development. These efforts, along with the stakeholders that were engaged, will be summarized in the ensuing subsections. All input gathered for the State Freight Plan is available online at: www.iowadot.gov/iowainmotion/freight.html.

Figure 8.1: Stakeholder and public engagement



Source: Iowa Department of Transportation, HDR

Updates to the State Freight Plan for FAST Act-compliancy were completed in late 2016 and early 2017 following the release of Guidance on State Freight Plans and State Freight Advisory Committees by USDOT on October 14, 2016.

FAC

As introduced in Chapter 2, Strategic goals, the Iowa DOT has worked to engage freight stakeholders through the FAC. This group was created as a forum for the exchange of ideas to help the Iowa DOT better understand the complexities associated with freight movements in order to more effectively guide public investment in the freight transportation system. The FAC assists the Iowa DOT in addressing a wide array of freight movement issues important to Iowans and serves as a discussion and advisory forum to:

- Advise Iowa DOT staff involved in freight mobility activities.
- Identify obstacles, challenges, and inefficiencies in the current freight transportation system.
- Proactively identify emerging trends that may impact freight mobility.
- Assist in the development of the Iowa DOT's State Freight Plan, including providing stakeholder input, reviewing draft content, and offering suggestions for improvement.
- Review and comment on modal plans and the state long-range transportation plan as they relate to freight mobility.
- Review and comment on proposals for freight policies, programs, and investments.
- Consult with interested constituents as appropriate.
- Suggest potential planning initiatives or research topics.
- Advocate for freight mobility issues.

This group was created as a forum for the exchange of ideas to help the Iowa DOT better understand the complexities associated with freight movements in order to more effectively guide public investment in the freight transportation system.

The FAC includes representatives from the rail, trucking, barge, distribution, energy, and agribusiness industries, as well as regional development groups, metropolitan planning organizations (MPOs), regional planning associations (RPAs), and a variety of state and federal agencies. All of these individuals provide input on the specific topics and/or issues addressed. The group meets on a quarterly basis to discuss topics to improve Iowa's freight transportation system. Agendas are cooperatively developed by the chair of the FAC and Iowa DOT staff. The chair and vice chair, which are nominated by the FAC members, lead the discussions at each meeting.

The FAC was engaged to provide input on the freight white paper development (that ultimately led to the freight issues and solutions lists), the freight plan document outline, the Freight Mobility Issues Survey, freight goals, freight performance measures, freight strategies, and freight improvements (refer back to Figure 8.1).

Rail Advisory Committee (RAC)

The mission of the RAC is to guide the Iowa DOT in fostering a safe and efficient rail transportation system. Through education, discussion, and sharing of concerns and opportunities, the RAC assists and advises the Iowa DOT on rail policies, programs, and investments. Responsibilities may include but are not limited to:

- Serve as an advisory body to Iowa DOT staff involved in rail activities.
- Identify obstacles and challenges in the current rail transportation system.
- Proactively identify emerging trends that may impact the rail transportation system.
- Assist in the development of Iowa DOT's State Rail Plan, including providing stakeholder input, reviewing draft content, and offering suggestions for improvement.
- Review and comment on proposals for rail policies, programs, and investments.
- Advocate for Iowa's rail transportation system.
- Advise on legislative issues that may impact rail transportation.

The group, which includes representatives from each of the railroads operating in Iowa, meets a minimum of twice per year or as issues require. The Iowa DOT also communicates and consults with the RAC, as needed, outside of regular biannual meetings. In addition to providing the RAC with regular status updates on plan development, the group was engaged to provide input as part of the Freight Mobility Issues Survey (refer back to Figure 8.1).

State Freight and Rail Plan Survey

With the assistance of a consultant team and Iowa State University's CyBizLab, a survey was conducted to better understand freight transportation in the state. Topic areas included demographics, economic and workforce development, multimodal networks, multimodal links, and safety and security.

A total of 272 people responded to the survey. Overall, respondents are concerned with the infrastructure for all modes in Iowa and want more funding to rebuild highways, create new rail connections, and provide easier access to transloading facilities.

Issues-Based Workshop

The Iowa DOT hosted a one-day workshop to engage a wide range of stakeholders in the development of the state freight and rail plans. The workshop was held on Sept. 24, 2015, in Des Moines, Iowa, and consisted of three interactive exercises that focused on consolidating the stakeholder issues, concerns, and goals tied to freight and rail planning for the Iowa DOT.

A presentation was given to participants that included the State Freight Plan goals and objectives, as well as context on what freight means in terms of intermodal connections. The presentation detailed current stakeholder input gathering and the plan strategies. Participants were then introduced to the Federal Highway Administration's guidance that was followed during development of the freight improvement strategies. Lastly, an overview was provided on the different freight improvements that were being developed for each mode: air, highway, railroad, and waterway.

The presentation was followed by a visioning session intended to validate the current State Freight Plan goals and identify what additional goals should be considered as part of the plan. Participants voted on the level of impact each goal would have on optimizing freight operations in the state of Iowa. After each voting opportunity, participants offered input on their responses. The voting results helped validate and refine the goals for the State Freight Plan.

High Leverage Stakeholder Committee (HLSC)

The HLSC was developed to gather input for the state freight and rail plans from freight infrastructure owners, freight industry stakeholders, shippers, public planning agencies, freight organizations, and others.

Meeting #1

The first meeting of the HLSC was held Nov. 18, 2015, in Ankeny, Iowa. The primary purpose of this meeting for the State Freight Plan was to engage stakeholders on the freight strategies developed for Chapter 9, Freight improvement strategy. These strategies were first introduced to participants followed by a discussion. Although the participants did not have strategies to add, general feedback on current draft strategies was provided.

After introducing each of the strategies, the discussion transitioned into a voting exercise where participants identified the level of impact and effort it would take to implement each strategy.

Meeting #2

The second meeting of the HLSC was held Feb. 26, 2016, in Ankeny, Iowa. The primary purpose of this meeting for the State Freight Plan was to engage stakeholders and gather feedback on modal freight improvement lists developed for Chapter 9, Freight improvement strategy, through two interactive exercises.

The first exercise consisted of an overview of the air and waterway improvement lists. This included identification methodology and the specific improvements. Participants were then asked to identify any fatal flaws in the methodology and make any necessary additions to the list. No flaws were identified, but recommendations for additions were recorded.

The second exercise consisted of an overview of the prioritized highway improvement list that utilized multiple tools as part of an evaluation matrix. The overview included the methodology and review of multiple handouts provided to the participants. After reviewing, participants were asked to view eight different maps showing highway improvement locations in regions of the state. Participants were then asked to identify any fatal flaws in the methodology and make any necessary additions. No flaws were identified, but recommendations for additions were recorded.

Public participation

The state's public participation process offers Iowans the opportunity to help identify transportation issues, needs, and priorities; plan how to meet those needs and priorities; and select transportation projects that turn the plans into reality. This means:

- Information and opportunities for public involvement will be provided continuously throughout the planning and programming process.
- Information will be widely distributed.
- Comments will be sought and encouraged from the public, including transportation disadvantaged individuals and groups.
- Public comments, suggestions, and concerns will be listened to and considered when transportation decisions are made.

The Iowa DOT engages the public by carrying out the participation process outlined in the State Public Participation Process for Transportation Planning. More information is available online at: www.iowadot.gov/program_management/StatePublicParticipationProcess.pdf. This identifies requirements for public participation, including:

> *The state shall provide for public comment on existing and proposed processes for public involvement. At a minimum, the state shall allow 45 calendar days for public review and written comment before processes are adopted and any major revisions to existing processes are adopted.*
>
> *Iowa's current public participation process requires that the public be notified of proposed amendments and be afforded the opportunity to comment on these proposals. After all comments concerning this proposal have been addressed, Iowa DOT staff will consider all comments and make changes accordingly. Comments concerning the process should be submitted to the Iowa DOT's Office of Program Management.*

Iowa DOT provided the required 45-day public comment period from May 2, 2016 to June 15, 2016. A public input meeting was held on June 8, 2016 in Des Moines, where display boards, handouts, and copies of the draft document were available for attendees to review and comment on. DOT staff was available to discuss the State Freight Plan, including information on goals, objectives, findings, and strategies, and answer any questions.

8.2 Decision-making tools

The following tools were used in the identification and prioritization of future freight improvements in Iowa, and are evidence of consideration of operational strategies and innovative technologies that improve the safety and efficiency of freight movement.

Freight Mobility Issues Identification

As required by Moving Ahead for Progress in the 21st Century Act (MAP-21), locations with freight mobility issues, or bottlenecks, were identified for each of the freight transportation modes. This process included analysis and extensive input from public and private stakeholders throughout the state who are familiar with the networks and operations of freight movement. Below is a summary of the identification process for each mode. More in-depth explanations and results are available in Chapter 7, Conditions and performance of the freight transportation system.

- **Air:** The Iowa DOT's Office of Aviation was contacted, along with the two largest air cargo airports in the state, to determine locations. After consulting these sources, it was determined that major air freight mobility issues do not currently exist in the state. There is currently excess capacity.
- **Highway:** INRIX traffic data was analyzed to identify bottleneck locations in the state and the number of occurrences for each during a one-year period. These locations were reviewed and additions were made by the FAC, MPOs, RPAs, and the Iowa DOT's districts on multiple occasions through exercises and the Freight Mobility Issues Survey.
- **Pipeline:** Locations with freight mobility issues were not identified for pipelines.
- **Railroad:** Surveys and exercises to identify locations were carried out on multiple occasions with the railroads operating in Iowa. Surveys were then sent to the MPOs, RPAs, and the Iowa DOT's districts for additions through the Freight Mobility Issues Survey.
- **Waterway:** Data from the U.S. Army Corps of Engineers was gathered and reviewed. Due to age, delay, and unavailability, each lock along Iowa's border was identified. All swing-span bridges, which cause delays for barges and trains, were also identified as locations with freight mobility issues.

Infrastructure Condition Evaluation (ICE)

To aid in the evaluation of the state's highway system, the Iowa DOT developed ICE to measure the current condition of roadway segments using a single composite rating calculated from seven different criteria: Pavement Condition Index, International Roughness Index, passenger annual average daily traffic (AADT), single-unit truck AADT, combination truck AADT, congestion index, and structure inventory and appraisal sufficiency rating. The process evaluates the entire system, independent of current financial constraints, using this select group of criteria weighted in terms of their relative significance. The resulting segments then represent those areas that should be considered for further study (e.g., environmental, design, engineering), with the possibility of being considered for future programming by the Iowa Transportation Commission.

ICE was originally developed for the Iowa Interstate Corridor Plan, a document that used the tool to provide an initial screening and prioritization of interstate corridors. The plan concluded with the identification of several priority interstate corridors, which are identified in *Appendix 4*. The second iteration of ICE was an expansion to include the full Primary Highway System while addressing an identical set of goals and objectives. The latter was used in development of this plan for information and analysis related to conditions in Chapter 7, Conditions and performance of the freight transportation system, and prioritization of highway improvements in Chapter 9, Freight improvement strategy.

Freight Network Optimization Strategy

The goal of this project is to effectively identify and prioritize investment opportunities for an optimized public and private freight network to lower transportation costs for Iowa's businesses and to promote business growth in Iowa. In order to achieve the project goal, a demand-based supply chain network design and optimization approach is used to create short- and long-term freight strategies for the state of Iowa.

With the completion of this project, Iowa will have an optimization strategy in place that will assist in improving the effectiveness and performance of the multimodal freight transportation network. It is expected that, over time, the optimization strategy will lower or stabilize transportation costs for Iowa businesses, make Iowa's transportation system a valuable and efficient asset in economic development, and enhance freight mobility. This project produced freight strategies 19 through 27 found in Chapter 9, Freight improvement strategy.

It is expected that, over time, the optimization strategy will lower or stabilize transportation costs for Iowa businesses, make Iowa's transportation system a valuable and efficient asset in economic development, and enhance freight mobility.

Iowa Travel Analysis Model (iTRAM)

iTRAM is a statewide travel demand model used in the evaluation of Iowa's transportation system. The first generation was completed in 2009 and has since been an essential tool for many traffic forecasts, planning studies, and research scenarios. The focus of this model version was to accurately predict the number of automobiles and trucks on the current primary road network, and then project traffic into the future. The second generation of the iTRAM builds upon the original statewide model architecture and incorporates two additional model components: passenger and freight movement on the rail system.

The enhancement includes a statewide rail freight model and a commodity freight flow model. This allows for the forecasting of future freight rail demand in the region. The tool also assesses the impacts of intermodal terminals, including truck/rail, truck, barge, and rail/barge facilities. This helps to establish Iowa's intermodal freight patterns, which in turn assists in the identification and prioritization of future freight projects.

iTRAM makes use of a variety of data sources including FHWA's Freight Analysis Framework data, which is based on the Commodity Flow Survey and estimates commodity movements nationally and illustrates the interactions with the state of Iowa. Also included is rail shipment information from the Iowa portion of the carload waybill sample to understand where goods are distributed around the state by rail. The freight commodity model component can help to answer many "what if" questions. This state-of-the-art new generation iTRAM model allows for many new scenarios to be tested to support freight planning efforts across Iowa. This application was used to help prioritize highway improvements in Chapter 9, Freight improvement strategy.

8.3 Coordination with states, freight-related groups, and institutions

Coordinating freight planning activities with surrounding states provides benefits and opportunities that include identifying and prioritizing investment opportunities, sharing design standards, and harmonizing regulations on specific corridors. It also assists in the sharing of resources and minimizing the duplication of efforts by multiple agencies. This section provides an overview of the events, regional planning groups, and institutions with which the Iowa DOT is actively involved.

Events

Midwest States webinar

Representatives from the states of Illinois, Kansas, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin were invited to join the Iowa DOT in a webinar on Feb. 24, 2016, to discuss freight and rail planning activities in the region. Topics covered included: freight plans, rail plans, freight data, current initiatives, etc., and the Iowa DOT also requested feedback on the Multimodal Freight Network identified in Chapter 6, Freight transportation assets, related to the identification methodology and locations of border crossings. No issues were identified by the other states related to the Multimodal Freight Network.

Moving Iowa Forward conference

The Moving Iowa Forward conference is typically held biennially in Iowa. It is a joint conference hosted by the Iowa DOT and Iowa Economic Development Authority (IEDA) to bring public and private stakeholders together to discuss and collaborate on freight and economic development for the state. It also helps attendees understand how transportation and economic development work together to make Iowa a better place to do business.

Regional groups

Mid America Association of State Transportation Officials (MAASTO)

MAASTO is one of four geographical regions of the American Association of State Highway Transportation Officials (AASHTO), which is an association representing highway and transportation departments in the 50 states. MAASTO consists of 10 states primarily in the Midwest, including Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The goal of MAASTO is to foster the development, operation, and maintenance of an integrated and balanced transportation system that adequately serves the transportation needs of the 10 member states. The Iowa DOT is represented at all

MAASTO meetings and works with these states on common freight and transportation issues in the region. Iowa DOT Director Paul Trombino served as MAASTO president from 2013-2014. More information is available online at: www.maasto.net/.

Mid-America Freight Coalition (MAFC)

The MAFC is a regional organization that cooperates in the planning, operation, preservation, and improvement of transportation infrastructure in the Mississippi Valley region. The states involved include Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. These states meet regularly via conference calls and webinars to collaborate on freight trends and initiatives, as well as an annual in-person meeting. This group was presented with the methodology used to prioritize highway investments in Chapter 9, Freight improvement strategy, and provided feedback to the Iowa DOT. More information is available online at: midamericafreight.org/.

Upper Mississippi River Basin Association (UMRBA)

A regional interstate organization formed by the governors of Illinois, Iowa, Minnesota, Missouri, and Wisconsin to coordinate the states' river-related programs and policies and work with federal agencies that have river responsibilities. UMRBA is involved with programs related to commercial navigation, ecosystem restoration, water quality, aquatic nuisance species, hazardous spills, flood risk management, water supply, and other water resource issues. More information is available online at: www.umrba.org/.

The UMRBA Navigation Group, consisting of the Illinois, Iowa, Minnesota, Missouri and Wisconsin transportation departments, has primary responsibility for implementing activities under the M-35 Marine Highway Corridor. As such, they provide the primary leadership and decision-making related to M-35 implementation and engage directly with stakeholders who have an interest in Upper Mississippi River commercial navigation. This group also works with a policy group consisting of other state departments and an advisory committee made up of other nonstate government public and private stakeholders. More information on the Navigation Group and work with the M-35 is available online at: www.umrba.org/commercialnavigation.htm.

State Interagency Missouri River Authority (SIMRA)

SIMRA was established by Iowa Code 28L to promote policy regarding the state's many uses and interests along the Missouri River Corridor. SIMRA is composed of a representative from the Governor's Office and each of the following Iowa agencies: Department of Agriculture and Land Stewardship, IEDA, Department of Natural Resources, Iowa DOT, and the Iowa Utilities Board. The SIMRA is chaired by the governor or, in the governor's absence, the Iowa DNR representative. The Iowa DNR representative serves as the coordinator of the SIMRA's activities.

Southeast Iowa Regional and Economic Port Authority (SIREPA)

SIREPA exists to create new economic development opportunities in Lee County and Southeast Iowa and seeks to encourage growth by removing obstacles to capital investment and lowering fixed costs for private companies in the region. As the only port authority in the state of Iowa, SIREPA has unique capabilities to foster and support economic growth in Lee County. State legislation enables SIREPA to establish and operate foreign trade zones, issue bonds, make loans, and more. SIREPA's tax-exempt status provides additional opportunities for public and private collaboration.

North American Strategy for Competitiveness (NASCO)

The goal of NASCO is to increase economic development activity while supporting multimodal infrastructure improvements, technology/security innovations, and environmental initiatives along the NASCO Corridor. This includes cities, counties, states, provinces, and private sector representatives along the corridor in Canada, Mexico, and the United States. The corridor also shadows U.S. interstates 29, 35, and 94, and the connecting transportation system in Canada and Mexico critical to national and international trade. More information is available online at: nasconetwork.com/.

Intelligent Transportation Systems (ITS) Heartland Corridor Coalition

The ITS Heartland Chapter of ITS America is intended to facilitate information sharing for ITS projects and activities and to showcase ITS applications in five heartland states: Missouri, Iowa, Kansas, Nebraska, and Oklahoma. To date, all five state transportation departments, along with major universities in each state and the FHWA, have been involved in developing the organization. More information is available online at: www.itsheartland.org/.

Great Lakes Regional Transportation Operations Coalition (GLRTOC)

GLRTOC collaborates on initiatives that improve cross-regional transportation operations in support of regional economic competitiveness and improved quality of life. The GLRTOC study area includes Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, Wisconsin, and Ontario, Canada. The group is working to align the GLRTOC region with that of the MAFC. More information is available online at: www.glrtoc.org/.

Iowa Motor Truck Association (IMTA)

The IMTA was formed in 1942 after a group of motor carriers felt the trucking industry needed a voice at the Iowa Capitol. The association is the recognized voice of trucking in Iowa and currently has more than 700 member companies while continuing to strengthen its foundation by enrolling additional members. The IMTA is comprised of several different divisions that represent specific segments of the trucking industry.

Iowa Regional and Shortline Railroad Association Inc.

The Iowa Regional and Shortline Railroad Association Inc. is an advocacy group made up of Iowa-based railroads. These companies represent the interests of shortline freight railroads operating in the state and come together as needed to enhance and streamline outreach, advocacy, and lobbying efforts.

Institutions

A number of freight-related institutions are present and active throughout Iowa. The following associations and educational institutions focus on freight interests in the state and coordinate with the Iowa DOT on various efforts. This list is not exhaustive of all freight-related institutions in the state.

Institute for Transportation (InTrans)

InTrans is a branch of Iowa State University that performs transportation research for public and private agencies and companies; manages its own education program for transportation students; and conducts local, regional, and national transportation services and continuing education programs. Their mission is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, and reliability while improving the learning environment of students, faculty, and staff in transportation-related fields. More information is available online at: www.intrans.iastate.edu/.

National Center for Freight & Infrastructure Research & Education (CFIRE)

CFIRE is a Tier 1 University Transportation Center funded by the U.S. Department of Transportation Research and Innovative Technology Administration with the theme being "Making Multimodal Freight Systems Work for Economic Recovery and Quality of Life." The CFIRE consortium is structured as a unique collaborative framework with northern and southern hubs that work collaboratively. More information is available online at: www.wistrans.org/cfire/.

