TENNESSEE
STATEWIDE MULTIMODAL FREIGHT PLAN

TN TDOT Department of Transportation

CONTENTS

1. Strategic Goals

1.1 INTRODUCTION

Freight transportation, including air, water, road, and rail systems, is a critical part of economic development, job creation, and global growth for the state of Tennessee. Efficient movement of goods to, from, and through Tennessee is also closely linked with manufacturing, which supports jobs throughout the state. Due to the heavy reliance of the state's economy on freight transportation, the Tennessee Department of Transportation (TDOT) established a guiding principle to provide for the efficient movement of people and freight. TDOT recognizes the importance of planning, designing, constructing, and maintaining freight related projects to sustain mobility and accessibility for the future growth of the state's population and industries.

Freight-related sectors across Tennessee have seen steady growth in employment since the global economic downturn, which occurred from 2007 through 2009. Employment growth data for key freight industry sectors, including warehousing, manufacturing, and wholesale trade (as defined by the US Bureau of Economic Analysis) shows that these sectors exhibited considerable decline through the peak of the recession (2008-2009). Following the recession, these same sectors began recovering. This increase in employment in the Tennessee freight sectors is likely indicative of increased production and consumption of commodities, linked with manufacturing.

The State Gross Domestic Product (GDP) for these key freight industry sectors accounts for nearly 40% of Tennessee's total GDP, which is higher than the percent of total GDP in the U.S. for the same industry sectors (35%)[1]. This metric further strengthens the need for TDOT to evaluate current and future freight projects for efficient movement of people and goods to, from, and through the state.

In July 2012, when the Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law, the importance of freight transportation planning on the national level was acknowledged. The requirements of MAP-21 respond to the increasing number of trucks on the roadway and the need to plan for a freight transportation system that is inclusive of all modes. Planning for all modes (truck, rail, water, air, and pipeline) can result in a system of freight corridors that works for all industries reliant on timely delivery of goods.

The purpose of this freight plan is threefold: 1) Define strategic goals for the Tennessee freight system; 2) Establish a strategy to achieve freight-related goals that align with TDOT's guiding principles; and 3) Fulfill the requirements of MAP-21.

[1] *Bureau of Economic Analysis, 2012*

Building on input from public and private freight stakeholders this plan inventories the existing assets of the freight transportation system, evaluates the economic benefits of the system, anticipates future trends and economic growth, and determines implementable strategies for Tennessee to improve freight movement across all modes of transportation, as well as the equally important connections between modes. This plan culminates with a list of short- and long-term projects that address future needs of the Tennessee freight system.

1.2 STRATEGIC GOALS FOR FREIGHT TRANSPORTATION

The Federal Highway Administration's (FHWA's) national goals for freight movement align closely with TDOT's guiding principles. These national goals are intended to guide future needs of a national freight system including Tennessee roads, rail lines, waterways, and air freight movement. Similarly, TDOT's guiding principles are intended to focus the transportation system improvements on areas of importance to the residents and economy in Tennessee. Aligning Tennessee's guiding principles with the national freight goals enforces the direction of freight planning and projects for efficient movement of people and goods.

1.2.1 National Freight Policy Goals

As transportation planning moves towards performance based metrics, goals are defined in a manner to measure success from current existing conditions. TDOT wants to determine if freight policies and programs are helping the department meet these established goals. The six National Freight Policy Goals, which Tennessee has adopted, are listed below:

- Improving the contribution of the freight system to economic efficiency, productivity, and competitiveness
- Reducing congestion on the freight transportation system;
- Improving the safety, security, and resilience of the freight transportation system;
- Improving the state of good repair of the freight transportation system;
- Using advanced technology, performance management, innovation, competition, and accountability in operating and maintaining the freight transportation system;
- Reducing adverse environmental and community impacts of the freight transportation system.

Public outreach efforts resonated with these goals while adding emphasis to multimodal system efficiency and system resiliency based on operational experiences. By focusing on the evaluation of existing data and projections to determine needs, implementing freight performance measures for the system, and coordination with stakeholders (including TDOT's Freight Advisory Committee) this plan will improve TDOT's ability to meet the National Freight Policy Goals.

1.3 STRATEGIC GOALS RELATED TO GUIDING PRINCIPLES FOR TENNESSEE'S TRANSPORTATION SYSTEM

As part of TDOT's Long Range Transportation Plan update that is currently being undertaken, the Department updated the seven guiding principles for the future of Tennessee's transportation system. Table 1-1 shows how six of these guiding principles align with the National Freight Policy Goals and form objectives of the freight system development in Tennessee. The seventh guiding principle, emphasize financial responsibility, is visible in all of TDOT's work from prioritizing infrastructure improvements to streamlining project implementation.

Table 1-1 Freight Goals Relative to Guiding Principles

Goals of National Freight Policy	TDOT Long Range Plan: Guiding Principle	Objectives
Improving the contribution of the freight transportation system to economic efficiency, productivity, and competitiveness	Support the State's Economy	Provide facilities for freight movement that **Support the State's Economy** through efficient movement of goods so that productivity of companies is enhanced and competitiveness is improved by industries in the state.
Reducing congestion on the freight transportation system	Preserve and Manage the Existing System	**Preserve and Manage the Existing System** through strategic investments designed to reduce congestion/bottlenecks, enhance efficiency of intermodal movements, and utilize new technology to provide alternative routing.
Improving the safety, security, and resilience of the freight transportation system	Maximize Safety and Security	**Maximize Safety and Security** by providing adequate, safe facilities to meet industry guidelines. Mitigate safety issues that arise from increased freight movement. Provide alternative routes in the case of an emergency, natural or manmade.
Improving the state of good repair of the freight transportation system	Preserve and Manage the Existing System	Maintain the freight system so that roadway bridges, rail bridges, locks for barges, and airport runways can support the industry and **Manage the Existing System**.
Using advanced technology, performance management, innovation, competition, and accountability in	Provide for the Efficient Movement of People and Freight	Consider land use when evaluating the transportation system in the state to Provide for the **Efficient Movement of People and Freight**.

Goals of National Freight Policy	TDOT Long Range Plan: Guiding Principle	Objectives
operating and maintaining the freight transportation system	Preserve and Manage the Existing System	Enhance the current system using Intelligent Transportation Systems (ITS) technology and other innovative technologies to **Preserve and Manage the Existing System**.
Reducing adverse environmental and community impacts of the freight transportation system	Protect Natural, Cultural, and Environmental Resources	Improve the freight system such that the environmental and community impacts are limited and **Natural, Cultural, and Environmental Resources are Protected**.
	Building Partnerships for Sustainable and Livable Communities	Work with industries and communities to create a freight system that **Builds Partnerships for Sustainable and Livable Communities**.

Although all the goals are important to the efficiency of freight movement and should be considered when evaluating Tennessee's freight transportation system, it is important for Tennessee to determine which goals will help growth of industries throughout the state. Based on discussions with TDOT and freight stakeholders, the three freight goals and objectives that are mentioned as a high priority to address current and future needs of the Tennessee freight transportation system are:

Goal: Improving the safety, security, and resilience of the freight transportation system

Objective: Provide adequate, safe facilities to meet industry guidelines. Mitigate safety issues that arise from increased freight movement. Provide alternative routes in the case of an emergency, natural or manmade.

Goal: Improving the state of good repair of the freight transportation system

Objective: Maintain the freight system so that roadway bridges, rail bridges, locks for barges, and airport runways can support the industry and manage the existing system.

Goal: Reducing congestion on the freight transportation system

Objective: Preserve and Manage the Existing System through strategic investments designed to reduce congestion/bottlenecks, enhance efficiency of intermodal movements, and utilize new technology that to provides alternative routing.

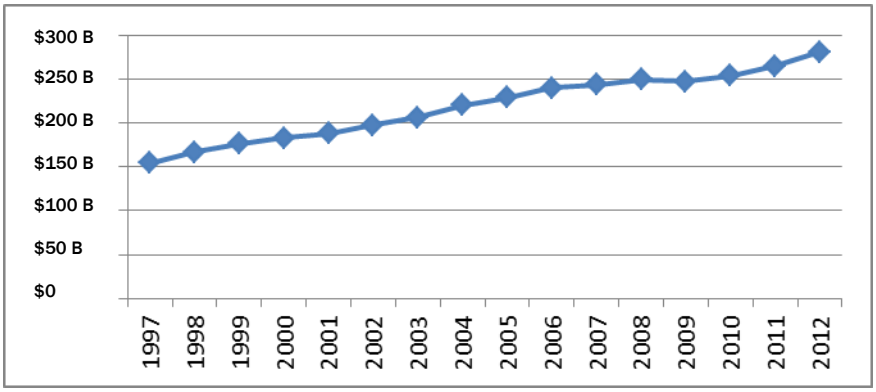
2. Economic Context of Freight Transportation Planning

Freight movements in Tennessee occur by each mode of the transportation system: truck, rail, air, water, and pipeline. All freight movements impact the State's economy, infrastructure, and consumers of the goods being shipped. To better understand the relationship between freight and the economy, it is important to understand the types of goods Tennessee produces, Tennessee's requirements from outside markets to support industry in the state, and Tennessee's role in connecting national and international markets. Defining these three aspects will specifically help to evaluate the freight system and how it affects the state's economy and industry.

2.1 STATEWIDE ECONOMY

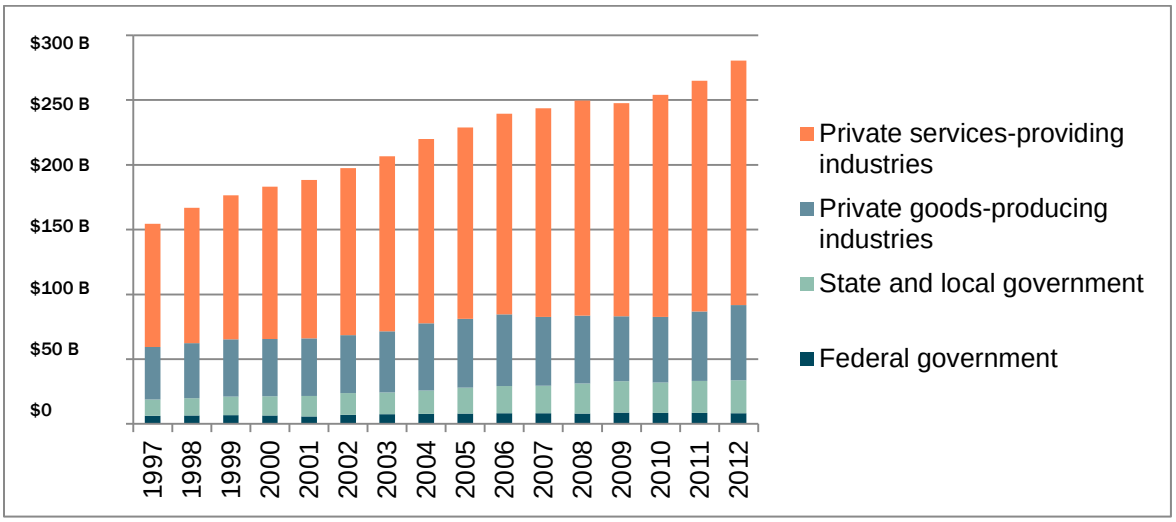
Tennessee's economy has experienced steady expansion over the last 15 years. Between 1997 and 2012, the economic output of the Tennessee economy increased from just over $150 billion to approximately $280 billion (Figure 2-1). As in most states, the majority of the economy is in private sector services-providing industries (Figure 2-2). In 2012, this sector represented 67 percent of the total State's economy with $189 billion. This represents significant growth over the last 15 years both in terms of total dollars and in terms of percentage of the total economy. This sector has almost doubled in size over the past 15 years and its size relative to the rest of the State's economy has grown from 61 percent to the 67 percent in 2012. The goods-producing portion of the economy has grown from $40 billion in 1997 to $58 billion in 2012, nearly a 50% increase

Figure 2-1 Tennessee Gross State Product (billions), 1997-2012



Source: Bureau of Economic Analysis

Figure 2-2 Economic Output by Industry Category, 1997 to 2012

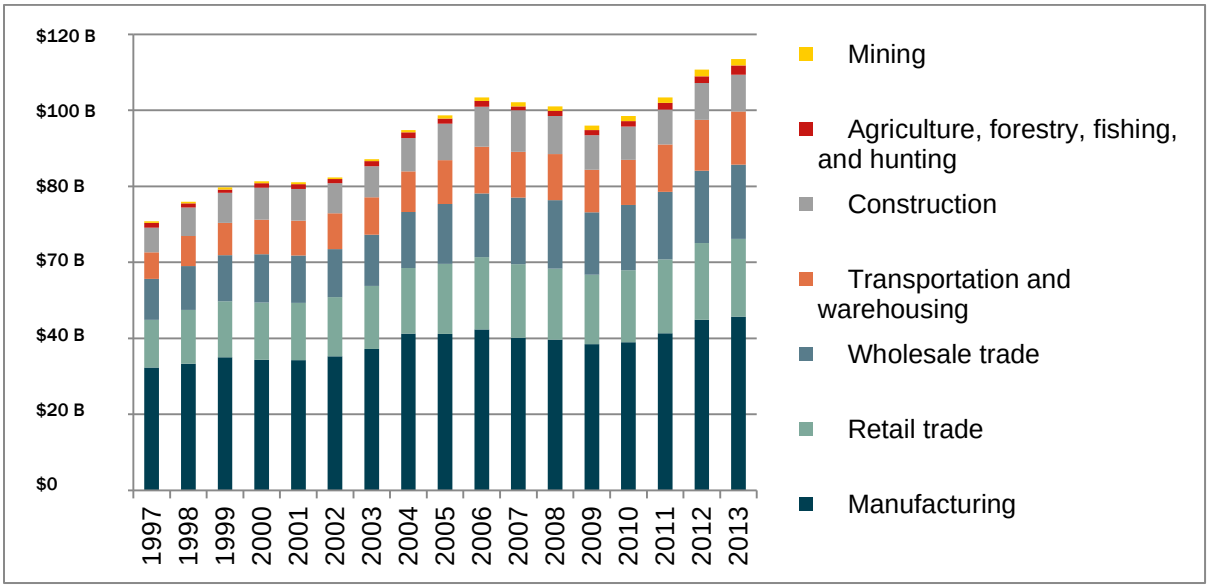


Source: Bureau of Economic Analysis

2.2 ECONOMIC OUTPUT BY INDUSTRY

A large portion of Tennessee's economy is considered goods-dependent industry meaning they rely heavily on freight transportation to sell goods and receive inputs. This includes the sectors of Manufacturing, Construction, Agriculture, and Mining. The service-providing industry also includes sectors that rely on freight transportation. This includes the sectors of wholesale, retail, and transportation and warehousing. As shown in Figure 2-3, the size of economic output by freight-reliant industries has grown from over $70 billion in 1997 to approximately $110 billion in 2012, a 57% increase.

Figure 2-3 Tennessee Economic Output by Freight-Reliant Industries, 1997 to 2013



Source: Bureau of Economic Analysis

Taking into account all modes of freight movement, a total of approximately 770 million tons of freight was moved via Tennessee's infrastructure in 2012 based on an analysis of Transearch data. It equates to approximately $1 trillion of goods. The top commodities by tonnage moved and by value in Tennessee are shown in Table 2-1 and Table 2-2, respectively.

The top commodities moving through Tennessee have been consistent in recent years. Table 2-1 and Table 2-2 show the wide variety of industries in the state relying on the freight system for the movement of goods.

- Gravel is the top commodity by tonnage moved on the system. It is interesting to note that 31.8 million tons are imported while almost the same amount is exported, 36.5 million tons.
- Coal traffic represents 90 million of the rail tons moved in Tennessee. Over two-thirds of this amount is through rail flows with coal mined in states to the north of Tennessee, such as Kentucky and West Virginia, shipping coal to locations south of Tennessee.
- With the three automotive companies located in Tennessee, vehicles are the top commodity shipped into, out of, through, and within the state when based on value.
- Farm products (agricultural products and other food products) make up the third and fourth largest commodities with a combined 82.3 million tons. This is over ten percent of the total flows for the state.
- Other key commodities for Tennessee, including miscellaneous transported products, cereal grains, and chemical products, were the only other rail commodities that were over 10 million tons in 2012.
- Other top commodities by value moving through Tennessee in 2012 include electronics, machinery, chemical products, and plastics.

Table 2-1 Top 20 Commodities by Tonnage Moved in Tennessee

Commodity	Import (million tons)	Export (million tons)	Internal (million tons)	Through (million tons)	Total (million tons)
Gravel	31.8	36.5	9.2	48.6	126.1
Coal	30.5	12.5	1.3	61.6	105.9
Other Agricultural Products	7.1	7.5	5.2	24.0	43.8
Other Foodstuffs	7.5	7.3	1.0	22.7	38.5
Non-Metal Mineral	7.3	9.2	7.9	11.1	35.5
Cereal Grains	9.6	4.0	0.8	15.6	30.0
Natural Gas and Petroleum Prods	4.5	5.9	2.0	15.3	27.7
Waste/Scrap	7.7	7.5	1.5	9.7	26.4
Basic Chemicals	5.6	6.1	0.7	13.2	25.6
Plastics/Rubber	3.0	2.5	0.4	16.5	22.4
Milled Grain Prods	2.7	2.8	0.2	11.9	17.6
Chemical Prods	2.7	3.1	0.4	11.0	17.2
Nonmetallic Minerals	2.9	3.1	0.6	10.6	17.2
Base Metals	2.3	1.8	0.2	12.8	17.1
Gasoline Products	4.2	4.2	3.9	4.7	17.0
Wood Products	3.0	3.3	0.4	10.2	16.9
Animal Feed	2.0	2.2	0.3	12.4	16.9
Misc. Transported Products	3.7	4.0	<0.1	9.1	16.9
Articles-Base Metal	2.9	2.3	0.3	9.4	14.9
Motorized Vehicles	1.9	2.4	0.6	10.0	14.9

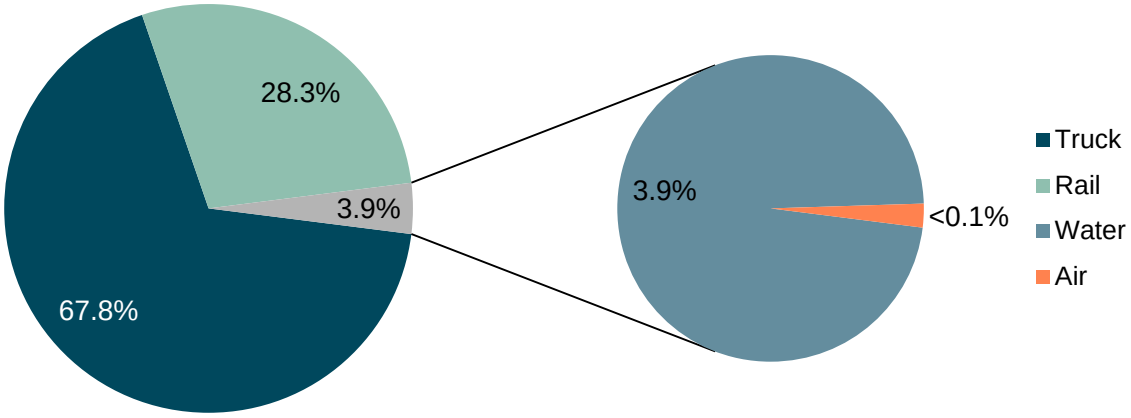
Table 2-2 Top 20 Commodities by Value Moved in Tennessee

Commodity	Import (billions)	Export (billions)	Internal (billions)	Through (billions)	Total (billions)
Motorized Vehicles	$ 17.6	$ 21.0	$ 5.2	$ 83.7	$ 127.6
Misc. Transported Products	$ 18.3	$ 20.0	$ -	$ 44.4	$ 82.7
Electronics	$ 10.1	$ 9.7	$ 0.5	$ 51.5	$ 71.8
Machinery	$ 9.3	$ 11.5	$ 1.5	$ 48.8	$ 71.1
Plastics/Rubber	$ 9.2	$ 8.1	$ 1.0	$ 48.6	$ 66.9
Misc. mfg. Products.	$ 4.9	$ 4.6	$ 0.3	$ 36.1	$ 45.9
Base Metals	$ 4.3	$ 3.5	$ 0.3	$ 37.1	$ 45.2
Articles-Base Metal	$ 8.0	$ 7.5	$ 0.8	$ 27.0	$ 43.3
Chemical Prods	$ 6.5	$ 7.6	$ 0.9	$ 24.1	$ 39.1
Other Foodstuffs	$ 6.4	$ 7.1	$ 0.9	$ 23.9	$ 38.3
Textiles/Leather	$ 4.3	$ 3.0	$ 0.2	$ 27.6	$ 35.1
Basic Chemicals	$ 7.6	$ 6.3	$ 0.9	$ 17.8	$ 32.6
Other Agricultural Products	$ 4.8	$ 4.4	$ 3.5	$ 15.8	$ 28.5
Meat/Seafood	$ 2.9	$ 2.7	$ 0.2	$ 20.2	$ 26.0
Milled Grain Prods	$ 3.5	$ 3.7	$ 0.4	$ 15.4	$ 23.0
Transport Equipment	$ 1.5	$ 3.0	$ 0.1	$ 14.7	$ 19.3
Gasoline Products	$ 4.6	$ 4.8	$ 4.3	$ 5.2	$ 18.9
Furniture	$ 2.3	$ 2.6	$ 0.1	$ 13.0	$ 18.0
Mixed Freight	$ 10.2	$ 6.4	$ 0.4	$ 0.6	$ 17.6
Precision Instruments	$ 1.9	$ 3.6	$ 0.2	$ 8.9	$ 14.6

Source: Tennessee Transearch Data, IHS Inc.

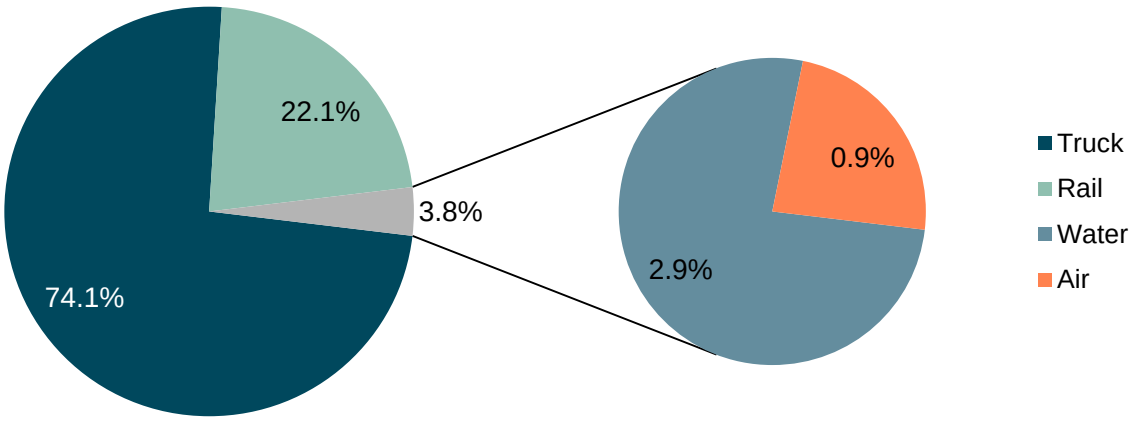
When the movement of freight is evaluated based on the mode, a large portion (67.6%) is transported in Tennessee by truck, as shown in Figure 2-4 and Figure 2-5. Rail is used to move a substantial amount of freight in, out, through, and within the state. Although air and water make up the smallest portion of the movement of freight by tonnage (4.0%) and value of commodities shipped (3.8%), they play an important role in the state's economy and industrial growth. Tennessee relies on all four modes to efficiently move freight, along with people, on the transportation system on a daily basis.

Figure 2-4 Modal Distribution by Tonnage of Commodity Movement in Tennessee



Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 2-5 Modal Distribution by Value of Commodity Movement in Tennessee



Source: Tennessee Transearch Data, IHS Inc., 2012

2.2.1 Intermodal Facilities

Annually there is approximately 14.3 million tons of truck drayage moving to and from intermodal rail and 0.42 million tons moving to and from air facilities through the state. Tables 2-3 and 2-4 shows the amount of truck drayage moved by rail and air in Shelby and Davidson Counties. Shelby County is a leader in the state in intermodal traffic, which is expected with the Port of Memphis, the Memphis International Airport, and several rail intermodal facilities located there. As shown in the tables, Shelby County leads in both imports and exports of truck drayage.

Table 2-3 Intermodal Rail– Truck Drayage

County	Export	Import
Shelby	10.5 mill tons	11.2 mill tons
Davidson	0.81 mill tons	0.76 mill tons
Hamilton	0.02 mill tons	0.03 mil tons
Knox	0.01 mill tons	0.04 mil tons

Source: Tennessee Transearch Data, IHS Inc., 2012

Table 2-4 Intermodal Air –Truck Drayage

County	Export	Import
Shelby	0.23 mill tons ($0.026 bill)	0.23 mill tons ($2.58 bill)
Davidson	0.03 mill tons ($0.38 bill)	0.27 mill tons ($3.03 bill)
Hamilton	0.06 mill tons ($0.70 bill)	0.03 mil tons ($0.36 bill)

Source: Tennessee Transearch Data, IHS Inc., 2012

2.2.2 Mode Shares by Movement Type

As shown in the previous section, Tennessee relies heavily on freight movement by truck and rail. Table 2-5 shows the mode shares broken down by movement types. Overall, trucks carried 576 million tons of goods to, from, within, and through Tennessee in 2012.

Rail is the second largest mode in the state in terms of tonnage with 240 million tons moved in 2012. Nearly two-thirds of the freight rail in the state is from through flows.

Table 2-5 Freight Mode Shares by Movement Type, 2012 (Millions of Tons)

Mode	Inbound	Outbound	Intrastate	Through	Total
Truck	108.9	118.8	58.9	289.5	576.1
Rail	43.1	32.3	3.3	161.5	240.2
Water	24.5	6.0	1.4	0.9	32.8
Air	0.17	0.16	0.005	0.0001	0.33

Source: Tennessee Transearch Data, IHS Inc., 2012

Although it may appear that trucking dominates the transport of freight, rail, marine, and air freight movements play integral roles in Tennessee's system. Table 2-6 shows the range of value per ton carried by each of the modes from the low-end (water) to the high-end (air). Commodities carried along waterways are generally low-value, heavy commodities, whose delivery is not time-sensitive (e.g. coal). Air freight tends to be used for commodities that are high-value (e.g. pharmaceuticals) and/or require time-sensitive delivery. For this reason, air cargo has a much higher value per ton than cargo moved by other modes.

Table 2-6 Modal Value per Ton of Tennessee Commodity Movement

Modes	Value per Ton (Average)
Truck	$1,840
Rail	$1,080
Water	$330
Air	$105,060

Source: Tennessee Transearch Data, IHS Inc., 2012

2.3 KEY FREIGHT-RELATED INDUSTRIES SUPPLY CHAINS IN TENNESSEE

After determining the industries important to Tennessee's economy, specific supply chains that drive freight-dependent aspects of the industries must be examined. This section describes those key industry supply chains in Tennessee. Understanding the supply chains can be a first step towards specifying the type and location of transportation improvements that will be the most beneficial to target industries.

On a large scale, the important corridors for key freight industry supply chains include the Interstate System in Tennessee and major Class I rail corridors. While the bulk of materials move along these networks, local roadways and short line railroads should not be overlooked when considering freight goods movement. Local connections and short lines are important for completing the first mile/last mile connection that may not be offered by the major freight transportation facilities.

This section describes the infrastructure most heavily used by key freight industry supply chains in Tennessee: Automotive, Advanced Manufacturing, Chemical Products and Plastics, and Agriculture. Table 2-7 on the following page shows the tonnage of the commodities moved by highway and rail for Tennessee's key freight industries.

Table 2-7 Tonnage and Value of Tennessee's Key Freight Industries

Supply Chain	Commodity	Tonnage	Value
Agriculture	Soybeans	168.2 mil	$75,849.7 mil
	Dairy	93.9 mil	$71,026.7 mil
	Grain	421.9 mil	$79,137.8 mil
	Meat	40.6 mil	$15,440.3 mil
Chemical and Plastic Products	Chemicals	709.0 mil	$1,021,241.1 mil
	Plastics	224.2 mil	$649,009.3 mil
Automotive	Vehicles	138.1 mil	$1,207,149.1 mil
	Vehicle Parts	29.8 mil	$243,570.5 mil
Advanced Manufacturing	Aerospace Electronics Machinery Pharmaceuticals Precision Instruments	121.0 mil	$1,254,879.4 mil

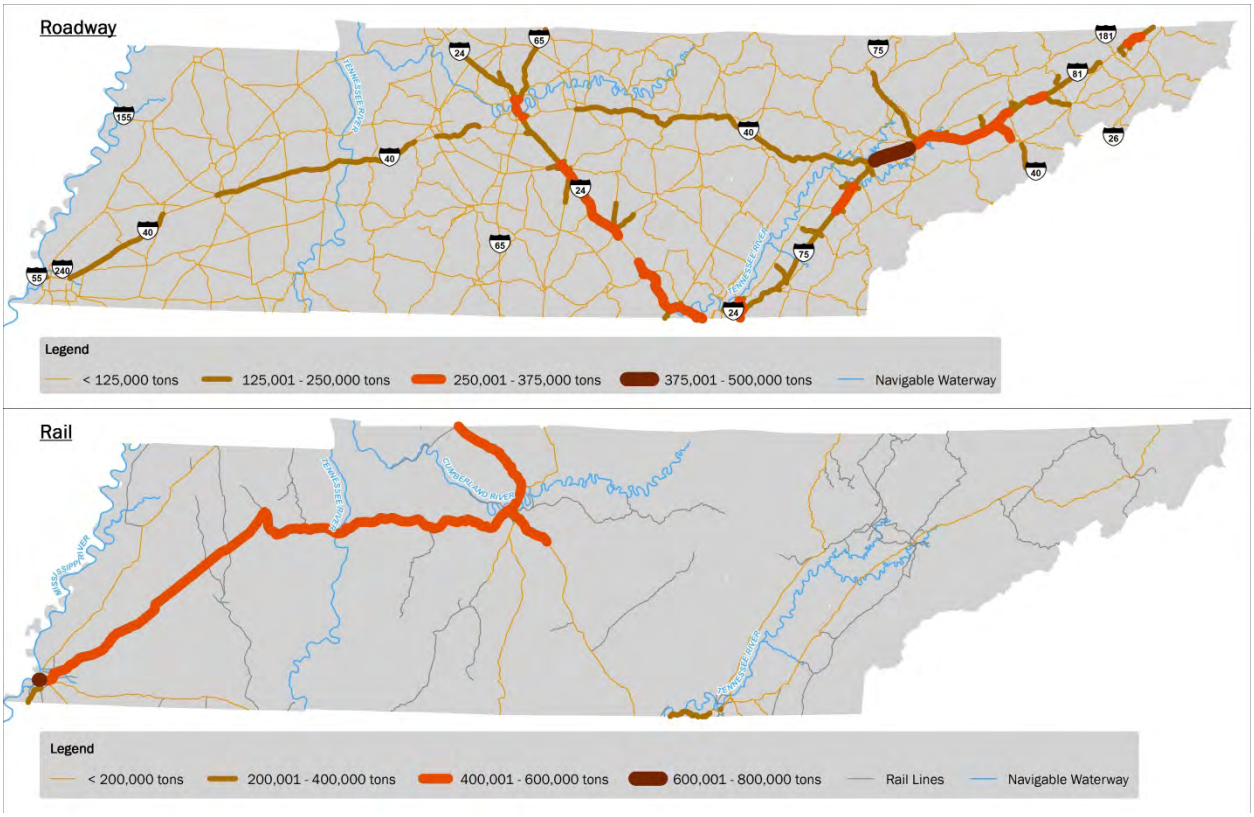
Source: Tennessee Transearch Data, IHS Inc., 2012

Automotive Industry

Typically, there are several suppliers co-located with automotive plants to streamline the processing of key component parts. However, the vast majority of parts are shipped in from outside locations, mostly by truck. Additionally, there also are several rail lines connecting to automotive plants as well. After cars are assembled, they are shipped to dealerships all over the world using trucks, railcars, and barges.

Within Tennessee there are three major automotive manufacturers: Nissan, Volkswagen, and General Motors. There are also a number of automaker suppliers in Tennessee to support the major manufacturers. The most used roadways and railroads in this supply chain follow the I-40 corridor in western Tennessee as well as the I-24 corridor (see Figure 2-6). These corridors connect the Nissan plants near Nashville and Decherd and the Chattanooga Volkswagen plant with major cities in the state as well as important automotive parts suppliers. The I-65 and I-75 corridors are used to connect to Detroit.

Figure 2-6 Automotive Industry Supply Chain Tonnage



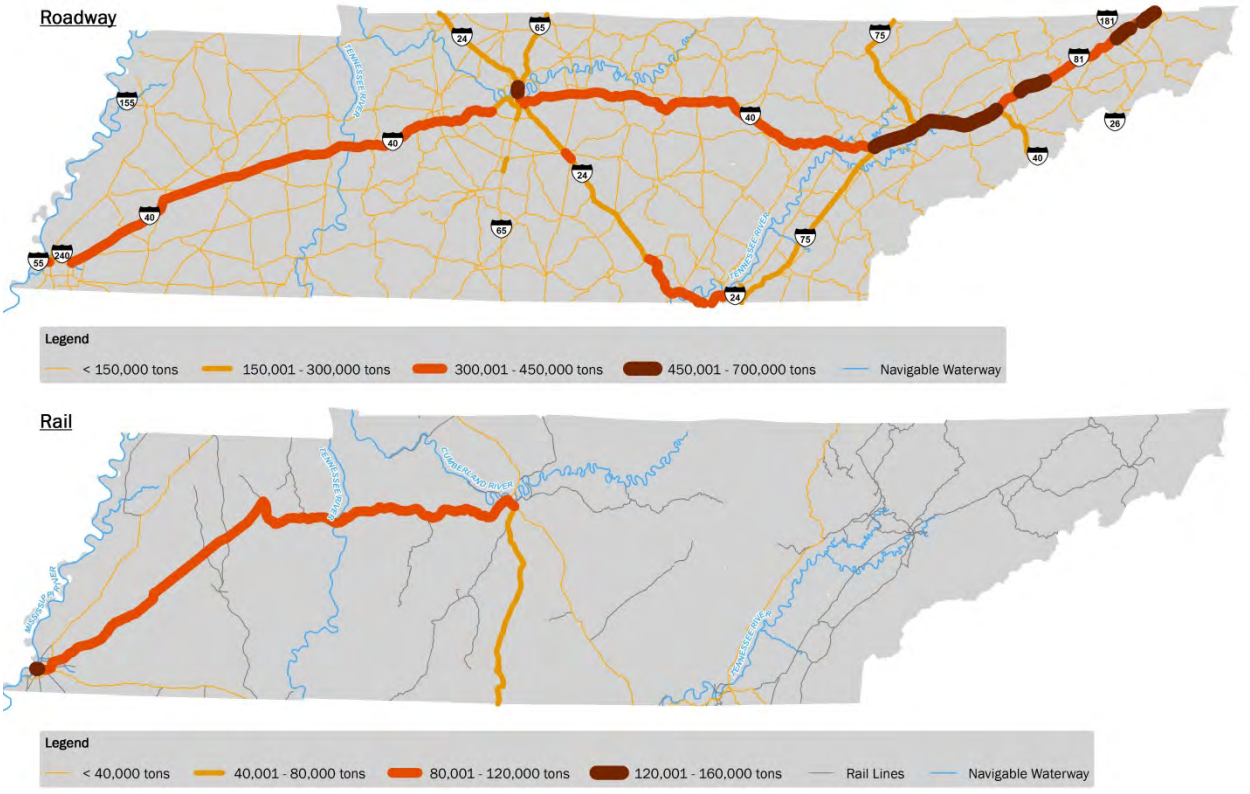
Source: Tennessee Transearch Data, IHS Inc., 2012

Advanced Manufacturing Supply Chain

The Advanced Manufacturing sector includes the sub-industries of Aerospace, Electronics, Machinery, Pharmaceuticals, and Precision Instruments. For these industries, transportation costs tend to be of less concern as opposed to transportation reliability, the primary concern for receiving supplies. Therefore, air cargo and trucking modes tend to be the most commonly used. Additionally, parts suppliers tend to be dispersed throughout the country and the world. The reliable delivery of supplies is critical towards ensuring that facilities are operating at maximum capacity and optimal efficiency, which is why air cargo and truck are the dominant modes for each. Depending on the type of manufacturing operations, rail shipments may be used for larger shipments of regularly needed supplies.

Finished products are typically delivered by truck for domestic portions of shipments and then by water for international shipments. The portions of the supply chain most relevant for Tennessee are the highway corridors. In addition to the CSX rail line connecting Nashville and Memphis, almost all of the interstates in Tennessee are highly utilized by advanced manufacturing industries (Figure 2-7).

Figure 2-7 Advanced Manufacturing Supply Chain Tonnage

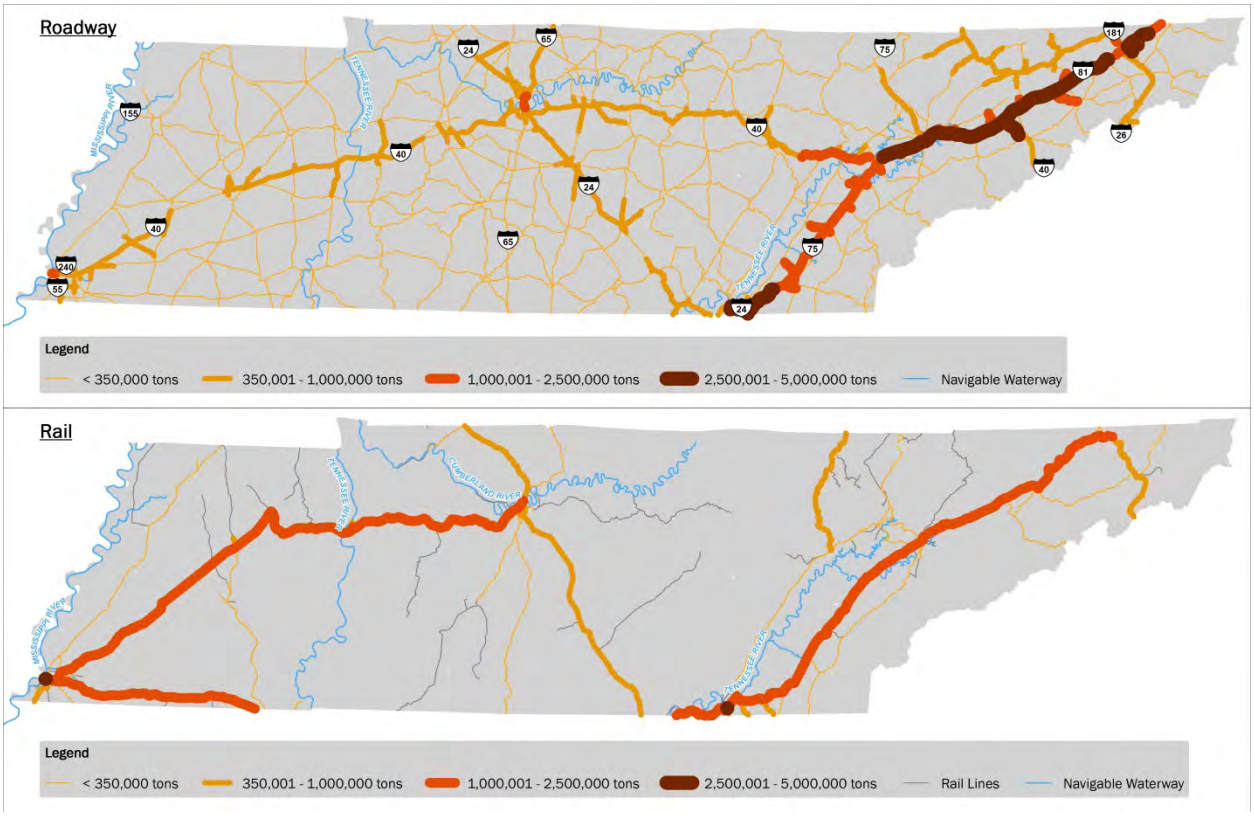


Source: Tennessee Transearch Data, IHS Inc., 2012

Chemical Products and Plastics

The vast majority of chemical and plastic products are derived from petroleum. This typically requires a sophisticated network of pipelines to access chemical and plastic facilities. Other types of specialized refined petroleum products may need to be shipped by rail or truck for delivery to plastic and chemical manufacturing locations. Chemical products tend to reach their end customers via rail or pipeline, while plastics are typically transported by truck. Figure 2-8 highlights the I-26 and I-81 corridors as carrying the highest amount of freight by tonnage for the chemicals and plastics industry. Also the Norfolk Southern rail line on the east side of the state and the CSX rail line between Memphis and Nashville are a critical part of this supply chain.

Figure 2-8 Chemicals and Plastics Supply Chain Tonnage

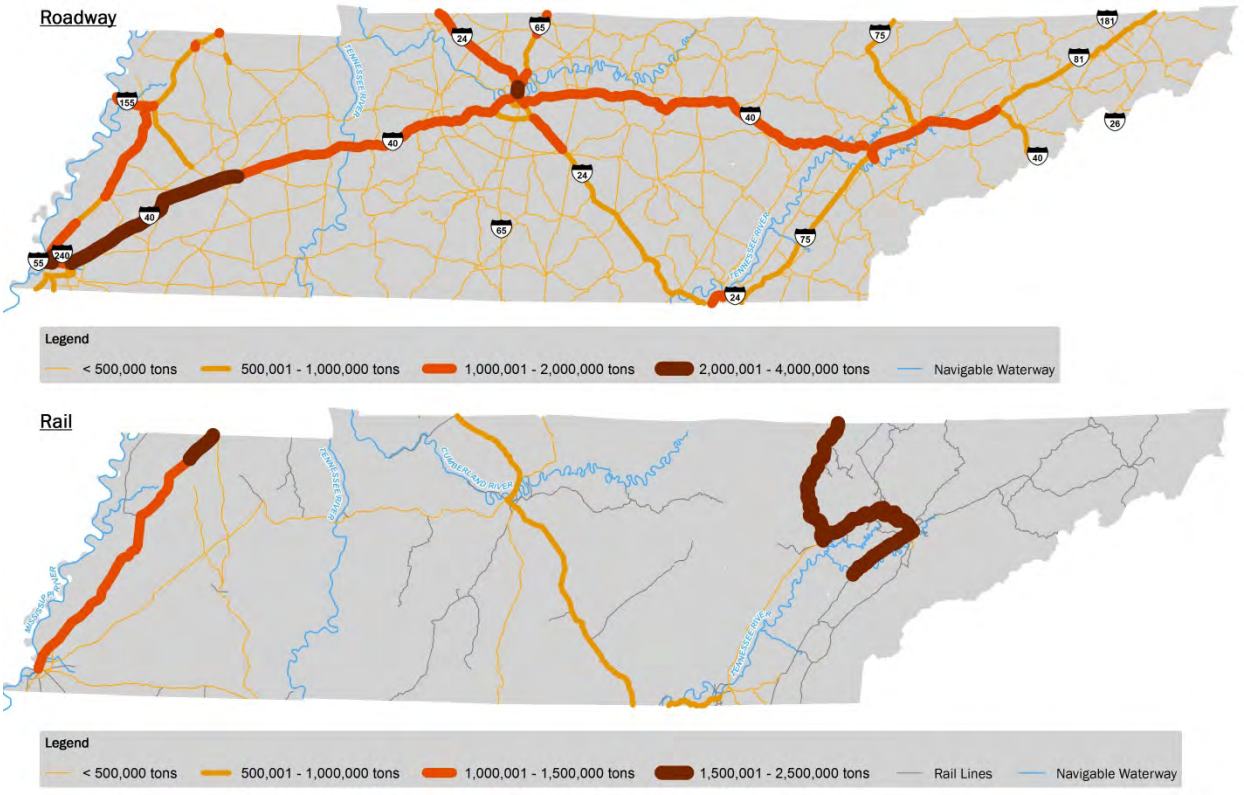


Source: Tennessee Transearch Data, IHS Inc., 2012

Agricultural

Agricultural products may be shipped from farms to a food manufacturer or a wholesale market and livestock are often shipped to a processing plant and on to a wholesale market. Most of these shipments are made via truck. In Tennessee, the majority of agricultural products are transported within the state and to surrounding states for domestic consumption. Agricultural products transported to California and Louisiana are destined to be exported from the U.S. Agricultural production occurs in all corners of Tennessee with more produce and grain farming in the flatter, western portion and livestock in the middle and eastern part of the state. As a result, the roadway system on the west side of the state is heavily used by the agriculture industry as seen in Figure 2-9.

Figure 2-9 Agricultural Supply Chain Tonnage



Source: Tennessee Transearch Data, IHS Inc., 2012

2.4 TENNESSEE FREIGHT ORIGIN-DESTINATION PATTERNS WITHIN THE STATE

The goods moving in Tennessee are imported, exported, moving between locations in the state, or are simply passing through. Of the approximately 770 million tons of freight annually moving on Tennessee infrastructure, five percent is moving within the state. This means that Tennessee businesses are transporting freight between their own facilities, purchasing needed materials or products from another Tennessee business, or delivering a product to a customer.

Table 2-8 presents the top commodities transported between counties in Tennessee.

Table 2-8 Top Commodities Transported between Tennessee Counties

Commodity	Tons (Million tons)	Commodity	Value (Billion dollars)
Gravel and Crushed Stone	9.2	Vehicles	$5.2
Non-metallic Mineral Products	7.9	Gasoline and Aviation Turbine Fuel	$4.3
Agricultural Products Except Live Animals, Cereal Grains, and Forage Products	5.2	Agricultural Products Except Live Animals, Cereal Grains, and Forage Products	$3.5
Gasoline and Aviation Turbine Fuel	3.9	Fuel Oils	$1.9
Products of Petroleum Refining n.e.c. and Coal Products	2.00	Machinery	$1.5

Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 2-10 through Figure 2-13 show the tonnage and value of the commodities for the key supply chains in Tennessee. These maps compliment the supply chain maps in Section 2.3 which show the infrastructure used to transport goods from one part of Tennessee to another.

As mentioned previously, the western portion of Tennessee is a heavy farming area for corn and soybeans. The counties in Tennessee exporting the most crops to other Tennessee counties by weight and value are all located within the West Tennessee geographic region, including Shelby, Gibson, Carroll, Weakley, Obion, and Haywood. The Tennessee counties that import the most agriculture from other Tennessee counties are Shelby and Loudon.

Chemicals and plastics are manufactured in counties throughout the state and shipped to various counties throughout the state. Top exporters of these commodities include Shelby, Humphreys, Davidson, Sullivan, and Washington Counties. Top importers of these commodities include Hamilton, Hamblen, Madison, and Shelby Counties.

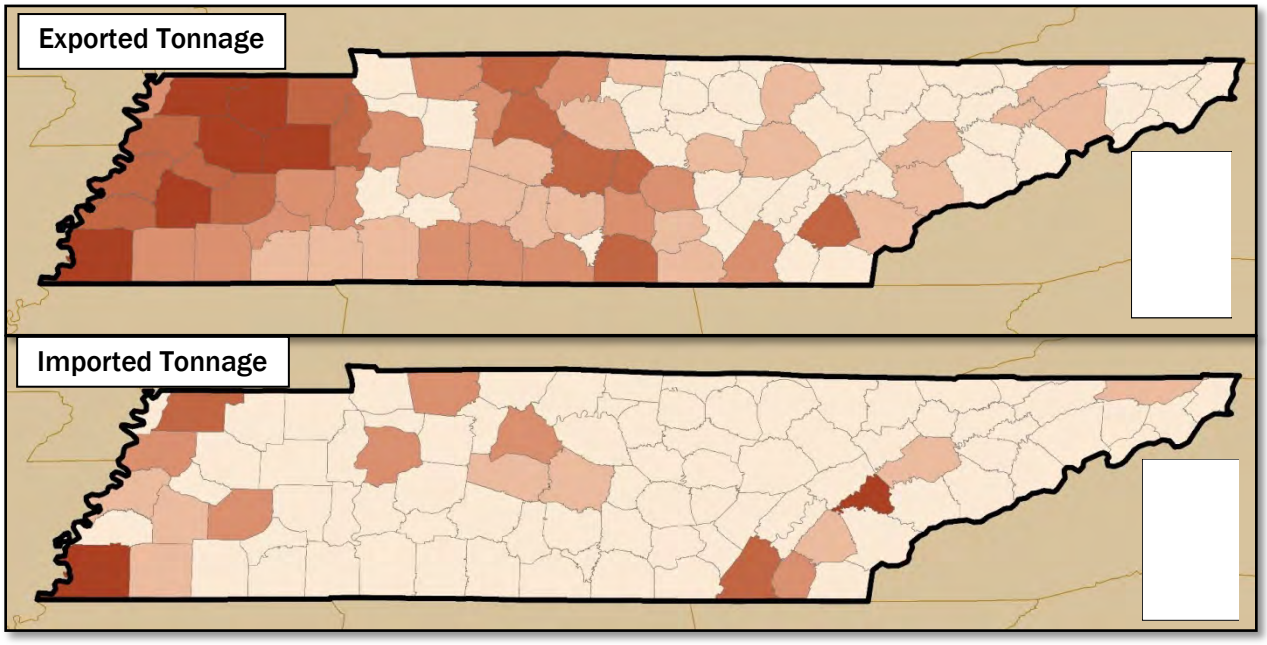
The automotive industry in the state of Tennessee affects the freight system in the middle and eastern portions of the state where the parts are manufactured and the vehicles assembled. Specifically in this area, Davidson, Hamilton, and Rutherford Counties are significant exporters of automotive commodities with Davidson and Rutherford also importing many of these commodities

as well. With the automotive plant in Maury County becoming more active after 2012, it is expected to be among the top exporters of automotive commodities.

Advanced Manufacturing is concentrated in the middle and western portions of the state. The counties exporting the most tonnage of these commodities are Carroll, Benton, and Cannon County; the most significant quantities of imported tonnage are found in Shelby, Humphreys, Montgomery, and Hamilton Counties.

