U.S. Department of Transportation

National Infrastructure Investments Grant Program

"TIGER Discretionary"

GRANT APPLICATION SUPPORTING DOCUMENTATION

BENEFIT-COST ANALYSIS AND ECONOMIC IMPACTS

for

Project Name: **South Orient Rehabilitation – Sulphur Junction to Fort Stockton**

Project Type: **Rural Freight Rail Transportation Project**

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Texas Department of Transportation

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Executive Summary

The South Orient rail line (SORR) rehabilitation project from Sulphur Junction to Fort Stockton, Texas, is a rural freight rail project that will provide for the continued development of energy resources in an Economically Disadvantaged Area with a low per-capita income and a high percentage of the population living below the poverty level.. The SORR is expected to become inoperable within the next 5 to 10 years from Sulphur Junction (MP 869.4) to Fort Stockton (MP 881.92) due to substandard rail, defective ties, and track alignment deficiencies. The project will upgrade this 12.52 mile section of the SORR from Excepted Track status to Class 2 (25 mph) conditions. The "shovel ready" status of the project would cause the immediate creation of construction jobs while stimulating local economies and providing an incentive for businesses to begin using improved rail service in the region.

The rehabilitation of this section of the line is necessary in order to continue operations and provide safe and efficient rail service to existing customers. Mining interests have located on this section of the line and other mining businesses have requested rates for the transportation of petroleum products to/from the Fort Stockton region. This section of the rail line cannot support the movement of these hazmat cars in the volumes requested due to the operational impacts of the Excepted Track status.

The Benefit/Cost Analysis was based upon forecasted traffic and actual 2011 traffic on the SORR between Sulphur Junction and Fort Stockton. The traffic forecast was based upon a report entitled *"Potential Economic Impact of the South Orient Railroad"*, which was produced by Alliance Transportation Group for the Fort Stockton Economic Development Corporation in 2007. The report used data provided by the University of Texas' Center for Transportation Research and the Fort Stockton Economic Development Corporation. According to the report, the forecasted goods would travel in a northeast/southwest direction between Fort Stockton and Fort Worth[1]. The traffic forecast is considered to be conservative as it does not include the recent initiatives to ship unit trains of crude oil from Fort Stockton to Fort Worth. This proposed weekly traffic could add over 6,000 additional car loads to this section of the line annually.

A description of the baseline problem and the impacts of not rehabilitating the SORR are shown in Table 1.

[1] Most of the existing SORR traffic currently moves through Fort Worth. Fort worth is also the closest point to Fort Stockton that has an adequate Interstate, U.S., and State highway system with rail connections, and was therefore used for determining Vehicular Miles Traveled in this analysis. The rail yard at San Angelo is near capacity serving customers in that area and therefore cannot be used as an alternative trans-loading site.

Baseline & Problem to Be Addressed	Change to Baseline/ Alternatives	Type of Impacts	Population Affected by Impacts	Economic Benefit	Summary of Results	Page Reference in BCA
Deteriorating Track Conditions Result in Cessation of Service from Sulphur Junction to Fort Stockton within 5 to 10 years	Diversion of freight from rail to truck causes increased highway maintenance	$0.127 increase in pavement maintenance per truck mile	Highway maintenance funds	Avoided highway maintenance costs from rail rehabilitation	**$35.5 million** in avoided highway maintenance costs if project completed	8, 9
	Diversion of freight from rail to truck causes increased congestion	$0.022 for congestion per truck mile	Vehicular drivers experiencing increased delays and vehicle/truck conflicts	Avoided congestion increase from rail rehabilitation	**$6.1 million** in avoided congestion costs if project completed	8, 9
	Diversion of freight from rail to truck causes safety impacts	$0.009 for crashes per truck mile	Public safety impacts from increased truck miles traveled	Avoided highway safety costs from rail rehabilitation	**$2.5 million** in avoided safety costs if project completed	8, 9
	Diversion of freight from rail to truck causes increased noise	$0.002 for noise pollution per truck mile	Noise increase in local communities	Avoided noise impacts from rail rehabilitation	**$0.55 million** in avoided noise costs if project completed	8, 9
	Diversion of freight from rail to truck causes increased emissions	$0.038 for air pollution per truck mile	Environment (all)	Avoided emissions increase from rail rehabilitation	**$11.6 million** in avoided emissions if project completed	8, 10
	Diversion of freight from rail to truck causes increased fuel use	$3.00 per gallon of fuel per truck mile	Shippers, receivers, economic, environmental	Avoided fuel costs from rail rehabilitation	**$147.9 million** in avoided fuel costs if project completed	8, 11

Table 1: Project Impact Matrix – Current Traffic

The estimated impacts from avoided truck traffic show a savings of over $204 million over a 20 year period. The project will have positive direct and indirect impacts on the economy, employment levels, tax revenues, and highway costs. The discounted benefit/ cost analysis are summarized in Table 2.

