# Chapter 3 – Missouri Freight System

## KEY POINTS

- One of the key products of this Missouri State Freight Plan is a defined Missouri freight network. This is the first time Missouri has had a defined freight network. That is important for several reasons, chief among those: a proposed improvement project must be located on or adjacent to the defined freight network to be considered in the freight prioritization process.
- The top 100 freight generators in Missouri were identified based on truck activity. This information helped support the identification of the freight network and shaped the prioritization process.
- Freight and commodity flows underscore the role Missouri plays as a bridge state for the nation, as most freight travels through our state instead of starting or ending here.

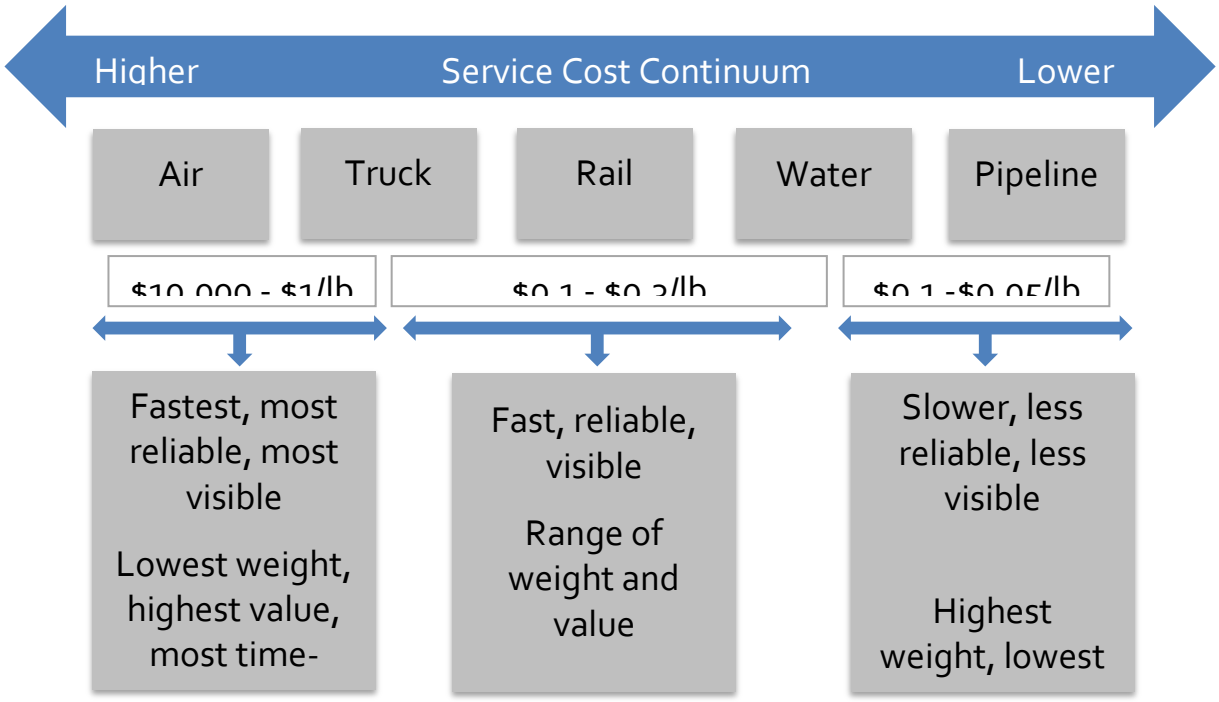
## Introduction

Missouri is at the freight crossroads of America. As the geographic and demographic center of population for the United States, Missouri is well positioned as the country's freight nexus.

Missouri's freight system is a network of highway, rail, air, water, pipeline, intermodal facilities, and freight generators that together move goods and commodities. The freight system is how Missouri products like soybeans and aviation parts are transported around the world. An understanding of the key features of the Missouri Freight Network is integral to understanding the strategies and future goals outlined in this Missouri State Freight Plan.

The freight system offers a range of service options. The best freight service for a particular shipment depends on the shipment weight, shipment value, the origin and destination, when the product is needed, security and safety, transportation costs, and customer needs. As shown in **Figure 3-1**, shippers use different freight modes depending on the type of shipment. All these freight modes are elements of the Missouri freight system.

*Figure 3-1: Range of Freight Service Options*

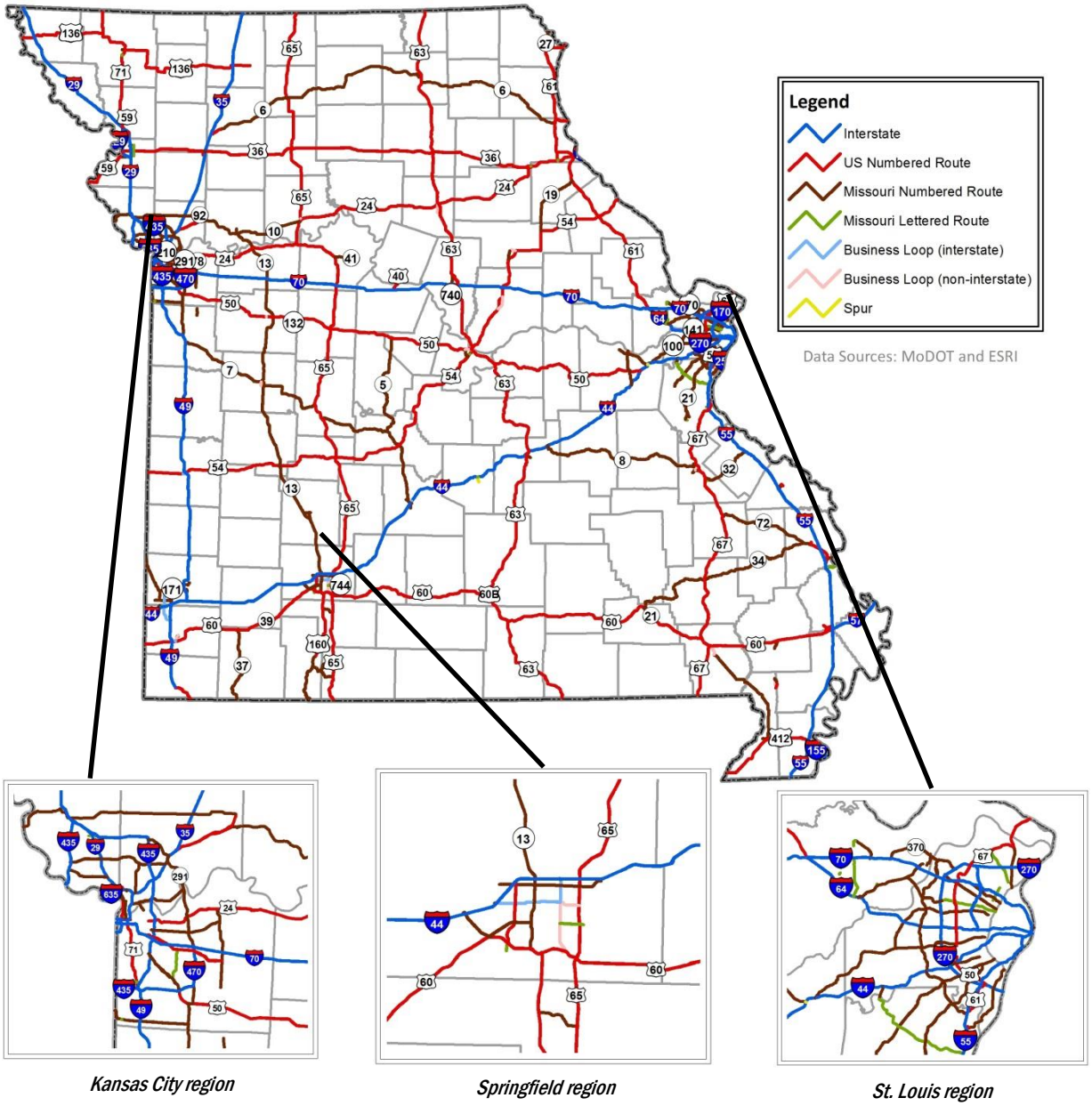



*Source: Federal Highway Administration*

## Highway

Missouri has the seventh largest state highway system in the United States. It is made up of approximately 33,700 centerline miles of roadway, 5,500 of which are classified as heavily traveled "major highways" and 28,200 miles of which are defined as lesser traveled "minor highways." Missouri's major highways are just 20 percent of the State highway miles, but carry 80 percent of the system's traffic and the majority of the highway freight traffic. There are 18 Interstate Highways within Missouri, including 9 main routes and 9 auxiliary routes. The more than 10,000 bridges that cross rivers, other highways, and valleys are also important elements of the highway system. **Figure 3-2** shows the Missouri major highway system, which defines many of the paths on which freight moves.

