

# APPENDIX F: RAIL ECONOMIC IMPACTS



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# **RAIL ECONOMIC IMPACTS**

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## EXECUTIVE SUMMARY

Rail economic impacts to Virginia are estimated using the IMPLAN® economic model with input data and assumptions from freight movement data (via the STB WAYBILL) and passenger rail operations and visitor characteristics. The impact of rail activities on the economy of Virginia emanates from railroads' capital and operating expenditures involved in providing freight and passenger transport services, industries using rail to trade goods (shippers/receivers), and the expenditures of visitors to Virginia who arrived by rail. Of these activities, freight-users generate the most significant impact.

Impacts are calculated and presented by activity (service provision and rail users), type (direct, indirect, induced, and total), and measure (employment, income, value added, output, and tax revenue) for year 2015 to provide a comprehensive perspective on how rail in Virginia impacts the economy as described below and shown in **Table E-1**:

- **Employment** – Economic impacts of rail extend beyond the 6,762 directly employed in the provision of rail transport (both passenger and freight). When the freight and visitor impact activities and multiplier impacts are included, rail-related employment in Virginia total 341,519 jobs, which represent 6.7 percent of the 5.1 million jobs statewide.
- **Income** – \$19.8 billion earned by these total employees represent 6.4 percent of Virginia's total labor income. Labor income includes employee compensation and proprietary income. Employee compensation, in turn, consists of wage and salary payments as well as benefits (health, retirement, etc.) and employer paid payroll taxes (employer side of social security, unemployment taxes, etc.). Proprietary income consists of payments received by self-employed individuals and unincorporated business owners.
- **Value Added** – The combined value added impact of rail services is over \$30.1 billion and represents 6.0 percent of the state's Gross State Product (GSP).
- **Output** – In terms of total revenue, the rail industry generated about \$72.9 billion in output, which represents 8.8 percent of Virginia's total output.
- **Tax Revenue** – Federal, state and local tax revenues generated by the rail industry totaled \$1.9 billion.



**Table E-1: Rail Economic Impacts in Virginia**

Measure and Type	Transport Services			Transport Users			Total		
	Pass.	Freight	Services	Pass.	Freight	Users	Pass.	Freight	Total
<b>Employment<sup>a</sup></b>									
<b>Direct</b>	914	5,848	6,762	438	163,674	164,111	1,352	169,522	170,873
<b>Total</b>	2,344	14,999	17,343	1,123	323,054	324,176	3,467	338,052	341,519
<b>Income<sup>b</sup></b>									
<b>Direct</b>	84.9	543.0	627.9	40.6	9,417.3	9,457.9	125.5	9,960.3	10,085.8
<b>Total</b>	168.4	1,077.4	1,245.8	80.6	18,502.8	18,583.5	249.0	19,580.2	19,829.2
<b>Value Added<sup>b</sup></b>									
<b>Direct</b>	146.6	937.9	1,084.5	70.2	12,999.8	13,070.0	216.8	13,937.7	14,154.5
<b>Total</b>	280.3	1,793.6	2,074.0	134.3	27,948.1	28,082.4	414.6	29,741.8	30,156.4
<b>Output<sup>b</sup></b>									
<b>Direct</b>	320.1	2,047.8	2,367.9	153.3	42,193.1	42,346.3	473.3	44,240.9	44,714.2
<b>Total</b>	553.1	3,538.8	4,091.9	264.9	68,529.0	68,793.9	818.0	72,067.9	72,885.8
<b>Tax Revenue<sup>b</sup></b>									
<b>Direct</b>	2.8	18.2	21.1	1.4	629.0	630.4	4.2	647.2	651.4
<b>Total</b>	12.8	82.2	95.0	6.2	1,805.3	1,811.5	19.0	1,887.5	1,906.5

Source: Amtrak, VRE, WAYBILL, IHS TRANSEARCH and IMPLAN

a. Employment rounded to the nearest 10 job-years; totals may not sum due to rounding

b. In millions of 2016 Dollars





# 1. INTRODUCTION

Economic impacts of rail activities in Virginia emanate from firms providing freight and passenger rail services, industries using such services to trade goods (shippers/receivers), and tourism-related visitors to Virginia via rail. Of these activities, freight-users generate the most significant impacts.

The Surface Transportation Board (STB) WAYBILL SAMPLE freight database is used to analyze Virginia rail goods movements. WAYBILL-derived, inbound, outbound, and intrastate commodity volumes and values<sup>1</sup> are applied, together with the IMPLAN<sup>®</sup> economic model, to determine how commodity movements generate direct economic impacts in Virginia relating to shippers/receivers.

Additionally, visits to Virginia via rail (spending on accommodations, food and beverages, recreational activities, etc.) and the provision of freight and passenger rail services also yield direct economic impacts.

Indirect impacts associated with suppliers, and induced impacts associated with the re-spending of income, are also quantified. The total economic impact comprises the direct, indirect, and induced types of market transactions. Total impact across these levels of market transactions is measured in terms of employment, income, value added (i.e., Gross State Product (GSP)), output, and taxes.

The analysis discussed in **Chapter 2.0** addresses a range of economic impacts that are directly and tangentially related to rail transportation. The chapter outlines the methodology, data sources, economic model, and the applied assumptions for freight and passenger movements.

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<sup>1</sup> Freight rail volumes are readily available from the STB WAYBILL database; however, values for the movements are not supplied; as such, values per ton for commodities from the TRANSEARCH<sup>®</sup> database pertaining to proximate geographies were applied to the STB WAYBILL data for Virginia.

## 2. METHODOLOGY, DATA SOURCES, AND ANALYSIS ASSUMPTIONS

### 2.1 METHODOLOGY AND TERMINOLOGY

Economic impacts of rail are driven by both transport service providers and the choice of rail made by users themselves. The total impacts of direct expenditures from each of these entities are quantified with economic multipliers to capture the additional indirect and induced effects of direct spending. The total impact is measured with five types of economic indicators: jobs (employment), income, value added, output, and taxes. The key dimensions in this analysis cover “activities,” “types,” and “measures,” which are defined as:

**Activities** – Virginia rail-related economic impacts are categorized into service provider and user impacts. Rail transport services would be curtailed in the absence of rail activity (elimination of goods or passenger movements). Transport user impacts pertain to industries using freight rail to transport goods or the industries supporting visitors to Virginia traveling by rail.

