



## Appendix A.

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**Benefit Cost Analysis and Methodology  
for South Orient Railroad (SORR)  
Rehabilitation & Presidio-Ojinaga  
International Bridge FASTLANE Grant**

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## Executive Summary

This memorandum summarizes the approach used for conducting benefit-cost analysis (BCA) for the South Orient Railroad (SORR) Rehabilitation & Presidio-Ojinaga International Bridge Project in Presidio County, Texas. Table 1 summarizes the project matrix for the proposed corridor. The project matrix describes status quo or baseline conditions; proposed improvements; types of impacts to users/population affected by impacts; summary of results; and table reference in this memorandum.

### *Baseline Condition*

The South Orient Railroad (SORR) runs approximately 391 miles from San Angelo Junction in Coleman County through San Angelo to Presidio at the Texas-Mexico Border (**Figure 1**). The line, which is one of the eight rail gateways between the U.S. and Mexico, is owned by the Texas Department of Transportation (TxDOT). TxDOT acquired the facility as the result of an application to abandon the old Kansas City, Mexico and Orient line by the Atchison, Topeka and Santa Fe Rail Company (ATSF). The line is maintained and operated by the lessee, Texas Pacifico Transportation, Ltd. (TXPF), under a 40-year operating lease with TxDOT signed in 2001.

In 2009, TxDOT began the rehabilitation of the line starting at the east end and has invested over \$34 million in rehabilitation projects from San Angelo Junction to Mertzon, Texas, a total distance of 112 miles. Additionally, TXPF has invested approximately \$35.8 million in rehabilitation and capacity expansion projects between 2002 and 2015. Rehabilitation of the eastern end of the line has resulted in improved operations and safety along with an increase in freight traffic; with annual carloads interchanged rising from an average of 2,031 pre-rehabilitation to over 25,000 in 2015, an increase of over 1,100 percent

Funding for the rehabilitation of the eastern section of the SORR came from a variety of sources including the American Recovery and Reinvestment Act (\$14.09 million), TXPF (\$8.85 million), the Omnibus Transportation Act (\$2.2 million), the Texas Legislature General Revenue (\$8.0 million), the Texas State Funding (\$0.5 million), and the City of San Angelo (\$0.25 million).

TxDOT continues seeking additional state and federal funds and developing projects to rehabilitate the western section, from San Angelo to Presidio, and rebuild the international bridge at Presidio destroyed by two fires, one in February, 2008 and the other in March, 2009. TXPF and Ferromex have not interchanged carloads at the Presidio border crossing since August 2006.

**Table 1. South Orient Railroad (SORR) Rehabilitation & Presidio-Ojinaga International Bridge Project - Project Matrix**

Current Status or Baseline	Changes to Baseline	Type of Impact	Population Affected by Impact	Economic Benefits	Summary of Results		Table Reference in BCA
					Discounted at 3%	Discounted at 7%	
Presidio-Ojinaga Int. Bridge out of service since 2008. The timber structure was destroyed by two fires, one in February, 2008 and the other in March, 2009. Lack of international crossing	Rehabilitation of track, bridge, and drainage systems along a 72 mile segment from mile post (MP) 956.7 to MP 1029 along the existing SORR from Presidio, Texas north to the UP crossing at Paisano Junction	Truck VMT saved (or avoided) due to the truck-to-rail freight diversion	Highway users	Reduction in highway congestion Improved in auto travel time Improved road safety	N/A	N/A	Table 5
		State of good repair (SOGR)	Highway users  Government	Monetized value of reduction in pavement maintenance costs from displacing truck travel	\$2,474,007	\$1,665,109	Table 8
		Freight rail transportation costs	Local, regional, national and international freight shippers	Monetized value of reduce freight transportation costs due to competitive transit times and operating costs offered by the improved rail service and the international bridge	\$38,622,743	\$25,937,498	Table 15
Track conditions restrict overall train speeds. Drainage conditions lead to track washouts.	Construction of a new international bridge railroad crossing between Presidio, Texas and Ojinaga, Mexico. The proposed bridge at Presidio will reopen an international						

Current Status or Baseline	Changes to Baseline	Type of Impact	Population Affected by Impact	Economic Benefits	Summary of Results		Table Reference in BCA
					Discounted at 3%	Discounted at 7%	
	rail crossing, thus allowing the railroad to become more cost competitive while opening another point of entry into Mexico.	Freight emission costs	Local/regional population	*Monetized value of reduced freight emission costs resulting from transporting goods via railroad as opposed to truck carrier	\$18,640,037	\$18,640,037	Table 18
Inoperable rail line and lack of international crossing limits market for freight movement and provide no opportunity for rail growth, including the future exporting of frac-sand and other critical exports.	Class 2 rail track improvements will increase operating speeds from 10 mph to 25 mph.	Freight accident costs	Local/regional freight shippers  Local/regional population	Monetized value of reduced freight accident costs resulting from transporting goods via railroad as opposed to truck carrier	\$1,938,517	\$1,304,702	Table 21
		Short-term economic impacts due to project construction expenditures in 2017.	Local/regional population	**Total (direct, indirect and induced) economic impacts generated by the Project during Development and Construction in 2017	100 Job-Years Labor Income = \$1.6 M GRP = \$2.3 M Tax Revenue = \$0.6 M	100 Job-Years Labor Income = \$1.6 M GRP = \$2.3 M Tax Revenue = \$0.6 M	Table 28

Current Status or Baseline	Changes to Baseline	Type of Impact	Population Affected by Impact	Economic Benefits	Summary of Results		Table Reference in BCA
					Discounted at 3%	Discounted at 7%	
Large trucks dominates the export markets as the existing shippers are forced to divert their rail freight to roadways		Short-term economic impacts due to project construction expenditures in 2018.		**Total (direct, indirect and induced) economic impacts generated by the Project during Development and Construction in 2018	150 Job-Years Labor Income = \$2.4 M GRP = \$3.5 M Tax Revenue = \$0.9 M	150 Job-Years Labor Income = \$2.4 M GRP = \$3.5 M Tax Revenue = \$0.9 M	Table 29
		Long-term economic benefits from reduced costs of conducting business in the region		**Total (direct, indirect and induced) economic impacts generated over the lifecycle of the Project, 2018-2037	410 jobs Labor Income = \$9.6 M GRP = \$16.7 M Tax Revenue = \$5.5 M	410 jobs Labor Income = \$9.6 M GRP = \$16.7 M Tax Revenue = \$5.5 M	Table 31

Notes: \*The social cost of carbon (SCC) dioxide emissions are to be discounted at a value of 3 percent rather than the 7 percent recommendation for all other non-carbon benefits or costs. \*\*Estimated using the Texas IMPLAN Model based on monetized values in 2015 dollars.



## Project Background

The proposed project includes the reconstruction of the Presidio-Ojinaga International Rail Bridge and the rehabilitation of approximately 72 miles of railroad from the U.S./Mexico border (Railroad Mile Post 1029) to Alpine, Texas (Railroad Mile Post 956.7). Rehabilitation will include track, bridge and drainage improvements from the new international rail bridge north to the Union Pacific Railroad (UP) main line at Paisano Junction (located 11 miles west of Alpine, Texas). There are multiple infrastructure issues that need to be addressed in this segment of track, which includes 83 bridges of varying lengths, heights, and configurations, many of which need repairs; 41 public and private grade crossings of varying lengths and construction, and approximately 38 rock cuts with some obstructed drainage ditches. These are necessary improvements that will enable this region to create its own “Ladders of Opportunity” by bringing additional jobs and businesses to the area as a result of the improved connectivity of the regional freight rail transportation system serving the energy industry and support services.

TxDOT and TXPF have used all resources allocated to-date to complete the rehabilitation of the line from San Angelo Junction to Sulphur Junction and do not have adequate rehabilitation funds remaining for the proposed project. The FASTLANE grant matching funds will be provided by in-kind services by TXPF in the reconstruction of the SORR international rail bridge over the Rio Grande. The reconstruction of this international rail bridge will re-establish connectivity between the U.S. and Mexico in this region of Texas and provide additional capacity for freight traffic between the two countries.