Midwest Transportation Center (MTC)

The MTC is one of 10 regional university transportation centers sponsored by RITA of the USDOT. The MTC is a consortium of six universities: Iowa State University, Creighton University, Harris-Stowe State University, University of Missouri-Columbia, University of Missouri-St. Louis, and Wichita State University. The research area for the MTC is "State of Good Repair," a program focusing on data-driven performance measurement of transportation infrastructure, traffic safety, and project construction. More information is available online at: www.intrans.iastate.edu/mtc/.

University and community college programs

There are a number of educational programs dealing with freight interests present at higher education institutions in the state. The supply chain management program in the College of Business at Iowa State University teaches students the integration of business processes in logistics and operations across organizations, from material sources and suppliers through manufacturing and processing to the final customer. The program integrates topics that include demand planning, purchasing, inventory control, material handling, product and service support, information technology, and strategic supply chain management. Other freight-related programs offered include transportation and transportation engineering.

The transportation infrastructure engineering programs at The University of Iowa are designed to develop specialized knowledge and skills that can be applied to the diverse set of issues associated with transportation infrastructure systems. Areas of study include traffic simulation, infrastructure management systems, pavement engineering, advanced construction materials, dynamic load and pavement simulation, intelligent sensors, nondestructive testing, optimal design, and winter highway maintenance. The logistics and transportation management program at Iowa Central Community College teaches the efficient and effective flow of materials through the supply chain system. The program integrates the topics of purchasing, material management, inventory management, operations, packaging, warehousing, transportation, and customer service.

8.4 Funding mechanisms

The majority of highway projects in Iowa are paid for using the Road Use Tax Fund (RUTF). However, the State of Iowa also has a number of different grant and loan programs that aid freight-related projects. Each has specific eligibility requirements, but all support projects intending to improve the movement of goods. This section provides a brief overview of these funding programs. Federal funding programs not specific to Iowa are not included. For a more detailed guide on the grant and loan programs, see the *Guide to Transportation Funding Programs* on the Iowa DOT's website at: www.iowadot.gov/pol_leg_services/Funding-Guide.pdf.

Linking Iowa's Freight Transportation System (LIFTS) program

The LIFTS program was created in fall 2015 as a one-time, flexible funding source of $2.6 million for freight-related projects. This was used for an initial round of project solicitation and awards that helped demonstrate the demand and value of a freight funding program. Types of projects that qualified for this program included new transload facilities, increasing capacity at barge terminals, replacing rail infrastructure, rehabbing old transportation infrastructure, etc. There were 25 total applications as part of this program with six being awarded grant funding. Of the six awarded, one was a study, one was a capacity improvement, and four were transload projects. All six were multimodal with two involving highway, railroad, and waterways.

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Section 167 of the Fixing America's Surface Transportation (FAST) Act documents the National Highway Freight Program (NHFP), The NHFP created a formula program funded at $1.15 billion to $1.5 billion per year to be used for freight-related projects across the country. Each state receives funds in proportion to the amount of funds a state receives compared to other states under all formula-apportioned programs. Each fiscal year, a state may obligate no more than 10 percent of the total apportionment to the state for freight intermodal or freight rail projects.

The Iowa DOT and Iowa Transportation Commission have chosen to allocate these flexible funds through a competitive grant program and updated version of the original LIFTS pilot program. The updated version of LIFTS allows stakeholders outside of the Iowa DOT to apply for the flexible funding for use on freight projects. Project evaluation criteria will be designated and communicated prior to the initial application cycle and Iowa DOT staff, with support from external freight stakeholders, will review and prioritize applications on an annual basis. Following each funding cycle, the freight investment plan

will be amended to incorporate the awarded projects. Iowa's freight investment plan is covered in Chapter 9, Freight improvement strategy.

Recent Iowa DOT budget proposals to the Legislature have included a permanent Freight Transportation Fund program. A sustainable program has not yet been funded, but the department views this as a priority for the future investment in the freight transportation system. If funded, it would help meet emerging needs in freight, aid with economic development opportunities for high-tech job creation, and bring essential flexibility to renewed programs, allowing the Iowa DOT and local jurisdictions to deliver innovative solutions.

RUTF

Dedicated highway use revenue, collected through a state excise tax on fuels, is deposited into the RUTF. No state General Fund (i.e., general tax) revenue is used for highway projects in Iowa. Established in 1949 by the 53rd Iowa General Assembly, the RUTF has provided a stable and reliable source for investing in the state's primary, secondary, and municipal roadway systems. After some off-the-top diversions, receipts into the RUTF are distributed according to a formula of 47.5 percent for the primary road system, 24.5 percent for secondary county roads, 8 percent for farm-to-market county roads, and 20 percent for city streets. More information is available online at: www.iowadot.gov/about/HighwayFinance.html.

State Airport Improvement Program

This program provides funding for airport improvements, navigational aids, communications equipment, marketing, safety, security, outreach, education, and planning. Airport Development and Immediate Safety Enhancement are specific funding programs under the Airport Improvement Program. Publicly owned airports in Iowa are eligible for the funds. More information is available online at: www.iowadot.gov/aviation.

Revitalize Iowa's Sound Economy (RISE)

The RISE program was established to promote economic development in Iowa through construction or improvement of roads and streets. Iowa cities and counties are eligible for these funds, which may be in the form of a grant, loan, or a combination thereof. Projects must involve construction or improvement of a public roadway. More information is available online at: www.iowadot.gov/systems_planning/rise.htm.

Railroad Revolving Loan and Grant (RRLG) Program

RRLG is a state loan and grant program was established to build or improve rail infrastructure or facilities that will spur economic development and job growth and provide assistance to railroads for the preservation and improvement of the rail transportation system. Those eligible include businesses, industries, railroads, local governments, and economic development agencies. Justification for projects focuses on improving the rail network, job creation, wage quality, and project investment. More information is available at www.iowadot.gov/iowarail/assistance/rrlgp.htm.

Highway-Railroad Crossing Surface Repair Program

This program assists railroad companies and public road jurisdictions with rebuilding public highway-railroad grade crossing surfaces in Iowa. Those eligible include railroad companies and other private entities, such as grain elevators that own a railroad track, and public road jurisdictions. More information is available at www.iowarail.com.

Iowa Clean Air Attainment Program (ICAAP)

ICAAP funds highway/street, transit, bicycle/pedestrian, and freight projects, as well as programs that help maintain Iowa's clean air quality by reducing transportation-related emissions. Eligible highway/street projects must be on the federal-aid system, which includes all federal functional class routes except rural minor collectors. The state, a county, or a city may sponsor an application or may co-sponsor for private, nonprofit organizations or individuals. Eligible projects will fall into one of the following categories, those projects that:

- Reduce emissions via traffic flow improvements.
- Reduce vehicle-miles of travel.
- Reduce single-occupant vehicle trips.
- Other transportation improvement projects that improve air quality or reduce congestion.

More information is available at www.iowadot.gov/systems_planning/icaap.htm.

County and City Bridge Construction Fund

This program provides funding for construction or replacement of public roadway bridges. Iowa counties and cities are eligible. Candidate bridges must be classified as structurally deficient or functionally obsolete according to federal guidelines. More information is available at www.iowadot.gov/local_systems/publications/im/2020.pdf.

County-State Traffic Engineering Program (C-STEP)

The intent of C-STEP is to solve traffic operations and safety problems on primary roads outside incorporated cities. Any Iowa county is eligible for these funds. The two types of eligible projects are spot improvements and linear improvements.

Iowa Traffic Engineering Assistance Program (TEAP)

TEAP provides traffic engineering expertise to local units of government. The purpose is to identify effective traffic safety and operational improvements, as well as potential funding sources to implement the recommendations. Typical studies address high-crash locations, unique lane configurations, obsolete traffic control devices, school pedestrian traffic, truck routes, parking issues, etc. Iowa cities and counties are eligible applicants.

Traffic Safety Improvement Program

This program provides funding for traffic safety improvements or studies on any public road under county, city, or state jurisdiction. Eligible projects will fall into one of three categories: construction or improvement of traffic safety and operations at a specific site with accident history, purchase of materials for installation of new traffic control devices such as signs or signals; or transportation safety research, studies, or public information initiatives. More information is available at www.iowadot.gov/tsip.htm.

Urban-State Traffic Engineering Program (U-STEP)

The intent of U-STEP is to solve traffic operation and safety problems on primary roads in Iowa cities. Improvements must involve a municipal extension of a primary road. The two types of eligible projects are spot improvements and linear improvements.

9. Freight improvement strategy

Section 1118 of Moving Ahead for Progress in the 21st Century Act (MAP-21) specifies that a state freight plan must include a description of the strategies the state is employing or will employ to address freight mobility issues. This chapter presents Iowa's overall freight improvement strategy, which includes both specific strategies and improvements, and illustrates how each element of this strategy aligns with the strategic goals outlined in Chapter 2, Strategic goals.

9.1 Iowa's freight strategies

Chapter 4, Trends and issues, introduced 48 critical issues in seven categories that were identified through a series of facilitated discussions and exercises between the Iowa Department of Transportation and the Freight Advisory Council (FAC). These issues represent those that are considered to be the most urgent by the freight industry representatives of the FAC. The identification of these issues was then followed by a process of developing and prioritizing possible solutions for each. The complete list of issues and solutions can be found in *Appendix 2*.

Building from the FAC-identified solutions, the following specific strategies represent the primary elements of the Iowa DOT's overall freight improvement strategy going forward. Some of the activities associated with these strategies are already underway, while others will be initiated in the near future as new tools and technologies are implemented. Each element of the department's strategy aligns with both the priorities of the FAC and the national freight goals identified in MAP-21.

Also, per U.S. Department of Transportation's interim guidance on state freight plans, these strategies relate to capital investments, operational improvements, policy changes, and the expanded use of innovative technologies. The table following each strategy shows which of these four items applies. Those that apply are represented in a blue box and those that do not apply are represented in a gray box. The numbering of strategies is for identification only and does not show priority of any kind, while the number in parentheses indicates where that strategy ranked (among the initial 18 draft strategies) in terms of anticipated impact according to stakeholder input.

1. Maximize the advantages inherent to Iowa's geographic proximity (8th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Iowa serves as a crossroads for our country's surface transportation system, with transcontinental interstates 35 and 80 traversing the state and intersecting in the central capital of Des Moines. The country's busiest freight rail system also crosses Iowa's midsection. Iowa has eight commercial service airports along with 100 general aviation airports. Iowa is the only state in the country bordered by two navigable waterways in the Mississippi and Missouri rivers.

Iowa's geographic proximity offers many natural advantages over other areas of the country when it comes to the movement of freight. Optimizing the freight transportation network to maximize these advantages and lower transportation costs will be critical to promote business growth in Iowa. Public officials and representatives from the freight industry must continue to work cooperatively to explore this issue through forums such as the FAC.

2. Explore/create other funding sources to increase investment in the freight transportation system (7th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Iowa is fortunate to have a strong multimodal freight transportation network. However, tackling the challenge of maintaining and improving this system relies heavily on available funding. As described in section *4.2 Freight issues*, there is a shortfall between anticipated future costs and revenues of freight transportation in the state. Costs are increasing while much of Iowa's revenue stream for transportation construction, maintenance, and operations has remained relatively stagnant until recently. The situation has been improved by a 10 cent fuel tax increase in Iowa that went into effect March 1, 2015, providing additional funding for road and bridge projects. However, with transportation costs increasing faster than revenues and freight movements expected to grow, Iowa's transportation system will be subject to more widespread deterioration and congestion.

Exploring other funding mechanisms, or even creating new ones, is extremely advantageous to freight movement in Iowa. Freight-specific investments will increase efficiency, connectivity, and profitability. Reserving a percentage of funding for freight projects and public-private partnerships to expedite investment is a potential option. There may be the possibility of creating a multimodal state funding program patterned after the Linking Iowa's Freight Transportation System (LIFTS) program, which was initiated as a pilot in 2015. LIFTS utilized State Infrastructure Bank funds that were repurposed and targeted to projects that improved multimodal connections and freight mobility. Unfortunately, there

were only enough funds for a one-time grant program. If creating a separate, sustainable multimodal freight fund is not an option, allowing flexibility in current funding mechanisms is beneficial in order to make multimodal freight improvements a reality.

3. Target investment to address mobility issues that impact freight movements (5th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

As required in the USDOT's guidance on State Freight Plans, Chapter 7, Conditions and performance of the freight transportation system, of this plan includes the identification of bottlenecks in the freight transportation system that cause delays and unreliability in freight movements. Bottlenecks were identified for four of the five major freight modes: air, highway, railroad, and waterway. This identification process involved a variety of stakeholders, including both users and those responsible for stewardship of the freight transportation system.

Investments that target the elimination or reduction of these freight mobility issues will be 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. Using the decision-making processes and tools identified in Chapter 8, Iowa's decision-making process, the department examined the feedback and outputs received via these channels for alignment with the strategies identified in this chapter. Where this alignment exists, priority investments were identified that will serve to implement this State Freight Plan. It is also important to acknowledge that congestion in surrounding areas outside of the state's borders may have an impact on Iowa freight movement. Collaboration with other states and exploration of solutions needs to be carried out in the future to maximize the effectiveness of investments made within the state.

4. Emphasize the Multimodal Freight Network and utilize designs that are compatible with significant freight movements (17th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

While a strategy that targets investments to address existing mobility issues is prudent, it is also necessary to avoid investments that unknowingly create new obstructions to freight movement. The most obvious example of this is the application of roadway design elements that are incompatible with oversize/overweight (OS/OW). Due to the dimensions and turning characteristics of these OS/OW vehicles, some design applications, such as restrictive roundabouts and overhead structures, can create unintended bottlenecks on the system.

Investments targeted for facilities that handle significant freight traffic, including OS/OW vehicles, should incorporate designs compatible with these types of freight movements. Particular emphasis should be placed on the highway portion of the Multimodal Freight Network identified in Figure 6.13. In addition, future routing and access control decisions and processes should consider those facilities that are known to be most compatible with freight movement. As part of plan implementation, the Iowa DOT's offices of Design and Systems Planning will coordinate with other interested parties to explore the applicability of certain design elements on the highway portion of the Multimodal Freight Network.

5. Target investment on the interstate system at a level that reflects the importance of this system for moving freight (2nd)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

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 8 percent of the length of Iowa's Primary Highway System, it carries 40 percent of total VMT and 62 percent of large truck VMT. Similar contrasts exist when examining the Primary Highway System alone. Interstate 80 carries the largest volume of freight traffic, where nearly one in every three vehicles is a large truck.

The *Iowa Interstate Corridor Plan* emphasized the importance of the interstate system while presenting a thorough evaluation of the system's condition. This plan concluded with the identification of several priority interstate corridors that should be considered for further study and programming. These priority corridors are identified in *Appendix 4*. In order to ensure that the interstate system can continue to support growing freight demands, future investment must be focused accordingly.

6. Right-size the highway system and apply cost-effective solutions to locations with existing and anticipated issues (6th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

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, some focused capacity expansion as resources allow, and perhaps even some contraction of the system.

Related to this right-sizing of the system is the application of cost-effective solutions to address existing and anticipated issues. An example of this would be the application of the "Super-2" concept, or some variation thereof, to address mobility issues on existing two-lane facilities that do not yet warrant more significant capacity expansion. This concept, which would provide significant benefits to freight mobility, involves the application of full-width lanes, paved shoulders, limited access, left- and right-turn lanes, climbing/passing lanes, and buffer zones. Applied correctly, such solutions will balance mobility needs with revenue limitations and the need to right-size the system, while also having more favorable long-term asset management implications.

7. Advance a 21st century Farm-to-Market System that moves products seamlessly across road, rail, and water to global marketplaces (3rd)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Per Iowa Code, "farm-to-market roads" or "Farm-to-Market System" means those county jurisdiction intracounty and intercounty roads that serve principal traffic generating areas and connect such areas to other farm-to-market and primary roads. This system is currently comprised of approximately 30,500 miles, and cannot exceed 35,000 miles. Iowa has an extensive highway system, including a nearly 90,000-mile Secondary Road System that 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.

A 2002 effort by Iowa's Road Use Tax Fund Committee sought to answer the following question. "What is the nature of the road and street system required to best serve the transportation needs of Iowa, and how should jurisdictional responsibility be assigned to the state, counties, and cities to assure a coordinated, balanced, and adequately funded system without wasteful duplication?" 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, now more than a decade removed from the last study. While some alternatives are likely to present more obstacles than others, all alternatives should be examined with interested stakeholders for their potential efficiencies, including road abandonments, vacations, and service conversions.

8. Implement asset management tools and practices and promote their use at the local level (15th)

Capital investments	Operational improvements	Policy changes	Innovative technologies

As transportation agencies transition from a capacity expansion mission to one more focused on preservation and modernization, it has become ever more important to maximize results from each dollar spent and to communicate funding needs to the public. This has been especially true in light of the loss of purchasing power experienced in recent years. As part of the response to these changing circumstances, many agencies are exploring adoption of enhanced asset management practices to improve their long-term, systemic maintenance results. The key tenets of asset management include the use of formalized, periodic condition measurement, tracking, analysis, and anticipation systems that can lead to greater efficiency in the use of scarce resources; and an investment approach that recognizes it can be more cost-effective to repair or renovate road and bridge assets early in their life cycles rather than after they are more fully depreciated.

The Iowa DOT, in seeking to implement asset management methods in its own operations and to promote enhanced practices by all road agencies, has invited representatives of cities and counties to collaborate and coordinate efforts in striving to reach new levels of efficiency and effectiveness and improve the state of the art. Toward this end, representatives of cities, counties, Iowa DOT, and Iowa State University's Institute for Transportation have been named to work together on the Iowa Transportation Asset Management Steering Committee.

9. Optimize the freight transportation network to minimize cost and travel time and improve supply chain efficiency (1st)

Capital investments	Operational improvements	Policy changes	Innovative technologies

The vision of the department's 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. This project aligns well with both the Iowa DOT's Strategic Plan and the national freight goals identified in MAP-21.

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; develop business cases to reduce transportation costs; and document a demand-based, value-driven analysis and design methodology to effectively identify and evaluate investment opportunities specific to Iowa's Freight

Network Optimization Strategy (See Chapter 8, Iowa's decision-making process). The individual strategies identified through this effort are included as items 19 through 27.

10. Optimize the availability and use of freight shipping containers (14th)

Capital investments	Operational improvements	Policy changes	Innovative technologies

Currently, there exists a significant imbalance when it comes to the use of in- and outbound shipping containers. This is a problem that is inherent to many intermodal facilities in major metropolitan areas. For example, current international trade places large numbers of empty containers in consumption markets like Dallas-Fort Worth, Texas; Memphis, Tennessee; and Indianapolis, Indiana.

Opportunities may exist to relocate some of these empty containers to locations in Iowa for reloading. With massive volumes of production, Iowa is well-positioned to provide potential loads for outbound movements of these containers. Otherwise, many of these containers are shipped back to international markets such as Asia without back-loads.

11. Explore opportunities for increasing value-added production within the state (4th)

Capital investments	Operational improvements	Policy changes	Innovative technologies

An ancillary yet extremely valuable product of the department's freight transportation network optimization study is the development of a robust database of economic information. This information is necessary to ultimately identify and evaluate transportation network optimization opportunities. However, it can serve the dual purpose of identifying specific economic development opportunities for the state of Iowa.

For example, a specific origin-destination analysis could identify that raw commodities are being shipped from a location in Iowa to a location just outside of the state for value-added product refinement. This could provide an opportunity for the state to consider investments that would allow for such value-added processes to occur in-state, prior to these products being exported. Such opportunities could improve the state's overall economic advantages, but would likely require corresponding adjustments to the optimized freight transportation network.

12. Continue to advance efforts on the M-35 Marine Highway Corridor (11th)

Capital investments	Operational improvements	Policy changes	Innovative technologies

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. Realizing this vision and improving the condition and efficiency of the Upper Mississippi River will require a great deal of effort, support, and collaboration.

The states will be 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. Strengthening Upper Mississippi River transportation mobility and utilization, in the context of regional and national transportation networks, will not only improve the economic competitiveness of the Midwest and nation, but will also relieve landside congestion on highways and railroads, reduce air emissions, and increase the efficiency of other surface transportation modes.

13. Promote freight movement on the M-29 Marine Highway Connector (12th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

The M-29 Marine Highway Connector is designated on the Missouri River from Kansas City, Missouri, 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.

Unreliable water levels and competition from other modes, namely railroads, has led to the dramatic decline in commodity movement on the Missouri River. 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.

