San Juan County Four Corners Freight Rail Project

Task 6: Economic Feasibility Analysis

Feasibility Study

San Juan County, New Mexico
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Contents

Economic Feasibility Analysis

1. Executive Summary

This economic analysis evaluates the **Four Corners Freight Rail Project** (Project) located within the Four Corners Region at the convergence of the states of New Mexico, Colorado, Utah, and Arizona. The Project entails construction of a new rail line that will connect Farmington, New Mexico, to the BNSF rail corridor near Gallup, New Mexico, across San Juan and McKinley Counties. The analysis includes the following components: (1) benefit-cost analysis, (2) financial analysis, and (3) economic impact assessment. This report documents these analyses, including the methodology, key assumptions and data, and results.

PROJECT OVERVIEW

The Project addresses the existing lack of freight rail services in the Four Corners Region (Region). Although some shippers use rail as the main mode of transportation, their shipments have to be drayed by truck between the Four Corners Region and the nearest rail connection point on the national network, a distance of approximately 100 miles or more, depending upon the shipper's location.

Previous studies have identified access to rail transportation as a significant requirement and a local priority for expanding and diversifying economic development in the Region.[1]

This – combined with the complexity of supply chains relying on long distance trucking – makes transportation-dependent industries in the Four Corners Region less economically competitive than comparable industries in other locations that have more direct access to rail. A direct rail connection would simplify the supply chain for existing transportation-dependent industries and reduce transportation costs.

Good freight rail connectivity could also enable local economic development, especially in the agriculture and resource extraction industries, or manufacturing and processing industries. These industries require high volumes of material inputs and produce high volumes of outputs and benefit from rail connectivity to improve their competitiveness and access to new domestic and overseas markets.

The Project will provide a more efficient connection to the national rail network. The Project will reduce the truck dray distances to existing rail shippers as well as provide a new viable freight transportation modal alternative to highway trucking which, as shown in this report, is anticipated to incentivize many existing truck shippers to divert their volumes to less expensive rail. Transportation costs should generally decline (compared to trucking), enhancing competitiveness of local businesses and generate enabling conditions for new economic activity.

This economic feasibility analysis determined that there are Project scenarios where, assuming capital costs are publicly funded, the benefit-cost ratio exceeds 1.0, the net present value is positive, and the financial analysis appears favorable.

[1] New Mexico Economic Development Department, Farmington-Thoreau Railroad Study, August 21, 2015. Retrieved from: https://www.sjcounty.net/home/showpublisheddocument/4459/637731780780370000

BENEFIT-COST ANALYSIS

The benefit-cost analysis (BCA) of this proposed rail Project focused on the economic benefits and costs to determine whether the Project makes sense in economic terms by creating socioeconomic benefits that exceed its costs.

All Project benefits were estimated using methodologies consistent with industry practice for this type of project, guidance from the US Department of Transportation (USDOT), estimated demand volumes and shipping distances, and input assumptions (valuation parameters) recommended by USDOT, or developed based on published relevant information and statistics.

The analysis considered a single with-Project scenario, or the Build scenario, which was analyzed against the No Build scenario.

It was assumed that the No Build scenario maintains the existing situation without a rail connection in the Region. The transportation-dependent industries in the Region would continue facing logistical challenges and high transportation costs.

The Build scenario involves construction of a new freight rail line which will provide a new transportation option, a more direct connection to the national rail network with a shorter dray distance for most shippers (or possibly eliminate dray entirely). This will provide an incentive to shippers using truck transportation to divert their shipments to rail while also benefiting the existing rail shippers by reducing the dray distances to a rail connection. In either case, the transportation costs will be reduced.

Table ES-1 summarizes the changes expected from the Project and the associated quantified benefits and their estimates.

Table ES-1: Summary of Infrastructure Improvements and Associated Quantified Benefits

Current Status or Baseline & Problems to be Addressed	Changes to Baseline / Scenarios	Type of Impacts	Population Affected by Impacts	Economic Benefit/Impact	Estimated Value, $M (Discounted)*
The Project addresses the existing lack of freight rail services in the Four Corners Region. Although some shippers use freight rail, their shipments have to be drayed by truck to the nearest rail connection point on the national network, a distance of 100 to, for some shippers, nearly 200 miles. This – combined with the complexity of supply chains relying on long distance trucking – makes freight-dependent industries in the Four Corners Region less economically competitive than comparable industries in other locations that have more direct access to rail.	The proposed Project entails construction of a new freight rail line that will connect the Four Corners region, near Farmington, New Mexico, to the BNSF corridor near Gallup, New Mexico. The Project will provide a shorter connection to the national rail network. This will reduce the truck dray distances for existing rail shippers as well as provide a new viable freight transportation modal alternative to highway trucking which will incentivize many existing truck shippers to divert their volumes to less expensive rail. Transportation costs will generally decline enhancing competitiveness of local businesses.	Shipper cost savings	Truck operators, shippers in Four Corners Region	Greater access to rail transportation will reduce overall transportation costs to shippers	$775.6
		Emission cost savings	Truck operators, residents of San Juan and McKinley Counties, society	Diversion of some truck shipments to rail will reduce overall emissions and emissions costs (greenhouse gases and criteria air contaminants)	$108.4
		Accident cost savings	Auto users, truck operators, residents of San Juan and McKinley Counties, society	Diversion of some truck shipments to rail will reduce total number of accidents and accident costs	$125.3
		External Highway Use	Residents of San Juan and McKinley Counties, society, New Mexico DOT	Reduction in truck traffic on regional highways leading to a reduction in road wear and tear, highway noise, congestion, and their related costs.	$130.4
		Residual Value of the Project	New Mexico DOT, society	The Project will construct new infrastructure that will have value remaining at the end of the BCA analysis period.	$233.0

Note: All monetary values in the table above are in millions of 2022 dollars over the period 2032–2061 discounted using a real discount rate of 3.1% (except for GHG emissions discounted at 2%).

The period of analysis used in the monetization of benefits and costs is 36 years including 6 years of development and construction and 30 years of operations based on USDOT BCA guidance. All costs and valuation parameters were expressed in 2022 dollars.[2] Total project construction costs are estimated at $1,532.7 million (in 2022 dollars), and operation and maintenance costs are estimated at about $3.5 million annually (in 2022 dollars) for a total of $114 million over 30 years (undiscounted).

Based on the analysis presented in the rest of this document, the Project is expected to generate $1,372.7 million in discounted benefits, $1,206.1 million in discounted capital costs, and $54.9 million in discounted operations and maintenance costs, using a 3.1 percent real discount rate.[3] Therefore, the Project is expected to generate a net present value of $111.7 million and a benefit/cost ratio of approximately 1.1, as shown below in Table ES-2.

Table ES-2: Summary of BCA Outcomes, in Millions of 2022 Dollars*

Project Evaluation Metric	Undiscounted	Present Value (3.1% Discount Rate)**
Total Benefits	$3,084.7	$1,372.7
Total Capital Costs	$1,532.7	$1,206.1
Total Operations & Maintenance Costs	$114.0	$54.9
Net Present Value	$1,438.0	$111.7
Benefit/Cost Ratio	1.9	1.1
Internal Rate of Return (%)	3.5%	

Notes: (*) Unless indicated otherwise. (**) All monetary values in the table above are in millions of 2022 dollars over the period 2026–2061 discounted using a real discount rate of 3.1% (except for GHG emissions discounted at 2%).

In addition to the monetized benefits presented in Table ES-1 and captured in the project evaluation metrics shown in Table ES-2, the Project will generate additional benefits. Though these additional benefits are difficult to quantify and monetize in a BCA framework, they can be considered as qualitative benefits of the Project. These benefits are briefly described below.

- Induced and facilitated economic development benefits. Access to rail transportation has been identified as a significant requirement for economic development and diversification in the Four Corners Region. By reducing transportation costs to key commodity markets and simplifying logistics and supply chain operations, the Project will make the freight-dependent industries in the region more competitive and facilitate access to markets which are currently difficult to serve. This will support and promote regional economic development and new economic activity leading to new jobs and streams of income.

[2] This BCA uses valuation parameters based on USDOT BCA Guidance December 2023 edition – the latest edition at the time when most of this analysis was completed – which recommended a range of parameters, all expressed in 2022 dollars. If costs (and revenues) were expressed in 2024 or 2025 dollars, all valuation parameters would have to be inflated accordingly. The key BCA evaluation metric, the Benefit-Cost Ratio would remain the same.

[3] Except for greenhouse gas emission impacts which were discounted at the 2% discount rate in this BCA.

FINANCIAL ANALYSIS

The financial analysis considered the flow of all Project-related costs and revenues over the Project life to determine the net fiscal impact, i.e., whether the Project will be able to finance itself over the analysis period.

The financial analysis is consistent with the benefit-cost analysis inputs. Project costs included the same components as those considered in the benefit-cost analysis: capital development and construction costs and annual operations and maintenance costs (including labor costs for train crews, equipment maintenance, fuel costs, and track maintenance). Revenues were estimated based on the Project length in miles and transportation rate per ton-mile that can be expected to be charged to shippers (the same rate as that used in the benefit-cost analysis developed based on typical industry operating ratios and costs estimated for this Project).

To focus the analysis on the outcomes more specific to the rail service operator, the analysis assumed that all capital costs would be funded from public funds, a combination of federal and non-federal sources.

This financial analysis was conducted in constant 2022 dollars and in current dollars by escalating the annual monetary values of costs and revenues by an inflation rate assumed based on recent general economy and rail transportation industry trends.

Table ES-3 presents the results of the analysis in current year dollars. The table shows that the Project will generate a net cash flow of $104.8 million undiscounted and $27.7 million discounted resulting in cost recovery ratios of well above 1.

Table ES-3: Summary of Project Financial Results, 2026-2061, Millions of Current-Year Dollars*

Impact Categories	Undiscounted	Value at 6.1% Discount Rate**
Revenues		
Freight Transportation Revenues	$343.0	$81.3
PV of Revenues	**$343.0**	**$81.3**
Costs		
Capital Costs	$1,770.4	$1,111.4
Capital Cost Covered Through Public Funding	-$1,770.4	-$1,111.4
Total Operations and Maintenance Costs	$238.1	$53.7
PV of Costs	**$238.1**	**$53.1**
Net Cash Flow	**$104.5**	**$27.7**
Operating Costs Recovery Ratio	1.44	1.52
Total Costs Recovery Ratio	1.44	1.52

Notes: (*) All monetary values in the table are in millions of 2022 dollars over the period 2026–2061, except for Cost Recovery Ratios. (**) Values discounted using a nominal discount rate of 6.1%.

ECONOMIC IMPACT ANALYSIS

The economic impact analysis of the Project assessed generation of economic activity as measured in terms of jobs and other related economic metrics. The activity considered in this analysis covers Project development and construction and then its operations.

The methodology of this analysis is the input-output (IO) methodology with Regional Input-Output Modeling System RIMS II multipliers from the Bureau of Economic Analysis (BEA) for the following geographic areas: (1) San Juan County, New Mexico; (2) Four Corners Region counties; (3) State of New Mexico; and (4) Four Corners States (New Mexico, Arizona, Utah, and Colorado).

Project development and construction impacts were estimated as cumulative impacts over the construction and development years while Project operating impacts were estimated as recurring annual impacts based on average Project revenues. Table ES-4 and Table ES-5 present the results for job-years (number of jobs for one year) and annual jobs, respectively, while the rest of this document reports the results for other economic activity metrics: business output, employment income, and gros domestic product (GDP).

Table ES-4 presents the estimates of job-years generated during the Project development and construction years. During those years, the Project is estimated to generate a cumulative total of 2,061 job-years in San Juan County, including 1,357 direct, 259 indirect, and 446 induced job-years. The number of job-years generated increase as the geographic area of impact is extended. Considering all Four Corners Region states, the Project is estimated to generate up to 16,857 job-years, including 6,725 direct, 3,278 indirect, and 6,854 induced job-years. The annual distribution of jobs is expected to be approximately proportional to annual Project-related expenditures: approximately 1.3 percent of impacts each year in the first three years of Project development (2026-2028) followed by approximately 32 percent of impacts each year in the subsequent three years of Project construction (2029-2031).

Table ES-4: Economic Impacts of Project Development and Construction, Cumulative Job-Years over Construction and Development Years

Impact Type	Geographic Area of Impact			
	San Juan County	Four Corners Counties	New Mexico	Four Corners States
Direct	1,357	3,045	5,888	6,725
Indirect	259	518	1,622	3,278
Induced	446	1,007	3,242	6,854
Total	**2,061**	**4,570**	**10,752**	**16,857**

Table ES-5 presents the results for Project operations. In San Juan County, the Project is estimated to generate 17 jobs each year, including 8 direct, 4 indirect, and 5 induced jobs. Additional jobs are estimated to be generated in other Four Corners Region counties for a total of 23 annual jobs, including 12 direct, 5 indirect, and 6 induced jobs. The supply chain effects and induced jobs generation further increase with increase in the geographic area evaluated. As a result, across all Four Corners states the Project is expected to generate 46 jobs, including 12 direct, 14 indirect, and 20 induced.

