MISSOURI SUPPLY CHAIN TASK FORCE

Draft Final Report

Draft 3: June 3, 2022

MoDOT

DEPARTMENT OF HIGHER EDUCATION & WORKFORCE DEVELOPMENT

Table of Contents

List of Tables

List of Figures

1.0 Introduction

Over the last several years, the global pandemic recovery, increased consumer demand and workforce shortages have placed increasing pressure on supply chains, creating historic shortages nationally and globally. Governor Mike Parson recognizes the importance of expanding, maintaining and protecting a safe and reliable supply chain system, and in November 2021 established the Missouri Supply Chain Task Force to identify the issues facing Missouri businesses and citizens and develop potential solutions to address these challenges.

This report recommends implementable solutions for Missouri's public and private sectors to address current and potential future supply chain challenges. It is informed by the experience and expertise of Supply Chain Task Force members, relevant information provided by stakeholders, citizens, and employers gained from regional town hall events held across Missouri between January and May 2022, and supported by the 2022 Missouri State Freight Plan and the 2021 Missouri Workforce Development Strategic Plan.

1.1 Background and Motivation

Missouri's multimodal freight network plays a pivotal role in national supply chains, as the state's central location, major interstates, and proximity to the Mississippi and Missouri Rivers connects businesses and consumers to domestic and global markets. In 2018, more than 985 million tons of freight moved throughout Missouri across railways, highways, pipelines, air cargo facilities, and ports and waterways. Freight transportation and freight-generating industries in Missouri generate $26 billion in income annually across 482,000 jobs. These industries contribute $42 million to Missouri's Gross State Product and $7 million in Federal, state, and local taxes. The freight network in Missouri delivers the raw materials, machinery, fuels, and foods that allow industry and people to thrive.

Missouri's role in supply chains supports the economic vitality and quality of life of its residents, businesses, and visitors, but many factors that impact freight flows in the state originate far beyond its borders. The onset of the COVID-19 pandemic in early 2020 triggered an economic slowdown resulting from pandemic-related layoffs, shipping reductions, and production slowdowns. At the same time, surging demand for e-commerce and Federal recovery measures led Americans to purchase more durable goods such as furniture, electronics, and kitchen appliances in lieu of dining in restaurants or attending live events. Once manufacturers were able to catch up to this unexpected demand, U.S. coastal ports were swiftly overwhelmed by too many container ships, leading to long wait times, limited container availability and rising shipping prices. Once containers were unloaded, many sat at ports for weeks unclaimed because of a national shortage of truck drivers and equipment needed to transport containerized cargo to warehouses; in many instances, containers and chassis were stalled at warehouses because there were insufficient workers to unload them, further compounding the delays and chokepoints across the supply chain network. At the same time, businesses in nearly every industry struggled to hire workers, including at warehouses and retailers, resulting in empty shelves and worsening the scarcity of goods. One example of a shortage that has dramatically impacted some Missouri-based manufacturing companies is the shortage of semiconductor chips, which are used in smartphones, computers, consumer electronics, and cars, among other modern technologies. With three-quarters of all semiconductors manufactured in China and East Asia, the shortage has demonstrated

significant vulnerabilities in the global chip industry and has hampered production for manufacturers across the globe, resulting in calls for diversification of where these chips are manufactured.[1]

In response to this increasingly urgent situation, Governor Parson issued Executive Order 21-13 to define the issues, investigate the causes, and develop solutions to mitigate and minimize these systemic supply chain issues to limit the impact to Missouri's businesses and consumers now and in the future. In addition, the Executive Order seeks to evaluate the impact of policy proposals to position Missouri ahead of accelerating dynamics of global and national supply chains.

1.2 Task Force Goals and Objectives

The goal of the Missouri Supply Chain Task Force is to identify specific supply chain issues facing Missouri businesses and citizens and develop recommended solutions for implementation by public and private sectors within Missouri to address those challenges. The Executive Order defines a supply chain as a system of many modes of transportation, businesses, and industries collaborating to provide efficient transportation and delivery of goods and services. Missouri is uniquely positioned to meet the needs of communities by serving as a major logistics hub for the country.

To enable a full understanding of the state's supply chain components and processes, the Task Force convened stakeholders with experience and expertise across various industries and modes of transportation to share market intelligence, operational practices, and other relevant supply chain-related information. The complete list of companies and organizations that presented to the Task Force between January and May 2022 is as follows:

American Patriot Holdings	Missouri Department of Transportation
AmerisourceBergen	Missouri Department of Higher Education and Workforce Development
AMTRAK	Missouri Eastern Railroad, Jaguar Transport
Association of American Railroads	Missouri Partnership
BMS Logistics	Missouri Trucking Association
BNSF Railway	Nestle Purina
Cambridge Systematics, Inc.	New Madrid County Port Authority
Central Transport	Port KC
Do-It-Best	Southeast Missouri Port Authority
General Mills	St. Louis Lambert International Airport
Global Gateway Logistics	Terminal Railroad Association of St. Louis
Hillyard Inc.	Transport 360
Jacobs International	Triumph Foods
MFA, Inc.	Union Pacific Railroad

[1] "The chips are down: four graphics explaining the global semiconductor shortage." Missouri Business Alert, 12/23/2021. Accessed June 2, 2022. https://www.missouribusinessalert.com/news/business/the-chips-are-down-four-graphics-explaining-the-global-semiconductor-shortage/article_db8dc2b0-a999-5649-bdd0-455f9e49c9ad.html

Mid-America Regional Counsel U.S. Department of Transportation

A total of seven in-person meetings were held in MoDOT District offices throughout the state. Meetings were open to the public and available to view in real-time and on demand through livestream video:[2]

- January 20, 2022—Jefferson City
- February 10, 2022—Jefferson City
- March 10, 2022—Chesterfield
- March 24, 2022—Sikeston
- April 7, 2022—Lee's Summit
- April 21, 2022—St. Joseph
- May 5, 2022—Hannibal

1.3 Task Force Members

The Missouri Supply Chain Task Force is co-chaired by Missouri Department of Transportation Director Patrick McKenna and Director of the Office of Workforce Development Dr. Mardy Leathers from the Missouri Department of Higher Education and Workforce Development.

The full list of appointed members who served on the Task Force includes:

- Patrick McKenna (Co-Chair), Director, Missouri Department of Transportation.
- Dr. Mardy Leathers (Co-Chair), Director, Office of Workforce Development, Missouri Department of Higher Education and Workforce Development.
- Chris Gutierrez, President, Kansas City SmartPort, Inc.
- Mary Lamie, Executive Vice President, Multimodal Enterprises, Bi-State Development.
- Caitlin Murphy, Founder and Chief Executive Officer, Global Gateway Logistics.
- Dustin Quesenberry, Vice President of Operations, Contract Freighters, Inc.
- Todd Spencer, President, Owner-Operator Independent Drivers Association.

1.4 Report Organization

The remainder of this report is organized as follows:

- Section 2.0 presents the state's supply chain regulatory response during emergencies.
- Section 3.0 describes supply chain workforce needs and shortages in Missouri, as well as barriers to employment in supply chain sectors, including workforce readiness, childcare, housing and transportation.

2 https://www.modot.org/meeting-dates-agendas.

- Section 4.0 describes Missouri's freight assets, demand and system performance for freight highway, rail, air cargo, pipeline and ports and waterways modes.
- Section 5.0 describes future freight demand in Missouri and potential implications for the state's key freight-intensive industries, as well as recommendations for solutions to various aspects of supply chain workforce and transportation-related issues in Missouri.

2.0 Supply Chain Regulatory Response During Crisis

The existing supply chains issues have an impact on Missouri's economy from the small agriculture or businesses in the state's largest cities to the largest industries in the state. Therefore, it is critical that state leaders understand the supply chain crisis and develop a responses to address supply chain disruptions.

2.1 State Emergency Response Regulatory Construct for Freight Network

Missouri has had regulatory measures in place to address supply chain efficiencies for many years. The following section summarizes the truck size and weight regulations on Missouri roadways and traffic incident management & open roads agreement.

Truck Size and Weight Regulations on Missouri Roadways

Missouri's current crisis response tactics span load types, load permits, special permits and impacts of heavy vehicles on infrastructure. These regulations are in the RsMo Chapter 304, 7CSR 10-25 and apply to state roads. Regulations relating specifically to weight can be found in 7CSR 10-25.020. MoDOT Motor Carrier Services issues permits for all **non-divisible** loads more than the legal limit of 80,000 pounds. Past exceptions for weight under special permits for 10% overweight (88,000 pounds) are propane shortages in the winter and hauling rock/sand for levee repair during flooding.

Presidential declared emergencies are another exception. This exception is for **divisible** load weight and is found in the Stafford Act (MAP 21, Section 1511). This allows states to issue permits for divisible loads more than 80,000 pounds on interstates for 120 days following the declaration. States can choose the weight limit, but carriers must still abide by load postings. During the onset of COVID-19, Missouri issued permits for 100,000 pounds for both interstate and state routes. The permit was available to print on MoDOT's website since the request for these permits was in high demand due to Missouri's key role in supplying the nation's food products. This helped expedite goods and services during the beginning of the COVID-19 pandemic. During the Presidential declared emergency, the issue neighboring states ran into was trucks hauling freight from one state to another traveled through states with different weight limits. Trucks would then haul at the lowest weight in the states they were traveling in to be under the weight limit for all states.

As a response to the Presidentially declared emergency and states permitting different weight limits, the Mid America Association of State Transportation Officials region worked together to aim for weight harmonization. This means that during future Presidential declared emergencies, states that are members of the 10 Midwest state MAASTO region set their weight limit to the agreed upon weight limit by all MAASTO states—88,000 pounds. ., Each state can still exceed the weight by the agreement, but trucks traveling through the states know that these states will allow at least 88,000 pounds. This will allow freight that crosses state lines via trucks to drive through all

MAASTO states, which includes Minnesota, Wisconsin, Michigan, Iowa, Illinois, Indiana, Ohio, Kansas Missouri and Kentucky.

The Federal Highway Administration requires each state to write and implement a State Enforcement Plan each year. The legislation corresponding with SEP's is 23 CFR Part 657—Certification of Size and Weight Enforcement. These plans set Federal weight standards to preserve the Nation's infrastructure. Excess vehicle weight damages roadways and decreases the life span of infrastructure. This leads to spending more money on infrastructure for repairs and spending the money sooner than if the weight limits were followed.

If Missouri considered increasing weight limits on roadways, future infrastructure conditions would have to be considered. The impact of increasing weight limits for longer periods of time would only change on state routes, more load postings would have to be posted on bridges that are under an increased weight limit and pavement would deteriorate quicker with increase weight. Additional load postings would include a statewide study of current posted bridges and how the increased weight limit would affect bridge infrastructure in the state.

Other exemptions Missouri implements in times of crisis are hours of service exemptions and trip/fuel permit waiver (72-hour permit). An HOS permit waives time restrictions on how long a driver can be behind the wheel. Currently, a shift is 14 hours on duty with 11 of those hours behind the wheel. The HOS permit is issued to a specific commodity or service and lasts for an average period of 30 days. The 72-hour permit helps expedite goods and services during emergencies. During emergencies, some goods are moved through Missouri (due to its central location) to reach other states to aid in emergency events. An example is when there was a hurricane in Louisiana and electric co-ops in Iowa were provided permits (issued by the Missouri Governor and posted to the MoDOT website) to travel through the state without requesting a permit for each individual truck to aid in disaster relief. Both HOS and 72-Hour permits are issued by the governor who then coordinates with MoDOT and are specific to a certain commodity or truck type for a limited amount of time.

Traffic Incident Management and Open Roads Agreement

Congestion is a growing problem in Missouri. 60% of all congestion on Missouri's roadways is related to incidents and 20% of all collisions are "secondary" collisions from earlier incidents. In these conditions, responders are at risk on high-speed, high-volume roadways.

Traffic Incident Management is a MoDOT program that focuses on clearing the roadway within 90 minutes after a crash has occurred. TIM aims to resolve issues associated with congestion and incidents; focus on controlled-access roadways; and emphasize urgent and safe clearance of highway incidents. MoDOT partners with emergency services and police departments to accomplish this goal. Many secondary incidents are more severe than the first incident. Therefore, it is important to get on location as quick as possible and help divert traffic from the incident and clear the road as quick as possible.

The Missouri Open Roads Agreement[3] focuses on restoring roadways to full capacity following an incident. The highest priority is to get traffic moving to avoid the secondary crashes that are often worse than the first event. This

[3] "Missouri Open Roads Agreement: Quick Clearance for Safety and Mobility". https://www.modot.org/sites/default/files/documents/Missouri%20Open%20Roads%20Agreement%20FINAL%202021%20SIGNED%20MSHP_MoDOT.pdf

agreement focuses on the safety of emergency responders and the public; restoring roadways to full capacity as soon as possible following an incident; using clear communication between responding parties; and utilizing strategies and tactics that support the National Unified Goal for safety. The NUG, developed by the National Traffic Incident Management Coalition, works for improved safety, clearance and communication. Shared responsibilities of the agreement include multi-agency coordination; 90-minute clearance goal; quick clearance of damaged vehicles, spilled cargo and debris; minimize traffic impacts; promote responder safety; special incident coordination; after-action reviews; traffic diversion planning; TIM planning; and communication.

TIM and the Open Roads Agreement both focus on clearing roadways of damaged vehicles, spilled cargo and debris when it is safe to do so. Noted concerns are that not all incidents can be cleared in 90-minutes; lack of trust between towing and trucking industries; substantial or unreasonable tow/cleanup costs; preferred tow may not be allowed due to circumstances; and recovery times may be delayed/restricted due to traffic volumes.

3.0 Workforce Challenges and Barriers

Challenges facing Missouri's supply chain before, during, and after the pandemic, include significant constraints on the availability of a skilled workforce. Increased demand for labor in sectors from manufacturing, to warehousing, to shipping, to delivery has placed pressure of ensuring Missouri has the necessary talent to efficiently move goods throughout the state. Improving the resiliency and responsiveness of the supply chain requires understanding the workforce issues that Missouri faces and designing solutions to address the challenges of building and maintaining the supply of labor in the warehousing and manufacturing sectors.

3.1 Supply Chain Workforce Needs and Shortages

The supply chain sectors represents more than 12% of Missouri's workforce in 2020, with manufacturing representing the largest share. Table 3.1 shows the size of Missouri's workforce in the manufacturing, truck transportation and warehousing sectors and the share of Missouri's total employment that each sector represents:

TABLE 3.1 SIZE AND SHARE OF MISSOURI WORKFORCE IN SUPPLY CHAIN SECTORS

Sector	Employment	Share of Total Workforce
Manufacturing	266,452	10.0%
Truck Transportation	38,305	1.4%
Warehousing and Storage	20,652	0.8%

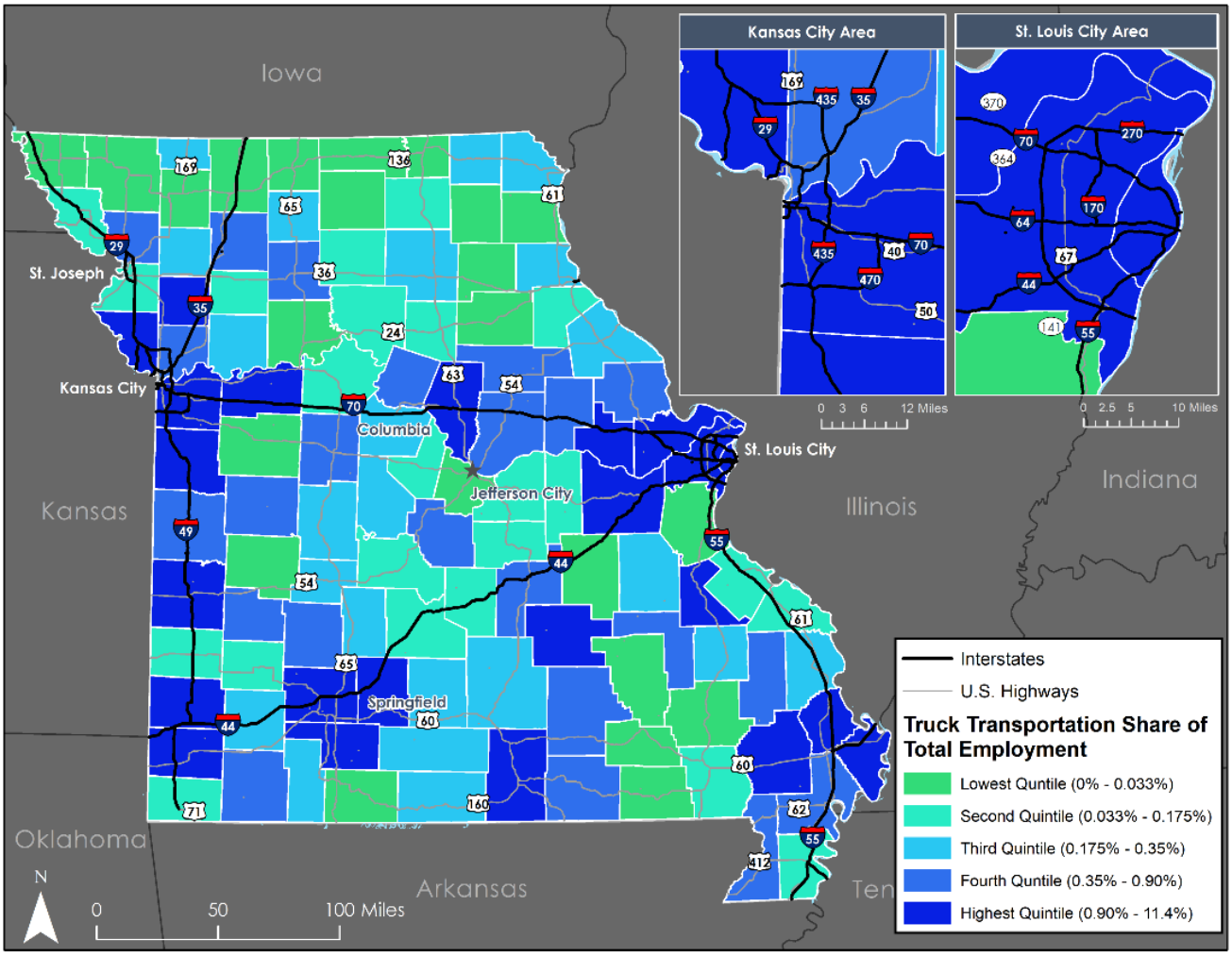
Source: Bureau of Labor Statistics.

Figure 3.1, Figure 3.2, and Figure 3.3 show the concentration of employment in truck transportation, warehousing, and manufacturing, respectively, throughout the state. These maps indicate the locations of employment, not the locations of residence for employees.

These sectors have demonstrated strong growth since the Great Recession. Manufacturing employment and truck transportation employment increased by 8.3% and 7.8% between 2010 and 2020, respectively, while warehousing and storage employment increased by 67.4% over the same decade, driven by a significant increase in e-commerce activity.

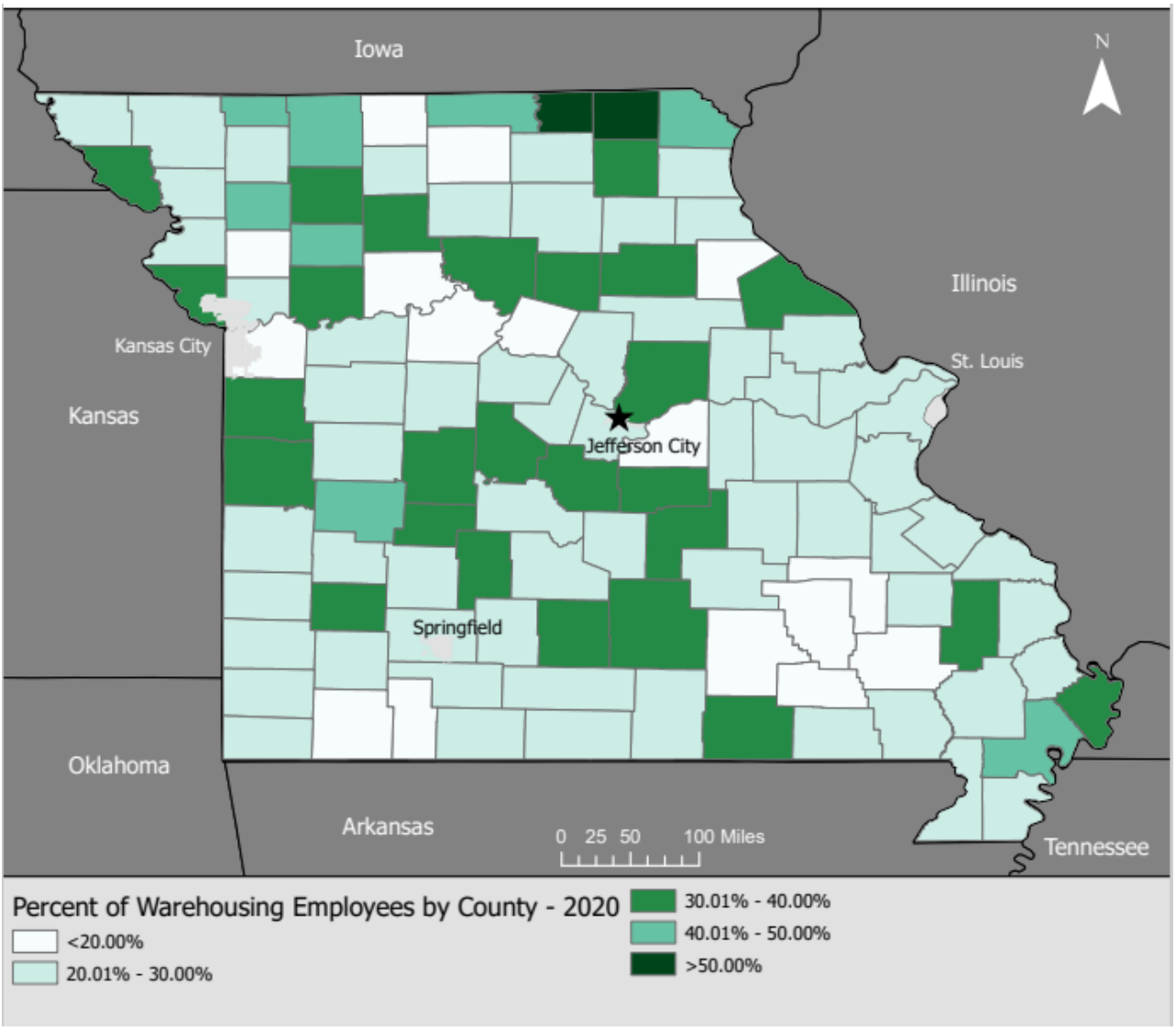
Despite this growth, industry analysts and trade associations have identified current and projected job shortages in these sectors. Nationally, estimates of job openings in March 2022 were 484,000 jobs for manufacturing, 200,000 job for warehousing and 80,000 jobs for truck transportation. In Missouri, these figures were 5,900 jobs for manufacturing, 500 jobs for warehousing, and 2,500 jobs for truck transportation. The manufacturing sector is projected to have a workforce shortage of up to 2.1 million by 2030. And while the truck transportation industry is estimated to have a shortage of 160,000 drivers in 2030, the industry will need to attract 1 million new drivers by this year in order to replace drivers who will retire over the next few years.

FIGURE 3.1 TRUCK TRANSPORTATION AS SHARE OF TOTAL EMPLOYMENT BY COUNTY, 2020



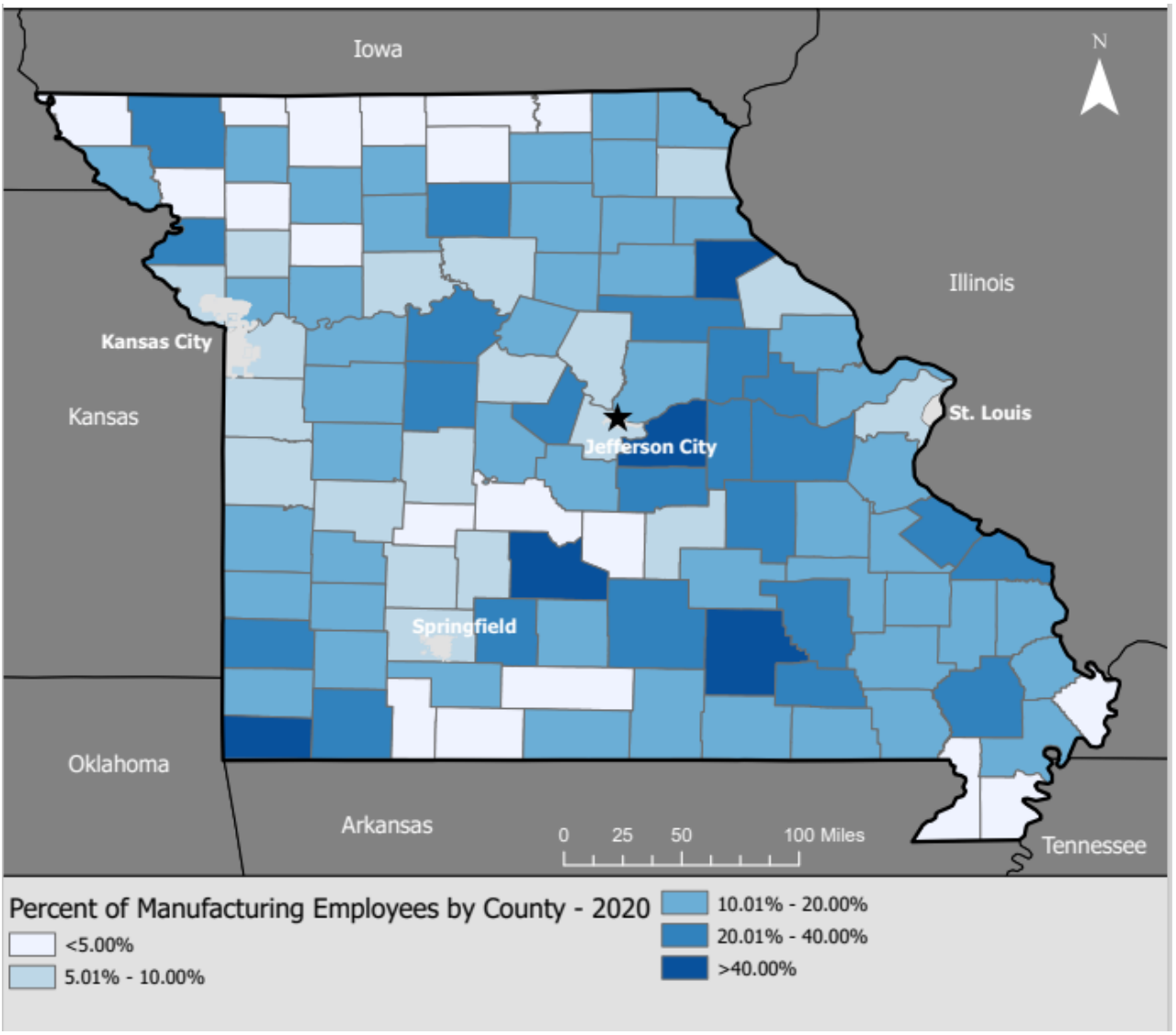
Source: Bureau of Labor Statistics.

FIGURE 3.2 WAREHOUSING AS SHARE OF TOTAL EMPLOYMENT BY COUNTY, 2020



Source: Bureau of Labor Statistics.

FIGURE 3.3 MANUFACTURING AS A SHARE OF TOTAL EMPLOYMENT BY COUNTY, 2020



Source: Bureau of Labor Statistics.

Worker Retention in Trucking and Warehousing

Workforce retention in the trucking and warehousing sectors has gained national attention due to high levels of turnover in these industries. The Bureau of Labor Statistics estimated annual warehouse turnover rates at 43% in 2021, while the American Trucking Association estimated an 89% turnover rate among truck drivers in March 2021, compared to an average rate of 12 to 15% across all industries. The turnover rate captures churn within the industry (i.e., workers switching companies) in addition to workers leaving the industry, but both factors significantly impact costs and productivity throughout the supply chain.

Finding new employees requires a company to spend additional money on recruitment and training and creates a slowdown in operations while the position remains unfilled. In an increasingly time-sensitive supply chain

environment, where next-day delivery is expected by a wide array of consumers, this slowdown can generate disruptions throughout the supply chain.

Both sectors are known for their challenging and demanding work environments that require workers to meet very high standards for performance, ranging from the number of orders filled and shipped to the number of parcels delivered to the distance traveled in a single day. News stories about the high pace of work and the impact that it has on workers' quality of life behind the wheel of a truck and in the rows of warehouses are common. Although a tightening job market following the COVID-19 pandemic has led to an increase in wages, wages in warehousing and trucking had seen little increase in the years preceding the pandemic.

