

Industrial Rail Corridor Expansion Project: Phase 1 BCA Analysis

Discretionary Grant Program

Benefit-Cost Analysis

February 2019



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Section I. BCA SUMMARY

I.A. OVERVIEW

This memo provides detailed documentation of the Benefit-Cost Analysis (BCA) performed to evaluate the public benefits generated by the Port of Longview's (Port) Industrial Rail Corridor Expansion (IRCE) Project. The BCA demonstrates the cost effectiveness of the project for which the project sponsor is seeking Federal support, measured in terms of a benefit-cost ratio (BCR) and net present value (NPV). The IRCE Phase I has independent utility with benefits exceeding cost.

The BCA methodology used in this analysis is consistent with the U.S. Department of Transportation, *Benefit-Cost Analysis Guidance for Discretionary Grant Programs*, December 2018. The detailed cost and benefit assumptions are provided in this BCA Appendix, and have been prepared by an independent professional accountant and economist. Exhibit.1.1 describes the Current Status (Baseline), the anticipated changes to the baseline (the Build Scenario), types impacts, Population Affects, anticipated Societal benefits and references to where the details can be found both in this technical memo as well as to which Tab the calculations can be found in the Excel Spreadsheet.

Exhibit I-1: Benefit-Cost Analysis Overview Matrix

Project Matrix for POL ICRE Project							
Current Status/ Base line (No Build) & Problem to be Addressed	Change to Baseline/ Alternatives	Type of Impacts	Population Affected by Impacts	Societal Benefit	Summary of Results (Mill \$ 2017)	Reference in BCA write up	Tab in Spreadsheet
<p>Constraints in Rail Capacity for the Port of Longview's customers cause inefficient use of Trucks to transfer cargo between Port and Inland Origins/ Destinations.</p>	<p>The expansion of the Industrial Rail Corridor (IRCE) will provide the Port and its customers with rail capacity to move cargo by rail versus by truck between the Port and the inland destinations/ origins. This analysis uses 25% of the Port's Cargo projections of a Potential new bulk customer to evaluate the Build scenario in this analysis.</p>	Improved efficiency in freight modal choice by switching freight to rail vs. truck	Freight Shippers utilizing the Port of Longview	Monetized value of reduced operational costs to shippers	Estimated \$1.2 billion operational costs savings to shippers	Page 9-10 Exhibit III-3	Op. Cost Savings
		Reduced VMT on highways and roadways	Truck drivers/ Rail Engineers	Monetized value of differential in truck vs. rail miles generating operator time value savings	Estimate \$178 million in Travel Time Savings	Page 11-12 Exhibit III-5	Time Value Savings
		Reduced road maintenance cost due to the reduction of VMT on highways	Government	Monetized value of reduced road maintenance costs to due to reduced Road VMT	Estimated \$38 million of Road maintenance savings to states and regions	Page 13 Exhibit III-7	Road Maintenance
		Reduced potential fatalities on highways	General public	Monetized value of the reduction of potential fatalities on roadways to due to reduced VMT	Estimated \$38 million of prevented fatalities and injuries from reduction of Vehicle Miles Traveled on Roads	Page 14 Exhibit III-8	Collision Costs
		Reduced pollutant emissions	Local, state, region and national populations	Monetized value of emission reductions due to reduced trucking	Estimated Emissions on 38 million gallons of fuel saved	Page 15-16 Exhibit III-10 & Exhibit III-11	Emission Savings

I.A.1. NO-BUILD SCENARIO

Under the no-build scenario, Port rail volume will be constrained to the current level, and additional cargo movements will be restricted to move by Truck as rail activity onto Port Facilities is nearing the throughput capacity of the current Industrial Rail Corridor. Delays will continue for motor vehicles passing through Longview's industrial area. It is expected to worsen over time along with delays in rail freight movements. The lack of running track and rail sidings to store unit or manifest trains at the Port of Longview will likely preclude significant private investment, additional Port cargo and limit any permanent job creation. The Port is working with a potential new bulk customer; however, the bulk customer requires the ability to bring in full unit train service. At this time, the Port cannot provide customers with unit train capacity to their non-grain terminals.

I.A.2. BUILD SCENARIO

The completion of Phase I, scheduled for 2024, will create significant increases in Economic Competitiveness Benefits, as measured by operating costs saved by shipper using rail versus truck and Travel time saved by cargo vehicle transportation operators; State of Good Repair Benefits from savings in road maintenance and preservation costs; Safety Benefits from the prevention of fatalities and injuries resulting in reduced vehicle miles traveled on the roadways; and Emission savings from the reduced fuel usage. The BCA recognizes life-cycle costs of the project as well as the useful life of the assets of the transportation capital improvements remaining at the end of the 25-year analysis. To be conservative, this analysis assumes that 25% of the new Port volume is assigned to this project's BCA.

I.A.3. BCA Model Development

An Excel spreadsheet-based BCA model was developed for the purpose of this analysis. The model utilizes available data provided by the Port, project specific data elements, and nationally accepted parameters. Many of the national parameters were provided by the United States Department of Transportation (USDOT) specifically for the purposes of Discretionary Grant applications such as FY2019 INFRA.

I.A.4. Organization of the BCA Memorandum

Section II describes the inputs and results of each of the Benefit components of the BCA model. The project specific inputs include items such as freight forecasts, project capital and operating costs, life-cycle costs, annual benefits, residual value of the project's assets at the end of this analysis. National modeling parameters include emission rates, crash rates, unit operating costs, values of time, average trip lengths, fuel efficiency and monetization factors for all classes of benefits. This section also displays the results of each benefit and cost category.

Section III describes the capital cost components of the BCA model.

Section IV summarizes the results of the BCA and the resulting BCA ratio.