14. Provide real-time information on system conditions to support the movement of freight (10th)

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Iowa's transportation system is an integral and essential part of society, serving commerce and the daily functions of all Iowans. The freight transportation system is in demand 24 hours a day, 365 days a year. This is regardless of the weather or other factors that impact the condition of the system, as a high-quality transportation system serves as the artery for economic activity.

Expectations and needs on the transportation system are changing fast and have significantly shifted over the past decade. Transportation information has become as important as the transportation infrastructure itself, which represents a shift in how state transportation departments view their

responsibilities as it relates to this information about the system. Providing real-time information on system conditions and truck parking availability will become increasingly important for the safe and efficient movement of freight, and such information should be made directly available to personal devices and vehicles.

15. Leverage real-time information from users of the system to support advanced decision-making and incident avoidance (13th)

Capital investments	Operational improvements	Policy changes	Innovative technologies

Successfully leveraging information from users relates directly to the issue of providing real-time information on system conditions. Social media provides the opportunity for users to have a direct role in providing information regarding the transportation system and other associated services. Social media is consumer-driven, transparent, engaging, and inclusive – all qualities that should also define transportation services.

State transportation departments must shift to begin more actively absorbing and utilizing social media information. Given the real-time nature of this information, it can often carry much more value than system information provided through more traditional means. Extracting this information from users will allow others to take it into consideration and be more proactive in their decision-making and incident avoidance.

16. Provide measured, clear, nontechnical performance results for the freight system (18th)

Capital investments	Operational improvements	Policy changes	Innovative technologies

MAP-21 placed an increased emphasis on performance measurement, requiring the establishment of national performance measures for which states are to develop targets. Performance measurement is not a new concept in the transportation industry. The concept predated MAP-21, and much study has gone into what makes an effective performance measure from the perspective of the user of the transportation system.

Perhaps most critical to the user are performance measures that are both clear and nontechnical. That is not to say a measure cannot be quantitative, but it must be presented in such a way it is usable to the layperson. Chapter 7, Conditions and performance of the freight transportation system, presents a set of performance measures that reflect the strategic goals identified in this plan. While these measures will help the department evaluate the effectiveness of the overall freight improvement strategy, these

are not necessarily the same measures that will be used to publically communicate the performance of the freight transportation system.

17. Streamline and align freight-related regulations and minimize unintended consequences (9th)

Capital investments	Operational improvements	**Policy changes**	Innovative technologies

As noted in Chapter 4, Trends and issues, the FAC identified differences in regulations as a major obstacle for the efficient movement of freight. 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 issues such as fuel, trips, vehicle registration, etc.

There are some potential short-term changes that could be made related to regulation that would be extremely beneficial to the users of the freight transportation system. These include, but are not limited to, streamlining the permitting process, which is both confusing and cumbersome to shippers and truckers traversing more than one state per trip; 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.

Although state and federal regulations are generally well-intentioned, not all have a positive impact on freight transportation. The regulatory environment will either encourage or deter business in a state. The Iowa DOT should 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. This can be done by analyzing the potential positive and negative impacts and discussing with the appropriate stakeholders before implementing.

18. Act as a point of contact and educator on freight transportation options (16th)

Capital investments	Operational improvements	**Policy changes**	Innovative technologies

The Iowa DOT should strive to be an educator to the public and a resource for companies and shippers looking to learn more about the freight transportation options in the state. One of the largest disincentives for shippers to use other modes is a lack of education or awareness on how and where to start. Typically, shippers are unaware of the full range of options or who to contact to begin the exploration of alternative modes or multiple modes. The Iowa DOT should fill this role.

Providing details on the multiple modal options for freight transport and where the connection points currently exist would be beneficial to the state's economy, as well as the overall transportation network.

The Iowa DOT could provide technical assistance and answer questions about the use of a specific mode or multiple modes, and provide contact information for different service providers in the shipper's area. These things can be done with websites, seminars, webinars, on-site visits, and/or online tools, just to name a few.

The following items are recommended optimization strategies to enhance Iowa's freight network and addresses the key findings as part of the Freight Network Optimization Strategy (see Chapter 8, Iowa's decision-making process). Strategies 19 through 25 are focused on optimizing Iowa's inbound and outbound freight. Strategies 26 and 27 are focused on improving freight movement within the state. The final freight transportation network optimization report provides in depth analysis on each opportunity, including the potential return on investment.

Like the strategies above, per USDOT's interim guidance on state freight plans, these strategies relate to capital investments, operational improvements, policy changes, and the expanded use of innovative technologies. The table following each strategy shows which of these four items applies to each strategy. Those that apply are represented in a blue box and those that do not apply are represented in a gray box. The numbering of strategies is for identification only and does not show priority of any kind.

19. Explore new truck cross-docking operations to enable greater opportunities to consolidate truck freight for Iowa shippers

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Cross-docking is a logistics practice of unloading materials from an incoming semi-trailer truck or railcar and loading these materials directly into outbound trucks, trailers, or railcars, with little or no storage in between. There are opportunities to establish new cross-docking operations in Iowa to consolidate small truck shipments to full truckload for multiple shippers and reduce transportation costs. Quantitative analysis in truck freight consolidation estimates that the total market opportunity on behalf of Iowa shippers in annual transportation cost savings is approximately $852 million. A business case developed for a mid-sized cross dock in Eastern Iowa shows approximately $22 million to $34 million in total annual transportation cost savings, with an Economic Feasibility Measurement (EFM) of approximately one year (after the cross dock is fully operational and freight volume has reached the expected level).

20. Explore a new rail intermodal facility to enable access to lower cost rail services for Iowa businesses

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Rail intermodal service involves the transportation of containerized freight using truck and rail, capturing the best of each mode: combining the lower cost of rail line-haul, with the door-to-door flexibility of trucking. A quantitative analysis for rail intermodal market opportunities on behalf of Iowa shippers estimates that the total market opportunity in annual transportation cost savings is approximately $197 million. A business case developed for a mid-sized intermodal facility in Eastern Iowa shows approximately $12.8 million to $15.5 million in total annual transportation cost savings, with an EFM of approximately one year (after the intermodal facility is fully operational and freight volume has reached the expected level).

21. Explore additional transload facilities to provide Iowa businesses with more access to lower cost railroad freight services

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Transloading is the process of transferring freight between two modes of transportation. Truck-to-rail and rail-to-truck transloading allows shippers to take advantage of the trucking access capabilities for short-haul pickup/delivery and the lower cost rail for long-haul shipments. Quantitative analysis of rail carload transportation estimates that the total market opportunity in annual transportation cost savings is approximately $20 million to $32 million per region, across different Iowa regions in Eastern, Central, and Western Iowa. A business case developed for a transload facility in each region shows the EFM is approximately 1.7 to 2.7 years, depending on location, after a facility is fully operational and freight volume has reached the expected level.

22. Explore opportunities to leverage a barge and rail multimodal solution to provide a cost-effective freight transportation alternative

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Barge transportation has the lowest cost structure measured by cost per ton-mile among all modes of transportation, though it typically requires longer transit time. Effectively leveraging barge transportation for non-time sensitive, large volume shipments can produce significant cost savings opportunities for Iowa companies. However, there are several constraints for Iowa businesses to fully utilize barge transportation, including limited access to adjacent barge terminals, delays in the aging lock and dam

system during peak season, and winter closures on the Upper Mississippi River. A rail and barge multimodal solution could be a viable alternative to transport commodities during winter between Iowa and the Gulf Coast. A cost analysis estimates that the multimodal solution has comparable cost to the all rail alternative during winter. A feasibility study is recommended to explore the economic viability of an Iowa to Gulf Coast bi-direction rail/barge multimodal service option.

23. Explore opportunities to build a logistics park to co-locate cross-docking, intermodal, transloading, and warehousing facilities

Capital investments	***Operational improvements***	***Policy changes***	***Innovative technologies***

A logistics park is a development concept in which warehouse and distribution centers are located in a single zone, typically with access to railroad networks and primary highway systems. Co-locating logistics functions in a single development provides many benefits, including substantially lower transportation costs, improved transportation efficiency, more transportation options for shippers, increased transportation capacity and better facility management. Quantitative analysis has identified a region in Eastern Iowa as an economically viable location for a new logistics park. The estimated annual transportation cost savings for the logistics park are approximately $37.7 million to $52.9 million.

24. Collaborate with the railroads to provide Iowa companies with more access and capacity to accommodate additional Iowa freight shipments

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

Iowa's railroad network provides significant opportunities for reducing transportation costs for Iowa shippers. Railroad capacity and access points are essential for Iowa shippers to convert additional truck freight to rail. Iowa DOT is currently in the process of developing a rail plan. It is recommended that Iowa DOT complete the development of a strategic rail plan that accommodates more shipping by rail.

25. Explore opportunities to reposition empty containers by barge and reduce repositioning costs

Capital investments	***Operational improvements***	***Policy changes***	***Innovative technologies***

There is a shortage of empty containers in Iowa. Because Iowa is a production state, it ships more containerized commodities than it consumes and potentially will ship more containerized commodities in the future. Repositioning empty containers is expensive. The estimated cost to reposition an empty container from Chicago to Iowa by rail is approximately $600. Many barges go up the Mississippi River empty, load grain and other commodities in Illinois, Iowa, Minnesota, Missouri, and Wisconsin, and

transport the commodities down river to the Gulf Coast. There are cost effective opportunities to leverage empty up river barges to reposition empty containers from cities with large container inventories, such as Memphis and New Orleans. The concept could include a virtual container yard to track and manage containers, facilitate container leasing and management of related documents, as well as container returns and exchanges.

26. Explore and implement strategies to reduce deadhead truck miles

Capital investments	*Operational improvements*	*Policy changes*	*Innovative technologies*

The volume of Iowa's outbound truck freight is much higher than inbound volume. This flow results in many deadhead miles as trucks return to Iowa empty in order to haul outbound freight. It is recommended that a public-private partnership be established to develop a mobile and web-based freight and truck information sharing and communication solution for both the contractual and spot markets to help reduce deadhead miles.

27. Explore opportunities for railroads to provide additional lower cost freight rail transportation for high volume traffic lanes in Iowa

Capital investments	Operational improvements	Policy changes	Innovative technologies

The driver shortage, higher insurance costs and new government regulations are pushing truck transportation costs higher. Railroads are making progress in the short-haul market, as they improve operating efficiencies and service times. It is recommended that opportunities be explored to provide additional lower cost freight rail services for intra-Iowa high volume traffic lanes.

Consistency with national freight goals

Each element of the Iowa DOT's freight improvement strategy will support one or more of the national freight goals identified in the Fixing America's Surface Transportation (FAST) Act. This is illustrated in Table 9.1. As recommended in the FAST Act, Iowa DOT will pursue and align with the national freight goals in a manner that is not burdensome to state and local governments.

Table 9.1: Alignment of freight strategies and national freight goals

		Improvements, policies, operational innovations	Safety, security, efficiency, resiliency	State of good repair	Innovation and advanced technology	Economic efficiency and productivity	Reliability	Short- and long-distance movement	Flexibility of states	Environmental impacts
1	Maximize the advantages inherent to Iowa's geographic proximity	X	X		X	X	X	X	X	X
2	Explore/Create other funding sources to increase investment in the freight transportation system	X	X	X	X	X	X	X	X	X
3	Target investment to address mobility issues that impact freight movements	X	X	X	X	X	X	X	X	X
4	Emphasize the Multimodal Freight Network and utilize designs that are compatible with significant freight movements	X	X		X	X		X	X	X
5	Target investment on the interstate system at a level that reflects the importance of this system for moving freight	X	X	X	X	X	X	X	X	X
6	Right-size the highway system and apply cost-effective solutions to locations with existing and anticipated issues	X	X	X	X	X	X	X	X	X
7	Advance a 21st century Farm-to-Market System that moves products seamlessly across road, rail, and water to global marketplaces	X	X	X	X	X	X	X	X	X
8	Implement asset management tools and practices and promote their use at the local level	X	X	X	X	X	X	X	X	X
9	Optimize the freight transportation network to minimize cost and travel time and improve supply chain efficiency	X	X	X	X	X	X	X	X	X
10	Optimize the availability and use of freight shipping containers	X	X		X	X	X	X	X	X
11	Explore opportunities for increasing value-added production within the state	X	X		X	X	X	X		X

		Improvements, policies, operational innovations	Safety, security, efficiency, resiliency	State of good repair	Innovation and advanced technology	Economic efficiency and productivity	Reliability	Short- and long-distance movement	Flexibility of states	Environmental impacts
12	Continue to advance efforts on the M-35 Marine Highway Corridor	X	X	X	X	X	X	X	X	X
13	Promote freight movement on the M-29 Marine Highway Connector	X	X	X	X	X	X	X	X	X
14	Provide real-time information on system conditions to support the movement of freight	X	X		X	X	X	X	X	X
15	Leverage real-time information from users of the system to support advanced decision-making and incident avoidance	X	X		X	X	X	X	X	X
16	Provide measured, clear, nontechnical performance results for the freight system	X	X	X	X	X	X	X		X
17	Streamline and align freight-related regulations and minimize unintended consequences	X	X		X	X	X	X	X	X
18	Act as a point of contact and educator on freight transportation options	X	X		X	X	X	X	X	
19	Explore new truck cross-docking operations to enable greater opportunities to consolidate truck freight for Iowa shippers	X	X	X	X	X		X		
20	Explore a new rail intermodal facility to enable access to lower cost rail services for Iowa businesses	X	X	X	X	X		X		
21	Explore additional transload facilities to provide Iowa businesses with more access to lower cost railroad freight services	X	X	X	X	X		X		
22	Explore opportunities to leverage a barge and rail multimodal solution to provide a cost-effective freight transportation alternative	X	X	X	X	X		X	X	X

		Improvements, policies, operational innovations	Safety, security, efficiency, resiliency	State of good repair	Innovation and advanced technology	Economic efficiency and productivity	Reliability	Short- and long-distance movement	Flexibility of states	Environmental impacts
23	Explore opportunities to build a logistics park to co-locate cross-docking, intermodal, transloading and warehousing facilities	X	X	X	X	X		X		
24	Collaborate with the railroads to provide Iowa companies with more access and capacity to accommodate additional Iowa freight shipments	X	X			X		X		X
25	Explore opportunities to reposition empty containers by barge and reduce repositioning costs	X	X		X	X	X	X	X	X
26	Explore and implement strategies to reduce deadhead truck miles	X	X		X	X	X	X	X	X
27	Explore opportunities for railroads to provide additional lower cost freight rail transportation for high volume traffic lanes within Iowa	X	X	X		X		X		

Source: Iowa Department of Transportation

9.2 Iowa's freight improvements

In addition to the strategies outlined in this chapter, specific improvements are necessary to address the freight mobility issues experienced in Iowa. These improvements were identified using the state's decision-making process and newly updated/developed tools outlined in Chapter 8, Iowa's decision-making process. They will support the state's freight strategies as well as the national freight goals identified in Chapter 2, Strategic goals, and will be analyzed using the state's freight performance measures outlined in Chapter 7, Conditions and performance of the freight transportation system.

Air

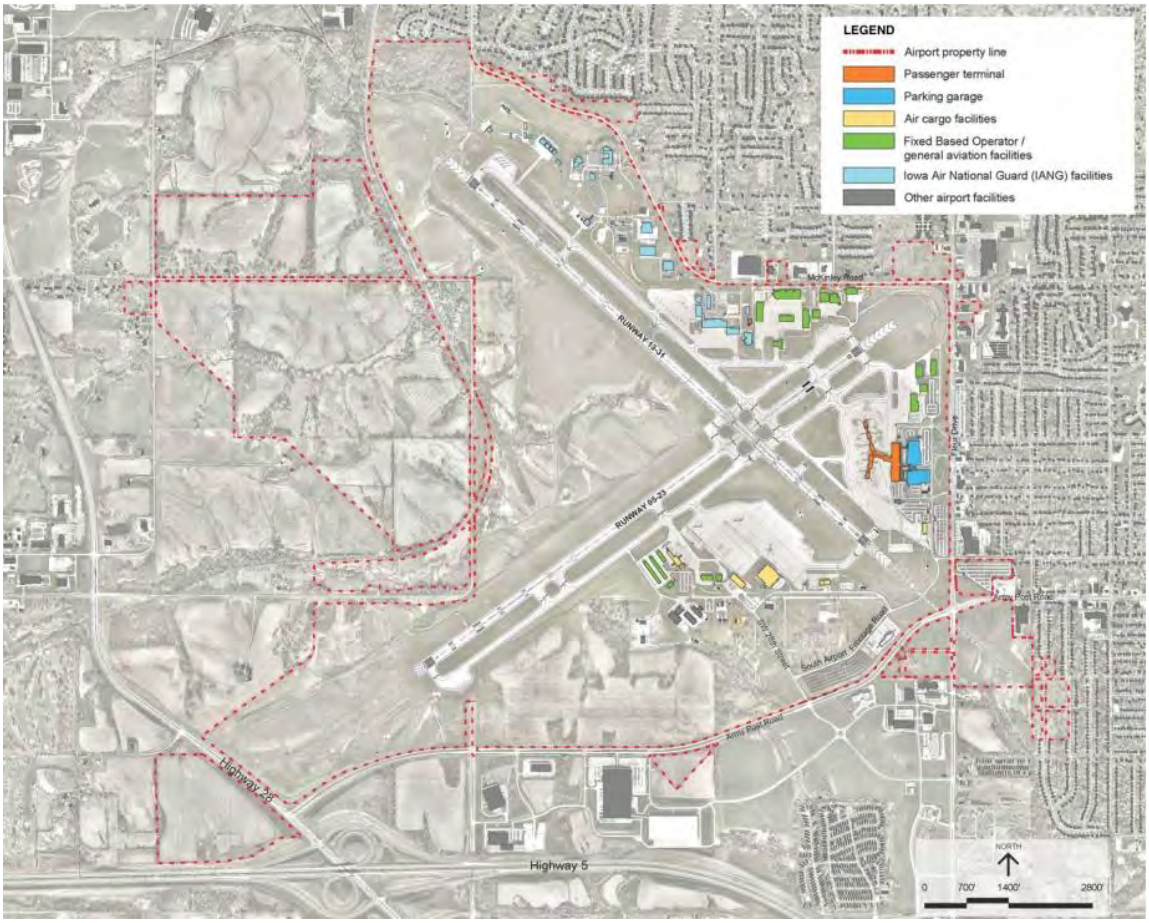
Most commercial airports in Iowa have the capacity, acreage, and necessary services to accommodate freight movement. However, the presence of freight service depends on whether or not a company decides to choose one of those locations for its operations. In Iowa, the Des Moines International Airport (DSM) and the Eastern Iowa Airport (CID) in Cedar Rapids handle more than 99 percent of reported air freight; therefore, current and future improvements at both locations are highlighted here.

DSM currently has about 50 acres reserved for air cargo operations between two quadrants (south cargo area and east cargo area), the majority of which is in the south cargo area. According to a recent study[52] conducted by the airport, these facilities are not fully utilized and can be downsized (see Figure 9.1).

- **South cargo area:** The existing air cargo apron occupies approximately 43 acres of pavement area. Two major all-cargo carriers, UPS Inc. and FedEx, operate out of this facility. UPS Inc. currently operates out of Building 31 and 32 with their sorting facility in Building 35. FedEx handles its express freight service and air mail through an exclusive contract with the United States Postal Service.
- **East cargo area:** The east cargo apron area is approximately 8 acres, located directly south of the existing passenger terminal complex. United Airlines currently leases a portion of Building 5 to handle their belly cargo operation. The Federal Inspection Facility occupies Building 2. Its primary function is to perform inspections on cargo merchandise. No international commercial passenger screening is currently performed.

