BENEFIT COST ANALYSIS

The Beckett Group

July 2018

Based upon June 2018 BCA Guidance and BCA webinars

Appendix A: BENEFIT COST ANALYSIS EXECUTIVE SUMMARY

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SUMMARY AND FINDINGS

This Benefit Cost Analysis (BCA) is for the Connell Rail Interchange Project, located in the City of Connell, WA in Franklin County along the BNSF Lakeside Subdivision. The BCA is developed to support future Grant Funding applications as required by USDOT in their federal funding guidance. As of July 2018, at 60% design the current total project cost estimate is $28.7 million. In 2015, the City of Connell secured $10 million in state funding through the Connecting WA transportation funding package. When secured, the funds will be invested in rail improvements to meet 21st Century rail demands by building a new larger interchange south of the center of Connell. This investment will relocate the rail switch yard southerly into industrial areas; away from residential and school traffic patterns.

The changes since the FY17 submittals:

A grant application for $14 million was submitted in FY 2016 FASTLANE and will be submitted in FY17 as a TIGER and INFRA application funding cycles to fill the current funding gap based upon a 2016 initial project design that estimate the Project cost to be $24.1 million.

Using some of the state funding, BNSF was contracted to update and complete the Preliminary Design and Permitting process for the Project. In May, an updated 30% design was completed, followed by a 60% design completed in mid-July. The 60% design includes the evaluation of wetlands. The alignment of the yard has been adjusted so that wetlands will not be disturbed. Although this, realignment slightly increased the cost, it removed permitting risks involving wetlands. It should be noted that in the current estimate f $28.7M there is a strong 20% contingency on all items totally $4.5M. Under guidance for the engineering team this contingency will remain in the cost estimates until the project is bid to cover inflation and any unidentified unit pricing or unit volumes.

The existing railyard configuration is outdated, undersized, inefficient and cannot accommodate today's modern train service requirements. The current yard configuration causes congestion at primary street crossings, bifurcates the city center and the main residential areas from local schools, and creates a critical "pinch point" in regional rail delivery.

The City of Connell's two primarily at-grade rail crossings: Clark Street and East Adams Street are routinely blocked by the movement of the trains being switched into and out of this outdated undersized interchange yard in addition to the 42 (2016) BNSF trains that move daily through the City.

Both at-grade crossings are protected by gates. The rail lines divide the town in two. To the east are the emergency services, business district and the majority of the residential areas, and to the west is a school complex and athletic fields, including (clockwise from the North) Connell Elementary School, Robert Olds Junior High, and Connell High School. Based upon current growth projections the mainline traffic will increase from 42 trains per day as of 2016 to 46 trains per day by 2020 to 93 trains per day by 2035. The proposed investment in the relocation and expansion of this improved interchange yard will reduce conflicts between the through trains and those trains that are moving to and from the CBRW.

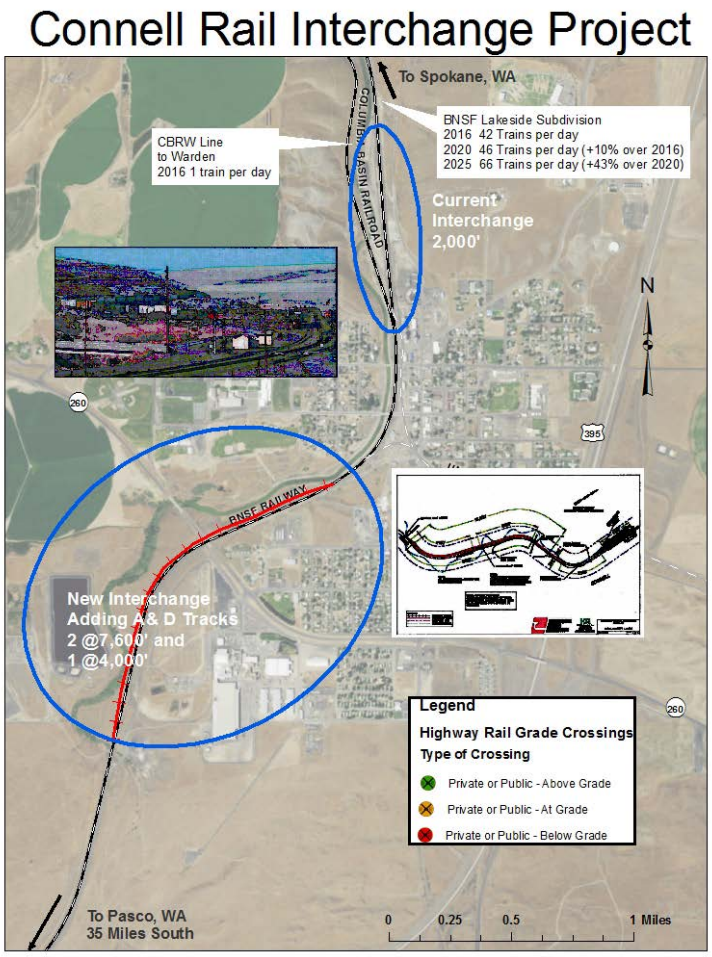
About the Project

The Connell Rail Interchange Project is a stand-alone project that creates *independent utility* to meet current and future freight rail shipping needs of the region. This project is necessary for the region to meet the requirements of the increasing rail volumes generated from industrial areas adjoining the CBRW track.