- **Transport Service Providers** – Impacts associated with the provision of rail transport (e.g., the rail industry) include a wide range of primarily modal transport activity, but also may include other support administrative operations. Service provider impacts are based on existing transportation industry information in the IMPLAN® model (e.g., “rail transportation”). It reflects freight (e.g., CSX Transportation, Norfolk Southern, and shortlines) and passenger (e.g., Amtrak and Virginia Railway Express) railroad operations.
- **Transport Users** – Impacts associated with shippers/receivers of freight and the industries that supply goods and services to out-of-state visitors traveling via rail.
  - **Freight Users** – Impacts associated with shippers/receivers using freight rail for goods movement (e.g., intermediate and final goods, etc.), excepting the rail industry itself. Rail users have several options available to transport freight and can substitute this service with other modes (truck and/or water) if rail services were unavailable. However, the choice to use railroads to ship/receive freight indicates cost and/or logistical advantages in a competitive marketplace. Loss of rail service would certainly negatively affect its current users.

- **Visitors** – Similarly, the local economy is also impacted by the activities of visitors to Virginia; and, for those visitors who reach Virginia by passenger rail (e.g., Amtrak), the economic impacts of their activities can be attributable to rail. Rail-transported visitors certainly have several transport options and could possibly substitute other modal transport (highway and/or air) if rail services became unavailable. The choice of those visitors to use Amtrak represents cost, convenience and/or amenity advantages. As such, if rail were unavailable, affected visitors' economic impact would certainly be reduced.

**Types** – The impact of transport service providers' and users' influence on the economy consists of three types that are additive in estimating a total impact:

- **Direct** – Represents the spending by each activity in either the provision of rail transport (e.g., "transport services"), or the use of rail by firms/industries to ship and receive goods or services to out-of-state visitors (e.g., "transport users"), or by visitors who travel by rail.
- **Indirect** – Impacts associated with the suppliers and providers of that provide intermediate goods and services to the directly impacted industries.
- **Induced** – Impacts associated with the re-spending of earned income from both the direct and indirect industries in the study area.<sup>2</sup>
- **Total** – Combines direct, indirect, and induced types.

**Measures** – Each type is measured in terms of five economic metrics<sup>3</sup>:

- **Jobs/Employment** – Measured in terms of full-time equivalent (FTE) job-years.
- **Income** – Wage/salary earnings paid to the associated jobs.
- **Value Added** – Net additional economic activity (e.g., total output less gross intermediate inputs), synonymous with Gross Regional Product; includes employee and proprietor income, other income types, taxes, etc., required to produce final goods and services.
- **Output** – Total sales value associated with all levels of economic activity (comprised of gross intermediate inputs and value added, combined).
- **Taxes** – Various taxes on production and imports (sales, property, excise, etc.), fines, fees, licenses, permits, etc. resulting from business economic activity; and, include all federal, state, and local tax revenues.

<sup>2</sup> Indirect and induced impact types are often referred to, jointly, as multiplier impacts.

<sup>3</sup> Note that all monetary measures are presented in 2016 dollars (e.g., income, value added, output, and taxes).

## 2.2 DATA SOURCES AND MODELS

Various data and modeling data are utilized to estimate economic impacts. Reflective of assorted production sectors, freight rail user impacts are typically much greater than those related to transport services, and higher still in comparison to visitor-related impacts. Generating comprehensive freight user-related estimates requires converting commodity movement data into direct industry output estimates. Key data sources include STB WAYBILL commodity movement data and the IMPLAN® economic model. Passenger-related impacts are derived from IMPLAN®, Amtrak, VRE, and other visitor-related data.

**WAYBILL SAMPLE** – Based on traditional Standard Transportation Commodity Classifications (STCC) developed for railroads, and by the Surface Transportation Board (STB), the WAYBILL provides detailed movement data by commodity at the county level. It uses a 2% stratified sample of carload waybills for all domestic rail traffic submitted by carriers that terminate 4,500 or more revenue carloads annually. STCC data were obtained from the WAYBILL at the four-digit level to ascertain the economic impact associated with firms that export locally produced goods, and/or import materials used in the production process (intermediate goods) or sold as finished products (final consumption). Although the WAYBILL database provides freight rail volumes, values for the movements are not supplied; as such, values per ton for commodities from the TRANSEARCH® database were applied to WAYBILL database for Virginia, effectively serving as a proxy estimate for the directional commodity movement values.

**IMPLAN®** – The IMPLAN® v3 model, produced by the IMPLAN® Group, LLC, is economic input-output software that performs analysis using a social account matrix. It is used to estimate the indirect and induced economic impacts to a defined geography (i.e., Virginia) based on direct expenditures in an industry or commodity.<sup>4</sup> The social account matrix reflects the economic transactions buyers and sellers across all industries (and commodities), households, and governments in an economy. These transactions measure the economic interdependency of each industry on others and are captured as impact “multipliers”. Multipliers are estimated with IMPLAN® based on regional purchase coefficients, production functions, and socioeconomic data for each of the economic impact variables and are geographically-specific. IMPLAN® data and industry-accounts closely follow the conventions used in the “Input-Output Study of the U.S. Economy” by the U.S. Bureau of Economic Analysis. IMPLAN® is one of the most commonly accepted models used for economic impact analysis and estimation throughout the country.

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<sup>4</sup> Note that all results presented pertain only to one-year static impacts for year 2012 flows (in year 2016 dollars), and do not provide any dynamic of feedback changes.

Additionally, IMPLAN® provides commodity-to-industry production and absorption matrices that enable the qualification, for example, of how inbound commodities are used (absorbed) across Virginia industries in the respective production processes to create final goods and services, or by institutions for final consumption. Further, algorithms developed for this analysis translate commodity (Standard Transportation Commodity Classification, or STCC) data into IMPLAN® industry categories. Such data and translation processes are used to estimate the impacts associated with directional commodity movements.

**Combined** - The WAYBILL commodity detail (supplemented with proxy values for the directional commodity tonnage movements) is linked with the IMPLAN® economic model to assess the economic interrelationships underpinning the Virginia economy, and to derive the economic impacts of freight. WAYBILL data provides the requisite commodity detail for translation into detailed economic interrelationships between commodities, industries, and institutions in the economy, made transparent via the IMPLAN® model.

IMPLAN® does not identify commodity tonnage movements (only the underlying commodity to industry structure), and the WAYBILL does not provide the economic interrelationships necessary to determine how the commodity movements interact within the economy. As such, the two sources are combined to derive the freight-related economic impacts to Virginia.

**Visitor Data** – Expenditures were estimated for out-of-state visitors arriving by Amtrak, based on various sources. Amtrak “Fact Sheets”<sup>5</sup> were used to estimate passenger movements. Travel expenditure data and overall visitor characteristics were estimated via similarly-conducted previous studies such as “Amtrak’s Economic Contribution.”<sup>6</sup>

## 2.3 FREIGHT TONNAGE AND VALUE

Freight tonnage volumes used in the economic analysis are based on the data and findings presented in **Chapter 2 of the State Rail Plan**. Economically-relevant directional movements include outbound (originating within Virginia, terminating beyond), inbound (originating beyond Virginia, terminating within), and intra (originating and terminating within Virginia). However, through-Virginia traffic is not directly applicable to freight users based in Virginia, and are thus excluded; albeit, such movements affect on the magnitude of freight transport service providers in Virginia.