[52] Des Moines International Airport Terminal Area Concept Plan Technical Report - http://www.dsmairport.com/webres/File/about-the-airport/terminal-study/DSM%20Terminal-Area-Concept-Plan-Technical-Report%20-%20FINAL.pdf

Figure 9.1: Des Moines International Airport property



Source: Des Moines International Airport Terminal Area Concept Plan

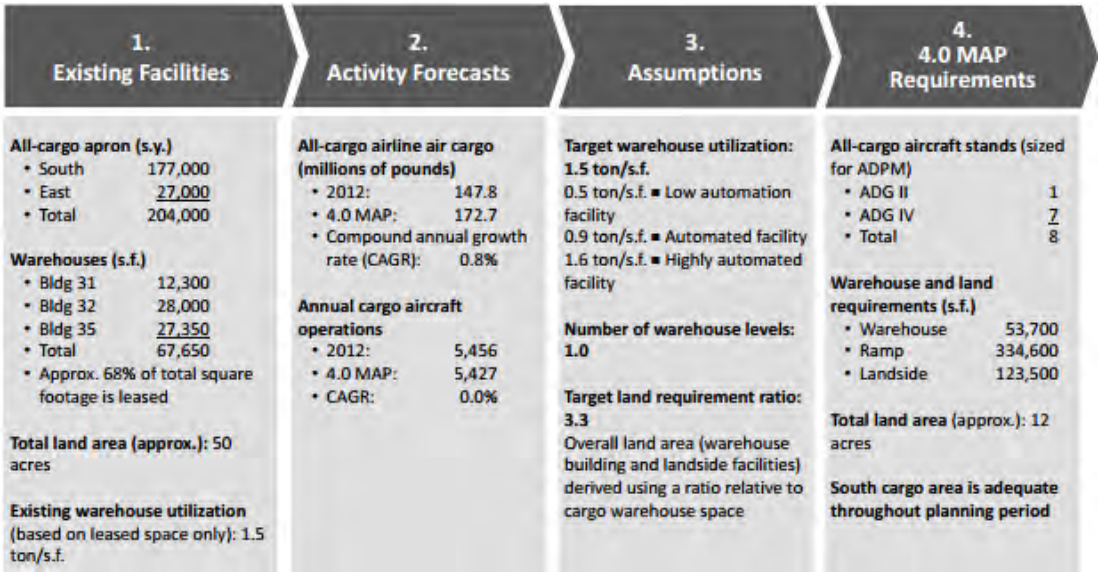
A new passenger terminal has been proposed at DSM with an anticipated construction start in 2022. One of the leading terminal site alternatives calls for the new terminal building to be built on the location of the existing south cargo area. If this option is ultimately chosen, cargo operations would then be moved to the location of the existing passenger terminal. If completed, the total air cargo handling area would decrease to roughly 12 acres. This was determined by analyzing current use and forecasts with generally accepted cargo facility use ratios.

- **Processing and warehouse space:** The generally accepted cargo facility use ratio is between 0.5 ton, for a low automation, mostly manual, facility and 1.6 tons annually per square foot of warehouse space for a highly automated cargo facility. In 2012, the airport achieved a warehouse utilization of 1.5 tons of cargo per square foot. It was assumed this rate would be maintained throughout the planning period, resulting in a total of 54,000 square feet of warehouse being required by 4 million annual passengers (MAP).

- **Ramp area:** Aircraft parking requirements were calculated centered on future demand. Based on the forecasts, it was determined that approximately eight aircraft will have to be accommodated by 4 MAP. This corresponds to a 335,000 square foot apron area.
- **Landside area:** Overall land area, which includes warehouse building footprint and the associated landside facilities, is derived using a ratio relative to the gross floor area of cargo warehouse space. The traditional cargo industry gross floor area to land requirement ratio is 1:3:3. By 4 MAP, 124,000 square feet should be reserved for landside facilities associated with all-cargo operations.

Figure 9.2 shows the breakdown of current and future cargo facilities.

Figure 9.2: Des Moines International Airport future cargo capacity



Source: Des Moines International Airport Terminal Area Concept Plan

CID completed *The Eastern Iowa Airport Air Cargo Service Study* in 2011 to analyze the current state of freight movement through the facility. The majority of air cargo moves through CID via the integrated express carriers FedEx, UPS Inc., and DHL Express, with FedEx being the market leader.

The airport has facilities that are able to accommodate cargo jet operations such as the Boeing 757 and the Airbus 300-600.

- **Cargo buildings:** There are three cargo-handling buildings that total 136,000 square feet. This space is currently 100 percent utilized.

- **Cargo apron:** The airport's cargo apron space is approximately 89,000 square yards between two cargo ramps. No cargo carriers have exclusive use of the cargo aprons, so with coordination, all of that space could be available based on the schedules of current cargo carriers with preferential use.
- **Future development:** There are an additional 106 acres identified in the airport's Master Plan[53] for future cargo development.

Although infrastructure projects for improving air cargo were not specifically identified (other than the 106 acres set aside for future cargo development), a number of recommendations were products of the study. These include:

- **Promote airport's role in economic development:** It is important for the airport to provide assets and services that businesses can utilize in their operations and for economic development officials to communicate airport capabilities to potential businesses looking for a new location, as well as established businesses.
- **Target industry clusters:** Airport staff and local economic development agencies should continue to collaborate in marketing the region to three industry clusters reliant on air cargo service – aerospace communications, heavy equipment manufacturing, and life sciences.
- **Support carriers:** The airport should continue to build relationships with FedEx, UPS Inc., and DHL Express to monitor their planning and development for the region.

Highway

In order to identify and prioritize candidates for highway freight improvements, the Iowa DOT utilized the Value, Condition, and Performance (VCAP) matrix. This approach takes advantage of multiple tools available at the Iowa DOT, including the Freight Mobility Issues Survey, Iowa Travel Analysis Model, (iTRAM), Infrastructure Condition Evaluation (ICE), INRIX bottleneck ranking tool, and Iowa's annual traffic counts. Below is a detailed description of the prioritization process.

Location list (Freight Mobility Issues Survey): The Iowa DOT initially developed a draft list of highway locations with freight mobility issues (see Chapter 7, Conditions and performance of the freight transportation system). This was completed by analyzing INRIX traffic data that can, among other things, identify "bottleneck" locations in the state and the number of times each occurs throughout the year. This data was retrieved for 2014 and overlaid with the Iowa DOT's truck traffic count data. INRIX

[53] "Master Plan." The Eastern Iowa Airport Cedar Rapids, May 2014. <http://www.eiairport.org/files/downloads/2014 Master Plan.pdf>.

bottleneck locations that occurred in each quarter of the year and had either 30 percent truck traffic or more than 5,000 total trucks per day were flagged as locations with potential freight mobility issues.

This draft list was presented to the FAC for input and was sent to the Iowa DOT' districts, metropolitan planning organizations, and regional planning affiliations. Each of these groups was asked to review the list, make necessary additions, and assign priority votes to each location. This was used to populate the initial candidate list.

Value (iTRAM): iTRAM is a statewide travel demand model used in the evaluation of Iowa's transportation system (see Chapter 8, Iowa's decision-making process). This tool was used to assess the value of each candidate location to the overall freight transportation network. An initial run of the model was completed first to show a base case scenario. A second run was then completed that excluded each one of the candidate locations individually. Once complete, the truck vehicle-hours traveled (VHT) was compared from the before-and-after scenarios and the difference was assigned as the value of the location. This process was completed for each individual candidate location, with higher priority being assigned to locations with larger VHT increases when excluded from the network. In other words, higher priority was assigned to locations that make the truck network more efficient from a VHT perspective.

Condition (ICE): ICE was originally developed as a tool for evaluating the Interstate Highway System based on seven criteria: Pavement Condition Index, International Roughness Index, structure sufficiency rating, passenger traffic, single-unit truck traffic, combination truck traffic, and congestion (see Chapter 8, Iowa's decision-making process). A normalization and weighting process is applied to each criterion and used to analyze highway segments before ultimately ranking them against each other based upon a final composite rating. The original tool was recently expanded to the entire Primary Highway System in Iowa.

ICE was used to evaluate the current condition of each candidate location. The segments that make up each location were analyzed using the seven criteria and the normalization and weighting processes that had already been established. This resulted in a composite rating for each location.

Performance (INRIX Bottleneck Ranking tool): INRIX has a tool to identify and rank bottleneck locations (see Chapter 7, Conditions and performance of the freight transportation system). This tool, with additional analysis using traffic data, was used to develop a draft list of highway locations with freight mobility issues. To determine the performance of each candidate location, the number of annual

bottleneck occurrences for each location was used, with higher priority being assigned to locations with more occurrences.

VCAP matrix (final ranking and prioritization): After each candidate location was assigned a Value, Condition, and Performance rating, each was ranked using those values for each of the three categories. 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, total truck traffic at the location was used as a tiebreaker.

Figures 9.3, Figure 9.4, and Table 9.2 show Iowa's highway freight improvements following VCAP analysis. The numbers on the figures represent each locations "Map ID" that corresponds with the number in Table 9.2. The color of each point next to the Map ID represents the priority level of each particular location after prioritizing all 94 improvement locations. Table 9.2 lists the improvements by priority with red boxes showing where a tiebreaker was used. Abbreviations in the table are as follows: "N" is north, "S" is south, "E" is east, "W" is west, and "CL" is City Limits. These locations represent areas that should be considered for further study (e.g., environmental, design, engineering), with the possibility of being considered for programming by the Iowa Transportation Commission.

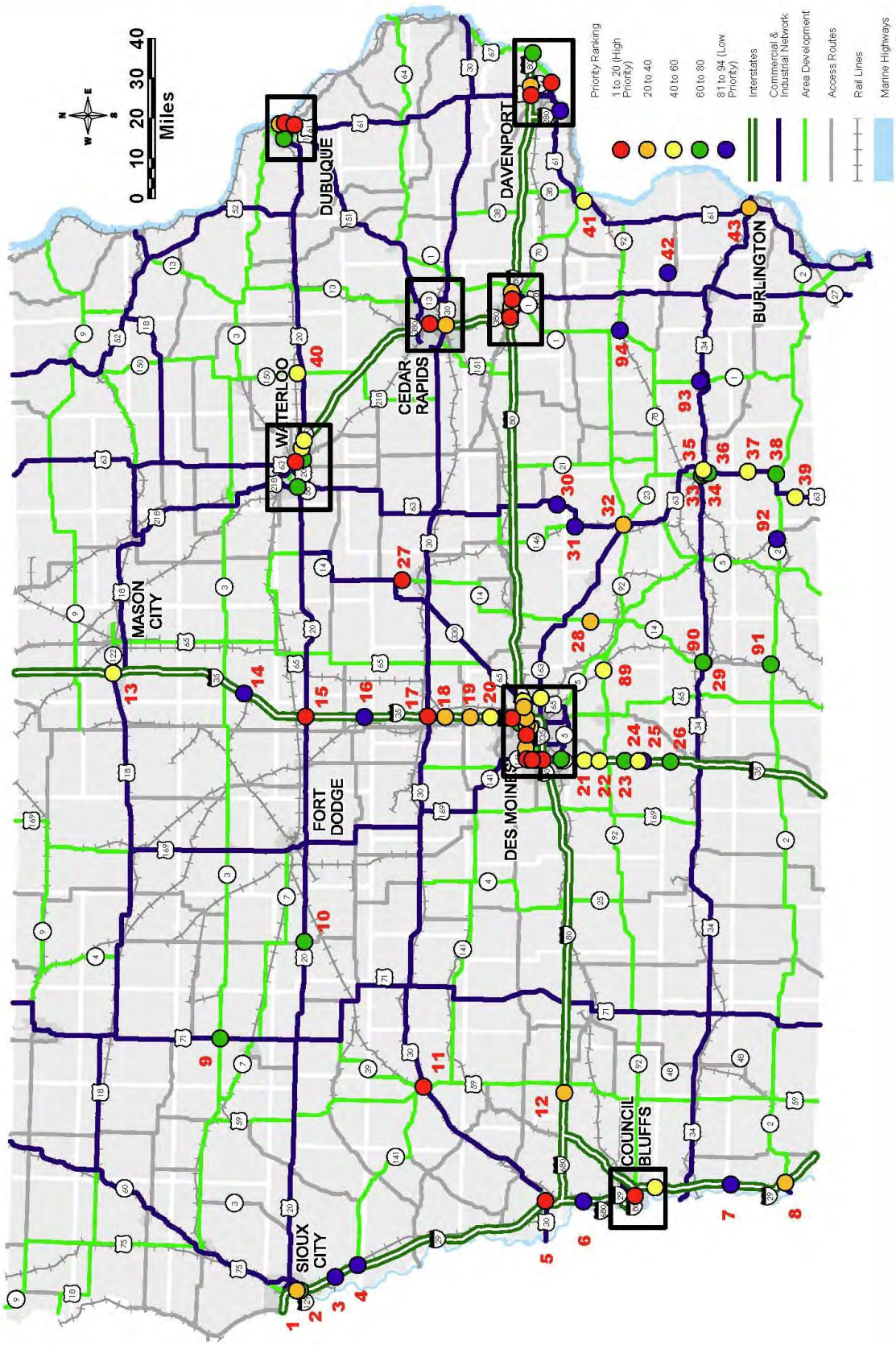


Figure 9.3: Highway freight priority locations

Source: Freight Advisory Council, metropolitan planning organizations, regional planning affiliations, Iowa Department of Transportation districts, INRIX, Iowa Travel Analysis Model, Infrastructure Condition Evaluation

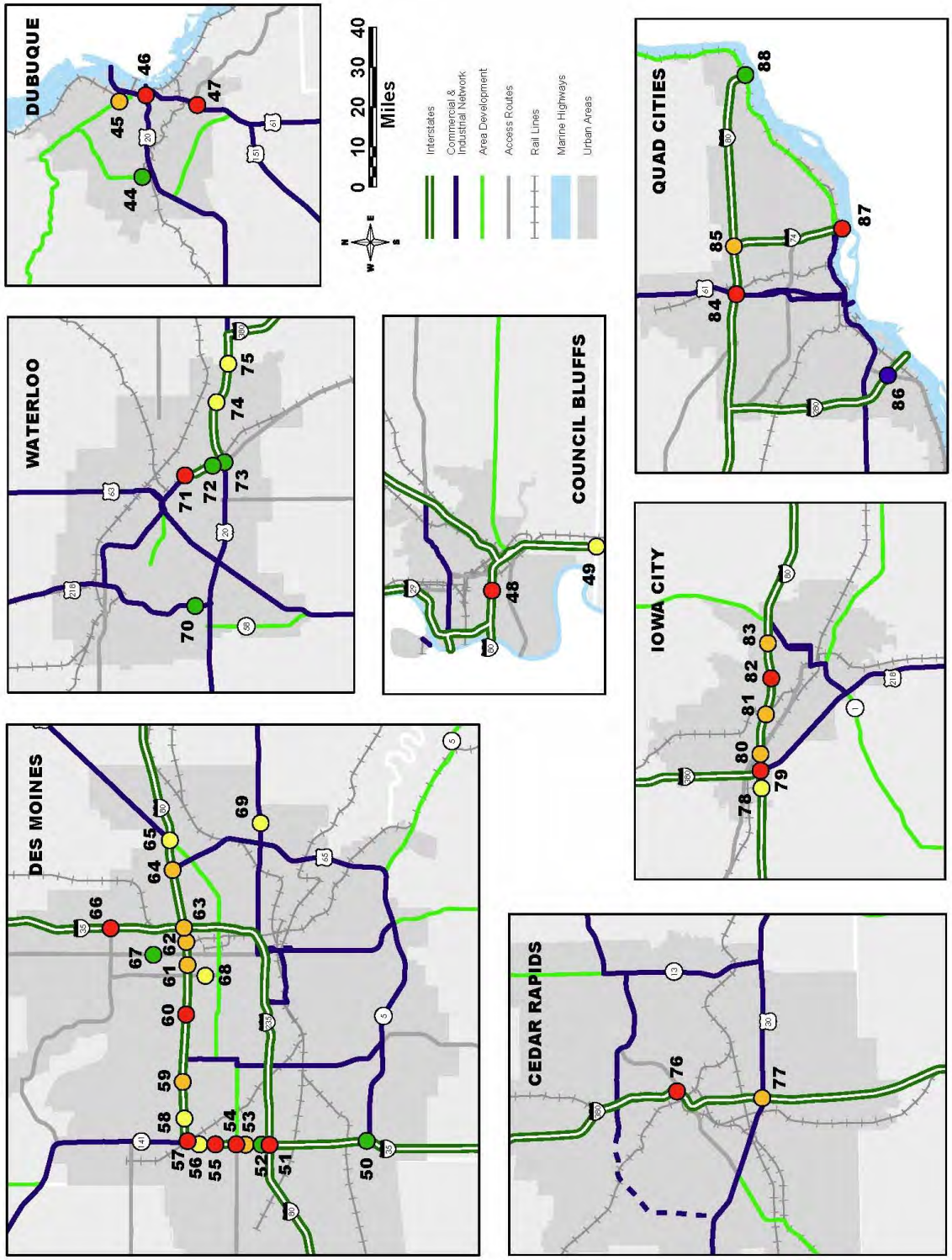


Figure 9.4: Highway freight priority locations, metro areas

Source: Freight Advisory Council, metropolitan planning organizations, regional planning affiliations, Iowa Department of Transportation districts, INRIX, Iowa Travel Analysis Model, Infrastructure Condition Evaluation

Table 9.2: Freight highway priorities

Map ID	Location	Value: iTRAM	Value: "V" rank	Condition: ICE	Condition: "C" rank	Performance: INRIX	Performance: "P" rank	Average ranking	Tie: Truck volume	Priority rank[54]
48	I-80/29 N/S through Council Bluffs	60.79	32	52.82	2	374	16	16.67	13579	**1***
47	U.S.151 N/S @ Maquoketa Dr	53.29	38	57.36	6	1040	6	16.67	2115	**2**
87	I-74 @ Mississippi River	90.95	23	65.53	23	706	9	18.33	2908	**3***
57	I-35/80 N/S, E/W@ Iowa 141	49.26	43	61.17	13	2036	2	19.33	12761	**4**
76	I-380 N/S through Cedar Rapids	76.37	26	55.34	4	123	33	21.00	7226	**5**
5	U.S. 30 E/W through Missouri Valley	21.80	58	54.31	3	1563	4	21.67	993	**6**
79	I-380 N/S @ I-80/exit 0 and I-80 E/W @ I-380/exit 239	146.63	10	73.35	47	250	24	27.00	11161	**7***
15	I-35 N/S @ U.S. 20/exit 142 and U.S. 20 E/W @ I-35/exit 153	114.43	17	73.91	51	420	14	27.33	5559	**8**
55	I-35/80 N/S @ Douglas Ave	52.83	41	59.84	11	116	34	28.67	12884	**9**
66	Iowa 160 E/W @ I-35 and I-35 N/S @ Iowa 160/exit 90	108.67	18	69.29	36	114	35	29.67	8331	**10**
11	U.S. 30 E/W @ U.S. 59/Iowa 141	60.33	33	70.81	41	387	15	29.67	1377	**11**
84	U.S. 61 N/S @ I-80/exit 123 and I-80 E @ U.S. 61/Brady St/exit 295	53.65	36	69.57	37	368	17	30.00	11230	**12**
51	I-80/I-35/I-235 N/S,E/W @ southwest mixmaster	92.24	22	73.83	50	365	18	30.00	6870	**13**
71	I-380/U.S. 218 N/S from San Marnan Dr to W Ninth St	12.87	61	66.45	27	1764	3	30.33	2799	**14**
46	U.S. 20 E/W@ Iowa 946	55.22	35	58.80	8	79	48	30.33	2212	**15**
27	Iowa 14 N/S from Marshalltown north city limits to Iowa 330	11.10	63	62.08	17	576	12	30.67	542	**16**
17	I-35 N/S @ U.S. 30/exit 111 and U.S. 30 E/W @ I-35/exit 151	131.58	13	77.55	61	336	19	31.00	7633	**17**

[54] These three high priority locations are included in the freight investment plan in section 9.3, Freight investment plan.