The impacts of this improved interchange will provide regional economic prosperity well beyond City of Connell. Expanded growth in rail traffic has heightened the need for modem improvements. The project is designed to accommodate efficient and cost- effective use of the local rail infrastructure while maintaining fluidity on the mainline. Thus, improving the flow of rail activities along the BNSF mainline and the corresponding rail interchange with the Columbia Basin Railroad (CBRW) which services the North Central region of WA.

The new rail interchange will be built starting at BNSF MP 112.55 south of Connell toward MP 110.45 in the town itself, as depicted in the image below.

Exhibit 1: Connell Rail Interchange Project



With the economic development that has been occurring in Grant County (i.e. Moses Lake, Wheeler and Warden) and Adams County (i.e. Schrag, Bruce and Othello) over the past few years, Columbia Basin Railroad has become one of the busiest short lines in Washington State, hauling over 10,000 carloads annually of various agricultural and industrial commodities and other cargo for 60 active rail shippers in the Columbia Basin. More importantly, the various shippers or companies that haul cargo on the Columbia Basin Railroad employ nearly 7,000 people in Grant and Adams Counties.

By comparison, most other short line railroads in Washington State handle much less tonnage and are classified R3 and R4 lines (See Exhibit 3 below).

In 2013, Columbia Basin Railroad began bringing 110-car unit trains of canola seed to Pacific Coast Canola's (PCC) crushing and oil refining facility at the Port of Warden in Washington State, which is the first commercial-scale canola seed crushing operation west of the Rocky Mountains. Stated Dale Pomeroy, Commissioner, Port of Warden, *"Having the ability to bring in Unit Trains into Warden on the Columbia Basin Railroad line to service companies such as Pacific Coast Canola is helping to establish the Port of Warden as a key location in Eastern Washington to handle freight and it is pivotal for our economic development and will provide low cost options which are critical for companies to competitively ship their goods to and from Warden."*

Columbia Basin Railroad also supports the Port of Moses Lake's "Northern Columbia Basin Railroad Project," which is a critical economic development, job creation and freight mobility project in Washington State that will enhance and improve rail access to vital industries in the northern Columbia Basin area near Moses Lake, Washington. The Northern Columbia Basin Railroad Project (NCBRP) will provide expanded freight rail service to the Moses Lake area, from the Wheeler Road Corridor across town to the Port of Moses Lake's Grant County International Airport Industrial Area. In addition, the NCBRP is integral to preserving existing manufacturing jobs and related investment in central Washington, while helping to bring new business opportunities, job creation and economic development to the region.

Furthermore, locations such as Bruce, WA and Schrag, WA in Adams County are becoming key agribusiness shipping hubs of eastern Washington in which products such as grain and fertilizer, etc. are shipped by rail. Columbia Basin Railroad believes that these locations have tremendous potential for increased economic growth and is working with Adams County and the Port of Othello on improving rail infrastructure at Schrag and Bruce, respectively.

While the increasing business and economic development on the Columbia Basin Railroad line is very positive, because of the growth in rail traffic of all types of freight and commodities on the line, there are rail infrastructure issues that need be addressed at the Connell, WA rail interchange, which is where the Columbia Basin Railroad line connects with the BNSF Railway mainline. As a result, discussions continue among various organizations such as the Great Northern Corridor Coalition, the Washington State Department of Transportation, the Washington State Department of Commerce, the Grant County Economic Development Council and the Adams County Development Council about how to address the additional funding gap remaining to fund the infrastructure needs at the Connell Rail Interchange.

The Project will:

- Enhance the ability of the Columbia Basin Railroad (CBRW) and BNSF Railway to perform interchange of longer trains while minimizing effect on mainline operations and rail capacity.
- Provide better service which would directly affect transit times for unit trains.
- Reduce delays to auto traffic at grade crossings in Connell.

Exhibit 2: CBRW Rail Service Area

Source: http://photos.prnewswire.com/prnh/20141104/156460-INFO

According to a 2014 Washington State Freight and Goods Transportation System report published by the Washington State Department of Transportation (WSDOT), the Columbia Basin Railroad line from Connell, WA to Moses Lake/Wheeler, WA is shown as an "R2" Freight Rail Corridor in Exhibit 3 below, which handles 1 million to 5 million tons per year. The report from WSDOT shows the Columbia Basin Railroad as the busiest short line in Eastern Washington.

Exhibit 3: Map of FGTS Freight Rail System by Volume

Washington State Freight and Goods Transportation System Update | March 2014
Map of FGTS Freight Rail System by Volume

The analysis presented in this summary estimates that the public benefit generated from the completion of this project is expected to meet or exceed the cost of this project. Public Benefits include: Shipper savings on transportation costs; jobs saved in rail-dependent industries; and reduced future costs to repair wear and tear on state and local highways due to fewer annual truck trips (reduced vehicle miles traveled).

