TRANSPORT OHIO

STATEWIDE FREIGHT PLAN

January 2017

OHIO DEPARTMENT OF TRANSPORTATION

Introduction

CSX Northwest Ohio Terminal near North Baltimore, Ohio

Ohio is a well-established base for companies moving goods around the globe, being just a one-day drive from more than 60 percent of the U.S. and Canadian populations. This, along with having the nation's fourth largest interstate system, fourth highest number of rail lines, eighth most maritime tonnage, and being second in the number of intermodal facilities, makes Ohio a pivotal point in the global marketplace.

But freight movement is incredibly competitive. The cost to move materials and products is a major consideration for conducting and locating businesses.

How can Ohio make smart transportation improvements to reduce business costs, improve freight movement connectivity, reliability, and access to local, regional and far flung international markets?

To address these questions, the Ohio Department of Transportation (ODOT) developed Transport Ohio as a guide to inform and support future infrastructure investments on Ohio's multi-modal freight network and to retain and attract jobs and commerce.

Transport Ohio supplements Access Ohio 2040 (AO40), Ohio's Statewide Long Range Transportation Plan, completed in 2014. Transport Ohio is based on analysis and findings developed through AO40 and a Statewide Freight Study[1] completed in 2012. Its recommendations reflect those in AO40 and the ODOT Business Plan.

Additional freight data, maps, infrastructure conditions analysis and proposed improvements can be found by contacting ODOT's Office of Statewide Planning and Research at *Statewide.Planning@dot.ohio.gov*

Ohio's transportation infrastructure supports all 5.5 million jobs in the state.

Source: http://www.bls.gov/eag/eag.OH.htm

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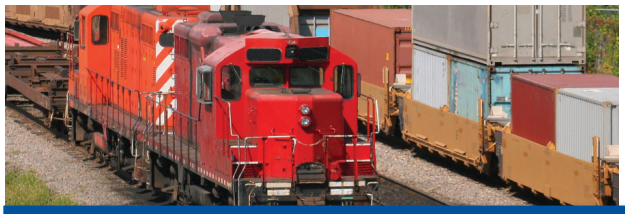

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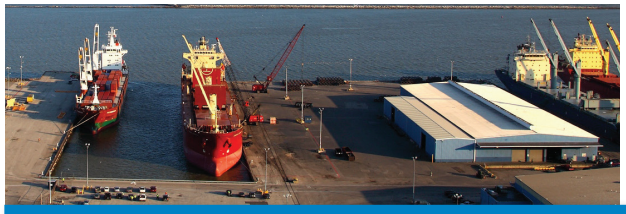

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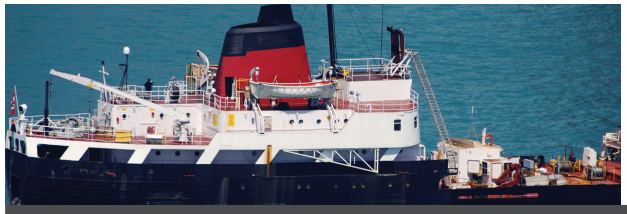

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Ohio's Freight Story

Carrying the Nation's Freight

The total value of all freight moved into, out of and through the U.S. is approximately $16.7 trillion.[2] Ohio's multimodal transportation system carries approximately $1.9 trillion of goods into, out of and through the state.[3] In other words, more than 11 percent by value of all goods and materials produced, used or exported by the entire nation travel on Ohio's transportation network.

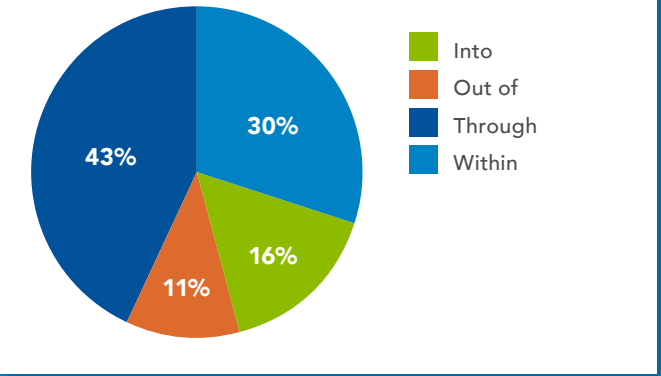
Of Ohio's total freight tonnage (1.38 billion tons), 43 percent passes through the state compared to 27 percent that either originates or terminates in Ohio from other points in the country. Thirty percent both originates and terminates in Ohio. See **Figure 1**.

A Note About Freight Data

The freight data used throughout Transport Ohio is based on Federal Highway Administration (FHWA), 2007 Freight Analysis Framework version 3 (FAF3). *http://ops.fhwa.dot.gov/Freight/freight_analysis/faf/index.htm*. This was the latest and most reliable set of national freight data available during the development of this plan. FAF integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. With data from the 2007 Commodity Flow Survey and additional sources, FAF3 provides estimates for tonnage, value, and domestic ton-miles by region of origin and destination, commodity type, and mode for 2007, the most recent year this data was assembled, and forecasts through 2040. FAF3 also includes state-to-state flows for these years plus 1997 and 2002, summary statistics, and flows by truck assigned to the highway network for 2007 and 2040.

Freight movements often cross political borders and the FAF data quantifies these movements by sorting by value and weight either originating or terminating within or outside a state or passing through the state. This data is presented as "into, out of, within, and through movements."

Figure 1: Ohio Freight Flows by Origin and Destination (Weight)



Source: Federal Highway Administration, Freight Analysis Framework version 3 (FAF3), Ohio Statewide Freight Study

How and Where the Freight Moves

Ohio's vibrant transportation network grew out of the need to move products from its strong manufacturing and agricultural base—corn, soybeans, automotive parts and plastics—to the rest of the world. It also grew from its own residents' consumption of other goods and commodities. **Table 1** presents an overview of how and where freight moves in and through Ohio. Several facts that set Ohio apart from other states include:

- Ohio ranks sixth in the nation for its volume of freight shipped in or out, measured by tonnage or value of goods.[4]
- The value of goods originating in Ohio topped $555 billion for a total of 573 million tons carried by all modes.[5]
- While seventh in population, Ohio ranks fourth in the U.S. for value of shipped goods originating in the state.
- Freight shipped through or between Ohio and other markets accounts for 70 percent of the state's tonnage and 87 percent of its freight value. Through freight alone represents 43 percent of tons and 58 percent of value.

These facts demonstrate the significance of the state in the nation's commerce, both for the contribution of Ohio-based shipping and the volume borne for other states.

Table 1: Ohio Freight Flows by Tonnage, Value and Mode

Into						Out of				
Mode	Tons (000's)	%	Value ($M)	%	Value/ ton	Tons (000's)	%	Value ($M)	%	Value/ton
Total	**214,769**	**100%**	**$256,430**	**100%**	**$1,194**	**157,789**	**100%**	**$303,199**	**100%**	**$1,922**
Air	148	.1%	$13,877	5%	$93,491	161	.01%	$8,313	3%	$51,571
Rail	64,206	30%	$19,350	8%	$301	31,356	20%	$22,280	8%	$728
Truck	111,041	52%	$220,465	86%	$1,985	119,689	76%	$271,418	90%	$2,268
Water	39,373	18%	$2,738	1%	$70	6,583	4%	$648	0%	$98

Through						Within				
Mode	Tons (000's)	%	Value ($M)	%	Value/ ton	Tons (000's)	%	Value ($M)	%	Value/ton
Total	**596,226**	**100%**	**$1,100,552**	**100%**	**$1,846**	**415,480**	**100%**	**$251,794**	**100%**	**$606**
Air	484	.1%	$37,347	3%	$77,091	48	.01%	$4,220	2%	$87,213
Rail	266,131	45%	$120,280	11%	$452	27,509	7%	$2,757	1%	$100
Truck	319,878	54%	$941,171	86%	$2,942	385,706	93%	$244,757	97%	$635
Water	9,733	2%	$1,724	0%	$177	2,217	1%	$61	0%	$27

Total					
Mode	Tons (000's)	%	Value ($M)	%	Value/ton
Total	**1,384,265**	**100%**	**$1,911,944**	**100%**	**$1,381**
Air	842	.1%	$63,757	3%	$75,679
Rail	389,202	28%	$165,207	9%	$424
Truck	936,315	68%	$1,677,810	88%	$1,792
Water	57,906	4%	$5,170	0%	$89

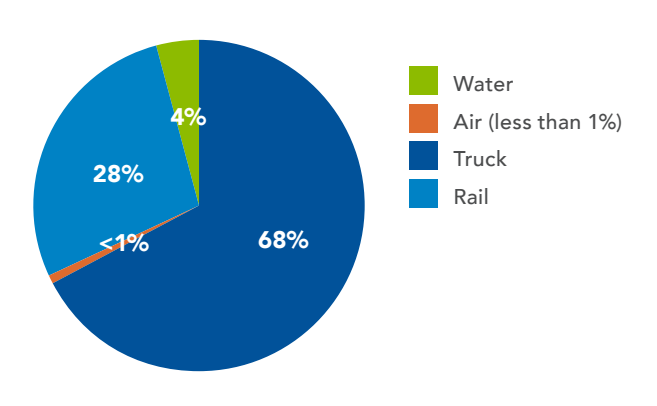
Source: FAF3 and Ohio Statewide Freight Study

The quick and reliable delivery of goods and raw materials to and from manufacturing plants, consumers and markets is critical for a business to be profitable. Delivery is often dependent on more than one mode. For the freight transportation system to function effectively, all parts must be in working condition with minimal congestion and easy connectivity between modes. Freight also crosses political boundaries and needs to be viewed from regional, multi-state, national and international perspectives. Changes to a roadway in another state may result in changes to how and where freight moves in Ohio.

Ohio's freight delivery system is made up of many types of infrastructure including roads, waterways and ports, railroads and air freight. They are interconnected, and together form multimodal corridors that cross the state, country and world. Ohio is fortunate to have such a strong, interconnected transportation system. Ohio has more major interstates—I-70, I-71, I-75, I-76, I-77 and I-80/90—than most states, as well as four major (Class I) multi-state railroad lines and the second highest number of intermodal facilities in the nation.

*Trucks carry most of Ohio's freight—68 percent by weight and 88 percent by value—compared to 28 percent by weight and 9 percent by value carried by rail and 4 percent by weight for water. See **Figure 2** and **Table 1**.*

Figure 2: Ohio Freight Flows by Mode (Weight)



Source: FAF3 and Ohio Statewide Freight Study (Figure 2-2)

Ohio's Freight System and Assets

Ohio has an impressive freight system and assets that need ongoing maintenance to stay at peak performance and to incorporate new time and money-saving technologies.

Access Ohio 2040 identified a Strategic Transportation System (STS) and a Strategic Freight System (SFS), shown in **Figure 3**. The SFS includes the transportation infrastructure carrying the highest volumes and values of freight moving in and through Ohio. Under MAP-21, the FHWA designated 1,425 miles of Ohio highways as part of the Primary Highway Freight System (PHFS). This was greater than 2 percent of the national network and gave Ohio the 5th highest number of miles on the PHFS. The latest federal transportation bill, the Fixing America's Surface Transportation (FAST) Act, repealed the Primary Freight Network and made its freight-related projects eligible for funding as part of the National Highway Freight Program (NHFP).

Figure 3: Ohio Strategic Freight System (SFS) (All Modes)

Maps of each individual mode are available through the Transportation Information Mapping System (TIMS) online at *gis.dot.state.oh.us/tims*

Source: Access Ohio 2040

The **At a Glance** charts highlight many of Ohio's transportation strengths. This variety of mode options gives Ohio industries convenient and affordable access to their customers and suppliers and gives Ohio a competitive edge in retaining and attracting businesses.

At a Glance: Ohio's Freight Assets

Intermodal and Warehousing Facilities

- 13 intermodal facilities (2nd highest in nation)
- 5th highest in nation in warehousing and storage services

Rail

- 5,388 active rail miles (3rd in nation)
- 34 railroads operating on more than 5,290 freight miles
- 4th largest network of operating railroads in nation
- 9th in rail tons moved in nation

Water Ports

- 736 miles of navigable waterways leading to the Gulf of Mexico and St. Lawrence Seaway
- 9 commercial ports on Lake Erie and multiple terminals along the Ohio River
- Nation's 4th by value largest maritime system (8th in freight tonnage moved by water)

Air

- 7 commercial air carrier airports
- 97 general aviation airports

Roads and Bridges

- 49,000 miles of paved roadways and 15,000 bridges
- 6,820 miles of interstate highway on 8 major routes (4th largest interstate system in nation)
- Between 182 and 195 million total ADT (average daily vehicle miles traveled) (5th in nation)
- Within a day's truck drive of 60 percent of U.S. and Canadian population centers including Chicago, New York City and Toronto

Source: Ohio Statewide Freight Study

Freight stakeholders interviewed for the Ohio Statewide Freight Study believed that most of Ohio's roadway system is in good condition and is well maintained.[6] They noted, however, that some freight infrastructure is aging and in need of investment. While there is excess capacity on Ohio's waterways, some land side improvements and restoration to the Ohio River locks and dams are needed. Significant recent investments in intermodal rail hubs and doublestack clearances have increased rail capacity and efficiency of the state's three major Class I multi-state railroads, yet there are needs for the short-lines and regional railroads that operate within Ohio.

OHIO'S HIGHWAY SYSTEM – THE TRUCKERS' LIFELINE

Ohio's roadway system is its most used freight infrastructure asset. Trucks dominate freight movements because they can reach nearly every destination, while typically trains, ships and planes are unable to deliver goods to the consumer's door or local grocery store.

Trucks make up about 13 percent of traffic on the state highway system, which includes all state, U.S. and interstate routes and 18 percent of traffic on the subset of Ohio's interstate highways.

Average daily truck traffic on each Ohio interstate route is about 10,500; nearly 15,000 trucks a day travel each of the heaviest truck routes (I-75 and I-70). Five-axle, semi-tractor trailers comprise 80 percent of truck traffic on rural interstate roadways, while urban truck traffic has a higher percentage of two- and three-axle panel and dump trucks. Maintaining Ohio's roadway system is critical to keeping freight moving in and through Ohio. **Table 2** shows the top commodities carried by truck in Ohio.

Table 2: Commodities Carried by Truck

Weight (Thousand Tons)			Value ($ Millions)		
Commodity	Number	Percent	Commodity	Number	Percent
Total	**936,314.5**		**Total**	**$1,677,810.1**	
Base metals	78,102.6	8.34%	Motorized vehicles	215,941.1	12.87%
Gravel	76,157.8	8.13%	Machinery	168,953.3	10.07%
Nonmetal min. prods.	60,689.8	6.48%	Electronics	130,210.3	7.76%
Other foodstuffs	60,449.4	6.46%	Base metals	110,376.1	6.58%
Waste/scrap	59,450.4	6.35%	Plastics/rubber	98,217.0	5.85%
Cereal grains	53,329.0	5.70%	Mixed freight	92,440.0	5.51%
Motorized vehicles	36,622.8	3.91%	Textiles/leather	92,049.8	5.49%
Natural sands	35,034.8	3.74%	Pharmaceuticals	78,840.1	4.70%
Plastics/rubber	34,122.4	3.64%	Chemical prods.	76,983.5	4.59%
Mixed freight	30,034.4	3.21%	Other foodstuffs	74,049.7	4.41%

Source: FAF3 and Ohio Statewide Freight Study

Where's the Truck Going?

AVERAGE DISTANCE FREIGHT ORIGINATING IN OHIO TRAVELS

$193 BILLION IN GOODS WEIGHING 314 MILLION TONS ARE DESTINED FOR OHIO FROM INTERNATIONAL AND OUT-OF-STATE MARKETS, MAKING OHIO THE SIXTH LARGEST FREIGHT DESTINATION IN THE U.S.

Source: FAF3 and Ohio Statewide Freight Study

Based on FAF3 data, state truck volumes totaled 937 million tons. Of that, intra-Ohio shipping accounted for 617 million tons or nearly two-thirds of the total. The remaining one-third was freight traveling through Ohio.

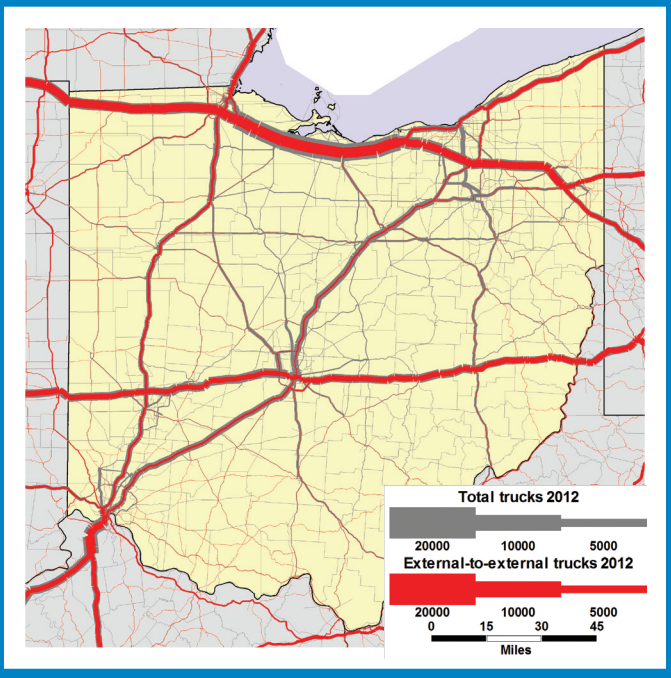
Figure 4 compares freight traveling through Ohio to intra-state freight flows. Each adheres to distinct patterns on Ohio's road network.

The map on the left shows truck flows beginning and ending outside Ohio. These external or through-flows generally favor interstates and other large capacity routes, most notably the east-west corridors of I-70 and the Ohio Turnpike. I-75 is a major north-south corridor that carries significant through traffic as well.

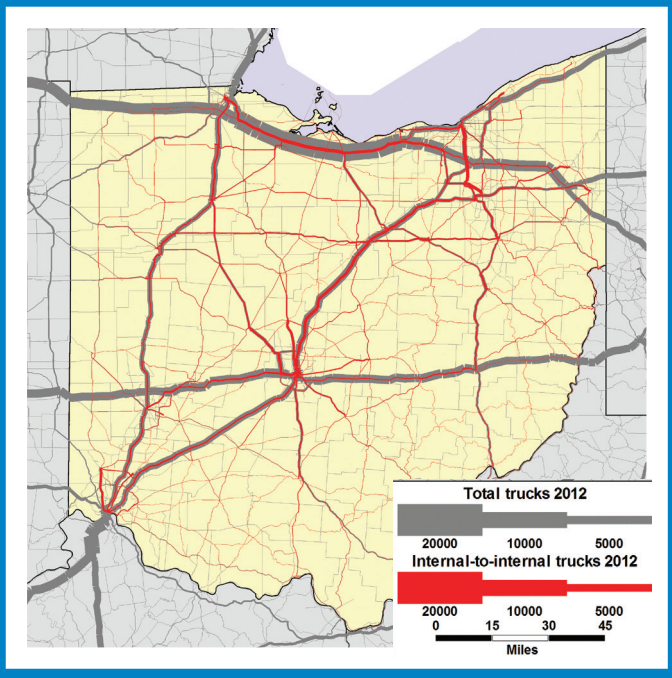
The map on the right shows truck flows that originate and terminate inside Ohio. Here, I-75 remains important—but I-71 is the backbone, connecting Ohio's largest cities of Cincinnati, Columbus and Cleveland. It also shows that Ohio's U.S. and state routes emerge as a primary system for Ohio-based truck trips. These are the roadways that serve as the primary support for Ohio businesses and industries. Maintaining and improving these routes as needed will benefit Ohio-based businesses.