Additionally, long-haul truck drivers face challenges with meeting regulatory requirements for vehicle operations and safety. These issues include limitations on total trailer weight, driving time and vehicle parking. Many DOT Safety Offices have called attention to the increasing frequency of reports of trucks parking on highway on-ramps and off-ramps or along the shoulder of roads. These areas are not designated for parking and can contribute to accelerated wear-and-tear of these areas or create safety hazards for the truck drivers and other vehicle operators. However, Hours of Service regulations limit drivers to a maximum of 11 hours of driving in a 24-hour period, and a lack of available truck parking will often force drivers to stop in non-designated areas in order to avoid violating these regulations.

The required interstate travel for long-haul truckers has also given rise to an increase in drug compliance issues. A May 2022 article in Politico Magazine pointed out that truckers who use marijuana recreationally or for medical purposes in states where it is legal may fail drug tests in states where it is illegal, and Federal regulations still prohibit marijuana usage.

The complexity of the regulatory environment for truck driving may result in drivers violating one rule in order to adhere to another, incurring penalties and causing stress that pressure them to leave the industry.

3.2 Barriers to Employment in Supply Chain Sectors

In addressing the workforce challenges embedded in the supply chain, it is critical to understand the factors that influence the availability and stability of the labor pool for these sectors. During Task Force meetings, multiple employers described ongoing workforce challenges throughout the pandemic recovery period. For example, Hillyard, a St. Joseph-based manufacturer of cleaning products, has increased wages for drivers by 13.5% since the start of the pandemic and has added additional pay bonuses for safety, retention and recruitment, but the company has still struggled to maintain the workforce necessary to meet the increased demand for cleaning products. Underlying workforce challenges may explain why increased wages have not been sufficient for growing and maintaining the labor pool.

Many workers, particularly those in low-income and/or entry-level positions, experience **barriers to employment** that hinder their ability to access and maintain employment. These barriers to employment represent a wide array of socioeconomic and geographic factors that incur costs or present logistical challenges for job seekers. Barriers to employment often fall upon two planes: economic and behavior. Humans are not rational actors and this requires us to not simply subscribe a rational theory to barriers to employment. Thus, barriers represent both lack of a good or service that a worker needs in order to participate in the workforce as well as human factors such as self-

efficacy, ability to manage home budgets, and understanding how to leverage public resources to gain access to training and employment. Principals of supply and demand must be coupled with understanding human behavior to ensure policy recommendations address the full spectrum of barriers to employment.

Many barriers to employment can be analyzed through a common economic framework: the principles of supply and demand. A barrier to employment may represent a **"supply" challenge** for a worker: the good or service that they need is not available in a sufficient quantity. A barrier to employment may also represent a "demand challenge" for the worker: the worker is unable to afford the good or service at its current cost. In this context, costs can be analyzed as a direct monetary cost (i.e., the purchase price of the good or service) and/or an opportunity cost (i.e., the time required to use that good or service). The supply and demand framework, in addition to considerations of the human element related to barriers to employment, must be considered when designing policy solutions to workforce-related supply chain challenges, as discussed in Section 5.0.

Workforce Readiness

The transportation and warehousing and manufacturing sectors offer many career pathways that do not require degrees from four-year colleges or universities. This can make these sectors attractive from a workforce development perspective, since workers can be connected with entry-level positions with few financial hurdles. However, many of these careers still require training or certification for employees to be workforce-ready, even at the entry level. Training and certification for these positions often focus on helping workers to develop technical skillsets and proficiency with tools, technologies, processes and regulations involved in warehousing operations, freight movement, or industrial production. Common certifications for these sectors are presented in Table 3.2:

TABLE 3.2 COMMON CERTIFICATIONS FOR ENTRY-LEVEL JOBS IN THE MANUFACTURING AND TRANSPORTATION AND WAREHOUSING SECTORS

Transportation and Warehousing Sector	Manufacturing Sector
• Certified in Production and Inventory Management • Certified Supply Chain Professionals • Forklift operator • Commercial Driver's License (CDL)	• National Career Readiness Certificate (NCRC) • Certified Welder • Certified Production Technician (CPT) • Precision Sheet Metal Operator (PSMO)

Source: Missouri Office of Workforce Development.

Workers can obtain these certifications in a relatively short amount of time, ranging from six weeks to one year. Again, these shorter timeframes are advantageous for workforce development programs and workers alike since these workers can reach a level of workforce readiness in a shorter amount of time, expediting the workforce pipeline and allowing workers to start work more quickly (and often at a more competitive wage). However, since the skillsets that these workers are developing are designed to be applied in a work environment, many of the certification programs require people to demonstrate their skills and pass an assessment in a simulated or actual work environment. For example, the Missouri commercial driver's license certification program includes a drivers assessment component. These assessments are administered by the Missouri State Highway Patrol, and workers must complete the assessment at a designated State Highway Patrol CDL Test Site.

Certification and workforce readiness can create a “chicken-and-egg” challenge for addressing the supply chain’s workforce needs: an employer in the supply chain must be confident that labor is available when the employer opens or expands its operations in the area, but workers want to ensure that the skillsets they develop will be in demand to employers in the area when they obtain that certification. This challenge demonstrates the need for a workforce development pipeline, where employers and employees can access the resources needed to align necessary skillsets and employment opportunities on a realistic timeframe. Public sector and non-profit entities can play a critical role in building the resource network for workforce investments, signaling to employers and employees that a pipeline exists to attract potential workers and connect them with careers upon completion.

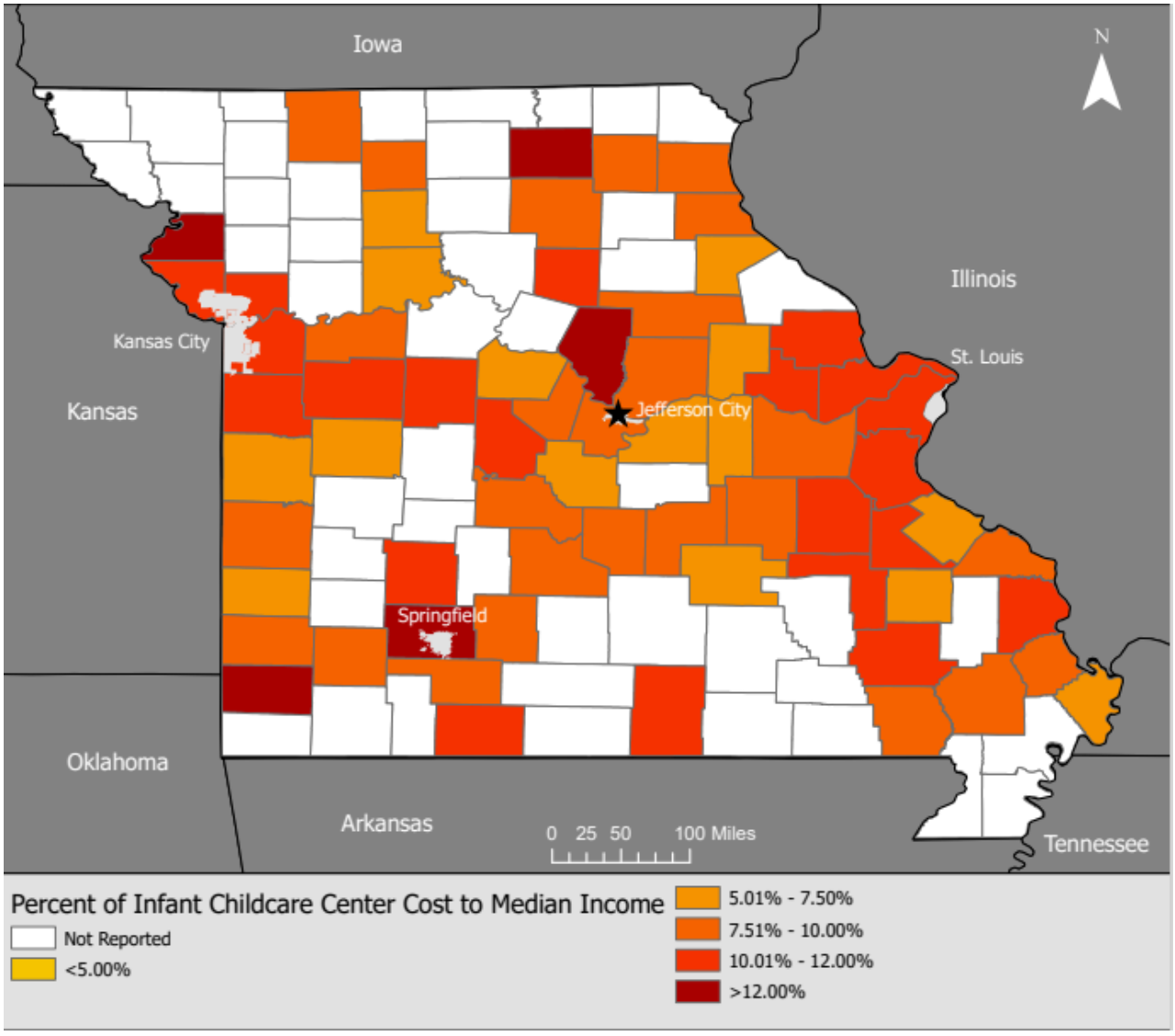
Childcare

Workers with children are frequently confronted with a challenge: earn the money necessary to care for their children while securing the childcare necessary to allow them to leave home and be away from their children for several hours per day. Addressing this challenge requires workers having access to childcare facilities that are affordable, that are proximate to their home and their workplace, and that offer services at times of day that align with the workers’ workday. This challenge can have a significant impact on workforce participation; a 2021 survey conducted by the Harvard Business Review found that 20% of working parents had to reduce their hours or leave the workforce due to a lack of childcare options.

While securing childcare is an issue faced by all workers, this issue is more significant for low-income, entry-level workers, single parents or caretakers, and women, since childcare costs can represent a larger share of income in lower income quintiles. While the U.S. Department of Health and Human Services sets an affordability standard of 10% of household income for childcare, low-income households spend up to 35% of their income on these costs.

In Missouri, the average childcare cost is $10,041 per year—comparable to annual housing expenditures for many families. These high costs can make a job untenable for a family; a worker who was previously responsible for childcare may be unable to take a new job if the incurred costs of childcare consume too high a share of the new income. Figure 3.4 shows a County-level analysis of infant childcare costs as a percentage of median income. Several counties throughout rural and urban Missouri exceed the 10% affordability standard.

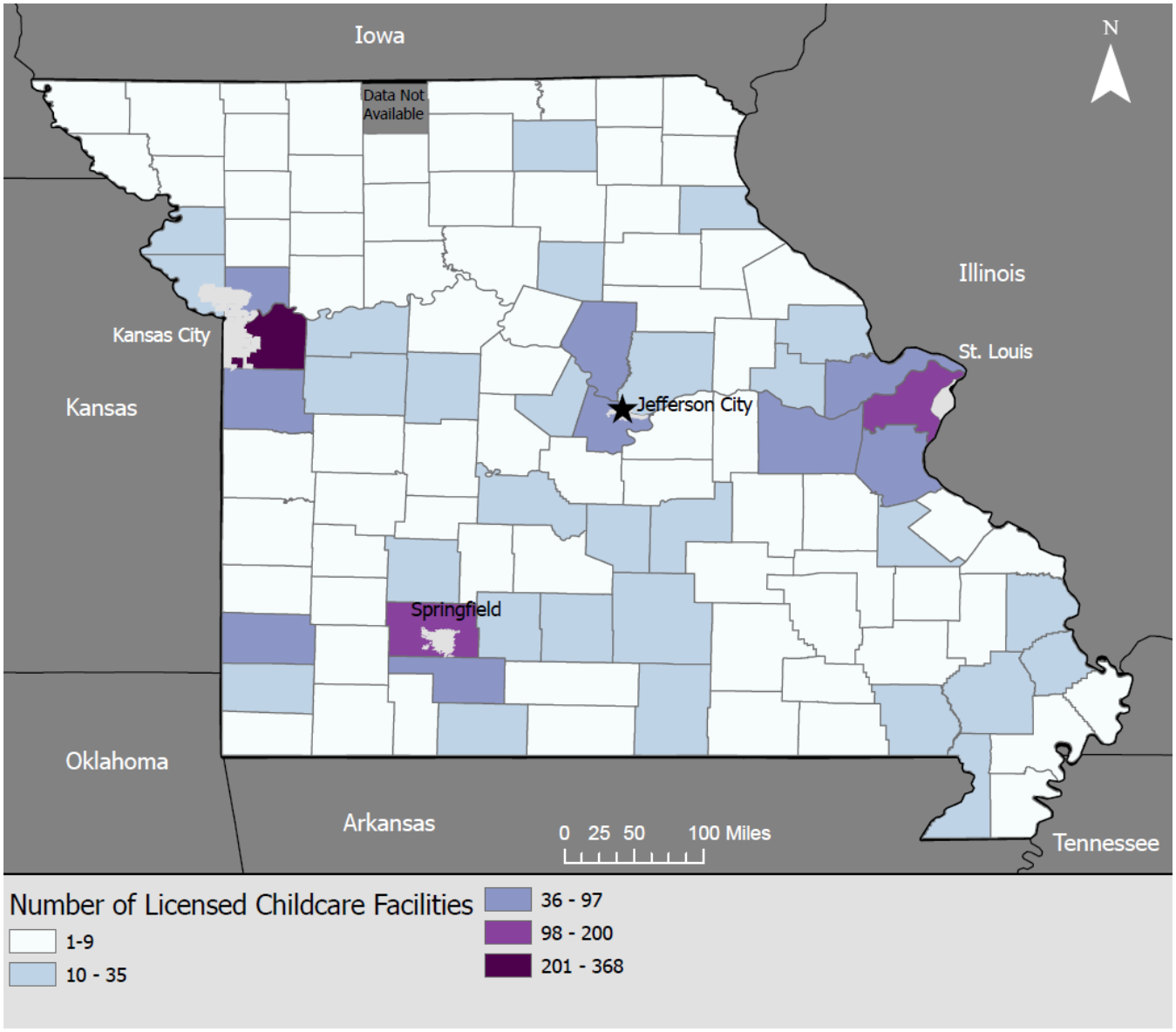
FIGURE 3.4 INFANT CHILDCARE COSTS AS SHARE OF MEDIAN INCOME, 2019



Source: Economic Policy Institute.

However, childcare is not just a matter of cost for working families. A worker must be able to access childcare services, which can be determined by the number of facilities in the area and the capacity of these facilities. A 2020 study from the Center for American Progress found that 54% of Missourians live in "childcare deserts," which is defined as a Census tract with more than 50 children under the age of 5 that either contains no licensed childcare providers or has three times as many children as licensed childcare slots. This percentage rises to 70% of residents in rural areas, posing a significant threat to the viability of a steady workforce in the rural areas where many manufacturing and warehousing facilities are located. Figure 3.5 demonstrates how rapidly the availability of licensed childcare providers decreases outside of Missouri's large population centers.

FIGURE 3.5 NUMBER OF LICENSED CHILDCARE CENTERS PER COUNTY, 2020



Source: ChildcareCenter.us, 2020; ChildCare Aware of America, 2020.

While many working families may rely on family or friends for childcare support, these networks can be inconsistent and sensitive to disruption due to their informal structure. Finding alternatives in response to disruptions in childcare can create sudden increases in childcare costs or force working parents to rearrange their work schedules. In the shift work that is common in the warehousing and manufacturing sectors, employers cannot readily accommodate changes in their employees' work schedules, creating a productivity risk. A 2019 analysis of childcare costs by the Council for a Strong Nation estimated that employers lose $12.7 billion annually due to challenges with access to childcare among employees.

The reality of employment in the warehousing and manufacturing sectors further complicates childcare access. Many warehouses and manufacturing facilities operate with multiple shifts that do not align with traditional "work

hours" of 9 a.m. to 5 p.m. Night shift and graveyard shifts that start in the evening or late at night are essential to meeting demand, yet licensed childcare facilities often operate on standard work hours, further limiting working families' options to maintain employment in these fields.

Housing

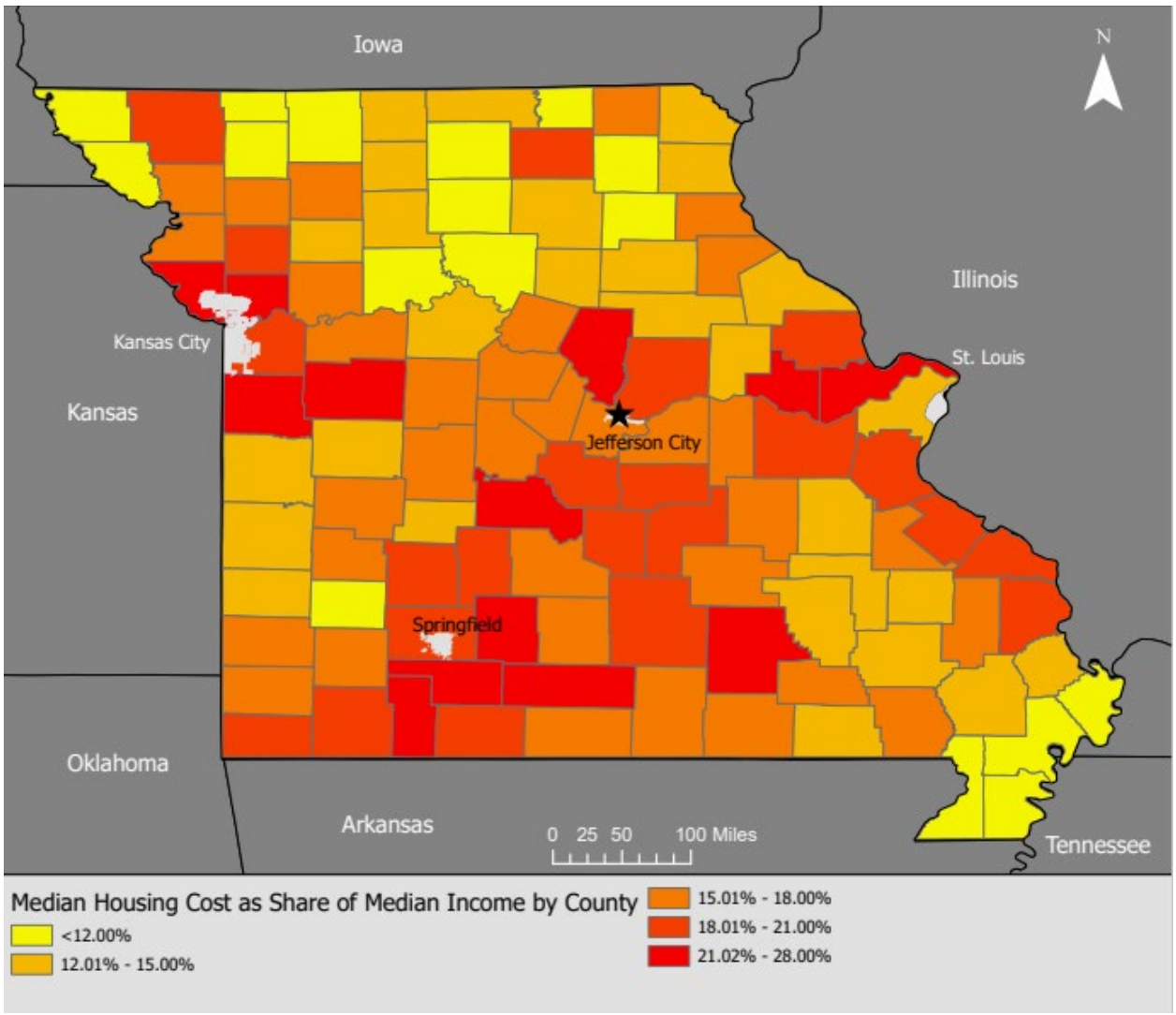
Housing affordability has gained increased attention as a result of significant increases in housing costs across the country in recent years. Data from the U.S. Census bureau shows that in 2020, 46% of renters spent 30% or more of their income on housing, which the U.S. Department of Housing and Urban Development defines as being cost-burdened. This trend has worsened even as the economy has recovered from the COVID-19 pandemic; average rents across the U.S. have risen 18% between 2017 and 2022, outpacing inflation.

Missouri has not experienced the housing affordability crisis to the same extent as other states, with many studies ranking the state as one of the more affordable states in the country. The median gross rent for a two-bedroom unit in Missouri was $833.00, compared to $1,080 for the United States, according to the 2016-2020 American Community Survey five-year estimates.

However, housing costs are not evenly distributed across the state. Figure 3.6 shows the distribution of median housing costs as a share of median income by County. While some rural counties in northern and southeastern Missouri have low housing costs as a share of median income, many counties in urban areas are approaching the affordability threshold for housing costs. As this figure reflects median costs, it is likely that many lower-income households in these counties are cost-burdened by housing prices.

While the housing affordability crisis has many causes, a significant factor is the shortage of affordable housing across the country. The National Low-Income Housing Coalition estimates that as of 2022, the U.S. has a shortage of 7 million rental homes available to extremely low-income renters, defined as households with income at or below 30% of area median income. In Missouri, this shortage is estimated at nearly 120,000 housing units, compared to more than 207,000 extremely low-income renters.

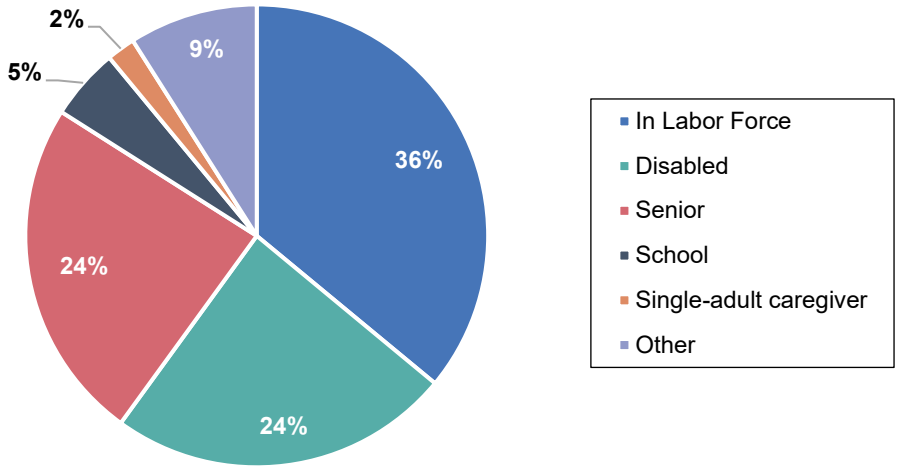
FIGURE 3.6 MEDIAN HOUSING COSTS AS SHARE OF MEDIAN INCOME BY COUNTY, 2020



Source: National Association of Realtors and Missouri Economic Research and Information Center, 2020.

The affordable housing crisis is also a workforce housing crisis. Within Missouri, 36% of extremely low-income renter households are currently employed, as shown in Figure 3.7. A workforce housing shortage means that workers have limited options to find homes that are proximate to work, childcare facilities, and other essential services, which can hinder employers efforts to attract and retain employees.

FIGURE 3.7 EXTREMELY LOW INCOME RENTER HOUSEHOLDS IN MISSOURI, 2022



Source: National Low Income Housing Coalition, 2022.

The shortage of workforce housing can be partially attributed to supply constraints in housing development. Since warehouses and manufacturing facilities have large physical footprints and rely on access to highways in order to access markets, they are often located in areas with lower land costs where facilities are spread out over a distance. Hence, rural areas have a high concentration of these facilities due to their favorable economic and geographic conditions for industrial development.

While the locations in which the facilities are located may have low housing costs due to low land costs, the large industrial footprints may limit the amount of housing that can be built, either due to land use regulations or unattractive markets for developers. The noise, emissions and other impacts associated with industrial production and freight movement also result in these facilities being situated far away from residential areas, through a combination of zoning regulations and market preference.

The limited supply of affordable housing for low-income workers is also a factor of a lack of investment in this housing supply. With increasing construction costs in the housing industry and stagnating incomes for low-income workers, it is increasingly unprofitable for developers to build more affordable housing. The limited production of affordable housing means that the affordable housing stock that does exist is more likely to be older and in poorer condition. Poorly-maintained housing can expose residents to health risks from mold, poor ventilation and lead. These health risks range from chronic health conditions, like asthma and high blood pressure, to acute health events, like carbon monoxide poisoning. The result is a home environment that can have a significant impact on worker health and well-being, which in turn can impact the productivity and stability of the workforce.

Many low-income workers struggle to afford housing and to find housing. With the significant housing shortage, low-income workers are vulnerable to disruption; if housing is hard to locate, a change in the condition of the housing or in the location of other essential services can result in a loss of employment.

Transportation

An underlying dimension of many barriers to employment is geographic access: the physical distance between a worker and the essential services that they need to find and maintain employment. In addressing geographic distance, it is critical to evaluate how transportation systems allow workers to traverse that distance or, more significantly, how they hinder workers' travel.

The previous sections discussed how warehousing and manufacturing jobs are often located in areas far away from other land uses. This geographic dispersal means that workers have to travel long distances to get to work, resulting in commute times that are high in travel time and in cost. Low-income households, who fill many of the entry-level roles at warehouses and manufacturing plants, are less likely to have access to a vehicle and spend more of their income on transportation than higher-income households. Table 3.3 shows transportation expenditures as a share of income, vehicles per household, and zero-vehicle households across national income quintiles:

TABLE 3.3 U.S. TRANSPORTATION COSTS AND VEHICLE OWNERSHIP BY QUINTILE, 2020

Quintile	Income Range	Transportation Spending as Share of After Tax Income	Vehicles Per Household	Households with No Vehicles (Percent)
All Quintiles	N/A	13.1%	1.9	10.0%
First Quintile	$0 to $24,009	28.8%	1.0	28.0%
Second Quintile	$24,010 to $45,264	17.1%	1.6	11.0%
Third Quintile	$45,265 to $75,889	15.8%	1.9	5.0%
Fourth Quintile	$75,890 to $124,431	14.0%	2.3	4.0%
Fifth Quintile	$124,432+	9.5%	2.7	3.0%

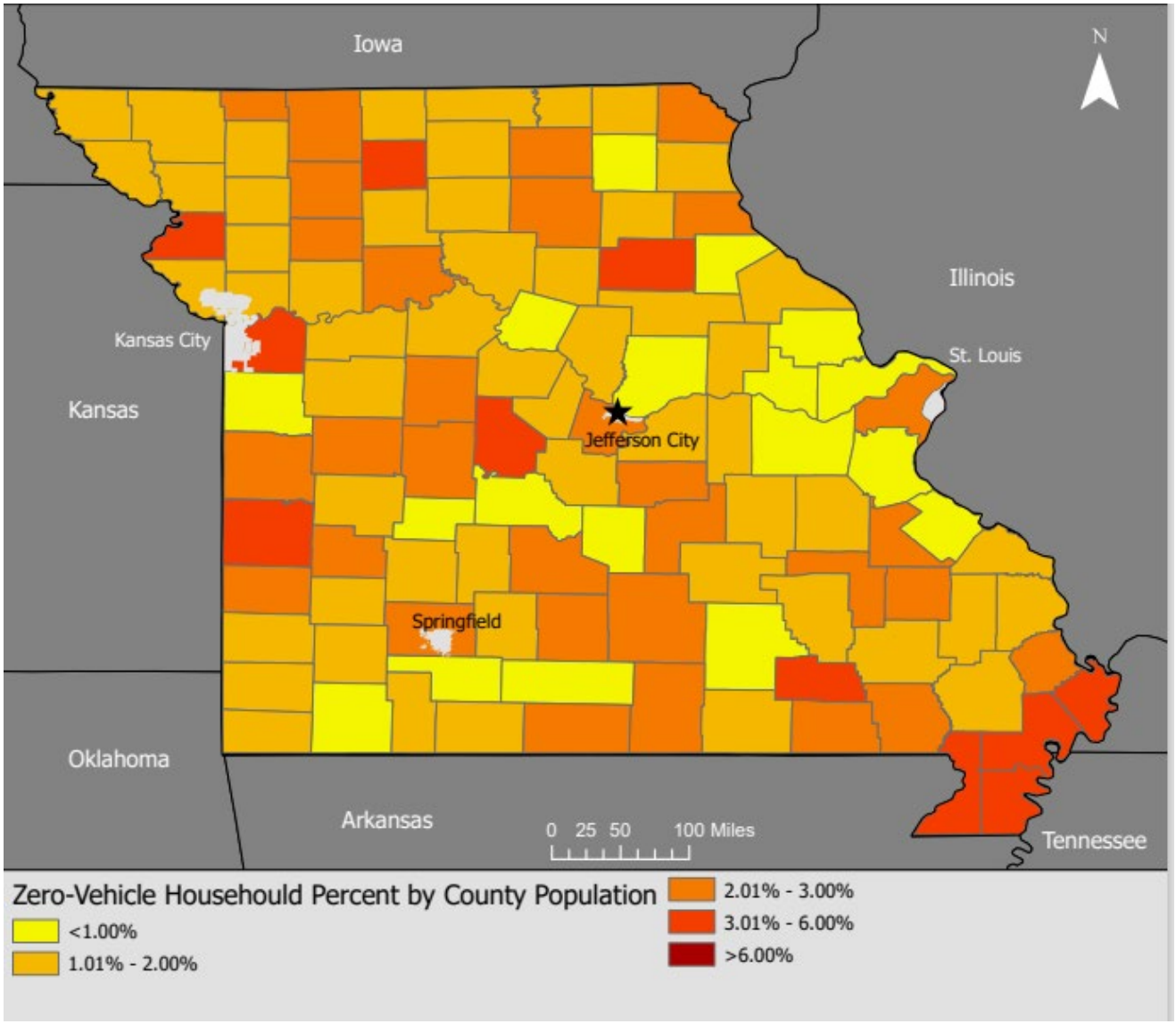
Source: Bureau of Labor Statistics.