*Figure 3-2: Missouri Major Highway System*




*Kansas City region*

*Springfield region*

*St. Louis region*

## Rail

Railroads are categorized as Class I, II, or III depending on operating revenues. In 2012 dollars, a railroad with operating revenues greater than $433.2[1] million for at least three consecutive years is a Class I railroad. A railroad with revenues greater than $34.7 million but less than $433.2[2] million is a Class II railroad, commonly referred to as a "regional" railroad. A railroad not within the Class I or II categories is considered a Class III railroad, also known as a "short line."

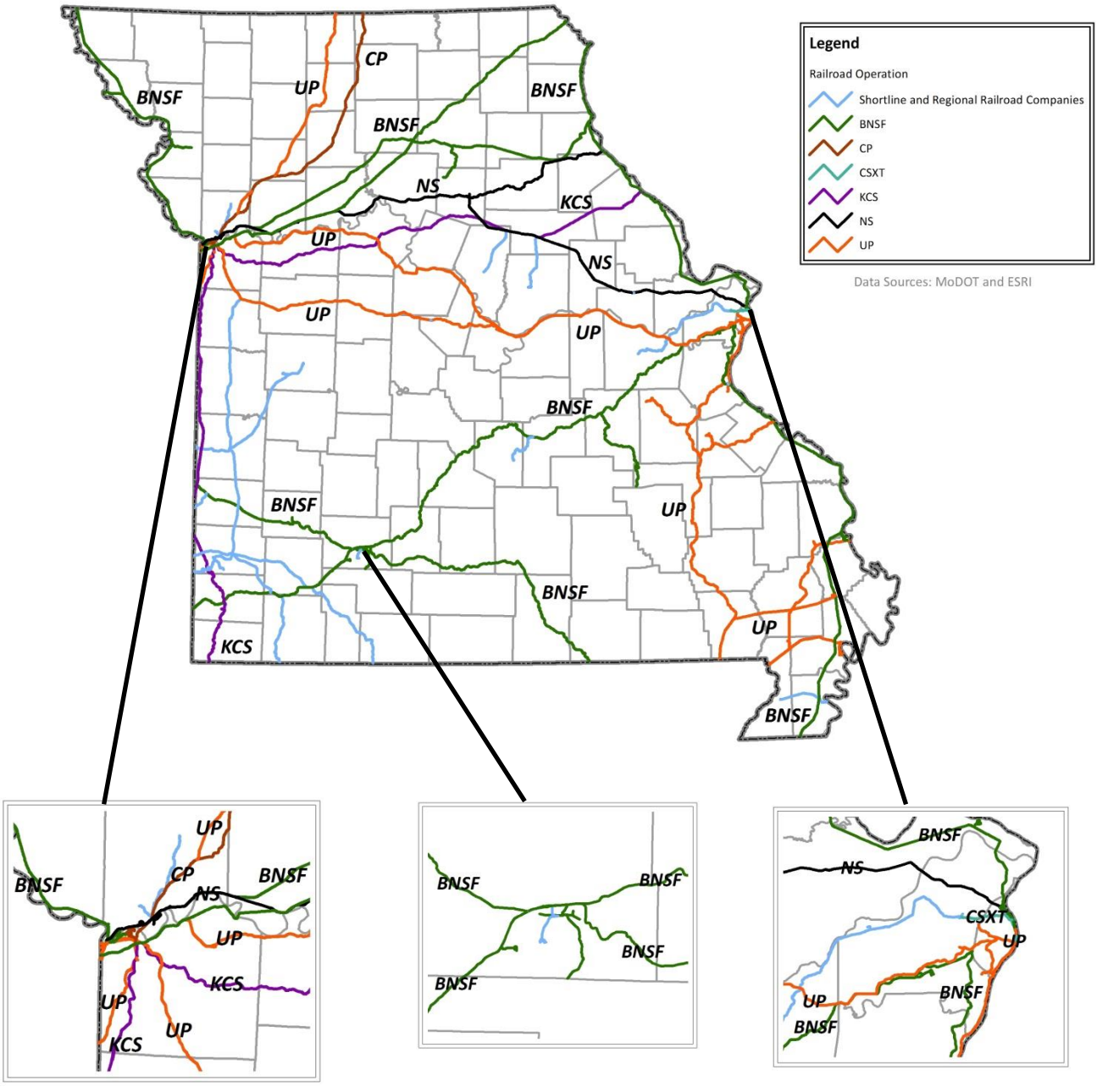
Missouri has a significant freight rail infrastructure with six Class I freight railroads currently operating on 4,218 miles of main track rail lines, 2,500 miles of yard track, and approximately 5,697 public rail-highway crossings within the State. There are no Class II railroads operating in Missouri; however, five short line railroads serve Missouri. The short line railroads collectively own and operate 426 track miles, varying from the smallest with 33 track miles to the largest with 331 track miles. **Figure 3-3** shows railroad ownership in Missouri.

At-grade rail crossings present potential roadway safety and delay issues. There are over 5,697 at-grade railroad crossings within Missouri, including freight railroad, Amtrak, and commuter rail operations.

[1] http://www.aslrra.org/about_aslrra/faqs/

[2] http://www.aslrra.org/about_aslrra/faqs/

*Figure 3-3: Missouri Railroad Ownership*



## Water

Missouri waterways move an average of $12.5 billion in cargo annually. The State contains 1,050 miles of navigable rivers, including 500 miles of the Mississippi River and 550 miles of the Missouri River. The Mississippi River is divided into the Upper Mississippi (nearly 860 miles) limited by a series of locks and dams and the Lower Mississippi (1,480 miles) with uninterrupted flow south to the Gulf of Mexico.

