



# Freight System and Goods Movement

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The Technical Memos were written to document early research for the 2015-2040 Oklahoma Long Range Transportation Plan (LRTP). Most of these memos were written in 2014; all precede the writing of the 2015-2040 Oklahoma LRTP *Document* and 2015-2040 Oklahoma LRTP *Executive Summary*.

The 2015-2040 Oklahoma LRTP *Document* and 2015-2040 Oklahoma LRTP *Executive Summary* were composed in Spring 2015.

If there is an inconsistency between the Tech Memos and the 2015-2040 Oklahoma LRTP *Document* or 2015-2040 Oklahoma LRTP *Executive Summary*, the reader should assume that the *Document* and *Executive Summary* contain the most current and accurate information.



# Oklahoma Long Range TRANSPORTATION PLAN

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# Oklahoma Long Range TRANSPORTATION PLAN

## 1 INTRODUCTION

This section discusses prior ODOT analysis of freight and freight needs.

### 1.1 BACKGROUND

#### 1.1.1 ODOT 2010-2035 Long-Range Transportation Plan

The Oklahoma Long Range Transportation Plan (LRTP) was updated in 2010 for a horizon year of 2035. (This is the currently adopted Plan which will remain in place until the 2015-2040 LRTP is approved, later in 2015.) It describes the framework of how to maintain and improve the state's transportation system and was developed in collaboration with many different individuals and groups that have an interest in transportation. The Plan addresses freight in terms of its economic impact on the state and the importance of the freight transportation network as a support to business and industry. Among the Plan recommendations are improvements to commercial vehicle routing and screening operations, targeted improvements for state-owned short line railroads, maintenance and reconstruction of highways and bridges, and enhanced connectivity with ports and airports. The Oklahoma Freight Flow Study<sup>1</sup> summarized below, is a technical memo that was prepared as a follow-up to the 2035 LRTP.

#### 1.1.2 Oklahoma Freight Flow Study

The Oklahoma Department of Transportation conducted an analysis of freight flows moving in, out, within and through Oklahoma in 2012. The freight flows in that study reflect the most recent year for which consistent and comprehensive data could be found for each freight mode, primarily 2009.

The report begins by depicting freight flows mapped to major freight corridors, including the freight rail network, major as well as secondary highway truck routes, and also the McClellan-Kerr Arkansas River Navigation System (MKARNS). A summary of total freight flow volumes, by mode, indicated several points as follows:

- The largest total freight volumes, for all modes combined, occur in the north-south corridor that includes the I-35 truck corridor and the BNSF Railway (BNSF) rail corridor. Those volumes are greatest between the Texas border and Oklahoma City (OKC), where some of the volumes are dispersed in east-west directions.
- Rail freight flows are predominantly in the north-south direction.
- Oklahoma waterways serve an important role in safe and economical shipping of bulk and oversized cargo.



### **1.1.3 Oklahoma Statewide Freight and Passenger Rail Plan (2012)**

The Oklahoma Statewide Freight and Passenger Rail Plan<sup>2</sup> was developed to comply with the Passenger Rail Investment and Improvement Act (PRIIA) (49 USC 22705), which laid the foundation for an expanded focus on rail planning. PRIIA requires each state to have an approved state rail plan as a condition of receiving rail funding in the future for either passenger or freight improvements. In addition to meeting the requirements, the Rail Plan and planning process have the following purposes:

- Educate the public on the importance of freight and passenger rail transportation to the economy of Oklahoma, the welfare of the state's communities, and its environment
- Synthesize the perspectives of the public, State of Oklahoma government agencies, local governments and planning agencies, shippers, Class I and Class III (short line) rail carriers, and other stakeholders and interested parties
- Set forth state freight and passenger rail transportation policy
- Present priorities and strategies to enhance freight and passenger rail service beneficial to the public
- Advance a rail improvement plan that serves as the basis for federal and state funding of rail infrastructure and service investments

### **1.1.4 Oklahoma Freight Study: Multimodal Freight System Inventory and Needs (2014)**

The Moving Ahead for Progress in the 21st Century Act (MAP-21), enacted in 2012, made a number of changes to improve the condition and performance of the national freight network and to support investment in multimodal freight- related surface transportation projects. Specifically, it required the Secretary of Transportation to encourage each state to develop a comprehensive State Freight Plan.

While State Freight Plans are not required, should a State choose to develop a freight plan, MAP-21 outlines content requirements. Several states are revising existing or developing new freight plans, as projects identified in a State Freight Plan are eligible for a higher percentage of Federal matching funds. The *Oklahoma Freight Study: Multimodal Freight System Inventory and Needs* (Multimodal Freight Inventory)<sup>3</sup> was a first step in addressing MAP-21 regulations for Oklahoma, and provided important information for the State with respect to:

- 1) Freight trends, needs, issues. The study provided an overview of key national and global freight trends that may have an impact on Oklahoma's freight system and industries. Stakeholder outreach conducted helped inform freight system needs and issues. These stakeholder perspectives were complimented by data analysis.



- 2) Freight policies, strategies and performance measures. The study provided an overview of performance measures, described current Federal guidance on the development and use of these measures, and identified some candidate performance measures that meet MAP-21 requirements for ODOT to consider.
- 3) The economic context, citing freight transportation system strengths and weaknesses, and identifying network assets.

The remainder of this document includes the highlights of the Multimodal Freight Inventory and amplifies it with updated and additional information on freight volumes and freight movements in Oklahoma.





# Oklahoma Long Range TRANSPORTATION PLAN

## 2 CURRENT OKLAHOMA ECONOMY, KEY INDUSTRIES, AND CRITICAL TRENDS

This section provides an overview of the current demographic and economic conditions in Oklahoma as they play a large role in freight demand. It also discusses how freight moves in Oklahoma, and looks at trends that might impact freight movement in the future.

### 2.1 EXISTING ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS

Demographic characteristics play a key role in defining a state's overall and freight transportation systems. A strong population base is crucial for growing and maintaining industries such as manufacturing, retail, and other freight-related businesses. The transportation system is critical as a means of responding to people's demands for goods and services, as well as for providing an avenue to travel to their respective businesses and places of employment. This section presents a recent snapshot and ten year trends of Oklahoma's population and per capita income. When possible, information and statistics are presented using a 2010 baseline. Additionally it includes information on cost of living and cost of doing business in Oklahoma as compared to its neighbors and the nation as a whole.

#### 2.1.1 Population

According to the 2010 Census, Oklahoma had just over 3.7 million residents. Annual estimates from the Census indicate that the state's total population is continuing to grow, to a 2013 total of nearly 3.9 million.

**Table 2-1** depicts the annual estimates of Oklahoma's resident population in the years since the 2010 decennial census. The state has experienced moderate growth each year, with an increase averaging over 33,000 annually. Oklahoma is the 28<sup>th</sup>-most populous state in the nation, a ranking it has maintained since the 1990 decennial census.

**Table 2-1: Annual Estimates of Resident Population, 2010 to July 1, 2013**

	Census 2010	July 1 Estimates		
		2011	2012	2013
Oklahoma	3,751,351	3,785,534	3,815,780	3,850,568

Source: U.S. Census Bureau



In the years since the 2010 Census, 33 of the state's counties have registered losses in total population. This has been offset by gains in the remaining counties, which have boosted the state's total population by nearly 100,000 since 2010. Counties experiencing the heaviest losses since 2010 included Blaine (west of the OKC metro area) and Sequoyah (at the eastern border near Ft. Smith), both with a decline of over 1,000 persons. The counties experiencing the greatest gains included Oklahoma (+36,612) and Tulsa, both of which added over 20,000 additional persons.

### **2.1.2 Per Capita Income**

Per capita personal income in Oklahoma increased by nearly 50 percent since 2003, from \$27,724 to \$40,620 in 2012. This growth in income consistently outpaced that of all other neighboring states. Oklahoma's low cost of living and doing business and continued growth in the energy sector also are likely contributors to the continued growth and economic competitiveness of the state.

The per-capita income in Oklahoma is highest in the metropolitan regions, along major corridors, and in the northwest parts of the state. Growth in per capita income is highest in the rural areas of the state.

### **2.1.3 Cost of Living**

The low cost of living in Oklahoma has been one factor that has helped Oklahoma attract growth in industry and other businesses. Low cost of living means that employees can obtain their household needs at a lower overall cost. Oklahoma's urban areas, in particular, have a cost of living that is below the national average for urban areas, and below that of similar municipalities in neighboring states. The overall cost of living index is about 10 percent less in Oklahoma City and Tulsa than in urban areas nationally.<sup>4</sup> This makes Oklahoma attractive to both businesses and future employees, which means that more freight will be produced and consumed within the state.

However, in part due to the higher than average growth rates and economy, housing prices in Oklahoma have been rising faster than average since 2006 and held value better than the national average after 2009. Nevertheless, Oklahoma remains competitive in terms of housing prices to both the national average and its neighboring states.<sup>5</sup>

### **2.1.4 Cost of Doing Business**

The Oklahoma State Chamber reports that Oklahoma has the fourth lowest nationwide state cost of doing business. According to Moody's Economy.com U.S. Cost of Doing Business report, Oklahoma has the fifth-lowest state and local tax index in the nation, and Oklahoma has the fifth-lowest overall tax burden in the nation.<sup>6</sup> This is a delicate balancing issue. State governments build a foundation for freight and economic growth by providing and maintaining streets and highways, port facilities, airports, etc., and the ability to pay for the infrastructure can be hampered if



tax income is insufficient to support the necessary improvements for business to thrive. Then delays or deletions of capital improvements such as highway interchange reconstruction, or cuts in school or public safety services can negatively affect the state growth climate in various ways.

## **2.2 OKLAHOMA'S FREIGHT-RELATED INDUSTRIES**

### **2.2.1 Oklahoma's Key Industries Rely on the Freight Transportation System**

Industries that depend on the movement of goods, referred to in this report as "freight-related industries," are a key component of Oklahoma's economy. Five industry groups in Oklahoma have been identified as critical users of the freight transportation system include:

- **Agriculture** – Agricultural production & agricultural support activities, including farm & ranch operation.
- **Energy and Mining** – Extraction of minerals and gases and supporting activities; utilities providing power or other services, excluding waste management.
- **Manufacturing** – Plants, factories, or mills and characteristically use power-driven machines and materials-handling equipment, but may also include other establishments that process or transform materials into new products.
- **Transportation and Distribution** – Industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities; wholesaling of agriculture, mining, manufacturing, and other products.
- **Other Industry (including retail and construction)** – Establishments primarily engaged in the construction of buildings or engineering projects; entities selling merchandise through a store or non-store location to the general public.

The future competitiveness of these major and emerging industries in the global marketplace will require an integrated freight transportation system with strengths in all modes –airports for moving high-tech goods, waterways and railroads for handling bulk shipments or intermodal containers, and highways for serving distribution centers and warehouses. Each industry relies on at least one, yet often multiple modes within their supply chain network, and each mode serves more than one function for Oklahoma's freight system. Rail and water serve commodities traveling over long distances, but also serve for specialized goods transport and link to major export markets. Airports provide not only high value freight and goods with tight delivery timeframes, but also serve to link businesses and industry with their global partners and supply chains. The highway system provides not only connections to and from origins and destinations, but also serves as a "last mile" connector to users of rail, water, and air transport.