Exhibit 4 (page 8) below summarizes the improvements and associated economic public benefits.

Example Routing Chosen for the Analysis

There are many origination or destinations for the volume moving through this improved railyard. It is too complicated to model all potential destinations in this analysis. Thus, an estimated sample rail route of 432 miles has been selected for this analysis. This representative route is used calculate the public benefits achieved when rail transportation is used to reduce vehicle miles travelled on the National Highway System.

Exhibit 4: Project Benefit Table

Current Status or Baseline & Problems to be Addressed	Changes to Baseline / Alternative	Type of Impacts	Population Affected by Impacts	Economic Benefits	Summary of Results (millions of $2017)	Page #	Worksheet tab
Rail shipments are limited due to Rail congestion at Connell, WA involving an outdated and undersized rail interchange yard configuration	Relocation and expansion of the Connell Rail Interchange yard to a location south of the City of Connell away from residential and school traffic patterns. The expanded rail connection will provide capacity to meet future rail demand on the CBRW which will keep heavy trucks off the regional and state roads/ highways	Reduction in annual State and Federal pavement maintenance costs	US citizens	Monetized reduction in road maintenance repair costs	$5,466,213	Pg. 17	Road Maint Savings
		Reduction in congestion costs	Primarily Washington State motorists but includes all US motorists	Monetized reduction in reduction of fuel costs	$16,367,622	Pg. 19	Gallons saved
		Reduction in vehicular fatalities	Motorists and Pedestrians in the CBRW service area in Central WA and motorists across the US from freight origin to freight destination	Monetized reduction in fatalities	$4,722,808	Pg. 20	Collision Costs
		Reduction in environmental emissions resulting from the use of rail vs road transportation	Citizens of Central WA, the region and the environment	Quantitative reduction in air emissions		Pg 19	Galls and MT CO2
Rail capacity for the CBRW is limited by the current interchange configuration	Construction of the interchange will provide additional rail capacity to meet rail demand related to industrial areas served by the CBRW	Decreased non-fuel operating cost to ship by rail vs. truck	Businesses served by the CBRW including import/export companies	Monetized reduction in cost to ship by rail versus truck	$32,290,694	Pg. 18	Operating Costs
Congestion cause by trains having to be broken up to fit in the current interchange yard which causes extensive closures of two at grade crossings providing access between schools, residential areas and downtown City of Connell	The relocation of the interchange will reduce at-grade crossing delays in the City of Connell	Greater mobility to the community, reduction of vehicle idling and improved quality of life	Local residents	Not monetized			

The period of analysis used in the estimation of benefits and costs corresponds to 23 years, consisting of the current year (2017), three years of construction and 20 years of operation after the completion of the Interchange plus a residual value after the final year. The $24.1 million for the Connell Rail Interchange project is expected to be funded through local and federal sources. To improve their funding opportunities, the City is submitting both a FY17 TIGER and INFRA grant application, each for the $14 million (58%) needed for the project. Local participants are committed to funding $10.1 million (42 %) of the project cost. The City understands that the project could receive one, not two, grant awards for the $14 million. A summary of relevant data as well as the Total Benefits and Total Costs used to derive the benefit costs analysis for the project are shown in *Exhibit 5* below.

Exhibit 5: Summary of Pertinent Data, Quantified Benefits and Costs

Calendar Year	Total Direct Beneficiaries (Reduction in Truck VMT)	Total Benefits (2017$)	Total Initial Capital Costs	Residual	Maintenance Costs (2017$)	Undiscounted Net Benefits (2017$)	Discounted Net Benefits (7%)	Discounted Total Capital Costs (7%)	NPV @7%
2016		$0	($77,000)		$0	$0	$0	($82,390)	($82,390)
2017		$0	$0		$0	$0	$0	$0	$0
2018		$0	($500,000)		$0	$0	$0	($467,290)	($467,290)
2019		$0	($200,000)		$0	$0	$0	($174,688)	($174,688)
2020	-	$0	($27,882,573)		$0	$0	$0	($22,760,485)	($22,760,485)
2021	1,969,920	$2,764,269			($18,000)	$2,746,269	$2,095,116	$0	$2,095,116
2022	1,999,469	$2,805,733			($18,000)	$2,787,733	$1,987,615	$0	$1,987,615
2023	2,029,461	$2,847,819			($18,000)	$2,829,819	$1,885,628	$0	$1,885,628
2024	2,059,903	$2,890,537			($18,000)	$2,872,537	$1,788,871	$0	$1,788,871
2025	2,090,801	$2,933,895			($18,000)	$2,915,895	$1,697,077	$0	$1,697,077
2026	2,122,163	$2,977,903			($18,000)	$2,959,903	$1,609,991	$0	$1,609,991
2027	2,153,996	$3,022,572			($18,000)	$3,004,572	$1,527,372	$0	$1,527,372
2028	2,186,306	$3,067,910			($18,000)	$3,049,910	$1,448,990	$0	$1,448,990
2029	2,219,100	$3,113,929			($18,000)	$3,095,929	$1,374,629	$0	$1,374,629
2030	2,252,387	$3,160,638			($18,000)	$3,142,638	$1,304,083	$0	$1,304,083
2031	2,286,173	$3,208,047			($18,000)	$3,190,047	$1,237,155	$0	$1,237,155
2032	2,320,465	$3,256,168			($18,000)	$3,238,168	$1,173,661	$0	$1,173,661
2033	2,355,272	$3,305,010			($18,000)	$3,287,010	$1,113,424	$0	$1,113,424
2034	2,390,601	$3,354,586			($18,000)	$3,336,586	$1,056,278	$0	$1,056,278
2035	2,426,460	$3,404,904			($18,000)	$3,386,904	$1,002,063	$0	$1,002,063
2036	2,462,857	$3,455,978			($18,000)	$3,437,978	$950,630	$0	$950,630
2037	2,499,800	$3,507,818			($18,000)	$3,489,818	$901,835	$0	$901,835
2038	2,537,297	$3,560,435			($18,000)	$3,542,435	$855,544	$0	$855,544
2039	2,575,356	$3,613,841			($18,000)	$3,595,841	$811,629	$0	$811,629
2040	2,613,987	$3,668,049	$ -	$ 20,778,191	($18,000)	$24,428,240	$5,153,061	$0	$5,153,061
Total	45,551,774	63,920,041	(28,659,573)	20,778,191	(360,000)	84,338,231	30,974,653	(23,484,853)	7,489,800