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<sup>5</sup> <https://www.amtrak.com/ccurl/782/388/VIRGINIA16,0.pdf>

<sup>6</sup> <https://www.amtrak.com/ccurl/941/821/Virginia15,0.pdf>

For economic analysis, two considerations to the data presented in **Chapter 2 of the State Rail Plan** were made:

- **Commodity Detail** – To translate between WAYBILL commodity categories with those of IMPLAN®, commodity flow data are analyzed from a detailed four-digit STCC code level, whereas the freight flow analysis is aggregated at the two-digit STCC level.<sup>7</sup>
- **Intrastate Movements** – Are combined with outbound movements, since both reflect industry production within Virginia.

While the detailed commodity freight flows (e.g., four-digit STCC) are evaluated in the economic impact calculations, the consolidated tons and value movements (e.g., two-digit STCC) are summarized in **Table 2-1**.

**Table 2-1: Economically-Relevant Freight Movements**

STCC 2	Commodity	Tons		Value (In Millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	
Outbound / Intrastate						
11	Coal	19,620,963	59	767	5	39
14	Nonmetallic Minerals	5,483,299	17	55	0	10
46	Misc. Mixed Shipments	1,672,760	5	8,600	51	5,141
28	Chemicals or Allied Products	1,317,228	4	2,355	14	1,788
32	Clay, Concrete, Glass or Stone	998,024	3	121	1	121
26	Pulp, Paper or Allied Products	983,000	3	713	4	725
29	Petroleum or Coal Products	781,999	2	792	5	1,013
33	Primary Metal Products	694,864	2	1,108	7	1,595

<sup>7</sup> STCC4 and STCC2 are commodity aggregation designations, with STCC4 reflecting more detailed commodity sub-categorization, whereas STCC2 reflect higher level category subtotals; the freight flow analysis presents STCC2 results for the sake of simplifying and presenting multidimensional results; however, the economic analysis necessitates the greater commodity detail because of the detailed commodity-to-industry economic model structure.

STCC 2	Commodity	Tons		Value (In Millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	
24	Logs, Lumber, Wood Prod.	436,864	1	135	1	308
40	Waste or Scrap Materials	305,392	1	73	0	238
	Remaining Commodities	790,477	2	2,019	12	2,554
	<b>Total</b>	<b>33,084,870</b>	<b>100</b>	<b>16,738</b>	<b>100</b>	<b>506</b>
<b>Inbound</b>						
11	Coal	46,208,864	75	1,806	7	39
28	Chemicals or Allied Products	3,291,869	5	4,877	19	1,482
46	Misc. Mixed Shipments	2,342,360	4	12,042	46	5,141
40	Waste or Scrap Materials	2,302,984	4	550	2	239
1	Farm Products	2,178,872	4	826	3	379
20	Food or Kindred Products	2,106,008	3	1,336	5	634
32	Clay, Concrete, Glass or Stone	966,932	2	467	2	483
26	Pulp, Paper or Allied Products	678,320	1	784	3	1,156
29	Petroleum or Coal Products	563,800	1	560	2	994
14	Nonmetallic Minerals	464,156	1	35	0	76
	Remaining Commodities	851,976	1	2,942	11	3,453
	<b>Total</b>	<b>61,956,141</b>	<b>100</b>	<b>26,227</b>	<b>100</b>	<b>423</b>

Source: STB WAYBILL 2012

**Outbound/Intrastate** – Combining outbound and intrastate rail movements, 33.1 million tons of freight in 2012, valued at \$16.7 billion, originates in Virginia. Coal and Nonmetallic Mineral comprise the majority of originating freight tonnage (76 percent, combined). Impacts associated with outbound/intrastate movements are derived by mapping the freight values with the respective industrial production in Virginia from the IMPLAN® model. While Miscellaneous Mixed Shipments category is a relatively small tonnage share (5 percent) compared to Coal (59 percent) the relatively high value per ton (mostly containers with a heterogeneous composition of goods) results in the first largest-valued movement originating in Virginia (51 percent). Such undefined commodities are mapped



into the economic model by allocating the associated value across the various existing physical goods production within the existing economy.

**Inbound** – In 2012, 62.0 million economically-relevant tons, valued at \$26.2 billion, were transported by rail into Virginia. Coal, by far the largest commodity by volume at 75 percent, only amounts to 7 percent of the inbound value. In contrast, Miscellaneous Mixed Shipments (i.e., containerized goods) comprise 4 percent of inbound volume, but 46 percent of the value. In combination with Chemicals or Allied Products, those two categories comprise nearly two-thirds of all inbound freight value (65 percent). Inbound commodities are translated into economic impacts by mapping the value of the inbound goods via the absorption of such respective goods into the industry production in Virginia. Non-defined miscellaneous commodities are reallocated to the various existing Virginia industries that absorb physical products into the production process.<sup>8</sup>

## 2.4 PASSENGER RAIL ASSUMPTIONS

Several data sources are used to estimate passenger rail use include: Amtrak, Virginia Railway Express, rail industry journals, annual reports, IMPLAN®, the internet, and consultant experience. Specific data from these sources include: the number of passengers (equally split between boardings and alightings), employment, revenues, operating expenses, visitor characteristics (percent of passengers, average expenditures), etc. Such information is used to estimate direct transport-service and transport-user impacts input into the IMPLAN® model.

**Passenger Transport** – IMPLAN® industry data provides various economic measures associated with the direct provision of rail transport in Virginia (e.g., employment, output, etc.). Unfortunately, such data are not subcategorized by passenger versus freight transport. As such, to estimate the passenger share of direct transport service impacts required evaluation of the Amtrak “Fact Sheets” for Virginia in Fiscal Year (FY) 2016 and VRE data. These data provide total employment and labor income for Amtrak and VRE passenger rail transport service. While Amtrak data excludes any freight transport activity, it is comparable to the overall industry sector IMPLAN® totals. Consequently, the difference between the IMPLAN® rail transport industry sector totals (i.e., 6,762 jobs) and the estimated direct passenger transport activity impacts (i.e., about 914 jobs) provides an estimate for direct freight rail provision activity impacts (i.e., 5,848 jobs).

**Passenger Visitor Expenditures** – Out-of-state visitor expenditures drive the impact that Amtrak rail passengers arriving in Virginia (obtained from the Amtrak Fact Sheets) have on the local economy.

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<sup>8</sup> These commodities are allocated in proportion to the existing economic composition of imported physical products to the region.



Expenditure data is used to estimate the share of rail visitors (i.e., out-of-state) and average visitor spending.