Figure 4: Truck Freight Traveling Through Ohio vs. Within Ohio Only (Annual Truck Volumes)

Through Ohio Truck Traffic



Truck Movements Within Ohio



Source: Ohio Statewide Freight Study

FREIGHT RAIL – POSITIONED FOR SHIFTS IN GLOBAL TRADE MOVEMENT

Ohio is a rail-intensive state with the nation's 4th largest number of rail carriers, the 3rd highest mileage of railroad routes and carrying the 9th highest volumes of rail traffic. Next to trucks, rail carries the second highest volume (28 percent by weight) of freight in and through Ohio. Ohio's freight rail network consists of 35 railroads operating over 5,290 miles of track. Four of the seven Class I North American freight carriers (CSX, Norfolk Southern, Canadian Pacific and Canadian National) serve Ohio businesses and industries. According to the Association of American Railroads 2010 data, 63 million tons of rail freight originated in Ohio, while 84.4 million tons terminated in the state.

More than 276 million total tons of freight moved by rail in Ohio in 2010, with more than 129 million tons or nearly 50 percent of the rail traffic moving between eastern locations and markets in the Midwest and West. Shipping by rail provides businesses with a less expensive option for moving freight, especially heavy commodities. Without rail, additional trucks would be on Ohio roadways potentially increasing damage to the routes they travel.

Coal was the number one freight rail commodity shipped in Ohio each year from 2007 to 2010 for both originating and terminating rail tons. Steelmaking also continues to be a key industry for Ohio.[7] A vast majority of metallic ore shipments in Ohio are iron ore. **Table 3** lists the top five commodities moved by rail in Ohio.

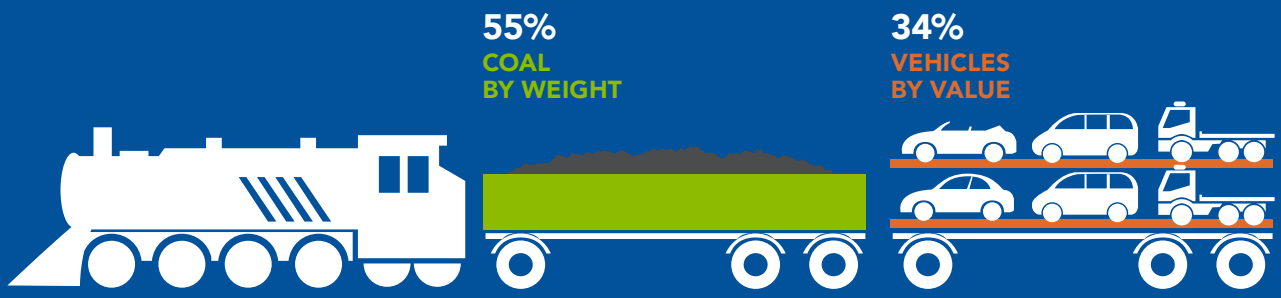
Ohio's Class I rail infrastructure is in excellent condition, with efficient switching terminals, good operating speeds and significant investments in new intermodal facilities. As part of a national strategy to improve rail efficiency across the U.S., the Class I railroads have invested substantial private and public funds in Ohio to modify tunnels and bridges to allow for doublestack intermodal containers. This includes CSX, with its National Gateway and North Baltimore projects, and Norfolk Southern with the Heartland Corridor. These allow trains to increase productivity with minimal additional cost, energy usage and environmental impacts. The result: Ohio's freight rail system is carrying record amounts of tonnage.

Table 3: Highest Volume Rail Commodities by Tons

Rank	Originating	Terminating
1	Coal	Coal
2	Metallic ores	Iron and steel products
3	Farm products	Waste and scrap
4	Iron and steel products	Chemicals
5	Crushed stone, gravel and sand	Metallic ores

Source: Association of American Railroads, 2010

What's on the Ohio Train?



Source: FAF3 and Ohio Statewide Freight Study, https://development.ohio.gov/files/research/E1000.pdf

One reason CSX and Norfolk Southern are making these doublestack improvements is to take advantage of potential new international shipping routes through the recently completed widening of the Panama Canal.

Many shippers and carriers believe transporting products from Asia to East Coast ports may become relatively less costly and quicker than shipping through southern California ports with rail connections to markets east of the Mississippi River. This belief has yet to be tested.

Expanding the Panama Canal might result in a national supply chain network shift or have a smaller impact on transportation costs than expected. Either way, Ohio is well positioned to benefit, given its rail and intermodal investments. (See **Figure 5**)

Figure 5: Projected New Shipping Patterns via the Panama Canal Could Give Ohio a Competitive Advantage

Source: ODOT

WATERWAYS AND MARINE TERMINALS – AN UNDER UTILIZED RESOURCE

Ohio, through its 265 miles of shoreline on Lake Erie and 451 miles along the Ohio River, has access to two of the nation's largest inland waterway systems, as well as the Gulf of Mexico and the North Atlantic Ocean.

Shipping on Ohio's waterways, either by barge on the Ohio River or water freighter on Lake Erie, provides an average transportation savings of $10.67 per ton over the cost of shipping by alternative modes. This translates into more than $7 billion annually in transportation savings to the U.S. economy.

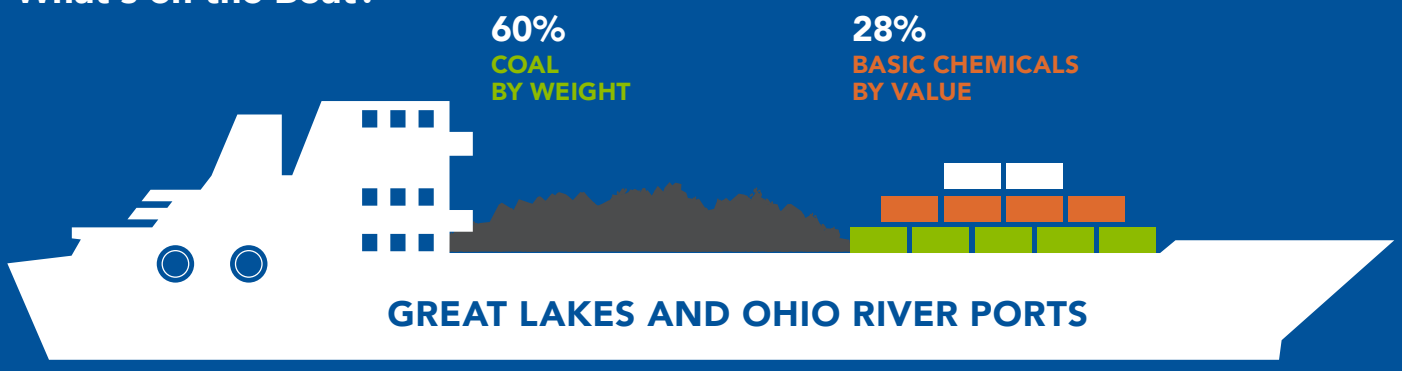
The Ohio River system serves five states and flows into the Mississippi River/U.S. inland waterway system serving 38 states. Barge terminals along the Ohio River cluster in three main areas: the regions of Cincinnati, Portsmouth-Marietta and the West Virginia Panhandle. The majority of these terminals are privately-owned and designed to meet the needs of a single commodity or owner, e.g., a coal terminal for an electric generation station.

The number one issue for Ohio river stakeholders is lock and dam deterioration. All are maintained by the U.S. Army Corps of Engineering (USACOE) and 47 percent nationally were classified as functionally obsolete in 2006. The USACOE is hampered by a lack of adequate funding. While ODOT is not the agency responsible for addressing these issues, it will continue to provide technical assistance as appropriate and work with stakeholders to improve road access to ports and waterways.

Ohio has eight major ports on Lake Erie. Great Lakes traffic is dominated by bulk cargo shipment, with some international trade of general cargo (primarily steel) via the St. Lawrence Seaway. Detroit and Toledo are major maritime destinations. Toledo has historically been the largest Ohio grain handling port, and is now the only grain handling port. The Port of Cleveland has the distinction of having the only container service on the Great Lakes. It is adapting to changing commodity markets with vessels carrying containerized and breakbulk freight and providing service to over 30 countries in Europe. The successful Cleveland-Europe Express continues to grow and serve Ohio and Midwest companies as envisioned.

The number one issue for Ohio's Great Lake ports is dredging. Again, while this isn't ODOT's responsibility, the agency will continue to work with stakeholders to improve land side and last mile access to ports and waterways.

What's on the Boat?



Source: FAF3 and Ohio Statewide Freight Study

AIR CARGO – ROADSIDE ACCESS CRITICAL TO FUTURE GROWTH

Just over a decade ago, Ohio was home to the most air cargo hubs of any state in the nation. Significant changes in the industry, however, have caused all hubs in Ohio to close.

Three shifts in the cargo business have led to the hubs in Toledo, Dayton and Wilmington closing and changes to how air cargo is handled by other Ohio airports. First, more shipments have shifted to trucks. Second, more air cargo is carried via passenger aircraft. Third, FedEx and UPS emerged as leaders in expedited parcel shipments with their primary hubs in Indianapolis, Memphis and Louisville, respectively. However, today Amazon, through Air Transport Services Group, will operate expanded services from Wilmington for e-commerce.

As a result of these shifts, Ohio's commercial airports are generally seeing increases in freight carried on passenger flights. Additionally, air cargo service at Cleveland International Airport and specifically Rickenbacker International Airport continue to provide consistent and expanded express service.

Global forecasts by Boeing, the Federal Aviation Administration and the Airports Council International project an annual 5 to 6.9 percent increase in air cargo volumes over the next 20 years. Much of this growth will occur on the trans-Pacific routes, but there will also be substantial growth in South and Latin American countries, Eastern Europe and Africa. Domestically, the e-commerce market is driving demand for expedited air and ground combination services.

There is little overlap between the low value, time insensitive commodities typically moved by rail and water and the high value, time sensitive goods more suitably moved by air. While some local economic development initiatives have proposed coalescing around a strategy of moving agricultural goods to Asia by air, a substantial modal shift in the last decade has seen increasing volumes of perishables moving to refrigerated ocean-bound containers. This contrasts with the previous preference for air freight and has been prompted by both lower costs and improved refrigeration technology in ocean containers—often called "reefers"—that reduce product damage in transit.

So, what is air freight's primary purpose today? Ohio shipping stakeholders report it is largely used as a safeguard mode to ensure the integrity of just-in-time supply chains for companies operating with low inventory, or one and two day delivery of services for e-commerce providers. Because all air cargo begins or ends its journey on a truck, the design and location of airports and their cargo facilities must have complementary, viable ground distribution systems. Ohio still has growth potential for expanded air cargo operations, and with that potential, an ongoing need to improve connecting road networks.

What's on the Plane?
(SHIPPED BY AIR)

	23% BY WEIGHT	30% BY VALUE
ELECTRONICS		

Source: FAF3 and Ohio Statewide Freight Study

Rickenbacker International Airport in Columbus, Ohio

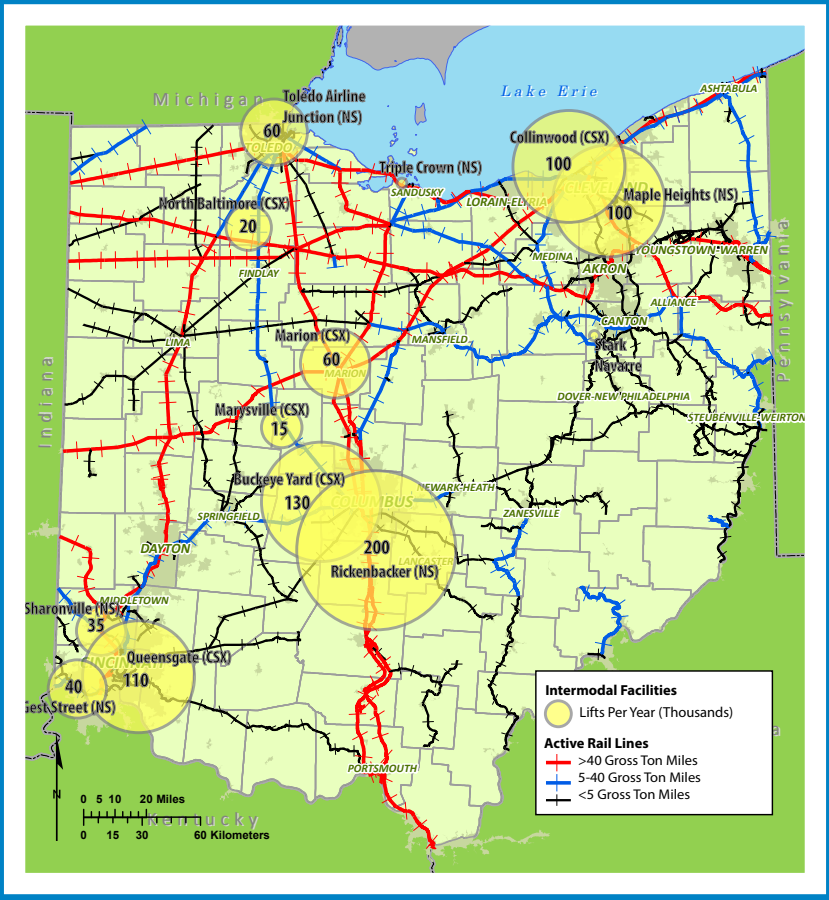
INTERMODAL CONTAINER FACILITIES – VOLUME AND INVESTMENT GROWING

Ohio has seen the upswing in volume and investment in railroad container intermodal facilities in the past 10 years. The trucking industry is one of the biggest customers of the railroads with intermodal containers and movements continuing to grow. Ohio hosts intermodal facilities in nine metropolitan areas, second only to Illinois in number according to the Ohio Statewide Freight Study. See **Figure 6**.

Historically, Chicago was the primary point in the nation where railroads met to transfer containers between eastern and western destinations. While significant improvements are being made, Chicago continues to experience major rail congestion.

Ohio's recent investments, such as the new intermodal terminal in North Baltimore, offer shippers a way to avoid congestion in Chicago and position Ohio to be the national leader in rail intermodal freight movement.

Figure 6: Ohio Rail Intermodal Facilities



Black numbers represent annual lifts of containers (in thousands) as of 2012. However, lift numbers change annually. For example, since this data was compiled CSX reports that its North Baltimore terminal had over 1 million lifts in 2014.

Source: Ohio Statewide Freight Study

Where Ohio Is Going: 2040 Freight Projections

Freight volumes and values are projected to increase across the nation and in Ohio. While short-term projections are not currently available and may fluctuate, the FHWA forecasts that by 2040 another 639 million tons of freight will travel annually in and through Ohio across all modes. Of this, 314 million annual tons (52 percent) are expected to be through traffic, while 48 percent will be Ohio-based. By 2040, outbound volumes are expected to increase to 12 percent of tonnage moved annually, or 245 million tons. Through tonnage will increase to 45 percent of tonnage moved, while inbound and intrastate totals will decline slightly as 2040 approaches. See **Figure 7**. These estimates may be low given they predate the impact of the Marcellus and Utica Shale development on oil and natural gas production, which has increased rail and truck activity and tonnage.

Most of the freight growth is expected to be in trucking. Trucking is forecast to increase about 67 percent by 2040.[8] In Ohio, trucked tonnage is projected to be evenly split between Ohio-based and through traffic. For trucking, most of the commodity gains are projected to be increasing volumes of gravel (66 million tons or 11 percent of trucking's gain), waste and scrap (49 million tons, 8 percent), and "other food" (45 million tons, or 7 percent).

Freight rail is predicted to increase by 6 million tons annually, or less than 1 percent of all incremental tonnage.

The essentially flat volume forecasts for rail and water (**Figure 8**) are caused by a declining coal business. This will likely be offset by increases in natural gas production.

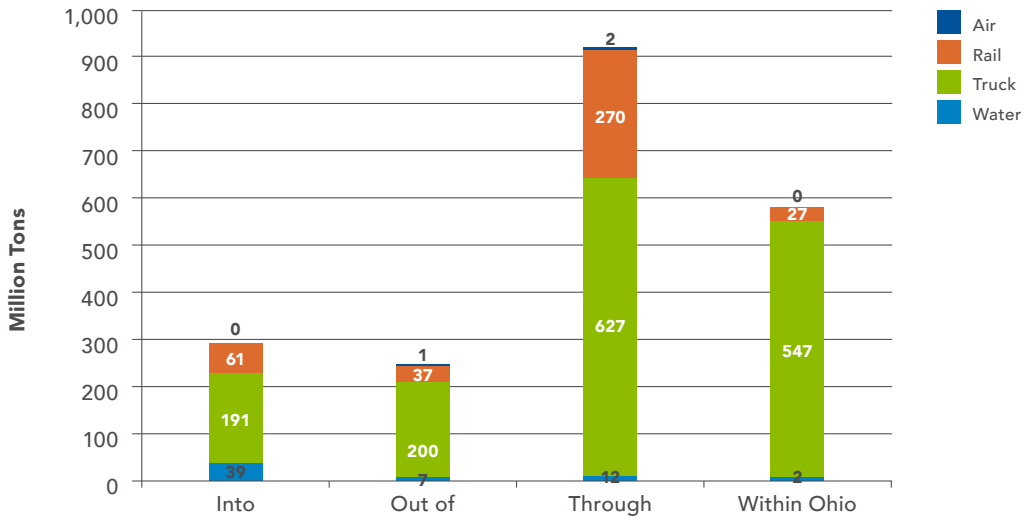
Continued growth in trucking will place significant demand on Ohio's highway system. This will require ODOT's continued attention to system preservation, maintenance and improved operations.

Overall growth in freight on all modes, both internal to Ohio and from the growing freight demand nationally, will mean increased freight traveling on all Ohio's transportation infrastructure, and will require ODOT to continue to monitor conditions and needs on all modes and intermodal connections.

The goal of forecasting is not to predict the future but to tell you what you need to know to take meaningful action in the present.