Table ES-5: Economic Impacts of Project Operations, Average Annual Jobs

Impact Type	Geographic Area of Impact			
	San Juan County	Four Corners Counties	New Mexico	Four Corners States
Direct	8	12	11	12
Indirect	4	5	9	14
Induced	5	6	11	20
Total	**17**	**23**	**31**	**46**

In addition, as discussed earlier, the Project will make the freight-dependent industries in the Four Corners Region more competitive and facilitate access to markets which are currently difficult to serve. This may enable additional new economic activity, as well as improve productivity and competitiveness of existing businesses. These effects would be reflected in additional incremental output, gross domestic product (GDP), employment income, and jobs in the Four Corners Region, New Mexico, and other Four Corners states. These effects were not quantified in this study but are acknowledged here qualitatively.

SENSITIVITY ANALYSIS

Sensitivity analysis was conducted to determine the impact of certain assumptions related to Project costs and Project operations on the BCA and the financial performance. Below is a summary of key takeaways from this analysis.

- Route alignment options with a lower cost increase the net present value (NPV) and benefit cost ratio (BCR) while the opposite is true for options with higher costs. With the El Segundo route alignment option, the least expensive option, Project NPV is $196.8 million and BCR is equal to 1.2. With the Defiance via Indian Creek alignment, the most expensive option, Project NPV is -$311.6 million and BCR is equal to 0.8.
- Regarding the financial performance, all options allow for the full recovery of operations and maintenance (O&M) costs.
- Higher volumes of shipments would increase the Project benefit cost analysis (BCA) benefits, NPV, and BCR. However, to improve significantly the financial performance, shipping volumes would have to increase to a level that also includes a portion of the identified potential new commodity streams that would be produced if a rail connection in the Four Corners Region was available.
- High shipping volumes (e.g., volumes equal to the average forecasts of existing shipments plus 33 percent of potential new volumes of coal and other commodities) would reduce significantly unit O&M cost (expressed in terms of $/ton-mile shipped) which would allow the Project operator to charge somewhat lower rates to shippers while still achieving the cost recovery objectives and generate economic benefits that exceed total Project costs.

2. Introduction

This document provides detailed technical information about the economic analysis of the **Four Corners Freight Rail Project** including the benefit-cost analysis, financial analysis, and economic impact analysis. These were prepared consistent with the "Economic Feasibility Analysis (Task 6) Proposed Methodology", as approved by the Federal Railroad Administration. The remainder of the document is organized as follows.

- Section 3, Project Overview, provides an overview of the Project, including a brief description of the existing conditions and the proposed investment, the definition of the No Build and Build cases for the benefit-cost analysis, overview of expected impacts, and a summary of cost estimates and schedule.
- Section 4, Demand Projections, presents estimates of shipping volumes (by commodity) that would be using the Project.
- Section 5, Benefit-Cost Analysis, presents the methodology, key input assumptions, and results of the Benefit-Cost Analysis.
- Section 6, Financial Analysis, presents the financial analysis of the Project together with key input assumptions, and results.
- Section 7, Economic Impact Analysis, presents the methodology, key input assumptions, and results of the economic impact assessment.
- Section 8, Sensitivity Analysis, discusses sensitivity analysis performed and reports the results.
- Section 9, Summary, provides concluding remarks.

3. Project Overview

3.1 Project Description

This economic analysis evaluates the **Four Corners Freight Rail Project** (Project) located within the Four Corners Region at the convergence of the states of Colorado, New Mexico, Utah, and Arizona. The Project entails construction of a new freight rail line that will connect Farmington, New Mexico, to the BNSF rail corridor near Gallup, New Mexico, across San Juan and McKinley Counties.

The Four Corners Region is a historically disadvantaged and underserved area of the United States that has not been connected to the national freight railroad network since a narrow-gauge railroad connection extending from Antonito, Colorado, to Farmington, New Mexico, was abandoned over 50 years ago. The majority of the Project area is also within the Navajo Nation.

Freight access to the Region currently exists via the National Highways (US-550, US-491, and US-64), State Highways (SH-371), and via privately-owned pipelines. Some freight volumes are also drayed by truck to nearest rail connections for further shipping, a distance of about 100 to 200 miles.

Previous studies, including the Farmington-Thoreau Railroad Study (2015) have identified access to rail transportation as a significant requirement and a local priority for expanding and diversifying economic development in the Region.[4]

The existing baseline freight transportation demand includes heavy shipments of coal from southwestern Colorado, as well as lime, fly ash, cement, lumber, steel pipe, drilling materials, liquid fertilizer, and agricultural products trucked to and from various points on the national freight rail network. The current need to coordinate long-distance trucking adds complexity to the supply chain and increases the cost of transportation. This makes transportation-dependent industries in the Four Corners Region less economically competitive than comparable industries in other locations that have more direct access to rail. A direct rail connection would simplify the supply chain for existing transportation-dependent industries and reduce transportation costs.

The lack of a direct rail connection to the national freight rail network also limits the economic development potential of the Four Corners Region, particularly in terms of resource-intensive manufacturing or processing opportunities. Because it is often impractical and costly to truck high volumes of freight over long distances, rail would directly enable new manufacturing or processing industries that require high volumes of material inputs and/or produce high volumes of material outputs to be economically feasible. Rail could also enable the existing agriculture and resource extraction industries to access new domestic and overseas markets and continue to contribute to the local economy; for instance, the Farmington-Thoreau Railroad Study (2015) found that the Navajo Nation could directly benefit from expanded market reach associated with a direct rail connection serving the existing Navajo Agricultural Products Industry (NAPI) crop production area and the Navajo Transitional Energy Company (NTEC) Navajo Mine.

The Project will provide a more efficient connection to the national rail network. This will reduce the truck dray distances to existing rail shippers as well as provide a new viable freight transportation modal alternative to highway trucking which will incentivize many existing truck shippers to divert their volumes to less expensive rail. Transportation costs are expected to generally decline enhancing competitiveness of local businesses and generate enabling conditions for new economic activity.

3.2 Base Case/No Build and Build Case

The No Build scenario maintains the existing situation without a rail connection in the Project area. The Four Corners Region will continue facing transportation challenges due to the need to rely on truck transportation, or rail transportation with long dray distances.

The Build scenario involves construction of a new freight rail line which will provide a new transportation option, a more direct connection to the national rail network with a shorter dray distance. This will provide an incentive to shippers using trucking to divert their shipments to rail while also benefiting the existing rail shippers by reducing the dray distances to a rail connection. Overall transportation costs will decline increasing the competitiveness of local businesses and generating enabling conditions for new economic activity.

[4] New Mexico Economic Development Department, Farmington-Thoreau Railroad Study, August 21, 2015.Retrieved from: https://www.sjcounty.net/home/showpublisheddocument/4459/637731780780370000

3.3 Types of Impacts

The expected benefits and impacts of the Project are summarized in the table below. The table also indicates whether a benefit or impact is quantifiable and monetized in this analysis.

Table 1: Benefit Categories of Four Corners Freight Rail Project

Impact #	Impact Categories	Description	Monetized
1	Shipper Cost Savings	Reduction in shipper transportation costs due to shorter dray distances to rail transload points and diversion of some shipping volumes from truck to less expensive rail mode.	Yes
2	Accident Costs Savings	Reduction in total number of accidents related to transportation of goods and accident costs in the Project area due to diversion of some shipping flows from truck to rail mode which has lower accident rates for the same tonnage and shipping distance.	Yes
3	Emission Costs Savings	Reduction in total transportation emissions in the Project area due to diversion of some shipping volumes from truck to rail mode which has lower total emissions for the same tonnage of goods and shipping distance.	Yes
4	Induced development benefits	By reducing transportation costs to markets and simplifying the logistics and supply chain operations, the Project will make the freight-dependent industries in the Four Corners region more competitive and support the regional economic development.	No
5	Transport Network Operations and Performance	By reducing truck shipping volumes and truck travel miles on regional segments of the National Highway System and State highways, the Project will help reduce traffic congestion.	No
6	External Highway Use Costs	Reduction in road wear and tear (and maintenance costs) as well as noise due to diversion of freight from truck to rail	Yes

3.4 Project Costs and Schedule

CAPITAL DEVELOPMENT AND CONSTRUCTION COSTS

Project capital conceptual cost estimates were developed in Task 4, and are presented in Table 2.

Table 2 shows that the total capital costs of the Project are estimated at between $1,501.7 million to $2,361.4 million in 2024 dollars, depending on the specific design option (or alignment).

This economic analysis (BCA, financial analysis, and economic impact analysis) was conducted using costs estimates based on the Defiance via Highway 491 Route option estimated at $1,645.6 million. This is the second least expensive option assessed as likely easier to implement compared to other options based on issues related to rights of way. For this BCA, costs were de-escalated to 2022 dollars using the gross domestic product (GDP) deflator.[5] **The adjusted capital cost is $1,532.7 million** in 2022 undiscounted dollars.

[5] The adjustment amounted to dividing 2024 conceptual cost estimate by the deflator index of 1.074 based on the GDP deflator for the years 2022–2024 (Office of Management and Budget of the White House, Table 10.1, https://www.whitehouse.gov/omb/historical-tables/ (accessed May 6, 2024).

Table 2: Project Capital Costs, by Route Alignment Option, Millions of 2024 Dollars

Cost Categories	Defiance via HWY 491	Defiance via HWY 371	Defiance via Indian Creek	El Segundo	Star Lake
10 - Guideway & Track Elements	$1,181.2	$1,351.6	$1,816.8	$1,070.0	$1,486.2
20 - Stations, Stops, Terminals, Intermodals	$0.0	$0.0	$0.0	$0.0	$0.0
30 - Support Facilities: Yards, Shops, Admin. Buildings	$134.1	$151.4	$151.4	$151.4	$162.3
40 - Sitework & Special Conditions	$197.5	$192.0	$222.6	$154.4	$175.3
50 - Systems	$9.6	$9.6	$9.6	$9.6	$9.6
60 - ROW, Land, Existing Improvements	$7.3	$7.9	$7.9	$7.9	$8.2
70 - Vehicles	$32.1	$32.1	$32.1	$32.1	$32.1
80 - Professional Services	$83.7	$93.8	$121.0	$76.2	$100.8
90 - Unallocated Contingency	$0.0	$0.0	$0.0	$0.0	$0.0
100 - Finance Charges	$0.0	$0.0	$0.0	$0.0	$0.0
Total Project Costs	**$1,645.6**	**$1,838.3**	**$2,361.4**	**$1,501.7**	**$1,974.6**

Note: Cost categories represent standard industry cost categories of rail transportation infrastructure estimates breakdowns used by the Federal Railroad Administration. Costs include 20% contingency.

Given that the proposed Project is a new "greenfield" project, the anticipated capital renewal and major maintenance costs during the first 30 years are minimal, except for locomotive mid-life overhaul estimated to be required after 20 years, and rail grinding costs. These costs were included under the operations and maintenance costs.

OPERATIONS AND MAINTENANCE COSTS

Operations and maintenance (O&M) costs were estimated as part of Subtask 4.6. Specifically, this task included estimates of the operating, maintenance, and capital renewal costs over a 40-year period for the projected railway operation for one single design option. The "Defiance Via Highway 491" route was selected as the design option to be analyzed. The Defiance via Highway 371 route is approximately the same length, traverses similar terrain, has similar track alignment characteristics and similar railroad operating characteristics as the other four route options under consideration. Since all route options would serve the same potential shippers and all would connect to the BNSF main line, all route options have the same opportunities for new rail traffic. Therefore, the O&M costs for the Defiance via Highway 491 route can be considered as representative of the O&M costs for the other options.

The major components driving the Proposed railroad's Operating and Maintenance Program consist of

(1) Workforce labor for train operation, inspection, and maintenance;

(2) Workforce labor for maintenance-of-way, equipment and vehicles, and maintenance of railroad assets;

(3) Locomotive fuel; and

(4) Other locomotive and rolling stock operations and maintenance, equipment and vehicles (including mid-life locomotive overhaul), and maintenance of railroad assets.

Three O&M plans and costs were developed as part of Subtask 4.6, one for the low-volume scenario and one for the high-volume scenario presented in the Freight Rail Feasibility Study as well as the scenario for the specific volumes used in this BCA.[6] These different plans accounted for the different train frequencies, with adjustments made to staffing levels and maintenance intervals based on the amount of gross tonnage over the railroad.

All cost elements were estimated in 2025 dollars and deflated to 2022 dollars for this BCA using a GDP deflator.

Table 3 provides the results of the cost analysis for key years. The table shows that the annual operating costs amount to about $3.5 million, except for years 2050 and 2060 when the annual costs increase to $11.7 million and $4.6 million, respectively, due to additional costs related to locomotive overhaul. The average annual cost over the analysis years amounts to $3.8 million. Translating these costs to $/ton-mile gives an average of $0.034 over the analysis years.

[6] See Section 4 for more details on freight volumes projections and reference to the Freight Rail Feasibility Study.