Lengthy commutes in private vehicles can exacerbate household costs, reducing the economic value of the job.

It is important to note that there is a lower share of zero-vehicle households in Missouri than the rest of the country, based on data from the American Community Survey (ACS): 6.6% compared to 8.5%.[4] Figure 3.8 shows the percentage of zero-vehicle households by county population throughout Missouri; the share of zero-vehicle households is 3.0% or below in a majority of counties.

[4] The difference in zero-vehicle household percentages between the ACS and the BLS is due to differences in statistical modeling used by each agency. Both figures are preserved here in order to facilitate comparison between Missouri and the national average and to demonstrate variation in car ownership by national income quintiles.

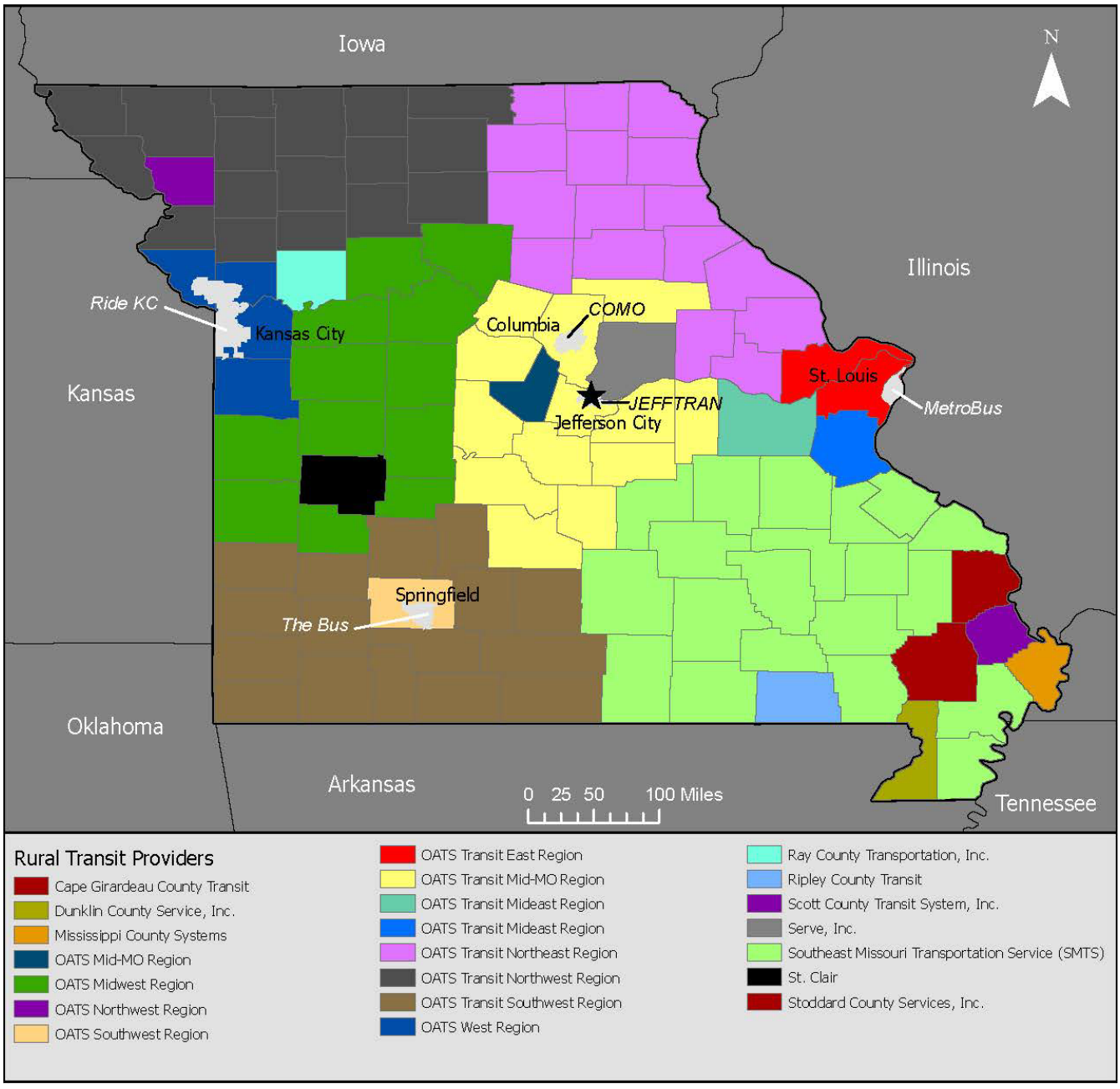
FIGURE 3.8 PERCENT OF ZERO-VEHICLE HOUSEHOLDS BY COUNTY, 2020



Source: U.S. Census Bureau American Community Survey Five-Year Data, 2016-2020.

Historically, public transit service has played an important role providing alternative transportation for people who do not have access to a private vehicle. In Missouri, OATS Transit and the Southeast Missouri Transportation Service provide public transit services in rural counties throughout the state. Figure 3.9 shows the map of transit providers throughout the state:

FIGURE 3.9 MISSOURI TRANSIT PROVIDERS, 2022



Source: Missouri Department of Transportation.

While public transit fulfills a critical role for low-income workers throughout the state, it can be difficult for transit to meet the needs of the supply chain workforce. The geographic separation between housing and employment in these rural areas reduces the density of activity that supports effective public transit service. At lower densities, public transit services must travel farther distances to connect origins and destinations. To manage travel times, the services reduce the number of pick-up and drop-off locations, limiting the number of access points for workers.

Additionally, the long travel times limit service frequency, since the vehicles require a long period of time to compete a route and return to service. Adding additional vehicles to the fleet in order to increase frequency is difficult for rural transit providers to justify due to the lower ridership and lower productivity of these services. Low frequencies result in long wait times for passengers, and a missed trip for a low-frequency service may create significant economic risk for workers in the industrial sectors. As discussed previously, many workers in these sectors are employed on shift work; showing up late for a shift can result in loss of income or loss of employment.

Transit agencies also struggle to provide service spans that meet the needs of the industrial workforce. As with childcare facilities, many transit agencies in rural and smaller urban communities operate along standard business hours. While some agencies try to arrange schedules that allow for pick-ups and drop-offs on either end of the standard 9 a.m. to 5 p.m. business day, these agencies are often unable to provide second-shift or third-shift services. This misalignment limits the ability of standard transit service to serve as workforce transportation for many workers in the warehousing and manufacturing sectors.

4.0 Missouri Freight Assets, Demand, and Performance

To better prepare Missouri for future supply chain issues, trends and opportunities, it is important to understand the current operations and conditions of the state's multimodal freight network. This section describes freight demand and network level of service in Missouri today, including infrastructure conditions, commodity flows, connectivity, safety and opportunities for improvement. Much of the technical information on current conditions and future trends was sourced from the 2022 Missouri State Freight and Rail Plan, and augmented by the numerous freight transportation industry experts and representatives that presented to the Supply Chain Task Force between January and May 2022.

4.1 Multimodal Freight in Missouri Today

Missouri's multimodal freight network includes highways, railroads, air, ports and pipelines, as shown in Figure 4.1. In 2018, 985 million tons valued at $1.14 trillion moved into, within, out of and through the state.[5] Missouri is unique among U.S. states for the high amount of freight transported by rail, the top mode by value and volume. Highway freight followed closely behind rail, with waterways, pipeline and air cargo modes comprising a relatively small share. Table 4.1 summarizes the key infrastructure and compares commodity flows by modal split in Missouri.

TABLE 4.1 SNAPSHOT OF MULTIMODAL FREIGHT NETWORK IN MISSOURI

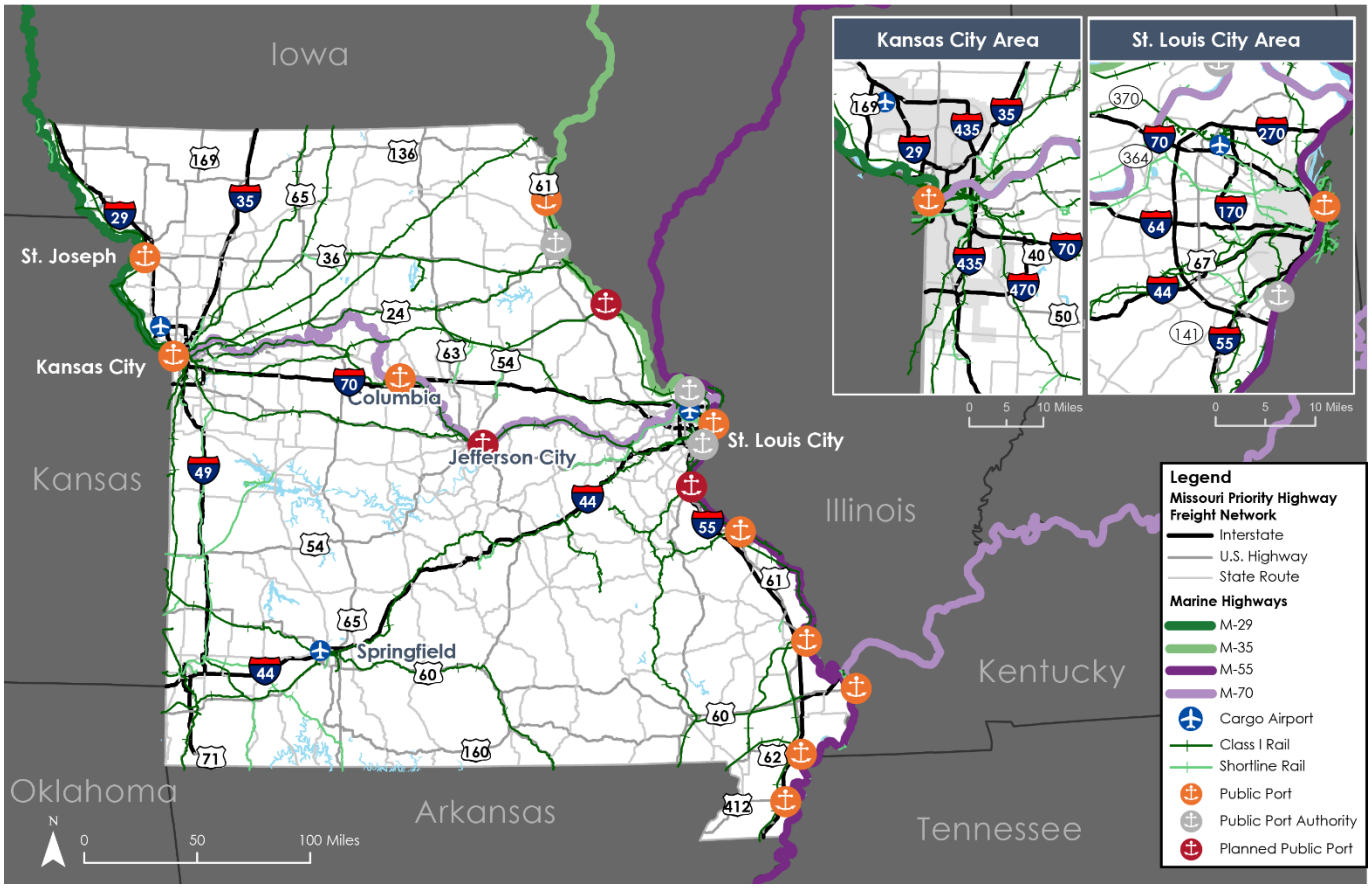
Mode	Key Infrastructure	Tons	% of Total	Value	% of Total
Highway	• 33,832 miles of state highways, including 1,380 miles interstate • 10,600 public and private truck parking spaces	406.6M	41%	$495.6B	43%
Rail	• 20 private railroad owners • 5,300 miles of railroad, including 4,670 of Class I Railroads • 5,500 at-grade highway-rail crossings • 141 intermodal facilities	414M	45%	$590.4B	51%
Air	• 3 primary air cargo facilities • All 3 airports located within Foreign-Trade Zones	0.2M	< 1%	$22.0B	2%
Ports and Waterways	• 1,050 miles of inland waterways along 4 federally-designated marine highways • 16 public port authorities	39.9M	4%	$7.6B	2%

[5] The 2022 Missouri State Freight and Rail Plan analyzes commodity flow data from IHS Transearch (now known as S&P Global). Although Transearch is a comprehensive database that provides a greater level of commodity flow detail along individual trade lanes and corridors than publicly available sources, data limitations exist for certain types of shipments. There is limited information about agricultural movements within a state or region. Detailed commodity flows are not available below the county level, and these data do not show how products move from farms to elevators, intermodal connections with railroads or waterways or processing locations. As a result agricultural movements are underreported and likely understated in this analysis.

Mode	Key Infrastructure	Tons	% of Total	Value	% of Total
	• 8 locks and dams • Over 120 river transload terminals				
Pipeline	• Over 25 major pipelines and 20 operators	89M	9%	$27.0B	2%

Source: 2022 Missouri State Freight and Rail Plan.

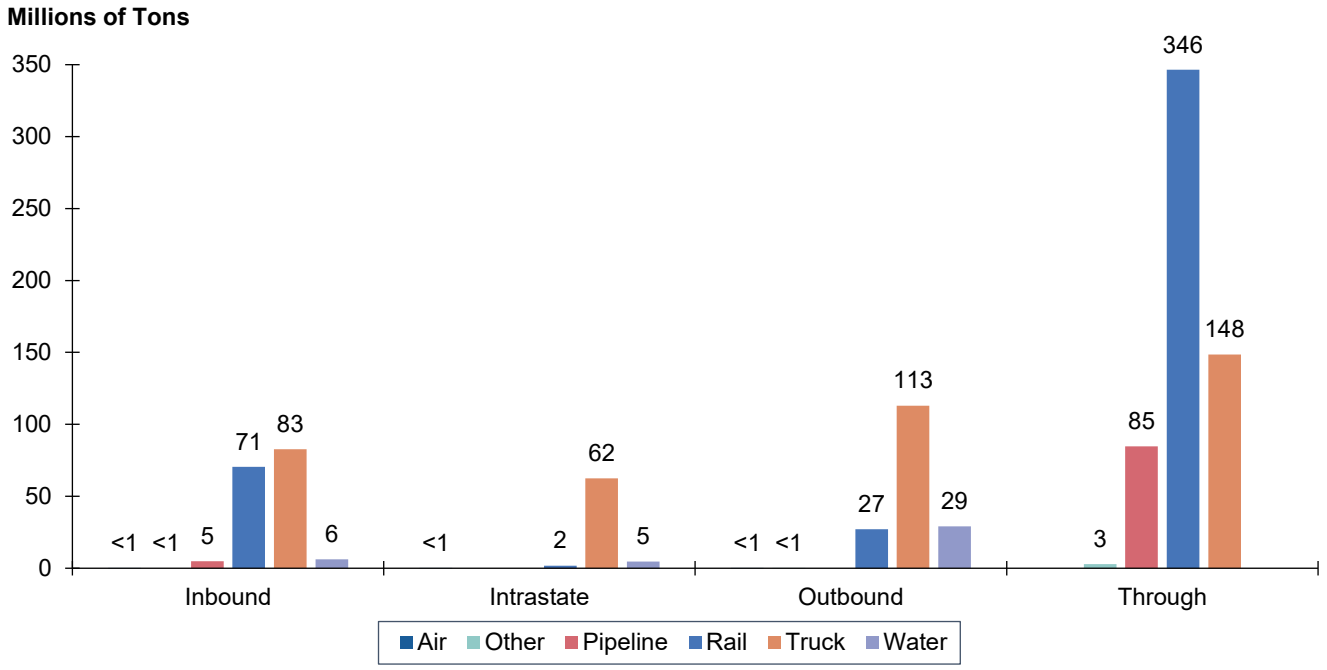
FIGURE 4.1 MISSOURI'S MULTIMODAL FREIGHT NETWORK



Source: 2022 Missouri State Freight and Rail Plan.

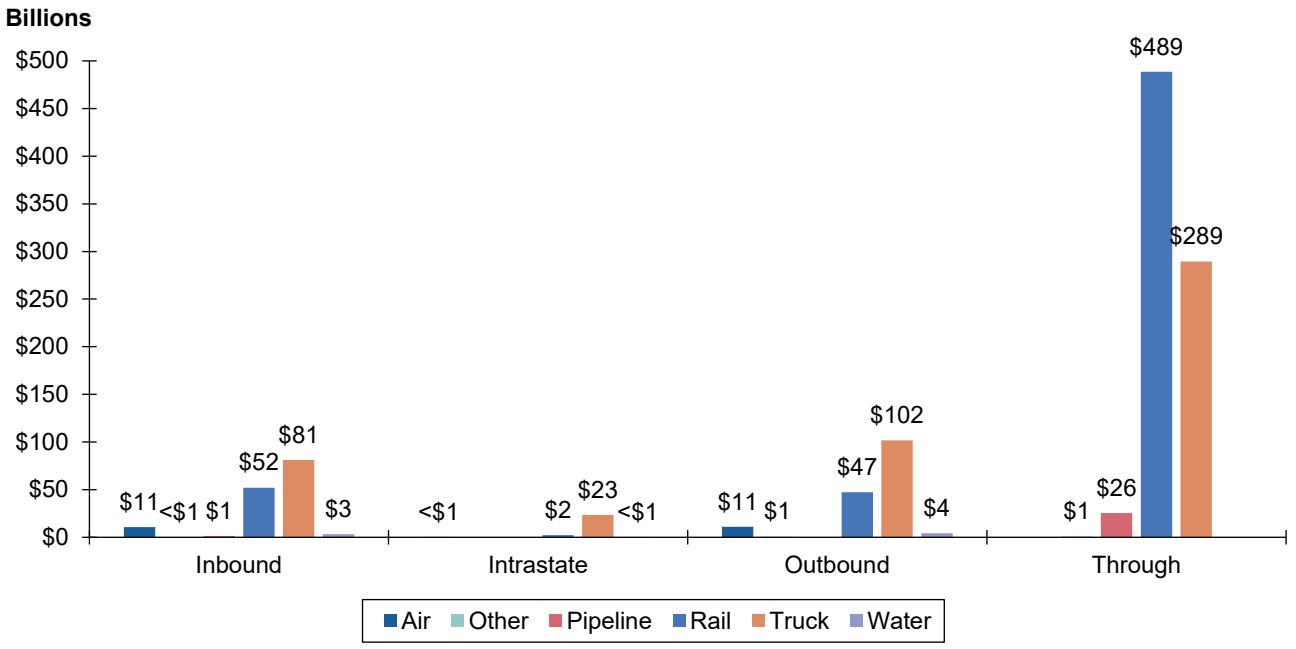
In terms of direction, the largest share of commodities traveled through Missouri without stopping, amounting to 59% of tonnage and 70% of value in 2018. By weight, outbound and inbound shipments each accounted for 17% and intrastate (beginning and ending within Missouri) accounted for 7% of total tonnage transported in 2018. By value, in 2018 outbound shipments accounted for 14% of total freight, inbound shipments for 13% and intrastate shipments only 2%. Figure 4.2 shows the total tonnage by mode and direction and Figure 4.3 shows mode and directional breakdown in terms of total value.

FIGURE 4.2 TOTAL TONNAGE BY MODE AND DIRECTION, 2018



Source: 2022 Missouri State Freight and Rail Plan.

FIGURE 4.3. TOTAL VALUE BY MODE AND DIRECTION, 2018



Source: 2022 Missouri State Freight and Rail Plan.

Table 4.2 lists the top five commodities by weight and value in Missouri in 2018. Table 4.3 summarizes the top trade partners and top commodities by volume and value for each freight transportation mode.

TABLE 4.2 TOP FIVE COMMODITIES BY TONNAGE AND VALUE IN 2018

Rank	Commodity	Tons (millions)	Share of Total	Commodity	Value ($B)	Share of Total
1	Non-metallic minerals	143	15%	Transportation equipment	$260	23%
2	Coal	140	14%	Mixed freight	$201	18%
3	Farm products	132	13%	Chemical & allied products	$104	9%
4	Crude petroleum and natural gas	109	11%	Food & kindred products	$99	9%
5	Food & kindred products	101	10%	Machinery	$71	6%

Source: 2022 Missouri State Freight and Rail Plan.

Overall, Illinois is Missouri's top trading partner, accounting for 17% of total combined inbound and outbound tonnage in 2018 (56.6 million tons). Wyoming, Kansas, Iowa, Arkansas, Louisiana and Texas are also significant trade partners. Some of Missouri's highest volume exports include broken stone/riprap, oil kernels, nuts and seeds and grain. For imports, bituminous coal from Wyoming is by far Missouri's largest import by volume with 46.5 million tons.

TABLE 4.3 TOP TRADE PARTNERS AND COMMODITIES BY VOLUME AND VALUE BY MODE

Transportation Mode	Top Trade Partners	Top Commodities by Volume	Top Commodities by Value
Highway	Illinois, Kansas, Iowa	Non-metallic materials Farm goods	Secondary moves Food and kindred goods Transportation equipment Farm goods
Rail	Wyoming, Texas, Illinois	Coal	Transportation equipment
Air	California, Texas, Tennessee	Small packaged freight shipments	Miscellaneous manufacturing Transportation equipment Electrical machinery, equipment, and supplies
Port and Waterway	Louisiana, Illinois, Tennessee	Non-metallic materials Farm goods Clay, concrete, glass, stone	Farm goods Chemicals and allied products Clay, concrete, glass, stone
Pipeline	Alberta, Canada	Crude oil	Crude oil

Source: 2022 Missouri State Freight and Rail Plan.

Missouri's two largest cities, Kansas City and St. Louis, serve as major attractors of multimodal and intermodal freight traffic. There are high concentrations of intermodal facilities in and surrounding Kansas City and St. Louis, serving as multimodal nodes for key freight generators within Missouri. As a byproduct, these urban areas experience more congestion and unreliability.

The metropolitan areas and counties surrounding Kansas City and St. Louis represent almost 50% of all freight activity originating and terminating in Missouri. Jackson County, home to Kansas City, is the top freight-generating county by weight, with 15% of all freight movement. St. Louis City and St. Louis County follow close behind, representing 10% and 9% of the state's total goods movement respectively. Five of the top ten counties for overall goods movement are located in the St. Louis area, including Jefferson, Franklin and St. Charles counties.

Outside of the two major metropolitan districts, the Southeast District generated the most freight activity, with nearly 70 million tons of imports and exports in 2018. The Northwest District saw the least amount of freight activity in 2018, with just under 30 million tons. Counties outside of the major metro areas with high levels of freight movement include Cape Girardeau County, Greene County (Springfield), Buchanan County (St. Joseph) and Sainte Genevieve County.

4.2 Freight Context by Mode

Freight flows in Missouri is the product of network design and management, infrastructure conditions and maintenance, multimodal connectivity, industry location and composition, and demand for commodities that flow to, from, within and through the state. This section describes freight assets and demand in Missouri today, including infrastructure network existing conditions by transportation mode, intermodal connections, and commodity flows by mode, direction and trading partners. The condition, capacity and location of the multimodal freight network directly contribute to the efficiency, reliability and competitiveness of supply chains in Missouri.

Freight Rail

Freight trains transported over half of all freight by value to, from and through Missouri in 2018. Missouri contains 3,421 route miles of Rail Freight Network Routes, within the federally designated National Multimodal Freight Network. There are 5,550 at-grade highway-rail crossings in Missouri, of which 60% are public crossings.

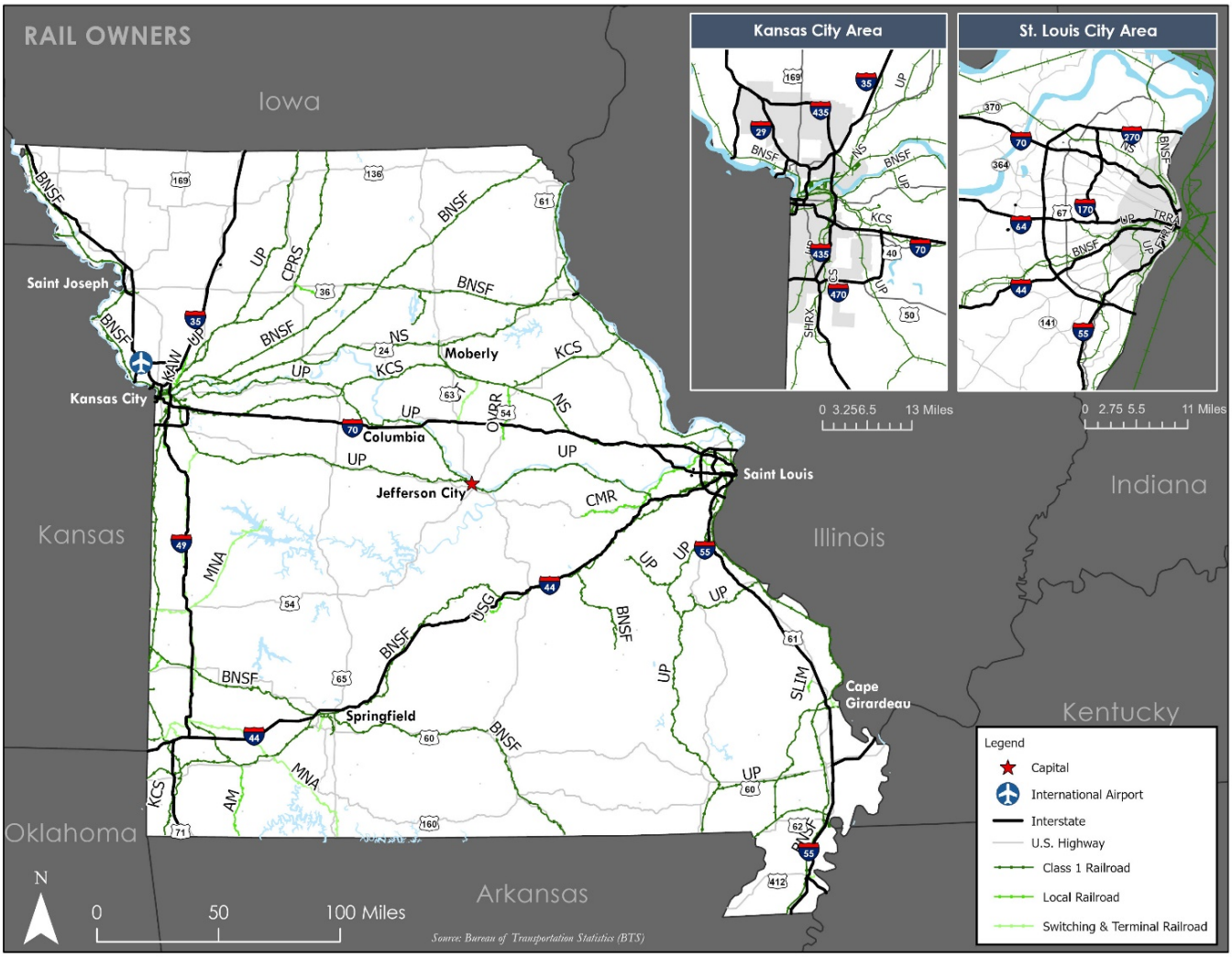
More than 20 private company owners control almost 5,400 miles of major railroads within Missouri. Five Class I Railroads own over 85% of all tracks in Missouri, including Burlington Northern Santa Fe Railway Company, Canadian Pacific, Kansas City Southern Railway Co., Norfolk Southern Corporation and Union Pacific.[6] Additionally, there are six local railroads and 10 switching/terminal railroads that operate as Class III within Missouri. Switching and terminal railroads in Missouri provide support functions and connectivity between industry and the national rail network. One example of this type of carrier is Terminal Railroad Association of St. Louis, which operates over 50 miles and two Mississippi River bridges, connecting with six Class I railroads to move significant volumes of freight in the St. Louis region. TRRA also facilitates multimodal connections to multiple river terminals, providing shippers with year-round access to rail and river modes. TRRA is in the process of making investments to modernize its infrastructure, including at-grade and grade separated crossings as well as rehabilitation of MacArthur Bridge and the complete replacement of Merchants Bridge, both of which received Federal grant funds in recent years. Despite the critical role short line railroads play in Missouri's multimodal freight

[6] In December 2021, Canadian Pacific completed its acquisition of Kansas City Southern, forming Canadian Pacific Kansas City. CPKC would provide the first single-line connection between the U.S., Canada and Mexico. Once the Surface Transportation Board formally approves the transaction (expected Q4 2022), the railroads expect to achieve full integration over the course of three years.

network, it can be difficult for carriers to secure funds to make necessary investments, and would benefit from additional access to state-administered funds.