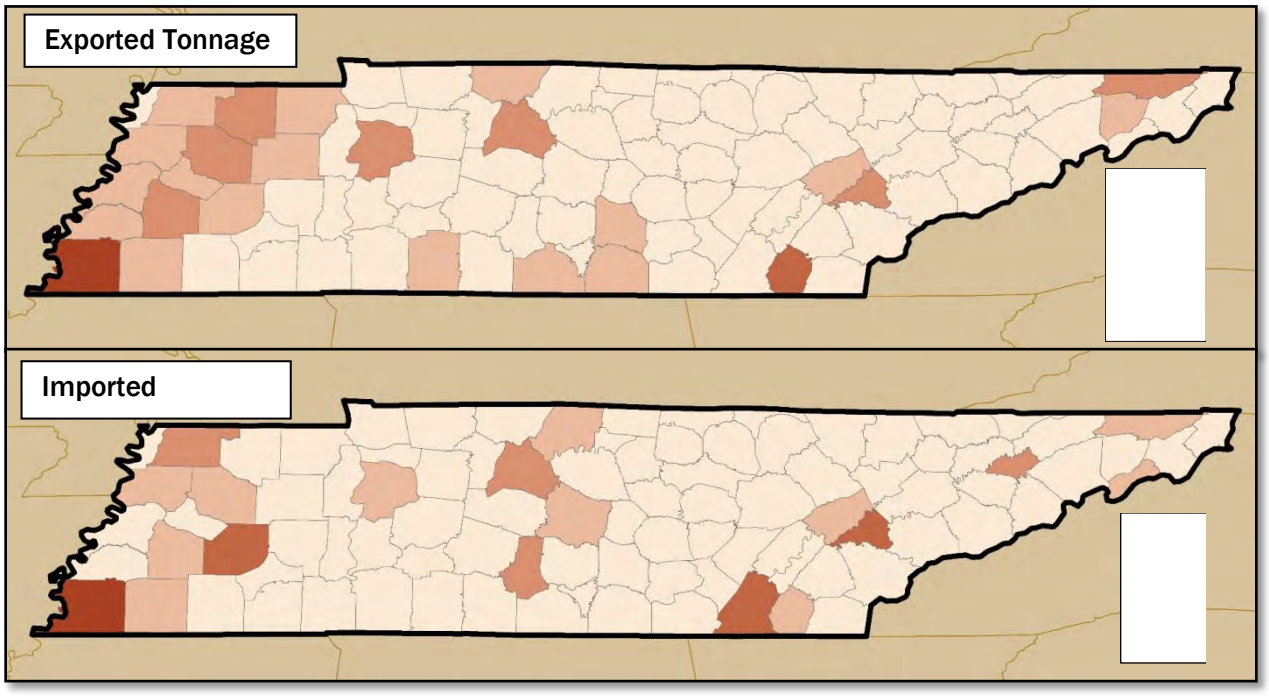
Several counties rise to the top as the heavy exporters to other Tennessee counties for the key economic industries in the state. These include Shelby, Davidson, Hamilton, and Knox. Although the counties show up repeatedly as a top exporter to other counties in the state, it is easy to see that Tennessee's key industries support a large portion of the counties throughout the state.

Figure 2-10 Agriculture Trade between Tennessee Counties (Tonnage)



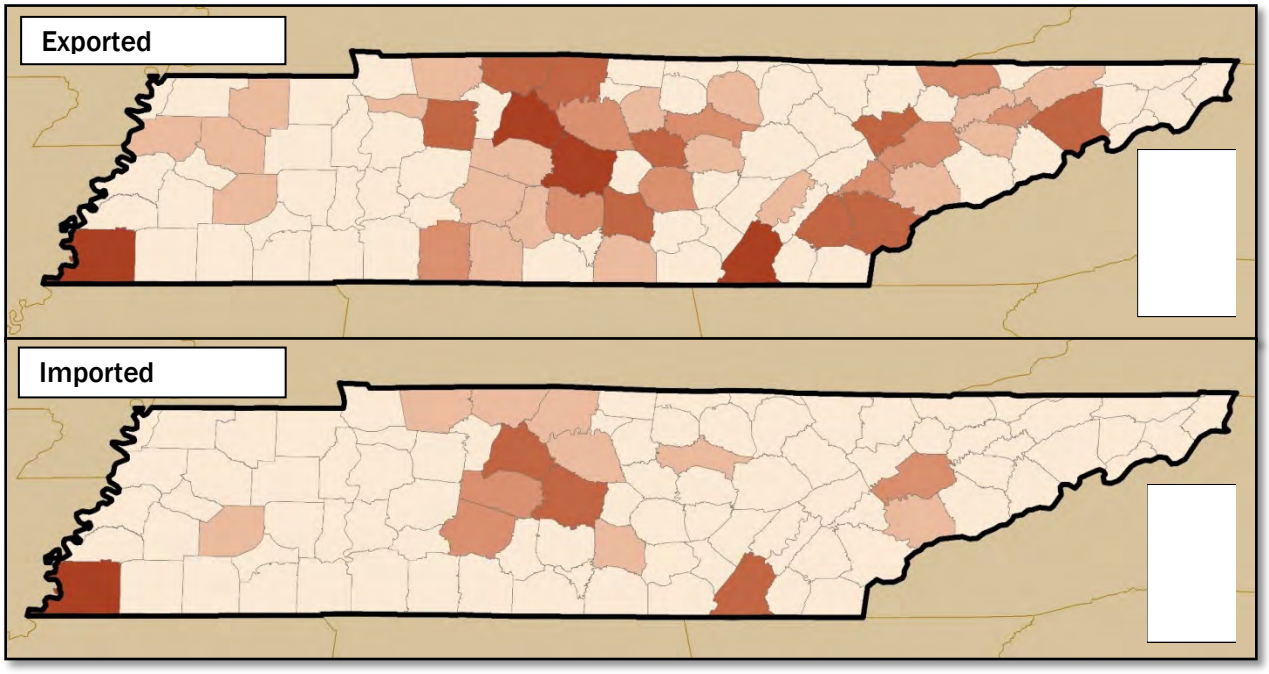
Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 2-11 Chemicals and Plastics Trade between Tennessee Counties (Tonnage)



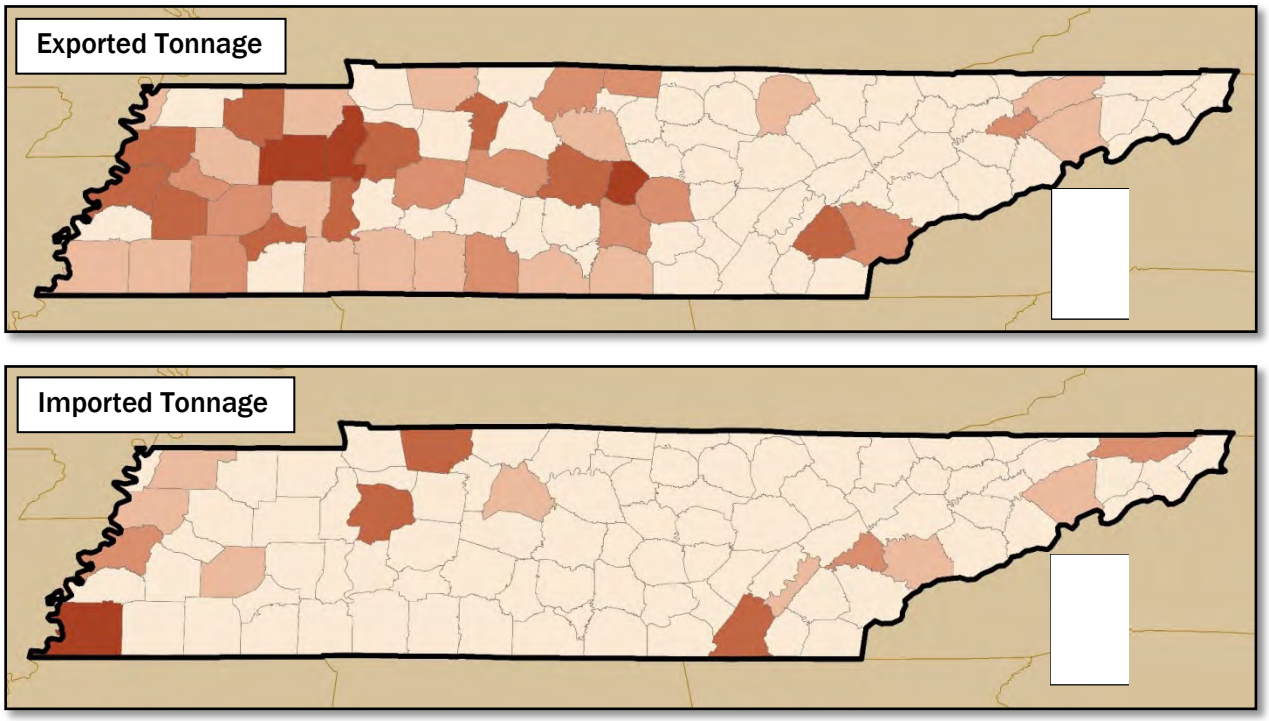
Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 2-12 Automotive Trade between Tennessee Counties (Tonnage)



Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 2-13 Advanced Manufacturing between Tennessee Counties (Tonnage)



Source: Tennessee Transearch Data, IHS Inc., 2012

2.4.1 Freight Origin-Destinations by Truck in Tennessee's Truck-Intensive Subregions

As described earlier, a large amount of freight tonnage in Tennessee is moved by truck, thus warranting a more in-depth analysis. Four weeks of truck Global Positioning System (GPS) data were collected through each of the four seasons in 2013 for the entire state of Tennessee. Figure 2-14 shows that the vast majority of truck origins in the state occurred close to the Tennessee interstate system and are much more concentrated in the urban areas. This indicates that truck-intensive facilities are also located primarily along the interstate system and in the larger urbanized regions.

Figure 2-15 shows truck origins in the largest metropolitan regions in Tennessee – Nashville, Memphis, Chattanooga and Knoxville. While the destinations are not shown on the maps, it can be inferred that the origin locations with truck activity are also destinations for trucks.

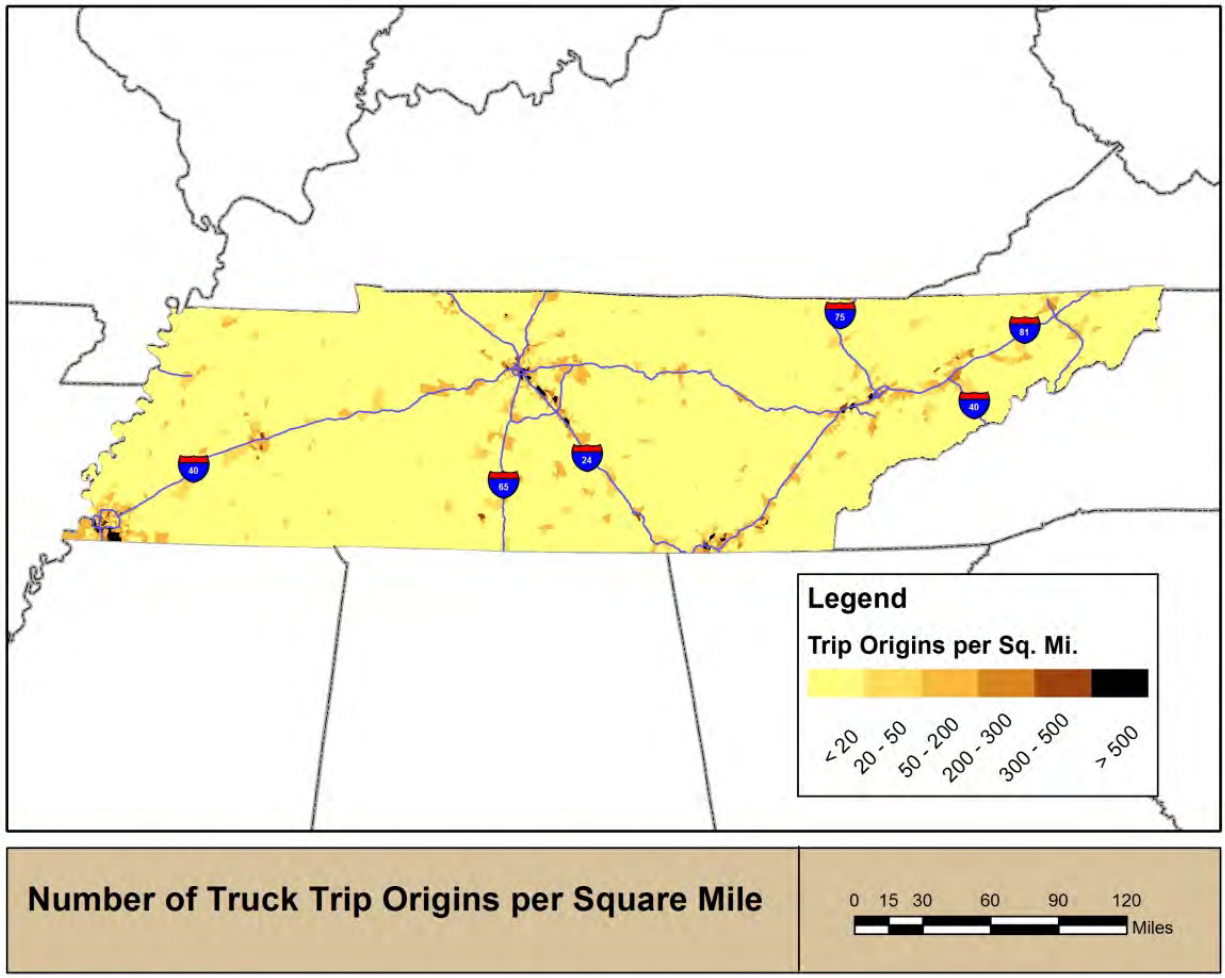
In the Nashville region, the largest concentration of truck origins are located along the I-24 corridor southeast of the Nashville region along with in the downtown Nashville area (Figure 2-15). This shows that the majority of truck-related facilities in the region are also along the I-24 corridor between downtown and Murfreesboro. Additional pockets of truck-intensive activities occur in and near the municipalities of Lebanon, Franklin, and Goodlettsville. When considering this information in conjunction with the information that some of the highest truck count locations in the region are on I-40, it appears that this corridor is used for a relatively higher percentage of through truck flows, while I-24 is used more often to connect with facilities based in the Nashville region.

Figure 2-15 shows truck origins within the Memphis region. This data shows that the highest concentrations of truck origins and destinations are along the Lamar Avenue corridor from South of the Mississippi state line to I-240. There are also high concentrations of truck origins and destinations along I-240 between Lamar Avenue and the downtown area. This underscores the importance of the Lamar Avenue corridor in the Memphis region, particularly as it indicates that there are truck-dependent facilities (such as manufacturing facilities, truck terminals, and warehouses) along Lamar Avenue.

In the Chattanooga region, the truck origins are very closely aligned to the interstate system (Figure 2-15). The truck trip ends are concentrated along I-75 and I-24 with the most concentrated truck trip ends occurring in the downtown region, and in the industrial area surrounding the Norfolk Southern Debutts Railyard. Outside of Chattanooga concentrations of truck trip origins and destinations can also be found in the Cleveland and Monteagle areas. Similarly, Figure 2-15 shows that the truck trip origins and destinations in the Knoxville region are concentrated along I-40 with the most highly concentrated regions occurring at the I-40/I-75 merge.

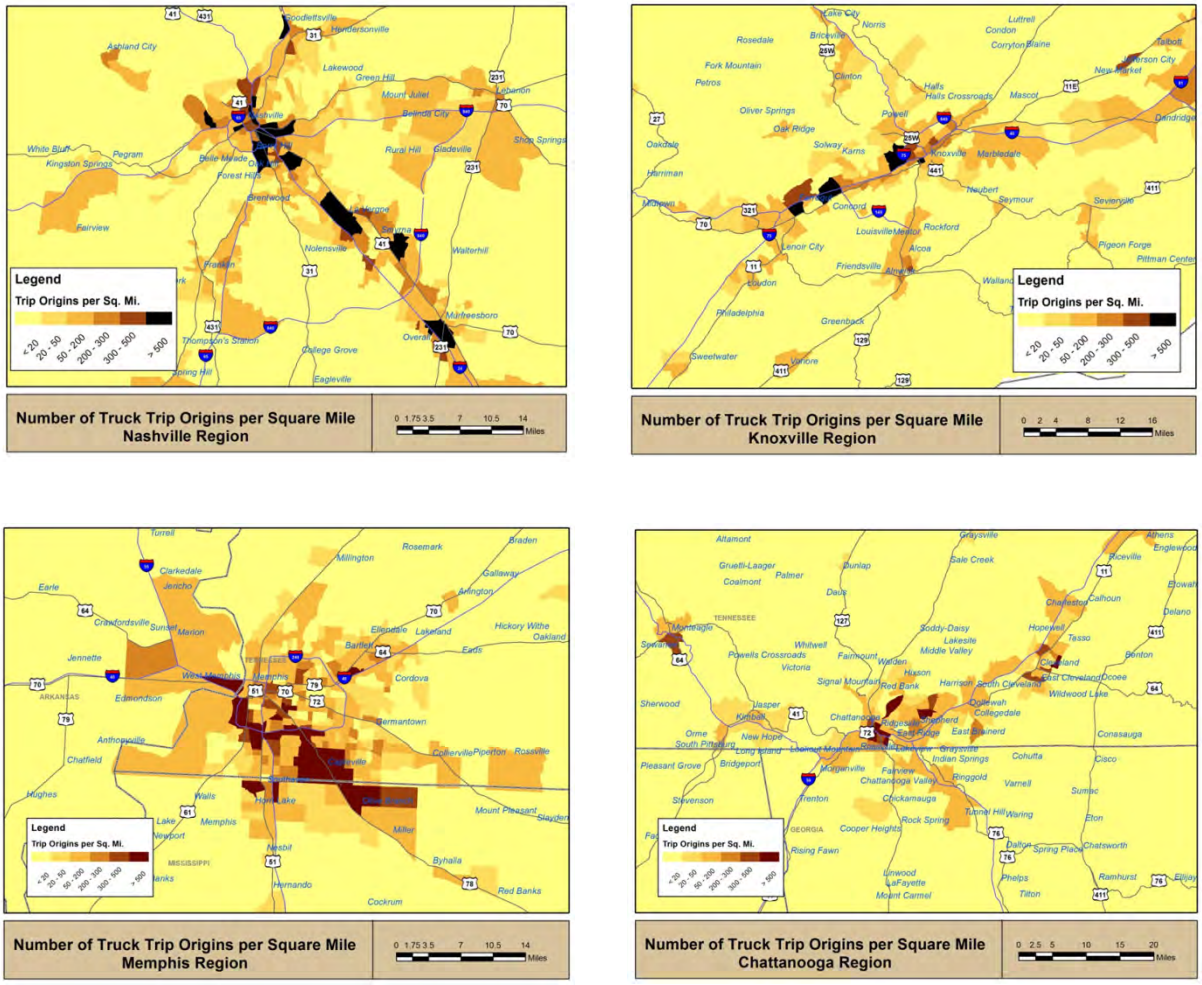
A high percentage of regional truck trips for the State are shown by the data used for the origin-destination analysis. The highest truck flows occur between Nashville and Clarksville; Memphis and Jackson; Chattanooga and Nashville; and Nashville and Jackson.

Figure 2-14 Tennessee Truck Trip Origins



Source: American Trucking Research Institute (ATRI), 2013

Figure 2-15 Truck Trip Origins in Nashville, Memphis, Chattanooga, and Knoxville



Source: ATRI, 2013

2.5 DOMESTIC TRADING PARTNERS

2.5.1 Outbound from Tennessee

Tennessee exports goods to every state in the U.S. In 2012, Tennessee exported a total of 143 million tons of goods valued at approximately $158 billion to its domestic partners. Table 2-9 presents the top commodities by tonnage exported domestically by Tennessee.

Table 2-9 Tennessee 2012 Domestic Exports based on Tonnage

Commodity	Tonnage (in millions)	Value (in millions)
Gravel	36.5	$0.4
Coal	12.5	$0.5
Nonmetal Minerals	9.1	$2.0
Waste/Scrap	7.5	$2.2
Other Agricultural Products	7.4	$4.2

Source: Tennessee Transearch Data, IHS Inc.

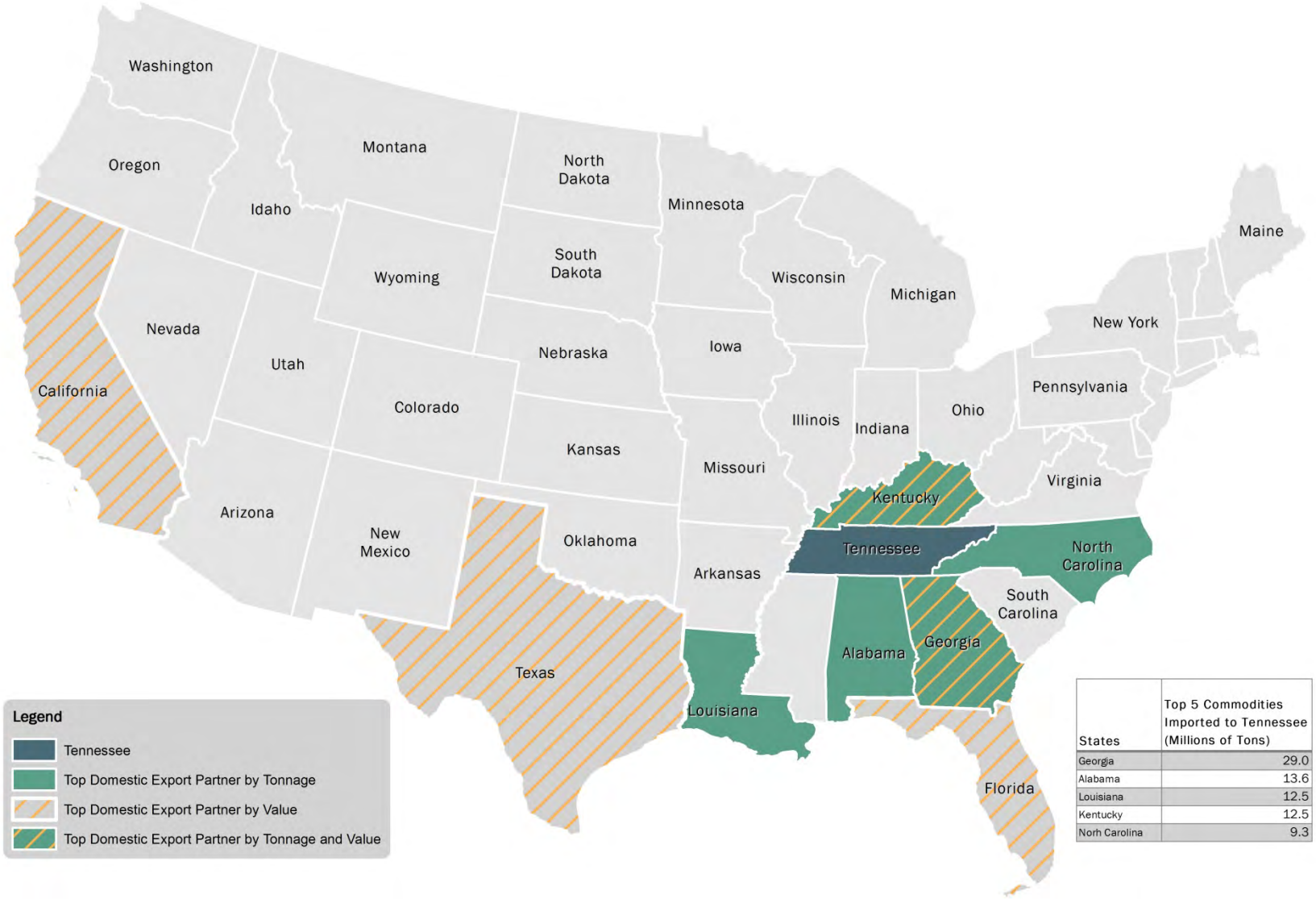
The top five outbound domestic partners are Alabama, Georgia, Kentucky, Louisiana, and North Carolina for freight tonnage. Of the top 5 outbound domestic partners for freight tonnage shown in Figure 2-16, four of them received more than 10 million tons of freight from Tennessee in 2012[1]. The highest tonnage and the highest value of goods were exported to Georgia. Kentucky was the only other state to be one of Tennessee's top 5 export partners for both the amount of tonnage and value of goods exported. California, Texas, and Florida are the other three states highlighted in Figure 2-16 for the value of freight exported to them.

2.5.2 Inbound to Tennessee

Importing goods for customer use or as part of Tennessee's supply chain is necessary for Tennessee's economic productivity. California, Kentucky, Georgia, Alabama, and Texas are all top inbound and outbound domestic trading partners for Tennessee as shown in Figure 2-17[1]. Illinois and Wyoming are the only two states that are not also identified as top export partners for Tennessee. From among the top import trading partners, coal is the dominant inbound movement. Almost 30 million tons of coal was imported by Tennessee from these states alone. The large majority of that coal was from Wyoming and Illinois.

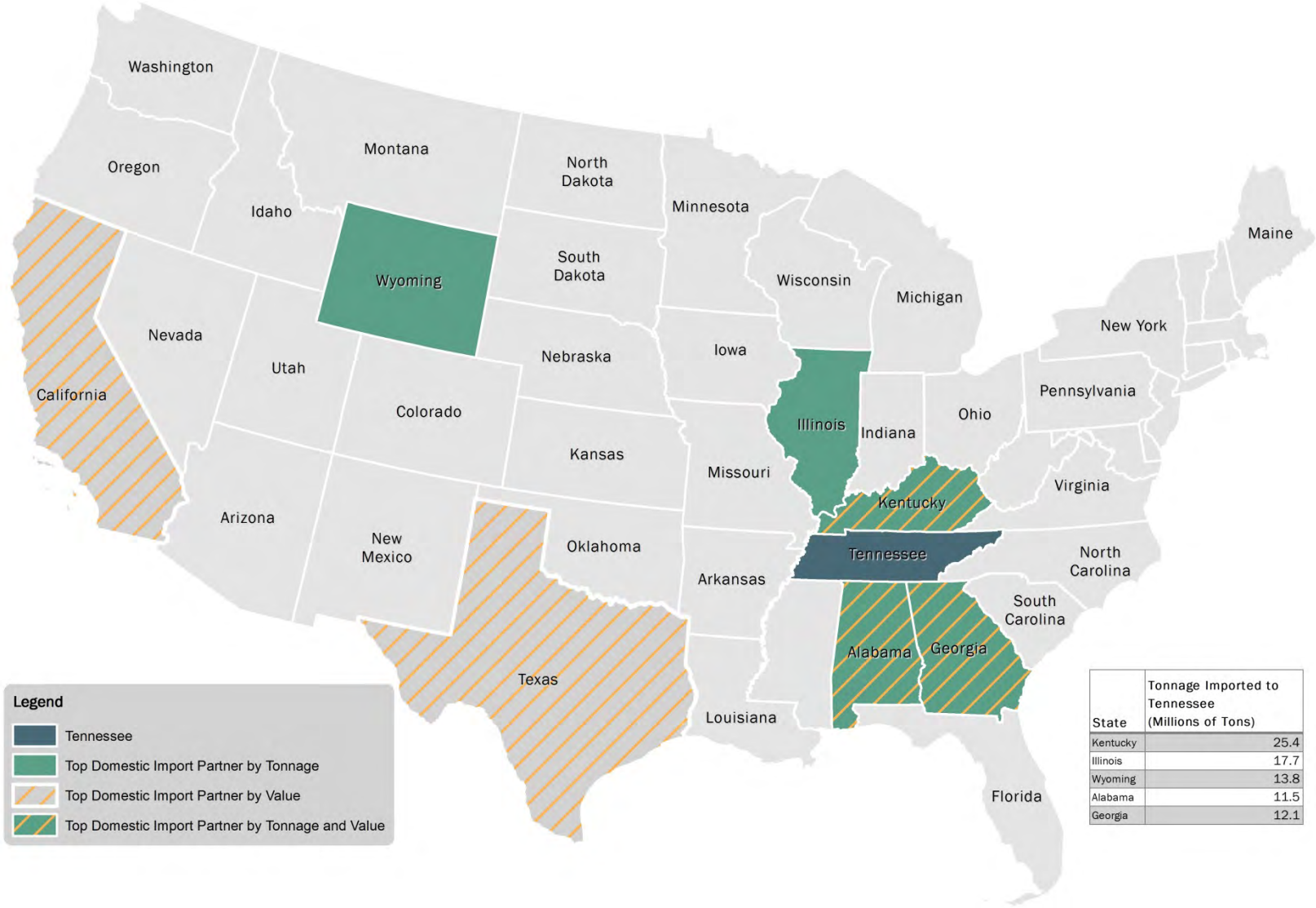
[1] *IHS Global Insights, Transearch Data, 2012.*

Figure 2-16 Tennessee's Outbound Domestic Trading Partners



States	Top 5 Commodities Imported to Tennessee (Millions of Tons)
Georgia	29.0
Alabama	13.6
Louisiana	12.5
Kentucky	12.5
Norh Carolina	9.3

Figure 2-17 Tennessee's Top Inbound Domestic Trading Partners

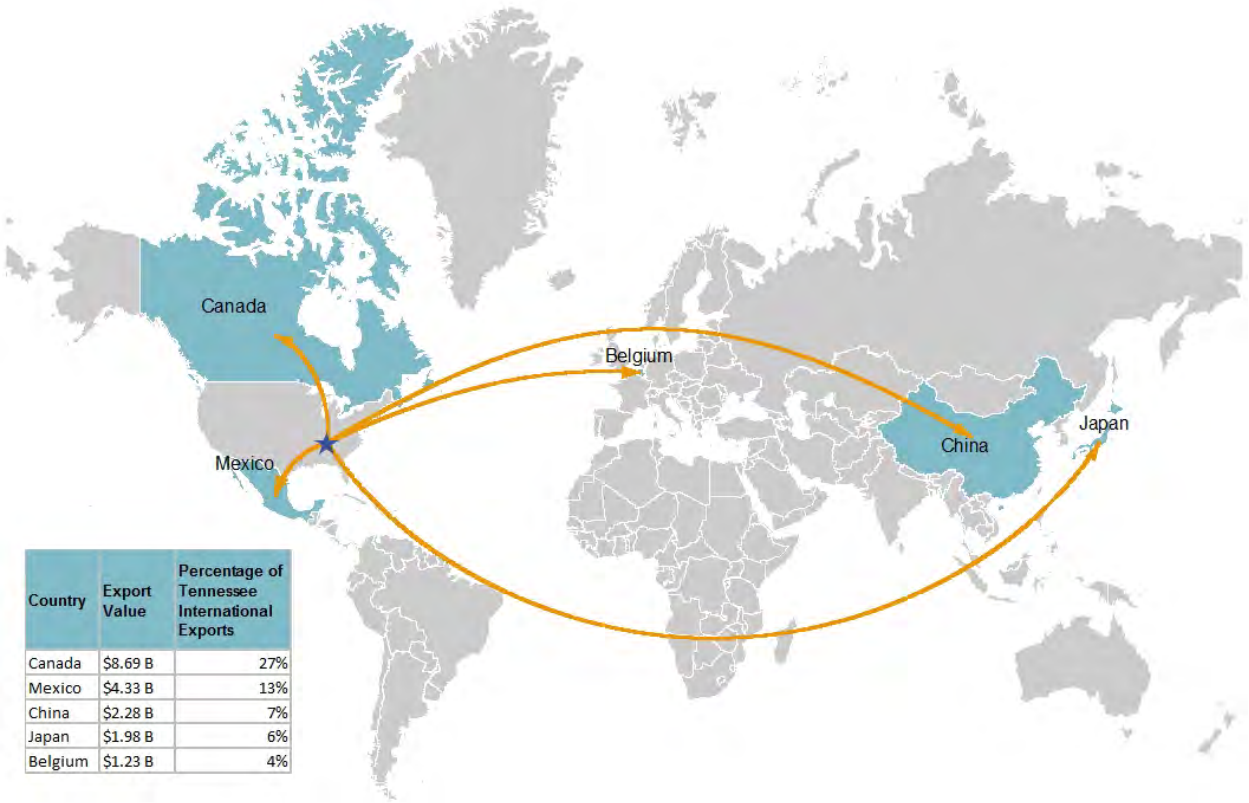


State	Tonnage Imported to Tennessee (Millions of Tons)
Kentucky	25.4
Illinois	17.7
Wyoming	13.8
Alabama	11.5
Georgia	12.1

2.6 INTERNATIONAL TRADING PARTNERS

Tennessee has substantial trading links with other countries worldwide. Understanding Tennessee's foreign trade relationships will help planners identify how growth in other countries will affect the freight transportation system within the state. The U.S. Census measures Tennessee's total export and import values for exports. In 2013, Tennessee exported over $32 billion in goods worldwide to 231 countries[2]. Figure 2-18 shows Tennessee's top five international export trading partners. As expected, due to geographic proximity and the effects of trade liberalization brought about by the North American Free Trade Agreement (NAFTA), Canada and Mexico receive a large share of Tennessee's international exports. Canada in particular accounts for goods worth about $8.7 billion in 2013 – 27 percent of the total foreign trade value. Exports to Mexico were about $4.3 billion in 2013, or 13 percent of total export value.

Figure 2-18 Tennessee's Top 5 International Export Partners

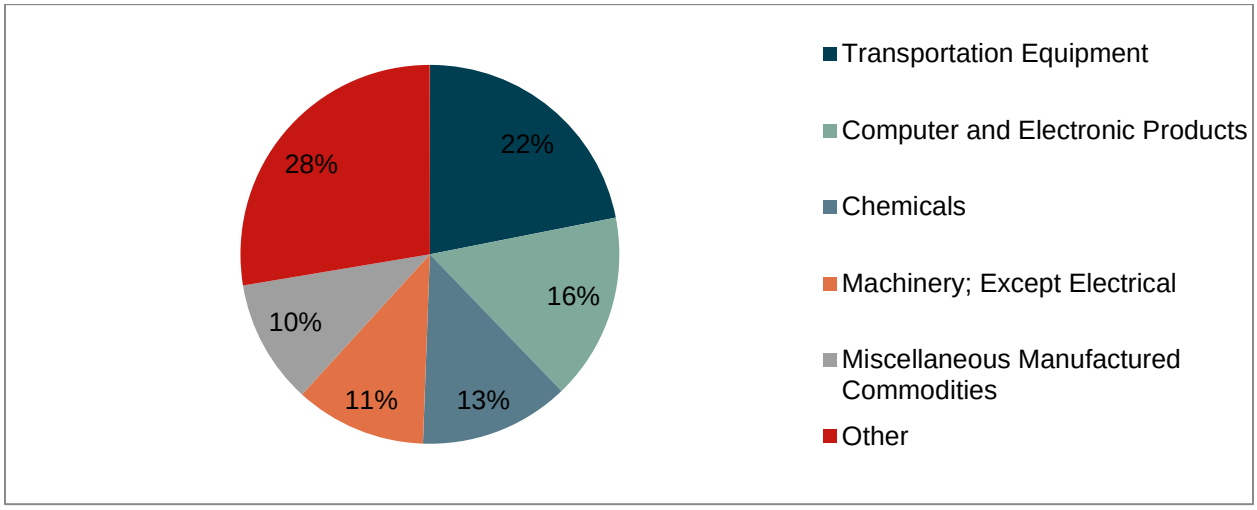


Country	Export Value	Percentage of Tennessee International Exports
Canada	$8.69 B	27%
Mexico	$4.33 B	13%
China	$2.28 B	7%
Japan	$1.98 B	6%
Belgium	$1.23 B	4%

[2] *U.S. Department of Commerce, International Trade Administration, TradeStats Express, http://tse.export.gov/TSE/TSEReports.aspx?DATA=SED*

The top commodities exported from Tennessee to these countries are generally high value commodities. Figure 2-19 shows the breakdown of commodities exported from Tennessee to Canada, Mexico, Belgium, China, and Japan.

Figure 2-19 Tennessee Commodities Transported to Top 5 Export Partners



Source: Tennessee Transearch Data, IHS Inc., 2012

2.7 CURRENT EMPLOYMENT PER INDUSTRY WITHIN TENNESSEE

Total employment across all sectors for the State of Tennessee in 2012 was 3,682,605. As previously mentioned, a large portion of Tennessee's economy is considered goods-dependent industry meaning that they rely on freight transportation to sell goods and receive inputs. All of the goods-producing sectors rely heavily on freight transportation. This includes the sectors of Mining, Manufacturing, Construction, and Agriculture. The services-providing industry also includes sectors that are goods-dependent. Specifically, the Wholesale, Retail, and Transportation/Warehouse sectors rely on the freight transportation system. In Tennessee, these sectors account for 36% of all jobs in the state.

Looking at the diversity of employment across the state, Shelby County leads Tennessee not only in total jobs but also having the highest number of jobs in Manufacturing, Wholesale Trade, Retail Trade, and Transportation and Warehousing. Table 2-10 depicts the State's top five counties having the largest employment base for Manufacturing, Retail Trade, Wholesale Trade, and Transportation and Warehousing. The State's next highest county in total employment is Davidson County which has the second highest goods-dependent employment base in Tennessee except for manufacturing employment. It has the State's fourth highest manufacturing employment base behind Hamilton and Rutherford Counties.

Table 2-10 Employment in Top 5 Counties in Tennessee for Freight Sectors[3]

County	Manufacturing Employment	Retail Trade Employment	Wholesale Trade Employment	Transportation & Warehousing Employment
Shelby	35,399	58,677	30,556	59,848
Hamilton	24,582	22,857	7,760	15,893
Rutherford	23,480	-	4,646	5,948
Davidson	20,483	51,011	27,555	22,779
Knox	13,060	35,892	-	-
Williamson	-	16,353	-	-
Madison	-	-	3,234	
Sumner	-	-	-	3,592

Source: Tennessee Transearch Data, IHS Inc.

\- *Indicates county is not in the top 5 for employment in this industry.*

[3] Bureau of Economic Analysis (BEA) 2012, CA25N Total full-time and part-time employment by NAICS industry

3. Freight Policies, Strategies, and Institutions

3.1 TENNESSEE'S FREIGHT POLICIES AND STRATEGIES

The State of Tennessee has a history of success with attracting and retaining industries from diverse freight sectors, such as Automotive, Manufacturing, and Transportation industries. State initiatives in economic development and transportation have helped define the freight profile for Tennessee. To support strategic investment in freight-related infrastructure, Tennessee has several steps underway:

- **Preparation of a Long Range Transportation Plan.** TDOT is currently preparing an update to the State's Long Range Transportation Plan (LRTP), which will include a more robust freight component than the previous plan. As part of the LRTP effort, a policy paper on freight logistics and planning was prepared to evaluate the current conditions of the freight system in Tennessee and to review freight policies and strategies used by surrounding and peer states. In concert with the development of the LRTP, a 10-Year Strategic Investment Plan is also being developed based on a deficiency analysis of transportation needs across the state. This Plan proposes multiple programmatic investment categories, including freight.

- **Update of Statewide Travel Demand Model.** TDOT is also updating the statewide travel demand model using TransCad which will include a freight component. To assist with the development, TDOT has obtained American Transportation Research Institute (ATRI) data to evaluate high truck traffic locations and Transearch data to evaluate commodity flows.

- **Development of a Statewide Rail Plan.** TDOT has also undertaken the task of creating a Statewide Rail Plan to comply with the Passenger Rail Investment and Improvement Act (PRIIA) and to evaluate freight movement on Tennessee's rail system.

- **Organization of a Statewide Freight Advisory Committee (FAC).** In 2013, TDOT established a statewide Freight Advisory Committee with members from the public and private sectors from truck, rail, water, air, and manufacturing industries as well as members from academia. The statewide committee is divided into three Regional Freight Advisory committees based on the three grand divisions of the State - West, Middle, and East Tennessee. The statewide FAC Executive Committee has representatives from all modes and all geographies across the state. The regional FACs are encouraged to meet regularly to discuss freight issues and exchange information and data.

- **Environmental.** TDOT's primary environmental policy influencing freight is the Policy on Highway Traffic Noise Abatement created in accordance with 23 CFR 772 and approved in April 2011. The Policy on Highway Traffic Noise Abatement outlines the process used to decide on highway traffic noise abatement and the cost-effective expenditure of funds on the state's highway system.

- **Land Use Coordination.** TDOT has developed Corridor Management Agreements (CMAs) that provide a framework for multi-jurisdictional coordination of transportation and land use planning efforts. Often the goals set for the CMA include promotion of economic development as well as preservation of the community character.

3.2 TENNESSEE'S GRANT AND LOAN PROGRAMS FOR FREIGHT-RELATED INFRASTRUCTURE

Beyond the Federal-aid Highway Program, there are many grant programs in Tennessee at the state-level for freight-related infrastructure improvements. In addition to the few state-level programs, there are also regional funding opportunities for freight-related improvements. Tennessee does not have any loan programs for freight-related transportation infrastructure.

3.2.1 State Grant and Loan Programs

TDOT provides grants for state industrial roadways through the **State Industrial Access Program**. The Industrial Highway Act of 1959 authorized TDOT to contract with cities and counties for the development of industrial highways throughout the state. These highways are to provide access to industrial areas such as industrial sites or industrial parks. This program provides grants for local agencies to design or construct public access roads to industrial areas based on project type, economic benefit, physical constraints, and available funding.

TDOT has provided grants to short line railroads through the **Shortline Railroad Program,** which was initiated in 1987. This program was funded by a portion of the Transportation Equity Fund, which collected the sales tax paid on fuel used by aeronautics, railroads, and towboats. This fund was established to assist short line railroad authorities in rehabilitating tracks and bridges on rail lines that connect to lines of the major railroads'. There are approximately 900 miles of track under control by short line operators throughout the state. In late 2013, this program was put on hold pending litigation between the major (Class I) railroads and TDOT with regard to how the program is funded.

The Multimodal Transportation Resources Division, Office of Rail and Water Transportation provides **funding assistance in waterway studies**. The funds are to increase the use of water transportation and to improve regional and national economic conditions by increasing utilization of cost-effective, fuel-efficient and environmentally-friendly waterway transportation.

TDOT's Division of Aeronautics administers all federal and state aeronautics grants. The grant applications are reviewed by the Tennessee Aeronautics Commission (a five-member board). The

federal and state funding for aeronautics comes from airport user fees and not from the state's general fund.

Local communities that apply to Tennessee Economic and Community Development (TNECD) with a goal of improving public infrastructure in order to create new jobs and business investment may be eligible to receive **FastTrack Infrastructure Development Program (FIDP)** funds. This program was established as a separate fund in the state's general fund. The money must be used for specific projects and tied to a company commitment to create or retain a defined number of jobs. Qualifying projects must involve manufacturing or other economic activities deemed beneficial to the state of Tennessee. Companies who export more than 50% of the product or service manufactured are also eligible for these funds. FIDP grants require a local community match calculated along a varying scale, based on a community's ability to pay.

Select federal grant programs have been established with a local purpose and need. The **Community Development Block Grant Program (CDBGP)** is intended to promote economic and community development in small cities. Eligible economic development projects include grants for industrial infrastructure and loans for industrial buildings and equipment. Projects are eligible for grants if they are in the public domain and available for use by a large segment of the community (i.e. infrastructure). The project must also target a certain percentage of employees from low income. CDBG assistance is in the form of a loan when the asset being financed for the exclusive use of one industry (i.e. buildings and equipment).

3.2.2 Regional Grant and Loan Programs

Through the **Appalachian Regional Commission (ARC)** Tennessee is able to award grants for economic and community development projects in the 52 counties in middle and east Tennessee served by the ARC. The program is a federal-state partnership designed to create opportunities for self-sustaining economic development and improved quality of life working with the Appalachia residents. The commission of governors is an alliance of the 13 Appalachian states and a presidential appointee representing the federal government. The amount Tennessee receives from the fund is established by a formula approved by the states and federal co-chair. Each state establishes priorities for the funds to be distributed. The top priority for Tennessee is the economic development projects where water, wastewater, rail, etc. are provided to a locating or expanding industry.

The **Delta Regional Authority Grants** are used to improve the lives of people in 21 Tennessee Delta Region counties, located in west Tennessee. The program aims to improve basic public infrastructure, transportation infrastructure, business development, and job training in the Delta Region. The assistance of the fund is limited to $200,000.

3.3 FREIGHT INSTITUTIONS IN TENNESSEE

3.3.1 Federal Agencies

Several Administrations within the United States Department of Transportation (USDOT) and other federal agencies are involved in the planning, funding, operations, and safety oversight of freight

activities. Ranging in their missions and modes, the following agencies provide a national perspective for freight activities in Tennessee:

- Federal Highway Administration (FHWA)

  FHWA is a federal agency housed within the USDOT and coordinates highway transportation programs in cooperation with Tennessee and other partners to enhance the country's safety, economic vitality, quality of life, and the environment. Major program areas include the Federal-Aid Highway Program, which provides federal financial assistance to Tennessee and other states to construct and improve the National Highway System, urban and rural roads, and bridges. This program provides funds for general improvements and development of safe highways and roads. The FHWA also manages a comprehensive research, development, and technology program.

- Federal Motor Carrier Safety Administration (FMCSA)

  FMCSA is a federal agency housed within the USDOT. Formerly a part of the Federal Highway Administration, the FMCSA's primary mission is to prevent commercial motor vehicle-related fatalities and injuries. FMCSA works to ensure safety in motor carrier operations through strong enforcement of safety regulations, improve safety information systems and commercial motor vehicle technologies, strengthen commercial motor vehicle equipment and operating standards, and increase safety awareness. To accomplish these activities, the FMCSA works with Federal, state, and local enforcement agencies, the motor carrier industry, labor safety interest groups, and others.

- Federal Aviation Administration (FAA)

  FAA is a federal agency housed within the USDOT and oversees the safety of civil aviation. The safety mission of the FAA is first and foremost and includes the issuance and enforcement of regulations and standards related to the manufacture, operation, certification and maintenance of aircraft. The agency is responsible for the rating and certification of airmen and for certification of airports serving air carriers. It also regulates a program to protect the security of civil aviation, and enforces regulations under the Hazardous Materials Transportation Act for shipments by air. The FAA, which operates a network of airport towers, air route traffic control centers, and flight service stations, develops air traffic rules, allocates the use of airspace, and provides for the security control of air traffic to meet national defense requirements. Other responsibilities include the construction or installation of visual and electronic aids to air navigation and promotion of aviation safety internationally.

- Federal Railroad Administration (FRA)

  FRA is a federal agency housed within the USDOT and promotes safe and environmentally sound rail transportation. With the responsibility of ensuring railroad safety throughout the nation, the FRA employs safety inspectors to monitor railroad compliance with federally

mandated safety standards including track maintenance, inspection standards, and operating practices. The FRA conducts research and development tests to evaluate projects in support of its safety mission and to enhance the railroad system as a national transportation resource. Public education campaigns on highway-rail grade crossing safety and the danger of trespassing on rail property are also administered by FRA.

- United States Maritime Administration (MARAD)

  MARAD is a federal agency housed within the USDOT. MARAD promotes development and maintenance of an adequate, well-balanced, United States merchant marine, sufficient to carry the Nation's domestic waterborne commerce and a substantial portion of its waterborne foreign commerce, and capable of serving as a naval and military auxiliary in time of war or national emergency. MARAD also seeks to ensure that the United States enjoys adequate shipbuilding and repair service, efficient ports, effective intermodal water and land transportation systems, and reserve shipping capacity in time of national emergency.

- Pipeline and Hazardous Materials Safety Administration (PHMSA)

  PHMSA is a federal agency housed within the USDOT and oversees the safety of hazardous materials in the United States and the nation's energy sources that are transported by pipelines. PHMSA is dedicated solely to safety by working toward the elimination of transportation-related deaths and injuries in hazardous materials and pipeline transportation, and by promoting transportation solutions that enhance communities and protect the natural environment.

- United States Army Corps of Engineers (USACE)

  USACE is a federal agency house within the Department of Defense. The USACE provides engineering, design and construction management services for the U.S. In addition to other responsibilities, USACE operates the Nation’s locks and dams and provides dredging for waterway navigability.

3.3.2 TDOT

TDOT is involved in all aspects of multi-modal freight within the state, including highways, railways, waterways, and air transport. These fall into different Bureaus within TDOT, and ultimately led by the Commissioner. The Aeronautics Division reports directly to the Commissioner’s Office; highways are under the Engineering Bureau; and freight rail and waterways are under the Multimodal Division.

The roles and responsibilities of TDOT for roadway, rail, water, and air infrastructure are outlined below:

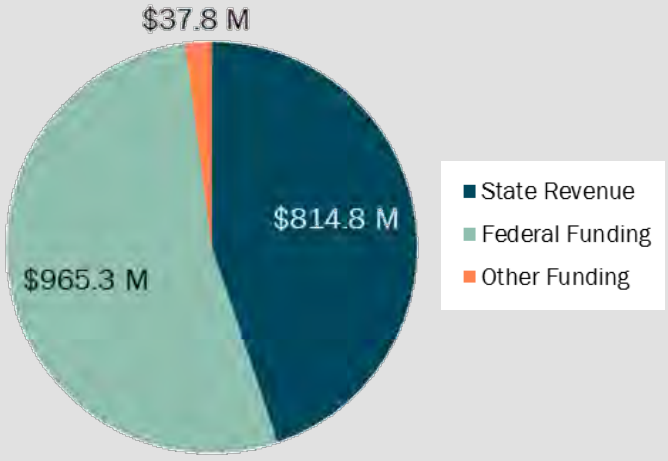
- Roadway - All projects on the State Route System and National Highway System, such as pavement and operations projects

- Rail - Safety projects at railroad crossing and projects for shortline railroad improvements, such as that the office provides assistance for track and bridge rehabilitation.
- Water - Port and marine projects
- Air - Distributes Federal Aviation Administration (FAA) funds for airport projects including runway and hangar improvements

TDOT Funding Sources

In Tennessee, all project funding is through dedicated revenues, the highway user taxes and fees, and federal funding. This is commonly referred to as a "pay as you go" system. In fiscal year 2013-2014, TDOT had $814,800,000 in state revenue. The remaining TDOT budget is financed through a mix of federal and other revenue sources.