Table 3: Annual Operations and Maintenance Costs

Variable Name	Unit	Value
Total O&M Costs		
2032 (First Year of Operations)	2022 $ M	$3.45
2050 (Year with Mid-Life Locomotive Overhaul Costs)	2022 $ M	$11.65
2060 (Year with Intermediate Locomotive Overhaul Costs)	2022 $ M	$4.61
2061 (Last Year of Analysis Period)	2022 $ M	$3.53
Average 2023-2061	2022 $ M	$3.80
O&M Costs Rate (per Ton-Mile)		
2032 (First Year of Operations)	2022 $/ton-mile	$0.027
2050 (Year with Mid-Life Locomotive Overhaul Costs)	2022 $/ton-mile	$0.109
2060 (Year with Intermediate Locomotive Overhaul Costs)	2022 $/ton-mile	$0.043
2061 Last Year of Analysis Period)	2022 $/ton-mile	$0.032
Average 2023-2061	2022 $/ton-mile	$0.034

PROJECT SCHEDULE

Planning and Project design are expected to start in 2026 and continue through 2029. Activities related to right of way and land acquisition are expected to take place in 2028 and 2029. Project construction is expected to start in 2029 and take about three years to complete (i.e., by end of 2031). Table 4 shows the annual distribution of capital costs. This distribution is based on alignment option Defiance via Highway 491. However, cost distributions for other options are similar. The table shows that more than 95 percent of costs are expected over the three years of construction 2029-2031. 2032 is assumed as the first full year of Project operations.

Table 4: Annual Distribution of Capital Costs, Percent of Total

	2026	2027	2028	2029	2030	2031
Share of Total Costs	1.3%	1.3%	1.5%	29.4%	38.6%	27.9%

4. Demand Projections

When assessing the economic merits of transportation infrastructure projects, current and future demand facing the facility needs to be analyzed and quantified.

A freight demand forecast report and freight volume estimates that could potentially divert to the proposed Project were prepared as a part of previously completed Task 2.[7] The study considered market demand from industry throughout the greater Four Corners Region that could potentially be supported by the expansion of freight rail service to the Farmington area, including existing rail shippers who could benefit from shorter dray distance to the proposed Project facilities as well as truck shippers who could reduce their transportation costs by switching to rail transportation with the proposed Project given a relatively short dray distance that would be required to use it.

[7] Four Corners Freight Rail Feasibility Study, “Freight Demand Forecast Report”, June 16, 2023.

The existing baseline freight demand for the study area was determined based on information gathered through interviews with potential shippers and supplemented with information gathered from other publicly available sources, primarily regarding shipments of coal and other minerals. This analysis provided characterization of the current freight transportation demand among businesses in the study area in terms of commodities, volumes (tonnage and carloads), as well as commodity origins, and destinations. The baseline year for existing freight demand is 2022.

Using the baseline freight demand estimate, the Freight Demand Forecast Report provided future commodity flow estimates to cover a period of 40 years including the first full year of operations for the corridor.

Commodity group-specific growth factors were sourced from the FHWA Freight Analysis Framework (FAF) database. The FAF-derived growth rates were applied to the existing freight flows to and from the Four Corners Region identified as part of the baseline freight demand (for year 2022), to calculate the corresponding future volumes for these existing freight flows.

Table 5 below shows the forecasts of demand facing the proposed Project, or commodity tonnage that could benefit from it, that was determined in the Freight Demand Forecast Report. The demand was estimated for two key categories of commodity flows:

(1) Existing rail shipments, or existing Four Corners Region shipments that access the North American freight rail network via drayage to intermediate transload sites, and
(2) Existing truck shipments, or existing Four Corners Region non-rail (truck) shipments where there is potential for mode shift from truck to rail as the main transportation mode.

Existing rail shipments comprise mostly outbound volumes of commodities such as coal, fly ash, and lumber, and smaller quantities of popcorn, fertilizers, frac sand, and steel beam. Existing truck shipments comprise mostly outbound shipments of agricultural products and inbound shipments of frac sand, chemicals, and diesel fuel.

In addition, the Project feasibility study identified a range of commodities and volumes that are currently not being shipped but that may materialize if a rail connection were to be developed. These volumes include primarily outbound coal but also a few other commodities such as soil conditioners and carbon black. [8]

Table 5 shows the low range of forecasted volumes, the high range, the average of the two, and the potential additional commodity volumes for key forecast years.

[8] This “induced demand” from new production and new shipping opportunities was not included in the main scenario of this BCA. It is pointed out qualitatively as a potential future benefit. A portion of this shipment volumes was included in the BCA as a sensitivity scenario discussed in Section 8.

Table 5: Forecasts of Commodity Shipping Demand for Proposed Rail Project, by Scenario, Tons

Commodity Category and Mode	2022 (Baseline)	2030	2040	2050	2060
Existing Shipments - Low Forecast					
Rail Shipments	728,853	626,018	488,330	410,731	368,869
Truck Shipments	173,552	203,486	230,575	273,512	328,860
Total	902,405	829,504	718,905	684,243	697,729
Existing Shipments - High Forecast					
Rail Shipments	1,381,191	1,182,737	932,637	787,879	705,162
Truck Shipments	318,598	373,505	415,727	486,725	578,184
Total	1,699,788	1,556,242	1,348,364	1,274,604	1,283,346
Average					
Total Existing Rail Shipments	1,035,022	883,339	687,333	572,956	506,640
Total Existing Truck Shipments	266,075	309,535	346,302	406,468	483,898
Total	**1,301,096**	**1,192,873**	**1,033,635**	**979,423**	**990,538**
Potential New Volumes Forecast (Induced Volumes)					
Bituminous Coal	8,800,000	7,435,939	5,203,439	3,796,013	2,908,423
Other Commodities	822,400	974,148	1,264,648	1,674,123	2,198,526

Source: Four Corners Freight Rail Feasibility Study, "Freight Demand Forecast Report", June 16, 2023.

This BCA assumed commodity shipments equal to **the average of low and high existing volumes forecasts.** The potential new volumes identified in the table were not included in the main analysis scenario – as conservative approach – given a somewhat speculative nature of these shipments. The sensitivity analysis considered BCA and financial outcomes with 33 percent of the new potential commodity volumes (coal, fly ash, carbon black, and soil conditioners) included in addition to the existing volumes.

Table 6 presents shipments by commodity and their current primary shipping mode (truck or rail). In the Build scenario, all truck shipments are assumed to divert to rail as the primary mode of transport.

Table 6: Forecasts of Commodity Shipping Demand for Proposed Rail Project, by Commodity, Average Scenario, Tons

Commodity	2022 (Baseline)	2030	2040	2050	2060
Existing Truck Shipments					
Alfalfa Meal, Cube or Pellet Form	45,000	43,768	41,542	39,613	38,525
Ammonium Polyphosphate Solution	3,598	5,223	7,520	10,608	14,700
Beans	47,600	59,225	75,235	96,641	124,458
Corn	10,500	14,353	15,632	17,893	20,494
Diesel Fuel	947	982	935	914	903
Frac Sand	96,000	112,267	117,274	132,974	151,847
Monoammonium Phosphate Fertilizer	1,600	2,458	3,539	4,993	6,919
Popcorn, Ear or Shelled, not Popped	20,000	21,039	23,151	26,349	30,376

Commodity	2022 (Baseline)	2030	2040	2050	2060
Potassium Chloride	5,000	7,300	9,691	12,828	16,855
Potassium Sulfate	550	803	1,066	1,411	1,854
Potassium Thiosulfate Solution	410	595	857	1,209	1,675
Potatoes	3,750	5,149	5,618	6,477	7,501
Thiosulfate Solution	650	944	1,359	1,917	2,656
Urea	1,500	1,705	1,956	2,217	2,587
Wheat	2,750	3,073	3,617	4,291	5,051
Wheat Flour	20,250	23,680	29,178	36,831	46,736
Total Truck Shipments	**260,105**	**302,562**	**338,170**	**397,165**	**473,136**
Existing Rail Shipments					
Ammonium Nitrate Fertilizer, Liquid	10,500	14,006	18,549	24,510	32,151
Bituminous Coal	718,595	599,566	476,213	392,132	328,305
Fly Ash	232,000	190,360	103,591	54,757	29,446
Frac Sand	10,000	11,665	12,189	13,822	15,781
Lumber	60,000	62,846	70,635	80,026	91,228
Phosphoric Acid	687	1,055	1,519	2,143	2,970
Steel Beam	3,780	4,500	5,458	6,587	8,038
Steel Pipe or Tubing	5,430	6,313	7,309	8,281	9,482
Total Rail Shipments	**1,040,992**	**890,312**	**695,465**	**582,258**	**517,401**
Total Coal vs Other Commodities					
Bituminous Coal	718,595	599,566	476,213	392,132	328,305
Other Commodities	582,501	593,308	557,421	587,292	662,232
Grand Total Shipments	**1,301,096**	**1,192,873**	**1,033,635**	**979,423**	**990,538**

Source: Four Corners Freight Rail Feasibility Study, “Freight Demand Forecast Report”, June 16, 2023.

In order to better understand the demand for the proposed Project and estimate shipping costs in the No Build versus the Build scenarios, the Four Corners Freight Feasibility Study also analyzed shipping distances of each commodity (including dray distances for commodities shipped by rail), and quantities such as tons of commodity per truck for truck shipments, tons per rail car and rail cars per train for rail shipments. This information is summarized in Table 7.

The Build scenario rail shipping distances are based on the distance that includes distance travelled on the proposed Project and distance from the Class I rail connection point to the representative destination point while the dray distances are based on the representative origin for each commodity to the Project connection point. No Build distances are based on the information collected for the existing shipments, their primary transportation mode, shipping destinations, and implied shipping distances.

The loading assumptions such as tons of commodity per truck for truck shipments, tons per rail car and rail cars per train for rail shipments, are based on common industry standards.

Table 7: Shipping Distances and Other Quantitative Parameters for Truck and Rail Shipping

Commodity	Tons per Truck	Tons per Rail Car	Rail Cars per Train	Share of Rail in No-Build	No Build Shipping Distances (Miles)			Build Shipping Distances (Miles)	
					Truck	Dray	Rail	Dray	Rail
Corn	25	100	100	0%	288	0	0	5	285
Wheat	25	100	100	0%	556	0	0	5	612
Popcorn, Ear or Shelled, not Popped	25	100	100	0%	441	0	0	5	393
Potatoes	25	64	100	0%	1,569	0	0	5	1,885
Beans	25	100	100	0%	722	0	0	5	787
Bituminous Coal	25	117	135	100%	0	159	670	49	770
Frac Sand	25	116	100	9%	145	183	25	9	149
Wheat Flour	25	100	100	0%	982	0	0	9	1,108
Alfalfa Meal, Cube or Pellet Form	25	100	100	0%	766	0	0	5	868
Lumber	25	90	100	100%	0	164	1,778	8	1,665
Potassium Chloride	25	96	100	0%	208	0	0	3	677
Potassium Thiosulfate Solution	25	96	100	0%	448	0	0	1	716
Potassium Sulfate	25	100	100	0%	459	0	0	3	1,622
Urea	25	100	100	0%	820	0	0	3	1,025
Phosphoric Acid	25	96	100	100%	0	414	194	3	258
Thiosulfate Solution	25	96	100	0%	422	0	0	3	719
Monoammonium Phosphate Fertilizer	25	100	100	0%	591	0	0	3	1,343
Ammonium Nitrate Fertilizer, Liquid	25	100	100	100%	0	112	304	3	258
Ammonium Polyphosphate Solution	25	96	100	0%	422	0	0	2	719
Diesel Fuel	25	96	100	0%	111	0	0	7	106
Steel Beam	25	90	100	100%	0	214	692	7	952
Steel Pipe or Tubing	25	90	100	100%	0	214	692	7	952
Fly Ash	25	116	100	100%	0	93	422	0	547

5. Benefit-Cost Analysis

The benefit-cost analysis (BCA) of this proposed rail Project focused on the economic benefits and costs to determine whether the Project makes sense in economic terms by creating socioeconomic benefits that exceed Project costs.

The financial flows, such as freight revenues to Project operator, are not included as they represent a "transfer" of value, rather, than a net impact on the use of economic resources. However, Project revenues represent an important consideration for financial performance and feasibility, and are analyzed in Section 6, Financial Analysis.

This section outlines the general BCA principles, discusses methodology of estimation of quantifiable impacts, discusses data and input assumptions, and presents the results.

5.1 General Assumptions and Principles

A BCA is a conceptual framework that quantifies in monetary terms as many of the costs and benefits of a project as possible to derive project performance metrics. Benefits are broadly defined and represent how stakeholders will be made better off. Benefits that are difficult to quantify and monetize are also acknowledged and included as qualitative project merits. Similarly, costs are broadly defined and include all costs related to the project and costs that arise to stakeholders as a consequence of the project. Estimated benefits are based on the projected impacts on both users and nonusers of the project facilities, valued in monetary terms.[9]

A BCA is typically a forward-looking exercise that seeks to anticipate the welfare impacts of a project or proposal over its entire life cycle. This means that the BCA measures benefits against costs throughout a period of analysis beginning at the start of project development and construction and including a period of project operations, usually 20 to 30 years, based on USDOT guidelines.