In the case of Amtrak, total annual passenger movements for the 20 Virginia stations totaled 1,553,010 in FY 16 (**Table 2-2**). Since each passenger typically embarks (boards) and disembarks (alights), it is necessary to divide total passenger movements by two to estimate the actual number of Amtrak passengers (776,505). It was estimated that approximately half of the boarding passengers are out-of-state visitors. Assuming that the duration of an average visit lasts 3.5 days and each visitor spends \$120 per day, then the total amount of direct spending in Virginia by these passengers is about \$153 million.

**Table 2-2: Passenger Rail Visitor Expenditures for Amtrak**

Expenditure	Amount
Location	Statewide
<b>Annual Passengers</b>	
Boardings	776,505
Alightings	776,505
Total Movements	1,553,010
<b>Visitors (Out-Of-State)</b>	
Percent	47
Number	364,957
Expenditures/Day	\$120
Days/Visit	3.5
Visitor Expenditures	\$153.3 million

Source: Amtrak

### 3. RAIL ECONOMIC IMPACTS

Rail impacts total 341,519 jobs across Virginia, reflecting the various impact activities (services provision and users) and types (direct plus multipliers). A vast majority of these total employment impacts arise from rail users who move goods via the freight system, with the fractional balance attributable to transport services and visitor impacts.

The ensuing discussion details the composition of the employment impact estimates, as well as the other impact measures (e.g., output, value added, income, and taxes). Impact types (e.g., direct, indirect, and induced) and measures are first presented for rail transport-services, and then for freight and visitor users.

## 3.1 TRANSPORT SERVICE IMPACTS

Provisioning rail transportation to Virginia yields a direct employment impact of 6,762 jobs, comprised of 914 passenger-related transport jobs and 5,848 freight transport jobs. The indirect and induced effects in other related industries due to spending on rail operations generates an additional 10,581 jobs (5,148 and 5,433 indirect and induced, respectively) throughout the State. Combined, an estimated 17,343 people owe their jobs, directly or tangentially to the provision of rail for freight and passenger service. Note, that as discussed below, additional job impacts are associated with impact of rail users.

Summary findings shown in **Table 3-1** indicate that the freight movement is a larger relative contributor to economic activity than the passenger component.

**Table 3-1: Transport Service Impacts**

Measure and Type	Passenger	Freight	Services Total
<b>Employment<sup>a</sup></b>			
<b>Direct</b>	914	5,848	6,762
<b>Indirect</b>	696	4,452	5,148
<b>Induced</b>	734	4,699	5,433
<b>Total</b>	<b>2,344</b>	<b>14,999</b>	<b>17,343</b>
<b>Income<sup>b</sup></b>			
<b>Direct</b>	84.9	543.0	627.9
<b>Indirect</b>	50.0	320.1	370.1
<b>Induced</b>	33.5	214.3	247.8
<b>Total</b>	<b>168.4</b>	<b>1,077.4</b>	<b>1,245.8</b>
<b>Value Added<sup>b</sup></b>			
<b>Direct</b>	146.6	937.9	1,084.5
<b>Indirect</b>	72.2	462.0	534.2
<b>Induced</b>	61.5	393.7	455.3



Measure and Type	Passenger	Freight	Services Total
<b>Total</b>	<b>280.3</b>	<b>1,793.6</b>	<b>2,074.0</b>
<b>Output<sup>b</sup></b>			
<b>Direct</b>	320.1	2,047.8	2,367.9
<b>Indirect</b>	128.4	821.3	949.6
<b>Induced</b>	104.7	669.7	774.4
<b>Total</b>	<b>553.1</b>	<b>3,538.8</b>	<b>4,091.9</b>
<b>Tax Revenue<sup>b</sup></b>			
<b>Direct</b>	2.8	18.2	21.1
<b>Indirect</b>	4.6	29.3	33.9
<b>Induced</b>	5.4	34.7	40.1
<b>Total</b>	<b>12.8</b>	<b>82.2</b>	<b>95.0</b>

Source: Amtrak, VRE, and IMPLAN

a Employment rounded to the nearest 10 job-years; totals may not sum due to rounding

b In millions of 2016 Dollars

- **Direct** – Combining the passenger and freight providers yield a direct impact of 6,762 jobs, earning \$627.9 million in labor income, producing \$1.08 billion in value added activity, which equates to \$2.37 billion in economic output, with tax revenues (on direct output) of \$21.1 million.
- **Total** – Including the Virginia multiplier effects, transport service-related activity impacts total 17,343 jobs, earning \$1.25 billion in labor income, producing \$2.07 billion in economic value added, which equates to a total economic output of \$4.09 billion, and yields a tax impact of \$95.0 million to the State and Federal governments.

## 3.2 TRANSPORT USER IMPACTS

Passenger-related activities reflect expenditures within the region by out-of-state visitors, based on Amtrak related passenger movements and assumptions regarding visitors (versus residents), average length of stay, average visitor expenditure per day, and an allocation to various expenditure categories (e.g., retail purchases, ground transportation, entertainment and recreation, lodging, and food purchases).

Freight-related activities reflect the extent to which inbound goods via rail are absorbed into the existing production processes as intermediates into the final production of saleable goods and services,

and how outbound/intrastate goods via rail are produced by the various existing industries in the region.

**Table 3-2** presents the impacts to Virginia from rail users, including passenger and freight activities. A breakdown of the directional-related freight user impacts is also provided in **Table 3-1**. Combining passenger and freight users yields the following combined impacts:

- **Direct** – The combined direct impact of passenger and freight users amounts to 164,111 jobs, earning \$9.46 billion in labor income, producing \$13.07 billion in value added activity, which equates to \$42.35 billion in economic output; with tax revenues (on direct output) equating to \$630.4 million.
- **Total** – The wider indirect and induced impacts of these direct expenditures is estimated to be 324,176 jobs, earning \$18.58 billion in labor income, producing \$28.08 billion in economic value added, which equates to a total economic output of \$68.79 billion, and yields a tax impact of \$1.81 billion to the State and Federal governments.