I.B. BCA SUMMARY

The results of the BCA analysis indicate a positive Benefit-Cost Ratio. As shown in **Exhibit I.2**, the **BCA ratio at a 7% discount rate is 6:1**.

Exhibit I-2: BCA Results (20-year analysis)

Benefit Cost Analysis of Port of Longview Industrial Rail Corridor Phase 1
Project Benefit and Cost Analysis Summary (20-year analysis) using 25% of Port's Projected increased volume

Category	Metric	Zero Discount Rate*	Discount Rate @7%
Project Benefits			
Improved Economic Competition	Savings to Shipper by using Rail vs. Truck	\$ 1,202,195,938	\$ 393,472,294
Improved Mobility	Truck Time Savings Offset by Rail Engineer Time Increase	\$ 178,039,281	\$ 58,271,303
Improved Safety	3.8 lives saved by reducing VMT on Roads	\$ 38,403,355	\$ 12,569,212
Improved State of Good Repair on Roads	Reduction of 0.3 billion VMT off road network	\$ 38,274,306	\$ 12,526,975
Emission Savings	343,750 MT of CO2 Saved	\$ 2,801,349	\$ 1,068,637
Total Societal Benefits		\$1,459,714,229	\$ 477,908,422
Life-Cycle Costs		\$ (15,133,128)	\$ (5,341,419)
Residual Value of Capital Improvements in Year 20		\$ 55,443,761	\$ 9,547,166
	Total Benefits	\$1,500,024,862	\$ 482,114,169
Project Cost			
	Prior Incurred Cost of Design	\$ (903,831)	\$ (903,831)
	Cost Industrial Rail Corridor Expansion	\$ (81,959,880)	\$ (73,454,533)
	Total Cost	\$ (82,863,711)	\$ (74,358,364)
Net Present Value		\$1,417,161,151	\$ 407,755,806
Benefit-Cost Ratio			
Calculated Benefit Cost Ratio		18.1	6.48
Benefit-Cost Ratio (rounded)		18:1	6:1

* These values are expressed in year 2017 dollar amounts.

I.C. ANNUAL RESULTS WITH COMPLETION OF THE BUILD SCENARIO

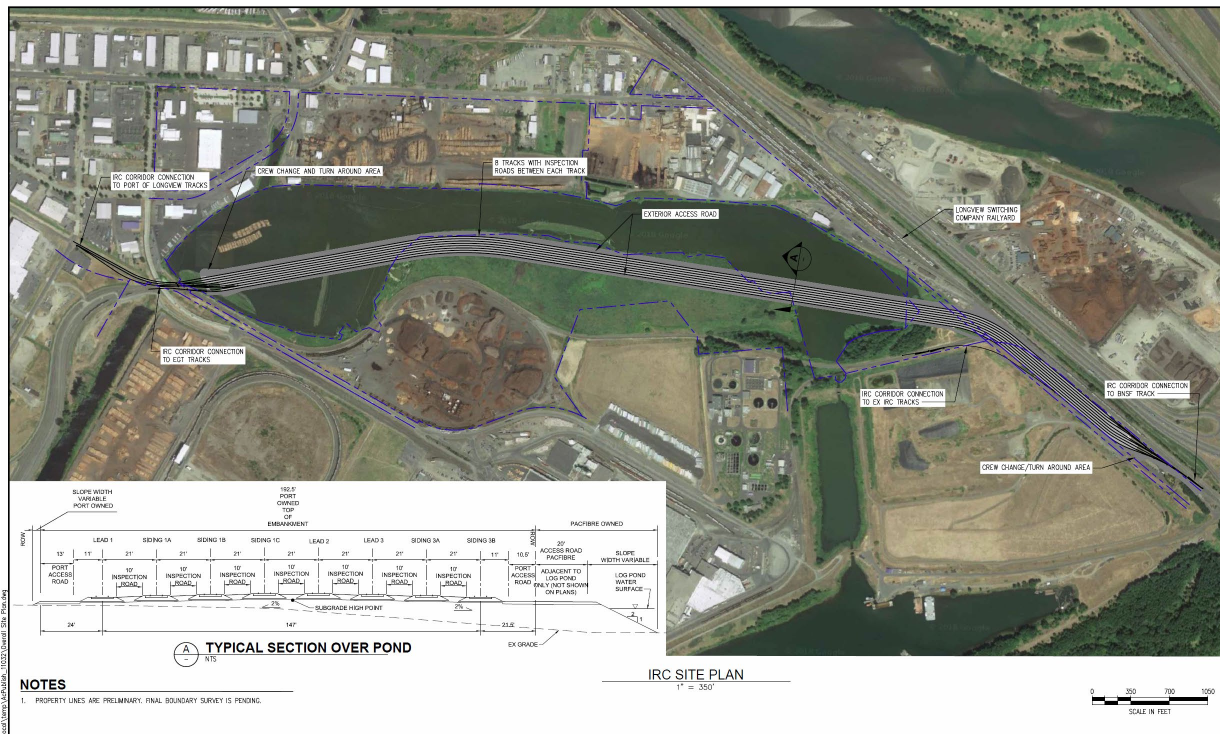
Exhibit I-3: Total Annual Benefits and Costs