Future project impacts are weighted against today's impacts through discounting, which is meant to reflect society's general preference for the present as well as broader intergenerational concerns. The specific methodology adopted for this application was developed using the above BCA principles and is consistent with USDOT's BCA guidelines. In particular, the methodology involves:

- Establishing existing and future conditions under the Build and No Build scenarios;
- Measuring benefits in dollar terms, whenever possible, and expressing benefits and costs in a common unit of measurement;
- Using US DOT guidance and recommended parameter values for the valuation of travel time savings, safety benefits, and reductions in air emissions, while relying on industry best practice for the valuation of other effects;

[9] USDOT, Benefit-Cost Analysis Guidance for Discretionary Grant Programs, December 2023.

- Discounting future benefits and costs with the real discount rates recommended by USDOT (at 3.1 percent except for greenhouse gas emissions impacts which are discounted at 2 percent); and,
- Estimation of Project benefits and costs in constant dollars (i.e., in real terms), and specifically **in 2022 dollars**.

The period of analysis was assumed to begin in 2026 and end in 2061. It included Project development and construction years (2026–2031) and 30 years of operations (2032–2061). This corresponds to the currently anticipated construction schedule and the first full year of operations in 2032. Given a long-lived nature of rail infrastructure, the operating period for this analysis was assumed at 30 years.

Unless specified otherwise, the results shown in this document correspond to the net effects of the full Build scenario.

5.2 Benefits and Costs Measurements, Data and Assumptions

This section describes the measurement approach used for each quantifiable benefit or impact category identified in Table 1 and provides an overview of the associated methodology and assumptions.

SAFETY IMPACTS

Safety impacts of rail projects are due to modal diversion of freight from trucks to rail and lower overall number of accidents for rail transportation compared to truck transportation for the same volume of freight ton-miles.

Accident costs for the Build and the No-Build scenarios were estimated for the specified tons of freight and distances to be transported by truck and rail in each of the two scenarios. The expected number of truck accidents and rail accidents were estimated based on the truck ton-miles and rail ton-miles that would be transported each year multiplied by truck crash rates and rail crash rates (in terms of number of fatalities and injuries per billion ton-miles), respectively, sourced from research conducted by Texas A&M Transportation Institute (TTI). These were multiplied by the unit costs of fatalities and injuries recommended by USDOT to obtain the monetary cost of the accidents for each mode.

Truck ton-miles were estimated as the quantity of commodity shipped by truck multiplied by the shipping distance and included the existing truck shipping volumes and volumes shipped by truck to a rail connection for further shipping by rail (i.e., the dray volumes). It is noted that in the Build scenario, truck ton-miles represent only dray shipments.

Rail ton-miles were estimated as the quantity of commodity to be shipped by rail in each scenario and the rail shipping distance. In the No Build scenario, the shipping distance represents the distance from the Class I rail connection point to destination while in the Build scenario, it also includes the distance on the proposed Project.

The difference between the Build scenario costs and the No Build scenario costs represents the impact of the evaluated project.

Table 8 below summarizes the assumptions used to quantify the transportation movements, truck ton-miles and train ton-miles while Table 9 presents key parameter assumptions for estimation of number of accidents and safety impacts of the Build scenario.

Table 8: Assumptions used in Quantification of Transportation Movements (Truck Ton-miles, Train Ton-Miles)

Variable Name	Unit	Value	Source
Tonnage of Freight	Tons	Varies by year, mode, commodity	Freight Rail Feasibility Study analysis. See Table 5 and Table 6. In the Build scenario, all freight is shipped by rail. All rail shipments require truck drayage to rail connection point.
Average Shipping Distance			
Truck	miles	Varies by commodity, scenario	Freight Rail Feasibility Study analysis. See Table 7.
Rail	miles	Varies by commodity, scenario	Freight Rail Feasibility Study analysis. See Table 7.
Average Dray Distances to Rail Connection			
No Build	miles	Varies by commodity, scenario	Freight Rail Feasibility Study analysis. See Table 7.
Build	miles	Varies by commodity, scenario	Freight Rail Feasibility Study analysis. See Table 7.

Table 9: Assumptions Used in Estimation of Safety Impacts

Variable Name	Unit	Value	Source
Truck Accident Rates			
Fatalities	Number/Billion ton-miles	2.22	Texas A&M Transportation Institute. A Modal Comparison of Domestic Freight Transportation Effects on the General Public: 2001–2019. January 2022.
Injuries	Number/Billion ton-miles	55.17	As above
Rail Accident Rates			
Fatalities	Number/Billion ton-miles	0.48	As above
Injuries	Number/Billion ton-miles	4.62	As above
Accident Costs			
Fatality	$/Victim	$12,500,000	US DOT BCA Guidance, December 2023.
Injury (Severity unknown)	$/Victim	$217,600	As above

SHIPPER TRANSPORTATION COSTS SAVINGS

Shipper cost savings from rail projects are due to a lower overall cost of freight transportation by rail compared to truck transportation. Benefits from modal diversion are driven by differences in total transportation costs in the Build scenario and the No Build scenario.

Data on the transportation costs currently paid by the shippers in the region, or the rates that would be charged by the operator of the proposed Project were not available for this study.

Therefore, the transportation costs for both the No Build and Build scenario were estimated based on publicly available data on transportation carriers operating statistics. Truck shipping costs and rail shipping costs by Class I rail carriers were assumed based on the revenue per ton-mile data reported in the National Transportation Statistics. The latest available data for 2021 was inflated to 2022 (using GDP deflator data) to align with other BCA valuation parameters. After inflationary adjustments, these data shows that the average per ton-mile shipping costs amount to $0.261 for truck and $0.049 for rail.

Similar operating data is not available for Class II and Class III railroads – classification expected for the proposed Project. Data on operating statistics for these railroads is generally limited.

A report by US Government Accountability Office (GAO) on precision-scheduled railroading (a strategy intended to increase efficiency and reduce costs) reported as a part of background information on Class I railroads their operating expenses and operating revenues, and the resulting operating ratio (operating expenses divided by operating revenues). Operating ratio declined from about 73 percent in 2011 to about 62 percent in 2021 implying an average of about 68 percent over the years 2011-2021. Assuming that these trends are broadly representative for the freight rail transportation industry, this operating ratio can be applied to the average O&M cost per ton-mile to estimate the revenue per ton-mile and shipper costs per ton-mile.

Table 10 provides a summary of the transportation cost data researched. For this study, truck transportation costs were estimated based on per ton-mile truck shipping cost shown in the table. No Build rail shipping costs were estimated based on Class I rail carriers' cost. Build rail shipping costs were estimated separately for the Project section and the remaining shipping distance (i.e., after connection to the Class I rail network). The transportation shipping cost rate for the former was based on the estimated cost per ton-mile and the average industry operating ratio while the cost rate for the latter was based on Class I carriers' rate as shown in the table.

Table 10: Summary of Transportation Cost Inputs

Variable Name	Unit	Value	Source
Truck Shipping Cost	$/ton-mile	$0.26	Average revenue per ton-mile for truck mode, National Transportation Statistics, Table 3-21. Value for 2021 inflated to 2022 using a GDP deflator
Rail Shipping Cost			
Class I Carriers	$/ton-mile	$0.049	Average revenue per ton-mile for Class I railroads, National Transportation Statistics, Table 3-21. Value for 2021 inflated to 2022 using a GDP deflator
Rail (New Line)	2022$/ton-mile	$0.050	Calculated based on cost per ton-mile and assumed operating ratio.
Rail Industry Operating Ratio	%	68.1%	US Government Accountability Office, "Freight Rail. Information on Precision-Scheduled Railroading", December 2022. Average operating ratio for Class I railroads, 2011-2021. https://www.gao.gov/assets/gao-23-105420.pdf
Average Operating Cost	2022$/ton-mile	$0.034	Average cost per ton-mile 2032-2061 calculated based on total costs and tonnage of commodities shipped.

Transportation costs were calculated for the total volume of freight to be transported by each mode, shipping distance, and average freight carrier revenue rate for both truck and rail mode. Costs for freight to be transported by rail include both the rail transportation cost as well as the truck drayage cost to a rail transload facility and the transload cost. The transload cost was estimated based on a per-ton cost sourced from literature.

The tons of freight to be transported by truck and rail in each scenario were converted to ton-miles based on the shipping distance for each commodity. Total truck ton-miles include both truck transportation as the main mode and truck transportation to rail connection (i.e., drayage).

In the No Build scenario, most tonnage is transported by rail but requires drayage to the Class I rail connection point, and some volumes are transported by truck to the final destination. In the Build scenario, all freight is transported by rail as the main mode. The Build transportation includes truck transportation (i.e., drayage) to the Project rail connection point, rail transportation on the proposed Project to Class I network connection point where Class I carriers take over the trains for transportation to the final destination.

The difference between total shipper transportation costs in the No Build scenario and the Build scenario is the projected shipper transportation cost savings. It is noted that the costs savings resulting from modal diversion from truck to rail were netted off by the dray cost and the transload costs for the freight volumes diverted. This captured the observation that the modal diversion from truck to rail will involve some truck transportation to rail connection station and additional transload operations and thus additional costs to shippers that have to be accounted for in a BCA.

Table 11 below shows the key input assumptions used for the estimation of shipper transportation cost savings.

Table 11: Assumptions Used in Estimation of Shipper Transportation Cost Savings

Variable Name	Unit	Value	Source
Truck Shipping Costs	$/ton-mile	$0.26	See Table 10.
Rail Shipping Cost			
Class I Carriers	$/ton-mile	$0.049	See Table 10.
Proposed Project	$/ton-mile	$0.050	See Table 10.
Shipping Distance	miles	Varies by commodity, mode, scenario	See Table 7.
Dray Distance		Varies by commodity, mode, scenario	See Table 7.
Transload Cost	$/ton	$7.65	Bryan, Joseph, Weisbrod, Glen, and Martland, Carl D. National Cooperative Highway Research Program. Rail Freight Solutions to Roadway Congestion - Final Report and Guidebook, 2006. Average value of $5.50 determined by authors inflated to 2022 dollars using a GDP deflator.
Shipping Volumes (by mode)	tons	Varies by commodity, year	See Table 6.

EMISSIONS COST SAVINGS

Emissions cost savings of rail projects are due to overall lower emissions of freight transportation by rail compared to truck transportation for the same volume of freight and distance.

To estimate truck emissions in each scenario, tonnage of truck shipments was converted into truck VMTs based on the assumed tons per truck, shipping distance, as well as the assumption accounting for empty returns. Truck VMTs were multiplied by truck emission factors to obtain the quantity of emissions, by pollutant type, which were then monetized using unit social costs of emissions recommended by USDOT. Truck emission factors were estimated based on the United States Environmental Protection Agency's (USEPA) Motor Vehicle Emissions Simulator (MOVES) simulations for San Juan and McKinley Counties, New Mexico. Truck emissions impacts included emissions from both the main freight movements (i.e., tonnage transported by truck) and drayage movements corresponding to rail shipments.

Rail emission costs were estimated based on fuel usage per ton-mile of commodity shipped and fuel emission factors (grams of emissions/gallon). Ton-miles of commodities shipped by rail were estimated separately for the No Build and Build scenario based of tonnage of shipments and shipping distances. Rail fuel efficiency factor, ton-miles shipped per gallon of fuel, was assumed based on research conducted by Association of American Railroads while emission factors were assumed were based on research conducted by the USEPA.

Both truck emissions and rail emissions were monetized using emissions unit costs provided by USDOT in its BCA Guidance. The sum of truck emission costs and rail emission costs gives the total emission costs of a scenario. The difference between the No Build scenario costs and the Build scenario costs represents the impact of the evaluated rail project.

Table 12 provides a summary of assumptions used in the estimation of emission impacts and emission reduction benefits.

Table 12: Assumptions Used in Estimation of Emission Impacts

Variable Name	Unit	Value	Source
Truck Ton-Miles	Ton-miles	varies by year, mode, scenario	See Table 8.
Train Ton-Miles	Ton-miles	varies by year, mode, scenario	See Table 8.
Average Tons per Truck	Tons	25	Assumption based on industry standards
Truck Emission Factors	g/VMT	Varies by year	MOVES simulations for San Juan and McKinley Counties. Detailed results in spreadsheet model.
Rail Emission Factors	g/gallon of fuel consumed	Varies by year	United States Environmental Protection Agency, Office of Transportation and Air Quality, "Emission Factors for Locomotives", EPA-420-F-09-025, April 2009.
Freight Train Fuel Efficiency (Fuel Consumption)	Ton-miles transported/ gallon	500	American Association of Railroads, "Freight Rail & Climate Change" briefing note. AAR-Climate-Change-Fact-Sheet.pdf

Variable Name	Unit	Value	Source
Emissions unit Costs			US DOT BCA Guidance, December 2023, Table A-6. Used to monetize the costs of truck emissions.
CO2	$/tonne	$262	Unit costs of CO2 emissions vary by year increasing on average by 1.4% each year over the years 2031-2053. Value shown is for 2031.
NOX	$/tonne	$22,000	
SO2	$/tonne	$61,500	
PM2.5	$/tonne	$1,069,000	

EXTERNAL HIGHWAY USE COSTS REDUCTION

Diversion of freight shipping volumes from truck to rail will reduce truck VMTs on regional highways which, in turn, will reduce the road wear and tear from heavy vehicles and thus reduce the highway maintenance costs. Similarly, reduction in truck volumes on regional highways will reduce highway noise and its related costs.