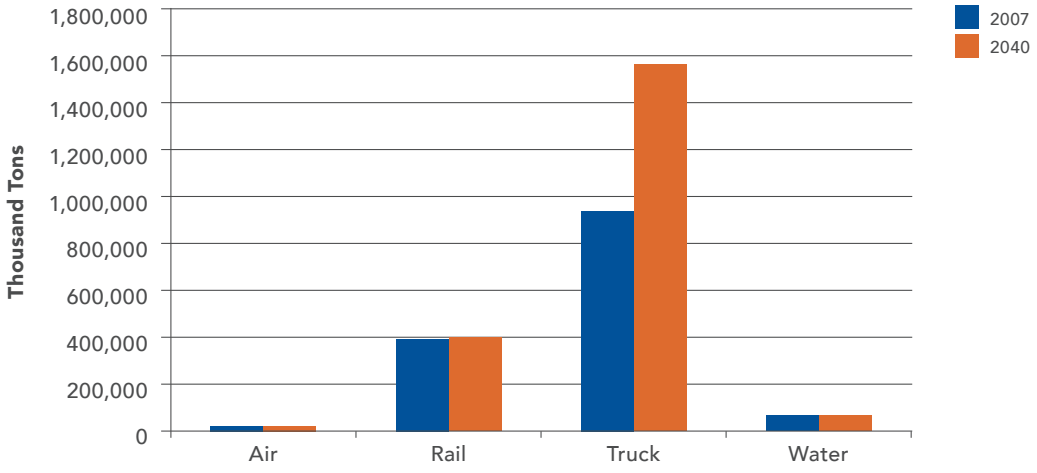
Source: Harvard Business Review, https://hbr.org/2007/07/six-rules-for-effective-forecasting

Figure 7: Projected Direction of Freight Flows by Mode by 2040



Source: FAF3 and Ohio Statewide Freight Study

Figure 8: Projected Ohio Freight Flows by Mode by 2040



Source: FAF3 and Ohio Statewide Freight Study

Funding Assessment and Financing Strategies – Enhanced Collaboration Required

ODOT doesn't currently have any stand-alone capital programs designated for funding freight projects. It is, however, actively incorporating the Fixing America's Surface Transportation Act (FAST Act) National Highway Freight Program formula funding amounts and FASTLANE Freight Discretionary funding opportunities in its existing multimodal freight planning and capital programming processes. ODOT also cooperates with federal, state, regional and local agencies as well as freight businesses and interest groups to fund and support freight research and infrastructure projects. As a result, freight projects and research are often financed by multiple agencies using varied funding sources. Several key agencies with access to freight-related funding that ODOT works with are shown in **Table 4**. The wide range of entities shows the extent of collaboration needed for coordinated freight investments to be made.

Table 4: Freight Related Institutions and Agencies

Type	Institution or Agency	Own Freight Infrastructure	Planning Responsibility	Other Roles
Public Sector	United States Department of Transportation		•	Regulatory authority
	Ohio Department of Transportation	•	•	Research
	Ohio Turnpike and Infrastructure Commission	•	•	
	Ohio Rail Development Commission	•	•	Economic development, research
	Ohio Development Services Agency			Economic development
	Metropolitan Planning Organizations, Regional Transportation Planning Organizations and other Planning Entities		•	Research
	Municipalities, Counties, Townships	•	•	
	Air and Water Port Authorities	•	•	
	Public Utilities Commission of Ohio			Regulatory authority
	Ohio Department of Public Safety Motor Carriers Division			Regulatory authority
Private Sector	Water Ports	•	•	
	Pipelines	•		
	Freight Carriers (trucking companies, railroads, air cargo companies, pipeline owners/operators)	•		
	Shippers (industries, farmers, manufacturing plants, etc.)	•		
	Warehousing and Distribution Center Owners	•		
	Third Party Logistics Providers (3PLs)	(Varies)		Consultants to the freight industry
Freight Interest Groups	Mid-America Freight Coalition (MAFC)			Multi-state freight coordination, research
	Ohio Association of Regional Councils Freight working group			Statewide working group
	Council of Great Lakes Governors			Multi-state coordination
	American Association of State Highway Transportation Officials			Research and advocacy

The largest publicly funded portion of Ohio's freight system is its roadways. ODOT spends over $2 billion annually on roadway capital improvement projects in addition to making sizable investments in maintenance and operational improvements. In general, state and federal motor fuel tax revenues can be spent only on roadway projects. Decisions concerning use of motor fuel tax for funding major new capacity roadway projects are made by Ohio's Transportation Review Advisory Council (TRAC). The TRAC, chaired by ODOT's Director, reviews and makes decisions based on criteria that include jobs created, economic impact and several freight factors such as truck average daily travel.[9] Planned and funded highway projects, including freight projects, are listed on the TRAC projects list and in the ODOT Bi-annual 2016–2017 Business Plan. These two documents are ODOT's Freight Investment Plan.

Other modal improvements for rail, water and airport freight infrastructure are financed by Ohio general revenue funds, and monies from a number of other state and federal programs, including the Appalachian Regional Commission, Federal Railroad Administration, Federal Aviation Administration, U.S. Army Corps of Engineers, JobsOhio, Ohio Public Works Commission, Ohio Rail Development Commission (ORDC) and local programs. ORDC and Ohio's metropolitan planning organizations, through their roles as facilitators, have had significant success in combining multiple public and private monies to fund and finance major freight projects. Private institutions also make significant freight-related investments in Ohio, primarily using company revenues as matching funds for available state and federal grants.

This mutually beneficial cooperation in freight investments strengthens Ohio's ability to maintain its competitive edge in the future. State and regional freight advisory committees help identify, and sometimes fund, priority freight research or improvement projects.

ODOT has established the Division of Innovative Delivery to assist in developing public-private partnerships (P3s) to fund transportation projects, and collaboration among all entities continues to increase.

Source: www.dot.state.oh.us/Divisions/InnovativeDelivery/Pages/default.aspx

Access Ohio 2040 steering committee

Opportunities *OHIO AT CROSSROADS OF GLOBAL MARKETPLACE*

How Ohio's Freight System Links to Prosperity

Ohio has a vibrant and diverse economy because of its location, central to the North American population, and its well maintained and interconnected freight infrastructure. More than 800 internationally owned companies from 43 countries depend on Ohio's roadways, air and water ports, rail lines and intermodal facilities for easy access to markets and established national and international supply chains. Products made in Ohio are distributed to markets worldwide and products and raw materials come into Ohio for distribution throughout the U.S. and Canada on Ohio's freight infrastructure. Ohio exports now exceed $50 billion a year and continue to grow.[10] **Figures 9** and **10** show the largest shares of Ohio's imports and exports are destined for markets in Canada and the Americas, with automobiles and machinery representing the highest in value.

Reaching international markets requires seamless connections between manufacturing plants, highways, rail lines and air and water ports. While Ohio is making strides in these areas, ODOT's designation of a Strategic Freight System will ensure focused intermodal investment continues.

Ohio's location, natural resources and historically strong infrastructure supports its traditional economic strengths in plastics, steel, electrical equipment manufacturing, agriculture and automotive manufacturing. In recent years, aerospace and aviation, bio-health, financial services, food processing, information technology, research and development and transportation have joined the mix, with new opportunities for commercial growth emerging daily from Ohio's wealth of universities, high profile companies, business incubators, venture capitalists and governmental policies. All of these industries depend on a robust transportation network to get employees to their jobs, receive raw materials and reach customers.

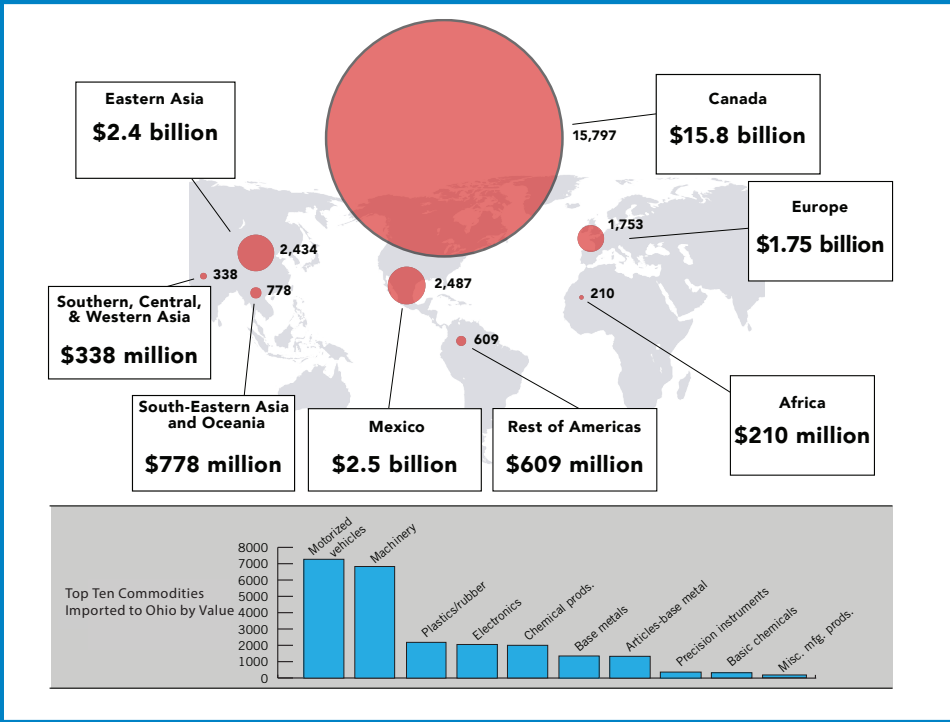
Growth in all industries over the last 10+ years has pushed Ohio's Gross State Product[11] from $426 billion in 2003 to over $565.3 billion in 2013 as estimated by the U.S. Bureau of Economic Analysis. This is more than 3 percent of the total U.S. GDP of over $15.5 trillion, making Ohio the seventh largest state economy.[12]

This boost in production capacity has in turn increased Ohioans' buying power, with real personal income in the state totaling $375 billion in 2010. Ohio now ranks 29th in the nation based on per capita income at $42,571.[13] This increased income, some of it disposable, is generating a high demand for goods and services.

The state's consumer base and economic diversity, (which has grown at a faster rate than the U.S. average over the past 10 years) underscores the relevancy of freight transportation to Ohio's future economic well-being.

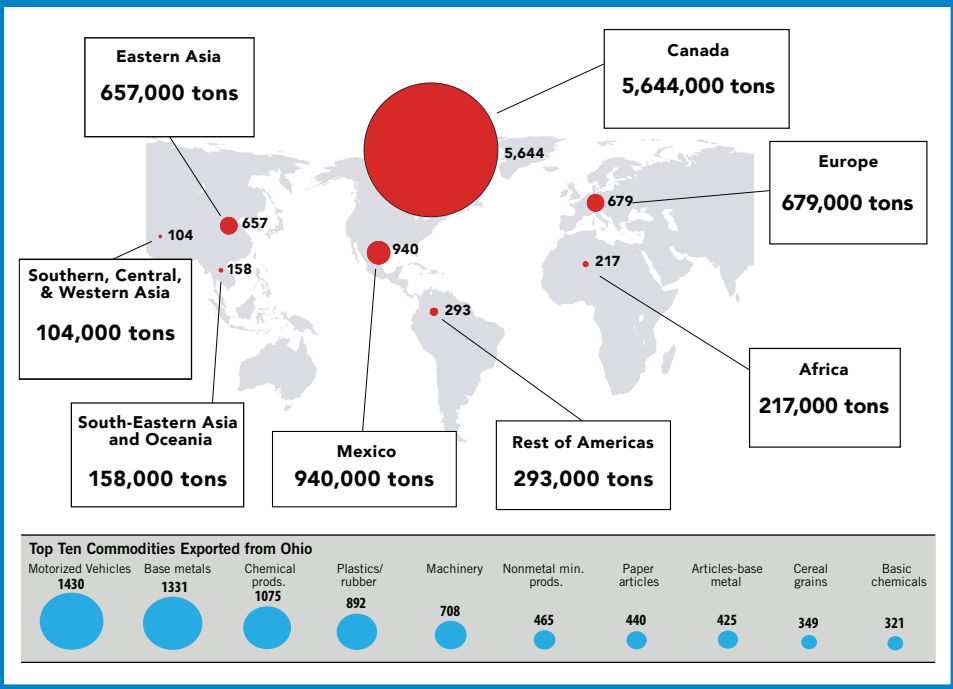
Wise, systemic freight planning and investments will help Ohio preserve its successful conveyance of goods produced and consumed here.

Figure 9: Imports to Ohio by Value Including Top 10 Commodities



Source: Ohio Statewide Freight Study, FAF3

Figure 10: Exports from Ohio by Weight and Destinations Including Top 10 Commodities



Source: Ohio Statewide Freight Study, FAF3

Business Freight Costs – It's All About Having the Right Connections

Companies today compete on more than just product quality and cost. The transportation networks that serve their facilities must also provide reliable connections to customers and access to many markets, ensuring dependable, cost efficient and timely deliveries of goods. Some business sectors are more dependent on the transportation network than others. For example, automotive manufacturing depends on receiving raw materials and parts from several locations, assembling vehicles in another location, and then getting its products to dealers. An industry sector's reliance on transportation can be measured by examining the amount the sector spends on transportation as a share of the total output of that sector.[14]

Figure 11 shows 2013 transportation costs per dollar of output for several industry sectors important to Ohio's economy. These national cost estimates are calculated by the Bureau of Transportation Statistics annually based on national data sources. The year 2013 is just one example. Transportation improvements and increases in predictable delivery times help businesses reduce their overall production costs. Reliability and speed to market are crucial for many.

Ohio businesses and industries are dependent on an efficient, reliable, interconnected and safe freight transportation system.

Figure 11: Transportation Cost per Dollar of Product Output (2013)

Source: Transportation Satellite Accounts Database, Bureau of Transportation Statistics, Research and Innovation Technology Administration

Location, Location, Location: The Importance of Transportation in Business Site Selection and Expansion

Economic development is very competitive and many businesses operate on small profit margins. A good transportation network can be the deciding factor in whether a company moves to a state or expands its existing location within that state. Transportation improvements that promote speed to markets, expand workforce catchment areas to improve ease of access for its existing or potential workforce (such as improved public transit), improve connections between modes or reduce overall transportation costs can make a location more attractive and a business more competitive. In the 2013 Corporate Site Survey,[15] (an annual research effort designed to identify the key elements influencing business site location decisions) 10 of the top 26 criteria were related to transportation. Highway accessibility has ranked first or second in importance over the life of this annual survey. Other key factors linked to transportation include accessibility to skilled labor, access to major markets, inbound and outbound shipping costs, access to major airports and the availability of railroad services.

Ohio's central location and extensive transportation network continue to make the state a top choice for the location of manufacturing plants, distribution centers and warehouses.

Industry Site Selection Factors

1. Highway accessibility	**6. Raw materials availability and accessibility**
2. Availability of skilled labor	**7. Availability (accessibility) of unskilled labor**
3. Inbound/outbound shipping costs	**8. Accessibility to major airports**
4. Proximity (accessibility) to major markets	**9. Railroad service**
5. Proximity (accessibility) to suppliers	**10. Waterway or ocean port accessibility**

Source: 2013 Corporate Site Survey, Area Development, Corporate Executive Survey Issue, Winter 2013.

Playing to Ohio's Strengths

Ohio's Development Services Agency (ODSA) has identified eleven target industries[16] that are vital to the state's economic future, which are listed below. Four of these are highly dependent on transportation infrastructure capable of moving massive amounts of freight. These include: aerospace and aviation, automotive, food processing, and polymers and chemicals.

These four freight-dependent industries ship:

- High-value products (computer and electronics, footwear, apparel and recreation products)
- General manufacturing products (metals, machinery, food and transportation equipment)
- Natural resource products (agriculture, forestry, fishing, wood and paper)

Industries Critical to Ohio Economy

1. **Advanced manufacturing**
2. **Aerospace and aviation**
3. **Automotive**
4. **Bio-health**
5. **Financial services (banking and insurance)**
6. **Food processing and beverage production**
7. **Information technology**
8. **Logistics**
9. **Polymers and chemicals**
10. **Research and development**
11. **Tourism**

Source: Ohio Development Services Agency

AT A GLANCE: OHIO'S FREIGHT DEPENDENT INDUSTRY ASSETS

Ohio's four freight-dependent industries, highlighted below, provide high paying jobs and a solid base for Ohio's economic vitality.

Aerospace and Aviation

- **Ohio is the number one supplier to EADS/Airbus and number two to Boeing.[17]**
- **Ohio is home to over 400 aerospace and aviation businesses that employ over 36,000 workers.[18]**
- **Ohio has two federal aviation laboratories and 20 universities offering related programs.**

Automotive

- **Ohio companies provide approximately 94,000 jobs across more than 600 firms in over 80 percent of the state's counties.**
- **Almost 350 Tier 1 automotive suppliers have operations in the state, making Ohio second nationally only to Michigan.[19]**
- **The automotive industry typically utilizes lean inventory management practices,[20] making them depend on the reliability of Ohio's freight infrastructure for the movement of their parts.**

Food Processing

- **Ohio's central location between the grain belt and the highly populated eastern markets make it an ideal location for food processing centers.**
- **There are food processing establishments present in almost all 88 Ohio counties.**

Polymers and Chemicals

- **Ohio is 1st in manufacturing rubber products and 2nd in plastic products.[21]**
- **Of the 1,758 rubber and plastic establishments located in Ohio, 29 are Fortune 1,000 companies. Seven of these companies have both polymer operations and their world headquarters located in the state.**
- **Most exports from the polymer and chemical industry go to Canada and Mexico.**

Source: http://jobs-ohio.com

MANUFACTURING

Ohio is a key manufacturing state with 5.5 percent of all U.S. manufacturing employment. Manufacturing is a significant driver of freight volumes transported both domestically and internationally. In aggregate, Ohio manufacturing industries alone move close to $150 billion of materials annually on Ohio's transportation network. This is only a portion of the freight moving through the system.[22]

According to the U.S. Census Bureau Survey of Manufacturers (see **Table 5**), Ohio's manufacturing represents 5.5 percent of all U.S. manufacturing employment. Ohio's employment is heavily concentrated in two sectors: motor vehicle parts manufacturing (13.22 percent of total U.S. employment) and motor vehicle manufacturing (12.8 percent of total U.S. employment).

Table 5: Ohio Manufacturing Employment

Industry Code and Subcodes	Description (North American Industry Classification)	U.S. Total Employment	Ohio Total Employment	Ohio Share of Total U.S. Employment	Share of Total Ohio Employment
	All Economic Sectors	**111,970,095**	**4,352,481**	**3.9%**	
31	All manufacturing	10,862,838	599,130	5.5%	5.52%
-311	Food manufacturing	1,432,843	50,042	3.49%	8.35%
-325	Chemical	722,485	36,096	5.00%	6.02%
-326	Plastics and rubber products manufacturing	667,615	56,041	8.39%	9.35%
-331	Primary metal manufacturing	352,280	36,312	10.31%	6.06%
-332	Fabricated metal product manufacturing	1,275,777	91,394	7.16%	15.25%
-333	Machinery manufacturing	928,673	60,712	6.54%	10.13%
-336	Transportation equipment manufacturing	1,201,956	93,328	7.76%	15.58%
-3361	Motor vehicle manufacturing	130,444	16,696	12.80%	8.80%
-3363	Motor vehicle parts manufacturing	402,916	53,285	13.22%	8.89%

Source: 2010 U.S. Census County Business Patterns

LOGISTICS

Logistics is the business of transportation. It includes moving and storing raw materials, intermediate and finished goods from the beginning to the end of the supply chain. It includes services by modal carriers, shippers and businesses, such as third party logistics providers (3PL), which coordinate all aspects of the supply chain including managing warehouses and transfer facilities.

According to the Ohio Development Services Agency Office of Research, logistics industry services comprised more than 83 percent of the $15.38 billion transportation and warehousing sector in Ohio in 2012.[23]

Without well-maintained infrastructure, Ohio's logistics industry would not only fail to attract new companies drawn by the state's strategic geographic location, but existing logistics hubs would face possible curtailment or collapse.