Figure 3-1 TDOT FY 2013-2014 Funding



TDOT's highway program comprises the largest portion of the transportation funding in Tennessee. Aeronautics, water, and rail funding are a smaller portion of the budget. In FY 2013-2014 funding for these other modes comprised approximately 8% of the total state revenue funding.

Figure 3-2 TDOT FY 2013-2014 State Funding

3.3.3 Port Authorities and Terminals

Four public ports operate on Tennessee rivers. Two are along the Tennessee River: Port of Nickajack and Centre South River Port. The other two are along the Mississippi River: Port of Memphis and Port of Cates Landing.

There are five locks and four lock-and-dam combinations located within the state. The majority of these assets are located along the Tennessee and Cumberland Rivers, with one lock and dam located along the Clinch River.

Port Commissions in Tennessee are established through legislative action, governed by a board of commissioners, and funded through their operating revenues. Below is a list of the Port Commissions in the state.

- Northwest Tennessee Regional Port Authority (NTRPA), Port of Cates Landing at Tiptonville
    - The NTRPA is a regional public authority, for the counties of Lake, Dyer, and Obion. It was established as a result of the Port of Cates Landing development.
    - NTRPA has received state and federal grant funds to conduct capital improvements for the Port of Cates Landing.
- Gainesboro Port Authority, Gainesboro
    - While the Gainesboro Port Authority exists on paper, it has not been operational for several years. It was established in 1981 to develop a complex of adjacent terminal facilities along the Cumberland River.
- Port Commission Memphis and Shelby County, Memphis
    - The Port Commission is a joint jurisdiction between the City of Memphis and Shelby County. Residents of the City of Memphis and Shelby County are nominated by the mayor to compose the five-member port commission.
    - The Commission is responsible for promotional and economic development of the Port of Memphis, including leasing and selling land on Presidents Island and the Frank C. Pidgeon Industrial Park.
- Nickajack Port Authority, South Pittsburg
    - The Port of Nickajack operates a public river port on 92 acres on the Tennessee River as a joint jurisdiction between New Hope and South Pittsburg.

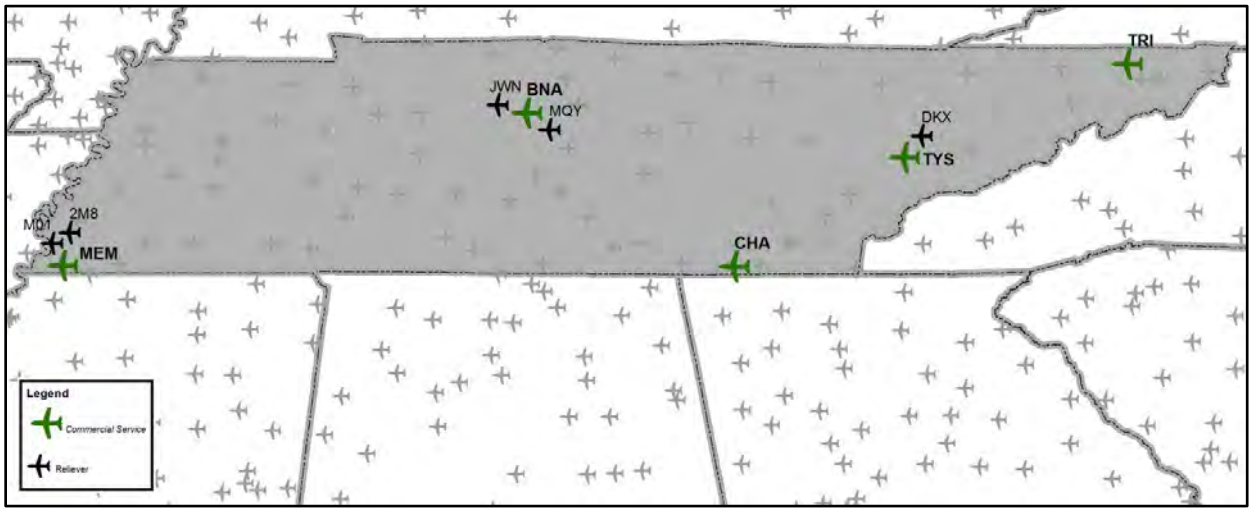
The majority of terminals in Tennessee are on the Mississippi River. There are four public for-lease terminals in Tennessee owned by public port authorities. All of these publicly-owned terminals are leased to and operated by private entities. However some of these reported are on neighboring states' land and are important to Tennessee because they have large scale operations or they complement or compete with Tennessee facilities. These include the Hickman-Fulton County Riverport Authority in Hickman, Kentucky, New Madrid County Port Authority in Missouri, Pemiscot County Port Authority in Missouri, and the Yellow Creek Inland Port in Luka, Mississippi.

3.3.4 Airports

There are 79 airports across the state including Commercial Service airports, general aviation airports, which are not privately owned, and other public-use airports. Currently there are five Commercial Service airports including Tri-Cities Regional Airport (Bristol/Johnson City/Kingsport), Chattanooga Metropolitan Airport, McGhee Tyson Airport (Knoxville), Memphis International Airport, and Nashville International Airport.

In Tennessee, most airports are overseen by an airport authority or airport commission with all but a limited number operated with an administrative board. Often authority or committee members are volunteer positions.

Figure 3-3 Airports in Tennessee



3.3.5 Public and Private Research Institutions

Tennessee has a number of universities with research programs dedicated to the transportation industry with one designated as an intermodal freight transportation institute. For many years, TDOT has worked closely with these institutions and continues to partner on research, planning, and development in the areas of freight and transportation logistics. These partner institutions include:

- The University of Tennessee Center for Transportation Research (CTR)

  In 1970, CTR was created to foster and facilitate interdisciplinary research, public service, and outreach in the field of transportation at The University of Tennessee in Knoxville. It began full-time operations in 1972 and since then has contributed greatly to the overall research needs of the State. As a research center under the auspices of UT's College of Engineering, CTR oversees various programs associated with the education, research, training, and workforce aspects of the transportation field. CTR, over the years, has assisted TDOT on a number of freight -related research and policy initiatives including truck lane restrictions, rail transportation research, and various transportation and freight related technology transfer activities. CTR is also an active participant in Tennessee's Freight Advisory Committee.

- The University of Memphis Intermodal Freight Transportation Institute (IFTI)

  In 2007 IFTI was created with funding provided in the 2005 federal Safe Accountable Flexible Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) transportation legislation. Since its inception, IFTI has brought together public, private, and academic sectors to identify and address critical issues impacting freight movement across the mid-south and the nation. IFTI works to advance research and education on a wide range of topics related to the physical transfer of goods and associated information, core transportation infrastructure, technology innovations, natural and man-made hazards, business practices, and policy and regulatory matters that impact one or more modes of freight transport. IFTI is also an active participant in Tennessee's Freight Advisory Committee.

- Vanderbilt University Center for Transportation Research (VECTOR)

  VECTOR is a research center located in Nashville that specializes in transportation research. Intermodal freight transportation, risk assessment, geographic information systems (GIS), and intelligent transportation systems (ITS) are some of VECTOR's key research areas. In the past VECTOR, has conducted freight -related research on trucking operations and safety, inland marine transportation, safety, security, and capacity of rail corridors, and freight diversion and capacity issues in Tennessee. VECTOR is also an active participant in Tennessee's Freight Advisory Committee.

- Center for Transportation Analysis (CTA)

  CTA is a research center is in the Energy and Transportation Science Division of Oak Ridge National Laboratory (ORNL). CTA has delivered over 20 years of research excellence in critical areas of national significance, including the fusion of security, safety, energy efficiency and transportation system performance. CTA is also an active participant in Tennessee's Freight Advisory Committee. CTA has seven major focus areas for their research:
  - Freight and Passenger Flows
  - Transportation Energy Efficiency
  - Transportation Safety and Security
  - Supply Chain Efficiency
  - Climate Change
  - Vehicle Technologies
  - Enterprise Modeling

3.4 PRIVATE INFRASTRUCTURE ENTITIES

3.4.1 Railroads

The rail system in Tennessee is used primarily for freight services as seen in Figure 3-3. There are six Class I railroads that operate within the state, including CSX Transportation (CSX), Norfolk Southern (NS), Burlington-Northern Santa Fe (BNSF), CN/IC (Canadian National/Illinois Central), Kansas City Southern Railway (KCS), and Union Pacific (UP). Together they operate over 2,768 track miles which is 73% of the railroads in the state.

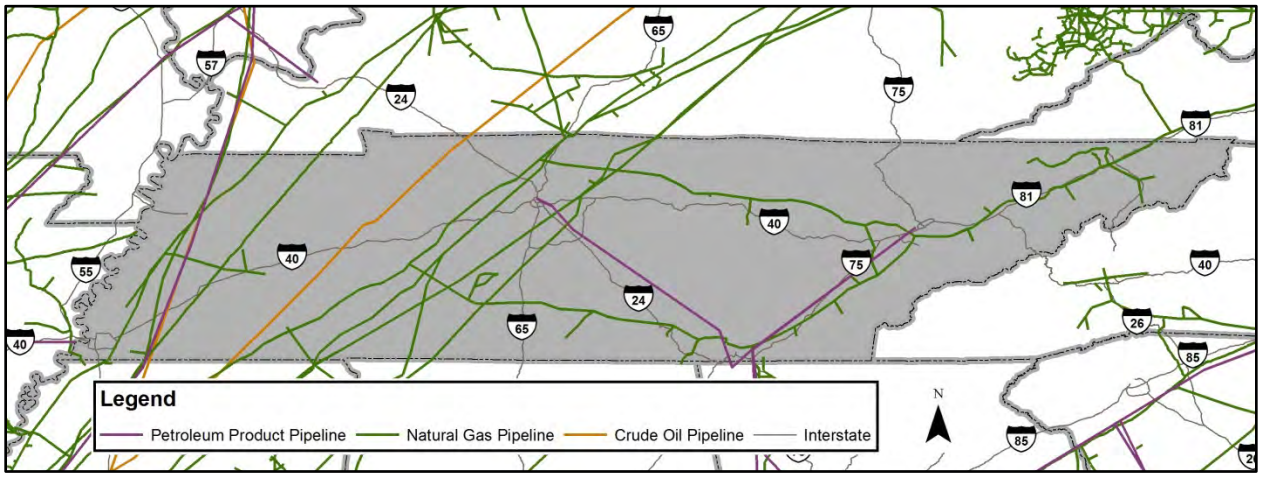
In addition, Tennessee has approximately 1,011 track miles of shortline railroads. There are 24 shortline railroads in Tennessee operating anywhere from 3 miles to route 206 miles.

Figure 3-4 Railroads in Tennessee

3.4.2 Pipelines

Pipeline is another mode of freight transportation used in Tennessee. As shown in Figure 3-5, the state has 23 interstate and at least 8 intrastate natural gas pipeline companies, including those operated by Kinder Morgan, Spectra Energy, and Tennessee Gas Pipeline Company. According to US Energy Information Administration, there are 4,304 miles of pipeline in the state as of 2008. Natural gas makes up 81% of the commodities transported through these pipelines. Other commodities that utilize pipelines in Tennessee include: highly-volatile liquid (HLV), crude oil, refined and/or petroleum product (non-HLV), and methane a landfill gas.

Figure 3-5 Approximate Pipeline Locations in Tennessee



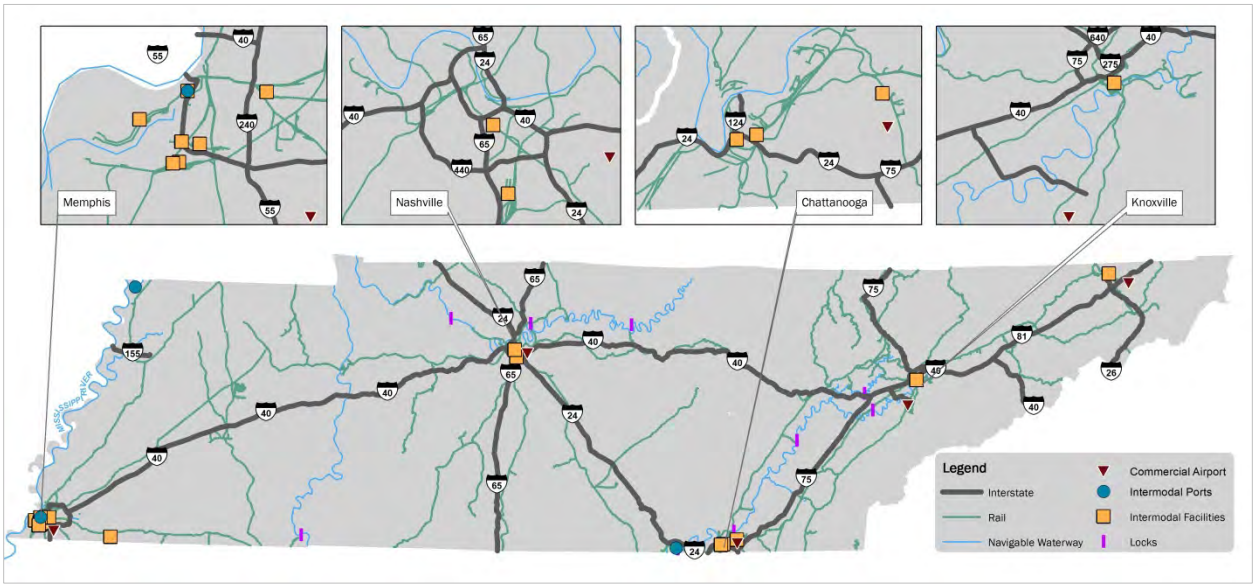
3.4.3 Freight Transfer Facilities

Freight transfer facilities are vital to moving cargo from one mode of transportation to another. The ability to move goods and commodities between modes is key to getting products to their ultimate destination. Intermodal facilities are most frequently found around urban areas. Intermodal rail is the most common freight transfer facility in Tennessee, with several locations across the state, as shown in Figure 3-6.

Several types of intermodal facilities are present in Tennessee including Transflo and Bulk transfer terminals. The three Transflo terminals in the state allow commodities to be moved between railcars, containers, and trucks. Also, there are several TDSI auto distribution terminals across the state such as the one in Nashville at Radnor yard, one in Smyrna where the Nissan plant is located, and one in Chattanooga where the Volkswagon plant is located.

At the Port of Memphis, all modes of transportation are supported by intermodal facilities. Other intermodal facilities present in Memphis primarily support FedEx. In 2003, CN and CSXT entered an agreement with the Port of Memphis and invested $25 million to create the Memphis Super Terminal, a state of the art railroad-truck intermodal facility. As part of the Crescent Corridor, NS Railway is conducting a market study to evaluate an East Tennessee Intermodal Facility.

Figure 3-6 Intermodal and Bulk Terminal Facilities in Tennessee



3.5 TENNESSEE'S INVOLVEMENT IN REGIONAL FREIGHT PLANNING

TDOT and Tennessee's MPOs have conducted several multi-modal freight planning studies in recent years involving truck, rail, air, and water freight activities. This section summarizes recent freight planning efforts at the multi-state and MPO level.

3.5.1 Multi-State Initiatives

Corridor K

The Corridor K study is an economic development and transportation study which follow US 64 / 74, linking Chattanooga and Asheville, North Carolina. The corridor includes Hamilton, Polk and Bradley counties in Tennessee, as well as six counties in North Carolina and two counties in Georgia. The study emphasizes the need for east-west access for movement of goods to and from market areas and Atlantic coastal ports.

Freight-related conclusions of the study, which reflect stakeholder input, are as follows:

- Deficiencies such as reliability of travel times and safety issues on US 64/74 have been identified and need to be addressed
- Better access to Atlantic coastal ports is important to businesses in the region as more companies utilize international suppliers and sell to international and national customers.
- Inadequate east-west connection of the transportation system costs the region's businesses time and money and creates a barrier to growth

I-81 Corridor Coalition

Tennessee is one of six states involved in the I-81 Corridor Coalition, an organization of local and state agencies, MPOs, and other public and private stakeholders. The states traversed by I-81 recognize its importance as a regional commerce connector. The I-81 Corridor Coalition's goals for the corridor focus on (1) safety, (2) freight movement, (3) environment, (4) technology and infrastructure, (5) economic development and (6) finance.

Tennessee and Virginia report that approximately 60% of the truck traffic on the I-81 corridor is traveling through their state to other states. TDOT and the Virginia Department of Rail worked together to develop rail improvements needed for diversion of truck traffic from I-81.

I-69 Corridor

The I-69 Corridor, also referred to as Corridor 18, touches the Mexican border to the south and the Canadian border to the north. The alignment of the road crosses 18 states including Tennessee and when completed will consist of approximately 1,650 miles of roadway. The road was identified in the early 90's as an economic corridor connecting the North American Free Trade Agreement countries, Canada, United States, and Mexico. The alignment in Tennessee will begin in Memphis and travel north through Tipton, Lauderdale, and Dyer counties before crossing into Kentucky.

Outside the Memphis urban area is I-269 which will provide a connection from east of downtown Memphis to the I-69 corridor.

Southern Gateway (new Mississippi River Bridge)

The Southern Gateway project intends to provide a new Mississippi River bridge crossing near Memphis to serve passenger and truck vehicles as well as a rail line for trains. This project is being developed through a multi-organizational effort by:

- Tennessee Department of Transportation (TDOT)
- Arkansas State Highway and Transportation Department (AHTD)
- Mississippi Department of Transportation (MDOT)
- Memphis, Tennessee and West Memphis, Arkansas Metropolitan Planning Organizations (MPOs)

Due to the multimodal demands and the need to move passengers and freight, the study of the Southern Gateway is exploring options to provide additional access across the Mississippi River for a variety of users and needs.

NS Rossville Facility and Roadway Improvements

The NS intermodal facility in Rossville just east of Memphis has created economic and development opportunities in south west Tennessee and in Mississippi. As a result, this facility has also created a need to improve US 72 which crosses the Tennessee/Mississippi state lines as a means to connect to regional roadway networks. Coordination between the states has occurred so that the highways around the intermodal yard are adequate for both states. As the intermodal yard develops there may also be a need to improve Interstate 55 and Highway 45 which both cross the state line.

I-95 Coalition

The I-95 Coalition is focused on the movements of people and goods along the I-95 Corridor from Florida to Maine. While Tennessee is not one of the states directly touched by I-95, TDOT does maintain an associate membership with the coalition. This enables Tennessee to keep informed of the Coalition's progress as well as take part in committees or special task forces within the coalition of significance to the southeast United States.

Tennessee-Tombigbee Waterway (TTW) Development Authority

The TTW Development Authority authorized by Congress was developed to ensure construction of the waterway. Since completion the TTW Development Authority is responsible for promoting economic development and trade along the waterway. The authority consists of governors from four states, Alabama, Kentucky, Mississippi, and Tennessee and five governor appointees from each state. Funding comes from the four member states.

3.5.2 Tennessee MPOs

MPOs conduct freight planning activities to develop a regional perspective for freight issues and needs. Regional freight planning activities can include stand-alone freight studies and plans, the inclusion of freight planning as a component within long range transportation plans (LRTPs), and the inclusion of freight projects in transportation improvements programs (TIPs). The boundaries of five of the 11 MPOs in the state cross into a surrounding state which requires coordination between Tennessee and Kentucky, Georgia, Mississippi, and Virginia. The freight planning activities of Tennessee's 11 MPOs have resulted in the identification of a number of freight-related infrastructure improvement projects, which are discussed in Chapter 10.

3.6 STATUTORY AND CONSTITUTIONAL CONSTRAINTS ON FREIGHT-RELATED INVESTMENTS AND POLICIES

New, upgraded, and replaced transportation improvements are increasingly expensive. The historical funding landscape is also changing. Freight movement brings TDOT directly in contact with the private sector, transportation owners, operators, and users. As a result, there will be opportunities and challenges to managing transportation investments consistent with Tennessee's legislative strategies and capitalize on multi-state and multi-party investments. The balance may vary by mode (e.g. there may be specific fees for specific projects or geographic area, for example a Tax Increment Financing, or TIF, District). TIF is a method to use future gains in taxes to subsidize current improvements, which are projected to create the conditions for gains above the routine yearly increases which often occur without the improvements. New sources of funding need to be consistent with state legislative strategies as well as be cost-efficient.

The **Transportation Fuel Equity Act** includes provisions for how the revenues received from the taxation of diesel fuel can be used. The amount of taxation and use of these funds for railways, aeronautics, and waterways programs and related activities cannot be altered without legislative action. It is important to note that the motor fuel tax in Tennessee has not been increased since 1989.

The **Tennessee Tollway Act** (2007 Public Chapter No. 597) enables TDOT to use tolling as a method for generating revenue to fund construction of new highways and bridges. Any tolling project must be approved by the State's General Assembly; however, the TDOT Commissioner has the authority to set and revise tolls.

Historically, funding of the short line rail program has come from the **Short Line Equity Fund** created by the state by collecting 7% tax on diesel fuel used by railroads. Funding of the short line rail program is currently on hold due to a ruling that has stopped the diesel tax from being used for short line rail projects. This may serve as an opportunity for TDOT to create an alternate fund for rail projects, both freight and passenger, throughout the state.

3.7 TENNESSEE'S FREIGHT IMPROVEMENT STRATEGY

As mentioned earlier, TDOT is currently updating their Long Range Transportation Plan. The freight component of this effort includes research into the policies, programs, and practices that effect freight movement in surrounding and peer states. Policy recommendations to improve the movement of freight through the state of Tennessee were based on this peer review. Future freight improvement strategies noted that could improve freight movement for all modes in Tennessee include:

- Increased focus on freight corridors
- Expanded funding programs for modes supporting freight movement
- Establishment of a freight and logistics office within TDOT to advance freight planning and investments in Tennessee
- Coordination of compatibility between freight-related land uses and the environment
- Continuing development of freight-related data and planning tools

4. State Freight Transportation Assets

Tennessee has a wealth of freight transportation infrastructure with roads, rail, airports, and marine facilities. It also includes intermodal facilities to improve the connection between these modes. These assets facilitate Tennessee's connection to the national and global marketplace.

4.1 ALL MODES OF INFRASTRUCTURE

4.1.1 Roadway and Bridge

Despite the constrained federal and state funding for transportation, Tennessee has managed to maintain its roadway and bridge infrastructure in fairly good condition. In fiscal year 2011, 96% of Tennessee's 19,985 bridges were structurally sound, and the interstate system had a pavement quality index of 4.41 out of a maximum of 5 points.[1] [2]

Movement of goods in Tennessee relies heavily on the highway system for long distance transport as well as moving freight over short distances, as seen in the transport of goods from a warehouse to a final destination. More freight tonnage is moved by trucks than by any other mode in the state. The state of Tennessee has approximately 95,500 miles of roadway, 15% of which is maintained by the state. Below is a summary of the roadway system in Tennessee.

Interstates

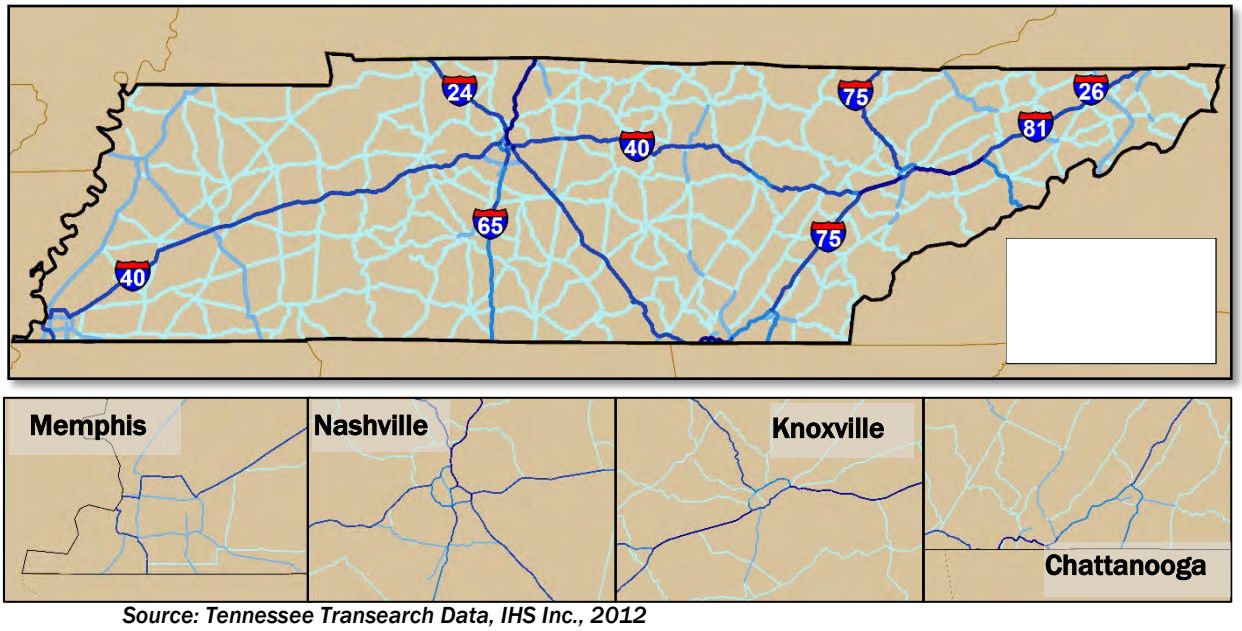
In Tennessee there are a number of key interstates that cross the state and provide regional connections to surrounding states. These include: I-40, I-65, I-75, I-24, I-26 and I-81 which comprise a combined total of 1,104 miles[2]. In total, Tennessee's roadway system carried 14.6 billion tons of freight in 2012, equating to $27 trillion in value.[3] Freight movements on Tennessee's Interstate system are supported by associated truck parking facilities, weigh stations, truck climbing lanes, and runaway truck lanes. As the only interstate crossing Tennessee from east to west, I-40 is an important corridor in the movement of goods in Tennessee. Figure 4-1 below shows the total tonnage by freight per corridor. It shows the greatest tonnage around urban areas such as Memphis, Nashville Chattanooga, Knoxville, and along the Interstate corridors. Along the I-40 corridor from the I-40/I-81 junction south through Knoxville to the I-40/I-75 split is an area of heavy freight. As shown in Figure 4-1 and Figure 4-2, I-40 from Memphis and I-24 from Chattanooga connecting to Nashville are important intrastate freight connections that carry a high

[1] American Society of Civil Engineers, 2013 Infrastructure Report Card
[2] Tennessee Department of Transportation, TDOT Measurement Report Fiscal Year 2012
[3] Transearch Data Analysis, 2012

amount of the commodities moved in the state when measured by tonnage and value. From Nashville, freight can connect to two other major U.S. freight hubs via I-65 – Chicago and Detroit.

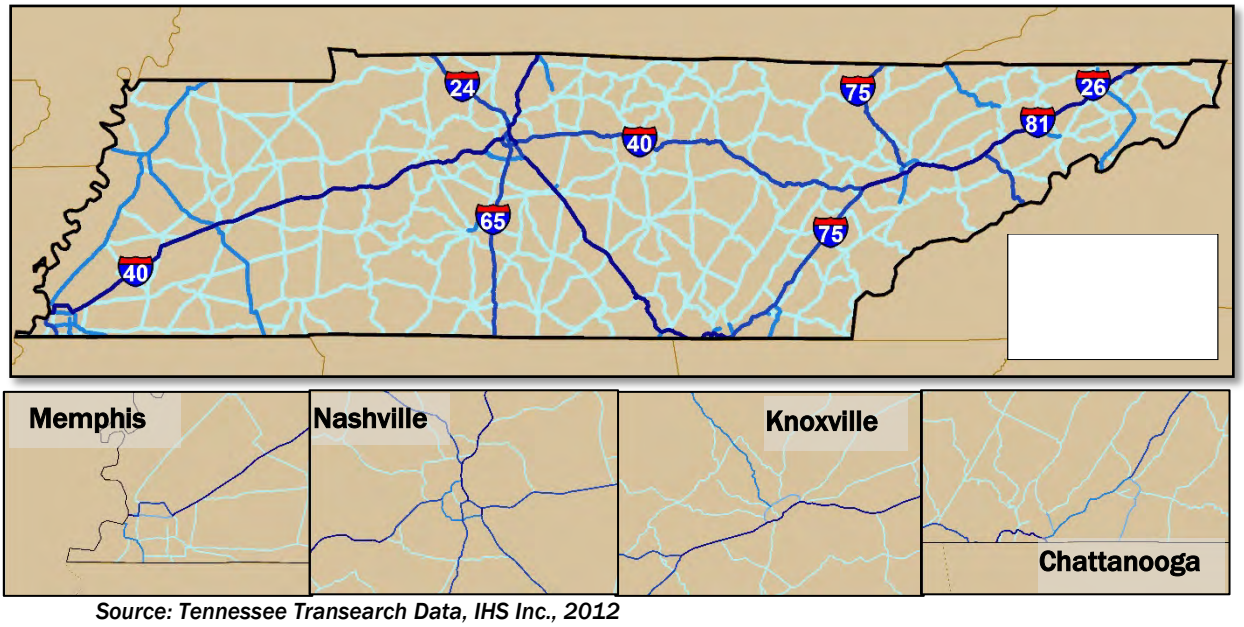
Other interstate freight corridors in urban areas include I-240 (in Memphis), I-440 (in Nashville), and I-640 (in Knoxville). These urban interstates provide an important connection between the major interstates and the freight industries.

Figure 4-1 Commodities Carried by Trucks (Tons)



Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 4-2 Commodities Carried by Trucks (Dollars)

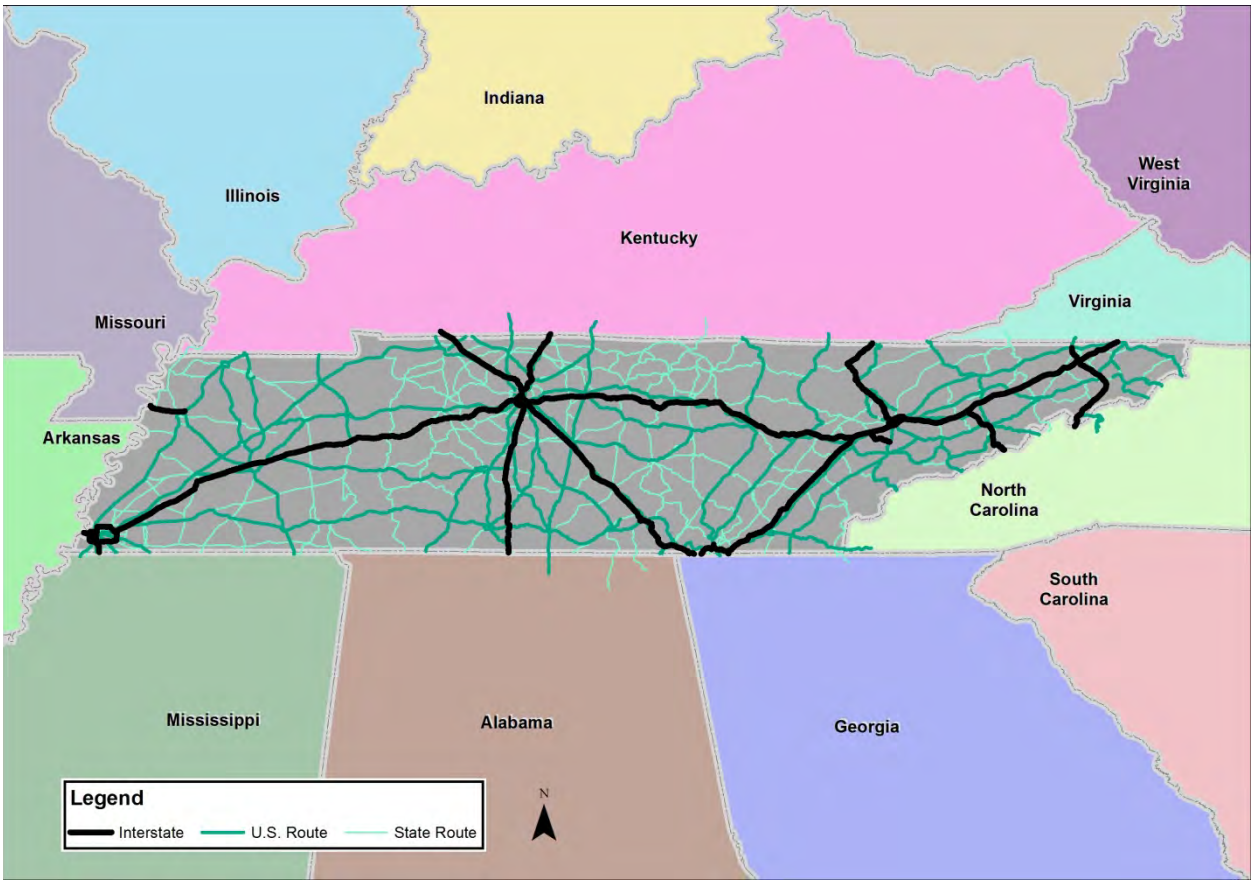


Source: Tennessee Transearch Data, IHS Inc., 2012

Arterials (U.S. and State Highways)

The majority of state-maintained roadways are state highways as shown in Figure 4-3. In Tennessee, there are 12,773 miles of State Highways[2]. This is 13% of all the roadway miles in the state. These roadways are important from a local and regional standpoint as they facilitate the movement of people and goods from local areas and through the urban areas.

Figure 4-3 U.S. and State Highways in Tennessee



Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 4-2 show that although state highways are important, the amount of freight they carry is much less in terms of total tonnage and value of the commodities. Some of the routes with the most freight are U.S. 61, U.S. 412, and U.S. 45 in the western part of the state. In middle Tennessee, SR 155 in Nashville serves as an important freight corridor for local industry. In the eastern part of the state, U.S. 23 and SR 32 stand out as freight corridors. Also, US-64 provides an east-west freight connection across the southern portion of the state.

First/Last Mile (Local/Urban Roadways)

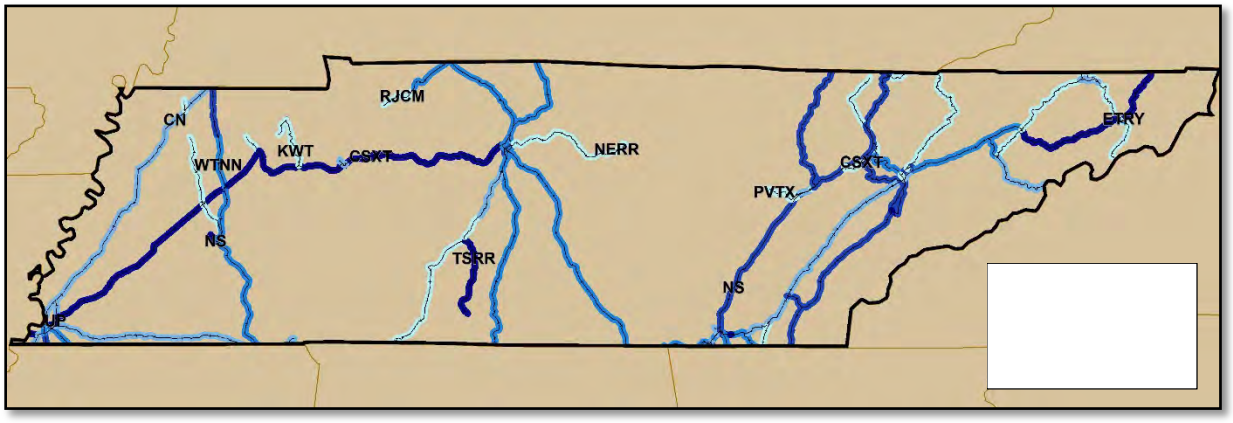
First mile/last mile roadways are connector facilities that link freight-intensive land uses to main freight routes. It is important to understand the importance of first mile/last mile connectors. They are generally the shortest portion of a freight trip; however, often times they are the most difficult to complete.

An example of such a connector road is Lamar Avenue (U.S. 78) in Memphis, along which are located BNSF's Memphis Yard, several warehouses, and distribution centers. It also passes near the Memphis International Airport. First-mile, last-mile connections, especially in well-populated urban areas, may experience issues such as traffic congestion, safety, freight-incompatible roadway geometry, and configurations resulting in delays to moving freight.

4.1.2 Railway Corridors

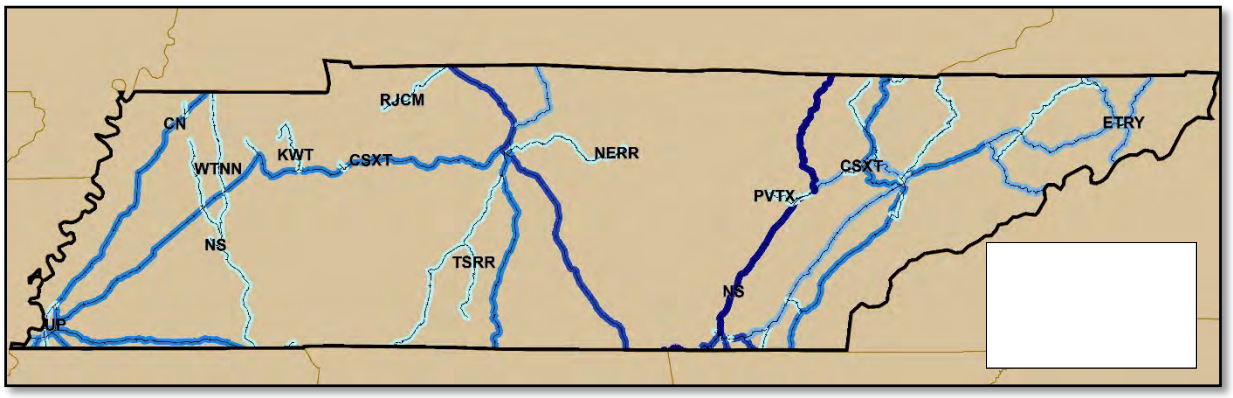
In 2012, 240 million tons of freight, equating to $260 billion, was moved by rail in Tennessee. Tennessee's rail system consists of approximately 3,780 track miles across the state and plays a major role in the movement of freight commodities. These miles are comprised of both short line and Class I railroads. The Class I railroads own 2,768 track miles which is 73.2% of the total track mileage in the state. The following four Class I railroads own and operate the majority of the railroad trackage in the state: Burlington Northern Santa Fe (BNSF), Canadian National (CN), CSX, and Norfolk Southern (NS). Two other Class I railroads operate track in Tennessee: Union Pacific and Kansas City Southern. Figure 4-4 and Figure 4-5 illustrates the tonnage and value of the commodities carried by the Class I railroads in 2012.

Figure 4-4 Rail Tonnage



Source: Tennessee Transearch Data, IHS Inc., 2012

Figure 4-5 Rail Commodity Value (Dollars)



Source: Tennessee Transearch Data, IHS Inc., 2012

The 2010 Annual Report prepared by TDOT's Multimodal Transportation Resource Division identifies the following 24 Class III's, short lines, operating within Tennessee:

- Caney Fork & Western Railroad (CFWR)
- Chattanooga and Chickamauga Railway (CCKY)
- East Chattanooga Belt Railway (ECTB)
- East Tennessee Railway, L.P. (ETRY)
- Franklin Mineral Industries (FIMX)
- Heritage Railroad Corporation (HR)
- Hiwassee River Railroad (HWRX)
- Kentucky West Tennessee Railway (KWT)
- Knoxville & Holston River Railroad (KXHR)
- Mississippi Central Railroad Co. (MSCI)
- Mississippi Tennessee Railroad, Inc. (MTNR)
- Nashville & Eastern Railroad Corporation (NERR)
- Nashville & Western Railroad Corporation (NWR)
- R.J. Corman Railroad Company- Eastern Tennessee Line (RJCR-ET)
- R.J. Corman Railroad Company-Memphis Line (RJCM)
- R.J. Corman Railroad Company- Tennessee Terminal (RJCK)
- Sequatchie Valley Railroad (SQVR)
- South Central Tennessee Railroad Company (SCTRR)
- Tennessee Southern Railroad (TSRR)
- Tennessee Valley Railroad Museum (TVRM)
- TennKen Railroad Company (TKEN)
- Tyner Terminal Railway (TNT)
- Walking Horse & Eastern Railroad (WHOE)
- West Tennessee Railroad Co. (WTNN)

The short line railroads consist of approximately 1,011 miles of track. These railroads focus on service to their individual customers within their respective geographies and support industrial locations and siting. For these railroads, there must be sufficient industry located along their line to sustain operations and enough investment from the railroads to sustain track classification. Unlike the Class I's, TDOT has supported short line bridge and track improvements via Tennessee's Transportation Equity Fund in order to create a strong linkage between short line and Class I rail systems in the state.

CSX

CSX Transportation operates more mileage in Tennessee than any other carrier at 1,003 route miles. Their tracks are located in the eastern, middle, and western parts of the state. From CSX's hub in Nashville, it is possible to connect with most parts of the eastern US. The CSX tracks connect Tennessee with the Chicago, Detroit, and Gulf of Mexico ports. CSX's line with the most tonnage in Tennessee is the line west of Chattanooga that travels north through Nashville and continues northwest into Kentucky. This route ultimately connects to Chicago as well as several points to the east, including as far as the East Coast and Canada.

Norfolk Southern

The Norfolk Southern (NS) Railway operates 847 route miles of primarily in the eastern part of the state near Chattanooga, Knoxville, and Johnson City. The NS Crescent Corridor runs through the eastern part of the US including portions of Tennessee and transports commodities to the eastern seaboard. An intermodal facility was opened east of Memphis in Rossville along the NS Crescent Corridor and is a vital part of moving freight to the Great Lakes and Gulf of Mexico. NS's most utilized freight route in Tennessee is a north-south line that runs from Chattanooga northeast towards Knoxville with connections to Detroit as well as the eastern U.S.

Burlington Northern Santa Fe

Burlington Northern Santa Fe (BNSF) operates 144 route miles in Tennessee including main, yard, industry trackage, and trackage right over other railroads. BNSF's main presence is in Memphis, but with trackage leading to the west and north, there are good connections to the Gulf of Mexico, Seattle, Los Angeles and Chicago. On the east side of the state, BNSF has leased their track to short line railroad companies, which provide the important first mile/last mile connections to the local industries.

Canadian Northern

The Canadian Northern/Illinois Central (CN/IC) Railroad operates 161 route miles in Tennessee. The main north-south CN/IC line - is primarily utilized as a link between Chicago and New Orleans/Mobile, but also passes through Memphis. One of CN's intermodal facilities, located in Memphis, makes Tennessee an important connection between the Gulf of Mexico and Chicago. The intermodal facility also provides an important connection west to Iowa and Nebraska along with a connection to Canadian ports.

Union Pacific

The Union Pacific (UP) Railroad is one of the largest Class I railroads in the country, operating almost exclusively west of the Mississippi River. The UP operates in the Midwest and western U.S. with hubs in Los Angeles, Oakland, and Seattle among many others. In Tennessee it operates just 14 route miles that runs from the intermodal facility in Marion, Arkansas to Memphis creating a connection between Memphis and the rest of the UP system.

Kansas City Southern

The Kansas City Southern (KCS) Rail Road operates in 11 states in the southern and central states with just 7 miles of track on the southern edge of Tennessee. This track connects to the Gulf of Mexico through Mississippi and connects to Mexico through Texas.

4.1.3 Waterways

According to the 2010 Annual Report prepared by TDOT's Multimodal Transportation Resource Division, there are 949 miles of navigable waterways in Tennessee (11th in the nation for mileage[4]). Of this length, 887 miles (93%) exist on the three main rivers in Tennessee: Tennessee (401 miles),

[4] American Society of Civil Engineers, 2013 Infrastructure Report Card

Cumberland (310 miles), and Mississippi (176 miles). These rivers feed into a larger network of inland waterways providing routes to the Gulf of Mexico and the Great Lakes. These provide important links in the transport of commodities regionally, nationally, and internationally.

Four public ports, five locks, and four lock and dams also make up the state's commercial waterway system. Two of the public ports, Port of Nickajack and Centre South River Port, are located on the Tennessee River, while the others, Port of Memphis and Port of Cates Landing, are located along the Mississippi River. The Port of Memphis is the 2nd largest inland port on the Mississippi River and the 4th largest in the U.S.[5] The American Society of Civil Engineers (ASCE) reported that the state's ports handled 33.7 million short tons of cargo in 2011 ranking it 22nd in the nation.[6] The majority of the locks and lock and dams are located along the Tennessee and Cumberland Rivers with one lock and dam located along the Clinch River. Several locks and dams are also located upstream of Tennessee's Inland Waterway System.

Mississippi River

The Mississippi River forms the western boundary of Tennessee and has 176 miles of navigable water in Tennessee[2]. There were 166.3 million tons of cargo shipped along this waterway in 2009, the most recent year for which waterborne commerce data are available. The primary commodities handled on the Mississippi River were Coal (27.5%), Food/Agriculture Products (23.3%), Petroleum Products (22.9%), and Crude Materials (15.2%) in 2009[7]. There are no locks on the Mississippi River in Tennessee, with the closest being at St. Louis, Missouri (Lock 27), which had 41,813 barges pass through in 2013[8]. There are two ports on the Tennessee side of the Mississippi River owned by port authorities, one at the Port of Memphis and one at the Port of Cates Landing. The Port of Memphis includes the Frank C. Pidgeon Industrial Park and Presidents Island, which has approximately 1,000 acres dedicated to industrial land use at more than 95% occupied.[9].

Tennessee River

The Tennessee River is the longest river in the state at 401 miles. There are two segments of the river: the western segment and the eastern segment. There were 39.2 million tons of cargo shipped on this river in 2009. Primarily, bulk commodities including Metals, Sand & Gravel, Aggregates, Petroleum, and Grain were shipped. There are five locks on the Tennessee River, only one of which is on the western segment, Pickwick Lock. The remaining four locks are on the eastern segment including Nickajack Lock, Chickamauga Lock, Watts Bar Lock, and Fort Loudon Lock. Two publically owned ports operate on this river: the Port of Nickajack and the Centre South River Port.

At Pickwick Landing, on the western segment of the Tennessee River, there were a total of 12,843 barges that passed though in 2013. Table 4-1 shows the barge traffic at the four locks on the eastern portion of the river[8].

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[5] https://www.tn.gov/ecd/graphics/maps/waterways2011.pdf

[6] American Society of Civil Engineers, 2013 Infrastructure Report Card

[7] TDOT Multimodal Transportation Resource Division Annual Report, 2010

[8] U.S. Army Corps of Engineers, Navigation Data Center – Lock Use, Performance and Characteristics

[9] http://www.portofmemphis.com/pres_island.asp

Table 4-1 Tennessee River Locks and Barge Traffic

Lock Name	Total Barges (2013)
Nickajack	2,377
Chickamauga	897
Watts Bar	716
Fort Loudon	513

Near the Tennessee-Alabama state line, just inside Alabama, is where the Tennessee River connects to the Tennessee-Tombigbee Waterway. This is an important route that provides a southern connection to the Gulf of Mexico.

Cumberland River

The Cumberland River has the second longest mileage in Tennessee at 310 miles. The total annual freight volume on the Cumberland River was 20.8 million tons in 2009. The main commodities shipped include Coal, Sand & Gravel, Aggregate, Grain, and Metals. Three locks are on the Cumberland River in Tennessee including Cheatham Lock, Old Hickory Lock, and Cordell Hull Lock. Table 4-2 shows the total barge traffic through the locks in 2013[8]. There are three privately owned ports in operation along the Cumberland River at this time.

Table 4-2 Cumberland River Locks and Barge Traffic

Lock Name	Total Barges (2013)
Cheatham	9,363
Old Hickory	4,922
Cordell Hull	17

4.1.2 Pipelines

There are over 6,000 miles of pipeline in Tennessee, which transport several different commodities. As with many non-highway modes, the State's jurisdiction over pipelines is limited, but it is nonetheless important to understand their role within the Tennessee commercial landscape. The largest commodity in terms of mileage of pipeline is natural gas. While the state produces less than 1% of the U.S.'s natural gas, it accounts for over 81% of the commodity transmission as of 2012[10]. Table 4-3 below summarizes the commodities transported by mileage and the percentage of the total commodity moved through Tennessee that was carried by both natural gas and other types of pipeline[11].

[10] U.S. Energy Information Administration Tennessee State Energy Profile, 2014

[11] U.S. DOT Pipeline and Hazardous Materials Safety Administration, 2012

Table 4-3 Tennessee Pipeline Information

Commodity	Pipeline Miles	Percentage
Highly-Volatile Liquid (HVL)	12	0.2%
Crude Oil	277	4.5%
Refined and/or Petroleum Product (Non-HVL)	866	14.1%
Landfill Gas	7	0.1%
Natural Gas	4,998	81.1%
Total	**6,160**	**100%**

Tennessee has one oil refinery located in Memphis, TN along the Mississippi River. The Valero Memphis Refinery (formerly of Premcor Refining Group, Inc.) has a total throughput capacity of 195,000[12] barrels per day. Valero receives crude oil from the Capline Pipeline as it crosses through western Tennessee on its route between the Gulf Coast and Midwest refineries. Valero then produces gasoline, diesel, jet fuel and petrochemicals. Its location on the river allows the refinery to serve many upstream markets and receive raw materials by barge. Valero also has the ability to transport jet fuel by pipeline directly to the Memphis International Airport. The Memphis site's logistic system includes the Collierville Crude System and the Memphis Products System, which is the refinery's primary distribution outlet for refined petroleum products.

4.1.3 Aviation

Tennessee is home to 79 public use airports. This includes five commercial service airports: Memphis International Airport, Knoxville's McGee Tyson Airport, Nashville International, Chattanooga Metropolitan, and Tri-Cities Regional in Sullivan County. The remaining 74 facilities are regional or local service (e.g. county or municipal) airports. In addition to the public airports, there are 132 private air facilities and 126 heliports throughout Tennessee[13]. This aviation system provides both commercial airline passenger and freight services, as well as other general aviation activities. The aviation industry generates an economic impact of approximately $3 billion and provides about 49,000 jobs.