Category	Benefit @ 7% Discount	Cost
Construction & Maintenance Cost		$10,123,865
Evaluated Benefits		
Highway Maintenance	$35,532,017	
Congestion	$6,127,559	
Safety	$2,518,017	
Noise	$558,511	
Emissions	$11,664,936	
Fuel	$147,948,048	
Total	**$204,349,088**	**$10,123,865**

Table 2: Discounted Project Benefit/Cost Summary

The economic indicators for the project show a discounted return on investment of 2,070% over 20 years with a Benefit/Cost ratio of 20.7 to 1. A summary of the economic indicators is shown in Table 3.

Economic Indicators	Total	Discounted 7%	Discounted 3%
Total Costs	$ 10,123,865	$ 9,415,194	$ 9,820,149
Total Benefits	$ 219,730,329	$ 204,349,088	$ 213,138,419
NPV	$ 209,606,464	$ 194,933,894	$ 203,318,270
ROI	1,970%	2,070%	5,217%
B/C	20.7/1	20.71	20.7/1

Table 3: Economic Indicators

The project will maintain the rail line in a state of good repair through a contractual agreement that requires the lessee to keep the rail line in the improved condition once the project is completed. It will improve the long-term efficiency and reliability of this transportation resource and contribute to the economic competitiveness of the region and state. It will provide additional transportation choices for energy and other businesses in the region and avoid adverse environmental impacts by encouraging the diversion of freight from highway to rail and prevent the diversion of existing freight from highway to rail.

The project was environmentally cleared by the state on March 13, 2009 and is “shovel ready”. The project can go to letting within 90 days of the execution of a grant agreement.

I. Benefit-Cost Analysis

A. Introduction

To assess the viability of the SORR for a TIGER 2012 Discretionary Grant, a benefit-cost analysis was performed. The benefit-cost analysis assesses the benefits to society of the project relative to the costs of the project. The benefits of the project are derived by comparing the "No Build" to the "Build" conditions. If the SORR is not rehabilitated it is expected to become inoperable between Sulphur Junction and Fort Stockton (No Build) within the next 5 to 10 years. In this No Build scenario, the existing and projected freight on that section of the line would be diverted to highways and immediately become negative impacts on society with the associated costs. If the SORR is rehabilitated (Build), rail operations would improve and benefits would result from the avoided impacts of diverting freight from rail to highway and increased economic opportunity from an improved rail facility.

The impacts to society which would occur if rail service ceased have been identified and quantified to determine the cost of diverting freight from the rail line to the highway. A conservative growth factor of 3.0% was used to project those benefits for 20 years and subsequently discounted 7% for use in determining the benefit/cost ratio.

The Benefit-Cost Analysis was based upon forecasted traffic and actual 2011 traffic on the SORR between Sulphur Junction and Fort Stockton. The forecasted traffic was determined from a report entitled *"Potential Economic Impact of the South Orient Railroad"*, which was produced by Alliance Transportation Group for the Fort Stockton Economic Development Corporation in 2007. The report used data provided by the University of Texas' Center for Transportation Research and the Fort Stockton Economic Development Corporation. According to the report, freight movements to/from Fort Stockton would increase on the South Orient if the line were rehabilitated. The goods identified in the report were projected to travel in a northeast/southwest direction between Fort Stockton and Fort Worth[2]. The traffic forecast is considered to be conservative as it does not include the recent initiatives to ship unit trains of crude oil from Fort Stockton to Fort Worth. This proposed weekly traffic could add over 6,000 additional car loads to the forecasted traffic on this section of the line annually.