Map ID	Location	Value: iTRAM	Value: "V" rank	Condition: ICE	Condition: "C" rank	Performance: INRIX	Performance: "P" rank	Average ranking	Tie: Truck volume	Priority rank
60	I-35/80 N/S, E/W from Merle Hay Rd to Iowa 415	75.78	27	57.96	7	30	63	32.33	14124	18
54	I-35/80 N/S @ U.S. 6/Hickman Rd	53.37	37	58.96	9	61	51	32.33	12804	19
82	I-80 E/W from First Ave to Dubuque St	199.88	1	67.18	32	27	64	32.33	12240	20
43	U.S. 61 N/S through Burlington	18.63	59	61.30	15	172	27	33.67	1107	21
63	I-35 N/I-235 W@ I-80/235/exit 87 and I-80 E/W@ I-35/235/exit 137	119.00	16	78.31	62	226	25	34.33	11709	22
18	I-35 N/S from Iowa 210 to U.S. 30	149.62	9	63.76	21	0	73	34.33	7964	23
59	I-35/80 N/S, E/W from Northwest 86th St to Merle Hay Rd	67.38	30	63.59	20	45	55	35.00	14089	24
19	I-35 N/S from Northeast 126th Ave to Iowa 210	142.71	11	64.93	22	0	73	35.33	8277	25
83	I-80 E/W from Dubuque St to Iowa 1	196.39	2	68.80	34	0	73	36.33	12389	26
81	I-80 E/W from Iowa 965 to First Ave	127.10	14	66.81	31	26	65	36.67	12390	27
64	I-80 E/W @ U.S. 65/exit 141	38.21	51	66.59	29	147	30	36.67	10379	28
8	Iowa 2 W @ County Road L-31/195th Ave and I-29 N/S @ Iowa 2/exit 10	122.64	15	85.98	90	1256	5	36.67	2750	29
85	I-80 E/W @ I-74/exit 298	84.42	24	75.59	56	144	31	37.00	10162	30
32	U.S. 63 N/S through Oskaloosa	3.94	75	56.19	5	143	32	37.33	633	31
80	I-80 E/W from I-380 To Iowa 965	165.25	8	68.91	35	0	73	38.67	12726	32
61	I-35/80 N/S, E/W from Iowa 415 to U.S. 69	53.25	40	63.50	19	33	59	39.33	13917	33
62	I-35/80 N/S, E/W from U.S. 69 to northeast mixmaster	56.34	34	60.45	12	0	73	39.67	13478	34

Map ID	Location	Value		Condition		Performance			Tie	Priority rank
		iTRAM	"V" rank	ICE	"C" rank	INRIX	"P" rank	Average ranking	Truck volume	
53	I-35/80 N/S, E/W from University Ave to U.S. 6/Hickman Rd	10.37	64	61.50	16	97	40	40.00	14092	35
12	I-80 W @ 385th St	169.38	5	73.34	46	14	69	40.00	8158	36
77	I-380 N/S @ U.S. 30/exit 16	39.60	49	70.43	38	110	37	41.33	7015	37
1	I-29 N/S @ I-129/U.S. 20/ U.S. 75/exit 144	36.03	53	78.39	63	756	8	41.33	4653	38
28	Iowa 14 N/S @ Des Moines River	30.49	55	66.00	26	88	44	41.67	416	39
45	U.S. 52 N/S @ Iowa 3	2.27	82	65.53	24	303	22	42.67	731	40
40	Iowa 150 N/S through Independence	31.86	54	49.54	1	0	73	42.67	696	41
56	I-35/80 N/S, E/W from Douglas Ave to Iowa 141	41.47	47	59.15	10	0	73	43.33	13339	42
65	U.S. 6 E @ I-80 (east) and U.S. 65 N/S @ I-80/U.S. 6/Northeast Hubbell Ave/exit 142	44.08	44	84.38	85	9375	1	43.33	9601	43
20	I-35 N/S from 36th St to Northeast 126th Ave	136.96	12	72.42	45	0	73	43.33	7957	44
89	Railroad bridge over Iowa 92 east of Sandyville	12.06	62	71.50	43	192	26	43.67	354	45
37	U.S. 63 N/S from Ottumwa south city limits to Iowa 2	43.28	45	73.57	48	103	39	44.00	530	46
39	U.S. 63 N/S from Iowa 2 to Missouri state line	40.75	48	79.00	65	331	20	44.33	432	47
78	I-80 E/W from Ireland Ave Northwest to I-380	98.71	21	74.50	53	32	60	44.67	9918	48
41	U.S. 61 S @ Iowa 92/Grandview Ave	23.63	57	70.84	42	114	36	45.00	1862	49
68	Iowa 415 N/S @ 0.6 miles south of I-35/80 (railroad bridge)	1.59	86	66.73	30	329	21	45.67	1583	50
13	I-35 N @ U.S. 18/exit 194	84.40	25	80.80	70	89	43	46.00	5452	51

Map ID	Location	Value: iTRAM	Value: "V" rank	Condition: ICE	Condition: "C" rank	Performance: INRIX	Performance: "P" rank	Average ranking	Tie: Truck Volume	Priority rank
75	I-380 N/S @ Iowa 297/exit 66	166.51	7	82.53	80	51	52	46.33	5250	52
58	I-35/80 N/S, E/W from Iowa 141 to Northwest 86th St	36.33	52	62.59	18	0	73	47.67	13858	53
49	I-29 N @ Mills/Pottawattamie County line and I-29 N/S @ Iowa 370	175.72	3	83.93	84	40	56	47.67	4253	54
35	U.S. 34 E/W from roundabout to U.S. 34/U.S. 63	4.61	73	76.82	60	580	10	47.67	1122	55
69	Iowa 163 E/W through Pleasant Hill	41.62	46	73.61	49	72	49	48.00	2109	56
22	I-35 N/S @ Hoover St (MP 58.5)	99.86	19	75.37	54	0	73	48.67	5517	57
24	I-35 N @ Quaker St (MP 49.1)	166.54	6	80.45	68	0	73	49.00	5144	58
74	I-380 N/S @Evansdale Dr/exit 68	69.32	29	82.10	77	95	41	49.00	4688	59
21	I-35 N/S @ Fillmore St (MP 61.5)	99.75	20	75.37	55	0	73	49.33	5517	60
73	I-380 S @ U.S. 20/Iowa 27 and U.S. 20 E @ I-380/U.S. 218/exit 71	53.26	39	80.87	71	108	38	49.33	3906	61
88	I-80 E/W @ U.S. 67/exit 306	49.73	42	74.25	52	34	58	50.67	9519	62
2	I-29 N/S @ Old Iowa 75/ Industrial Rd/exit 143	4.78	72	82.13	78	815	7	52.33	4030	63
38	U.S. 63 N/S @ Iowa 2	6.00	69	82.00	75	548	13	52.33	447	64
9	Iowa 3 W @ U.S. 71/130th St	70.28	28	75.71	57	0	73	52.67	550	65
34	U.S. 34 E/W @ U.S. 63 (roundabout)	-0.51	93	76.06	59	580	10	54.00	826	66
50	I-35 S @ Iowa 5/Army Post Rd/exit 68	63.04	31	82.35	79	49	53	54.33	5638	67
67	U.S. 69 N/S from I-35/80 to Ankeny south city limits	-3.79	94	65.73	25	88	44	54.33	1406	68

Map ID	Location	Value		Condition		Performance			Tie	Priority rank
		iTRAM	"V" rank	ICE	"C" rank	INRIX	"P" rank	Average ranking	Truck volume	
36	U.S. 63 N/S @ 0.9 mile south of U.S. 34	39.28	50	70.60	40	0	73	54.33	595	**69**
52	I-35/80 N/S, E/W from southwest mixmaster to University Ave	29.11	56	71.89	44	18	67	55.67	13548	**70**
33	U.S. 34 E/W from Quincy Ave to roundabout	5.28	71	66.50	28	14	69	56.00	699	**71**
26	I-35 N/S @ Robin St (MP 40.8)	172.88	4	88.10	93	0	73	56.67	5076	**72**
44	Iowa 32 N/S @ Chavenelle Rd	1.63	83	61.20	14	0	73	56.67	1066	**73**
91	Railroad bridge over Iowa 14 @ Corydon	0.76	88	79.00	66	287	23	59.00	121	**74**
10	Iowa 4 S @ U.S. 20/270th St	4.30	74	84.42	86	169	28	62.67	682	**75**
70	Iowa 58 from U.S. 20 to Greenhill Rd	2.95	80	70.60	39	0	73	64.00	1097	**76**
90	Railroad bridge over Iowa 14 @ Chariton	0.54	90	68.00	33	0	73	65.33	167	**77**
72	I-380/U.S. 218 N/S from U.S. 20 to San Marnan Dr	9.93	66	85.73	89	88	44	66.33	2814	**78**
29	U.S. 34 E/W @ Iowa 14	0.30	91	83.66	83	167	29	67.67	526	**79**
23	I-35 N/S @ County Road G-50/exit 52	6.20	68	84.86	87	68	50	68.33	5079	**80**
6	I-29/680 N/S @ Rosewood Rd	15.91	60	86.35	92	49	53	68.33	4057	**81**
86	I-280 N @ Iowa 22/Rockingham Rd/exit 8	3.35	77	78.85	64	26	65	68.67	5289	**82**
25	I-35 N/S @ County Road G-64/exit 47	3.10	79	85.49	88	90	42	69.67	5032	**83**
93	Railroad bridge over Iowa 1 @ Fairfield	-0.31	92	76.00	58	32	60	70.00	150	**84**
4	I-29 N/S @ Iowa 141/exit 127	7.80	67	81.89	74	10	72	71.00	3729	**85**

Map ID	Location	Value		Condition		Performance			Tie	
		iTRAM	"V" rank	ICE	"C" rank	INRIX	"P" rank	Average ranking	Truck volume	Priority rank
92	Railroad bridge over Iowa 2 east of Centerville	10.26	65	82.00	76	0	73	71.33	302	**86**
16	I-35 S @ County Road D-65/exit 128	2.33	81	79.44	67	17	68	72.00	6308	**87**
30	U.S. 63 N/S from Iowa 146 to Iowa 85	5.83	70	81.57	73	0	73	72.00	393	**88**
94	Railroad bridge over Iowa 1/Iowa 92 @ Washington	1.33	87	83.00	82	84	47	72.00	292	**89**
14	I-35 N @ County Road C-47/Exit 159	1.61	84	81.41	72	31	62	72.67	4125	**90**
31	U.S. 63 N/S @ Iowa 146	3.38	76	80.55	69	0	73	72.67	499	**91**
3	I-29 N/S @ exit 134	3.17	78	86.04	91	35	57	75.33	3945	**92**
42	Iowa 78 E/W @ 2 miles W of W-66	0.60	89	83.00	81	0	73	81.00	122	**93**
7	I-29 N @ County Road L-31/ exit 24	1.60	85	92.00	94	14	71	83.33	3425	**94**

Source: Iowa Department of Transportation

Railroad

Iowa railroad improvements were identified through input opportunities with the railroad companies operating in Iowa and other stakeholders. Due to the fact that most railroads are private entities, the companies make the ultimate decisions on when and where to complete improvement projects. The list of freight railroad improvements included in this section is intended to highlight potential future projects that could be considered. Some of these improvements do have funding partially committed, but most do not have set schedules or committed funding sources. Table 9.3 shows Iowa's freight railroad improvements.

Table 9.3: Freight railroad improvements

ID	Improvement	Description
1	BJRY Le Mars Transload Expansion	Construct improvements that expand the capacity of a transload operated by the BJRY in the Le Mars Industrial Park and allow it to handle additional commodities.
2	ADM "S" Curve Improvement Project at Clinton	Reconfiguration of a rail spur at the ADM Plant in Clinton, in order to straighten the curve so that multiple cars can transit the spur.
3	Construct Des Moines Rail Port Facility at Des Moines	Develop a new private rail port / transload facility in Des Moines.
4	Expand Transload Facility on IAIS at Council Bluffs	Develop an expanded transload facility on IAIS at Council Bluffs to include new track for direct rail-to-truck and truck-to-rail transloads.
5	Iowa Traction Transload Improvements	Development of an expanded transload facility on IATR at Mason City through installation of three switches, construction of 950 feet of new track, and a new bumping post.
6	Construct Siding Track for Transload Facilities on BNSF at Pottawattamie and Mills Counties in the Council Bluffs Area	Develop a siding track for use in serving a transload facility under development near Council Bluffs on the BNSF Council Bluffs Subdivision.
7	Relocate and Expand the Present CIC Team track and Transload Facility at Cedar Rapids to the Eastern Iowa Logistics Park in Cedar Rapids	Develop an expanded team track and transload facility that will offer weather-protected and bulk transload options near Edgewood Road and US Highway 30 on the CIC in southwest Cedar Rapids.
8	Expand Transload Services in Williams	Convert the existing Alliant Energy coal transloading facility on the CN Waterloo Subdivision at Williams to a standard transload facility that could handle additional commodity and product types.
9	Iowa Traction Railway Propane Terminal in Mason City Area	Project to install infrastructure to store and transfer propane between rail and truck modes on the IATR in the Mason City Area.
10	Construct a Transload / Intermodal / Port Facility at Muscatine on CP	Construct a multimodal transload / intermodal / port facility on the CP Ottumwa Subdivision and the Mississippi River at Muscatine.
11	Standard Distribution Company Rail Transload Facility Expansion in Cedar Falls	Project will increase facility size, track capacity, and staff at a transload facility on the CN Osage Subdivision in Cedar Falls.
12	Construct an Intermodal Facility at Manly on IANR	Develop a new intermodal facility on the IANR Manly Subdivision at Manly.
13	Construct an Intermodal Facility at Cedar Rapids on CIC	Develop a new intermodal facility at the Eastern Iowa Logistics Park on the CIC in Cedar Rapids.
14	Iowa Falls / Hardin County Dual Rail Connection and Transload Facility at Iowa Falls	Project would construct a dual-rail connection track to the UP Mason City Subdivision and the CN Waterloo Subdivision, four yard tracks and a siding each near CN and UP interchanges, and a transload / terminal facility.
15	A to Z Drying Rail Enhancement in Osage	Project will construct a new rail spur to serve the A to Z Drying campus utilizing the existing switch off the CN Osage Subdivision.

ID	Improvement	Description
16	Boone Industrial Park Rail Line Upgrade on BSV	Install a new, 1700-foot siding track including grading, ties, and ballasting and install ballast on a spur into an existing industrial park on the BSV in Boone in order to continue serving one rail customer and to serve one new rail customer; the upgrades on this segment will allow BSV to accommodate 286K railcars.
17	Big Soo Terminal Rail Expansion in Sioux City	Construct a new industrial spur to supplement the existing rail capacity at the Big Soo Terminal Facility in Sioux City.
18	Kemmin Industries Rail Delivery Addition in Des Moines	Construct a rail spur, bulk storage, and pumping station in Des Moines to supply local manufacturers via rail.
19	Pattison Sand Unit Train Capacity Expansion near Garnavillo	Project will cover Phases 1 and 2 of a six-phase project to expand the unit train capacity for Pattison Sand on the CP Marquette Subdivision near Garnavillo.
20	Fauser Rail Terminal Rail Access at New Albin	Construct a rail spur to serve Kemmin Industries located on the CP Marquette Subdivision at New Albin.
21	Track Upgrade on IAIS in Des Moines and West Des Moines	Rehabilitation of existing track structure with new 115 lb. rail, tie replacement, ballast placement, surfacing, and new turnouts in Des Moines and West Des Moines (4.34 miles). Improved track conditions will allow train speeds to increase from 10 mph to 25 mph, and will reduce wait times, traffic congestion, and emissions at 19 at-grade crossings in Polk County.
22	KJRY Yard Enhancements II in Keokuk	Two phase project to expand the KJRY Twin Rivers Yard in Keokuk by adding track capacity through track and switch improvements.
23	Construct Bypass Track on CIC at Cedar Rapids	Rail traffic currently moves through ADM Plant in Cedar Rapids, affecting the efficiency of operations. Project could construct a track that bypasses ADM that would allow CIC trains to travel around the plant, thus promoting efficiency and minimizing potential operating conflicts for CIC trains.
24	Develop Conceptual Design for Grade Separation at Merrill	Develop a concept for grade separation of US Highway 75 and the BNSF Marshall Subdivision in Merrill.
25	Construct the OR Bypass on CIC in Cedar Rapids	Project would construct a bypass track on CIC in Cedar Rapids to better accommodate interchange between CIC and IANR and to provide additional capacity for CIC switching operations.
26	Statewide Grade Crossing Improvement and Upgrade Projects (Federal Highway-Railroad Crossing Safety Program)	Includes anticipated annual funding from the Federal Highway-Railroad Crossing Safety Program (approximately $5.7 Million per year) to upgrade crossings with passive warning devices including cross bucks to active warning devices including flashing light signals and gate arms; upgrading existing signals; improve crossing surfaces; and to provide low-cost improvements such as increased sight distance, medians, widened crossings, or to close crossings.
27	Statewide Grade Crossing Improvement and Upgrade Projects (State Highway-Railroad Surface Repair Program)	Includes anticipated annual funding from the State Highway-Railroad Crossing Surface Repair Program (approximately $900,000 per year) to promote safety through surface replacement programs at public highway-railroad grade crossings.

ID	Improvement	Description
28	Statewide Grade Crossing Safety Fund	Includes funding for a portion of the maintenance costs for traffic control devices activated by the approach or presence of a train installed under the Highway-Railroad Crossing Safety Program.
29	Construct an Intermodal Facility in the Dubuque Area	Develop an intermodal facility in the Dubuque Area with potential access to CN and CP.
30	Construct a Transload Facility on IAIS at Wilton	Develop a transload facility on the IAIS Iowa City Subdivision at Wilton to serve Eastern Iowa.
31	Construct a Transload Facility, Cross-Dock Facility, and Industrial Siding at Forest City on NCIRC	Construct a transload facility, cross-dock facility, and an industrial siding in an industrial park area on the NCIRC (operated by IANR) at Forest City.
32	Expand and Enhance the KJRY Transload Facility at Keokuk	Expand and enhance a KJRY transload facility at Keokuk to serve southeastern Iowa.
33	Rail Access Improvement in Fort Dodge Area	Provide enhanced rail access to CN and UP in the Fort Dodge Area at a certified industrial site located in Tara, west of Fort Dodge. Options could potentially include an industrial spur and transload facility.
34	Enhancements to Manly Terminal / IANR Transload Facilities and Services at Manly	Construct the following enhancements to the Manly Terminal / IANR transload facilities at Manly: A 500,000-gallon methanol storage tank, infrastructure for a formaldehyde transload site, a dried peas transload conveyor, and infrastructure to support the manufacture and transloading of urea solution.
35	Upgrades to Main Track and Industry Track at La Porte City on IANR	Upgrade existing main and industrial track at La Porte City on the IANR Cedar Rapids Subdivision.
36	Replace the Existing UP Mississippi River Bridge at Clinton	Replace the existing UP Mississippi River swing bridge at Clinton. This location has also been recognized as an operations bottleneck, owing to delays incurred by trains that are delayed as a result of the need to open and close the bridge for barge traffic on the Mississippi River.
37	Rehabilitate or Replace the Existing CN Mississippi River Bridge at Dubuque	Rehabilitate or replace the existing CN Mississippi River swing-bridge between Dubuque, Iowa, and East Dubuque, Illinois.
38	Replace Government Bridge over the Mississippi River at Davenport	Rehabilitate or replace the existing Government Bridge over the Mississippi River between Davenport, Iowa, and Rock Island, Illinois, used by IAIS and CP.
39	Replace Crescent Bridge over the Mississippi River at Davenport	Railroad bridge functionally obsolete and cannot handle 286K car weights. Bridge used by BNSF and CP should be replaced.
40	Address Operating Bottleneck on the Existing BNSF Mississippi River Bridge at Fort Madison	Address operating bottleneck. The bridge closes for rail traffic to accommodate barge passage on the river during navigation season. The time typically required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations cause delays to BNSF, Amtrak, and vehicular traffic that share the bridge.
41	Address Operating Bottleneck on the Existing Mississippi River Bridge at Keokuk (used by KJRY)	Address operating bottleneck. The bridge closes for rail traffic to accommodate barge passage on the river during navigation season. The time required to stop trains, open the bridge for river traffic, return the bridge to its original position, and restore normal railroad operations cause delays to KJRY. Note also that the bridge cannot handle 286K railcars.