These cost savings were estimated based on the truck VMTs reduced (No Build truck VMT minus Build truck VMTs) multiplied by unit values of external highway use costs for congestion and noise recommended by USDOT in its BCA Guidance. Pavement damage cost was estimated based on a highway cost allocation study with values inflated to 2022 dollars. The calculations accounted for both truck shipping distances and truck drayage distances in the No Build versus Build scenarios. Table 13 provides a summary of assumptions used to estimate the external highway use reduction benefits.

Table 13: Assumptions Used in Estimation of Highway Use Costs Savings

Variable Name	Unit	Value	Source
Truck VMTs	VMT	Varies by year, Scenario	Calculated based on assumptions summarized in Table 8, as for Environmental Costs Savings.
External Highway Costs Reduction Benefits			
Congestion	$/VMT	$0.236	US DOT BCA Guidance, December 2023, Table A-14. Bus and trucks, all locations.
Noise	$/VMT	$0.022	US DOT BCA Guidance, December 2023, Table A-14. Bus and trucks, all locations.
Pavement Damage	$/VMT	$0.167	FHWA, Addendum to the 1997 Federal Highway Cost Allocation Study Final Report, 2000; average for 60 kip 4-axle trucks, rural and urban highways. 1994 value inflated to 2022.

STATE OF GOOD REPAIR AND RESIDUAL VALUE

Rail projects are long-lived assets and can be expected to have some value remaining at the end of a 30-year evaluation period used in this BCA. To quantify the benefits associated with the remaining life of the Project, the residual value of the project assets was estimated and entered as the benefit in the BCA in the last year of the analysis.

The service life was assumed at 60 years, and Project costs were assumed to depreciate in a linear manner over the asset service life. For this BCA, the Project was assumed to have half of its value remaining at the end of the 30-year operating period.

PROJECT COSTS AND SCHEDULE

Project costs and schedule were discussed in some detail in Section 3.4. Project costs considered in this BCA include costs related to track design & development and construction, subsequent track maintenance and train operations. Table 14 below provides a summary of these costs over the Project life cycle that includes Project development and construction years (2026–2031) and 30 years of operations (2032–2061). Total Project costs amount to $1,646.7 million in undiscounted dollars and $1,261.1 million discounted at 3.1 percent. These costs were compared against the benefit estimates.

Table 14: Project Costs, Millions of 2022 Dollars over Project Life Cycle

Cost Category	Constant Dollars	Discounted at 3.1%
Track Development and Construction	$1,532.7	$1,206.1
Total O&M Costs	$114.0	$54.9
Total Costs	**$1,646.7**	**$1,261.0**

5.3 Summary of Findings and BCA Outcomes

Table 15 summarizes the BCA findings for this Project. Annual costs and benefits were computed over the lifecycle of the Project (six (6) years of planning, development and construction, and 30 years of operations). As stated previously, construction is expected to be completed by the end of 2031. Benefits accrue during the full operation of the Project over the period 2032 to 2061.

Table 15: Overall Results of the Benefit-Cost Analysis, Millions of 2022 Dollars*

Project Evaluation Metric	Undiscounted	Value at 3.1% Discount Rate**
Total Benefits	$3,084.7	$1,372.7
Total Capital Costs	$1,532.7	$1,206.1
Total O&M Costs	$114.0	$54.9
Net Present Value	$1,438.0	$111.7
Benefit/Cost Ratio	1.9	1.1
Internal Rate of Return (%)	3.5%	

Notes: (*) All monetary values in the table are in millions of 2022 dollars over the period 2026–2061, except for the Benefit/Cost Ratio and the Internal Rate of Return. (**) Discounted using a real discount rate of 3.1%, except for GHG emissions impacts which were discounted at 2%.

Considering all monetized benefits and costs, the estimated internal rate of return of the Project is 3.5 percent. With a 3.1 percent real discount rate, the $1,206.1 million capital investment would result in $1,372.7 million in total benefits, $111.7 million in NPV (all discounted at 3.1 percent discount rate, except for greenhouse gas emissions which were discounted at the 2 percent rate), and a BCR of approximately 1.1.

Table 16 provides an overview of project benefits by category. At the 3.1 percent discount rate, the largest category of benefits is represented by shipper costs savings at $775.6 million (or 56.5 percent of total benefits) followed by the residual value of Project assets at $233 million (or 17 percent of total benefits) and external highway use cost savings at $130.4 million (or 9.5 percent of total benefits). Emissions costs savings and accident cost savings account for 9.1 and 7.9 percent of total Project benefits, respectively.

Table 16: Project Benefits by Category, Millions of 2022 Dollars

Category of Benefits	Undiscounted	Present Value at 3.1% Discount Rate
Shipper Cost Savings	$1,606.8	$775.6
Accident Costs Savings	$260.3	$125.3
Emissions Cost Savings	$180.3	$108.4
CO_2 Emissions Reduction	$164.2	$100.4
Non-CO_2 Emissions Reduction	$16.0	$8.0
External Highway Use Cost Savings	$271.0	$130.4
Residual Value	$766.4	$233.0
Total Benefits	**$3,084.7**	**$1,372.7**

6. Financial Analysis

The financial analysis considered the flow of all Project-related costs and revenues over the Project life to determine the net fiscal impact, or whether the Project will be able to finance itself over the analysis period. The sections below discuss Project financial costs and revenues considered, their estimation, and financial outcomes.

6.1 Financial Assumptions

Table 17 provides a summary of assumptions used for this financial analysis.

Project freight revenues were estimated as average shipper costs on the Project (in terms of $/ton-mile) multiplied by demand for Project services (tonnage of commodities shipped) and Project length in miles. As discussed in Section 5.2, average cost per ton-mile on the Project and rail industry average operating ratio were used to estimate shippers' costs (Project revenue).

Project costs considered included capital development and construction costs, annual fixed operations and maintenance costs for the Project, and train operating costs (fuel and labor). Assumptions for each category of these costs were discussed in Section 3.4.

To derive revenues and costs estimates in current-year dollars, the initial assumptions were escalated by annual inflation/escalation rates. Capital costs were assumed to increase at an average annual rate of 3 percent. Freight revenue inflation (or escalation rate) was calculated based on the per-ton revenue statistics for Class I railroads for a 10-year period before the COVID 19 pandemic period as reported in the National Transportation Statistics. The resulting escalation rate of 3.23 percent was also assumed for rail operating costs and track maintenance costs.

To focus the analysis on the outcomes more specific to the rail service operator, the analysis assumed that all capital costs would be funded from public funds, a combination of federal and non-federal sources.

Table 17: Key Assumptions for Financial Analysis

Variable Name	Unit	Value	Source
Average Shipping Distance on Project Facility (1-Way)	miles	110	Based on distance Farmington to Gallup reflecting approximate Project length. The same distance was assumed for all shipments.
Freight Shipping Revenue	$/ton-mile	$0.050	See Table 10, extrapolates for Class II/Class III average.
Freight Rail Operating Cost		$0.034	See Table 10
Project Capital Costs, Total	$ million	$1,532.7	See **Error! Reference source not found.** for total costs and annual distribution over construction period.
Inflation/Escalation Rates			
Capital Costs	%	3.00%	Assumption
Freight Revenues	%	3.23%	National Transportation Statistics, Table 3-21, average rail revenue, Class I carriers, average annual rate of growth over 10 years before COVID-19, 2010-2019.
Rail Operating Cost	%	3.23%	Assumed the same as revenue inflation.
Track O&M Costs	%	3.23%	Assumed the same as revenue inflation.
Discount Factor, Real	%	3.1%	The same real discount rate as in the BCA.
Discount Factor, Nominal	%	6.1%	Assumed equal to the real discount rate plus an average inflation rate of 3%.
Public Capital Cost Share	%	100%	Assumption. Analysis intended to focus on outcomes to rail service operator.

6.2 Summary of Findings and Financial Analysis Outcomes

Table 18 presents the results of the financial analysis in constant dollar-terms while Table 19 shows the same set of results in current-year dollars (i.e., based on annually escalated revenues and costs). The analysis included freight revenues only (as no other sources of revenues were identified at this time) which were analyzed against the costs, capital costs and operating costs. The results are presented both in undiscounted dollars and discounted dollars terms (at 3.1 percent for constant dollars and 6.1 percent for current dollars). The tables show that the Project will generate a net cash flow estimated at $54.4 million in 2022 dollars or $104.8 million in current dollars (undiscounted). Discounted cash flow is estimated at $28.6 million in constant dollars and $27.7 million in current dollars.

The Project operator will be able to finance the operating costs generating revenues that are estimated to be well above the operating costs resulting in cost recovery ratios of 1.48 and 1.52 in constant dollars terms (undiscounted and discounted, respectively), or 1.44 and 1.52 in current dollars (undiscounted and discounted, respectively).

Table 18: Summary of Project Financial Results, 2026-2061, Millions of 2022 Dollars*

Impact Categories	Undiscounted	Value at 3.1% Discount Rate**
Revenues		
Freight Transportation Revenues	$168.4	$83.5
Other Revenues	$ -	$ -
PV of Revenues	**$168.4**	**$83.5**
Costs		
Capital Costs	$1,532.7	$1,206.1
Capital Cost Covered Through Public Funding	-$1,532.7	-$1,206.1
Total O&M Costs	$114.0	$54.9
PV of Costs	**$114.0**	**$54.9**
Net Cash Flow	**$54.4**	**$28.9**
Operating Costs Recovery Ratio	1.48	1.52
Total Costs Recovery Ratio	1.48	1.52

Note: * Except for Cost Recovery Ratios. (**) Discounted using a real discount rate of 3.1%.

Table 19: Summary of Project Financial Results, 2026-2061, Millions of Current-Year Dollars*

Impact Categories	Undiscounted	Value at 6.1% Discount Rate**
Revenues		
Freight Transportation Revenues	$343.0	$81.3
Other Revenues	$ -	$ -
PV of Revenues	**$343.0**	**$81.3**
Costs		
Capital Costs	$1,770.4	$1,111.4
Capital Cost Covered Through Public Funding	-$1,770.4	-$1,111.4
Total O&M Costs	$238.1	$53.7
PV of Costs	**$238.1**	**$53.7**
Net Cash Flow	**$104.8**	**$27.7**
Operating Costs Recovery Ratio	1.44	1.52
Total Costs Recovery Ratio	1.44	1.52

Note: * Except for Cost Recovery Ratios. (**) Discounted using a nominal discount rate of 6.1%.

7. Economic Impact Analysis

The economic impact analysis of the Project considered generation of economic activity as measured in terms of jobs and other related metrics. The sections below describe the key concepts, methodology, assumptions, and report the results of the analysis.

7.1 Key Concepts in Economic Impact Analysis

Economic impact analysis is a type of conceptual analysis that identifies and quantifies the economic activity that is generated or can be attributed and linked to the investment project, government policies, events, etc. being evaluated (for simplicity referred to as “project”). This

project has some underlying change in the stream of expenditures in an economy which lead to a change in the demand for goods and services. This has implications on the number of jobs and other measures of economic activity in the local, regional, and national economy.

Traditionally, 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. These are defined as follows:

- Direct effects refer to the initial economic effects occurring as the result of capital or operating expenditures directly related to the project being evaluated. Examples of direct impacts include construction activities at the project site, manufacturing of major equipment, or operation and maintenance activities of the project assets. Direct spending results in the employment of workers, business output, and sales of locally produced goods and services.

- Indirect effects refer to the "spin-off" economic activities that result from purchases of production inputs and goods and services by businesses that are impacted by the initial expenditures. The spending by the supplier firms on their labor, production inputs, and goods and services that they require creates output of other firms further down the production chain, bringing about additional business output, employment, and earnings. The sum of these effects across the supply chain is the indirect impact.

- Induced effects represent the increase in business output, employment, and earnings over and above the direct and indirect impacts, generated by re-spending of employment income derived from direct and indirect employment. Induced impacts are thus changes in economic activity that are the result of personal (household) spending on goods and services by employees comprising the direct and indirect impacts.

- Total economic impact is the sum of the direct, indirect, and induced effects for the project being evaluated.

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

- Output, or total gross value of all business revenue, represents the total sum of all economic activity that has taken place in connection with the project. This is the broadest measure of economic activity.

- Value Added, also known as Gross Domestic Product (GDP), the "value added" to the economy, or value of output minus value of purchased goods and services used in the production process. Value added represents the unduplicated measure of the total value of economic activity.

- Employment is the number of incremental jobs created as a result of the capital expenditures and operating expenditures related to the project.[10]

- Salaries and Wages represents the additional salaries and wages that would result from capital expenditures on the project and its future operations.

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 described above.

In addition, an investment project, event, or government policies may result in various other impacts and broader socio-economic benefits affecting broader local and regional economies. These may include additional enabled economic activity, improvements in productivity and competitiveness, improved quality of life in the affected region, or improved socio-economic profile of the affected region. These effects are partly addressed through the BCA discussed and reported in the previous section with estimation of shippers' cost savings and impacts on externalities such as transportation accidents. However, broader output, jobs and income implications of these effects are not quantified in this study.