Based upon the BCA presented in the remainder of this document, the project at a 7% discounted rate is expected to generate $31 million in discounted net benefits and $23 million in discounted capital costs. Therefore, the project generates a Net Present Value (NPV) of $7.5 million and a Benefit/ Cost Ratio of 1.3:1 at 7%. *Exhibit 6* below summarizes the Long-term Outcomes calculated in this BCA.

Exhibit 6: Summary of Benefit Cost Analysis

	Present Value of Capital Costs	PV of Total Benefits	Net Present Value	Benefit/ Cost Ratio
Connell Rail Interchange				
Discounted at 7%	($23,484,853)	$30,974,653	$7,489,800	1.3:1

Introduction

This document provides detailed technical information on the economic analyses conducted in support of a grant application for the Connell Rail Interchange project.

The Methodology section introduces the conceptual framework used in the BCA. The Project Overview provides an overview of the project, including a brief description of existing conditions and the proposed alternative. Assumptions describes the current and future situations used in the analysis. Project Cost and Schedule provides a summary of cost estimates and schedule. The Long-Term Outcomes section discusses the general assumptions used in the estimation of project costs and benefits, Specific data elements and assumptions pertaining to the long-term outcome selection criteria are summarized in this section. Estimates of the project's Net Present Value (NPV), its Benefit/Cost ratio (BCR) and other project evaluation metrics are also discussed. Short and long-term job estimates are found in the Job Creation section.

Methodology

A Benefit-Cost Analysis (BCA) is a conceptual framework that quantifies, in monetary terms, as many of the costs and benefits of a project as possible. Benefits are broadly defined. They represent the extent to which people impacted by the project are made better-off, as measured by their own willingness-to-pay. In other words, central to BCA is the idea that people are best able to judge what is "good" for them, i.e. what improves their well-being or welfare. A BCA also adopts the view that a net increase in welfare (as measured by the summation of individual welfare changes) is a good thing, even if some groups within society are made worse off. A project or proposal would be rated positively if the benefits to some are large enough to compensate the losses of others.

Finally, a BCA is typically a forward-looking exercise, seeking to anticipate the welfare impacts of a project or proposal over its entire life cycle. Future welfare changes are weighted against today's changes through discounting, which is meant to reflect society's general preference for the present, as well as broader inter-generational concerns.

The specific methodology developed for this application was designed using the above BCA principles and is consistent with the USDOT Discretionary Grant Program guidelines. The methodology involves:

- Establishing existing and future conditions under the build and no-build scenarios;
- Assessing benefits with respect to each of the five long-term outcomes identified in the Notice of Funding Opportunity (NOFO);
- Measuring benefits in dollar terms, whenever possible, and expressing benefits and costs in a common unit of measurement;
- Using U.S. Department of Transportation (USDOT) guidance 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;
- Discounting future benefits and costs with the real discount rates recommended by the USDOT (7%).

Project Overview

Requested funds of $16.6 million will complete the construction of the Connell Rail Interchange. Following the opening of the new rail interchange, cargo will be able to efficiently move by rail versus truck due to the improved interchange of the Columbia Basin Railroad at the BNSF Lakeside Subdivision.

Project comparison is with the most likely alternative and a "no build" scenario

Base Case- “no build scenario”

The base case in the BCA represents the current state “no build” state of the interchange. Currently, the Connell interchange yard is too small to hold unit trains and is inadequate to meet current rail standards and capacity demands.

