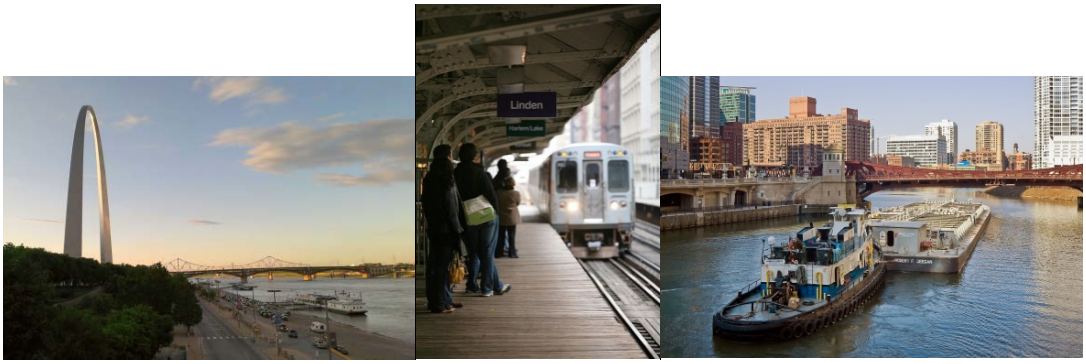
MIDWEST TRANSPORTATION WORKFORCE CENTER

Job Needs and Priorities Report: Phase 1



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INTRODUCTION AND OVERVIEW

As with any industry, the transportation industry faces challenges finding the best available employees to do the needed work. The purpose of this report is to identify areas in which skill development is most important for employees, as well as key transportation careers in the Midwest region* of the United States that should be the focus of workforce development efforts in the next ten years. However, while focusing on transportation workforce needs, it is also important to understand challenges that will be faced when looking to improve the workforce. Participants of the 2012 National Transportation Workforce Summit organized by the Council of University Transportation Centers (CUTC) identified four major challenges to the transportation workforce (Council of University Transportation Centers 2012). These challenges include:

- Demographic changes, particularly retiring baby boomers.
- Career awareness and recruitment.
- New technologies and the need for operators and managers who can use them.
- Changing demands and priorities of transportation agencies requiring a workforce with broader, new skills.

Most of these challenges are not unique to the transportation sector. For example, the retirement of baby boomers is a major challenge that affects all mature industries across the nation (Warne 2005). The retirement of this large group of workers is in itself problematic due to the large number of positions that will need to be filled. However, this problem is also exacerbated by demographic differences in those who are available to fill the open positions. Lack of understanding about the transportation industry could also contribute to the challenges. For example, the workforce is more diverse than it has been in the past and recruiting and retaining women in transportation organizations has been a challenge due to a lack of career interest in transportation (Agrawal & Dill 2008), few female role models in transportation careers (Rivera et al. 2007), and negative perceptions of the industry, such as a gender barrier and lack of flexibility (Dainty et al. 2004). Further, the younger generation of employees, not just women, typically expects more support from their employers with respect to flexibility and work-life balance (Zemke et al. 2000). Because this has not been important to previous generations of transportation workers, occupations and organizations are often not currently structured to offer these elements to employees.

Technology advancements are changing the way transportation infrastructure is designed, built, and operated as well as the way transportation systems use contributes to economic growth. For example, computerized manufacturing and inventory management systems have completely changed the role of transportation in supply chain logistics. The U.S. air transportation industry is currently experiencing the implementation of NextGen, the ongoing and wide-ranging update to the National Airspace System. NextGen utilizes new technologies and is radically transforming how work is done. Other modes of transportation are also experiencing changes in the types of technology and equipment used to do work. Another example is the research and testing of connected vehicle technology, driverless car and truck testing that is fundamentally changing occupations related to the maintenance of the vehicles. With increases in the usage of computers and computerized equipment, employees who are able to work with the new technology are needed. Further, technology changes, new safety requirements, and changing legislation place additional burden on transportation organizations because they need to be able to meet changing requirements to be successful.

These transportation workforce challenges exist across the nation as a whole, and experiences in the Midwest region of the United States are no different. These same challenges are

* For the purposes of this report, the Midwest region includes nine states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

experienced when working to develop a high-quality transportation workforce in this region. This report emphasizes workforce needs and priorities in the Midwest region now and emerging in the future. It provides an overview of the transportation industry in the Midwest and specific workforce needs for the region within the road, water and rail modes. It provides information about the key types of transportation occupations in the region currently as well as job projections for these occupations for the next ten years. Based on these findings, skills required for key occupations will be identified, including skills that need additional training and development based on the experiences of transportation stakeholders within the region.

Methodology

The methodology for developing this report includes several key phases, which are described below.

Background review. Our team identified and analyzed information from federal, state, and private sector research, technical reports, conference presentations, case studies, and human resources documents (e.g., position descriptions, job advertisements, career ladders, trainings, and strategic plans). The objective was to characterize the transportation industry and employment trends in the Midwest. Results increased our team's overall understanding of the region's transportation workforce and related issues. We used this information to evaluate transportation occupations by three criteria: *high-wage*, *high-skill*, and *high-demand*.

Engage stakeholders. Next, we engaged transportation industry stakeholders throughout the region—both public and private partners—who are specifically knowledgeable about transportation occupations. We leveraged our contacts within state departments of workforce development, departments of transportation, economic development associations, industry associations, workforce investment boards, labor unions, higher education systems (colleges and universities), technical education systems (community and technical colleges), and major employers throughout the region to gather input from stakeholders. In addition to face-to-face meetings and teleconferences, we hosted a two-day Strategic Advisory Meeting in April 2015 and a Regional Workforce Summit in December 2015. The broad range of participants discussed the burning issues and concerns of both the public and private sectors of the transportation industry. We engaged stakeholders in all modes to identify critical job functions, workforce development activities, recruitment and retention challenges, diversity challenges, targeted labor pools, and workforce trends over the next ten years. We identified common challenges and some innovative strategies underway to address these challenges. Results of this phase helped us define the workforce at the regional level and create a list of critical workforce occupations.

Estimating regional workforce demand for occupations. The project team used real-time job postings, ten-year projections from the Bureau of Labor Statistics (BLS), and a summary of future trends gleaned from stakeholder interviews to compile a picture of future regional workforce demand. These analyses demonstrated an unequivocal, across-the-board demand for truck drivers and support staff, especially diesel mechanics, in the public and private sectors. The team also examined a proposed expansion of the inland waterway system in the Midwest, which has the potential to enlarge the maritime workforce and subsidiary manufacturing and service sectors. The project team also considered the effects of overdue infrastructure improvement projects across the nine-state region, especially highways and bridges, which would impact construction worker demand. The implications of increasing global free trade were also considered to include a corresponding increasing demand for supply chain and logistics professionals.

The following sections provide a preliminary overview of our research data as well as areas where we are requesting additional input from stakeholders.

THE TRANSPORTATION INDUSTRY IN THE MIDWEST

The Midwest region includes nine states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio and Wisconsin.

This section includes the data, descriptions, and characterizations of the multimodal transportation network in the Midwest states. This extensive multimodal network serves both passengers and freight movement.

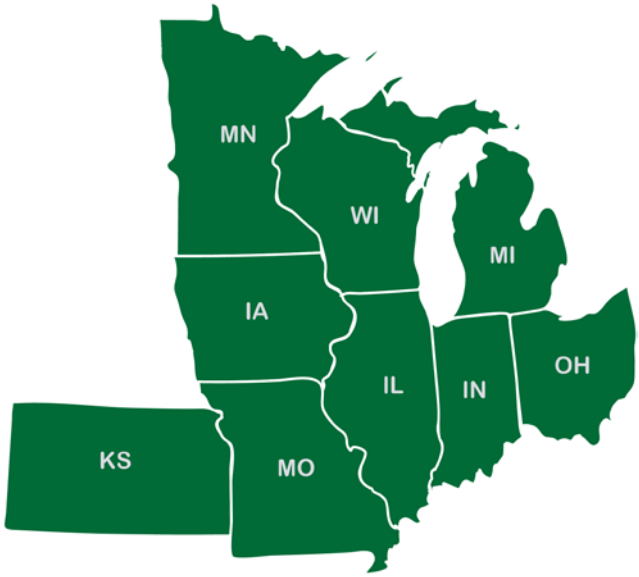

Figure 1. Midwest Transportation Workforce Region

Figure 1 provides a geographic overview of the states included in the Midwest region. Table 1 details the region's population, land area, and transportation infrastructure information. This region covers 528,888 square miles, approximately 14 percent of the United States. These states are home to 64,270,948 residents, approximately 20 percent of the U.S. population (U.S. Census Bureau 2014). Three of the 15 most densely populated areas in the United States are in this region: Chicago, Indianapolis and Columbus. Additionally, major metropolitan areas exist in each of these states (U.S. Census Bureau 2014). Only one state in the region, Ohio, makes the list of the top ten most densely populated states. Other states ranking near the top ten most densely populated states include Illinois (12th), Indiana (16th), and Michigan (17th). These states are moderately sized, contain both rural and urban areas, and demonstrate geographic, economic, and resource variance. This variation can be assumed to affect the dynamics of the transportation system as well as the corollary workforce composition.

Table 1. Overview of Population and Transportation Information by State for the Midwest Region (Bureau of Transportation Statistics 2014a; Bureau of Transportation Statistics 2014b)

State	Population	Land Area (Sq. Miles)	Public Road Miles	Commuters Using Public Transit	Freight Railroad Miles	Inland Waterway Miles
Illinois	12,880,580	55,519	144,337	8.5%	7,027	1,100
Indiana	6,596,855	35,826	97,289	1.1%	4,273	350
Iowa	3,107,126	55,857	114,387	1.1%	3,855	490
Kansas	2,904,021	81,759	140,614	0.6%	4,855	120
Michigan	9,909,877	56,539	122,051	1.3%	3,632	0
Minnesota	5,457,173	79,627	138,833	3.3%	4,449	260
Missouri	6,063,589	68,742	131,978	1.3%	3,958	1,030
Ohio	11,594,163	40,861	123,281	1.6%	5,338	440
Wisconsin	5,757,564	54,158	115,094	1.8%	3,385	230

As is typical across the U.S. transportation system, public investment and demand centers on highways and their associated car and truck freight movements in this region. According to the Bureau of Transportation Statistics (2012), the nine states accounted for 635 billion passenger vehicle miles travelled (VMT). Ohio ranked third in the country with 112 billion VMT, followed by Illinois at 8th with 104 billion, Michigan at 10th with 94.5 billion and Indiana at 12th with 78.9 billion VMT. Missouri ranked 15th with 68.5 billion VMT followed by Wisconsin (18th) at 59 billion and Minnesota (19th) at 57 billion. Iowa's VMT totaled 31 billion (31st) and Kansas (33rd) had 30.6 billion.

The Midwest region plays a major role in the nation's transportation, economic, and social systems. With more than a million public road miles, approximately 64 percent of all freight tonnage is moving on the highways. Clearly, highways, whether for personal vehicles or commercial trucks, dominate the system. Each of these states also has significant marine, rail, and aviation systems that move both freight and people. In addition to passenger demands, the region boasts three major U.S. rail hubs, access to nearly all of the marine systems through the Great Lakes and Mississippi systems, and critical freight aviation facilities.

With this extensive multimodal regional transportation system, the total transportation expenditures by state and local governments in the Midwest region exceed $42 billion per year (U.S. Census Bureau 2011; U.S. Department of Commerce 2012). This makes up approximately 18 percent of the $241 billion spent by state and local governments within the United States. The Midwest region contributes 21.1 percent of funds in the United States for highways, 10.6 percent of total funds for transit, 15 percent of funds for air, and approximately two percent of total funds for water transportation. With this modal distribution, major transportation employers in the area include the full range of possible occupational positions. Just a sample of occupations would include the state and local department of transportation workforce together with rail, transit, marine, and aviation system employees, as well as drivers, educators, and researchers. These occupational areas are supplemented with a strong presence of transportation-dependent industries such as agriculture, natural resources, manufacturing, and supply chain logistics.

Table 2. Budget by State and Mode (Millions of Dollars) (Bureau of Transportation Statistics 2014a)

State	Total	Highway	Transit	Air	Water
Illinois	$11,807	$7,149	$3,435	$1,223	--
Indiana	$3,215	$2,713	$170	$312	$20
Iowa	$2,347	$2,128	$108	$111	--
Kansas	$1,879	$1,759	$49	$71	--
Michigan	$4,640	$3,565	$614	$460	--
Minnesota	$4,225	$3,603	$281	$311	$30
Missouri	$3,991	$3,250	$425	$315	$2
Ohio	$6,264	$5,090	$787	$356	$30
Wisconsin	$4,418	$3,734	$386	$277	$21
Total	**$42,787**	**$32,991**	**$6,255**	**$3,437**	**$104**

Two states provide examples of how the breadth of the region's multimodal systems affects workforce composition needs. The transportation system in Missouri requires employees to maintain more than 131,000 miles of state facilities, including eight interstate highways, approximately 3,958 miles of the national freight network mileage, two major airports, and 17 railroads. This system also includes 15 public ports and more than 200 private docks along the Mississippi and Missouri rivers. If all public roads are considered, a state such as Illinois must maintain more 144,000 miles of roadway. Illinois also has the Chicago rail network, the largest rail hub in the United States, freight systems on the Mississippi and Illinois rivers, as well as the Great Lakes maritime transportation system. Chicago is also home to Chicago O'Hare International Airport, ranked second worldwide in terms of aircraft landing and take-off. The Midwest region includes nine designated Marine Highway Routes created to support maritime freight movement. These states also contain the second and third largest rail hubs at Kansas City and St. Louis. Roughly 63 percent of the nation's rail tonnage moves through the area. Nearly 24 percent of the nation's Primary Freight Network, as designated by USDOT in MAP-21, lies within this region.

The Midwest supports significant transportation systems that require a diverse and broad-based transportation workforce. Although the skills and knowledge requirements for the various jobs will differ, key skills will likely overlap across many of these varied occupations.

Ports of Entry to the Midwest

A port of entry is a designated area where a customs officer is authorized to accept entries of merchandise, collect duties, and enforce customs and navigation laws (19 C.F.R. § 101.1). US Customs and Border Patrol (CBP) is responsible for screening all foreign visitors, returning American citizens, and imported cargo at these facilities (Pew 2015).

The Midwest region has both border and inland ports of entry. Inland ports of entry are typically international airports, whereas border ports of entry are land or rail crossings. Figure 2 shows the locations of ports of entry in the Midwest region (Pew 2015).

The Midwest region shares a border with Canada and thus has a number of border ports of entry. Border crossings in Minnesota and Michigan that qualify as ports of entry are listed in Table 3. This table characterizes the activity at these border ports of entry, showing mode by mode variance. Detroit is the region's busiest border crossing. The number of modes in which an individual or cargo can cross a border of entry (e.g., trucks, trains, busses, car, or on foot) increases the role and required staffing required for CBP.

The Midwest region has fresh water ports on the Great Lakes and the Ohio and Mississippi Rivers that serve as important ports of entry through the Saint Lawrence Seaway and the Gulf Coast.

Table 4 shows the Great Lakes and river ports that support both domestic and international shipping. The ports of St. Louis and Cincinnati are not ports of entry but are listed because of their important contribution to domestic shipping on inland waterways.