The world's second busiest cargo airport, according to Tennessee's Department of Economic and Community Development, is located in Memphis. In fact, the Federal Aviation Administration reported that Memphis International Airport landed the greatest weight of cargo in the U.S. in 2012. The FedEx World Hub, located alongside Memphis' International Airport, houses 196 gates to serve its plane fleet. This site alone accounts for 63% of statewide air freight tonnage and 86% of statewide air freight value in Tennessee. The World Hub connects customers to more than 220 countries and territories on six continents. It is important that TDOT's Department of Aviation closely monitor this asset's progress, while also providing sufficient infrastructure for the inevitable truck moves on either end of the shipment. The U.S. Department of Housing and Urban

[12] Valero Website. http://www.valero.com/ourbusiness/ourlocations/refineries/pages/memphis.aspx

[13] Tennessee Department of Economic and Community Development, Transportation Factsheet

Development (HUD) and the City of Memphis have partnered through the FY 2010 HUD Community Challenge Grants Program to fund preparation of a comprehensive Master Plan for the Memphis Aerotropolis, Airport City target site. This effort recognizes that the region's growth and prosperity are intimately tied to the Memphis International Airport. The Airport City Master Plan presents a well-considered and coordinated plan of action to support reinvestment and guide future airport area development. Its implementable strategy will reinforce Memphis' position as the leading logistics and distribution center for the Mid-South Region, attracting business, creating employment opportunities, enhancing neighborhoods, and providing other benefits that address deficiencies in the community's social and physical infrastructure. In addition to the high volume of air freight movements in Memphis, Nashville, Knoxville, and the Tri-Cities, the Chattanooga and Smyrna Airports also ship significant amounts of cargo.

4.2 TENNESSEE INTERMODAL FACILITIES

Tennessee has several intermodal facilities around the state. Intermodal facilities can be any combination of goods movement between truck, rail, port, and air. Figure 4-6 shows the rail yards and rail intermodal facilities, along with intermodal port terminals and airport facilities. In general, intermodal facilities are concentrated in urban areas where manufacturing, warehousing, and other freight-heavy industries are located. The water and air multimodal facilities are shown in Figure 4-7. The large urban areas in Tennessee also have airports, which can handle cargo. One of the busiest areas for intermodal facilities is in Memphis, which is home to the Port of Memphis, the 4th largest port in the U.S., and the Memphis International Airport, which is one of the busiest airports in the world for cargo shipments which is largely due to the FedEx hub located there.

Figure 4-6 Intermodal Infrastructure in Tennessee

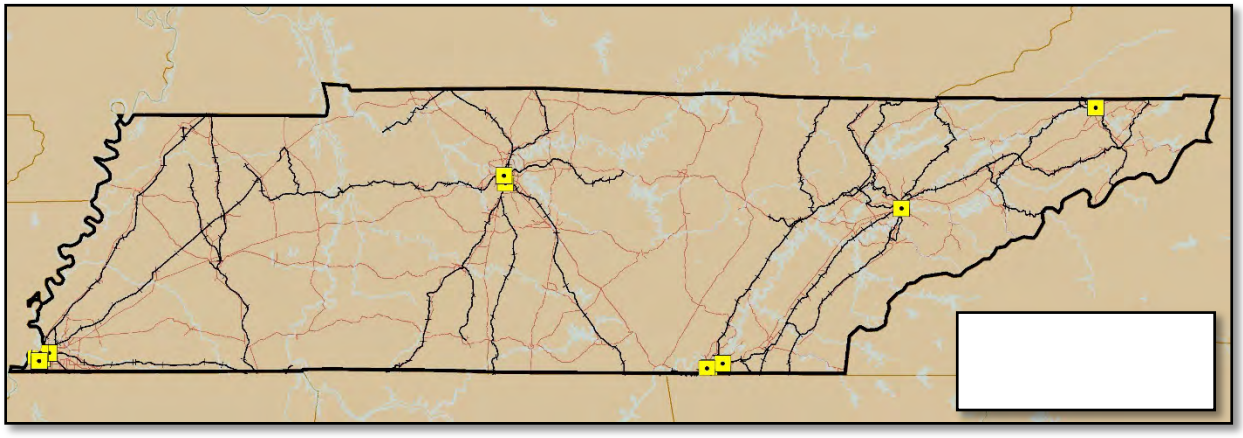
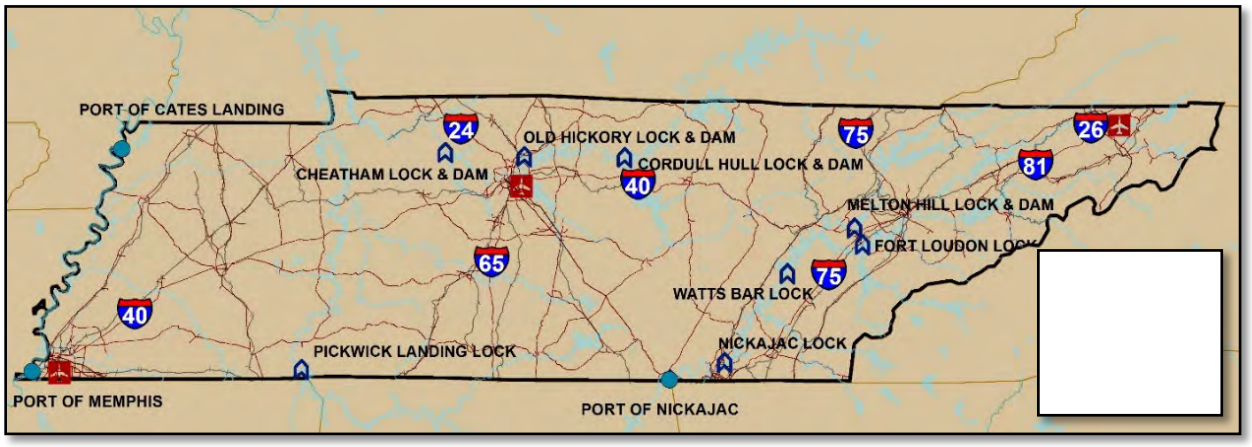


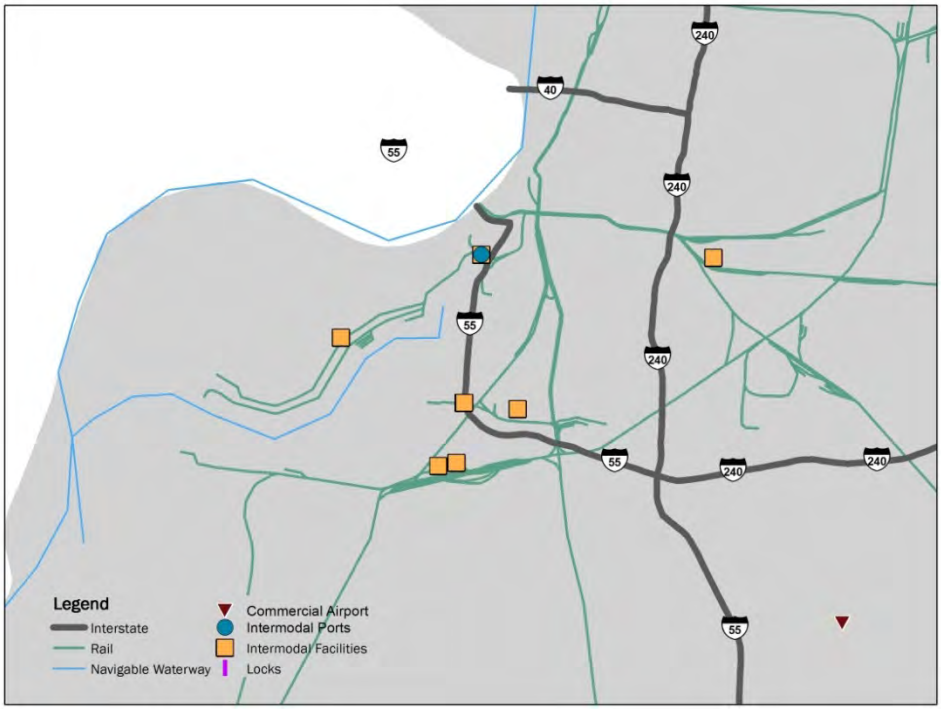
Figure 4-7 Marine Infrastructure and Commercial Airports in Tennessee



4.2.1 Intermodal Facilities in Tennessee Major Metropolitan Areas

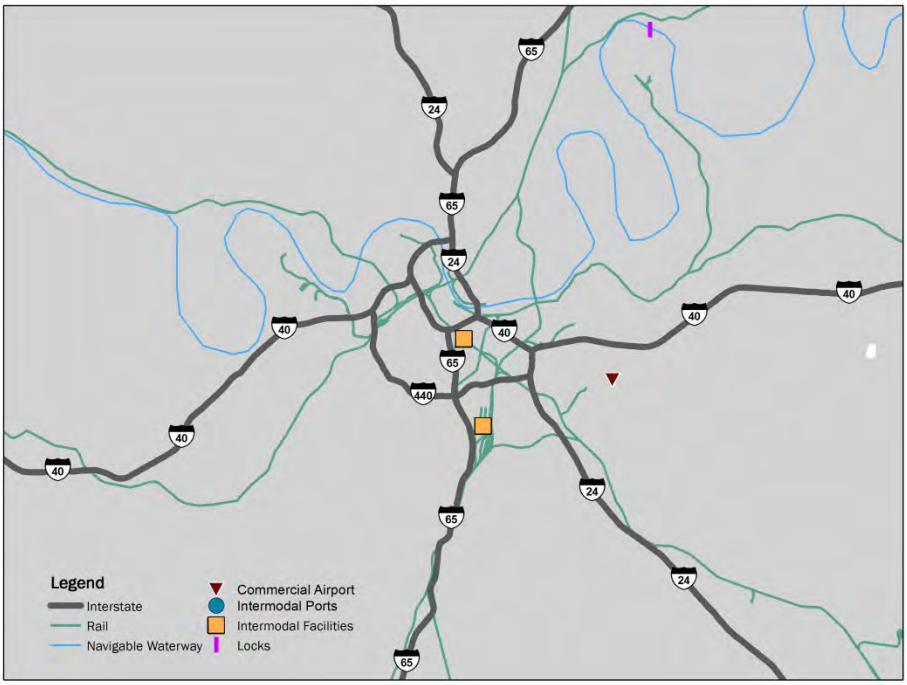
Of the cities in Tennessee, Memphis has the most intermodal facilities. The Memphis area is ideally situated to support intermodal facilities with direct access to the Mississippi River, interstates, rail, and an international airport. Intermodal rail yards in the area include the newly expanded Memphis Yard, Harrison Yard, Forrest Yard, and Marion Yard in Arkansas. As mentioned previously, the Class I railroads serving the area include the UP, NS, BNSF, CSX, and CN. The Port of Memphis supports a large amount of port activity on the Mississippi River. These ports and rail yards are further served by the Memphis International Airport, which is the hub for FedEx. The intermodal facilities for the cities of Memphis and Nashville are shown in Figure 4-8 and Figure 4-9.

Figure 4-8 Intermodal Infrastructure in Memphis



Radnor Yard in Nashville is the main intermodal rail yard in the city and is operated by CSX. Three private port terminals are situated along the Cumberland River, which supports important freight movement of heavy commodities that would otherwise be moved by truck or rail.

Figure 4-9 Intermodal Infrastructure in Nashville



In addition, to these intermodal facilities in Memphis and Nashville, Burkhart Yard near Knoxville is served by NS and also has a barge terminal on the Tennessee River. Proposed projects, such as NS's proposed intermodal facility in east Tennessee along the Crescent Corridor are likely to increase freight activities in Tennessee.

4.3 ENERGY DEVELOPMENT CORRIDORS

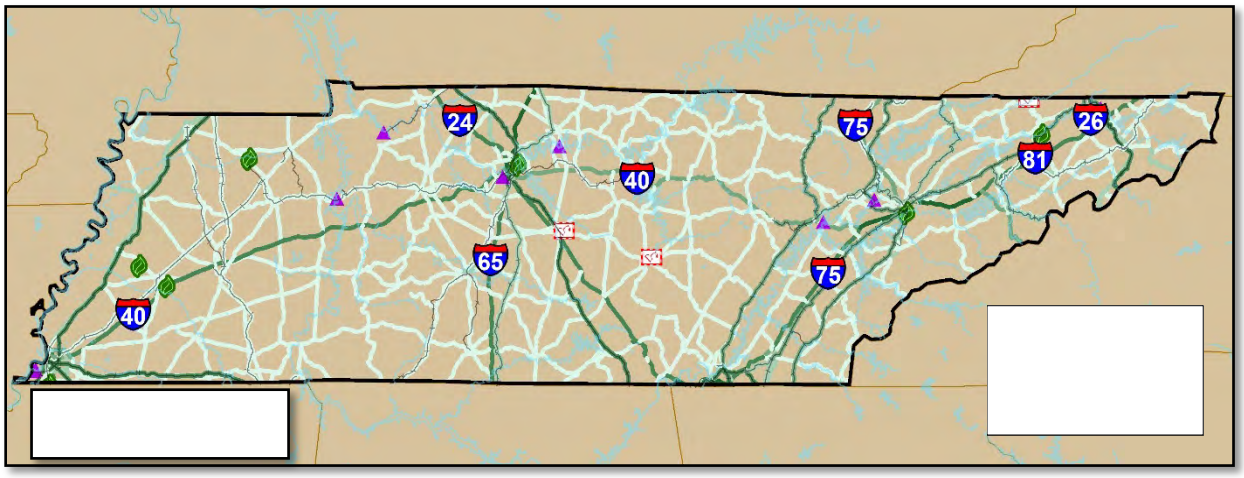
Tennessee is not a major exporter of energy development products such as coal and natural gas; however, these commodities enter the state either to be used within Tennessee or on their way to other destinations. In 2012, approximately 1.2 billion tons of coal and another 365 million tons of energy development products (crude oil, gasoline, petroleum, and natural gas) moved through and within Tennessee. Sharing a border with Kentucky, one of the top coal-producing states and home to the largest natural gas field in the Appalachian Basin, it is not surprising that energy commodities pass through Tennessee. The major corridors for transporting energy commodities are shown in Figure 4-10.

By and large commodities to support energy are transported on rail or barges with trucks used to complete the last-mile connections when needed. Coal, crude oil, and petroleum are mainly transported in Tennessee along the major rail corridors through Memphis, Nashville, and Chattanooga. Crude oil and petroleum travel primarily along the CN line between the Gulf of Mexico, Chicago, and the Midwest and the NS line between Chattanooga, the Gulf of Mexico, the

Midwest, and east coast. These commodities also travel along the I-40 and I-65 corridors. In addition, the navigable waterway system in Tennessee also supports the movement of energy development products.

Natural gas is transported along all major interstates and rail lines passing though Tennessee, but it is also moved via pipeline as described in Section 4.1.2. The only refinery in the state of Tennessee is located at the Port of Memphis and has a pipeline that carries jet fuel directly from the refinery to the Memphis International Airport[14].

Figure 4-10 Key Corridors for the Transport of Energy Development



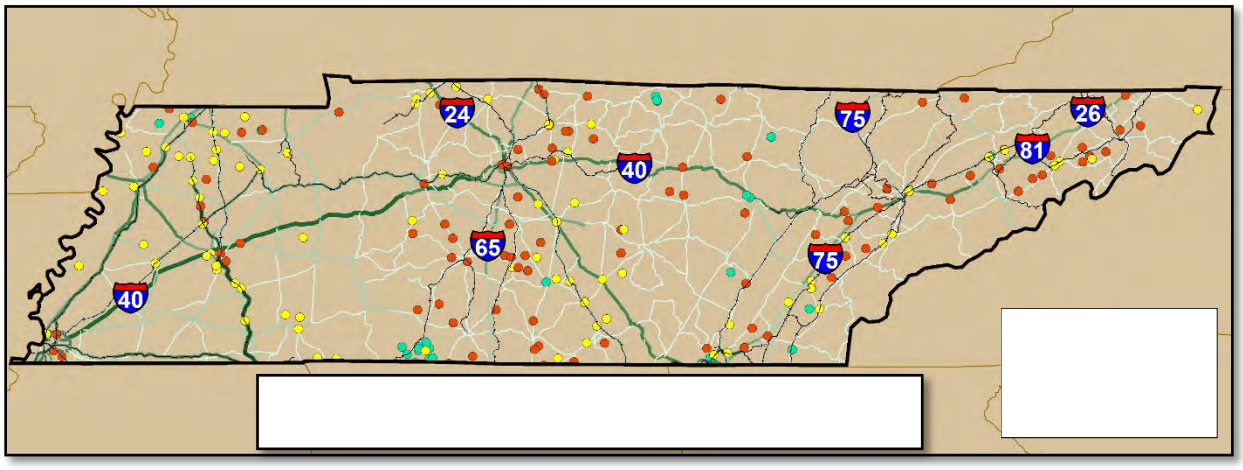
Source: Tennessee Transearch Data, IHS Inc., 2012

4.4 AGRICULTURE CORRIDORS

Tennessee is a manufacturer of agricultural products, with the major crops being corn and soybeans. Most of the animal farms in the state are either cattle or poultry. Tennessee's agricultural activity occurs throughout the state with corn and soybeans farms being located more in the western part and livestock in the middle and eastern portions of the state with a few meat-related activities in the northwest corner. The I-24, I-40, I-65, and I-81 corridors are key corridors for agricultural industries in Tennessee. A total of approximately 73 million tons of grain, beef, poultry, and dairy products are harvested in Tennessee. Wheat and non-sweet corn constitute the majority of the agricultural products transported in bulk via rail cars.

[14] http://www.portofmemphis.com/vitals1.asp

Figure 4-11 Key Transportation Corridors supporting Agricultural Industries

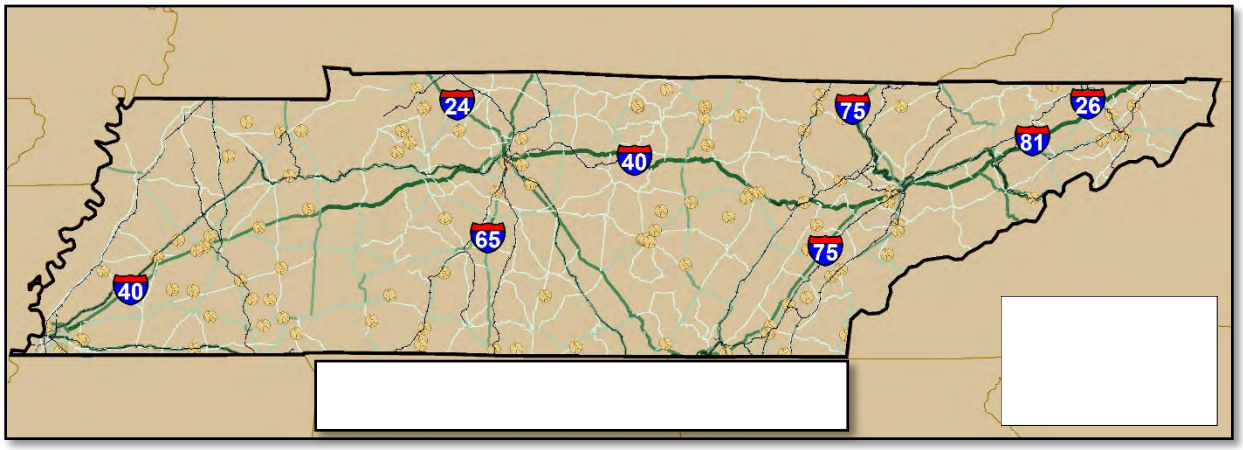


Source: Tennessee Transearch Data, IHS Inc., 2012

4.5 TIMBER PRODUCTION CORRIDORS

Logging and manufacturing of wood products still occurs in Tennessee and can be seen by the number of logging companies, lumber wholesalers, and timber companies shown in Figure 4-12. These are not major industries in Tennessee based on either tonnage or value of commodity moved. In 2012, approximately 180 million tons of wood products were produced in Tennessee totaling approximately $193.5 billion. Logging is concentrated in the more rural areas, away from major interstates or other major transportation infrastructure. As such, the state highways support the movement of logging trucks from tree farms or other private lands to the interstate system. The lumber wholesalers are mainly located in major urban areas, and companies rely on the Interstate system to move their wood products to the wholesalers.

Figure 4-12 Logging Companies, Lumber Wholesalers, and Timber Companies in Tennessee



Source: Tennessee Transearch Data, IHS Inc., 2012

5. Conditions and Performance of the State's Transportation System

5.1 INTRODUCTION

An efficient freight system is an essential ingredient for economic development and enhancing the State's economic competitiveness in the national and global marketplace. Anticipated population and economic growth will continue to increase the pressures on an already heavily utilized transportation system. Current issues such as aging infrastructure and congestion will only be exacerbated. Aside from growth within, the State's geographic position as a "through" state will ensure increased usage of Tennessee's roadways, railways, waterways, and airports. Seeing that key freight industry sectors currently account for nearly 40% of Tennessee's total GDP, it is essential that the transportation network keep up with this anticipated demand in an efficient and timely manner.

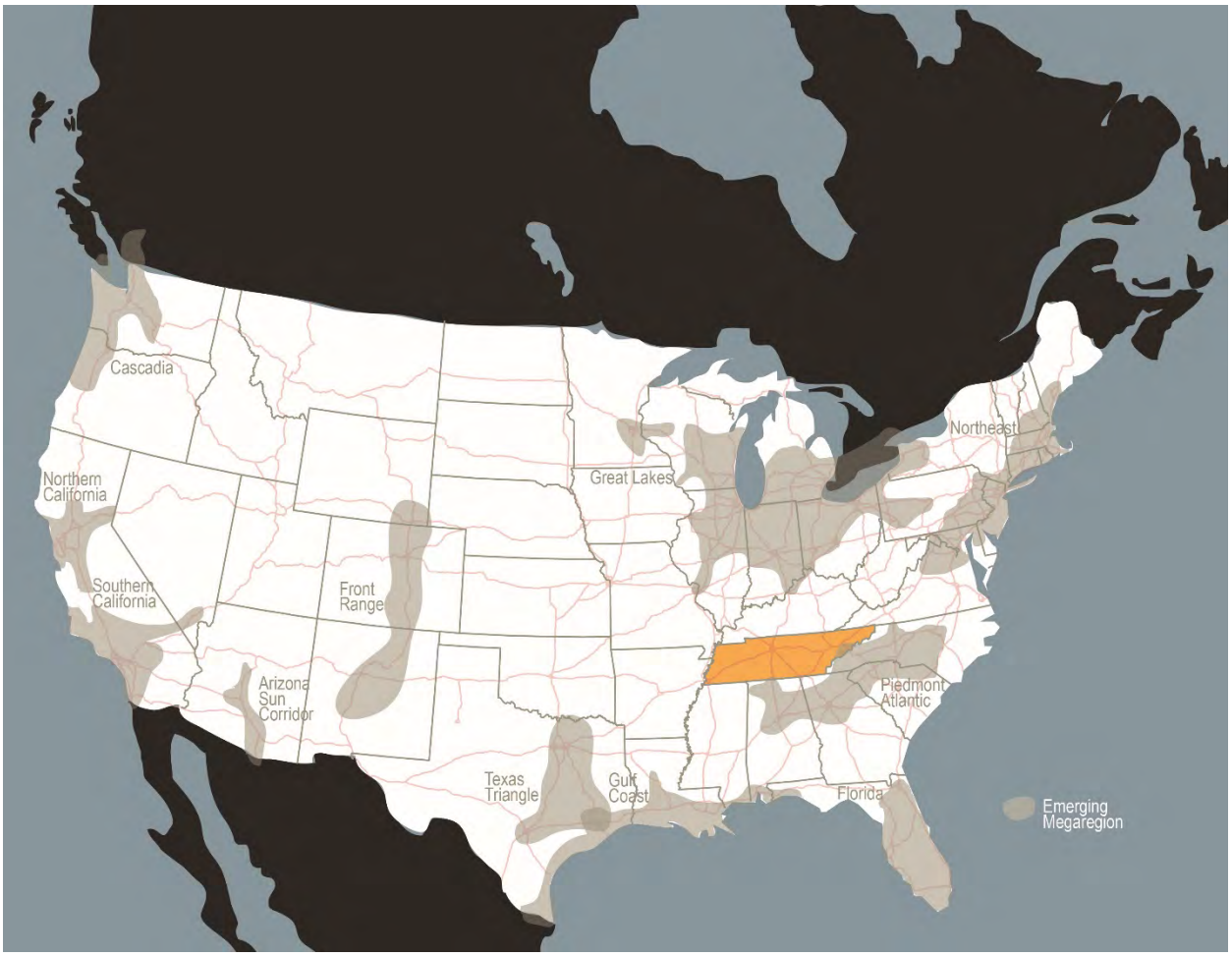
In order to guide cost effective capital and operating investments it is important to understand Tennessee's current multimodal freight transportation system. Freight-related issues regarding bottlenecks and safety will be discussed to understand common barriers to the system's efficiency. Stakeholder perceptions of the system's performance will also be discussed to provide a more comprehensive and inclusive analysis. Performance measures will be outlined that will help the public and TDOT evaluate effects of constructed projects on freight movement in the state.

5.2 PERFORMANCE OF TENNESSEE'S FREIGHT TRANSPORTATION SYSTEM

5.2.1 Roadways

There are approximately 95,500 miles of roadway in the state of Tennessee, of which approximately 15% are state-maintained. While only 1 percent (1,100 miles) of the total roadway miles is part of the Interstate System, these roadways are a primary link and critical resource for truck freight movement in Tennessee. These interstates make the majority of U.S. markets within an approximate day's drive, especially connecting to nearby emerging Texas Triangle, Northeast, DC-Virginia, Great Lakes, Piedmont Atlantic, Gulf Coast, and Florida Megaregions.

Figure 5-1 Mega Regions



Source: America 2050

In relation to other states, Tennessee is outperforming in the delivery of highway-related services. According to 2010 Highway Performance Monitoring System (HPMS) data, 63.9% of Tennessee's roads are ranked as either good or very good, while the corresponding national value is only 40.3%. Limited funding for preserving and improving Tennessee's transportation infrastructure may, however, affect the quality of Tennessee's transportation infrastructure over time. Tennessee will need to continue to track the balance between local, regional and through traffic. Although the majority of movements are through, Tennessee benefits from federal investment on national corridors, a portion of which are in the state. The industrial supply chains will continue to adapt in the regional and global marketplace, adding further impetus for Tennessee to track the freight balance.

Beyond roadway conditions, other factors may require investments to maintain an efficient freight transportation system. A good example is truck parking. The trucking industry (private sector companies making use of public transportation infrastructure investments) is currently implementing new industry requirements promulgated with the MAP-21 legislation. Changes in "hours of service" regulations require additional driver breaks and rest, administration, and driver logs. In response to these requirements, and an increase in truck traffic in general, the public

sector may need to provide additional or expanded facilities and truck parking rest areas. Some states have already begun this process by increasing the number of locations that allow truck parking and using technology to better inform drivers. For example, real-time truck parking systems allow drivers to not only locate rest stops, but locate ones with open truck stalls.

5.2.2 Railways

Of the seven Class I railroads currently operating in the U.S., six operate within Tennessee: Burlington-Northern Santa Fe (BNSF), Canadian National (CN), CSX Transportation (CSXT), Kansas City Southern Railway (KCS), Norfolk Southern (NS), and Union Pacific (UP). There is a total of approximately 1,679 route miles of Class I railroads in Tennessee, with CSXT and NS owning nearly 1,487 of these miles. The 2010 Annual Report prepared by TDOT's Multimodal Transportation Resource Division identifies a number of Class III's, short lines, operating within Tennessee. The 24 short line railroads consist of approximately 867 route miles.

Each railroad examines their network for capacity, connectivity, and freight flows across their respective networks seeking opportunities for improvement. Current barriers to the rail system's efficiency include infrastructure updates and intermodal congestion issues. As Class I railroads upgraded their track for 286,000 pound rail cars, Class III railroads (shortlines) have had to respond to this change in order to continue to serve their customers. With shortline railroads comprising approximately a quarter of the railroad track miles in Tennessee, upgrading shortline track to 286,000 pound track capacity is important to Tennessee's freight transportation system. A 2005 study conducted by TDOT identified that a $200 million investment would be needed to bring the short line tracks up to the 286k car standard. As of 2011, 39% had been retrofitted for this standard.

5.2.3 Aviation

According to TDOT's Best Practices for Statewide Freight Planning, enplaned and deplaned cargo is expected to grow by nearly 500% between 2002 and 2035. Threatening the freight aviation system's ability to accommodate this growth is having adequate space for freight activities at major airports. Airports generally tend to evaluate themselves in terms of passenger travel, such as the ability to support the volume of origin/destination and through passengers and the ability to meet their shifting needs and amenities. Left up to these individual airports, passenger accommodation oftentimes limits available area for air freight facilities. Additionally, airports are often limited in their ability to expand due to encroachment of urban and suburban growth. TDOT must be able to plan for and accommodate traffic generated around and through airports to facilitate the efficient movement of people and goods. Similar to the Land Use Compatibility Manual in Minnesota, TDOT should develop a Land Use Compatibility Manual to quantify and help lesson effects of air traffic on surrounding land uses, as well as preserve the land around airports for future expansion.

5.2.4 Waterways

While water transportation is the slowest mode of goods movement, barge shipments are the most cost effective, environmentally friendly, and safest mode compared to the other modes. Bulk goods, which make up the top commodities shipped by waterway are expected to grow around

60% for both weight and value between 2002 and 2035 according to the State's Best Practices of Statewide Freight Planning.

The age and condition of the lock and dam system for the US inland waterways are as important as the specific structures in Tennessee. As the system continues to age and accumulate more deferred maintenance there is an increased concern for the systems effectiveness. One of the specific concerns to stakeholders is the Chickamauga Lock on the Tennessee River seven miles northeast of Chattanooga. If conditions of the Chickamauga Lock deteriorate to the point where it needs to be closed, it would eliminate 318 miles of commercial navigation waterways.

5.3 EVALUATION OF PERFORMANCE

5.3.1 Bottleneck Analysis

While performance measures for bridge and pavement give a good indication of the physical quality of the system, perceived quality is subjective and oftentimes related to congestion and the induced delay users experience on the system. In order to accurately select projects to improve the efficiency of the system, bottlenecks must be defined and identified in the context of Tennessee's multimodal freight system.

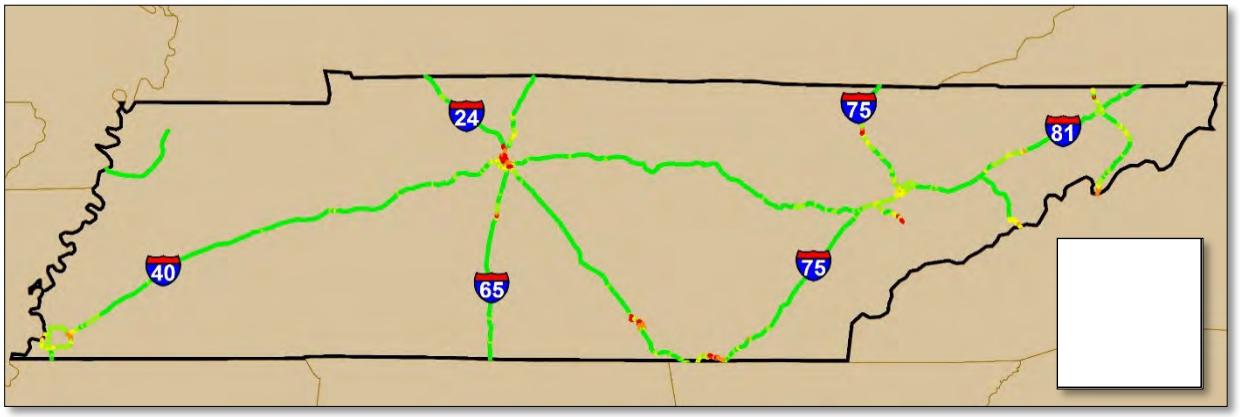
Typically, the term bottleneck is associated with a blockage of traffic flow within the roadway infrastructure. In terms of freight, a bottleneck may have a broader meaning, specifically for trucks. Bottlenecks can be caused by typical congestion, where the volume of a roadway exceeds its capacity, typically during peak hours. In addition to normal congestion, trucks also experience bottlenecks from operational and geometric issues. For instance, many state routes, which can serve as major freight corridors, make use of traffic signals; while they allow for minor street traffic to access the facility easier, signals also induce large amounts of delay for trucks that take considerable amounts of time and energy to accelerate and decelerate along these segments. Steep grades are another form of bottlenecks for trucks as they force larger vehicles to traverse at slower speeds, decreasing their efficiency. Lane drops are also common causes of bottlenecks, both for freight and passenger movements as the capacity of the roadway segment is decreased suddenly. In addition to roadway congestion and operational issues, bottlenecks for trucks can also occur at weigh stations, where they must wait in line to be serviced and intermodal facilities where they must wait for transfers.

While they are traditionally thought of in terms of the roadway system, bottlenecks can also occur in rail, air, and waterway systems. In terms of rail, bottlenecks can result from obstructions on the rail lines, delays incurred at intermodal facilities, and steep grades on rail facilities, similar to roadways. Aviation bottlenecks can occur at airports as freight is being loaded and unloaded, but can also reference congestion on airport runways, which often result from weather events and schedule changes. Waterways also experience bottlenecks, though they result from different issues. Inland waterways in particular experience significant delays while waiting in locks and for tows. They are also susceptible to weather events such as flooding and drought, which may induce delay for shipments. Ports can also experience congestion when shipments are not staggered in time.

Noting all of the complexities of identifying bottlenecks, both for trucks and other modes, multiple data sources were employed to determine their location throughout the state. Data related to truck speeds from GPS data, capacity analysis, and truck volumes were all used to identify areas where bottlenecks consistently occur on the roadway system. GPS data used in this study included truck speed data from the ATRI 2012 data set and the Federal Highway Administration's (FHWA's) National Performance Management Research Data Set (NPMRDS). With regard to capacity, TDOT's EValuation of roadway Efficiency (EVE) program was used in conjunction with TDOT's Tennessee Roadway Information Management System (TRIMS) network to evaluate the overall level-of-service (LOS) of roadway segments, although this metric includes passenger and freight movements into the calculations. While TDOT's TRIMS network contains recent truck volume data from 2012, additional data from the Freight Analysis Framework (FAF) was used to analyze forecasted truck volumes on roadway facilities for 2040.

The ATRI data uses GPS units that are installed in trucks to record position and speed data throughout truck hauls, although it is only available for interstates in Tennessee. For this analysis, data was examined for the first six months of 2012 to determine where truck speeds are the lowest on the interstate system. Figure 5-2 below shows the average speed of trucks for the month of March in 2012, which was deemed a representative sample of corridor congestion throughout the state.

Figure 5-2 Average Truck Speeds on Interstates



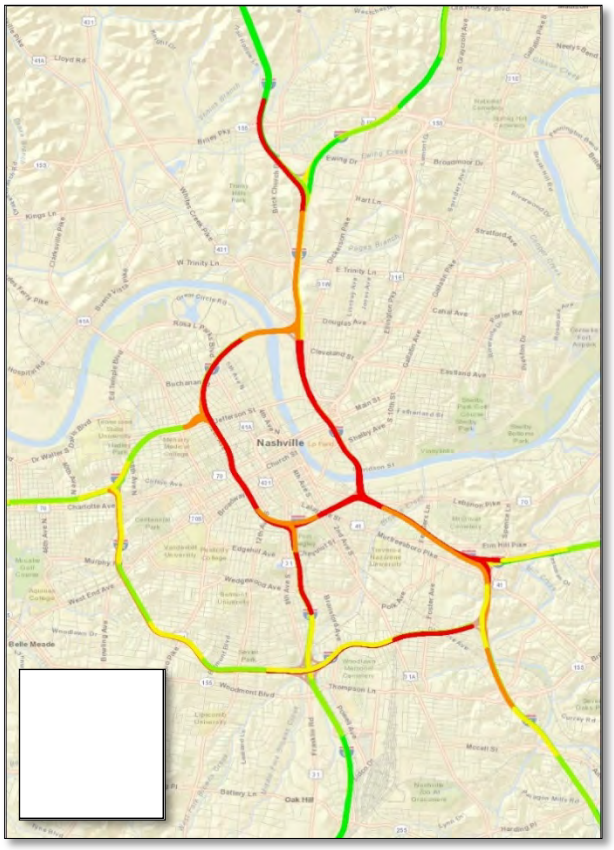
Source: ATRI. 2012

At a closer look, many of the corridors exemplify some of the typical causes of bottlenecks. For instance, in Memphis and Nashville, routine congestion on the interstates causes bottlenecks for trucks, as seen in Figure 5-3 and Figure 5-4. Due to the varying geography across the state, mountainous terrain in east Tennessee causes bottlenecks as trucks slow down significantly to traverse steep slopes as seen in and around Chattanooga and north of Knoxville in Figure 5-5 and Figure 5-6.

Figure 5-3 Average Truck Speeds in Memphis

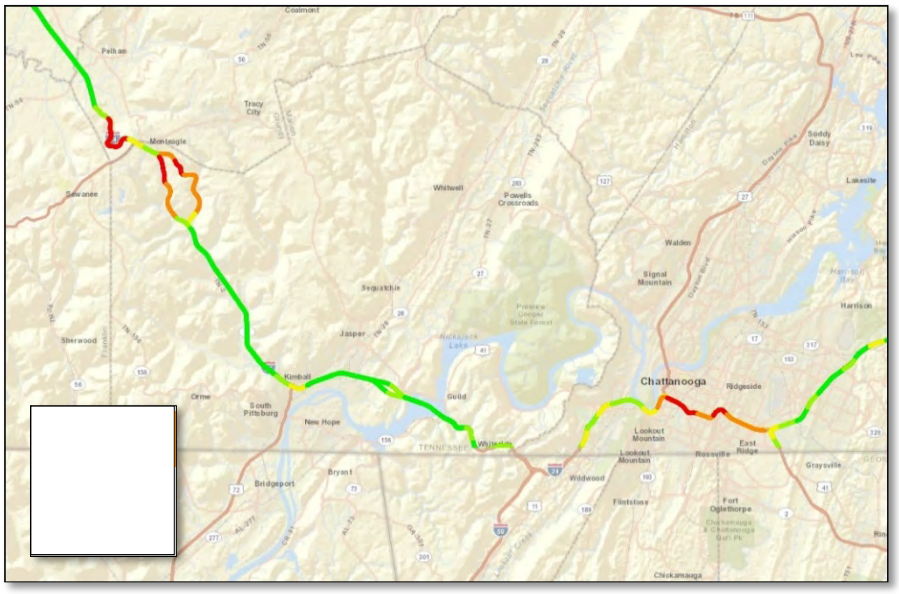
Source: ATRI, 2012

Figure 5-4 Average Truck Speeds in Nashville



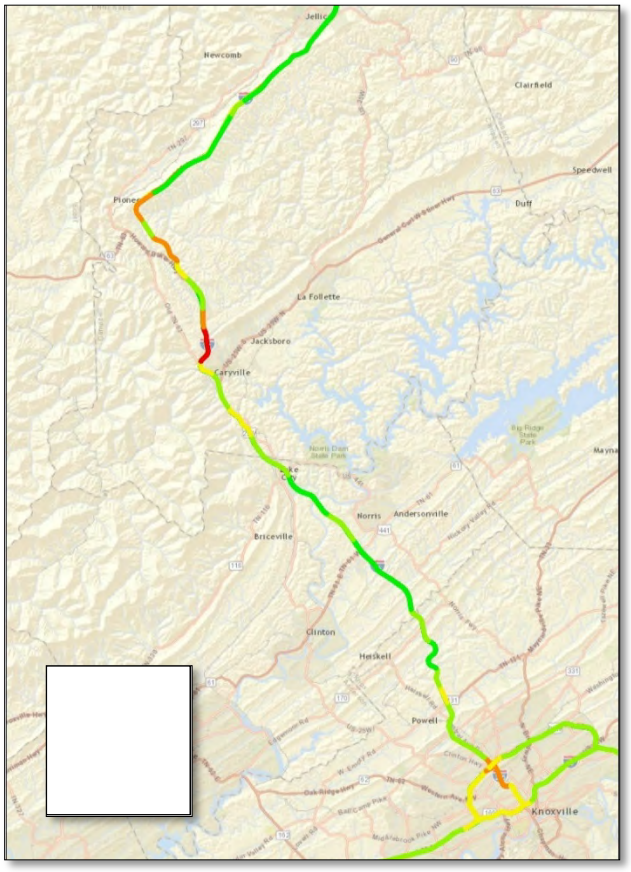
Source: ATRI, 2012

Figure 5-5 Average Truck Speeds in Chattanooga



Source: ATRI, 2012

Figure 5-6 Average Truck Speeds in Knoxville



Source: ATRI, 2012

In addition to examining the raw data, ATRI produced a report that identified the top 100 congested locations in the nation based on the time spent below free flow speed for trucks during peak hours. Of those top 100 locations, the following four were located in urban areas of Tennessee:

- Nashville - Interstate 24 at Interstate 440, Rank=19, Average Peak Hour Speed=42 mph
- Nashville - Interstate 40 at Interstate 65, Rank=40, Average Peak Hour Speed=35 mph
- Memphis - Interstate 40 at Interstate 240, Rank=73, Average Peak Hour Speed=46 mph
- Nashville - Interstate 65 at Interstate 24, Rank=77, Average Peak Hour Speed=48 mph

In addition to this report, ATRI also produced information on the costs incurred by the trucking industry due to congestion[1]. Delay induced by the transportation system is important to consider, especially for truck traffic, as the freight industry contributes heavily to the economic competitiveness of the state. Interestingly, between 2012 and 2013, Tennessee's cost of congestion decreased by 7.5%, which equates to nearly $17 million. The cost of congestion per interstate mile in Tennessee and in its metropolitan areas in 2013 is shown in Table 5-1.

Table 5-1 Cost of Congestion in Tennessee

	Percent of TN's Congestion Costs	2013 Cost of Congestion	Percent Change from 2012	Cost per Interstate Mile
Chattanooga	15%	$31,783,890	-13.0%	$106,412
Clarksville	3%	$5,421,203	340.6%	$47,635
Cleveland	0%	$854,278	-53.8%	$14,874
Jackson	0%	$675,996	-15.9%	$11,097
Johnson City	0%	$862,234	-3.3%	$9,011
Kingsport/Bristol	1%	$2,039,229	-30.2%	$14,851
Knoxville	4%	$7,473,597	24.7%	$35,498
Memphis	12%	$24,031,762	0.8%	$73,190
Morristown	2%	$3,341,667	94.4%	$44,948
Nashville	63%	$131,778,037	-1.1%	$243,669
Statewide	**100%**	**$208,126,970**	**-7.5%**	**$88,486**

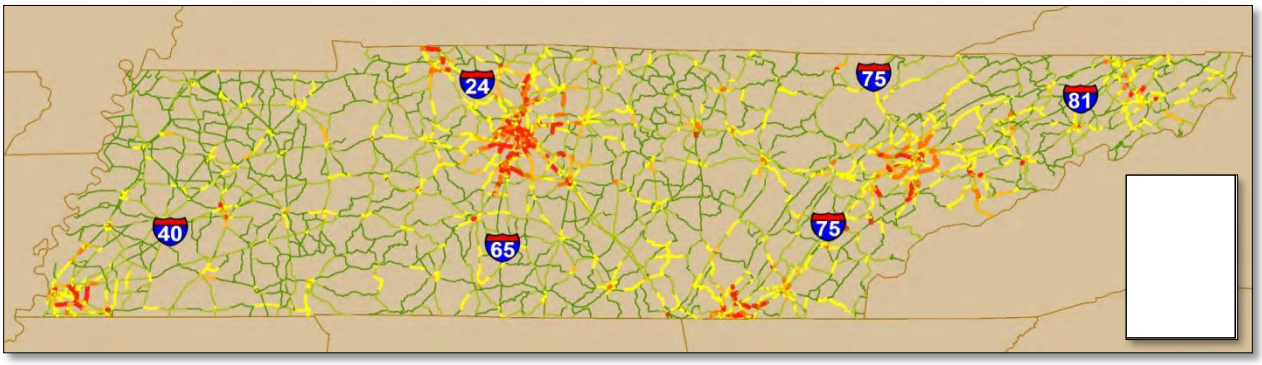
Truck speed data was also examined using NPMRDS data from FHWA. This data set includes probe vehicle-based travel time data for 5-minute intervals for both truck and passenger movements along the National Highway System (NHS). It is important to note that this data set includes the

[1] American Transportation Research Institute, Cost of Congesiton to the Trucking Industry, April 2014.

probe data for passenger vehicles as well as freight movement data provided by ATRI. After examining the data, it appeared that there were significant gaps where travel time data was missing from vital links such as interstates. Due to these and other similar gaps in the data and the fact that truck speeds had already been captured by the analysis of ATRI data, the NPMRDS data was not used for analysis of bottlenecks for this study.

A brief look at capacity analysis of roadway segments was also used to determine congested corridors that could potentially function as bottlenecks for freight movement. TDOT's TRIMS database in conjunction with its EVE program have assigned a 2013 LOS based on demand and capacity along the segments; it is important to note that the analysis includes both passenger and truck volumes. Figure 5-7 shows the network with LOS assigned to each roadway.

Figure 5-7 Level of Service on Tennessee Roadways

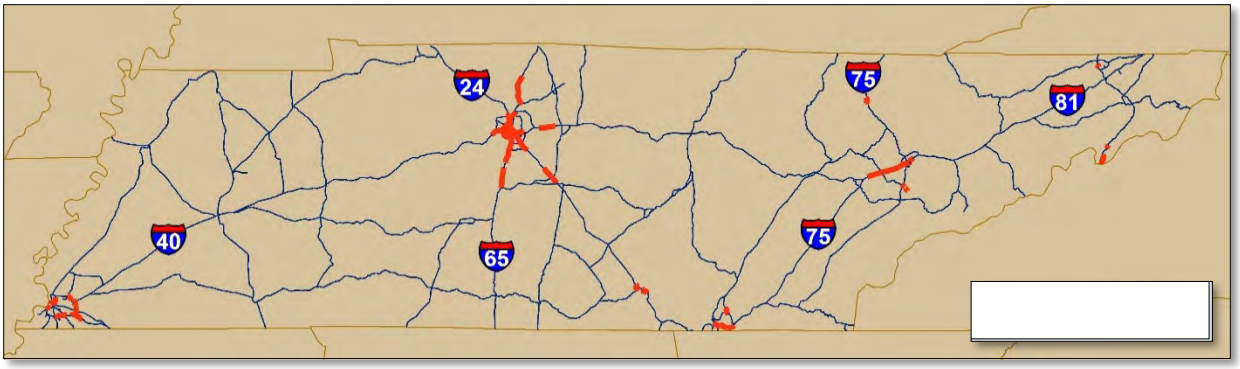


Source: 2013 TDOT TRIMS/EVE

Based on a combination of speed, volume, and LOS data from these sources, 32 bottleneck locations were identified for potential improvements and are shown in Figure 5-8. Each segment identified as a possible bottleneck met one of the following conditions:

- Had a LOS of F and a truck volume greater than 5,000 trucks per day
- Had an average daily truck speed of less than 45 mph

Figure 5-8 Potential Bottleneck Locations



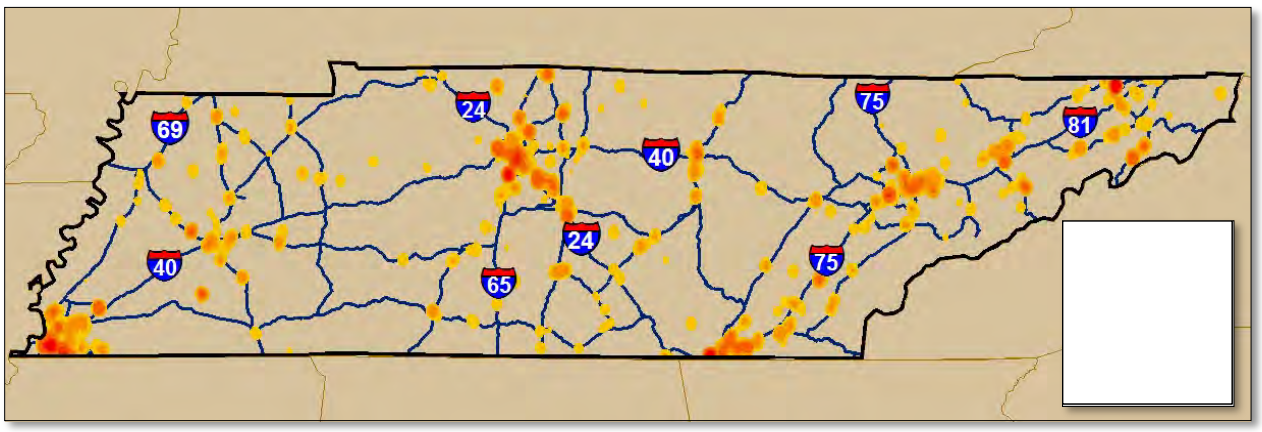
Of those 32 locations, 15 have truck volumes greater than 10,000 and six have truck volumes over 20,000. Most of these locations are concentrated in and around the four major urban areas of the state. However, many of the locations found in east Tennessee and in more rural areas of the state are primarily due to the impacts of terrain on truck speeds. The increased planning focus for freight transportation will need to address the vehicle mix and its effect on infrastructure design, as volumes continue to grow.

5.3.2 First and Last Mile Analysis

A bottleneck analysis is helpful to determine where delays occur on the major elements of the transportation system. However, freight traffic accesses this network through lower-classified facilities. First mile/last mile analyses can be used to address these elements of the transportation system that may inhibit freight mobility. A variety of relevant data was used to examine the need for improvements, specifically those relating to highway truck movements; such data sources included information on congestion levels, truck volumes, freight trip generators, and highway connectivity.

To begin identifying where first and last mile improvements may be needed, Tennessee industries were examined using 2013 InfoGroup data, which includes employment data for various industries across the state. In an effort to narrow this analysis down, however, a list of industries deemed freight-dependent were pulled from this data set by North American Industry Classification System (NAICS) code and examined separately. Overall, a total of 26 NAICS codes were selected and included those businesses that rely on freight movements such as manufacturing, trucking operations, and many others. Using this data, the following heat map shown in Figure 5-9 was created to depict locations that had a high concentration of these freight-dependent industries. The intensity of economic activity was based on the number of employees at each location, which necessitated a closer examination in some areas as headquarter locations for industries oftentimes indicated intense freight activity due to the number of employees, but in reality, produce little to no freight traffic.