[2] Most of the existing SORR traffic currently moves through Fort Worth. Fort Worth is also the closest point to Fort Stockton that has an adequate Interstate, U.S., and State highway system with rail connections, and was therefore used for determining Vehicular Miles Traveled in this analysis. The rail yard at San Angelo is near capacity serving customers in that area and therefore cannot be used as an alternative trans-loading site.

Several public benefits have been assessed that result from shipping by railway as compared to shipping by truck and quantified over a twenty year period. These effects are measured and the net effect (or benefits) monetized. These benefits include:

Benefit #1 - Highway maintenance cost savings: heavy trucks put a great deal of physical wear and tear on roads, and the roads must be maintained at the taxpayer's expense. Moving the existing freight by rail instead of trucks reduces the amount of truck travel and leads to less required highway maintenance and associated costs. This cost reduction benefit is quantified by determining the avoided highway maintenance costs from moving the existing freight by rail instead of truck.

Benefit #2 - Highway congestion relief benefits: a truck takes up more physical space on the road than a car and typically operates at lower speeds depending on grades, tonnage, operating characteristics, and speed limits. This benefit determines the avoided highway congestion cost savings for the regional population.

Benefit #3 - Safety benefits: highway accidents should diminish as freight is diverted from trucks to railcars. This benefit calculates the avoided highway safety costs from moving the freight by rail.

Benefit #4 – Noise benefits: a 100-car train can move the same amount of freight as 350 trucks, on average. Reducing the number of trucks on the roadways provides a significant reduction in noise along those roadways and in the communities they traverse. This benefit captures the avoided noise costs.

Benefit #5 - Reduction in emissions: this benefit category captures the emissions quantities avoided that result from moving the freight by rail.

Benefit #6 – Fuel savings: the Association of American Railroads (AAR) has determined that a freight train (on average) can carry one ton of cargo a distance of 480 miles on a single gallon of fuel, making them four times more fuel efficient than trucks. This high level of efficiency reduces the nation's dependence on foreign oil and helps shrink its carbon footprint. This benefit identifies the fuel savings from moving the freight by rail versus truck.

In all calculations for this analysis a conservative diversion of 3.5 trucks per rail car was assumed. Each of these figures was multiplied by the total annual truck miles to determine the impact that would occur to society and the highway system if the rail freight was diverted to highway. A summary of the project benefits is shown in Table 4.

Benefit #	Description	Category	Effects	Benefit
1	Avoided Highway Maintenance Costs	State of Good Repair	Rail line & roadways in state of good repair	$35,532,017
2	Avoided Highway Congestion	Livability, Environmental Sustainability	Avoided vehicular/truck conflicts	$6,127,559
3	Avoided Highway Safety Costs	Safety	Avoided crashes	$2,518,017
4	Avoided Truck Noise	Livability	Avoided truck noise near communities	$558,511
5	Avoided Truck Emissions	Environmental Sustainability	Avoided truck emissions improve air quality	$11,664,936
6	Avoided Truck Fuel Costs	Economic Competitiveness, Energy Independence	Avoided truck fuel use contributes to lower consumer prices & energy independence	$147,948,088
	Total			**$204,349,088**

Table 4: Summary of Benefits

B. Benefit Calculations

Several customers have received materials at the Fort Stockton rail yard for trans-loading over the last five years. These have included 283 carloads of pipe, 817 carloads of sand, and 454 carloads of wind towers. However, only the Tex-Sand Corporation was used in this analysis as they located a permanent sand unloading facility at the rail yard in Fort Stockton late in 2009. In 2010, Tex-Sand received 414 carloads at the facility in Fort Stockton, an average rate of approximately 34 carloads per month. In 2011, Tex-Sand received 924 carloads, a 123% increase in carloads from 2010 to 2011. This sand is being shipped to Fort Stockton from the Chippewa County, Wisconsin region – a distance of approximately 1,355 miles.

Although Tex-Sand has projected up to 100 carloads of sand per week by mid-2012, this analysis uses their 2011 traffic level **(924 carloads)** for determining impacts. Other customers have expressed an interest in locating rail-served facilities in the Fort Stockton region and some are moving ahead with developing plans for those facilities. The traffic forecasts developed by Alliance Transportation Group[3] (ATG) were used to project possible traffic increases on the SORR.