While the majority of capital improvements and investments are funded by railroad owners, in recent years Missouri has increased public investment to alleviate operating constraints. Figure 4.4 shows the statewide railroad owners and infrastructure. Missouri also has over 140 intermodal facilities integrating rail with other freight transportation modes, concentrated in the St. Louis and Kansas City regions. The majority of intermodal facilities connect rail to highway trucking.

FIGURE 4.4 STATEWIDE RAILROAD OWNERS



Source: Missouri 2022 State Freight and Rail Plan.

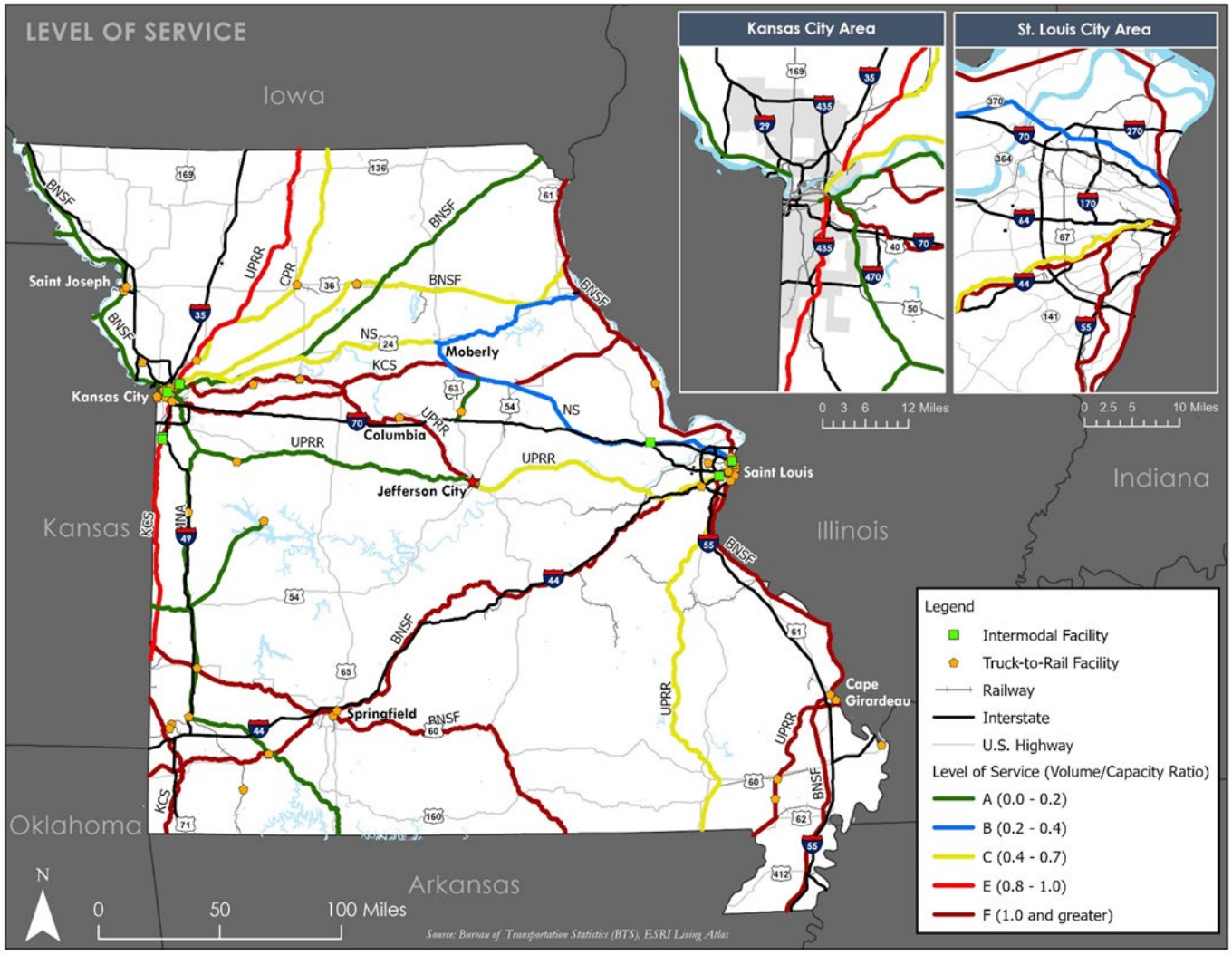
About 414 million tons of rail freight moved to, from, within or through the Missouri in 2018. Through freight dominates the state's freight flow due to Missouri's central location within the country, accounting for more than 75% of freight tonnage. While there is almost three times as much inbound freight as outbound freight by volume, inbound and outbound rail freight represent similar value of commodities. This indicates that Missouri is importing

more lower value, higher weight freight than it is exporting (such as coal). Almost 85% of rail freight were classified as carload shipments, typically for raw materials such as coal or grain moved in large quantities. The remaining 16% were intermodal shipments, which are products that rely on trucks to connect freight shipments with rail facilities or final destinations. However, intermodal shipments represent over half of rail freight value. Wyoming is by far Missouri's top trading partner by rail, representing almost half of all freight rail trade due to the import of bituminous coal. Coal is by far the state's top commodity for freight rail by tonnage yet represents less than 1% of freight value.

On freight rail corridors, level of service and congestion compare corridor volumes to overall capacity. Railroad networks are limited by the fixed capacity of rail lines, demand for freight shipment and aging infrastructure. The aging infrastructure conditions in neighboring states, including Kansas and Illinois, also affect freight operations in Missouri. Figure 4.5 shows the existing level of service on railroads in Missouri.

Similar to highways, rail network bottlenecks occur where underperforming components affect capacity or performance at a systemwide level. Factors that create bottlenecks include congestion caused by having a single track only, a stalled train, broken traffic signals, or a lack of proper equipment at intermodal facilities. The surrounding built environment in urban areas can also limit expansion of rail corridor capacity.

FIGURE 4.5 RAILROAD EXISTING LEVEL OF SERVICE (CORRIDOR VOLUME TO CAPACITY)

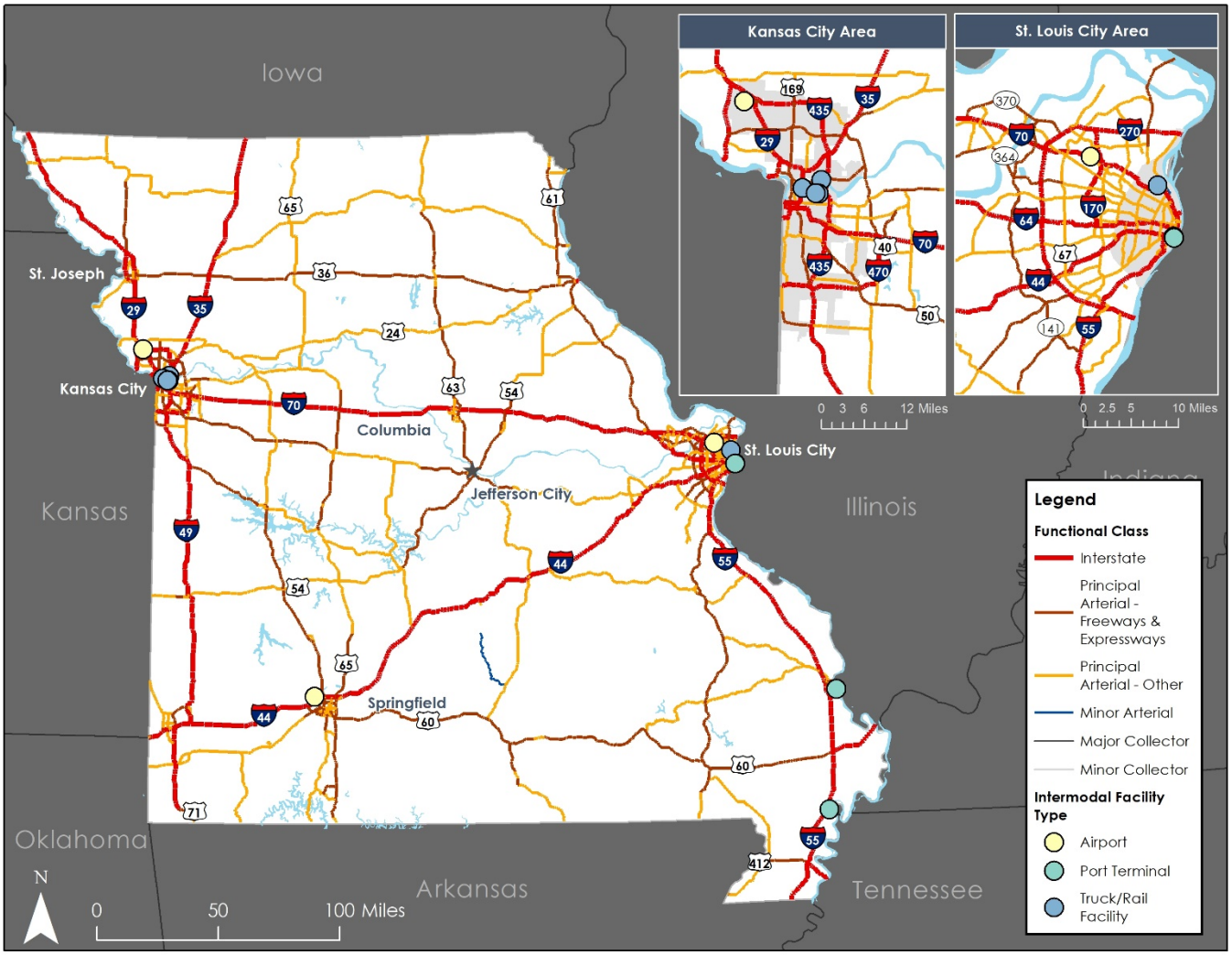


Source: Missouri 2022 State Freight and Rail Plan.

Freight Highways

Over one-third of all freight travels along Missouri's highway system. MoDOT manages 33,832 miles of state highways, including 1,380 miles of interstates. Over 1,000 miles of interstates and intermodal connectors (roads leading to major intermodal freight facilities) are part of the Primary Highway Freight System, within the federally designated National Highway Freight Network (shown in Figure 4.6). Interstates are essential infrastructure for highway freight and long-haul trucking. Although interstates compose only 4% of Missouri's total highway network, they are by far the highest volume highways for truck traffic.

FIGURE 4.6. MISSOURI'S NATIONAL HIGHWAY SYSTEM AND FREIGHT INTERMODAL FACILITIES



Source: Highway Performance Monitoring System, 2018; analysis by Cambridge Systematics, 2020.

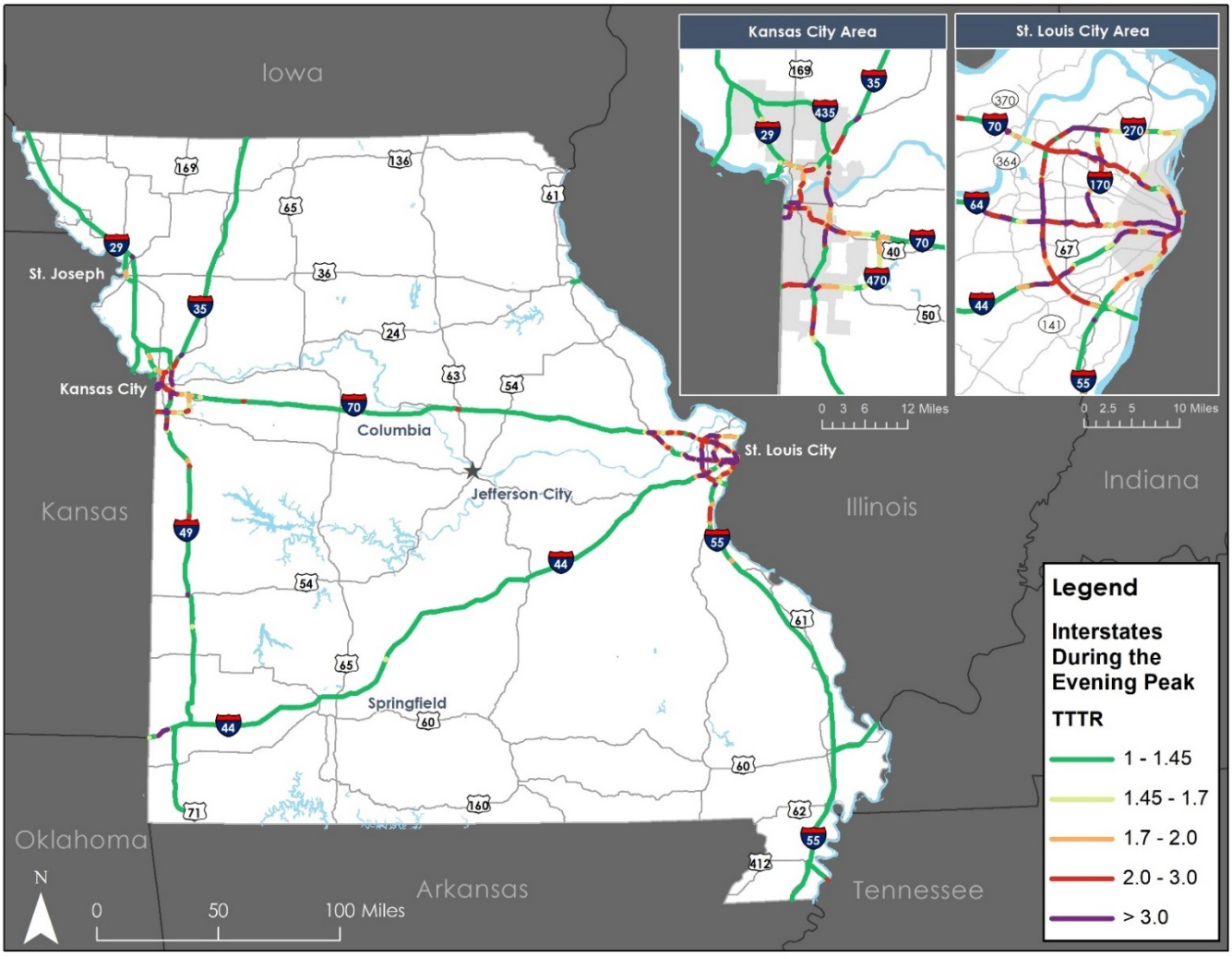
In 2018, 32.5 million trucks transported more than 400 million tons of freight worth more than $495 billion on Missouri's highways. I-44 is Missouri's top freight highway corridor, carrying a more than 1.3 billion tons of freight valued at $3.7 billion in 2018. Other major corridors carrying between 100 and 150 million tons include I-29, U.S. 54, U.S. 60, U.S. 7 and I-70. By value, key corridors carrying over $200 million include U.S. 54, MO-744 and I-270.

I-70 is one of the main east-west highways nationally and connects Missouri's two largest cities, Kansas City and St. Louis. I-44 connects St. Louis to Springfield, the third largest city in Missouri. I-49 and I-55 are key north-south highways connecting the Great Lakes and Gulf states. I-70, I-44, I-49 and I-55 all experience high truck traffic volumes. Truck traffic volumes are highest on the interstates that are in and surround St. Louis and Kansas City, including I-270, I-255, I-64, I-635 and I-670. Although non-interstate routes accommodate fewer trucks than interstates, these crucial routes serve as first-mile/last-mile connections statewide, in both urban and rural settings.

The agriculture industry in particular depends on rural highway connections. Key connector routes include U.S. 36, U.S. 61, MO-364, MO-370 and MO-249.

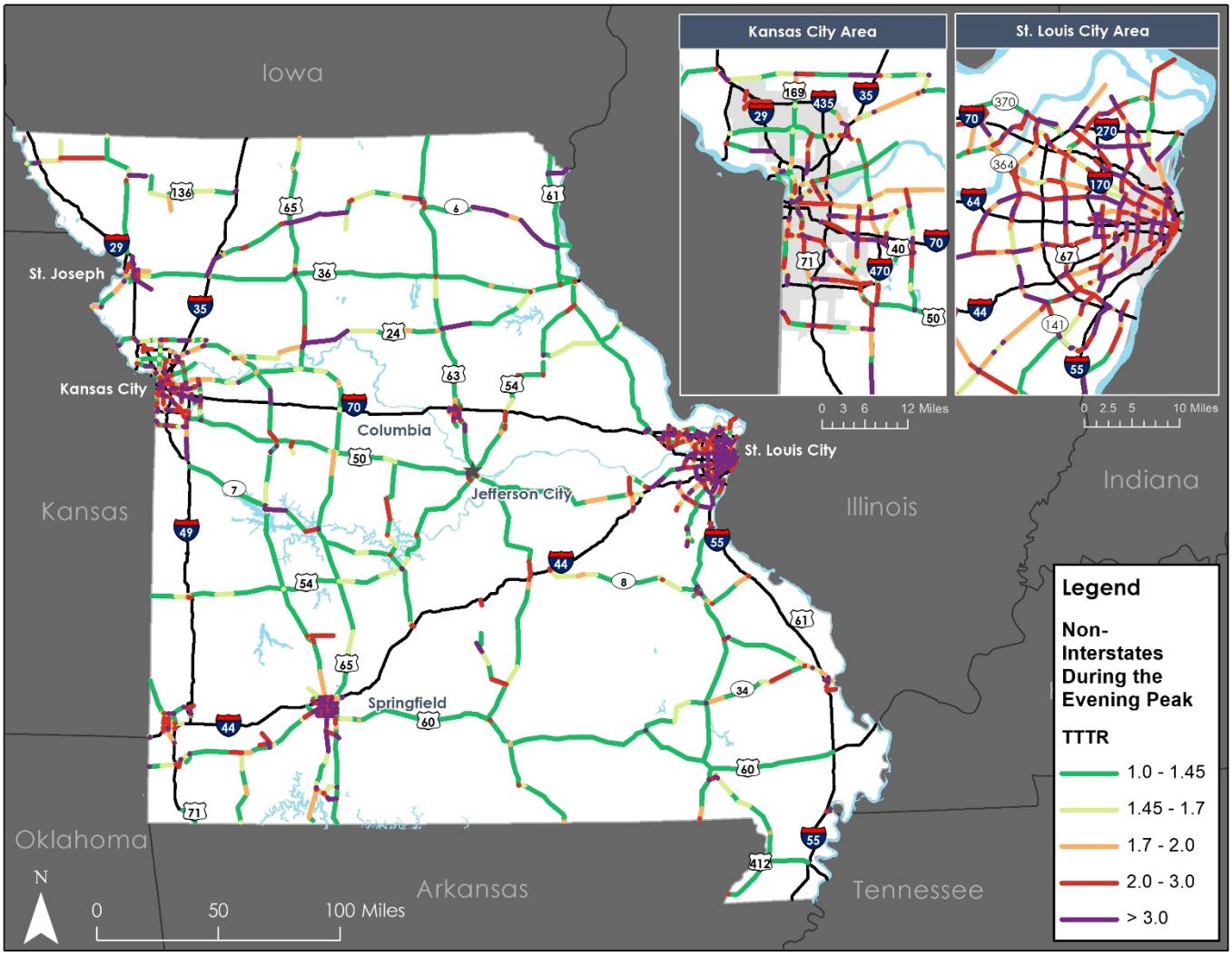
Travel time reliability, which measures variability of travel time during a given period, is important for motor carrier operations. Unreliable travel times may lead to increased shipping costs and schedule delays. On Missouri interstates, congestion primarily occurs within urban areas, in particular St. Louis and Kansas City. In St. Louis, there are congested segments during the evening on parts of I-64, I-270 and I-44. There is also congestion at the intersection of I-170 and I-64. In Kansas City, the area with the most congestion is where I-70, I-670, I-29 and I-35 loop downtown. Approximately 13% of Missouri interstates are unreliable at any time period. Similar to congestion, most unreliable interstate miles are within urban areas.

FIGURE 4.7. EVENING PEAK TRUCK TRAVEL TIME RELIABILITY ON INTERSTATES



Non-interstate roads experience more variability in speeds due to traffic control, functional class and roadway design, contributing to lower average truck speeds and reliability in urban centers. Rural non-interstate roads experience higher reliability than urban non-interstates but are also less uniformly reliable than interstates (Figure 4.8). Crashes on rural interstates can lead to variability in reliability on some corridors.

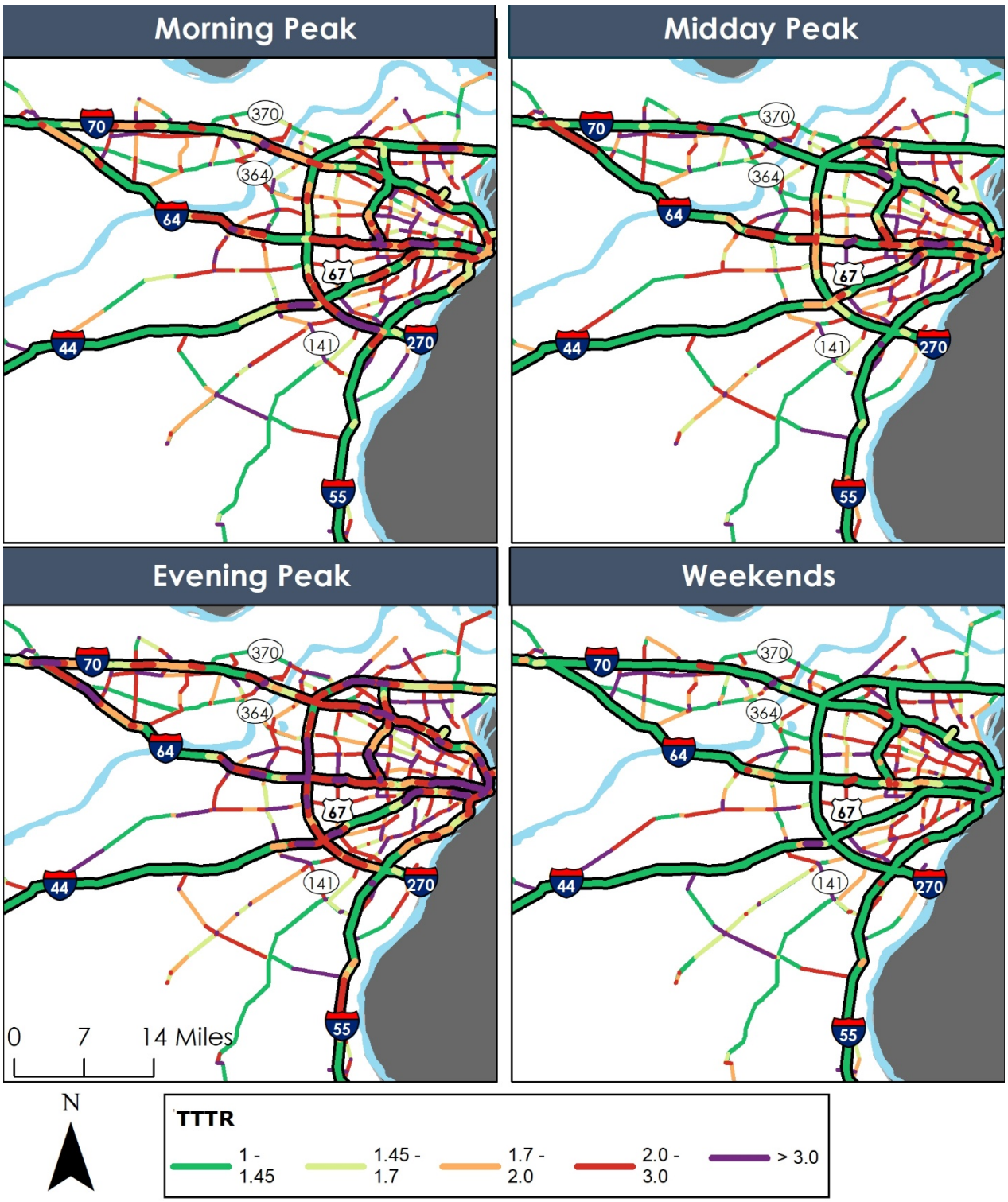
FIGURE 4.8. EVENING PEAK TRUCK TRAVEL TIME RELIABILITY ON NON-INTERSTATES



Source: National Performance Management Research Data Set, 2019; analysis by Cambridge Systematics, 2020.

Reliability of roads varies greatly in urban areas. For example, in St. Louis the unreliable segments along the interstates differ during the morning and evening peaks, and are generally non-existent during the weekend. However, unreliability on the non-interstate network is generally consistent and persists even during the weekends (Figure 4.9).

FIGURE 4.9 TRUCK TRAVEL TIME RELIABILITY FOR THE ST. LOUIS AREA



Truck Parking

In 2019, there were approximately 166,000 trucking industry in jobs in Missouri, comprising 1 in 14 jobs in the state. There are 13,430 trucking companies located in Missouri, which are primarily small, locally-owned businesses. However, truck drivers in Missouri come from all across the country to move freight to, from, and through the state. Truck drivers need designated parking for staging, breaks, emergencies, rest and time off, as regulated by the Federal Motor Carrier Safety Administration. There are five primary types of truck parking needs, each with a specific set of circumstances and challenges:

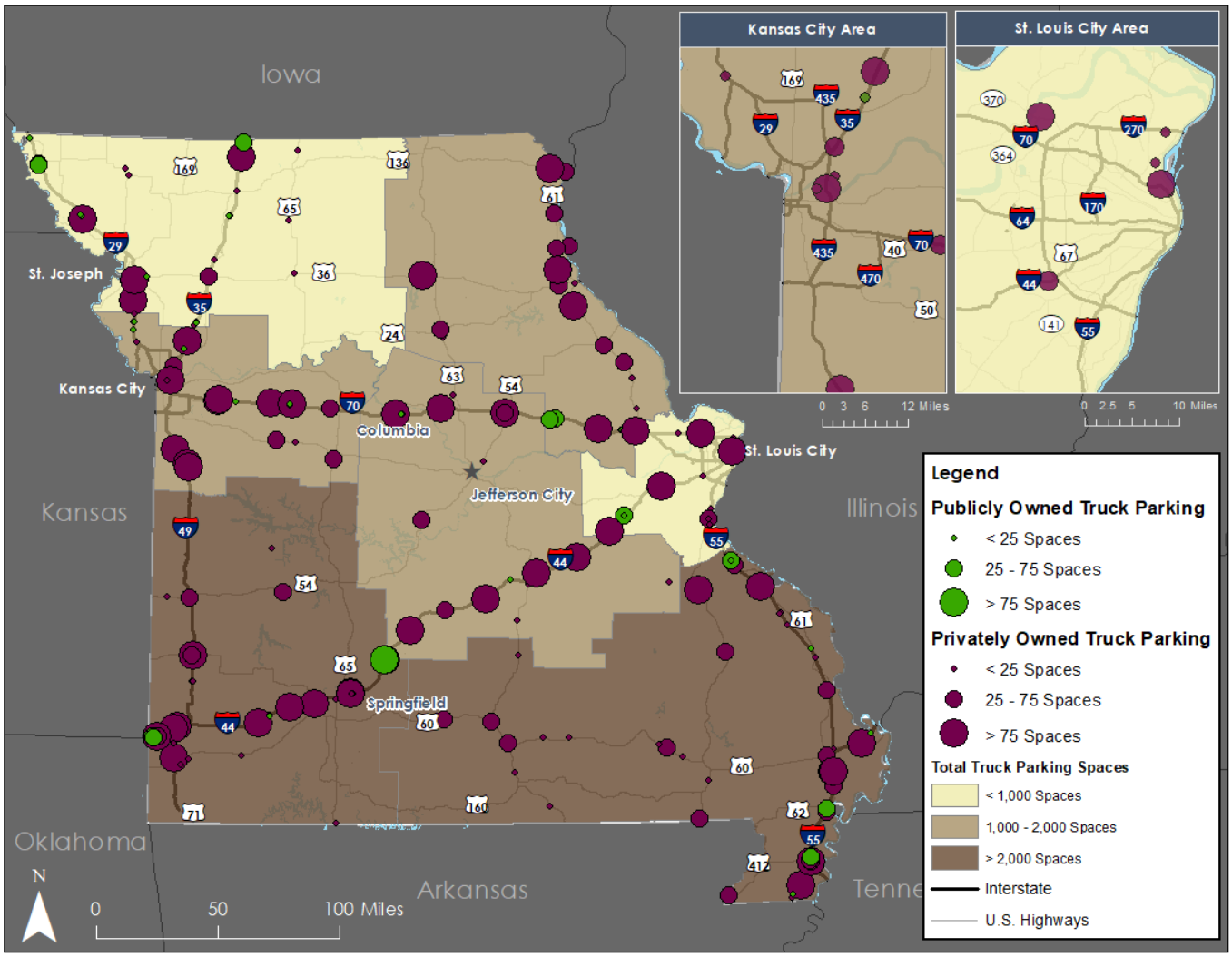
FIGURE 4.10 TYPES OF TRUCK PARKING NEEDS

Long Haul	•Drivers are on the road days or weeks •Cross-country travel
Staging	•Drivers need a place to park to wait for pick-up/delivery windows •Manufacturing plans, warehouses, DCs, etc. have different protocols
30-Minute Break	•Federally mandated •Driver must stop for 30 min. and not move the truck for any reason
Emergency	•Parking needed when incidents result in roadway closures or severe congestion
Time Off	•Independent drivers don't have a company to provide parking during time off

In Missouri, there are an estimated 10,600 public and private truck parking spaces, of which 1,140 spaces (11%) are publicly owned (Figure 4.11). There are 141 truck parking sites within a half mile of an interstate. All publicly owned facilities except one are located on an interstate corridor. The Southeast and Southwest Districts have the highest number of truck parking spaces, while the Northwest and St. Louis Districts have the lowest. I-44, I-70 and I-55 have the greatest concentrations of truck parking spaces on a per-mile basis. There are notable gaps in truck parking availability along U.S. 60 east of Springfield and sections of U.S. 36, two of the highest traveled non-interstate corridors within Missouri.