## 2.2.2 Oklahoma’s Freight Movements<sup>7</sup>

Within Oklahoma, freight movements by highway mode are by far the most common. Many of these truck movements may also entail final delivery, or “last mile” connections to the rail, waterway, and air system. Rail typically moves low value bulk items, but is most efficient over longer moves. As such, internal rail movements in Oklahoma are few. Instead, rail accounts for a greater portion of the inbound, outbound, and through movements in Oklahoma; and overall, rail accounts for about a third of the tonnage moving within the state. Waterway movements in Oklahoma are often also bulk goods which tend to be low value and are not as time-sensitive as both rail and highway commodities may be. However, there is also a growing trend of shipping large energy sector equipment to Oklahoma using the waterway system, which is then transferred to truck for delivery within Oklahoma or to nearby states. Waterway movements account for a small portion of the overall tonnage, only about 3 to 4 percent of inbound and outbound movements. As the head of the McClellan-Kerr Arkansas River Navigation System begins in Oklahoma, no moves are recorded as passing “through” the state. (See **Table 2-2** and **Table 2-3**.)

**Table 2-2: Directional Freight Flow in Oklahoma, All Modes (2015 estimate)**

Truck, Rail, and Waterway		
Flow	Million Tons	Percent
Inbound	79.9	7.9%
Outbound	81.2	8.1%
Internal	153.6	15.3%
Through	692.1	68.7%
Total	1,006.8	100.0%

*Sources: Freight Analysis Framework, FHWA ( FAF3), 2013.; Class 1 Railroad Annual Reports, 2013; Commerce on the Oklahoma Segment, MKARNS, 2013; Tulsa District, US Army Corps of Engineers*

**Table 2-3: Oklahoma Freight Tonnage Flow, by Mode and Direction (2015 estimate)**

Mode	MILLION TONS OF FREIGHT - 2015					Percent by Mode
	Inbound	Outbound	Internal	Through	Total	
Truck	45.8	59.0	149.8	407.1	661.7	65.7%
Rail	31.0	18.9	3.8	285.0	338.7	33.6%
Waterway	3.1	3.3	0.0	0.0	6.4	0.6%
Total	79.9	81.2	153.6	692.1	1,006.8	100.0%

### 2.2.2.1 2015 Through Freight

Through movements dominate Oklahoma’s freight transportation system, with more than two-thirds of movements on the freight system considered through movements.



Over 400 million tons (equivalent to 59 percent) of through tonnage is carried on the highway system, with the remainder carried by rail.

#### 2.2.2.2 2015 Inbound Freight

In Oklahoma, inbound freight movement is dominated by truck and rail, with trucks carrying 57 percent of inbound freight, by tonnage, and rail carrying 39 percent, respectively.

#### 2.2.2.3 2015 Outbound Freight

Trucking moved a high percentage of outbound freight, 73 percent, followed by rail, at 23 percent. The direction of rail shipments within the state is imbalanced, with a greater amount of tonnage moving into the state (31 million tons) by rail than leaving it (18.9 million tons).

#### 2.2.2.4 2015 Internal Freight

Trucks dominate the movement of freight within the state, carrying 98 percent of internal freight both by tonnage and value.

### 2.2.3 Freight Commodities Connected to Oklahoma's Key Industries

**Figure 2-1** and **Figure 2-2** illustrate the top commodities, by weight and value, traveling on Oklahoma's multimodal freight system. These figures represent commodities which have an origin, destination, or intrastate movement in Oklahoma, not those that pass through the state. The major commodities by tonnage consist of bulk goods with relatively low values. Coal n.e.c.<sup>8</sup> consists of 19 percent of total tonnage moved to, from, or within Oklahoma for a total of over 69 million tons. Other major commodities are also focused on the oil/gas industry such as crude petroleum and fuel oils. Typically these commodities will travel via highway, rail, or pipeline.

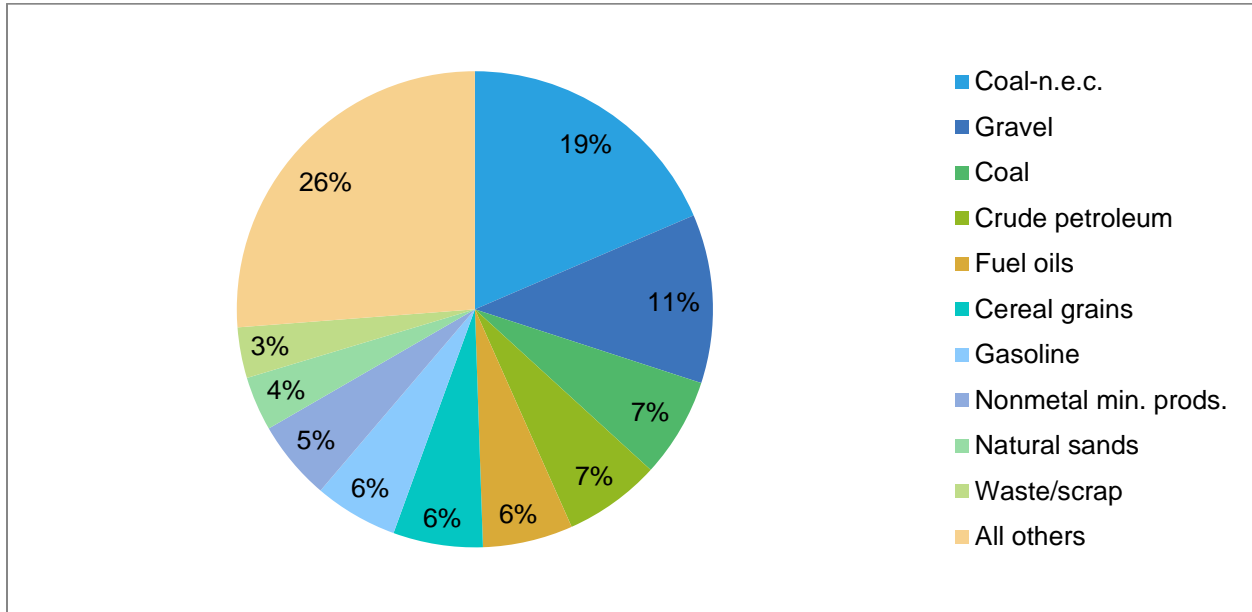
The top commodities traded look somewhat different when measured by value. As **Figure 2-2** illustrates, machinery is the top value commodity in the state. Other commodities, such as pharmaceuticals and motorized vehicles, are also included in the list of top commodities by value.

Commodities which appear on both top tonnage and value lists include those in the energy sector such as Coal-n.e.c. and Crude Petroleum. These commodities, along with others, have a broad impact across the state. The production, transfer, and use of these commodities create jobs throughout the state and are products of Oklahoma's extensive energy production sector.



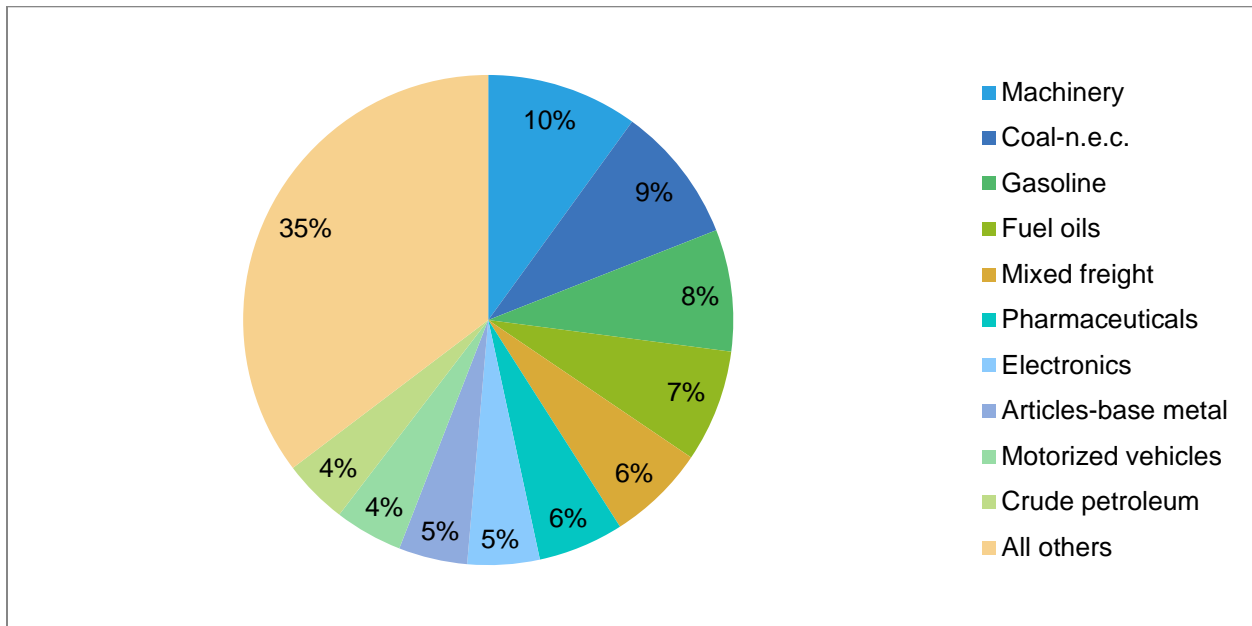


**Figure 2-1: Major Freight Commodities by Tonnage, Oklahoma, 2012**



Source: FAF 3.4. 2012 provisional data

**Figure 2-2: Major Freight Commodities by Value, Oklahoma, 2012**



Source: FAF 3.4. 2012 provisional data



## **2.3 FREIGHT TRENDS: OKLAHOMA AND BEYOND**

Freight movements affecting Oklahoma are increasingly national and global in scope, and are sensitive to market forces as well as the decisions of supply chain and logistics professionals both within and outside the state. Industries may make business decisions based on these national and global trends, which may often result in effects that are felt locally and can have profound impacts on goods movement within the state. Regional or national decisions made by other transportation agencies and operators can also be felt locally. This section presents an overview of key freight trends that may impact Oklahoma's industries and freight system.

### **2.3.1 Energy Sector**

Oklahoma has long been a leader in the energy production sector, and it has recently seen increasing focus on technological and manufacturing solutions for the energy market. In addition to raw materials extraction, core components of Oklahoma's energy industry include machinery and manufacturing, natural gas products, distribution, and engineering services, according to the Oklahoma Department of Commerce. In 2010, Oklahoma ranked 5th in the U.S. in terms of oil production, 8th in wind energy capacity, 5th in new wind capacity installations, and 8th in total energy production. In 2010, Oklahoma produced more than 8 percent of the U.S. natural gas supply, and is home to some of the largest energy companies in the U.S., including Chesapeake Energy and Devon Energy.<sup>9</sup>

The energy sector is also tied in with oversize-overweight (OS/OW) freight movements in Oklahoma. Movement of large-scale wind energy components such as blades and other turbine components, as well as equipment needed for oil and gas extraction will continue to cause challenges for the state as these energy sectors continue to grow and expand. Being able to move this equipment safely and efficiently through the state requires coordination of the needs of the energy sector with transportation policy and programming within the state, including aspects such as OS/OW permitting (through the OkiePros system<sup>10</sup>), construction of new and maintenance of existing infrastructure, and policies and programs that support economic activities while maintaining and improving Oklahoma's transportation system.