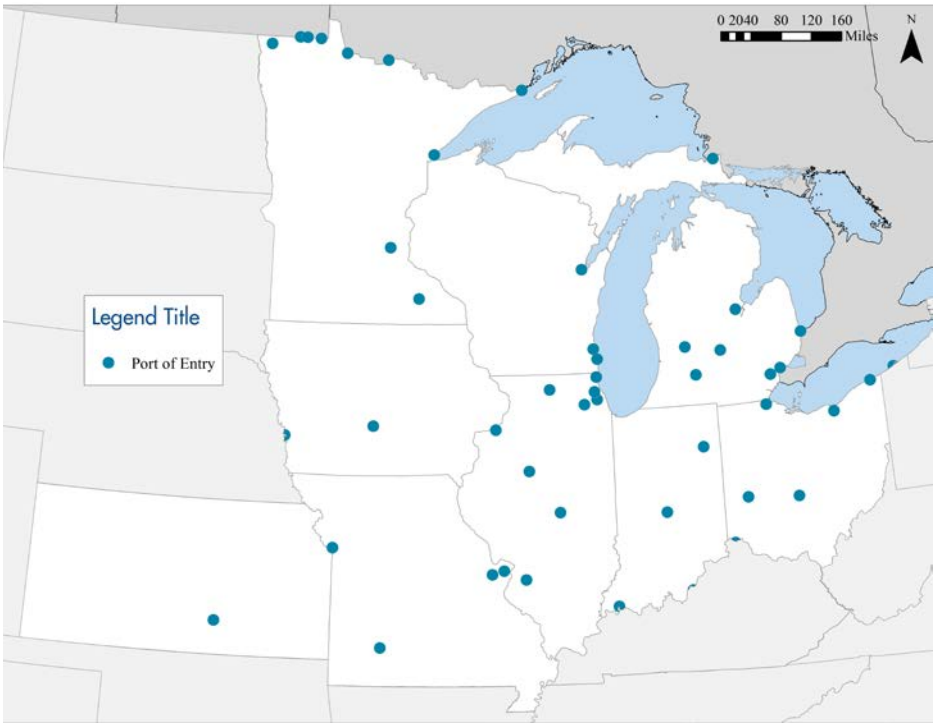

Figure 2. Midwest Ports of Entry (Mid-America Freight Coalition 2014)

Table 3. 2014 Border Ports of Entry in the Midwest Region (Bureau of Transportation Statistics 2015)

Port of Entry	Trucks	Trains	Train Pass.	Buses	Bus Pass.	Personal Vehicles	Personal Vehicle Pass.
MI: Detroit	1,554,152	2,181	6,884	21,247	260,497	4,027,427	7,049,603
MI: Port Huron	778,268	4,074	10,001	2,958	79,070	1,975,750	3,864,165
MI: Sault Ste. Marie	38,932	361	694	3,761	39,494	941,615	1,745,628
MN: Baudette	6,268	1,074	2,127	44	1,120	171,583	296,255
MN: Grand Portage	16,640	0	0	1,325	20,387	324,896	524,485
MN: International Falls	16,528	3,333	6,666	257	6,619	511,600	799,441
MN: Lancaster	5,496	0	0	42	636	35,657	74,643
MN: Pinecreek	643	0	0	0	0	5,811	10,039
MN: Roseau	8,805	0	0	0	0	46,235	71,555
MN: Warroad	8,729	3,222	7,745	414	6,323	142,242	170,092

Table 4. 2013 Ports by Cargo Volume in Short Tons (USACE 2013)

	Total Trade	Domestic	Foreign	Exports	Imports
Duluth-Superior, MN and WI	36,477,257	28,729,476	7,747,781	659,886	7,087,895
St. Louis, MO and IL	33,574,650	33,574,650	0	0	0
Two Harbors, MN	16,709,479	16,579,501	129,978	0	129,978
Chicago, IL	15,428,892	13,862,867	1,566,025	1,475,235	90,790
Detroit, MI	12,981,468	10,656,033	2,325,435	2,222,427	103,008
Indiana Harbor, IN	12,354,161	12,050,259	303,902	303,902	0
Cincinnati, OH	11,682,473	11,682,473	0	0	0
Cleveland, OH	11,454,092	9,925,787	1,528,305	1,459,648	68,657
Toledo, OH	8,836,985	4,078,044	4,758,941	3,041,967	1,716,974
Gary, IN	8,669,252	8,521,929	147,323	147,323	0

Port of entry status can also be combined with foreign trade zone designation (FTZ) to encourage local economic activity (15 C.F.R. § 400.1). FTZs increase the number of options available to users when applying tariffs to imports. The ability to manage tariff options is an attractive development incentive and can encourage business and industrial clusters to locate in proximity to support importers.

Marine Highways

The United States is poised to expand its inland waterway freight system. The Midwest region contains nine of the nation's Marine Highways. As such, the Midwest Transportation Workforce Center (MTWC) is focusing on the emerging workforce demands and development challenges as these Marine Highways develop.

Figure 3 shows the designated marine highways that traverse the Midwest region. According to the Maritime Administration, America's Marine Highway System consists of more than 29,000 nautical miles of navigable waterways including rivers, bays, channels, the Great Lakes, the Saint Lawrence Seaway system, and coastal and open-ocean routes. This system was established by the Energy Independence and Security Act of 2007 and the Coast Guard and Maritime Transportation Act of 2012.

A marine highway project can be a planned service, or expansion of an existing service, on a designated Marine Highway Route. The benefits of marine highway projects include: new modal choices to shippers of cargo, reduction in transportation costs, and public benefits including reduced air emissions, reduced road maintenance costs, and improved safety and resiliency impacts. One project, to upgrade primary routes for new container-on-barge service in the Midwest region, is on the Mississippi and Illinois rivers. These river routes, designated as M-35 and M-55 respectively, connect Chicago and Minneapolis to New Orleans. Development of these Marine Highways will expand employment opportunities for a new generation of maritime workers.

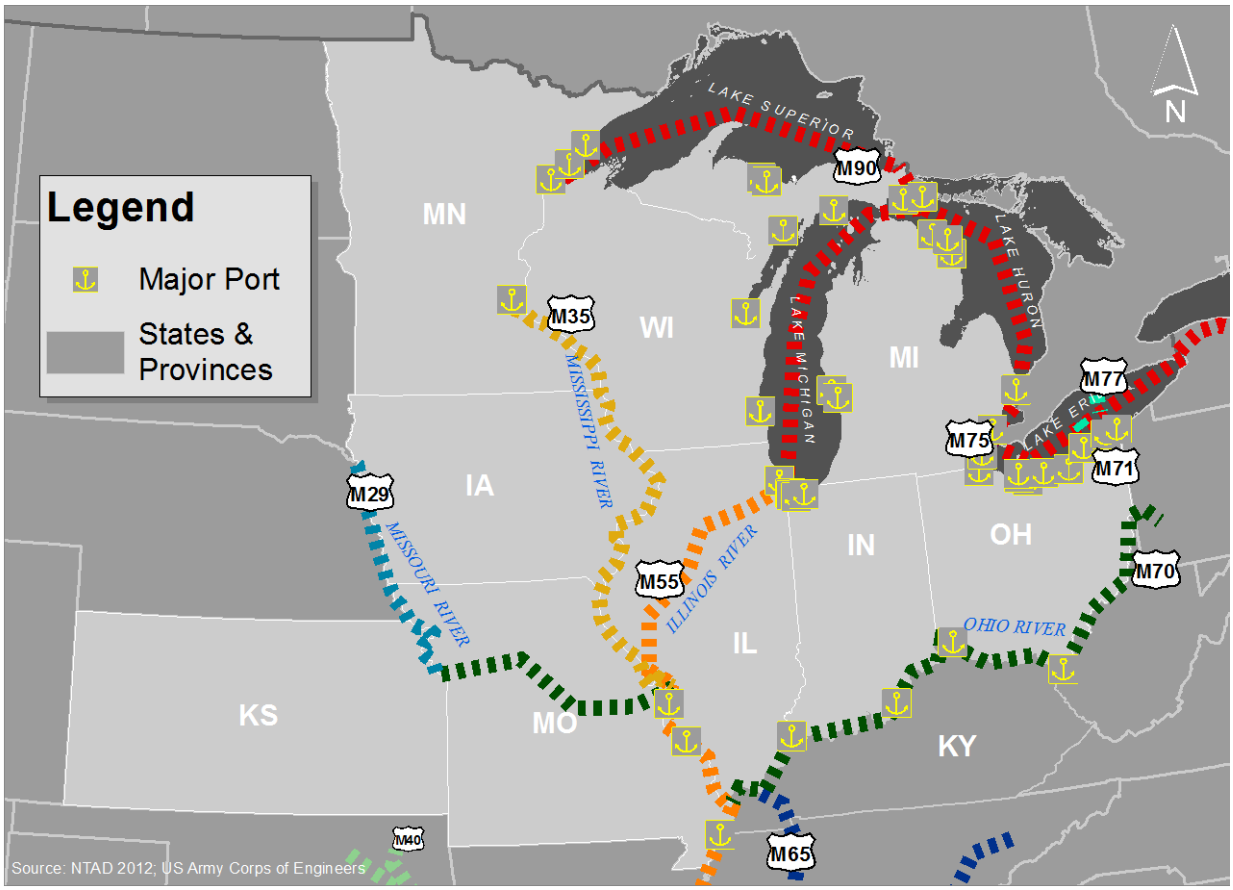

Figure 3. Marine Highway Routes in the Midwest (Mid-America Freight Coalition 2014)

These Marine Highways will bring new jobs on vessels, at ports, and in shipyards. If the Marine Highway system is developed to capacity, the demand for workers with skills to operate fresh water vessels and ports will greatly increase. According to O'Connell and Brock (2013), occupations with the greatest demand will be barge personnel, deckhands, engineers, pilots, and captains. This expansion will also result in a need for fleet modernization and system rehabilitation. Other impacts may include increased manufacturing of marine equipment and vessels.

Table 5 lists the tonnage moved per state on the waterways. At just over 30 million tons in Wisconsin, and certainly over 90 million tons in Illinois, these are significant waterborne freight systems across these states. These systems not only require the barge- and tow-specific crews and navigation support, other needs include infrastructure to connect rails and highways to ports, equipment to handle container cargo, fueling, and fleeting. The expansion of the use of

the region's waterways will only serve to increase demand for these types of workers and occupations.

Table 5. State Water Tonnages in Thousand Short Tons (USACE 2013)

State	Total	Domestic Shipping	Foreign Shipping	Domestic Receiving	Foreign Receiving	Intrastate
Illinois	92,015	68,424	91	16,239	1,475	5,786
Indiana	64,922	18,722	21	43,215	1,033	1,930
Iowa	7,861	4,552	-	3,257	-	53
Kansas	391	391	-	-	-	-
Michigan	58,222	19,950	5,459	19,979	3,471	9,364
Minnesota	41,466	30,441	2,230	7,194	316	1,286
Missouri	36,979	26,899	-	6,197	-	3,883
Ohio	93,749	17,102	6,321	54,048	5,466	10,812
Wisconsin	34,225	18,893	5,958	7,018	2,341	15

MODE BY MODE DESCRIPTIONS OF THE MIDWEST REGION

Highways

The nation's road system is functionally classified by the Federal Highway Administration (FHWA) as: the Interstate Highway System, other freeways and expressways, arterials, collectors, and local roads. In addition to moving people, these facilities also serve the other modes by providing important connectivity at airports, rail or truck terminals, railway stations, and ports. The United States contains the largest highway system in the world, covering over 4.09 million miles (U.S. Census Bureau 2012).

The Midwest region encompasses 1,127,915 miles of total road miles, approximately 27 percent of the total road miles in the United States. This includes 10,930 miles of interstate highway, which is 23 percent of the interstate highway mileage in the country. There are more than 106,000 miles of principal and minor arterials, 235,774 miles of major and minor collectors, and more than 774,000 miles of local roads. Approximately 21 percent of the roads in the Midwest region are urban, with nearly 79 percent classified as rural. Again, this diversity in urban and rural transportation systems, passenger and freight systems, seasonal weather variation, diverse natural resources, manufacturing, and industry provide a wide range of transportation workforce needs (Bureau of Transportation Statistics 2014b).

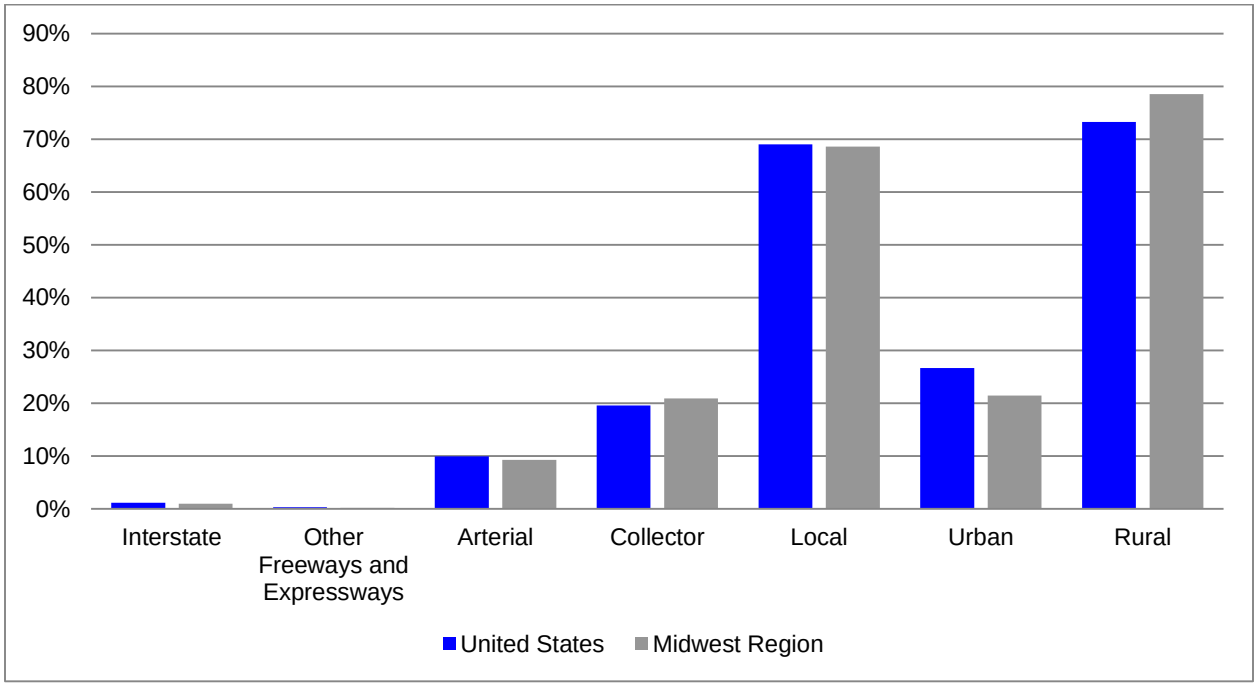

Figure 4. Percentage of Roadway Types in the Midwest and United States (U.S. Census Bureau 2012)

Freight movement on the highway is the primary logistics driver in the United States. According the USDOT Freight Analysis Framework 4 (Federal Highway Administration 2015):

> 17.0 billion tons of goods worth about $17.9 trillion were moved on the transportation network, which equates to 47 million tons of goods valued at more than $49 billion a day moved throughout the country on all transportation modes—compared to $45 billion per day in 2007. Trucks remain the most commonly used mode to move freight, transporting

64 percent of the weight and 71 percent of the value in 2012—compared to 65 percent of the value in 2007.

Freight movement on trucks alone accounts for more $11 billion in goods moved per year (Federal Highway Administration 2013).

On a state-by-state basis, Illinois highways carry the most freight in the region.

Table 6 shows the freight tonnage moved by truck per state. Figure 5 shows the major freight corridors in the region as defined by FHWA.

Table 6. State Truck Tonnages in Thousand Short Tons (Freight Analysis Framework 3.6 2013)

State	Total	Within	From	To
Illinois	850,936	525,886	138,046	157,240
Indiana	554,416	305,750	115,764	132,192
Iowa	413,986	297,621	64,325	69,971
Kansas	303,754	194,322	55,886	62,366
Michigan	478,429	294,132	80,084	87,500
Minnesota	410,109	276,517	56,415	66,322
Missouri	431,359	263,074	71,530	80,888
Ohio	659,995	407,091	119,390	131,929
Wisconsin	369,321	222,620	67,985	76,690

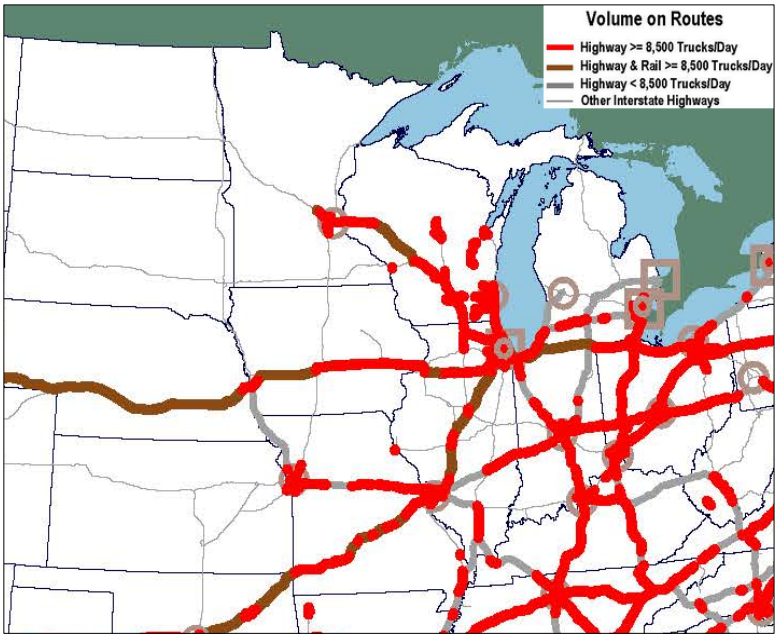

Figure 5. Midwest Freight Routes (Federal Highway Administration 2013)

While the dominance by trucking is apparent, there is a high degree of interdependency between intermodal connections and other modes, warehousing, and logistics. Combined, passenger travel and cargo movement create the demand for a range of occupations: truck

drivers, highway engineers, construction trades, planning and operations, and warehousing and logistics.

Bridges on the nation's highways are a critical and often overlooked piece of infrastructure that creates the demand for additional professions specific to structural engineering, maintenance, and hydraulic management. There are 184,505 bridges in the Midwest region (Table 7). This represents 30.5 percent of the 605,471 bridges in the United States (Federal Highway Administration 2014). Of the bridges in the region, 20,283 are structurally deficient and 17,641 are functionally obsolete. This represents 33 percent of all structurally deficient bridges and 20.9 percent of all functionally obsolete bridges nationwide (Federal Highway Administration 2014).