ID	Improvement	Description
42	Terminal Capacity Improvements at Sioux City	To improve the safety and efficiency of train operations of BNSF, CN, DAIR, and UP at an at-grade crossing of several rail lines in the congested terminal area and to improve capacity for carload interchange between railroads.
43	Expand Capacity at IANR Bryant Yard in Waterloo	Expand yard capacity to accommodate the convergence of traffic from three IANR subdivisions (Cedar Rapids, Manly, and Oelwein) and provide sufficient trackage to classify trains at Waterloo.
44	Expand Capacity at Nora Springs, Iowa, on IANR Manly Sub	Expand capacity to better accommodate interchange between IANR and CP at Nora Springs.
45	Expand Capacity to Address Bottleneck between Le Mars and Sioux City	Enhance capacity on the CN Cherokee Subdivision (owned by CN; maintained by UP) trackage shared by CN and UP between Le Mars and Sioux City.
46	Expand Capacity to Address Bottleneck between 26th Street and Edgewood Road in Cedar Rapids on CIC	Ease congestion and enhance capacity on CIC in the Cedar Rapids Area by double-tracking the segment between 26th Street and Edgewood Road.
47	Make Track Geometry Improvements to Address Bottleneck on the Eighth Avenue Curve on CIC in Cedar Rapids	The current 18-degree curve on the CIC at Eighth Street in Cedar Rapids limits train size and motive power options for train operations, which increases the number of trains and the volume of congestion. Project could potentially improve the track geometry so that the curve is not as restrictive.
48	Address Traffic Congestion and Safety in the Fourth Street Rail Corridor in Downtown Cedar Rapids	Note that this shared-use, mostly single-track urban corridor hosts operations of CIC, CN, IANR, and UP, and has several grade crossings.
49	Construct IAIS Bypass Track around UP Short Line Yard at Des Moines	Short Line Yard owned by UP; IAIS has trackage rights over UP between East Des Moines and Short Line Junction in Des Moines. Construct a bypass track for IAIS around UP Short Line Yard to add capacity and allow IAIS to operate through the terminal without restrictions.
50	Address Bottleneck for CN between Council Bluffs and Omaha	CN uses trackage rights over UP Mississippi River Bridge between Council Bluffs and Omaha, and experiences operating delays. CN traffic between Council Bluffs and Omaha is limited. Capacity improvements could be made to lessen CN operating delays.
51	Construction / Enhancements to the DuPont Rail Spur on CIC in Cedar Rapids	Construction / enhancements to the DuPont Rail Spur on CIC in Cedar Rapids to provide improved rail access for shipper.
52	Construct a Third Main Track on the UP Clinton Subdivision	Enhance line capacity by constructing a third main track on the UP Clinton Subdivision between Clinton and Cedar Rapids.
53	Make Capacity Improvements on the UP Trenton Subdivision	Enhance line capacity by constructing additional sidings on the UP Trenton Subdivision between Des Moines and the Iowa/Missouri state line at Lineville.
54	Address Capacity Constraints on the UP Mason City Subdivision in the Mason City Area	Enhance operating capacity on the UP Mason City Subdivision in the Mason City Area, potentially through the closure and/or separation of grade crossings and enhancement of siding capacity.

ID	Improvement	Description
55	Make Capacity Improvements on the UP Sioux City and Worthington Subdivisions in Western Iowa	Enhance line capacity by constructing additional sidings on the UP Sioux City Subdivision between California Junction and Sioux City and on the UP Worthington Subdivision between Le Mars and the Iowa/Minnesota state line near Sibley, potentially through the enhancement of existing sidings and/or construction of additional siding capacity.
56	Add Yard Capacity to the CP in Dubuque	Enhance rail yard capacity near Garfield Avenue in Dubuque. Could potentially include the extension of additional yard tracks or the extension of existing yard tracks.
57	Add Yard Capacity to the CN in Dubuque	Enhance rail yard capacity near South Port in Dubuque. Could potentially include the extension of additional yard tracks or the extension of existing yard tracks.
58	Close and/or Grade Separate Three Urban Grade Crossings on the UP at Sioux City	Consider closing and/or grade separating the following crossings with UP in Sioux City: 11th Street, 18th Street, and 28th Street; coordination between UP and the City of Sioux City for potential projects is ongoing.
59	Track and Bridge Infrastructure Upgrades on the Iowa Rail Network to Accommodate 286K Railcars	Note that there are several segments of the Iowa rail network that were identified during the railroad outreach as being incapable of handling 286K railcars; however, no specific rail line segments were specifically identified for the upgrades by stakeholders during outreach undertaken for the State Rail Plan.
60	Make Vertical Clearance Improvements to the Gordon Drive Viaduct on BNSF in Sioux City	Make clearance improvements at the Gordon Drive viaduct in Sioux City, which presently has a vertical clearance of 17'6" Above Top of Rail and does not allow for the passage of BNSF double-stack container trains.
61	Bridge Modifications to Improve Clearances for Handling High-Wide Dimensional Loads on IAIS at Marengo, Colfax, Des Moines, West Des Moines, Van Meter, and De Soto	These bridges restrict the movement of high-wide loads due to the truss construction. This affects movements between Des Moines and Council Bluffs, Iowa, and restricts movements from wind tower producers. Bridges include: Marengo (Newton Subdivision MP 268.6), Colfax (Newton Subdivision MP 329.1), Des Moines (Council Bluffs Subdivision MP 360.9), West Des Moines (Council Bluffs Subdivision MP 373.0), Van Meter (Council Bluffs Subdivision MP 378.1), and De Soto (Council Bluffs Subdivision MP 380.4).
62	Mitigation Measures in Flood Prone Areas on IAIS at Moscow, Colfax, Pleasant Hill, and Des Moines	Address the following flood prone areas: Moscow (Iowa City Subdivision MP 211.75-MP 212.75); Colfax (Newton Subdivision MP 334.25-MP 336.0); Pleasant Hill (Newton Subdivision MP 352.25-MP 353.0); and Des Moines (Council Bluffs Subdivision MP 359.04-MP 362.25).
63	Mitigation Measures in Flood Prone Areas on KJRY in Keokuk Area	Address the flood prone area along the Mississippi River between Keokuk, Iowa, and Hamilton, Illinois.
64	Mitigation Measures in Flood Prone Areas on UP at Cedar Rapids, Beverly, Montour, and Missouri Valley-Council Bluffs/Omaha	Address flood prone areas on the UP Clinton Subdivision in Cedar Rapids, Beverly Yard, and Montour, and on the UP Omaha Subdivision between Missouri Valley and Council Bluffs/Omaha.

ID	Improvement	Description
65	Statewide Grade Crossing Improvement and Upgrade Projects (Federal Highway-Railroad Crossing Safety Program)	Includes anticipated annual funding from the Federal Highway-Railroad Crossing Safety Program (approximately $5.7 Million per year) to upgrade crossings with passive warning devices including cross bucks to active warning devices including flashing light signals and gate arms; upgrading existing signals; improve crossing surfaces; and to provide low-cost improvements such as increased sight distance, medians, widened crossings, or to close crossings.
66	Statewide Grade Crossing Improvement and Upgrade Projects (State Highway-Railroad Surface Repair Program)	Includes anticipated annual funding from the State Highway-Railroad Crossing Surface Repair Program (approximately $900,000 per year) to promote safety through surface replacement programs at public highway-railroad grade crossings.

Source: Iowa Department of Transportation

Waterway

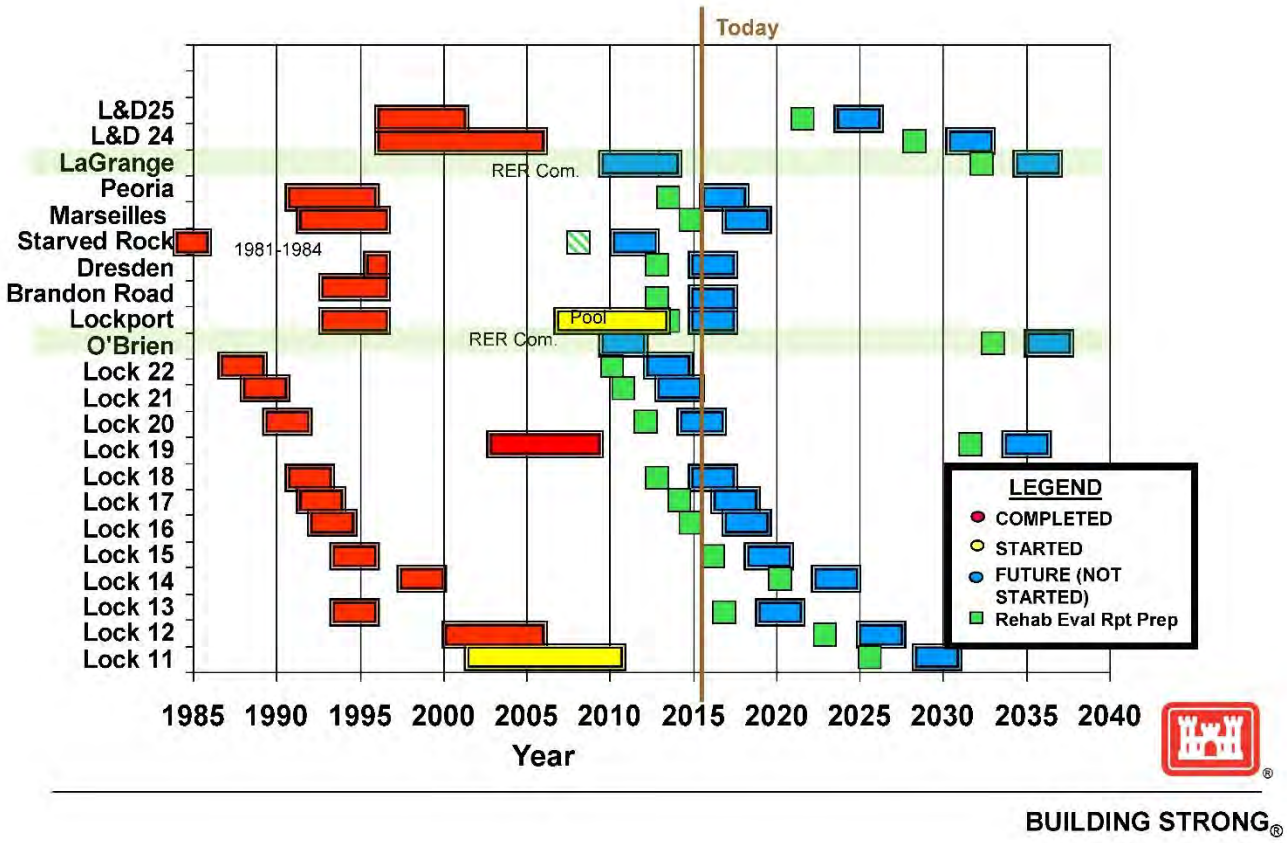
The U.S. Army Corps of Engineers is responsible for all inland waterway navigation projects in the United States. In Iowa, the USACE Rock Island and St. Paul districts maintain the Mississippi River (M-35) and the Omaha District maintains the Missouri River (M-29). This section outlines current and future navigation projects provided to the Iowa DOT by each of the three districts.

The USACE refers to the river navigation infrastructure priorities they are responsible for as a “three-legged stool.” The three parts 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 Lock and Dam 11-19 in Iowa (refer back to Figure 6.8) are below.

- **Operations and maintenance (O&M):** 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 hasn’t been allocated for the last 15 years.
- **Improvements (small- and large-scale):** The authorization for improvements is the Navigation and Ecosystem Sustainment Program (NESP), 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 9.5. Most of the locks bordering Iowa (Lock 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 a project being funded for construction. These spell out the cost, scope, urgency, and objectives of the rehabilitation project. As of now, none of the RERs have been funded for any of the Iowa locks. Rehabilitation was recently started on Lock and Dam 11 but wasn't funded to completion.

Figure 9.5: Schedule of major rehabilitations on the Upper Mississippi River, Rock Island District



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

New 1,200-foot locks have been authorized at seven locations, five of which are on the Mississippi River. The seven include Lock and Dam 20, 21, 22, 24, and 25 on the Mississippi and the La Grange and Peoria lock and dams on the Illinois River (see Figure 9.6). Although none of these locations border the state, Iowa products traveling down the river to the Gulf of Mexico must pass the five Mississippi River locations on the way.

Expanding these locks from 600 feet to 1,200 feet would allow for more efficient transportation, operation 12 months of the year, and eliminate the single-point-of-failure system as far north as Lock and Dam 18 at Burlington, Iowa. (A new 1,200-foot lock would be constructed next to the existing 600-foot lock allowing for traffic to lock through even if one lock is unavailable.) All of this, of course, depends on funding levels and whether sufficient amounts are allocated for operations and maintenance, major rehabilitations, and improvements.

Figure 9.6: Proposed 1200-foot locks in the Upper Midwest

Source: U.S. Army Corps of Engineers, Prairie Rivers Network

The St. Paul District is responsible for Lock and Dam 9 and 10 in Northeast Iowa (refer back to Figure 6.8). This district recently finished a major rehab at Lock 9, which was opened to traffic for the 2016 navigation season. This was the last major rehab/dewatering in the foreseeable future in this District. A dredge material placement site unloading in Pool 10 was completed in 2015 that has established some capacity for future routine dredging operations in that pool. Although there will continue to be channel maintenance dredging projects in both pools annually, the district doesn't anticipate any large scale projects that will significantly impact navigation.

The Omaha District is responsible for the portion of the Missouri River that borders Iowa. The primary focus is on the Bank Stabilization and Navigation Project (BSNP) with the authorized purpose of providing a reliable, self-scouring navigation channel from St. Louis, Missouri, to Sioux City, Iowa, that is 9 feet deep and not less than 300 feet wide.

Between 3,500 and 4,000 structures (various rock dikes and revetments) were originally built for the BSNP in the Omaha District. Of those structures, about 2,500 to 3,000 are within the river's normal flow level for which the Omaha District performs inspection and O&M activities. These activities are mainly accomplished with in-house labor crews and float plants, and typically require between 20,000 and 30,000 tons of rock placement for annual maintenance.

When significant damages occur from major flood events, the Omaha District will hire contractors to supplement in-house efforts. The district completed the last of the BSNP flood repair contracts in 2016, which combined required in excess of 520,000 tons of rock to stabilize the navigation channel from the more significant effects of a 2011 flood. Although this will not fully restore the channel to its pre-2011 flood condition, the remaining less significant repairs are being prioritized through the routine O&M program to avoid negatively impacting performance to the extent possible. No major issues occurred with navigation channel depths during the 2015 flow season, and no additional major rehabilitation projects or large-scale repair efforts are planned on the BSNP in the foreseeable future.

In addition to supporting the USACE in developing and completing the lock and dam rehabilitation, dredging, facility and equipment upgrades, and other channel maintenance projects listed here, the Iowa DOT will continue to work with the Upper Mississippi River and Missouri River states, as well as other stakeholders toward common goals of improved inland waterway infrastructure and navigation on the M-35 and M-29 Marine Highways.

9.3 Freight investment plan

Section 167 of the FAST Act documents the National Highway Freight Program (NHFP), a policy developed to improve the condition and performance of the National Highway Freight Network (NHFN). The NHFP created a formula program funded at $1.15 billion to $1.5 billion per year to be used for freight-related projects across the country. Each state receives funds in proportion to the amount of funds a state receives compared to other states under all formula-apportioned programs.

A state may not obligate these funds unless the state has developed a freight plan in accordance with 49 U.S.C. 70202[55] of the FAST Act. Under this section, freight investment plans that include a list of priority projects and describe how funds made available would be invested and matched are a required element of state freight plans. Iowa's allocation of NHFP funding is shown in Table 9.4.

Table 9.4: National Highway Freight Program funding allocation – Iowa, 2016-2020

	Allocation	10% of allocation
FY2016	$14,085,949	$1,408,595
FY2017	$13,386,574	$1,338,657
FY2018	$14,627,929	$1,462,793
FY2019	$16,535,678	$1,653,568
FY2020	$18,372,976	$1,837,298

Source: Iowa Department of Transportation, Federal Highway Administration

These NHFP funds may be spent on any of the following components of the NHFN:

- Primary Highway Freight System (PHFS)
- Critical Rural Freight Corridors (CRFCs)
- Critical Urban Freight Corridors (CUFCs)
- Portions of the Interstate Highway System not designated as part of the PHFS

See Chapter 6, Freight transportation assets, for more information on the routes in Iowa that are on the NHFN.

[55] 49 U.S.C. 70202 of the FAST Act provides requirements for state freight plans. See Chapter 1, Introduction for a listing of these requirements.

Each fiscal year, a state may obligate no more than 10 percent (see Table 9.4) of the total apportionment to the state for freight intermodal or freight rail projects, including projects:

- Within the boundaries of public or private freight rail or water facilities (including ports); and
- That provide surface transportation infrastructure necessary to facilitate direct intermodal interchange, transfer, and access into or out of the facility.

The Iowa DOT and Iowa Transportation Commission have chosen to allocate these flexible funds through a competitive grant program known as Linking Iowa's Freight Transportation System (LIFTS), an updated version of the original LIFTS pilot program described in Chapter 8, Iowa's decision-making process. LIFTS allows stakeholders outside of the Iowa DOT to apply for the flexible funding for use on freight projects. Project evaluation criteria will be designated and communicated prior to the initial application cycle and Iowa DOT staff, with support from external freight stakeholders, will review and prioritize applications on an annual basis. Following each funding cycle, this freight investment plan will be amended to incorporate the awarded projects.

Table 9.5 shows Iowa's freight investment plan for the use of allocated NHFP funds through 2020. The majority of NHFP funds (90 percent) will be used for highway projects ranking in the top 10 of the VCAP matrix in Section 9.2, Iowa's freight improvements. The remaining 10 percent will be used to fund freight projects through the LIFTS program (see Table 9.6).

Table 9.5: Iowa freight investment plan, 2016-2020 (funding in 1,000s)

County	Location, Project	Funding	FY2016	FY2017	FY2018	FY2019	FY2020	Total
Pottawattamie	Council Bluffs, Interstate Highway System *VCAP #1*	NHPP	$118,353,646	$86,520,083	$102,107,032			$306,980,761
		NHFP	$12,677,354	$12,047,917	$12,462,968			$37,188,239
		Primary Road Fund match	$14,559,000	$10,952,000	$12,730,000			$38,241,000
		Total project cost	$145,590,000	$109,520,000	$127,300,000			$382,410,000
Scott	Davenport, I-74 bridge replacement *VCAP #3*	NHPP			$216,083,294	$55,110,890		$271,194,184
		NHFP			$702,168	$14,882,110		$15,584,278
		Primary Road Fund match			$24,016,300	$7,777,000		$31,793,300
		Total project cost			$240,801,762	$77,770,000		$318,571,762
Johnson	Iowa City, I-80/I-380 interchange *VCAP #7*	NHPP					$24,924,222	$24,924,222
		NHFP					$16,535,678	$16,535,678
		Primary Road Fund match					$4,609,100	$4,609,100
		Total project cost					$46,069,000	$46,069,000
	LIFTS projects	NHPP						
		NHFP		$2,528,931	$1,681,114	$1,653,568	$1,837,298	$7,700,911
		Match						
		Total project cost						

(continued on following page)

County	Location, Project	Funding	FY2016	FY2017	FY2018	FY2019	FY2020	Total
	Totals	Allocated	$14,085,949	$13,386,574	$14,627,929	$16,535,678	$18,372,976	$77,009,106
		Carryover previous year		$1,408,595	$218,321			
		Programmed	$12,677,354	$14,576,848	$14,846,250	$16,535,678	$18,372,976	$77,009,106
		Fiscally constrained	Yes, the amount programmed is less than or equal to the amount available	Yes, the amount programmed is less than or equal to the amount available	Yes, the amount programmed is less than or equal to the amount available	Yes, the amount programmed is less than or equal to the amount available	Yes, the amount programmed is less than or equal to the amount available	Yes, the amount programmed is less than or equal to the amount available

Source: Iowa Department of Transportation

Table 9.6: FY2017 LIFTS Grant Program awards

Awardee	Project Description	Total Awarded
Iowa Northern Railway and City of Garner	Construction of 4,100 feet of track to allow Zinpro Corporation to receive and ship hydrochlorid acid by rail. This will also allow other local businesses to utilize truck-to-rail or rail-to-truck transloading.	$1,112,068
Pattison Sand Company	Construction of a bridge over rail tracks to keep their existing supply hauling route open for the sand plant operation during and after the construction of a $25 million unit train expansion facility.	$513,012
Growmark, Inc.	Construction of a propane unloading and storage facility on the Iowa Southern Railway in Moravia.	$497,000
Keokuk Junction Railway Company	Replacement of an existing rail structure in Keokuk on the KJRY railway that was damaged by a previous derailment and is beyond repair. Structure will be replaced with triple box culverts.	$222,851
Cerro Gordo County	Construction of a permanent ground level storage tank with a containment dike and piping to improve the efficiency of transferring liquid sulfuric acid from truck to rail.	$184,000
Available Funding		**$2,747,252**
Total Awarded		**$2,528,931**
Remaining Funds (available for future awards)		**$218,321**

Appendix 1

The table below provides the state freight plan requirements from 49 U.S.C. 70202 of the Fixing America's Surface Transportation (FAST) Act and the location in the Iowa State Freight Plan where each is documented.