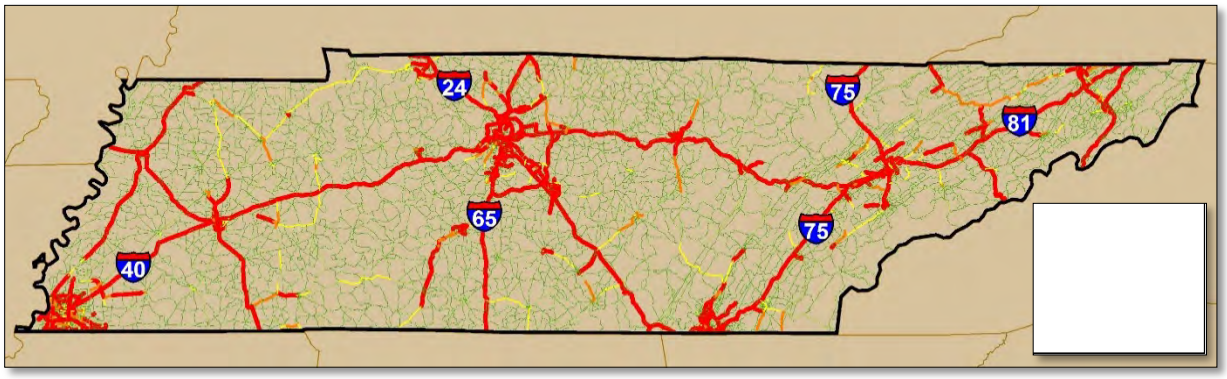
Figure 5-9 Intensity of Freight Activity



In addition to the economic data, traffic data was used to determine locations along the highway network that currently experience relatively high truck volumes on a daily basis. To do this, data from TDOT's TRIMS network was utilized and is depicted in Figure 5-10. As expected, the interstate

system as well as numerous state routes were found to have high truck volumes. However, there are segments in more rural areas of the state that experience high truck volumes as well. FAF data was also examined in this process although FAF data reports truck volumes for a base year of 2007 in contrast to TRIMS, which reports 2012 truck volumes based on classification counts and estimation procedures.

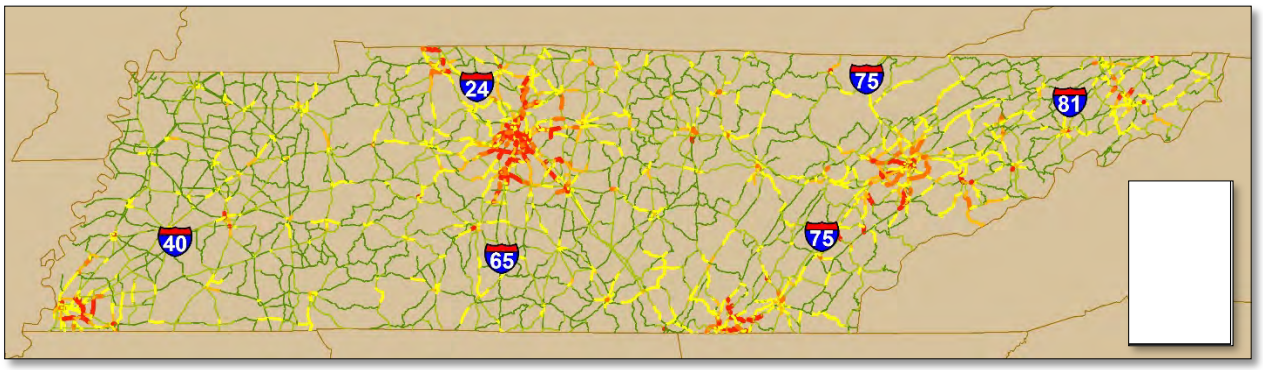
Figure 5-10 2012 Daily Truck Volumes



Source: 2013 TDOT TRIMS

Another traffic component to the first and last mile analysis consisted of examining the level-of-service (LOS) of these same facilities as maintained by TDOT's EVE program. Similar to a report card, the LOS of a roadway depicts how well the segment functions based on the capacity available and the traffic demands. As seen in Figure 5-11 below and previously in Figure 5-7, the LOS is worst on urban facilities, where congestion plays a large role in the functionality of a roadway. The more rural areas of the state typically experience lower levels of congestion and therefore, better LOS, as expected.

Figure 5-11 Level of Service on Tennessee Roadways

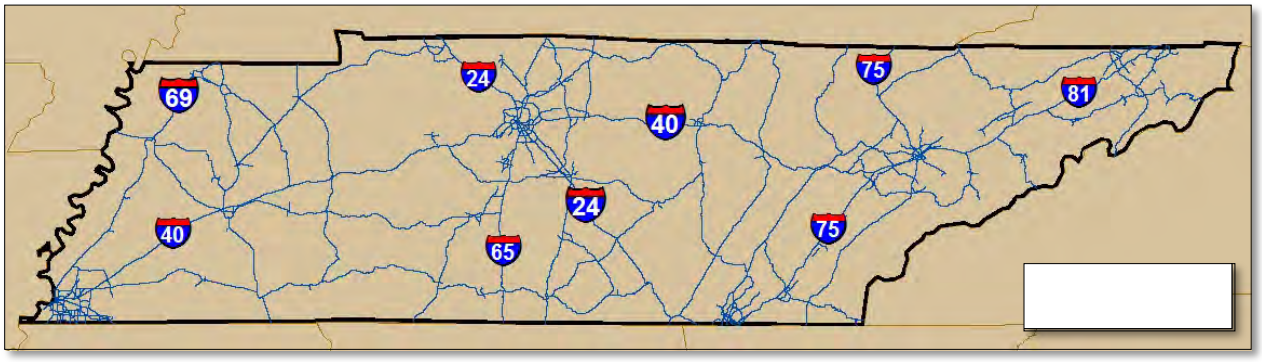


Source: 2013 TDOT TRIMS/EVE

Lastly, consideration was given to connectivity of first and last mile links to the National Highway System (NHS). The NHS, shown in Figure 5-12, is a system of roadways that play an important role in the economy, not only for Tennessee, but also for the country; as such, these facilities are often well-maintained in comparison to more local roads as states are encouraged to spend federal

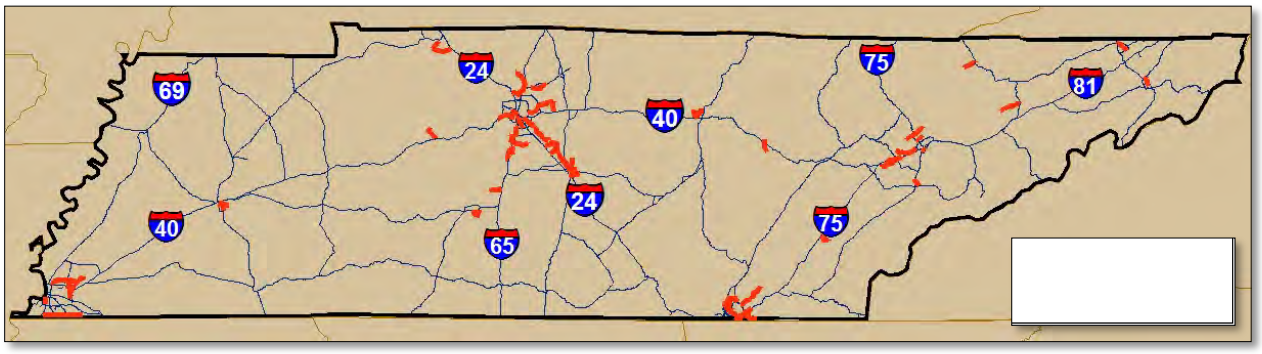
funds on the efficiency and safety of this network. This first and last mile analysis specifically looked for roadway segments that provide missing connections within the NHS. Additionally, segments providing direct linkage to the NHS were given consideration as freight movements often incur delay on segments that provide access to the NHS.

Figure 5-12 National Highway System in Tennessee



Using connectivity to the NHS, LOS of roadway segments, truck traffic volumes, and intensity of freight-dependent industries, potential locations for first and last mile improvements were identified and are shown in Figure 5-13. Additionally, consideration was given to locations that would move freight efficiently through multiple modes; an example of this may include a freight location that transports commodities by rail and by truck. Locations were ultimately chosen based on a combination of the aforementioned factors.

Figure 5-13 Potential First Mile-Last Mile Locations



As an example of a chosen location, State Route 35 near Maryville and Alcoa, TN serves a number of freight industries as seen in Figure 5-14 below. Additionally, rail lines serve Alcoa Inc., a manufacturer of molten and sheet metals as seen below and on the right. The heat map of freight-dependent industries indicated that this location was a relative 'hot spot' for freight-intense activity as shown in Figure 5-9. Additionally, this segment has LOS F and C on different portions of the roadway, and carries approximately 4,700 trucks each day.

Figure 5-14 Example of First Mile-Last Mile Location

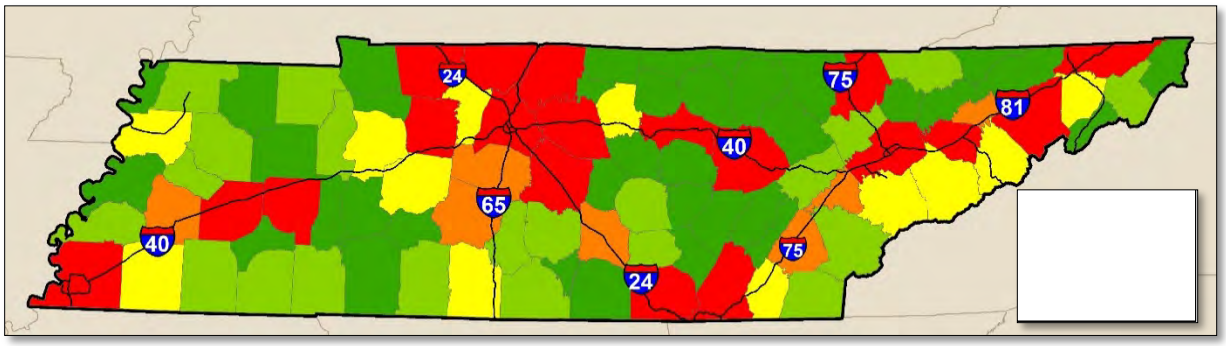
Locations such as this one, and the other first and last mile locations identified, exemplify the linkage between the transportation system, the movement of goods, and employment in the freight industry. While these locations may not currently be problematic in terms of congestion, this analysis could lead to a program used to continually identify, monitor, and improve locations that advance connectivity for freight industries to the transportation system.

5.3.3 Crash Analysis

Just as bottleneck and first mile/last mile analyses can highlight areas for improvement, analysis of crashes provides insight on specific roadway locations that may be more hazardous than others for trucks and passenger vehicles. While segments may have a high crash occurrence, this is not necessarily indicative of a safety issue with aspects of the roadway.

For this crash analysis, three years of data was analyzed along all classified roads in Tennessee. Figure 5-15 below shows the counties with the most crashes over the three year period examined by TDOT (2010 – 2012). For the most part, the counties with the most crashes are those where an interstate corridor passes through the county. Table 5-2 below shows the top ten counties, the number of crashes in each for the three year time period, and the equivalent number of crashes per year.

Figure 5-15 Truck Crashes by County (2010-2012)



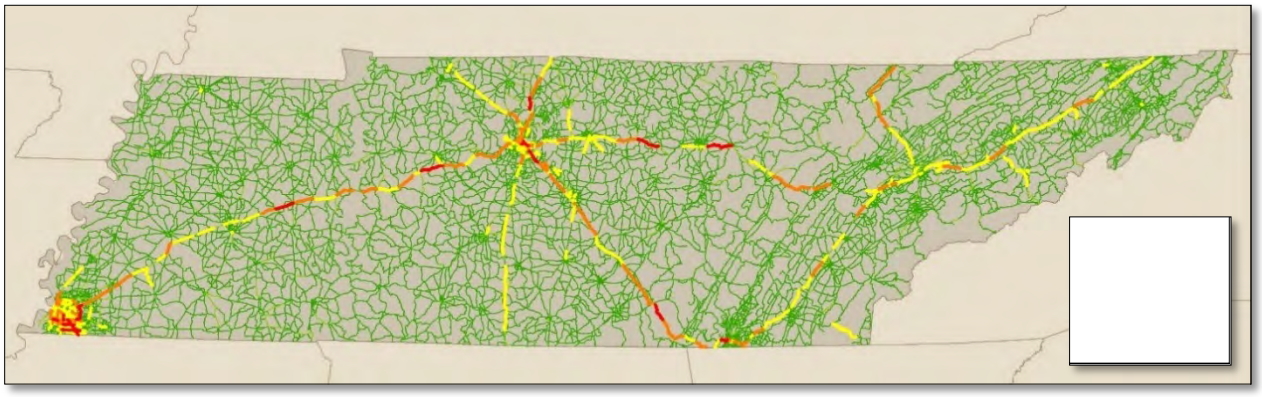
Source: 2010-2012 TDOT TRIMS Crash Database

Table 5-2 Top Ten Counties for Truck Crashes (2010-2012)

Rank	County	Crash Occurrence 2010-2012	Annual Crash Occurrence
1	Shelby	4,493	1,498
2	Davidson	3,136	1,045
3	Knox	841	280
4	Hamilton	818	273
5	Rutherford	617	206
6	Wilson	456	152
7	Madison	323	108
8	Sullivan	313	104
9	Sumner	305	102
10	Dickson	285	95

A more detailed look at the crash data involved examining the number of crashes on each segment of the roadway network. Figure 5-16 below shows the segments with the highest number of crashes in the state.

Figure 5-16 Truck Crashes on Tennessee Roadways (2010-2012)



As expected, the interstate system has the highest number of crashes as it carries the highest volumes of truck traffic. Typically, a crash rate calculation is used to provide perspective on the safety issues of a segment; by including the volume of traffic on the roadway into the calculation, segment safety is somewhat normalized, which is important because the segments with the most crashes may not always be the most dangerous. Unfortunately, crash rates that are calculated for only truck traffic may not be significant. This is due to the fact that truck crashes most often do not occur with other trucks because passenger car volumes greatly affect the frequency of crashes for large trucks. For this reason, spatial analysis tools were utilized to examine the high crash locations throughout Tennessee for segments of roadway that were approximately one half mile in length.

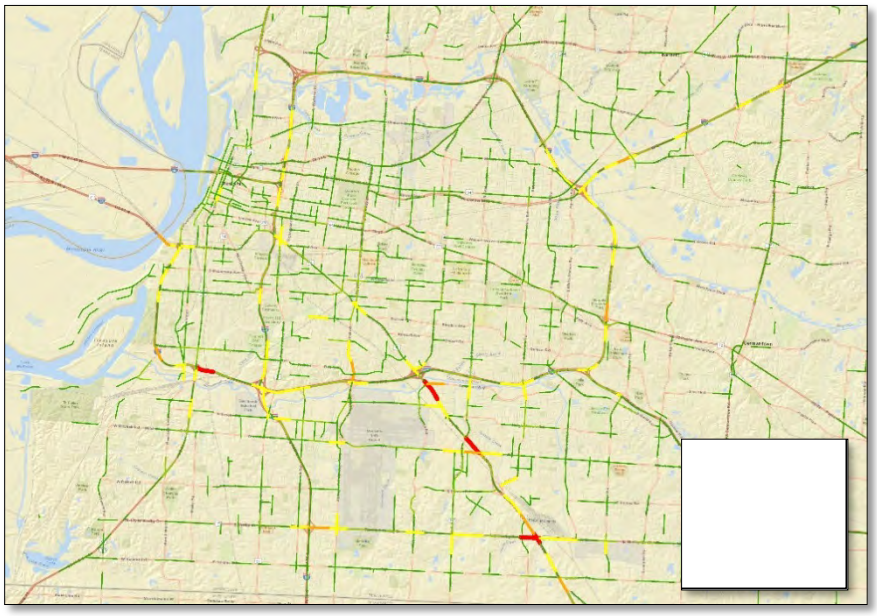
Based on this perspective, Figure 5-17 below shows the roadway segments with the most crashes throughout the state.

Figure 5-17 Truck Crashes for Roadway Segments of 0.5 Miles (2010-2012)

This analysis offers a different look at the occurrence of truck crashes on different facilities. When the number of crashes on a segment was examined without addressing the length of the segment, the interstate system appeared to have the highest frequency of truck crashes. However, once accounting for length of segments, the analysis shows that while the interstates still have crashes occurring on most every segment, urban areas experience more truck crashes, both on and off the interstate system. Additionally, some segments in rural areas are even comparable to those urban areas in terms of crash occurrence. Figure 5-18 and Figure 5-19 show insets of the Memphis and Nashville urban areas to highlight these aspects of the crash analysis. It is evident that safety concerns off the interstate system are oftentimes linked to freight industry locations and their accessibility to the transportation network.

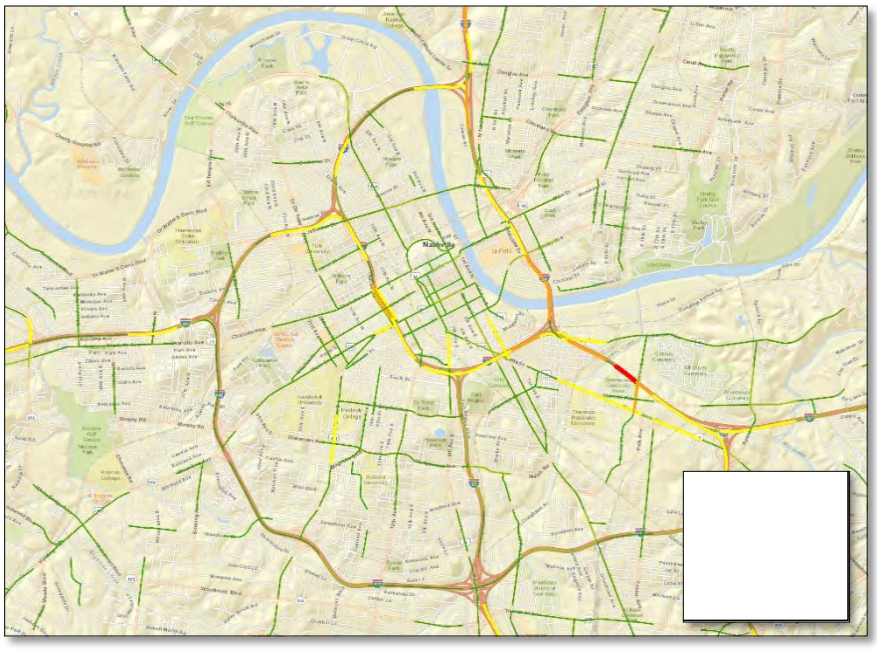
For instance, the inset of the Memphis area in Figure 5-18 shows multiple locations where there were more than 50 crashes within half mile segments (shown in red below). One of these locations is on I-55, three appear on Lamar Avenue (SR-4/US-78), and one occurs on Shelby Avenue where it intersects Lamar Avenue. Obviously the high crash locations on and near Lamar Avenue are a result of the dense concentration of freight activity in the area and the corresponding high truck volumes on these facilities.

Figure 5-18 Truck Crashes in Memphis



Similarly, in Nashville some of the worst crash segments occur within the interstate loop surrounding the downtown as shown in Figure 5-19. However, the intersection of I-24 and Fesslers Lane is the location where the most crashes occur within this urban area. This is likely due to the high truck volumes seen at this interchange and the intensity of freight activity in the area.

Figure 5-19 Truck Crashes in Nashville



As a result of this analysis, it is obvious that safety trends with regard to truck crashes require an in depth examination in order to draw conclusions. However, a number of observations can be noted from this analysis:

- Truck crashes occur more frequently in areas that have intense concentrations of freight industry activity.
- Interstate corridors are likely to have a higher number of truck crashes than other, lower-classified facilities simply due to the fact that truck volumes are typically higher.
- Interstate ramps and those segments closest to the interstate often appear as having a relatively high crash occurrence, which may be indicative of short ramps, tight turning radii, or other geometric concerns.

5.3.4 Highway-Rail At-Grade Crossing Safety

TDOT currently measures the number of crashes and number of fatalities occurring at highway/rail at-grade crossings. The Highway-Rail Grade Crossing Program implemented by TDOT identifies and evaluates locations for potential grade crossing safety improvements. TDOT conducts Diagnostic Team Reviews (DTR) to evaluate the current conditions of a rail crossing by a team consisting of TDOT representatives, railroad representatives, and consultants. Recommendations are made to improve the safety of the crossing and consist of improvements to be completed by the railroad company, TDOT, and local governments. TDOT also receives federal funding through FHWA's Section 130 Program to complete safety improvements.

5.4 PERFORMANCE MEASURES

Performance measures are tools for TDOT to evaluate the condition of the transportation system in a transparent manner for all users to see. The measures evaluate implemented programs and projects to help guide future decisions regarding the types of projects needed to fill the identified gaps in the system. Solving the problems identified in the system will improve the department's ability to reach the established goals and strengthen the economic development of the state. As a result of MAP-21, the federal government continues to develop performance measures for the freight program area. Until the MAP-21 performance measures are published and even afterwards, TDOT should establish an annual evaluation of appropriate performance measures to ensure specific performance conditions and targets are being met for the freight system.

TDOT currently tracks their progress against several performance measures related to freight transportation and implementation programs to facilitate freight transportation. These measures and programs are described in plans and reports prepared by TDOT. Table 5-3 is a summary of the performance measures currently tracked by TDOT that help evaluate the conditions of the freight transportation system:

Table 5-3 TDOT Freight-Related Performance Measures

Mode	Performance Measure
Road	• Traffic volumes (including truck volumes) • Highway crash data (including highway/rail at-grade crossing crash data) • Miles of Interstate Freeway Managed by ITS Infrastructure • Roadway and bridge condition data • Highway incident clearance data • Oversize, overweight or overlength permits
Rail	• Shortline Rail track miles and capacity rating • Rail yard and highway-rail crossing inspections
Air	• Airports meeting design and safety criteria as well as federal approach standards • Airport pavement condition data • Percentage of business with 10 or more employees within 25 miles or 25 minutes of an airport with an instrument approach minimum of at least 400 feet and 1 mile.
Water	• Waterway performance measurement data is not collected by TDOT, but is available from other agencies (e.g. U.S. Army Corps of Engineers)

In addition to the current performance measures tracked by TDOT, the following performance measures related to the following National Strategic Freight Goals and stakeholder needs will help TDOT track their progress. Because the national performance measures for freight are still in development, these performance measures were developed based on TDOT's access to the required data. While each performance measure is listed under one of the six Freight Policy Goals, some apply to more than one of the goals:

Improve the contribution of the freight transportation system to economic efficiency, productivity, and competitiveness

- Tennessee share of national freight market: This is measured as the value and tonnage of Tennessee exports as compared to all U.S. state exports.
- Freight tonnage by mode: This is measured by the total freight tonnage imported to and exported from Tennessee and transported by each of the different modes.
- Cost of Congestion: This is defined as the millions of dollars lost due to trucks sitting in congestion on Tennessee roadways.

Reduce congestion on the freight transportation system

- Freight travel time reliability: This is defined as the percentage of combination truck vehicle miles traveled at speeds less than 45 miles per hour compared to all vehicle miles traveled on interstates.
- Freight travel time variability: This is defined as the 95th percentile travel time compared to the travel time during free flow conditions.
- Queues at Waterway Locks: This is defined as the transit time it takes barges and other water vessels to traverse through locks on Tennessee rivers.
- Terminal Dwell Time: This is defined as the amount of time that loaded Class I rail cars spend in intermodal facilities waiting to continue moving.

Improve the safety, security, and resilience of the freight transportation system

- Number of trucks parked in undesignated space: The number of trucks parked on a ramp or undesignated space at a rest area
- Number of truck crashes: This is defined as the number of crashes involving a truck along the National Highway System.
- Number of railroad crashes: This is defined as the number of crashes involving a train, whether at a highway/rail at-grade crossing or along the railroad system, and can include crashes that occur due to a variety of different factors.
- Extent of rail system operating under positive train control: This is defined as the percentage of rail miles within Tennessee operating under positive train control

Improve the state of good repair of the freight transportation system

- National Ranking of State's Transportation Infrastructure: This is defined as Tennessee's rank as compared to all U.S. states in the annual study from the Consumer News and Business Channel.
- Ratio of Overweight Trucks: This is defined as the ratio of overweight vehicles to the total number of vehicles weighed.

Use advanced technology, performance management, innovation, competition, and accountability in operating and maintaining the freight transportation system

- Geographic range of real-time freight travel information: This is defined as the percentage of Tennessee's geography included in TDOT's SmartWay system.
- Commercial vehicles utilizing electronic bypass technology at weigh stations (PrePass): This is defined as the percentage of commercial vehicles using PrePass technology to bypass weight stations. It should be noted that oversize/overweight vehicle must still pull into weigh stations in Tennessee.

Reduce adverse environmental and community impacts of the freight transportation system

- Quiet Zones: This is defined as the number of quiet zones along freight rail lines within Tennessee.

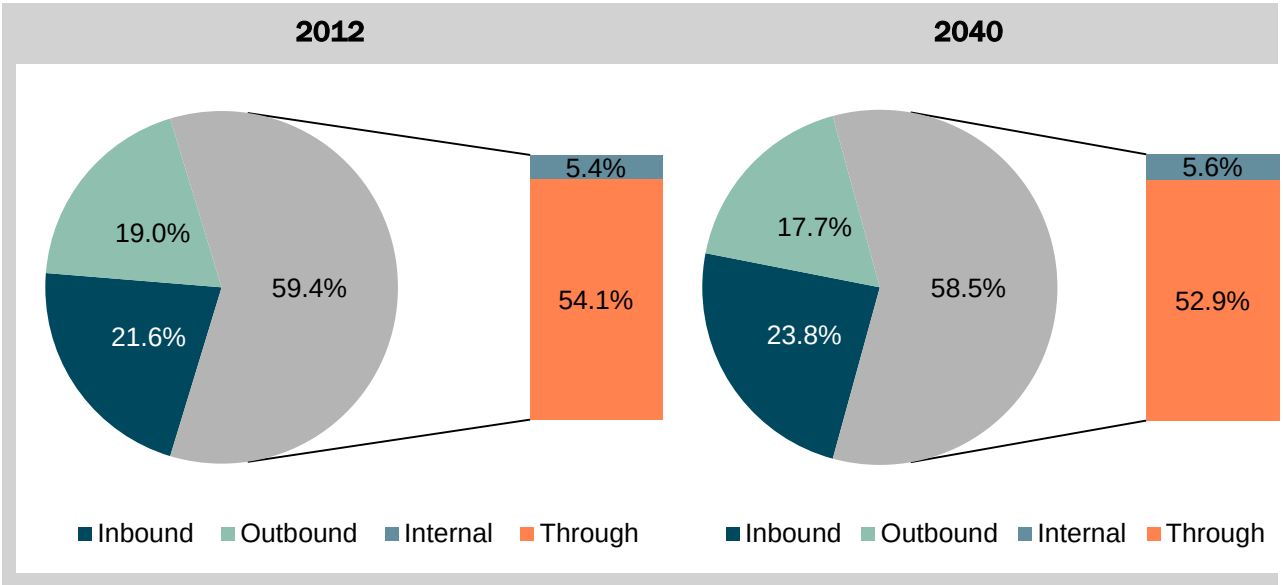
6. Freight Forecast

The freight industry is closely linked to the economy, which makes it challenging to predict what Tennessee freight movements will be in 2040. In terms of economic growth, forecasting Tennessee's industry outlook using standard industry practices will assist TDOT in evaluating projects that will help accommodate future freight demands. Therefore, the Transearch 2012 (IHS Global Insights) data set was used to predict trends in commodity flows arising from global changes to the freight industry such as the Panama Canal expansion and local changes, such as expected increases in door to door deliveries. Additionally, Woods & Poole Employment data was used to examine forecasts for jobs in freight-related industries throughout Tennessee.

6.1 INDUSTRY GROWTH

By the year 2040, it is expected that 1.2 billion tons of commodities will be moved by the Tennessee freight system. This includes roads, rail, water, air, pipeline, and intermodal commodities. The top 20 commodities by tonnage traveling in, out, within, and through the state will likely remain the same although the ranking of the commodities by tonnage may change slightly. Figure 6-1 shows the projected percent change between 2012 and 2040 in inbound, outbound, internal, and through movements of freight on the Tennessee transportation system. The change in these movements is relatively minor between 2012 and 2040. However, inbound traffic and internal movements are expected to increase, while outbound and through traffic is expected to decrease.

Figure 6-1 Movement Type of Freight Tonnage on Tennessee Infrastructure (2012 and 2040)



Source: Tennessee Transearch Data, IHS Inc.

The top five commodities by tonnage shipped on Tennessee's freight system will remain gravel, coal, agricultural products, other foodstuffs, and non-metallic minerals. The expected percentage increase in tonnage of these commodities is shown in Table 6-1.

Table 6-1 Projected Percent Change in Tonnage for Top 5 Commodities

Commodity	% Change in Tonnage (2012 to 2040)
Gravel	62%
Coal	-24%
Agricultural Products (Except Live Animals, Cereal Grains, & Forage Products)	66%
Other Food Stuffs	61%
Non-Metallic Mineral Products	126%

Source: Tennessee Transearch Data, IHS Inc.

Coal is expected to remain a top commodity moving through Tennessee on a tonnage basis; however, less coal is expected to be transported in 2040 than current levels (expected decrease of 24%). Highway and rail are expected to transport less coal and water is expected to experience a slight increase in coal traffic (Table 6-2). All modes are expected to see an increase in commodity traffic for the other top commodities based on tonnage transported on Tennessee's infrastructure as shown in Table 6-2.

Table 6-2 Modal Distribution of Top 5 Commodities by Tonnage Moved in Tennessee (2012 and 2040)

Commodity	Code	2012 (million tons)				2040 (million tons)			
		Hwy	Rail	Water	Air*	Hwy	Rail	Water	Air*
Gravel	12	119.1	4.2	2.8	-	192.8	6.9	4.9	-
Non-Metallic Mineral Products	31	32.4	2.2	1	-	74.3	4.4	1.6	-
Coal	15	0.8	91.6	13.5	-	0.6	62.2	17.2	-
Agricultural Products (Except Live Animals, Cereal Grains, & Forage Products)	3	34.8	7.4	1.6	-	47.4	22.5	2.9	-
Other Food Stuffs	7	29.6	8.6	0.2	-	47.1	14.4	0.4	-

* Tonnage < 1,300 tons
Source: Tennessee Transearch Data, IHS Inc.

Tennessee's freight system is expected to be moving the same top commodities based on value in 2040 as are being moved today. The 2040 forecasts are reported in 2012 dollars for a simple comparison between the 2012 and 2040 data. The top five commodities by value (in 2012 dollars) are expected to remain Electronics, Vehicles, Machinery, Plastics and Rubber, and Miscellaneous Transported Products. The percent change in value for the top five commodities is shown in Table 6-3. The forecast of commodities created by IHS is based on the employment, output, and purchases by industry and does not take into account recent industry announcements such as the expansion of the auto plants within the state. However, the increase in the freight industries is healthy based on the economic assumptions used.

Table 6-3 Top 5 Commodities by Value Percent Change (2040)

Commodity	% Change in Value
Electronics	331%
Vehicles	117%
Machinery	183%
Plastics and Rubber	130%
Miscellaneous Transported Products	53%

Source: Tennessee Transearch Data, IHS Inc

The amount of electronics moved through the air based on value is expected to increase by over 400% when compared to the amount shipped in 2012 (see Table 6-4). There are similar increases in the amount being shipped on the highway and by rail for Electronics, Vehicles, Machinery, and Plastics and Rubber. The same four commodities being shipped by water are expected to double by 2040.

Table 6-4 Modal Distribution of Top 5 Commodities by Value Moved in Tennessee (2012 and 2040)

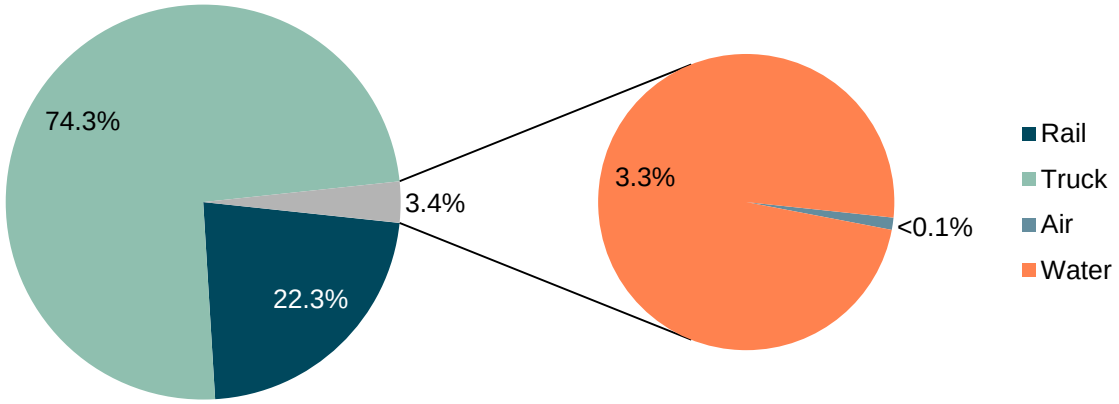
Commodity	Code	2012 (billions of dollars)				2040 (billions of dollars)			
		Hwy	Rail	Water	Air	Hwy	Rail	Water	Air
Electronics	35	$66.8	$2.5	$0.01	$2.5	$291.0	$8.0	$0.02	$10.4
Vehicles	36	$65.9	$59.2	$0.01	$2.5	$149.7	$121.4	$0.01	$5.7
Machinery	34	$67.1	$2.7	$0.1	$1.2	$190.0	$7.5	$0.2	$3.3
Plastics & Rubber	24	$50.1	$16.6	$0.02	$0.1	$121.4	$31.9	$0.04	$0.2
Miscellaneous	42	-	$82.7	-	-	-	$127.0	-	-

- Less than $15,000

Source: Tennessee Transearch Data, IHS Inc.

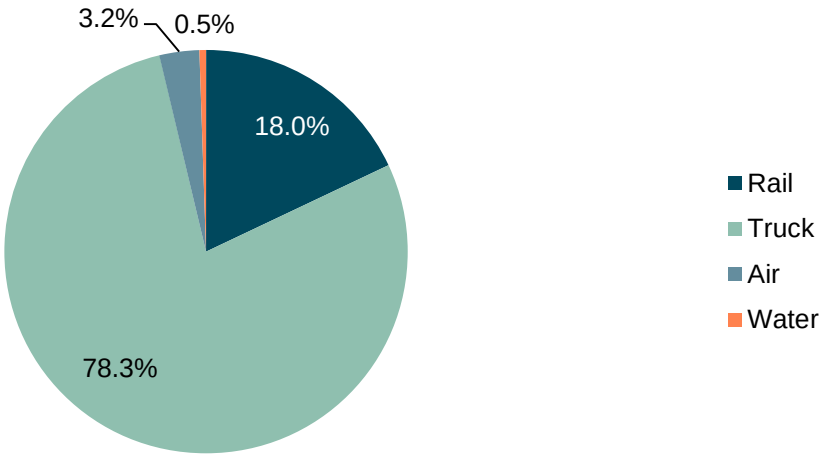
The expected growth in the commodities moving through Tennessee by 2040 will place a higher demand on all modes of freight transportation. However, trucking is expected to remain the main mode for freight movement as seen in Figure 6-2 and Figure 6-3, with the demand to transport goods via trucks increasing slightly based on both the tonnage and value. Although the tonnage and value will increase between 2012 and 2040 on rail, the proportion of commodities moving on rail is expected to decrease slightly. The same trend appears for water and air, where the tonnage and value of commodities being moved will increase; however, the proportion of the freight transportation occurring on waterways and through the air will remain relatively unchanged. These changes may be related to expected growth in intermodal. With the increase in intermodal facilities recently opened and planned, there may be increased demand for trucks to and from these facilities (approximately 90% increase in intermodal tonnage carried by trucks forecasted by 2040). Although a significant shift in the modes being used to move freight is not expected, each of these modes needs to be prepared to handle the expected freight through the state of Tennessee in 2040 so that the reliability and efficiency of the system is maintained.

Figure 6-2 2040 Modal Distribution by Tonnage of Commodity - Tennessee



Source: Tennessee Transearch Data, IHS Inc.

Figure 6-3 2040 Modal Distribution by Value of Commodity - Tennessee



Source: Tennessee Transearch Data, IHS Inc.

With the truck and rail combining for about 96 percent of the commodity movement in the state of Tennessee in 2040, it is forecasted to consist of growth in all movements to, from, within, and through the state. Trucks are expected to carry almost double the amount of freight tonnage moving through the state in 2040, and the commodity tonnage shipped on the state's rail infrastructure is expected to increase by approximately 30 percent.

Freight is not always transported using just one mode. Intermodal shipments at Tennessee rail intermodal and airport facilities are expected to increase 90 percent by 2040. Expected increases in tonnage being shipped will influence TDOT's decisions on roadway projects as well as other projects being completed by private industry. Tonnage movement may more closely correlate with transportation capacity while value may more closely correspond to congestion and velocity effects.

6.2 TENNESSEE FREIGHT GROWTH WITHIN STATE

By evaluating the types and tonnages of commodities expected to be moving within the state, needs for the transportation system can be more readily identified. For Tennessee, movement of commodities between counties within the states is expected to increase. The top 10 commodities moving within the state in 2040 based on tonnage and value are listed in Table 6-5 and Table 6-6, respectively. There are five commodities that appear on both the tonnage and value top 10 lists including Vehicles, Gasoline and Aviation Turbine Fuel, Agricultural Products, Fuel Oils, and Non-Metallic Mineral Products. Movement of these five commodities is forecasted to equate to approximately 32.7 million tons and $33.5 billion dollars. At the state level, the commodities moving between Tennessee counties in 2040 are projected to be transported almost exclusively by truck (94 percent).

Table 6-5 Top Commodities Transported between Tennessee Counties by Tonnage (2040)

Commodity	Tons (Millions)
Non-Metallic Mineral Products	17.9
Gravel	12.3
Agricultural Products (Except Live Animals, Cereal Grains, & Forage Products)	6.4
Gasoline and Aviation Turbine Fuel	4.2
Waste and Scrap	3.6
Vehicles	2.5
Products of Petroleum and Coal	2.1
Fuel Oils	1.8
Natural Sands	1.8
Cereal Grains	1.6

Source: Tennessee Transearch Data, IHS Inc.

Table 6-6 Top Commodities Transported between Tennessee Counties by Value (2040)

Commodity	Value (Billions) (2012 Dollars)
Vehicles	$20.9
Machinery	$9.7
Gasoline and Aviation Turbine Fuel	$4.6
Base Metal	$4.5
Agriculture Products(Except Live Animals, Cereal Grains, and Forage Products)	$4.3
Electronics and Components	$3.8
Plastics and Rubber	$2.4
Fuel Oils	$2.0
Basic Chemicals	$1.8
Mineral Products	$1.8

Source: Tennessee Transearch Data, IHS Inc.

As expected, the urban counties of Shelby, Davidson, Hamilton, Knox, and Rutherford are projected to import and export the largest quantities of these goods in 2040. This is expected since population and total employment are both expected to grow more prominently in the urban areas of the state. However, based on the top commodities expected to move within the state in 2040, it appears that many of the counties supporting these industries today will continue to import and export similar products in 2040. Chapter 2 contains a detailed explanation of the freight movements and supply chains within the state that support these major industries.

6.3 DOMESTIC TRADING PARTNERS

Tennessee's shipment of goods to and from other states within the U.S. is a main part of the state's freight industry. Based on the Transearch 2040 analysis, domestic trading is projected to account for 38 percent of the freight moved in and out of Tennessee. The Transearch data includes 2040 freight projections for truck, water, rail, and air. Based on these projections, Tennessee is expected to export approximately 195 million tons of freight to its domestic trading partners and import approximately 280 tons of freight from them.

6.3.1 Domestic Exports from Tennessee

For the most part, Tennessee's major domestic export trading partners are not expected to change from 2012 to 2040. The following states represent these major domestic trading partners:

- North Carolina, Alabama, Louisiana, and Kentucky based on tonnage
- Texas, Florida, California, and Pennsylvania based on value
- Georgia, which is expected to be a top 5 domestic trading partner based on tonnage as well as on value

By 2040, Tennessee is projected to be exporting more freight goods than it did in 2012. Gravel, Coal, Non-Metal Minerals, Waste/Scrap, and other Agricultural Products are expected to be the top commodities exported from Tennessee to its domestic partners as was the case in 2012 (see Table 6-7).

Table 6-7 Top 5 Domestic Exports from Tennessee (2040)

Commodity	Tonnage (in millions)	Value (in billions) (2012 Dollars)
Gravel	34.0	$0.4
Coal	18.4	$3.5
Nonmetal Minerals	12.2	$3.5
Other Agricultural Products	7.5	$10.8
Waste/Scrap	7.4	$5.0

Source: Tennessee Transearch Data, IHS Inc.

6.3.2 Domestic Imports to Tennessee

By 2040, some of Tennessee's top freight import states are expected to change when compared to 2012. Alabama, Georgia, Kentucky, Illinois, and Texas are projected to continue to export a large volume or value of goods to Tennessee. However, Tennessee is expected to also import a significant portion of their goods from Indiana (in top 5 for tonnage and value), North Carolina (in top 5 for value), and Ohio (in top 5 for value).

While coal continues to be a major import for Tennessee, gravel is expected to be the highest import in 2040 based on tonnage (Table 6-8). In terms of import value, electronics are projected to be the largest import for Tennessee (approximately $42 billion) with a significant portion of Tennessee import value also being motorized vehicles (approximately $35 billion).

Table 6-8 Top 5 Domestic Imports to Tennessee (2040)

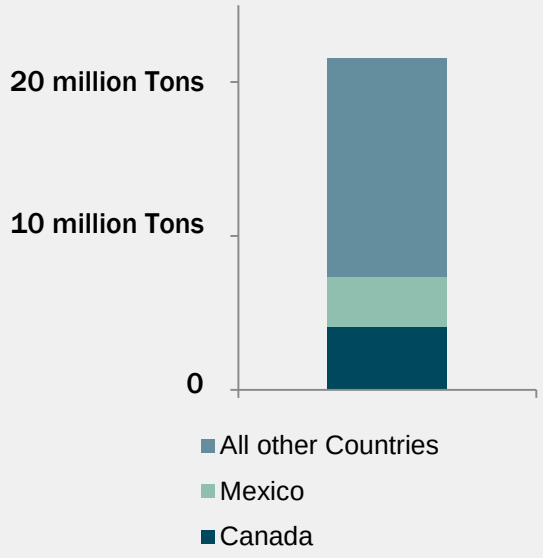
Commodity	Tonnage (in millions)	Value (in billions) (2012 Dollars)
Gravel	73.8	$0.6
Coal	28.0	$1.1
Nonmetal Minerals	17.2	$3.0
Waste/scrap	16.0	$4.6
Cereal Grains	15.5	$3.1

Source: Tennessee Transearch Data, IHS Inc.

6.4 INTERNATIONAL TRADE

According to the Transearch data, Canada and Mexico continue to be dominant international trading partners with Tennessee. In 2040, Canada and Mexico are expected to account for one-third of Tennessee's international exports. Tennessee is expected to export approximately 4.1 million tons to Canada (19 percent of all exports) and 3.3 million tons to Mexico (15 percent of the state's international exports).

Figure 6-4 Tennessee's 2040 International Exports (Tons)



6.5 EMPLOYMENT GROWTH IN FREIGHT INDUSTRIES

By 2040, the state of Tennessee is expected to see employment grow to 5,470,861 jobs, which is a 32 percent increase. The majority of this growth is expected to occur in the urban areas. Table 6-9 presents top 10 counties based on total employment in 2012 and their expected employment ranking in 2040. The top 3 counties in 2012 and 2040 include major urban areas.

Table 6-9 Total Employment 2012 and 2040 (All Industries) – Top 10 Counties in Tennessee

County	2012 Ranking	Total Employment	County	2040 Ranking	Total Employment
Shelby	1	631,176	Shelby	1	917,549
Davidson	2	562,024	Davidson	2	847,692
Knox	3	299,460	Knox	3	491,883
Hamilton	4	241,686	Hamilton	4	305,196
Rutherford	5	142,001	Williamson	5	289,297
Williamson	6	135,460	Rutherford	6	251,526
Sullivan	7	90,126	Washington	7	135,765
Washington	8	77,476	Montgomery	8	116,614
Madison	9	69,506	Sullivan	9	112,548
Montgomery	10	67,537	Wilson	10	102,059

Source: Woods & Poole, 2012

The goods-dependent industries consisting of Farming, Forestry, Mining, Construction, and Manufacturing are expected to make up approximately 12 percent of the work force. In addition, approximately 18 percent of the work force in the state will come from the service-dependent industry. The service-dependent industry includes Wholesale Trade, Retail, and Transportation and Warehousing.[1] Table 6-10 presents the goods-dependent employment of the top 10 counties in 2012 as well as their projected employment in this sector in 2040.

[1] *Woods & Poole, 2012*

Table 6-10 Goods-Dependent Employment 2012 and 2040 (Select Industries) – Top 10 Counties in Tennessee

County	2012	County	2040
Shelby	210,730	Shelby	272,573
Davidson	148,148	Davidson	176,613
Hamilton	83,577	Knox	125,684
Knox	66,482	Hamilton	86,987
Rutherford	57,877	Rutherford	81,618
Sullivan	34,918	Williamson	68,165
Williamson	32,034	Wilson	40,144
Blount	23,801	Montgomery	40,024
Madison	23,384	Sullivan	37,836
Bradley	21,556	Madison	36,680

Source: Woods & Poole, 2012

7. Overview of Trends, Needs, and Issues

Freight operates through corridors that cross a wide number of geographic and political boundaries. As a result, freight movement is sensitive to shifts in local, national, and global market places. At the local level, TDOT recognizes that changes in population and employment, as well as in market sectors, are inevitable and will affect freight movement in Tennessee. Freight will also be influenced by global changes, from adjustments in equipment, like the Class I railroads' shift to higher weight capacity rail cars (286,000 lbs.) to new and improved international freight facilities, such as the Panama Canal Expansion. Freight movement is influenced by private investments and market demands as well as public policy and regulations. Understanding changes in freight trends, needs, and issues, as well as communicating the effects of these attributes to stakeholders, will guide Tennessee's path forward.

7.1 FREIGHT TONNAGE

Across the nation, Tennessee ranked 20th (shown in bold in Table 7-1) in 2011 for total tonnage (inbound and outbound) moved through the state based on data from the U.S. Department of Transportation's Freight Analysis Framework tool which is based on the Bureau of Economic Analysis data. Of the eight states adjacent to Tennessee, four of them rank higher than Tennessee in total tonnage moved as seen in Table 7-1 (shown in italics).

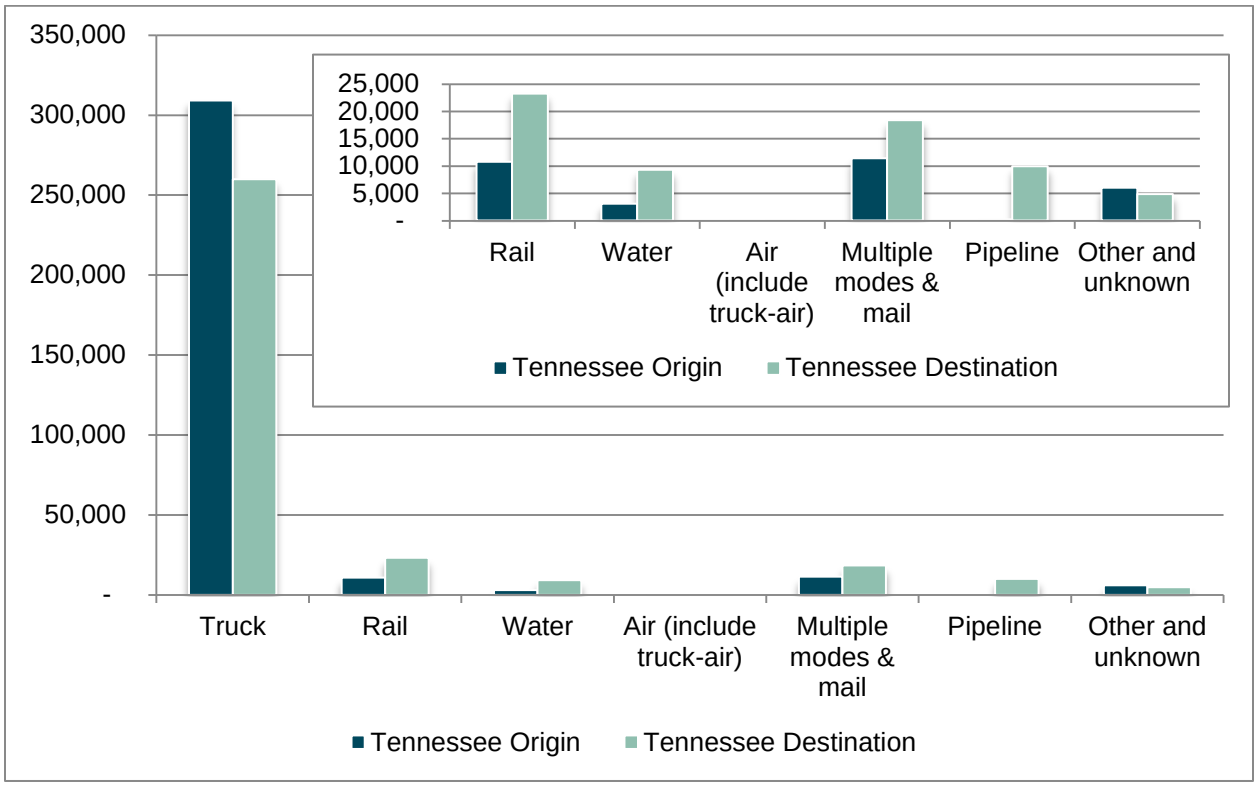
Table 7-1 State Rankings Based on Thousands of Tons of Freight Moved through the State (2011)

Rank	State	Thousands of Tons
1	Texas	4,329,850
2	California	2,791,111
3	Illinois	1,625,148
4	Louisiana	1,535,281
5	Florida	1,317,077
6	Ohio	1,242,074
7	Pennsylvania	1,231,280
8	New York	1,182,611
9	Minnesota	981,628
10	*Georgia*	*951,104*
11	Indiana	950,905
12	Michigan	887,519
13	*Missouri*	*844,567*
14	Washington	823,135
15	*Virginia*	*725,761*
16	Iowa	721,051
17	Wyoming	719,784
18	*Alabama*	*717,931*
19	New Jersey	699,185
20	**Tennessee**	**666,021**

Source: Bureau of Economic Analysis

Operating characteristics that have significant implications for Tennessee's stakeholders on a local and statewide basis emerge when examining the aggregate tonnage moved by mode and freight type, in addition to changes in infrastructure, capacity, and technology. As shown in Figure 7-1, most of the inbound and outbound freight tonnage in Tennessee is moved by truck. The details for the non-truck modes are shown in the inset in the upper right quadrant of this figure. In Tennessee, trucking is expected to remain the dominant mode of freight transportation in terms of total tons moved (see Chapter 6 for more information).