7.2 Overview of Approach and Key Input Assumptions

The direct, indirect, and induced impacts discussed above are typically estimated based on project or program financial and engineering cost information and using input-output modeling approaches. An input-output model captures and quantifies the flows of goods and services between various industries in an economy. The indirect multipliers from such models provide an aggregate measure of the effect that each $1 of revenue of an industry has on all other industries in the economy that arise through supply-purchase relationships, or input demand of this industry to produce own outputs. Indirect multipliers can be expressed in terms of employment (indirect jobs per $1 of incremental direct revenue in an industry), indirect output (indirect output per $1 of incremental direct industry revenue), indirect employment income (indirect wages and salaries per $1 of incremental direct industry revenues), and value added (indirect value added per $1 of incremental direct industry revenue). Direct multipliers provide measures of average employment, employment income, and value added in an industry for each dollar of revenues in that industry. Input-output models and multipliers from such models can thus be used to estimate the economic impacts of investment projects and policy initiatives.

This study used multipliers from the Regional Input-Output Modeling System (RIMS II) developed by the US Bureau of Economic Analysis (BEA). RIMS II multipliers are available for 371 detailed industries and 63 industry aggregations. They are provided in the format of final demand multipliers (without and with induced effects included, referred to as Type 1 and Type 2 multipliers, respectively) but can be recalculated to direct, indirect, and induced multipliers discussed above.

[10] In economic impact analysis, employment impacts are typically estimated in terms of job-years which expresses the number of jobs created times the length of time in years that they would last for. For example, 1 job-year is 1 job created for 1 year. For simplicity, we refer here to these impacts as "jobs" or employment impacts.

The methodology of the estimation of economic impacts with RIMS II multipliers involves the following key steps:

Step (1): Identify the streams of expenditures, or industry revenues, directly resulting from the proposed Project-related activity (or the number of jobs that would be involved in various activities) and classify them into industrial sectors;

Step (2): Identify RIMS II industries that most closely correspond to the industrial sectors of expenditures listed in Step (1) (based on North American Industrial Classification System [NAICS] codes concordance);

Step (3): Construct an Excel-based input-output model that combines multipliers with expenditures and employment data to simulate direct, indirect, and induced impacts of construction and operations of the finished facility.

The streams of expenditures and industry business revenues identified as directly resulting from the proposed Project considered in this study include: (1) development and construction costs, and (2) project freight revenues (which, in turn, are used to hire labor, purchase fuel and other goods and services, and provide for operating surplus). Construction costs represent a conceptual engineering cost estimate of the Project and were described in some detail in Section 3. Freight rail revenues represent a high-level estimate based on expected charge to shippers using the Project facility discussed in some detail in Section 5.2 and 6.1.

The impact of the Project was estimated as: (1) the impacts of total cumulative construction expenditures, and (2) the impacts of average annual operations and maintenance. The former represents the cumulative impacts over the development and construction years, and the latter represents annual recurring impacts after the start of Project operations. Construction impacts can be converted to average annual impacts during the development and construction period by dividing all impact estimates by the number of years that development and construction are expected to take place or extrapolated based on the percentage distribution of expenditures over the construction years.

Economic impact analysis with input-output multipliers also requires specification of the geographic area where impacts are evaluated. RIMS II multipliers can be obtained from BEA for a wide range of geographies, including states, counties, metropolitan statistical areas (MSAs), or electoral districts. This analysis was conducted using multipliers for the following geographic areas:

(1) San Juan County, New Mexico;

(2) Four Corners Region Counties: San Juan County, New Mexico; McKinley County, New Mexico; Apache County, Arizona; San Juan County, Utah; Montezuma County, Colorado;

(3) State of New Mexico; and

(4) Four Corners States: New Mexico, Arizona, Utah, and Colorado.

The first set of estimated impacts (i.e., for San Juan County) is intended to provide an assessment of impacts in the local economy where the Project is located. The second set of impacts (for the Four Corners Region Counties) is intended to present the impacts more specific to the Four Corners Region that is expected to be the key beneficiary of the Project. However, the impacts of investment expenditures and activities may extend beyond the local economies through the employment of specialized labor and resources for the project itself, as well as through the purchase of equipment, production input materials and services by the direct project suppliers. Therefore, the third set of impacts (i.e., for the State of New Mexico) is designed to provide a measure of regional and state impacts while the fourth set (for all Four Corners States) will approximate broader national level impacts.

RIMS II multipliers are provided by BEA in the form of final demand multipliers for Type 1 impacts (without induced effects) and Type 2 impacts (with induced effects included) and direct effects for earnings and employment. In BEA's terminology, final demand multipliers are expressed in relation to $1 of output of the affected industry while the direct effect multipliers are expressed in terms of the same impact variable (as an example, direct effect employment multiplier shows the number of total jobs created in the entire economy per each one job added in the affected industry). These multipliers were used to calculate the direct, indirect, and induced multipliers corresponding to the terminology of impacts discussed earlier in this chapter.

7.3 Key Input Assumptions

PROJECT DEVELOPMENT AND CONSTRUCTION

Project development and construction costs were discussed and presented in Section 3.4. The costs of the alignment evaluated in this study, Defiance via Highway 491, amount to $1,645.6 million in 2024 dollars, or $1,532.7 million in 2022 dollars (as of October 2024). These costs include construction of tracks, rail, and civil infrastructure; engineering and design; signaling and train control; vehicles; and right of way (ROW) acquisition. Contingency of 20 percent is also included in the conceptual cost estimates.

Economic impact simulations require information as to where project expenditures will be made, or where the various key input components, equipment and services would be coming from.[11] At this time, this information is not available and reasoned assumptions were made based on the general understanding of the local, state and regional economy.

It was stipulated that San Juan County, as a relatively small community and economy, would not be able to provide all resources and expertise related to the development and engineering, construction process, or provision of equipment, systems, and vehicles. Although the Project is

[11] It is noted that the multiplier data automatically accounts for the sources of input supplies, materials, and services (e.g., cement needed for construction) that typical contractors in the geographic area would be using in the course of their contracts (in local county/state economy, or in another county/state). These assumptions are reflected in the magnitude of indirect impacts. Large indirect impacts suggest that many inputs are acquired locally (in the same county/state) whereas relatively low indirect impacts are indicative of a large portion of the supply chains being located outside of the county or state. The largest the geographic area of analysis, the higher the supply chain impacts typically will be. The key issue here is the allocation of the initial stream of expenditures, or the direct costs/contracts, such as major equipment, major categories of services, or construction contracts where contractors would be coming from.

located in San Juan County, certain construction contractors may be coming from other counties in the Four Corners Region, or elsewhere in New Mexico. Since there are no locomotive or maintenance of way equipment manufacturers in New Mexico, most of the equipment and vehicles will also likely be procured elsewhere (not in San Juan County, nor New Mexico). As the geographic area of the analysis is extended beyond San Juan County to the Four Corners Region, the State of New Mexico, and the four states in the Four Corners Region (Arizona, Colorado, Utah, and New Mexico), the ability to provide these goods and services increases.

Table 20 provides the construction conceptual cost estimates and the assumptions regarding the percentage of expenditures in each cost category that would be made in each of the geographic areas considered. It was assumed that 20 percent of construction related expenditures and 20 percent of professional expenditures would be made with San Juan County contractors, and 80 percent of ROW-related expenditures (real estate costs) would be made with San Juan County firms. At the other geographic extent, to better illustrate the total potential impacts of the Project, it was assumed that all expenditures would be made somewhere in the Four Corners States.

Table 20: Project Development and Construction Costs (2022 Dollars) and Geographic Distribution of Expenditures

Cost or Revenue Item	Total Cost Amount ($M)	Spend in San Juan County, %	Spend Place in Four Corners Counties, %	Spend in New Mexico, %	Spend in Four Corners States, %
10 Guideway & Track Elements	$1,100.2	20.0%	50%	80%	100%
20 Stations, Stops, Terminals, Intermodals	$0.0	0.0%	0%	0%	0%
30 Support Facilities: Yards, Shops, Admin. Bldgs.	$124.9	20.0%	50%	80%	100%
40 Sitework & Special Conditions	$183.9	20.0%	50%	80%	100%
50 Systems	$8.9	0.0%	0%	50%	100%
60 ROW, Land, Existing Improvements	$6.8	80.0%	80%	100%	100%
70 Vehicles	$29.9	0.0%	0%	0%	100%
80 Professional Services	$78.0	20.0%	30%	50%	100%
90 Unallocated Contingency	$0.0	0.0%	0%	0%	0%
100 Finance Charges	$0.0	0.0%	0%	0%	0%
Total Capital	**$1,532.7**				

Source: HDR cost assessment.

The allocation of cost categories to RIMS II industries is shown in Table 21. It is noted that "NA" indicates cost categories which are equal $0, and which do not generate any economic impacts.

Table 21: Allocation of Construction Cost Categories to RIMS II Industries

Cost Categories	RIMS Industry Classification	RIMS Industry Name
10 Guideway & Track Elements	2332TH	Transportation structures and highways and streets
20 Stations, Stops, Terminals, Intermodals	NA	NA
30 Support Facilities: Yards, Shops, Admin. Bldgs.	2332OT	Other nonresidential structures
40 Sitework & Special Conditions	2332TH	Transportation structures and highways and streets
50 Systems	334290	Other communications equipment manufacturing
60 Row, Land, Existing Improvements	531000	Real estate
70 Vehicles	336500	Railroad rolling stock manufacturing
80 Professional Services	541300	Architectural, engineering, and related services
90 Unallocated Contingency	NA	NA
100 Finance Charges	NA	NA

PROJECT OPERATIONS

The impacts of Project operations are driven by business revenues. Section 6.1 outlined assumptions for estimation of freight revenues, essentially a product of the tons of goods shipped and the average shipping rate expressed in $/ton-mile. Since the volume of shipments varies from year to year, revenues are also somewhat variable. In the first five years of operations, they are estimated at between $6 million and $6.3 million, for an average annual revenue of about $6.2 million in 2022 dollars. This average annual revenue was allocated to RIMS II rail transportation industry (482000 Rail Transportation) and used to estimate the impact from Project operations.

It was assumed that most labor would be hired locally in San Jaun County, and the remaining labor would be hired in the rest of the Four Corners Region. The resulting assumptions are summarized in Table 22.

Table 22: Project Operations Assumptions

Assumption Category	Value
Railroad Operations/Average Annual Revenue, First 5 Yrs., $M	$6.2
Spend in San Juan County, %	75.0%
Spend in Four Corners Counties, %	100%
Spend in New Mexico, %	90%
Spend in Four Corners States, %	100%

MULTIPLIERS AND OTHER ASSUMPTIONS

As discussed in Section 7.2, this study uses RIMS II multipliers for four levels of geographies which were also defined in that section. They were used to estimate the number jobs, business

output, employment income, and GDP in each affected industry based on the Project-related revenues of this industry (essentially capital expenditures during Project development and construction and freight revenues to rail service provider during Project operations).[12] The multipliers obtained (in January 2025) are based on 2022 regional data. Since construction expenditures were expressed in 2024 dollars, they were deflated to 2022 dollars – as shown in Table 20 – to align them with the year of the multiplier data and values used in the BCA.

7.4 Economic Impact Analysis Results

ECONOMIC IMPACTS OF PROJECT DEVELOPMENT AND CONSTRUCTION

Table 23, Table 24, Table 25, and Table 26 present the economic impact results for the San Juan County, Four Corners Region Counties, New Mexico, and Four Corners States (Arizona, Colorado, Utah, and New Mexico), respectively.

All results represent cumulative impacts over the years when development and construction activities take place, from 2026 to 2031. Annual impacts can be expected to be approximately proportional to the share of total development and construction expenditure each year. As shown in Table 4, in the first three years (2026-2027) about 1.3 percent to 1.5 percent of total costs will be spent, mostly on professional services and real estate costs, for a cumulative of 4 percent of total costs. The majority of Project expenditures (at almost 96 percent) will take place in the subsequent three years from 2029 to 2031 with annual spend amounting to between 28 percent to almost 39 percent of total costs for an annual average of about 32 percent.

Table 23 presents the results for the San Juan County. Over the construction years, the Project is expected to generate in San Juan County about 1,357 direct job-years, 259 indirect job-years, and 446 induced job-years for a total of 2,061 job-years. These jobs are expected to earn a total of $117.5 million. Total value added generated by Project development and construction expenditures in San Juan County is estimated at $233.9 million while total output is estimated at $428.5 million.

Table 23: Economic Impacts of Project Development and Construction, San Juan County

Impact Type	Employment (Job-Years)	Labor Income $M	Value Added $M	Output $M
Direct	1,357	$83.3	$164.7	$302.9
Indirect	259	$15.6	$33.3	$65.7
Induced	446	$18.6	$35.9	$59.9
Total	**2,061**	**$117.5**	**$233.9**	**$428.5**

Note: All monetary metrics are in millions of 2022 dollars.