Not all truck parking sites are created equal. Truck drivers value sites that offer amenities such as restrooms with flushing toilets, lighting, enhanced vending machines, Wi-Fi, and paved and striped lots.

FIGURE 4.11 MISSOURI TOTAL TRUCK PARKING INVENTORY

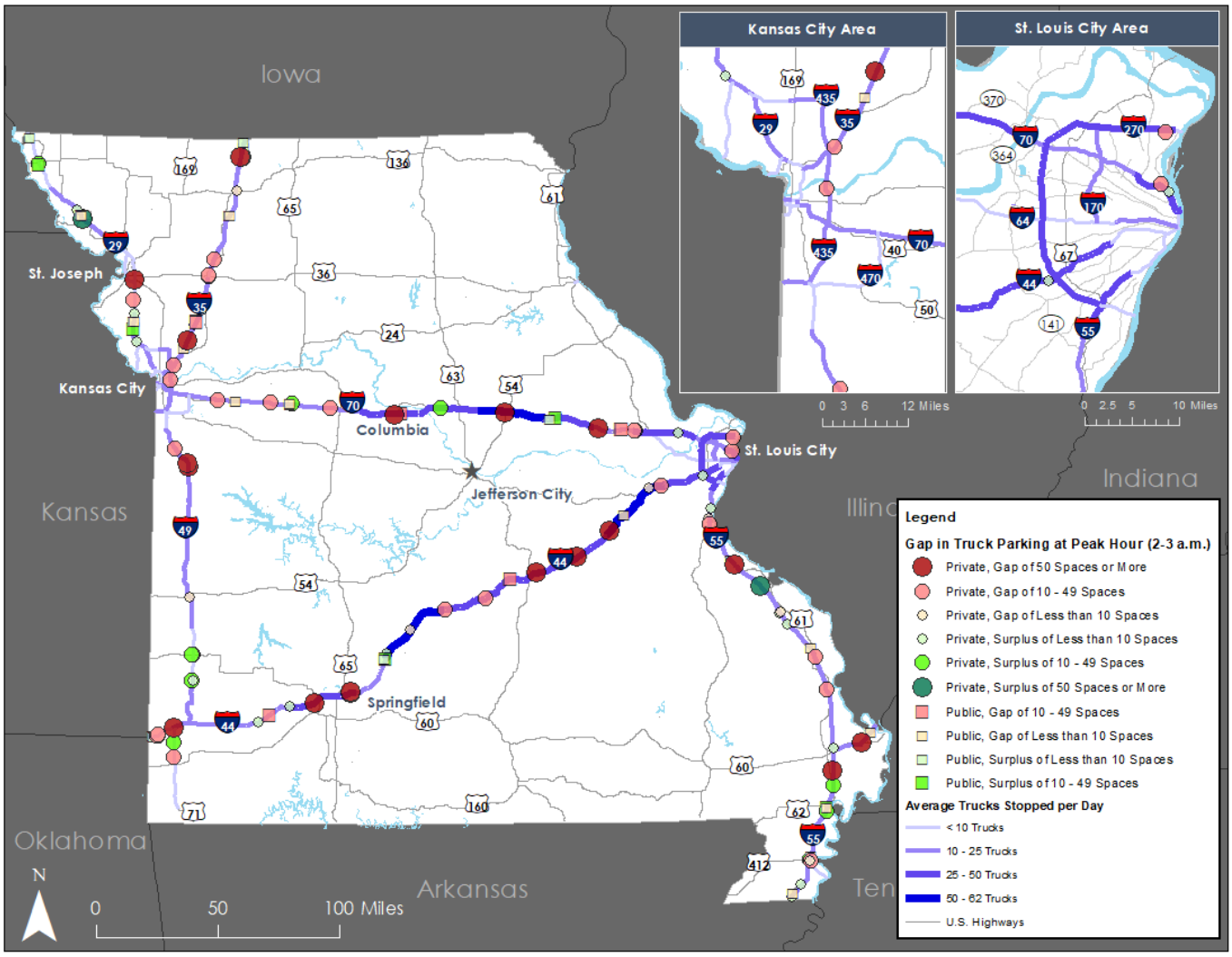


Source: MoDOT. Truck parking websites and applications. Analysis by Cambridge Systematics (2020).

Overall, parking supply does not meet demand during the peak nighttime hours. Areas where parking demand consistently exceed supply may have higher rates of unauthorized parking. At- or over-capacity truck parking sites may lead commercial vehicles to park on ramps, shoulders or other undesignated locations, creating safety concerns.

Demand for truck parking during nighttime peak periods exceeds overall capacity by more than 2,300 spaces. Out of 141 designated truck parking sites within a half-mile of the interstate system, 87 sites (62%) are at or over capacity from 2-3 a.m. Another 23 sites (16%) are at 80% capacity or above. Figure 4.12 shows the gap at publicly owned and privately owned designated truck parking sites the peak hour. A cluster of over-capacity sites exist on I-35 northeast of Kansas City, most of I-44, I-70 west of I-270 and near the I-55/I-57 interchange. These locations also experience a high number of trucks parked on interstate right-of-way. The greatest parking shortages occur in the Central District, followed by Kansas City, St. Louis and Southwest Districts.

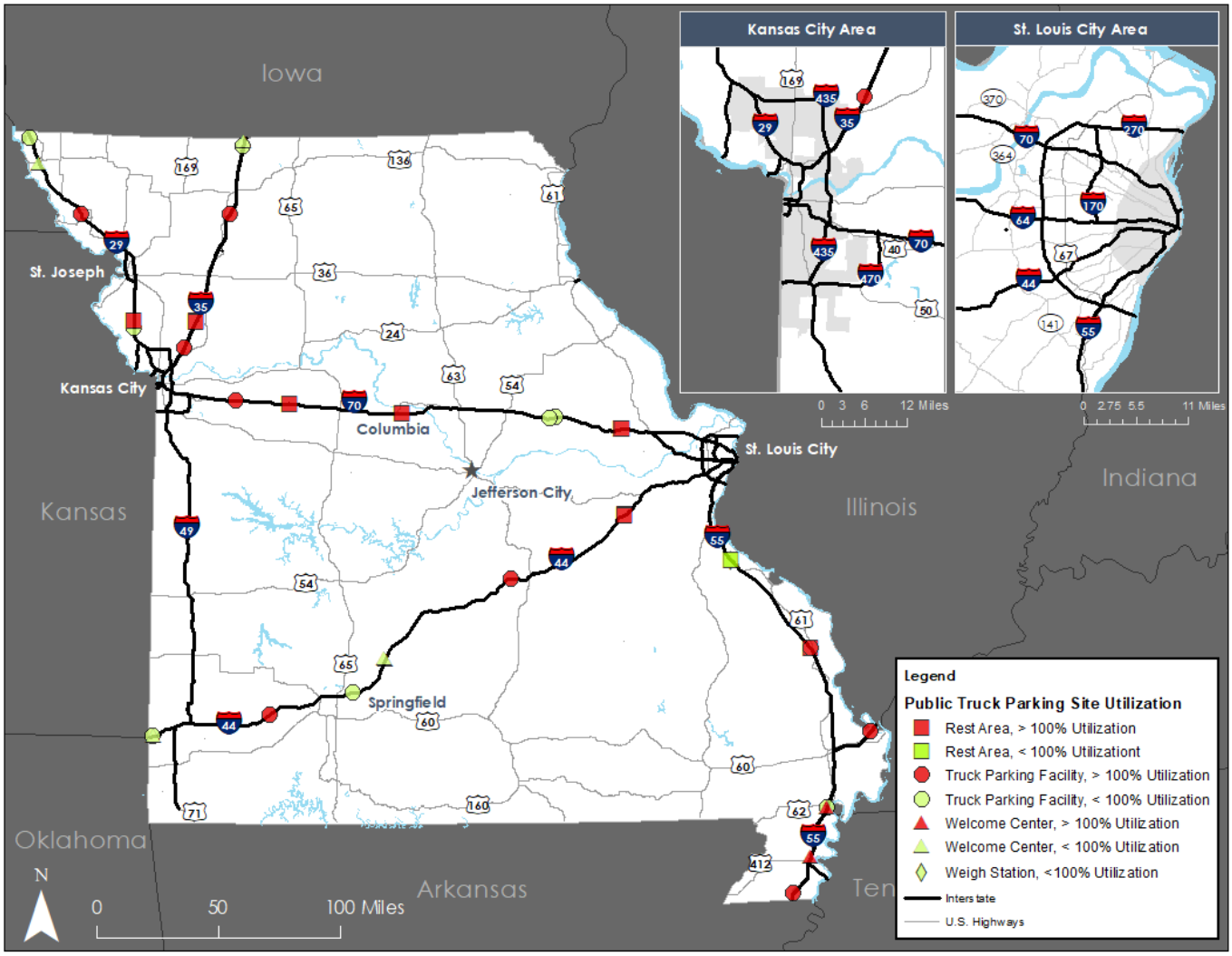
FIGURE 4.12 MISSOURI TRUCK PARKING GAP AT DESIGNATED PARKING SITES WITHIN ½ MILE OF THE INTERSTATES



Source: Missouri 2022 State Freight and Rail Plan.

Utilization at publicly-owned truck parking sites—which includes welcome centers, rest areas, truck parking-only facilities and weigh stations—is high during the peak hour (2–3 a.m.), as shown in Figure 4.13. In total, the rest areas had a gap of approximately 104 spaces and an average utilization rate of 147%, the truck parking facilities had a gap of 7 spaces and an average utilization rate of 111%, the weigh station had a surplus of five spaces and a utilization rate of 67% and the welcome centers had a surplus of 30 spaces and an average utilization rate of 91%. However, there was a great deal of variation within specific sites. The sites with the highest utilization rate include Lathrop Rest Area I-35 NB (239% utilization), Wright City Rest Area I-70 WB (213% utilization) and Doolittle Truck Parking Facility I-44 EB (209% utilization) and I-44 WB (196% utilization).

FIGURE 4.13 MISSOURI TRUCK PARKING UTILIZATION AT PUBLICLY-OWNED SITES



Source: Missouri 2022 State Freight and Rail Plan.

Hours of service rules are designed to eliminate the type of drowsiness that can lead to crashes. HOS regulations are strongly enforced by state agencies and fines for non-compliance can be high. To avoid the steep fines and negative impact to their safety rating, drivers are under pressure to find parking as quickly and efficiently as possible to avoid violating HOS regulations while trying to meet stringent delivery schedules. In addition, the mandatory use of electronic logging devices in most commercial vehicles as of April 2018 has sharpened the focus on truck parking issues.

Beyond HOS, many other factors influence when and where a driver decides to park. For example, the driver could be carrying a load for a facility with a very strict delivery window (time when the driver can arrive on-site), and drivers can face fines or potentially lose future business if they are not there on-time. In a heavily congested area or corridor, this requirement may influence a driver to park as close to the facility as possible to not risk missing their appointment. If parking is not available in a designated location, they may seek to park in an undesignated spot

instead.[7] Similarly, a driver may be forced to wait longer than planned for a facility to load their truck, impacting their ability to reach a planned stopping place later in their trip. Table 4.4 shows some of the factors that influence where trucks park based on the various companies involved in a supply chain.

TABLE 4.4 HOW FIRMS CAN INFLUENCE THE TRUCK PARKING DECISION

Principal Agent	Truck Company/Driver	Origin/Receiver	Infrastructure/ Parking Provider	Regulator or Enforcement[8]	Other Public Entities
Key Objective	Manage operational costs and reduce under-utilized miles (empty or nonrevenue producing trips)	Manage inventories with logistical solutions	Provide parking for safety reasons (public) or for profit (private)	Improve traffic safety	Community safety
Potential Areas of Control	The truck route, equipment, in-transit parking decisions	Time of pick-up/delivery	Build and maintain parking, signage, driver notifications concerning parking slots	Safety inspections, citation authority, operational allowances, time	Land use, truck routes, restricting truck operations
What They Do Not Control	The truck destination, last mile parking, zoning issues, truck operational bans	Smaller sites -near site parking (larger sites may provide some parking areas or could provide space)	Demand for parking by location or time	Hours of pick-up/delivery	Shippers need to receive cargo

Source: Institute for Trade and Transportation Studies, Thoughts on the Challenges Associated with Public-Sector Planning for Truck Parking Facilities, 2016.

Ports and Waterways

Missouri's location on the Mississippi and Missouri Rivers makes waterway freight an essential part of Missouri's freight economy and connection to domestic and global markets. There are 1,050 miles of inland navigable waterways in Missouri that may be used to transport interstate or foreign commerce. Transporting freight by barge or ship is an attractive alternative for many commodities, due to dedicated throughway, low emission levels and comparatively low costs.

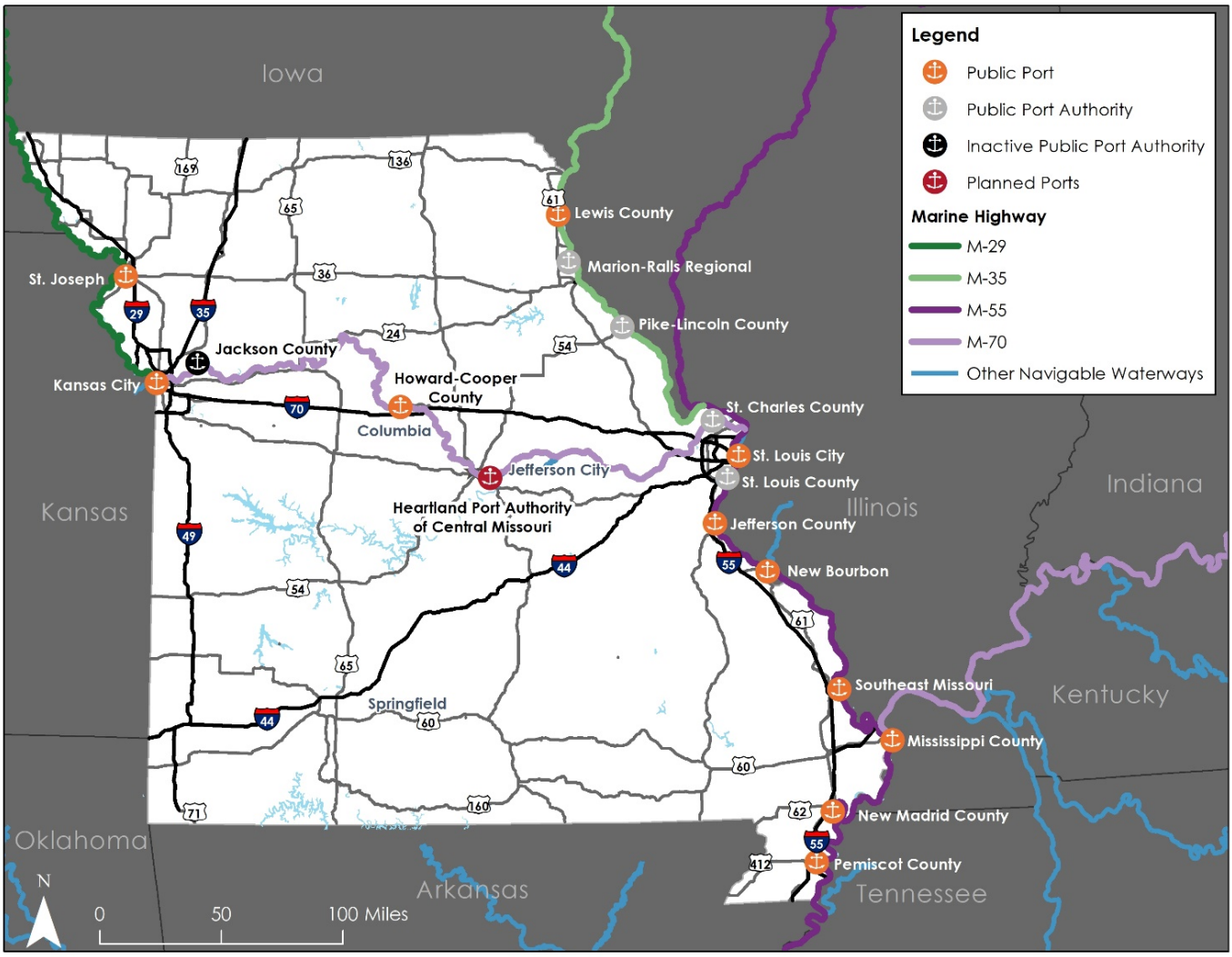
From a national perspective, the most significant routes of waterway freight movement happen on the marine highways designated by the U.S. Department of Transportation. Marine highways add another layer of redundancy to America's freight network by providing alternatives to the highway and rail networks. Missouri occupies a central location in the inland waterways of the marine highway system. The major rivers that are involved include the Mississippi River, Missouri River, Illinois River and Ohio River, with four marine highway routes, including M-29, M-35, M-55 and M-70. In particular, M-55 composes most of the eastern border of Missouri and is one of the busiest inland waterways in the country. Figure 4.14 shows the ports and marine highways in Missouri; there are 16 active public port authorities along the marine highways. In addition, there are hundreds of private facilities along

[7] Note that in many cases, businesses will not allow a driver to park on property prior to or after a delivery.

[8] Note that in Missouri, the regulator and enforcement are shared between MoDOT, Missouri State Highway Patrol, St. Louis and Kansas City metropolitan police departments, and St. Louis County police department.

these waterways that move a substantial amount of waterborne freight, including facilities like grain elevators, storage centers and pipeline infrastructure.

FIGURE 4.14 PORTS AND MARINE HIGHWAYS IN MISSOURI



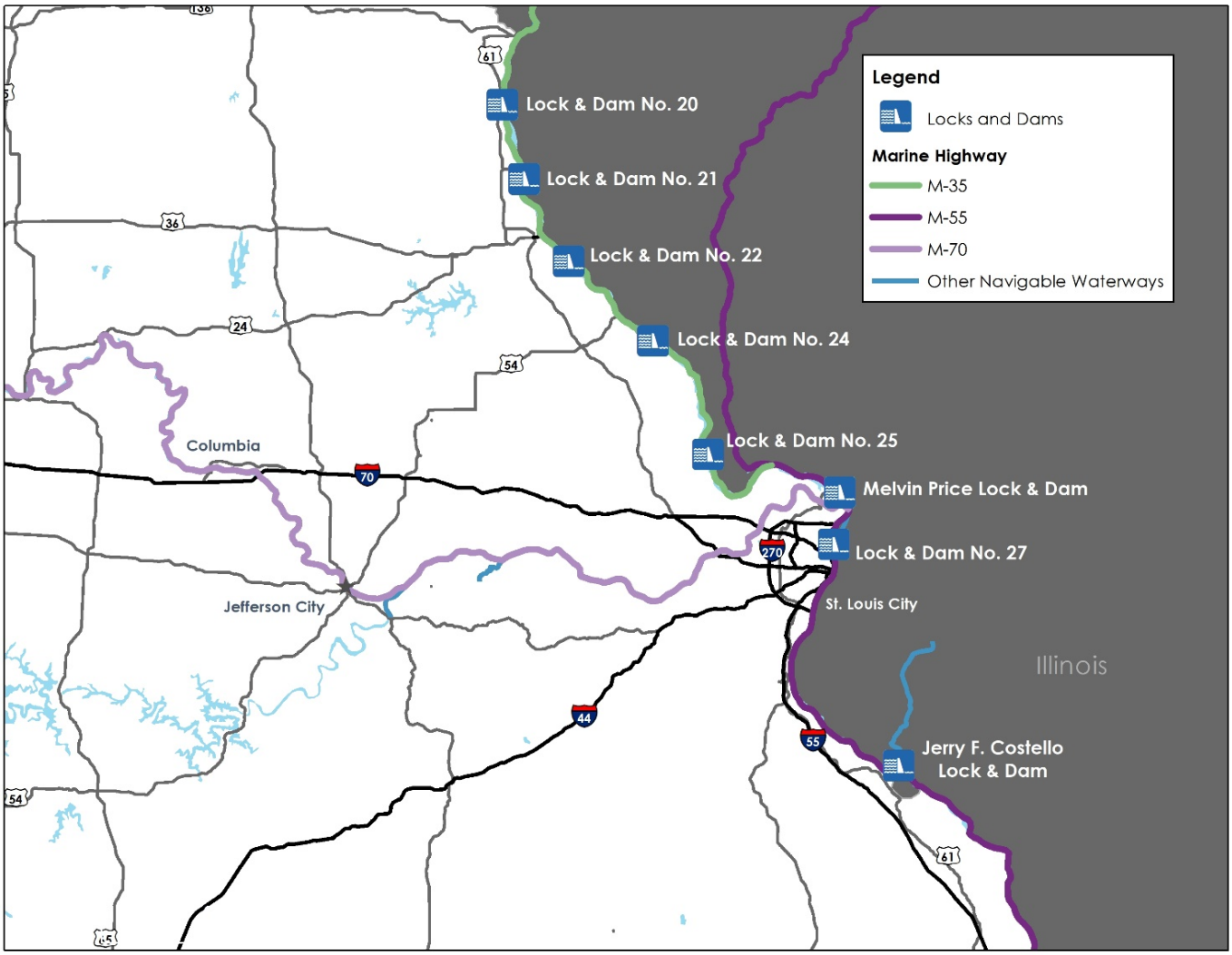
Source: Missouri 2022 State Freight and Rail Plan.

The state of Missouri is a member of the Mid-America Port Commission, a partnership of 26 counties from Illinois, Iowa and Missouri with the goal to coordinate freight logistics and link waterways with other freight modes. In October 2020, the USACE announced that the Mid-America Port Commission was approved as a Port Statistical Area, comprising 59 public and private terminals moving 14 million tons of commodities annually. In Missouri, it will encompass the Pike-Lincoln County Port Authority, the Marion-Ralls Regional Port Authority and the Port of Lewis County.

In the northern half of the state, the upper Mississippi River is maintained using locks and dams to control the depth of water and allow barge traffic through. The U.S. Army Corps of Engineers maintains seven locks along the Mississippi River in Missouri, including Lock & Dam 20, 21, 22, 24, 25, 26 (also called the Melvin Price Lock &

Dam) and 27 (Figure 4.15). There is also one lock (the Jerry F. Costello Lock and Dam) that is located where the Kaskaskia River intersects with the Mississippi River. Many of these locks are approaching 100 years old.

FIGURE 4.15 LOCKS AND DAMS ON THE MISSISSIPPI RIVER



Source: Missouri 2022 State Freight and Rail Plan.

About 40 million tons of commodities valued at $7.6 billion were transported into, out of and within Missouri's ports and waterways in 2018. Outbound trade made up the majority of trade both in terms of tonnage (73%) and value (54%). The Port of St. Louis, which includes both public and private facilities on both sides of the Mississippi River, handled the highest volume of commodities at over 37 million tons. The next highest volumes pass through the Port of New Madrid (2.3 million tons), Port of Kansas City (1.4 million tons) and the Southeast Missouri Regional Port (1 million tons). Louisiana is Missouri's the top trading partner by water, which captures shipments that are transferred to and from container ships to and from international markets. Illinois and Tennessee are also top trade partners by water. Non-metallic materials comprised the highest share of tonnage (35%), while farm goods represent the highest share by value (28%). The high tonnage and value of agriculture commodities, including oil kernels, grain and fertilizer, reflect the significant role that agriculture plays in Missouri's economy.

In addition to the bulk commodities currently moving through Missouri's ports, some facilities see opportunity in supporting container-on-barge or container-on-vessel movements. At New Madrid Port, $27.5 million in infrastructure investments have been identified to prepare its North Harbor for container activities, including dredging, sheet piling, road and rail improvements, land acquisition, utilities expansion and other infrastructural needs. Southeast Missouri Regional Port currently supports COV or containerized rail freight, which has the potential to increase once the SEMO Port loop track project, which will allow the port to handle larger unit trains and increasing loading/unloading capacity, is complete. Another opportunity with great potential to expand COV/COB capabilities in Missouri is being led by American Patriot Holdings. The project includes a intermodal logistics gateway terminal in Plaquemines, La., with a network of developing and future inland port terminals across the Mississippi River System, including Memphis, Tn., Cairo, Il., St. Louis, Mo., Jefferson City, Mo., Kansas City, Mo. and Chicago, Il. It will use high capacity liquid natural gas-powered vessels at Cairo, Memphis and St. Louis, and smaller vessels built to navigate the tributaries serving Kansas City and Jefferson City. APH has signed an letter of intent to develop a site at Herculaneum, Mo. to service the St. Louis region, and is working with Port KC to secure service at the future MRT. APH is also in early discussions with the Heartland Port Authority in Jefferson City to potentially provide COV service at that future site.

Another example of promising port opportunities in Missouri is at the Port of Kansas City, which has significantly invested in its infrastructure since re-starting operations in 2007. Currently, it is working on developing the Missouri River Terminal through a public-private partnership after acquiring a riverfront site formerly owned by AK Steel. Since land acquisition, Port KC has formed a short line railroad to serve the site, applied for and received nearly $10 million in U.S. DOT Port Infrastructure Development Program grant funds, and is currently working through the preconstruction process. The MRT is expected to begin construction in late 2023 and commence operations in 2024.