Figure 7-1 Thousands of Tons of Freight with an Origin/Destination in Tennessee by Mode (2011)



Source: U.S. Department of Transportation's Freight Analysis Framework Tool

7.2 SOCIOECONOMIC TRENDS

7.2.1 Population

By 2040, Tennessee is expected to experience more than a 30 percent increase in population with urban areas expected to see the majority of this growth[1]. The I-75 and I-40 corridors, which are important freight corridors, pass through these high growth areas. These projected increases will place additional demand on the State's public infrastructure and services including the transportation system. With expectations for growth in freight volumes as described in Chapter 6, the all-too-common misalignment between industrial land use and freight transportation facilities will be an issue that needs to be addressed.

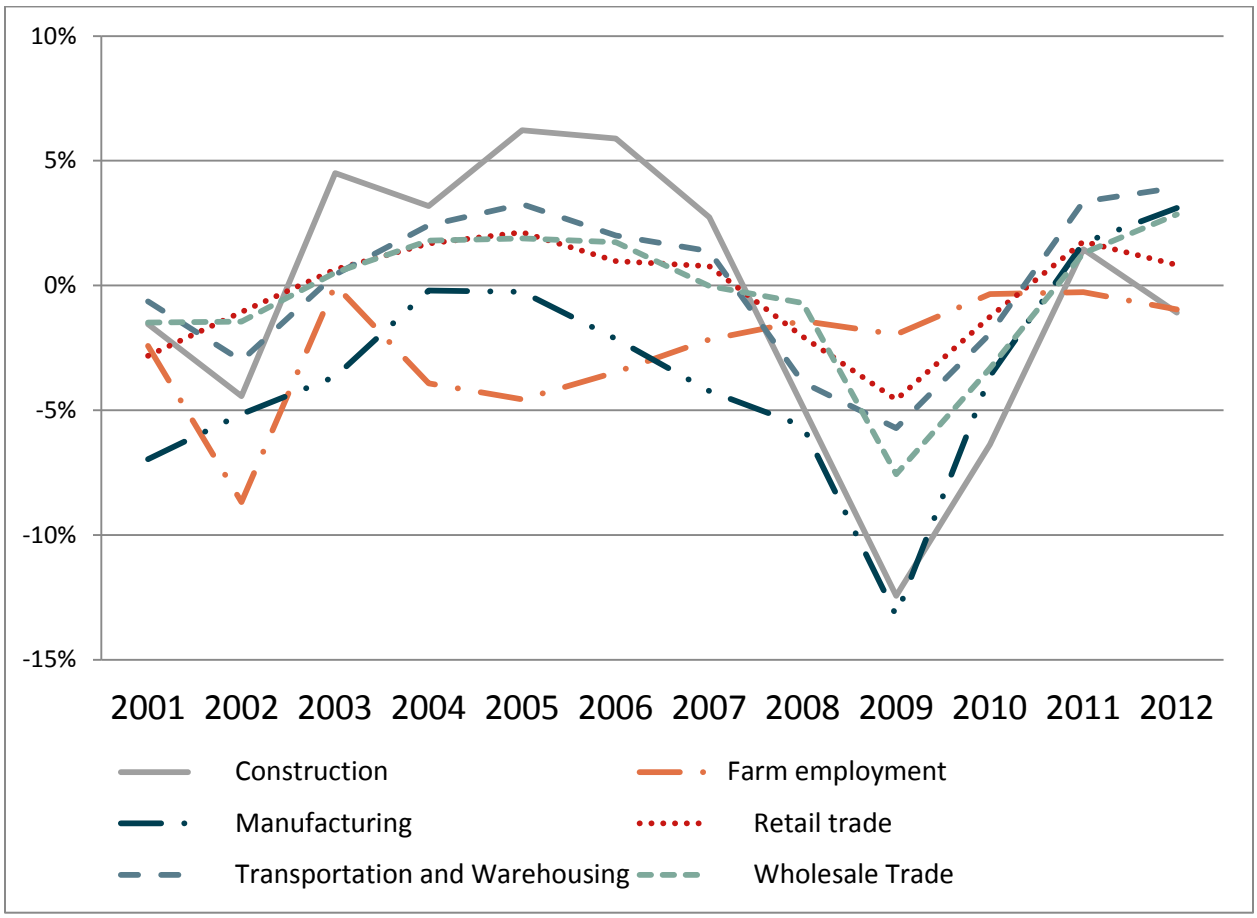
7.2.2 Employment

In addition to significant population growth, Tennessee is also expected to see a 50 percent increase in jobs over the next 25 years[2]. Historical employment growth data for key freight industry sectors, calculated from the Bureau of Economic Analysis, is presented in Figure 7-2 below. As was common in most all industry, employment in the freight sectors saw a considerable decline at the peak of the recession (2008-2009); following the recession, these same sectors began recovering.

[1] Woods & Poole 2013
[2] Woods & Poole 2013

This increase in employment in the Tennessee freight sectors is likely indicative of increased production and consumption of commodities. Despite the increases shown in these sectors, there is a decline in the number of truck drivers to move the increasing freight. A need for workforce development to recruit and train new drivers is needed to fill this gap.

Figure 7-2 Annual Percent Employment Growth by Selected Sectors, Tennessee (2001-2012)



Source: Bureau of Economic Analysis

7.2.3 Freight and Land Use Compatibility

A customer survey of transportation infrastructure users was conducted by TDOT in 2013. The groups surveyed included residents, agency partners, and elected officials. One important freight finding from the survey was that two of the three survey groups identified commercial truck traffic as one of the top five transportation priorities over the next 25 years.

The concern about increased truck traffic is perhaps not unwarranted, especially in urban areas where truck movements are changing in response to the growth of internet shopping. This point is magnified by continued growth in internet based shopping. According to the U.S. Census Bureau, in 2012, electronic shopping accounted for more than 5% of retail sales[3]. Growth of the internet has also changed distribution, with the emergence of larger order fulfillment centers run by companies

[3] U.S. Census Bureau, U.S. Retail Trade Sales – Total and E-commerce: 2012-1998

such as Amazon and others. Memphis, Tennessee was identified by the U.S. Census Bureau as one of the metropolitan areas experiencing the greatest employment increase in electronic shopping and mail-orders between 2011 and 2012.[4]

The trend towards more intermodal freight may also have impacts on the local area surrounding these facilities. While rail can move commodities long distances, intermodal facilities are still dependent on trucks to complete the first mile/last mile transport to distribution facilities or the customer's door.[5] Growth in traffic may create disproportionate impact on adjacent sensitive communities. Tennessee may be able to adapt policies from peer states to mitigate shifting impacts.

7.3 ECONOMIC TRENDS

7.3.1 Manufacturing and Re-shoring

On a basic level, the nature of manufacturing has fundamentally changed within the last 15 years. Where once heavy manufacturing facilities imported raw materials and turned them into finished goods in a single large facility, manufacturing has become an increasingly additive process, with products moving through several assembly stages, taking place over large distances and multiple suppliers, linked by longer supply chains. As a result, supply chain operators track volume, schedule, and performance on a detailed basis.

This additive process of increasing the supply chains in terms of distance and quantity is most evident by the movement of manufacturing from domestic to international locations as a means of reducing costs. However, as a result of increased labor costs in overseas countries (particularly in China), rapid labor turnover in India, higher transportation costs, and more unstable supply chains, some firms have started moving manufacturing back to North America. While Mexico was the primary beneficiary of this trend through 2012, manufacturing re-shoring in North America has implications for freight trends and movements in the U.S. as well. Foreign Trade Zones may prove to be a favorable economic tool for more manufacturing. The administrative process as well as a cost and benefit analysis should be evaluated on a case by case basis.

7.3.2 Auto Sector Implications

One result of the recession of 2009 was the geographic retreat of the auto industry back towards its core, anchored by the I-75 and I-65 corridors (also known as "Auto Alley"), which extends down from Michigan to newer assembly locations in the southeast. Located along "Auto Alley", Tennessee has attracted automakers such as the Nissan, Volkswagen, and General Motors. Along with the major automakers, Tennessee is also home to a number of automaker suppliers. "From 2010 to 2012, Tennessee's share of North American motor vehicle manufacturing employment from 2.9 percent to 3.3 percent" and "in 2012, U.S. auto sales grew by over 13 percent—the fastest

[4] U.S. Census Bureau, Online Shopping and Mail Order Businesses Jump 27 Percent, Census Bureau Reports, May 29, 2014
[5] Federal Highway Administration Freight and Land Use Handbook, April 2012

rate in two decades—and created over 250,000 jobs"[6]. The shift in the auto sector has also enabled finished products to be assembled closer to end markets.

Recovery in automotive is also closely linked to the currently unfolding shift toward intermodal service for movement of parts and modules. An increasing share of automotive components is being moved by rail, using intermodal shipping containers. Since 2005, auto production in Mexico has surged, growing from a 10% share of North American production (including the U.S., Mexico, and Canada) to a 19% share by 2012. Importantly, both U.S. and Canadian auto production decreased in share over the noted period, with a rapid growth in Mexico's share occurring since the onset of the recession in 2008 as a result of the significant number of U.S. automotive assembly plants that closed their doors.

7.4 TRANSPORTATION INFRASTRUCTURE

7.4.1 Panama Canal

Currently, the Panamax standard dictates the largest ship that can fit through the Panama Canal. The Panama Canal Expansion is scheduled for completion in early 2016. The project includes a new parallel set of longer locks with a greater draft and deeper navigational channels at a cost of approximately $5 billion. The improvements will allow ships significantly larger than the current Panamax standard to pass through the canal, creating potential savings and opening up new markets.

There remains a degree of uncertainty where these larger post-Panamax ships will sail as they enter the fleet in larger numbers. A review of industry literature would suggest that owners of these ships are likely to experience considerable pressure to keep them at sea and to minimize unloading time, suggesting that few U.S. ports will see significant increases in activity. However, stakeholder input indicated an expected increase in the number of containers on barges at the Port of Cates Landing in northwestern Tennessee as a result of the Panama Canal expansion.

7.4.2 Mexico and Canada Connections

The increase in manufacturing in Mexico is influencing the movement of freight through North America. For instance, the Union Pacific railroad (UP) has responded to this shift by developing an intermodal facility in Santa Teresa, New Mexico near El Paso, Texas. The U.S.DOT also recognized the importance of the connection between Mexico, the U.S., and Canada when it identified I-69 as a 'Freight Corridor of the Future' (see Figure 7-3). The I-69 corridor, which will eventually connect the Canadian border in Michigan and the Mexican border in Texas, is being constructed in sections (e.g. in Indiana and Kentucky). The portion of I-69 through Tennessee, once it is completed, will traverse the western portion of the state. Sections of the I-69 corridor in Tennessee are in different stages of development; however, construction of the corridor in Tennessee has not yet started.

[6] The Brookings Institute; Muro, M., Andes, S., Firki,. K., Ross, M., Lee, J., Ruiz, N. and Marchio, N.; Drive! Moving Tennessee's Automotive Sector Up the Value Chain, 2013

Figure 7-3 Corridors of the Future

Source: http://ops.fhwa.dot.gov/freight/freight_story/responses.htm

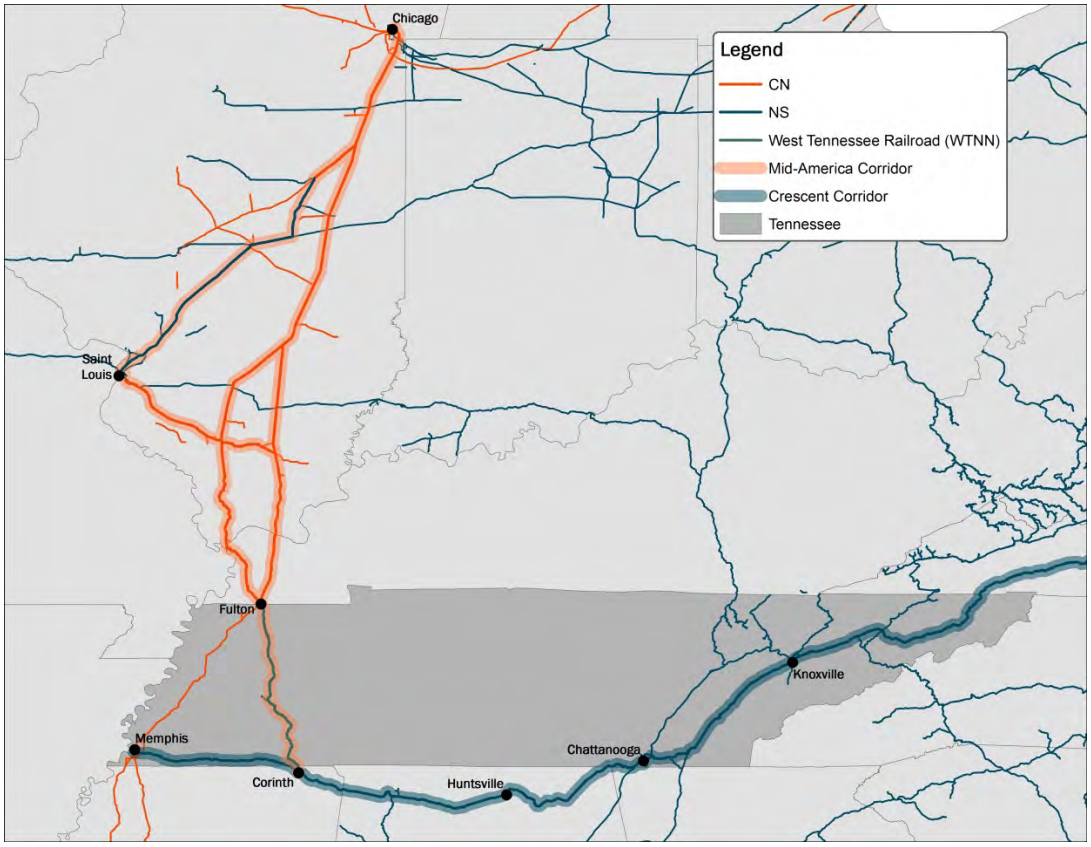
Detroit is moving forward with plans to build a new rail tunnel connection with Windsor, Canada, called the Continental Rail Gateway. The $400-million-dollar project would allow for double stack container service. The project has received significant commitments from Canadian Pacific as well as the Windsor Port Authority. The tunnel is significant because it will be available to all railroads for moving larger rail cars between Canada and the U.S., including some of the Class I railroads with connections to Tennessee.

7.4.3 U.S. Rail Infrastructure Improvements

Class I Railroads are investing in infrastructure and capacity, either through direct capital outlay or through public private partnerships. Norfolk Southern (NS) is investing in the Crescent Corridor (see Figure 7-4), which crosses 13 states, improving the connection between the southeastern and the northeastern portions of the U.S. The NS project is focused on 2,500 miles of rail infrastructure with a reported cost of $2.5 billion. The project will expand capacity from New Orleans and Memphis, through Birmingham, Chattanooga, Knoxville, and Charlotte, to connect with Philadelphia and New York. The project involves investments to rail infrastructure in Tennessee including a recently opened terminal in Rossville (east of Memphis), and another location is under study in east Tennessee near Knoxville. By paralleling Interstate alignment, the Crescent Corridor improves the capacity and resiliency of the freight transportation system in the U.S. with the added potential to support additional mode shifts from truck to rail for long haul traffic.

NS is also partnering with Canadian National on the Mid-America Corridor to reduce transit time between Chicago, St. Louis, and Memphis (see Figure 7-4). The goal of this corridor partnership is to share track between the three gateway cities. The Class I railroads continually assess their networks and identify potential improvements for long term freight movement. The NS Crescent Corridor and the CSX Heritage Corridor are examples. TDOT examined the restoration of an east-west corridor in Tennessee linking Memphis, Nashville and Knoxville on a more direct alignment by restoring the rail infrastructure between Algood and Oliver Springs. Future freight volumes and railroad network considerations may renew interest in the corridor development. The North American Steel Interstate Concept (NASIC) visualizes a high-speed and high-capacity network, which aims to connect the US with rail at competitive speeds.

Figure 7-4 NS Crescent Corridor and NS/CN Mid-America Corridor



Even as the Class I's are benefiting from these corridor improvements, their local networks and yards in metropolitan areas continue to be a challenge, both in terms of operations and capital investment priorities. Many older yards are not equipped to deal with growth in intermodal traffic and overall train length. Class I railroads are pushing longer unit trains with anywhere from 115 to 140 cars, typically carrying coal, grain / commodities, refrigerated food, petrochemicals, or containers. The growth of unit trains aligns with trends for increased efficiency and more uniform operations. The shifts in traffic, in turn, affect the capacity and performance of existing infrastructure.

For metropolitan areas, these trends also have land use implications. Land surrounding the older yards has generally been developed and makes expansion of these yards difficult if not impossible.

Expansion of Radnor Yard, as one example, is constrained due to the residential and commercial developments surrounding it. Additionally, longer trains may result in longer or more frequently blocked at-grade highway/rail crossings.

7.4.4 Waterway Connections

The Mississippi, Tennessee, and Cumberland Rivers play an important role in the Tennessee and the U.S. freight transportation system. With respect to the waterway system, there is an apparent need to improve the lock system. As discussed in Chapter 5, the state of the Chickamauga Lock is deteriorating. Stakeholders expressed an expectation of an increase in truck movements on I-75 between Chattanooga and Knoxville if the Chickamauga lock closes. The new Chickamauga lock expansion project is expected to be completed in 2021, but is dependent on sufficient available funding.

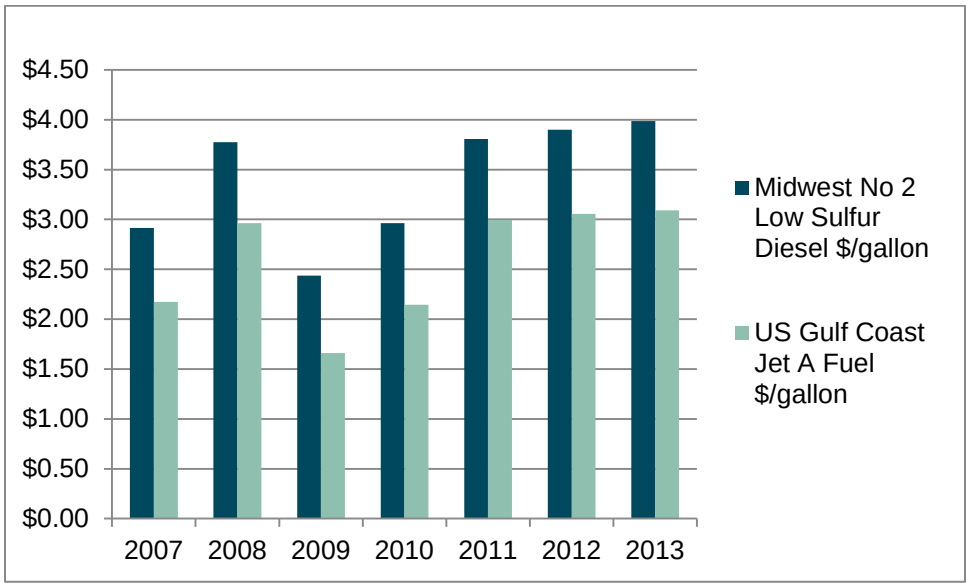
7.5 TRANSPORTATION COSTS

For companies involved in freight, transportation and logistics are simply a cost of doing business. Improvements to the transportation system, even with limited job creation in some cases, enhance the competitive position of a region to grow and create employment opportunities in other sectors.

For manufacturers and distributors, pressure to reduce costs is driving greater fuel efficiency, interest in alternative fuels, larger distribution buildings, closer physical alignment between intermodal yards and distribution centers, and interest in overweight truck routes to directly connect these assets. There is a need to focus on areas where intermodal connections between truck and rail can be improved and how these centers align with current land uses, particularly in underutilized sites proximate to intermodal locations that have growth potential.

Manufacturers and retailers face continued pressure to keep shipping costs as low as possible as transportation has consistently absorbed the largest share of logistics costs for companies. Higher costs are driven by labor as well as fuel, the latter of which has grown at rates well above the rate of inflation since 2007. While costs per gallon for low-sulfur diesel have grown at a rate of about 5.4% (annualized), rates for jet fuel have grown faster (about 6%) as seen in Figure 7-5. Increasing costs of jet fuel are one reason why air cargo growth has recently slowed, as cargo has diverted to expedited ground transportation. The increased use of regional aircraft with a smaller airframe to balance passenger loads and reduce fuel surge also reduces air cargo capacity.

Figure 7-5 Fuel Price Comparisons, $/Gallon



Source: www.eia.gov

While sustainability arguments have not gained universal traction, experience reinforces the reality of how higher fuel prices are gradually pushing freight from air and truck toward rail and water. From an efficiency standpoint, one rail car can generally carry 112 tons of cargo, 4,000 bushels by approximate volume, while one truck can generally carry 26 tons of cargo or 910 bushels by volume.[7] Containerization of freight has also dramatically reduced transportation costs partly because it can be handled more efficiently between different modes.

7.6 REGULATIONS

7.6.1 Trucking Regulations

The trucking sector has been undergoing changes resulting from additional regulations including:

- **The Compliance Safety Accountability (CSA) initiative -** The CSA is a program instituted by the Federal Motor Carrier Safety Administration (FMCSA) in December 2010 to improve safety for motor carriers and the public. The FMCSA uses the Safety Measurement System (SMS) tool to collect data about safety incidents in an effort to identify emerging problems more readily, including high-risk carriers. While the goal is to improve safety, it has resulted in drivers leaving involuntarily due to unsatisfactory safety ratings and thereby reducing the number of available drivers.

- **Hours-of-Service -** The Hours-of-Service (HOS) Final Rule was issued on December 22, 2011. The effective date of the Hours of Service of Drivers Final Rule was February 27, 2012, and the compliance date of selected provisions on July 1, 2013. The rule decreases

[7] Iowa Department of Transportation, http://www.iowadot.gov/compare.pdf

the average work week, dictates the re-start time, and requires drivers to take a 30-min break in the first 8 hours of a shift. One of the indirect results of this ruling includes the demands placed on truck parking facilities; in order to comply with the regulations, there needs to be sufficient truck parking available along routes carrying large truck volumes. Currently in Tennessee, commercial vehicles can be seen parking along Interstate entrance and exit ramps, which is indicative of the unavailability of truck parking or even the availability of truck parking, just not in convenient locations. Several stakeholders voiced concern over the lack of truck parking availability in Tennessee.

- **Electronic Logging Device (ELDs) -** The FMCSA is expected to finalize the rules on electronic logging devices in 2014 with the regulation to likely take effect in 2016. The rule would require drivers currently using paper logs to use ELDs. One of the main concerns raised by the trucking industry was driver harassment through the use of e-logs. The proposed rule now includes provisions to protect drivers from pressure to exceed hours of service and "inappropriate communication that affect drivers' rest periods".

- **Jason's Law**- The recent federal transportation bill, MAP-21, and other transportation legislation addressed additional issues for truck transportation, one notable aspect is the "Jason's Law" provision. The federal bill required states to provide safe rest areas for trucks and their drivers to augment the sometimes limited space and time available at fuel and food/retail shopping service areas. The legislation grew out of an unfortunate incident while also recognizing the need for additional truck rest areas with the increase in traffic volumes and rest rules.

- **Truck Size and Weight -** Truck size and weight regulations have remained relatively unchanged since the Surface Transportation Assistance Act (STAA) in 1982. The STAA set size and weight limits for commercial vehicles traveling on Interstates and created the National Network. The National Network provides commercial truck drivers a designated set of roads that can accommodate conventional combination trucks. Several studies and legislation have been created in an effort to increase the size and weight limits. The current efforts include the *MAP-21 Comprehensive Truck Size and Weight Limits Study* and an industry push for increased truck weight with the addition of an extra axle. Currently, special permits allow for overweight and oversized shipments and are issued at the state level.

7.6.2 Rail Regulations

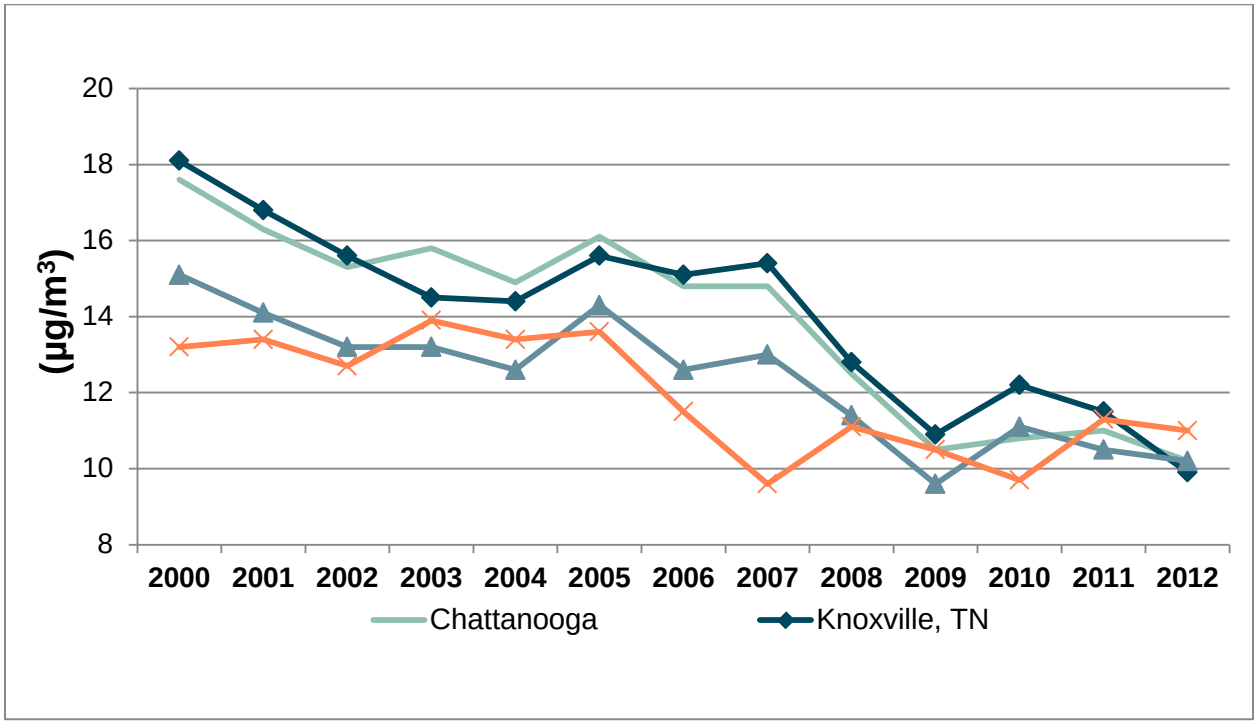
Federal regulations related to the railroads are continuing to shift. The industry is currently struggling with the technology needed for implementation of Positive Train Control (PTC). PTC institutes technology to monitor and control train movements as a means to improve railroad safety primarily through train separation or collision avoidance, line speed enforcement, temporary speed restrictions, and rail worker wayside safety. The Rail Safety Improvement Act of 2008 mandated the implementation of PTC which requires implementation on any rail corridor with passenger trains or transports hazardous materials. Tennessee has very limited passenger rail service and may not be as affected as other states with high passenger rail service. Due to the high estimated cost to implement PTC on all of the Class I railroad tracks (estimated at more than $10 billion), some speculate that the costs may be passed on to customers.

Equally significant are current discussions within the Surface Transportation Board focused on the concept of reciprocal switching for "captive shippers". If implemented, the rule would allow shippers to access other railroads, reducing shipping costs. Canada currently utilizes interswitching regulations for pre-determined distances on other carrier rail lines.

7.6.3 Air Quality

Air quality regulations will continue to impact transportation. The U.S. Environmental Protection Agency (USEPA) air quality requirements will further transform rail and barge transportation in the next 10 years. Growth in freight traffic directly relates to use of diesel fuel, with related concerns for particulates (PM 2.5) as well as broader social justice issues. Figure 7-6 shows the PM 2.5 Average Annual Emissions concentration (micrograms per cubic meter) for select Tennessee Metro Areas based on data from the USEPA.

Figure 7-6 PM 2.5 Average Annual Emissions by Metro Area



As one strategy for reducing diesel emissions in the rail sector, USEPA rules are now implementing TIER 4 regulations for locomotive engines to reduce emissions. With growing awareness of air quality impacts on adjacent/at-risk populations, the connection between land use and freight movements will become increasingly important to the freight discussion.

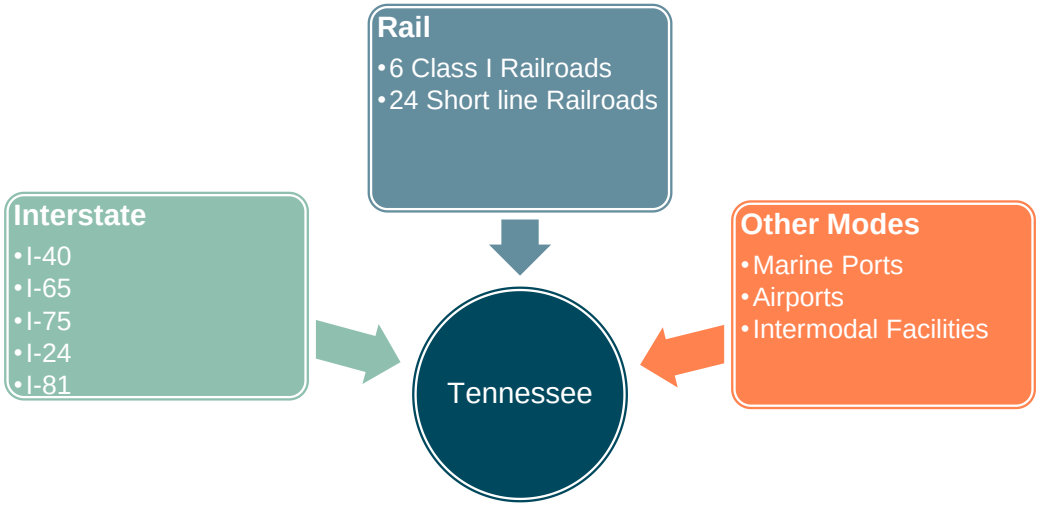
8. Tennessee's Freight Transportation System Strengths and Challenges

8.1 STRENGTHS OF THE TENNESSEE FREIGHT TRANSPORTATION SYSTEM

Tennessee's geographic location between the north and Midwest and ports along the East Coast and the Gulf leads to the need to have a strong interstate system. This also strengthens Tennessee's ability to serve leading industries within the state, such as Automobile Manufacturing, Pharmaceuticals, Agriculture, Machinery, and Chemical Products, by providing connections to ports through its strong interstate system and rail lines. Tennessee also has the ability to utilize the national waterway system through the Port of Memphis, connection to the Tennessee-Tombigbee waterway, and the Tennessee and Cumberland Rivers. This provides bulk industries, such as Coal, Agriculture Products, Stone, Sand, and Gravel, a cost effective means for shipping.

Freight movement in Tennessee relies heavily on the extensive interstate system, which is anchored west to east by Interstate 40 and south to north by Interstate 65 and Interstate 75 (see Figure 8-1). Interstate 24 runs northwest to southeast through middle Tennessee while Interstate 81, beginning 30 miles east of Knoxville, serves additional freight movement in the eastern part of the state. Although I-55 only runs through the southwest corner of Tennessee it is an important freight corridor connecting New Orleans to Chicago. The freight system is enhanced by the 6 Class I railroads in the state and 24 short line railroads serving industrial sites and regional freight movement. The ports, airports, and multimodal facilities strategically located throughout the state provide important connections to corridors and industrial centers outside of the state that complete the freight system.

Figure 8-1 Tennessee's Freight Transportation Infrastructure



8.1.1 West Tennessee

Located in west Tennessee, Memphis is the state's largest intermodal freight hub, offering significant air, water, rail, and highway infrastructure. Home to FedEx, the Memphis International Airport connects to more than 220 countries, serves 95% of the global economy in 24 to 48 hours, and is one of the busiest cargo airports in the world. This provides an invaluable connection for the industries located in Tennessee. The FedEx hub is capable of processing more than 500,000 packages per hour.

The International Port of Memphis services 122 tenants, which utilize the Mississippi River to move freight north and south, resulting in annual revenue of $3.3 Billion. Additionally, the Cates Landing public port, located in the northwest corner of the state, is the only developable site along the Mississippi River, between Memphis and Cairo, Illinois that is outside the 100-year flood plain. Tennessee's ports on the Mississippi River are strategically located at the mid-point along the water-freight corridor connecting Canada and Mexico. Location of the Port of Memphis will provide industries in the state the ability to utilize the waterway system for shipment of heavy machinery or automobiles to international markets.

The Tennessee River (which is the largest tributary of the Ohio River) also serves freight traffic within west Tennessee, offering 215 miles of navigable waters connecting the Tennessee-Tombigbee Waterway to the Ohio River. This link is critical to the north-south waterway corridor serving Pennsylvania and the Gulf Coast. According to the Tennessee Valley Authority (TVA), the west Tennessee segment is the busiest portion of the Tennessee River System, carrying sand and gravel, coal, chemicals, petroleum, ores, and minerals on tows consisting of up to 15 barges. Only two lock and dams are located along this stretch of the Tennessee River – one near Paducah, Kentucky, which is currently being expanded to accommodate more river traffic, and one at Pickwick Landing near the Mississippi border.

Six Class 1 railroads serve west Tennessee and five converge in Memphis: Burlington Northern Santa Fe (BNSF), Canadian National (CN), Norfolk Southern (NS), Union Pacific (UP), and CSX. Many short line railroads branch from these Class 1 lines to serve the west Tennessee region. BNSF has

a 185 acre intermodal yard located southeast of downtown Memphis within blocks of the Memphis International Airport. CN and CSX both have intermodal facilities located within Frank C. Pidgeon Industrial Park, which is part of the International Port of Memphis. In addition to its Forrest Yard in downtown Memphis, NS opened an intermodal facility in 2012 in Rossville, Tennessee (approximately 38 miles east of Memphis)as part of its strategy to strengthen rail freight movement along the Crescent Corridor. This new facility offers capacity for 200,000 shipping containers and piggyback trailers. NS has dedicated $2.5 billion towards infrastructure investment along this 11 state Corridor to provide one of the fastest, most direct routes between the Southeast and Northeast.

The interstates are an important part of the manufacturing in Tennessee where just in time shipments are critical to the supply chain. Interstate 40, which moves freight east-west through the region, intersects Interstate 55 in Memphis. Interstate 55 is a north-south freight corridor between Chicago and New Orleans connecting through Memphis, Tennessee. As part of Federal Corridor 18, which is proposed to provide a continuous connection between Canada and Mexico, Tennessee is working toward completion of Interstate I-69 from Fulton, Kentucky to Hernando, Mississippi. Portions of Segment 7 (Fulton, KY to Dyersburg, TN) are currently under construction. The remaining sections are in the Environmental and Design phases.

8.1.2 Middle Tennessee

Middle Tennessee also provides a robust multimodal freight network which allows Tennessee to receive long haul shipments and deliver by truck to the destination. Interstate 40, Interstate 65, and Interstate 24, which are key intrastate freight corridors, travel through the region and converge in Nashville serving through traffic for freight movement as well as providing a reliable connection between middle Tennessee and east and west Tennessee. Interstate 440, State Route 840, and State Route 155 (Briley Parkway) support the north-south and east-west freight movement within the Nashville area.

Nashville also serves as a hub for CSX freight movement to and from Chicago / St. Louis, Cleveland / Louisville, Chattanooga / Atlanta, Birmingham / Montgomery, and Memphis. CSX Radnor Yard, which is located along I-65 just south of I-440, accommodates 150 railcars and 450 trucks weekly. CSX also has an intermodal terminal in Nashville which serves as a critical transfer point for the automobile industry. CSX has Total Distribution Services Inc. (TDSI) auto distribution terminals in Nashville, Smyrna, and Spring Hill. Short line railroads move freight in the areas between Nashville and Knoxville due to the absence of a direct connection.

The Nashville International Airport includes the Nashville Air Cargo all-cargo complex which serves as an important connection for the electronic industry. In 2013, the airport experienced an increase of 26% in cargo moving through its facilities compared to 2012. Due to growing cargo demand, the airport is rehabilitating and expanding the Nashville Air Cargo facilities. A total of 113 acres have been reserved for continued expansion of air freight services.

Barge traffic on the Cumberland River moves coal, oil, sand, scrap metal, and gravel. While the 381 miles of navigable water is circuitous, the ability to transport these commodities in bulk provides an alternative to truck transport on I-40, which is beneficial both to manufacturers and to passenger vehicles. In addition this relieves the wear on the roadway system. The U.S. Army Corps

operates and maintains four navigation locks on the Cumberland River: Barkley, Cheatham, Cordell Hull, and Old Hickory.

Of note within middle Tennessee is the movement of military equipment to and from Fort Campbell. This equipment is transported by truck on Interstate 24 and Highway 72, and by rail along CSX lines.

8.1.3 East Tennessee

The multimodal freight network in east Tennessee continues to attract private industry, such as Volkswagen, which opened a facility in Chattanooga in 2011 designed to assemble up to 173,000 automobiles with 1,500 employees. Volkswagen recently announced plans for a second vehicle line and an additional 2,200 jobs as the next step in moving towards producing 800,000 vehicles a year in the domestic North American market. Interstate 75 serves north-south truck movements, providing an important link in the freight corridor between Atlanta and Detroit. Interstate 81, which begins southwest of Morristown, Tennessee, links Interstate 40 in Tennessee to the Northeastern US and on to the Canadian border.

Norfolk Southern's Crescent Corridor travels through east Tennessee, from the Tri-Cities area to Chattanooga. Currently, NS is conducting market-based research for a potential intermodal truck/rail facility in the Knoxville area which will provide the ability for long haul shipments to transfer to truck in the region. CSX lines travel north-south in the east Tennessee Region, providing connections between Chattanooga and Jellico at the Kentucky state line, as well as from Erwin to Kingsport. CSX has a major rail yard in Erwin, Tennessee and TRANSFLO Terminal Service Bulk Transfer Terminals in Chattanooga and in Knoxville.

East Tennessee boasts three major airports that provide for cargo shipments. Knoxville's McGhee Tyson Airport, which is a U.S. Customs port of entry, covers over 2,000 acres of land and provides 9,000 foot runways to accommodate any size aircraft. The Tri-Cities Regional Airport covers over 1,225 acres including a 35 acre air cargo logistics center and a 75 foot wide taxiway system. In 2013, the Chattanooga Metropolitan Airport recorded that total cargo transported was 54.8 million pounds. The airports in the region provide a strong connection for time critical shipments.

The Tennessee Valley Authority and U.S. Army Corps of Engineers maintain nine main and four auxiliary locks on the Tennessee River, five of which are within the east Tennessee Region. Two major inland ports are located in east Tennessee as well, in Chattanooga and Lenoir City. Within east Tennessee, the Tennessee River travels north-south, providing for major distribution of fertilizer, road salt, and asphalt. The river also enables an efficient bulk transport of zinc from mines in Jefferson County to customers downstream. The Tennessee River is also used to transport large equipment and parts not only for TVA's power plants, but also for military purposes and major industries such as Volkswagen.

8.2 CHALLENGES OF THE TENNESSEE FREIGHT TRANSPORTATION SYSTEM

8.2.1 Congestion

Tennessee's roadway system is expansive and efficient. Like most states, however, Tennessee faces challenges related to localized congestion. Bottlenecks resulting from recurring congestion on urban interstates result in higher fuel costs, delayed products, and reduced air quality. These recurring bottlenecks are typically caused by limited roadway capacity, geometric designs that inadequately serve the traffic demand and vehicle mix, ramps with minimal storage and/or inefficient cross-road intersections, and in some cases steep grades that slow truck traffic. The following locations on Tennessee's interstate system have been identified in Chapter 5 with recurring bottlenecks:

- Interstate 75 / Interstate 24 junction in Chattanooga
- Interstate 24 / Interstate 440 junction in Nashville
- Interstate 40 / Interstate 65 junction in Nashville
- Interstate 65 / Interstate 24 junction in Nashville
- Interstate 40 / Interstate 240 junction in Memphis

In recent years, TDOT's Strategic Transportation Investments Division has worked closely with the Federal Highway Administration and local governments to identify locations where ramp queues impact the adjacent interstate lanes and to mitigate the impact. In many cases queuing has been addressed by signalizing the ramp / cross-road intersection or modifying an existing signal. In some cases, ramps and the approach lanes have been widened and/or extended.

In more isolated instances, recurring congestion can result from delays at weigh stations, causing truck queues to extend onto the interstate, or where on-going, multi-year construction projects on adjacent facilities detour traffic onto a segment of interstate.

While bottlenecks on the interstate system typically result in the most detrimental impacts to freight movement, Lamar Avenue (U.S. 78) in Memphis is an extreme example of how congestion on the adjacent roadway network can impact truck travel times. In this case, the congestion also impacts operation of the BNSF intermodal yard and Memphis International Airport. The Lamar Avenue Corridor Study, completed in June 2011, found that adding lanes to Lamar Avenue would provide the highest benefit/cost ratio as opposed to other investigated improvement options. At an estimated cost of $89.1 million, however, the widening of Lamar Avenue is not an immediate solution. Upgrades to key intersections along the corridor would be a cost-effective near-term solution. Currently, the City of Memphis is performing signal optimization projects to make the best use of the existing facility.

According to Tennessee's Rail System Plan, a basic forecast suggests rail traffic in 2020 will be 50% higher than that experienced in 2002. The state must take appropriate action to maintain sufficient rail infrastructure in order to avoid congestion issues. While current congestion at metropolitan intermodal hubs is attributed to operational constraints versus capacity issues, future demand may necessitate additional capacity. TDOT's role will be to provide system improvements that make the railroad more user-friendly, while ensuring intermodal facilities are properly maintained and adequately developed. For short line railroads, this means efficient administration of the short line rehabilitation program and possibly increased funding.

8.2.2 Safety and Resiliency

The resiliency of a freight system relies both on the ability to re-route and divert freight traffic in the event a key infrastructure component fails and on the ability to recover quickly from small-scale non-recurrent events. Safety quickly becomes a concern as freight is diverted to routes or railroads that are not designed to accommodate the size, weight, or material being moved.

Two major infrastructure components in Tennessee are currently in jeopardy. The Chickamauga Lock on the Tennessee River has been deteriorating for years as a result of concrete growth caused by a reaction between alkali in the cement and the aggregate rock. This has resulted in the expansion of the concrete structures, cracking, and movement. The lock is in work-to-fail mode while TVA and the Corp of Engineers wait for funding to complete construction of a new 110' x 600' lock. Should the existing Chickamauga lock fail prior to completion of the new lock, barge traffic along the Tennessee River System will be diverted to adjacent rail and highway systems. In 2013, 637 loaded barges passed through the Chickamauga Lock. A standard river box barge can carry 81 20'-containers, which means that up to approximately 52,000 20' containers would need to be transported via another mode if the Chickamauga lock closes. Not only will this have a significant impact on the economy in the southeast region, but also on the level of roadway congestion and capacity at the impacted rail yards.

Currently four bridges span the Mississippi River in the Memphis area – two highway bridges (I-55 and I-40) and two railroad bridges. The Frisco and Harahan rail bridges, constructed in 1892 and 1916, respectively, are not designed to withstand seismic activity. The highway bridges are also aging and experiencing deficiencies that frequently result in delayed movement across the river. With the nearest interstate crossing over 60 miles away near Helena-West Helena, Arkansas, it is estimated that loss of these bridges would result in a negative economic impact to the region ranging from $4.176 to 4.316 billion dollars[1]. An environmental document is underway for a new multi-modal bridge in Memphis, but currently there is no funding dedicated for future phases of the project.

Similar to the Mississippi River, the mountainous topography of Tennessee also presents a challenge to the east-west movement of freight. Currently, I-40 is the only east-west interstate crossing the state and there are no major east-west rail corridors in the state. In the event of an unplanned closure of a portion of I-40, there is no alternate roadway to carry the overflow of traffic. This would place increased pressure on state and other local routes or require drivers to travel a

[1] Tennessee Department of Transportation, Mississippi River Crossing Feasibility and Location Study, June 2006

less direct route on the Interstate system. Similar issues have arisen in North Carolina, where rock slides have caused portions of I-40 to be closed for extended periods of time forcing drivers to divert to I-81.

As a means of combatting issues such as these on Tennessee's roadways, TDOT's HELP program was initiated in 1999. The program has not only bolstered TDOT's reputation in the eyes of Tennessee's citizens, but it also dramatically decreased non-recurrent delay and secondary collisions. Currently, the HELP trucks only serve the four major urban areas and generally follow designated routes so they can quickly respond to events. Freight stakeholders agree that to improve congestion, safety, and travel times across the state, the HELP truck service should be expanded into some of the rural areas where a non-recurrent event can completely shut down a two-lane interstate facility.

8.2.3 Maintenance and Deterioration of Rail lines, Bridges, Locks

In addition to the Chickamauga Lock deterioration and age-related maintenance issues associated with the Mississippi River bridges described in the previous section, infrastructure in Tennessee will experience increased maintenance and deterioration issues as federal, state, and local funding constrict.

Although the road and bridge maintenance programs in Tennessee are currently funded so that adequate maintenance occurs, it is expected that as the future funding landscape changes, there will be a strain on the sources used for the regular maintenance of roads and bridges.

Class I rail lines in Tennessee have been upgraded to accommodate 286,000 lb. cars. This improves the efficiency of the Class I system because they can move a heavier load per rail car. Due to restricted funding, short line railroads in the state have been unable to match this effort, creating a missing link between Class I rail lines and the industries they serve.

8.2.4 Truck Parking

The trucking industry relies on drivers to travel long distances in short periods of time, a scenario that results in the frequent use of rest stops rather than overnight stays at hotels. In July 2013, legislation was passed to implement the Federal Motor Carrier Safety Administration (FMCSA)'s regulations on driver breaks. The new law requires drivers to include at least two nighttime periods (from 1 AM to 5 AM) in the restart break – a requirement resulting in drivers seeking parking more frequently.

Existing facilities along Tennessee interstates provide approximately 767 truck parking spaces, including 472 at 30 rest areas/welcome centers across the state, and approximately 295 unmarked spaces at 16 temporary weigh stations. A study conducted by the University of Tennessee and Clemson University revealed a shortfall of approximately 1,460 truck parking spaces across the state. This study was conducted over 10 years ago, suggesting an even greater

shortfall today. A possible solution is to reopen pull outs with additional lighting, restrooms, and more patrol. [2]

8.2.5 Funding

Tennessee's public transportation infrastructure relies heavily on federal funding and the motor fuel tax. Federal funding for transportation has declined rapidly in the last several years with no indication that this trend will change. Additionally, the Tennessee Motor Fuel Tax has not been increased since 1990, nor has the Gas Tax been increased since 1989 – causing revenues to fall well behind inflation. Compounding this issue is the fact that the gasoline tax in Tennessee is based on the number of gallons of gasoline sold rather than indexed on the price of gas. Therefore the revenue does not respond positively to increases in gas prices, rather it suffers due to the typical reduction in the number of gallons purchased at higher prices. The trend toward more fuel efficient vehicles also negatively impacts the gas tax revenue.

Interviews with freight stakeholders in Tennessee suggested a general lack of funding for multimodal efforts. In part, this is a reflection of the state's limited ability to enter public-private partnerships, including toll projects, based on legislation. Most recently, multi-modal funding is also limited due to the court's ruling on the Short Line Equity Fund, which disallows the state to charge a diesel fuel tax on rail cars that shift funds between classes of rail service. The decision is currently pending an appeal.

8.2.6 Land Use and Infill in Urban Areas around Airports, Ports, Rail Yards

In line with national trends toward sustainability and smart growth, Tennessee's metropolitan areas have developed policies to promote urban redevelopment and infill. This transition has enormous economic potential for the cities and counties within the metropolitan area; however, it creates new capacity constraints on existing freight infrastructure. The CSX Radnor Yard, for example, has reached capacity. Expansion of this facility is prevented by the surrounding land uses and zoning, forcing CSX to relocate to a less restrictive, but less attractive location.

The Nashville International Airport has encountered similar challenges as it tried to extend existing runways and expand parking as a relocation of Donelson Pike would be necessary to accommodate expansion of the airport.

8.3 PRIORITY OF SOLUTIONS TO ISSUES

At a joint FAC meeting, stakeholders were able to prioritize the freight infrastructure issues facing Tennessee. The key issues that freight movement in Tennessee faces are shown in Figure 8-2:

[2] Truck Parking and Safety in Rest Areas in Tennessee, University of Tennessee

Figure 8-2 Tennessee Freight Challenges

The FAC members, along with TDOT representatives, ranked safety and congestion as the two most important issues to address through projects that support freight movements. Maintaining a state of good repair of the state's freight infrastructure and supporting economic development were the next most important issues to be addressed as identified by the FAC. Using advanced technology and community impacts are the next two primary areas the stakeholders feel should be addressed through freight projects. Freight-related projects oftentimes will address more than one issue, as well as contribute in varying measures to these same issues, such that priorities across the state will still necessitate a balancing in order to aid freight movement.

Recognizing that stakeholder input is a vital component to determining priorities for improving freight movement, TDOT will want to build on the outreach with public and private sector freight stakeholders throughout their efforts to maintain and improve Tennessee's freight infrastructure.