Proposed funding for the project is being sought through the public-private sector partnership between the State of Texas and the rail line lessee, TXPF (**Table 2**). TxDOT and TXPF have funded the cost of developing plans, specifications, estimates, and environmental clearances for the project. The construction and project management costs would be funded by the \$7 million FASTLANE Discretionary grant funds. TXPF would fund the reconstruction of the international rail bridge, providing a 56.9 percent match (\$9,244,572) from these in-kind services. With federal funding support, the SORR will continue to serve the strategically located Port of Entry (POE) in Presidio, Texas, which has local, national, and international significance, and can make broad economic contributions to the region and nation.

*Table 2: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project – Funding Sources*

Project Component	Cost (in 2016 Dollar)		FASTLANE	TXPF (In-Kind)
	USD	%		
International Bridge Replacement	\$7,703,810	48%	\$0	\$7,703,810
Track Tie, Surfacing, and Switches	\$4,030,710	25%	\$4,030,710	\$0
Bridge Component Replacements	\$380,520	2%	\$380,520	\$0
Bridge Tie Replacements	\$536,450	3%	\$536,450	\$0
Drainage Improvements	\$1,503,850	9%	\$1,503,850	\$0
Contingency	\$2,089,232	13%	\$548,470	\$1,570,762
<b>Total</b>	<b>\$16,244,572</b>	<b>100%</b>	<b>\$7,000,000</b>	<b>\$9,244,572</b>
<b>Share (%)</b>		<b>100%</b>	<b>43.1%</b>	<b>56.9%</b>

Source: The Texas Department of Transportation (TxDOT).

### *Proposed Alternative Benefit- Cost Analysis*

This section describes the method used for estimating benefits and life cycle costs of the South Orient Railroad (SORR) Rehabilitation & Presidio-Ojinaga International Bridge Project. This analysis emphasizes the importance and full benefits of the Project. In conducting the benefit-cost analysis, Federal guidance was followed regarding evaluation criteria, discount and monetization rates, and evaluation methods recommended by the U.S. DOT in the Guide to Preparing Benefit-Cost Analyses for FASTLANE Grants<sup>1</sup> and the Notice of Funding Opportunity (NOFO) for the Department of Transportation’s Nationally Significant Freight and Highway Projects (FASTLANE Grants) for Fiscal Year 2017.<sup>2</sup>

<sup>1</sup> U.S. DOT Benefit-Cost Analysis (BCA) Resource Guide (November 2016) supplement to the *2016 Benefit-Cost Analysis Guidance for Grant Applicants*, Updated November 17, 2016. Available at <https://www.transportation.gov/fastlanegrants/bca-resource-guide>.

<sup>2</sup> Notice of funding opportunity (NOFO) for the Department of Transportation’s Nationally Significant Freight and Highway Projects (FASTLANE Grants) for Fiscal Year 2016. Available at <https://www.transportation.gov/build-america/fastlane/fastlane-ii-notice-funding-opportunity>.

*“No-Build” and Build Conditions*

The analysis considers two conditions:

- A “No-Build Condition” in which the proposed investments in the railroad between Paisano Junction and Ojinaga, Mexico to a Class 2 standard, including the reconstruction of the Presidio-Ojinaga International Bridge, does not occur.
- A “Build Condition” in which the rehabilitation of the railroad between Paisano Junction and Ojinaga, including the reconstruction of the Presidio-Ojinaga International Bridge, occur, rail service is preserved, and train speeds are increased. This results in a modal shift away from truck transport to rail for those shippers currently using truck transport.

The project infrastructure improvements under the “Build Condition” include:

- Rehabilitation of track, bridge, and drainage systems along a 72 mile segment from mile post (MP) 1029 to MP 956.7 along the existing South Orient Railroad (SORR) from Presidio, Texas (MP 1029) north to the Union Pacific Railroad (UP) main line connection at Paisano Junction (MP 956.7). This segment is located 11 miles west of Alpine, Texas. Proposed track improvements to Class II rail would result in speed increases from 10 miles per hour to 25 miles per hour.
- Reconstruction of the international bridge railroad crossing between Presidio, Texas and Ojinaga, Mexico, which was destroyed by fires in 2008 & 2009.

The rail demand forecast shown in **Table 3** reflects TXPF’s forecasting for carload traffic by commodity as well as forecasting done for TXPF on potential Mexican traffic should the international bridge open.

*Table 3: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project – Freight Rail Forecast*

Year	Annual Carloads	Annual Rail Ton-Miles	Total Train-Hours
2018	18,920	73,882,180	849
2019	17,839	69,659,408	674
2020	16,670	65,098,270	512
2021	16,038	62,629,076	379
2022	21,625	84,446,735	511
2023	23,545	91,943,896	556
2024	25,422	99,274,553	600
2025	27,513	107,439,742	650

Year	Annual Carloads	Annual Rail Ton-Miles	Total Train-Hours
2026	29,664	115,836,882	700
2027	32,052	125,164,871	757
2028	33,344	130,207,192	787
2029	34,004	132,784,159	803
2030	34,692	135,471,167	819
2031	35,504	138,645,061	838
2032	36,275	141,652,546	856
2033	36,275	141,652,546	856
2034	36,275	141,652,546	856
2035	36,275	141,652,546	856
2036	36,275	141,652,546	856
2037	36,275	141,652,546	856
<b>Total =</b>	<b>584,481</b>	<b>2,282,398,470</b>	<b>14,572</b>

Sources: (1) TXPF's forecasting for carload traffic provided by the Texas Department of Transportation (TxDOT). (2) Texas A&M Transportation Institute (TTI), *Texas Pacifico Railroad Economic and Market Analysis*, August 2014.

### Truck Freight Diverted To Rail Line after Rehabilitation

The BCA is prepared based on an estimate of potential truck-to-rail mode shift benefits. Rail track improvements along the project corridor and construction of the international bridge at Presidio will result in existing truck freight loads shifting to the SORR. This mode shift would reduce the trip length to the nearest international point of entry at Del Rio, El Paso, Eagle Pass, or Laredo in Texas.

The BCA assumes that 50 percent of the projected rail-ton miles are diverted from truck to rail. Assuming that the proposed infrastructure improvements are put in place, the total average annual truck vehicle miles travelled (VMT) saved (or avoided) is estimated by dividing the average annual rail ton-miles (diverted from truck to rail) by the average truck payload factor (**Table 4**) and then, by the truck to rail distance factor of 0.83 to take into account the relatively longer rail routes for the same origin-destination (O-D) pair.<sup>3</sup> This estimation yields 89 million truck VMT avoided on regional roads over the analysis period (**Table 5**).

<sup>3</sup> National Cooperative Highway Research Program (NCHRP) Report 388, "A Guidebook for Forecasting Freight Transportation Demand". This analysis assumes that this factor includes dray distances.

*Table 4: Estimated Average Tons of Cargo per Truck*

SAM Commodity Group	Commodity Name	Tons per Loaded Truck
1	Agriculture	16.88
2	Nonmetallic Minerals	24.31
13	Petroleum	24.16
14	Secondary & Misc. Mixed	19.62
<b>Average =</b>		<b>21.24</b>

Source: Source: Statewide Analysis Model (SAM), Third Version (SAM-V3), October 2013.

*Table 5: The SORR Rehabilitation and Presidio-Ojinaga International Bridge Project – Estimated Avoided Truck Vehicle Miles Traveled*

Year	Rail Ton-Miles	Truck VMT	Adjusted Truck VMT
2018	73,882,180	2,886,770	1,443,385
2019	69,659,408	2,721,775	1,360,888
2020	65,098,270	2,543,560	1,271,780
2021	62,629,076	2,447,082	1,223,541
2022	84,446,735	3,299,555	1,649,777
2023	91,943,896	3,592,488	1,796,244
2024	99,274,553	3,878,916	1,939,458
2025	107,439,742	4,197,952	2,098,976
2026	115,836,882	4,526,050	2,263,025
2027	125,164,871	4,890,519	2,445,259
2028	130,207,192	5,087,535	2,543,768
2029	132,784,159	5,188,224	2,594,112
2030	135,471,167	5,293,213	2,646,606
2031	138,645,061	5,417,225	2,708,612
2032	141,652,546	5,534,735	2,767,368
2033	141,652,546	5,534,735	2,767,368

Year	Rail Ton-Miles	Truck VMT	Adjusted Truck VMT
2034	141,652,546	5,534,735	2,767,368
2035	141,652,546	5,534,735	2,767,368
2036	141,652,546	5,534,735	2,767,368
2037	141,652,546	5,534,735	2,767,368
<b>Total =</b>	<b>2,282,398,470</b>	<b>89,179,274</b>	<b>44,589,637</b>

### *Project Benefits*

Consistent with FASTLANE grant methodology and guidance, the benefits resulting from the SORR rehabilitation & Presidio International Rail Bridge Reconstruction Project (**Table 6**) are broken down into the following major categories:

- A. State of Good Repair;
- B. Economic Competitiveness;
- C. Livability;
- D. Environmental Sustainability; and
- E. Safety.