Table 7. Bridge Totals and Condition in the Midwest Region (Federal Highway Administration 2014)

State	All Bridges	Structurally Deficient	Functionally Obsolete
Illinois	26,588	2,216 (8.3%)	1,971 (7.4%)
Indiana	19,019	1,902 (10.0%)	2,201 (11.6%)
Iowa	24,300	5,022 (20.7%)	1,183 (4.9%)
Kansas	25,085	2,416 (9.6%)	1,813 (7.2%)
Michigan	11,072	1,295 (11.7%)	1,754 (15.8%)
Minnesota	12,961	830 (6.4%)	363 (2.8%)
Missouri	24,385	3,310 (13.6%)	3,145 (12.9%)
Ohio	26,986	2,080 (7.7%)	4,452 (16.5%)
Wisconsin	14,109	1,212 (8.6%)	759 (5.4%)
Region Total	**184,505**	**20,283 (11.0%)**	**17,641 (9.6%)**

As a region, the percentage of functionally obsolete bridges is lower than the national percentage; 9.6 percent of the bridges are functionally obsolete compared to 13.8 percent nationwide. The percentage of structurally deficient bridges in the Midwest region is slightly higher than the national percentage; 11.0 percent of the bridges are structurally deficient compared to 10.3 percent nationwide. Iowa, Michigan, Missouri, and Ohio are above the nationwide benchmarks on at least one of these two metrics. Missouri reports that as many as six bridges a year will be closed due to deficient conditions and the state has generated a list of bridges in critical condition that has more than 600 bridges listed (Missouri DOT 2015). This, paired with a fact that one-third of the nation's structurally deficient bridges are in the Midwest region, suggests that there will be an above-average demand for workers who are familiar with traditional as well as newer forms of bridge construction and maintenance.

Transit

Public transit typically includes city busses, trolleys, trams or light rail, rapid transit, passenger trains, and ferries. Bus systems operate on normal roads and require less additional infrastructure. Buses and bus systems are often used in smaller cities and towns and are also used to supplement other means of transit in large cities. The other transit modes require integrated or separated systems with their own

logistics, management, and operations. Trains, particularly those in rapid-transit systems, provide the ability to move a high capacity of individuals for short or long distances. But, because they have full-grade separation from other traffic, they require additional infrastructure, including the building and maintenance of track, signaling, and stations. Light rail systems are not fully separated from traffic, operating typically at street or curb level on existing streets and are often integrated into rapid-transit systems. Ferry crossings are also common across the region, often crossing the Mississippi River system in rural areas, or providing cross-lake service. These smaller system components provide unique and critical services to these areas and create general as well as unique workforce needs.

Table 8 details commuting patterns and transit use of Midwest region residents. Driving alone to work is the dominant commuter mode. Rates for driving alone fall between a low of 73 percent of all commuters in Illinois to a high of more than 83 percent of commuters driving alone to work in Indiana and Ohio. The variation in public transit use in the Midwest region ranges from less than 1 percent in rural, low density states such as Kansas to more than 9 percent in Illinois, where this statistic is driven largely by the excellent transit availability and access in the Chicago metropolitan area.

Table 8. Commuters in the Midwest Region (U.S. Census Bureau 2014)

State	Drove Alone	Carpooled	Public Transportation	Walked	Taxi, Motorcycle, Bicycle or Other Means	Worked at Home
Illinois	73.45%	7.98%	9.40%	3.08%	1.71%	4.37%
Indiana	83.15%	9.01%	1.07%	1.99%	1.40%	3.37%
Iowa	80.81%	8.61%	1.04%	3.36%	1.42%	4.76%
Kansas	82.14%	9.50%	0.49%	2.46%	1.38%	4.03%
Michigan	82.31%	8.93%	1.53%	2.23%	1.34%	3.66%
Minnesota	77.70%	8.81%	3.66%	2.91%	1.79%	5.12%
Missouri	81.77%	8.87%	1.56%	2.08%	1.32%	4.40%
Ohio	83.56%	7.83%	1.70%	2.19%	1.09%	3.64%
Wisconsin	80.88%	8.17%	1.90%	3.22%	1.76%	4.08%

Of the Midwest residents commuting and using public transit, there is considerable variance in the types of transit used. Most of this variability is a function of availability. Except in a few highly developed urban areas, only one transit mode is provided: bus systems. In many parts of these Midwest states, it has long been argued the population density and rural-ness inhibits greater transit growth. Chicago and its suburbs are clearly the leader in transit availability and use. Of those using public transportation in Illinois, 54 percent use buses, 33 percent use heavy rail, and 10 percent use commuter rail. Urban centers in Minnesota, Missouri, and Wisconsin provide the next highest levels of transit availability and use. In Minnesota, 86 percent of transit users ride the bus, 10 percent use light rail, and less than 1 percent use commuter rail. In Missouri 73 percent of transit users ride the bus, nearly 25 percent use the light rail system in

St. Louis. And, in Wisconsin, 97 percent of transit users are riding the bus, with less than 1 percent on light rail.

Table 9. Public Transit Commuters by Mode in the Midwest Region (Bureau of Transportation Statistics 2014a)

State	Bus	Heavy Rail	Light Rail	Commuter Rail
Illinois	54.5%	33.5%	0.0%	10.8%
Indiana	86.1%	0.0%	0.0%	10.7%
Iowa	95.8%	0.0%	0.0%	0.0%
Kansas	90.9%	0.0%	0.0%	0.0%
Michigan	92.2%	0.0%	0.0%	0.0%
Minnesota	86.6%	0.0%	10.3%	0.7%
Missouri	73.1%	0.0%	24.8%	0.0%
Ohio	86.8%	5.5%	2.5%	0.0%
Wisconsin	97.4%	0.0%	0.1%	0.0%

Bus ridership dominates the transit modes securing the majority of transit trips.

Table 10. Public Transit Commuters by Mode in Midwest Cities (Bureau of Transportation Statistics 2014a; American Public Transportation Association 2014)

	Annual Trips (thousands)	Bus	Heavy Rail	Light Rail	Commuter Rail	Other
Chicago, IL & IN	664,108	52.4%	34.8%	0.0%	11.7%	1.1%
Minneapolis-St. Paul, MN & WI	94,674	85.8%	0.0%	11.1%	0.7%	2.4%
Cleveland, OH	49,115	79.5%	12.7%	5.8%	0.0%	2.0%
Milwaukee, WI	47,497	98.4%	0.0%	0.0%	0.0%	1.6%
Detroit, MI	46,479	90.5%	0.0%	0.0%	0.0%	9.5%
Cincinnati, OH, KY & IN	21,445	98.2%	0.0%	0.0%	0.0%	1.8%
Columbus, OH	18,692	98.6%	0.0%	0.0%	0.0%	1.4%
Kansas City, MO & KS	17,189	96.3%	0.0%	0.0%	0.0%	3.7%
Louisville/Jefferson County, KY & IN	17,162	96.0%	0.0%	0.0%	0.0%	4.0%
Indianapolis, IN	10,243	97.4%	0.0%	0.0%	0.0%	2.6%

The availability and use of public transportation services across the Midwest states reflects the rural, often less dense, population profiles of these states. More transit options are available in denser areas where these systems see greater utilization. Transit presents a rich area of workforce composition and availability with the different modes, services, and workforce needs. While not every state has all of the common public transportation modes and services, these services do exist across the region resulting in a need for transportation workers with a wide range of skills, knowledge, and capabilities.

Rail

Rail in the Midwest region predominantly serves freight movement. Freight railroads contract with Amtrak to provide passenger services on their right-of-way. The system includes the continental United States as well as seamless connections with both Canada and Mexico. The majority of the rail system is privately owned: the tracks, right-of-way, engines, and cars. Increasingly, states have begun purchasing railway for short line operations and connections to ensure rail access for shippers. Two prominent examples in the region can be found in Kansas and Michigan. In Kansas, a short line rail program is funded to ensure continued connections for the state's large agricultural producers. In Michigan, the example frames the state's support to both maintain economic connectivity and to provide passenger rail. State ownership of lines is increasingly common.

Freight railroads are classified by their operating revenue: Class I railroads (with revenues of $475 million or more in 2014) include all the transcontinental lines, Class II railroads are regional in nature, and Class III railroads include short lines, switching lines, and terminal railroads. Historically both eastern and western rail systems have met in Chicago. Recent development is shifting traffic movements out of Chicago to other cities in the Midwest. As of 2012, slightly more than 10 percent of all freight tonnage was moved on rail, while trucks carried 67 percent (Federal Highway Administration 2013).

Table 11 details the number of operating railroads, total rail miles, tons, and carloads for each of the nine states in the Midwest region. Table 11 shows that there are between 8 and 40 railroad companies operating in each state. It is important to note that many of the railroads operate over state boundaries so the number of railroads should not be totaled in this table. The number of railroads ranged from a low of eight in Wisconsin to a high of 41 in Indiana. In terms of total rail miles, Illinois ranks number one in the region at nearly 7,000 miles followed by Ohio at 5,288 miles. Wisconsin (3,449 miles) and Michigan (3,542 miles) have the fewest rail miles in the Midwest region. Both carloads moved and tons carried, originated, and terminated follow similar state-by-state trends. Illinois and Ohio tend to be the larger rail states in the region with Wisconsin and Michigan on the lower end of the range.

Table 11. Freight Rail in the Midwest Region (Association of American Railroads 2012)

State	Number of Railroads	Total Rail Miles	Tons Originated (millions)	Tons Terminated (millions)	Tons Carried (millions)	Carloads Originated	Carloads Terminated	Carloads Carried
Illinois	40	6,986	115.9	157.8	503.1	3,706,200	3,956,100	11,975,400
Indiana	41	4,075	54.2	56.5	288.4	637,300	598,700	6,815,600
Iowa	14	3,869	46.3	35.4	321.9	516,900	394,700	6,337,500

State	Number of Railroads	Total Rail Miles	Tons Originated (millions)	Tons Terminated (millions)	Tons Carried (millions)	Carloads Originated	Carloads Terminated	Carloads Carried
Kansas	13	4,855	17.9	23.4	344.6	332,100	384,200	6,142,400
Michigan	27	3,542	21.9	32.7	86.0	572,400	545,700	1,760,200
Minnesota	18	4,450	90.3	70.3	248.4	1,171,300	967,500	3,837,800
Missouri	17	3,957	16.7	68.9	425.5	403,500	820,800	8,140,900
Ohio	34	5,288	66.2	77.3	286.6	1,116,400	1,157,900	6,575,600
Wisconsin	8	3,449	20.6	57.5	175.0	230,000	557,600	2,890,000

Table 12 shows that Illinois has more 13,000 rail employees with a payroll of more than $1 billion. There are more than 6,000 rail employees in Indiana with a payroll of more than $460 million. The smaller systems in Michigan and Wisconsin are reflected in the employment levels and payroll with just over 3,000 employees with a payroll reaching $252 million in both Wisconsin and Michigan.

Table 12. Freight Rail Employment in the Midwest Region (AAR 2012)

State	Employment	Wages (millions)
Illinois	13,152	$1,035.3
Indiana	6,223	$460.4
Iowa	3,746	$287.3
Kansas	5,427	$437.0
Michigan	3,194	$252.5
Minnesota	4,566	$361.3
Missouri	7,333	$581.1
Ohio	7,619	$552.5
Wisconsin	3,128	$255.1

Amtrak operates 13 passenger rail services, most of which have origins or destinations in Chicago (Figure 7). Table 13 lists the available routes in the region as well as the destinations cities served by the routes.

Table 13. Passenger Rail Routes in the Midwest (Amtrak 2014)

Route	Major Cities Served	Region
California Zephyr	Chicago - Denver - Glenwood Springs - Emeryville (San Francisco)	West Midwest California
Capitol Limited	Washington, DC - Pittsburgh - Cleveland - Chicago	Midwest Northeast

Route	Major Cities Served	Region
Cardinal	New York - Washington, DC - Cincinnati - Indianapolis - Chicago	Midwest Northeast
City of New Orleans	Chicago - Memphis - New Orleans	Midwest South
Empire Builder	Chicago - Milwaukee - St. Paul/Minneapolis - Spokane - Portland/Seattle	West Midwest Northwest
Hiawatha	Milwaukee - Chicago	Midwest
Hoosier State	Indianapolis - Chicago	Midwest
Illinois Service	Chicago - Quincy/St. Louis/Carbondale	Midwest
Lake Shore Limited	New York/Boston - Albany - Chicago	Midwest Northeast
Michigan Services	Chicago - Grand Rapids/East Lansing - Port Huron/Detroit - Pontiac	Midwest
Missouri River Runner	St. Louis - Kansas City, MO	Midwest
Southwest Chief	Chicago - Albuquerque - Los Angeles	West Midwest California
Texas Eagle	Chicago - St. Louis - Dallas - San Antonio - (Los Angeles)	West Midwest South California

Table 14 shows that in the Midwest region, Chicago, Milwaukee, and St. Louis are the top three busiest stations; the next three are all in Illinois. The Chicago Amtrak station is the fourth busiest station in the United States with close to 3.4 million trips.

Table 14. Busiest Passenger Rail Stations in the Midwest (Amtrak 2013)

City	Total Ridership
Chicago, IL	3,522,388
Milwaukee, WI	617,153
St. Louis, MO	378,146
Bloomington-Normal, IL	263,235
Springfield, IL	202,095
Champaign-Urbana, IL	190,851

Figure 6 shows how many Amtrak routes converge in Chicago highlighting its role in the nation's passenger rail system.

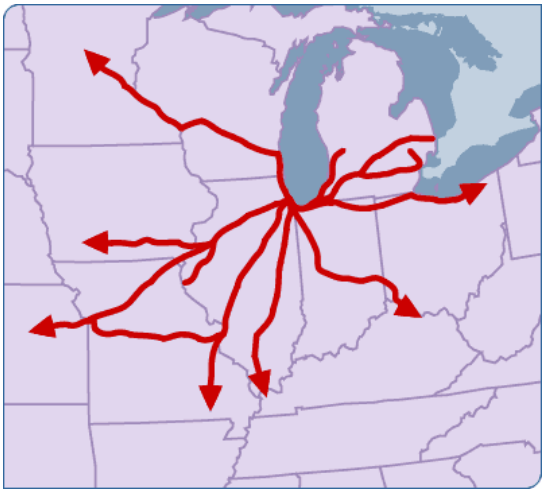

Figure 6. Amtrak Train Routes in the Midwest (Amtrak 2015)

Air

According to 2013 Airports Council International (ACI) data, Chicago O'Hare International Airport ranked strongly in several U.S. performance metrics: second in all aircraft movements, third in passenger movements, and sixth in freight movements. The top 50 airports in North America include 10 from the Midwest region. Minneapolis ranked 14th in all movements, Indianapolis ranked eighth in cargo movement, Detroit, Chicago Midway, St. Louis, Kansas City, Cincinnati/Northern Kentucky, Chicago Rockford, and Cleveland Hopkins all round out the list of Midwest airports on the top 50 list (Table 15).

Table 15. North American Airport Usage Statistics 2013 (Airports Council International 2014)

Airport	All Movements (N. American Rank)	Passengers (N. American Rank)	Cargo (short tons) (N. American Rank)
Chicago O'Hare International Airport (ORD)	881,933 (1)	69,999,010 (3)	1,377,664 (6)
Minneapolis/St. Paul International Airport (MSP)	412,586 (14)	35,147,083 (17)	198,574 (28)
Detroit Metropolitan Wayne County Airport (DTW)	392,635 (17)	32,513,555 (18)	202,032 (27)
Chicago Midway International Airport (MDW)	249,252 (33)	21,069,564 (26)	--
Lambert – St. Louis International Airport (STL)	183,920 (45)	12,384,015 (35)	--
Kansas City International Airport (KCI)	--	10,166,881 (40)	85,002 (40)
Indianapolis International Airport (IND)	--	--	1,070,196 (8)

Airport	All Movements (N. American Rank)	Passengers (N. American Rank)	Cargo (short tons) (N. American Rank)
Cincinnati/Northern Kentucky Intl. Airport (CVG)	--	--	652,666 (9)
Chicago Rockford International Airport (RFD)	--	--	101,912 (10)
Cleveland Hopkins International Airport (CLE)	--	--	75,012 (48)

Freight aviation or air cargo has also created a large web of occupational relations and demands in support of the economy. In 2010, total freight movement originating or terminating in the region represented by the Mid-American Freight Coalition (MAFC) was valued at almost $5 trillion; air cargo shipments account for $155 billion of this total (Mid-American Freight Coalition 2012). This represents almost 31 percent of all U.S. freight movements and 16 percent of air cargo movements.

Freight movement in the region is expected to grow on par with the rest of the United States through 2040. In this same period, air cargo in the MAFC region is projected to grow by 4.9 percent compared to 3.2 percent for all modes. Note that the MAFC region includes all nine states of the MTWC region, as well as Kentucky. Figure 7 shows the reach of these aviation facilities and their activity level.