There are some potential negative impacts associated with increasing heavy truck traffic and overall truck traffic. Roadways used by heavier trucks or on high truck traffic corridors can experience decreased overall pavement/concrete service life, resulting in the need for more frequent, and thicker, overlays and reconstruction sooner than would otherwise be expected under current use. Increased heavy and large truck traffic can have significant safety impacts to other drivers, pedestrians, and even bicyclists. For example, conflicts between bicyclists and heavy trucks, especially on roads without shoulders, could increase with additional heavy truck traffic.



Additionally, highways that lack shoulders or safe passing areas are problematic when cars wish to pass slow moving heavy trucks, trucks entering or leaving the roads, or when either trucks or cars need to pull off the road to a safe location.

Wider shoulders, or other improvements, may be needed to ensure the safety of the traveling public where substandard, or no, shoulders currently exist. Finally, trucks driving on unpaved and gravel roads can release harmful dust plumes into the air, which could present health risks for workers and area residents.

Energy technology will continue to play a huge part in Oklahoma's economy. Much of Oklahoma's increases in oil production, 14 percent between 2007 and 2010, is attributable to innovation and technology. New and existing companies are also bringing research and innovation to Oklahoma. Incentives for bringing high-end jobs to Oklahoma and the state's seven ABET (Accreditation Board for Engineering and Technology) accredited engineering programs also contribute to this trend. General Electric announced in April 2013, that it plans to build a \$110 million research center in Oklahoma that will focus on researching new ways to improve oil and gas extraction. The center will be one of eight such facilities in the world and will employ up to 125 engineers and scientists.<sup>11</sup>

Additionally, oil and gas companies are increasingly using trains as an alternative to pipeline transfer of petroleum products. According to the AAR, in 2008, U.S. Class I railroads originated just 9,500 carloads of crude oil nationally. In 2012, they originated nearly 234,000 carloads and will likely originate around 400,000 carloads in 2013.<sup>12</sup> Although transportation costs for shipment by train are higher than pipeline, rail offers competitive advantages that will make it a likely contender for continuing to grow in volume and market share. Rail serves all of the major refineries on both coasts, as well as in the inland and Gulf markets, allowing companies to ship their products to the highest-margin market. Another consideration is that rail allows for uncontaminated shipment of different grades of petroleum, whereas shipping via pipeline means that different grades may get mixed together. Moving oil by train presents mixed safety benefits. The AAR reports that the "spill rate" for oil moving by train is about one third as high as that for oil moving by pipeline; however several recent disasters have occurred in the rail industry that indicate that the issue may be more complex.

### **2.3.2 Maritime Shipping and the Panama Canal Expansion**

Since opening in 1914, the Panama Canal has been a critical element of the global transportation network. It now serves over 140 maritime trade routes to over 80 countries; an estimated five percent of global maritime cargo transits the Panama Canal every year.<sup>13</sup> The Panama Canal expansion project, projected to be completed in 2015, will allow larger ships to pass through the Canal and will increase the annual capacity of the canal by more than 75 percent. The effect of the expansion on U.S. ports and trade is a much-debated topic.



Many factors, such as port physical attributes, connections to the surface transportation system, and access to inland markets, will influence how the expansion of the Panama Canal will affect U.S. trade. The use of larger ships will likely lead to fewer and more concentrated ship calls at larger ports that can accommodate larger vessels and have good access to inland markets. New Orleans, along with many East Coast and Gulf ports, is conducting a study as part of a plan to increase channel depth from 45 feet to 50 feet to accommodate these larger ships.<sup>14</sup>

Oklahoma is connected to ocean shipping through the inland waterway system and the road and rail connections to the Port of New Orleans, Houston, and other Gulf ports. The MKARNS, is a Marine Highway Connector which leads to the Mississippi River and the Gulf of Mexico. Commodities such as grain, petroleum products, gravel, and oversize equipment currently depend on the inland waterway system in Oklahoma.

According to Panama Canal Executives, some of the biggest growth cargoes in Panama after the expansion project is completed will be dry and liquid bulk cargoes,<sup>15</sup> which may lead to the potential for increased export traffic from Oklahoma, among others. According to the Panama Canal Phase I Report, reductions in transportation costs due to Canal expansion could affect the movement of goods through the inland waterways in several ways. Reductions in ocean transportation costs out of Gulf ports may lead to a reduction of costs to export bulk commodities, particularly grain, by the Mississippi River System. Furthermore, lower transportation costs could help increase overall demand for exports. However, as noted by the U.S. Army Corps of Engineers (USACE), increases in congestion on the inland waterway system may offset some of these costs. On the other hand, increases in container traffic due to the expansion will likely occur along east-coast corridors, according to the analysis in the Panama Canal Phase I Report. The potential for container traffic on the Arkansas River System is limited without heavy investments in container-on-barge (COB) service at New Orleans, and investments to improve the reliability of the inland waterway system.

### **2.3.3 Inter-American Trade and Nearshoring Trends**

Trade between the U.S. and its southern neighbors of Mexico and Central and Latin America is an important part of the U.S. economy. Increasing trends in Inter-American trade as well as potential new trade agreements<sup>16</sup> between these countries increase the potential for increased import and export trade for Oklahoma's businesses. According to the U.S. Census Bureau Foreign Trade Statistics, Oklahoma exported \$6.9 billion worth of products in 2013, up 5.2% from 2012.<sup>17</sup> Manufactured exports support 21 percent of manufacturing jobs, and since 2003 export manufacturing has risen more than twice as fast as the state's overall economy. A total of 90 percent of Oklahoma's exports are manufactured goods, and 50 percent of Oklahoma's total exported manufactured goods went to Free Trade Agreement partner countries in 2010.<sup>18</sup>



The top five commodities exported made up 39 percent of total exports, and include Civilian Aircraft, Engines and Parts; Medical and Surgical related Instruments and Appliances; Tires; Crude Oil; and Parts for Boring or Sinking Machinery. Oklahoma has four Foreign Trade Zones (FTZ 53, FTZ 106, FTZ 164, and FTZ 227) and several subzones positioned for air, ground transport, and water trade.

In addition to increased trade opportunities, U.S. businesses are increasingly moving their overseas operations to locations in the U.S. or Mexico, potentially increasing the supply chain and manufactured goods traffic that will flow through the U.S.'s southern border. This “reshoring” or “nearshoring” trend is the result of many factors influencing manufacturing costs, such as labor and production costs, quality control, and transportation.

In a world increasingly focused on “just in time” delivery, businesses located in the U.S. or Mexico can easily be transported to North American markets via multiple modes, and do not require long transit times via sea shipping, reducing the cost and increasing the reliability of bringing the goods to market. A 2012 survey found that 37 percent of American manufacturing companies with annual sales above \$1 billion reported that they were planning or actively considering shifting production facilities from China to America.<sup>19</sup>

#### **2.3.4 Other Logistics Trends**

Changing demand for when and how goods are shipped and delivered has led to changes in the logistics sector and growth in the warehousing and distribution sector of the economy. With the rise of e-commerce, consumers can order directly from a company or online retailer, and receive their goods without visiting a retail store. Companies are competing to provide two-day, or even same-day service to consumers. This has led to companies like Amazon.com to locate warehouses in large and highly concentrated markets like California, New York, and New Jersey in spite of less-than-stellar business climates and high operating-cost structures.<sup>20</sup> Distribution centers are also being located closer to rail lines in order to take advantage of the reduced rates and environmental factors of shipping via rail versus truck. Growth in occupied distribution space has grown at an annual rate of above 7 percent between 2000 and 2013,<sup>21</sup> and growth in and around urban areas, especially those with access to road and rail, is expected to continue as e-commerce trends increase. This means that there are opportunities to capture growth in the warehousing and distribution sector, especially due to Oklahoma’s geographic location and proximity to major markets. However, for those companies preferring to locate adjacent to major dense urban areas to meet consumer demand, the state may be at a disadvantage. A clear understanding of company’s location and relocation needs is required in order to attract businesses to Oklahoma.

As demand for high-quality rail service, including scheduled service, high-speed passenger service, and container traffic continues to increase; many railroads are changing their interactions with local customers. Class I railroads are increasing





their focus on unit trains and high demand traffic, which requires Class II railroads and customers with direct rail connections to change the way that they do business. High volume shipments on rail will likely increase.

Both Class I and Class II railroads are making record investments in infrastructure to allow them to provide the level of service required by their customers. Regional intermodal facilities, such as the BNSF Gardner Intermodal Facility outside of Kansas City, provide a hub for intermodal traffic to be delivered in a 300 mile radius from a single location including Oklahoma. Transload and multimodal facilities are also being built by railroads, private operators, and public agencies to facilitate industry and distribution center growth by providing rail and/or water access, and to offset supply chain volatility by allowing customers to utilize multimodal shipping options.



# Oklahoma Long Range TRANSPORTATION PLAN

## 3 FREIGHT SYSTEM INVENTORY AND FUTURE DEMAND

This section establishes a picture of Oklahoma's multimodal freight transportation infrastructure and operational characteristics, as well as describes current freight demand of the state's highway, rail, waterway, and air cargo systems. This section draws upon a number of recent projects which have described elements of Oklahoma's statewide freight system.<sup>22</sup>

### 3.1 MULTIMODAL FREIGHT SYSTEM INFRASTRUCTURE

#### 3.1.1 Highway Inventory

Oklahoma's 12,265 mile State Highway System<sup>23</sup> is mostly rural in nature with two major metropolitan areas (Oklahoma City and Tulsa) that have urban highways and expressways.

Oklahoma has an extensive highway network which serves to provide connections between the east and west coasts of the U.S. as well as northbound movements from Texas to the central U.S. Major interstates in Oklahoma include I-35, I-40, and I-44 as well as several bypass routes, for a total of 933 miles.<sup>24</sup> As both a portion of and a complement to the interstate system, Oklahoma has a large network of toll roads within the state totaling roughly 600 miles. These turnpikes are maintained by the Oklahoma Turnpike Authority. As a testament to Oklahoma's role as a through state, approximately 40 percent of the toll revenues collected on the turnpikes comes from out-of-state motorists.

Supplementary connectivity is provided by state and U.S. routes, adding additional mileage to the state system. Oklahoma has approximately 112,800 miles of public roads, a number that has been quite stable since the previous Long Range Transportation Plan was completed. The public road mileage includes nearly 3,400 miles of the National Highway System (NHS),<sup>25</sup> which consists of roadways deemed important to the nation's economy, defense, and mobility.