Annual Cashflow								
Year	Calendar Year	Total Direct Beneficiaries (Reduction in Truck VMT)	Total Benefits (2017\$)	Total Initial Costs	Maintenance Costs (2017\$)	Residual	Undiscounted Net Benefits (2017\$)	Discounted Net Benefits (7%)
	2017			(\$903,831)			(\$903,831)	(\$903,831)
1	2018			(\$563,958)			(\$563,958)	(\$563,958)
2	2019			(\$730,280)			(\$730,280)	(\$682,505)
3	2020			(\$12,906,503)			(\$12,906,503)	(\$11,273,039)
4	2021			(\$1,613,313)			(\$1,613,313)	(\$1,316,944)
5	2022			(\$1,613,313)			(\$1,613,313)	(\$1,230,789)
6	2023	-		(\$33,072,913)			(\$33,072,913)	(\$23,580,530)
7	2024	-		(\$31,459,600)			(\$31,459,600)	(\$20,962,860)
8	2025	12,758,102	\$58,489,722	\$0	(\$756,656)		\$57,733,066	\$35,953,252
9	2026	12,758,102	\$58,475,774	\$0	(\$756,656)		\$57,719,118	\$33,593,052
10	2027	12,758,102	\$58,462,739	\$0	(\$756,656)		\$57,706,082	\$31,388,285
11	2028	12,758,102	\$58,450,556	\$0	(\$756,656)		\$57,693,899	\$29,328,653
12	2029	12,758,102	\$58,439,170	\$0	(\$756,656)		\$57,682,514	\$27,404,547
13	2030	12,758,102	\$58,428,529	\$0	(\$756,656)		\$57,671,873	\$25,607,001
14	2031	12,758,102	\$58,418,584	\$0	(\$756,656)		\$57,661,928	\$23,927,650
15	2032	12,758,102	\$58,409,290	\$0	(\$756,656)		\$57,652,633	\$22,358,685
16	2033	12,758,102	\$58,400,604	\$0	(\$756,656)		\$57,643,947	\$20,892,819
17	2034	12,758,102	\$58,392,486	\$0	(\$756,656)		\$57,635,829	\$19,523,249
18	2035	17,010,802	\$77,846,532	\$0	(\$756,656)		\$77,089,875	\$24,404,680
19	2036	17,010,802	\$77,837,078	\$0	(\$756,656)		\$77,080,421	\$22,805,315
20	2037	17,010,802	\$77,828,242	\$0	(\$756,656)		\$77,071,586	\$21,310,936
21	2038	17,010,802	\$77,819,985	\$0	(\$756,656)		\$77,063,328	\$19,914,628
22	2039	17,010,802	\$77,812,267	\$0	(\$756,656)		\$77,055,611	\$18,609,938
23	2040	21,263,503	\$97,256,319	\$0	(\$756,656)		\$96,499,662	\$21,781,244
24	2041	21,263,503	\$97,232,659	\$0	(\$756,656)		\$96,476,003	\$17,775,624
25	2042	21,263,503	\$97,225,781	\$0	(\$756,656)	\$55,443,761	\$151,912,886	\$26,158,714
	Total	276,425,540	\$1,265,226,317	(\$82,863,711)	(\$13,619,816)	\$55,443,761	\$1,224,186,552	\$382,223,819

Section II. PROJECT DESCRIPTION

The Port of Longview's IRCE project includes relocating the IRC north on to a newly constructed rail bed within the Pacific Fiber's Log Pond as displayed in Exhibit II-1. The full project build-out includes 8 rail tracks (8,500' clear length) with rail inspection roads in between the tracks. Phase I will construct the rail bed, supporting utility and storm drainage improvements, and construct 3 tracks including 1 new running track and 2 sidings. The addition of 6.4 miles of track to the Port's current rail network will provide new rail capacity for cargo entering/ departing the Port. Each of the sidings (storage tracks) will be able to store a full unit train. This new capacity will enable Port cargo to be transported more efficiently by rail versus road into/out of the Port terminals.

Exhibit II-1: Full Build out of IRCE



Section III. PROJECT BENEFITS

This section describes the key assumptions and results of each of the anticipated project benefit category. Each Category describes the calculation of the benefit, displays the anticipated annual project benefits associated with the no-build and build scenarios.

III.A. SUMMARY OF DETAILED BENEFITS

Exhibit III-1: Detailed Benefits by year

Detailed Benefits							
Year	Calendar Year	Operating Cost Saved	Reductions due to rail capacity				Total Benefits
			Travel Time Increase differential between Truck and Rail	Highway maintenance cost savings using rail vs truck	Reduced severity of accidents due to VMT reduction	Reduced Pollutant Emissions	
	2017						
1	2018						
2	2019						
3	2020						
4	2021						
5	2022						
6	2023						
7	2024						
8	2025	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$213,207	\$58,489,722
9	2026	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$199,259	\$58,475,774
10	2027	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$186,223	\$58,462,739
11	2028	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$174,041	\$58,450,556
12	2029	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$162,655	\$58,439,170
13	2030	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$152,014	\$58,418,529
14	2031	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$142,069	\$58,418,584
15	2032	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$132,775	\$58,409,290
16	2033	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$124,089	\$58,400,604
17	2034	\$48,087,838	\$7,121,571	\$1,530,972	\$1,536,134	\$115,971	\$58,392,486
18	2035	\$64,117,117	\$9,495,428	\$2,041,296	\$2,048,179	\$144,512	\$77,846,532
19	2036	\$64,117,117	\$9,495,428	\$2,041,296	\$2,048,179	\$135,058	\$77,837,078
20	2037	\$64,117,117	\$9,495,428	\$2,041,296	\$2,048,179	\$126,222	\$77,828,242
21	2038	\$64,117,117	\$9,495,428	\$2,041,296	\$2,048,179	\$117,965	\$77,819,985
22	2039	\$64,117,117	\$9,495,428	\$2,041,296	\$2,048,179	\$110,247	\$77,812,267
23	2040	\$80,146,396	\$11,869,285	\$2,551,620	\$2,560,224	\$128,794	\$97,256,319
24	2041	\$80,146,396	\$11,869,285	\$2,551,620	\$2,560,224	\$120,368	\$97,247,893
25	2042	\$80,146,396	\$11,869,285	\$2,551,620	\$2,560,224	\$112,493	\$97,240,019
26	2043	\$80,146,396	\$11,869,285	\$2,551,620	\$2,560,224	\$105,134	\$97,232,659
27	2044	\$80,146,396	\$11,869,285	\$2,551,620	\$2,560,224	\$98,256	\$97,225,781
		\$1,202,195,938	\$178,039,281	\$38,274,306	\$38,403,355	\$2,801,349	\$1,459,714,229

To be conservative, the Benefits summarized in Exhibit III-1 are based upon 25 percent of a potential bulk customer's projected tonnage which is anticipated to start in 2025. The customer would like to export a bulk product from the Port starting with 1,500,000 Metric Tons (MT) per year for the first 10 years, increasing to 2,000,000 MT in years 11-16, increasing again to 2,500,000, in years 17-22.