Table 24 presents the results for the Four Corners Region counties. Over the construction years, the Project is expected to generate in the counties about 3,045 direct job-years, 518 indirect job-years, and 1,007 induced job-years for a total of 4,570 job-years. These jobs are expected to earn

[12] The number of rail transportation jobs related to the Project, wages and salaries, and other cost elements were also estimated as a part of the O&M cost analysis for this Project. The EIA results for direct impacts reported in this document are consistent with the results from the O&M costs analysis.

a total of $297.5 million. Total value added generated by Project development and construction expenditures in the counties is estimated at $560.0 million while total output is estimated at $1,032.7 million.

Table 24: Economic Impact of Construction and Development, Four Corners Region Counties

Impact Type	Employment (Job-Years)	Labor Income $M	Value Added $M	Output $M
Direct	3,045	$217.0	$395.8	$733.4
Indirect	518	$34.9	$73.5	$148.7
Induced	1,007	$45.6	$90.7	$150.6
Total	**4,570**	**$297.5**	**$560.0**	**$1,032.7**

Note: All monetary metrics are in millions of 2022 dollars.

Table 25 presents the results for the State of New Mexico. Over the construction years, the Project is expected to generate in the state about 5,888 direct job-years, 1,622 indirect job-years 3,242 induced job-years for a total of 10,752 job-years. These jobs are expected to earn a total of $596.7 million. Total value added generated by Project development and construction expenditures in the state is estimated at $1,086.7 million while total output is estimated at $1,814.5 million.

Table 25: Economic Impacts of Project Development and Construction, New Mexico

Impact Type	Employment (Job-Years)	Labor Income $M	Value Added $M	Output $M
Direct	5,888	$361.4	$638.0	$1,177.5
Indirect	1,622	$99.9	$190.2	$378.5
Induced	3,242	$135.3	$258.4	$258.4
Total	**10,752**	**$596.7**	**$1,086.7**	**$1,814.5**

Note: All monetary metrics are in millions of 2022 dollars.

Table 26 presents the results for the four Four Corners States. Over the construction years, the Project is expected to generate in the states about 6,725 direct job-years, 3,278 indirect job-years and 6,854 induced job-years for a total of 16,857 job-years. These jobs are expected to earn a total of $1,021.8 million. Total value added generated by Project development and construction expenditures in the states is estimated at $1,870.8 million while total output is estimated at $2,988.1 million.

Table 26: Economic Impacts of Project Development and Construction, Four Corners States

Impact Type	Employment (Job-Years)	Labor Income $M	Value Added $M	Output $M
Direct	6,725	$482.4	$824.3	$1,532.7
Indirect	3,278	$222.1	$417.2	$826.1
Induced	6,854	$317.3	$629.3	$629.3
Total	**16,857**	**$1,021.8**	**$1,870.8**	**$2,988.1**

Note: All monetary metrics are in millions of 2022 dollars.

ECONOMIC IMPACTS OF PROJECT OPERATIONS

Table 27, Table 28, Table 29, and Table 30 present the economic impact results for the San Juan County, Four Corners Region Counties, New Mexico, and Four Corners States, respectively.

The results represent average annual impacts based on the first five years of Project operations.

Table 27 presents the results for the San Juan County. After operations begin, the Project is expected to generate in the County approximately 8 direct jobs, 4 indirect jobs and 5 induced jobs for a total of 17 jobs. These jobs are expected to earn a total of $1.3 million. Total value added generated by Project operations in San Juan County is estimated at $3.5 million while total output is estimated at $6.3 million (including Project freight revenue).

Table 27: Economic Impacts of Project Operations, Average Annual, San Juan County

Impact Type	Employment Jobs	Labor Income $M	Value Added $M	Output $M
Direct	8	$0.8	$2.6	$4.6
Indirect	4	$0.3	$0.5	$1.0
Induced	5	$0.2	$0.4	$0.6
Total	**17**	**$1.3**	**$3.5**	**$6.3**

Note: All monetary metrics are in millions of 2022 dollars.

Table 28 presents the results for the Four Corners Region Counties. After operations begin, the Project is expected to generate in the Counties approximately 12 direct jobs, 5 indirect jobs and 6 induced jobs for a total of 23 jobs. These jobs are expected to earn a total of $1.7 million. Total value added generated by Project operations in the Region is estimated at $4.6 million while total output is estimated at $8.3 million (including Project freight revenue).

Table 28: Economic Impacts of Project Operations, Average Annual, Four Corners Region Counties

Impact Type	Employment Jobs	Labor Income $M	Value Added $M	Output $M
Direct	12	$1.1	$3.5	$6.2
Indirect	5	$0.3	$0.6	$1.3
Induced	6	$0.3	$0.5	$0.9
Total	**23**	**$1.7**	**$4.6**	**$8.3**

Note: All monetary metrics are in millions of 2022 dollars.

Table 29 presents the results for the State of New Mexico. After operations begin, the Project is expected to generate in the state approximately 11 direct jobs, 9 indirect jobs and 11 induced jobs for a total of 31 jobs. These jobs are expected to earn a total of $2.1 million. Total value added generated by Project operations in the state is estimated at $5.0 million while total output is estimated at $9.0 million (including Project freight revenue).

Table 29: Economic Impacts of Project Operations, Average Annual, New Mexico

Impact Type	Employment Jobs	Labor Income $M	Value Added $M	Output $M
Direct	11	$1.1	$3.2	$5.5
Indirect	9	$0.5	$0.9	$1.9
Induced	11	$0.5	$0.9	$1.5
Total	**31**	**$2.1**	**$5.0**	**$9.0**

Note: All monetary metrics are in millions of 2022 dollars.

Table 30 presents the results for the four Four Corners States (Arizona, Colorado, Utah, and New Mexico). After operations begin, the Project is expected to generate in the states approximately 12 direct jobs, 14 indirect jobs and 20 induced jobs for a total of 46 jobs. These jobs are expected to earn a total of $3.0 million. Total value added generated by Project operations in the state is estimated at $7.1 million while total output is estimated at $10.9 million (including Project freight revenue).

Table 30: Economic Impacts of Project Operations, Average Annual, Four Corners States

Impact Type	Employment Jobs	Labor Income $M	Value Added $M	Output $M
Direct	12	$1.1	$3.5	$6.2
Indirect	14	$1.0	$1.7	$3.3
Induced	20	$1.0	$1.9	$1.5
Total	**46**	**$3.0**	**$7.1**	**$10.9**

Note: All monetary metrics are in millions of 2022 dollars.

8. Sensitivity Analysis

The BCA and financial analysis outcomes presented in the previous sections rely on a large number of assumptions and long-term projections, both of which are subject to some uncertainty.

The primary purpose of the sensitivity analysis is to determine the outcomes under alternative assumptions expected to have the greatest impact such as costs, or shipping volume projections, so as to provide a more comprehensive view about how the Project is likely to perform.

This sensitivity analysis was conducted with respect to three categories of assumptions:

(1) Project costs, as captured by the costs of various route alignment options (see Table 2);

(2) Tonnage of commodities shipped on the Project; and

(3) Revenues of the Project operator.

The key assumptions and results are provided in the sections below. All results are compared against the main scenario presented in the previous sections of this report.

8.1 Other Route Alignment Options

As discussed in Section 3.1, this economic analysis was conducted using conceptual cost estimates based on the Defiance via Highway 491 Route option estimated at $1,645.6 million (in

2024 dollars). This is the second least expensive alignment assessed and potentially easier to implement compared to several other options based on issues related to rights-of-way.

Table 31 presents the key outcome metrics of the BCA for other route alignment options listed in Table 2. It is noted that user benefits and external impacts remain the same under each of the alternative options as under the base option, and the difference in benefits is due to differences in the residual value of the Project infrastructure.

The table shows that under the least expensive option, the El Segundo alignment, Project NPV increases and amounts to $196.8 million and the BCR increases to approximately 1.2. Under the Defiance via Highway 371 alignment, the Project almost breaks even with NPV of (negative) $2.2 million and BCR just below 1 (BCR equal to 0.998 before rounding). Under the Defiance via Indian Creek and the Star Lake options, the Project NPV is negative and the BCR is below 1. The NPV results are particularly sensitive to initial capital cost; as designs are advanced the capital cost estimates may also be updated, which could result in a change in the NPV results.

Table 31: Benefit-Cost Analysis Outcomes, by Route Alignment Option, Millions of 2022 Dollars*

BCA Outcome Metrics	Defiance via HWY 371	Defiance via Indian Creek	El Segundo	Star Lake
Total Benefits	$1,400.0	$1,474.1	$1,352.4	$1,419.3
Capital Costs	$1,347.3	$1,730.7	$1,100.6	$1,447.2
O&M Costs	$54.9	$54.9	$54.9	$54.9
Net Present Value (NPV)	-$2.2	-$311.6	$196.8	-$82.8
Benefit-Cost Ratio (BCR)	1.0	0.8	1.2	0.9
Internal Rate of Return (IRR), %	3.0%	2.0%	4.0%	2.7%

Notes: (*) Except for BCR and IRR. All monetary values are in millions of 2022 dollars over the period 2026–2061 discounted at a real discount rate of 3.1% (except for GHG emissions impacts which were discounted at 2%). Operating costs were assumed the same as in the main BCA route option.

Table 32 presents the results of the financial analysis in current dollars terms. Since revenues and operating costs remain unchanged under each of the alternative alignment options, the operating cost and total cost recovery ratios are the same as under the main route option of Defiance via Highway 491 equal to 1.52. The net cash flow is also the same as in the main option equal to $27.7 million.

Table 32: Summary of Project Financial Results, by Route Alignment Option, Millions of Current-Year Dollars*

Impact Categories	Defiance via HWY 371	Defiance via Indian Creek	El Segundo	Star Lake
Revenues				
Freight Transportation Revenues	$81.3	$81.3	$81.3	$81.3
PV of Revenues	**$81.3**	**$81.3**	**$81.3**	**$81.3**
Costs				
Capital Costs	$1,241.5	$1,594.8	$1,014.1	$1,333.6
Capital Cost Covered Through Public Funding	-$1,241.5	-$1,594.8	-$1,014.1	-$1,333.6

Impact Categories	Defiance via HWY 371	Defiance via Indian Creek	El Segundo	Star Lake
Total O&M Costs	$53.7	$53.7	$53.7	$53.7
PV of Costs	$53.7	$53.7	$53.7	$53.7
Net Cash Flow	**$27.7$27.7**	**$27.7**	**$27.7**	**$27.7**
Operating Costs Recovery Ratio	1.52	1.52	1.52	1.52
Total Costs Recovery Ratio	1.52	1.52	1.52	1.52

Note: (*) Except for Cost Recovery Ratios. All monetary values in the table are in millions of 2022 dollars over the period 2026–2061 discounted using a nominal discount rate of 6.1%.

8.2 Higher Commodity Shipping Volumes

As discussed in Section 4, this BCA assumed commodity shipments tonnage equal to the average of low and high existing volumes forecasts from the Four Corners Freight Rail Feasibility Study, excluding the potential new volumes of coal and a few other commodities that could materialize if the Project was operational. Sensitivity simulations with the BCA and financial models were performed assuming two scenarios:

(1) A higher volume of the *existing* commodity forecasts, and

(2) Realization of some of the *potential new* commodity volumes in addition to the existing volumes.

HIGHER VOLUME OF EXISTING COMMODITY FLOWS

This commodity tonnage scenario assumed a higher share of the high existing volumes forecasts from the Four Corners Freight Rail Feasibility Study – with weights of 0.9 for the high scenario and 0.1 for the low scenario (instead of a weight of 0.5 for both high and low scenario which resulted in an unweighted average). This resulted in **an increase in the commodity tonnage of about 24 percent**.

O&M costs per ton-mile were assumed to remain the same as in the main scenario which resulted in a small increase in total O&M costs. This is a conservative simplifying assumption, because, as demonstrated below for a scenario with even higher commodity tonnages, O&M costs decrease as ton-miles increase. All other input assumptions were assumed to be the same.

Table 33 shows the results of the BCA for this scenario. Higher tonnage of shipments resulted in higher user benefits, greater safety and emissions reductions benefits, as well as greater other externalities cost reductions benefits. As a result, total benefits increased while there was only a small increase in O&M costs. Overall, NPV increased to $342.1 million and BCR increased to approximately 1.3.

Table 33: Results of the Benefit-Cost Analysis, Higher Tonnage of Existing Commodity Volumes Scenario, Millions of 2022 Dollars*

Key BCA Outcome Metrics	Undiscounted	Value at 3.1% Discount Rate**
Total Benefits	$3,576.6	$1,616.4
Capital Costs	$1,532.7	$1,206.1
O&M Costs	$141.5	$68.2
Net Present Value (NPV)	$1,902.3	$342.1
Benefit-Cost Ratio (BCR)	2.2	1.3
Internal Rate of Return (IRR)	4.5%	

Notes: (*) Unless indicated otherwise. All monetary values are in millions of 2022 dollars over the period 2026–2061. (**) Discounted using a real discount rate of 3.1% (except for GHG emissions impacts which were discounted at 2%).