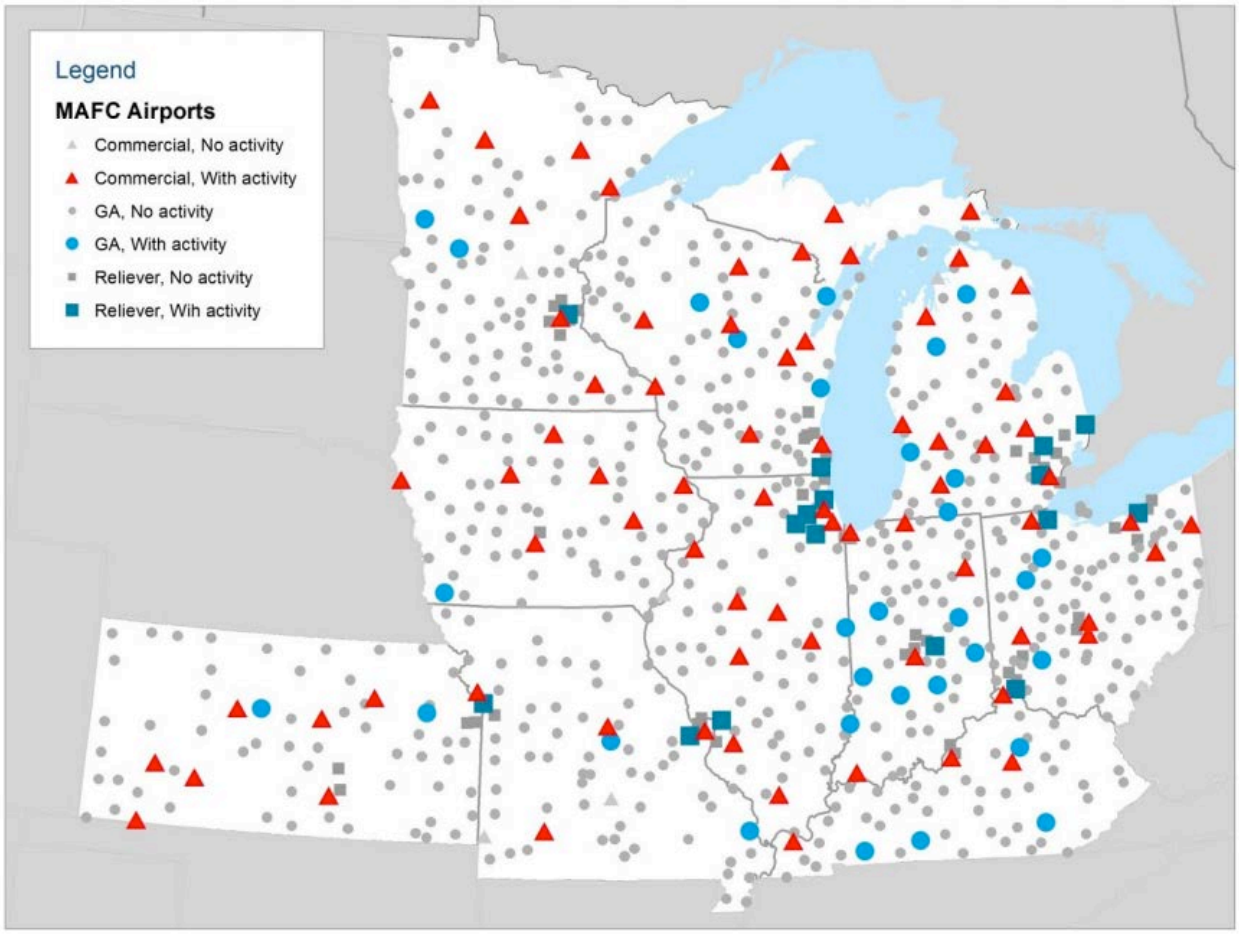

Figure 7. MAFC Airport Facilities Inventory by NPIAS Classification and Activity Status (Mid-American Freight Coalition 2012)

At the state level, air transportation is crucial in terms of moving both passengers and cargo. A recent study by the Missouri Department of Transportation revealed that 108 of the airports it helps support contribute 100,621 jobs with a payroll of $3.1 billion to the Missouri economy. When all economic activities are considered, total annual economic output of Missouri's system of airports is estimated at $11.1 billion. This represents 4.3 percent of the gross state product (Missouri DOT 2012).

In terms of all air movements, the Midwest region comprises five of the top 10 busiest airports in the United States. Some transportation positions, like aircraft handlers and maintenance, runway maintenance, airport planners, and air traffic controllers, are necessary for both passengers and cargo. Other positions, like baggage handlers, are specific to the contents of the plane. While the airports in the region tend to have heavier passenger usage, they also handle a significant amount of cargo, which will have to be taken into account for workforce planning. Both the MAFC and Missouri studies noted that small facilities also provide critical connections and impacts.

Pipeline

Pipeline transportation moves liquids or gas, including crude and refined petroleum, fuels, slurry, and water. Pipelines are mainly long pipes with large diameters that run between cities, countries, and continents. Pipelines are important in all regions because newly developed

energy sources have constrained existing pipelines, in some cases shifting crude and refined products to railways and trucks.

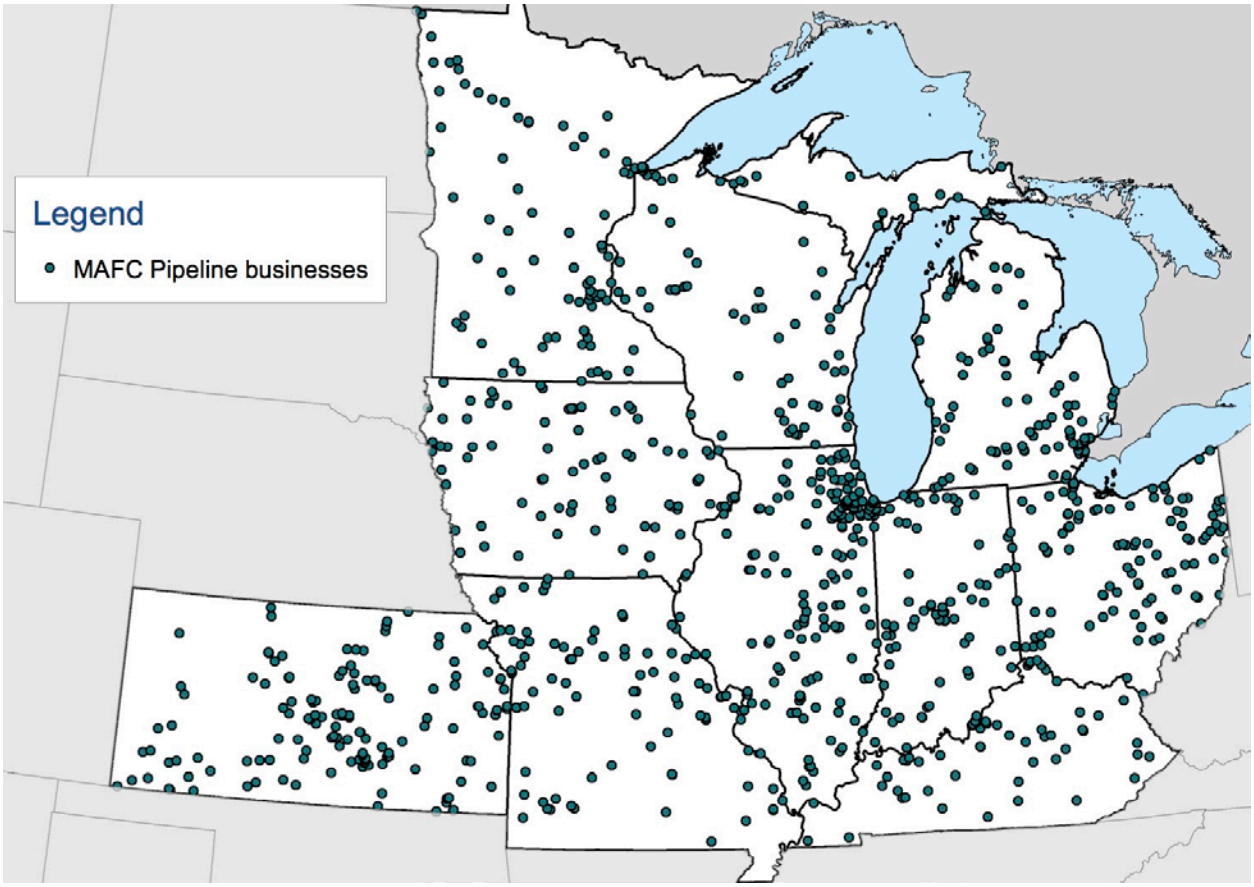

Figure 8. Pipeline Businesses in the Midwest (Mid-America Freight Coalition 2013)

THE TRANSPORTATION WORKFORCE IN THE MIDWEST

The transportation industry is a broad sector, encompassing a wide range of occupations with diverse job functions. These transportation occupations span the modes including highways, waterways, and rail.

Federal agencies and other organizations that collect, analyze, and share occupational data do so by using the Standard Occupational Classification (SOC). In this system, each occupation has its own code and the codes are grouped into categories of similar occupations. This allows for more consistent reporting and analysis of occupations.

From an industry perspective, Table 16 shows average annual employment data classified by the North American Industry Classification System (NAICS). In 2014, the Midwest employed more than 1.1 million individuals within the Transportation and Warehousing sector. The majority of these employees (84 percent) work in private organizations and the remainder in federal, state, or local government. While these individuals work in different modes of transportation and different organizations, this table shows the importance and prevalence of transportation jobs and careers in the region.

Table 16. Number of Employees in Transportation and Warehousing Occupations (NAICS Codes 48-49) by State, Annual Average for 2014 (Bureau of Labor Statistics 2014b)[†]

	Employees in Private Organizations	Employees in Federal, State and Local Government	Total Number of Employees
United States Total	**4,391,274**	**934,197**	**5,325,471**
Iowa	53,863	9,920	63,783
Illinois	231,614	42,945	274,559
Indiana	116,772	17,291	134,063
Kansas	43,209	6,465	49,674
Michigan	106,716	24,409	131,125
Minnesota	77,869	18,150	96,019
Missouri	85,069	21,797	106,866
Ohio	170,691	32,587	203,278
Wisconsin	87,720	13,383	101,103
Total in Midwest Region	**973,523**	**186,947**	**1,160,470**

Of the 5.3 million transportation and warehousing employees in the country, almost 22 percent are employed in the nine states that comprise the Midwest region. And, more than 41 percent of transportation and warehousing employees in this region are employed in just two states: Illinois

[†] Table 17 does not show employment for highway constructions workers, which is attributed to NAICS code 237300.

and Ohio. All nine states, however, have both private and public employees working in transportation-related occupations.

For a more in-depth look at the Midwest transportation workforce, we must shift from employees within the industry to those employed in specific occupations. Further, to plan for the future of the transportation workforce in the region, we must examine projections about changes in the number of employees for each occupation being examined.

To begin exploring the transportation workforce in the Midwest, important occupations within the industry were first identified using occupational codes and employment data from existing state Department of Labor (DOL) and Bureau of Labor Statistics (BLS) databases. This information was then used to provide a broad overview of the transportation workforce in the Midwest.

The BLS and individual state departments of labor develop 10-year predictions to help with long-term planning, specifically with regard to career choice. As such, the education typically required for each occupation is provided. The projections are based on how fast employment is expected to grow or decline for each occupation. Projections are updated every two years. The data in this report includes both the number of employees in the Midwest in each occupation, as well as a 10-year projection. This information presented in this report is based on 2012 data and includes projections for 2022.

There are 23 major groups of occupations within the SOC system, including Transportation and Material Moving Occupations, designated by SOC codes that begin with 53. Table 17 provides data for occupations within this group relevant to the Midwest. For each occupation, the table includes an SOC code, occupation title, number of employees in the Midwest in May 2014, national average hourly wage, and the typical education required for entry into the occupation. This list was further refined by examining transportation knowledge required of each occupation. This knowledge refers to the design, maintenance, of transportation infrastructure or operating a conveyance such as a bus or truck.

Table 17. Occupational Data and Projections for Relevant Occupations in the Midwest Region within the SOC Major Group of Transportation and Material Moving Occupations

SOC Code	Occupation Title	# of employees in the MW, May 2014[a]	National Average Hourly Wage[a]	Typical Education Needed For Entry[a]	# of Employees, 2012[b]	Projected # of Employees, 2022[b]	Change in # of Employees[b]	Percent Change[b]
53-1021	1st Line Supvr. of Helpers, Laborers, and Material Movers, Hand	37,420	$23.55	High school diploma or equivalent	37,048	40,897	3,849	10.39
53-1031	1st Line Supvr. of Transp and Material-Moving Machine and Vehicle Operators	44,050	$27.66	High school diploma or equivalent	41,521	44,879	3,358	8.09
53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians	3,220	$12.26	High school diploma or equivalent	1,852	2,198	346	18.68
53-3021	Bus Drivers, Transit and Intercity	28,340	$18.95	High school diploma or equivalent	32,609	34,382	1,773	5.44
53-3022	Bus Drivers, School or Special Client	98,690	$14.38	High school diploma or equivalent	111,649	118,092	6,443	5.77
53-3032	Truck Drivers, Heavy and Tractor-Trailer	409,190	$20.16	High school diploma or equivalent	385,122	467,148	82,026	21.30
53-3033	Truck Drivers, Light or Delivery Services	176,930	$16.28	High school diploma or equivalent	183,182	194,095	10,913	5.96
53-3041	Taxi Drivers and Chauffeurs	30,560	$12.35	High school diploma or equivalent	38,969	44,676	5,707	14.64
53-4011	Locomotive Engineers	11,290	$27.41	High school diploma or equivalent	6,105	5,879	-226	-3.70
53-4013	Rail Yard Engineers, Dinkey Operators, and Hostler	740	$21.54	High school diploma or equivalent	1,119	1,148	29	2.59
53-4021	Railroad Brake, Signal, and Switch Operators	5,900	$25.14	High school diploma or equivalent	2,057	2,018	-39	-1.90
53-4031	Railroad Conductors and Yardmasters	3,360	$26.84	High school diploma or equivalent	11,171	10,676	-495	-4.43
53-4041	Subway and Streetcar Operators	0	$28.48	High school diploma or equivalent	15	16	1	6.67
53-5011	Sailors and Marine Oilers	2,260	$19.70	High school diploma or equivalent	1,823	2,003	180	9.87

SOC Code	Occupation Title	# of employees in the MW, May 2014[a]	National Average Hourly Wage[a]	Typical Education Needed For Entry[a]	# of Employees, 2012[b]	Projected # of Employees, 2022[b]	Change in # of Employees[b]	Percent Change[b]
53-5021	Captains, Mates, and Pilots of Water Vessels	2,450	$38.07	High school diploma or equivalent	2,112	2,294	182	8.62
53-5031	Ship Engineers	--	--	High school diploma or equivalent	--	--	--	
53-6041	Traffic Technicians	920	$22.38	High school diploma or equivalent	547	579	32	5.85
53-6051	Transportation Inspectors	4,060	$34.05	High school diploma or equivalent	4,080	4,512	432	10.59
53-7011	Conveyor Operators and Tenders	10,970	$16.35	High school diploma or equivalent	13,105	13,956	851	6.49
53-7021	Crane and Tower Operators	8,540	$25.75	High school diploma or equivalent	8,758	9,860	1,102	12.58
53-7031	Dredge Operators	320	$21.94	High school diploma or equivalent	124	133	9	7.26
53-7041	Hoist and Winch Operators	860	$23.47	High school diploma or equivalent	782	815	33	4.22
53-7061	Cleaners of Vehicles and Equipment	70,060	$11.22	High school diploma or equivalent	70,769	76,673	5,904	8.34
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	561,860	$13.07	High school diploma or equivalent	526,001	589,591	63,590	12.09
53-7063	Machine Feeders and Offbearers	26,820	$14.73	High school diploma or equivalent	28,126	29,010	884	3.141
53-7064	Packers and packagers	185,510	$11.08	High school diploma or equivalent	172,395	187,528	15,133	8.78
53-7081	Refuse and Recyclable Material Collectors	23,380	$17.32	High school diploma or equivalent	25,639	28,229	2,590	10.10
53-7121	Tank Car, Truck, and Ship Loaders	2,150	$21.41	High school diploma or equivalent	1,046	1,173	127	12.14

Sources. [a] Bureau of Labor Statistics, 2014b and [b] State 2012–2022 Employment Figures and Projections, 2015. "--" indicates that data were not available from the identified source.

The greatest long-term (defined as 2012-22) increases in the Midwest region are projected to be in *Heavy and Tractor Trailer Truck Drivers* (more than 82,000 jobs), followed by *Stock Laborers and Freight and Hand Material Movers* (more than 63,000 jobs). No other occupations approach these totals. The third projected swiftest growing occupation is *Packers and Packagers* (more than 15,000 jobs) and the fourth, *Light or Delivery Services Truck Drivers* (nearly 11,000 jobs). Some occupations are expected to experience only modest increases, while others, such as in the railroad industry, are expected to actually contract.

It is also important to look at employment changes in terms of percent change, which shows occupations expected to grow quickly, without the focus on the larger occupations. The largest percentage increases are expected to be in *Heavy and Tractor Trailer Truck Drivers* (21 percent), followed by *Ambulance Drivers and Attendants (except Emergency Medical Technicians)* (nearly 19 percent), *Taxi Drivers and Chauffeurs* (more than 14 percent), and *Crane and Tower Operators* (more than 12 percent). When examining the occupations shown in Table 17, each mode described for the Midwest is represented in these occupations.