9. The State's Decision-Making Process

Commodities are largely moved through the state by private entities. The infrastructure upon which they move is public, private or a mix of both. Not only does freight travel over different jurisdictions (geographical and public vs. private), sometimes several modes are used to move a commodity from its origin to its destination. The complex logistics to move freight requires coordination between public and private stakeholders to ensure sufficient infrastructure exists to support current and future commodity movements.

9.1 STAKEHOLDER AND PUBLIC OUTREACH

TDOT recognizes the importance of coordination with all stakeholders involved in the freight industry. With this in mind TDOT established a FAC for the state of Tennessee that is made up of public representatives from TDOT, MPOs, counties, cities, chambers of commerce, port authorities, airports, and universities. The private industry representatives include rail companies, trucking companies, distribution and logistics companies, and manufacturing companies. The statewide committee meets quarterly and has been divided into the West, Middle, and East sub-committees, which are encouraged to meet on a quarterly basis.

The Tennessee Statewide Freight Plan was first introduced at the December 2013 statewide FAC meeting. The purpose was to expose all the members to the purpose of the plan and make them aware of the input being requested of them.

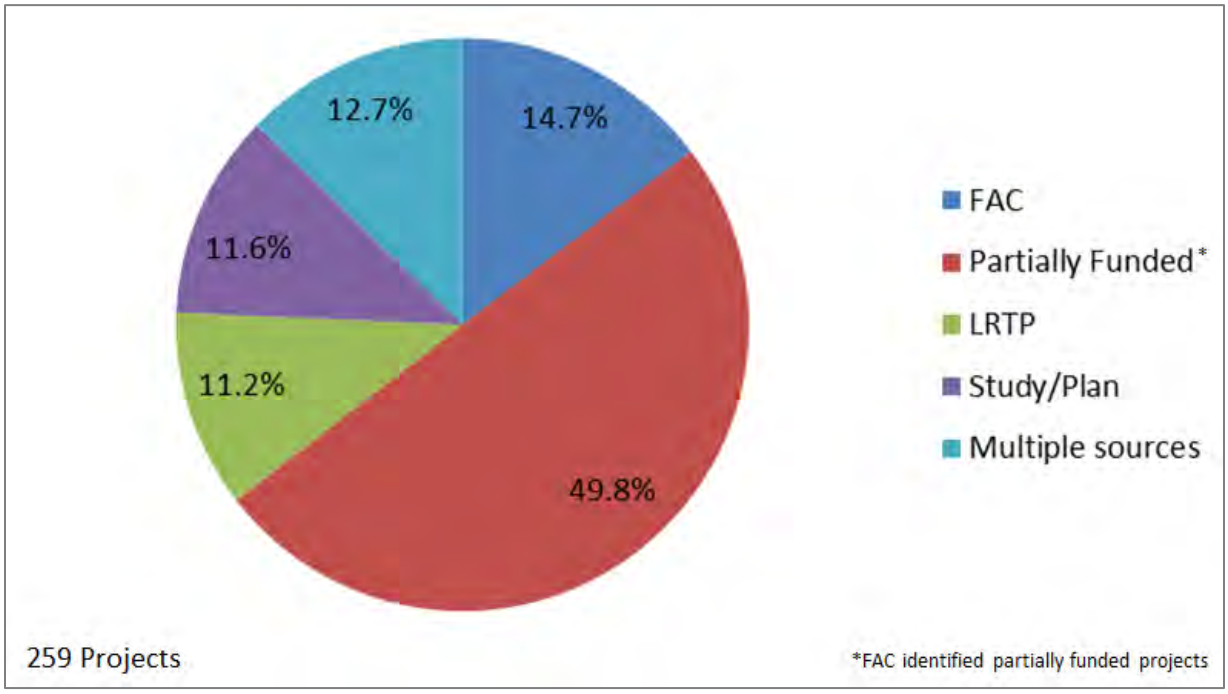
Outreach to the FAC members occurred through several efforts. The first part of the outreach to the members was requesting a response to an e-mail with specific freight related questions including:

- Roadblocks or limitations seen from funding or from policies and programs
- Gaps in the freight system
- Congestion and performance issues on arterials or collector roads
- Accessibility issues to industry such as first mile/last mile
- Identify low-cost, readily implementable projects for freight movement
- Identify freight programs and initiatives or travel information systems that you utilize in other states that Tennessee should consider

Committee members responded with information that helped the team begin to form an enriched understanding of barriers and opportunities to improving freight mobility in Tennessee. Additionally, input also resulted in a number of specific project and program recommendations which form a large portion of the recommendations within this freight plan.

The next part of the outreach included an online survey and a request to each FAC member to set up an interview to discuss the freight assets, strengths, and challenges in the state. Both of these requests received a good response from FAC stakeholders. The online survey gave the stakeholders the opportunity to identify more freight projects as well as to rank the freight goals. Phone interviews occurred throughout the month of March 2014 and gave the team invaluable knowledge of the freight system in Tennessee. An outcome of the online survey and phone interviews was additional insight into statewide freight transportation needs as well as project specific recommendations in each of the geographies of the state. Figure 9-1 shows the various sources where each of the identified projects originated.

Figure 9-1 Source of Project Recommendations



From this input a draft project list was created, which the team presented to the statewide FAC committee at their April 2014 meeting. Attendees were given the opportunity to prioritize the projects for their geography and an opportunity to give input on critical strategic freight corridors in Tennessee. In addition, an interactive portion of the presentation was aimed at determining the stakeholder's importance on addressing the challenges seen by the freight transportation system. For FAC members that were unable to make the April 2014 statewide FAC meeting, members were called directly and given the opportunity to provide the team with information regarding freight transportation system needs. The guidance received from the meeting and the culmination of additional input from committee members was used to shape the prioritization of the projects.

In addition to reaching out to external stakeholders, the team also conducted meetings with the different divisions within TDOT as part of the Long Range Plan effort. The purpose of this was to identify freight initiatives within the division. Feedback from TDOT staff helped form the policies and projects described in this plan.

9.2 PRIORITIZATION OF STRATEGIES, PROJECTS, AND POLICY CHANGES

All of the projects identified in this plan, once implemented, would benefit Tennessee and improve Tennessee's transportation system. Funding constraints limit the number and scope of projects which can be implemented at any one time. In order to identify short-term and long-term projects, a prioritization process was developed to assist the department in deciding which projects are of most importance in meeting Tennessee's growing freight demands.

9.2.1 Prioritization Methodology

The projects in this plan are evaluated using measurable criteria to show how a project will help the state achieve its goals and objectives. The points assigned to each criteria are reflective of its importance as identified through the stakeholder input described in Section 9.1.

In order to evaluate the projects across all modes, metrics had to be defined for each mode per criteria. Grouping the projects together for all modes emphasizes the intermodal focus of freight projects, which is important to the efficiency of TDOT's freight system.

The criteria chosen for evaluation pivot off the goals and objectives focused on the goods movement sector. With the growing participation in freight management by more stakeholders, additional factors are being evaluated. Along with this focus is the potential to develop additional freight attributes and performance metrics that are not currently captured or distributed widely. Several candidate criteria were identified that have the potential for future measurement and are discussed at the end of this section. Seven Project Prioritization Goals were used in prioritizing the projects as shown in Table 9-1.

Table 9-1 Project Prioritization Goals

	Project Prioritization Goals	Percentage
A	Safety, Security, & Resilience	20%
B	Improves State of Good Repair	10%
C	Reducing Congestion	20%
D	Improve Contribution of Freight Transportation System to Economic Efficiency, Productivity, & Competitiveness	15%
E	Advanced Technology, Performance Management, Innovation, Competitiveness, & Accountability	10%
F	Reduce Adverse Environmental & Community Impacts	10%
G	FAC Input	15%
		100%

Each project prioritization goal and attribute is discussed below:

A) **Safety, Security and Resiliency –** Maximizing safety and security is always an important objective and as such is a goal for the Freight Plan and stated as a Guiding Principle in TDOT's LRTP. Projects receive points if:

   a. The project is located in a high crash location or at a rail/highway at-grade crossing and the project improves safety either by reducing congestion, improving infrastructure, or diverting freight to a safer mode.

   b. The project provides an alternative route to a supply chain. The resiliency of the system is important for freight movement if there is an incident that requires an alternate route or mode to be used for long term or short term solutions

B) **Improves State of Good Repair** – This project goal recognizes that maintaining transportation assets sustains the original planned benefits, as well as minimizes the long term maintenance and replacement costs that would otherwise arise from deferred maintenance. Points are awarded to projects based on the freight tonnage moved on the infrastructure because heavier tonnage will result in faster deterioration of the infrastructure.

C) **Freight Congestion Relief –** This goal addresses mobility of goods on Tennessee roadways. Congestion relief is often addressed by adding roadway capacity, building bypasses around urban areas, and providing highway traffic diversions. Projects receive points if:

   a. The project will effectively reduce congestion either directly (such as lane widening) or indirectly (such as providing alternative mode of transportation). Projects located in bottleneck locations will receive high priority.

D) **Improve Contribution of Freight Transportation System to Economic Efficiency, Productivity, & Competitiveness** – Freight volume, in weight or transport unit, e.g., railcars, has been a long term freight metric that often affects overall capacity and physical condition of the transportation infrastructure. The value side of freight movement has grown in importance as the freight industry is aligned with supply chains as well as the physical movement of goods. Four criteria were defined for this goal including:

   a. Multi-modal facility proximity to NHS, tonnage per truck/rail/barge/air on a supply chain, value per truck/rail/barge/air, and project proximity to freight industry. This addresses the need to connect freight facilities with the freight infrastructure.

   b. Projects that improve access to more freight facilities, such as warehouses, distribution centers, rail yards, air cargo airports, and marine ports along with major freight generators and attractors, such as manufacturing areas, should receive high priority.

   c. Projects that connect to the interstate system and underserved industrial or rural areas that serve important supply chains.

E) **Advanced Technology, Performance Management, Innovation, Competitiveness, & Accountability** – This attribute addresses the Guiding Principle to "preserve and manage the existing transportation system." System preservation is seen as an important option to consider before system expansion and is important for achieving a sustainable transportation system. Two attributes were identified for this overall technology and management assessment goal, System Management and Trip Detour for Non-Recurring and Intermittent Events. Projects receive points if:

   a. The project is a highway and railway maintenance and upgrade project.

   b. The project diverts freight to modes with the lower maintenance cost on a ton-mile basis.

F) **Reduce Adverse Environmental & Community Impacts** - This addresses the Guiding Principle of protection of the environment. Projects receive points if:

   a. If it is an interstate project not inside an urban area. Because of right of way constraints around urban interstates improvements to these facilities often result in adverse effects such as noise impacts or encroachment on the land use.

   b. If it is improving an existing alignment. Improving existing facilities versus a new alignment can help avoid impacts to undeveloped natural areas and farm land.

G) **FAC Input** – The criteria captures those projects identified by the regional and statewide FAC committees as a high priority.

Future Project Selection Criteria

Several candidate metrics were identified that have not been tracked in the past by TDOT but might be considered in the future.

- Maintenance Rating Index- Roads/Maintenance requirement on track/Maintenance for water/Maintenance on roads around airport
- Rail Speed Restrictions/Time through Lock.
- Travel time delivery (On-time Delivery)(truck/rail/water/air)
- Combined Truck Average Travel Speed
- Travel Time Variability/Time through Lock
- Truck LOS
- Data may be developed in the future to support measurement of the multi-modal facility in proximity to the congested area attribute.
- Incident response
- Support of non-traditional fuels and balancing local land use and transportation
- Improvement of air quality and water quality.
- Projects receiving considerable public support

Once TDOT has the Statewide Travel Demand Model complete it should be utilized as a tool to evaluate the freight projects. The model, along with the ATRI data and the Geographic Information System (GIS) spatial analysis that can be conducted, are all useful tools for TDOT to evaluate the freight project list and determine the effects on the freight corridors.

9.3 ECONOMIC ANALYSIS

Freight transportation relies on several unique operational and infrastructure conditions to be successful. Railroads own their own infrastructure and manage their own operations. Barge companies own their own equipment and manage their operations, relying on the public infrastructure for locks, dams and navigational controls. The marine right-of-way is largely self-sustaining if there is adequate rainfall. Trucking requires the maintained public infrastructure of the roadway system(s) in addition to the private sector equipment ownership and management. Roadways have the largest audience for multiple users, and are often times the dominant form of transportation. With the close proximity between the public and private sector, it becomes important to shape transportation alternatives that are the most effective in balancing benefits and costs while meeting the objectives from each of the stakeholders.

Freight transportation alternatives will in many cases take the form of past transportation projects, such as pavement resurfacing, adding lanes, separating road / rail at-grade crossings. In other cases, the projects may involve operational concepts such as time of day traffic movements and dedicated lane usage. Each project and alternative may incorporate documentation of future users and accrual of benefits to fine tune the project's implementation and operation. The current Tennessee Freight Plan has a greater number of physical projects due to the build up from past

transportation budgets within state agencies. Future plan updates and modifications are anticipated to have a greater number of non-physical projects.

9.3.1 Benefits and Costs

The efforts in freight planning and management, together with the increasing competition for scarce public sector infrastructure funds, has prompted a close examination of project benefits and costs as changes are proposed to the transportation system that accommodates freight. The US Department of Transportation's Federal Highway Administration (FHWA) has been in the forefront of this effort, in part due to the dual use of the highway system for passenger and freight transportation.[1] Further, the commingled operations and physical requirements make tracking the system's benefits, costs and impacts difficult to quantify and to separate.

Traditionally, transportation improvements are evaluated using a cost-benefit analysis framework (CBA). This type of analysis typically applies a dollar value to defined benefits and costs associated a proposed transportation improvement. In general, benefits relate to economics, transportation, and the environment. Of primary concern with traditional models is the challenge of valuing intangible factors, which have ranged over time from the value of safety / a human life, the value of time, and the value of ancillary real estate development, to current concerns associated with social justice and impacts on at risk populations. As such, when discussing the effects of a transportation improvement on the freight industry, the benefits may not be fully captured in a traditional CBA.

Recent industry conversations about CBA have also focused on outcomes associated with initial rounds of Transportation Investment Generating Economic Recovery (TIGER) grant funding, where CBA was required as part of the grant application, and applicants in some cases struggled with distinctions between CBA and economic impact analysis. Critically, in these conversations related to TIGER, reports suggest that the question of how to value existing infrastructure assets (i.e. are they in a state of good repair?) in relation to proposed improvements was an area of interest, along with resulting environmental benefits.

As study and research into the connection between transportation and the economy continue, methods of analyzing this link will be refined. As the Tennessee Department of Transportation moves forward, the following considerations are paramount:

- CBA correlates expected costs with the benefits anticipated from the initial identification and selection of alternatives to be evaluated, including the status quo, or a "no- action" alternative; as a result, the methods used to define alternatives and infrastructure options, as well as their geographic extent, are critical in shaping the analysis and outcomes.
- While the CBA needs to be comprehensive, it must also balance accuracy, precision and applicability of the measured costs and benefits. The project costs must also bear a relation to the outcomes and benefits. Put another way, it is important to confirm the

[1] http://www.ops.fhwa.dot.gov/freight/freight_analysis/cba/index.htm

magnitude and weight of specific assumptions that drive the CBA model, such that changes in specific inputs result in unexpected outcomes.

- Debate about externalities, non-monetary benefits, and intangibles can add considerable complexity to the analysis. Tools such as "willingness to pay" and "contingent valuation" have been used to derive non-financial inputs.
- The social aspects of CBA are important, linked to a greater focus on social justice and at-risk populations, to ensure that while the net social benefits of a project are positive, specific groups do not "lose out" to a significant degree. For transportation projects, including harbors and interstate roadways, the immediate proximity of an at-risk populations to these assets has raised equity and environmental justice issues.
- As CBA studies typically involve the valuation of several years of impacts, in many cases 20 to 50 years, decisions regarding discount rates matter significantly.
- Lastly, transportation projects rely on underlying transportation demand models to help calculate impacts. Our experience over the past 5 years suggests that as demand models rely on historical data, these models will need to account for the impact of significant changes, such as the Great Recession, which have dramatically altered land use, real estate demand, and transportation patterns. Models that are built on data from between 2009 to 2012 may need additional sensitivity analysis as a result, to ensure that demand forecasts are reasonable.

10. Tennessee's Freight Improvement Strategy

Through the stakeholder involvement and analysis of Tennessee's freight data conducted for this plan, TDOT has identified policies and strategies to improve the state's freight landscape. This information will contribute to the decisions that TDOT will make today and in the future on the prioritization on the projects chosen to advance Tennessee's multimodal freight transportation system.

10.1 COORDINATION OF THE FREIGHT PLAN WITH OTHER FREIGHT AND TRANSPORTATION PLANS

TDOT is currently preparing a new 25-Year Long Range Transportation Plan, with a target completion date by the end of 2015. This Statewide Freight Plan has been developed concurrently to most efficiently coordinate freight information between the two plans. The state is also preparing a Statewide Rail Plan with an expected completion in 2016. Information gathered during the Freight Plan process will help inform the Statewide Rail Plan.

Within the last several years TDOT has conducted several research studies in support of statewide freight planning. TDOT has also prepared several studies for key interstate freight corridors, including Interstate 40/Interstate 81, Interstate 75, and Interstate 24. Each of these studies was reviewed to identify potential freight projects that will improve or maintain commodity movements for the key freight industries in Tennessee. Other freight related studies and projects have been undertaken across Tennessee by the public and private sector.

At the regional level, the Statewide Freight Plan is built upon information gathered from MPOs, RPOs and other freight stakeholders. The long-range transportation plans developed by these organizations, as well as other freight-related studies, were used to build the freight project list, detailed in Section 10.5. In the development of the Statewide Freight Plan TDOT also included a historical review of projects that are in the Department's current project development process to assess their importance to freight goods movement in Tennessee.

Transportation needs, including freight related investments, come from a culmination of input and study by a variety of sources at the local, regional, state, and national levels of both public and private interests. As TDOT continues to develop and refine its freight initiatives, it will continue to work with these stakeholders, surrounding states, and others to optimize freight mobility to, through, and within Tennessee.

10.2 ADVANCING TENNESSEE'S STRATEGIC GOALS

As described in Section 1.3 of this Statewide Freight Plan, the three strategic objectives for Tennessee's Freight Transportation System include: (1) improving the safety, security, and resilience of the freight transportation system, (2) improving the state of good repair of the freight transportation system, and (3) reducing congestion on the freight transportation system. The projects included in this plan support these objectives either through capital investments, operational investments, or additional use of innovate technology.

10.2.1 Capital Investment

When discussing transportation improvement projects and the resulting economic influence, most often construction jobs are highlighted. However, the economic benefits of a transportation solution do not end there. For the freight industry, transportation projects can also result in improvements in reliability of service and reductions in travel times. This can translate to cost savings for shippers, consumer, and other parties involved in the freight industry. In many instances freight and passenger transportation systems and infrastructure will overlap. As a result, improvements to the freight system can also benefit passenger vehicles.

10.2.2 Operational Improvement and Expanded use of ITS/Innovative Technology

TDOT's intelligent transportation system (ITS) and incident management program (HELP) are designed to improve the safety and operations of the transportation system. This program is known in Tennessee as the SmartWay program. TDOT uses different avenues, from dynamic message signs to social media, to distribute real-time information about incidents, construction, and projected travel times. Motorists can use this information to plan their routes accordingly. The SmartWay program is currently in operation in the four urban centers in Tennessee (Chattanooga, Knoxville, Memphis, and Nashville). In rural locations, ITS use is limited to select locations along the Interstate system. One of the goals for the SmartWay program is to have all Traffic Management Centers (TMCs) staffed 24 hours per day and seven days a week (24/7)[1]. As of 2012, only two of the TMCs operate on a 24/7 schedule.

Operational improvements that support freight flows are not limited to the highway system. On Tennessee's navigable waterways, extending the lock hours of operations and maintaining dredging schedules can help support marine transportation operations. Freight railroads are ultimately responsible for the capacity, operations and technology of their systems. Reducing the number of highway/rail at-grade crossings or rail/rail at-grade crossings not only improves safety, but also improves the rail operations. Airport capacity and operations are influenced by FAA regulations and operational procedures.

[1] Tennessee Department of Transportation Help and Transportation Management Center (TMC) Program Annual Report, January 1, 2012 – December 31, 2012, August 2013.

10.3 FREIGHT POLICY RECOMMENDATIONS

The state's freight policy is intended to optimize safety, efficiency and reliability of the freight system within and through the state. In order to achieve buy-in from the industries and various modes of freight transportation affected by the state's policies, consistent coordination and consultation with stakeholders is necessary.

As part of TDOT's LRTP update, a freight policy paper, which included a peer review, was prepared. The peer review identified freight programs, policies, and initiatives undertaken in surrounding and peer states. Based on this information, policies were identified that would benefit Tennessee's freight system and support economic growth.

Based on the strengths and challenges identified in this Statewide Freight Plan and the review of peer state programs conducted for the Freight Policy Paper, the following set of recommended state-level freight initiatives and policies were developed. Examples of other states using this policy are noted in *[italics]*:

10.3.1 Freight Policy and Initiatives Recommendations

- Freight Corridors – Reaffirm and expand Tennessee's Strategic Corridors to include rail, water, and intermodal facilities including joint use of corridors and terminals (airports, ports, and railroad terminals) [*Washington]*
- Multimodal Freight Funding Program – Establish a funding program with a dedicated revenue source for multimodal freight investments [*Virginia*] as well as select modal funding programs [*Indiana*]
- State Industrial Access Program – Expand this program to allow for other transportation improvements (e.g. rail spurs to industrial sites) [*North Carolina]*
- DOT Organizational Structure – Establish a freight and logistics office within TDOT to further advance freight planning and investments in Tennessee [*Washington*]
- Land Use & Environment - Increase TDOT's capabilities to assist communities and freight partners in best practices considering freight land use including quiet zones, idling restrictions, and noise impacts. [*California*]
    - This may involve providing technical assistance to communities conducting transportation studies or assisting local agencies with completing funding request applications in accordance with Federal and State requirements.
- FAC Coordination – Continue to coordinate with the statewide FAC on a quarterly basis to provide a regular forum for stakeholders to provide input and discuss Tennessee's freight transportation system.
- Data and Planning Tools – Continue to increase TDOT's technical resources in freight decisions
    - Develop and maintain a statewide commodity flow-based travel demand model and acquire and maintain Transearch data, travel time data, ATRI truck flow data, and other freight data as needed) [*Washington*]
- Sustain the transportation support for industrial land use development, including re-use of former industrial areas. [*Kentucky*]

- For example, the Traffic Impact Study prepared for Volkswagen to assess the impacts of the development on the freight transportation system.

10.3.2 Mode Specific Policy and Initiative Recommendations

Freight transportation infrastructure and operations are influenced by the overall economic and industrial marketplace, as well as by the details and individual characteristics of freight movement. Specific modal recommendations include the following:

Road

- Implementation of freight-related programs and policies to address:
  - Truck parking needs
  - First mile/last mile connections
  - Freight bottlenecks
  - Freight spot safety improvements
- Expansion of TDOT's ITS and incident management program (HELP) coverage and capabilities, in order to respond to growing freight demands on Tennessee's highways. This may go beyond the traditional urban areas currently covered by these services.

Rail

- Continued communication and collaboration with railroads (including Class I and Shortline railroads), particularly for updates on their respective network developments including the Crecent Corridor and Mid-America Corridor capacity improvements
- Continued use of the Diagnostic Team Review process to address railroad highway crossing safety
- Update State's Comprehensive Rail Plan (expected completion 2016)
- Continue to address Tennessee's short line railroad needs (upgrading tracks to handle 286,000 lb. cars)

Water

- Formation of selective coalitions for support of timely and effective marine infrastructure investments in locks and dams.
- Sustain the dialogue with states and users of the Upper Mississippi, Illinois and Ohio Rivers for coalitions surrounding river structures
- Expansion of TDOT's coordination practices with neighboring states to include issues associated with ports and waterways.
- Promotion of environmental initiatives at public ports, similar to other ports' efforts, to improve air and water quality, preserve and restore natural habitats, and encourage use of alternative fuels.

Air

- Sustain hub airports in Memphis and Nashville, while maintaining and selectively augmenting regional airports in response to existing and future cargo traffic.
- Development of a Land Use Compatibility Manual to quantify and help lessen effects of air traffic on surrounding land uses, as well as preserve the land around airports for future expansion.

- Investigation of strategies to relieve congestion on airport access roadways.

Pipelines

- In response to changes in the natural gas markets, Tennessee should track the implication of these changes for current and future industries affected by natural gas as a feedstock and as an energy source.

10.4 STRATEGIES TO ADDRESS ENERGY DEVELOPMENT, MINING, AGRICULTURE, AND TIMBER SUPPLY CHAINS

In Tennessee, agriculture, timber, and mining for gravel are important to the state's economy. While the state is dependent upon energy products, these products (e.g. coal) are generally imported from other states. The equipment, and in some cases the product, are moved as heavy or oversized loads and can be detrimental to the quality of Tennessee's infrastructure. The Statewide Freight Plan, therefore, prioritizes projects along the supply chains for these industries. The state's strategy also prioritizes projects that improve the state of good repair of the transportation infrastructure, one of the three primary objectives identified by TDOT and stakeholders.

10.5 PROJECT LIST

The project list included in this Statewide Freight Plan is based on input from a number of sources at the national, state, and regional levels including:

- FAC
- Class I and Short line Railroads, Port Facilities, barge and waterway operators, Airport Managers, Trucking industry representatives, and manufacturing representatives
- MPOs and RPOs
- MPO and RPO LRTPs and other freight-related studies

Additionally, a review of projects currently within TDOT's project development process was undertaken to assess their importance to goods freight movement in Tennessee. These partially funded projects are in the following lists according to their geographic location within the state to coincide with the geographies of the regional FACs:

- East Tennessee (Figure 10-1 and Table 10-1)
- Middle Tennessee (Figure 10-2 and Table 10-2)
- West Tennessee (Figure 10-3 and Table 10-3)

At this time, no funding has been allocated for the projects in the following lists. All statewide projects are presented in Table 10-4. Location-specific projects are listed according to their geographic location within the state to coincide with the geographies of the regional FACs:

- East Tennessee (Figure 10-4 and Table 10-5)

- Middle Tennessee (Figure 10-5 and Table 10-6)
- West Tennessee (Figure 10-6 and Table 10-7)

Figure 10-1 Partially Funded Freight Projects in East Tennessee

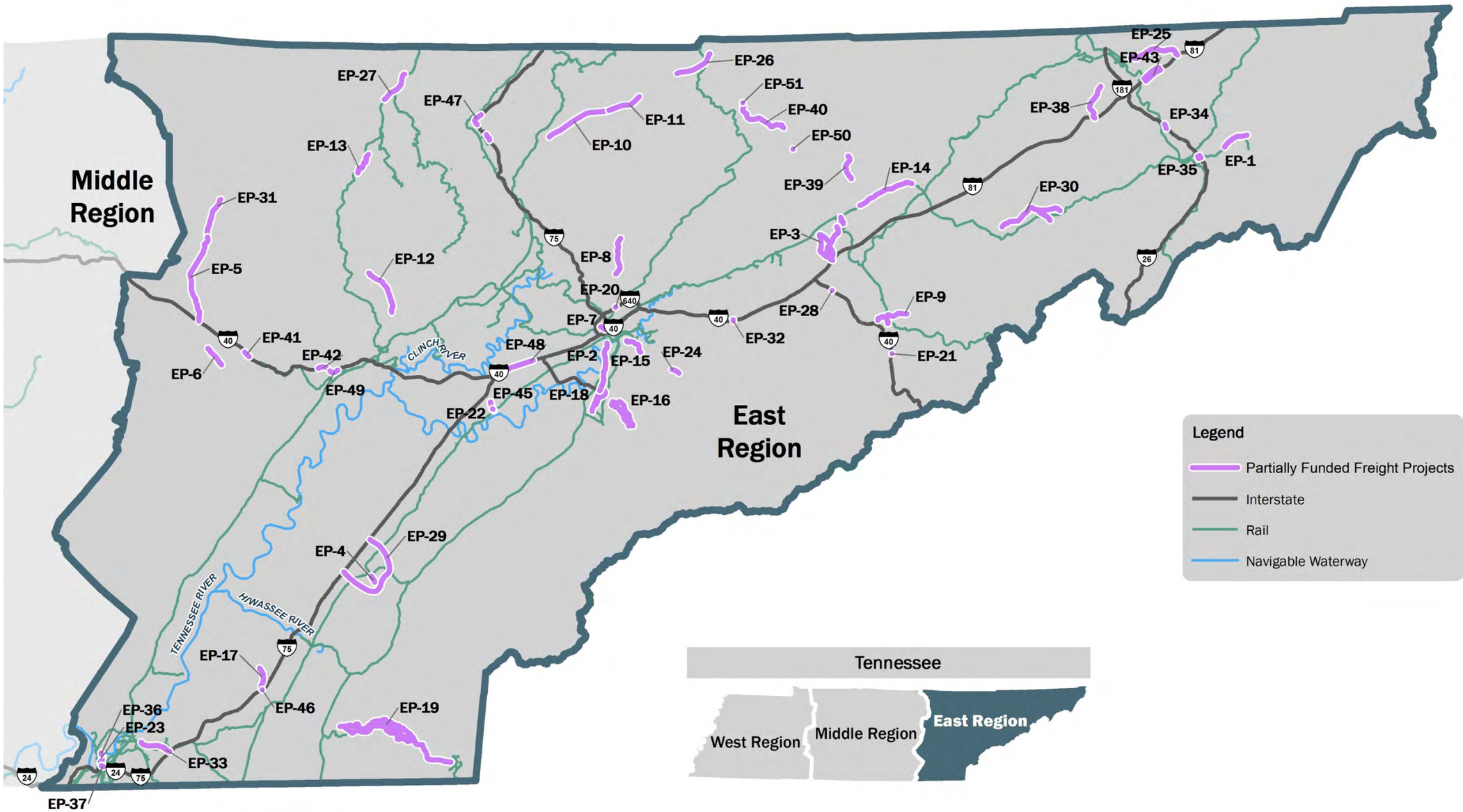


Table 10-1 Partially Funded Freight Project List for East Tennessee

Project Number	Location	Project Route	Project Description
EP-1	Carter	SR-91	From SR-67 (US-321) to SR-37 (US-19E) reconstruction for various safety and pedestrian improvements
EP-2	Knox and Blount	SR-115	(Alcoa Highway); Pellissippi Parkway to North of Little River, From North of Little River to North of Maloney Road, From Woodson Drive to Cherokee Trail Interchange, From North of Maloney Road to Woodson Drive – Widen from 4 to 6 lanes
EP-3	Hamblen and Jefferson	SR-66	North of I-81 at SR-341 in Jefferson County to SR-160 in Morristown, Jefferson/Hamblen county line to I-81 in Jefferson County, SR-160 in Hamblen County to Jefferson/Hamblen county line – Construct new 4/5 lane roadway
EP-4	McMinn	SR-30	Widen White Street, Near Park Street to East of Knight Road in Athens
EP-5	Cumberland, Fentress, Van Buren	SR-28	North of I-40 to near Legion Road, Near Legion Road to near Hollow Lane, Near Hollow Lane to near Lowe Road, South of Lowe Road in Cumberland County to SR-62 in Fentress County – Widen to 4 lanes
EP-6	Cumberland	SR-28	SR-68 to Cleveland Street in Crossville – Widen to 4 lanes
EP-7	Knox	SR-62	Western Avenue, From Texas Avenue to Major Avenue in Knoxville – Widen to 4 lanes
EP-8	Knox	SR-33	From Temple Acres Drive to Union County Line – Widen to 4/5 lanes
EP-9	Cocke	SR-35	Newport Bypass, From SR-9 to Saint Tide Hollow Road – Construct new 4-lane
EP-10	Campbell	SR-63	From LaFollette Urban Boundary to Frontier Road/Woodson Lane, From Frontier Road/Woodson Lane to Claiborne County Line – Widen to 4 lanes
EP-11	Claiborne	SR-63	From Campbell County Line to Hall Lane – Widen to 4 lanes
EP-12	Morgan	SR-29	From North of SR-328 to North of Ray Cross Rd/Mossy Grove Rd(Formerly Westminster Rd), North of Ray Cross Rd/Mossy Grove Rd(Formerly Westminster Rd) to SR-62 in Wartburg – Widen to 4 lanes
EP-13	Scott	SR-29	From North of Wolf Creek Road to Old US-27 at Robbins – Construct new 2 lane roadway
EP-14	Hamblen	SR-34	From SR-32 in Morristown to West of Old Stagecoach Road in Russellville, From West of Old Stagecoach Road in Russellville to Steadman Road, From SR-32 in Morristown to near Morris Blvd, From Near Morris Blvd to West of Old Stagecoach Road in Russellville – Construct new roadway
EP-15	Knox	SR-71	(James White Parkway Extension), From Chapman Highway to Moody Avenue – Construct new 4-lane roadway
EP-16	Blount	SR-162	(Pellissippi Parkway), From SR-33 to SR-73 (US-321) – Construct new 4-lane roadway
EP-17	Bradley	SR-60	From 4-Lane North of I-75 (Westlake Drive) to SR-306 – Reconstruct to 5 lanes
EP-18	Blount	SR-115	(Relocated Alcoa Highway), From Hall Road (SR-35), South of Airport Road to Proposed Interchange serving McGhee Tyson Airport, (Relocated Alcoa Highway), From Proposed Interchange serving McGhee Tyson Airport to Pellissippi Parkway (SR-162), (Relocated Alcoa Highway), From SR-162(Pellissippi Parkway) to Existing SR-115 at Singleton Station Road – Construct new 8-lane roadway
EP-19	Polk	SR-40	Ocoee River Gorge Bypass – Construct new roadway
EP-20	Knox	I-640	Interchange at North Broadway (PHASE II) – Reconstruct/Relocate ramps and widen to 5 lanes

Project Number	Location	Project Route	Project Description
EP-21	Cocke	I-40	Construct new interchange at ONeil Road, MM 438.9
EP-22	Loudon	SR-73	From Simpson Street to SR-2/US-11 in Lenoir City – Miscellaneous improvements
EP-23	Hamilton	US-27	From North of I-24 to South of the Tennessee River Bridge – Widen to 6 lanes
EP-24	Sevier	SR-71	SR-35/338(US-411) to Macon Lane – Widen to 5 lanes
EP-25	Sullivan	SR-126	Widen East Center Street in Kingsport to East of Cooks Valley Road, East of Cooks Valley Road to I-81 in Kingsport
EP-26	Claiborne	SR-63	From West of Old Town Creek to SR-32 (US-25E) - Reconstruction
EP-27	Scott	SR-29	Oneida ByPass; 5-LN section North of Oneida to 5-LN Section South of Oneida – Construct new 5-lane roadway
EP-28	Jefferson	I-40	Bridge over French Broad River, LM 14.70 - Bridge Replacement & Bridge Rehabilitation
EP-29	McMinn	I-75	Construct new interchange I-75 and connect US-11, US-411 and SR-30
EP-30	Greene	SR-34	(Greeneville Bypass); From US-11E, West of Greeneville to US-11E, East of Greeneville – Environmental Studies
EP-31	Fentress	SR-28	From SR-62 at Clarkrange to North of South Franklin Loop Road, From North of South Franklin Loop Road to the 4-Lane section North of Grimsley – Widen to 4 lanes
EP-32	Sevier	I-40	Interchange improvements at SR-66 (Exit 407)
EP-33	Hamilton	SR-317	Widen Bonny Oaks Drive, from SR-17 to I-75
EP-34	Washington	I-26	Interchange at SR-354 (Interchange Modification)
EP-35	Washington	I-26	Interchange at SR-67 (US 321) - Construct Auxiliary lane, Widen EB I-26
EP-36	Hamilton	SR-29 (US-27)	Olgiati Bridge over Tennessee River - Widen to 6 lanes with auxiliary lanes
EP-37	Hamilton	I-24	Interchange Modification Study of Interstate 24 and State Route 2 (Broad St.)/State Route 58 (Market St.) Upgrade ramps and improve access from I-24 to the south side of Chattanooga.
EP-38	Sullivan and Washington	SR-93	From Morgan Lane to South of Baileyton Road in Sullivan County (TPR Option 5, Spot Improvement), From South of Horse Creek to North of Derby Drive (TPR Option 5, Spot Improvement), From I-81 to SR-347 (Lone Star Road) (TPR Option 5, Spot Improvement)
EP-39	Grainger	SR-32	Construct new rest area south of Bean Station
EP-40	Claiborne	SR-32	Construct new rest area southeast of Tazewell
EP-41	Cumberland	I-40	Westbound near Mile Marker 326 – Construct Truck Climbing Lane
EP-42	Cumberland	I-40	Eastbound near Mile Marker 339 – Construct Truck Climbing Lane

Project Number	Location	Project Route	Project Description
EP-43	Sullivan	I-81	Construct Eastbound Truck Climbing Lane @ Mile Marker 60
EP-44	Hamilton	I-75	Interchange Modification at I-24
EP-45	Loudon	SR-73 (US-321)	Intersection at SR-2(US-11) in Lenoir City – Intersection Improvements
EP-46	Bradley	I-75	Interchange improvements at SR-60
EP-47	Campbell	I-75	Construct Truck Climbing Lane MP 144.9 to MP 147.6
EP-48	Knox and Loudon	I-40	I-75 (Exit 369) to Lovell Road (SR-131) - Add WB Auxiliary Lane
EP-49	Roane	I-40	Construct Truck Climbing Lane Near MP 341(WBL)
EP-50	Grainger	SR-32	Off-setting intersection at SR-131 – Intersection Improvements
EP-51	Claiborne	SR-32	Interchange at SR-345 (including bridge over Powell River) - New Interchange

Figure 10-2 Partially Funded Freight Projects in Middle Tennessee

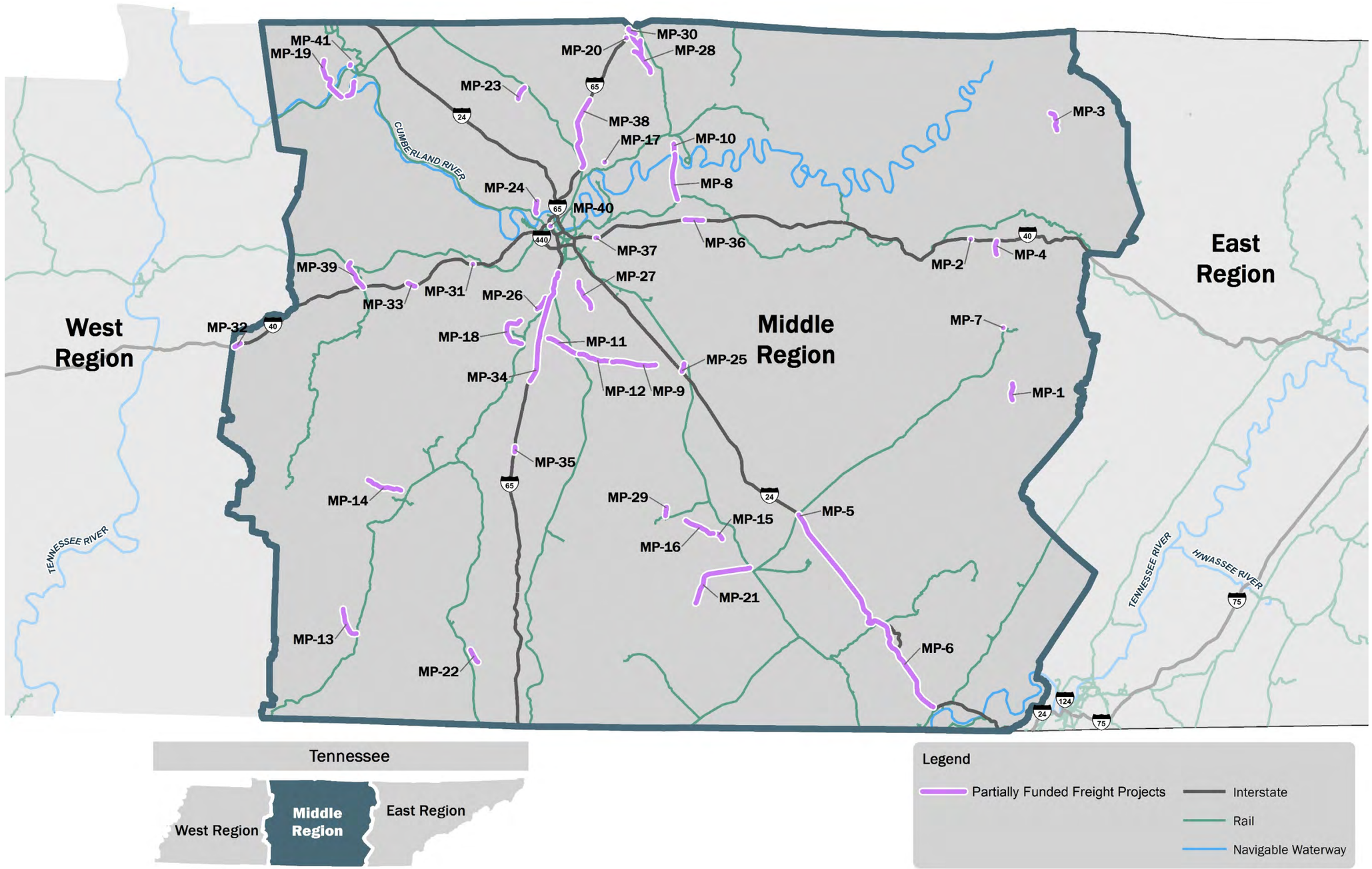


Table 10-2 Partially Funded Freight Project List for Middle Tennessee

Project Number	Location	Project Route	Project Description
MP-1	Van Buren	SR-111	From South of Manus Road to South of SR-285 near Double Bridge Road
MP-2	Putnam	I-40	Construct new interchange at Mine Lick Creek Road
MP-3	Overton	SR-52	(Corridor J), Near Allons Road to SR-111 Intersection – Widen to 5 lanes
MP-4	Putnam	SR-136	SR-111 to I-40 – Widen to 5 lanes
MP-5	Coffee	I-24	Interchange Modification at SR-55
MP-6	Coffee, Grundy, Marion	I-24	Over Monteagle Mtn, from West of SR-55 (Exit 111) to East of SR-150, (Exit 152) - ITS implementation
MP-7	White	SR-111	Reconstruction of a Grade Separation at Taft Church Road in Sparta
MP-8	Wilson	SR-109	From North of SR-24 (US-70) to South of Dry Fork Creek, From South of Dry Fork Creek to South of Cumberland River – Widen to 4 lanes
MP-9	Rutherford and Williamson	SR-96	From SR-840 in Williamson County to East of Overall Creek near Murfreesboro - Reconstruction
MP-10	Sumner	SR-109	North of the Cumberland River Bridge to SR-109 Bypass South of Gallatin – Widen to 4/5 lanes, replace bridges
MP-11	Williamson	SR-96	From East of Arno Road to SR-252 (Wilson Pike) - Reconstruction
MP-12	Williamson	SR-96	East of SR-252 (Wilson Pike) to SR-840 - Reconstruction
MP-13	Lawrence	SR-15 (US-64)	Lawrenceburg Bypass; Existing SR-15 West of Gibbs Road to SR-6 – Construct new 4-lane roadway
MP-14	Maury	SR-166	SR-6 (US-43) in Mount Pleasant to Lewis County Line – Construct new 2-lane roadway
MP-15	Bedford	SR-16	SR-276(Thompson Creek Road) to West of Rippy Ridge Road - Reconstruction
MP-16	Bedford	SR-16	SR-64 East of Shelbyville to Jenkins Road, From Jenkins Road to SR-276 (Thompson Creek Road), SR-64 East of Shelbyville to SR-276 (Thompson Creek Road) - Widening
MP-17	Sumner	SR-386	Construct new interchange at Forest Retreat Road
MP-18	Williamson	SR-397	Mack Hatcher Parkway West, From South of SR-96 West of Franklin to East of SR-106 (US-431) North of Franklin, SR-6 (US-31) South of Franklin to SR-96 West of Franklin – Construct new roadway
MP-19	Montgomery	SR-374	SR-149 to Dotsonville Road in Clarksville, Dotsonville Road to SR-76 (US-79) in Clarksville, SR-149, From River Road to SR-13; SR-13, From SR-149 to Zinc Plant Road – Construct new 2-lane roadway
MP-20	Robertson	I-65	Construct new Weigh Station

Project Number	Location	Project Route	Project Description
MP-21	Coffee and Moore	SR-55	First Avenue to SR-16 (Jackson Street), in Tullahoma, From Bridge Street in Lynchburg to Jackson Street (SR-16/US-41A) in Tullahoma - Widening
MP-22	Giles	SR-7	Bunker Hill Road to SR-15 (US-64/Pulaski bypass) in Pulaski - Widening
MP-23	Robertson	SR-65	Walling Road to SR-11(US-41, Memorial Boulevard) in Springfield – Widen to 5 lanes
MP-24	Davidson	SR-112	SR-12(Ashland City Highway) to SR-155(Briley Parkway) – Reconstruction
MP-25	Rutherford	SR-99	(New Salem Highway), I-24 to SR-96 (Old Fort Parkway) in Murfreesboro - Widening
MP-26	Williamson	SR-6	SR-253 (Concord Road) To SR-441 (Moores Lane) - Reconstruction
MP-27	Davidson and Williamson	SR-11	South of Burkitt Road to near SR-254 (Old Hickory Blvd.) – Reconstruction
MP-28	Sumner	SR-109	Proposed SR-109 Portland Bypass – Construct new 4-lane roadway
MP-29	Bedford	SR-10	From SR-16(US-41/Elm St/Madison St) to North of Rolling Road – Widen to 5 lanes
MP-30	Robertson and Sumner	I-65	Construct new interchange at I-65 from existing SR-109 to I-65
MP-31	Davidson	I-40	McCrory Lane Interchange Modification - Phase 2
MP-32	Hickman	I-40	Construct westbound Truck Climbing Lane @ Mile Marker 161
MP-33	Dickson and Williamson	I-40	Construct eastbound Truck Climbing Lane @ Mile Marker 180
MP-34	Williamson and Davidson	I-65S	Nashville SmartWay ITS Expansion
MP-35	Maury	I-65	Interchange Modification at SR-99 (US-412) in Columbia
MP-36	Wilson	I-40	From SR-109 to SR-840 – Widen to 8 lanes with HOV lane
MP-37	Davidson	I-40	Donelson Pike interchange (includes Donelson Pike relocation from taxiway bridges over Donelson Pike to I-40)
MP-38	Sumner, Davidson, Robertson	I-65	Exit 96 to Exit 108 - ITS Expansion
MP-39	Dickson	SR-46	(Mathis Drive), from I-40 to SR-1 (US-70, Henslee Drive), including the intersection of SR-1 (Henslee Drive at SR-1 (East College Street) – Intersection improvements and Signals
MP-40	Davidson	I-40	Bridges over Herman St and ICG R/R, LM 16.62; Clinton St and CSX R/R, LM 16.75; Jo Johnston Ave, LM 16.88; and Charlotte Ave, LM 17.09 - Bridge Replacement & Bridge Rehabilitation

Project Number	Location	Project Route	Project Description
MP-41	Montgomery		Cumberland River Intermodal Port Facility