##### 3.1.1.1 Highest Truck Volumes in Oklahoma

Analysis of truck volumes allows identification of the most critical freight corridors in the state. **Table 3-1** shows estimates of truck traffic on the National Highway System as an indicator of the location of these corridors. Each of these routes serves as an important link for goods movement. Oklahoma City's position as a major freight generator and attractor is shown by the high volumes along I-40 and I-35. Coupled with this is US 69, providing a critical and more direct link from Dallas to the eastern and northern portions of the country beyond Oklahoma.



**Table 3-1: Highest Truck Volume on Key Roadways, Oklahoma, 2013**

Roadway	County	Single Unit Truck Volume	Combination Truck Volume	Total Truck Volume	AADT
I-35	Oklahoma	5,830	9,400	15,230	123,100
I-40	Oklahoma	6,380	8,152	14,532	108,100
I-44	Rogers	3,880	8,030	11,910	67,600
US 69	Pittsburg	1,670	5,450	7120	19,800
US 169	Tulsa	5,030	2,490	7520	116,000
US 259	McCurtain	150	460	610	9,500
US 281	Canadian	740	1,240	1,980	7,100
US 287	Cimarron	300	1,310	1,610	3,200

Source: Oklahoma Department of Transportation, National Highway System, 2013.

**Figure 3-1** shows the location of the high volume truck corridors.

**3.1.1.2 Highest Truck Percentages in Oklahoma**

The percentage of trucks compared to overall traffic is highest on other roadways other than interstates on the National Highway System. On US 287 in the Oklahoma panhandle, trucks make up 58 percent of the total traffic. Roadways with the highest percentage of truck traffic are detailed in **Table 3-2**. Although these listed locations have truck percentages well over 20 percent; it is important to note that in many cases the location along a roadway with the highest percentages of truck traffic is not the same as the location with the highest *volume* of trucks or vehicles. For instance, the highest percentage of truck traffic on I-35 is found in Noble County, which has an average annual daily traffic (AADT) volume of 14,900, as reported in Table 3-2, while the segment with the highest overall truck volume is found in Oklahoma County and has an AADT volume of 123,100 as reported in Table 3-1.

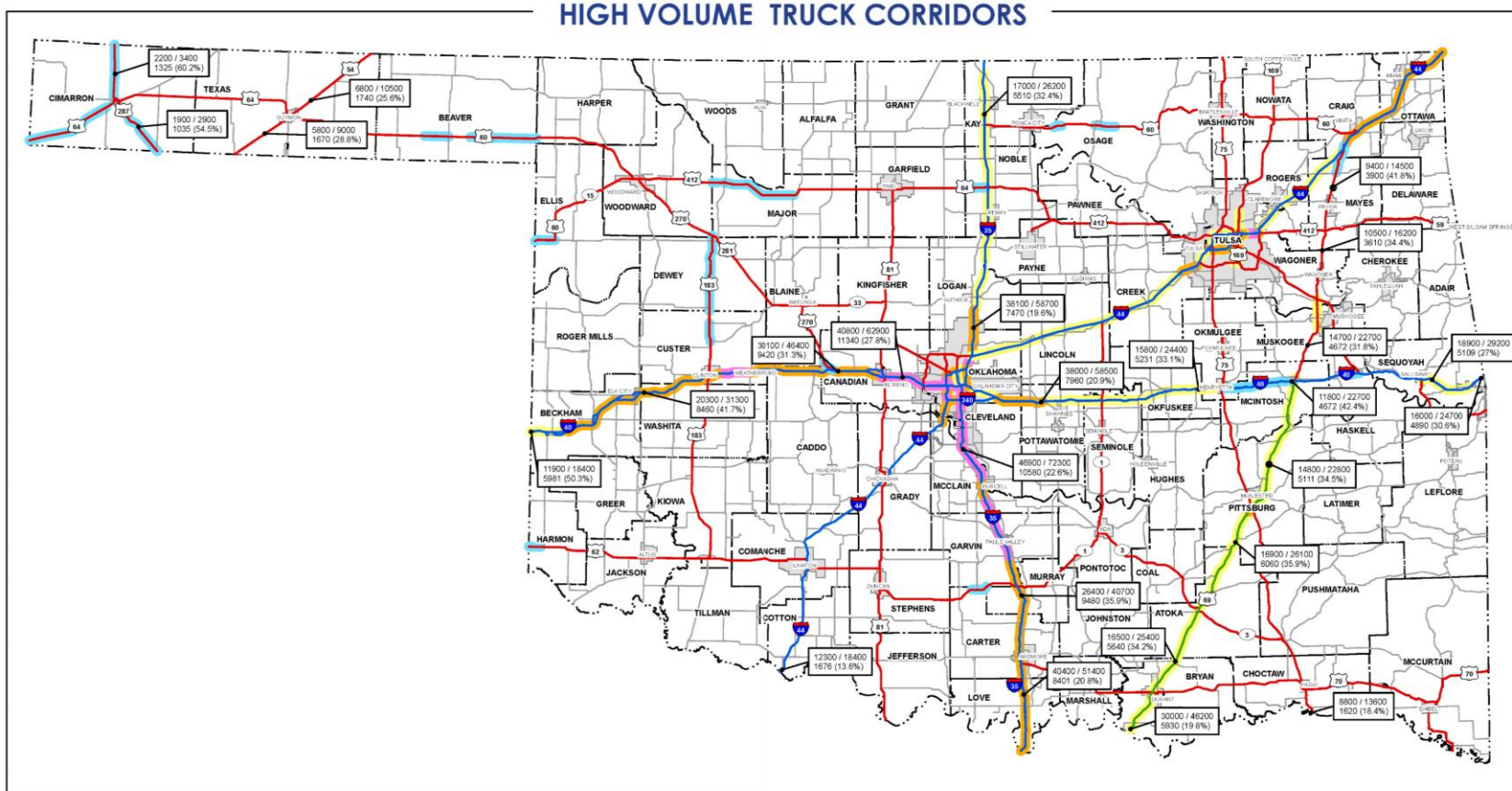
**Table 3-2: Highest Truck Percentages on Key Roadways, Oklahoma, 2013**

Roadway	County	Single Unit Truck Percent	Combination Truck Percent	Total Truck Percent	AADT
I-35	Noble	10%	34%	44%	14,900
I-40	Beckham	9%	46%	55%	12,600
I-44	Ottawa	5%	36%	41%	18,282
US 69	Craig	6%	39%	45%	8,700
US 169	Nowata	12%	22%	34%	4,700
US 259	McCurtain	5%	20%	25%	2,400
US 281	Canadian	18%	32%	50%	3,800
US 287	Cimarron	5%	53%	58%	2,200

Source: Oklahoma Department of Transportation, National Highway System, 2013



**Figure 3-1: High Volume Truck Corridors, Oklahoma, 2013**



# High Volume Truck Corridors

2013 Analysis Period

Oklahoma Dept. of Transportation  
Strategic Asset & Performance Management  
200 NE 21st St  
Oklahoma City, OK 73105

**Legend**

- Interstates
  - STRAHNET
  - Other Principal Arterial
  - Proposed NHS Route
  - Non-NHS Toll Route
  - Other Highways
- 0-4999 (Not Shown)
  - 5000-6999
  - 7000-9999
  - > 10000
  - > 40% and < 5000 AADT

**Count Site Data**

2013 AADT / 2040 AADT	2013 AADTT (% Truck)
-----------------------	----------------------





### 3.1.1.3 Ports of Entry

The Oklahoma Department of Transportation in partnership with the Oklahoma Corporation Commission and the Oklahoma Turnpike Authority unveiled an initiative on January 22, 2008 to upgrade the port of entry facilities in Oklahoma. The goal is to develop eight new port of entry facilities at Oklahoma borders by utilizing funding from the Oklahoma Petroleum Storage Tank Release Indemnity Program, the Turnpike Authority and ODOT.

Two ports of entry are already operational, on I-35 in Kay County at the Kansas state line and on I-40 in Beckham County at the Texas state line. Construction on the facility on I-40 in Sequoyah County began in 2014 and the facility on I-35 in Love County will begin construction in early 2015. The other locations will be completed as fiscal resources become available.

The new ports of entry facilities will use advanced weigh-in-motion technology to check trucks' weight, size and permit status through road sensors to make the process more efficient. Additionally, the facilities will help enforce vehicle and freight laws and regulations, ensure proper truck registration, operation and permitting, and enforce weight and size regulations, creating a safer transportation system.

### 3.1.1.4 Oversize/Overweight Commercial Motor Vehicles

The Oklahoma economy is dominated by the agriculture and energy industries, which translates into a large number of oversize/overweight (OS/OW) commercial vehicle loads. On an annual basis hundreds of thousands of OS/OW trucking permits are issued by the Department of Public Safety (DPS). In 2008 ODOT and DPS initiated a joint project to improve the OS/OW permitting and routing process. This project allows carriers to submit a standard OS/OW permit request, generate a safe route, and pay for and receive the permit all electronically.

Over 250,000 permits were processed and approved by the system in the first full year of operation, an increase of almost 10,000 from the previous highest year. A second phase of development that will include additional functional enhancements is currently in the planning stages.

In addition to OS/OW permits, there is a statewide focus on improving structurally deficient bridges. The Department has reduced the number of structurally deficient bridges by 50% in recent years and has a goal of achieving less than 1 percent structurally deficient bridges by the end of the decade. Improving bridge conditions ensures that the structures can support both legally and specially permitted loads across the state.

## 3.1.2 Railway Inventory

The railroad system plays an important part in Oklahoma's freight network. A single train replaces several hundred trucks on the roadways and thus helps to alleviate congestion throughout the state. Based on data from the Association of American





Railroads (AAR), cargo volumes handled by train in 2011 would have required an additional 17.1 million trucks had they moved by roadways. Beyond the benefits coming from the efficient movement of goods, railroads also provide highly desirable jobs.

Currently there are three Class I railroads operating in Oklahoma, with the Burlington Northern Santa Fe (BNSF) Railway operating the largest network. Supplementing these large operators are 19 short line railroads providing service for regional needs. Approximately 68 percent of the state’s rail lines are operated by Class I railroads, and the remaining by short line railroads. A full list of rail lines, including segments owned by the state of Oklahoma, is detailed in **Table 3-3**.