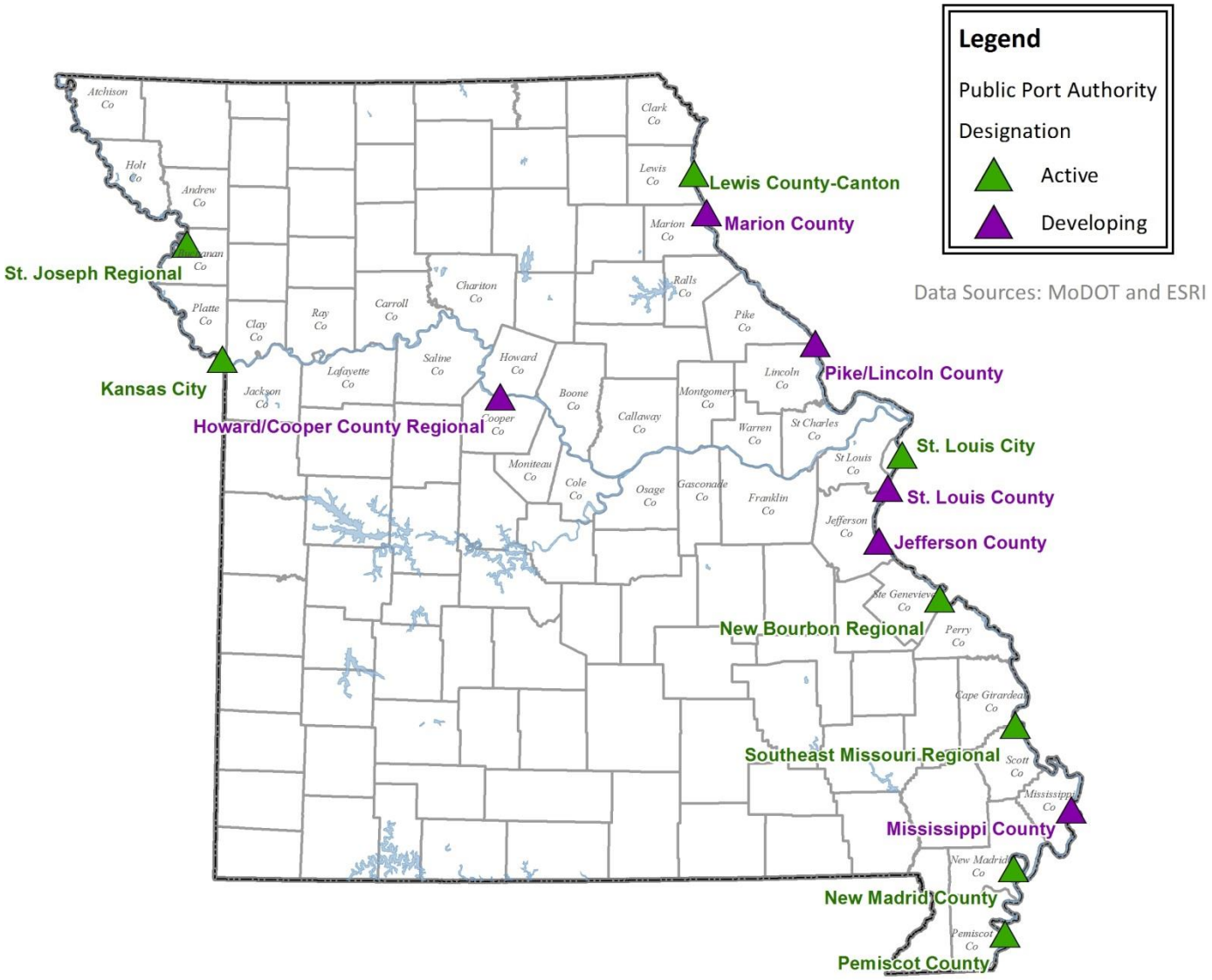
A total of 14 public ports and more than 200 private ports can be found along Missouri's waterways. There are eight active ports; six of the eight shipped product within the last year, and two of the eight did not. There are six developing ports which currently do not have a public port facility. **Figure 3-4** shows the port authority locations.

Since 2009, the U.S. Department of Transportation (USDOT) has designated several marine highways for transporting cargo on water, thereby reducing pollution and congestion on roads. Designated marine highways receive preferential treatment for federal assistance from the U.S. Maritime Administration (MARAD). Marine highways serving Missouri include:

- M-29 connecting the Upper Missouri River from Kansas City to Sioux City, Iowa
- M-70 covering the Missouri River from Kansas City to St. Louis
- M-35 recently approved and covering the Upper Mississippi River from the Twin Cities to St. Louis
- M-55 connecting the Illinois River from Chicago to St. Louis and then the Mississippi River from St. Louis to the Gulf of Mexico

**Figure 3-5** shows the marine highways serving Missouri.

*Figure 3-4: Missouri Public Port Authorities*




*Source: MoDOT and ESRI*

*Figure 3-5: U.S. Marine Highway Routes*


*Source: U.S. Department of Transportation*

## Air

Missouri is home to three of the top 110 cargo airports in North America in terms of total tonnage in 2012. These three airports handled nearly 170,000 tons of air cargo in 2011, which is a decrease of 4.9 percent annually since 2001. In this same time frame, Missouri's fastest growing airport by total tonnage was Springfield-Branson National (SGF) at 0.79 percent increase annually. Kansas City International and Lambert – St. Louis International airports both experienced decreases in total air cargo from 2001-2011. **Figure 3-6** shows Missouri's top freight airports.

*Figure 3-6: Missouri Top Freight Airports*

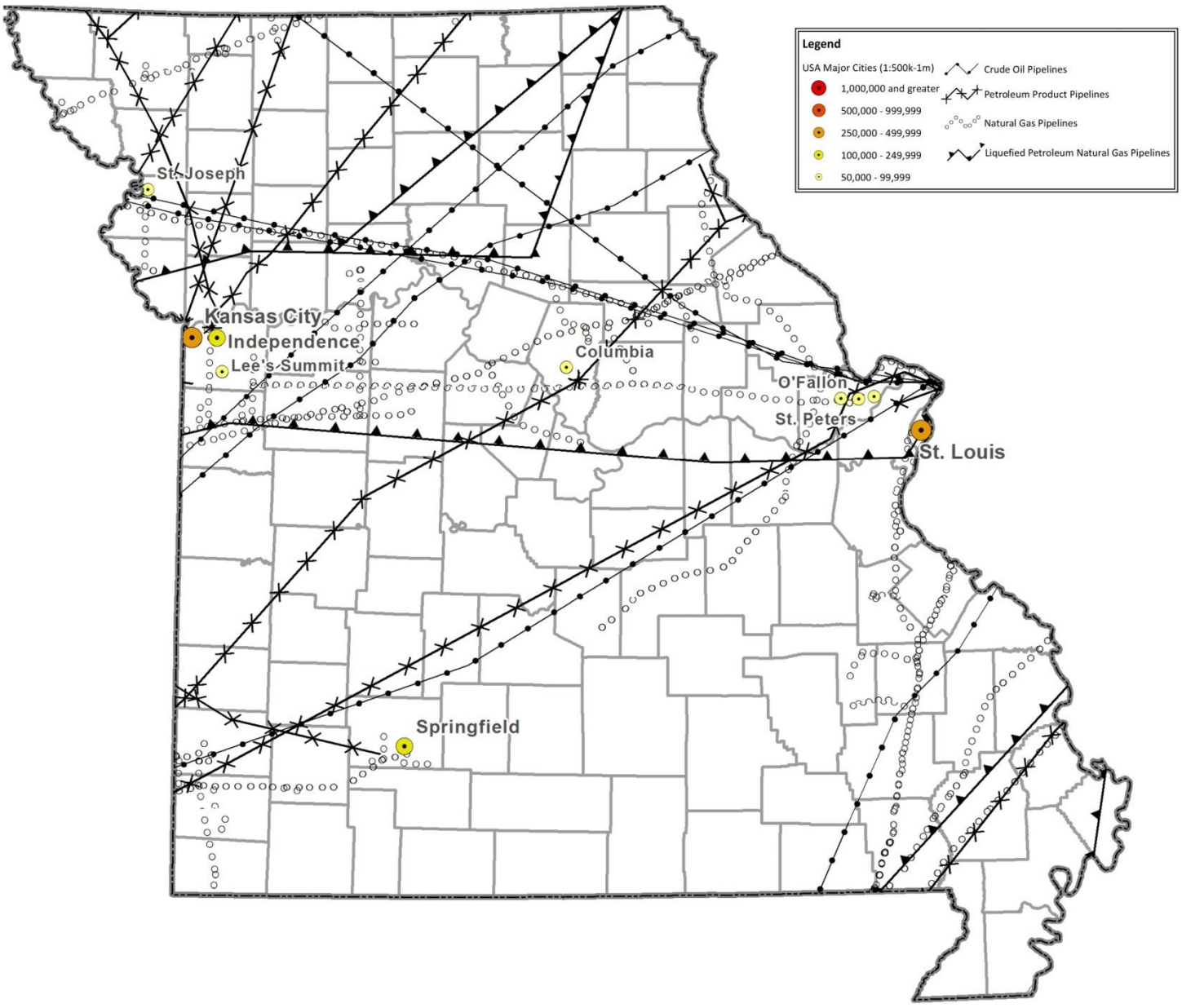
*Source: MoDOT and ESRI*

## Pipeline

Approximately 10,700 miles of pipelines move natural gas, crude oil, and petroleum products throughout Missouri. The highest percentages of pipeline miles, according to the Missouri Incident and Mileage Overview authored by the Pipeline and Hazardous Materials Safety Administration (PHMSA), are in St. Charles County (4.9 percent), Cass County (3.6 percent), Audrain County (3.5 percent), and Johnson County (3.4 percent). These counties are located in the northern half of the State where the majority of major pipelines pass. **Figure 3-7** shows Missouri's major pipelines.