*Table 6: Direct Benefits Resulting from the SORR Rehabilitation & Presidio-Ojinaga International Bridge Project*

Benefit Category	Metrics
<b>A. State of Good Repair of Roadway Infrastructure</b>	Pavement Maintenance Costs
<b>B. Economic Competitiveness</b>	Freight Transportation Costs
<b>D. Environmental Sustainability</b>	Freight Emissions Costs
<b>E. Safety</b>	Freight Accident Costs

Increased rail system capacity will result in a significant increase in carload flows once the project is completed, contributing to reductions in the cargo being shipped by truck and to capture of additional market share. This truck-to-rail mode shift and improved rail connectivity have the potential to generate the following direct benefits:

- **Highway System Impacts** - Fewer trucks on the roadway reduces road wear and tear, which in turn, reduces highway maintenance cost and helps to achieve the state of good repair (SOGR) for pavement assets in the region.

- **Freight Transportation Cost Savings** – Freight rail provides an impact to commodity access through the difference in transportation costs of shipping via rail rather than truck.
- **Freight Environmental and Safety Impacts** - Less trucks on the roadway has the potential to reduce truck related emissions and improve highway safety.

The benefits of the Project are calculated in 2015 dollars over a time horizon of 20 years, starting in 2019 and ceasing in 2038.

### State of Good Repair of Roadway Infrastructure

The expected increase in truck VMT will lead to an increase in pavement wear and tear over the 20-year analysis period. The method to assess highway system state of good repair (SOGR) impacts involves estimation of the marginal external cost associated with pavement maintenance for trucks and rural highways.

This analysis uses the average external marginal costs for rural highways provided by the Federal Highway Administration (FHWA) (**Table 7**) which represent the additional spending (or saving) in all costs of maintaining pavements, including resurfacing and reconstruction, resulting from a unit increase/decrease in VMT borne by public agencies responsible for highway maintenance. The marginal pavement cost is multiplied by the annual changes in truck VMT over the 20-year analysis period.

*Table 7: Marginal External Pavement Cost for Rural Highways*

Vehicle Class	Rural Highways (Average) in 2000 Dollar	Rural Highways (Average) in 2015 Dollar
Trucks	0.0565	0.0778

Source: 1997 Federal Highway Cost Allocation Study, Final Report, Table V-26. Available at <http://www.fhwa.dot.gov/policy/hcas/final/five.cfm>

Note: Marginal pavement cost was inflated from 2000 to 2015 dollars based on the Consumer Price Index (CPI) from all South Urban Areas provided by the Bureau of Labor Statistics (BLS).

**Table 8** summarizes the SOGR benefits resulting from the Project. Savings in pavement maintenance costs generated by the Project over the 20-year analysis account for \$3.5 million (in 2015\$), representing \$1.7 million in benefits (in 7 percent discounted 2015 dollars) and \$2.5 million in benefits (in 3 percent discounted 2015 dollars).

*Table 8: The SORR Rehabilitation and Presidio-Ojinaga International Bridge Project – Sate of Good Repair Cost Benefits*

Year	Calendar Year	Saved Pavement Cost (in 2015\$)	NPV of Pavement Maintenance Cost Saved	
			3%	7%
			NPV = [C/(1+3%)^A]	NPV = [C/(1+7%)^A]
1	2018	\$112,253	\$108,984	\$104,910
2	2019	\$105,838	\$99,762	\$92,443
3	2020	\$98,908	\$90,514	\$80,738
4	2021	\$95,156	\$84,545	\$72,594
5	2022	\$128,305	\$110,677	\$91,480
6	2023	\$139,696	\$116,993	\$93,085
7	2024	\$150,834	\$122,641	\$93,932
8	2025	\$163,239	\$128,863	\$95,007
9	2026	\$175,998	\$134,888	\$95,731
10	2027	\$190,170	\$141,504	\$96,673
11	2028	\$197,831	\$142,918	\$93,988
12	2029	\$201,747	\$141,501	\$89,578
13	2030	\$205,829	\$140,160	\$85,412
14	2031	\$210,651	\$139,265	\$81,694
15	2032	\$215,221	\$138,142	\$78,006
16	2033	\$215,221	\$134,119	\$72,903
17	2034	\$215,221	\$130,212	\$68,133
18	2035	\$215,221	\$126,420	\$63,676
19	2036	\$215,221	\$122,737	\$59,510
20	2037	\$215,221	\$119,163	\$55,617
<b>Totals =</b>		<b>\$3,467,779</b>	<b>\$2,474,007</b>	<b>\$1,665,109</b>

### Freight Transportation Cost Benefits

This benefit category captures the cost savings from transporting goods via railroad as opposed to truck carrier. The truck and rail operating costs are calculated by multiplying truck mile diversion with truck and rail operating cost, respectively. The difference in truck and train operating cost captures the net reduction in freight transportation cost from displacing heavy truck travel.



The values and key inputs and sources used in the estimation of this benefit category include:

- Truck marginal vehicle operating cost (**Table 9**)
- Truck value of time (**Table 10**)
- Truck travel speeds on Texas rural highways (**Table 11**)
- Train hourly operating costs cost (**Table 12**)

*Table 9: Average Marginal Vehicle Operating Cost for Trucks for the Southeast Region (Dollar per Mile)*

Operating Cost	VOC (in Dollar per Mile) in 2015
Fuel Costs	\$0.401
Truck/Trailer Lease or Purchase Payments	\$0.247
Repair & Maintenance	\$0.151
Truck Insurance Premiums	\$0.065
Permits and Licenses	\$0.017
Tires	\$0.042
Tolls	\$0.025
<b>Total =</b>	<b>\$0.948</b>

Source: American Transportation Research Institute (ATRI), *An Analysis of the Operational Costs of Trucking: 2016 Update* (ATRI, September 2016), Table 18, p. 29. Available at: <http://atri-online.org/2016/09/26/an-analysis-of-the-operational-costs-of-trucking-2016-update/>

*Table 10: Truck Value of Time*

Vehicle Type	Average Vehicle Occupancy (AVO)	Value of Time (VOT) in 2015\$
Truck	1.00	\$27.20

Sources: (1) AVO for trucks is assumed to be one which provides a conservative estimate of travel time benefits accruing to freight truck movements. (2) Truck VOT comes from the Benefit-Cost Analysis (BCA) Resource Guide (November 2016) supplement to the *2016 Benefit-Cost Analysis Guidance for Grant Applicants*, Updated 11-17-2016. Available at: <https://www.transportation.gov/fastlanegrants/bca-resource-guide>

**Table 11: Truck Speed Limits in Texas by Highway Functional Class**

	Highway Functional Class		
	Rural Interstates	Urban Interstates	Other Limited Access Roads
Truck Speed Limit (mph)	75; 80 or 85 on specified segments	75	75

Source: Speed limits on Texas roads, Texas Transportation Code § 545.352.