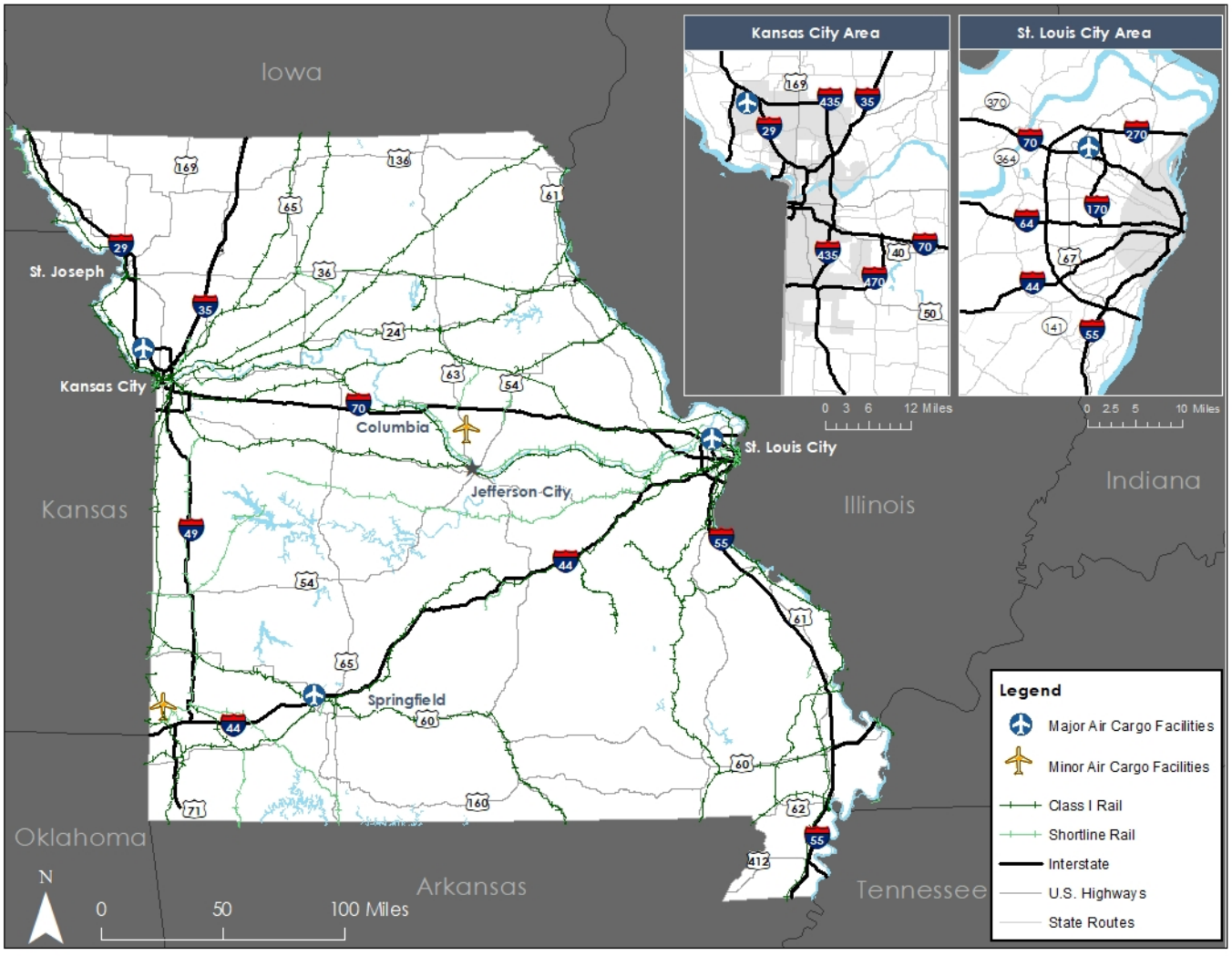
Similar to air cargo, condition and performance of ports in Missouri is largely context-dependent at the individual port or facility level. It can be influenced by a combination of the port's scope of services, user base and weather conditions. There are three primary factors that affect port and waterway level of service:

1. **Aging infrastructure.** Many of the locks and dams in Missouri are 100+ years old. Additionally, maintenance practices focus on reactive fixes as lock components fail, rather than preventative maintenance. There is an estimated backlog in maintenance along the entire Mississippi and Illinois Rivers of over $1 billion as of FY2019.
2. **Flooding and hazardous weather.** Repeated severe flooding events in 2019 caused an estimated total economic cost of over $383 million in delays, closures and damage along highway, rail, air and water transportation routes. The Governor-appointed Flood Recovery Advisory Working Group recommended more investment in flood control and navigation infrastructure and to conduct a study to develop modern flood control infrastructure. The working group also recommended that the USACE have more control over the repairs and maintenance of river infrastructure, along with authorization to fund repairs at 100% of Federal expense. Furthermore, it recommended that Congress funds the USACE to dredge the Upper Mississippi River and modernize the Mississippi River lock and dam system.
3. **Emerging port development.** Many ports are in the early stages of development or revitalization. As of the 2020-2024 planned Capital Improvement Plan, Missouri's ports have identified more than $100 million in current port capital improvement needs, such as dock construction, mooring, site development, access improvements and facility upgrades.

Air Cargo

Air cargo is best suited to move high-value, low-weight commodities and time-sensitive goods. Missouri is an air cargo origin and destination point of freight shipments for national and international locations. Kansas City International (MCI), St. Louis Lambert International (STL) and Springfield-Branson National (SGF) are the three primary air cargo facilities and distributors in Missouri, carrying over 99% of all air cargo (Figure 4.16). These key hubs are located within Foreign-Trade Zones, approved by the U.S. Customs and Border Protection and designed to provide security and tax benefits on foreign and domestic merchandise moved within the zone.

FIGURE 4.16 AIRPORTS SERVICING AIR CARGO IN MISSOURI



Source: Missouri 2022 State Freight and Rail Plan.

Despite the small proportion of Missouri's freight tonnage transported by air, overall tonnage has increased over the past decade. In 2018, 201,000 tons valued at $22 billion moved to and from Missouri airports, which equates to a value of nearly $109,000 per ton. California is Missouri's top trading partner for air freight (32 million tons), followed by Texas (16 million tons) and Tennessee (14 million tons). Small packaged freight shipments were the top

commodity shipped by air in terms of tonnage for both imported and exported air cargo. In terms of value, miscellaneous manufacturing, transportation equipment, and electrical machinery, equipment and supplies were top air cargo commodities. FedEx imports and exports more than half of total cargo tonnage in Missouri, with UPS handling another quarter. The United States Postal Service partners with both express carriers and several major airlines to transport its letters and parcels at all three Missouri cargo-handling airports.

Missouri's airports have capacity to handle additional air cargo volumes, and there currently exist opportunities to transport more tonnage by air at STL in particular. STL is home to a Livestock Export Center, which is a 36,000 square-foot facility that is approved by the U.S. Department of Agriculture as a Temporary Export Inspection Facility and Port of Embarkation. It was designed for off-loading tractor trailers, penning, crating and loading livestock such as hogs, cattle, goats, sheep and horses onto aircraft for transport. However, investment in improvements and specialized equipment are need to make this facility more competitive and to better meet the needs of Missouri's agribusinesses, including epoxy flooring, 100 AMP electrical feeder, emergency generator, roof ventilators and other upgrades to the building. These upgrades will improve the safety and efficiency; however, there are no revenue sources to support the improvement.

Air cargo performance is largely context-dependent at the facility level, and also includes access roads to Missouri's airports. At MCI, STL and SGF, air cargo operators complete all operations at night and outside of regularly scheduled passenger airport hours. STL experiences significant truck traffic and congestion due to nighttime operations unloading air cargo onto trucks. Additionally, congestion on nearby highway corridors impacts truck access to STL, including I-44 toward Springfield/Joplin and on the I-55 and I-70 bridges in St. Louis can cause delays for trucks as well.

Pipelines

Pipelines efficiently transport liquid and gas commodities—including crude oil, natural gas, petroleum products and hydrocarbon gas liquids—used in the energy industry across vast distances, including both raw materials and refined products. Because these materials are typically flammable, toxic and heavier than other types of goods, dedicated pipeline infrastructure can help to mitigate potential harm, such as accidental hazardous releases. Many pipelines move these products across Missouri, from raw material sources to plants and refineries and then to destinations for use. There are pipeline destinations in industrial areas of Kansas City (in both Missouri and Kansas) and in East St. Louis, Illinois, where several pipelines converge. There are also many destinations for natural gas pipelines within the state, including producing and processing areas and storage and distribution centers.

In addition to the pipelines themselves, terminals are locations where the liquids are loaded into the pipeline or unloaded for storage or use, such as outlet terminals, refineries, chemical plants, gas plants or power plants. The port of St. Louis contains several petroleum product terminals used to transfer between pipelines and barges. Additionally, Phillips 66 operates the Wood River petroleum refinery in Roxana, IL to the northwest of St. Louis. Limited information about location and purpose of terminals is available for security reasons.

In Missouri, pipeline infrastructure is 100% owned and operated by the private sector. Therefore, level of service for pipelines is managed by individual firms. In Missouri, the Missouri Pipeline Safety Authority, Missouri Propane Safety Commission and Missouri Emergency Response Commission work with pipeline operators to ensure the

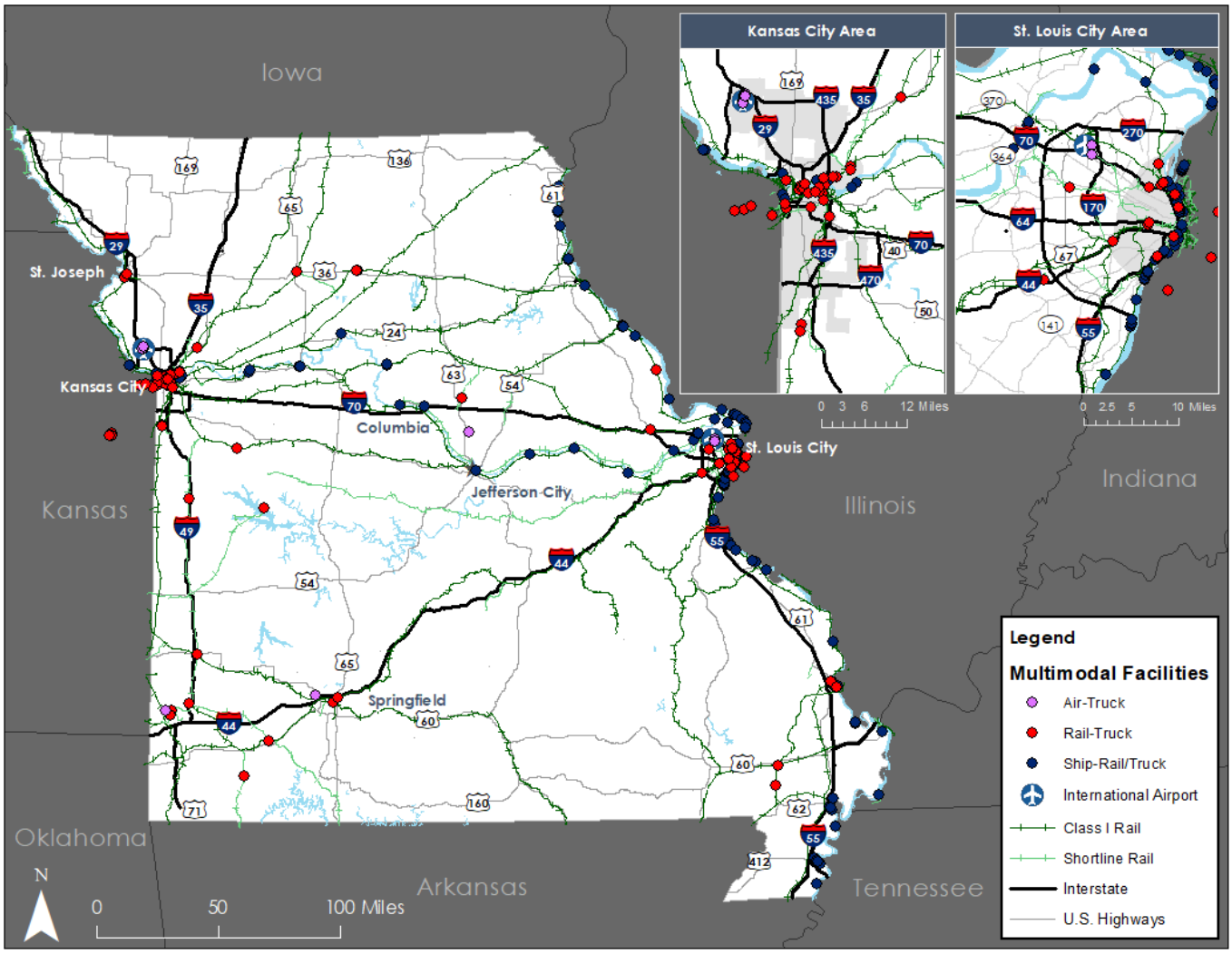
safe operation of pipelines and create plans to respond to any incidents that cause damage to or breaches of pipelines in Missouri.

Intermodal and Multimodal Connectivity

Freight often has to travel by more than one mode of transportation throughout the supply chain, from its origin as raw material to its destination as final product. Supply chain design and the location of key facilities in relation to multimodal transportation networks often play an integral role in the competitive nature of a state's businesses. Properly designing and maintaining Missouri's local first and last mile routes, highways, interstates, rail, air cargo and river network access points is necessary to maintain a competitive advantage for the state's advanced manufacturing companies, energy solution providers and agricultural operations. Therefore, a well-connected multimodal transportation network improves Missouri shippers and manufacturers' efficiency and cost competitiveness.

All of Missouri's freight modes have the potential to interface with other modes, and Missouri has a robust multimodal freight network with connections between rail, ships and barges, trucks, air and pipelines (Figure 4.17). Multimodal nodes are locations where freight can be transferred from one transportation mode to another. This allows shippers to take advantage of each mode's strengths: rail and river networks' economies of scale; air cargo speed and security; and trucking's ability to cover the first and last miles. Dedicated intermodal facilities reduce cargo handling time, leading to a well-connected multimodal transportation network that improves Missouri shippers' efficiency and cost competitiveness.

FIGURE 4.17 MAJOR MULTIMODAL NODES IN MISSOURI



Source: Missouri 2022 State Freight and Rail Plan.

Multimodal freight facilities include the state's intermodal ramps, air cargo facilities, river port terminals with rail access, truck-to-rail transload facilities, as well as grain elevators, distribution and fulfillment centers and rail-served warehouses. There are over 140 rail intermodal facilities in Missouri integrating rail with other modes, including 122 facilities connecting primarily rail and truck. These rail intermodal facilities are heavily concentrated in the Kansas City and St. Louis regions, along with a number of facilities in the southwest and southeast portions of the state.

Missouri has more than 50 truck-to-rail transload terminals, which allow for the transfer of dry or liquid bulk goods between modes. Transloading is a popular supply chain solution for shippers who lack direct access to rail and waterway networks. Transload terminals tend to be commodity specific and require specialized equipment. Additionally, there are more than 120 river transload terminals in the state and more than 150 when including nearby terminals in Illinois and Kansas. Roughly 120 of these marine transload terminals are located on the Mississippi River and 35 are on the Missouri River.

Intermodal connectors are corridors of public roads which link rail terminals, river ports and air cargo facilities to the federally designated National Highway System. Primary criteria for an NHS intermodal facility include handling the equivalent of more than 100 trucks per day in each direction on the principal connecting route. Missouri has nine multimodal facilities currently linked to the NHS by a designated intermodal connector:

- Kansas City International Airport;
- Springfield-Branson National Airport;
- Southeast Missouri Regional Port Authority;
- Port of St. Louis;
- New Madrid County Port Authority;
- Three railroad owner facilities within the Kansas City Intermodal Yard: Kansas City Southern, Union Pacific and Norfolk Southern; and
- Norfolk Southern within the St. Louis Intermodal Yard.

5.0 Preparing Missouri for Future Trends and Opportunities

Today's freight and supply chain issues are impacting every state in the nation, including Missouri. There is national acknowledgment that reliable and resilient supply chains are central to the economy of the United States. President Biden signed Executive Order 14017 ordering "a comprehensive review of critical U.S. supply chains to identify risks, address vulnerabilities and develop a strategy to promote resilience." The resulting report "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-based Growth" is a review of national supply chains for four critical products. The review identifies the following challenges contributing to supply chain vulnerabilities, many of which align with the critical issues brought forward to the Missouri Supply Chain Task Force for consideration:

- Insufficient U.S. manufacturing capacity and loss of innovation capacity.
- Focus on short-term investment strategies and capital returns in the private sector, instead of quality, sustainability, and long-term productivity.
- Adoption of competitive industrial policies and programs by allied, partner, and competitor nations, while at the same time U.S. industrial investment has declined.
- Geographic concentration of key supply chains in few nations, increasing vulnerability to disruptions.
- Limited international coordination to supply chain security.

Freight demand and activity is only expected to increase in the future. While the 2022 Missouri State Freight and Rail Plan details current and projected freight flows through 2045, forecasts are derived from socioeconomic, macroeconomic and societal trends and assumptions based on our current understanding of the future of freight. However—as we know from unforeseen current events, such as the COVID-19 global pandemic—there are infinite possibilities for the future that may be influenced by changes in technology, geopolitics and other innovations, among many other influences. It is important to consider a range of possibilities for the future of freight. The state also recognizes that the state's economic vitality and quality of life are inexplicably linked to the state's freight transportation system, and as such established a robust set of freight-specific goals, performance measures and strategies as part of the 2022 SFRP.

This section will build on the current supply chain challenges discussed in previous sections by expanding on the state's freight-related goals and strategies, future freight trends and projections, and technology and intelligent transportation system needs that will be necessary to support the future of freight in Missouri. The final subsection presents the Missouri Supply Chain Task Force's recommendations to address the critical supply chain issues discussed throughout this report, including freight investments for both transportation infrastructure and expanded access to critical equipment and shipping services, workforce retention and development for Missouri-based industries, and opportunities to mitigate the impacts of national truck driver industry challenges in Missouri.

5.1 MoDOT's Freight Goals and Strategies

As part of the 2022 State Freight and Rail Plan, MoDOT developed a freight vision, goals and objectives to meet the state's growing need to compete globally for quality jobs and to provide safe and efficient mobility of people and goods. The goals and objectives are consistent with MoDOT's pillars—safety, service and stability—and were informed by stakeholder outreach and national best practices. They build on previous MoDOT planning efforts, including the 2018 Long-Range Transportation Plan. The goals and objectives provide the foundation for multimodal freight and passenger rail investment decision-making.

The goals established as part of the 2022 SFRP will direct MoDOT's vision and direction for the future of the freight system as well as its passenger rail system (Table 5.1).

TABLE 5.1 SFRP GOALS ALIGN WITH MODOT'S 3 PRIMARY PILLARS

Safety	Service	Stability
• Improve the **SAFETY & SECURITY** of the multimodal freight and passenger rail system.	• Improve the **CONNECTIVITY & MOBILITY** of the multimodal freight and passenger rail system. • Support **EQUITY & ENVIRONMENTAL RESILIENCY** of the multimodal freight and passenger rail system. • Improve **COORDINATION & COLLABORATION** with freight and passenger rail stakeholders and regional planning partners.	• **MAINTAIN** the multimodal freight and passenger rail system in good condition. • Support **ECONOMIC GROWTH & COMPETITIVENESS** through strategic investments in the multimodal freight and passenger rail network. • Institute policies and practices that encourage **INNOVATION** and efficient use of resources.

The 2022 SFRP identifies a number of challenges and needs across the state's multimodal freight and passenger rail transportation network, including aging infrastructure, congestion and bottlenecks, safety concerns, system capacity constraints, rural and multimodal connectivity challenges and funding challenges. In addition to establishing the seven aforementioned goals, the SFRP established four multimodal, multifaceted and comprehensive strategies to meet these challenges. The four strategies are designed to change the course of multimodal freight and passenger rail in Missouri based on current and projected opportunities:

- **Expand the "Ag Coast of America".** The "Ag Coast of America" is a region that covers a 15-mile stretch of the Mississippi River that features some of the highest levels of capacity anywhere along this crucial waterway. The purpose of this strategy is to expand the Ag Coast of America to support increased shipments of agriculture products – including grain, fertilizer and processed food products – on Mississippi and Missouri rivers, continuing the success of the Ag Coast of America and providing additional opportunities for agribusinesses to leverage Missouri's efficient and robust inland waterways network. This strategy will not only lead to increased job and business opportunities, but it will also benefit other industries by lowering freight costs across the state and providing additional capacity and access to marine shipping modes.

- **Missouri Manufactures.** Missouri has a long history of supporting some of the nation's most important manufacturing sectors, including motor vehicles, chemicals and e-commerce, warehousing and distribution. While the foothold of these industries remains strong in Missouri, certain macroeconomic and global trends –

such as the near-shoring of manufacturing and the global impact of the COVID-19 pandemic – may lead to changes in sourcing, shipping and employment for Missouri's freight-intensive companies in some impacted industries. Shifting to increased domestic sourcing may result in increased inbound and outbound freight movements, advanced manufacturing employment, and demand for industrial space. While MoDOT does not have control over these macroeconomic trends, it is in a unique position to expand access and connectivity for potential new and existing businesses, educate the public and improve partnerships and coordination between private and public sector organizations throughout the state. The purpose of the "Missouri Manufactures" strategy is to enable the state to support the evolving freight transportation needs for goods movement and its supporting workforce.

- **Efficient and Intelligent Multimodal Freight Corridors.** There are various levels of transportation technology – from dynamic signage to connected and autonomous vehicles – that have the potential to improve mobility and safety across the multimodal network. Some of these technologies are used by shippers while others can be implemented by state and local public works agencies. In addition to technology solutions, other operational, program and policy actions can result in mobility and safety outcomes through improved coordination, communication and education. The goal of this strategy is to leverage technology solutions and operational changes to improve the efficiency of freight movement across all modes.

- **Expand Freight and Passenger Rail Market Opportunities.** Missouri is in a position to significantly grow rail freight in the state by capitalizing on recent developments within the state as well as global shifts in trade patterns. Through implementable actions, Missouri can expand its rail freight market, making the state more competitive for shippers and easing the pressures on the highway system. Missouri's passenger rail network has also struggled with funding shortfalls, limited support for unserved and underserved communities, station and track infrastructure maintenance and issues related to service, operations and coordination. The purpose of this strategy is to expand the rail freight market to make Missouri more competitive for shippers and to improve and expand passenger rail service and access to improve passenger mobility options.

To support these strategies, the SFRP also includes implementable actions under the context of four multimodal and broad-based categories designed for addressing multimodal freight and passenger rail transportation challenges in Missouri:

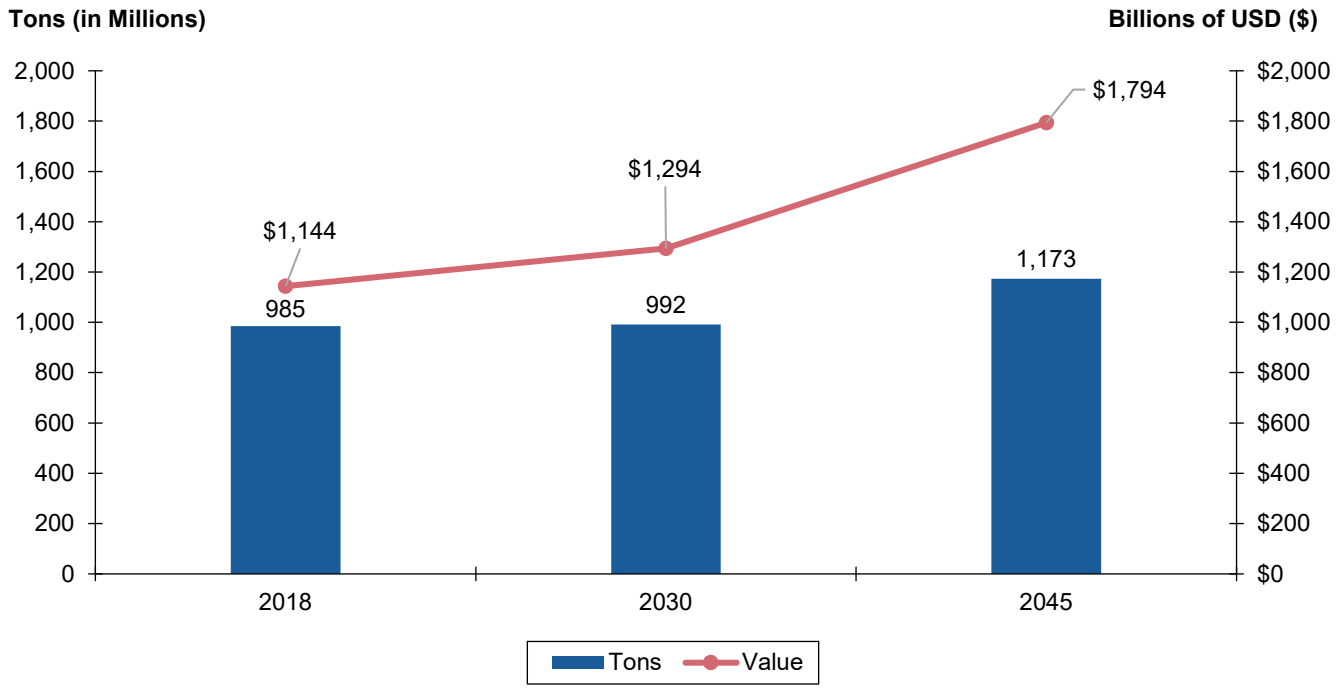
- **Operations & Technology.** Specific planning, engineering and public works improvements to support improved multimodal freight and passenger rail mobility and safety.
- **Programs.** A collection of programs and initiatives that can be undertaken to achieve policy goals.
- **Policy, Outreach & Coordination.** Broad policy recommendations to help change the way Missouri approaches multimodal freight and passenger rail planning, including expanding communication and interaction with critical stakeholders.
- **Projects.** Specific infrastructure projects that support policy goals and improve multimodal freight and passenger rail movement throughout Missouri.

5.2 Future Freight Trends and Projections

In 2018, more than 985 million tons of freight valued at $1.1 trillion moved on Missouri's freight transportation system. By 2045, the state's transportation system is projected to carry more than 1.1 billion tons of freight, valued at $1.8 trillion annually, an increase of 19% by tonnage and 57% by value (Figure 5.1).

These projected increases in freight volume and tonnage will be felt in both Missouri's urban and rural communities. Today, goods movement activity is heavily concentrated in the state's most populous areas, particularly in the Kansas City and St. Louis metropolitan areas, which comprise almost 50% of freight activity. Jackson County, home to Kansas City, saw the highest county-level share of freight movement, with more than 50 million tons of goods moving through the county in 2018, accounting for 15% of the state's total. Counties outside of the major metro areas with high levels of freight movement include Cape Girardeau County, Greene County (Springfield), Buchanan County (St. Joseph) and Sainte Genevieve County. Freight movement in both the Kansas City and St. Louis metropolitan areas is expected to grow significantly by 2045, with tonnage exceeding 55 million tons and 37 million tons, respectively. Clay County (north of Kansas City) is expected to see freight traffic more than double in that time period, explaining the growth in the Kansas City metropolitan area.

FIGURE 5.1 CURRENT AND FUTURE COMMODITY FLOWS IN MISSOURI, 2018-2045



Source: Missouri 2022 State Freight and Rail Plan.

The top commodities by weight moved in Missouri is expected to change significantly by 2045, with food & kindred products and farm products emerging as top goods, reflecting the growing importance of agricultural freight movement and activity in the state (Table 5.2).

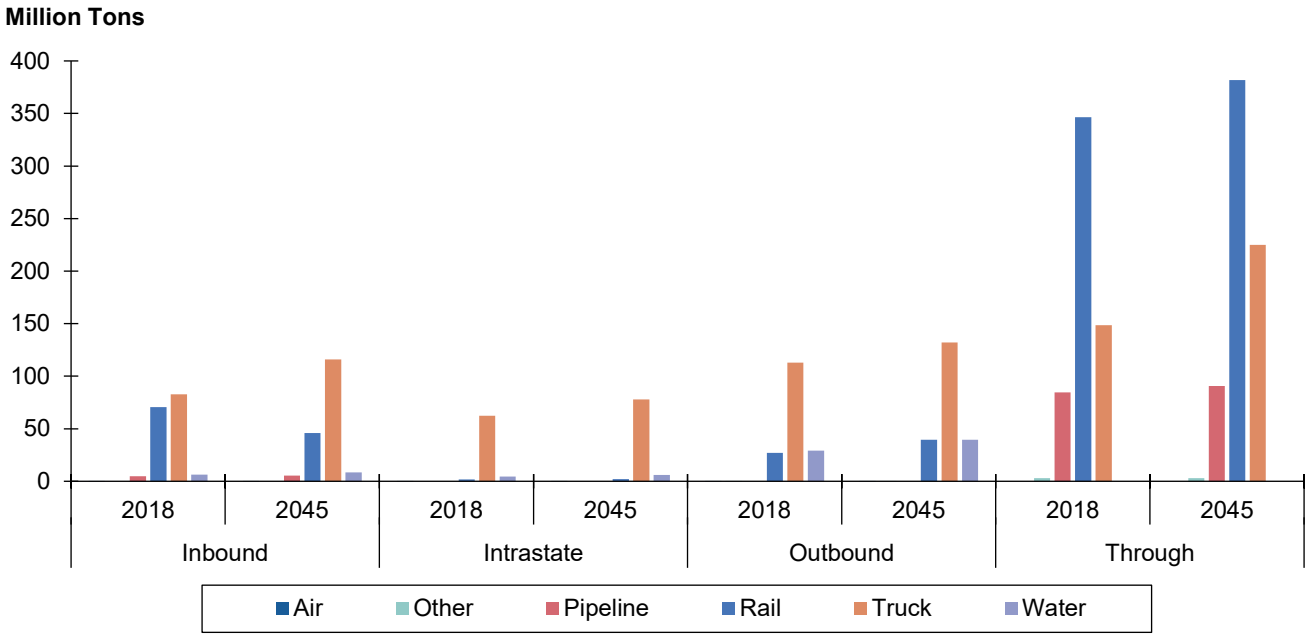
TABLE 5.2 TOP COMMODITIES BY TONNAGE AND VALUE, 2018-2045

Rank	Commodity	2018 Tons (millions)	Share of Total	Commodity	2045 Tons (millions)	Share of Total
1	Non-metallic minerals	143	15%	Farm products	171	15%
2	Coal	140	14%	Food & kindred products	158	13%
3	Farm products	132	13%	Non-metallic minerals	157	13%
Rank	**Commodity**	**2018 Value ($B)**	**Share of Total**	**Commodity**	**2045 Value ($B)**	**Share of Total**
1	Transportation equipment	$260	23%	Transportation equipment	$404	23%
2	Mixed freight	$201	18%	Mixed freight	$295	16%
3	Chemical & allied products	$104	9%	Chemicals & allied products	$167	9%

Source: 2022 Missouri State Freight and Rail Plan.