Build Alternative

This alternative measures the incremental freight that can be moved through the interchange with the expanded and reconfigured interchange yard to be built to the south of the existing yard. Currently, there is extensive delays in interchanging cargo on and off the CBRW line due to lack of a yard that can hold a full unit train of 100 plus cars at one time. For the CBRW to meet future cargo projections, a more efficient interchange of railcars between BNSF and CBRW must occur. To do this, the interchange yard must be reconfigured and expended. This project adds a new interchange yard to the south of the current yard and adds 3 tracks totaling 19,200 linear feet of track.

To be conservative in the analysis, it is assumed that the new configuration will provide capacity for a minimum of an additional 1,200 railcars per year. Thus, the analysis starts in 2021, with an additional 1,200 railcars per year. Annual growth is anticipated to be 1.5%.

Assumptions

For the purposes of this analysis, the proposed project is compared with a no build alternative. The analysis includes total project costs of the remaining design, environmental documentation, permitting and upcoming construction for a total project cost of $28.7 million. The BCA was run for a period of 24 years, beginning with the base year of 2017 and including a residual value calculated in 2040 of $21 million, for the remaining estimated life of the improvements of the project elements.

A project cost analysis recently completed by project engineers indicates the cost to complete this project is $28.7 million in 2017 dollars.

Estimation of costs and benefits are limited to the 2017 to 2040 period. The analysis incorporates assumptions based upon the availability of new interchange capacity starting in 2021.

Estimated loads were developed based upon an additional 100 railcars of freight per month or 1200 carloads per year basis.

Current Situation

The demand to move freight on and off the Columbia Basin rail line has been averaging 10% growth per year and has pushed the interchange to its capacity. Additional interchange capacity is needed to meet future rail demand of the industries adjacent to the Columbia Basin Rail line. Without additional capacity, the CBRW shortline will not be able to provide cost effective rail service to its current and potential customers

Future Situation

The proposed improvements construct a 21st century rail interchange facility south of Connell, WA. This new interchange yard when fully completed will have the capacity to hold two full unit trains of 110 rail cars in addition to the run around track. This modern facility will provide the CBRW with additional rail capacity to meet forecasted rail demand from expansion of current customers and provide rail capacity, so the more rail dependent industries can locate along the CBRW line. The ability to provide rail capacity in this service areas, will allow rail dependent user to save the millions of dollars per year in transportation costs and allows the users to experience the cost per ton efficiency of rail.

The rail move is estimated to be approximately an average of a 432-mile trip from the origin to destination. This analysis should not be considered a modal conversion as it is in response to

future demand for rail service to the Columbia Basin Railroad service area not a conversion of cargo from truck to rail.

Project Cost and Schedule

Project Costs

Exhibit 7: Total Project Budget

Use of Funds		
Project Budget	**in Millions**	**%**
CN	$22.5	79%
FE/ CN Engineering	$1.6	5%
Prior costs	$0.1	
Contingency	$4.5	16%
Total Cost	**$28.7**	**100%**

Exhibit 8 below, shows the break out of the project funding. The FY 2016 FASTLANE and TIGER grant applications each requested $16.7 million (58%) in Federal support. The local investment of $12.1 million (42%) is comprised of funds committed by the City, Connection WA through the Washington State Department of Transportation and the Freight Mobility Strategic Investment Board.

Project Funding

Exhibit 8: Project Funding Sources

The City and its stakeholders request $16.6 million in federal funding to meet the funding gap to complete the construction of the project.

CONNELL RAIL INTERCHANGE PROJECT			
Funding Sources	**Amount in Millions**	**Status**	**Use**
City of Connell/ Local	$ 0.1	Committed	PE
FMSIB	$ 2.0	Requested	Construction
Connecting WA	$ 10.0	Committed	FE, Enviromental, and Construction
Federal BUILD 2018	$ 16.6	Requested	Construction
Total Project Funding	**$ 28.7**		

Project Schedule

Exhibit 9: Project Schedule

Task	Rail Improvements
Complete Prel. Engineering	2018
Complete NEPA/SEPA	2019
Receive Federal Permits	N/A
Federal BUILD Award	Dec-18
Obligation	Sep-19
Issue Call-For-Bids	Oct-19
Award Construction Contract	Nov-19
Begin Construction	Dec-19
Substantially Completion	**Jul-20**

Project Completion

Federal grant funds received from this grant request will enable the applicant to complete the full rail interchange project. Due to limited funding options, the project will be delayed until the final funding becomes available from a federal funding source. With the successful award of a grant request by late 2018, construction for the federally funded portion of the project can begin in early 2020 if not before (pending obligation). During obligation discussions*, the City would request a pre-award authorization for state monies already spent on PE.