We also find employees working in transportation across other SOC Major Groups. For example, many transportation agencies employ engineers or planners, which are not included in the list of occupations in Table 17. Engineers and planners may be employed by transportation organizations, but they may also work in other industries. It was necessary to examine occupations in other SOC major groupings. To identify transportation occupations outside of the Transportation and Materials Moving Occupations SOC grouping, the research team adopted a broad definition of “transportation occupations” to encompass: *Occupations related to the planning, design, construction, operation, management and maintenance of transportation infrastructure: conveyances, systems; and modes that support the movement of people, materials, and goods.*

One group of employees who serve an important role in transportation are engineers and other scientists responsible for designing and building needed infrastructure, as well as individuals working in construction, maintenance, and repair of roads, tracks, or other structures used in transportation. To provide information on these occupations, Table 18 includes data for relevant occupations from the following SOC groups:

- Architecture and Engineering Occupations (17-0000)
- Life, Physical and Social Science Occupations (19-0000)
- Construction and Extraction Occupations (47-0000)
- Installation, Maintenance and Repair Occupations (49-0000)

When considering the outlook for these industry-spanning occupations in terms of number of employees, it is important to note that there will likely be more competition due to the diverse employers for which they can work. This is especially true for occupations expected to grow in the next seven years.

Table 18. Occupational Data and Projections for Relevant Occupations in the Midwest Region within Engineering, Science, Construction, and Maintenance/Repair SOC Codes

SOC Code	Occupation Title	# of employees in the MW, May 2014[a]	National Average Hourly Wage[a]	Typical Education Needed for Entry[a]	# of Employees, 2012[b]	Projected # of Employees, 2022[b]	Change in # of Employees[b]	Percent Change[b]
17-2051	Civil Engineers	38,740	$41.89	Bachelor's degree	39,871	45,939	6,068	15.22
17-2121	Marine Engineers	390	$47.67	Bachelor's degree	110	124	14	12.73
19-3051	Urban and Regional Planners	5,140	$33.18	Master’s degree	5,235	5,576	341	6.51
19-3099	Transportation Planners	3,790	$38.48	Master’s degree	4,255	4,165	-90	-2.12
47-2051	Cement Masons and Concrete Finishers	34,470	$19.70	High school diploma or equivalent	32,989	39,818	6,829	20.70
47-2061	Construction Laborers	157,540	$17.19	High school diploma or equivalent	179,103	210,899	31,796	17.75
47-2071	Paving, Surfacing, and Tamping Equipment Operators	10,160	$20.41	High school diploma or equivalent	11,156	12,751	1,595	14.30
47-2073	Operating Engineers and Other Construction Equipment Operation	72,880	$23.09	High school diploma or equivalent	70,278	80,118	9,840	14.00
47-2221	Structural Iron and Steel Workers	22,360	$25.55	High school diploma or equivalent	11,750	13,3310	1,581	13.46
47-4051	Highway Maintenance Workers	38,790	$18.22	High school diploma or equivalent	42,333	43,791	1,458	3.44
47-4061	Rail-Track Laying and Maintenance Equipment Operators	5,880	$24.39	High school diploma or equivalent	3,650	3,725	75	2.05

SOC Code	Occupation Title	# of employees in the MW, May 2014[a]	National Average Hourly Wage[a]	Typical Education Needed for Entry[a]	# of Employees, 2012[b]	Projected # of Employees, 2022[b]	Change in # of Employees[b]	Percent Change[b]
49-3023	Automotive Service Technicians and Mechanics	135,180	$19.22	High school diploma or equivalent	147,305	157,291	9,986	6.78
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	58,030	$21.71	High school diploma or equivalent	60,042	64,669	4,627	7.71
49-3043	Rail Car Repairers	5,290	$25.27	High school diploma or equivalent	5,753	5,815	62	1.08
49-3093	Tire Repairers and Changers	19,030	$12.31	High school diploma or equivalent	18,764	20,131	1,367	7.29

Sources. [a] BLS Employment Data (Bureau of Labor Statistics 2014b) and [b] State 2012–2022 Employment Figures and Projections, 2015.

Only some occupations in Table 18, specifically *Civil Engineers, Marine Engineers, Urban and Regional Planners,* and *Transportation Planners,* require a college degree (i.e., bachelor's or master's degree). With only one exception, each occupation is projected to increase in size by 2022. Two have projected increases of approximately 20 percent (*Cement Masons and Concrete Finishers, Construction Laborers).* The exception is *Transportation Planners*, which is projected to decrease by 90 positions, or more than 2 percent. Two occupations within the rail industry (*Rail Car Repairers; Rail-Track Laying and Maintenance Equipment Operators)* are projected to show quite modest growth of one percent and two percent, respectively.

Beyond the engineering and technical employees that support transportation organizations, there are also employees in management, finance, computer technology, and support. Table 19 provides occupational data and projections for these types of occupations, which come from the following SOC groups:

- Management Occupations (11-0000)
- Business and Financial Operations Occupations (13-0000)
- Protective Service Occupations (33-0000)
- Office and Administrative Occupations (43-0000)
- Computer and Information Technology Occupations (15-0000)

Like the previous occupational data and projections tables, Table 19 provides SOC code, occupation title, number of employees in the Midwest, average hourly wage, typical education required for entry into the occupation and 2012-22 occupational projections.

Table 19. Occupational Data and Projections for Relevant Occupations in the Midwest Region within Management, Service, and Support Occupations

SOC Code	Occupation Title	# of employees in the MW, May 2014[a]	National Average Hourly Wage[a]	Typical Education Needed for Entry[a]	# of Employees, 2012[b]	Projected # of Employees, 2022[b]	Change in # of Employees[b]	Percent Change[b]
11-1021	General and Operations Manager	422,040	$56.35	Bachelor's degree	379,960	416,470	36,510	9.6
11-3071	Transportation, Storage and Distribution Managers	25,410	$44.80	High school diploma or equivalent	24,866	26,489	1,623	6.53
11-9199	Managers, All Others (includes Supply Chain Managers)	97,550	$52.99	Bachelor's degree	202,730	217,950	15,220	7.50
13-1081	Logisticians	27,340	$36.94	Bachelor's degree	25,212	30,429	5,217	20.7
13-1199	Customs Brokers	199,420	$35.10	Bachelor's degree	202,815	218,426	15,611	7.70
15-1132	Software Developers, Applications	123,550	$47.85	Bachelor's degree	113,640	134,790	21,150	18.6
33-3052	Transit and Railroad Police	420	$25.56	Some college, no degree	91	91	0	0.00
33-9093	Transportation Security Screeners	4,690	$18.56	Some college, no degree	6,272	7,084	812	12.95
43-5011	Freight Forwarders	15,590	$21.14	High school diploma or equivalent	16,239	19,016	2,777	17.10
43-5032	Dispatchers, Except Police, Fire, and Ambulance	39,940	$19.09	High school diploma or equivalent	38,370	42,147	3,777	9.84

Sources. [a] BLS Employment Data (Bureau of Labor Statistics 2014b) and [b] State 2012–2022 Employment Figures and Projections, 2015.

Table 19 clearly demonstrates how important is for educators and transportation organizations in the Midwest, and indeed across the country, to be preparing students for careers as *Logistics Analysts* and *Freight Forwarders*. Both occupations are expected to see increases around 20 percent (nearly 21 percent and more than 17 percent, respectively), which translates to nearly 8,000 additional positions across the region by 2022.

Other occupations, such as *Managers, all Others* (*Supply Chain Managers)* and *Customs Brokers*, do not demonstrate such large increases, but are expected to grow by nearly 30,000 positions—nearly 15,000 and 16,000, respectively.

Finally, occupational data and projections were analyzed at the state level to identify differences in the workforce and potential workforce needs across the Midwest. Table 20 breaks down transportation occupations with the greatest expected increases and decreases in employment by state. Examining changes in the Midwestern transportation workforce this way allows us to see similarities and differences across the region.

Table 20. Transportation Occupations with Greatest Expected Increases and Decreases in Employment by State in the Midwest Region.

State	SOC Code	Occupation Title	No. of Employees, 2012	Projected No. of Employees, 2022	Change (Number)	Percent Change
Iowa	53-3032	Truck Drivers, Heavy and Tractor-Trailer	42,685	50,715	8,030	1.88
	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	24,865	28,420	3,555	1.43
	47-2061	Construction Laborers	10,365	13,025	2,660	2.57
	53-7063	Machine Feeders and Offbearers	1,465	1,540	75	.51
	53-4011	Locomotive Engineers	675	685	10	.15
	53-4031	Railroad Conductors and Yardmasters	630	640	10	.16
Illinois	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	127,888	148,385	20,497	16.03
	47-2061	Construction Laborers	49,807	59,063	9,256	18.58
	53-3032	Truck Drivers, Heavy and Tractor-Trailer	67,747	76,811	9,064	13.38
	47-4061	Rail-Track Laying and Maintenance Equipment Operators	1,539	1,533	-6	-0.39
	19-3099	Transportation Planners	1,120	1,093	-27	-2.41

State	SOC Code	Occupation Title	No. of Employees, 2012	Projected No. of Employees, 2022	Change (Number)	Percent Change
	53-4031	Railroad Conductors and Yardmasters	3,107	3,028	-79	-2.54
Indiana	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	58,298	67,222	8,924	15.31
	53-3032	Truck Drivers, Heavy and Tractor-Trailer	45,004	49,651	4,647	10.33
	47-2061	Construction Laborers	14,659	17,234	2,575	17.57
	17-2121	Marine Engineers	24	27	3	12.5
	19-3099	Transportation Planners	216	219	3	1.39
	33-9093	Transportation Security Screeners	399	366	-33	-8.27
Kansas	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	22,107	25,704	3,597	16.3
	53-3032	Truck Drivers, Heavy and Tractor-Trailer	21,044	23,635	2,591	12.3
	47-2061	Construction Laborers	10,274	11,692	1,418	13.8
	19-3099	Transportation Planners	185	178	-7	-3.78
	53-4021	Railroad Brake, Signal, and Switch Operators	750	727	-23	-3.1
	53-4031	Railroad Conductors and Yardmasters	1,114	1,075	-39	-3.5
Michigan	53-3032	Truck Drivers, Heavy and Tractor-Trailer	48,610	54,070	5,460	11.2
	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	61,790	66,130	4,340	7
	13-1199	Customs Brokers	40,300	44,130	3,830	9.5
	53-4021	Railroad Brake, Signal, and Switch Operators	330	310	-20	-6.3

State	SOC Code	Occupation Title	No. of Employees, 2012	Projected No. of Employees, 2022	Change (Number)	Percent Change
	53-7063	Machine Feeders and Offbearers	2,870	2,520	-350	-12.4
	53-3022	Bus Drivers, School or Special Client	15,980	15,560	-420	-2.6
Minnesota	53-3032	Truck Drivers, Heavy and Tractor-Trailer	35,935	38,478	2,543	7.1
	47-2061	Construction Laborers	11,107	12,969	1,862	16.8
	47-2073	Operating Engineers and Other Construction Equipment Operation	8,351	9,759	1,408	16.9
	53-4011	Locomotive Engineers	849	807	-42	-4.9
	53-4031	Railroad Conductors and Yardmasters	771	713	-58	-7.5
	53-7063	Machine Feeders and Offbearers	1,588	1,488	-100	-6.3
Missouri	53-3032	Truck Drivers, Heavy and Tractor-Trailer	42,718	47,026	4,308	10.08
	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	40,838	45,090	4,252	10.41
	47-2061	Construction Laborers	18,391	22,071	3,680	20.01
	19-3099	Transportation Planners	181	179	-2	-1.1
	53-4021	Railroad Brake, Signal, and Switch Operators	871	855	-16	-1.84
	53-4031	Railroad Conductors and Yardmasters	782	766	-16	-2.05
Ohio	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	101,050	114,220	13,170	13
	53-3032	Truck Drivers, Heavy and Tractor-Trailer	70,010	75,650	5,640	8.1
	47-2061	Construction Laborers	30,260	35,830	5,570	18.4

State	SOC Code	Occupation Title	No. of Employees, 2012	Projected No. of Employees, 2022	Change (Number)	Percent Change
	19-3099	Transportation Planners	1,410	1,300	-110	-7.8
	53-4011	Locomotive Engineers	1,490	1,260	-230	-15.4
	53-4031	Railroad Conductors and Yardmasters	2,590	2,170	-420	-16.2
Wisconsin	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	56,227	60,119	3,892	6.92
	53-3032	Truck Drivers, Heavy and Tractor-Trailer	47,304	51,112	3,808	8.05
	47-2061	Construction Laborers	13,900	16,515	2,615	18.81
	49-3023	Automotive Service Technicians and Mechanics	13,346	13,360	14	.1
	17-2121	Marine Engineers	81	91	10	12.35
	53-7081	Refuse and Recyclable Material Collectors	2,299	2,269	-30	-1.3

Source. State 2012–2022 Employment Figures and Projections, 2015.

Overall, Iowa is expected to demonstrate modest (little more than two percent) increases. Illinois, Indiana, Kansas, Minnesota, Missouri, and Wisconsin are expected to demonstrate robust increases (up to 20 percent) in some occupations such as *Construction Laborers, Operating Engineers, Laborers, Freight, Stock, and Hand Material Movers* but decreases in railroad occupations, *Transportation Security Screeners, Transportation Planners,* and certain other occupations. For example, Michigan is expected to demonstrate good (11 percent) increases in truck drivers but large decreases in *Machine Feeders and Offbearers.* This occupation is also expected to decrease by more than six percent in Minnesota.

These similarities could indicate that efforts to train and recruit employees in these occupations would be beneficial region wide. Understanding the workforce across states can help identify areas where coordination of efforts would be useful to transportation stakeholders.

KEY OCCUPATIONS IN THE MIDWEST

A careful review of labor market data, in-person and phone interviews, labor site visits, and summits has uncovered trends in the Midwestern transportation labor market in the aftermath of the Great Recession and uneven recovery. These methods include:

- Real-time labor market data
- Archived U.S. Census data
- Bureau of Labor Statistics data
- Two stakeholder workshops with more than 150 participants representing all nine MTWC states and stakeholder groups.
- Interviews with:
    - Trucking company executives
    - Technical and vocational instructors and executives
    - Major metropolitan area public transit human resource executives from Milwaukee
    - Manufacturers and commerce association representatives
    - Concrete and engineering trade group representatives
    - Workforce board executives
    - School district human resource managers
    - State department of transportation human resource managers

Demand for certain transportation occupations has declined in the Midwest (railroads), but highway occupations, notably light and heavy truck drivers and support staff such as diesel mechanics have surged. These occupations are experiencing enormous difficulty across the board, in both the public and private sectors, attracting qualified personnel. There are compelling arguments on both the market and labor side for this absence of qualified applicants.

The MTWC used high-demand, high-wage, and high-skill metrics as criteria for identifying priority occupations. The MTWC also focused on workforce demand for the emerging Marine Highway system, as well as the traditional highway design and construction industry.

We have prioritized these occupations based on the criteria outlined in Table 21.

Table 21. Criteria for Prioritizing Transportation Options in the Midwest Region

Criteria	Rationale for Inclusion
Increasing employee demand/High growth occupation	• Examine gross percentage of demand change to identify occupations with highest percentage of expected growth. • Eliminate occupations expected to decrease in number of employees.
Established high demand for employees	• Examine historic, current, and future number of employees in an occupation. • Select occupations with greatest number of employees or job openings—positions that must be filled in these occupations.
Future demand for employees	• Project data from projects or programs intended to enhance existing transportation network. • Identify occupations to fill expected needed positions.
Challenges in recruiting or retaining employees	• Gather input from stakeholders regarding occupations with traditional challenges in filling or keeping filled. • Selected occupations with these problems because occupations may benefit from additional attention.

Table 22 lists the resulting prioritized occupations.

Table 22. Priority Occupations in the Midwest Region

STEM Occupations	SOC Code	Rationale
Civil engineers	17-2051	• Occupational outlook is bright, expected to grow rapidly in the next several years, with large numbers of job openings. • Considered a green or enhanced skills occupation. • Civil engineer pipeline not being efficiently filled, with many approaching retirement and large gaps projected within 10 years. • Many make lateral moves to private sector for better pay.
Ship engineers	53-5031	• US poised to expand cargo shipping on inland waterway system. • Occupation almost completely unpublicized and ranks depleted by retirement.
Software developers, applications	15-1132	• Bright occupational outlook. • Hardware (trucks, transit systems, trains) increasingly tracked by, tied to and dependent on software systems. • Includes cyber security. • Systems can be purchased off the shelf but many are customized, requiring skilled developers. • Burning Glass analysis shows demand.
Vocational or Technical Occupations	**SOC Code**	**Rationale**
Bus and truck mechanics, diesel engine specialist	49-3031	• Becoming greener—hybrid, alternative fuel technologies. • High need career in DOT, public transit, and trucking firms. • Competition with private sector: better wages, working conditions. • Second most difficult position to fill regionally. • Tied to connected vehicle, new fuels adoption, and driverless cars scenario. • Burning Glass analysis shows demand.
Heavy and tractor-trailer truck drivers	53-3032	• Bright outlook, increasingly green. • Overwhelmingly most difficult position to fill. • Cost of entry into occupation is high; many required DOT tests paid by driver. • Background checks, drug checks, increasingly stringent DOT requirements present barriers to recruitment for this sector. • Retirement crisis. • Women and minorities increasingly turning to truck driving as alternative to low paid service, office jobs.