**Table 3-3: Railroad Lines**

Railroad	Acronym	STB Classification	Total Mileage	State-owned Mileage
BNSF Railway	BNSF	I	1,475	
Kansas City Southern Railway	KCS	I	139	
Union Pacific Railroad	UP	I	921	
AOK Railroad Company	AOK	III	69.9	69.9
Austin Todd & Ladd Railroad	AT&L	III	46	9.0
Blackwell Northern Gateway Railroad	BNG	III	17	17.0
Cimarron Valley Railroad	CVR	III	35	
Farmrail Corporation	FMRC	III	179	89.9
Grainbelt Corporation	GNBC	III	186	
Hollis and Eastern	H&E	III	14	
Kiamichi Railroad	KRR	III	157	
Northwestern Oklahoma	NOW	III	7	
Port of Catoosa	PC	III	20	
Port of Muskogee	PMR	III	9	
Public Service of Oklahoma	PSO	III	11	
Sand Springs Railway	SS	III	10	
South Kansas & Oklahoma Railroad	SK&O	III	79	5.0
Stillwater Central Railroad	SLWC	III	240	22.0
Texas, Oklahoma & Eastern Railroad	TO&E	III	40	
Tulsa Sapulpa Union Railway	TS	III	10	
WFEC Railroad Company	WFEC	III	14	
Wichita, Tillman & Jackson Railway	WT&J	III	61	
Total Miles			<b>3,740</b>	<b>213</b>

Source: Oklahoma State Department of Transportation



Most rail traffic in the state moves in a north-south direction over the following five Class I mainlines:

- BNSF line in the far western part of the state through Boise City, part of the BNSF route between the Powder River Basin and Texas.
- BNSF west-central Oklahoma line through Woodward/Alva, part of the east- west Transcon.
- BNSF line through Oklahoma City, the former Santa Fe line between Kansas City and Fort Worth, which is part of the MidCon traffic lane.
- Union Pacific (UP) mainline in eastern Oklahoma through Muskogee/Durant, the former Katy line from Kansas City to Dallas.
- Kansas City Southern (KCS) mainline in far eastern Oklahoma through Sallisaw connecting Kansas City and the Gulf ports.

Some of the east-west intermodal traffic on the BNSF Transcon also uses the route through Tulsa to reach destinations in Memphis and Birmingham.

### 3.1.3 Waterway Inventory

Oklahoma’s waterway system begins on the eastern side of the state at the Arkansas border. As the terminus of the McClellan Kerr Arkansas River Navigation System (MKARNS), Oklahoma plays an important role in the nation’s inland waterway system. This navigation channel begins at the Port of Catoosa and stretches 445 miles to the Mississippi which can be seen in **Figure 3-2**.

As part of the U.S. Army Corps of Engineers (USACE) Tulsa District, which oversees 150 miles of the MKARNS, five of the eighteen locks and dams of MKARNS are located along the Verdigris and Arkansas Rivers in Oklahoma. The characteristics of these locks are highlighted in **Table 3-4**.

**Table 3-4: Lock and Dam Characteristics, Oklahoma**

Lock and Dam	River	Navigation Mile	Purpose	Length (ft.)	Chamber Width (ft.)	Chamber Length (ft.)	Normal Lift (ft.)
W. D. Mayo	Arkansas	319.6	Navigation	7,400	110	600	20
Robert S Kerr	Arkansas	336.2	Navigation, hydroelectric power, recreation	7,230	110	600	48
Webbers Falls	Arkansas	366.6	Navigation, hydroelectric power	4,370	110	600	30
Chouteau	Verdigris	401.4	Navigation, recreation, fish and wildlife	11,690	110	600	21
Newt Graham	Verdigris	421.7	Navigation, recreation, fish and wildlife	1,630	110	600	21

Source: U.S. Army Corps of Engineers, 2013.



Figure 3-2: Total Annual Freight Volumes, Waterway, 2013



Source: Tulsa District, US Army Corps of Engineers



All five locks provide navigational aid. In addition, some provide hydroelectric power, recreation, and fish and wildlife uses. These locks are consistent with one another, with 110 foot chamber widths and 600 foot chamber lengths. The main variable is their normal lift, ranging from 20 feet up to 48 feet, which in turn affects how long each takes to traverse.

These locks provide a way to safely move goods along the MKARNS in Oklahoma to the Port of Catoosa, the Port of Muskogee, and other port facilities in the state. As one of the two main public ports within Oklahoma, the Tulsa Port of Catoosa is considered the most inland water port in the U.S. Going beyond the waterside capabilities of the Port, there is also a 2,000 acre industrial park and multimodal shipping complex available at the Port of Catoosa. This port has a variety of terminals and docks available to meet the needs of goods flowing through the state.

Available terminal areas are:

- General dry cargo dock;
- Roll-on/roll-off low water wharf;
- Dry bulk terminal;
- Grain terminals; and
- Bulk liquid terminal.

Supplementing these terminals are numerous multimodal transportation options. Available services include river barges, trucking, railroad (served by all three Class I carriers via the South Kansas and Oklahoma Railroad), containers, and air transport via the Tulsa International Airport. In addition to transportation options, the Port of Catoosa is home to Foreign Trade Zone (FTZ) 53 and bonded warehouses which help to reduce customs and duty taxes on goods.

Similarly, the Port of Muskogee, to the south of the Port of Catoosa, also provides service to the MKARNS. Situated on 450 acres, this port has room to grow with 115 available acres. Consisting of public and private port terminals, major industrial areas include the Riverside Industrial Park, Three Forks Harbor, and the John T. Griffin Industrial Park. The Port of Muskogee has mainline rail service provided by Union Pacific Railroad through a line operated by the Port itself. Other transportation options provided by this port include barge and truck, as well as the Davis Field Airport 11 miles away and Tulsa International Airport 50 miles away. The Port of Muskogee also has its own Foreign Trade Zone (FTZ 164) to allow for the reduction or elimination of duties and customs fees.

Within the state are also other port facilities operated by private entities. One of the largest is Oakley's (previously Johnston's) Port 33, owned by Bruce Oakley, Inc. a transportation company headquartered in Little Rock Arkansas. This private port maintains the furthest north, year round operation on the MKARNS and can accommodate both large and small volumes of dry bulk commodities.



This facility was recently expanded in 2009 with the addition of 90 acres with a 20,000 ton warehouse and drop shoot for truck to barge loading. Oakley's Terminal is also under contract with the Muskogee City-County Port Authority, for managing the public terminal at the Port of Muskogee.

### **3.1.4 Airport Inventory**

Oklahoma is home to a large number of airports supplementing local, regional, and national needs. As part of the National Plan of Integrated Airport Systems (NPIAS), nearly 3,400 existing and proposed airports across the country are identified as significant to national air transportation. This identification allows the airports to receive Federal grants under the Airport Improvement Program (AIP).

The three primary airports in Oklahoma are the Tulsa International (TUL), Will Rogers World (OKC), and Lawton-Fort Sill Regional (LAW) airports. In addition to being identified as primary airports due to the number of passengers boarding each year, both Tulsa International and Will Rogers World meet the Federal Aviation Administration (FAA) requirement for cargo service airports (facilities with aircraft providing cargo transportation with a total annual landed weight of more than 100 million pounds). Based on FAA data, Tulsa International consistently has a landed weight of over 300 million pounds and Will Rogers World consistently has over 200 million pounds. Lawton-Fort Sill Airport maintains significant use by military personnel.

The NPIAS also identifies general aviation airports- including seven regional airports. These airports support regional economies by connecting communities to regional and national markets. These airports have higher levels of general aviation activity with some jets and multi-engine propeller aircraft. These airports average about 90 total based aircraft. Oklahoma's regional airports are: Bartlesville Airport, Woodring in Enid, McAlester Airport, University of Oklahoma Westheimer Airport in Norman, Wiley Post Airport in Oklahoma City, Ponca City Airport, and Richard Jones Jr. Airport in Tulsa.

#### **3.1.4.1 Tulsa International Airport (Tulsa)**

Tulsa International Airport is located to the northeast of Downtown Tulsa. This location gives users access to a series of major interstates, railways, and inland sea ports. Cargo operators utilizing these benefits include American Airlines Cargo, United Airlines, FedEx, Southwest Cargo, UPS, and the U.S. Postal Service. Three runways ranging in length from 6,101 feet to 9,999 feet support these operations. Most recently, 6,900 feet of the 9,999 foot runway was reconstructed, after the previous reconstruction of a portion of the southern and northern ends of the runway in 2011 and 2012, respectively. The next phase of reconstruction in 2014 will focus on a runway intersection. Tulsa International is also seeking to develop some of the available 700+ acres of real estate to encourage growth of the aerospace industry. Aerospace is currently one of the state's largest industry clusters, with Tulsa ranked eighth nationally for the aerospace engines manufacturing.





#### 3.1.4.2 Will Rogers World Airport (Oklahoma City)

Will Rogers World Airport (OKC), to the southwest of Oklahoma City, operates four runways ranging in length from 3,078 feet to 9,800 feet on about 8,100 acres of land. As a joint civil-military airport, OKC is the second largest cargo airport in the state. Similar to Tulsa International, Will Rogers World is also seeking to expand industrial development on roughly 1,000 acres of land. This development will focus on three primary areas: Direct Aviation, Aviation Support/Indirect Aviation, and Retail/Industrial/Office. This development will complement many of the businesses and associations already situated at Will Rogers World and will include businesses outside the airport as well. The Federal Aviation Administration (FAA) operates their non-D.C. headquarters at the Mike Monroney Aeronautical Center which also houses the Logistics Center and FAA Academy Training. Other entities with a large presence at the airport include AAR Corp., ARINC, Metro Technology Center's Aviation Career Campus, and the Ninety Nines Museum of Women Pilots.

#### 3.1.4.3 Lawton – Fort Sill Airport

Lawton-Fort Sill Airport (LAW) is located in Lawton, Oklahoma in Comanche County. One 8,599 foot runway is in operation at this 1,300 acre facility. Daily direct passenger service to Dallas-Fort Worth International Airport is provided by American/American Eagle Airlines. While there were just over 68,000 passenger enplanements at Lawton-Fort Sill in 2010, the airport is of strategic logistics importance due to the fact that the bulk of operations at this airport are for military purposes.



### 3.2 FUTURE FREIGHT FLOWS

Total freight tonnage moving inbound, outbound, and within the state is forecast to grow to 1.4 billion tons by 2040, up 42 percent from 2015. This is largely driven by a 52 percent increase in truck tonnage, followed by a 22 percent increase in rail tonnage and 30 percent increase in waterway. In the year 2040, trucks are forecast to carry 71 percent of all freight tonnage, and rail is projected to transport a 29 percent share. Waterborne freight stays is expected to carry less than one percent. (See **Table 3-5**.)

**Table 3-5: Oklahoma Forecasted Freight Tonnage Flow, by Mode (2015 and 2040)**

MILLION TONS OF FREIGHT								
Mode	2015	2040					2040	2015-2040 Change
	Total Estimated	Inbound	Outbound	Internal	Through	% by Mode	Total Forecast	
Truck	661.7	79.8	76.2	222.6	629.9	70.6%	1008.4	52.4%
Rail	338.7	47.7	17.3	5.0	341.7	28.8%	411.7	21.6%
Waterway	6.4	4.0	4.3			0.6%	8.3	29.7%
<b>Total</b>	<b>1006.8</b>	<b>131.5</b>	<b>97.7</b>	<b>227.6</b>	<b>971.7</b>	<b>100.0%</b>	<b>1428.5</b>	<b>41.9%</b>

Sources: FHWA Freight Analysis Framework, version 3; ODOT Traffic Analysis Branch; Class One Rail data; 2012 ODOT Freight Flows Study; 2035 Oklahoma Long Range Transportation Plan; ODOT Waterways Program; US Army Corps of Engineers, Tulsa District.

#### 3.2.1 Through Freight

Through tonnage is forecasted to grow 40 percent from 2015 to 2040. Through movements will continue to dominate Oklahoma’s freight transportation system, with more than two-thirds of movements on the freight system considered through movements. Most of the through tonnage will be carried on the highway system, with the remainder carried by rail. (See **Table 3-5**.)