At a Glance: Logistics

Logistics is highly sensitive to economic change. According to the Ohio Developmental Services Agency, Ohio logistics businesses grew to $15.3 billion in 2012 from $12.8 billion in 2007. The largest part of the industry is the trucking subsector at $6.01 billion (47 percent), followed by couriers and selected support services with an estimated $2.74 billion (about 21 percent), and warehousing and storage at $2.47 billion (19 percent).[24]

More focused services such as rail, pipelines and water transportation provided a combined $1.61 billion in services, or 13 percent of the industry total.

The automotive industry is particularly dependent on the reliability of transportation infrastructure, not only to bring materials for Just-In-Time (JIT) production, but also for consumers to be able to use their end products.[25]

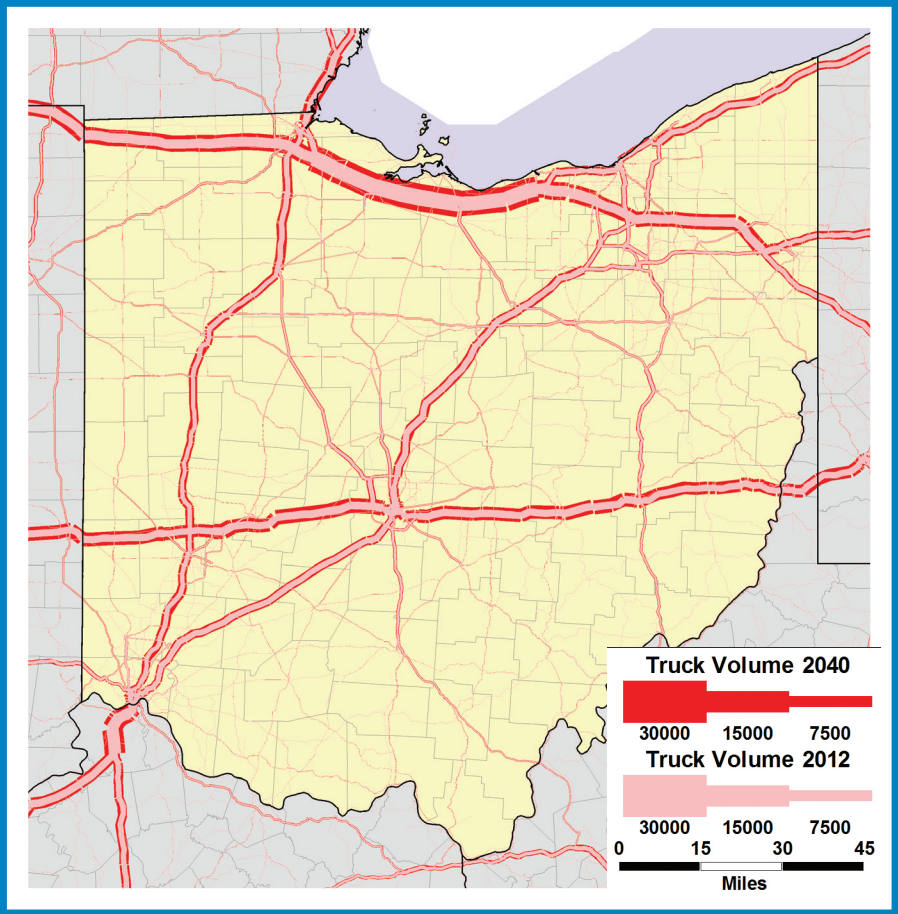
Challenges

Problems Impeding Freight System Performance

A strong freight network is crucial to retaining and attracting businesses and jobs. When trucks are stuck in traffic, goods are unable to reach the marketplace on time, costing businesses money.

In **Figure 12**, the location of potential freight growth appears as dark colored 2040 total truck volumes surrounding the lighter colored volumes of today.[26] Comparing this map to the maps in **Figure 4** shows that growth will occur on routes used by both through and Ohio-based freight traffic.

Figure 12: Total Truck Flows, 2012 (Light Shading) vs. 2040 (Dark Shading)



Source: Access Ohio 2040; Ohio Statewide Freight Study

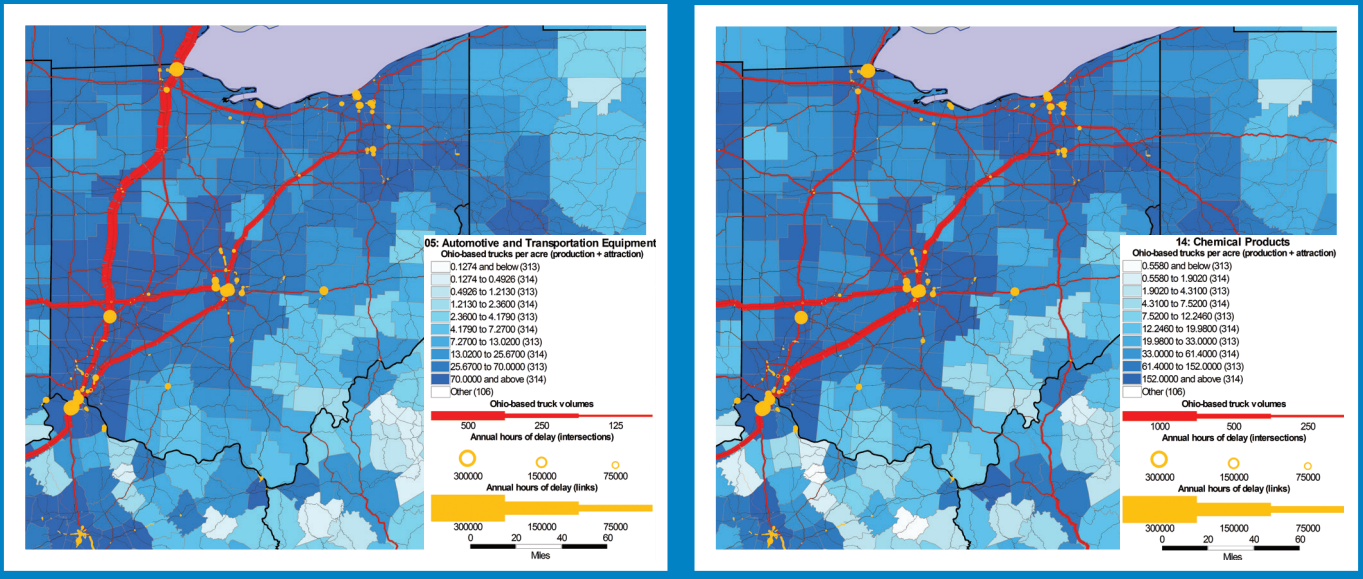
HIGHWAY FREIGHT CHALLENGES

Figure 13 illustrates some overall challenges Ohio faces by using two of its biggest employment sectors and freight dependent businesses as examples, namely automotive and chemical producers.[27] The maps, produced for the Ohio Statewide Freight Study, show the amount of truck shipping picked up and delivered by county, the roadway volumes for Ohio-based shipping, and freight bottlenecks on the roadways. Three things stand out. First, these two industries rely on different sections of the network. Supporting them requires attention to different parts of the system. Second, both industries use the regional road network extensively, allowing them to ship from and serve customers in counties throughout much of the state. Third, freight bottlenecks delaying service today are chiefly in the urban areas surrounding the I-71 and I-75 corridors.

This means the urban networks require most of the immediate improvements and that service on the regional system is more about addressing intermittent disruption than chronic delay. ODOT is working aggressively to reduce these urban bottlenecks. The immediate regional solutions include promoting route alternatives and Intelligent Transportation Systems (ITS) that alert truck drivers and logistics planners to temporary delays, as well as TRAC projects to increase capacity at Ohio's most congested road segments.

Other needs affecting truck performance range from providing rest areas to support compliance with tightened hours-of-service safety regulations, to shortages of qualified drivers, to adding natural gas fuel stations to serve the conversion away from diesel.

Figure 13: Highway Bottlenecks Affecting Ohio-Based Automotive (Left) and Chemical Traffic (Right)



Source: Ohio Statewide Freight Study

RAIL, MARINE AND AIR CARGO FREIGHT CHALLENGES

Rail and rail/truck intermodal traffic are expected to continue to expand, especially on the Heartland and National Gateway corridors where railroads have been making investments. This affords highway relief but creates rising demand on roads accessing intermodal facilities. Completing track upgrades to handle the 286,000-pound industry weight standard is an important need on the short-line rail networks. This will allow rail cars carrying these heavy loads to travel on all tracks throughout the state. Current shale petroleum production in southeast Ohio poses both a looming challenge and rail opportunity. Railroads are well suited to handle the great volumes of heavy bulk materials required for drilling, and have successfully carried raw products from other shale formations. However, the southeast part of the state has a high proportion of inactive rail lines. Private development of new rail services can help this Ohio industry grow with less new demand on local roads.

Marine facilities on Lake Erie operate at less than capacity. While maritime freight growth is projected to be low, maintaining clear navigational channels through dredging, and the associated disposal of dredge material, is essential for ports to function. Dredging on the lakes is a federal responsibility for which funding is limited, and even the highest volume facilities have some unmet needs.

Ohio River terminals are mostly single user ports, with no capacity problems or growth impediments for markets where they are competitive. The challenge is on the river itself, where capacity is capped by the slow operation and size limitations of an aging lock and dam infrastructure. There are nine locks and dams on the Ohio-adjacent section of the river. The federal Inland Waterways Trust Fund provides funding for improvements to just two or three of these structures per year anywhere in the nation. With the stress placed by drought and floods on Mississippi River channels, Ohio River needs may be kept waiting.

As mentioned, the problems facing the air-cargo industry are largely economic and industry-wide. The top air-freight carriers continue to replace air cargo service with truck networks wherever possible. Regional air hubs are consolidating in larger markets like Memphis and Louisville, while Ohio facilities face reduced demand. The state's more active cargo airports face challenges mainly from rising roadway congestion affecting the truck feeder services that connect air cargo to customers on the ground. Fortunately, through the work of public-private partnerships and a federal TIGER grant, access to Rickenbacker International Airport in Columbus is being improved. On-airport facility conditions are adequate, with decreased parking availability being the greatest concern.

Trends

What Drives Changes in Freight Movements and Their Impact on Ohio's Transportation System

For a business to remain profitable it must be nimble, able to quickly change the routes it takes, modes it uses and the volumes it moves. Shifts can and must occur quickly to get goods in customers' hands cost-effectively.

There are emerging national and statewide economic, demographic, infrastructure, environmental and technological trends influencing business decisions on how to move products. These trends are also changing freight origins, destinations, modes and volumes shipped, and may impact where, how and how much freight will be moving on and through Ohio's freight system and infrastructure.

ODOT's understanding of these trends and their potential impacts is critical to maintaining and improving Ohio's freight transportation network, and ensuring it remains an asset to its citizens and businesses. This understanding enables ODOT to plan and respond effectively.

Like the businesses its transportation network serves, ODOT must be adaptive in its policies, programs and investments to meet the changing demands of the freight network. Transport Ohio presents ODOT's plan for how it intends to address its freight infrastructure needs to create a transportation system well-prepared for the future.

The future rarely moves in predictable, incremental ways. Often seemingly small changes in technology, demographics, regulations, economics, or a myriad of other factors have dramatic and unintended impacts on how any organization (public or private) plans and operates. These nonlinear impacts are very difficult to predict using traditional forecasting methods and techniques since they, by definition, do not follow any historical patterns.

Source: NCHRP Report 750: Strategic Issues Facing Transportation

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Economic Trends and Impacts

NATIONAL TREND: RESURGENCE IN U.S. MANUFACTURING AND EMERGING MARKETS LEAD TO INCREASES IN INTERNATIONAL TRADE[28]

While the U.S. has always been and continues to be a world manufacturing leader, by 2005 the U.S. had shifted to a service-oriented economy, providing 68 percent of the country's gross domestic product (GDP).[29] This resulted from low foreign labor costs and relatively low transportation costs. As manufacturing growth moved from the U.S. to emerging and developing countries such as China, India and other Pacific Rim countries, freight flows shifted and supply chains lengthened, requiring a change in the U.S. transportation system. Hundreds of millions of tons of imported product entered the U.S. primarily through West Coast ports and moved across the nation by rail and truck, passing through Ohio to eastern population centers to feed the growing consumer demand these lower cost goods engendered.

Today, manufacturing is shifting back to the U.S., Canada, Mexico and South and Central America. This is due in part to rising costs for labor in developing countries like China and India, changes in fuel costs, changes in philosophy in U.S. supply chain management, increasingly sophisticated manufacturing automation and lower U.S. energy costs and interest rates. This manufacturing rebound is often referred to as "near-shoring" or "re-shoring."

Also, growing personal wealth in countries like China has increased the demand for U.S. and Ohio-made products. These expanding business opportunities for American and Ohio companies will increase the demand for freight transportation services as more companies ship products to a growing array of global customer destinations.[30] Once again, supply chains are changing and freight flows are shifting. ODOT must be in a position to respond quickly.

Today, 95 percent of the world's consumers and 80 percent of the world's purchasing power are outside the U.S., creating new business opportunities for American companies and increasing demand for freight services.

Source: U.S. Chamber of Commerce

NATIONAL TREND: FUEL PRICE VOLATILITY AND CHANGING ENVIRONMENTAL REGULATIONS

Fuel is the second-largest expenditure after labor for most transportation companies. It is the most costly for fuel-intensive modes such as aviation. Changing fuel prices have dramatically affected transportation economics and logistics decisions. At the same time, regulations to reduce emissions are challenging engine makers to develop technology that provides the same power with improved fuel efficiency.[31] These two trends have caused transportation companies to seek shorter routes between products and consumers, more energy efficient modes and alternative energy resources.

OHIO TREND: RICH WITH ENERGY RESOURCES

As China grows, its lack of domestic oil resources will require it to increase imports of energy products such as coal, oil and natural gas, many of which are produced in Ohio.

Natural gas is cheaper and in some ways more environmentally friendly than other fossil fuels. In the past five years, American natural gas production increased more than 50 percent annually. According to the U.S. Energy Information Agency in 2013, the U.S. became the largest producer of natural gas in the world. Moreover, the U.S., including Ohio, is projected to become a net exporter of dry natural gas via pipeline and liquefied natural gas by vessel as a result of increased shale gas production.[32]

The location of these resources in rural parts of the state, often lacking in rail service, will place increasing demand on Ohio's two-lane roadway system. ODOT is working to improve flow on the entire two-lane SFS to ensure that Ohio's freight network is ready to keep pace with this growing demand.

OHIO TREND: ECONOMY POSITIONED TO GROW

As discussed previously, Ohio is the ninth largest exporting U.S. state, with over $50.5 billion worth of goods sent to 211 countries and territories.[33] Ohio represents over 3 percent of the U.S. economy measured as gross domestic product (GDP). Ohio's equivalent gross state product (GSP) has demonstrated stable, slow growth from 2009 through 2012, in recovery from the Great Recession of 2008–2009.[34] In the near future, several specific industry trends could generate additional economic growth in Ohio, further increasing demand on the freight transportation system over the next five to ten years.

Coming in at number nine in 2013, food manufacturing is one of the ten fastest-growing U.S. export sectors. Exports of manufactured food products increased by 92.1 percent between 2001 and 2010, and are projected to increase by an additional 48.9 percent between 2011 and 2020.[35] This is encouraging news for Ohio's 967 agribusinesses and food processing companies, which employ more than 59,000 workers in producing a diverse range of foods including cheese, beverages, fruit and vegetables on more than 14 million Ohio acres.[36]

Private sector investment in manufacturing in Ohio is growing. From 2008 through 2013, 145 companies announced 155 major investments for fabricated metal products manufactured in Ohio. The companies intended to invest a total of $1.02 billion and create more than 4,500 new jobs.[37]

As a leader in energy development and with growth potential from natural gas reserves in Utica Shale, Ohio is in a position to gain jobs and grow its economy as a major energy producer. Ohio consistently ranks first in the creation of new energy projects.[38]

Ohio's polymer and chemical industry is supported by its world-class academic and technical institutions, designers and material suppliers, mold builders, resin suppliers and compounders, plastic and polymer processors, industry associations and economic development groups. Ohio employs more than 80,000 people at more than 1,100 companies that develop or manufacture polymers, rubber and plastics.

So, as the economy rebounds and some manufacturing returns to the Americas and Ohio, Ohio could see increased demand on all modes and levels of its freight network, including its two-lane roadway and short-line rail infrastructure.

Table 6: Summary of Potential Impacts from Economic Changes to Ohio's Freight System

Economic Trends	Potential Impacts
Manufacturing growth/ growth in energy products	• Growth in Ohio manufacturing facilities, many of which are located along Ohio's two-lane system and local roadways, may result in an increase of freight traffic along these lower functional class roadways. • Growth in the natural gas industry will increase truck traffic on rural and two-lane system roads and increase the demand for rail.
Shifts in international trade growth and demand, especially with Mexico, South and Central America, China and Asia	• As wealth grows in developing countries, there will be greater demand for U.S. and Ohio manufactured products, increasing freight volumes on all modes of Ohio's freight system. • With increased international trade, freight volumes on routes serving destinations outside Ohio will increase. • As more goods are produced in Mexico, South and Central America and Southeast Asia, there may be a shift to transportation through the Suez Canal, Panama Canal and U.S. East Coast ports, rather than through U.S. and Canadian West Coast ports. This change would shift inbound rail traffic from the west to rail traffic arriving from the east via either CSX or Norfolk Southern. • As businesses continue to source and sell products and materials globally, shippers and carriers will continue to seek the most cost-efficient methods to increasingly move higher value commodities using lower cost modes such as water, rail and intermodal connections that also offer reliable travel/delivery times. Ohio railroads and water ports may experience growth in the types and character of commodities they handle.
Changes in freight regulations	• Increased regulations for improved safety and environmental efficiency will continue to prompt transportation companies to look for shorter routes between products and consumers, more energy efficient modes (such as rail and water), and alternative energy sources.
Modal improvements and shifts	• As freight volumes and highway congestion continues to grow, shippers and carriers will expand their use of alternative supply chain strategies such as trans-loading—switching from one mode of transportation to another. Demand for locations for rail intermodal facilities and new warehouses will increase. • As businesses continue to source and sell products and materials globally, shippers and carriers will continue to seek the most cost-efficient methods to increasingly move higher value commodities using lower cost modes such as water, rail and intermodal connections that also offer reliable travel/delivery times. Ohio railroads and water ports may experience growth in the types and character of commodities they handle.
Economic recovery/ changes in fuel prices	• As the U.S. economy continues to recover, consumer spending will increase. As population and personal income rise around the world, the demand for Ohio agricultural and manufactured products will likely rise. Both will result in growth in freight traffic and freight flow volumes across all modes.