[3] See "Potential Economic Impact of the South Orient Railroad" at http://www.txdot.gov/business/rail/tiger2012.htm for additional information.

The ATG study projected that the rehabilitation of the line to Fort Stockton would increase rail cars on the line in the first year as shown in Table 5. A conservative diversion of 3.5 trucks per rail car was assumed. Table 6 shows that the railcars that could be moved between Fort Stockton and Fort Worth represent over 11 million vehicle-miles-traveled by trucks on an annual basis.

Commodity	Carloads	Equivalent Trucks
Sand (Existing Traffic)	924	3,234
Limestone Aggregate	1,300	4,550
Gravel	1,300	4,550
Processed Livestock Feed	150	525
Diesel Fuel	48	168
Corn & Milo	120	420
Cottonseed	500	1,750
Feed Grains	120	420
Drilling Fluids	200	700
Wind Towers	70	245
Total	**4,732**	**16,562**

Table 5: Projected Carloads and Truck Equivalency based on 3.5 Carloads/truck

Estimated Additional VMT Due to Modal Shift from Rail To Highway												
Annual		**Total Loaded Railcars**		**Avg. Truckloads per Railcar**		**Total Trucks**			**Route Mileage***		**Truck Mileage**
Current		**924**	**x**	**3.5**	**=**	**3,234**		**x**	**676**	**=**	**2,186,184**
Forecast		**3,808**	**x**	**3.5**	=	**13,328**		**x**	**676**	**=**	**9,009,728**
									Total	**=**	**11,195,912**

Table 6: Estimated Annual Avoided Truck VMT in Corridor

The information presented in the report was used to determine some of the benefits that would result from moving this freight by rail versus truck. The analysis used the FHWA's Highway Cost Allocation Study (updated May 2008) methodology for highway maintenance, congestion, safety, and noise impacts.

1.Highway Cost Calculation Methodology

The FHWA study found that the impacts of operating an 80 kip 5-axle truck on rural interstate were:

- $0.127 for pavement maintenance per truck mile,
- $0.022 for congestion per truck mile,
- $0.009 for crashes per truck mile, and
- $0.002 for noise pollution per truck mile.

These FHWA costs were multiplied by the annual truck miles traveled that would accumulate from the diversion of freight from rail to highways (no build). These same costs can be considered a benefit if the rail line is rehabilitated , which would prevent the diversion of freight from rail to highway (build). The impacts of pavement maintenance, congestion, crashes, and noise pollution using FHWA's costs are quantified in Table 7.

2. Emissions Cost Calculation Methodology

Emissions impacts were determined in accordance with the TIGER Benefit-Cost Analysis Resource Guide. The methodology used to determine emissions impacts uses the grams of pollutants per truck mile traveled by year. The methodology used to determine emissions impacts is:

1. # Cars Moved x 3.5 trucks per car = #Trucks
2. #Trucks x Route Miles = Vehicle Miles Traveled
3. Grams per VMT x VMT = Grams emitted
4. Grams emitted / Grams per ton = Tons Emitted
5. Tons Emitted x Cost per ton = Emissions Cost

The impacts of emissions avoided are quantified in Table 8.

3. Fuel Cost Calculation Methodology

Fuel impacts were determined using AAR statistical information. The AAR has determined that railroads can move a ton of freight 480 miles on a gallon of fuel. The AAR has also determined that rail freight movements are four times more fuel efficient than trucks.[4] The methodology used to determine fuel used by rail versus truck is:

1. # Cars Moved x 100 = Annual Tons[5]
2. Annual Tons x Route Miles = Ton Miles
3. Ton Miles / 480 mpg per ton = Gallons of Fuel, Rail
4. Gallons of Fuel, Rail x 4 = Gallons of Fuel, Truck

The impacts of avoided truck fuel use are quantified in Table 9.

[4] *See* ASSOCIATION OF AMERICAN RAILROADS, ENVIRONMENT, http://www.aar.org/~/media/aar/backgroundpapers/railroadsgreenfromthestart.ashx

[5] Assuming 100 tons per car, average.