*Figure 3-7: Missouri Major Pipelines*

*Source: U.S. Energy Information Administration, MoDOT, and ESRI*



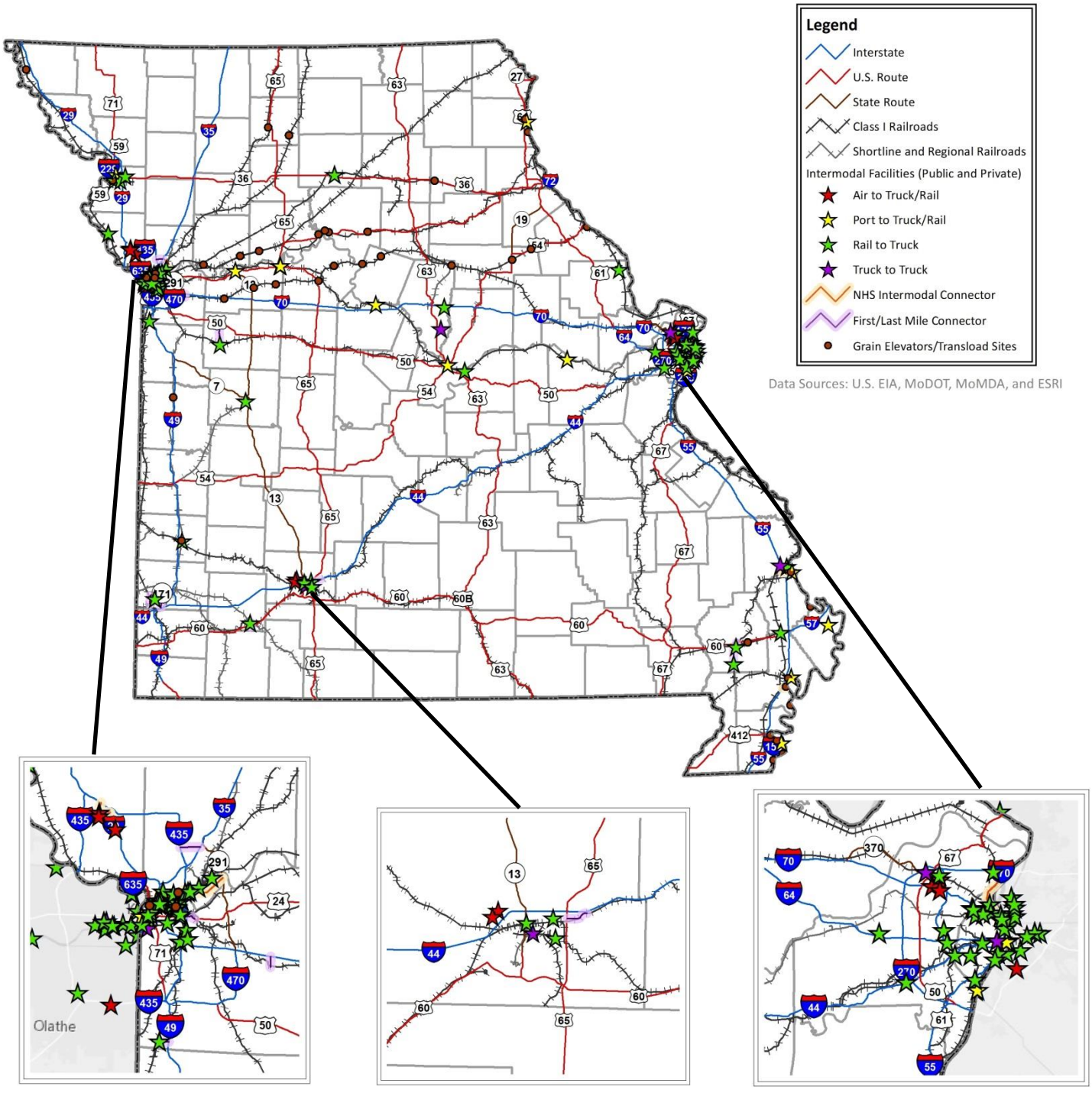
## Intermodal Facilities

The National Transportation Atlas Data through the Bureau of Transportation Statistics identified 114 intermodal facilities located in Missouri. These facilities provide a variety of intermodal connections. The majority of the intermodal facilities (71 percent) accommodate transfers of commodities between rail and trucks. Other intermodal facilities offer transfers between rail/truck and ports (16 percent), rail/truck and airports (eight percent), or other modes (five percent).

The majority of intermodal activity occurs in metropolitan areas. The Kansas City area has 47 intermodal facilities and St. Louis has 30 intermodal facilities. Smaller clusters of intermodal facilities are in Springfield, which has six intermodal facilities, and St. Joseph, which has four intermodal facilities. The remaining 28 intermodal facilities are dispersed throughout the State. **Figure 3-8** shows Missouri's Intermodal Facilities.

Most, if not all, intermodal facilities are associated with private companies and offered as a service to customers. Intermodal facilities can affect the overall cost of logistics, increase efficiency, reduce congestion and burden on the highway system, and generate higher returns on public and private infrastructure investments. For these reasons, intermodal facilities can enhance Missouri's ability to compete domestically and internationally.

*Figure 3-8: Missouri Intermodal Facilities*



*Kansas City region* *Springfield region* *St. Louis region*

*Source: U.S. EIA, MoDOT, and ESRI*

## Freight Generators

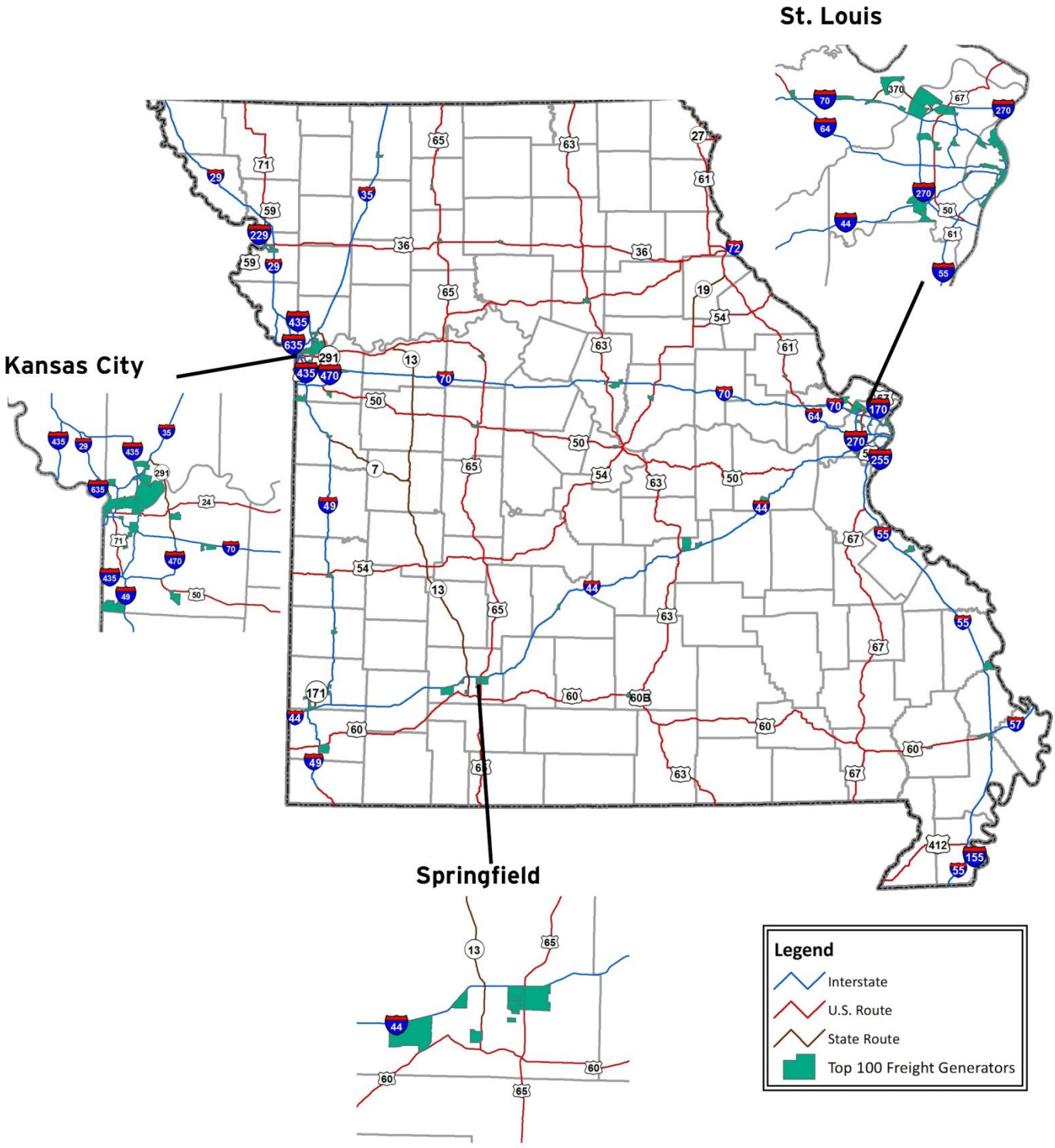
Freight generators create freight. Freight generators include distribution centers, warehouses, manufacturing facilities, and other origins and destinations.