By increasing the freight revenues due to higher shipments volume, this scenario also increased the overall cash flow of the Project as shown in Table 34. However, the cost recovery ratio remained the same compared to the main scenario.

Table 34: Summary of Project Financial Results, Higher Existing Volumes Scenario, Millions of Current-Year Dollars*

Impact Categories	Undiscounted	Value at 6.1% Discount Rate**
Revenues		
Freight Transportation Revenues	$425.6	$101.0
PV of Revenues	**$425.6**	**$101.0**
Costs		
Capital Costs	$1,770.4	$1,333.6
Capital Cost Covered Through Public Funding	-$1,770.4	-$1,333.6
Total O&M Costs	$295.5	$66.6
PV of Costs	**$295.5**	**$66.6**
Net Cash Flow	**$130.1**	**$34.4**
Operating Costs Recovery Ratio	1.44	1.52
Total Costs Recovery Ratio	1.44	1.52

Note: (*) Except for Cost Recovery Ratios. All monetary values are in millions of 2022 dollars over the period 2026–2061 (**) Discounted using a nominal discount rate of 6.1%.

INCLUSION OF POTENTIAL NEW COMMODITY VOLUMES

This scenario assumed that in addition to the existing base scenario commodity volumes, a portion of the potential new volumes of coal and other commodities shown in Table 5 is actually realized. This portion was assumed at **33 percent of the total potential new volumes** shown in the table.

Since this scenario would significantly increase the total tonnage of shipments (by about 150 to 230 percent, depending on the year) and their structure (with a greater share of coal), O&M costs were analyzed separately and re-estimated for this scenario. Although the total O&M costs

increased, costs per ton-mile actually decreased to $0.018 from an average of about $0.037 in the main scenario (in 2025 dollars over the years 2032-2061, or an average of $0.016 in 2022 dollars over the same period). Applying the same methodology to calculating cost-revenue charge to shippers as in the main BCA scenario discussed in Section 5.2 resulted in cost to shippers of $0.024 per ton-mile.

Table 35 shows the results of the BCA analysis when the potential new commodity volumes are included. In this scenario, total benefits increased compared to the main scenario due to higher total shipper cost savings[13]. The scenario resulted in a higher NPV and a higher BCR compared to the main scenario (with discounted NPV of $263.9 million and BCR of 1.2).

Table 35: Results of the Benefit-Cost Analysis, Main Existing and 33 Percent of Potential New Commodity Volumes Scenario, Millions of 2022 Dollars*

Key BCA Outcome Metrics	Undiscounted	Value at 3.1% Discount Rate***
Total Benefits	$3,528.5	$1,545.8
Capital Costs	$1,532.7	$1,206.1
O&M Costs	$156.2	$75.9
Net Present Value (NPV)	$1,839.6	$263.9
Benefit-Cost Ratio (BCR)	2.2	1.2
Internal Rate of Return (IRR)	4.4%	

Notes: (*) Unless indicated otherwise. All monetary values are in millions of 2022 dollars over the period 2026–2061. (**) Discounted using a real discount rate of 3.1% (except for GHG emissions impacts which were discounted at 2%).

Table 36 presents the summary of Project financial performance (in current year dollars) when the potential new commodity volumes are included. Higher shipping volumes in this scenario increased the freight transportation revenues increasing the net cash flow and the operating cost ratios.

Table 36: Summary of Project Financial Results, Main Existing and 33 Percent of Potential New Commodity Volumes Scenario, Millions of Current-Year Dollars*

Impact Categories	Undiscounted	Value at 6.1% Discount Rate**
Revenues		
Freight Transportation Revenues	$485.2	$119.9
PV of Revenues	**$485.2**	**$119.9**
Costs		
Capital Costs	$1,770.4	$1,111.4
Capital Cost Covered Through Public Funding	-$1,770.4	-$1,111.4

[13] It is noted that the benefits methodology in this scenario accounted for the "rule of half" when estimating shippers' transportation cost savings related to the potential new coal and other commodity volumes attributing to these volumes only half of the shipper cost saving applicable to comparable *existing* commodities. The analysis also accounted for additional accidents and emissions costs due to additional train and truck drayage movements. However, the benefits from the additional economic activity in the form of additional commodity outputs, jobs, income, state and national GDP, are not included as there is no general consensus on how to account for these benefits in a BCA context. In this sense, the BCA benefits estimates of this scenario can be seen as under-stated.

Total O&M Costs	$323.4	$74.1
PV of Costs	**$323.4**	**$74.1**
Net Cash Flow	**$161.7**	**$45.9**
Operating Costs Recovery Ratio	1.50	1.62
Total Costs Recovery Ratio	1.50	1.62

Note: (*) Except for Cost Recovery Ratios. All monetary values are in millions of 2022 dollars over the period 2026–2061 (**) Discounted using a nominal discount rate of 6.1%.

8.3 Higher Project Revenues from Shippers

The charge to shippers for providing services on the Project infrastructure is the cost to shippers that determines their transportation cost savings from using it compared to other options (such as truck transportation or draying to another rail connection further away) which determines Project benefits and the BCA performance. On the other hand, it is a revenue to the Project operator used to cover costs which determines Project financial performance. As the charge to shippers increases, shippers' transportation cost savings realized from using the Project will decrease. While higher charges to shippers improve the financial performance of the Project, higher charges to shippers actually reduce the BCR.

As discussed in Section 5.2, this cost-revenue charge was assumed based on the estimated O&M cost per ton-mile and industry operating ratio. The purpose of this sensitivity analysis is to consider the impact of a higher cost-revenue on the BCA and the financial performance. This sensitivity analysis was conducted for the main BCA scenario with the existing commodity volumes and the scenario that includes potential new commodity volumes. In both cases, the commodity volumes were assumed to remain the same under the alternative cost-revenue charge (i.e., no impact from higher charges).

EXISTING COMMODITY VOLUMES (MAIN BCA SCENARIO)

As shown in Table 10, in the main BCA scenario (for the Defiance via Highway 491 route option) the rail shipping cost on the Project line was assumed at $0.05 per ton-mile (in 2022 dollars). In this sensitivity analysis, **the rate was increased to about $0.117 per ton-mile**, a rate which maintains the Project NPV at about the break-even value of $0. The BCA results for this sensitivity scenario are shown in Table 37 below.

Table 37: Results of the Benefit-Cost Analysis, Higher Cost-Revenue Charge to Shippers, Millions of 2022 Dollars*

Key BCA Outcome Metrics	Undiscounted	Value at 3.1% Discount Rate**
Total Benefits	$2,859.5	$1,261.0
Capital Costs	$1,532.7	$1,206.1
O&M Costs	$114.0	$54.9
Net Present Value (NPV)	$1,212.8	$0.0
Benefit-Cost Ratio (BCR)	1.8	1.0
Internal Rate of Return (IRR)	3.0%	

Notes: (*) Unless indicated otherwise. All monetary values are in millions of 2022 dollars over the period 2026–2061. (**) Discounted using a real discount rate of 3.1% (except for GHG emissions impacts which were discounted at 2%).

Table 38 below shows the financial performance of the Project for this higher cost-charge rate to shippers (in current-year dollars). The table demonstrates that over the analysis period the Project generates a net cash flow of $563.5 undiscounted and $136.5 million discounted and cost recovery ratios in excess of 3.0.

Table 38: Summary of Project Financial Results, Higher Cost-Revenue Charge to Shippers, Millions of Current-Year Dollars*

Impact Categories	Undiscounted	Value at 6.1% Discount Rate*
Revenues		
Freight Transportation Revenues	$801.7	$190.1
PV of Revenues	**$801.7**	**$190.1**
Costs		
Capital Costs	$1,770.4	$1,111.4
Capital Cost Covered Through Public Funding	-$1,770.4	-$1,111.4
Total O&M Costs	$238.1	$53.7
PV of Costs	**$238.1**	**$253.7**
Net Cash Flow	**$563.5**	**$136.5**
Operating Costs Recovery Ratio	3.37	3.54
Total Costs Recovery Ratio	3.37	3.54

Note: (*) Except for Cost Recovery Ratios. All monetary values are in millions of 2022 dollars over the period 2026–2061 (**) Discounted using a nominal discount rate of 6.1%.

INCLUSION OF POTENTIAL NEW COMMODITY VOLUMES

As discussed in Section 8.2, this scenario assumed that in addition to the existing base scenario (the Defiance via Highway 491 route option) commodity volumes, a portion of the potential new volumes of coal and other commodities shown in Table 5 is actually realized. This portion was assumed at **33 percent of the total potential new volumes** shown in that table. O&M cost in this scenario were reduced which also led to a reduction in cost-revenue charge to $0.024 per ton-mile, a very low rate compared to the rate of $0.049 assumed for Class I railroads (see Table 10).

This sensitivity scenario considered **an increase in the rate charged to shippers to a level typical of Class I railroads of $0.049**. Table 39 shows the BCA results while Table 40 shows the financial analysis results.

Table 39 shows that in this scenario, the Project still has a positive NPV with a BCR equal to 1.1

Table 39: Results of the Benefit-Cost Analysis, Higher Cost-Revenue Charge to Shippers, Millions of 2022 Dollars*

Key BCA Outcome Metrics	Undiscounted	Value at 3.1% Discount Rate**
Total Benefits	$3,355.7	$1,458.8
Capital Costs	$1,532.7	$1,206.1
O&M Costs	$156.2	$75.9
Net Present Value (NPV)	$1,666.7	$176.8
Benefit-Cost Ratio (BCR)	2.1	1.1
Internal Rate of Return (IRR)	4.0%	

Notes: (*) Unless indicated otherwise. All monetary values are in millions of 2022 dollars over the period 2026–2061. (**) Discounted using a real discount rate of 3.1% (except for GHG emissions impacts which were discounted at 2%).

Table 40 shows that the Project net cash flow increases further compared to previously considered sensitivity tests. Cost recovery ratios remain strong at a level exceeding 3.0.

Table 40: Summary of Project Financial Results, Higher Cost-Revenue Charge to Shippers, Millions of Current-Year Dollars*

Impact Categories	Undiscounted	Value at 6.1% Discount Rate*
Revenues		
Freight Transportation Revenues	$1,004.3	$248.2
PV of Revenues	**$1,004.3**	**$248.2**
Costs		
Capital Costs	$1,770.4	$1,111.4
Capital Cost Covered Through Public Funding	-$1,770.4	-$1,111.4
Total O&M Costs	$323.4	$74.1
PV of Costs	**$323.4**	**$74.1**
Net Cash Flow	**$680.9**	**$174.2**
Operating Costs Recovery Ratio	3.11	3.35
Total Costs Recovery Ratio	3.11	3.35

Note: (*) Except for Cost Recovery Ratios. All monetary values are in millions of 2022 dollars over the period 2026–2061 (**) Discounted using a nominal discount rate of 6.1%.

9. Summary

At the main BCA scenario, for the Defiance via Highway 491 route option, and assuming the freight operator does not have to bear capital costs, the discounted BCR is approximately 1.1 and the discounted NPV is approximately $112 million. Key metrics for the BCA for the Defiance via Highway 371 route option are shown in the table below (repeated from Section 5).

Table 41: Overall Results of the Benefit-Cost Analysis, Millions of 2022 Dollars*

Project Evaluation Metric	Undiscounted	Value at 3.1% Discount Rate**
Total Benefits	$3,084.7	$1,372.7
Total Capital Costs	$1,532.7	$1,206.1
Total O&M Costs	$114.0	$54.9
Net Present Value	$1,438.0	$111.7
Benefit/Cost Ratio	1.9	1.1
Internal Rate of Return (%)	3.5%	

As noted in Section 8, if it is assumed that the proposed railroad captures a higher proportion of existing shipping volumes, both the BCA and financial analysis improve further.

The sensitivity analysis described in Section 8 showed that the El Segundo route option, being less capital intensive, had a BCR of 1.2 and a positive NPV of $196.8 million. The Defiance via

Highway 371 route option showed a BCR of 1.0 and a NPV of $-2.2 million, the latter which could shift to slightly positive with minor adjustments in costs or revenue assumptions. The next most favorable route option was Star Lake, with a base case BCA of 0.9 and NPV of $-82.8 million. Conceivably, the Star Lake route option could also become more favorable with refinements in capital cost that would accompany later stages of design. The Defiance via Indian Creek route option had a BCR of 0.8 and a NPV of $-311.6 million; these comparatively unfavorable results are due to the high capital cost of the Defiance via Highway 371 route.

A sensitivity analysis was conduced on the main BCA scenario (the Defiance via Highway 491 route option); it established that the Project has the potential to increase shipping rates somewhat, possibly in combination with capturing additional shipping volumes above the baseline volume assumption described in Section 4) thereby improving financial performance, while still maintaining a BCA of 1.0 or more.

As described in Section 7, the economic impact analysis indicates that the development and construction phases of the Project would have the potential to create over 2,000 construction-related job-years (total of direct, indirect, and induced jobs) in San Juan County alone; over 10,000 direct, indirect, and induced job-years when considering the State of New Mexico as a whole; and nearly 17,000 direct, indirect, and induced job-years when considering the four Four Corners states (Arizona, Colorado, Utah, and New Mexico).