Impact to Highways if SORR Ceases Operations - Sulphur Junction to Fort Stockton Traffic

Total Loaded Railcars		Avg. Truckloads per Railcar		Equivalent Trucks		Route Mileage		Truck Mileage
4,732	x	3.5	=	16,562	x	676	=	11,195,912

Impacts to Highways from Freight Diversion			Year	Pavement Only	Congestion	Crashes	Noise	Truck Miles Avoided
Costs for 80 kip 5-axle on rural interstate****								
	Cents/truck-mile	$/Year	2014	$1,421,881	$246,310	$100,763	$22,392	11,195,912
			2015	$1,464,537	$253,699	$103,786	$23,064	11,531,789
			2016	$1,508,473	$261,310	$106,900	$23,755	11,877,743
Pavement (loaded)	0.127	$1,421,881	2017	$1,553,728	$269,150	$110,107	$24,468	12,234,075
			2018	$1,600,339	$277,224	$113,410	$25,202	12,601,098
Congestion	0.022	$246,310	2019	$1,648,350	$285,541	$116,812	$25,958	12,979,131
			2020	$1,697,800	$294,107	$120,317	$26,737	13,368,504
Crashes	0.009	$100,763	2021	$1,748,734	$302,930	$123,926	$27,539	13,769,560
			2022	$1,801,196	$312,018	$127,644	$28,365	14,182,646
Noise pollution	0.002	$22,392	2023	$1,855,232	$321,379	$131,473	$29,216	14,608,126
			2024	$1,910,889	$331,020	$135,417	$30,093	15,046,370
Total annual cost =		**$1,791,346**	2025	$1,968,216	$340,951	$139,480	$30,996	15,497,761
			2026	$2,027,262	$351,179	$143,664	$31,925	15,962,693
20 yr Total Cost, Discounted 7%=		**$44,736,105**	2027	$2,088,080	$361,715	$147,974	$32,883	16,441,574
			2028	$2,150,722	$372,566	$152,413	$33,870	16,934,821
			2029	$2,215,244	$378,155	$156,986	$34,886	17,442,866
			2030	$2,281,701	$389,499	$161,695	$35,932	17,966,152
			2031	$2,350,152	$401,184	$166,546	$37,010	18,505,137
****From FHWA's Highway Cost Allocation Study			2032	$2,420,657	$413,220	$171,543	$37,565	19,060,291
			2033	$2,493,277	$425,616	$176,689	$38,692	19,632,099
*****Assumes a 3% annual increase in traffic & costs								
			Total 20 years	**$38,206,470**	**$6,588,774**	**$2,707,545**	**$600,550**	**300,838,348**
			Disounted 7%	**$35,532,017**	**$6,127,559**	**$2,518,017**	**$558,511**	

*****Additional costs assumes a 3% annual increase in costs

Total 20 years	**$6,420,179**	**$1,112,157**	**$454,973**	**$101,105**	**50,552,591**

Table 7: Avoided Highway Costs from SORR Rehabilitation – Sulphur Junction to Fort Stockton

Year	CO2	CO	NOx	PM10	Sox	VOC	VMT	CO2 Short Tons	CO2 Cost	Other Pollutants Long Tons
			Grams of Pollutants Emitted per VMT by Trucks at 60 mph*							
2014	1267.478	3.019971	6.897128	0.299371	0.012204	0.563989	11,195,912	15,642	$364,469	119
2015	1269.423	2.843552	6.34293	0.282011	0.012219	0.528985	11,531,789	16,136	$384,047	114
2016	1271.37	2.677439	5.833264	0.265657	0.012234	0.496154	11,877,743	16,646	$404,498	109
2017	1273.32	2.52103	5.36455	0.250252	0.012249	0.465361	12,234,075	17,172	$425,858	104
2018	1275.274	2.373758	4.933498	0.23574	0.012264	0.436478	12,601,098	17,714	$448,164	99
2019	1277.23	2.235089	4.537082	0.222069	0.012279	0.409389	12,979,131	18,273	$471,453	95
2020	1279.19	2.104521	4.172519	0.20192	0.012294	0.38398	13,368,504	18,850	$495,767	90
2021	1281.152	1.98158	3.837249	0.197061	0.012309	0.360149	13,769,560	19,446	$525,036	87
2022	1283.118	1.865822	3.528919	0.185633	0.012324	0.337796	14,182,646	20,060	$553,652	83
2023	1285.086	1.756825	3.245363	0.174868	0.012339	0.316831	14,608,126	20,693	$585,622	79
2024	1287.057	1.654196	2.984592	0.164728	0.012355	0.297167	15,046,370	21,347	$616,924	76
2025	1289.032	1.557562	2.744774	0.155175	0.01237	0.278724	15,497,761	22,021	$651,821	72
2026	1291.009	1.466573	2.524226	0.146177	0.012385	0.261425	15,962,693	22,716	$686,036	69
2027	1292.99	1.3809	2.3214	0.1377	0.0124	0.2452	16,441,574	23,434	$724,105	66
2028	1294.974	1.300231	2.134871	0.129715	0.012415	0.229982	16,934,821	24,174	$761,476	63
2029	1296.96	1.224275	1.96333	0.122193	0.01243	0.215708	17,442,866	24,937	$800,486	61
2030	1298.95	1.152756	1.805573	0.115107	0.012446	0.20232	17,966,152	25,725	$843,773	58
2031	1300.943	1.085415	1.660491	0.0108432	0.012461	0.189764	18,505,137	26,537	$886,342	54
2032	1302.938	1.022008	1.527068	0.102144	0.012476	0.177986	19,060,291	27,375	$933,495	53
2033	1304.937	0.962305	1.404365	0.096221	0.012491	0.166939	19,632,099	28,240	$979,919	51
Total 20 years							**300,838,348**	**427,139**	**$12,542,942**	**1,602**
							Discounted 7% =		**$11,664,936**	