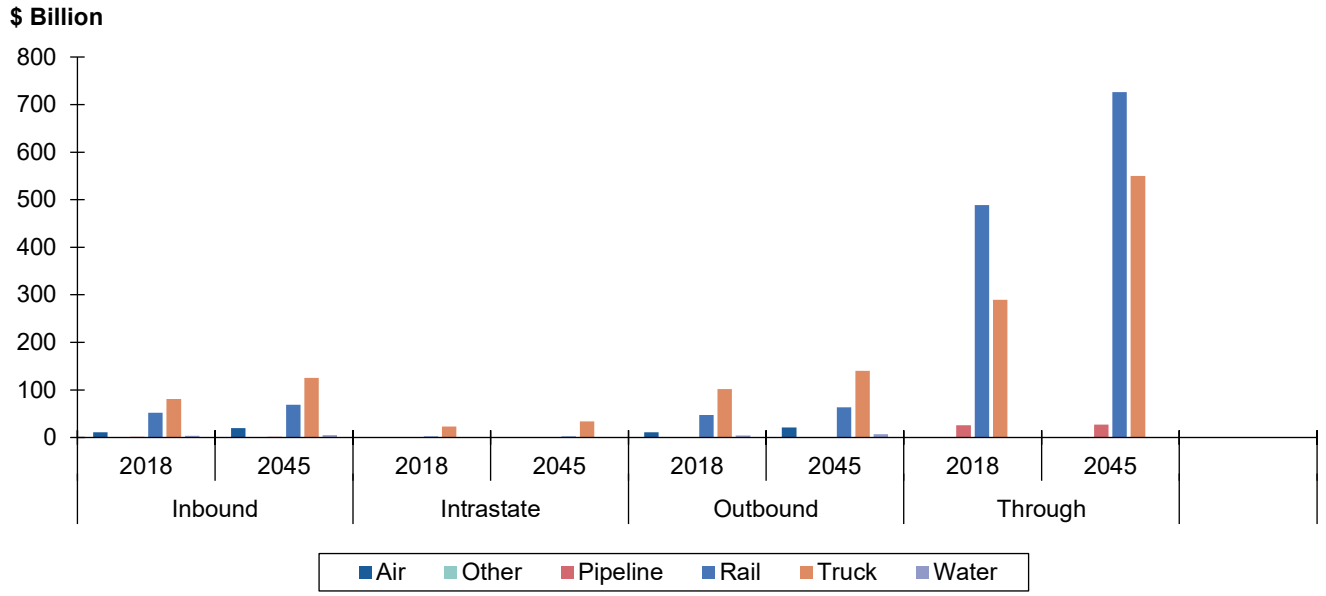
Freight traffic by both value and weight is projected to grow in all directions between 2018 and 2045 (Figure 5.2 and Figure 5.3). By tonnage, increases between 20% and 25% are expected in all directions except for inbound traffic, which is only projected to grow by 7%. By value, through traffic is projected to grow by more than 60%, while the value of freight moved in other directions is projected to grow between 40% and 50%. Due to Missouri's extensive transportation network and central location in the national transportation system, through traffic will continue to account for largest share of freight movement in the state.

FIGURE 5.2 TONNAGE BY MODE AND DIRECTION, 2018-2045



Source: Missouri 2022 State Freight and Rail Plan.

FIGURE 5.3 VALUE BY MODE AND DIRECTION, 2018-2045



Source: Missouri 2022 State Freight and Rail Plan.

Trends and Disruptors

Beyond the freight projections discussed in the previous section, there are a number of trends that have the potential to change the future of freight in Missouri. These trends, which were evaluated as part of the 2022 State Freight and Rail Plan, are shown in Table 5.3. Missouri's growing population and evolving industries, coupled with external factors such as government policies, regulations and technologies, can all potentially impact freight activities in differing ways.

TABLE 5.3 TRENDS AND DISRUPTERS WITH POTENTIAL TO IMPACT FREIGHT IN MISSOURI

Theme	Representative Trends
Business and Consumer Practices	• Near-shoring • Growing e-commerce demand • Growing demand for warehouse and distribution space • Challenges with securing transportation/logistics equipment • Ocean service challenges impacting freight options for Missouri-based firms
Demographics	• Continued population growth • Aging population • Increasing urbanization and concentration of population
Workforce and Employment	• Diversifying and growing employment • Training in advanced manufacturing technologies • Evolving automobile manufacturing practices and electric vehicle production

Theme	Representative Trends
Energy and Environment	• Instability due to extreme weather • Evolving battery technology • Reduced coal consumption and expanding renewable energy • Increasing use of alternative fuels
Policies and Regulations	• Changing Federal, state and local policies and regulations • Evolving trade, carrier and freight industry regulations • Shifting environmental policies and regulations
Technology	• Expanding use of Intelligent Transportation Systems • Emerging autonomous vehicles • Advanced manufacturing technologies, particularly in biotechnology, agriculture (“agtech”), aerospace and defense.

These trends and disrupters have the potential to have significant implications for Missouri’s key industry sectors. Two trends that were reviewed in detail in the 2022 SFRP and modeled using the Missouri Freight Analysis System tool, known as MoFAS, are: 1) a growing renewable energy sector and 2) a national shift towards near-shoring of manufacturing activities.

- The **renewable energy scenario** assumes a shift away from fossil fuel commodities and toward renewable energy commodities. Market shifts from fossil fuels to renewable energy sources and fuel types, such as battery electric vehicles, will impact Missouri’s industries, freight flows and supporting infrastructure. In Missouri, it is expected that there would be reduced volumes of coal, crude oil, petroleum, natural gas and other fossil fuels and increased volumes of metallic ores transported on Missouri’s freight network. In St. Genevieve County in particular, which has a robust mining sector, volumes of metallic ore shipments could grow by nearly 26,000 tons annually, equivalent to an additional 650 fully-loaded trucks on local roads.

  There are a number of key considerations for adapting to this shift to renewable energy in Missouri, such as establishing a robust network of alternative fueling infrastructure, securing alternative state revenue streams due to declining motor fuel tax collection, and achieving strong supply chains for metal and parts for zero-emission vehicle manufacturing. There are also opportunities for public-private partnerships between states and automobile manufacturers to capitalize on global demand, as well as a strong potential for manufacturing sector job growth.

- The **near-shoring scenario** assumes a shift away from imported goods and toward domestic production of commodities related to apparel, machinery, electrical equipment, transportation equipment and instruments and optical goods. The commodities do not change, just where they are produced – what changes is where the freight flows begin and end, and how they get there. In Missouri, it is expected that there would be reduced volumes of through-state flows, and increased volumes of inbound, outbound and intrastate flows. It's also expected that the value and volume of freight flows in Missouri’s urban areas, including Kansas City and St. Louis, would increase by 4.9% and 2.5%, respectively.

  There are a number of key considerations for adapting to near-shoring in Missouri, including expanding the network and capacity of intermodal connectors to support increased inbound and outbound flows vs. through

traffic, modernized facilities, and workforce training and development. There are also opportunities for increased investment in domestic sourcing, advanced manufacturing sector job growth, and new and repurposed industrial facilities.

5.3 Technology and ITS Needs and Opportunities

This section discusses the capabilities of key connected and automated vehicle and electric vehicle technologies, needs and opportunities as they pertain to freight movement in Missouri.

Connected and Automated Vehicle Infrastructure Needs and Impacts

Connected and Automated Vehicle technologies encompass a wide range of systems that have been rapidly evolving in both passenger cars and heavy vehicles for road use, as well as inside ports and at multimodal facilities. From vehicle-based safety systems to cooperative cruise control and pilots of autonomous trucks, many systems rely on basic infrastructure such as pavement markings and road signs for safe operations. For last-mile solutions like Personal Delivery Devices, sidewalk and pedestrian networks are critical. Missouri can proactively prepare for these technological opportunities to the supply chain by understanding the impacts to infrastructure owners and operators, workforce needs, and where smart policies can be implemented to encourage their use.

Current and Emerging CAV Technologies within Supply Chains

Truck Parking Information Management Systems and Truck Parking Availability Systems collect and share truck parking availability information in real-time. Truck parking spaces are monitored in public rest areas and in some jurisdictions at privately owned truck stops, with availability shared on electronic roadside signs, mobile apps, and to third parties via an open data exchange. These systems help truckers make informed parking decisions, thus making their trip safer and more efficient. The Mid America Association of State Transportation Officials went live with a regional TPIMS at over 130 truck parking areas across 8 states in 2019, and Missouri has been participating in quarterly meetings with the coalition to plan future participation.

Dedicated truck lanes are a concept being explored in several key freight corridors across the country. Similar to express lanes, dedicated truck lanes can help increase overall system efficiency by separating long-haul heavy vehicles in the traffic stream that do not need access to every point of ingress/egress that passenger vehicles do. Typically barrier-separated and tolled to repay capital costs and help with operational expenses, truck-only infrastructure can improve safety by having less merging and weaving in a mixed traffic stream. This concept is now integrating with the idea of dedicated lanes for CAV as they can provide a more controlled environment for automated vehicles and platoons. MoDOT participated in a four state, 800-mile corridor study of dedicated truck lanes on I-70 through Missouri, Illinois, Indiana and Ohio in 2009.[9]

Additional Intelligent Transportation System technologies can be added to any these facilities, along with traditional roadways, such as sensors that can evaluate tire inflation, over-height vehicles, and weigh vehicles while in motion.

[9] https://www.tribstar.com/news/local_news/indiana-other-states-to-study-truck-only-lanes-on-i-70/article_275246d7-5a41-53ea-9fea-eb5e799c428e.html

Freight Signal Priority is a technology that can be implemented at signalized intersections, commonly used to extend a green light to allow an approaching truck to make it through an intersection without stopping. This can increase safety by reducing the potential for the truck to run a red light, and also reduce the delays and congestion that are caused by the longer time it takes trucks to accelerate to the posted speed limit. Priority is typically given to a heavy truck that may be close to the traffic signal and have a hard time stopping when the light turns yellow. This is especially important when the approach to the traffic signal is on a high-speed roadway or on a downhill approach. Priority may also be provided to a truck on an uphill approach, so that they can clear the intersection with a little extra green time in order to reduce delay and congestion. MoDOT can work with MPOs like Mid-America Regional Council to deploy this on high priority corridors and team up with efforts like Operation Green Light in Kansas City.

Freight Automation is a fast moving industry, with new initiatives and pilots being announced weekly. Automation includes truck platooning on public roads, driverless vehicles on public roads and within ports and intermodal facilities, personal delivery devices, and advanced air mobility. While much of this innovation is occurring within private industry, infrastructure owners and operators have a role to play in helping the industry get off the ground. The first step starts with AV-enabling policies and legislation for use of these technologies on public roads and sidewalks. Kansas recently passed SB 313 which would permit operation of driverless-capable vehicles without a human driver with the automated driving system engaged under certain circumstances. The legislation is for a middle-mile automated truck to operate. The Bill is pending signature by the Governor as of May 2022.

Advanced Driver Assistance Systems are included on many late model vehicles and include adaptive/cooperative cruise control, lane departure warning/correction, pedestrian detection/avoidance, traffic sign recognition, automatic emergency braking and blind spot detection. These ADAS and emerging fully automated vehicles rely on cameras and sensors that recognize pavement markings, traffic signs and objects along their path. Therefore, pavement markings need to be in good condition and some agencies have updated their standards from 4-inch to 6-inch wide markings to help these systems operate. Impacts to infrastructure also include:

- Less wheel wander—pavement wear patterns can accelerate rutting and need for maintenance.
- Less time for pavement slabs to recover—requiring alternate pavement design and materials for increased life, especially on bridge spans.
- Personal Delivery Devices for food, small supplies and last-mile goods rely on pedestrian facilities for door-to-door service—these assets are not inventoried and maintained by the same units of Government as roadways in a lot of cases.

Automation Impacts

The supply chain industry has been plagued with a driver shortage for many years. The American Trucking Associations estimates the driver shortage is over 80,000 operators now and will increase to 160,000 by 2028. Automation and self-driving trucks will be able to help cover some of these shortfalls. These numbers also do not include increases in last mile services and PDDs or the exponential growth of e-commerce trends that accelerated during the COVID-19 pandemic and are projected to increase over the next decade. Yet, fear remains that in some markets the introduction of automation will eliminate jobs.

To accommodate the shift in workforce needs and adapt to these trends, the state of Missouri should look at an aggressive approach to retain and retrain both long-haul and last-mile operators. Job displacement caused by the need for fewer vehicle operators and staff within ports and logistics centers will create other more desirable jobs such as systems operators, computer programming technicians and robot/machine repair staff.

Electric Vehicle Infrastructure Needs and Impacts

Electric power is expected to transform everything we as a society do. This will have a transformative impact on freight and supply chain efficiency, and the infrastructure needs for electric vehicles are far reaching, including grid modernization and charging stations. With heavy-duty, electric trucks having the potential for zero emissions, lower operating and fuel costs, and increased life spans, fleet operators are very interested in transitioning from internal combustion engines. However, supply chain industry experts believe that electric vehicles are most likely to be seen at ports, intermodal yards and first/last mile connections rather than long-haul truck trips. Long haul truck trips are expected to first transition to fuel sources such as Hydrogen rather than electricity or batteries due to the economics.

The Bipartisan Infrastructure Law, passed in late 2021, establishes a National Electric Vehicle Infrastructure Formula Program ("NEVI Formula") to provide funding to states to deploy electric vehicle charging infrastructure and to establish an interconnected network to facilitate data collection, access and reliability focused on primarily on passenger vehicles in the next five years. The freight industry will see impacts related to battery manufacturing and other EV related needs but at this point, medium-heavy-duty long-distance trucking is not expected to significantly electrify until after 2040. The U.S. DOT released its guidance for the NEVI Formula Program on February 10, 2022. Under the Program, a total of $7.5 billion has been allocated to developing and constructing a national network of 500,000 EV charging stations by 2030. The first $5 billion of the $7.5 billion has been dedicated to funding state programs over the next five years, and each state is required to submit an EV Infrastructure Deployment Plan no later than August 1, 2022 to the Joint Office Of Energy and Transportation. 10% of the $5 billion will be set aside to provide discretionary grants to fill gaps in the national network. The remaining $2.5 billion will be allocated for a discretionary grant program for EV charging infrastructure in rural and underserved communities.

Transition to Freight EVs

Commercial freight consumers have a different set of constraints than passenger vehicle consumers when deciding which type of vehicle to purchase. Performance and range requirements are more critical factors, especially given that the typical semi averages 63,000 miles per year compared with 13,476 for a passenger vehicle.

Based on projections, it is likely that battery electric vehicles will supplant internal combustion engine vehicles in short-range, regional, and fixed-route applications as EVs will have an increasing advantage in Total Cost of Ownership. However, even freight use cases with TCO parity today will likely not be fully electrified before 2030 without aggressively addressing barriers on a national scale. Availability of reliable charging infrastructure, for example, is key to the success of EV deployments. Freight operations with daily returns to a home base with charging infrastructure under their control will have the greatest success. As demand for home delivery rises and electric van production ramps up, Last Mile Delivery vehicles are expected to be the first to electrify, beginning in 2022. Midrange battery electric trucks are expected to find cost parity with diesel powered medium duty freight vehicles by 2025. In anticipation of this, manufacturers are racing to provide best of kind technology to scale

production. Heavy duty trucks (Class 7 and 8 freight vehicles) will likely experience a delayed transition due to high costs for EV chargers and lack of long range vehicle options. With current cost projections, heavy duty EVs are not expected to capture significant market share before 2025 and are anticipated to achieve near cost parity around 2030.

Passenger vehicle registrations are tracked at the Federal level and are a good measure of electric vehicle adoption. Some states have begun tracking electric vehicle registrations. To be proactive Missouri should consider tracking this at the state level.

There are many levers in play that are accelerating the market. In June 2020, California enacted the Advanced Clean Truck Rule, which over 12 years from 2024 through 2035, increases the percentage of zero emission trucks that manufacturers must sell in the state. As of July 2020, fourteen states plus Washington, D.C., signed an MOU to join California to ban the sale of diesel trucks by 2050. This pledge includes an intermediate target requiring 30% zero emission vehicles sales for the medium and heavy duty segments by 2030.

The viability, pace and ultimate success of transitioning the freight sector to EVs will require collaboration across all levels of Government, the utility sector, the freight/logistics industry, OEMs, equipment providers, and the financial sector.

State and Regional Initiatives

Missouri will submit its NEVI plan to the Federal Highway Administration by August 1, 2022 that recommends how Missouri will organize the placement of charging stations along interstate and other alternative fuel corridors in the state. MoDOT has established a NEVI project website. Missouri has an EV Task Force that was legislatively enacted in 2021 (HB661). The EV Task Force Report is due December 31, 2022.

In 2021 a Regional Electric Vehicle Midwest Coalition was formed between Illinois, Indiana, Michigan, Minnesota and Wisconsin. The Regional Electric Vehicle Midwest Coalition (“REV Midwest”) creates a regional framework to accelerate vehicle electrification in the Midwest. REV Midwest provides the foundation for cooperation on fleet electrification along key commercial corridors to safeguard economic security, reduce harmful emissions, improve public health and advance innovation. Participating States will develop a coordinated approach to advance electrification that is informed by industry, academic and community engagement. Participating States will work together to enable an equitable transition to electric vehicles for all with specific consideration for communities that are historically disadvantaged. REV Midwest will position states in the Midwest region to leverage and collectively increase public and private investment in electric vehicles and electric vehicle infrastructure.

Impacts to the State of Missouri and its Workforce

Missouri, as with other states, will experience tax implications as fleet operators begin replacing ICE vehicles with newer EVs. To estimate tax implications, market maturity and model availability can be examined for Last Mile Delivery (Class 2 commercial), Medium Duty (Classes 3-6) and Heavy Duty (Classes 7-8) vehicle class categories.

One option is to apply a fuel consumption tax on electricity. This would present new challenges. Pennsylvania is the first International Fuel Tax Association jurisdiction to implement a motor fuel tax for electricity to power vehicles.

The current Pennsylvania tax is set at 1.72 cents per kWh. This rate was determined by normalizing the tax rate for alternative fuels to reflect a taxation based on energy content of gasoline.

Freight electrification comes with several tax concerns that need to be addressed including unfamiliarity of vehicle owners with the new taxes (compliance), the need to determine equitable tax rates and vehicle registration fees, and IFTA ramifications among others. Vehicle electrification also has implications on the Federal fuel tax revenues and MoDOT revenues from Federal taxation that will also need to be addressed.

To offset diesel manufacturing unemployment during this transition, the United States is looking to on-shore more of the semiconductor chip, lithium-ion battery and other emerging automotive technology supply chains. Currently, there are notable shortages with the semiconductor supply, causing several automakers to cut back on vehicle production. These supply chains are absolutely critical for current and future EV production and the competitiveness of Missouri and the United States in the automotive industry moving forward.

The freight and logistics and the automotive sectors together support nearly 140,000 jobs in Missouri. The state could leverage support for electrification transition to attract more manufacturing investments and spur parallel investments in automation that are rapidly transforming the freight industry.

EVs have about 40% fewer parts and are generally easier to assemble than ICE vehicles, therefore there will likely be fewer automotive manufacturing jobs in the future. However, EV and other advanced automotive technologies have the potential to replace many lost ICE vehicle manufacturing jobs.

5.4 Supply Chain Task Force Recommendations

Future freight projections, trends and potential disrupters to supply chain activities have the potential to put further pressure on Missouri's freight transportation network and associated workforce in the state's supply chain sectors. This section presents the Missouri Supply Chain Task Force's recommendations for meeting the challenges of today and delivering Missouri's businesses and consumers a secure, efficient and cost-effective supply chain network for the future. The Task Force has identified **33 recommendations** under three main categories: targeted freight investments, opportunities to support workforce needs and regulatory and programming opportunities, which are described in the following sections.

Targeted Freight Investments

The 2022 Missouri State Freight Plan identifies capital improvement projects on Missouri's multimodal freight system that could be funded by National Highway Freight Program funds distributed to Missouri. The Missouri Freight Investment Plan consists of nearly 600 fully-funded projects totaling $2.5 billion in project costs. In addition, the SFRP identifies unmet freight needs, which capture longer range investment in Missouri's multimodal freight network, including private sector rail and port projects identified by MoDOT's partners and projects proposed by stakeholders that are not yet in any MoDOT plans.

In addition to the specific capital improvements identified in the SFRP, there are a number of other targeted freight investments that the Task Force recommends Missouri consider implementing. A total of 7 recommendations that

fall into four categories – first and last mile rail investment, container and chassis manufacturing, investment in container on vessel, and economic development grant opportunities – are detailed in the following subsections.

First and Last Mile Rail Investment

Class I railroads comprise an extensive share of the U.S. freight rail network and move large quantities of freight throughout the country. Rail spurs, intermodal facilities and short line railroads provide pickup and drop off point for rail cargo. Many freight businesses require rail access as part of the site selection process; however, it is a significant challenge, particularly in rural Missouri, to pay for the first and last mile of rail connectivity to these businesses. While many of neighboring states provide multi-million dollar grant programs for constructing and maintaining these rail facilities, Missouri is limited to the $1 million annually for the Freight Enhancement Program. This places Missouri at a disadvantage in attracting and retaining advanced manufacturing facilities, since $1 million is not sufficient to cover the cost of just one such project.

Task Force Recommendation 1: Establish state general revenue funds in short line railroads. The Task Force recommends that state general revenue investment in short line railroads be similar to neighboring states. For example, Nebraska provided $10 million in funding as part of the Rural Project Act in 2021, and has proposed funding $50 million in 2022 (LB788). Kansas allocates $10 million annually for transportation investments, $5 million annually for loans and grants to short line railroads, and $100 million for economic development grants. It is recommended that Missouri align its funding for short line railroads with similar levels to its peer states.

Task Force Recommendation 2: Implement a short line infrastructure tax credit in Missouri to support reinvestment in rail. Providing programs to assist railroads in increasing or accelerating infrastructure investment increases the efficiency of goods movement, including increased speeds, passing sidings and transload opportunities. Similar programs can also lead to reduced congestion on interstate highways and transload bottlenecks, creating critical jobs and improving connectivity to rural communities and economies. Nationally, six states offer this tax credit and seven states are considering offering it. One example of a successful program is the Alabama Short Line Railroad Tax Credit Program, which was passed into law in 2019. The program has been widely used, and each year the Alabama Department of Commerce receives numerous applications exceeding the $3.7 million available. The program has resulted in accelerated track reinvestment from short line railroads, with reinvestment expenditures growing by over $13 million since 2019—a 38% increase in spending. The program currently sunsets in 2022 and the railroad industry and their shippers would like to extend the tax credit given the success of the program. The Task Force recommends that the state implement a similar program to help with reinvestment in the state's freight rail infrastructure.

Container and Chassis Manufacturing

Task Force Recommendation 3: Support the manufacturing of container and chassis equipment in Missouri. One of the many impacts of the COVID-19 pandemic was the slowdown in production and shipment of newly manufactured shipping containers, which led to further congestion and trade imbalances throughout the globe. The rate of production was already down in 2019 relative to previous years, and production dropped even further in 2020 after the onset of the pandemic and beginning of national and local lock-downs. Because inventories were low, prices increased significantly, from $1,600 per container in 2019 to $2,500 per container in 2021, which

has continued to rise due to ongoing scarcity.[10] However, shippers and carriers had little choice in sourcing containers because the industry is extremely consolidated. Currently, there are three major companies based in China that manufacture almost all (95%) intermodal cargo containers used globally. These companies are state-owned enterprises as they are subsidized by the Chinese Government. In addition, approximately 85% of all intermodal truck chassis used globally is also manufactured in China by state-owned enterprises. There is some chassis production in Mexico and Texas, but this industry has also faced challenges in ramping up production due to supply chain challenges that have inhibited production capacity.

While the coverage of impacts of this crisis have been focused on the coastal deep water ports, the shortage is even more pronounced in Missouri where turnaround time is critical to get the containers (empty or full) back to the coast for the ship. The shortage of containers will be a challenge for the state as it pursues container-on-barge and container-on-vessel opportunities in the near future. However, it is difficult for emerging manufacturers to compete with dominant international producers that receive and benefit from Government subsidies. There is an opportunity for Missouri to incentivize the production of container and chassis manufacturing in the state by providing financial/tax incentives, developing workforce training programs specific to the industry, and guidance in selection of optimal sites that can leverage the state's access to multimodal transportation modes.

Invest in Container on Vessel

Missouri strongly supports the expansion of container on vessel services at the state's public ports. American Patriot Holdings and Plaquemine Port in Louisiana have signed memoranda of understanding with several Missouri ports to institute a COV service. This service will use a new low-draft, self-propelled vessel to transport cargo containers from the Gulf of Mexico to Missouri and back. This service could transform the underutilized waterways by expanding the types of cargo suitable for transport on the inland waterways. The primary Missouri hubs will be in Kansas City and in St. Louis with secondary facilities in New Madrid County and Jefferson City.

Task Force Recommendation 4: State investment in and marketing of COV infrastructure. COV must provide a reliable service to attract customers to the inland waterway. This will require facilities capable of handling the containers with easy intermodal access to highways and rail for further handling. The Task Force recommends that the state work closely with American Patriot Holdings and other COV ventures to support the development of intermodal connectors, railroad track connection, and other critical infrastructure to complement the private investment being made for this service in Missouri.

In addition, one of the challenges with growing COV in Missouri is adequate marketing of the service; there is a relatively small number of Missouri-based companies that actively support COV as a viable mode of transportation that they would use if it were available. Many companies want to see demonstrated success of these services before committing to using it. To help promote the potential viability of COV in Missouri, the Task Force also recommends that the state provide public support through short-term tax incentives, partnerships with other state agencies (such as the Missouri Department of Economic Development or Missouri Chamber of Commerce and Industry), or other methods to promote and market the service.

[10] https://www.fmc.gov/wp-content/uploads/2022/03/ContainerandChassisManufacturingFinalReport.pdf.

Task Force Recommendation 5: Federal and state investment in inland waterways to provide consistent navigable channel. Reliable navigability of the Missouri River represents a significant obstacle for COV service reaching Jefferson City and Kansas City. One of the longstanding issues for condition and performance on Missouri's waterways is aging lock and dam infrastructure. Missouri's location along the Mississippi River is at a particularly critical part of the river. In the northern half of the state, the upper Mississippi River is maintained using locks and dams to control the depth of water and allow barge traffic through. Most of these locks and dams are close to 100 years old, and have gradually outlived their useful life. One of the notable issues with their design is that many of them are undersized cannot accommodate a standard 15-barge tow configuration, which requires barge operators to run smaller configurations or break down the barges transport them through the locks. This can lengthen delays that accumulate along the Upper Mississippi River.