**Table 12: Train Hourly Operating Costs (in 2015 Dollar)**

Line	Cost Category	Hourly Cost (in 2015 Dollar)	Source
(a)	Transportation (Train & Engine) Wages	\$31.67	Estimated based on the 2015 Annual Wage Forms A and B submitted by Class I Railroads, Surface Transportation Board (STB), Office of Economics, Wage Statistics of Class I Railroads in the U.S.
(b)	Fringe Benefits	43%	Association of American Railroads (AAR), 2012b. <i>Analysis of Class 1 Railroads</i> , AAR, Washington, D.C.
(c)	Two person crew	2	Assumed
(d)	Crew (per train-hour) = (a) x (b) x (c)	\$90.57	Estimated

Line	Cost Category	Weight of Cost	Hourly Cost (in 2015 Dollar)	Source
(e)	Labor (% of total cost) = (d)	31.2%	\$90.57	Assume based on the current weight of cost components provided by the Association of American Railroads (AAR), <i>Quarterly RCAF Filing</i> ,
(f)	Fuel (% of total cost)	22.3%	\$64.73	
(g)	Materials & Supplies (% of total cost)	4.9%	\$14.22	

Line	Cost Category	Weight of Cost	Hourly Cost (in 2015 Dollar)	Source
(h)	Equipment Rents (% of total cost)	5.6%	\$16.26	Second Quarter 2014
(i)	Depreciation (% of total cost)	11.9%	\$34.54	
(j)	Interest (% of total)	2.0%	\$5.81	
(k)	Other (% of total)	22.1%	\$64.15	
	<b>Total =</b>	<b>100.0%</b>	<b>\$290.28</b>	

The metrics to measure net savings in freight transportation costs arising from the SORR Rehabilitation & Presidio-Ojinaga International Bridge Project are the savings in transit time costs and vehicle operating costs (VOC) resulting from truck VMT saved (or avoided) due to the truck-to-rail freight diversion. The estimation of this category of benefits involves the following steps:

- Estimation of the average annual truck VOC saved by multiplying the average annual truck VMT avoided by the marginal truck VOC (in \$/mile) over the 20-year analysis period (**Table 13**).
- Estimation of the average annual truck transit-time cost saved by multiplying the average annual truck VMT avoided by the average truck travel speed and the average truck driver wage rate (in \$/hr) over the 20-year analysis period (**Table 13**). The average truck travel speed is assumed to be 75 mph. This assumption yields a conservative estimate given the higher speeds allow on Texas rural interstate highways.
- Calculation of the train operating cost (due to truck cargo diverted to rail) by multiplying the train hourly operating cost by the annual train-hours over the 20-year analysis period (**Table 14**).
- Estimation of the annual net savings in freight transportation costs by subtracting the annual train operating costs from the annual truck operating costs and then, adding the net savings over the 20-year analysis period.

Total net savings in freight transportation costs resulting from the Project over the 20-year analysis period, summarized in **Table 15**, account for \$54.2 million (in 2015\$). This represents \$26 million in benefits (in 7 percent discounted 2015 dollars) and \$38.6 million in benefits (in 3 percent discounted 2015 dollars) over the 20-year analysis period.

**Table 13. The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Truck Transportation Cost Saved**

Year	Annual Truck-Miles Avoided	Marginal Truck VOC (in 2015 Dollar per Mile)	Saved Truck Operating Costs (in 2015 Dollar) (h) x (i)	Average Truck Driver Wage Rate (2015 Dollar per Hour)	Average Truck Speed (mph)	Saved Truck Transit-Time Cost (h) x (k) / (l)	Truck Transportation Cost Saved (in 2015 Dollar) (j) + (m)
2018	1,443,385	\$0.948	\$1,368,329	\$27.2	75	\$523,468	\$1,891,797
2019	1,360,888	\$0.948	\$1,290,121	\$27.2	75	\$493,549	\$1,783,670
2020	1,271,780	\$0.948	\$1,205,647	\$27.2	75	\$461,232	\$1,666,879
2021	1,223,541	\$0.948	\$1,159,917	\$27.2	75	\$443,737	\$1,603,654
2022	1,649,777	\$0.948	\$1,563,989	\$27.2	75	\$598,319	\$2,162,308
2023	1,796,244	\$0.948	\$1,702,839	\$27.2	75	\$651,438	\$2,354,277
2024	1,939,458	\$0.948	\$1,838,606	\$27.2	75	\$703,377	\$2,541,983
2025	2,098,976	\$0.948	\$1,989,829	\$27.2	75	\$761,229	\$2,751,058
2026	2,263,025	\$0.948	\$2,145,348	\$27.2	75	\$820,724	\$2,966,071
2027	2,445,259	\$0.948	\$2,318,106	\$27.2	75	\$886,814	\$3,204,920
2028	2,543,768	\$0.948	\$2,411,492	\$27.2	75	\$922,540	\$3,334,031
2029	2,594,112	\$0.948	\$2,459,218	\$27.2	75	\$940,798	\$3,400,016
2030	2,646,606	\$0.948	\$2,508,983	\$27.2	75	\$959,836	\$3,468,819
2031	2,708,612	\$0.948	\$2,567,765	\$27.2	75	\$982,323	\$3,550,088
2032	2,767,368	\$0.948	\$2,623,465	\$27.2	75	\$1,003,632	\$3,627,096
2033	2,767,368	\$0.948	\$2,623,465	\$27.2	75	\$1,003,632	\$3,627,096

Year	Annual Truck-Miles Avoided	Marginal Truck VOC (in 2015 Dollar per Mile)	Saved Truck Operating Costs (in 2015 Dollar) (h) x (i)	Average Truck Driver Wage Rate (2015 Dollar per Hour)	Average Truck Speed (mph)	Saved Truck Transit-Time Cost (h) x (k) / (l)	Truck Transportation Cost Saved (in 2015 Dollar) (j) + (m)
2034	2,767,368	\$0.948	\$2,623,465	\$27.2	75	\$1,003,632	\$3,627,096
2035	2,767,368	\$0.948	\$2,623,465	\$27.2	75	\$1,003,632	\$3,627,096
2036	2,767,368	\$0.948	\$2,623,465	\$27.2	75	\$1,003,632	\$3,627,096
2037	2,767,368	\$0.948	\$2,623,465	\$27.2	75	\$1,003,632	\$3,627,096
<b>Total</b>	<b>44,589,637</b>		<b>\$42,270,976</b>			<b>\$16,171,175</b>	<b>\$58,442,151</b>

*Table 14: The SORR Rehabilitation and Presidio-Ojinaga International Bridge Project - Additional Train Operating Cost*

Year	Total Train-Hours	Train Hourly Operating Costs (Dollar per Hour)	Additional Train Transportation Cost (in 2015 Dollar) (c) x (n)
2018	849	\$290.28	\$246,356
2019	674	\$290.28	\$195,600
2020	512	\$290.28	\$148,519
2021	379	\$290.28	\$109,912
2022	511	\$290.28	\$148,201
2023	556	\$290.28	\$161,359
2024	600	\$290.28	\$174,224
2025	650	\$290.28	\$188,553
2026	700	\$290.28	\$203,290
2027	757	\$290.28	\$219,660
2028	787	\$290.28	\$228,510
2029	803	\$290.28	\$233,032
2030	819	\$290.28	\$237,748
2031	838	\$290.28	\$243,318
2032	856	\$290.28	\$248,596
2033	856	\$290.28	\$248,596
2034	856	\$290.28	\$248,596
2035	856	\$290.28	\$248,596
2036	856	\$290.28	\$248,596
2037	856	\$290.28	\$248,596
Total =	14,572		\$4,229,857

Table 15: The SORR Rehabilitation and Presidio-Ojinaga International Bridge Project – Net Freight Transportation Cost Benefits