*Grams of Pollutants per VMT from Calif. Dept of Transportation Life-cycle Benefit/Cost Analysis Model Technical Supplement User's Guide 2009

Calculation based on 4,732 carloads x 3.5 trucks per car = 16,562 trucks

16,562 trucks x 676 route miles = 11,195,912 VMT
3% annual growth factor included in VMT for increased traffic

Table 8: Emissions Impacts if SORR Freight is Diverted to Truck

Fuel Impacts if SORR Freight is Diverted to Truck

Route Mileage = 686

Year	Rail Tons	Rail Fuel (gals)**	Truck Fuel (gals)**	Reduction Rail vs Truck	Cost Savings @ $3/gal base
2014	473,200	676,282	2,705,120	2,028,838	$6,086,514
2015	487,396	686,426	2,745,697	2,059,271	$6,177,812
2016	502,018	707,019	2,828,068	2,121,049	$6,270,479
2017	517,078	728,230	2,912,910	2,184,680	$6,458,593
2018	532,591	750,076	3,000,297	2,250,221	$6,652,351
2019	548,568	772,579	3,090,306	2,317,727	$6,851,922
2020	565,026	795,756	3,183,015	2,387,259	$7,057,479
2021	581,976	819,629	3,278,506	2,458,877	$7,269,204
2022	599,436	844,218	3,376,861	2,532,643	$7,487,280
2023	617,419	869,544	3,478,167	2,608,622	$7,711,898
2024	635,941	895,631	3,582,512	2,686,881	$7,943,255
2025	645,480	922,499	3,689,987	2,767,487	$8,181,553
2026	664,845	950,174	3,800,687	2,850,512	$8,426,999
2027	684,790	978,680	3,914,707	2,936,027	$8,679,809
2028	705,334	1,008,040	4,032,148	3,024,108	$8,940,204
2029	726,494	1,038,281	4,153,113	3,114,832	$9,208,410
2030	748,289	1,069,430	4,277,706	3,208,276	$9,484,662
2031	770,737	1,101,513	4,406,037	3,304,525	$9,769,202
2032	793,859	1,134,558	4,538,218	3,403,660	$10,062,278
2033	817,675	1,168,595	4,674,365	3,505,770	$10,364,146
Total 20 years	**12,618,152**	**17,917,159**	**71,668,425**	**53,751,266**	**$159,084,048**
			Discounted 7%		**$147,948,165**

* Carload calculation based upon Sulphur Junction to Fort Stockton traffic of
4,732 cars per year at 100 tons per car with a 3% annual growth factor

**Using the AAR's statistics: 473,200 tons 676 x miles = 324,615,200 ton-miles;
divided by 480 miles per ton = 676,282 gallons of fuel used by rail.
Rail is 4 times more fuel efficient than truck.Trucking fuel is therefore 676,282 x 4 = 2,705,120

Table 9: Fuel Impacts if SORR Freight to/from Fort Stockton is Diverted to Truck

The impacts from diverting the freight from rail to highway over 20 years are summarized in the narrative below.