In addition, the Missouri River has experienced substantial variation in channel depth since 2019 due to flood-damaged river structures and unrepaired levees. The Bipartisan Infrastructure Law authorized over $17 billion in funding to the U.S. Army Corps of Engineering to address current and future water resources infrastructure needs. The USACE Kansas City District is set to receive approximately $278 million, and almost $249 million of that is to repair damages caused by the 2019 flood to the Bank Stabilization and Navigation Project along the Missouri River from Rulo, Neb. to St. Louis, Mo.[11] Although these funds will help address some of these navigational issues, it will not address all the Missouri River's navigability needs, and the Task Force recommends that the state also invest in dredging and critical lock and dam infrastructure to provide a consistently navigable channel for COV service, as well as other barges and vessels.

Task Force Recommendation 6: Consider developing secondary distribution sites with direct access by truck or rail to reduce congestion at port site. Many East and West Coast ports have established secondary distribution sites to reduce backlog at ports. Increased container traffic from COV service at the ports will require sufficient chassis for trucks and efficient ingress/egress from the congested port facilities. The Task Force recommends further study into potentially developing secondary distribution sites near key Missouri ports to better accommodate the influx of containerized freight volumes while also continuing to support legacy bulk, breakbulk, and liquid cargoes.

Economic Development Grant Opportunities

Task Force Recommendation 7: Establish an economic development infrastructure grant program for multimodal projects. There is a clear link between transportation and economic development, and it is in the best interest of the state to invest in targeted freight-intensive facilities, especially those that facilitate multimodal freight. One example of such an investment is at St. Louis Lambert International Airport, which developed a live animal export business to support Missouri agribusinesses. Before this constructing this facility, livestock were typically trucked to Chicago for export. The Livestock Export Center has received provisional approval from USDA to export the animals; however, it needs additional investment to improve the safety and efficiency of the holding facilities. There are no revenue sources to support the improvement. The Task Force recommends the state establish a multimodal transportation-focused, economic development infrastructure grant program to support the Livestock Export Center and other similar efforts that will better facilitate freight mobility for Missouri-based businesses.

[11] https://www.nwk.usace.army.mil/Media/News-Releases/Article/2908069/us-army-corps-of-engineers-receiving-infrastructure-funds-for-the-missouri-rive/

Opportunities to Support Workforce Needs

This third and final category of recommendations focuses on workforce development needs. Site selector decisions are primarily based on available workforce, workforce with existing knowledge of the industry, and real estate availability. Availability of housing (purchase or rental) was cited as a challenge for industries recruiting workers to relocate. For the logistics and manufacturing industries availability in evenings and overnight is often required. Reliable workers also need childcare and transportation options during those times as well. A total of 15 recommendations that fall into four categories – workforce readiness, childcare, housing and transportation – are detailed in the following subsections.

Workforce Readiness

Task Force Recommendation 8: Increase awareness and promote access to work-based learning, industry-specific training, and apprenticeship programs. The transportation and warehousing and manufacturing sectors offer many career pathways that do not require degrees from four-year colleges or universities, which can be expensive and difficult to access. This can make these sectors attractive since workers can be connected with entry-level positions that require less upfront investment. The Task Force recommends that the state encourage and promote increased awareness of and access to training and employment pathways in the transportation, warehousing, and manufacturing sectors to high school students. Many of these careers require training or certification for employees to be workforce-ready, even at the entry level, and with the right support and guidance, students can quickly launch their careers in skilled trades after graduating from high school.

Task Force Recommendation 9: Establish and expand virtual credentialing programs. Technical schools, community colleges, training providers and workforce development organizations should coordinate to establish online programs for workforce training and certification. Workforce development organizations should then partner with trade associations, chambers of commerce and other business associations to promote these programs to employers and workers. Although an on-site component will be necessary for testing and assessment, making resources available online will increase access and reduce travel requirements for workers, giving them greater flexibility to complete the programs.

Task Force Recommendation 10: Establish accelerated credential-to-employment programs and pipelines. Trade associations and workforce development organizations should establish programs that enable job-seekers to reduce the time needed for certification or credentialing under specific conditions and standards. Such a program may allow current employment, apprenticeship hours, or prior military service to count towards training hours necessary for a credential. For example, the Federal Motor Carrier Safety Administration maintains a Military Skills Test Waiver Program, which allows veterans with two years of experience in operating heavy military vehicles to obtain a commercial driver's license without taking the CDL driving skills test. Additionally, the Missouri Department of Social Services offers a SkillUP program to Supplemental Nutrition Assistance Program recipients that allows them to take classes and participate in training programs needed for a Class-A CDL license at no cost. Promoting these programs to businesses and veterans in Missouri could expedite the influx of veterans into the truck transportation and warehousing sectors.

Task Force Recommendation 11: Promote statewide standards for credentials. The Task Force recommends that the Missouri Office of Workforce Development convene a working group with representatives from private, non-profit and public sector entities to promote its Missouri Industry Recognized Credentials program. The OWD

maintains a centralized database of MIRCs, which are credentials that are valued or preferred by an industry for employment. The Office maintains MIRCs for 11 industries, including manufacturing and transportation and logistics. This program is designed to help local and regional agencies identify credentialing programs to direct job-seekers towards in order to train them for development. Promoting the program through a network of public and private sector partners would help local and regional agencies strengthen their pipeline and help job seekers determine what skills they should pursue for employment in a field.

Task Force Recommendation 12: Establish a tax credit for apprenticeship and job training programs for high-demand positions. In order to build the pipeline for skilled labor, Missouri should encourage businesses to play a more active role in workforce development. A tax credit for on-the-job training programs targeted to high-demand positions, such as truck drivers or warehouse operators, would incentivize businesses to undertake these new programs by reducing their cost to the businesses. Illinois currently maintains an Apprenticeship Education Expense Tax Credit Program that allows employers to receive state tax credits of up to $3,500 per apprentice, if that apprentice is enrolled in a U.S. Department of Labor-registered apprenticeship program. The Program provides additional tax credits if the apprentice resides in or the employer's place of business is in an underserved area. This model could be adopted in Missouri and tailored to high-priority positions that can contribute to supply chain resiliency.

Childcare

Task Force Recommendation 13: Expand childcare subsidies for employees. Missouri currently offers a Child Care Subsidy Program to reduce the costs of childcare for families and provides additional resources for finding childcare. Families who participate in the Program are permitted to receive childcare from licensed providers, in-home care providers, and licensed-exempt providers, such as schools, businesses, and in-compliance religious facilities. Families that earn up to 138% of the Federal poverty level are eligible for this program, but Missouri expanded the income-eligibility cap to 215% through 2020 using funding from the CARES Act for COVID-19 recovery. Permanent extension of this income-eligibility cap could increase childcare access for families. The state could also increase the maximum subsidy amount for families to reduce the cost burden of childcare. For parents who work on second- or third-shifts, Missouri could expand child care subsidies to cover work shifts as well as day shifts to allow the parents time to sleep while their child is cared for.

Task Force Recommendation 14: Expand childcare subsidies for employers. The Federal Employer-Provided Child Care Credit offers employers a tax credit of up to 25% of qualified child care expenditures, which include direct operation of childcare facilities as well as childcare support for workers. Missouri could establish a similar tax credit for state corporate income taxes to incentivize businesses to assist their employees with childcare costs or operate their own childcare facilities.

Task Force Recommendation 15: Offer incentives for on-site childcare provision. Some businesses have established on-site childcare facilities for their employees to use. For example, Daimler Trucks partnered with KinderCare Education, a childcare provider, to build an on-site childcare center at its headquarters. This arrangement reduces the number of trips that a working parent has to complete in order to meet their family's needs and simplifies the scheduling process for families. The Task Force recommends that the Missouri Department of Social Services and Missouri Department of Economic Development establish standards and

guidance for on-site childcare provision and assist businesses with identifying resources to support these programs.

Housing

Task Force Recommendation 16: Expand housing subsidies. During the COVID-19 recovery process, Missouri used funding from Congress to establish a rental assistance program, the State Assistance for Housing Relief for Renters, for renters financially impacted by COVID-19. This program was limited to Missouri renters with income at or below 80% of Area Median Income, and its purpose was to help people who had lost income due to COVID-19 maintain their housing.

While this program was intended to address the extreme economic disruptions caused by COVID-19, the program nevertheless serves as a model that could be adapted to provide rental assistance for low-income employees struggling to find affordable housing in areas with housing shortages. The State could structure the program to be time-limited or use phase-out subsidies to encourage workers to find alternative housing or support systems after settling into their new jobs. Alternatively, the program could be structured to align with existing work incentive programs, providing rental or mortgage assistance for a worker's initial months of employment in the transportation, warehousing, or truck driving industries. The program could require a contribution from the employer in order to reduce program costs and encourage the company to support the worker during their transition period.

Task Force Recommendation 17: Establish affordable housing incentives for new developments. The Missouri Housing Development Commission is a state entity that administers Federal and state programs for affordable housing construction and housing assistance, in addition to providing affordable housing financing.

These programs include the Affordable Housing Assistance Program, which provides an incentive for businesses and individuals to provide funding, equity, services, or property to a non-profit community-based organization for affordable housing in the form of one-time tax credits. For the past three years, total tax credit issuances have been below the annual program funding, meaning the program is underutilized. These credits could be expanded in value or duration, or the State could fund the program at a higher level and promote its availability to potential donors in order to encourage greater participation in the program. An example of a company currently addressing this issue is Triumph, which works with local developers to guarantee affordable rentals for employees.

The MHDC also administers the Low Income Housing Tax Credit program, which issues federal and state tax credits to developers. Developers in turn sell the credit to investors to obtain funding for construction. In 2020, MHDC adjusted the application process for the tax credits to increase the ranking of projects that provide workforce housing or connect to other economic development projects, such as providing housing near a new employment center. As with the AHAP, the State could adjust its tax credits to be higher in value or duration and could promote the program more aggressively. Since MHDC has increased the value of projects that tie to other economic development projects, the State should partner with economic development agencies and chambers of commerce to incorporate the LIHTAC program into economic development programming and marketing materials for the transportation, logistics, and manufacturing sectors.

Task Force Recommendation 18: Provide incentives to municipalities to enact zoning reform. Zoning regulations determine how land can be developed, for what purpose, and to what level of intensity or density. These regulations can significantly impact the quantity of housing in an area, which in turn affects housing costs.

Zoning regulations are generally set at the municipal level by city or county governments. However, Missouri can offer incentives for municipalities to adopt zoning regulations that support housing development, such as establishing eligibility requirements for state grant programs that require municipalities to expand zoning for multifamily housing or increase residential density. Missouri can also offer technical assistance for comprehensive land use planning to help municipalities accommodate growth and expand their housing supply as part of economic development planning efforts.

Transportation

Task Force Recommendation 19: Establish dedicated microtransit programs for employment centers. Microtransit services represent an advancement in traditional demand-response transit services, making these services more accessible, flexible and responsive. Demand-response transit services operate flexible routes that are based on riders' specific trip requests. Historically, their routes had to be built several days in advance due to limited service capacity. Microtransit systems use smartphone applications and tech-enabled call centers to schedule trips and build routes in "real-time," giving customers greater flexibility for travel and reduced wait times for pick-up. This type of service can be coordinated with shift changes to central locations, and can potentially be accessed at any time of day or night.

Microtransit services have been deployed throughout the country to provide workforce transportation. In early 2022, the University of Wisconsin-Milwaukee and the Southeastern Wisconsin Regional Planning Commission established FlexRide Milwaukee, a microtransit service designed to connect Milwaukee residents to employment centers in the neighboring cities of Menomonee Falls and Butler. This program allows current and prospective employees to request trips from the Milwaukee County Transit System's service area to an area of concentrated jobs. Business organizations and the Waukesha-Ozaukee-Washington Workforce Development Board are working with the FlexRide program to recruit employers and build the number of eligible workplace destinations. The program is funded to run through Fall 2022, at which point the program will be evaluated to determine its success.

The Task Force recommends that MoDOT work with the Missouri Public Transit Association to provide technical assistance and planning support to transit providers for microtransit service planning. Federal funding is also available for planning and implementing microtransit projects through multiple grant programs, including the Federal Transit Administration's Accelerating Innovative Mobility program and the Helping Obtain Prosperity for Everyone program. Additionally, the Missouri Legislation added $7 million to the Transit Operating Assistance fund, in the FY2023 budget—a significant increase from its historic $1.7 million funding level that could provide resources to fund these new programs.

Task Force Recommendation 20: Establish funding agreements with employers. A funding agreement with employers represents a public-private partnership between the employer, the transit service provider, and/or the public agency to fund the costs for providing workforce transportation to the employer's workers. Many transit providers have established standard procedures for arranging such agreements with employers. The Dallas Area Rapid Transit Authority maintains an Interlocal Agreement program for standing up transit service within specific geographic areas. The agreements have been used to provide service in municipalities and for private companies, including warehouse operators. These agreements establish cost-sharing commitments from partners, define service routes and schedules, establish service quality standards and a methodology for the service provider or

contractor to meet those standards, and a statement demonstrating how accessibility for people with disabilities and other mobility challenges will be provided under the service.

The Task Force recommends that MoDOT work with the Missouri Public Transit Association to create guidance and recommended standards for transit agencies to establish funding agreements with employers in areas not served or underserved by transit. These agencies can also coordinate on outreach to transit agencies around the state to encourage them to study and evaluate these partnerships as workforce transportation solutions in their communities.

Task Force Recommendation 21: Establish partnerships with rideshare companies to subsidize rides. Rideshare partnerships are agreements established between a transit provider or a public agency and a Transportation Network Company, like Uber, Lyft, or taxi companies. A TNC uses a network of independent operators to provide on-demand transportation service to customers, who use the TNC's common platform to arrange trips with the independent operators and pay for the trip. Under a rideshare partnership, the transit provider or public agency establishes a program to subsidize trips for customers on rideshare vehicles.

Many transit agencies have established these rideshare partnership programs as a "first-mile/last-mile" solution to allow customers to travel to or from a fixed-route transit stop or as replacement services for customers when transit service is no longer running, i.e., as a late-night service or emergency ride home. In 2019, the Valley Regional Transit Authority, which serves the Boise, ID metropolitan area, established VRT Late Night to subsidize trips for low-income workers traveling between the hours of 9pm and 6am, recognizing that fixed-route transit did not operate at the hours when these workers needed to travel.

The Task Force recommends that MoDOT work with the Missouri Public Transit Association to create guidance and recommended standards for transit agencies to establish TNC partnerships. These agencies can also coordinate on outreach to transit agencies around the state to encourage them to study and evaluate these partnerships as workforce transportation solutions in their communities.

Task Force Recommendation 22: Expand transit service brokerage and coordination services. Transit service brokerage and coordination services consist of a centralized agent who coordinates trips for customers across multiple transit providers. This model is often established for specific transit programs, such as Human Services Transportation or Non-Emergency Medical Transportation programs that connect customers with specialized transportation services under certain eligibility conditions. In Missouri, NEMT is administered through the state Medicaid program, MO HealthNet. MO HealthNet operates a trip booking system via a centralized phone-based system for all statewide NEMT trips.

A brokerage model reduces the administrative costs for providers by eliminating the need for each provider to maintain its own trip booking and scheduling system and expands the geographic coverage of transit service by connecting several smaller providers into a more comprehensive network. Additionally, the model streamlines the customer experience by establishing a single point of contact in an environment where a customer has multiple options available to them, but may not be able to use a given transit provider in all circumstances due to the provider's capacity or eligibility requirements for travel.

The Task Force recommends that MoDOT coordinate with the Missouri Department of Social Services, Area Agencies on Aging, MO Rides, and the Missouri Independent Living Council to identify specialized transit programs and providers. These organizations could conduct a joint study to identify opportunities for establishing transit brokerage models or expanding existing brokers to incorporate additional transportation programs into their portfolios.

Regulatory & Programming Opportunities

Some of the issues impacting supply chain issues in Missouri have the potential to be addressed by new or modified regulations and government-sponsored programs. The recommendations fall under four categories: truck driver shortage and retention, truck driver work environment, emergency response, and reduced costs for port investment. A total of 11 recommendations are described in the following subsections.

Truck Driver Shortage and Retention

The American Trucking Association in 2021 estimated that the industry will be short 80,000 drivers, a historic high. This shortage is anticipated to continue increasing beyond the current 80,000 drivers. The industry has struggled with early retirement of seasoned drivers as well as retention of new drivers. The following recommendations look to mitigate the challenges associated with retention in this industry.

Task Force Recommendation 23: Leverage and expand access to commercial driver training programs in rural areas of the state. The Task Force heard from several presenters that encouraged forming new regulations requiring additional training for drivers. Many of the larger trucking firms are providing the training in-house; however, independent drivers or people considering entering the field are having difficulties accessing training opportunities due to both cost and geographic location. Leveraging and expanding commercial driver training programs, particularly in rural areas of the state, would be benefit for new drivers as well as incumbent drivers who need to renew or upgrade licensee requirements. By leveraging and expanding both public and private resources for commercial driver training, a pipeline of skilled workforce can be better cultivated.

Task Force Recommendation 24: Promote standard for companies to hire dockworkers and pay while training to become driver. Apprenticeships and on-the-job training programs for dockworkers seeking to become truck drivers are an effective way to train on-the-job. The Task Force heard from presenters that while an effective training and recruitment strategy, it is uncommon for commercial driver trainees to be compensated during their training programs. It is often not feasible for potential drivers to forego pay during this training period, and the Task Force recommends that the state promote standards for companies to provide payment to help encourage more potential drivers in Missouri.

Task Force Recommendation 25: Promote stackable credentials for commercial driver's license and dockworker certifications that follow employees throughout their career. Allowing workers to build credentials that are transferrable to different companies and industries enables employees flexibility in taking advantage of better job opportunities without jeopardizing their career progression.

Task Force Recommendation 26: Provide resources for drug rehabilitation facilities to reduce number of drivers leaving the field. The Task Force heard from several presenters that discussed the challenges with retaining drivers due to positive random drug testing. It is recommended that the state provide additional resources

for drug rehabilitation facilities to support drivers in their recovery rather than risk them leaving the industry all together. In addition to helping to address the driver shortage issue, it also provides public health benefits by reducing drug use in the state. It is also recommended that the state encourage trucking companies to provide support for drivers that wish to return their driving jobs after completing rehabilitation, as it currently requires corporate sponsorship and represents an additional hurdle in retaining drivers.

Task Force Recommendation 27: Align Missouri's commercial driver's license requirements with other states. Expanding access to CDLs in Missouri will make it easier for potential drivers to acquire a CDL and operate within the state. Due to existing federal laws, the drivers that are not U.S. residents face additional obstacles to be CDL-licensed in any state, including providing proof of residency. However, states have flexibility in determining what documentation demonstrates proof of residence, and some states have relaxed these requirements to encourage more truck drivers. In Nevada, an acceptable form of documentation establishing residency includes a motel, hotel, campground, or recreational vehicle park receipt showing that the applicant has been residing in Nevada for at least 30 consecutive days. In Alabama and California, applicants may provide school enrollment documentation, which could cover a driver training school program. In Connecticut, a variety of documents, including school records and other statements, do not need to include a postmarked envelop and may have been sent to a P.O. Box or by email to the applicant. By contrast, in Missouri residence is defined as "person's true, fixed, principal, and permanent home, to which a person intends to return and remain, even though currently residing elsewhere. A post office box is not allowed as a residential address."

The Task Force recommends that Missouri align its CDL requirements with other states by relaxing the documentation establishing residency in Missouri to support additional training and hiring of truck drivers in the state. Doing so would help support programs such as the Crowder College Driver Training program, which has had multiple participants from Puerto Rico who are not permitted to apply for a Missouri CDL. While the program has successfully increased national drivers, it is not helping businesses located in Missouri in addressing the shortage.

Truck Driver Work Environment

The Task Force heard from presenters that drivers are using their available hours of service waiting at customer facilities to drop off or pick up loads, looking for available truck parking, trying to find customer facility, and in roadway congestion. In Missouri, 87 out of 141 truck parking locations exceeded 100% utilization for the peak time of 2 am to 3 am. Beyond designated truck parking facilities, many drivers do not have access to basic amenities like bathrooms or food vending at customer facilities. Addressing these issues may help reduce the driver shortage and improve retention by improving the quality of the work environment for drivers.

Task Force Recommendation 28: Develop a uniform rating system for preferred facilities. The Task Force heard from presenters that truck drivers often struggle with long wait times and lack of access to critical amenities such as bathrooms or food/drink vending while at customer facilities. Long wait times take up valuable hours of service time, and drivers are often not compensated for the time they spend waiting to pick up/drop off cargo. It is also uncomfortable and dehumanizing to not be provided access to basic needs at these sites, similar to what would be provided to any visitor of a public building, such as MoDOT Central District office. The Task Force recommends that the state, Missouri Trucking Association, and Owner-Operator Independent Drivers Association and other trucking advocacy groups collectively develop a uniform rating system to identify and promote preferred facilities for truck drivers. Companies that provide key amenities would receive a Preferred Facility Certification in

one of three levels – platinum (highest), gold, or silver. Companies and drivers could use the system to determine costs and whether to serve that facility, encouraging more facilities to increase efficiency for trucks. Amenities to be included in the certification evaluation include, but are not limited to:

- Access to bathroom;
- Access to breakroom/vending for food and drink;
- Access to on-site overnight parking;
- Appointment system for drop-off and pick-up;
- Guaranteed two-hour turnaround for loading or unloading;
- Clear signage and wayfinding to/from freight facilities and on-site; and
- Clear and comprehensive safety standards to protect drivers accessing the site.

Task Force Recommendation 29: Safe technology communication method for inside the truck and on changeable message boards to alert drivers to hazards and available truck parking. It is challenging to communicate important information to truck drivers that are on the road, such as roadway hazards or available truck parking. Because of concerns with distracted driving, it is important to develop communication methods that can relay critical information inside the truck without posing any safety risk to the driver. The Task Force recommends that the state and MoDOT develop a communication method accessible by any driver that can safely and effectively deliver key information to drivers in Missouri.

Task Force Recommendation 30: Increase truck parking availability at public and private sites. Demand for truck parking in Missouri during nighttime peak periods exceeds overall capacity by more than 2,300 spaces. Out of 141 designated truck parking sites within a half-mile of the interstate system, 87 sites (62%) are at or over capacity from 2-3 a.m. A cluster of over-capacity sites exist on I-35 northeast of Kansas City, most of I-44, I-70 west of I-270 and near the I-55/I-57 interchange. These locations also experience a high number of trucks parked on interstate right-of-way, which poses a significant safety concern for both truck drivers and other motor vehicles. The Task Force recommends that MoDOT and private operators of truck parking sites invest in increasing availability in areas that are known to have high demand and insufficient capacity, on both interstate and non-interstate roads.

Task Force Recommendation 31: Provide waivers for divisible load restrictions to allow increased weights. During Presidential declared emergencies, states are allowed to issue permits for divisible loads more than 80,000 pounds on interstates for 120 days following the declaration. During the onset of COVID-19, Missouri issued permits for 100,000 pounds for both interstate and state routes. This waiver process helped expedite goods and services during the beginning of the COVID-19 pandemic. The Task Force recommends that MoDOT provide waivers for divisible load restrictions to allow increased weights and require fewer trucks to move the same volume of freight, alleviating some of the pressure on the existing truck driver workforce.

Emergency Response

Task Force Recommendation 32: Negotiate rates for tow companies called to scene by emergency responder. The purpose and goals of the Open Roads Agreement is to do whatever is reasonable to reduce risk to responders, reduce secondary crashes and delays and clear the road within 90 minutes. Although this timeframe was established to improve safety on the roadways, many trucking firms have negotiated towing rates with companies that cannot meet the 90-minute window. Firms have noted receipt of very large bills from tow companies called to the scene by emergency responders, which increases the cost of doing business in Missouri. The Task Force recommends that the state negotiate rates for tow companies called to the scene by emergency responders. This action will preserve the safety goals of the Open Roads Agreement while recognizing that unexpected costs can put additional burden on carriers operating in Missouri.

Reduced Costs for Port Investment

Task Force Recommendation 33: Develop a waterways trust fund to allow multi-fiscal year construction with appropriated revenue. For the last eight years, Missouri's budget has included an annual General Revenue appropriation for capital improvements at public port authorities. However, there exists an issue with the timing of the allocation of annual state funds as compared to a typical construction season of Missouri River ports. Construction generally occurs during April to October while Missouri's annual funds expire annually in July, since the state allocated funds are valid from July 1−June 30 each year. Because the state's timeline and the port's timelines are not aligned, it leads to challenges with completing construction projects as planned. Factoring in inflation, this adds fiscal constraint in the budget process. Contractors often include a premium on the bid prices to account for the split construction season due to the fiscal year appropriation and weather variability. In addition, other factors such as flooding/high water levels may result in partially or completely missing an entire construction season, leaving state money on the table. The Task Force recommends that the state establish a waterways trust fund, which could be leveraged at any time and over a multi-year period, to acknowledge the realities behind financing port-related projects.

Appendix A. Record of Public Comments

A.1 Meeting on January 20, 2022

No public comments received.

A.2 Meeting on February 10, 2022

No public comments received.

A.3 Meeting on March 10, 2022

A comment was brought to the Task Force. Due to audio connection, the comment was not heard on the live stream.

Response from Caitlin Murphy: From my view of it, a lot pertains to the freight equipment matching and working together. Kansas has a lot more export rail bookings. When equipment comes to the Kansas City terminal, the equipment will go right back out. Kanas City does more exports out of their terminal than St. Louis.

A.4 Meeting on March 24, 2022

No public comments received.

A.5 Meeting on April 7, 2022

No public comments received.

A.6 Meeting on April 21, 2022

Comment from Michael Castle with AlTech: The challenges we heard today are very similar to the challenges we're facing. My role is in engineering, but I deal with the manufacturing side as well. Almost everything AlTech builds goes on a truck. We need technicians that know how to keep trucks on the road. Some of the things we're considering doing in AlTech to help work force development is being done by others and has had success. We need to have infrastructure improvements to keep trucks going. We appreciate the time today. We believe a change is coming with electric work trucks in the coming years. We expect 5% of our trucks in 2026 to be electric.

Response/Question from Mardy Leathers: That is great to hear in the state. Is anyone in other states working on using EVs?

Response from Michael Castle: Some people ahead of us are on the coasts—such as California.

A.7 Meeting on May 5, 2022

Received 05/04/2022 from Scott Meyer scottmeyerpe@gmail.com.

Please accept this email and attachments as my submission to the Supply Chain task force.

I represent the MAGNET group of the Cape Girardeau Area Economic Development group made up of Cape Girardeau, Jackson, Scott City and Cape Girardeau County in the matter of the TransAmerica Corridor. I have attached a white paper about the history and current status of the project for your information.

I am sorry we were unable to attend the open meeting in Hannibal. The work you are doing is work that should have been done many years ago to address issues that are now causing supply chain pinch points that impact the entire Nation and our economy.

In fact, more than 30 years ago, a proposal was made to address the East West freight issue that was initially called I-66 and was written into Federal transportation law as a high priority corridor. (the TransAmerica Corridor—TAC). If the Corridor had started to be studied and built at that time, there would be an all weather highway, freight rail and pipeline corridor to address many of the issues we have today. It is like the old story... The best time to plant a tree was 50 years ago, the second best time is today !

In recent years, the concept of the TransAmerica Corridor has been refined to include the Power Grid Connection of the 3 power grids and has looked at connecting the sustainable power production of the west to the coal dependent east using a Tennessee Valley Authority model or partnership. The idea has been endorsed in the Missouri Vision of the Department of Economic Development and has now embraced new efficiencies of Intelligent Highway Systems, Driverless and platooning of trucks and a vision for Container on Barge operations along the Mississippi river at the ports from Cairo, IL, SEMO (Cape) and the new Jefferson County Port.

The Freight rail opportunity is enhanced with the Canadian Line acquisition that will connect Mexico to Canada (going through Wichita and Kansas City). I believe there is tremendous opportunity to impact the freight rail bottleneck in Chicago by providing a new connection to the east via the TAC.

We also believe the MoDOT freight study points to a need to enhance freight options in Southern Missouri to handle the growth projected in the freight study. It also seems that the continued Agricultural commodity growth of the bootheel will replace the movement of coal from the west to the east.

We have envisioned a build segment from Wichita, KS to Bowling Green, KY that could fully test these concepts. We propose building this segment primarily with Bipartisan Infrastructure Bill funds, (through various categories) and believe step one would be to build a model to test the concepts using real time data of a GIS twin. WE also propose maintaining the TAC using the operating fees of rail, Smart trucks, pipeline use, and electricity grid use.

I have attached a white paper and several maps that describe what we have proposed. You may also visit the website via this link: trans America Corridor.

I would be happy to meet and answer any questions you might have about this innovative solution to an extremely challenging problem. The thinking of yesterday is unlikely to solve tomorrow's problems!