Year	Calendar Year	Truck Operating Cost Avoided (in 2015 Dollars)	Additional Train Operating Cost (in 2015 Dollars)	Net Savings (in 2015 Dollars) C - D	NPV of Truck Operating Cost Avoided	
					3%	7%
					NPV = $[E/(1+3\%)^A]$	NPV = $[E/(1+7\%)^A]$
1	2018	\$1,891,797	\$246,356	\$1,645,441	\$1,597,515	\$1,537,795
2	2019	\$1,783,670	\$195,600	\$1,588,070	\$1,496,908	\$1,387,082
3	2020	\$1,666,879	\$148,519	\$1,518,360	\$1,389,515	\$1,239,434
4	2021	\$1,603,654	\$109,912	\$1,493,742	\$1,327,171	\$1,139,569
5	2022	\$2,162,308	\$148,201	\$2,014,107	\$1,737,386	\$1,436,030
6	2023	\$2,354,277	\$161,359	\$2,192,919	\$1,836,535	\$1,461,234
7	2024	\$2,541,983	\$174,224	\$2,367,759	\$1,925,205	\$1,474,522
8	2025	\$2,751,058	\$188,553	\$2,562,504	\$2,022,864	\$1,491,401
9	2026	\$2,966,071	\$203,290	\$2,762,781	\$2,117,442	\$1,502,770
10	2027	\$3,204,920	\$219,660	\$2,985,259	\$2,221,313	\$1,517,555
11	2028	\$3,334,031	\$228,510	\$3,105,522	\$2,243,495	\$1,475,411
12	2029	\$3,400,016	\$233,032	\$3,166,984	\$2,221,259	\$1,406,179
13	2030	\$3,468,819	\$237,748	\$3,231,071	\$2,200,202	\$1,340,780
14	2031	\$3,550,088	\$243,318	\$3,306,770	\$2,186,165	\$1,282,423
15	2032	\$3,627,096	\$248,596	\$3,378,501	\$2,168,531	\$1,224,524
16	2033	\$3,627,096	\$248,596	\$3,378,501	\$2,105,370	\$1,144,415
17	2034	\$3,627,096	\$248,596	\$3,378,501	\$2,044,048	\$1,069,547
18	2035	\$3,627,096	\$248,596	\$3,378,501	\$1,984,513	\$999,576
19	2036	\$3,627,096	\$248,596	\$3,378,501	\$1,926,712	\$934,184
20	2037	\$3,627,096	\$248,596	\$3,378,501	\$1,870,594	\$873,069
<b>Totals =</b>		<b>\$58,442,151</b>	<b>\$4,229,857</b>	<b>\$54,212,294</b>	<b>\$38,622,743</b>	<b>\$25,937,498</b>

## Freight Emission Cost Benefits

This category of project benefits captures the net savings in emission damage costs resulting from truck VMT saved (or avoided) due to the truck-to-rail freight diversion. The values and key inputs and sources used in the estimation of this benefit category include:

- Freight (truck and rail) emission rates (**Table 16**); and
- Monetized unit values of emissions (**Table 17** and **Table 18**)

*Table 16: Freight Emission Rates*

Freight Mode	Emission Type (Grams per Ton-Mile)			
	VOC	NOx	PM	CO <sub>2</sub>
Railroad)	0.018201	0.35356	0.010251	21.14
Truck	0.10	1.45	0.06	171.83

Source: *A Modal Comparison of Domestic Freight Transportation Effects on the General Public*. Prepared for U.S. Maritime Administration and National waterways Foundation. Prepared by the Texas Transportation Institute. Feb 2012.

**Table 17. Emission Damage Costs**

Emission Type	Emission Damage Cost (Dollar per Short Ton) in 2015 Dollar Gram/Mile
VOCs	\$1,844
NOx	\$7,266
PM	\$332,405
SOx	\$42,294

Source: U.S. DOT Benefit-Cost Analysis (BCA) Resource Guide (November 2016) supplement to the 2016 Benefit-Cost Analysis Guidance for Grant Applicants; Corporate Average Fuel Economy for MY2017-MY2025 Passenger Cars and Light Trucks (August 2012), page 922, Table VIII-16, "Economic Values Used for Benefits Computations (2010 dollars). Available at <https://www.transportation.gov/fastlanegrants/bca-resource-guide>.

Note: The U.S. DOT Benefit-Cost Analysis (BCA) Resource Guide (November 2016) converts the emission damage cost value into 2015 dollars.



*Table 18: Social Cost of Carbon (3 Percent)*

Year	3% SCC (Dollar per Metric Tons) in 2015 Dollar	Year	3% SCC (Dollar per Metric Tons) in 2015 Dollar
2018	45		
2019	46	2030	57
2020	47	2031	58
2021	47	2032	59
2022	49	2033	60
2023	50	2034	61
2024	51	2035	62
2025	52	2036	63
2026	53	2037	64
2027	54	2038	66
2028	55	2039	67
2029	55	2040	68

Source: U.S. DOT Benefit-Cost Analysis (BCA) Resource Guide (November 2016). Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866 (May 2013; revised August 2016), page 25, Table A1 “Annual SCC Values: 2010-2050 (2007\$/metric ton CO<sub>2</sub>);” values for 3% discount rate. Available at <https://www.transportation.gov/fastlanegrants/bca-resource-guide>.

The metric to measure environmental benefits arising from the SORR Rehabilitation and Presidio-Ojinaga International Bridge Project is the net savings in emission costs resulting from truck VMT saved (or avoided) due to the truck-to-rail freight diversion. The estimation of this category involves the following steps:

- Estimation of the truck emission damage costs saved due to truck cargo diverted to rail. This is accomplished by multiplying the average annual truck VMT avoided by the truck emission rates (in grams/ton-mile) for the major clean air pollutants, and then, by the corresponding emission damage costs, over the 20-year analysis period. This estimation involves converting grams to short tons for the non-carbon emissions (VOC, NO<sub>x</sub>, and PM) and grams to metric tons for of carbon dioxide (CO<sub>2</sub>).
- Estimation of the additional rail emission damage costs by multiplying the average annual rail ton-miles by the rail emission rates (in grams/ton-mile) for the major clean air pollutants, and then, by the corresponding emission damage costs, over the 20-year

analysis period. This estimation involves converting grams to short tons for the non-carbon emissions (VOC, NOx, and PM) and grams to metric tons for of carbon dioxide (CO<sub>2</sub>).

- Estimation of the annual net emission cost benefits by subtracting the annual rail emission costs from the annual truck emission costs and then, adding the net savings over the 20-year analysis period.

Total net savings in emission costs resulting from the Project over the 20-year analysis period, summarized in **Table 19**, account for \$26 million (in 2015 dollars). This represents \$14 million in benefits (in 7 percent discounted 2015 dollars) and \$18.5 million in benefits (in 3 percent discounted 2015 dollars) over the 20-year analysis period.

*Table 19: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Emission Cost Benefits*

Year	Calendar Year	Truck Emission Cost Avoided (in 2015 Dollar\$)			Rail Emission Cost (in 2015 Dollar)			Net Savings (in 2015 Dollar)	NPV of Truck Emission Costs Saved		
		VOC, NO <sub>x</sub> , PM	CO <sub>2</sub>	Total	VOC, NO <sub>x</sub> , PM	CO <sub>2</sub>	Total		E - H	3%	7%
										NPV	NPV
1	2018	\$1,036,398	\$237,082	\$1,273,480	\$489,462	\$70,284	\$559,746	\$713,734	\$692,945	\$673,095	
2	2019	\$1,065,892	\$228,499	\$1,294,391	\$461,487	\$67,740	\$529,226	\$765,164	\$721,241	\$679,442	
3	2020	\$996,100	\$218,180	\$1,214,279	\$431,270	\$64,680	\$495,950	\$718,329	\$657,373	\$601,543	
4	2021	\$958,317	\$209,904	\$1,168,221	\$414,912	\$62,227	\$477,139	\$691,083	\$614,018	\$545,771	
5	2022	\$1,292,160	\$295,071	\$1,587,230	\$559,451	\$87,475	\$646,926	\$940,304	\$811,114	\$701,485	
6	2023	\$1,406,877	\$327,823	\$1,734,701	\$609,119	\$97,185	\$706,304	\$1,028,397	\$861,266	\$724,736	
7	2024	\$1,519,047	\$361,040	\$1,880,087	\$657,684	\$107,032	\$764,716	\$1,115,371	\$906,899	\$742,945	
8	2025	\$1,643,987	\$398,396	\$2,042,383	\$711,778	\$118,106	\$829,884	\$1,212,499	\$957,158	\$763,817	
9	2026	\$1,772,475	\$437,794	\$2,210,269	\$767,408	\$129,786	\$897,194	\$1,313,075	\$1,006,363	\$782,752	
10	2027	\$1,915,207	\$481,974	\$2,397,181	\$829,205	\$142,883	\$972,088	\$1,425,092	\$1,060,403	\$804,383	
11	2028	\$1,992,362	\$510,675	\$2,503,037	\$862,610	\$151,392	\$1,014,002	\$1,489,035	\$1,075,711	\$796,291	
12	2029	\$2,031,793	\$520,782	\$2,552,576	\$879,682	\$154,388	\$1,034,070	\$1,518,505	\$1,065,049	\$768,533	
13	2030	\$2,072,909	\$550,641	\$2,623,550	\$897,483	\$163,240	\$1,060,723	\$1,562,827	\$1,064,209	\$751,561	
14	2031	\$2,121,474	\$573,429	\$2,694,903	\$918,510	\$169,995	\$1,088,506	\$1,606,397	\$1,062,018	\$733,247	
15	2032	\$2,167,493	\$595,969	\$2,763,462	\$938,434	\$176,678	\$1,115,112	\$1,648,350	\$1,058,013	\$714,594	
16	2033	\$2,167,493	\$606,070	\$2,773,563	\$938,434	\$179,672	\$1,118,107	\$1,655,456	\$1,031,626	\$682,042	
17	2034	\$2,167,493	\$616,171	\$2,783,664	\$938,434	\$182,667	\$1,121,101	\$1,662,563	\$1,005,878	\$651,366	
18	2035	\$2,167,493	\$626,272	\$2,793,765	\$938,434	\$185,661	\$1,124,096	\$1,669,669	\$980,755	\$622,447	
19	2036	\$2,167,493	\$636,373	\$2,803,866	\$938,434	\$188,656	\$1,127,090	\$1,676,776	\$956,242	\$595,172	
20	2037	\$2,167,493	\$646,475	\$2,813,967	\$938,434	\$191,650	\$1,130,085	\$1,683,883	\$932,325	\$569,437	
<b>Totals =</b>		<b>\$34,829,954</b>	<b>\$9,078,621</b>	<b>\$43,908,575</b>	<b>\$15,120,670</b>	<b>\$2,691,397</b>	<b>\$17,812,067</b>	<b>\$26,096,508</b>	<b>\$18,520,603</b>	<b>\$13,904,659</b>	