**Table 3-2: Transport User Impacts**

Measure and Type	Passenger	Freight			Users Total
		Outbound/Intra	Inbound	Subtotal	
Employment <sup>a</sup>					
Direct	438	62,947	100,727	163,674	164,111
Indirect	333	29,638	49,263	78,901	79,235
Induced	352	31,402	49,076	80,478	80,830
Total	1,123	123,987	199,067	323,054	324,176
Income <sup>b</sup>					
Direct	40.6	3,724.3	5,693.0	9,417.3	9,457.9
Indirect	24.0	2,069.8	3,348.6	5,418.4	5,442.4
Induced	16.0	1,430.6	2,236.5	3,667.1	3,683.1
Total	80.6	7,224.7	11,278.1	18,502.8	18,583.5
Value Added <sup>b</sup>					
Direct	70.2	5,065.8	7,934.0	12,999.8	13,070.0
Indirect	34.6	3,136.2	5,071.5	8,207.7	8,242.3



Measure and Type	Passenger	Freight			Users Total
		Outbound/Intra	Inbound	Subtotal	
<b>Induced</b>	29.5	2,629.8	4,110.8	6,740.7	6,770.1
<b>Total</b>	134.3	10,831.8	17,116.3	27,948.1	28,082.4
<b>Output<sup>b</sup></b>					
<b>Direct</b>	153.3	16,273.6	25,919.5	42,193.1	42,346.3
<b>Indirect</b>	61.5	5,727.4	9,145.8	14,873.2	14,934.7
<b>Induced</b>	50.1	4,471.8	6,990.9	11,462.7	11,512.9
<b>Total</b>	264.9	26,472.8	42,056.2	68,529.0	68,793.9
<b>Tax Revenue<sup>b</sup></b>					
<b>Direct</b>	1.4	238.9	390.2	629.0	630.4
<b>Indirect</b>	2.2	233.4	348.6	582.1	584.3
<b>Induced</b>	2.6	231.9	362.3	594.2	596.8
<b>Total</b>	6.2	704.2	1,101.1	1,805.3	1,811.5

Source: Amtrak, WAYBILL, IHS TRANSEARCH and IMPLAN

a Employment rounded to the nearest 10 job-years; totals may not sum due to rounding

b In millions of 2016 Dollars

### 3.2.1 VISITOR IMPACTS

The results in **Table 3-2** show that passenger-related rail user impacts are significantly smaller than freight-user impacts. This result is not surprising considering the overall volumes carried by each mode (i.e. annual passengers as compared to annual freight volumes). The impact differential is a function of the relative volumes and the value carried. In addition, the passenger-related user impacts reflect spending in service industries. In contrast, freight-related user impacts are dispersed throughout various industries in the economy, including those almost entirely rail dependent. As such, the narrowly-focused passenger user-related impacts are overshadowed by the more broadly-encompassing freight-related impacts.

- **Direct** – Passengers and the tourism-related spending yields a direct impact of 438 jobs, earning \$40.6 million in labor income, producing \$70.2 million in value added activity, which equates to \$153.3 million in economic output, with tax revenues (on direct output) of \$1.4 million.



- **Total** - Including the multipliers, passenger-related user activity impacts a total of 1,123 jobs, earning \$80.6 million in labor income, producing \$134.3 million in economic value added, which equates to a total economic output of \$264.9 million, and yields a tax impact of \$6.2 million to the State and Federal governments.

### 3.2.2 FREIGHT USER IMPACTS

In addition to the transport-service impacts detailed above, many consignees and shippers heavily rely on rail service to receive and/or ship freight; in doing so, they generate significant impacts. While these firms/ industries are not entirely dependent on rail for shipping freight (as alternative modes are available, such as trucking), it is hard to envision continued operations without such access. In fact, rail access is often instrumental in major manufacturing business location decisions.

If railroads did not accommodate demand, consignees and shippers could use other modes (i.e., truck, water, air, etc.) to transport freight. However, the use of other modes would likely entail higher transport costs (due to longer transport distances, price, logistics, etc.) and could increase overall demand (and resulting handling costs) for all users of other modes (both the diverted rail users as well as current users). In the long-run, without rail, rail-dependent industries could shift away from Virginia to other locations with relatively better rail accessibility and better modal options/mix.

The results that follow then represent the share of the economy in Virginia that is influenced in some way by freight rail use. Recognizing that rail is the preferred but not only choice of these shippers, these results indicate the contribution of rail to the state's economy based on sound business decisions in a competitive economy. If the low cost shipping services provided by rail were compromised, the impact of transportation cost increases would ripple through the economy and likely lead to a significant decline overall.

The following analysis estimates the economic impacts associated with industries in Virginia that rely on freight rail transport. To estimate such impacts associated with rail tonnage movements requires an understanding of how the various inbound and outbound/intrastate commodities are used or produced by various industries to generate output, income, and employment. To do so, the IMPLAN® commodity-to-industry matrices and other algorithms were applied to estimate direct impact measures. Indirect and induced multipliers were then applied to the direct impact estimates to derive total economic impacts.

**Outbound/Intrastate** – 33.1 million tons of freight originating in Virginia is either shipped via rail out-of-state (18.2 million tons) or internally (14.9 million tons). Combined, rail freight originating in Virginia is valued at \$16.8 billion (see **Table 2-1** and generates an estimated 123,987 total jobs (see **Table 3-2**).

**Inbound** – 62.0 million tons of inbound freight originating beyond Virginia, valued at \$26.2 billion (see **Table 2-1**), are used by Virginia industries and institutions to generate 199,067 total jobs (see **Table 3-2**). Inbound freight user impacts comprise final demand and intermediate demand. Final demand goods are distributed via wholesale or retail outlets, or through direct sales, with economic impacts stemming from the trade margins associated with the transfer of goods from suppliers to end-users.

- **Direct** – Combining the directional components of freight users yields a direct subtotal impact of 163,674 jobs, earning \$9.42 billion in labor income, producing \$13.00 billion in value added activity, which equates to \$42.35 billion in economic output, with tax revenues (on direct output) of \$630.39 million.
- **Total** – Including the multipliers, freight user activity impacts total 323,054 jobs, earning \$18.50 billion in labor income, producing \$27.95 billion in economic value added, which equates to a total economic output of \$68.53 billion, and yields a tax impact of \$1.81 billion.

### 3.3 TOTAL RAIL ACTIVITY IMPACTS

Rail service is essential to Virginia’s economy. While the actual provision of rail service generates 6,762 direct jobs (17,343 including multipliers), the impact of rail users generates 164,111 direct jobs, a significant majority of which relates to freight users (compared with passengers). Impacts to Virginia by rail activity (transport services and users, differentiated by passenger and freight rail purposes), by impact measure (output, employment, labor income, value-added, and taxes), and by type (direct, indirect, induced, and total) are summarized in **Table 3-3**.

- **Direct** – Combining the various rail-related activities yields a direct impact of 170,873 jobs, earning \$10.09 billion in labor income, producing \$14.15 billion in value added activity, which equates to \$44.71 billion in economic output, with tax revenues (on direct output) of \$651.4 million.
- **Total** – Including the multipliers, the various rail-related activities total 341,519 jobs, earning \$19.83 billion in labor income, producing \$30.16 billion in economic value added, which equates to a total economic output of \$72.89 billion, and yields a tax impact of \$1.91 billion.