The Benefits of the completion of this project have been divided into five societal benefits: Economic-Operating Cost savings; Mobility-Travel Time Saved by the Mode Operator; State of Good Repair-Road Maintenance and Preservation Savings; Safety-Prevention of Fatalities and Injuries; and Emission Savings.

III.A.1. Operating Cost Savings

Operating cost savings is calculated by estimating the operating cost savings achieved by shipper when Phase 1 of the IRCE is completed. The assumptions below show 25 percent of the projected new volume converted to Short Tons for ease of comparison. Thus, volume starts at 413,363 ST for the first 10 years, followed by 551,150 ST in years 11-16, and 688,938 for years 17-22, for a total of 10,334,063 ST for the 20-year analysis period post-construction.

Exhibit III-2: Assumptions used in calculating operational cost savings

Assumptions		Assumption Value	Unit	Source
Value of Truck Driver Travel time per hour		\$ 28.60	per hour	Benefit -Cost Analysis Guidance for Discretionary Grant Programs, Dec 2018 Table A-3: Value of
Average Drivers per Truck		1.00		Benefit -Cost Analysis Guidance for Discretionary Grant Programs, Dec 2018 Table A-4: Average
Average Speed of Truck		50	mph	
Tons per Truck		27	Short Tons	BNSF
		24	Metric Tons	Calculated
Tons per Rail Car		115	Short Tons	BNSF
		104.3	Metric Tons	Calculated
Operating cost per Rail Ton		\$0.0415	\$2017 Cost / Ton Mile	USDOT National Transportation Statistics, Table 3-21 Average Freight Revenue per Ton Mile. Converted to \$2017
Operating cost per Truck Ton		\$0.1894	\$2017 Cost / Ton Mile	
Average Truck Trip Distance		833	OW Trip miles	Port of Longview
Truck to Rail Distance Factor		1.2	Rail mile / Truck mile	National Cooperative Highway Research Program (NCHRP) Report 388. "A Guidebook for Forecasting Freight Transportation Demand". 1997. It is assumed that this factor includes drayage distances. This factor is used to adjust truck miles to rail miles as it is assumed that truck shipping distances are generally shorter than rail shipping distances. The model assumes that for every mile of trucking avoided, 1.20 miles of rail travel is added.
Average Number of Miles per Railcar		1000	miles	Calculated using truck miles per rail mile
Rail vs. Road Metrics				
		Rail	Road	
Metric Tons Shipped Per Year in the Analysis		Annual Number of Rail Cars	Number of Trucks Removed from Roads	VMT Removed per Yr using Rail
	ST	Rail Cars (ST)	Trucks (ST)	
Years 1-10	413,363	3,594	15,310	12,758,102
Years 11-15	551,150	4,793	20,413	17,010,802
Years 16-20	688,938	5,991	25,516	21,263,503
Total over 20 years post CN	10,334,063	89,861	382,743	318,952,546

Exhibit III-3: Results of the Operating Cost saving between the No-Build and the Build Alternatives.

Operating Cost Savings								
			No Build		Build			
Year	Calendar Year	Truck VMT	Ton Miles Truck Only Route (ST)	Operating Cost Truck only	Railcar VMT	Ton Miles Rail Only Route (ST)	Rail operational cost of switching to Rail from Truck	Total Operations Cost Savings
			27	\$0.1894		115	\$0.0415	
	2017							
	2018							
	2019							
	2020							
	2021							
	2022							
	2023							
	2024							
1	2025	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
2	2026	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
3	2027	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
4	2028	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
5	2029	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
6	2030	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
7	2031	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
8	2032	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
9	2033	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
10	2034	12,758,102	344,468,750	\$65,242,381	3,594,457	413,362,500	\$17,154,544	\$48,087,838
11	2035	17,010,802	459,291,667	\$86,989,842	4,792,609	551,150,000	\$22,872,725	\$64,117,117
12	2036	17,010,802	459,291,667	\$86,989,842	4,792,609	551,150,000	\$22,872,725	\$64,117,117
13	2037	17,010,802	459,291,667	\$86,989,842	4,792,609	551,150,000	\$22,872,725	\$64,117,117
14	2038	17,010,802	459,291,667	\$86,989,842	4,792,609	551,150,000	\$22,872,725	\$64,117,117
15	2039	17,010,802	459,291,667	\$86,989,842	4,792,609	551,150,000	\$22,872,725	\$64,117,117
16	2040	21,263,503	574,114,583	\$108,737,302	5,990,761	688,937,500	\$28,590,906	\$80,146,396
17	2041	21,263,503	574,114,583	\$108,737,302	5,990,761	688,937,500	\$28,590,906	\$80,146,396
18	2042	21,263,503	574,114,583	\$108,737,302	5,990,761	688,937,500	\$28,590,906	\$80,146,396
19	2043	21,263,503	574,114,583	\$108,737,302	5,990,761	688,937,500	\$28,590,906	\$80,146,396
20	2044	21,263,503	574,114,583	\$108,737,302	5,990,761	688,937,500	\$28,590,906	\$80,146,396
		318,952,546	8,611,718,750	\$1,631,059,531	89,861,413	10,334,062,500	\$428,863,594	\$1,202,195,938

The cost of moving 25 percent of the new cargo tonnage by rail versus is estimated to save shippers over \$1.2 billion over the 20 years post construction. It is estimated that the cost to move cargo by truck is \$0.1894 per ST versus \$0.0415 per ST on rail. Based upon transporting over 10.3 million MT between the Port and an inland destination that is 1000 miles away by rail (833 miles by road), it is estimated the truck transport would cost \$1.6 billion compared to rail transport of \$428 million. Netting a \$1.2 billion savings if the shippers had rail capacity available to them to ship their products.