**Table 3-6: Oklahoma Forecasted Through Tonnage, by Mode (2015 and 2040)**

THROUGH Freight Traffic By Mode, 2015-2040			
Mode	Million Tons		2015-2040 % Change
	2015 Total Estimate	2040 Total Forecast	
Truck	407.1	629.9	54.7%
Rail	285.0	341.7	19.9%
Waterway	0.0	0.0	NA
<b>Total</b>	<b>692.1</b>	<b>971.6</b>	<b>40.4%</b>

Sources: FHWA Freight Analysis Framework, version 3; ODOT Traffic Analysis Branch; Class One Rail data; 2012 ODOT Freight Flows Study; 2035 Oklahoma Long Range Transportation Plan; ODOT Waterways Program; US Army Corps of Engineers, Tulsa District.



### 3.2.2 Inbound Freight

Inbound cargo is expected to grow by 65 percent, led by trucks with 74 percent growth, followed by rail at 54 percent growth. Trucks will still carry the majority of inbound freight. (See **Table 3-5.**)

**Table 3-7: Oklahoma Forecasted Inbound Tonnage, by Mode (2015 and 2040)**

INBOUND Freight Traffic By Mode, 2015-2040			
Mode	Million Tons		2015-2040 % Change
	2015 Total Estimate	2040 Total Forecast	
Truck	45.8	79.8	74.5%
Rail	31.0	47.7	53.9%
Waterway	3.1	4.0	29.0%
Total	79.9	131.5	64.6%

Sources: FHWA Freight Analysis Framework, version 3; ODOT Traffic Analysis Branch; Class One Rail data; 2012 ODOT Freight Flows Study; 2035 Oklahoma Long Range Transportation Plan; ODOT Waterways Program; US Army Corps of Engineers, Tulsa District.

### 3.2.3 Outbound Freight

Outbound freight cargo is expected to only grow 20 percent between 2015 and 2040. Rail will actually see a reduction in total tonnage outbound (9 percent drop). Trucks are still forecast to carry the large majority of outbound freight in 2040 (78 percent), which is a 5 percent increase in share compared to 2015. (See **Table 3-5.**)

**Table 3-8: Oklahoma Forecasted Outbound Tonnage, by Mode (2015 and 2040)**

OUTBOUND Freight Traffic By Mode, 2015-2040			
Mode	Million Tons		2015-2040 % Change
	2015 Total Estimate	2040 Total Forecast	
Truck	59	76.2	29.2%
Rail	18.9	17.3	-8.5%
Waterway	3.3	4.3	30.3%
Total	81.2	97.7	20.3%

Sources: FHWA Freight Analysis Framework, version 3; ODOT Traffic Analysis Branch; Class One Rail data; 2012 ODOT Freight Flows Study; 2035 Oklahoma Long Range Transportation Plan; ODOT Waterways Program; US Army Corps of Engineers, Tulsa District.



### 3.2.4 Internal Freight

Internal freight tonnage movement is expected to grow by 48 percent. All modes are expected to see some internal freight movement growth between 2015 and 2040, led by trucks with a 49 percent increase, and rail with a 32 percent increase. (See **Table 3-9**).

**Table 3-9: Oklahoma Forecasted Internal Tonnage, by Mode (2015 and 2040)**

INTERNAL Freight Traffic By Mode, 2015-2040			
Mode	Million Tons		2015-2040 % Change
	2015 Total Estimate	2040 Total Forecast	
Truck	149.8	222.6	48.6%
Rail	3.8	5.0	31.6%
Waterway	0.0	0.0	NA
Total	153.6	227.6	48.2%

Sources: FHWA Freight Analysis Framework, version 3; ODOT Traffic Analysis Branch; Class One Rail data; 2012 ODOT Freight Flows Study; 2035 Oklahoma Long Range Transportation Plan; ODOT Waterways Program; US Army Corps of Engineers, Tulsa District.

The 2040 forecast shows a freight system that continues to be dominated by commercial motor carriers. Trucking is expected to increase its modal share for inbound, outbound and through movements. Directional freight patterns are expected to stay largely similar to 2015, with through freight still capturing 68 percent of all freight.



# Oklahoma Long Range TRANSPORTATION PLAN

## 4 FREIGHT SYSTEM NEEDS AND ISSUES

As a part of the Plan development process, a summary of freight needs was developed based on analysis of ODOT data, previous reports and research, and consultation with the Freight Advisory Committee and the public. Following is a description of needs organized by mode. These needs were coordinated with the overall transportation system needs identified in the tech memo.

### 4.1 HIGHWAY SYSTEM NEEDS AND ISSUES

#### 4.1.1 Bridge Condition

Oklahoma's bridge challenges are well documented. In 2004, Oklahoma led the nation in poor bridge conditions and in fact had 1,168 bridges (17%) classified as structurally deficient on the state highway system. However, based on strategic investments, the structurally deficient bridges on the state highway system have shown a steady decline from 1,168 in 2004 to 468 in 2013. This reduction is a direct result of the increased legislative priority in transportation funding as well as ODOT's focus on improving the bridge condition throughout the state. The Governor instituted a funding plan in 2012 to reduce the number of structurally deficient bridges on the state highway system to less than one percent by 2020. This is a very aggressive strategy that will greatly improve bridge conditions throughout Oklahoma. It is important that bridges located along major freight corridors, especially those with a high percentage of OS/OW, are not structurally deficient so that freight movement is not interrupted.

While the State of Oklahoma has made a commitment to minimize the number of structurally deficient bridges on the state highway system, it is important to note that even with this investment, the number of bridges over 80 years old continues to grow from 883 bridges in 2014 to an anticipated 1,493 in 2021. This trend clearly illustrates the need to continue with a sound, dedicated bridge construction, rehabilitation, and maintenance program.

#### 4.1.2 Narrow, Two-Lane Roads

Although accident rates on rural roadways have decreased in recent years they remain at unacceptably high levels. A rural motorist is almost 3 times more likely to be involved in a fatal crash per mile traveled than their urban counterpart. Approximately half of the 8,700 miles of two lane highways in Oklahoma are rural roads with shoulders less than two feet wide. Narrow, two-lane roads often make it difficult for large trucks to stay within their lanes and can provide a safety challenge if another vehicle is disabled or stopped on the roadway. The severity of hills and curves are numerous. Steep hills and sharp curves present a particular challenge for trucks as they are not able to maneuver as easily as smaller passenger vehicles.





There are also line of sight issues, especially for vehicles attempting to pass slow-moving trucks.

Many of these roads were not designed to carry a great deal of truck traffic. Law enforcement officials utilize paved roadway shoulders and other features for roadside enforcement. The lack of adequate space to do so creates challenges and safety hazards for personnel engaged in enforcement activities. Safety features such as passing opportunities, and the existence of paved shoulders as recovery areas for errant vehicles are very much needed. Adequate shoulders at least four feet wide provide many benefits, including but not limited to space for roadside emergencies, space to maneuver and avoid potential crashes, space for bus stops, mail delivery and detours, and improved sight distance.

#### **4.1.3 Heavy Haul Highways Designation**

Due to the changing nature of oversize/overweight commodity movements, such as increased movements of wind energy components, there is a need for designated high/wide roadways in the State. The need for high/wide highways were noted by both the Tulsa Port of Catoosa and the Port of Muskogee as related to the connectivity required to get goods to market. Of particular need are the roads surrounding the ports because of the “project cargo” that uses those facilities for transfer to the highway system. Oversize or heavy equipment for Oklahoma industries also needs to travel from production to site, including cargo such as wind turbines, oil and gas equipment, and heat exchangers.

#### **4.1.4 Congested Roadways**

As a part of 2015-2040 Oklahoma Long Range Transportation Plan (LRTP), a pilot study was conducted along two corridors – I-40 and U.S. 69 – to identify congested roadways for freight and commuter travel. The study analyzed the travel time data provided by Federal Highway Administration (FHWA) and developed congestion performance measures which were then used to identify the congested roadways.<sup>26</sup> This pilot study can be extended to study all National Highway System in Oklahoma and assist with identifying and managing the congested freight corridors.



## **4.2 RAILWAY SYSTEM NEEDS AND ISSUES**

### **4.2.1 Switching and Storage Facilities**

Increasing traffic on the rail system has led to a shortage of facilities for switching and rail car storage in the state, particularly for Oklahoma's short-line railroads. Today Class I rail business practices often require customers and short-lines to stage larger trains or unit trains. Currently, Class I railroads are requiring short line railroads and other customers to provide longer trains, i.e., 110+ cars, which is difficult for short-line railroads that do not have switching and storage facilities.

As a result, Class I railroads have increasingly been diverting traffic from short-line railroads using truck-rail transload facilities, where customers truck goods directly to the Class I railroad facility.

### **4.2.2 Traffic Congestion at At-Grade Crossings**

In addition to being a safety factor, at-grade crossings also contribute to congestion and traffic issues. The trend of railroads utilizing longer "unit trains" places pressure on facilities/communities they serve, such as increasing congestion at railroad crossings.

In cities and communities such as Tulsa, Claremore, Owasso, and Muskogee, long, slow trains can block crossings for an extended period, bringing cross-town traffic to a halt. Many of these communities do not have alternative routing for emergency or other vehicles. Other blockages are also caused because of Class I carrier requirements for longer unit trains to be constructed; this can also cause congestion at at-grade crossings near rail yards as cars often must be moved in and out of yards multiple times.

### **4.2.3 Rail Safety Program**

Safety issues are present at both state and national levels and are of high importance to stakeholders. Highway rail crossing safety is a high priority. The ODOT Rail Safety Program works to minimize risks to this mode through three primary focuses: single high-priority rail crossing locations, statewide minimum rail safety standards projects, and rail corridor safety improvements. ODOT utilizes rail safety program funds to improve at-grade rail crossings throughout the state. The sale of state-owned rail miles in 2014 has provided the state with resources to improve a large number of at-grade rail crossings over the next several years. Further details are explained in the *Multimodal Needs Technical Memo*, part 6,

#### **4.2.3.1 Other Rail Safety Issues**

With the increased use of rail tank cars for carrying crude oil, there has been heightened attention to the need to strengthen rules regarding labeling of hazardous material, tank car specifications, and potential route and/or speed restrictions. A federal Pipeline and Hazardous Material Safety Administration rulemaking is pending.



Other concerns include derailment and release of hazardous materials. Positive train control (PTC), a technology improvement designed to automatically stop or slow a train before certain types of accidents occur will assist greatly with addressing train-to-train collisions, derailments caused by excessive speed, and movement of a train through a track switch left in the wrong position. All effected railroads are required to comply with PTC by December 31, 2015. This would include all the Class I railroads in Oklahoma.<sup>27</sup>

#### **4.2.4 East-West Rail Connectivity**

Unutilized or under-utilized rail lines in the state have led to a lack of connectivity to certain markets within the state. As a prime example, there is a lack of east-west connectivity due to the out-of-service UP line from Shawnee to McAllister.