**Table 3-3: Rail Impacts**

Measure and Type	Transport Services			Transport Users			Total		
	Passenger	Freight	Services	Passenger	Freight	Users	Passenger	Freight	Total
<b>Employment<sup>a</sup></b>									
<b>Direct</b>	914	5,848	6,762	438	163,674	164,111	1,352	169,522	170,873
<b>Total</b>	2,344	14,999	17,343	1,123	323,054	324,176	3,467	338,052	341,519
<b>Income<sup>b</sup></b>									
<b>Direct</b>	84.9	543.0	627.9	40.6	9,417.3	9,457.9	125.5	9,960.3	10,085.8
<b>Total</b>	168.4	1,077.4	1,245.8	80.6	18,502.8	18,583.5	249.0	19,580.2	19,829.2
<b>Value Added<sup>b</sup></b>									
<b>Direct</b>	146.6	937.9	1,084.5	70.2	12,999.8	13,070.0	216.8	13,937.7	14,154.5
<b>Total</b>	280.3	1,793.6	2,074.0	134.3	27,948.1	28,082.4	414.6	29,741.8	30,156.4
<b>Output<sup>b</sup></b>									
<b>Direct</b>	320.1	2,047.8	2,367.9	153.3	42,193.1	42,346.3	473.3	44,240.9	44,714.2
<b>Total</b>	553.1	3,538.8	4,091.9	264.9	68,529.0	68,793.9	818.0	72,067.9	72,885.8
<b>Tax Revenue<sup>b</sup></b>									
<b>Direct</b>	2.8	18.2	21.1	1.4	629.0	630.4	4.2	647.2	651.4
<b>Total</b>	12.8	82.2	95.0	6.2	1,805.3	1,811.5	19.0	1,887.5	1,906.5

Source: Amtrak, VRE, WAYBILL, IHS TRANSEARCH and IMPLAN

<sup>a</sup> Employment rounded to the nearest 10 job-years; totals may not sum due to rounding

<sup>b</sup> In millions of 2016 Dollars

**Impacts as Percentage of Economy** – It is important to contextualize the preceding economic impact estimates, as it is difficult to visualize millions of jobs and billions of dollars, etc. As such, the economic impacts can be compared with existing economic composition of Virginia in 2015, by the same measures as the presented economic impacts, per **Table 3-4**.



**Table 3-4: Virginia Economic Measures, 2015**

Measure	Value
<b>Employment</b>	5,059,628
<b>Labor Income<sup>a</sup></b>	309,064
<b>Value Added<sup>a</sup></b>	500,175
<b>Output<sup>a</sup></b>	831,490
<b>Tax Revenue<sup>a</sup></b>	29,625

Source: IMPLAN

<sup>a</sup> In millions of 2016 Dollars

Total share of economic impacts related to rail movements in Virginia range between 6.0% (value added) to 8.8% (economic output) of the statewide economy, depending on measure, as seen in **Table 3-5**. Again the largest relative contribution to the statewide economy from rail pertains to freight users.

**Table 3-5: Impacts as Percentage of Virginia Economy, 2015**

Measure and Type	Transport Services			Transport Users			Total		
	Passenger	Freight	Services	Passenger	Freight	Users	Passenger	Freight	Total
<b>Employment (percent)</b>									
<b>Direct</b>	0.018	0.1	0.1	0.009	3.2	3.2	0.027	3.4	3.4
<b>Indirect</b>	0.014	0.1	0.1	0.007	1.6	1.6	0.020	1.6	1.7
<b>Induced</b>	0.015	0.1	0.1	0.007	1.6	1.6	0.021	1.7	1.7
<b>Total</b>	<b>0.046</b>	<b>0.3</b>	<b>0.3</b>	<b>0.022</b>	<b>6.4</b>	<b>6.4</b>	<b>0.069</b>	<b>6.7</b>	<b>6.7</b>
<b>Income (percent)</b>									
<b>Direct</b>	0.027	0.2	0.2	0.013	3.0	3.1	0.041	3.2	3.3
<b>Indirect</b>	0.016	0.1	0.1	0.008	1.8	1.8	0.024	1.9	1.9
<b>Induced</b>	0.011	0.1	0.1	0.005	1.2	1.2	0.016	1.3	1.3
<b>Total</b>	<b>0.054</b>	<b>0.3</b>	<b>0.4</b>	<b>0.026</b>	<b>6.0</b>	<b>6.0</b>	<b>0.081</b>	<b>6.3</b>	<b>6.4</b>
<b>Value Added (percent)</b>									

Measure and Type	Transport Services			Transport Users			Total		
	Passenger	Freight	Services	Passenger	Freight	Users	Passenger	Freight	Total
<b>Direct</b>	0.029	0.2	0.2	0.023	2.6	2.6	0.052	2.8	2.8
<b>Indirect</b>	0.014	0.1	0.1	0.011	1.6	1.7	0.026	1.7	1.8
<b>Induced</b>	0.012	0.1	0.1	0.010	1.3	1.4	0.022	1.4	1.4
<b>Total</b>	<b>0.056</b>	<b>0.4</b>	<b>0.4</b>	<b>0.043</b>	<b>5.6</b>	<b>5.6</b>	<b>0.099</b>	<b>5.9</b>	<b>6.0</b>
<b>Output (percent)</b>									
<b>Direct</b>	0.038	0.2	0.3	0.018	5.1	5.1	0.057	5.3	5.4
<b>Indirect</b>	0.015	0.1	0.1	0.007	1.8	1.8	0.023	1.9	1.9
<b>Induced</b>	0.013	0.1	0.1	0.006	1.4	1.4	0.019	1.5	1.5
<b>Total</b>	<b>0.067</b>	<b>0.4</b>	<b>0.5</b>	<b>0.032</b>	<b>8.2</b>	<b>8.3</b>	<b>0.098</b>	<b>8.7</b>	<b>8.8</b>
<b>Tax Revenue (percent)</b>									
<b>Direct</b>	0.010	0.1	0.1	0.005	2.1	2.1	0.014	2.2	2.2
<b>Indirect</b>	0.015	0.1	0.1	0.007	2.0	2.0	0.023	2.1	2.1
<b>Induced</b>	0.018	0.1	0.1	0.009	2.0	2.0	0.027	2.1	2.1
<b>Total</b>	<b>0.043</b>	<b>0.3</b>	<b>0.3</b>	<b>0.021</b>	<b>6.1</b>	<b>6.1</b>	<b>0.064</b>	<b>6.4</b>	<b>6.4</b>

Source: Amtrak, VRE, WAYBILL, IHS TRANSEARCH and IMPLAN

**Employment by Industry** – In **Table 3-6**, **Figure 3-1** and **Figure 3-2**, the employment impacts to Virginia from the combined transport services and user-related impacts are presented by industry (according to the North American Industry Classification System, or NAICS, at the two-digit industry aggregation level).

More than 40 percent of the total (i.e., direct and multiplier) 341,519 employment impacts stemming from rail are concentrated within the Manufacturing industry. The other top industries: Transportation and Warehousing, Professional, Scientific, and Technical Services, Administrative and Support and Waste Management and Remediation Services, Retail Trade, Health Care and Social Assistance account for 26 percent of the total 341,519 jobs.



