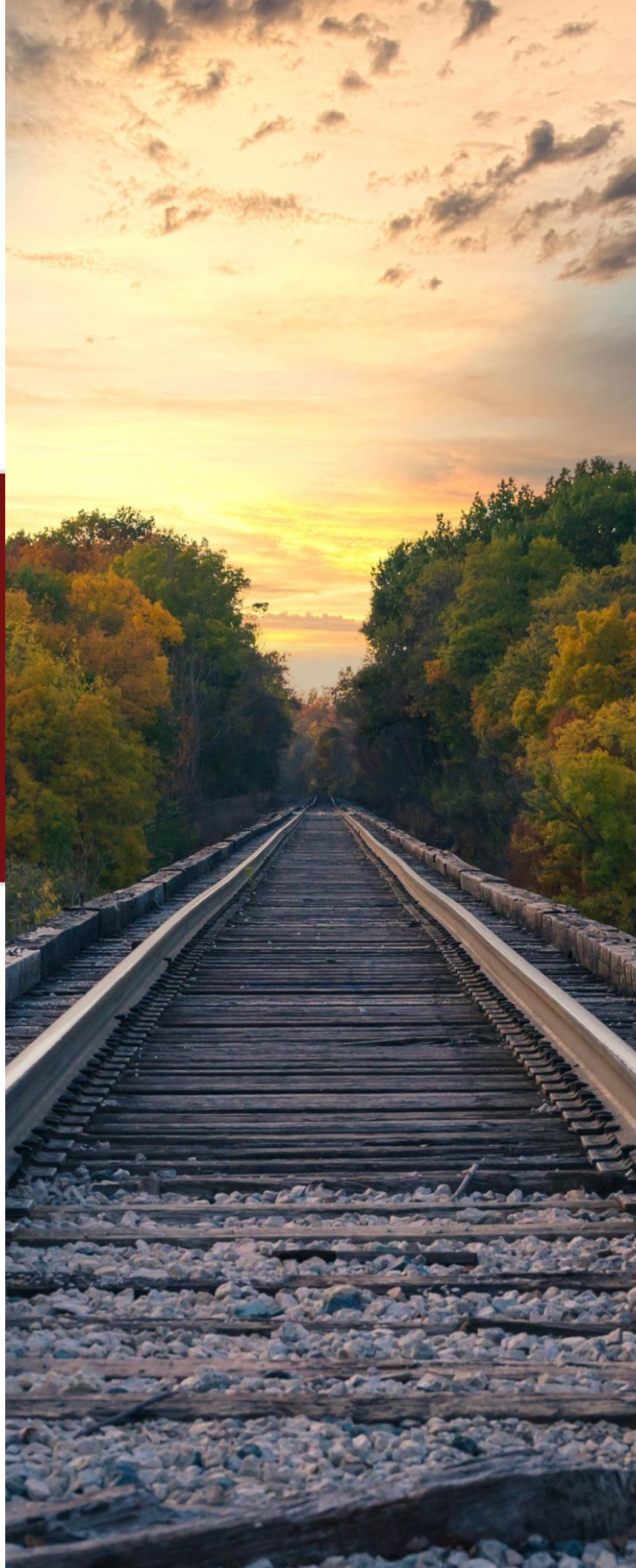
Appendix A: Economic Impact Analysis

South Dakota State Rail Plan

December 2022



This Page Intentionally Blank

CONTENTS

TABLES

This Page Intentionally Blank

1.0 EXECUTIVE SUMMARY

The economic impacts of freight rail were estimated in South Dakota. Economic impacts of freight rail activities in South Dakota stem from railroads providing freight transportation services, and industries that use such services in the production and trading of goods. Of these two types of activities, industries that are freight rail users generate the most significant impacts. The economic impacts of freight rail in South Dakota in 2019 were estimated using IMPLAN®, an economic modeling, input-output based social account matrix software.

Input data and assumptions are based on:

- Freight movements derived from the 2019 Surface Transportation Board (STB) Carload Waybill Sample of rail shipments originating in South Dakota
- Values of commodity shipments extracted from the Federal Highway Administration (FHWA) Freight Analysis Framework version 5 (FAF5) database for rail shipments originating in South Dakota

Economic impacts of freight rail are categorized into two activity types: freight rail service providers and freight rail users. For each activity, three impact types were modeled: direct, indirect, and induced. Then, for each type, four measures of economic activity were quantified: employment, labor income, value added, and output to provide a comprehensive perspective on how freight rail in South Dakota impacts the overall economy. Table 1 provides a summary of impacts. Key results from each activity include the following:

- **Output:** Freight rail industries generated approximately $7.6 billion dollars in output.
- **Employment:** Freight rail related employment in South Dakota in 2019 totaled 32,261 jobs, which represented 5.2% of the 615,171 total statewide employment.
- **Labor Income:** Labor income includes both employee compensation and proprietary income. The amount earned by these employees amounted to over $1.6 billion, representing 4.9% of the state's total labor income in 2019.
- **Value Added:** The total value added impact is over $2.6 billion and represents 4.7% of South Dakota's Gross State Product.