American Transportation Research Institute (ATRI) analyzed Global Positioning System (GPS) data from Missouri to identify census block groups where freight activity is most intense. The goal of the analysis was to identify geographic locations where freight is generated. These locations were identified based on the intensity of truck activity to, from, and within the census block group. The results of this analysis provide insight into the sources of freight movement.

Based on truck activity, the analysis identified 400 census block groups with significant freight movement, out of a total of 4,506 census block groups in the State. The 100 most intense freight generators were identified among the 400 census block groups. Note that the analysis included only stopped trucks and filtered out locations on major roadways or at truck stops. The full text of the ATRI *Missouri Freight Generators Analysis* is located in Appendix A-Attachment B.

The majority of key freight generators are located adjacent to (but not within the footprint of) major roadways. Urban areas such as St. Louis and Kansas City contain the largest share of freight generators, although several other freight generating locations were identified throughout the State. **Figure 3-9** depicts the 100 Missouri freight generators identified through this analysis. Each of the 100 locations is shown in green.

*Figure 3-9: Missouri Top 100 Freight Generators*




*Source: MoDOT, ESRI, and ATRI*

## Freight Flows

More than one billion tons of freight crosses Missouri's infrastructure annually. Volumes of freight (especially compared to the capacity of the Missouri freight system), values of freight and related economic impacts, and public perception regarding freight movement are important considerations in the development of the Missouri State Freight Plan. **Table 3-1** shows the flow of freight in Missouri by freight tonnage and value by transportation mode and relative direction.

*Table 3-1: Missouri Flow of Freight (2011)*

| Direction | Air | Pipe | Rail | Truck | Water | Total |
|---|---|---|---|---|---|---|
| **Tons** | | | | | | |
| Outbound | 34,313 | #N/A | 21,510,433 | 75,301,621 | 19,973,291 | 116,819,658 |
| Inbound | 38,249 | 932,258 | 92,326,793 | 89,250,507 | 5,093,847 | 187,641,654 |
| Intrastate | 370 | #N/A | 2,436,087 | 105,627,915 | 4,941,503 | 113,005,875 |
| Through | 71 | 7,412,827 | 341,805,597 | 230,212,488 | 19,850,043 | 599,281,026 |
| Total | 73,003 | 8,345,085 | 458,078,910 | 500,392,531 | 49,858,684 | 1,016,748,213 |
| **Value, in millions** | | | | | | |
| Outbound | $7,620 | #N/A | $40,364 | $95,005 | $3,479 | $146,468 |
| Inbound | $3,656 | $643 | $39,647 | $119,731 | $3,083 | $166,760 |
| Intrastate | $100 | #N/A | $1,616 | $62,346 | $117 | $64,179 |
| Through | $10 | $5,117 | $383,409 | $433,794 | $5,870 | $828,200 |
| Total | $11,387 | $5,761 | $465,035 | $710,876 | $12,549 | $1,205,607 |

*Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011*

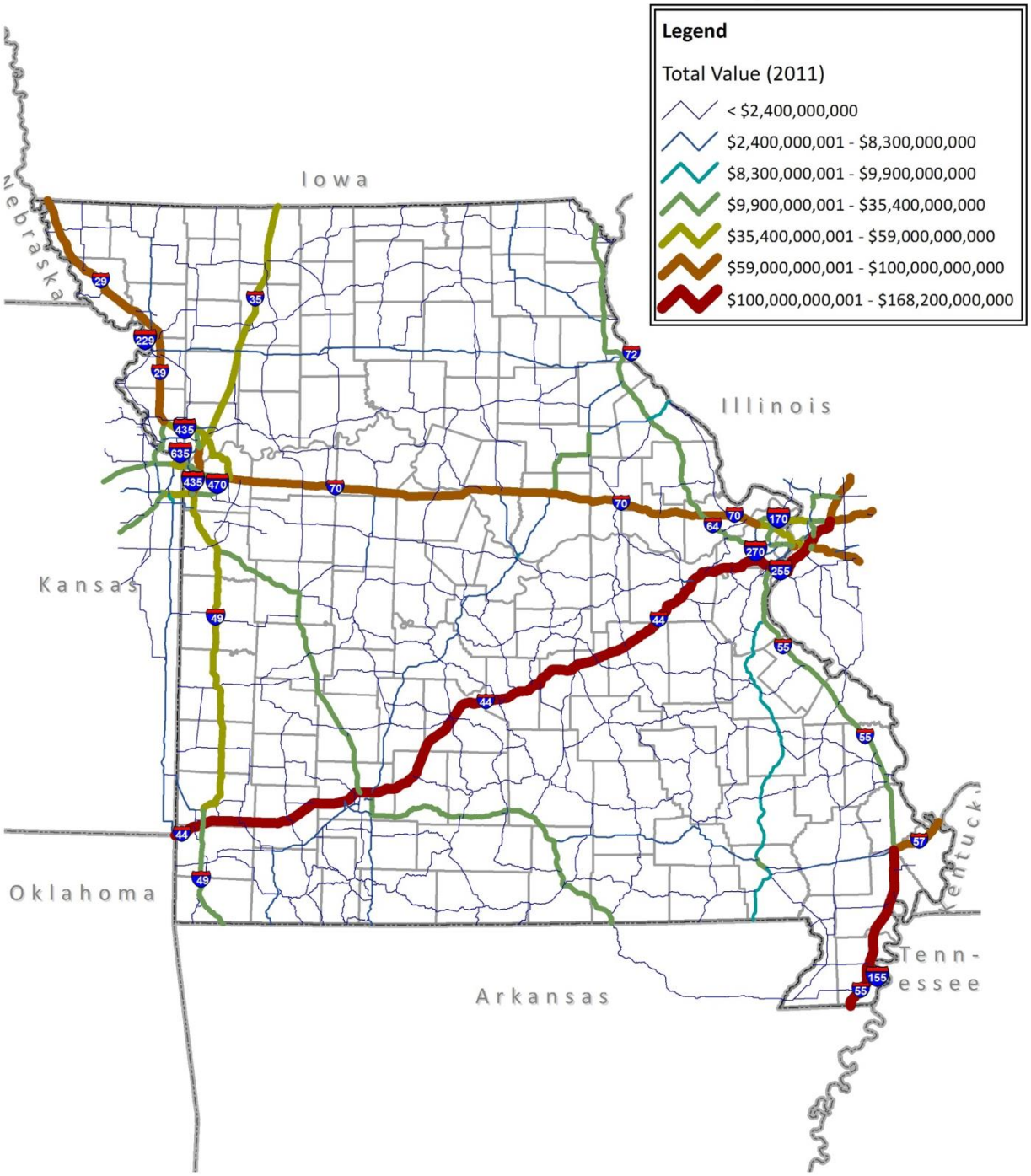
### Truck Commodity Flows

In 2011, 40.6 million trucks in Missouri carried 500.4 million tons of freight valued at $710.9 billion (see **Table 3-1)**. On average, truck commodity movements are valued at $1,421 per ton. More freight was moved by trucks than by any other transportation mode in Missouri in 2011—truck movements were 49.2 percent of freight movement by tonnage and 59.0 percent of freight movement by value. The major truck freight corridors include the major interstates (I-44, I-55, I-70, I-35, I-29, and I-49), as shown in **Figure 3-10** based on tonnage and **Figure 3-11** based on freight value. Additionally, major U.S. and State highways in the urban centers also accommodate significant freight movements (US-61 and I-49).