Note: In accordance with Federal guidance, the social cost of carbon (SCC) dioxide emissions changes over time and are discounted at a lower discount rate of 3%, even in the 7% discount rate benefit-cost analysis.

## Freight Accident Cost Benefits

This category of project benefits captures the net savings in traffic crash costs resulting from truck VMT saved (or avoided) due to the truck-to-rail freight diversion. The values and key inputs and sources used in the estimation of this benefit category include:

- External cost of truck and rail freight accidents (**Table 20**)

*Table 20: External Cost of Truck and Rail Freight Accidents*

Freight Mode	1994 Dollar per Ton-Mile	2015 Dollar per Ton-Mile
Freight Truck	\$0.006	\$0.009
Freight Rail	\$0.002	\$0.003

Source: *External Costs of Truck and Rail Freight Transportation*, David J. Forkenbrock, University of Iowa, 1998.

Note: Marginal pavement cost was inflated from 1994 to 2015 dollars based on the Consumer Price Index (CPI) from all South Urban Areas provided by the Bureau of Labor Statistics (BLS).

The metric to measure safety benefits arising from the SORR Rehabilitation & Presidio-Ojinaga International Bridge Project is the net savings in accident costs resulting from truck VMT saved (or avoided) due to the truck-to-rail freight diversion. The estimation of this category involves the following steps:

- Estimation of the truck accident costs saved due to truck cargo diverted to rail. This is accomplished by multiplying the average annual truck VMT avoided by the unit cost of truck freight accidents (in \$/ton-mile) over the 20-year analysis period.
- Estimation of the rail accident costs (due to truck cargo diverted to rail) by multiplying the unit cost of freight rail accidents (in \$/ton-mile) by the additional annual rail ton-miles over the 20-year analysis period
- Estimation of the annual net safety benefits by subtracting the annual rail accident costs from the annual truck accident cost avoided and then, adding the savings over the 20-year analysis period.

Total net savings in accident costs resulting from the Project over the 20-year analysis period are shown in **Table 21**. These savings account for \$2.7 million (in 2015 dollars). This represents \$1.3 million in benefits (in 7 percent discounted 2015 dollars) and \$1.9 million in benefits (in 3 percent discounted 2015 dollars) over the 20-year analysis period.

*Table 21: The SORR Rehabilitation and Presidio-Ojinaga International Bridge Project – Accident Cost Benefits*

Year	Calendar Year	Truck Accident Cost Avoided (in 2015\$)	Additional Rail Accident Cost (in 2015\$)	Net Savings (in 2015\$) C - D	NPV of Truck Accident Cost Saved	
					3%	7%
					NPV = [E/(1+3%)^A]	NPV = [E/(1+7%)^A]
1	2018	\$287,724	\$199,768	\$87,957	\$85,395	\$82,202
2	2019	\$271,279	\$188,350	\$82,929	\$78,169	\$72,434
3	2020	\$253,517	\$176,017	\$77,499	\$70,923	\$63,263
4	2021	\$243,901	\$169,341	\$74,560	\$66,245	\$56,881
5	2022	\$328,867	\$228,333	\$100,534	\$86,721	\$71,679
6	2023	\$358,063	\$248,604	\$109,459	\$91,670	\$72,937
7	2024	\$386,612	\$268,425	\$118,186	\$96,096	\$73,600
8	2025	\$418,410	\$290,503	\$127,907	\$100,971	\$74,443
9	2026	\$451,111	\$313,208	\$137,904	\$105,692	\$75,010
10	2027	\$487,438	\$338,429	\$149,009	\$110,876	\$75,748
11	2028	\$507,075	\$352,063	\$155,011	\$111,984	\$73,645
12	2029	\$517,110	\$359,031	\$158,079	\$110,874	\$70,189
13	2030	\$527,574	\$366,296	\$161,278	\$109,823	\$66,925
14	2031	\$539,935	\$374,878	\$165,057	\$109,122	\$64,012
15	2032	\$551,647	\$383,010	\$168,637	\$108,242	\$61,122
16	2033	\$551,647	\$383,010	\$168,637	\$105,089	\$57,123
17	2034	\$551,647	\$383,010	\$168,637	\$102,028	\$53,386
18	2035	\$551,647	\$383,010	\$168,637	\$99,056	\$49,894
19	2036	\$551,647	\$383,010	\$168,637	\$96,171	\$46,630
20	2037	\$551,647	\$383,010	\$168,637	\$93,370	\$43,579
<b>Totals =</b>		<b>\$8,888,498</b>	<b>\$6,171,307</b>	<b>\$2,717,190</b>	<b>\$1,938,517</b>	<b>\$1,304,702</b>

### Job Creation

The expenditure of public sector dollars is expected to create short-term jobs in the development and construction phase of the South Orient Railroad (SORR) Rehabilitation & Presidio-Ojinaga International Bridge Project (**Table 22**). The benefit of increase in the job-years as a result of the Project during development and construction is computed as a product of the undiscounted project cost and the value on government dollars spent to create a single job-year (i.e., \$76,900 in 2015\$). These benefits are not counted in the B/C calculation.

*Table 22: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project – Job Creation Benefits*

Job Creation	Value
Increase in Short-Term Job-Years due to Project during Development and Construction	210 Job-Years
Average # of Short-Term Jobs Created in a Year due to Project during Development and Construction	105 Jobs

### *Total Monetized Benefits*

**Table 23** summarizes the monetized benefits (undiscounted and discounted) for each benefit category resulting from the Project implementation over the 20-year analysis period. Total benefits account for \$86.6 million (in 2015 dollars). This represents \$45 million in benefits (in 7 percent discounted 2015 dollars) and nearly \$60 million in benefits (in 3 percent discounted 2015 dollars) over the 20-year analysis period.