Mates-ship, boat, and barge	53-5021	• US poised to shift cargo from other modes to inland waterway system. • Occupations almost completely unpublicized.
Operating engineers and other construction equipment operation	47-2073	• Crucial to building and developing new transportation infrastructure.
Skilled Laborer Occupations	**SOC Code**	**Rationale**
1st Line supervisor of transportation and material-moving machine and vehicle operators	53-1031	• Crucial to building and developing new transportation infrastructure. • This occupation serves as pathway for other workers.
Construction laborers	47-2061	• Bright outlook, increasingly green. • Crucial to building and developing new transportation infrastructure. • High turnover.
Supply Chain and Logistics Occupations	**SOC Code**	**Rationale**
Customs brokers	13-1199	• Bright outlook. • Higher demand as U.S. manufacturing contracts, international trade expands. • Lack of qualified applicants. • Higher wages, but significant training involving on-the-job. • Burning Glass analysis shows demand.
Logisticians	13-1081	• Bright outlook. • Demanding, responsible for entire life-cycle of products, including acquisition, distribution, internal allocation, delivery, final disposal.
General and operations managers	11-1021	• Bright outlook, green. • Burning Glass analysis shows demand.

These occupations can be broadly grouped as highway or river operations. There are no rail or air-specific occupations on this list.

Highway

As previously indicated, interviews and labor market data reveal an overwhelming, seemingly permanent demand for heavy and tractor-trailer drivers and mechanics, especially diesel mechanics.

Unattractive working conditions, high cost of entry into the truck driving profession (up to $9,000 to acquire a CDL license at a truck driving school), stalled wage growth, turnover, and a poor work-life balance contribute to this shortage.

Market-side solutions include increasing participation by females, minorities, and recent immigrants in the truck driving profession.

Additional factors include:

- Equipment for the trucking industry is expensive, placing pressure on wages. Most larger firms don't keep trucks more than three or four years and prices keep going up—$150,000 for a modern tractor-trailer, $40,000 for a dry van.
- Funding for CDL training is critical. Cost to attend a truck driving school can be prohibitive, up to $9,000.
- Wages are stagnant. Firms decided not to raise salaries when fuel costs were high; as fuel costs dropped, wages have not risen.
- Women, minorities, and immigrants could play key roles. One truck driving school reports 34 percent of students are women, and that the school sees more Caucasian women than Caucasian men. Lack of childcare is a barrier.
- Federal testing and regulations include blood pressure, sleep apnea, stent and cardiac issues, and diabetes. Sleep apnea test costs vary but can have up to $3,500 in costs not covered by the company.
- Public transit and DOT officials report difficulty maintaining a quality base of drivers and mechanics due to competition from the private and public sector (cities and counties with better pay). Diesel mechanics and drivers are unenthusiastic about night shifts.
    - "We expect turnover rate to be high indefinitely," said one transit executive.
    - "We are unable to hire all of the seasonal help in this area that we need for winter operations," said another.
    - "We never used to have trouble filling jobs in rural areas, but this is becoming increasingly difficult."
    - MoDOT also reports difficulty hiring certified appraisers for right-of-way acquisitions.

Highway occupation issues are not unique to the Midwest, of course. The entire country is struggling.

Inland Waterways

New inland waterway projects currently underway in the Midwest may significantly impact the labor market, especially the upgrading of the M-35 and M-55 Marine Highway Routes on the Mississippi and Illinois rivers connecting Chicago, Minneapolis and New Orleans. These and other routes connect every major metro area in the Midwest.

Occupations with the greatest demand are expected to be barge personnel, deckhands, engineers, pilots, and captains. Because waterways are increasingly multi-modal, other inland waterway occupations include:

- Sailors and oilers.
- Laborers and freight, stock, and materials movers, hand.
- Industrial truck and tractor operators.
- Tank car, truck, and ship loaders.
- Material moving workers, all other.
- First-line supervisors of transportation and material moving machine and vehicle operators.
- Crane and tower operators.
- Cargo and freight agents.

This projected expansion will also likely result in a need for fleet modernization and system rehabilitation, which, in turn, will drive secondary economic activity such as increased manufacturing of marine equipment and vessels, as well as increased activity in niche marine construction projects.

Because most river operations firms are also privately held, they do not pursue shareholder value every quarter and make decisions for the long haul. This has resulted in generally good benefits and relatively high pay.

However, issues include:

- Seasonality. Operations slow throughout the region, but especially in the upper Midwest. Some occupations report six months idle.
- Work-life balance. Unless land-based, river jobs require being away from home for 28 days at a time, minimum.
- Lack of female, African American, and Hispanic diversity
- Heavy workload, stringent daily schedules, exposure to the elements, unpredictable working conditions, and risk of injury.

ANALYSIS OF KEY OCCUPATIONS IN THE MIDWEST

This section provides information about each key occupation identified across the region. For each occupation, types of employers for each occupation and educational requirements for employees are given. The Midwest region lags behind the rest of the United States in projected job growth in key occupations. The region will experience significant growth above the national rate (11.3 percent) in Heavy and Tractor-trailer Truck Drivers. The remaining targeted occupations are near or below national growth rates, though the region lags in employment growth among Civil Engineers, Software Developers, Applications, and Construction Laborers.

1St Line Supervisor of Transportation and Material–Moving Machine and Vehicle Operators

This occupation directly supervises and coordinates activities of transportation and material-moving machine and vehicle operators and helpers. Job titles associated with this occupation include: Dock Supervisor, Driver Manager, Fleet Manager, On Car Supervisor, Operations Supervisor, Street Supervisor, Supervisor, Trainmaster, Transportation Supervisor, Warehouse Supervisor.

Duties for this occupation include enforcing rules and regulations, planning work assignments and equipment allocations, inspecting materials and vehicles, and reviewing orders, schedules, blueprints, and other forms and documents to ensure proper completion of tasks and assignments. In the Midwest this occupation has a projected change of eight percent by 2022, resulting in an expected 3,358 additional employees.

Bus and Truck Mechanics and Diesel Engine Specialists

With a 2012 reported median income of $42,320, mechanics and driving specialists represented 250,800 jobs, and expect to see a nine percent increase within the reporting period, according to BLS employment projections. This represents an average increase in an occupation that may not require even a high school diploma. Certification from the National Institute for Automotive Service Excellence adds value to employees within this industry. The BLS indicates that workers certified through this program, or other comparable programs, will see a larger increase in opportunity than workers without advanced training. Typical employers include truck transporters, government (all levels), repair and maintenance firms, motor vehicle and motor vehicle parts and supplies merchant wholesalers, and manufacturers.

Civil Engineers

Civil engineers are responsible for the design, construction and oversight of broad-range construction projects encompassing the infrastructure of communities. A bachelor’s degree is required for entry into this profession. According to BLS and other sources, this occupation is projected to experience faster than average growth in the United States, largely due to aging infrastructure. The types of firms that employed the most civil engineers in 2012, according to BLS, were architectural, engineering, and related services; state government, excluding education and hospitals; local government, excluding education and hospitals; nonresidential building construction; and federal government, excluding the postal service. A bachelor’s degree is required for this occupation.

Construction Laborers

Construction laborers perform tasks requiring physical labor on a variety of construction sites. This mainly consists of preparing and cleaning construction sites, but it can also include loading

and unloading building materials, operating or tending construction equipment and machines, and controlling traffic around work zones. Construction laborers may operate hand and power tools of all types: air hammers, earth tampers, cement mixers, small mechanical hoists, surveying and measuring equipment, and a variety of other equipment and instruments. They may clean and prepare sites, dig trenches, set braces to support the sides of excavations, erect scaffolding, and clean up rubble, debris and other waste materials. Sample titles include: Construction Laborer, Construction Worker, Curb and Gutter Laborer, Skill Labor, Union Laborer. In the Midwest, construction laborers have a bright outlook with a projected growth rate of 17.8 percent by 2022. Iowa has a greater than national growth projection at 25.7 percent.

Laborers and helpers work in all aspects of transportation in both the private and public sectors, and demand for these workers historically mirrors levels of overall construction activity. Construction laborers and helpers generally learn their trade through short-term on-the-job training or two- to four-year apprenticeship programs. There are no specific education requirements, but wages are fairly competitive at $29,160 in 2012, according to the BLS.

Customs Brokers

The occupational outlook for customs brokers is considered fair, according to the BLS, at 7.4 percent. Such brokers prepare customs documentation and ensure that shipments meet all applicable laws, federal, state and foreign, to facilitate the import and export of goods; determine and track duties and taxes payable and process payments on behalf of clients; sign documents under a power of attorney; meet with customs officials; apply for duty refunds and tariff reclassifications; coordinate transportation and storage of imported goods; and other, highly specific duties. Surprisingly, the educational requirements for the overarching occupational classification (13-1199), Business operations specialists, all others) is only a high school diploma or equivalent, with average wages higher than average at $65,120. Sample reported job titles include customs broker, customs compliance director, and import manager. These occupations work in air freight, roadway freight, rail, general freight, deep sea, coastal, and Great Lakes transportation firms.

General and Operations Manager

The outlook for such managers is good, with a 2012-22 growth rate of 12.4 percent, according to BLS, and excellent mean annual wages of $117,200 in 2012. These managers plan, direct, or coordinate public transit and private sector transportation organizations of every description. Duties and responsibilities are too diverse to be classified in any one area of management or administration such as personnel, purchasing, or administrative services, but generally exclude first-line supervision. A bachelor's degree or higher educational attainment and an average of less than five years related experience are considered prerequisites. These managers are employed in all transportation industries and sectors mentioned above in numerous capacities.

Heavy and Tractor-trailer Truck Drivers

This occupation is expected to experience average growth (about 11 percent nationally and 21.3 percent regionally). Truck drivers in the oil and gas industry are currently in decline as fewer drivers are needed at mining sites. Requirements vary within this occupation, but they always require at least short-term training and a Commercial Drivers License (CDL). Firms hiring drivers are general freight trucking, specialized freight trucking, and merchant wholesalers of nondurable goods.

Logisticians

Logistician employment growth will be driven by the important role logistics plays in the transportation of goods in a global economy. Employment in this area is projected to grow 21.9 percent from 2012 to 2022, much faster than the average for all occupations. Logisticians analyze and coordinate a transport organization's supply chain, the system that moves products from supplier to consumer. They must manage the entire life cycle of a product, including acquisition, distribution, allocation, and delivery. The BLS considers this job to be stressful because logistical work is fast paced. Although an associate's degree may be sufficient for some logistician jobs, a bachelor's degree is typically required for most positions. Median annual wages for logisticians was $72,780 in 2012, and they are generally employed by manufacturing firms, the federal government (excluding the postal service), professional, scientific, and technical service firms, transportation equipment manufacturers, and land, air, and marine product and parts manufacturers.

Supply Chain Managers are closely related to Logisticians, but are currently grouped under the Managers, all Other SOC Category and it is difficult to extract data on employment numbers and projections at this time. This occupation has been listed as a new and emerging field since 2006.

Mates–Ship, Boat, and Barge

Employment of captains, mates, and pilots of water vessels is projected to grow a robust 14 percent, according to the BLS. Wages are comparatively high in these occupations, at an average of $66,150 in 2012. Job growth is likely to be concentrated on inland rivers and the Great Lakes, driven by the demand for such commodities as iron ore, grain, and petroleum. Firms that employ these occupations are deep sea, coastal, and Great Lakes water transporters, inland water transporters, support firms for water transportation, government, and scenic and sightseeing transportation firms.

Operating Engineers and Other Construction Equipment Operation

Operating engineers and other construction equipment operators are responsible for operating various types of power construction equipment such as motor graders, bulldozers, scrapers, compressors, pumps, tractors, or front-end loaders. They may also be responsible for repairing and maintaining equipment in addition to operating. Example job titles within this occupation in the Midwest include Operating Engineer, Operating Engineer Apprentice, Construction Equipment Operator, or Heavy Equipment Operator. Regional projections show that this occupation is expected to increase by 7,300 employees (12.0 percent in the Northeast Region) by 2022. Not all of the employees within this occupation are in transportation organizations, but many transportation or transportation-related companies will see the increased need for these employees to assist in things like road construction and maintenance, bridge building, or other activities that require the use of heavy equipment.

Ship Engineers

Ship engineers supervise and coordinate activities of crew engaged in operating and maintaining engines, boilers, deck machinery, and electrical, sanitary, and refrigeration equipment aboard ship. Some titles that are reported for this occupation include: Barge Engineer, Engineer, Ferry Engineer, Harbor Engineer, Harbor Tug Engineer, Inland Marine Towing Vessel Engineer, Port Engineer, Towboat Engineer, Tug Boat Engineer

Median wages for a ship engineer were $70,890 in 2012 according to BLS—higher than that of mates and pilots—and projected to grow 8.3 percent nationally. While the reported employment

in the Midwest for this occupation is low, the occupation was selected for it's role in an expansion of the marine highway system in the Midwest. Firms employing ship engineers include architectural, engineering and related service firms; ship and boat builders; and deep sea, coastal, and Great Lakes water transportation firms.

Software Developers, Applications

This occupation develops, creates, and modifies general computer application software or specialized utility programs. They analyze user needs and develop software solutions. They may also design software or customize software for client use with the aim of optimizing operational efficiency. They may analyze and design databases within an application area, working individually or coordinating database development as part of a team. Someone in this occupation may supervise computer programmers. As part of the Burning Glass query, there were 784 job posting between March and September 2015 that fell within the transportation and warehousing industry sector. According to BLS, the median salary is in excess of $93,000 for employees with a bachelor's degree. The types of firms that employed the most software developers in 2012 were computer systems design and related services; computer and electronic product manufacturing; finance and insurance; and software publishers.

Table 23. Priority Occupational Projections for the Midwest Region.

SOC Code	SOC Occupation Title	# of Employees 2012[a]	Projected # of Employees 2022[a]	Change in # of Employees	Midwest Percent Change 2012-2022	National Percent Change 2012-2022[b]
53-1031	1st Line Supervisor of Trans and Material Moving Machine and Vehicle Operators	41,521	44,879	3,358	8.09	8.6
49-3031	Bus and Truck Mechanics, Diesel engine specialists	60,042	64,669	4,627	7.7	8.6
17-2051	Civil Engineers	39,871	45,939	6,068	15.2	19.7
47-2061	Construction Laborers	179,103	210,899	31,796	17.8	24.3
13-1199	Customs Brokers*	202,815	218,426	15,611	7.7	7.4 [c]
11-1021	General and Operations Manager	379,960	416,470	36,510	9.6	12.4
53-3032	Heavy and Tractor-Trailer Truck Drivers	385,122	467,148	82,026	21.3	11.3
13-1081	Logisticians	25,217	30,429	5,212	20.7	21.9
53-5021	Mates - Ship, Boat and Barge**	2,112	2,294	182	8.6	13.8
47-2073	Operating Engineers and Other Construction Equipment Operation	70,278	80,118	9,840	14	18.9
53-5031	Ship Engineers	--	--	--	--	7.8
15-1132	Software Developers, Applications	113,640	134,790	21,150	18.6	22.8

Sources. [a] State 2012–2022 Employment Figures and Projections 2015; [b] Bureau of Labor Statistics 2014b; [c] Sokanu 2016.

Notes: * Classified under 13-1199 Business Operations Specialists, (SOC) 13-1199.03 (O*NET).

** Statistics represent SOC category: Captains, Mates and Pilots of water vessels

-- Employment estimate not available.

A deeper analysis of job postings across the Midwest from Burning Glass show an unequivocal and urgent need for drivers.

Figure 9 shows the top transportation and warehousing job postings in the nine-state region from Burning Glass from March to September 2015 and clearly indicates more heavy and tractor trailer truck driver job postings (more than 92,000) than any other posting. In fact, there are more than triple as many tractor-trailer truck driver job postings as the next 24 postings *combined* (nearly 30,000).

Some occupations, such as security guards, sales and customer service representatives, and merchandisers are common across industries and not specific to transportation, warehousing, or logistics.