*Figure 3-10: Total Tonnage of Freight Moved by Truck in Missouri (2011)*


*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*

*Figure 3-11: Total Value of Freight Moved by Truck in Missouri (2011)*




*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*

## Rail Commodity Flows

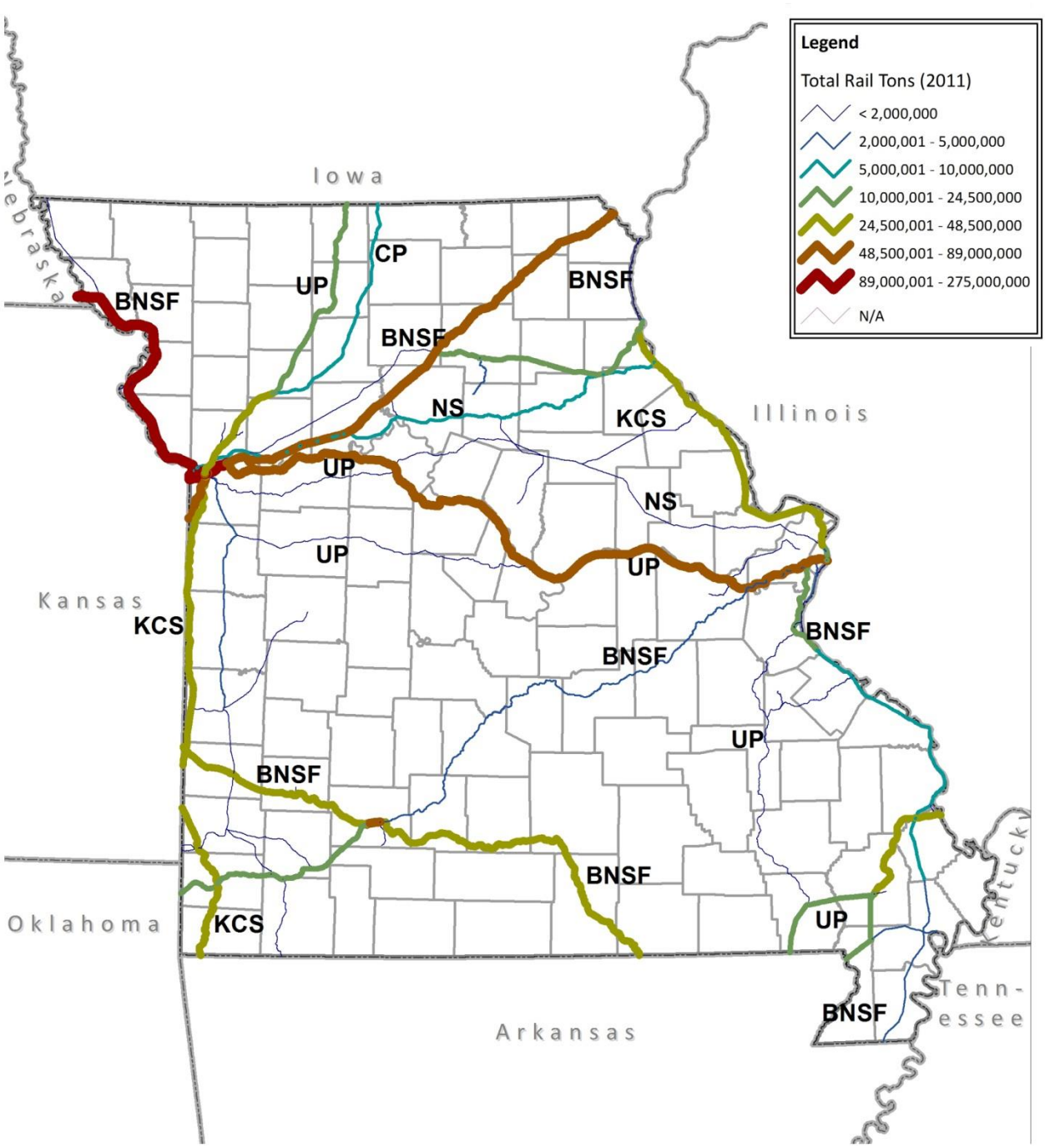
In 2011, 8.2 million rail cars carried 458.1 million tons of freight valued at $465.0 billion (see Table 3-1). On average, total rail commodity movements are valued at $1,015 per ton. Rail was the second most common way to move freight in Missouri in 2011—rail movements accounted for 45.1 percent of freight movement by tonnage and 38.6 percent of freight movement by value. Key rail freight corridors include routes served by the major Class I carriers, especially those surrounding Kansas City, as seen in **Figure 3-12** based on tonnage and **Figure 3-13** based on freight value. The routes carrying the most rail tonnage include the Union Pacific line between Kansas City and St. Louis and the Burlington Northern-Santa Fe lines between Kansas City and Chicago and between Kansas City and Wyoming (via Nebraska).

*Table 3-2: Missouri Railroad Abbreviations, Routes and Classes*

| Class | Abbreviation | Route |
|---|---|---|
| Class 1 | BNSF | Burlington Northern Santa Fe |
| Class 1 | CSX | CSX Transportation |
| Class 1 | KCS | Kansas City Southern Railway |
| Class 1 | NS | Norfolk Southern Railway |
| Class 1 | CP | Soo Line Corporation (U.S. operating arm of Canadian Pacific) |
| Class 1 | UP | Union Pacific Railroad |
| Switching and Terminal Railroads | CMR | Central Midland Railway |
| Switching and Terminal Railroads | (COLT) | Columbia Terminal |
| Switching and Terminal Railroads | KCT | Kansas City Terminal Railway Company |
| Switching and Terminal Railroads | MRS | Manufacturers Railway Company |
| Switching and Terminal Railroads | MVP | Missouri & Valley Park Railroad |
| Switching and Terminal Railroads | MNC | Missouri North Central Railroad |
| Switching and Terminal | (SE) | Semo Port Railroad |

| | | |
|---|---|---|
| **Railroads** | | |
| **Switching and Terminal Railroads** | TRRA | Terminal Railroad Association of St. Louis |
| **Short Line Railroads** | AM | Arkansas & Missouri Railroad |
| **Short Line Railroads** | KAW | Kaw River Railroad |
| **Short Line Railroads** | MNA | Missouri & Northern Arkansas Railroad |
| **Short Line Railroads** | OVRR | Ozark Valley Railroad |
| **Short Line Railroads** | SKOL | South Kansas & Oklahoma Railroad |

*Figure 3-12: Total Tonnage of Freight Moved by Rail in Missouri (2011)*




*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*

*Figure 3-13: Total Value of Freight Moved by Rail in Missouri (2011)*


*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*

*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*

### Waterway and Ports Commodity Flows

In 2011, Missouri ports (waterborne) carried 49.9 million tons of freight valued at $12.5 billion (**Table 3-1**). On average, total port commodity movements are valued at $252 per ton. Port movements were 4.9 percent of freight movement by tonnage and 1.0 percent of freight movement by value in Missouri in 2011, a small proportion relative to the dominant truck and rail modes.

### Air Commodity Flows

In 2011, Missouri air cargo was 73,003 tons valued at $11.4 billion (**Table 3-1**). On average, total air cargo movements are valued at $155,974 per ton. Air cargo movements were less than 0.01 percent of freight movement by tonnage and less than 1.0 percent of freight movement by value in Missouri in 2011, a very small proportion relative to other modes.