*Table 23: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Total Monetized Benefits by Benefit Category*

Benefit Category	Savings	In 2015 Dollar	Discounted at 3%	Discounted at 7%
<b>A. State of Good Repair</b>	Pavement Maintenance Cost	\$3,467,779	\$2,474,007	\$1,665,109
<b>B. Economic Competitiveness</b>	Freight Transportation Costs	\$54,212,294	\$38,622,743	\$25,937,498
<b>C. Sustainability</b>	Freight Emissions Costs	\$26,245,629	\$18,520,603	\$13,904,659
<b>E. Safety</b>	Freight Accident Costs	\$2,717,190	\$1,938,517	\$1,304,702
<b>Total Benefits (B) =</b>		<b>\$86,642,892</b>	<b>\$61,555,870</b>	<b>\$42,811,968</b>

### **Project Life Cycle Cost Analysis**

The cost of the SORR Rehabilitation & Presidio-Ojinaga International Bridge Project consists of capital expenditures, including replacement of the international bridge, track tie and surfacing, switch replacement, timber bridge component replacements, and drainage

improvements along the existing line from the new international rail bridge north to the Union Pacific Railroad (UPRR) crossing near Paisano Junction, Texas for approximately 72 miles in total. Since the project includes the reconstruction and rehabilitation of existing facilities within existing ROW, the project does not require additional ROW and is not a schedule constraint.

The Texas Department of Transportation (TxDOT) provided capital cost estimates (in 2015 dollars) and expected construction schedule for the Project (**Table 24**). The Project is expected to require \$16.2 million (in 2016 dollars) in capital expenditures, within a 18-month construction period. Environmental clearance has already begun on the project, and it is estimated that environmental clearance and permitting will be completed by March 2017. Once the environmental clearance and final permits are received, the project will be procured and awarded. This will be a five-month process with the international bridge project's anticipated letting date in fall 2017; construction is anticipated to begin one month later. Construction is expected to last 18 months and complete in May 2018. Phased construction costs over the construction period are allocated as follows: 40 percent in 2017, 50 percent in 2018, and 10 percent in 2019.

*Table 24: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project – Capital Cost Estimates*

Project Component	Component Cost (in 2016 Dollar)	Component (Percent)
International Bridge Replacement	\$7,703,810	47%
Track Tie, Surfacing, and Switches	\$4,030,710	25%
Bridge Component Replacements	\$380,520	2%
Bridge Tie Replacements	\$536,450	3%
Drainage Improvements	\$1,503,850	9%
Contingency	\$2,089,232	13%
Total =	<b>\$16,244,572</b>	<b>100%</b>
	<b>Start</b>	<b>End</b>
Construction Period	Sept, 2017	Feb, 2019
Annual Allocation (%) of Construction Spending	40%	60%
Construction Costs (in 2016\$)	\$6,497,829	\$9,746,743
Construction Costs (in 2015\$)	\$6,460,717	\$9,691,076

Source: Texas Department of Transportation (TxDOT).

Notes: (1) Since the project includes the reconstruction and rehabilitation of existing facilities within existing ROW, the project does not require additional ROW and is not a schedule constraint. (2) TXPF's contractual obligations have eliminated any future maintenance or rehabilitation requirements by the State for track infrastructure or the local communities for grade crossing surface conditions.(3). Construction costs were deflated from 2016 to 2015 dollars based on the Consumer Price Index (CPI) from all South Urban Areas provided by the Bureau of Labor Statistics (BLS).

**Table 25** presents the life cycle cost of the proposed SORR Rehabilitation & Presidio-Ojinaga International Bridge Project.

*Table 25: The SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Life Cycle Cost Analysis*

Year	Calendar Year	Project Year	Undiscounted Construction Cost (in 2015 Dollar)	Discounted	
				3%	7%
				NPV = [I/(1+3%)^A]	NPV = [I/(1+7%)^A]
0	2017	Const 1	\$6,460,717	\$6,460,717	\$6,460,717
1	2018	Const 2/1	\$9,691,076	\$9,408,812	\$9,057,081
2	2019	2			
3	2020	3			
4	2021	4			
5	2022	5			
6	2023	6			
7	2024	7			
8	2025	8			
9	2026	9			
10	2027	10			
11	2028	11			
12	2029	12			
13	2030	13			
14	2031	14			
15	2032	15			
16	2033	16			
17	2034	17			
18	2035	18			
19	2036	19			
20	2037	20			
<b>Total</b>			<b>\$16,151,794</b>	<b>\$15,869,529</b>	<b>\$15,517,798</b>

Source: Texas Department of Transportation (TxDOT)



Note: TXPF's contractual obligations have eliminated any future maintenance or rehabilitation requirements by the State for track infrastructure or the local communities for grade crossing surface conditions.

### Summary of Benefit-Cost Results

This memorandum describes the methodology used for conducting benefit-costs analysis (BCA) for the proposed SORR Rehabilitation & Presidio-Ojinaga International Bridge Project. The analysis quantifies the expected economic benefits generated by the potential truck-to-rail freight diversion in terms of reduced pavement maintenance cost and net reductions in freight operating costs, emissions and accidents arising from transporting goods via railroad as opposed to truckload carrier.

**Table 26** summarizes the BCA findings. Annual costs and benefits are computed over the lifecycle of the project (20 years). As stated earlier, construction is expected to be completed by 2019 and benefits to be accrued during the full operation of the project. The Project has a benefit-cost ratio of **2.8** at a real discount rate of 7 percent and **3.9** at a real discount rate of 3 percent. These findings demonstrate that there are significant long-term economic benefits associated with the Project, and is a regionally important project.

*Table 26: SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Summary of Benefit-Cost Analysis*

	Discounted at 7%	Discounted at 3%
<b>BENEFIT-COST RATIO = (B) / (C) =</b>	2.8	3.9
<b>NET PRESENT VALUE = (B) - (C) =</b>	\$27,294,170	\$45,686,341
<b>PROJECT COSTS</b>		
<b>Capital Costs (C) =</b>	\$15,517,798	\$15,869,529
<b>PROJECT BENEFITS</b>		
A. State of Good Repair (SOGR)	\$1,665,109	\$2,474,007
B. Economic Competitiveness	\$25,937,498	\$38,622,743
C. Sustainability	\$13,904,659	\$18,520,603
D. Safety	\$1,304,702	\$1,938,517
<b>Total Benefits (B) =</b>	<b>\$42,811,968</b>	<b>\$61,555,870</b>

These findings demonstrate the permanent, long-term value the Project generates for the regional economy and its likely effects on the environment and communities, including:

- A reduction in highway maintenance costs
- A reduction in highway congestion costs from displacing heavy truck travel
- A reduction in freight transportation costs due to better transit time and operating costs along the SORR served by the Texas Pacifico Transportation, Ltd. (TXPF)

- A reduction in air emission costs
- A reduction in highway safety costs

The Project direct benefits which total \$43 million (in 7 percent discounted 2015 dollars) over the lifecycle of the project (20 years) are distributed as follows:

- Freight shippers/consignees and end customers for goods will realize the greatest benefits, that is, \$26 million or 61 percent of the total quantified benefits, by shipping cargo by rail (as opposed of shipping it by truck) due to reductions in transit times and operating costs.
- Freight rail contributes to the quality of life of Presidio County residents by saving \$18.5 million in air pollutant costs and \$2.0 million in accident costs. The combined safety and environmental benefits represent 35 percent of the total direct benefits.
- Heavy trucks accelerate deterioration of roadways. Therefore, savings in truck vehicle-mile travelled (nearly 44.6 million truck VMT) prevent public agencies from spending \$1.7 million in pavement maintenance

At the regional level, the Project will have a positive impact by reducing energy producer input prices in the Permian Basin, creating new jobs in support of international trade, and increasing shipments of frac-sand, grain, automobile parts and critical exports. At a national level, this project will support energy independence as well as contribute to the efficient transportation of goods between the U.S. and Mexico, reactivating an international gateway for new service and relief to existing congestion.

The Project will foster the creation of high-paying jobs in a region with relatively high unemployment rates, reactivate an existing out-of-service international rail border crossing between the U.S. and Mexico, provide additional infrastructure for the movement of NAFTA freight between the two countries, and will improve safety and environmental conditions by removing truck traffic from state and national roadways.

The median household income in Presidio County is \$30,9834, while the unemployment rate is at 10 percent. This economically disadvantaged area would benefit from these high-paying jobs which would provide financial security for many who would otherwise be working in lower paying jobs or unemployed. Although not explicitly quantified as part of this BCA, a reduction in shipment costs may also help enable greater employment in Presidio County principally consisting of over 3,100 workers (**Table 27**). The counties served by the SORR area an Economically Distressed Area and the primary area of employment is rural.