Table A.1: Fixing America's Surface Transportation Act state freight plan requirements

State freight plan requirement	Location in Iowa State Freight Plan
An identification of significant freight system trends, needs, and issues with respect to the state.	Freight trends, needs, and issues in the state are identified in Chapter 5, Trends and issues.
A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state.	Freight policies and strategies are discussed in Chapter 9, Freight improvement strategy. Performance measures are discussed in Chapter 7, Conditions and performance of the freight transportation system.
When applicable, a listing of - (a) multimodal critical rural freight facilities and corridors designated within the state under section 70103 of title 49 (National Multimodal Freight Network); and (b) CRFCs and CUFCs designated within the state under 23 U.S.C. 167 (National Highway Freight Program).	Multimodal critical rural freight facilities and corridors designated within the State under 49 U.S.C. 70103 (National Multimodal Freight Network) and CRFCs and CUFCs designated within the state under 23 U.S.C. 167 (National Highway Freight Program) are identified in Chapter 6, Freight transportation assets.
A description of how the plan will improve the ability of the state to meet the national multimodal freight policy goals described in 49 U.S.C. 70101(b) and the national highway freight program goals described in 23 U.S.C. 167.	The national freight goals are identified in Chapter 2, Strategic goals. Alignment with the national freight goals is highlighted in Chapter 9, Freight improvement strategy.
A description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of the freight movement, were considered.	Innovative technologies and operational strategies that improve the safety and efficiency of freight movement are discussed in Chapter 9, Freight improvement strategy.
In the case of roadways on which travel by heavy vehicles, including mining, agricultural, energy cargo or equipment, and timber vehicles, is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration.	Roadways travelled by heavy vehicles are identified in Chapter 6, Freight transportation assets, and Chapter 7, Conditions and performance of the freight transportation system. Improvements are identified in Chapter 9, Freight improvement strategy.
An inventory of facilities with freight mobility issues, such as bottlenecks, within the state, and for those facilities that are state owned or operated, a description of the strategies the state is employing to address those freight mobility issues.	Facilities with freight mobility issues are inventoried in Chapter 7, Conditions and performance of the freight transportation system. Strategies to address these locations are discussed in Chapter 9, Freight improvement strategy.

State freight plan requirement	Location in Iowa State Freight Plan
Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay.	Significant congestion or delay caused by freight movements is discussed in Chapter 7, Conditions and performance of the freight transportation system. Strategies to mitigate the congestion or delay are discussed in Chapter 9, Freight improvement strategy.
A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched.	The Iowa freight investment plan is identified and discussed in Chapter 9, Freight improvement strategy.
Consultation with the State Freight Advisory Committee, if applicable.	Chapter 8, Iowa's decision-making process, highlights the involvement of the Iowa Freight Advisory Council in development of the Iowa State Freight Plan.

Source: Federal Highway Administration, Iowa Department of Transportation

Appendix 2

Freight Advisory Council identified issues

In the council's first meeting, members identified 48 specific issues perceived to be roadblocks to efficient and competitive freight movement. Realizing the difficulty of researching, validating, and prioritizing all of the issues, they were sorted into seven categories; some falling into more than one category. Council members and government personnel were divided into subgroups to write reports to further define and gain a common understanding of the issues relating to each category. The following sections show the original 48 identified issues.

Infrastructure

- Limited intermodal connections
- Deteriorating infrastructure, including rural roads and bridges
- Congestion/Capacity challenges
- Need more direct water transportation information
- Website
- Coordinate with federal agencies
- Aging locks and dams
- Impact on transportation costs
- Distillers dried grain (DDG) – oil aggregation site
- Potential transload
- Transload facility study
- Bridge abutments/approaches
- Poor elevation alignment may cause damage to bridges and vehicles
- Better bridge analysis to minimize requirements for oversize vehicles (i.e., must straddle centerline and reduce speed considerably)
- Safety of curves due to lack of signage
- Migration of long-haul movements to rail (intermodal need)
- Fuel costs
- Driver shortage
- Ramps – trucks make roundtrip container hauls (paper ramps)
- Getting containers to Central Iowa – Firestone and identity preserved soybeans

- Container balance – Chicago
- Farm-to-market (FM) roads – local roads direct access
- Diesel fuel shortage – upcoming harvest season diversion to the Dakotas for fracking
- Road condition impact on equipment
- Analyze truck size and weight requirements: heavier containers provide advantage

Operations

- Congestion/Capacity challenges
- Roadway geometry issues at intersections related to the length of turbine blades (i.e., roundabouts for bigger loads)
- Labor (driver shortage)
- Weight considerations for carriers switching to compressed natural gas (CNG)
- Reasonable access to commercial driver's license (CDL) testing facilities
- Get quality drivers/ability to pass tests (drug, etc.)
- Lack of quality drivers to pursue that career path – being home at night
- Shortage of labor for all skilled industries in Iowa and retaining youth in Iowa
- Mechanical solutions to carry more weight per truck – more axle configurations
- Farmers using more semis to haul grain farther resulting from changes in farming, also other businesses have changed resulting in more trucking
- Long construction zones
- County budgets limiting when local roads are cleared from snow/ice
- Information on road conditions for transport providers to make routing decisions
- Consider freight movements when performing state, county, and city maintenance activities

Regulations

- Hours of service
- Federal truck size and weight study
- Rail regulation
- Integrated county and local permitting
- Oversize/Overweight (OS/OW) permitting
- Interstate (cross state) coordination of regulations
- Make it easier to comply
  - o Education
  - o Information/User friendly

- o Use agriculture extension to educate
- o Turbo Tax® type of interface to educate on regulations/Iowa Economic Development Authority example for small businesses
- Too lax – allowing non-CDL drivers to operate air brakes
  - o Require farmers to have CDL if trucking on roadways

Financial

- Transportation funding (i.e., fuel tax increase, etc.)
- Energy costs and their relationship to freight
- Economy
- How to generate revenues from alternative fuel vehicles for use of the roadways

Research and education

- Factors influencing freight modal shifts
- Lack of empty containers for use in Iowa
- Lack of engagement by stakeholders in the transportation planning and programming processes

Etc.

- Impacts from new industries like biofuels and cellulosic
- Development of infrastructure to support use of compressed natural gas along commercial corridors
- Compliance, safety, and accountability (CSA) challenges
  - o Federal Motor Carrier Safety Administration enforcement
  - o Iowa DOT enters/records every inspection

Freight Advisory Council (FAC) strategic solutions

Chapter 7, Conditions and performance of the freight transportation system, introduced 48 critical issues in seven categories identified through a series of facilitated discussions and exercises between the Iowa DOT and the FAC. These issues represent those that are considered to be the most urgent by the freight industry representatives of the FAC. The identification of these issues was then followed by a process of developing and prioritizing possible solutions for each.

Council members and government personnel were divided into subgroups to write reports to further define and gain a common understanding of the issues relating to each of the seven categories. Each subgroup then generated a list of possible solutions and expected outcomes. This was an “all-inclusive”

list, with the understanding that some of the ideas will not be pursued. The full FAC convened to prioritize the list of ideas into a set of prioritized solutions.

The prioritized solutions were determined using three separate methodologies. The FAC conducted a multivote (scale of 1-5) of the perceived impact each of the 63 possible solutions may have on the movement of freight in the state. They then took the scores that were predominantly 4 and 5 and used stickers to rank those solutions. A statistical process was then used on the multivote results to provide a weighted score for each solution. The result was a list of 12 prioritized solutions to be immediately pursued, which were presented in Chapter 9, Freight improvement strategy.

The full list of possible solutions is as follows.

Financial

A. Consider increasing the state's fuel tax rates by legislature.
   (F)1. **Solution:** Increase the state's fuel tax.
   Outcome: This is currently the most equitable way of increasing revenue as it charges based on use of the highway system and it captures out-of-state travelers.
   (F)2. **Solution:** Eliminate variable fuel tax exemption.
   Outcome: Elimination of the variable fuel tax exemption for ethanol would add an additional $7 million annually to the RUTF.
   (F)3. **Solution:** Eliminate dyed diesel fuel tax exemption for agricultural uses.
   Outcome: Elimination of this exemption would bring in additional revenue to the RUTF from users of the system that are not currently paying for their use.
   (F)4. **Solution**: Craft a bipartisan deal that starts the tax increase lower than an initial 10 cents recently proposed and index the increase each year, such as a 6 cents increase, indexed to increase 1 cent every two years.
   Outcome: A consistent, regular funding source that helps to meet Iowa's infrastructure needs, and leaves room for other funding mechanisms to take place (registrations, licenses, etc.).

B. Consider fuel tax indexing opportunities for legislature.
   (F)5. **Solution:** Index fuel tax rates to consumer price index (CPI).
   Outcome: Additional fuel tax would be generated as fuel tax rates are increased based on CPI.

C. Evaluate all freight modes, financial needs, resources, and impacts.
   (F)6. **Solution:** Conduct a comprehensive study of the freight modes, needs, resources and impacts.
   Outcome: Results of the study could guide an investment strategy for the limited funding available for freight activities.

D. Propose a funding mechanism that applies to alternatively fueled vehicles.
   (F)7. **Solution:** Change from fuel tax to a mileage-based user fee.
   Outcome: A reliable funding source based on the use of the system.
   (F)8. **Solution**: Propose a weight fee for alternatively fueled vehicles (going all the way up to natural gas or hybrid semitrucks) that would index to slightly less than what that typical weight vehicle would pay in fuel taxes.
   Outcome: An incentive to drive alternatively fueled vehicles remains, but it starts a funding source to assess impacts of the vehicle closer to standard fuel tax paying vehicles.

E. Consider fairness and equity across all modes with any new revenue-generating models.
   (F)9. **Solution**: Produce a report for each funding source, including a breakdown of the vehicles paying the tax and where the money goes.
   Outcome: Additional awareness and education of how and where money comes from to maintain/develop the system.

F. Consider other funding sources besides the RUTF (e.g., rail property taxes, barge fuel tax, pipeline fees).
   (F)10. **Solution:** Explore other funding options, such as customs fees on containers (federal); state tire tax; investment tax credits for railroads (federal); sales tax on motor fuel, local option taxes and tolls.
   Outcome: Increasing revenue sources beyond the RUTF would provide funding for other modes beyond just highway.
   (F)11. **Solution**: Add other funding source options to previously done studies to show what the fees would go toward and what issues they would address.
   Outcome: Provide a tangible link to funding proposed and work to be done.
   (F)12. **Solution:** Further explore new and innovative funding options, such as those included in the Citizen Advisory Committee Final Report.
   Outcome: Potential for additional revenue. Current funding revenue sources to the RUTF weigh heavily on usage by drivers.

In the final analysis, only one of the possible solutions regarding government revenue streams ranked in the top 12 to be immediately pursued.

- (F1) Increase the state fuel tax.

Infrastructure challenges

A. Secure funding to address the present and future needs of Iowa's freight infrastructure by exploring all revenue generating mechanisms.
   (I)1. **Solution:** Evaluate using more than one mechanism to raise revenue. Generating revenue from multiple sources will spread the impact over highway users and lessen the impact a fuel tax inflicts.
   Outcome: Consistency in the revenue stream.
   (I)2. **Solution:** Increase the state fuel tax.
   Outcome: Meet the urgent road and bridge repair needs the Iowa DOT has identified.

B. The need for coordinated, multimodal prioritization between all entities and modes.

(I)3. **Solution:** Recognize agriculture's contribution to the state, including its economy, and factor into prioritizing projects. According to the Iowa State University's analysis of U.S. Department of Agriculture data, agriculture employs (directly or indirectly) one in six Iowa workers and is responsible for 27 percent of the state's total economy.
Outcome: A road system that supports Iowa's economy and prioritizes projects accordingly.

(I)4. **Solution:** Prepare a state freight infrastructure plan to optimize our infrastructure investments.
Outcome: This will allow the state to identify better relationships between sectors, see more clearly where the opportunities to better our infrastructure lie, and help to decide which projects should be prioritized.

(I)5. **Solution**: Study the movement of freight and how each modal system competes and cooperates with the others.
Outcome: Better understanding of the larger multimodal picture.

C. Making Iowa's freight infrastructure more relevant to today's and tomorrow's industries.

(I)6. **Solution:** Take a proactive approach to making independent solutions as a state and not waiting for federal guidance.
Outcome: Solutions are streamlined as contributions are made at the state level.

(I)7. **Solution:** Identify a mechanism for the growing/changing size of loads and equipment in the planning and design of the roadway infrastructure.
Outcome: Roads and bridges are built and maintained to meet the needs of Iowa's economy.

(I)8. **Solution:** Using geographic information systems (GIS), identify the key freight shippers in the state of Iowa.
Outcome: Using GIS to illustrate the large industries and their transportation connections and needs.

D. Evaluate what other jurisdictions are currently doing to address infrastructure challenges.

(I)9. **Solution:** Explore best-practice solutions from other jurisdictions so investment strategies are tried and true.
Outcome: Using alternatives that are known to work makes the overall system more efficient.

E. Focus on infrastructure challenges of all freight modes (rail, water, etc.).

(I)10. **Solution:** Intermodal and multimodal facilities must be optimized to allow movement of freight between modes efficiently so it is economical for businesses to use alternative modes.
Outcome: Freight movement using intermodal and multimodal facilities will help improve the overall efficiency of the movement and help lower logistic costs.

(I)11. **Solution:** Include other freight modes in funding conversations.
Outcome: A valued learning experience of how the various freight modes work with each other and how enhancements may be accomplished.

F. Evaluate where Iowa's funds are currently generated from and where they are being spent.
   (I)12. **Solution:** Maintain the RUTF's current distribution formula. Add revenue to the formula by increasing the state's fuel tax.
   Outcome: A properly funded road system that meets the needs of our population and our economy.
   (I)13. **Solution:** A thorough review of the modal funding information we already have access to, including the trends.
   Outcome: Outlining where things are going in Iowa, make that information available to the public and legislature, and establishing our future outcomes based on the current trends.

In the final analysis, five of the possible solutions regarding infrastructure challenges ranked in the top 12 to be immediately pursued. These are:

- (I1) Evaluate using more than one mechanism to raise revenue.
- (I2) Increase the state fuel tax.
- (I4) Prepare a state freight infrastructure plan to optimize our infrastructure investments.
- (I5) Study the movement of freight and how each modal system competes and cooperates with the others.
- (I10) Optimize intermodal and multimodal facilities.

Labor and driver shortages

A. The age-gap between when prospective drivers are choosing a career and when they are old enough for licensing.
   (L)1. **Solution:** Hold industry specific job fairs and create various recruitment programs such as "ride-along" opportunities at the high school and early college levels for students interested in a trucking career. Create early preparation programs at the high school and college level.
   Outcome: Potential new drivers will be introduced to the trucking career before they are 21-25 years old.
   (L)2. **Solution:** Recruitment of veterans who are returning to the civilian work force to be truck drivers.
   Outcome: Will help with the shortage of drivers and help take care of veterans looking for employment.

B. Insurance company restraints (age requirements).
   (L)3. **Solution:** A collaborated effort between the insurance companies and the truck driving schools to come together to better standardize driver training programs. Work together to better understand the reasoning behind the age requirement
   Outcome: If commercial truck insurance companies were more involved in creating standardized curriculum, perhaps they would be more comfortable with new drivers.

C. Quality of life – balancing a job on the road with life at home.

(L)4. **Solution:** When hiring new drivers, include training on adapting and understanding the lifestyle of a long haul driver.
Outcome: Training programs would focus more on the lifestyle skills it takes to succeed in the industry. Training could also incorporate health and fitness, diet, sleep, hygiene, and personal budgeting so potential drivers see these programs not only as beneficial to their careers but to their personal health as well.

D. Appeal – raise the esteem of the trucking industry so that potential employees see it as a desirable career choice.

(L)5. **Solution:** Develop a strong education/public awareness campaign to do away with the preconceived notion that truck drivers are all middle-aged men alone on the road. Instead, these drivers possess highly qualified skills and have to adhere to tight delivery schedules, comply with a variety of rules and regulations, and handle a variety of technology.
Outcome: Changing the stereotype of the typical truck driver to help create an appealing industry image.

(L)6. **Solution:** Focus on the up and coming technology aspect of the truck driving profession. Technology used includes automatic transmissions, automated handling of freight (loading and unloading no longer done by the driver, which keeps them well rested), and safety developments that may aid in the evaluation of driver fatigue or other health issues. Trucks now have the same technology one would see in luxury sedans.
Outcome: Will create an image that says truck drivers are highly skilled in some of the industry's latest technology.

(L)7. **Solution:** Find new ways to recruit and draw women into the trucking industry. Better attempts to target women directly by organizing "all-women" events and giving women who are already in the industry the chance to speak with other women.
Outcome: Changing the stereotype of a male-dominated industry to help solve the driver shortage issues.

In the final analysis, none of the possible solutions regarding labor shortage ranked in the top 12 to be immediately pursued.

Operations

A. Design considerations.

(O)1. **Solution:** Establish a truck maximum capacity where truck operations improvements need to be evaluated to increase the roadway's truck capacity.
Outcome: In order to improve high truck volume locations, there needs to be guidance/standard/threshold information available as to what is a high truck volume to improve the roadway capacity in high volume truck locations.

(O)2. **Solution:** When business developments are created or expanded, conduct traffic and safety studies early in development to look at individual locations and possible solutions.
Outcome: Proactively assess anticipated changes in freight flows to deal with anticipated congestion and safety issues.

(O)3. **Solution:** Develop standards for roadway design (especially for recent innovations such as roundabouts) that take into consideration the local and regional freight transportation needs, adequate clearances, turning lanes and radii, lane width, etc.
Outcome: This will provide improved mobility and safety.

(O)4. **Solution**: Coordinate with the IEDA to identify prime locations for freight intensive development and incorporate alternatives in design plans for future infrastructure needs at those locations
Outcome: Encourage development at locations that are most suitable for freight intensive industry.

B. Maintenance considerations.

(O)5. **Solution:** Develop a regional Freight Roadway Network for Iowa utilizing origination/ destination or travel demand modeling that compares the number of trucks and freight tonnage.
Outcome: This will allow recognition of the primary freight corridors and their needs to be included when considering interrupting traffic operations.

(O)6. **Solution:** Evaluate the potential to conduct more construction and maintenance activities in hours or time increments that minimize the impact to freight traffic.
Outcome: Congestion involving heavy freight movements would be improved, increasing safety and mobility for all.

(O)7. **Solution:** Develop standards for construction zone lengths with multiple intersection closings if the truck percentage is high or the detour route also has construction planned (state, county, and city communication prior to construction).
Outcome: This will provide a balance between the needs for maintenance and the movement of freight.

C. Policy considerations.

(O)8. **Solution:** Study the effects of restructured county road systems by designating routes as local farm ground/residence access or regional access (rural collectors). Comparisons of the current mile-by-mile grid versus a new prioritized hierarchical system should be developed.
Outcome: This will allow counties to manage their roads as they are currently operating and assist with implementing asset management principles, which will improve the overall performance of the county road system.

D. Consideration for changes in farming.

(O)9. **Solution:** Conduct a thorough examination of current federal surface transportation bill, Moving Ahead for Progress in the 21st Century Act (MAP-21).
Outcome: This will provide a better understanding of new policy issues and knowledge of new possible funding sources.

(O)10. **Solution:** Conduct congestion studies at grain distribution hubs, such as major grain processors, consolidated farms, coops, and barge terminals.
Outcome: Improved freight traffic flow regarding movement of grain.

(O)11. **Solution:** Re-evaluate the Farm-to-Market System to better allow for actual freight movements for areas with changes or additional destinations (i.e., ethanol plants, new transloading facilities, biofuel changes, etc.).
Outcome: This will allow a planned approach for traffic conflict resolution where new urban expansion has made areas virtually inaccessible for the new farm equipment.

In the final analysis, two of the possible solutions regarding operations ranked in the top 12 to be immediately pursued. These are:

- (O3) Develop standards for roadway design (especially for recent innovations such as roundabouts) that take into consideration the local and regional freight transportation needs.
- (O11) Re-evaluate the Farm-to-Market System to better allow for actual freight movements for areas with changes or additional destinations (i.e., ethanol plants, new transloading facilities, biofuel changes, etc.).

Policy support and communication

A. Assessing Iowa's strengths and weaknesses within its freight transportation system.
(P)1. **Solution**: Work with the FAC to develop goals and criteria to achieve an efficient and balanced freight network and identifying policies that the State of Iowa currently has related to the movement of freight. Compare current conditions with goals and criteria to identify shortfalls.
Outcome: This analysis will provide direction to create a strategy for implementation.