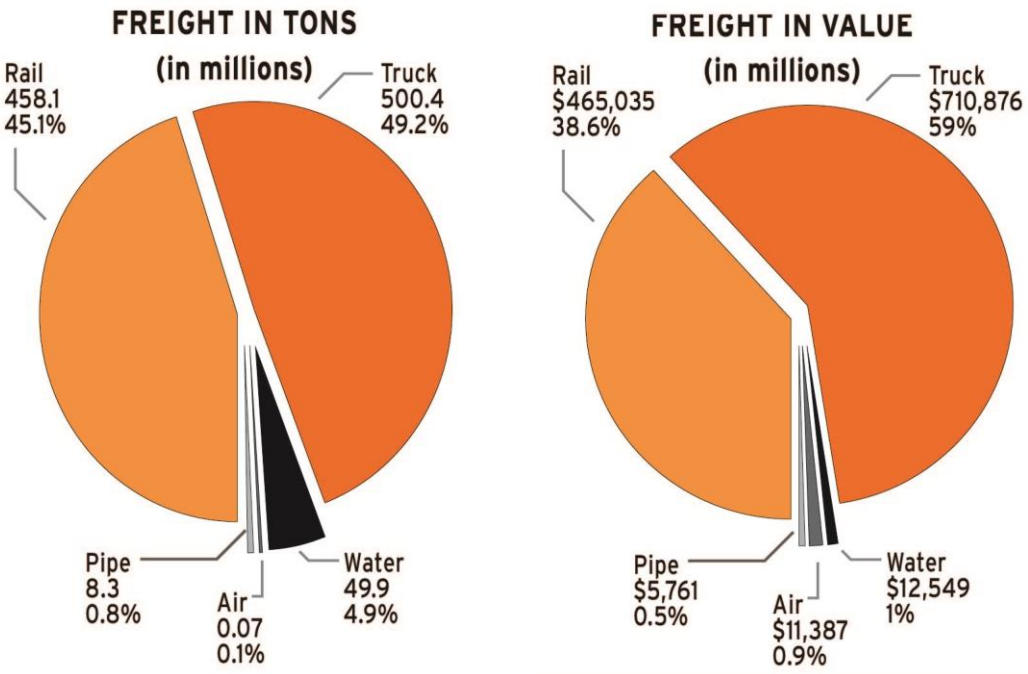
### Pipeline Commodity Flows

In 2011, Missouri pipelines moved 8.3 million tons of freight valued at $5.8 billion (**Table 3-1**). On average, total pipeline commodity movements are valued at $690 per ton. Pipelines movements were less than one percent of freight movements by tonnage and 0.5 percent of freight movements by value in Missouri in 2011, also a small proportion relative to the dominant truck and rail modes.

## Freight Flow Summary

Data indicates that Missouri is a bridge state. This means that the majority of movements traversing Missouri's transportation network is truck- and rail-based through traffic. The main commodities are rail-based coal and truck-based secondary traffic. Secondary traffic is the movement of goods from a distribution source (i.e. warehouse). The goods at the distribution source had previously been transported to the facility by truck or another freight transportation mode. Truck transports the largest relative volume and value of freight relative to the other transportation modes, followed closely by rail (**Figure 3-14**).

*Figure 3-14: Freight Movement by Tonnage and Value per Mode (2011)*




*Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011*

## Missouri Freight Network

The *Moving Ahead for Progress in the 21st Century Act* (MAP-21) directed the U.S. DOT to establish a national freight network to assist states in strategically directing resources toward improved system performance for efficient movement of freight on the highway portion of the nation's freight transportation system. In response to MAP-21, the Freight Plan developed the Missouri Freight Network of highway, freight rail, air cargo, and inland waterways.

This Missouri Freight Network is important and will be used in a number of ways:

- The network is one of the criteria used in the projects prioritization process for this Missouri State Freight Plan. A project would need to be a freight network Tier 1, 2, or 3 route or be an immediate connection (i.e. within one mile or an agreed-upon range).
- The network can help prioritize future freight projects beyond those identified in the Missouri State Freight Plan.
- The network includes the Primary Freight Network, designated by U.S. DOT and key rural freight routes which will be part of Missouri's Critical Rural Freight Network.

## Freight Data Analysis

The first step in developing the Missouri Freight Network was compiling and analyzing data from several sources, including existing internal MoDOT data. Data included:

- TRANSEARCH 2011 data
- ATRI – freight generators via truck
- Truck volumes
- Other network maps
- Modal data – rail, ports, airports, and intermodal facilities

Along with the above data, specific criteria were used to determine the proposed facilities for each mode. These criteria were established based on best practices from across the county and based on what is most relevant to Missouri.

## Highways

The Missouri Freight Network includes the Missouri major and minor highway system. Segments of these highways are classified by a tiered approach, which includes four classes of importance (Tiers 1 through 4). The primary criterion for classification is the amount of freight tonnage. All the interstates and particular U.S. and State routes are Tier 1, Tier 2, or Tier 3. The remaining routes in the network are Tier 4, and they impact freight in some way. For example, Tier 4 includes the lettered routes that are important for the movement of farm-to-market goods.

Below are the criteria for classifying the Tier 1, Tier 2, and Tier 3 highway segments.

- Interstate
  - Identified on the National Freight Network
  - Identified on the Missouri Major Road System
  - Federal Truck Route designation
  - Truck tonnage of over one million for a section or all of the route and/or at least 5,000 trucks per day for a section of the route
  - Connectivity to freight generators and/or intermodal facilities
- U.S. and State Routes
  - Identified on the Missouri Major Road System
  - Federal/State Truck Route designation
  - Truck tonnage of over one million for a section or all of the route and/or at least 2,500 trucks per day for a section of the route
  - Connectivity to freight generators and/or intermodal facilities

**Figure 3-15** shows the proposed highway network with segments by freight class.

## Freight Rail

Freight railroads in Missouri are grouped into several categories: Class I, Switching and Terminal, and Class III (Short Line) railroads. A total of 19 railroads operate within the State:

- **Class I Railroads –** Burlington Northern Santa Fe (BNSF), CSX Transportation (CSX), Kansas City Southern Railway (KCS), Norfolk Southern Railway (NS), Soo Line Corporation (CP - U.S. operating arm of Canadian Pacific), and Union Pacific Railroad (UP)
- **Switching and Terminal Railroads** – Central Midland Railway (CMR), Columbia Terminal (COLT), Kansas City Terminal Railway Company (KCT), Manufacturers Railway Company (MRS), Missouri & Valley Park Railroad (MVP), Missouri North Central Railroad (MNC), Semo Port Railroad (SE), and Terminal Railroad Association of St. Louis (TRRA)
- **Short Line Railroads** – Arkansas & Missouri Railroad (AM), Kaw River Railroad (KAW), Missouri & Northern Arkansas Railroad (MNA), Ozark Valley Railroad (OVRR), and South Kansas & Oklahoma Railroad (SKOL)

**Figure 3-15** shows the proposed freight rail network.

## Air Cargo

The Missouri Freight Network includes airports that report the movement of cargo to the Air Carrier Activity Information System. These airports are:

- Kansas City International Airport (MCI)
- Lambert-St. Louis International Airport (STL)
- Springfield-Branson National Airport (SGF)

Airports selected on the Missouri Freight Network are classified as either primary or secondary. A primary airport has domestic and international air cargo routes. A secondary airport offers only domestic air cargo routes. **Figure 3-15** shows the airports by class.

## Inland Waterways

The Missouri Freight Network includes inland waterways with a public port authority along the Missouri or Mississippi Rivers. The 14 public water port authorities In Missouri are:

- City of St. Louis
- Howard/Cooper County Regional
- Jefferson County
- Kansas City
- Lewis County-Canton
- Marion County
- Mississippi County
- New Bourbon Regional
- New Madrid County
- Pemiscot County
- Pike/Lincoln County
- Southeast Missouri Regional
- St. Joseph
- St. Louis County

Ports selected for inclusion in the Missouri Freight Network are classified as either active or developing. Active means that a port has the ability to ship freight. Developing means that a port does not have the ability to ship freight. **Figure 3-15** shows the ports by class.

## NHS Intermodal Connectors and First and Last Mile Connectors

The Missouri Freight Network incorporates the National Highway System (NHS) freight intermodal connectors and first and last mile connectors. NHS intermodal connectors are designated public roads identified by the state departments of transportation and metropolitan planning organizations because the roads connect major intermodal terminals to the Missouri Freight Network. The final designations are approved by the U.S. DOT. In Missouri, there are 15 NHS intermodal connectors. These are critical components of the freight system and important conduits for the timely and reliable delivery of goods and services.