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<sup>4</sup> U.S. Census Bureau, 2014 American Community Survey 5-Year Estimates

*Table 27: Employment by Industry in Presidio County, 2015*

Rank	Industry	Employment	Percentage of Total
1	Employment and payroll of local govt, education	323	10%
2	Employment and payroll of federal govt, non-military	276	9%
3	Employment and payroll of local govt, non-education	206	7%
4	Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming	152	5%
5	Extraction of natural gas and crude petroleum	117	4%
6	Truck transportation	98	3%
7	Full-service restaurants	80	3%
8	Retail - Gasoline stores	77	2%
9	Retail - Food and beverage stores	72	2%
10	Employment and payroll of state govt, non-education	67	2%
	Sub-Total=	1,468	47%
	<b>Total =</b>	<b>3,112</b>	<b>100%</b>

Source: Texas IMPLAN Model.

### **Economic Benefits Resulting from Project Spending on Construction**

Economic impacts from the proposed Project initially occur as a result of the actual construction of the project. Expenditures on construction are of economic value because infrastructure development disbursement increases the Gross Regional Product (GRP) and supports the creation and retention of construction related jobs.

The project construction expenditures serve as inputs into the Texas IMPLAN Model for analysing the economic impacts on Presidio County which is the project primary impact area. In estimating the economic impacts resulting from investment spending on construction the following assumptions are made:

- Only expenditures on equipment and materials within the primary impact area results in economic impacts within Presidio County. Any spending beyond Presidio County is considered expenditure leakages, and, consequently, has no economic value for the primary project area. This analysis assumes that about 50 percent of the total construction spending is expended outside the project area. As a result, construction

costs presented in **Table 24** are reduced by 50 percent to reflect the revised allocation of construction costs within the project primary impact area.

- Annual construction spending is allocated as follows: 40 percent in 2017, 50 percent in 2018, and 10 percent in 2019.

**Table 28** and **Table 29** displays the total (direct, indirect, and induced) effects on employment, labor income, GRP (or value added) and tax revenues generated by construction spending in years 2017 and 2018.

*Table 28. SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Total Economic Benefits Resulting from Construction Expenditures in 2017*

Impact Type	Employment	Labor Income (in 2016\$)	GRP (in 2016\$)
Direct Effect	84	\$1,219,262	\$1,641,568
Indirect Effect	12	\$300,457	\$497,743
Induced Effect	4	\$82,190	\$195,924
<b>Total Effect =</b>	<b>100</b>	<b>\$1,601,909</b>	<b>\$2,335,235</b>

Tax Revenue Type	Federal Tax Revenues (in 2016\$)	State & Local Tax Revenue (in 2016\$)	Total (in 2016\$)
Tax on Production and Imports	\$30,382	\$248,595	\$278,977
Social Security Contributions	\$123,029	\$3,993	\$127,022
Personal Income Tax	\$145,219	N/A	\$145,219
Corporate Profits and Dividend Taxes	\$18,048	\$528	\$18,576
Personal Sales and Property Taxes	N/A	\$23,865	\$23,865
<b>Total =</b>	<b>\$316,678</b>	<b>\$276,981</b>	<b>\$593,658</b>

Note: Estimated using the Texas IMPLAN Model

*Table 29. SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - Total Economic Benefits Resulting from Construction Expenditures in 2018*

Impact Type	Employment	Labor Income (in 2016\$)	GRP (in 2016\$)
Direct Effect	126	\$1,828,892	\$2,462,352
Indirect Effect	19	\$450,686	\$746,614
Induced Effect	6	\$123,285	\$293,886
<b>Total Effect =</b>	<b>151</b>	<b>\$2,402,863</b>	<b>\$3,502,853</b>

Tax Revenue Type	Federal Tax Revenues (in 2016\$)	State & Local Tax Revenue (in 2016\$)	Total (in 2016\$)
Tax on Production and Imports	\$45,573	\$372,892	\$418,465
Social Security Contributions	\$184,544	\$5,989	\$190,533

Personal Income Tax	\$217,828	N/A	\$217,828
Corporate Profits and Dividend Taxes	\$27,072	\$792	\$27,863
Personal Sales and Property Taxes	N/A	\$35,798	\$35,798
<b>Total =</b>	<b>\$475,017</b>	<b>\$415,471</b>	<b>\$890,488</b>

Note: Estimated using the Texas IMPLAN Model

## Long-Term Economic Benefits Resulting from Reduced Costs of Conducting Business in the Region

This section presents the long-term economic impacts resulting from the direct benefits generated by the Project over the 20-year analysis period. As shown, the project will generate savings related to freight shipping (transportation), emissions and accident costs, and will contribute to the good condition of the roadway infrastructure resulting due to the truck-to-rail freight diversion.

The economic impacts are estimated by applying the monetized savings in freight transportation costs and accidents as inputs into IMPLAN and then running the model (Table 30). These savings reduce the cost of conducting business in the region. Other benefits such as reduction in emission costs and pavement maintenance expenditures have no multiplier effect in the regional economy and therefore, they are not input into the economic model.

*Table 30. SORR Rehabilitation & Presidio-Ojinaga International Bridge Project - IMPLAN Input Variables*

Direct Benefit	Economic Input	IMPLAN Input Variable
Savings in freight transportation costs  Savings in accident costs	Reduced costs of conducting business accrue to individual industries based on (1) the proportion of each respective industries' output share of total industry output in the study region; (2) the value of the transportation services each respective industry consumes in order to produce one dollar of output based on the Transportation Satellite Accounts (TSA) coefficients and the economic output by industry within the study region as reported by the IMPLAN model in the year 2015; (3) the output elasticities with respect to freight (truck and rail) costs and ground (car and passenger train) travel costs for the good sector and the service sector, and (4) the price elasticities of freight (truck and rail) transport demand	Industry Change in Output

Table 31 presents the total (*direct, indirect, and induced*) effects on employment, labor income, GRP (or value added) and tax revenues generated by the project over the 20-year

analysis period. **Table 32** indicates the ten industry sectors in Presidio County most impacted by the project in terms of job creation.

*Table 31: SORR Rehabilitation & Presidio-Ojinaga International Bridge Project – Economic Impacts Generated over the 20-Year Analysis Period*

Impact Type	Employment	Labor Income (in 2016\$)	GRP (in 2016\$)
Direct Effect	290	\$6,968,534	\$12,337,599
Indirect Effect	96	\$2,121,760	\$3,192,272
Induced Effect	23	\$487,767	\$1,161,985
<b>Total Effect =</b>	<b>409</b>	<b>\$9,578,061</b>	<b>\$16,691,856</b>

Tax Revenue Type	Federal Tax Revenues (in 2016\$)	State & Local Tax Revenue (in 2016\$)	Total (in 2016\$)	Total (%)
Tax on Production and Imports	\$387,308	\$3,169,046	\$3,556,355	65%
Social Security Contributions	\$794,009	\$25,769	\$819,778	15%
Personal Income Tax	\$837,679	N/A	\$837,679	15%
Corporate Profits and Dividend Taxes	\$141,309	\$4,133	\$145,442	3%
Personal Sales and Property Taxes	N/A	\$141,345	\$141,345	2%
<b>Total =</b>	<b>\$2,160,305</b>	<b>\$3,340,294</b>	<b>\$5,500,599</b>	<b>100%</b>

Note: Estimated using the Texas IMPLAN Model

*Table 32: Economic Sectors Most Impacted by the SORR Rehabilitation & Presidio-Ojinaga International Bridge Project in terms of Employment*

Sector	Description	% of Total Employment
<b>395</b>	Wholesale trade	18%
<b>464</b>	Employment services	6%
<b>468</b>	Services to buildings	5%
<b>433</b>	Monetary authorities and depository credit intermediation	5%
<b>448</b>	Accounting, tax preparation, bookkeeping, and payroll services	5%
<b>143</b>	Manufactured home (mobile home) manufacturing	4%
<b>456</b>	Scientific research and development services	4%
<b>411</b>	Truck transportation	3%
<b>62</b>	Maintenance and repair construction of nonresidential structures	3%

436	Other financial investment activities		3%
		<b>Subtotal =</b>	56%
		<b>Total =</b>	100%

Note: Estimated using the Texas IMPLAN Model