Table 1: Summary of Freight Rail Economic Impacts in South Dakota

Measure and Type	Rail Service Provision	Freight Rail Users	Total
	OUTPUT *		
Direct	$676	$3,610	$4,287
Indirect	$327	$1,933	$2,260
Induced	$168	$836	$1,004
Total	**$1,171**	**$6,380**	**$7,551**
	EMPLOYMENT		
Direct	1,823	11,533	13,356
Indirect	1,796	10,212	12,008
Induced	1,157	5,740	6,897
Total	**4,776**	**27,485**	**32,261**
	LABOR INCOME *		
Direct	$128	$576	$704
Indirect	$88	$521	$609
Induced	$52	$260	$313
Total	**$268**	**$1,358**	**$1,625**
	TOTAL VALUE ADDED *		
Direct	$180	$896	$1,076
Indirect	$143	$831	$974
Induced	$94	$466	$559
Total	**$416**	**$2,193**	**$2,609**

*All monetary values are in millions of 2017 dollars

2.0 INTRODUCTION

This appendix describes the economic impacts of freight rail in South Dakota as well as the methodology of the quantification of these impacts for both freight rail service provision and freight rail users. The methodology represents an input-output approach that captures and quantifies the flow of goods and services (expenditures) between various industries in the economy arising from technical requirements of one industry for inputs provided by another industry.

The 2019 STB Carload Waybill Sample is used to analyze South Dakota goods movements. Waybill-derived outbound and intrastate commodity volumes and values are bridged with the IMPLAN®, economic model to determine how freight movements generate direct economic impacts in South Dakota.

2.1 TYPES

Economic impact analysis involves the estimation of three distinct types of economic activity, commonly referred to as "direct effects," "indirect effects," and "induced effects" that are attributable to an initial stream of incremental capital or operating expenditures. Indirect and induced impacts are often referred to as "multiplier effects," since they increase the overall economic impacts of the original expenditure that initiated the rounds of spending and effects.

The types are defined as follows:

- **Direct:** Impacts from the provision of rail transportation (railroads), as well from the firms/industries that use such rail services to ship and receive goods (freight rail users).
- **Indirect:** Impacts associated with the suppliers that provide intermediate goods and services (inputs) 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.
- **Total:** Aggregated direct, indirect, and induced types.

2.2 ECONOMIC MEASURES

Each of the direct, indirect, and induced impacts defined is estimated in terms of the various measures of economic activity that include the following:

- **Employment:** The number of incremental jobs created as a result of all expenditures related to the activities evaluated
- **Labor Income:** Wage/salary earnings paid to the associated jobs
- **Value Added:** Net economic activity (i.e., total output less gross intermediate inputs), synonymous with GRP (gross regional product); includes employee and proprietor income, other income types, taxes, etc., required to produce final goods and services

- **Economic Output:** Total market value of sales associated with all levels of economic activity (comprised of gross intermediate inputs and value added, combined). Note that gross output is not the same as gross regional/state product, which only includes economic value added.

2.3 ECONOMIC ACTIVITIES

South Dakota freight rail-related economic impacts are categorized into freight rail service provider and freight rail user impacts:

- **Freight Rail Service Providers:** Impacts associated with the provision of freight rail transportation (i.e., the rail industry) include transportation operations and administrative support.
- **Freight Rail Users:** Impacts associated with shippers using freight rail for goods movements (including both intermediate and final goods produced in South Dakota), excluding the rail industry itself. Shippers utilizing rail have several options available to transport freight and could possibly substitute other modal transport (e.g., truck), if rail services became unavailable. However, the choice to use railroads to ship freight indicates cost and/or logistical advantages, and as such, removal of such advantages would negatively affect freight rail users.

The above analysis is implemented and estimated using IMPLAN®, an input-output based economic modeling and social account matrix software. IMPLAN® estimates the economic impacts to a defined geography (i.e., South Dakota) resulting from expenditures in an industry or commodity in a particular year. A social account matrix reflects the economic interrelationships between the various industries (and commodities), households, and governments in an economy and measures such interdependency via impact multipliers. Multipliers are developed within IMPLAN® from regional purchase coefficients, production functions, and socioeconomic data for each impact variable and are geographically specific. IMPLAN® is one of the most accepted models used for economic impact analysis and estimation throughout the country.

2.4 DATA AND INPUT ASSUMPTIONS

2.4.1 FREIGHT RAIL SERVICE PROVISION

Economic impact of freight rail service provision is estimated based on railroad revenues associated with a representative sample of unique rail shipment waybill records contained in the Carload Waybill Sample data. To align this analysis with the scope of impacts to transportation users, the focus is on impacts due to outbound and intrastate shipping and corresponding railroad revenues. It is recognized that some of this revenue would likely accrue to destination states. However, railroad revenues in South Dakota, and thus economic impacts, may also accrue via services provided to inbound and through shipments. Overall, economic impacts based on railroad revenues from outbound and intrastate shipping are likely to represent a conservative estimate of impacts.