To match funding availability with the cost of the Project, the City and BNSF has looked at phasing the construction but have determined that the majority of the work is site related and would not be cost effective nor provide independent utility. Thus, unlike previous submittals where the City planned to start construction of Phase I of the project this year (2018) using State Connecting WA funds while the final phase of funding was secured. The City and BNSF has determined that the Project should be completed in one phase versus the multiple phasing option that they had looked at in 2017. Based upon that decision, the design team has completed 60% design and is entering their final design efforts including the identification of required permits and apply for such. The design team foresees no complicating or project ending factors. However, to mitigate any unforeseen risk, a $4.5 million contingency fund has been budgeted and established for the project. The project site is owned by the BNSF, so there are no land purchases or right of way issues. As noted earlier, the alignment has been adjusted slightly to avoid potential wetland issues. The project meets all local requirements for approvals and permits. It is anticipated that State and federal requirements will be met no later than 2018, so when funded, USDOT would be able to obligate funding very quickly. The engineers believe that a Categorical Exemption will be given to the project based upon their prior experience with

rail projects of this scope and size. Project risks have been identified and mitigation strategies incorporated. The project schedule illustrates that all contract bid documents will be finalized quickly.

With federal funding, the full project can be completed by fall 2020.

Long Term Outcomes

Summary of the Benefit Cost Analysis

Exhibit 10 displays the summary of the BCA. Quantified benefits include the transportation cost savings of modal conversion to rail, reduced emissions due to reduced truck miles, better fuel efficiency, and improved safety by the reduction of potential accidents anticipated from the reduction of truck vehicle miles traveled when this project is completed.

This BCA follows guidance set forth in the Benefit-Cost Analysis Resource Guide and the 2018 Benefit-Cost Analysis Guidance for Discretionary Grant Program Applications.

A **discount rate of 7 %** was used, following the Discretionary Grant BCA Resource Guide updated June 2018. Bottom line, the present value (PV) of capital costs in 2017 dollars is $23.5 million and the PV of net benefits is $30.8 million. This rate yields conservative estimates of NPV and benefit cost ratio. This is appropriate because funds are public and would be spent on other public projects. This analysis yields a NPV of $7.5 million and a benefit-cost ratio of 1.3:1. The greatest share of benefits is Economic Competitiveness from operational savings as a result of the use of rail for the forecasted freight shipments.

Exhibit 10: Project Benefit to Cost Ratio Analysis Summary

Benefit Cost Analysis Summary				
Long-term Outcomes	**Social Benefit**	**Inputs**	**Value**	**Monetized Value**
				Discount Rate 7%
Safety	Reduced fatalities from reduction of VMT	Fatality cost savings of 0.54 fatalities	$4.7 million saved	$ 1,976,250
State of Good Repair	Reduction of maintenance on US Roads & Hwys, Consistent with State and Regional Plans	Maintenance, preservation and upgrade savings of Highways	46 million VTM reduced off the highways	$ 2,287,326
Economic Competiveness	Fuel savings due to cargo transported Rail vs. Truck	Gallons of fuel saved	6 million gallons of fuel saved by reducing miles traveled with modal shift to Rail	$ 8,971,664
Economic Competiveness	Operational cost savings	Savings of rail transport vs. truck transport	455 million ton miles @$0.071 savings (non fuel) per mile (truck vs. rail)	$ 13,511,980
Environmental Sustainability	Environmental Benefits from Reduced Emissions by modal change to rail	Saving in CO2	51,062 MT Saved	$ -
Qualtiy of Life	Improved Transportation Choices for Rural Producers	Not Quantified	Not Quantified	
Total Cost				($23,484,853)
Total Benefits				$30,974,653
Net Present Value				**$ 7,489,800**
Benefit to Cost Ratio				**1.3:1**

The use of rail service for future cargo shipments eliminates at least 46 million commercial truck miles off the local roads and highways. This reduction in commercial vehicle miles reduces the probability of fatality accidents by 0.54 fatalities during the 20-year analysis from occurring on the related roads and highways.

Affected Populations and Types of Impacts

Personal vehicle users, commercial carriers, and local residents are the three main groups benefiting from improved mobility with less trucks on local and regional roads and highways. The following description and tables attempt to present costs and benefits for each type of impact that could be monetized:

Quantified benefits include:

- Improved economic competitiveness based upon the reduction of transportation costs for the Central Washington shipper;
- Reduction of gallons of fuel used to transport cargo;
- Improved state of repair of the roads and highways, due to the reduction of truck miles;
- Reduced emissions due to lower Vehicle miles traveled by commercial trucks;
- Improved safety, resulting in reduced economic costs of potential fatalities on the highway due to the reduced VMT of the trucks.

Costs include construction and lifecycle costs. Construction costs are best available estimates at the 60% design level as of July 2018. This analysis anticipates general operations and maintenance costs. Unquantified benefits include:

- Downtown Safety benefits from reduced rail congestion along the BNSF mainline;
- Benefits to the regional community by increased job opportunities among the industries currently or in the future located within the CBRW service area;
- Benefits to the area citizens of the increased connectivity across the rail lines within Connell for non-motorized modes of transportation that provide access to work centers, educational sites, and daily services when rail congestion is improved by the completion of the project.