The model calculates Vehicle miles traveled (VTM) by road, then converts the VTM into ton-miles for both road and rail routes. Once Ton-miles are determined for each mode, the model calculates the modal cost by multiplying the respective ton-mile by modal cost per ton mile.

III.A.2. Travel Time Value Savings

Travel Time Value Saving Benefit captures the net value savings to the transportation operator for transporting the goods via railroad as opposed to truckload carrier. Using 25 percent of the projected new Port’s volume, total truck driver’s hours are calculated and multiplied by the Hourly Truck Driver Time Value rate of \$28.60/ hour and then compared to the total number of rail engineer hours required to move the same amount of cargo. The number of train hours are then multiplied by the number of Train engineers on a train. For these trains, it is estimated that the train will have three Engineers at an hourly value of travel time rate of \$44.90 each. The model estimates that \$178 million in time value will saved in the 20-years post construction.

Exhibit III-4: Assumptions used in calculating Travel Time Value savings

Assumption	Assumption Value	Unit	Source:
Truck Driver Hourly Value of Travel Time Savings	\$ 28.60	\$/ hr	Source: USDOT BCA Guidance Table A-3
Average Drivers per Truck	1.00		Benefit -Cost Analysis Guidance for Discretionary Grant Programs, Dec 2018 Table A-4: Average Vehicle Occupancy
Average Speed of Truck	50	mph	
Miles per Train	1000	miles	Port of Longview
Train Engineer Hours Value of Travel Time	\$ 44.90		Source: USDOT BCA Guidance Table A-3
Average Engineers per Train	3.00		BNSF
Average Speed of Train	25	mph	American Association of Railroads

Exhibit III-4: Travel Time Value Savings

		Truck Driver Travel Time Savings				Engineer Travel Time Increase				Net Decrease in Travel Time	
		No Build	Build			No Build	Build				
Calendar Year	Truck Route-VMT	Truck Route-VMT Saved	Driver Hours Saved at 50 mph	Truck travel Time cost saved by switching to Rail from Truck \$	Total Truck Travel Time Cost Savings	Calendar Year	Rail Route-VMT	Number of Trains * miles per train	Engineer Hours Increased at 25 mph	Engineer travel Time Increase by switching to Rail from Truck \$	Total Engineer Travel Time Cost Increase
2017											
2018											
2019											
2020											
2021											
2022											
2023											
2024											
1	2025	12,758,102	255,162	\$28.60	\$7,297,634	2025	-	32,677	1,307	\$134.70	\$176,063
2	2026	12,758,102	255,162	\$28.60	\$7,297,634	2026	-	32,677	1,307	\$134.70	\$176,063
3	2027	12,758,102	255,162	\$28.60	\$7,297,634	2027	-	32,677	1,307	\$134.70	\$176,063
4	2028	12,758,102	255,162	\$28.60	\$7,297,634	2028	-	32,677	1,307	\$134.70	\$176,063
5	2029	12,758,102	255,162	\$28.60	\$7,297,634	2029	-	32,677	1,307	\$134.70	\$176,063
6	2030	12,758,102	255,162	\$28.60	\$7,297,634	2030	-	32,677	1,307	\$134.70	\$176,063
7	2031	12,758,102	255,162	\$28.60	\$7,297,634	2031	-	32,677	1,307	\$134.70	\$176,063
8	2032	12,758,102	255,162	\$28.60	\$7,297,634	2032	-	32,677	1,307	\$134.70	\$176,063
9	2033	12,758,102	255,162	\$28.60	\$7,297,634	2033	-	32,677	1,307	\$134.70	\$176,063
10	2034	12,758,102	255,162	\$28.60	\$7,297,634	2034	-	32,677	1,307	\$134.70	\$176,063
11	2035	17,010,802	340,216	\$28.60	\$9,730,179	2035	-	43,569	1,743	\$134.70	\$234,751
12	2036	17,010,802	340,216	\$28.60	\$9,730,179	2036	-	43,569	1,743	\$134.70	\$234,751
13	2037	17,010,802	340,216	\$28.60	\$9,730,179	2037	-	43,569	1,743	\$134.70	\$234,751
14	2038	17,010,802	340,216	\$28.60	\$9,730,179	2038	-	43,569	1,743	\$134.70	\$234,751
15	2039	17,010,802	340,216	\$28.60	\$9,730,179	2039	-	43,569	1,743	\$134.70	\$234,751
16	2040	21,263,503	425,270	\$28.60	\$12,162,724	2040	-	54,461	2,178	\$134.70	\$293,438
17	2041	21,263,503	425,270	\$28.60	\$12,162,724	2041	-	54,461	2,178	\$134.70	\$293,438
18	2042	21,263,503	425,270	\$28.60	\$12,162,724	2042	-	54,461	2,178	\$134.70	\$293,438
19	2043	21,263,503	425,270	\$28.60	\$12,162,724	2043	-	54,461	2,178	\$134.70	\$293,438
20	2044	21,263,503	425,270	\$28.60	\$12,162,724	2044	-	54,461	2,178	\$134.70	\$293,438
		318,952,546	6,379,951		\$182,440,856		-	817	32,877		\$4,401,575

III.A.3. State of Road Good Repair

Savings on Road Maintenance and Preservation is calculated based upon the number of VMT that the Project is estimated to take off of the local roads and highways. For this analysis, it is estimated that over the 20-year period post construction that 318 million miles of VMT will not be driven on the roads and highways due to the availability to move cargo in and out of the Port by rail versus truck.