2.4.2 FREIGHT MOVEMENTS

Freight rail tonnage volumes and commodity values used in the economic analysis are based on the Carload Waybill Sample data. The economically relevant directional movements include: 1) Outbound (originating within South Dakota, terminating in other states); and 2) Intrastate (originating and terminating within South Dakota).

The FHWA FAF5 database of freight flows among states was used to extract values of shipments by rail in millions of 2017 dollars that originate in South Dakota. The total shipment values matched to commodity categories in the Carload Waybill Sample data. The Carload Waybill Sample data includes some movements that are not actual movements of economically relevant goods, such as Waste or Scrap Materials, which have no associated production value. Hence, such a commodity category was excluded.

Table 2 presents the results of the analysis. The table also demonstrates that the two largest types of shipment in terms of value were Food or Kindred Products and Farm Products.

Table 2: Freight Shipments Included in Economic Impact Assessment

Commodity Category	Tons (in thousands)	Value (in millions)*
OUTBOUND/INTRA		
Food or Kindred Products	2,314	$1,932
Farm Products	7,813	$1,582
Crude Petroleum, Natural Gas or Gasoline	0	$361
Nonmetallic Minerals	4	$53
All Other Commodities	0	$34
Transportation Equipment	50	$5
Chemicals or Allied Products	2,531	$3
Misc. Mixed Shipments	0	$1
Clay, Concrete, Glass or Stone	173	$1
Logs, Lumber, Wood Prod.	0	$0
Pulp, Paper or Allied Products	0	$0
Coal	0	$0
Primary Metal Products	0	$0
Petroleum or Coal Products	92	$0
Total	12,976	$3,972

*All monetary values are in 2017 dollars.

Source: Based on 2019 STB Carload Waybill Sample and FHWA FAF5 Data

3.0 RESULTS

3.1 FREIGHT RAIL SERVICE PROVISION IMPACTS

Table 3 presents the economic impacts of freight rail service provision in South Dakota in 2019. The rail transportation services industry is estimated to have generated a direct employment impact of 4,776 jobs. The indirect and induced effects in other related industries due to spending on rail operations generated an additional 2,953 jobs (1,796 indirect jobs and 1,157 induced jobs) throughout the state.

Other industry impacts include: $268 million in labor income, $416 million in value added, and nearly $1.2 billion in output.

Table 3: Freight Rail Service Provision Impacts

Category of Impact	Output*	Employment	Labor Income*	Value Added*
Direct	$676	1,823	$128	$180
Indirect	$327	1,796	$88	$143
Induced	$168	1,157	$52	$94
Total	**$1,171**	**4,776**	**$268**	**$416**

*All monetary values are in millions of 2017 dollars.

3.2 FREIGHT RAIL USER IMPACTS

Table 4 presents the impacts of freight rail transportation users on South Dakota in 2019. Through their economic activities, freight rail users generated a direct employment impact of 11,533 jobs. The indirect and induced effects in other related industries due to spending on input goods and services used by shippers or providers of goods and services to visitors generated an additional 10,212 indirect and 5,740 induced jobs throughout the state.

Other industry impacts include nearly $1.4 billion in labor income, nearly $2.2 billion in value added, and nearly $6.4 billion in output.

Table 4: Freight Rail User Impacts

Category of Impact	Output*	Employment	Labor Income*	Value Added*
Direct	$3,610	11,533	$576	$896
Indirect	$1,933	10,212	$521	$831
Induced	$836	5,740	$260	$466
Total	**$6,380**	**27,485**	**$1,358**	**$2,193**

*All monetary values are in millions of 2017 dollars.

4.0 SUMMARY OF IMPACTS

4.1 TOTAL FREIGHT RAIL IMPACTS

Table 5 provides a summary of all freight rail-related impacts. The findings reported demonstrate that the impacts of industries that are freight rail users are much larger than those from the impacts of provision of freight rail transportation service by the railroads themselves. Freight rail service provision and freight rail user impacts together account for over 32,261 jobs, over $1.6 billion in total labor income, over $2.6 billion in total value added, and nearly $7.6 billion in total economic output.

Table 5: Total Freight Rail Impacts

Category of Impact	Output*	Employment	Labor Income*	Value Added*
Direct	$4,287	13,356	$704	$1,076
Indirect	$2,260	12,008	$609	$974
Induced	$1,004	6,897	$313	$559
Total	**$7,551**	**32,261**	**$1,625**	**$2,609**

*All monetary values are in millions of 2017 dollars.

4.2 IMPACTS AS A PERCENTAGE OF THE TOTAL STATE ECONOMY

It is important to contextualize the preceding economic impact estimates. To that effect, the economic impacts of freight rail are compared to the corresponding economic statistics for the entire state.

Table 6 illustrates that the economic impacts associated with freight rail in South Dakota range between 4.7% (value added) to 6.9% (output) of the total statewide economy.

Table 6: Relativity of Impacts by Measure

Economic Measure	State Value	Total Freight Rail Impacts	
		Value	Percentage
Employment	615,171	32,261	5.2%
Labor Income*	$33,102	$1,625	4.9%
Total Value Added*	$55,647	$2,609	4.7%
Output*	$109,637	$7,551	6.9%

*All monetary values are in millions of 2017 dollars