Oklahoma's leaders, from local mayors to the Governor, have noted that there are potential markets for economic development not being served due to the lack of east-west connectivity. Further study is needed to identify the specific needs and opportunities of this line.

#### **4.2.5 Class III 286,000 pound capacity issue**

The shortline (Class III) railroad industry in Oklahoma has a significant portion of its rail system that is unable to accommodate industry-standard 286,000 pound gross weight railcars. Railroads that are not capable of these loads put shippers at a disadvantage by removing some of the efficiencies and advantages of rail freight shipments. In Oklahoma, expansion and growth in the energy sector is projected, which will increase freight rail demand over the next 20 years. According to the 2012 Oklahoma Freight and Passenger Rail Plan, approximately 130 miles of track and at least 230 structures need to be upgraded in order to handle 286,000 pound loads. At this time, there is no cost estimate associated with these needs.

#### **4.2.6 Needs for double tracking**

The highest freight flows along Oklahoma's railroads occur along Burlington Northern Santa Fe railway (BNSF) line in the northwestern part of Oklahoma (through Alva and Woodward), north-south BNSF rail line (through Oklahoma City) and Union Pacific rail line parallel to U.S. 69 (through Atoka, McAlester, Muskogee and Vinita). A study conducted by the *Association of American Railroad*, indicates that most of Oklahoma's Class I railroads will be operating above capacity in 2035 if no capacity improvements are made to the rail lines. Work to double track the BNSF railway line in the northwestern part of Oklahoma through Alva is expected to begin in 2016 and be completed before 2017. Double tracking of the other heavily traveled rail lines should also be considered to relieve the congestion.



## **4.3 MARITIME SYSTEM NEEDS AND ISSUES**

### **4.3.1 Maintenance Backlog and Conduct of Preventative Maintenance**

There are a number of initiatives that would be helpful in advancing the benefits of the Oklahoma waterways. There is a backlog of critical maintenance of approximately \$100 million needed on the 100 percent federally funded navigation features of the system. The Corps of Engineers is responsible for the operation and maintenance of the system and defines “critical maintenance” projects as having a 50 percent or greater probability of failure within the next five years. The available funding has not kept pace with the demand over the years with the increasing wear and tear on the locks that are now over 40 years old.

Additionally, the locks do not currently have tow haulage equipment, which means that only eight barges and a towboat can fit in a lock chamber at a time. If there are more than eight barges in the tow, the tow is separated so the captain can push the first eight barges and lock through, then turn around and lock the towboat through to get the remainder of the barges and lock through again. This process almost doubles the lock time for tows of 9-17 barges.

### **4.3.2 MKARNS Authorized Depth and Width**

While stakeholders noted that the McClellan-Kerr Arkansas River Navigation System (MKARNS) is not at the congressionally authorized depth (12 feet versus 9 feet actual), there were conflicting opinions from stakeholders on whether or not this poses a major threat today, or may in the future. Channel maneuverability is limited with the narrower, 150-foot width on the Verdigris River segment of the MKARNS. However, congestion in the channel was not noted as an issue, although two tows cannot pass in certain segments.

### **4.3.3 Need for Fleeting Areas**

The Port of Catoosa currently has room for approximately 150 barges, but due to channel configuration, the Port does not operate efficiently when at capacity. Johnston’s Port 33 has fleeting for 100 barges but also needs additional fleeting; currently the Port pays (\$2K-\$3K/barge) to have barges transferred back and forth to maximize the dock and fleeting areas they do have. The Port of Catoosa and Johnston’s Port 33 have been working the USACE to lease additional land where barges waiting to be loaded and unloaded can be docked. This has been a lengthy process with numerous setbacks and Johnston’s has had to turn away a few industries because they did not have the fleeting capacity necessary to handle the new industries’ needs.

### **4.3.4 Need for Access via Road and Railway Connections**

Oklahoma’s Ports serve not only as connections to the waterway system, but also as industrial parks and multimodal hubs serving a variety of industrial customers.



Stakeholders at the ports and industrial facilities report that in general, the roadway network, and in particular bridges, on routes serving the ports need to be maintained and upgraded in order to allow for efficient operations in and out of the port. Stakeholders at both public ports reported issues with moving OS/OW cargo from the port to its destinations due to a lack of heavy haul routes leading from the ports to the interstates.

#### **4.3.5 Impact of Panama Canal Expansion**

One of the major factors affecting the efficiency, distribution and competitiveness of goods transportation is the expansion of the Panama Canal. Since sea freight is growing, the number and size of vessels that are able to use the Canal will increase after the expansion is completed. The direct impact of the expansion to Oklahoma ports and waterways is not yet known, however, the expansion will provide opportunities to increase the export of dry bulk commodities such as grains, agricultural products, petroleum products, and steel.





## **4.4 AVIATION SYSTEM NEEDS AND ISSUES**

### **4.4.1 Service**

While the air cargo network has remained unchanged, there has been a steady decline in terms of the weight shipped from one of Oklahoma's major cargo airport, Will Rogers World. Tulsa's cargo did not decline as much in recent years, as it relies more on oil and gas related equipment, as well as cargo moving to and from hubs such as Indianapolis, Memphis, and Louisville.

### **4.4.2 Access**

Although most of Oklahoma's airports do not provide commercial passenger service, airports in these communities provide needed access for freight and industry through scheduled and on-demand less than truckload (LTL) and freight service through UPS, contract carriers, and others. Maintaining access to these markets is critical to serving communities outside the range of larger commercial airports; however funding and maintenance challenges exist.

### **4.4.3 Air Force Base**

Oklahoma's Air Force Bases, including Tinker AFB and Altus AFB which serve as hubs for aviation maintenance require large amounts of materials to be brought in by truck for distribution. In recent years, ODOT has worked with Tinker to improve the signage and access to the base; however issues still remain with accessing the base from I-240 in Eastern Oklahoma County. With 200-400 trucks a day and delivery of oversize loads and equipment, maintaining access to the Base is crucial for operational efficiency and maintaining national security.



# Oklahoma Long Range TRANSPORTATION PLAN

## 5 OKLAHOMA'S FREIGHT OPPORTUNITIES

### 5.1 IDENTIFYING OKLAHOMA'S STRENGTHS

The Multimodal Freight Inventory and the 2015-2040 Oklahoma Long Range Transportation Plan process received input from a variety of public and private sector freight stakeholders.

Feedback from those involved provided insight into aspects of Oklahoma's business climate and quality-of-life amenities that the State should continue to nurture to ensure that they remain strengths of the State. Several of these strengths relate to Oklahoma's multimodal system and incentives for industries that generate freight and include:

- **Multimodal transportation system.** Oklahoma has an extensive, multimodal freight transportation system that comprises interstates and major highways, three Class I and 19 short line railroads, the McClellan-Kerr Arkansas River Navigation System (MKARNS) system with 30 terminal facilities within Oklahoma, three primary airports, and numerous other supporting facilities. These facilities provide conduits for the goods movement activities of Oklahoma's key industries and access to regional, national and international markets.
- **Low cost of living, high quality-of-life.** Several businesses noted that Oklahoma's cost of living is low compared to other parts of the U.S. The population centered in urban areas also benefit from recent and planned amenities aimed at creating vibrant communities such as bike sharing and bus rapid transit. These two transportation strategies are often used to attract younger adults to cities. The highly technical, growing industries in Oklahoma (e.g., aerospace) see these conveniences as essential to their continued ability to attract and maintain a well-educated workforce in the state. The low cost of living and high quality of life attracts businesses and residents to the state, which in turn translates into more freight being produced and consumed. The ability to attract workers to new jobs also depends on the quality of life as demonstrated in good schools, and the quality of public safety and public recreation facilities.
- **Positive business climate, including the Oklahoma Quality Jobs Program and the 21st Century Quality Jobs Act.** Oklahoma has been proactive in the incentives provided to employers that create jobs, as the State is vulnerable to labor shortages due to key industry and skill requirement mismatch. Targeted toward manufacturers and certain service companies, these programs provide cash back incentives to companies that establish new, or expand existing, businesses.



Oklahoma continues to view these services as priorities. New and expanded businesses means that more freight will be produced in Oklahoma.

- **Education.** Related to the fact that Oklahoma is vulnerable to labor shortages due to key industry and skill requirement mismatches, the State continues to work to provide higher education opportunities. Oklahoma is home to a half-dozen accredited engineering programs that feed the aerospace and other industries, and numerous other support programs to ensure that the industries have the local workforce it needs. In Oklahoma, the Workforce Investment Board is focused on identifying skills required within the key industries and providing training to maintain and grow each of those industries. Many of these industries are those that rely on the freight transportation system and services provided by transportation carriers.
- **Synergies created between businesses.** Oklahoma has had success in attracting and retaining several key industry clusters that have provided the foundation for the state's economy, including the aerospace (e.g., Boeing, Tinker Air Force Base, and American Airlines' largest maintenance facility) and energy-related (e.g., oil and gas, wind, and solar) industries. These synergies make it attractive for likeminded and collaborative companies to locate within the state.



# Oklahoma Long Range TRANSPORTATION PLAN

## 6 CONCLUSION AND NEXT STEPS

There are several actions the Oklahoma DOT should consider to ensure that Oklahoma's strengths remain.

### 6.1 CONTINUE TO ENGAGE INDUSTRIES

Key industries in the State, such as agriculture and energy, should be regularly engaged. The feedback that industries provided in the Multimodal Freight Inventory offered insight into freight transportation issues within the state, and also how freight transportation impacts the state economy. This feedback is of value to not only Oklahoma DOT, but other state agencies, such as the Oklahoma Department of Commerce.

It is important to understand industry needs and consider them as part of short- and long-term planning and investment decision-making. And, while a Freight Advisory Committee is one means of engaging industry, there may be other pre-existing mechanisms that the DOT may consider. For example, outreach activities currently undertaken by the Oklahoma Department of Commerce or local chambers may be one way to receive input on targeted freight transportation system needs in the State.

### 6.2 PUBLIC-PRIVATE SECTOR PARTNERSHIPS

While it is important to understand industry needs, it is also important to be able to act on them and provide a means of mitigating known issues. In many cases, infrastructure improvements that benefit the private sector will also benefit the general traveling public; therefore, mechanisms that use public funds (or other non-financial public means) to leverage private resources through public-private partnerships should be explored. These partnerships could be useful while developing planning, operations, and capital investment strategies for the transportation system.

### 6.3 DEDICATE FUNDING

During stakeholder interviews, the concept of dedicated funding such as an "industrial access program" was suggested. Several stakeholders were unaware that the State of Oklahoma has an Industrial Access Road Program.<sup>28</sup> Created by state statute, this program can assist with funding "last mile" connector projects on both roadway and railway systems with the intent of connecting a specific industry or industrial area to the transportation system via road or rail spur. The program is funded by special apportionments of the state legislature, which typically provides \$2.5 million per year. Enhancement of, and broader education about, this program could be a catalyst to more public-private ventures.