Exhibit III-5: Assumptions used to calculate Road Maintenance and Preservation Cost savings.

Assumption	Assumption Value	Unit	Source:
Pavement Maintenance Cost	\$0.12	per truck mile	WSDOT

Based upon estimates provided by Washington State Department of Transportation, savings can be estimated based upon \$0.12 per truck mile not travelled on the local roads and highways.

Exhibit III-6: Annual Saving in Road Maintenance and Preservation Costs

Decreased road maintenance due to construction of Project and use of on-dock rail			
Year	Truck Miles saved	Maintenance rate/ mile	Total savings
		\$ 0.12	
2020		\$ 0.12	\$ -
2021		\$ 0.12	\$ -
2022		\$ 0.12	\$ -
2023	-	\$ 0.12	\$ -
2024	-	\$ 0.12	\$ -
2025	12,758,102	\$ 0.12	\$ 1,530,972
2026	12,758,102	\$ 0.12	\$ 1,530,972
2027	12,758,102	\$ 0.12	\$ 1,530,972
2028	12,758,102	\$ 0.12	\$ 1,530,972
2029	12,758,102	\$ 0.12	\$ 1,530,972
2030	12,758,102	\$ 0.12	\$ 1,530,972
2031	12,758,102	\$ 0.12	\$ 1,530,972
2032	12,758,102	\$ 0.12	\$ 1,530,972
2033	12,758,102	\$ 0.12	\$ 1,530,972
2034	12,758,102	\$ 0.12	\$ 1,530,972
2035	17,010,802	\$ 0.12	\$ 2,041,296
2036	17,010,802	\$ 0.12	\$ 2,041,296
2037	17,010,802	\$ 0.12	\$ 2,041,296
2038	17,010,802	\$ 0.12	\$ 2,041,296
2039	17,010,802	\$ 0.12	\$ 2,041,296
2040	21,263,503	\$ 0.12	\$ 2,551,620
2041	21,263,503	\$ 0.12	\$ 2,551,620
2042	21,263,503	\$ 0.12	\$ 2,551,620
2043	21,263,503	\$ 0.12	\$ 2,551,620
2044	21,263,503	\$ 0.12	\$ 2,551,620
	318,952,546		\$ 38,274,306

This will save \$38 million in road maintenance and preservation over the 20-years post construction of the Project.

III.A.4. Prevention of Fatalities and Severe Injuries

This benefit is calculated based upon VMT removed for the local roads and highways when rail capacity is available to move cargo between the Port and inland destinations. National factors obtained for fatality and severe injuries per 100 million VMT were multiplied by the VMT removed from the roads times the value of each type of collision.

Exhibit III-7: Assumptions for the Prevention of Fatalities and Severe Injuries on the Roads

Fatality and Injury Rates per 100 Million VMT				
Type		Rate	Value	Source
Fatality		1.18	\$ 9,600,000	NHTSA
Injury- Severity Unknown		4.0946	\$ 174,000	

Exhibit III-8: Savings from Prevention of Fatalities and Severe Injuries on the Roads

Year	Preventions of Collisions					
	Reduction of Truck VMT in 100 Million Miles	Highway Fatalities Prevented	Value	Highway Injuries Prevented	Value of Injuries Prevented	Total Value of Accidents Prevented
		1.18	\$ 9,600,000	4.0946	\$ 174,000	
2020		-	\$0	-	\$0	\$0
2021		-	\$0	-	\$0	\$0
2022		-	\$0	-	\$0	\$0
2023	-	-	\$0	-	\$0	\$0
2024	-	-	\$0	-	\$0	\$0
2025	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2026	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2027	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2028	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2029	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2030	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2031	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2032	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2033	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2034	0.128	0.15	\$1,445,238	0.52	\$90,896	\$1,536,134
2035	0.170	0.20	\$1,926,984	0.70	\$121,195	\$2,048,179
2036	0.170	0.20	\$1,926,984	0.70	\$121,195	\$2,048,179
2037	0.170	0.20	\$1,926,984	0.70	\$121,195	\$2,048,179
2038	0.170	0.20	\$1,926,984	0.70	\$121,195	\$2,048,179
2039	0.170	0.20	\$1,926,984	0.70	\$121,195	\$2,048,179
2040	0.213	0.25	\$2,408,730	0.87	\$151,494	\$2,560,224
2041	0.213	0.25	\$2,408,730	0.87	\$151,494	\$2,560,224
2042	0.213	0.25	\$2,408,730	0.87	\$151,494	\$2,560,224
2043	0.213	0.25	\$2,408,730	0.87	\$151,494	\$2,560,224
2044	0.213	0.25	\$2,408,730	0.87	\$151,494	\$2,560,224
Total	3.190	3.76	\$36,130,944	13.06	\$2,272,411	\$ 38,403,355

The results indicate that removing 319 million miles off the roads and highways will prevent 3.76 fatalities and an additional 13.06 severe injuries for a total saving so \$38 million is Safety benefits.

III.A.5. Emission Savings

Emission savings were calculated based upon fuel savings of transporting cargo by rail versus road. Each pollutant was estimated and valued based upon the cost per unit of each pollutant.