Demographic Trends

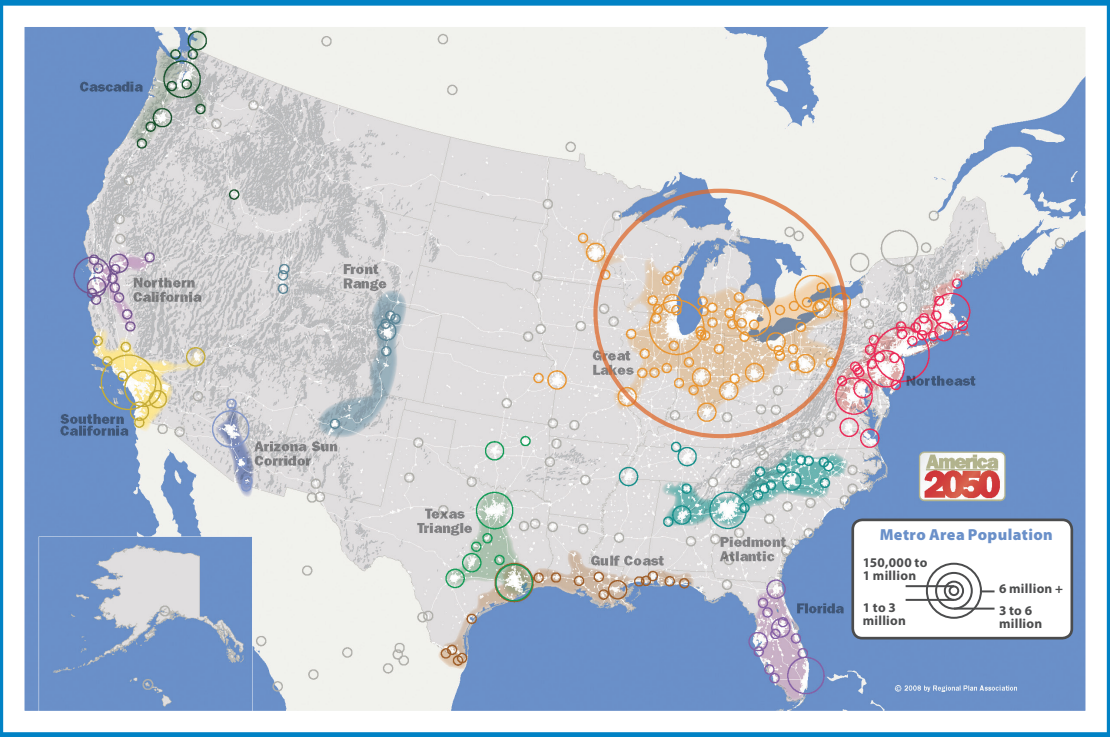
NATIONAL TREND: POPULATION SHIFTS TO MEGA-REGIONS

For several decades, geographers, planners and economists have observed patterns of population shifts around the nation and the world. They have realized that "mega-regions," rather than particular cities, states or nations, are the real driving force in the world economy. Mega-regions have been described as "one or a grouping of several urban areas, linked by social, economic, demographic, environmental and cultural ties."[39]

The Regional Plan Association has identified eleven mega-regions in the United States.[40] Shown in **Figure 14**, these account for only 30 percent of the geographical area, but make up 77 percent of both population and employment, 81 percent of gross regional product and 92 percent of Fortune 500 Companies' revenue.[41]

Ohio is part of the Great Lakes Mega-Region and includes U.S. cities surrounding the Great Lakes and Canadian cities near the Saint Lawrence Seaway. It extends from Minneapolis to Rochester, NY and Johnstown, PA. It includes Chicago, Milwaukee, Grand Rapids, Detroit, Toledo, Indianapolis, Fort Wayne, South Bend, Lansing-Kalamazoo, Cleveland, Columbus, Cincinnati, Akron, Erie, Pittsburgh, Ottawa, Buffalo and the Southern Ontario area of Canada and Quebec along with large parts of Pennsylvania and New York. The region had an estimated population of 59,144,461 as of 2011 and is projected to reach approximately 65 million by 2025.

Figure 14: Emerging U.S. Mega-Regions



Source: Regional Plan Association

OHIO TREND: DECENTRALIZED, OLDER POPULATION

Similar to the shifts seen in other mega-regions, the greatest relative gains in population within Ohio (in absolute numbers) have occurred in the suburban counties surrounding Cincinnati, Cleveland and Columbus. Franklin County, home to the city of Columbus, is the exception with the city's population also continuing to grow.

The median age of Ohioans continues to increase, up to 38.8 in 2010 compared to 36.4 in 2000 and 33.3 in 1990. As people age, the type of products they buy change, which in turn can affect freight movement. For example, seniors tend to take more medications over longer periods of time. Pharmaceuticals and medical products often move by air.[42]

As stated, freight is a demand driven activity. Large population centers are major consumers of goods and attract great volumes and varieties of freight commodities.

Table 7: Summary of Potential Impacts from Demographic Changes to Ohio's Freight System

Demographic Trends	Potential Impacts
U.S. and Ohio population shifting to mega-regions	• Ohio's urban and suburban growth regions will see increases in freight flows to meet increased consumer demand in these locations. • As more people move to other U. S. mega-regions, freight originating in Ohio as well as "overhead or through traffic" will increase to the nation's mega-regions. Identifying the areas of growth and decline will impact where new infrastructure may be needed compared to where maintenance of existing infrastructure is sufficient. • Overall economic, freight and mega-region growth will increase demand on interstates and rural highways, air and water ports, rail and international trade routes as well as routes to mega-region population centers throughout the U.S. • There will be a greater need to partner with regional agencies and neighboring states to improve multi-state corridor highways, and to partner with rail, air and water port owners and managers to improve national and international freight routes.
Ohio population shifts	• As Ohio's population becomes more urban and suburban, freight movement and volumes to these areas will increase.
Aging population	• Older populations demand different types of products which may result in shifts in origins of products and the mode they take to consumers.

Infrastructure Trends

NATIONAL TREND: HIGHWAY INFRASTRUCTURE AND FUNDING

While Ohio's freight stakeholders feel that its highway system operates relatively efficiently, each day approximately 12,000 miles of the U.S. highway system operates below posted speed limits. An additional 7,000 miles of the U.S. highway system experiences stop-and-go conditions.[43] This congestion negatively impacts the overall efficiency and reliability of the nation's highway network.

The North American Transportation Research Council also concluded that the "Just-in-Time-lean inventory" system, developed in the 1970s that has enabled North America and many Ohio companies to compete successfully with Asian and European manufacturers, is now reaching its capacity limits. The nation's supporting transportation infrastructure is now considered inadequate to handle the projected volume of growth of North American supply chain freight flows.[44]

Adding to the problem is the fact that the FHWA estimates that in the next 30 years, there will be 60 percent more freight that must be moved across the nation.[45] Given the national public highway lane mileage increased at an average rate of only 0.2 percent between 1997 and 2010, while total vehicle miles traveled grew at an average annual rate of 1.3 percent during the same period,[46] there will be more traffic on virtually the same number of miles of roadway. This will result in more congestion on roadways.

Ohio has the fifth greatest number of miles on the FHWA-identified U.S. Primary Highway Freight System (PHFS) (1,425 miles). Maintaining this system requires large investments for which funding is critical.

On December 4, 2015, President Obama signed the FAST Act into law that authorized funding for surface transportation through 2020. While the bill placed a major emphasis on freight, including limited additional funding for freight projects, the new Act did not include raising Federal motor fuel taxes. Rates are currently 18.4 cents per gallon of gasoline and 24.4 cents per gallon of diesel.[47] The tax rate was last increased in 1993 and is not indexed to inflation. As a result, inflation reduces the purchasing power of the revenue collected over time.

Jeremiah Morrow Bridge in Oregonia, Ohio

OHIO TREND: FUNDING CHALLENGES

As stated, Ohio is significant as a "crossroads" state. Thirty-four percent of Ohio truck traffic is "overhead," passing non-stop through the state. The Ohio Turnpike (I-80/90) exemplifies an overhead truck route, with 69 percent of truck trips originating and terminating outside the state. The national growth in freight may result in increases in freight volumes, potentially increasing congestion in Ohio.

ODOT is facing the financial challenge of maintaining and improving a large system in an era of limited revenue growth. Current forecasts point to an average 2.7 percent per year federal revenue increase through 2020, with flat revenue assumptions after and a 1 percent growth in state revenue through 2017 with flat assumptions after. Based on 2015 figures, Ohio's transportation system receives approximately $3.67 billion in federal and state funding annually. ODOT's annual capital budget is about $2.4 billion, with nearly half coming from Federal highway revenue, about 45 percent from the Ohio Motor Fuel Tax, and an additional 5 percent coming from other sources (e.g., bonds, other state revenues, local governments). Even with limited short term increases in federal and state gas tax revenues, inflation will continue to erode ODOT's purchasing power. There has also been an increase in fuel efficient vehicles, leading to fewer gallons purchased, and less fuel tax revenue, while motorists can drive the same number—or more miles—on Ohio's roads. This trend is expected to accelerate, potentially resulting in less money to support growing freight demands on Ohio's infrastructure.

ODOT recognizes funding is an ongoing challenge and is making efforts to reduce its funding gaps. It is taking action to address congestion to the extent funding allows. One way ODOT is trying to address this is through bonding. Ohio secured a short-term funding boost by bonding against future toll revenues in 2013. This generated approximately $1 billion for road construction.

ODOT is also implementing an innovative and aggressive asset management strategy to redirect an estimated $300 million toward more preservation over the next six years. It includes using state-of-the-art technology such as pavement management software to determine road resurfacing priorities with the highest benefit at the lowest cost. It also includes aggressive preservation treatments such as chip seal and micro-surfacing of roads that will extend surface life at fractions of the cost of conventional overlays, and proactively cleaning and sealing bridges to keep them in good repair longer.

Table 8: Summary of Potential Impacts from Infrastructure and Funding Changes to Ohio's Freight System

Infrastructure Trends	Potential Impacts
Limited federal funding increases	• Ohio will be expected to manage additional freight volumes and to maintain its system with limited federal revenue growth.
Limited system capacity growth	• The existing system is aging with continuing maintenance and preservation will be needed from increased volumes on the same number of roadways. • As freight volumes grow, congestion may also grow. • Many Ohio manufacturing plants and suppliers rely on the state's two-lane network. This system will experience heavy usage and may require expanded capacity and operational improvements.
Freight volumes increasing, especially through or "overhead" traffic	• In its role as a "crossroads" or "bridge" state, Ohio will see increased through traffic volumes, potentially leading to more congestion. • Ohio will continue to experience growth in oversize, overweight and specialized cargo volumes causing more wear and tear on Ohio's freight system. • Like other states with heavy manufacturing, energy and large agricultural businesses, Ohio will need to address pavement damage on local roads and problems with small bridges and culverts. • Improvements or expansion of river port and short line rail will need to continue.
Changes in Just-in-Time (JIT) supply chain patterns	• As JIT supply chains reach their limits, more warehouse locations will be developed, shifting roadway volumes and routes. ODOT will continue monitoring traffic patterns to determine changing needs. • JIT changes and growth in trade with South and Central Americas may shift freight to water and rail infrastructure serving the East Coast and Panama Canal trade routes. • While water ports are a unique freight asset for Ohio, many face stiff competition from out-of-state ports and may need additional funding to stay competitive.

Environmental Trends

NATIONAL TREND: ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability and climate change are receiving a lot of attention from the public, businesses and the federal government (including the U.S. Department of Transportation and the Environmental Protection Agency). Advertising by Class I railroads promoting the use of rail as one of the most environmentally sustainable modes of land transportation also raises awareness of environmental issues in transportation discussions. FHWA encourages and recommends state DOTs evaluate transportation infrastructure projects using a "triple bottom line" approach that focuses on social, economic and environmental sustainability.[48]

Through nationwide interviews and statements by freight professional association leadership, it is clear that shippers prefer carriers who are attentive to environmental issues and carriers are eager to participate where it is economically feasible. A large national private truck fleet will implement an environmentally favorable device or design when it is either positive or neutral in terms of cost. For shippers, the story changes when the economics are reflected in a change in price. The differential in price shippers are willing to pay is quite small—perhaps less than two cents per mile—in spite of their motivation to act otherwise.[49]

Alternative energy sources such as biofuels, solar and wind power and natural gas have advanced in the market with changes in technology and government regulations. There is increased attention to liquefied natural gas (LNG) and compressed natural gas (CNG) as power sources for freight transportation. This change has been slow because few fueling stations are available around the U.S.. It may be years before a shift to alternative fuels is widespread. However, with more energy efficient vehicles potentially fueled by energy sources other than diesel, less revenue may be collected via the motor fuel tax. This could result in less funding for transportation system infrastructure.

Growth in the natural gas industry may mean more trucks in rural locations not accessible by other modes. This will yet again put extra pressure on the rural and two-lane road system. Further, like other states with heavy manufacturing and large agricultural businesses, Ohio will need to address pavement damage on local roads and problems with small bridges and culverts.

OHIO TREND: IMPROVING AIR QUALITY

Ohio has 28 counties that are currently not meeting (non-attainment areas) or that are working to maintain (maintenance areas) the national ambient air quality standards for Fine Particulates (PM2.5) and/or Ozone. Efficient vehicular operations (including limits on truck idling) and congestion reduction are effective strategies assisting Ohio to meet and maintain the national air quality standards. Industry action is also critical. However, some of the advanced technology is expensive and out of reach for small carriers and independent owner-operators, who comprise a large part of the trucking services in the U.S. and Ohio.

A bright spot is that Ohio's growing natural gas industry offers potential for growing this as a fuel source offering lower emissions per vehicle miles traveled.

Another consideration is that Ohio is a home rule state where local governments make land use decisions. As a result, the state is a tapestry of various approaches to land use controls. Without local land use planning and zoning, future locations of freight generators such as new warehouses, manufacturing plants and even shopping malls may result in longer driving distances, more time spent idling in congestion or lack of access to more fuel-efficient modes for both businesses and the public.

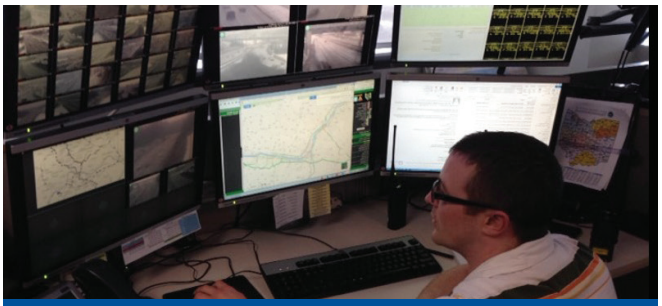
The concepts of a "freight village" and freight as a "good neighbor" are being discussed and evaluated by several MPOs and ODOT planning partners. Freight villages are a zoning and land development concept that concentrates a variety of freight related activities and services in one location rather than across a large area. Similarly, the good neighbor concept for freight is a planning and land use approach to reduce the negative impacts (such as noise, light pollution, dirt, etc.) on residential areas and activities. Increased adoption of land use planning mechanisms may influence future transportation demand by reducing the sprawl of freight facilities and slowing growth in truck vehicle miles traveled and associated emissions.

Table 9: Summary of Potential Impacts from Environmental Changes to Ohio's Freight System

Environmental Trends	Potential Impacts
Sustainability	• Without local land use planning and zoning, future locations for freight generators such as new warehouses, manufacturing plants and even shopping malls may result in longer driving distances, more time spent idling in congestion or lack of access to more fuel-efficient modes for both businesses and the public.
Alternative energy and fuels (e.g. oil and gas extraction [shale])	• Advances in alternative fuels may reduce freight transportation emissions on the environment improving air quality. • Rail plays a key role in the transportation of energy products, such as in the development of shale oil and in the transportation of ethanol and its derivative product, Distillers Dried Grains with Soluble (DDGS). Changes in energy markets may impact the demand for rail services. • Unless changes are addressed as to how motor fuel taxes are collected, increased use of alternative fuels may result in less funding.

Technology Trends

The integration of information and transportation to accommodate global supply chains has given rise to a logistics technology revolution in private sector business practices and public expectations. Electronic shipment tracking, the use of multiple transportation modes, the optimization of distribution facilities, satellite and unmanned aircraft systems (drone) technology and e-commerce are just some of the changes that have occurred and are constantly evolving.



ODOT's Traffic Management Center

NATIONAL TREND: E-COMMERCE, HAND-HELD TECHNOLOGY AND CONNECTED AND AUTONOMOUS VEHICLES

E-commerce throughout the U.S. increased from 0.6 percent of total retail activity in 1999 to 5.5 percent in the first quarter of 2013. E-commerce requires fast, on-time delivery, typically directly to the consumer. This expedited delivery approach is sensitive to both distance and congestion.

Those who have a smartphone walk around with both a computer and GPS. This has raised expectations for information to be available instantly, including information on the availability and conditions of the transportation system. Truck drivers are no different; most drivers now have similar satellite technology in their cabs. Commercial GPS units can relay information related to detours, weather conditions and incidents to provide the driver with real time information customized for truck operating dimensions. This can be beneficial in helping to improve the reliability of trips and out-of-route mileage and emissions.

In-vehicle technology improvements are being looked at and developed to improve the efficiency, safety and capacity of the existing transportation system.

The first autonomous vehicles were shown in an exhibit at the 1964 New York World's Fair. Experts anticipate that by 2040, connected and autonomous technology will be integrated into many vehicles, including trucks. As evidence of this rapidly evolving technology, passenger cars on the market today are already equipped with a self-parking feature.

Truck-platooning using autonomous, interconnected vehicle technology is already on the road in international locations such as Australia. Both vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) technology are advancing rapidly, and are being embraced as features that will make roads safer and help traffic move more efficiently. Guidance on V2I deployment will be provided by USDOT soon. Legislation is now being considered in several states, including Ohio, with California and Nevada recently passing laws to legalize and regulate self-driving cars.[50]

OHIO TREND: ATTRACTING WAREHOUSE AND DISTRIBUTION CENTERS

To meet consumer demand for next-day delivery, e-retailers are constructing multiple distribution warehouses to serve as part of their supply chain management and be closer to customers. It is anticipated that more warehouses and distribution centers may be developed or relocated to Ohio to take advantage of its central location. As a result, smaller freight vehicles traveling on lower functional class roadways will likely deliver more goods directly to consumers. ODOT has recognized this and begun a series of studies around the state to identify operational improvements to enhance freight flows on its two-lane roadway system.

The growing trend for more and larger home-based businesses is resulting in more small delivery trucks on residential streets. This impacts congestion, safety and the geometric design of local and residential streets and intersections as well as Ohio's two-lane system. Roundabouts that have become increasingly popular in suburban areas are often unsuitable for large truck traffic unless specific design requirements are considered. There is every indication that the home business trend using smaller delivery trucks will continue to grow, and that Ohio will need creative ways to manage small truck traffic in residential neighborhoods.

OHIO TREND: INTELLIGENT TRANSPORTATION SYSTEMS ADVANCEMENTS

Ohio is continuing to grow and improve its Intelligent Transportation Systems (ITS) and Freeway Management Systems (FMS). Today Ohio's six regional FMS cover a combined total of nearly 880 centerline miles of urban interstates and freeways.

ODOT has expanded data coverage to provide real-time speeds on an additional 709 centerline miles of rural interstate routes between major metropolitan areas.