## **6.4 DEVELOP A OKLAHOMA STATE FREIGHT PLAN**

While progress is being made by the Oklahoma DOT toward understanding and including the multimodal freight system in overall DOT planning and decision-making, several next steps are suggested to ensure that the State can capitalize on the special provisions provided through MAP-21. For instance, MAP-21 encourages the prioritization of projects to improve freight movement, and allows a 95 percent Federal share for projects on the Interstate System and 90 percent for any other project that meets two requirements.

One of the requirements is for the project to demonstrate an improvement to the efficient movement of freight through the application of performance measures. A second requirement for funding is that the project must be identified in the State Freight Plan. Related to MAP-21 alignment, next steps are described below. Undertaking the additional steps to complete a State Freight Plan could provide an avenue for Oklahoma DOT to make freight system investments that both align with DOT strategic directions and link to industry needs within the state. The State Freight Plan can be a standalone document, or incorporated as a chapter/element of the long-range plan, currently under development.

## **6.5 ESTABLISH A FREIGHT ADVISORY COMMITTEE**

MAP-21 encourages State's to establish Freight Advisory Committee's (FAC) comprised of a cross-section of public and private sector freight stakeholders. Private sector stakeholders that should be identified and included are rail operators, shipper/carrier associations, shippers, carriers, logistics service providers, and key industry stakeholders (e.g., oil and gas industry). Public sector stakeholders that should be included are State DOTs, MPOs, port authorities/port districts, chambers of commerce, economic development organizations, partner agencies (e.g., Oklahoma Corporation Commission, Department of Public Safety), and universities that have freight or supply chain programs. Many of these stakeholders have already been engaged through development of the Oklahoma Freight Study and many are serving on the 2015-2040 LRTP Freight Advisory Committee. Stakeholders have shown interest and provided thoughtful feedback on goods movement issues in the state and should continue to be engaged after the LRTP is adopted.

## **6.6 OTHER CONSIDERATIONS TO INTEGRATE FREIGHT WITHIN THE OKLAHOMA DOT**

While not directly related to MAP-21 compliance, a number of additional considerations internal to Oklahoma DOT may ease the implementation of actions identified in the Freight Study or an eventual Oklahoma State Freight Plan. These include:





- **Identify a freight champion.** Identify a high-level person within Oklahoma DOT and/or the State of Oklahoma to be a visible, vocal advocate for goods movement and freight projects. Other States have been successful in their freight planning their efforts because of the commitment and active involvement of DOT management, including the Secretary or Deputy Secretary of Transportation. Recently, in Illinois and Kansas, FACs have been established with leadership provided by the State Secretaries of Transportation.
- **Identify a freight point-of-contact/technical lead.** A freight point-of-contact/technical lead is a key element of successful integration of freight issues within state transportation planning processes and will be critical in acting on the recommendations developed as part of the Freight Study and future freight activities. Oklahoma DOT should identify a lead staff person to serve as a liaison between the private sector freight community and the State. Ideally, one person should be dedicated to this task, as having a single point of contact can help keep the focus on freight issues while developing and maintaining relationships with freight stakeholders. Designation of a freight point of contact will help demonstrate a commitment to freight planning and improvements within Oklahoma, as well as allow the DOT to build and sustain relationships with key members of the private sector freight community.
- **Establish a freight link in all qualifying DOT activities.** Give freight planning staff the leeway to get involved in projects that have not traditionally been viewed as freight projects. Through this interaction, all project stakeholders will begin to understand freight's importance and how improving travel for passengers oftentimes also benefits freight.

The goods movement system in the State of Oklahoma will continue to provide safe and efficient mobility to support key industries if Oklahoma DOT can continue to progressively plan for freight growth while providing continuing economic opportunities and ensuring quality-of-life amenities for communities. The Oklahoma Freight Flow Study and Multimodal Freight Inventory provided a blueprint to help the State focus its efforts and highlights several key next steps. While freight studies and other research and planning efforts can be labor intensive and costly, it is important to remember that simple actions can also yield big results, and any action taken should be considered a positive step forward.



# Oklahoma Long Range TRANSPORTATION PLAN

## 7 ENDNOTES

- <sup>1</sup> Oklahoma Department of Transportation, by Parsons Brinckerhoff, *Freight Flow Study*, 2009
- <sup>2</sup> Oklahoma Department of Transportation, by Parsons Brinckerhoff, *Oklahoma Statewide Freight and Passenger Rail Plan*, May 2012.
- <sup>3</sup> Oklahoma Department of Transportation, by Cambridge Systematics, *Oklahoma Freight Study: Multimodal Freight System Inventory and Needs* (June 2014)
- <sup>4</sup> Cambridge Systematics, *Oklahoma Freight Study: Task 3 - Description of the Current Oklahoma Economy, Key Industries, and Critical Trends, and Task 4 - System Inventory and Demand*, 2014
- <sup>5</sup> Cambridge Systematics, *Oklahoma Freight Study: Task 3 - Description of the Current Oklahoma Economy, Key Industries, and Critical Trends, and Task 4 - System Inventory and Demand*, 2014
- <sup>6</sup> *Ibid*
- <sup>7</sup> The primary source for the rail and truck data was the FHWA Freight Analysis Framework, version 3. The FAF3 information (2012 and 2040) was available for inbound, outbound and internal traffic. This was supplemented with historical truck AADT information available through the ODOT Traffic Analysis Branch, Class One Rail information provided through ODOT Rail Programs, and truck and rail information provided through the 2012 ODOT Freight Flows Study, and the 2035 Oklahoma Long Range Transportation Plan. The rail and truck data for 2015 was forecast based on a 0.9% growth rate. Waterways data for 2013 were provided through ODOT Waterways Program and the US Army Corps of Engineers, Tulsa District. The Waterway 2040 forecast was calculated based on a 0.9% growth rate, and was developed in consultation with staff from ODOT Waterways Program and the US Army Corps of Engineers, Tulsa District. Regarding through tonnage, the 2015 through estimate was derived based on updating the 2009 and 2010 data from the 2012 Oklahoma Freight Flows Study and the 2035 Oklahoma Long Range Transportation Plan. This was supplemented with truck AADT data available through the ODOT Traffic Analysis Branch, and Class One Rail information provided through ODOT Rail Program. Through truck volumes were calculated based on an assumed average annual growth rate of 1.6%, consistent with national freight trends. Through rail tonnage was calculated based on consultation with ODOT Rail Programs staff and data from Class One Railroads, and used an assumed average annual growth rate of 0.9%.
- <sup>8</sup> N.e.c.: Primarily natural gas, selected coal products, and products of petroleum refining that are not elsewhere classified, excluding gasoline, aviation fuel, and fuel oil.
- <sup>9</sup> Oklahoma Department of Commerce. <http://okcommerce.gov/location-or-expansion/oklahomas-business-ecosystems/energy/>
- <sup>10</sup> Oklahoma Department of Public Safety. <https://www.dps.state.ok.us/swp/>
- <sup>11</sup> Bailey, Brianna. "Oklahoma's manufacturing sector sees growth." *The Oklahoman*, October 10, 2013. <http://newsok.com/oklahomas-manufacturing-sector-sees-growth/article/3891821>
- <sup>12</sup> Association of American Railroads, <https://www.aar.org/keyissues/Documents/Background-Papers/Crude-oil-by-rail.pdf>
- <sup>13</sup> Panama Canal Authority, 2009 Annual Report. <https://www.pancanal.com/eng/general/reporteannual/2009/pdf/InformePDFingles.pdf>.
- <sup>14</sup> U.S. DOT Maritime Administration. *Panama Canal Expansion Study Phase I Report*, November, 2013. [http://www.marad.dot.gov/documents/Panama\\_Canal\\_Phase\\_I\\_Report\\_-\\_20Nov2013.pdf](http://www.marad.dot.gov/documents/Panama_Canal_Phase_I_Report_-_20Nov2013.pdf)



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- <sup>15</sup> Mongelluzzo, Bill. "Panama Canal's Sabonge: Canal to Recapture Much Suez Traffic." *Journal of Commerce*, September 11, 2013. [https://www.joc.com/port-news/panama-canal-news/panama-canals-sabonge-canal-recapture-much-suez-traffic\\_20130911.html](https://www.joc.com/port-news/panama-canal-news/panama-canals-sabonge-canal-recapture-much-suez-traffic_20130911.html)
- <sup>16</sup> *Miami Herald*. "U.S. Considering Deal to Expand Trade in the Americas." December 14, 2013. <http://www.miamiherald.com/2013/12/14/3819165/andres-oppenheimer-us-considering.html>
- <sup>17</sup> <https://www.census.gov/foreign-trade/statistics/state/data/ok.html>
- <sup>18</sup> National Association of Manufacturers, <http://www.nam.org/~media/A11D3C9D16F14B16BE10DE3117E15310.ashx>
- <sup>19</sup> "Coming Home." *The Economist*, January 19, 2013. <http://www.economist.com/news/special-report/21569570-growing-number-american-companies-are-moving-their-manufacturing-back-united>
- <sup>20</sup> Boyd, John. "Three Trends to watch." *Supply Chain Quarterly*, 2013. <http://www.supplychainquarterly.com/topics/Warehousing/20130904-three-trends-to-watch/>
- <sup>21</sup> <http://www.rejournals.com/2013/10/15/e-commerce-fueling-demand-for-industrial-distribution-space/>
- <sup>22</sup> *Oklahoma Freight Study: Multimodal Freight System Inventory and Needs (2014)*, *Oklahoma Freight Flows (2012)*, the *2010-2035 Oklahoma Long Range Transportation Plan (2010)*, and the *Oklahoma Statewide Freight and Passenger Rail Plan (2012)*.
- <sup>23</sup> The highways under the jurisdiction of the Oklahoma Department of Transportation include: Interstate, U.S. and State Highways. This group of facilities is often referred to as the "Oklahoma highway system" or the "state highway system". Bridges on those facilities are also the responsibility of ODOT.
- <sup>24</sup> The U.S. DOT tracks highway statistics by year. Public road miles <http://www.fhwa.dot.gov/policyinformation/statistics/2011/hm10.cfm>
- <sup>25</sup> The National Highway System (NHS) is a network of strategic highways within the United States, including the Interstate Highway System and other roads serving major airports, ports, rail or truck terminals, railway stations, pipeline terminals and other strategic transport facilities.
- <sup>26</sup> The National Performance Monitoring Roadway Data System (NPMRDS) project is sponsored by FHWA. FHWA has contracted with HERE North America, (formerly known as Nokia/NAVTEQ) to provide a national data set of average travel times for its use in transportation system performance management. American Transportation Research Institute (ATRI) has also provided data and is a contracting partner in this project. The objective is to collect, analyze, validate, and disseminate the NPMRDS for various applications in measuring performance, identifying transportation improvement areas and monitoring their effectiveness.
- <sup>27</sup> The Federal Register posted the Positive Train Control Systems (RRR) rule by the Federal Railroad Administration on 05/14/2012 <https://www.federalregister.gov/articles/2012/05/14/2012-11706/positive-train-control-systems-rrr>
- <sup>28</sup> [www.oar.state.ok.us/viewhtml/730-10-1-14.htm](http://www.oar.state.ok.us/viewhtml/730-10-1-14.htm)