Exhibit III-9: Assumptions Emission Rates for Truck and Rail Transportation

Assumption	Unit	Truck	Rail	Source
Volatile Organic Compounds (VOCs)	grams per ton-mile	0.08	0.0128	TTI: A Modal Comparison of Domestic Freight Transportation Effects on the General Public. January 2017
Nitrogen Oxides (Nox)	grams per ton-mile	0.94	0.283	
Particulate Matter (PM)	grams per ton-mile	0.05	0.0075	
Carbon dioxide (CO ₂)	lbs/ gallon	22.28	22.28	http://nationalwaterwaysfoundation.org/documents/Final%20TTI%20Report%202001-2014%20Approved.pdf

Exhibit III-10: Emission Savings of the Project- Volume

Total Emissions Savings					
Factor	CO2 emissions	NOX emissions	PM2.5 emissions	VOC emissions	SOX emissions
Source	TTI 2017				
Units	MT	ST	ST	ST	ST
ST					
2017					
2018					
2019					
2020					
2021					
2022					
2023					
2024					
2025	13,688	12.0729	0.6987	1.0721	-
2026	13,688	12.0729	0.6987	1.0721	-
2027	13,688	12.0729	0.6987	1.0721	-
2028	13,688	12.0729	0.6987	1.0721	-
2029	13,688	12.0729	0.6987	1.0721	-
2030	13,688	12.0729	0.6987	1.0721	-
2031	13,688	12.0729	0.6987	1.0721	-
2032	13,688	12.0729	0.6987	1.0721	-
2033	13,688	12.0729	0.6987	1.0721	-
2034	13,688	12.0729	0.6987	1.0721	-
2035	18,250	16.0972	0.9316	1.4295	-
2036	18,250	16.0972	0.9316	1.4295	-
2037	18,250	16.0972	0.9316	1.4295	-
2038	18,250	16.0972	0.9316	1.4295	-
2039	18,250	16.0972	0.9316	1.4295	-
2040	22,813	20.1215	1.1646	1.7868	-
2041	22,813	20.1215	1.1646	1.7868	-
2042	22,813	20.1215	1.1646	1.7868	-
2043	22,813	20.1215	1.1646	1.7868	-
2044	22,813	20.1215	1.1646	1.7868	-
	342,190	301.82	17.47	26.80	0.00

Exhibit III-11: Emission Savings of the Project- Value in Dollars

Total Value in Dollars of Emissions							
Source of Pollutant	CO2		NOX emissions	PM10 emissions	VOC emissions	SOX emissions	Total Emissions
		MT	ST	ST	ST	ST	
	0 \$/ MT		\$ 8,300	\$ 377,800	\$ 2,000	\$ 48,900	
2017							
2018							
2019							
2020							
2021							
2022							
2023							
2024							
2025	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2026	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2027	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2028	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2029	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2030	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2031	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2032	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2033	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2034	\$ 13,688	\$ 1	\$ 100,205	\$ 263,980	\$ 2,144	\$ -	\$ 366,330
2035	\$ 36,500	\$ 2	\$ 133,607	\$ 351,974	\$ 2,859	\$ -	\$ 488,440
2036	\$ 36,500	\$ 2	\$ 133,607	\$ 351,974	\$ 2,859	\$ -	\$ 488,440
2037	\$ 36,500	\$ 2	\$ 133,607	\$ 351,974	\$ 2,859	\$ -	\$ 488,440
2038	\$ 36,500	\$ 2	\$ 133,607	\$ 351,974	\$ 2,859	\$ -	\$ 488,440
2039	\$ 36,500	\$ 2	\$ 133,607	\$ 351,974	\$ 2,859	\$ -	\$ 488,440
2040	\$ 45,625	\$ 2	\$ 167,009	\$ 439,967	\$ 3,574	\$ -	\$ 610,550
2041	\$ 45,625	\$ 2	\$ 167,009	\$ 439,967	\$ 3,574	\$ -	\$ 610,550
2042	\$ 45,625	\$ 2	\$ 167,009	\$ 439,967	\$ 3,574	\$ -	\$ 610,550
2043	\$ 45,625	\$ 2	\$ 167,009	\$ 439,967	\$ 3,574	\$ -	\$ 610,550
2044	\$ 45,625	\$ 2	\$ 167,009	\$ 439,967	\$ 3,574	\$ -	\$ 610,550
	\$ 547,504		\$ 2,505,132	\$ 6,599,507	\$ 53,605	\$ -	\$ 9,158,243

Based upon the results displayed above, it is estimated that \$9.2 million in public benefit will be achieved from lower emissions by removing trucks off the roads.

III.B. SECONDARY BENEFITS

In addition to the primary benefits that are quantified by this BCA, there would also be added benefits that have not been included in the B-C ratio at this time. Such secondary benefits include:

- Construction job creation attributed to project design and construction.
- Permanent job creation attributed to new cargo at the Port of Longview.
- Phase I IRCE investment will set the stage for expanded rail capacity and track access to EGT and other terminal modernizations that are planned for future industrial development at the Port.

Section IV. PROJECT COSTS

This section identifies the basis of the capital cost estimates used in this BCA.

IV.A. CONSTRUCTION COST

The final design, right of way and construction costs associated with Phase I IRCE project is estimated to be \$80.7 M (\$2017). Total Project Cost are \$82.9 million. This equates to \$67.1 M when discounted at a 7%. These figures are based on the detailed construction cost estimates provided as part of the Discretionary Grant application.