Table 10: Summary of Potential Impacts from Technology Changes to Ohio's Freight System

Technology Trends	Potential Impacts
E-commerce	• The impacts of e-commerce on the transportation system will increase parcel delivery traffic on local street networks and the two-lane system and potentially reduce growth in larger trucks serving traditional retail establishments. • Demands for next day delivery will attract more warehouses and distribution centers to the state and will change traffic patterns from longer to shorter term routes. • Deliveries to households will shift freight to smaller trucks and local roadways. • The high costs of next-day home delivery, high fuel costs and driver shortages may force businesses to frequently re-evaluate truck shipping practices. • While delivery drones are now being considered, it is more likely that logistics practices will evolve to more complex and dynamic combinations of delivery sizes with more sophisticated management of inventories, emergency stocks and distribution in manufacturing and in retail—especially if interest rates are low.
Alternative fuel vehicles	• Public and private fleets will experience increased use of alternative fuel vehicles. ODOT will continue to support alternative fuel vehicle fleet expansion through the Diesel Emission Reduction Grant Program (DERG). • Increased use of alternative fuels will decrease the amount of state and federal motor vehicle fuel tax collected and available to Ohio.
Autonomous and connected vehicles	• ODOT will have a role in implementing and regulating autonomous vehicles. Legislative and liability issues will need to be addressed. Licensing for commercial truckers driving autonomous vehicles will need to parallel license changes for the general population. Special skills may need to be considered, such as commercial drivers leading and managing platoons of vehicles on general purpose roadways or specialized truck lanes.
Public expectations for up-to-the-minute information	• As the public and truck drivers' expectations for more up-to-the-minute transportation information rises, ODOT's Intelligent Transportation Systems (ITS) and Freeway Management Systems (FMS) will need to continue to improve and expand. • As technology advances, real time data on parking availability, congestion, and road and weather conditions will need to be transmitted between vehicles, roadside units and traffic management centers. • To remain competitive in the new global economy, businesses will seek transportation systems and technology options that allow integrated supply chain strategies to meet expectations of the commercial, industrial and retail sectors. To remain competitive, Ohio will need to address demands for more real time information about their routes.

"If anything is certain, it is change. The world we are planning for today will not exist tomorrow."

– Philip Crosby, quality management expert

"It is far better to foresee, even without certainty, than not to foresee at all."

– Henri Poincare, French mathematician, physicist and philosopher

Ohio's Plan Moving Forward

Aligning with National Goals

MAP-21 established a national freight policy (NFP) in section 1115. The policy included seven goals "to improve the condition and performance of the national freight network to ensure that the national freight network provides the foundation for the United States to compete in the global economy." These goals, retained by the FAST Act, served as a guide to state Departments of Transportation in developing their individual freight plans. **Table 11** lists the seven national freight goals along with goals developed as part of ODOT's long range transportation plan, Access Ohio 2040. As evidenced in **Table 11**, the national freight goals, including those of the FAST Act, align very closely with ODOT's own transportation goals.[51]

The following pages contain a series of recommendations that will advance both national freight goals and ODOT's own transportation goals. The recommendations include new initiatives and the continuation of existing policies, programs and/or projects.

Main Avenue Lift Bridge in Cleveland, Ohio

PERFORMANCE MEASURES

Plans are most effective when their recommendations are implemented and changes in system conditions are measured over time. "Performance measures" are strategic system attributes that are indicative of total system performance. The FAST Act supports and continues the overall performance management approach, within which states invest resources in projects that collectively will make progress toward national goals. Monitoring and tracking performance measures over time provides clear evidence if plan recommendations are having the intended impact and if goals are being met. However, knowing which system attributes to measure on a complicated system like Ohio's freight network is difficult.

For example, much of Ohio's freight infrastructure is privately owned and operated. Performance data on private infrastructure is usually considered proprietary by the owner and is not shared with ODOT and the public. Consequently, performance measures identified here in Transport Ohio have been generally limited to highway measures for which ODOT can readily obtain performance data and exercise influence. **Table 11** shows performance measures that will be monitored to track ODOT's progress towards meeting each goal.

Table 11: National Freight and Ohio Transportation Goals and Performance Measures (for State Fiscal Year 2016)

National Freight Goals	ODOT Transportation Goals	ODOT Performance Measures Critical Success Factors Targets
Goal 1: Invest in infrastructure improvements and implement operational improvements that: • Strengthen the contribution of the national freight network to the economic competitiveness of the United States • Reduce congestion • Increase productivity, particularly for domestic industries and businesses that create high-value jobs	**Economic Development:** Develop and operate a state transportation system that supports a competitive and thriving economy, attracts new businesses and provides predictable freight movements **Mobility and Efficiency:** Reduce congestion and increase travel reliability	• Travel time reliability index **(88%)** • Snow and ice control **(96%)**
Goal 2: Improve the safety, security and resilience of freight transportation	**Safety:** Continue to improve transportation system safety	• Annual number of crashes **(168,232)** • Annual number of serious injuries **(7,136)** • Annual number of fatalities **(948)**

(continued on page 47)

Table 11: National Freight and Ohio Transportation Goals and Performance Measures *(continued)*

National Freight Goals	ODOT Transportation Goals	ODOT Performance Measures Critical Success Factors Targets
Goal 3: Improve the state of good repair of the national freight network	**Preservation**: Promote cost-effective preservation of multimodal assets	• Percentage of roads on the SFS with acceptable pavement condition ratings **(85%)** • Percentage of bridges on the SFS with acceptable general appraisal condition ratings **(6.8 out of 9)**
Goal 4: Use advanced technology to improve the safety and efficiency of the national freight network	**Accessibility and Connectivity**: Increase customer access to Ohio's multimodal transportation system and improve linkages between modes *(Note: This goal includes expanding the use of technology to improve user access to real time system condition information.)*	• Percentage of the highway component on the SFS covered by ODOT's ITS and displayed on *OHGO.com* **(100%)**
Goal 5: Incorporate concepts of performance, innovation, competition and accountability into the operation and maintenance of the national freight network	**Accountability:** Finalize ODOT's performance management goals once the FHWA releases final guidance	• Percentage of Ohio MPOs and RTPOs that incorporate performance-based planning into their long-range plans **(100%)**
Goal 6: Improve the economic efficiency of the national freight network	**Economic Development**: Develop and operate a state transportation system that supports a competitive and thriving economy, attracts new businesses and provides predictable freight movements	• Amount of non-ODOT investment capital leveraged **(1 to 7)** • Number of approved and delivered economic development projects per year **(70)** • Percentage of economic development projects delivered on time **(90%)**
Goal 7: Reduce the environmental impacts of freight movement on the national freight network	**Stewardship**: Advance financial, environmental and social objectives for transportation investments	• Total amount of Diesel Emission Reduction Grants (DERG) awarded annually **($10 million)** • Percentage of DERG projects complete within 24 months of award **(90%)**

Specific Recommendations

NEW INITIATIVE: COMPLETE AN OHIO MARITIME STUDY

Action: Complete a two phase maritime freight study for Ohio which will:

Phase 1 Assess baseline existing conditions including understanding the environment and opportunities for improvement; i.e. regulatory and physical impediments, constraints preventing optimal performance

Phase 2 Determine the future blueprint of maritime freight in Ohio based on industry trends

Supporting Information: Ohio is fortunate to have access to two robust maritime corridors along Lake Erie and the Ohio River. Maritime access gives the state's freight network an added dimension and Ohio a strategic advantage over many other states. Both maritime corridors are lined with public and private ports serving a widely varying and evolving list of customers. Utilizing Ohio's freight Plan Transport Ohio as a resource, the study will examine Ohio's maritime system for existing and future opportunities to keep Ohio competitive and goods moving.

This effort is important as Master Planning is financially difficult or outright impossible for many port operators. Because ports are owned and operated by both public and private entities, there is no single organization responsible for identifying and prioritizing the sum of port improvements across the state.

Ohio needs a maritime freight study that identifies Ohio's maritime capabilities and inventories both existing public and private port facilities. The completed study will serve as a game plan for understanding the maritime marketplace and analyzing Ohio's maritime capabilities as well as integrating Ohio ports into the overall state intermodal freight transportation system.

General Tasks:

Task 1 Assemble a multi-agency steering committee to develop a future blueprint for maritime freight in Ohio

Task 2 Perform targeted interviews with business, industry, operators, and logistics professionals

Task 3 Analyze individual maritime port capabilities

Task 4 Analyze and understand future market trends and limitations

Cost of Implementation: As a maritime plan of this sort has not been completed in the past, an informed estimate to complete the plan is not possible. However, based on experience completing other types of transportation plans, ODOT will set aside $500,000 for the Maritime Infrastructure Study.

National Goal(s) Advanced: Completion of an Ohio Maritime Infrastructure Study will advance all of the MAP-21 and FAST Act NFP goals from **Table 11**.

NEW INITIATIVE: COMPLETE AN OHIO TRANSPORTATION SYSTEM MANAGEMENT AND OPERATIONS PLAN

Action: Complete a statewide management and operations plan that seeks to define infrastructure needs, policies, procedures and strategies for managing Ohio's transportation system through the 21st century.

Supporting Information: As documented in nearly every long range transportation plan across the nation (including ODOT's own Access Ohio 2040), transportation agencies no longer have the funding necessary to maintain and operate their transportation systems using traditional methods (i.e. building bigger systems). By necessity, transportation agencies are looking for innovative and creative ways to maintain or improve performance on existing facilities without major new investments. Serious consideration is being given to the manner in which agencies maintain and operate their facilities. This has given rise to a new approach for managing transportation facilities called Transportation System Maintenance & Operation (TSM&O). TSM&O has recently become a high-priority across the U.S. by seeking to improve mobility through the use of real time active management systems like Intelligent Transportation Systems (ITS).

TSM&O may be viewed as an organizational shift from transportation system outputs (like Level of Service [LOS]) to mobility outcomes (like Travel Time Reliability Indices [TTRI]) with the goal of maximizing efficiency of the transportation system. TSM&O is more of a performance driven approach for solving congestion and traffic problems, in real-time, by using ITS, signal system control and other congestion management and operational strategies to locate and correct the causes of congestion. While TSM&O cannot solve every problem, it can maximize the efficiency of existing transportation facilities with minimal investment.

To advance TSM&O principles in addressing mobility problems, ODOT will develop a TSM&O plan to identify locations with infrastructure needs, document necessary policy and procedural changes and develop new sustainable strategies for system operations. ODOT has already made use of a federal State Highway Research Program 2 grant to conduct a preliminary workshop and visit eight other states with cutting edge maintenance and operation systems and programs. ODOT will build on the experience of other state DOTs in developing its own plan.

Desired Outcomes:

- Create a road map that allows ODOT to transform into an operations-oriented organization
- Develop a business case for each TSM&O activity
- Provide realistic and attainable TSM&O performance measure recommendations
- Improve transportation system sustainability

Cost of Implementation: $1 million initially.

National Goal(s) Advanced: Completion of an Ohio Transportation System Management & Operations Plan will advance all of the MAP-21 and FAST Act NFP goals.

NEW INITIATIVE: DEPLOY A TRUCK PARKING INFORMATION MANAGEMENT SYSTEM (TPIMS)

Action: Develop and deploy an information management system that monitors available public and private truck parking spaces and publishes the information "real time" via the internet and roadside signs.

Supporting Information: As noted previously, approximately 54 percent of the truck freight tonnage in Ohio passes through to destinations outside the state. However, even trucks passing through Ohio still stop for fuel and to allow drivers to rest. At some locations along heavy freight routes, the number of trucks stopping for the night exceed the number of available truck parking spaces. Since federal regulations mandate the maximum number of hours a driver can be behind the wheel, drivers at these locations are forced to park other places. Drivers often stop along interstate exit and entrance ramps to get their mandated rest time. Meanwhile, available parking spaces at other locations along the same route go unused because truck drivers have run out of time to find them.

Trucks parked along exit and entrance ramps pose a safety and maintenance concern. Stopped trucks along the edge of the traveled lane represent a hazard to other vehicles that are accelerating or decelerating from freeway speeds. In addition, the graded shoulders along ramps quickly break apart leading to recurring maintenance costs for DOTs because ramp shoulders are not designed for parked trucks.

The number of crashes involving tired truck drivers is a growing concern across the nation. Even though trucks parked along ramps are safety hazards, drivers who ignore federal regulations and stay on the road because they cannot locate a parking space are a much greater hazard.

This recommendation proposes to develop an information management system that will use available technology to monitor truck parking spaces along heavy truck routes at both public rest stops and private truck stops. The system will automatically monitor the number of available spaces and publish the information via the internet and roadside signs. Truck drivers will be able to use the information to make better decisions about where to stop for the night and fully utilize all available parking spaces.

Because localized truck parking shortages are not unique to Ohio, ODOT has already engaged in preliminary discussions with neighboring states to develop a multi-state system. This would maximize system benefits and share the burden of system development costs.

Desired Outcomes:

- Fewer trucks parked along freeway entrance and exit ramps
- Fewer crashes involving trucks operated by tired drivers
- Fewer trucks idling while drivers rest

Cost of Implementation: Ohio was part of a multi-state team that was awarded a $25 million TIGER grant to develop and deploy a Truck Parking Information and Management System (TPIMS). The actual cost to Ohio to design, build, operate, and maintain a TPIMS for five years is approximately $5 million.

National Goal(s) Advanced: Completion of a Truck Parking Information Management System will advance MAP-21 and FAST Act NFP goals: 2 (Safety), 4 (Technology) and 7 (Environment).

CONTINUING INITIATIVES: EXISTING STRATEGIC POLICIES AND PROGRAMS

ODOT has a number of existing policies, programs and projects that promote freight mobility in Ohio. These efforts should be continued and, in some cases, expanded to maximize their benefit.

To maximize Ohio's freight system, many actions are necessary. While the completion of maritime and TSM&O plans, as well as the development of a TPIMS, are great first steps, other steps are also needed.

At ODOT, a number of these steps have already been taken. They take the form of existing policies, programs and projects that directly or indirectly promote freight mobility in Ohio. These efforts should be continued and even expanded. Individually, these steps make only incremental improvement, but together they significantly enhance statewide freight mobility.

- **Goal 1: Invest in infrastructure improvements and implement operational improvements that strengthen the contribution of the national freight network to the economic competitiveness of the United States; reduce congestion and increase productivity, particularly for domestic industries and businesses that create high-value jobs.**

  How ODOT Supports Goal 1

  - Offers grants and funding opportunities through ODOT's Office of Jobs & Commerce, as well as professional transportation expertise to local partners
    - Leverages grants to finance incremental improvements that promote the safe and efficient movement of goods
    - Serves as a resource on national freight trends, Ohio's freight network and freight strategies specific to Ohio
  - Explores and encourages public-private partnership opportunities
    - Works collaboratively with local governments and industry to promote economic development in various regions through freight-related transportation improvements
  - Collaborates with metropolitan planning organizations, regional transportation planning organizations, Ohio Rail Development Commission, JobsOhio and other state agencies to move projects forward
    - Encourages these entities to address items concerning freight in their transportation plans
    - Serves as a resource for information and assistance in developing and pursuing improvements to critical freight routes within their respective jurisdictions
  - Uses the Strategic Freight System (SFS) network as a project selection factor for ODOT's Transportation Review Advisory Committee (TRAC) Program
  - Identifies, evaluates and addresses incremental operational improvements to encourage the efficient flow of freight on the two-lane SFS
    - Develops a repeatable methodology to identify and prioritize opportunities for improvements on the two-lane system that ensures the most efficient and effective focus of efforts and funds
    - Performs the analysis needed to develop a statement model to improve the flow of freight on the entire two-lane SFS

- **Goal 2: Improve the safety, security and resilience of freight transportation.**

  How ODOT Supports Goal 2

  - Promotes safety in the transportation of freight
    - Collects and monitors crash data on the highway system
    - Identifies high-risk, high-crash areas on Ohio's freight network and encourages solutions to reduce incidents

Goal 3: Improve the state of good repair of the national freight network.

How ODOT Supports Goal 3

- Monitors and maintains the national highway system connectors
  - In addition to preserving the roads and bridges throughout the state, ensures the national highway system intermodal connectors are safe and efficiently operating to encourage the flow of freight
- Encourages maintenance of rail lines that accommodate 286,000 pounds
- Encourages the repair of the aging locks and dams throughout the state
  - Works with the U.S. Army Corps of Engineers, public port authorities and private terminal operators to identify critical locks, dams and structures that need repair
  - Supports efforts to identify funds to ensure the safe and efficient operation of locks and dams such as the Water Resources Reform and Development Act of 2014 and the Harbor Maintenance Trust Fund
  - Considers the establishment of a dedicated state funding program similar to the program in Wisconsin

Goal 4: Use advanced technology to improve the safety and efficiency of the national freight network.

How ODOT Supports Goal 4

- Explores new technologies and developments in Intelligent Transportation Systems
  - Considers technology advancements that do not include the acquisition of infrastructure that requires additional operational and maintenance costs (e.g. connected and autonomous vehicles)
  - Identifies opportunities to leverage existing resources
- Evaluates opportunities for Active Transportation and Demand Management
  - Incorporates newer technologies and strategies into the assessment
  - Identifies opportunities to leverage existing resources
- Encourages needed improvements to enhance access to and through intermodal facilities
  - Identifies opportunities to enhance services
  - Supports applications for funding that promote the ease of freight transition to and through these facilities
- Encourages workforce access to freight hubs

Goal 5: Incorporate concepts of performance, innovation, competition and accountability into the operation and maintenance of the national freight network.

How ODOT Supports Goal 5

- Continues measuring, reporting and publishing ODOT's Critical Success Factors (CSFs).
  - Refines measures as national measures are released by the USDOT
- Continues development and execution of ODOT's Transportation Asset Management Plan (TAMP)
- Conducts Ohio freight network customer surveys to understand user concerns and gain feedback on the effectiveness of ODOT freight policies, programs and projects
  - Repeats the surveys every three to four years to track trends over time

Goal 6: Improve the economic efficiency of the national freight network.