In contrast to Manufacturing, many of the other top industries impacts by rail are predominately done via indirect and induced-related impacts; that is, those industries supplying materials to the Manufacturing and other industries, and via the re-spending of income earned by the directly and indirectly affected employee base. Also notably, Accommodation and Food Services employment impacts attributable to rail total 14,029, of which 78 percent (10,969) reflect induced impacts.

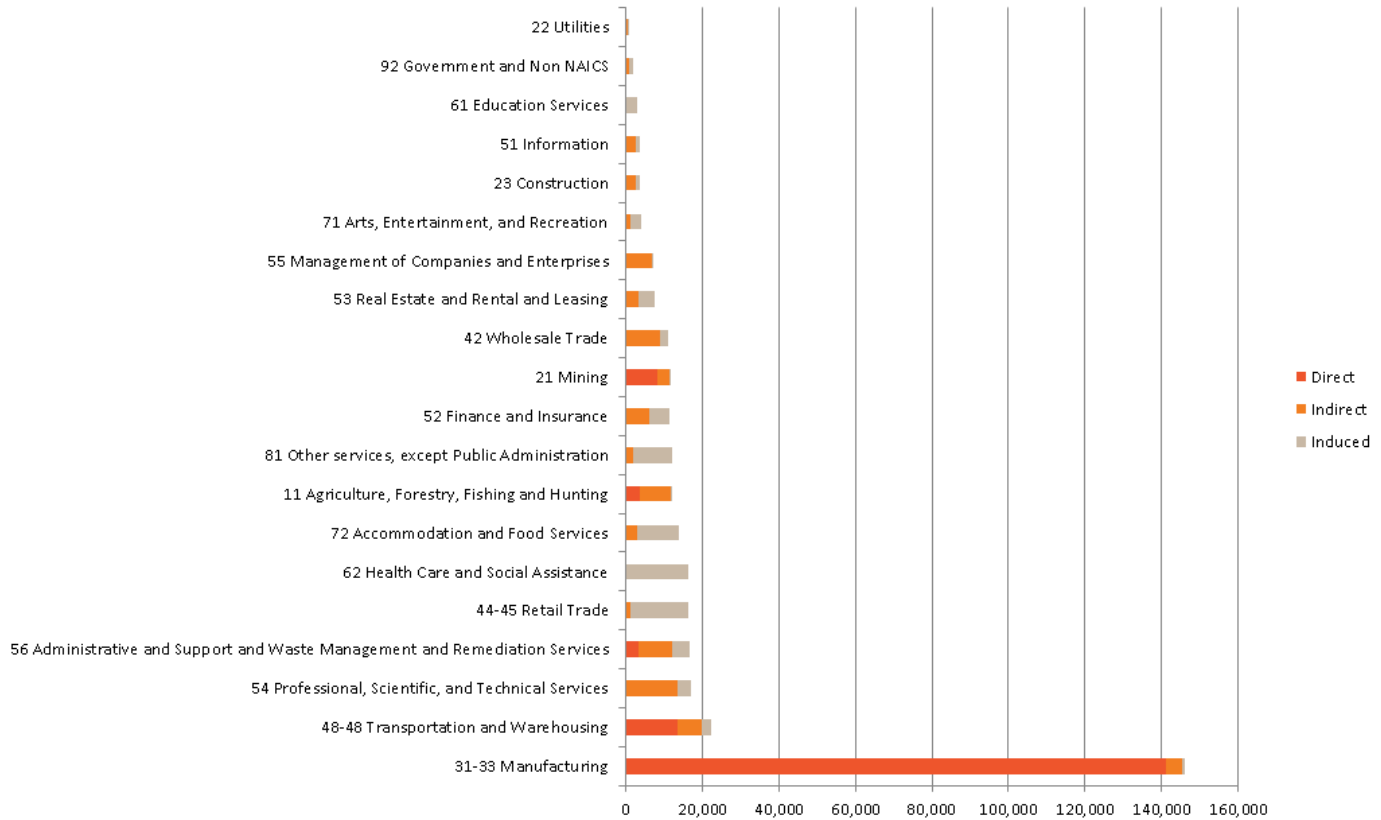
**Table 3-6: Rail Employment Impacts by Industry, 2015**

Industry	Direct	Indirect	Induced	Total
<b>31-33 Manufacturing</b>	140,963	4,386	718	146,066
<b>48-48 Transportation and Warehousing</b>	13,813	6,071	2,566	22,450
<b>54 Professional, Scientific, and Technical Services</b>	0	13,575	3,716	17,290
<b>56 Administrative and Support and Waste Management and Remediation Services</b>	3,317	8,819	4,555	16,691
<b>44-45 Retail Trade</b>	0	1,520	15,077	16,597
<b>62 Health Care and Social Assistance</b>	0	1	16,382	16,383
<b>72 Accommodation and Food Services</b>	0	3,059	10,969	14,029
<b>11 Agriculture, Forestry, Fishing and Hunting</b>	3,889	7,988	375	12,252
<b>81 Other services, except Public Administration</b>	0	2,022	10,194	12,216
<b>52 Finance and Insurance</b>	0	6,138	5,518	11,656
<b>21 Mining</b>	8,457	3,083	92	11,631
<b>42 Wholesale Trade</b>	25	9,059	1,959	11,043
<b>53 Real Estate and Rental and Leasing</b>	410	3,203	4,058	7,671
<b>55 Management of Companies and Enterprises</b>	0	6,910	579	7,490
<b>71 Arts, Entertainment, and Recreation</b>	0	1,367	2,762	4,130
<b>23 Construction</b>	0	2,839	1,123	3,962
<b>51 Information</b>	0	2,614	1,301	3,915
<b>61 Education Services</b>	0	33	3,043	3,076
<b>92 Government and Non NAICS</b>	0	1,023	1,056	2,079
<b>22 Utilities</b>	0	672	219	891
<b>Total</b>	<b>170,873</b>	<b>84,382</b>	<b>86,263</b>	<b>341,519</b>