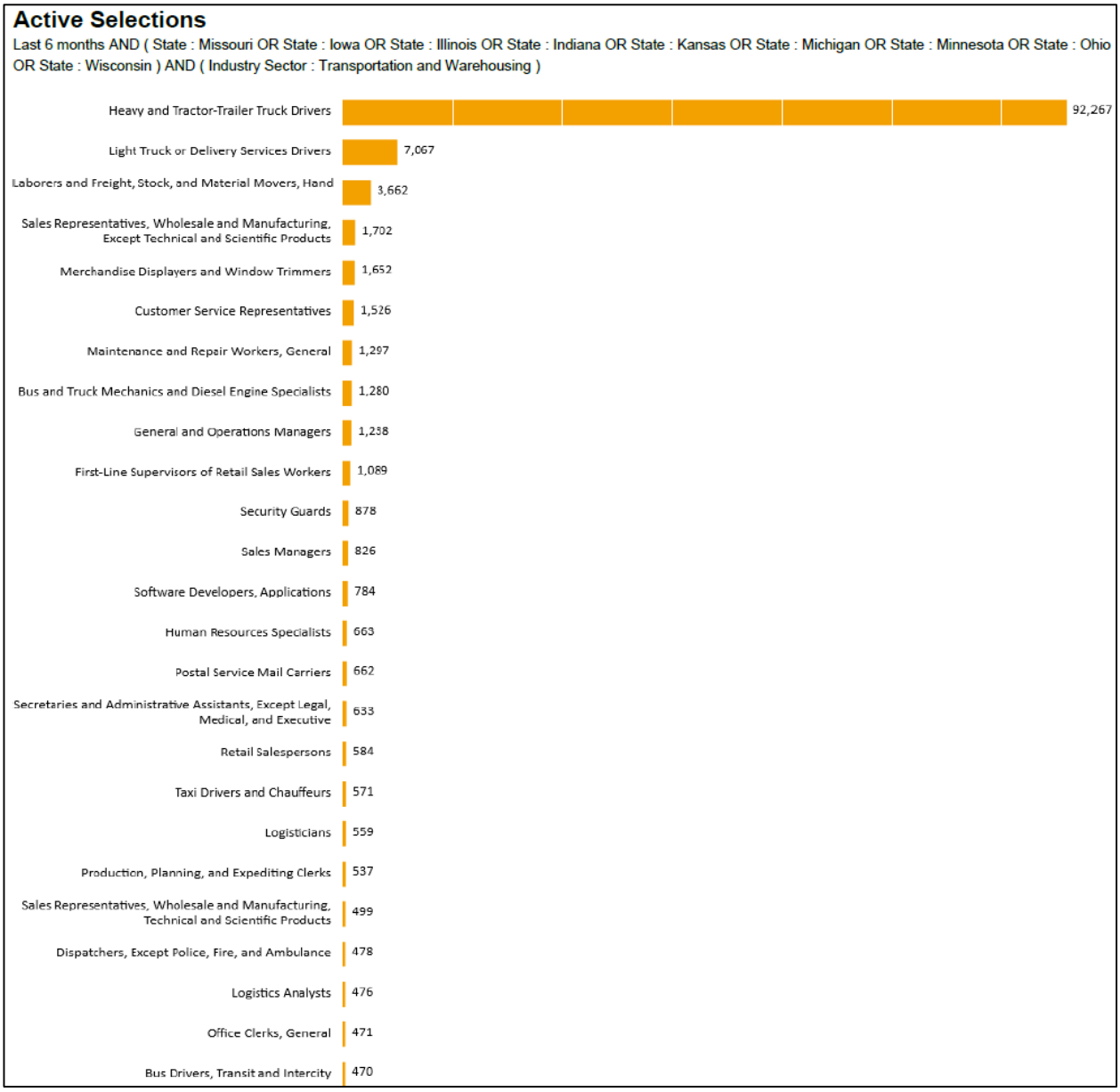

Figure 9. Top Transportation Job Postings in the Midwest Region: March-September 2015

Transportation labor demand has also been steadily increasing in the Midwest, excluding the recession. Figure 10 shows job postings for 2007 (before the recession) and 2010-15 (afterward). This data shows a decided spike in 2014 and 2015 year to date.

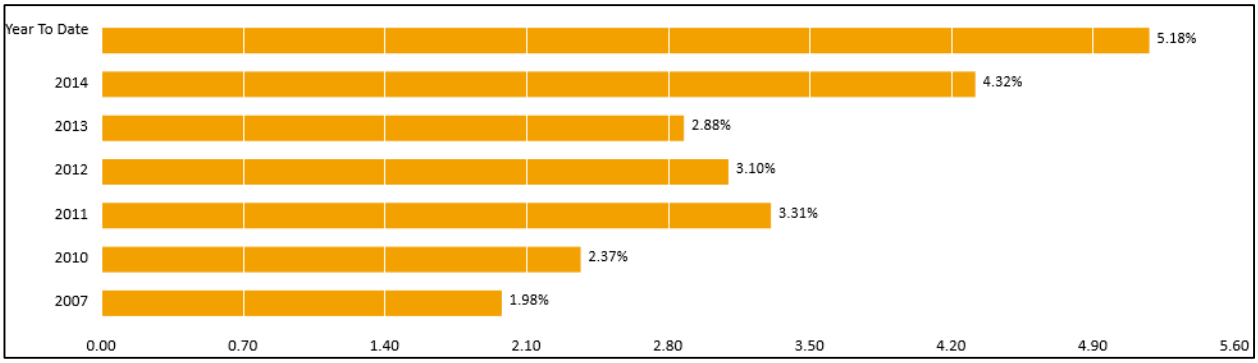

Figure 10. Transportation Job Postings by Year: 2007, 2010-15

A Burning Glass analysis (Figure 11) of job postings skills shows a preference for repair, inspection, logistics, and forklift operational skills. So-called soft skills are also in high demand, such as sales and marketing; as are certain STEM skills, notably mathematics. Many of these occupations require a high degree of precision and planning.

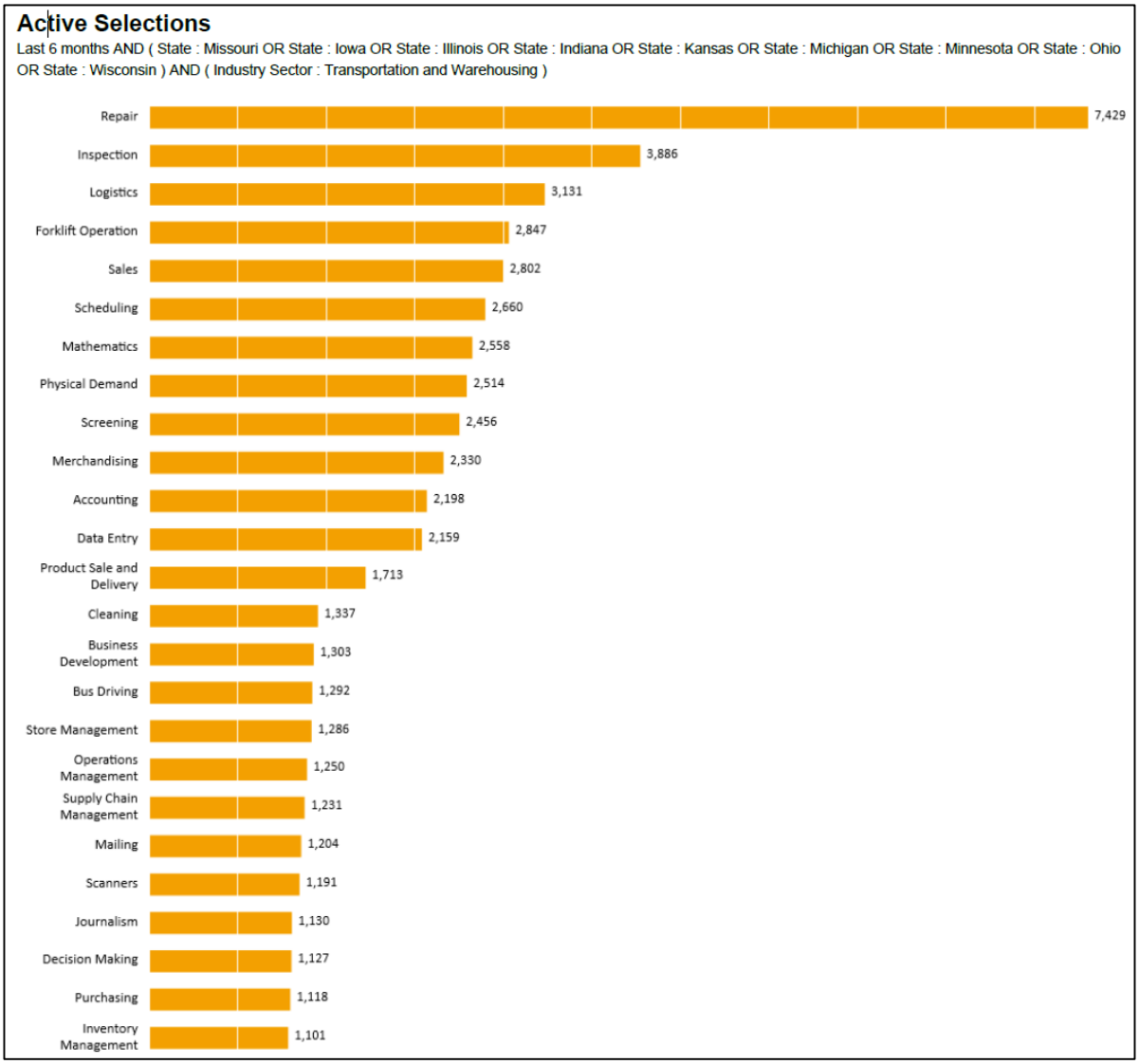

Figure 11. Top Job Postings Skills in the Midwest Region: March-September 2015

Figure 12 shows the top industry employers across the region, again from Burning Glass. These firms are overwhelmingly trucking, other highway transport, and transportation broker firms.

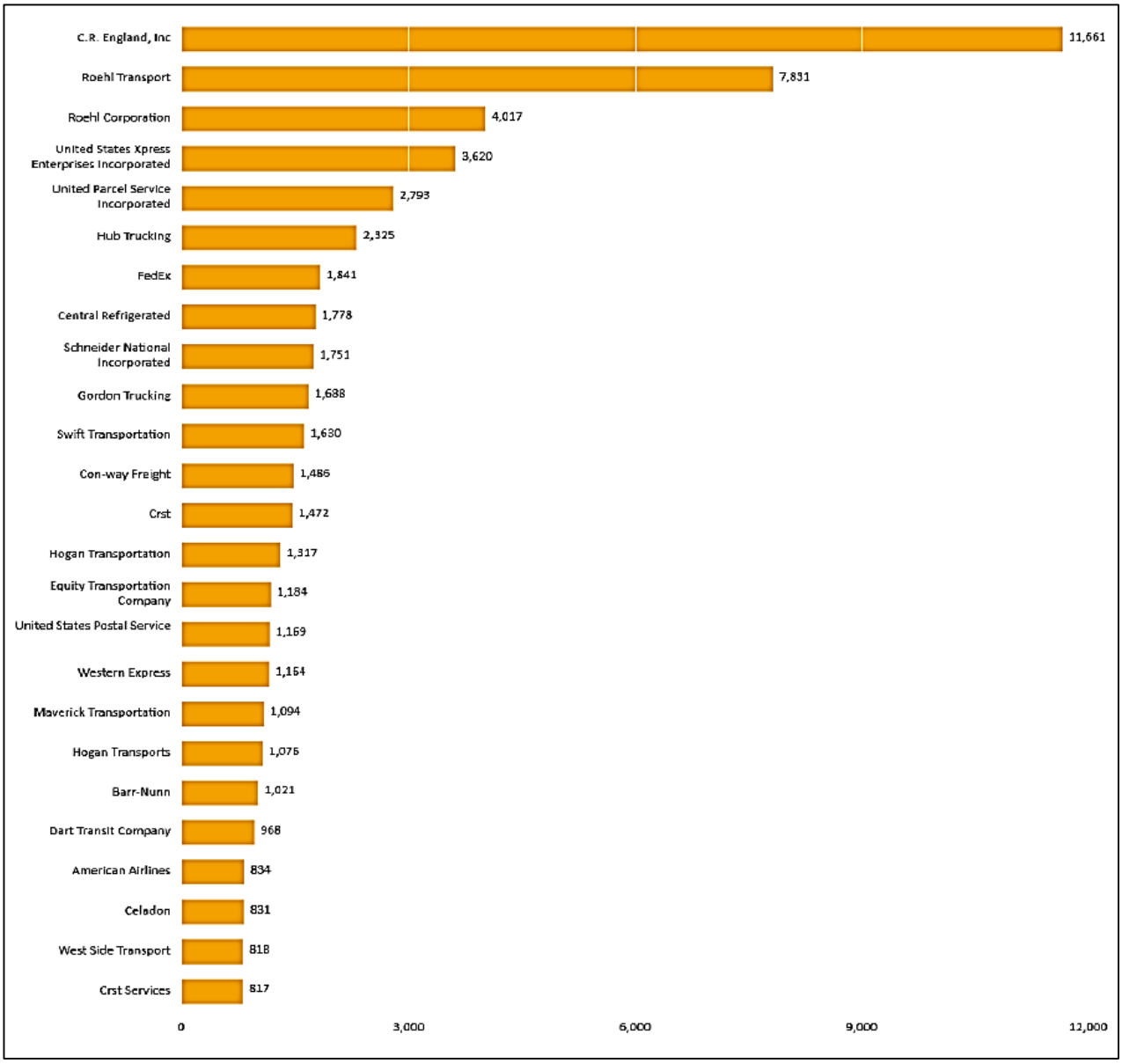

Figure 12. Top Transportation Employers in the Midwest Region by Job Postings: September 2015

Figures 13-16 provide a summary of the transportation workforce in the Midwest. Figure 13 is a comparison of transportation jobs by wages and skills. Only a few occupations, such as civil engineers and planners, enjoy high starting salaries and require high educational attainment. The majority of these occupations do not require a high educational attainment but may pay above-average wages, such as truck drivers. Packers and packagers rank lowest in both categories. Crucial to the work of the MTWC will be to create pathways from lower wage to higher wage occupations.

Figure 14 breaks down the occupations by demand. Figure 15 includes current educational attainment of the workforce, illustrating that more and more workers without postsecondary education are retiring from the workforce. Lastly, Figure 16 shows the distribution of wages in transportation occupations.

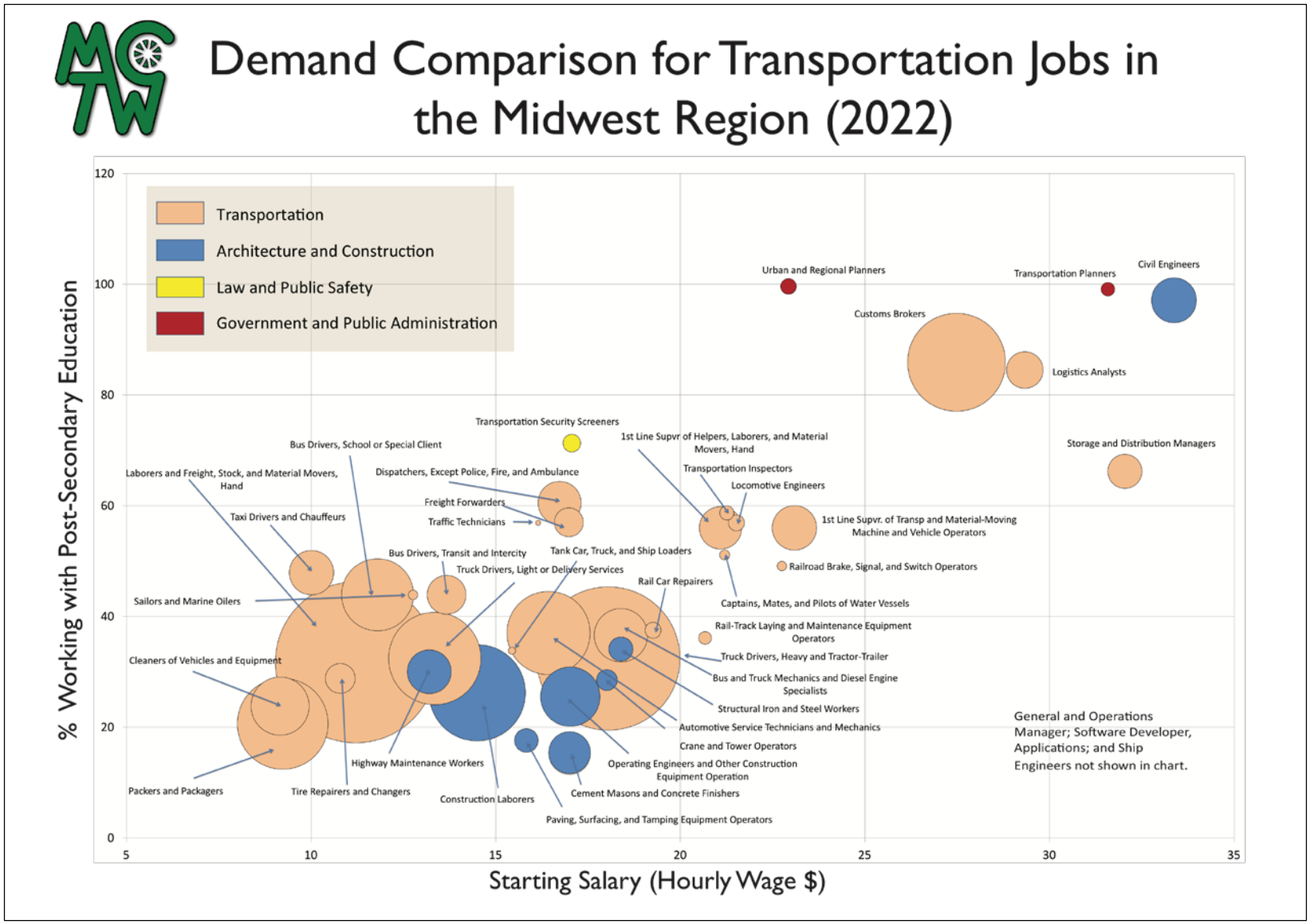

Figure 13. Demand Comparison of Transportation Jobs in the Midwest Region by Wages and Skill