How ODOT Supports Goal 6

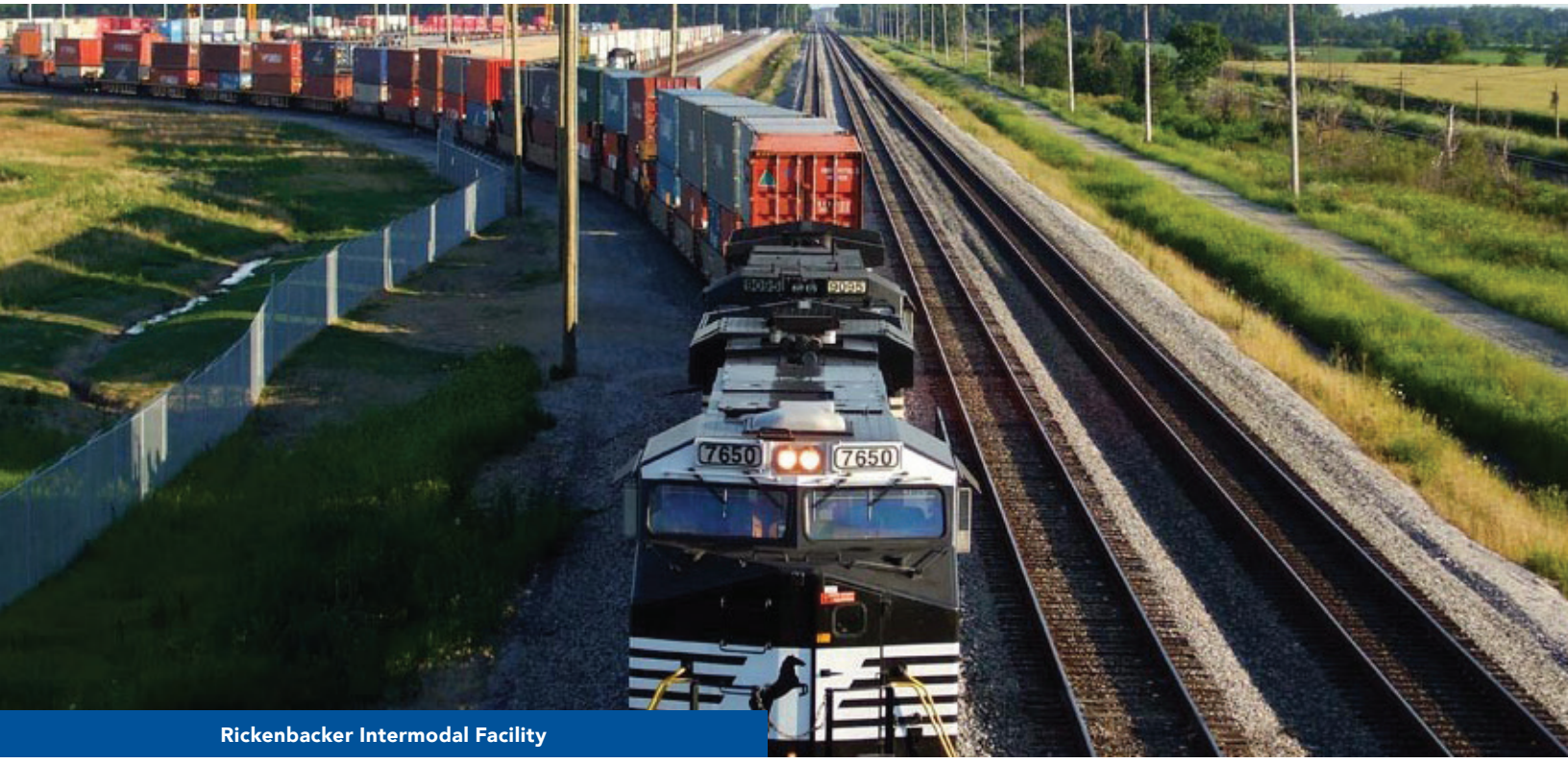
- Same policies and programs as listed under Goal 1 on page 51.

(goals continued on page 53)

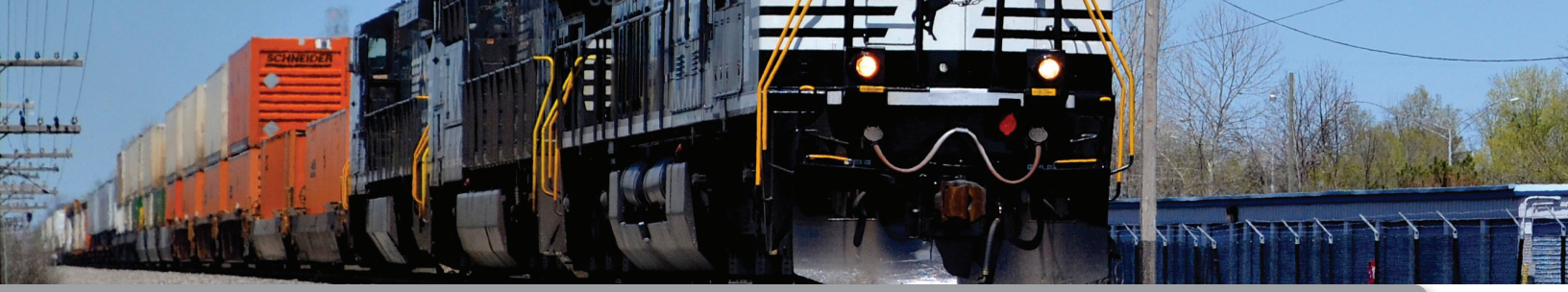
Goal 7: Reduce the environmental impacts of freight movement on the national freight network.

How ODOT Supports Goal 7

- Optimizes funds at every opportunity
  - Promotes flexibility in the application of available funds
  - Leverages the limited funding available to ensure the most advantageous return on investment
- Continues working with the Ohio EPA to utilize the DERG program to finance diesel emission reduction improvement projects to Ohio's rail, maritime and trucking industries
  - Strives to streamline the execution of DERG applications and awards to ensure efficient use of the program
  - Promotes the opportunities the DERG program provides to industries and educates industries and the public on the benefits the program provides



Rickenbacker Intermodal Facility



Freight Investment Plan

Ohio's FAST Act Freight Investment Plan for Fiscal Years 2016–2020

The passage of the FAST Act on December 4, 2015, offered state departments of transportation the opportunity to obtain dedicated freight funding if the state developed a comprehensive freight plan and a freight investment plan, both of which would be updated every five years.

ODOT's compliance with these requirements is Transport Ohio, which includes this freight investment plan showing its funding approach, maps and a list of priority freight projects.

This investment plan includes a list of priority projects with descriptions of how funds would be invested and matched.

HOW ODOT'S FAST ACT FUNDING WILL WORK

FAST Act freight appropriations are formula-based funding available to states.

Table 12 shows the FAST Act freight appropriations to ODOT. Each year the fund increases incrementally.

Table 12: Ohio National Highway Freight Program FAST Act Apportionments

Fiscal Year				
2016	2017	2018	2019	2020
	FAST Act Apportionment Increases			
	+2.06%	+2.16%	+2.16%	+2.39%
$38,239,864	$38,318,638	$39,146,321	$39,991,881	$41,551,565

WHERE FUNDS MAY BE USED

FAST Act freight funding may be used for freight projects on the National Highway Freight Network (NHFN) in accordance with 23 U.S.C. 167. The FAST Act repealed both the Primary Freight Network and National Freight Network from the Moving Ahead for Progress in the 21st Century Act (MAP-21), and directed the FHWA Administrator to establish a NHFN to strategically direct federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system.

What Does the National Highway Freight Network (NHFN) Include?

- **Primary Highway Freight System (PHFS):** This is a network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerlines miles, including 37,436 centerline miles of interstate and 4,082 centerline miles of non-interstate roads across the US.
- **Other Interstate Portions Not on the PHFS:** These highways consist of the remaining portion of interstate roads not included in the PHFS. These routes provide important continuity and access to freight transportation facilities. These portions amount to an estimated 9,511 centerline miles of interstate, nationwide, and will fluctuate with additions and deletions to the Interstate Highway System.
- **Critical Rural Freight Corridors (CRFCs):** These are public roads not in an urban area which provide access and connection to the PHFS and the interstate with other important ports, public transportation facilities, or other intermodal freight facilities.
- **Critical Urban Freight Corridors (CUFCs):** These are public roads in urban areas which provide access and connection to the PHFS and the interstate with other ports, public transportation facilities, or other intermodal transportation facilities.

State DOTs are responsible for designating public roads for the Critical Rural Freight Corridors (CRFCs), state DOTs and metropolitan planning organizations (MPOs) are responsible for designating public roads for the Critical Urban Freight Corridors (CUFCs) in accordance with section 1116 of the FAST Act.

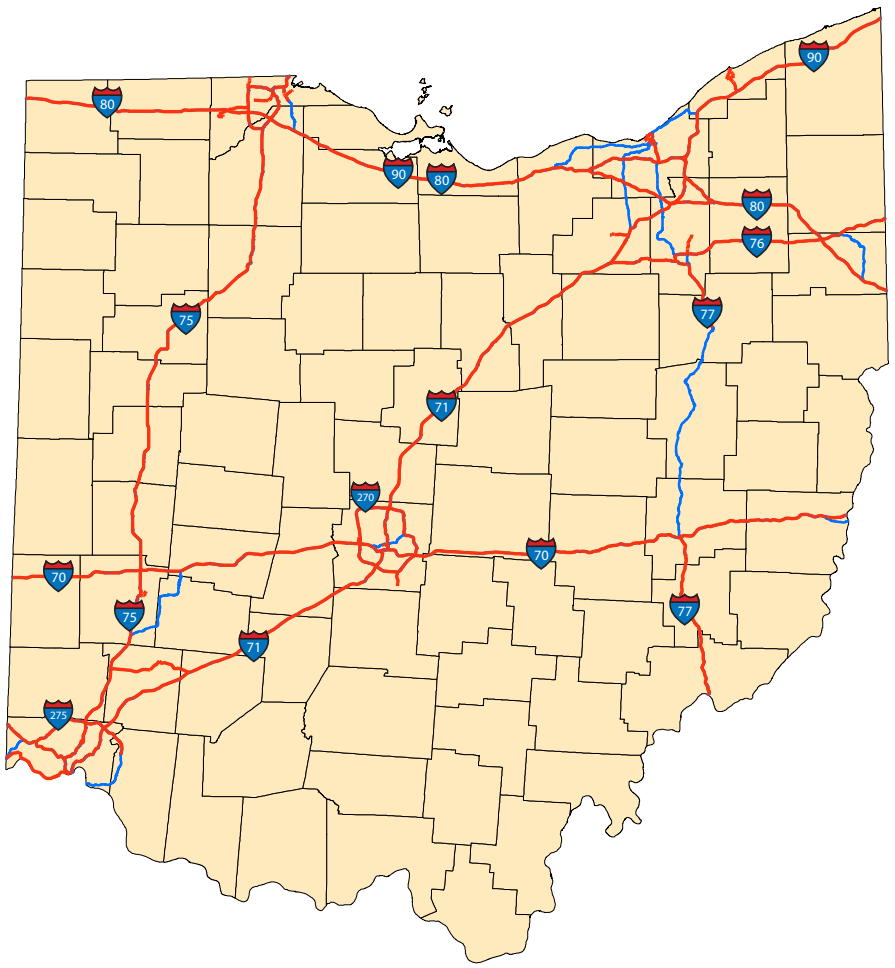
What Does NHFN Look Like in Ohio?

As Ohio is one of 18 states with Primary Highway Freight System (PHFS) mileage greater than or equal to 2 percent of the total PHFS mileage in all states, Ohio may obligate FAST Act funds for projects on the PHFS, the Critical Rural Freight Corridors (CRFCs) and the Critical Urban Freight Corridors (CUFCs) only.

Ohio may designate 284.91 miles of CRFC and 142.46 miles of CUFC. ODOT anticipates that the additional miles will be located on Ohio's Strategic Freight System (SFS). In accordance with the FAST Act Section 1116, USDOT guidance will be developed to provide information on the identification, designation, and certification of these corridors.

Figure 15 shows the FHWA-designated NHFN on which ODOT may direct its FAST Act freight funding. **Figure 16** shows Ohio's Primary Highway Freight System (PHFS) as designated by USDOT and the highway portion of Ohio's State Freight System (SFS) developed through Access Ohio 2040 and Transport Ohio. ODOT may direct freight funds to these roadways upon FHWA approval of these additional corridors.

Figure 15: Ohio's Portion of the National Highway Freight Network (NHFN)



Critical Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC) are part of the NHFN but have not yet been designated.

Source: http://ops.fhwa.dot.gov/freight/infrastructure/ismt/state_maps/states/ohio.htm

Figure 16: Ohio's Primary Highway Freight System (PHFS) and State Freight System (SFS)

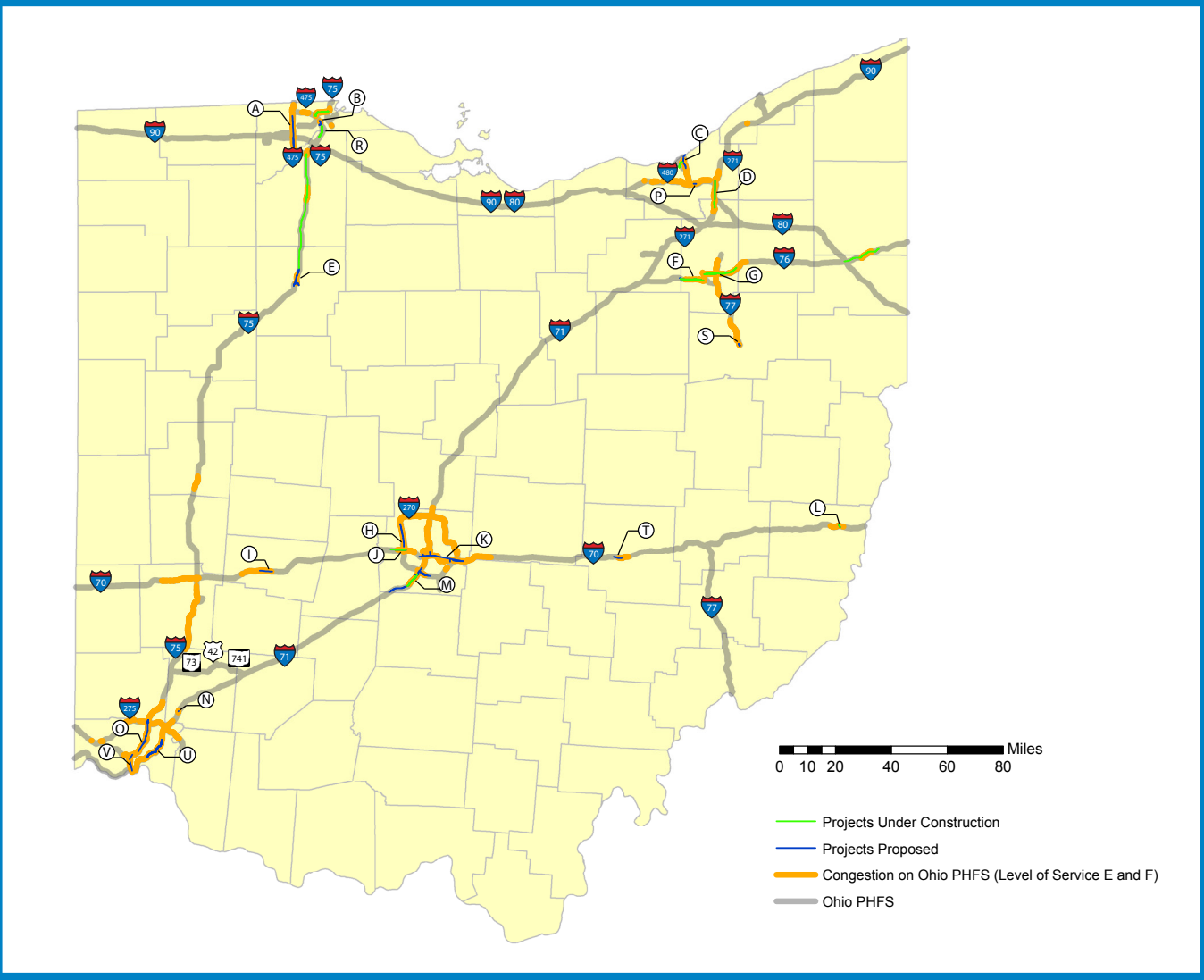
Source: ODOT

ODOT'S FREIGHT INVESTMENT PLAN APPROACH AND PROJECTS

ODOT's Freight Investment Plan approach is to apply FAST Act freight funding for federal fiscal years (FFY) 2016 to 2018 to existing projects addressing freight bottlenecks and congestion on the PHFS.

ODOT developed a list of candidate projects by using its statewide travel demand model to identify segments of the PHFS that currently experience levels of service (LOS) E and F. These locations are shown in yellow in **Figure 17**. ODOT then identified projects on these segments that will improve the efficient movement of freight. These projects are labeled alphabetically A through V. More information about these projects is found in **Table 13**. These projects are in various stages of development and are either in an existing fiscally-constrained STIP/TIP or in the ODOT pipeline, but currently unfunded.

Figure 17: Projects Addressing Congestion on Ohio's Primary Highway Freight System



Source: ODOT

Table 13: Freight Projects Eligible for Funding with FAST Act Freight Funds

Table Key	
ID = Figure 17 Map Identification Letter	**PE** = Preliminary Engineering Amount
PID = ODOT Internal Project Identification Number	**RW** = Right of Way Amount
DIST = ODOT District	**CO** = Construction Amount

ID	PID	DIST	Project Name	Project Description	Costs in Millions		
					PE	RW	CO
2016							
E	87005	1	HAN IR 75 14.39	Reconstruct I-75 from US-68 to CR-99	**$0.43**		
A-1	99737	2	LUC IR 475/Dorr St. interchange	Construct new I-475/Dorr St. interchange	**$1.62**	**$2.81**	
A-3	96482	2	LUC IR 475 0.93 over Monclova Rd.	Replace the bridge deck on I-480 over Monclova Rd. and railroad	**$1.45**		
A-4	95875	2	LUC IR 475 0.09 Widening	Reconstruct and widen I-475 from US-24 to US-20	**$2.76**		
B-1	93594	2	LUC IR 75 1.10	Reconstruct I-75 and widen bridges from South Ave. to Door St.	**$4.39**	**$0.55**	
R-1	93592	2	WOO/LUC IR75 30.70/0.00 Major	Reconstruct I-75 and widen bridges from Glenwood Rd. to Segur Rd./South Ave.	**$6.93**	**$3.92**	
F-1	93501	4	SUM/MED IR 0076 00.00/11.43 DB	Reconstruct and widen I-76 from Medina County line to Central Ave.	**$0.03**		
H	76469	6	FRA IR 270 9.15	Reconstruct and widen of I-270 from Trabue Rd. to US-33	**$0.40**		
K-1	77371	6	FRA IR 71 17.14 (Project 3)	Reconstruct/reconfigure I-71 from I-70 to I-670		**$10.83**	
K-3	81828	6	FRA IR 70 11.78 (Project 6)	Reconstruct/reconfigure the I-70/I-71/ SR-315 interchange	**$0.22**		
K-4	89464	6	FRA IR 70 13.10 (Project 6A)	Construct new ramps from/to the west side of downtown Columbus to I-70		**$4.69**	
K-5	77372	6	FRA IR 70 12.68 (Project 4A)	Reconstruct/reconfigure I-70/71 from SR-315 to the I-70/71 split east of downtown Columbus	**$0.60**	**$0.67**	
K-7	77370	6	FRA IR 70 14.48 (Project 2D)	Reconstruct/reconfigure the I-70 and I-71 interchange east of downtown Columbus	**$0.50**	**$2.40**	**$161.60**
K-8	88035	6	FRA IR 70 15.29 (Project 5)	Reconstruct/reconfigure I-70 from 18th Ave to Fairwood Ave.	**$0.35**		
M-5	92616	6	FRA IR 270 51.500	Reconstruct the I-71/US-23 interchange	**$0.16**		
M-6	84868	6	FRA IR 71 5.29	Reconstruct and widen I-71 from SR-665 to Stringtown Rd.	**$0.29**		
N	93964	8	WAR IR 71 3.62 Western Row Rd.	Reconstruct/reconfigure the I-71/Western Row Rd. interchange		**$3.76**	
O-2	76256	8	HAM IR 75 10.10 (14.61)	Widen and add auxiliary lanes on I-75 from Sharon Rd. to Glendale Milford Rd.		**$3.03**	

Table 13: Freight Projects Eligible for Funding with FAST Act Freight Funds (continued)