Figure 10-3 Partially Funded Freight Projects in West Tennessee

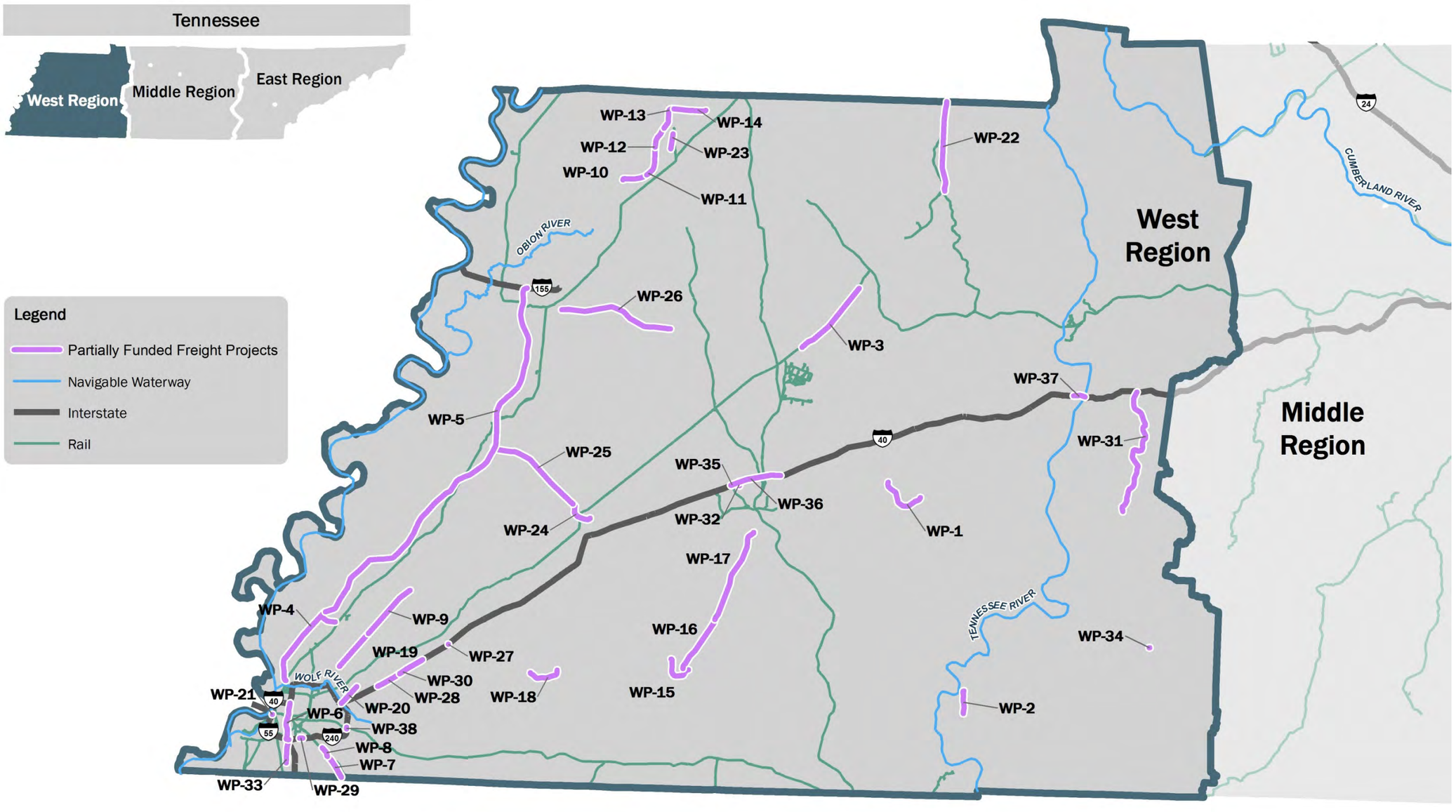


Table 10-3 Partially Funded Freight Project List for West Tennessee

Project Number	Location	Project Route	Project Description
WP-1	Henderson	SR-459	(Lexington Bypass), From SR-20, West of Lexington to SR-22, South of Lexington, (Lexington Bypass), From SR-22, South of Lexington to SR-20, East of Lexington – Construction of new roadway
WP-2	Hardin	SR-128	South Of One Stop Drive to US-64, South of Opel Loop to US-64 in Savannah – Construct new roadway
WP-3	Gibson and Carroll	SR-76	From West of Cades-Atwood Road to East of SR-77, From East of SR-77 to West of Cutlip Lane, From West of Cutlip Lane to West of Sydnor Rd/Winston Rd – Construct new 4-lane roadway
WP-4	Shelby	I-69	From 0.8 Mile East of US-51 to 0.5 MIle South of SR-388, From South of SR-388(North Watkins Street) to South of Fite Road, From North of Woodstock-Cuba Road to East of SR-3(US-51), From South of Fite Road to 0.5 Miles North of Woodstock-Cuba Road – Construct new 4-lane roadway
WP-5	Shelby, Tipton, Dyer, Lauderdale	I-69	From South of Dry Hill Road to I-155 – Location and Environmental Study
WP-6	Shelby	I-240	From I-55 to the Midtown Interchange (I-40) – Widen to 8 lanes
WP-7	Shelby	SR-4	From the Mississippi State Line to 0.6 mile South of Shelby Drive, From South of Shelby Drive to Raines Road
WP-8	Shelby	SR-4	From Raines Road/ Perkins Road Interchange to Getwell Road(SR-176)
WP-9	Shelby	SR-14	East of Kerrville-Rosemark Road to Tipton County Line, SR-385 to East of Kerrville-Rosemark Road
WP-10	Obion	I-69	From 1.2 miles South of SR-183 to 0.2 mile South of SR-21 (Troy/Rives Road) – Construct new interstate
WP-11	Obion	I-69	From South of SR-21(Troy-Rives Road) to South of SR-3(US-51) – Construct new interstate
WP-12	Obion	I-69	From South of SR-3(US-51) to South of SR-5 – Construct new interstate
WP-13	Obion	I-69	South of SR-5 to West of SR-21 – Paving
WP-14	Obion	I-69	West of SR-21 to SR-3(US-51) Near Mayberry Road (Includes Weigh Station/Welcome Center on US-51) – Construct new interstate
WP-15	Hardeman	SR-458	From SR-15 (US-64) West of Bolivar to 0.2 Mile East of SR-18, Bolivar ByPass & SR-15(US-64), From East of SR-18 to West of Old Middleton Road – Construct 4-lane roadway
WP-16	Hardeman	SR-18	From SR-15(US-64) in Bolivar to SR-100 – Location and Environmental Study
WP-17	Hardeman and Madison	SR-18	North of Medon-Malesus Road to SR-5 (US-45) in Jackson, SR-100 in Hardeman County To North of Medon/Malesus Road – Location and Environmental Study
WP-18	Fayette	SR-460	Somerville Beltway, From SR-15(US-64) West of Somerville to SR-15(US-64) East of Somerville – Construct new roadway
WP-19	Shelby	SR-14	(Austin Peay Highway), From SR-204 (Singleton Parkway) to East of Old Covington Pike, (Austin Peay Highway), From SR-204 (Singleton Parkway) to SR-385 (Paul Barret Parkway) in Bartlett - Reconstruction
WP-20	Shelby	SR-1	Summer Avenue, From I-40 to 0.1 Mile North of Sycamore View Road, Summer Avenue, From 0.1 Mile North of Sycamore View Road To 0.1 Mile North of Elmore Road - Widening

Project Number	Location	Project Route	Project Description
WP-21	Shelby	I-55	Interchange Modification; Crump Boulevard
WP-22	Henry	SR-54	Near Rison Street to Near Smith Road, Near Smith Road to the Kentucky State Line – Widen to 5 lanes
WP-23	Obion	SR-5	From Allie Campbell Road to SR-3(US-51) in Union City – Widen to 4 lanes
WP-24	Haywood	SR-19	(Brownsville Bypass), from East of SR-87 to SR-76 South of Brownsville – Construct new roadway
WP-25	Lauderdale and Hardeman	SR-19	East of Eastland Ave. to Haywood County Line, From Lauderdale County Line To East of Binford Road, East of Binford Road To East of Bobby Mann Road, From East of Bobby Mann Road To East of SR-87 – Widen to 4 lanes
WP-26	Dyer and Gibson	SR-104	From SR-20 (US-412) in Dyersburg to old SR-104 near the Gibson County Line, OLD SR-104 (TATUMVILLE) TO MILLIGAN-GUMWOODS RDS., Old SR-104 to West of SR-188, Old SR-104 to West of SR-188, From SR-20 (US-412) in Dyersburg to East of Don Hurley Road, From East of Don Hurley Road to old SR-104 near the Gibson County Line – Construct new 4-lane roadway
WP-27	Fayette	I-40	Construct new interchange at SR-196(Hickory Withe Road)
WP-28	Shelby	I-40	SR-177(Germantown Road) to East of Canada Road – Widen to 8 lanes
WP-29	Shelby	I-240	Interchange Modification at Airways Blvd
WP-30	Shelby	I-40	From East of Canada Road to SR-205 (Collierville-Arlington Road) – Widen to 8 lanes
WP-31	Perry and Humphreys	SR-13	From SR-20 to South of the Humphreys County Line, From the Perry County Line to I-40, From SR-20 (US-412) in Perry County to I-40 in Humphreys County – Spot Improvements
WP-32	Madison	SR-186	Keith Short Bypass, from I-40 Ramps to Old Hickory Boulevard – Modifications to SR-186
WP-33	Shelby	SR-3 (US-51 N)	Craft Road To Winchester Road, Commercial Parkway to South of Winchester (Elvis Presley Blvd), South of Winchester Road to Craft Road (Elvis Presley Blvd), Craft Road To Shelby Drive (Elvis Presley Blvd) – Widening and resurfacing
WP-34	Wayne	SR-15 (US-64)	Intersection improvements at Dexter L. Wood Blvd.
WP-35	Madison	I-40	US-45 Bypass Interchange Modifications
WP-36	Madison	I-40	From East of SR-5(US-45) to SR-1(US-70) in Jackson, From SR-20(US-412) to SR-1(US-70) in Jackson – Widen to 6 lanes
WP-37	Benton	I-40	Construct westbound Truck Climbing Lane @ Mile Marker 133
WP-38	Shelby	I-240	Replacement of 3 Overhead Bridges; Norfolk Southern RR (LM 15.45), Poplar Ave. (SR-57 EB LM 15.57) and Poplar Ave. (SR-57 WB LM 15.73)

Table 10-4 Tennessee's Statewide Freight Project List

Project Number	Location	Project Description	National Freight Goals	Supply Chains	Cost
Entire State	Feasibility Study Rail Corridors	Prepare Feasibility Study of rail lines running parallel to I-81, I-40, I-65, and I-24	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$824,000[a†]
Entire State	Statewide Dedicated Truck Lane	Conduct a statewide study to determine which roadways would benefit from dedicated truck lanes.	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$258,000[a]
Entire State	Statewide Study of Intermodal Facility locations	Work with Railroads, Water Ports, and Airports to conduct a study to locate multi-modal facility locations in the state and funding/coordination efforts required to construct them.	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$258,000[a]
Entire State	Statewide Truck Parking Facilities	Truck parking needs along TN Interstates (Statewide) - Identified from previous statewide corridor studies	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$155,000[a]
Entire State	Statewide Truck Route Study	Conduct a statewide Truck Route study that results in a statewide truck routing system that can be utilized by truck traffic to efficiently move through communities.	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$155,000[a]

Project Number	Location	Project Description	National Freight Goals	Supply Chains	Cost
Entire State	Statewide Interstate Interchange Ramp Program	Program to address geometric and ramp design issues associated with short ramps (lengthen or redesign short ramps & other geometric issues)	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$20,600,000[a‡]

Note: a- Estimated cost in 2015 dollars

†- Cost is based on $200,000 per corridor

‡- $2 Million per year

Figure 10-4 Freight Projects in East Tennessee

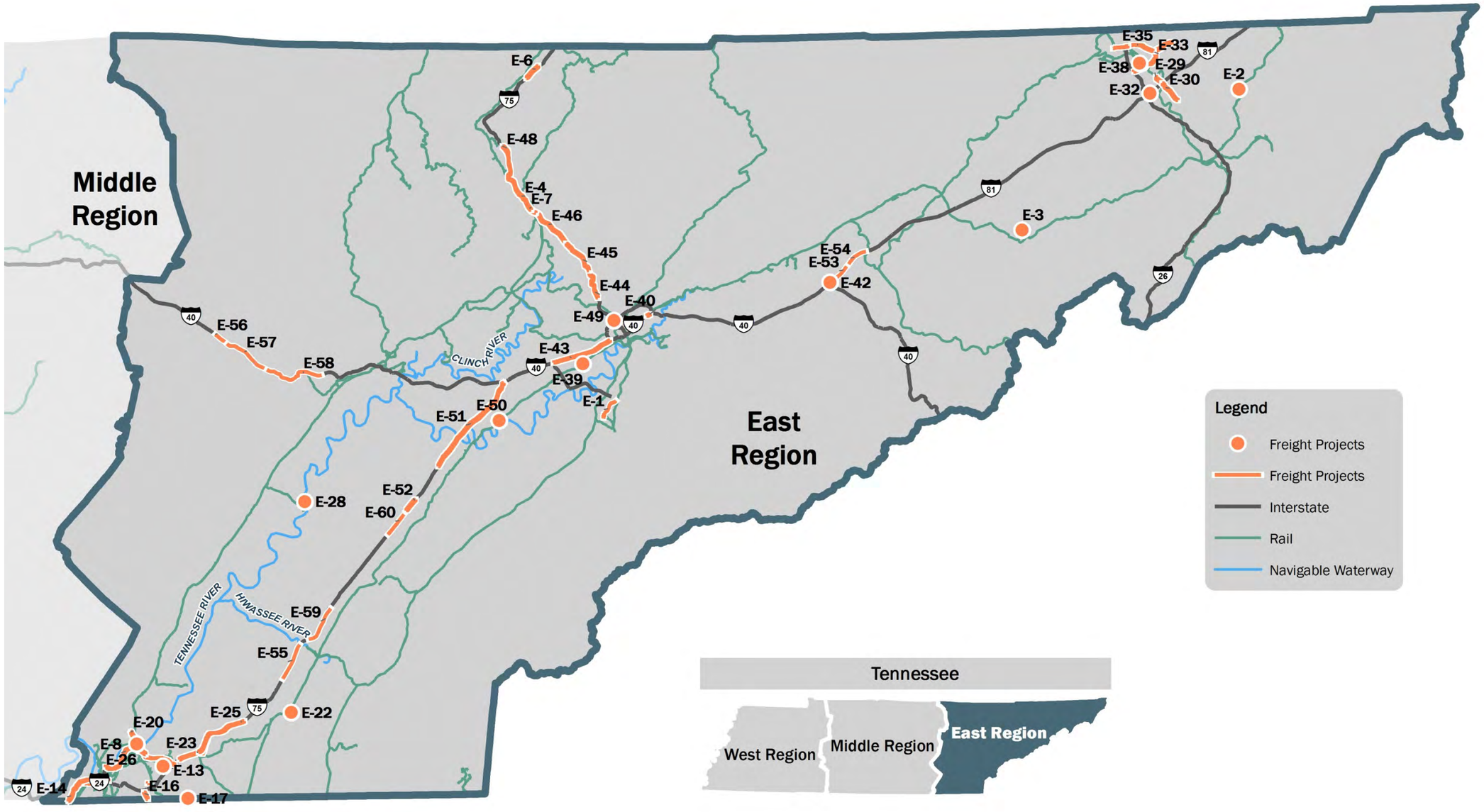


Table 10-5 Freight Project List for East Tennessee

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-1	I-140	Airport Terminus	Pellissippi Pkwy (I-140/SR 162)	Add new interchange ramps for direct access to future terminal and cargo area	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing Agriculture Automotive Chemicals and Plastics ✓ Energy Development Mining Timber	$21,661,000 [b]
E-2	Hwy 11E & Hwy 19E	Hwy 11E	Hwy 19E	Interchange Construction - Replace Signalized intersection with diamond interchange	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$20,403,000 [b]
E-3	Leesburg Road	Hwy 11E	SR-81	Improve Access to I-81 from Hwy 11E	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture ✓ Automotive Chemicals and Plastics ✓ Energy Development Mining Timber	$26,225,000 [a]
E-4	I-75	MP 131.3	MP 132.3	Add truck climbing lane	Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive Chemicals and Plastics Energy Development ✓ Mining ✓ Timber	$4,753,000 [b]
E-6	I-75	MP 155.0	MP 157.5	Add truck climbing lane	Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$14,375,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-7	I-75	MP 129.0	MP 130.1	Add truck climbing lane	Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$16,346,000 [b]
E-8	Amnicola Hwy (SR 58)	Riverport Rd	SR 153	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$51,085,000 [b]
E-9	Amnicola Hwy/Riverside Pkwy	Chestnut St	SR 153	Signal Timing & Optimization	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture ✓ Automotive ✓ Chemicals and Plastics Energy Development ✓ Mining Timber	$124,000 [b]
E-10	Bonny Oaks (SR 317)	Preservation Dr	Silverdale Rd	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$24,179,000 [b]
E-11	Bonny Oaks Dr	SR 153	I-75	Signal Timing & Optimization	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$72,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-12	Brainerd Rd & Honest St	Brainerd Rd		Install Traffic Signal & Improve Turn Radii	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$206,000 [a]
E-13	Hickory Valley Rd	Standifer Gap Rd	Enterprise Pkwy	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$10,985,000 [b]
E-14	I-24	TN/GA State line	US-27	Widen from 4 lanes to 6 lanes; fix structurally deficient bridge at I-24 and I-124	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$188,220,000 [b]
E-16	I-75	Ga State Line	I-24	Widen I-75 from 6 lanes to 8 lanes; fix structurally deficient bridge at southern portion of I-24 interchange	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$17,388,000 [b]
E-17	I-75 Bypass			Bypass around Chattanooga	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$755,255,000 [a]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-19	Ooltewah-Georgetown Rd	US 11/64 Lee Hwy	Mountain View Rd	Addition of shoulder width and left turn lanes	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$5,206,000 [b]
E-20	SR-153	SR 317 (Hixson Pk)	SR 17/SR 58	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development ✓ Mining ✓ Timber	$53,569,000 [b]
E-21	US 11/US 64	Browns Ferry	Tennessee Ave	Ensure 4 lanes including through the RR underpass; add median, turn lanes, & shoulders	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$6,392,000 [b]
E-22	Bypass Road	Old Powerline Rd	20th St	Create an alternative truck route into an industrial area and improve condition on SR 60 and SR 74	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$32,345,000 [a]
E-23	I-75	SB I-75		Install Dynamic Message Sign East of US 11	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$118,000 [a]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-25	I-75	US 64	US 74	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$102,016,000 [b]
E-26	Chickamauga Lock			Improve so it functions adequately	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$885,800,000 [a]
E-27	Intermodal Facility			Study market needs for intermodal facility in East TN	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$670,000 [a]
E-28	Watts Bar Lock & Dam			Increase operating schedule	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$21,000 [a]
E-29	Fort Henry (SR 36)	Moreland Dr/Hemlock Rd	I-81	Improve intersections and coordinate signal timings	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$36,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-30	Fort Henry Dr (SR 36)	I-81	Airport Rd (SR 75)	Widen existing 2 lane road to 4/5 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$33,340,000 [b]
E-32	I-81/I-26 Interchange			Reconstruct interchange for safety (TDOT is looking at short term fixes but may need reconstruction)	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$19,669,000 [a]
E-33	John B. Dennis Hwy (SR 93)	I-26	Stone Dr West (US 11W/SR 1)	Reconstruct Intersections/Interchanges to improve traffic flow and upgrade signals and Improve geometrics at intersections/Interchanges	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$1,672,000 [b]
E-34	Stone Dr East (US 11W/SR 1)	Orebank Rd/Bancroft Chapel Rd	John B Dennis (SR 93)	Improve intersections and coordinate signal timings	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$426,000 [b]
E-35	Stone Dr East (US11W/SR1)	John B. Dennis (SR 93)	Lynn Garden Dr (SR 36)	Improve Intersections and coordinate signal timings	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$426,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-36	US 11W			Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive ✓ Chemicals and Plastics Energy Development Mining Timber	$17,496,000 [b]
E-37				Increase presence of Help Trucks in area	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$670,000 [a]
E-38	East TN			Redevelop Intermodal yard so it is being used by truck & rail	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$206,000,000 [a]
E-39	Cessna Rd RR Crossing			Improve at-grade RR crossing	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$82,000 [b]
E-40	I-40	EB I-40 West of Knoxville		Install Dynamic Message Signs EB on I-40 before I-640 west of Knoxville	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$129,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-42	I-40/I-81 Interchange			Lengthen Ramps	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$1,739,000 [b]
E-43	I-75	I-40/I-75 Junction	Pellissippi Pkwy	Widen I-75 from 6 lanes to 8 lanes with auxiliary lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$280,081,000 [b]
E-44	I-75	SR 131 (Emory Rd)	SR 170 (Raccoon Valley Rd)	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$91,447,000 [b]
E-45	I-75	SR 170 (Raccoon Valley Rd)	SR 61 (Andersonville Hwy)	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$79,016,000 [b]
E-46	I-75	SR 170 (Andersonville Hwy)	SR 116 (Cherry Bottom Rd)	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$129,723,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-47	I-75	SR 116 (Cherry Bottom Rd)	Campbell County Line	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$12,868,000 [b]
E-48	I-75	Anderson County Line	SR 63/US 25W	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$92,447,000 [b]
E-49	I-75/I-640/I-275 Interchange			Improve Interchange to include additional thru lanes on I-75 north and southbound ramps	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$82,519,000 [b]
E-50	South C St RR Crossing			Improve at-grade RR crossing	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$111,000 [b]
E-51	I-75	Pond Creek Rd (SR 323)	I-40/I-75 junction	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$201,482,000 [b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-52	I-75	SR 68	SR 322 (Oakland Rd)	Widen I-75 from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$6,956,000 [b]
E-53	I-81	I-40 (Ext 1)	SR-341 (Ext 4)	Widen from 4 to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$48,211,000 [a]
E-54	I-81	SR-341 (Ext 4)	SR-340 (Ext 15)	Widen from 4 to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$108,475,000 [a]
E-55	I-75	Cleveland Urban Boundary	Bradley/McMinn Co. Line	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$27,423,000 [a]
E-56	I-40	Crossville Urban Boundary	SR-101 (Peavine Rd.)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$26,392,000 [a]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
E-57	I-40	SR-101 (Peavine Rd.)	Market St.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$98,417,000 [a]
E-58	I-40	Market St.	SR-299 (Westel Rd.)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$123,054,000 [a]
E-59	I-75	SR-164 (Lamontville Rd.)	SR-39 (Riceville/Decatur Rd.)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$83,286,000 [a]
E-60	I-75	SR-309 (Union Grove Rd.)	McMinn/Monroe Co. Line	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$51,685,000 [a]

Note:

a – Estimated cost in 2014 dollars

b – Cost Estimate from previous study and year of expenditure varies

Figure 10-5 Freight Projects in Middle Tennessee

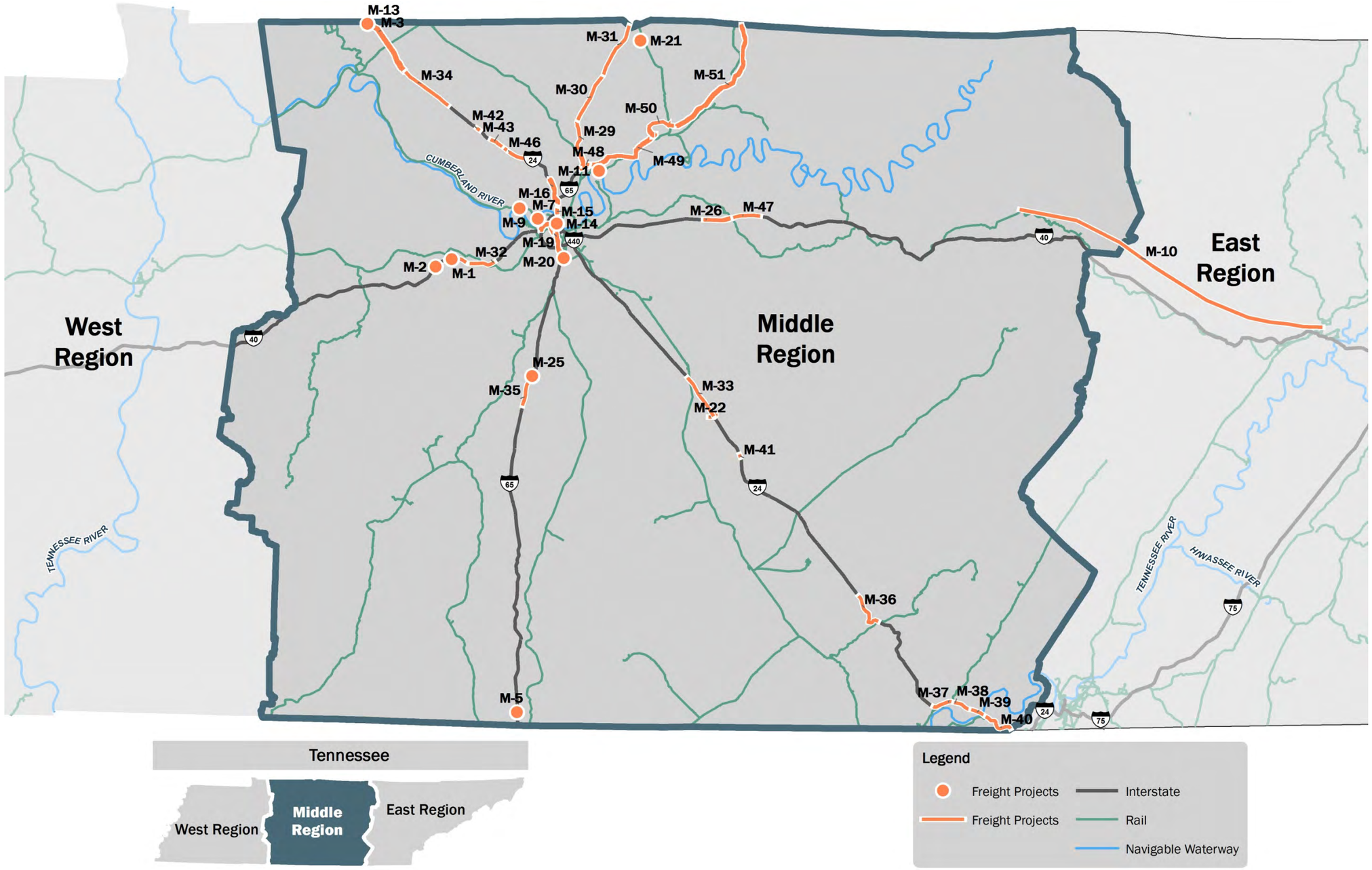


Table 10-6 Freight Project List for Middle Tennessee

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-1	I-40	MP 189		Add truck climbing lane - Add EB lane	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining ✓ Timber	$20,971,000[b]
M-2	I-40	MP 186		Add truck climbing lane - Add WB lane	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining ✓ Timber	$29,223,000[b]
M-3	I-24	KY/TN Stateline	SR 76	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$104,231,000[b]
M-5	I-65	North of AL Stateline		Install Dynamic Message Sign NB I-65 north of AL Stateline	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive Chemicals and Plastics ✓ Energy Development Mining Timber	$155,000[a]
M-7	Bordeaux RR Bridge			Improve bridge for larger barges to pass	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$53,560,000[a]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-8	Container on Barge Service			Conduct a study that evaluates container on barge service in the Nashville area that reviews potential locations, markets, benefits, and economic feasibility of service.	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$979,000[a]
M-9	Hailey's Harbor Terminal	Construct Rail Access		Create Rail Access to Hailey's Harbor terminal that connects to near-by Nashville-Western Rail line	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$4,120,000[a]
M-10	New East-West I-40 Rail Corridor			Create a connection east-west through Tennessee that runs through the Cumberland Plateau.	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$174,756,000[a]
M-11	Old Hickory Lock & Dam			Increase operating schedule	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$21,000[a]
M-12	Corridor Study	I-40	I-24	Study Corridor Improvement Options for better frieght flow between I-40 west of Nashville and I-24 near Clarskville.	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$206,000[a]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-13	I-24	South of KY Stateline		Install Dynamic Message Sign EB south of KY Stateline (and/or east of Clarksville)	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$155,000[b]
M-14	CSX RR Bridge			Improve bridge for larger barges to pass	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$64,890,000[a]
M-15	I-24/I-65	I-24 junction (S of Fern Ave)	Trinity Lane	Replace underpass to accommodate 6 lanes in each direction	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$108,363,000[b]
M-16	I-24W	I-65	SR 45 (Old Hickory Blvd)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$59,512,000[b]
M-17	I-40/I-65	I-65 junction (E of Demonbreun)	I-40 junction (W of Charlotte)	Widen from 6 to 8 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$30,799,000[b]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-18	I-40W	I-440	I-65	Widen from 6 lanes to 10 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$30,679,100[b]
M-19	I-65	SR 255 (Harding Place)	I-40	Widen from 6 lanes to 8 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$58,544,000[b]
M-20	Radnor Yard			Relocate Radnor Yard to outlying location (possibly Smyrna) to increase capacity of the yard.	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$767,350,000[a]
M-21	SR 109	Kirby Dr		Install traffic signal and turn lanes from SR-109 onto Kirby and from Kirby onto SR-109	Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture ✓ Automotive Chemicals and Plastics Energy Development ✓ Mining Timber	$760,000[b]
M-22	Epps Mill Rd	Auldridge Dr/Epps Mill Rd	US-41 (Manchester Hwy)	Widen Epps Mill Rd from 2 lanes to a 3 lane cross section and redesign/improve Exit 89	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$18,270,000[b]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-23	I-65 North	Two Mile Pkwy/Rivergate Pkwy	US 31W (SR-41)	Widen from 4 lanes to 8 lanes. Currently 6 lanes from Rivergate Pkwy to SR 174 (Long Hollow Pk), 4 lanes from SR 174 to US 31W/SR 41	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining Timber	$61,767,000[b]
M-25	I-65	South of SR 840		Install Dynamic Message Sign NB I-65 south of SR 840	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$155,000[b]
M-26	I-40E	SR 840	US 70	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$76,088,000[b]
M-28	Nashville Western Railroad			Reopen Nashville Western railroad for freight to proposed Intermodal at MM 122	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$66,950,000[b]
M-29	I-65	Blue Star Road	SR-257 (Exit 104)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$51,546,000 [a]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-30	I-65	SR-257	SR-25 (Exit 112)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$114,539,000 [a]
M-31	I-65	SR-25 (Exit 112)	Tennessee State Line	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$117,614,000 [a]
M-32	I-40	McCrory Lane (Exit 192)	West of SR-1/US-70S (Exit 196)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$42,903,000 [a]
M-33	I-24	US-231 (Shelbyville Highway)	Epps Mill Road	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$110,851,000 [a]
M-34	I-24	SR-76 (Exit 11)	SR-256 (Exit 19)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$81,739,000 [a]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-35	I-65	SR-840	SR-396	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$53,728,000 [a]
M-36	I-24	SR-50	Grundy-Marion Co.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$90,516,000 [a]
M-37	I-24	SR-27/US-72	SR-156	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$47,936,000 [a]
M-38	I-24	SR-28	SR-27 (TVA Rd.)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$41,375,000 [a]
M-39	I-24	SR-27 TVA Rd.	SR-156	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$35,350,000 [a]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-40	I-24	SR-156	Marion/Hamilton Co.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$71,235,000 [a]
M-41	I-24	Rutherford/Bedford Co.	Bedford/Coffee Co.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$6,026,000 [a]
M-42	I-24	Robertson/Cheatham Co.	Cheatham/Robertson Co.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$9,373,000 [a]
M-43	I-24	Robertson/Cheatham Co.	SR-249 (Jackson Felts Rd)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$35,484,000 [a]
M-44	I-24	SR-249 (Jackson Fels Rd.)	New Hope Rd.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$13,122,000 [a]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-45	I-40	SR-249(Luyben Hills Rd.)	Cheatham/Davidson Co.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$46,597,000 [a]
M-46	I-24	Cheatham/Davidson Co.	SR-65 (Whites Creek Pk.)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$40,170,000 [a]
M-47	I-40	Lebanon Urban Boundary	Bobo Rd.	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$66,468,000 [a]
M-48	I-65		SR-386	Connecting ramps from westbound SR-386 to northbound I-65	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$25,285,000 [a]
M-49	SR-386	SR-174	I-65	Widen from 4 to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$120,644,000 [b]

Project Number	Location	To	From	Project Description	National Freight Goals	Supply Chains	Cost
M-50	SR-386	SR-6/US-31E	SR-174	Extending SR-386 limited access connector	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing Agriculture ✓ Automotive Chemicals and Plastics Energy Development ✓ Mining Timber	$46,597,000 [b]
M-51	SR-6/US-31E	Kentucky State Line	SR-386	Widen from 2 to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing Agriculture ✓ Automotive Chemicals and Plastics Energy Development ✓ Mining Timber	$169,950,000 [b]

Note: a – Estimated cost in 2014 dollars

b – Cost Estimate from previous study and year of expenditure varies

Figure 10-6 Freight Projects in West Tennessee

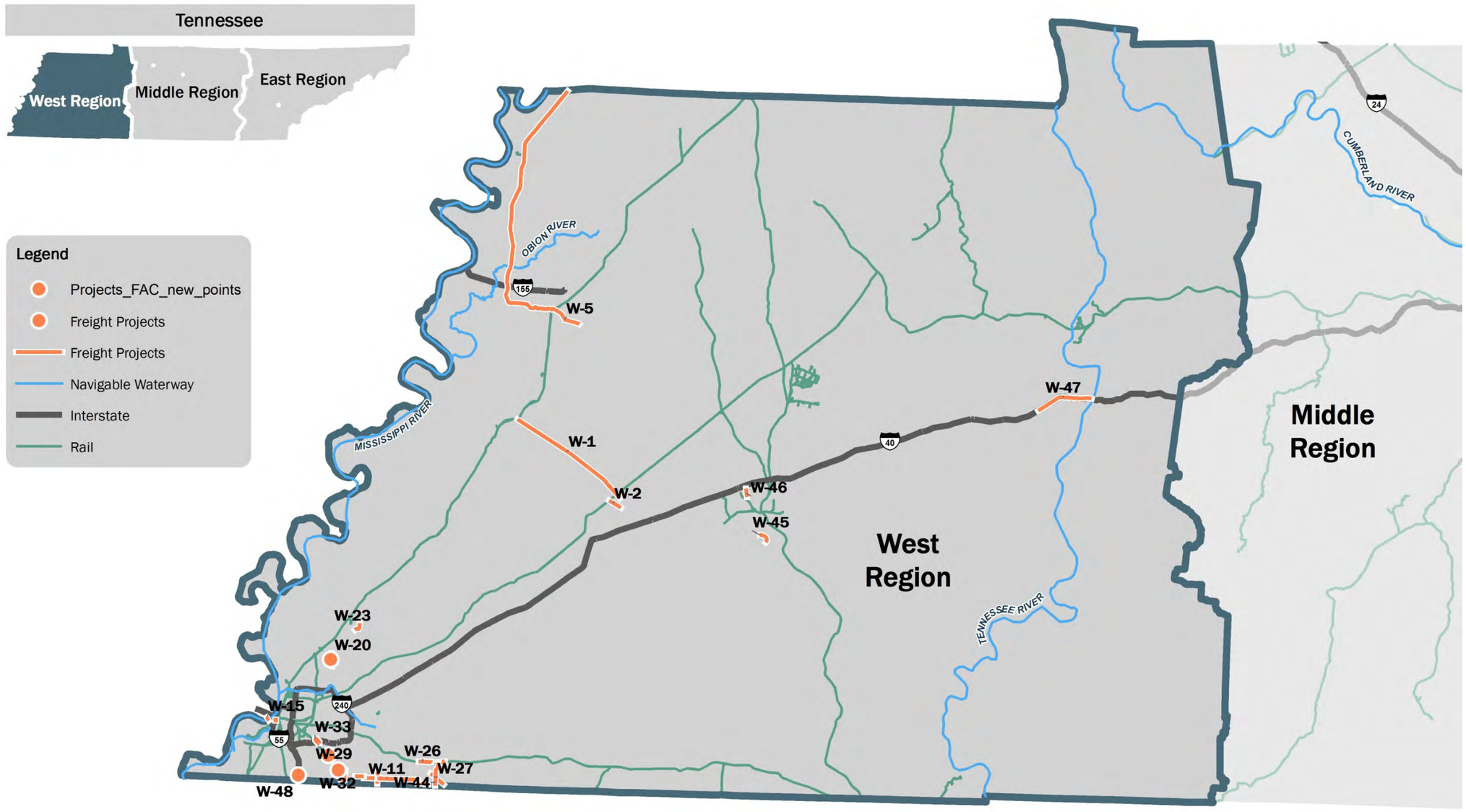


Table 10-7 Freight Project List for West Tennessee

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
W-1	CN RR			Construct a rail line spur 18 miles to the CN Fulton Subdivision	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$41,734,000[b]
W-2	CSX RR			Construct a rail spur to the industrial site in Brownsville, TN	✓ Economic Efficiency, Productivity, and Competitiveness Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$93,730,000[a]
W-5	Tennken RR			Upgrade Tennken railroad to 286k compatibility and rehabilitate excepted track	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$26,976,000[b]
W-8	Hacks Cross Rd	Stateline Rd	SR 175	Widen from 2 to 7 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$18,977,000[b]
W-9	Holmes Rd	Kirby Pkwy	Riverdale Rd	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$8,883,000[b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
W-10	Holmes Rd	Riverdale Rd	Hacks Cross Rd	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$17,910,000[b]
W-11	Holmes Rd	Hacks Cross Rd	Reynolds Rd	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$31,617,000[b]
W-12	Holmes Rd	Reynolds Rd	Byhalia Rd	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$24,215,000[b]
W-13	Holmes Rd	Byhalia Rd	US 72	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$34,006,000[b]
W-15	Third River Bridge Crossing	Mississippi River		Construct a third bridge crossing the Mississippi River in the Memphis area (accommodating both vehicles and rail)	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$1,159,274,000[b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
W-19	I-55	McLemore		Improve Interchange	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics ✓ Energy Development Mining Timber	$40,170,000[a]
W-20	New Allen Rd	Raleigh Millington Rd		Realign intersection to provide safety improvements	Economic Efficiency, Productivity, and Competitiveness Reduce Congestion ✓ Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$2,761,000[b]
W-21	Raleigh Millington Rd	Egypt Central	Fite Rd	Replace the bridge of the Looshatchie River with a 4 lane bridge	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$11,141,000[b]
W-22	Raleigh Millington Rd	Egypt Central	Fite Rd	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$17,519,000[b]
W-23	Singleton Pkwy Extension	SR 205 (Navy Rd)	Bethuel Rd	New 4 lane road	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$12,698,000[b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
W-24	SR-175 (Shelby Dr)	US-78/SR-4 (Lamar Ave)	Mendenhall Rd	Widen from 5 lanes to 6 lanes (divided)	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$17,673,000[b]
w-26	US 72 (Poplar Ave)	SR 57 (Collierville Arlington Rd)	SR 175 (Shelby Dr)	Widen from 2 lanes to 5 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$33,990,000[a]
W-27	US 72 (Poplar Ave)	SR 175 (Shelby Dr)	SR 196	Widen from 2 lanes to 4 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$37,080,000[a]
W-28	US 78 (Lamar Ave)	Holmes Road		Modify Interchange at Holmes Rd	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$28,466,000[b]
W-29	US 78 (Lamar Ave)	Winchester Road		Construct Interchange at Winchester Rd	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$60,463,000[b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
W-32	US 78 (Lamar Ave)	SR 175 (Shelby Dr)		Construct Interchange at Shelby Dr	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development Mining Timber	$119,317,000[b]
W-33	US 78 (Lamar Ave)	Semmes St	American Way	Widen from 5 to 7 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$9,457,000[b]
W-40	US 72 (Poplar Ave)	SR 385	SR 196	Widen from 2 lanes to 5 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics Energy Development Mining Timber	$9,489,000[b]
W-44	New I-69	I-69 (Memphis)	I-155	New 4 lane interstate	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$959,302,000[a]
W-45	US-45 Bypass (Southern Extension)	North of Edwarsd Drive	East of US 45 (Seavers Road)	New 4/5 lane roadway	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing Agriculture Automotive Chemicals and Plastics ✓ Energy Development Mining ✓ Timber	$166,590,000[b]

Project Number	Location	From	To	Project Description	National Freight Goals	Supply Chains	Cost
W-46	US45 Bypass/SR-186	Old Hickory Boulevard	Hollywood Drive ramps	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion Improve Safety, Security, and Resilience Improve State of Good Repair Use of Advanced Technology Reduction in Adverse Freight Impacts	Advanced Manufacturing ✓ Agriculture ✓ Automotive Chemicals and Plastics ✓ Energy Development Mining Timber	$19,888,000[b]
W-47	I-40	Decatur/Benton Co.	SR-191 (Birdsong Rd.)	Widen from 4 lanes to 6 lanes	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$94,400,000[a]
W-48	I-55	Holmes Road		New interchange on I-55 at Holmes Road	✓ Economic Efficiency, Productivity, and Competitiveness ✓ Reduce Congestion ✓ Improve Safety, Security, and Resilience ✓ Improve State of Good Repair ✓ Use of Advanced Technology ✓ Reduction in Adverse Freight Impacts	✓ Advanced Manufacturing ✓ Agriculture ✓ Automotive ✓ Chemicals and Plastics ✓ Energy Development ✓ Mining ✓ Timber	$23,107,000[b]

Note:

a – Estimated cost in 2014 dollars

b – Cost Estimate from previous study and year of expenditure varies

11. Implementation Plan

Tennessee's strong economy and positive economic outlook requires the state to proactively plan for and support sound investments in the State's multimodal freight transportation system. As Tennessee looks for ways to improve the movement of commodities along roadways, rail lines, waterways, and through the air, it is important to look at expected revenue and funding sources, as well as an evaluation process for implementing future projects. TDOT should also explore additional initiatives to improve freight movement and keep Tennessee's economy healthy. The most recent federal transportation legislation in MAP-21 gave renewed support for performance metrics, tracking actual transportation system operations and infrastructure characteristics over time. The measurements will become part of the path going forward to adapt existing projects and systems to changing conditions, as well as identifying projects.

11.1 SHORT TERM PROJECTS

The projects listed in Chapter 10 range from large roadway widening projects to smaller projects such as truck parking studies or lock schedule changes. Some general projects that can be easily implemented include:

- Identify and construct truck parking locations
- Coordinate with the Corp of Engineers to determine if the lock schedule at Watts Bar Dam or Old Hickory Dam can be increased
- Prepare an intermodal freight study in middle Tennessee and east Tennessee to determine if an additional rail or rail/port/truck facility is plausible and where to locate it. Work closely with freight stakeholders throughout the preparation of the study.
- Construct Dynamic, Real-Time Message signs where plausible to divert freight when incidents occur
- Prepare signal timing and optimization studies on heavy freight corridors and implement new timing plans
- Construct intersection improvements and rail crossing improvements where freight movement deficiencies have been identified

In addition to these projects, TDOT should create a freight prioritization process to be included in the three-year Comprehensive Multimodal Program in order to help the Department identify top priority freight projects for economic stability and growth.

11.2 EXISTING FREIGHT FUNDING

As discussed in Chapter 3, Tennessee supplements the state revenue for its budget with federal funding and a small portion from other funding sources. Airports in Tennessee also receive federal funds through the FAA's block grant program. Improvements to the locks and dams along the navigable waterways are funded through the U.S. Army Corps of Engineers. The most recent Waterways Regional Development Act (WRDA) has made several substantial changes to the previously existing waterway programs. At the state and national level, project funding requests are greater than the available funding. This section discusses the financial constraints facing Tennessee and potential options for funding sources.

11.2.1 Federal Funding

Federal funds are Tennessee's largest funding source for highways, making up 42% of all receipts from 2007 to 2012 and averaging $800.8 million annually. The national Highway Trust Fund (HTF), which receives proceeds from the federal motor fuel tax of 18.4 cents per gallon for gasoline and 24.4 cents per gallon for diesel fuel, is the primary funder of FHWA funding programs.

There is considerable concern over the last several years about the sustainability and solvency of the HTF due to declining proceeds from the federal motor fuel tax, which provides around 90% of the HTF's total revenues. According to the U.S. Department of Transportation on September 4, 2015, based on the current spending and revenue levels, the highway account of the HTF will encounter a shortfall in July of fiscal year 2016.[1] Increasing construction costs coupled with decreasing fuel tax receipts are main drivers of the projected shortfall.

11.2.2 State Funding

Motor fuel taxes are Tennessee's second largest funding source for highways, constituting close to 37% of all receipts from 2007 to 2012 and averaging $704.8 million annually. The remaining portion of the Department's revenue comes from other sources such as the Transportation Equity Fund and other miscellaneous department revenues. Like most states, Tennessee's motor fuel tax is a per gallon excise tax charged on the consumption of both gasoline and diesel fuel. At the state level, Tennessee's gasoline tax rate has remained unchanged since 1989 at 21.4 cents per gallon. Table 11-1 shows how the State's gas tax is distributed. Tennessee experienced a steady decline in motor fuel tax revenue from 2007 to 2012.

[1] http://www.dot.gov/highway-trust-fund-ticker

Table 11-1 Distribution of Tennessee State Gas Tax

State Gas Tax	Tax Breakdown
21.4 cents per gallon	12.8 cents to TDOT
	7.9 cents supports cities and counties
	0.7 cents to the General Fund

Historically, funding of the short line rail program has come from the Short Line Equity Fund created by the state through the collection of a 7% tax on diesel fuel used by the railroad industry. Funding of the short line rail program is currently on hold due to a ruling that has stopped the diesel tax from being used for short line rail projects.

11.3 FUTURE REVENUE OPTIONS FOR FUNDING FREIGHT INFRASTRUCTURE

Historically Tennessee has utilized "pay-as-you-go" strategies exclusively, which has served the Department well to this point. With the current funding outlook, however, there may come a day when alternative strategies such as tolling and debt financing, may need to be explored as a means of meeting Tennessee's growing transportation demands. With "pay-as-you-go" strategies still strongly preferred at this point, Tennessee has few viable options beyond current available revenue sources to fund the State's transportation needs. Other options include:

- Debt Financing. Tennessee is one of only a handful of states that does not use debt mechanisms as a funding source for highways. The most significant advantage of debt financing is the ability to realize the benefits of the transportation project sooner than if the project was financed on a pay-as-you-go basis. It should be noted, however, that the timing of the implementation of the project can significantly affect the desirability of debt financing.
- Public-Private Partnerships. P3s are proven, performance-based solutions to deliver projects faster, cheaper, and with less financial risk to the public. More than 33 states—including Tennessee—have enacted legislation allowing these partnerships to improve infrastructure. P3s are contractual agreements between the government and private partners that allow the private industry to take on traditionally public roles in projects, including the financing, management, operations, and maintenance of a facility. For highway construction, toll projects are the best candidates for implementing a P3 arrangement.
- Mileage-based Transportation Funding. Some states are considering a vehicle miles traveled tax in lieu of a tax on motor fuel. The tax is paid on actual miles driven.

11.4 NEXT STEPS

The implications for the Statewide Freight Plan are far greater than simply putting together a required plan. This effort has brought together stakeholders from all modes, geographies, and types of sectors in Tennessee and initiated a dialogue among them. The next steps for freight planning and transportation infrastructure improvements in Tennessee include:

- Continuing the Freight Discussion: Through the FAC and other outreach efforts, TDOT should continue to foster an environment to support multi-modal planning and infrastructure improvements, while minimizing impacts to the environment and communities. Additionally, the FAC should work with TDOT to develop a strategic plan as a means of identifying strategies and priorities for advancing the implementation of the freight plan recommendations.

- Freight-Related Data Collection: During the course of the plan development and coordination with stakeholders, opportunities to expand data collection and availability for evaluating freight-related infrastructure improvements became apparent. A consistent base of data, particularly data of direct importance to the system's users and the general public as described in the MAP-21 guidance, may facilitate future prioritization and implementation of projects.

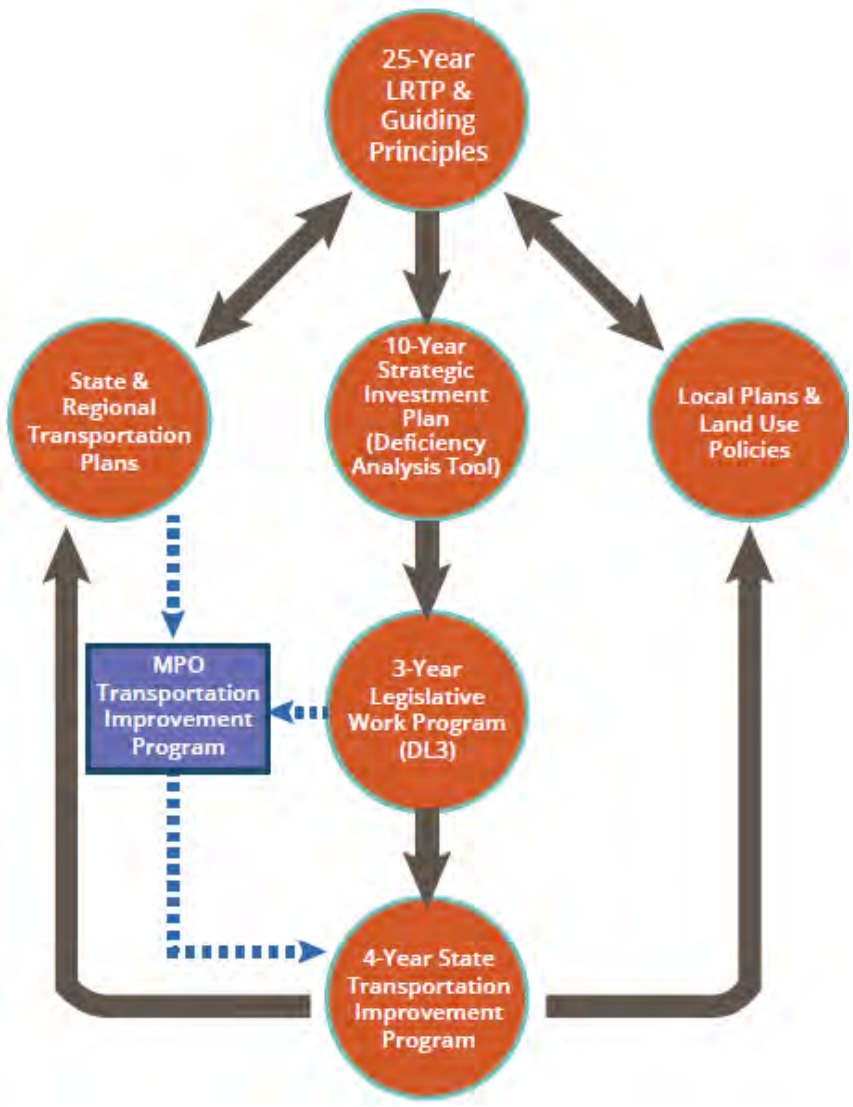
- Statewide Travel Demand Model with Freight Components: The updated statewide travel demand model that included freight components was not available during the preparation of this plan. Once completed, the model can be used to further evaluate freight movements within the state.

- Enabling Legislative and Funding Priorities: One of the greatest challenges facing Tennessee's infrastructure are fiscal constraints. Tennessee can encourage the Federal Government to sufficiently fund the Highway Trust Fund and provide additional funding for other modal improvements (e.g. Chickamauga Lock and Dam). In addition, Tennessee's gas and motor fuel taxes have not been increased in over 20 years.

- Integrating Transportation Planning and Economic Development: Updates to the statewide freight mobility plan may further explore the connection between land use and transportation. Potentially TDOT and economic development organizations within the state may be able to align their initiatives to facilitate the flow of freight in Tennessee and support the freight industry.

- Implementation of Projects and Tracking Progress: Projects from the freight plan should be included in the state's project selection process. As seen in the following diagram, TDOT's planning process is dynamic and supports consistency between plans, programs, and projects. This occurs through the underlying influence of the Department's guiding principles and Long-Range Transportation Plan. In addition to overlapping policy recommendations, projects included in this Freight Plan also contributed to the development of the 10-Year Strategic Investment Plan, which impact the 3-Year Legislative Work Program, the 4-Year STIP, and the MPO TIPs. In addition to project consideration, freight performance measures should be established by the state as MAP-21 guidance is established. Performance measures evaluate the freight transportation system on a

regular basis and identify strengths and weaknesses that guide the project selection process.



In conjunction with the steps outlined above, it is the intention of the Department to keep this document relevant. The freight industry is booming with most of its activity beyond TDOT's control, a fact that necessitates the flexibility of this Plan. Over time, Tennessee's Freight Plan is intended to be updated in conjunction with the state's Long-Range Transportation Plan. However, significant changes in the economy, legislation, or the freight industry may necessitate more frequent updates. More specifically, the potential impacts of future MAP-21 rulemakings may necessitate short-term changes in the document. These revisions can be considered as minor amendments, which have little to no effect on the recommendations of the plan, or major amendments, which may significantly affect policy and project needs. Each of these situations have their own process for approval as outlined in TDOT's Public Involvement Plan.