Quantified Costs and Benefits Measurement of Long-Term Outcomes

The largest positive benefits at a 7% discount rate result from the economic competitiveness criteria. The availability of rail capacity to aid industries served by the CBRW will generate an estimated reduction of 455 million-ton miles off the public roads and highways. The reduction in truck VMT results in an annual operating savings of approximately $13 million due to the lower ton/mile transportation costs generated by the energy efficiency of rail versus truck. This outcome accounts for 51% of the total benefits. Over the 20-year analysis, it is calculated that 5 million gallons of fuel will be saved; $9 million or 34% of the long-term benefits. The monetized saving of the reduction of a total of 0.54 highway fatalities due to the reduction of VMT generates a Safety benefit of $2 million, accounting for 7% of the benefits. Saving in road maintenance from the improvements account for the remaining $2 million or 9% of the monetized benefits.

State of Good Repair

Exhibit 11: Decreased road maintenance

Decreased road maintenance due to construction of Project						
Year	Truck Miles saved	Maintenance rate/ mile	Total savings	No Build Total Miles	No Build Total Maintenance Cost	Decrease in Maintenance Costs using rail vs. truck
		$0.12				
2016						
2017						
2018						
2019						
2020						
2021	1,969,920	$0.12	$236,390	1,969,920	$236,390	$236,390
2022	1,999,469	$0.12	$239,936	1,999,469	$239,936	$239,936
2023	2,029,461	$0.12	$243,535	2,029,461	$243,535	$243,535
2024	2,059,903	$0.12	$247,188	2,059,903	$247,188	$247,188
2025	2,090,801	$0.12	$250,896	2,090,801	$250,896	$250,896
2026	2,122,163	$0.12	$254,660	2,122,163	$254,660	$254,660
2027	2,153,996	$0.12	$258,479	2,153,996	$258,479	$258,479
2028	2,186,306	$0.12	$262,357	2,186,306	$262,357	$262,357
2029	2,219,100	$0.12	$266,292	2,219,100	$266,292	$266,292
2030	2,252,387	$0.12	$270,286	2,252,387	$270,286	$270,286
2031	2,286,173	$0.12	$274,341	2,286,173	$274,341	$274,341
2032	2,320,465	$0.12	$278,456	2,320,465	$278,456	$278,456
2033	2,355,272	$0.12	$282,633	2,355,272	$282,633	$282,633
2034	2,390,601	$0.12	$286,872	2,390,601	$286,872	$286,872
2035	2,426,460	$0.12	$291,175	2,426,460	$291,175	$291,175
2036	2,462,857	$0.12	$295,543	2,462,857	$295,543	$295,543
2037	2,499,800	$0.12	$299,976	2,499,800	$299,976	$299,976
2038	2,537,297	$0.12	$304,476	2,537,297	$304,476	$304,476
2039	2,575,356	$0.12	$309,043	2,575,356	$309,043	$309,043
2040	2,613,987	$0.12	$313,678	2,613,987	$313,678	$313,678
	45,551,774		$5,466,213	45,551,774	$5,466,213	$5,466,213

It is anticipated that there will be over 45 million truck miles saved with the increased rail capacity achieved with the completion of the Connell Rail Interchange project. This is a total savings in road maintenance of $5 million over the 20-year post-construction analysis period.

Economic Competitiveness Benefits

Exhibit 12: Operational Savings

Decreased Operational Costs due to construction of the project and use of rail			
Year	Total additional ton miles on rail after completion of project	saving /ton mile before fuel cost	Reduction in operation cost based upon differential rate/ mile rail vs truck
		$ 0.071	
2017			
2018			
2019			
2020	-	$ 0.071	$ -
2021	19,668,096	$ 0.071	$ 1,396,435
2022	19,963,117	$ 0.071	$ 1,417,381
2023	20,262,564	$ 0.071	$ 1,438,642
2024	20,566,503	$ 0.071	$ 1,460,222
2025	20,875,000	$ 0.071	$ 1,482,125
2026	21,188,125	$ 0.071	$ 1,504,357
2027	21,505,947	$ 0.071	$ 1,526,922
2028	21,828,536	$ 0.071	$ 1,549,826
2029	22,155,964	$ 0.071	$ 1,573,073
2030	22,488,304	$ 0.071	$ 1,596,670
2031	22,825,628	$ 0.071	$ 1,620,620
2032	23,168,013	$ 0.071	$ 1,644,929
2033	23,515,533	$ 0.071	$ 1,669,603
2034	23,868,266	$ 0.071	$ 1,694,647
2035	24,226,290	$ 0.071	$ 1,720,067
2036	24,589,684	$ 0.071	$ 1,745,868
2037	24,958,530	$ 0.071	$ 1,772,056
2038	25,332,908	$ 0.071	$ 1,798,636
2039	25,712,901	$ 0.071	$ 1,825,616
2040	26,098,595	$ 0.071	$ 1,853,000
	454,798,504		$ 32,290,694

The Economic Competitiveness Benefits are realized by monetizing the decreased operational costs to the shipper being achieved based upon rail transportation being more cost effective than trucking. *Exhibit 12* (left) shows the operational savings to the shippers of using rail.

This chart shows the estimated operational cost saving based upon the differential cost of $0.071 per ton savings which will total $32 million over the analysis period. This anticipates that the interchange will provide additional rail capacity to the CBRW service area, so that rail dependent industries either grow or locate along the CBRW line.