Exhibit IV-1: Detailed Project Costs

Item Descriptions	INFRA Funds	Local Matching Funds	Total Project Funds	INFRA %	Total %
IRC Expansion Project Phase I- Future Eligible Costs 2020-2024					
ROW		\$5.0	\$5.0	0%	6.2%
Mobilization		\$6.4	\$6.4	0%	7.9%
Site Preparation		\$0.6	\$0.6	0%	0.7%
Site Work	\$39.9		\$39.9	82%	49.4%
Storm Drainage		\$1.2	\$1.2	0%	1.5%
Utilities		\$1.0	\$1.0	0%	1.2%
Track Work	\$8.9		\$8.9	18%	11.0%
WA Sales Tax		\$5.0	\$5.0	0%	6.2%
Contingency		\$12.7	\$12.7	0%	15.7%
Total Phase I Cost	\$48.8	\$31.9	\$80.7	100%	100.0%
INFRA Funds	\$48.8				
Port of Longview Contribution		\$31.9			
Grand Total	60%	40%	\$80.7		

Exhibit IV-2: Project Schedule

LONGVIEW Industrial Rail Corridor Expansion Project	2017				2018				2019				2020				2021				2022				2023				2024				2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
NEPA/SEPA																																				
Permitting																																				
INFRA Funding Award																																				
Obligation of Federal Funds																																				
Property Acquisition																																				
Engineering																																				
Bid Process																																				
Procurement																																				
Construction																																				
Contract Close out																																				

Exhibit IV-3: Project Cost Schedule by Year

Port of Longview Industrial Rail Corridor Phase 1, Project Cost by Year									
Year:	2017	2018	2019	2020	2021	2022	2023	2024	2018-2024
Project Cost	Prev. Incurred Design	Design	NEPA/ Permitting	NEPA/ Permitting/ ROW	ROW Permitting	Pre-Construction	Construction	Construction	Total before Prev. Incurred Costs
No Discount Rate	\$ 903,831	\$563,958	\$730,280	\$12,906,503	\$1,613,313	\$1,613,313	\$33,072,913	\$31,459,600	\$81,959,880

Total Future Eligible Costs for the years 2020-2024 equal \$80,665,642

IV.B. LIFE CYCLE COSTS

Life Cycle costs have been estimated at 1% per annum of the Project costs or \$756,656 per year. For a total of \$15.1 million over the analysis period.

Exhibit IV-3: Life Cycle Costs

Life-Cycle	
Year	Annual Maint.
2020	
2021	
2022	
2023	
2024	
2025	\$756,656
2026	\$756,656
2027	\$756,656
2028	\$756,656
2029	\$756,656
2030	\$756,656
2031	\$756,656
2032	\$756,656
2033	\$756,656
2034	\$756,656
2035	\$756,656
2036	\$756,656
2037	\$756,656
2038	\$756,656
2039	\$756,656
2040	\$756,656
2041	\$756,656
2042	\$756,656
2043	\$756,656
2044	\$756,656
Total	\$15,133,128

IV.C. RESIDUAL AT YEAR 2042

Exhibit IV- 4: Assumptions for the Calculation of Residual Value

Assumptions					
Residual	Life of the Asset	Analysys Period	Remaining Life at 2044	Cost of Asset	Value of Asset Yr 2044
Project Construction Cost	60	20	67%	\$ 75,665,642	\$ 50,443,761
Right of Way		20	100%	\$ 5,000,000	\$ 5,000,000
Total				\$ 80,665,642	\$ 55,443,761

It is expected that the right-of-way (ROW) investments included with Phase I will have a permanent value that equates to the original purchase price. Capital investments in rail tracks and other improvements are assumed to have a 60-year lifecycle. Hence, by year 20, it is assumed that the residual value of Phase I IRCE investments will equate to 2/3 of the capital investment plus the original ROW cost, which equates to \$55.4 M in 2017 dollars. This amount has been discounted at 7% in the BCA.

Section V. BENEFIT COST SUMMARY

A favorable Benefit- Cost Ratio is one that exceeds 1.0, indicating that the 20-year analysis of the benefits, life-cycle costs and residual value of the asset exceed the capital costs expended during that same time period. As Exhibit V-1 shows, the Project when discounted at 7 percent, generates \$477 million in societal benefits before life-cycle costs of \$5.3 million and a residual value of \$9.5 million, for a total benefit of \$482 million. Project costs are \$74.4 million when discounted at 7 percent. The Benefit Cost Ratio is estimated to exceed 6:1 with a Net Present Value of \$407 million. Economic Competitiveness accounts for 94 percent of the total societal benefit with \$393 million in operating cost savings. Mobility Improvements are estimate at \$58 million based upon Travel Time Value savings. State of Good Repair for Roads and Safety Benefits each account for approximately 2.5 percent of the benefits with Savings in Emission accounting for the remaining 1 percent of the total societal benefits.

Exhibit V-1: Selection Criteria Summary

Benefit Cost Analysis Summary				
Long-term Outcomes	Social Benefit	Inputs	Value	Monetized Value
				Discount Rate 7%
Quality of Life	Fuel savings due to reduced miles traveled by cargo using Rail vs. Truck	Gallons of fuel saved	38 million gallons of fuel saved by reducing miles traveled with modal shift to Rail	not monetized (in Op. Cost Savings)
Economic Competitiveness	Operational cost savings	Savings of rail transport vs. truck transport	\$1.2 billion saved by shipper using rail vs. truck	\$ 393,472,294
Mobility	Travel Time Savings	Differential Travel time value cost between Truck and Rail	\$178 million Travel Time saved	\$ 58,271,303
State of Good Repair	Reduction of maintenance on US Roads & Hwys, Consistent with State and Regional Plans	Maintenance, preservation and upgrade savings of Highways	319 million VTM reduced off the highways	\$ 12,526,975
Environmental Sustainability	Environmental Benefits from Reduced Emissions by modal change to rail	Emission cost savings	342,190 metric tons of CO ₂ saved	\$ 1,068,637
Safety	Reduced fatalities and sever injuries from reduction of Highway VMT	Fatality cost savings of 3.8 fatalities + 13.1 severe injuries	\$38 million saved	\$ 12,569,212
Total Benefits				\$ 477,908,422
Life-Cycle (O&M) Costs				\$ (5,341,419)
Residual				\$ 9,547,166
Total Benefits				\$ 482,114,169
Total Cost				(\$74,358,364)
Net Present Value				\$ 407,755,806
Benefit to Cost Ratio				6.48