ID	PID	DIST	Project Name	Project Description	Costs in Millions		
					PE	RW	CO
2016 (continued)							
O-3	82288	8	HAM IR 75 12.60	Reconstruct I-75 and construct a new local connection from Shepherd Ln. to Glendale-Milford Rd.		**$3.66**	
O-8	88124	8	HAM IR 75 10.10	Reconstruct and widen I-75 from Mill Creek to SR-126	**$0.57**	**$0.23**	
O-9	77889	8	HAM IR 75 7.85	Reconstruct and widen I-75 from SR-562 to SR-126/Galbraith Rd.		**$0.50**	
U	94741	8	HAM IR 71 6.86	Widen and move exit ramps on northbound I-71 through the SR-562 interchange	**$0.17**		
V-1	83723	8	HAM IR 75 3.85	Reconstruct/reconfigure I-75 from Monmouth Ave. to Clifton Ave.		**$2.40**	
V-2	89068	8	HAM IR 75 0.22	Reconstruct/reconfigure I-75 from the Brent Spence Bridge over the Ohio River to Marshall Ave.	**$42.30**	**$38.52**	
2017							
E	87005	1	HAN IR 75 14.39	Reconstruct I-75 from US-68 to CR-99		**$0.97**	**$142.03**
A-2	99731	2	LUC IR 475 1.85 @20A interchange	Reconstruct/reconfigure the I-475/ US-20 interchange	**$0.60**		
A-3	96482	2	LUC IR 475 0.93 over Monclova Rd.	Replace the bridge deck on I-480 over Monclova Rd. and railroad		**$1.00**	**$5.92**
A-4	95875	2	LUC IR 475 0.09 Widening	Reconstruct and widen I-475 from US-24 to US-20			**$51.50**
F-2	96670	4	SUM IR 0076 05.62	Reconstruct/reconfigure I-76 from Central Ave. to 27th St.	**$0.35**	**$3.99**	
G	77269	4	SUM IR 0076 10.00 (Main/Broadway)	Reconstruct/reconfigure the I-76/77 interchanges at Main/Broadway and Wolf Ledges/Grant	**$0.11**	**$0.28**	
S-1	90973	4	STA IR 0077 (9.12)(9.37)	Reconstruct/repair three bridges at the I-77/US-30 interchange	**$1.50**		
H	76469	6	FRA IR 270 9.15	Reconstruct and widen I-270 from Trabue Rd. to US-33			**$66.58**
J	25594	6	FRA IR 70 3.41	Reconstruct and add auxiliary lanes on I-70 from Rome-Hilliard Rd. to Wilson Rd.			**$0.80**
K-12	95639	6	FRA-70-22.61 (FEF 1A)	Reconfigure the southbound I-270 ramp to eastbound I-70	**$0.33**		
K-5	77372	6	FRA IR 70 12.68 (Project 4A)	Reconstruct/reconfigure I-70/71 from SR-315 to the I-70/71 split east of downtown Columbus			**$139.33**
K-6	96053	6	FRA IR 70 14.000 (Project 4B)	Reconstruct/reconfigure I-70 from Front St. to Grant Ave.	**$0.27**		
M-1	92615	6	FRA IR 71 8.87	Construct collector-distributor lanes along I-71 from White Rd. to Dyer Rd.	**$0.48**		

Table 13: Freight Projects Eligible for Funding with FAST Act Freight Funds (continued)

ID	PID	DIST	Project Name	Project Description	Costs in Millions		
					PE	RW	CO
2017 (continued)							
M-6	84868	6	FRA IR 71 5.29	Reconstruct and widen I-71 from SR-665 to Stringtown Rd.			**$0.56**
I	83663	7	CLA IR 70 10.55	Reconstruct and widen I-70 from US-68 to SR-72	**$0.59**	**$0.61**	
N	93964	8	WAR IR 71 3.62 Western Row Rd.	Reconstruct/reconfigure the I-71/Western Row Rd. interchange			**$21.69**
O-3	82288	8	HAM IR 75 12.60	Reconstruct I-75 and construct a new local connection from Shepherd Ln. to Glendale-Milford Rd.			**$99.93**
O-7	88129	8	HAM IR 75 11.09	Replace/reconfigure railroad bridge over I-75 near Galbraith Rd.		**$0.77**	
L	89314	11	BEL-CR 29/Commons Mall Crossing	Construction of a new 1.66 mile connector road over I-70 from Mall Rd. to US-40			**$14.23**
C-3	82380	12	CUY IR 077/090 14.96/16.33 CCG3	Reconstruct/reconfigure the I-90/ I-77 interchange	**$19.65**		
C-4	13567	12	CUY IR 077 14.35 CCG6A	Replace and widen the I-77 bridge over I-490	**$0.58**		
C-5	82388	12	CUY IR 077 13.80 CCG6B	Replace the Broadway (SR-14) bridge over I-77	**$6.23**	**$0.01**	**$35.59**
D	80418	12	CUY/SUM IR 271 00.00/14.87	Reconstruct/widen I-271 from Summit County to Miles Rd.	**$0.58**	**$0.07**	**$5.10**
P	90591	12	CUY IR 480 18.42 L&R Deck	Replace the twin bridge decks on I-480 over the Cuyahoga River Valley	**$24.02**	**$0.05**	
2018							
A-2	99731	2	LUC IR 475 1.85 @20A interchange	Reconstruct/reconfigure the I-475/ US-20 interchange		**$3.80**	
B-1	93594	2	LUC IR 75 1.10	Reconstruct I-75 and widen bridges from South Ave. to Door St.			**$165.18**
K-6	96053	6	FRA IR 70 14.000 (Project 4B)	Reconstruct/reconfigure I-70 from Front St. to Grant Ave.		**$1.00**	
K-8	88035	6	FRA IR 70 15.29 (Project 5)	Reconstruct/reconfigure I-70 from 18th Ave to Fairwood Ave.		**$1.18**	
O-4	88132	8	HAM IR 75 10.87	Reconstruct and widen southbound I-75 from Shepherd Rd. to Galbraith Rd.		**$2.00**	
O-5	88133	8	HAM IR 75 10.62	Reconstruct and widen northbound I-75 from Shepherd Rd. to Galbraith Rd.		**$2.74**	
U	94741	8	HAM IR 71 6.86	Widen and move exit ramps on northbound I-71 through the SR-562 interchange		**$0.37**	**$7.88**
V-1	83723	8	HAM IR 75 3.85	Reconstruct/reconfigure I-75 from Monmouth Ave. to Clifton Ave.			**$172.31**

ID	PID	DIST	Project Name	Project Description	Costs in Millions		
					PE	RW	CO
2018 (continued)							
C-4	13567	12	CUY IR 077 14.35 CCG6A	Replace and widen the I-77 bridge over I-490			**$35.66**
P	90591	12	CUY IR 480 18.42 L&R Deck	Replace the twin bridge decks on I-480 over the Cuyahoga River Valley			**$266.93**
2019							
A-1	99737	2	LUC IR 475/Dorr St. interchange	Construct new I-475/Dorr St. interchange			**$15.45**
F-2	96670	4	SUM IR 0076 05.62	Reconstruct/reconfigure I-76 from Central Ave. to 27th St.			**$18.50**
I	83663	7	CLA IR 70 10.55	Reconstruct and widen I-70 from US-68 to SR-72			**$52.43**
M-8	93496	6	FRA IR 71 0.000	Reconstruct and widen I-71 Madison county line to SR-665			**$61.60**
2020							
A-2	99731	2	LUC IR 475 1.85 @20A interchange	Reconstruct/reconfigure the I-475/ US-20 interchange			**$21.00**
K-1	77371	6	FRA IR 71 17.14 (Project 3)	Reconstruct/reconfigure I-71 from I-70 to I-670			**$42.00**
R-1	93592	2	WOO/LUC IR75 30.70/0.00 Major	Reconstruct I-75 and widen bridges from Glenwood Rd. to Segur Rd./South Ave.			**196.93**
S-1	90973	4	STA IR 0077 (9.12)(9.37)	Reconstruct/repair three bridges at the I-71/US-30 interchange			**$44.00**
O-2	76256	8	HAM IR 75 10.10 (14.61)	Widen and add auxiliary lanes on I-75 from Sharon Rd. to Glendale Milford Rd.			**$0.80**
O-4	88132	8	HAM IR 75 10.87	Reconstruct and widen southbound I-75 from Shepherd Rd. to Galbraith Rd.			**$0.55**
O-8	88124	8	HAM IR 75 10.10	Reconstruct and widen I-75 from Mill Creek to SR-126			**$4.82**
V-2	89068	8	HAM IR 75 0.22	Reconstruct/reconfigure I-75 from the Brent Spense Bridge over the Ohio River to Marshall Ave.			**$951.40**

Table 14 summarizes the costs for the projects in **Table 13** based on the fiscal year in which various phases of the projects are to be completed. As shown, the costs for these projects over the five years of the Investment Plan are more than $3 billion, which far exceeds FAST Act freight funding available to Ohio.

Table 14: Estimated Costs for Ohio's Five Year Freight-Related Projects

Totals (Costs in Millions)				
Year	Preliminary Engineering	Right of Way	Construction	Total
2016	$63.16	$77.97	$161.60	**$302.74**
2017	$55.28	$7.75	$583.26	**$680.86**
2018		$11.09	$647.96	**$659.05**
2019			$147.98	**$147.98**
2020			$1,261.50	**$1,261.50**

STRATEGY FOR USING FAST ACT FREIGHT FUNDS

For federal fiscal years (FFY) 2016 through 2018, ODOT will set aside 10 percent of Ohio's NHFP annual apportionment for projects that improve the flow of freight into and out of freight intermodal or rail facilities (as allowed by the FAST Act). ODOT will use 10 percent of Ohio's NHFP annual apportionment to fund the following project:

- Project ID (PID) 90264 MAR-309 19.59
  - $11.7M of NHFP
  - $1.6M of State Funds

The remaining portion of Ohio's NHFP annual apportionment will be used on the following highway projects:

- Fiscal Year 2016 to 2017: Project ID (PID) 82288 HAM-75-12.60 (Map ID "O")
  - $56.24 M of NHFP
  - $21.9 M of Federal Garvee Bonds
  - $21.7 of State Funds
- Fiscal Year 2018: Project ID (PID) 90591 CUY-480 18.42 (Map ID "P")
  - $30.6 M of NHFP
  - $222.5 M of Federal Garvee Bonds
  - $13.83 M of State Funds
- Fiscal Year 2019: Project ID (PID) 83663 CLA-70 10.55 (Map ID "I")
  - $39.99 M of NHFP
  - $12.44 M of State Funds
- Fiscal Year 2020: Project ID (PID) 77371 FRA-71 17.14 (Map ID "K-1")
  - $41.55 M of NHFP
  - $0.45M of State Funds

INVESTMENT PLAN – NEXT STEPS

ODOT knows the USDOT will be issuing clarification on the eligibility for NHFN funds, specific requirements for Freight Investment Plans within Statewide Freight Plans, and approval of the Critical Rural Freight Corridors (CRFCs) and Critical Urban Freight Corridors (CUFCs) on which FAST Act freight funding may be used. When the associated rulemaking and guidance is released, the Transport Ohio Statewide Freight Plan will be amended as needed to meet FAST Act state freight plan and investment plan requirements.

Committed to Freight

ODOT is in for the Long Haul

As Ohio's economy continues to grow, moving people and freight has become more complicated. Ohio needs a transportation system that will power it ahead. The development of Transport Ohio, the Statewide Freight Plan, and the continuing, coordinated and comprehensive (3C) planning process followed to generate its data and information, demonstrate ODOT's ongoing commitment to meeting this challenge. This includes fully understanding the economic cost and benefits of transportation projects, emphasizing performance, prioritizing investments, and making informed, performance-based choices for the use of freight funding and other resources to tackle the challenges of tomorrow.

Freight patterns are changing at a global and local scale. Through ongoing freight research and planning, ODOT can anticipate trends to more effectively:

- Develop policy making and strategies for the use of funding resources
- Encourage coordination between public and private sectors
- Implement advanced technologies that optimize performance
- Promote efficiency and safety

Efficient freight movement depends on a robust multimodal network to support the economy. The freight strategy presented in Transport Ohio's FAST Act Freight Investment Plan focuses on reducing congestion and addressing chokepoints that drive up the cost of doing business.

PERFORMANCE-BASED DECISION MAKING

ODOT understands that Ohio's transportation challenge is not just funding. For decades, ODOT has adopted and applied quantitative performance measures, such as the "critical success factors" identified in ACCESS Ohio 2040 and discussed in Transport Ohio, as the best way to prioritize the investments needed to create a highly functioning multimodal network. As USDOT formalizes freight performance measures in the FAST Act, ODOT will revise Transport Ohio and integrate these into its existing measures.

COORDINATION WITH STAKEHOLDERS

Any comprehensive plan requires consultation and coordination by all participants. With the globalization of the economy and intermodal shipping, the efficient functioning of Ohio's freight system depends on reliable and seamless freight movements across borders and modes to meet just-in-time expectations. ODOT remains committed to an ongoing freight dialogue with its planning partners, private sector shippers and carriers, modal partners, neighboring governments and other freight stakeholders for this purpose.

REVISIONS TO COME BASED ON USDOT GUIDANCE

Transport Ohio began under the guidance of MAP-21 and was completed after the FAST Act passed in December 2015. ODOT understands that USDOT is in the process of developing more detailed guidance for the implementation of the FAST Act—including freight planning policies.

When the associated rulemaking and guidance is released, Transport Ohio will be revised as needed to meet FAST Act statewide freight plan and investment plan requirements.

After Transport Ohio is submitted to USDOT for approval and further guidance is received, ODOT will continue to work with its MPOs and stakeholders to designate the CUFCs and the CRFCs of the NHFN miles.

Per current regulations, Transport Ohio will be updated in five years.

Footnotes

[1] http://www.dot.state.oh.us/Divisions/Planning/SPR/StatewidePlanning/access.ohio/Pages/documents.aspx

[2] Freight Facts and Figures 2012, FHWA, p.12

[3] Ohio Statewide Freight Study, 2012, based on Federal Highway Administration (FHWA), Freight Analysis Framework Version 3 (FAF3) database

[4] FHWA Freight Analysis Framework Version 3 (FAF3). Ohio outbound traffic ranked 8th by tonnage but 6th by value, and inbound traffic ranked 6th by both measures

[5] FAF3 2007 data

[6] See summaries of stakeholder input from Access Ohio 2040 and Ohio Statewide Freight Study

[7] https://development.ohio.gov/files/research/E1000.pdf

[8] FAF3 and Ohio Statewide Freight Study

[9] http://www.dot.state.oh.us/trac/Pages/Default.aspx

[10] http://jobs-ohio.com

[11] Gross State Product (GSP) is the state counterpart similar to Gross Domestic Product (GDP) for a nation—the Bureau of Economic Analysis's (BEA) main measure of U.S. output. U.S. GDP = Real gross domestic product—the output of goods and services produced by labor and property located in the United States; real state GDP are calculated to show chained dollars so values are not double counted by multiple states. http://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm

[12] http://bea.gov and http://development.ohio.gov/files/research/E1000.pdf ; http://www.bea.gov/regional/bearfacts/pdf.cfm?fips=39000&areatype=STATE&geotype=3

[13] http://bea.gov

[14] USDOT Research and Innovation Technology Administration, "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy." Data based on North American Industrial Classification [NAICS])

[15] Area Development, Corporate Executive Survey issue, winter 2013

[16] http://development.ohio.gov/reports/reports_industry_series.htm and http://development.ohio.gov/files/research/B1006.pdf

[17/18] http://jobs-ohio.com/images/aerospace_aviation_aug13.pdf

[19] http://jobs-ohio.com/images/Automotive_2014v2.pdf

[20] Lean management practices means that limited inventory is held on site and to keep manufacturing processes running they depend on the Just-In-Time (JIT) delivery of goods

[21] http://jobs-ohio.com/polymers

[22] Access Ohio 2040, Economic Trends Analysis Tech Memo 1, p.19

[23] www.development.ohio.gov

[24] FAF3 2007 data

[25] Just-In-Time (JIT)—lean inventory—is a business logistics management concept that focuses on maintaining limited inventories and therefore reducing the amount of money invested in supplies setting in a warehouse or supply house before the materials, components or products are actually needed for production or sale. This results in components and materials needed for production, being delivered as needed and products or materials shipped to users as requested

[26] Ohio Statewide Freight Study (Section 2.3 p.26)

[27] Ohio Statewide Freight Study (Figure 2–6 p.27)

[28] Economic trends section is based on a synthesis of research conducted by IHS Global Insights and Economic Development Research Group

[29] U.S. Department of Commerce, Bureau of Economic Analysis, GDP by industry; http://www.bea.gov/iTable/index_industry_gdpIndy.cfm

[30] Peterson Institute for International Economics, for the Office of U.S. Trade Representative, 2012

[31] Theodore P. (Ted) Stank and J. Thomas Mentzer; http://logisticsquarterly.com/issues/12-1/article3.html

[32] Energy Information Administration, Annual Energy Outlook 2013, Natural Gas; http://www.eia.gov/forecasts/aeo/cource_natural_gas.cfm

[33] Ohio Development Services (ODS) Annual Report 2014

[34] Source: U.S. Bureau of Economic Analysis; http://bea.gov/newsreleases/regional/gdp_state/gsp_newsrelease.htm

[35] IHS Global Insight for the United States Conference of Mayors, U.S. Metro Economies: Exports in the Next Decade, February 2012

[36] http://jobs-ohio.com

[37] ODSA, Advanced Manufacturing_2014

[38] http://jobs-ohio.com/energy

[39] Attributed to Shirley Franklin in "Planning for Mega-Regions", Fleming, Billy, The New Planner. Winter 2012 American Planning Association

[40] America 2050 Prospective, p.4

[41] Ross, C., & Woo, M., "Mega-Regions and Mobility." The Bridge. National Academy of Engineering. Vol 41, No 1 Spring 2011: pp. 27–34

[42] Merck Manual, "Aging and Drugs," Consumer Version

[43] U.S. Dept. of Transp., Fed. Highway Admin. (FHWA), Freight Facts and Figures Report 10 (2012); U.S. Dep't. of Transp., Research and Innovative Tech. Admin. (RITA), Transp. Statistics Annual Report 1 (2012)

[44] Stanley, Guy, "Review of Recent Reports on North American Transportation Infrastructure." North American Transportation Competitiveness Research Council, Working Paper 3

[45] USDOT, Improving the Nation's Freight Transportation System, Findings and Recommendation of the Special Panel on 21st Century Freight Transportation, House Committee on Transportation and Infrastructure, October 2013

[46] FHWA Conditions and Performance Report, pp. 2–8

[47] Financing Federal-Aid Highways; https://www.fhwa.dot.gov/policy/olsp/financingfederalaid

[48] https://www.sustainablehighways.org

[49] TRB annual meeting, 2013, Washington, D.C. statement presentation by Dan Murray, Vice President, American Transportation Research Institute (ARTI) the research arm of the American Trucking Associations (ATA)

[50] http://www.federalnewsradio.com/615/3631934/How-Google-got-states-to-legalize-driverless-cars

[51] See National Freight Policy (23 USC 167) and Access Ohio 2040 for national and Ohio goals, respectively

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