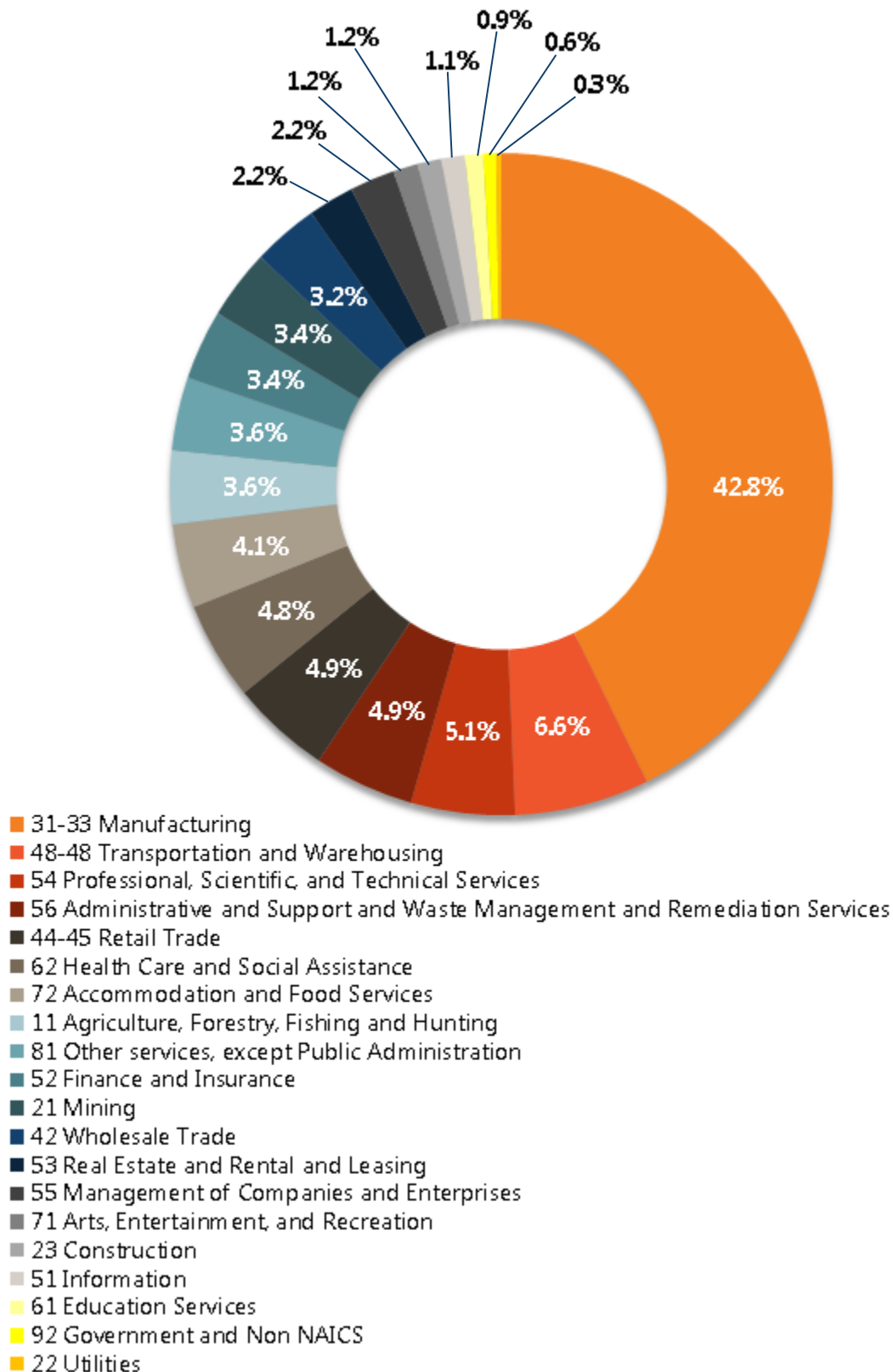
Source: IMPLAN



**Figure 3-1: Employment Impacts by Industry and Type, 2015**



**Figure 3-2: Total Employment Impact Composition, 2015**



## 4. CONCLUSION

Rail provides a major contribution in Virginia to the movement of both goods (freight) and people (passengers), which facilitates economic activity. Freight movements reflect the reallocation of intermediate goods for production and final goods for consumption; and, passenger movements are linked with personal consumption patterns. Both types of movements are supported by rail and can be captured by economic impact metrics via tracing the movement volumes, translated into applicable values (and, subject to economic/geographic factors) through the various interrelationships within the economy.

Translation of rail passenger and freight volumes into economic impacts demonstrates the vital role rail provides in Virginia's economy. Such economic impact analysis provides a complementary perspective for traditional freight-related analysis that predominately emphasizes the volume (units and/or tons) of the movements and the capacity of the transportation route.

An economic analysis provides an important perspective on the relative importance of freight rail. In instances, the volume of a certain commodity movement is substantial and would thus be considered relevant from a traditional freight analysis perspective; however, that same high-volume movement may be a low-value (per weight) commodity with little economic relevance (e.g., certain waste material movements). Consequently, not all traditionally-assessed freight movements (from a volume perspective) would be considered equally relevant, as compared with other freight movements observed from an economic perspective. In effect, volumes do not always translate into relevant values, and into direct economic impacts (and thus, into total impacts, reflective of multiplier effects as economic activity permeates through the economy).

Impacts, as measured in terms such as employment, income, value added, and output, span all industries and reach every region of the state based on year 2015 data:

- **Employment** – Economic impacts of rail extend beyond the 6,762 directly employed in the provision of rail transport (both passenger and freight). When the freight and visitor impact activities and multiplier impacts are included, rail-related employment in Virginia total 341,519 jobs, which represent 6.7 percent of the 5.1 million jobs statewide.
- **Income** – \$19.8 billion earned by these total employees represent 6.4 percent of Virginia's total labor income. Labor income includes employee compensation and proprietary income. Employee compensation, in turn, consists of wage and salary payments as well as benefits (health, retirement, etc.) and employer paid payroll taxes (employer side of social security,

unemployment taxes, etc.). Proprietary income consists of payments received by self-employed individuals and unincorporated business owners.

- **Value Added** – The combined value added impact of rail services is over \$30.1 billion and represents 6.0 percent of the state’s Gross State Product (GSP).
- **Output** –In terms of total revenue, the rail industry generated about \$72.9 billion in output, which represents 8.8 percent of Virginia’s total output.
- **Tax Revenue** – Federal, state and local tax revenues generated by the rail industry totaled \$1.9 billion.

It would be erroneous to conclude that all of these impacts are entirely and solely dependent on rail and would disappear if rail ceased operating (i.e., no modal substitutability). Rather, the findings show that rail service facilitates business throughout the State. Specifically, these impacts highlight the magnitude of the contribution of freight rail use by manufacturers across the State, as well as dealers, retailers, and others who transport materials, component parts, and products.

Of the rail activities analyzed, passenger-related economic impacts are relatively smaller in comparison to the comparatively large-scale freight-related impacts but provide an important contribution to local markets where stops occur. The impact of freight users, including both outbound/intrastate and inbound movements, pertaining to production and absorption, respectively, far exceeds the economic impacts associated with provisioning the services that facilitate the movement of both people and goods. In conclusion, the rail industry provides some economic activity, in itself; but, it facilitates far more economic activity via the services rendered to people and industries, particularly by enabling the movement of goods necessary to conduct economic pursuits.