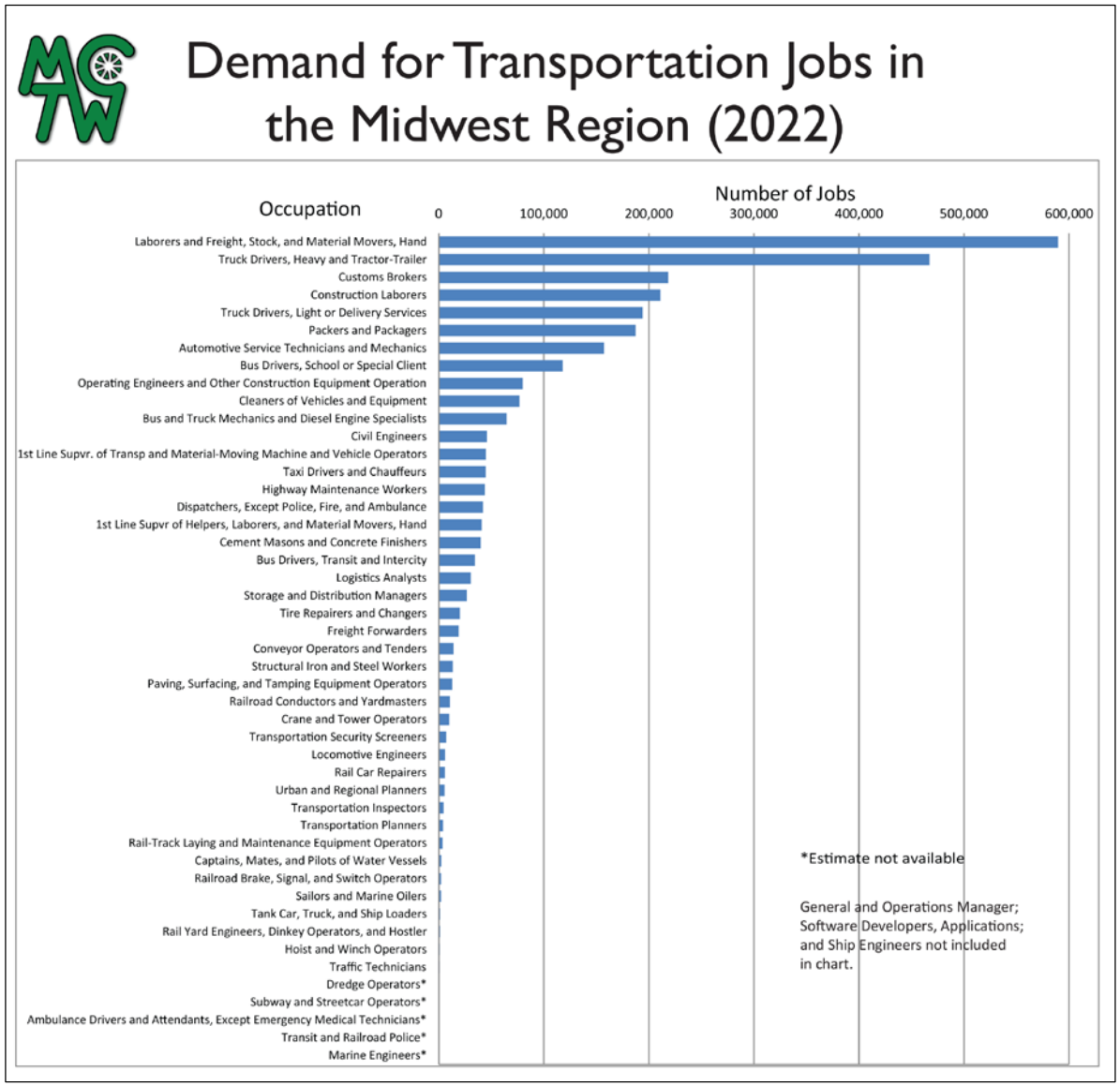

Figure 14. Demand for Transportation Jobs in the Midwest

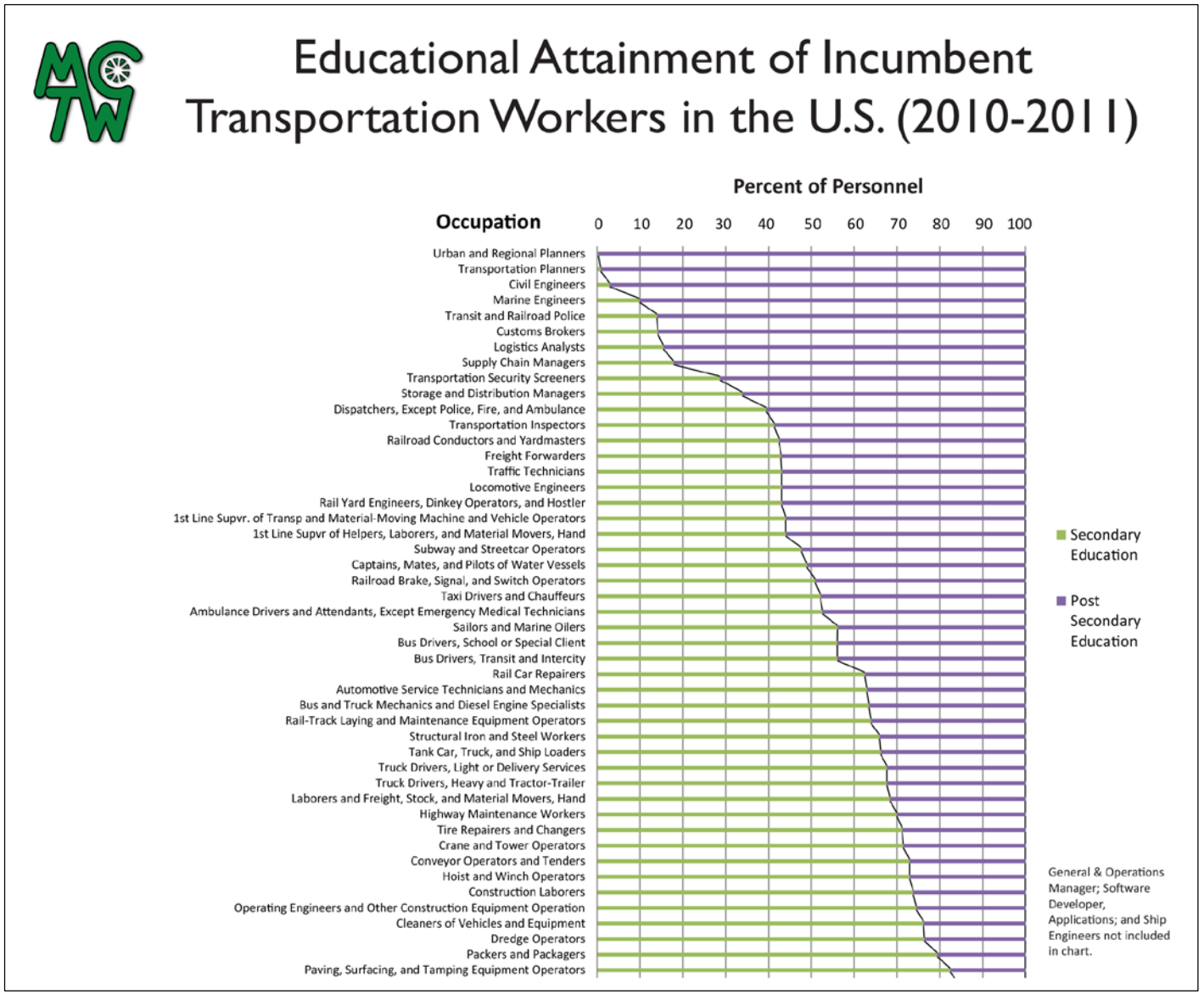

Figure 15. Educational Attainment of Incumbent Workers

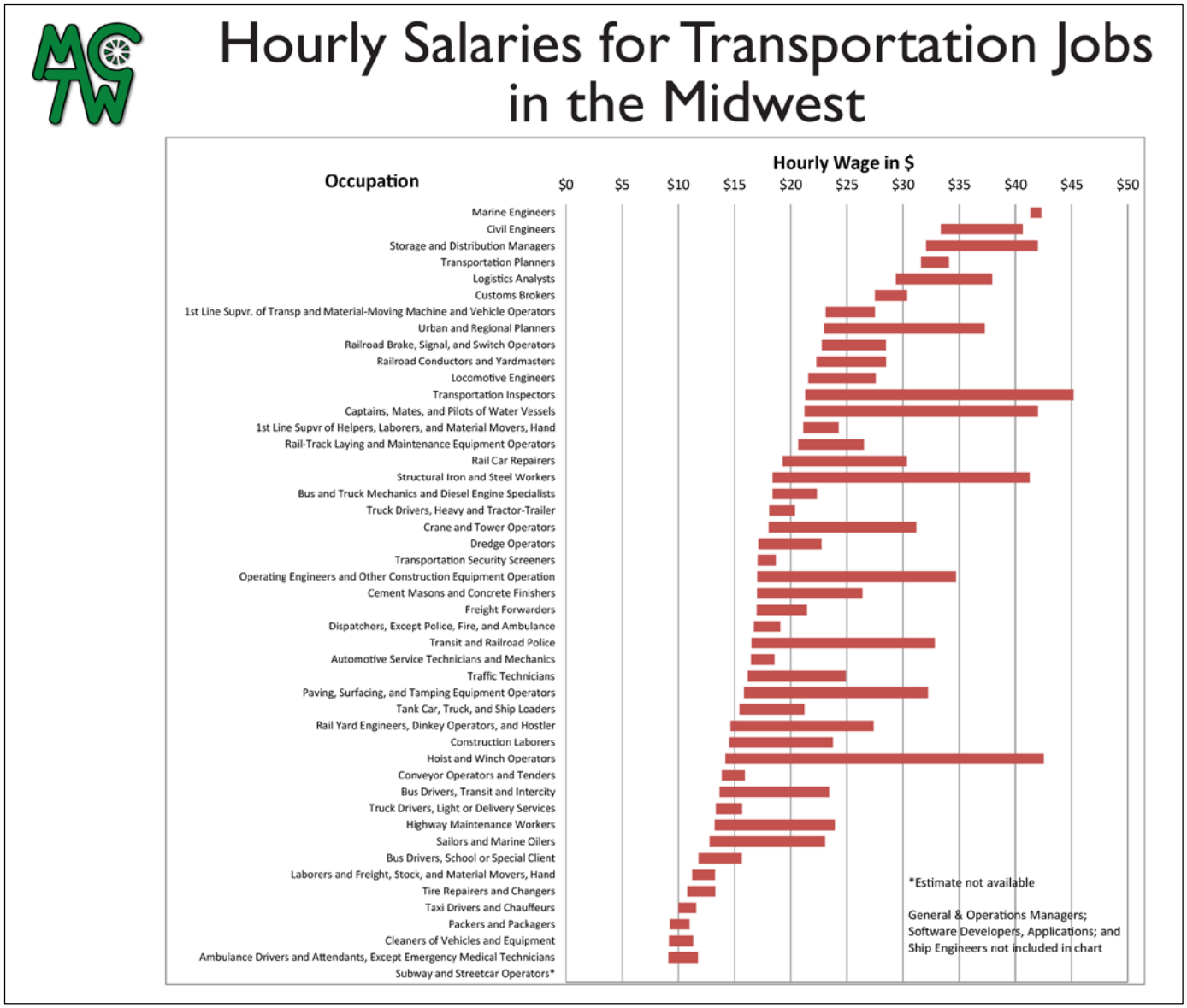

Figure 16. Hourly Salaries in the Midwest

SKILLS NEEDS FOR KEY OCCUPATIONS IN THE MIDWEST

Identifying skill needs for these occupations allows a clearer understanding of the requirements and expectations related to specific occupations, and for guidance into proper training and employment consistent with these skills and abilities. This will be more fully outlined in Phase 2 of this report.

Table 24 lists the Midwest's identified priority occupations and the top skills identified for each, as well as additional required skills as identified by data collected from O*NET and Burning Glass.

While relevant work experience is important to many employers, some offer on-the-job training. Workforce programs offering training support for these jobs is also available, although the decline of public funding region-wide is impacting the entry of many individuals into the workforce, notably minorities and those of limited means.

Many of these skills can be applied across multiple occupations but other occupations require unique and highly industry-specific skills. Ship, barge, and tug engineers, for instance, must be fully trained in ship engine and equipment operations and maintenance; customs brokers must possess updated and detailed knowledge of state, federal, and foreign customs regulations and operations.

Interviews in the private and public transportation sectors have also identified the lack of additional, essential skills:

- Communications
- Customer service
- Problem solving and critical thinking
- Decision making
- Prioritizing tasks

These, however, are skills perhaps universally lacking in an unprepared US workforce and not unique to the transportation workforce.

Table 24. Skill Requirements for Priority Occupations in the Midwest Region

Occupation	Top Skills Highlighted in Job Postings	Additional Required Skills
STEM Occupations		
Civil engineers	Computer-aided design (CAD), engineering design, inspection, construction management, civil 3D	Mathematics, critical thinking, complex problem solving, reasoning, decision making
Software developers, applications	JavaScript, SQL, Microsoft C#, .NET programming, C++	Programming, systems evaluation, complex problem solving, reasoning, fluency of ideas
Ship engineers	Repair, machinery, CAD, inspection, architecture software	Critical thinking, equipment maintenance, troubleshooting, problem sensitivity
CTE/Vocational or Technical Occupations		
Bus and truck mechanics and diesel engine specialists	Repair, inspection, vehicle maintenance, hand tools, fuel systems	Machine troubleshooting, equipment monitoring, manual and finger dexterity
Mates - ship, boat, and barge	Cleaning, first aid, robotics, inspection, data entry	Equipment operation, monitoring and control, critical thinking, control precision, problem sensitivity
Heavy and tractor-trailer drivers	Inspection, repair, product delivery, forklift operation, record keeping	Equipment operation, control and monitoring, critical thinking, control precision, far and near vision, reaction time
Operating engineers and other construction equipment operation	Equipment operation, heavy equipment, repair, machinery	Operational control and monitoring, personnel monitoring, equipment maintenance, control precision, depth perception
Skilled Laborer Occupations		
First line supervisors of transportation and material-moving machine and vehicle operators	Scheduling, forklift operation, inspection, operations management, logistics	Management of personnel and resources, critical thinking, oral and written comprehension, expression, problem sensitivity, deductive reasoning
Construction laborers	Hand tools, power tools, machinery, repair	Coordination, machine operation, manual dexterity, arm/hand steadiness, static strength
Supply Chain and Logistics Occupations		
Customs brokers	Product sales and delivery, expediting, logistics, data entry, invoicing	Complex problem solving, written and oral comprehension, expression, deductive reasoning
General and operations manager	Budgeting, scheduling, project management, customer service, process improvement, performance management	Coordinating work of others, oral and written comprehension, problem sensitivity, decision making, active listening
Logisticians	Logistics, procurement, supply chain, purchasing, inventory management	Critical thinking, complex problem solving, oral comprehension and expression, problem sensitivity

Sources: O*NET and Burning Glass

CONCLUSION

By identifying the region's key occupations, the findings of this report provide for a coordinated, strategic, and structured approach to transportation workforce development at the region, state and local levels. These results will help to focus the work of the Center going forward and guide its interactions with the Center's public and private sector stakeholders. Through partnership, the Center can work with the transportation, education, workforce investment, and labor/union communities throughout the region to address pressing workforce challenges related to these key occupations. This collaborative approach will be important to the success of transportation workforce development and to the efficiency and effectiveness of the region's transportation system. This focus will also ensure the region's workforce development efforts, particularly around these 14 critical occupations, are meeting the needs of the industry as these careers continue to become more complex and technologically advanced.

The Phase 2 Job Needs Report will further build upon the findings included in this document. In Phase 2, we will identify and discuss potential workforce development programs to address the skills needs identified. We will also include detailed action plans and recommendations to address workforce needs regarding the key occupations in the Midwest Region. These initiatives will allow for the Center and partners to better support the rapidly progressing transportation industry.

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Iowa at http://iwin.iwd.state.ia.us/iowa/ArticleReader?itemid=00003928&segmentid=0001&tour=0&p_date=1;

Kansas at https://klic.dol.ks.gov/gsipub/index.asp?docid=442;

Michigan *(note that these are 2010 and 2020 figures)* at http://milmi.org/?PAGEID=67&SUBID=201; Minnesota at https://apps.deed.state.mn.us/lmi/oes/Results.aspx;

Missouri at https://www.missourieconomy.org/occupations/occ_proj.stm;

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