The function of first/last mile connectors is similar to NHS intermodal connectors; however, they are not approved by the USDOT. During the development of the Freight Plan, 11 first and last mile connectors were identified by evaluating the locations of the top 100 freight generators and intermodal facilities in Missouri. **Table 3-3** shows the first/last mile connectors.

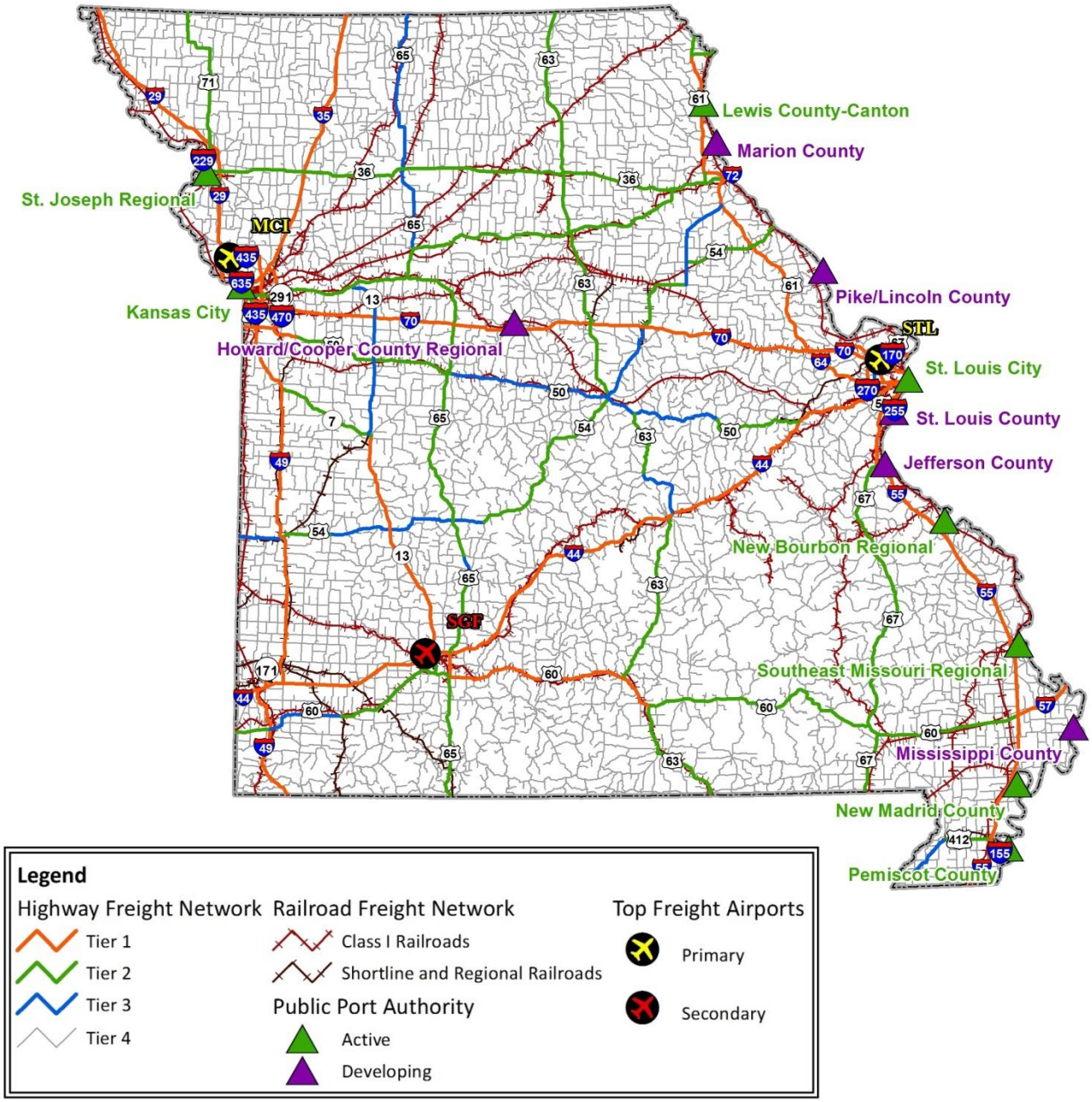
*Table 3-3: First/Last Mile Connectors in Missouri*

| Route | Limits |
|---|---|
| **US-24** | I-435 to Winner Road |
| **MO-7** | I-70 to US-40 |
| **MO-25** | US-60 to RT-U/Z |
| **MO-39** | US-60 to Olive Street |
| **MO-43** | MO-171 to MO-66 |
| **MO-131** | US-50 to MO-58 |
| **MO-150** | I-49 to Thunderbird Road |
| **MO-152** | I-35 to I-435 |
| **MO-171** | MO-171/249 to MO-43 |
| **MO-744** | US-65 to Mulroy Road |
| **LP-49** | MO-171 to I-44 |

*Data Source: CDM Smith*

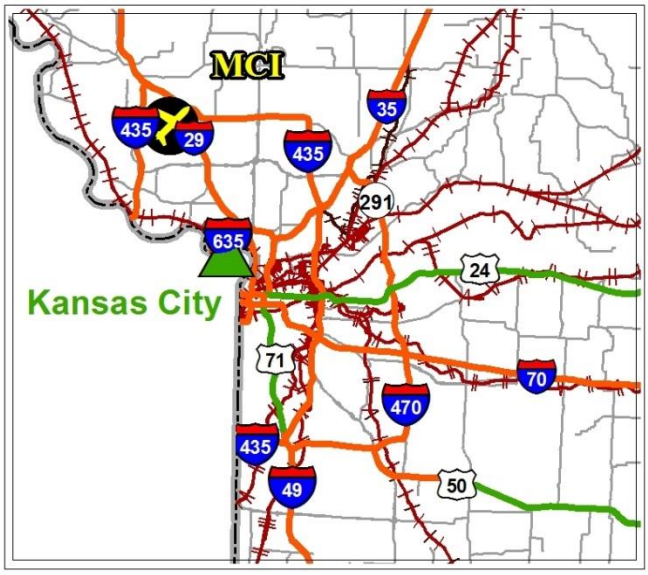
The proposed freight network is discussed in further detail in Appendix A: Assets and Freight Flow.

*Figure 3-15: Missouri Freight Network*




*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*

*Figure 3-16: Missouri Freight Network-Kansas City*



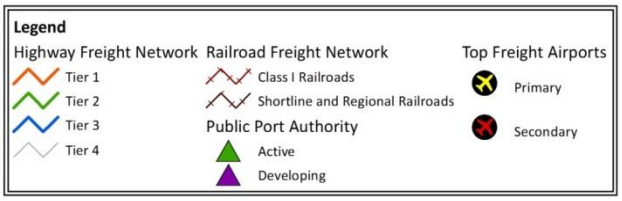
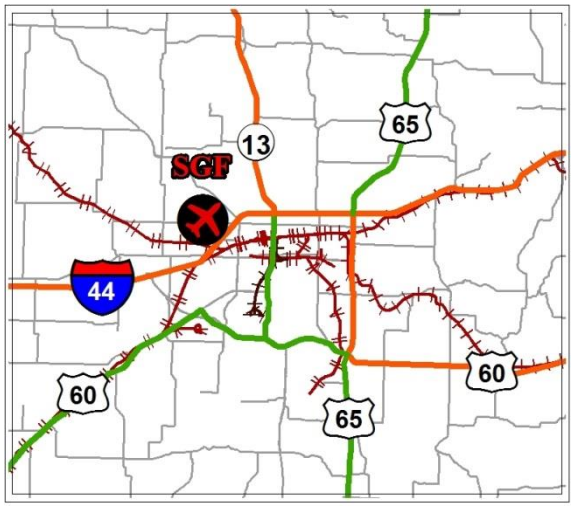




*Figure 3-17: Missouri Freight Network-St. Louis*


*Figure 3-18: Missouri Freight Network-Springfield*




*Source: MoDOT, ESRI, TRANSEARCH 2011, and CDM Smith*


Figure 3-19: National Primary Highway Freight Network