B. A compilation of information on freight terminal locations for **all** modes.
(P)2. **Solution**: Update current directories (see Regulatory authorities section) and consolidate into a single map-based interface that provides a one-stop shop for modal links. Identify/Research other areas that may impact freight movement and policy decisions.
Outcome: This will provide current information on all modes of transportation as it relates to the freight industry.

C. A comparative analysis (delivery times, environmental impacts, etc.) of the different modes.
(P)3. **Solution**: Conduct a literature review of recent research.
Outcome: As stated above, some research has already been conducted (TTI, AAR). This will provide a compilation of current thoughts and provide insight into gaps in needed research.

D. Study future needs for growth industries
(P)4. **Solution**: Proactively be involved in early stages of new or expanded development to assess transportation impacts and needs.
Outcome: This will provide a "jump start" for needed improvements that may have a longer planning and funding cycle than private development.

E. A better conduit for input and discussion for policy development.
   (P)5. **Solution**: Explore and implement technology-based communications such as a freight-related "social network."
   Outcome: By providing current policy or regulatory topics under consideration, this input feed can allow for timely input from all stakeholders.
   (P)6. **Solution**: Advertise outputs of the Iowa FAC and conduct a biennial open house to the freight community.
   Outcome: This will provide an opportunity for the at-large freight community to voice opinions on current policy decisions and the operations of the Iowa FAC.

F. A single resource to link all of the above.
   (P)7. **Solution**: Create a Web-based site for a "one-stop" research area that provides links to comparative shipping analyses, regulations, research, and policy input opportunities.
   Outcome: This will provide easy access to information to enhance decision-making for shippers, carriers, and regulatory authorities.

In the final analysis, none of the possible solutions regarding policy support and communication ranked in the top 12 to be immediately pursued.

Regulation

A. Streamline the permitting process. The current processes are confusing and cumbersome to shippers and truckers.
   (R)1. **Solution**: Reach reciprocity agreements with neighboring states to minimize the number of permits (e.g., fuel and trip) needed by Iowa freight haulers, within an agreed distance of the states' borders.
   Outcome: Free economic movement with fewer procedural fines.
   (R)2. **Solution**: Iowa is developed the Iowa Automated Permitting System (IAPS), which has been in use since the end of 2013. Continued updates and improvement of this system will be necessary.
   Outcome: A streamlined permit issuance process with an interface similar to most of Iowa's surrounding states, as well as better communication and reporting capabilities for carriers.
   (R)3. **Solution:** Getting Iowa involved in the Got Permits system, which gives OS/OW carriers and permitting agencies direct online access to state transportation departments OS/OW and licensing systems. It would also offer intelligent online mapping and routing. (Other states that are currently involved include Alabama, Nebraska, New Jersey, Ohio, South Dakota, West Virginia, Illinois, and more.)
   Outcome: Allowing OS/OW carriers to get to their destinations as quickly and efficiently as possible.
   (R)4. **Solution**: Develop a Midwestern/regional regulation and permitting website.
   Outcome: Streamlines the process for shippers and truckers, providing easier access and potentially leading to some cost savings.
   (R)5. **Solution**: Continued involvement in the American Association of State Highway and Transportation Officials and the Standing Committee on Highway Transport so that the State of Iowa can continue to be involved with and provide input on a number of issues, including the harmonization effort for member states to reach a consensus on certain standardized truck size permitting requirements.

Outcome: To ensure and promote seamless and efficient transportation systems across the state and region.

B. Provide easier access to information regarding Iowa's Trucking regulations.
   (R)6. **Solution**: Online module(s) to help various types of freight haulers to understand which rules and regulations apply to them. The module would ask the freight hauler for information about his/her truck/trailer, trip, and cargo, and provide the relevant rules/regulations for that situation.
   Outcome: Clearer understanding and better compliance.
   (R)7. **Solution**: Improve the Iowa DOT's Office of Motor Carrier website that provides information to the trucking industry.
   Outcome: Information is readily accessible to the trucking industry.

C. Better coordination and education of multiple agencies, including border states, regarding these processes and other regulations.
   (R)8. **Solution:** Provide integrated information on "next steps" (i.e., direct links to counties/cities/states contact person or permitting site) to users that may need multiple state/jurisdictional operating authorities.
   Outcome: Streamlines and encourages compliance with all jurisdictions' regulations throughout a trip.
   (R)9. **Solution**: Develop regional goals and objectives for freight transportation in conjunction with surrounding states.
   Outcome: Goals and objectives would build a framework that would help prevent conflict among states in the development of any future regulations.

In the final analysis, only one of the possible solutions regarding regulation ranked in the top 12 to be immediately pursued.

- (R9) Develop regional goals and objectives for freight transportation in conjunction with surrounding states.

Transload and intermodal facilities

A. Examine strategies that provide more local rail connections and intermodal centers to decrease the distance exports must be trucked to get to a transload or intermodal facility.
   (T)1. **Solution**: Study previous attempts at introducing new transload or intermodal facilities in Iowa to discern what may be done differently to achieve a more successful outcome. A logistics analysis and market potential study would provide data to help determine if trainload facilities and intermodal facilities are feasible. In previous years, businesses in Iowa have attempted to start intermodal facilities.
   Outcome: By researching "lessons learned" new ventures may be more feasible.
   (T)2. **Solution**: Investigate the current freight flows for major industry sectors in Iowa to determine the current and future needs and impediments to more local transload and intermodal facilities.
   Outcome: This research will better isolate the specific challenges of industry sectors and help identify solutions.

B. Evaluate ways to make it feasible and cost-effective to invest in rail transfer facilities within Iowa to reduce transportation costs for Iowa's producers and receivers of goods.

(T)3. **Solution**: Conduct a market analysis that incorporates a study of the key elements, including volume thresholds and the entire transportation chain required to develop and sustain both transload and intermodal facilities.
Outcome: By analyzing the business required to maintain successful facilities, the infrastructure that currently exists, and the density of producers and receivers in Iowa, we can more appropriately identify locations where new facilities may built.

C. Investigate ways to address the container imbalance, which creates added transportation costs due to the need to haul empty containers into Iowa.

(T)4. **Solution**: Study shipping lines and customs clearance capabilities.
Outcome: This research may help determine the driving forces that can shift the imbalance of empty containers available for use in Iowa.

(T)5. **Solution**: Pursue strategies that will make better use of current transloading sites and Iowa's sole intermodal facility.
Outcome: Optimize the utilization of existing facilities and options for multimodal transportation.

(T)6. **Solution**: Initiate a state-run system that tracks current importers within the state of Iowa already utilizing containers for import goods.
Outcome: This will provide more efficient opportunities for access to empty containers.

In the final analysis, three of the possible solutions regarding transload and intermodal terminals ranked in the top 12 to be immediately pursued. These are:

- (T1) Study previous attempts at introducing new transload or intermodal facilities in Iowa.
- (T2) Investigate the current freight flows for major industry sectors in Iowa to determine the current and future needs and impediments to more local transload and intermodal facilities.
- (T3) Conduct a market analysis transload and intermodal facilities.

Appendix 3

Inventory of freight facilities

Table A.1 inventories Iowa's transload facilities shown in Chapter 6, Freight transportation assets.

Table A.2: Transload facilities

Name	City	Public	Intermodal	Transload	Cross Dock	Team Track	Warehouse	Truck to Rail	Truck to Barge	Rail to Barge
ADM Terminal Services, Camanche Terminal	Camanche, Iowa	X		X	X		X	X	X	X
ADM Terminal Services, Clinton Terminal	Clinton, Iowa	X		X			X	X	X	X
BAT Logistics	Council Bluffs, Iowa			X				X		
Big Soo Terminal	Sioux City, Iowa			X				X	X	X
BJRY	Mount Pleasant, Iowa	X		X				X		
Bryant Yard	Waterloo, Iowa	X		X	X		X	X		
Buesing Bulk Transport Inc.	Mason City, Iowa	X								
Burlington Junction Railroad	Burlington, Iowa	X		X	X	X	X	X		X
Burlington Junction Railroad	Ottumwa, Iowa	X		X	X	X		X		
Burlington Junction Transload	Le Mars, Iowa	X		X	X	X		X		
Butler Logistics Park	Shell Rock, Iowa									
CAM II Warehouse	Muscatine, Iowa	X					X	X		
Cartersville Elevator Inc.	Mason City, Iowa	X		X				X		
Catch-Up Logistics	Davenport, Iowa									
Clausen Companies Warehousing	Clinton, Iowa	X		X	X		X	X		
Cloverleaf Cold Storage	Cherokee, Iowa	X					X	X		
Consolidated Grain and Barge	Clayton, Iowa			X				X		X
Council Bluffs Railport	Council Bluffs, Iowa	X	X					X		
Cox Contracting Co. Inc.	Council Bluffs, Iowa			X				X		
CRANDIC Railroad, Wilson Avenue Team Track	Cedar Rapids, Iowa	X		X	X	X		X		
Des Moines Cold Storage	Des Moines, Iowa									
Gavilon	Dubuque, Iowa			X			X	X	X	X
Gavilon	Prairie du Chien, Wisconsin	X		X				X	X	X
GCC Dakotah Cement/L.G. Everist	Hawardan, Iowa	X		X				X		
Geo Transload LLC	Omaha, Nebraska	X		X			X	X		
IEI Barge Services	East Dubuque, Illinois	X		X		X	X	X	X	X

Name	City	Public	Intermodal	Transload	Cross Dock	Team Track	Warehouse	Truck to Rail	Truck to Barge	Rail to Barge
Iowa Cold Storage	Altoona, Iowa	X			X			X		
Iowa Dry Warehouse	Mason City, Iowa	X		X	X	X	X	X		
Iowa Interstate Railroad	Newton, Iowa	X				X		X		
Iowa Interstate Railroad Intermodal Facility	Council Bluffs, Iowa		X					X		
Iowa Traction Railroad/Progressive Rail	Mason City, Iowa			X	X	X		X		
Kinder Morgan/Muscatine	Muscatine, Iowa	X		X			X	X		
Kinder Morgan/Omaha Terminal	Omaha, Nebraska	X		X			X	X	X	
L.G. Everist	Sioux City, Iowa	X		X				X		
Le Mars Public Storage Inc.	Le Mars, Iowa				X		X	X		
Luckey Logistics	Des Moines, Iowa			X				X		
Luckey Logistics	Newton, Iowa			X				X		
Manly Terminal	Manly, Iowa			X				X		
Manly Yard	Manly, Iowa	X		X			X	X		
Merchants Distribution Service	Altoona, Iowa	X		X	X		X	X		
Merchants Distribution Service	Des Moines, Iowa	X		X	X		X	X		
Murrays Warehousing	Davenport, Iowa	X		X	X		X			
New Hampton Transfer & Storage	New Hampton, Iowa	X		X	X		X	X		
Omaha Transloading	Omaha, Nebraska	X		X			X	X		
Pattison Sand Co.	Garnavillo, Iowa									
Quest Liner/Foodliner	Ottumwa, Iowa			X				X		
Riverport Railroad LLC	Savanna, Illinois	X		X			X	X		
Standard Distribution Rail Facility	Cedar Falls, Iowa	X		X	X		X	X		
Union Pacific Distribution Services	Council Bluffs, Iowa				X	X				
Union Pacific Distribution Services	Camanche, Iowa									
Williams Bulk Transfer	Williams, Iowa	X		X	X	X	X	X		

Source: Surveys of Iowa companies

Table A.2 lists public and contract warehouses located in Iowa.

Table A.3: Public/contract warehouses

Firm name	City	Classification
Action Warehouse Co. Ltd.	Des Moines	Public warehousing, contract warehousing, heated
Ankeny Cold Storage	Ankeny	Refrigerated space, freezer space
AmeriCold Logistics	Bettendorf	Public warehousing, contract warehousing, freezer space, refrigerated space, temperature controlled
Big Soo Warehouse	Sioux City	Public warehousing, contract warehousing, heated space
C A M II Warehouse	Muscatine	Public warehousing, contract warehousing, food grade, heated
Centennial Warehouse Corp.	Des Moines	Public warehousing, contract warehousing, customs bonded warehouse
Catch-Up Logistics Warehousing and Distribution	Davenport	Public warehousing, contract warehousing, food grade, freezer space, refrigerated space
Clausen Warehousing & Trucking	Clinton	Public warehousing, contract warehousing, food grade, freezer space
Crystal Distribution Services Inc.	Waterloo	Public warehousing, food grade, freezer space, refrigerated space
Diversified Distribution Service Center	Burlington	Public warehousing, contract warehousing, heated
Des Moines Cold Storage Co. Inc.	Des Moines	Food grade, refrigerated space, freezer space
Economy Coating Systems Inc.	Camanche	Public warehousing, contract warehousing, freezer space, refrigerated space, food grade
Diverse Solutions MBE	Des Moines	Contract warehousing, food grade
GSTC Logistics Inc.	Walford	Public warehousing, contract warehousing, food grade, temperature controlled
Heyl Truck Lines	Akron	Contract warehousing, customs bonded warehouse, food grade
Hardsocg Pneumatic Tool Co./HPT Stores-All	Ottumwa	Public warehousing, contract warehousing
Iowa Cold Storage LLC	Altoona	Public warehousing, contract warehousing, food grade, refrigerated space
Jacobson Companies	Des Moines	Public warehousing, contract warehousing, food grade, hazardous materials
Jacobson Companies	Sioux City	Public warehousing, contract warehousing, food grade, hazardous materials
Jacobson Companies	Le Mars	Public warehousing, contract warehousing, food grade, freezer space, refrigerated space, humidity controlled
Jacobson Companies	Ames	Unknown, dedicated
Jacobson Companies	Ankeny	Unknown
Jacobson Companies	Ankeny	Unknown, dedicated
Jacobson Companies	Davenport	Unknown, dedicated
Jacobson Companies	Clinton	Unknown, dedicated
Jacobson Companies	Des Moines	Unknown
Jacobson Companies	Des Moines	Unknown, dedicated
Jacobson Companies	Des Moines	Unknown

Jacobson Companies	Des Moines	Unknown, dedicated
Firm name	**City**	**Classification**
Jacobson Companies	Des Moines	Unknown
Jacobson Companies	Grinnell	Dedicated
Jacobson Companies	Newton	Dedicated, some public available
Jacobson Companies	Sioux City	Dedicated, some public available
Jacobson Companies	Sioux City	Dedicated, some public available
Jacobson Companies	Sioux City	Public warehousing, contract warehousing, food grade, hazardous materials
Kitt's Transfer & Storage	Des Moines	Public warehousing, contract warehousing, hazardous materials, heated
Merchants Distribution Service	Altoona	Public warehousing, heated, food grade
Murray's Warehouse Inc.	Davenport	Public warehousing, refrigerated space, freezer space, food grade
Midwestern Third Party Logistics	Cedar Rapids	Public warehousing, contract warehousing, food grade, heated
New Hampton Transfer & Storage Inc.	New Hampton	Public warehousing, contract warehousing, food grade, heated
Nor-Am Cold Storage	Le Mars	Public warehousing, food grade, refrigerated space, freezer space
Standard Distribution Co.	Cedar Falls	Food grade
Peosta Warehousing	Peosta	Public warehousing, contract warehousing, food grade
Variety Distributors Inc.	Harlan	Contract warehousing
Waterloo Warehousing and Service Co. Inc.	Waterloo	Contract warehousing, hazardous materials
Worley Warehousing Inc.	Cedar Rapids	Contract warehousing, refrigerated space, air conditioned space, food grade. Temperature controlled, transportation
PDI, LTD	Ankeny	
Crescent	Mason City	Co-packing/Logistics
Millard Refrigerated Services	Des Moines	
Millard Refrigerated Services	Ottumwa	
Millard Refrigerated Services	Mount Pleasant	
Millard Refrigerated Services	Denison	
Millard Refrigerated Services	Iowa City	
Murray's Warehouse Inc.	Davenport	Public warehousing, refrigerated space, freezer space, food grade
Murray's Warehouse Inc.	Davenport	Public warehousing, refrigerated space, freezer space, food grade
Murray's Warehouse Inc.	Eldridge	Public warehousing, refrigerated space, freezer space, food grade
Murray's Warehouse Inc.	Davenport	Public warehousing, refrigerated space, freezer space, food grade
AmeriCold Logistics	Cedar Rapids	Public warehousing, contract warehousing, freezer space, refrigerated space, temperature controlled
AmeriCold Logistics	Fort Dodge	Public warehousing, contract warehousing, freezer space, refrigerated space, temperature controlled

GSTC Logistics Inc.	Oskaloosa	Public warehousing, contract warehousing, food grade, temperature controlled
Firm name	**City**	**Classification**
GSTC Logistics Inc.	Fremont	Public warehousing, contract warehousing, food grade, temperature controlled
GSTC Logistics Inc.	Ottumwa	Public warehousing, contract warehousing, food grade, temperature controlled
Merchants Distribution Service	Des Moines	Public warehousing, heated, food grade
Cloverleaf Cold Storage	Le Mars	Food grade items
Cloverleaf Cold Storage	Cherokee	Food grade items
Cloverleaf Cold Storage	Sioux City	Food grade items
Cloverleaf Cold Storage	Sioux City	Food grade items

Source: Leonard's Guide National Warehouse and Distribution Directory

Table A.3 lists distribution centers located in Iowa.

Table A.4: Distribution centers

Name	City	Size (sq. ft.)
United States Postal Service Des Moines NDC	Urbandale	
Casey's General Store	Ankeny	210,000
Family Dollar	Maquoketa	900,000
Florist Distributing Inc.	Des Moines	111,000
Hy-Vee	Chariton	1,500,000
Hy-Vee	Cherokee	620,000
Lomar Distributing Inc.	Des Moines	145,000
Menards	Shelby	735,000
Nordstrom	Dubuque	480,522
Nordstrom Direct Contact and Fulfillment Center	Cedar Rapids	590,000
Perishable Distributors of Iowa	Ankeny	400,000
Proctor & Gamble	West Branch	1,300,000
Target	Cedar Falls	1,830,000
Walmart	Mount Pleasant	1,200,000
Ferguson Enterprises	Waterloo	608,000
Fareway Stores	Boone	257,000

Source: Surveys of Iowa companies

Appendix 4

Priority corridors

As indicated in the *Iowa Interstate Corridor Plan*, one of the primary needs to be addressed through that planning effort was the identification of priority corridors that should be considered for more in-depth, near-term study. With this in mind, the plan identified several such corridors with an average Infrastructure Condition Evaluation (ICE) rating lower than the systemwide average. The vast majority of these locations were accounted for by the corridors that make up the length of Interstate 80, including the I-35/80 duplicate route through the Des Moines metropolitan area. In addition, I-35 from Des Moines to Ames and portions of I-380 were also identified. The following summarizes the more significant priority corridors from the *Iowa Interstate Corridor Plan*.

I-35 (west junction of I-80/235 to east junction of I-80/235)

- Many segments with an ICE rating lower than 60
- Higher than average combination truck annual average daily traffic (AADT), and among the highest systemwide
- Higher than average single-unit truck AADT, and among the highest systemwide
- Higher than average passenger AADT, and among the highest systemwide
- Higher than average congestion index, and among the highest systemwide
- Many segments identified among the bottom 25 percent and 5 percent of the system

I-80 (junction of I-380 to Illinois state line)

- Many segments with an ICE rating lower than 60
- Higher than average combination truck AADT, and among the highest systemwide
- Higher than average congestion index, and among the highest systemwide
- Many segments identified among the bottom 25 percent and 5 percent of the system

I-80 (east junction of I-35/235 to junction of I-380)

- Many segments with an ICE rating between 60 and 70
- Higher than average combination truck AADT
- Higher than average congestion index
- Many segments identified among the bottom 25 percent of the system

I-80 (Nebraska state line to west junction of I-35/235)

- Many segments with an ICE rating between 60 and 70

- Higher than average combination truck AADT
- Many segments identified among the bottom 25 percent and 5 percent of the system

I-380 (junction of Iowa 100 to Waterloo)

- Many segments with an ICE rating between 60 and 80
- Lower than average IRI, and among the lowest systemwide
- Some segments identified among the bottom 25 percent of the system

I-35 (east junction of I-80/235 to junction of U.S. 30)

- Many segments with an ICE rating between 60 and 80
- Higher than average single-unit truck AADT
- Higher than average passenger AADT
- Higher than average congestion index, and among the highest systemwide
- Some segments identified among the bottom 25 percent of the system