Quality of Life

Exhibit 13: Gallons of Fuel Saved

Gallons and CO2 MT Saved due to shift in mode						
Year	Total gallons saved (reduced) due to the use of rail	Fuel savings due to reduced VMT @cost per gallon			CO2 Reduced (Metric Tons)	CO2 Savings
		$3.75				
2017						
2018						
2019						
2020						
2021	247,320	$707,335		2021	2,208	$0
2022	251,030	$717,945		2022	2,241	$0
2023	254,795	$728,714		2023	2,275	$0
2024	258,617	$739,645		2024	2,309	$0
2025	262,496	$750,740		2025	2,344	$0
2026	266,434	$762,001		2026	2,379	$0
2027	270,430	$773,431		2027	2,415	$0
2028	274,487	$785,032		2028	2,451	$0
2029	278,604	$796,808		2029	2,488	$0
2030	282,783	$808,760		2030	2,525	$0
2031	287,025	$820,891		2031	2,563	$0
2032	291,330	$833,205		2032	2,601	$0
2033	295,700	$845,703		2033	2,640	$0
2034	300,136	$858,388		2034	2,680	$0
2035	304,638	$871,264		2035	2,720	$0
2036	309,207	$884,333		2036	2,761	$0
2037	313,846	$897,598		2037	2,802	$0
2038	318,553	$911,062		2038	2,844	$0
2039	323,331	$924,728		2039	2,887	$0
2040	328,181	$938,599		2040	2,930	$0
Total	5,718,945	$16,356,184			51,062	$0

The use of rail to move cargo in the CBRW service area will reduce the growth of trucks on public roads. This modal choice improves the mobility and air quality of local and regional residents.

Fuel savings are calculated upon shippers choosing to use the more energy efficient rail mode to transport cargo to and from the CBRW service area. *Exhibit 13* (above) shows the estimated number of gallons of fuel saved by the availability of rail to move the cargo. The construction of the project will reduce fuel usage by over 5 million gallons of fuel during the analysis period, which will save shipper over $16 million at today's average west coast diesel prices of $3.75/gallon as of July 9, 2018.

Safety benefits

Exhibit 14: Conversion of Collision Statistics

Conversion of Collision statistics based upon 100 Million miles travel by truck									
Collision Type					Annual Average for 2006-2011		Current est. accident costs	Effect on Accidents with conversion to rail	
AIS Level	Severity	Fraction of VSL	Unit value ($2017)*	Conversation of Truck Traffic	Accident Count by KABCO	# KABCO Accidents Converted to AIS	Current Annual social cost of Accidents	Estimated reduction in injuries by 70 % per Insurance Inst for Highway Safety	Estimated Annual accident costs savings
AIS 0	no injury					0	$0	$0	
AIS 1	Minor	0.003	$28,200			0	$0	$0	$0
AIS 2	Moderate	0.047	$451,200			0	$0	$0	$0
AIS 3	Serious	0.105	$1,008,000			0	$0	$0	$0
AIS 4	Severe	0.266	$2,553,600			0	$0	$0	$0
AIS 5	Critical	0.593	$5,692,800			0	$0	$0	$0
AIS 6 reduction VMT	Unsurvivable	1.000	$9,600,000	0.026876	0	0	$258,005	$0	$258,005
AIS 6 due to crossing closure	Unsurvivable	1.000	$9,600,000		0	0	$0	$0	$0
Property Damage Only			$4,198				$0	$0	$0
							$258,005	$0	$258,005
*BUILD BENEFIT-COST ANALYSIS (BCA) RESOURCE GUIDE updated June 2018								annual savings	

Conversion of Collision statistics based upon 100 Million miles travel by truck				
US Traffic Fatalities Per 100 Million miles traveled on Roads				Annual
Total Truck miles reduced over the 20 years		45,551,774	/20	2,277,589
Total Truck miles divided by 100 million miles		0.455517743		0.022775887
Estimated Fatalities Per 100 million miles travel based upon average US's experience		1.18		0.026875547
2015 Unsurvivable value	$9,600,000			
Annual life savings based upon reduced truck mileage				$258,005
Total lives saved over 20 years				0.54
Total social cost saved based upon estimated mileage saved per year				$4,722,808

Safety benefits on *Exhibit 14* (above) are estimated at $4.7 million in total social benefit of 0.54 lives saved over the 20 years after project construction is completed. This is calculated based upon the reduction of potential fatalities due to the use of rail versus truck along the 432-mile sample route.

Qualitative Benefits not Quantified.

Although, the reduction of potential fatalities has been calculated, the social benefits of preventing other less sever accidents has not. Nor has environmental benefits derived from any emissions been calculate due to guidance from USDOT that prior calculations for CO2 have been rescinded. A third benefit not qualified in this analysis is Quality of Life demonstrated through the increase in mobility within the City of Connell due to the increase rail fluidity through their town from the relocation of the interchange out of their downtown area, school zone, residential districts and emergency routes.

SOURCES

All sources and additional notes have been cited in the Benefit Cost Analysis excel workbook that can be found attached to the CRISI application.