Benefit #1 – The analysis determined that 50,552,591 truck miles traveled would be added to the highway system if the SORR becomes inoperable between Sulphur Junction and Fort Stockton. The added **highway maintenance** costs from this base case traffic totalled **$35,532,017**.

Benefit #2 – The highway **congestion** that would result from the diversion of the existing freight from rail to truck is valued at **$6,127,559.**

Benefit #3 - Highway accidents should increase as freight if the SORR becomes inoperable and freight is diverted from railcars to trucks. The FHWA highway cost allocation methodology assigns a $0.009 per truck mile traveled for crashes. The resultant **safety** impact would therefore be **$2,518,017**.

Benefit #4 – The increase in **noise** from diverting the freight from rail to truck is valued at **$558,511** using the FHWA methodology.

Benefit #5 – The analysis showed that if the existing materials had been transported by truck, those trucks would have emitted 9,446,113 tons of carbon dioxide (CO_2); while transporting the same freight by rail resulted in only 794,398 tons of CO_2 emissions. This represents a 92% reduction in CO_2 emissions from shipping by rail. The **emissions** methodology places a **$11,664,936** impact on society from this pollution.

Benefit #6 – The **fuel** used to transport the existing freight would increase by 10,342,845 gallons, with a cost increase of **$147,948,048** (at a constant $3 per gallon).

C. Cost Calculations

The cost of developing plans, specifications, estimates, and environmental clearances for the project has been absorbed by TxDOT and will not be charged to the project.

1. Project Construction Costs

The project estimate and uses of funds are shown in Table 10.

Description	Unit	Unit Cost	Quantity	Total
Rail	Linear Foot	$40	132,211	$5,288,440
Crossties Installation	Each	$77	20,000	$1,540,000
Ballast	Ton	$50	7,512	$375,600
Surfacing & Regulating	Mile	$6,500	12.52	$81,380
Timber Grade Crossings	Linear Foot	$800	68	$54,400
Turnouts - Complete	Each	$20,000	4	$80,000
Subtotal				$7,419,820
Engineering & Contingencies	7%			$519,387
Mobilization	8%			$593,586
Total				**$8,532,793**

Table 10: Project Estimate and Uses of Funds

2. Project Maintenance Costs

The maintenance costs of the rehabilitated section of the line are estimated at $5,000 per mile per year. The maintenance costs were projected with a 2.45% to reflect the average inflation rate for the last 10 years[6]. Table 11 shows the annual calculated maintenance costs.

[6] http://www.usinflationcalculator.com/inflation/current-inflation-rates/

Projected Maintenance Costs - 2.45% growth*					
	Total Project Mileage		**Annual Maintenance Cost per Mile**		**Annual Cost**
	12.52	**x**	**$5,000**	**=**	**$62,600**
		Year	**Annual Cost**		
		2014	$62,600		
		2015	$64,134		
		2016	$65,705		
		2017	$67,315		
		2018	$68,964		
		2019	$70,654		
		2020	$72,385		
		2021	$74,158		
		2022	$75,975		
		2023	$77,836		
		2024	$79,743		
		2025	$81,697		
		2026	$83,699		
		2027	$85,749		
		2028	$87,850		
		2029	$90,002		
		2030	$92,207		
		2031	$94,466		
		2032	$96,781		
		2033	$99,152		
		Total 20 years	**$1,591,072**		
*Based on average inflation for 2001 - 2011					
Source: www.usinflationcalculator.com/inflation/current-inflation-rates/					

Table 11: Estimated Maintenance Costs for Project Area

As Table 11 shows, the annualized cost of maintaining this 16 mile project over 20 years at 2.45% growth is $1,591,072.

On June 15, 2009, the Lease and Operating Agreement between TxDOT and TXPF for the SORR was amended as agreed to by both parties. Article V, "Duty to maintain rail line" states:

"…Lessee must maintain a segment in the same or better condition, as compared to the segment's condition when the upgrade was completed by the State.", and;

"Lessee must not allow the condition of the track (including the alignment and profile of the rails) to deteriorate in any substantial manner or form.", and;

"Lessee must undertake all maintenance and repairs needed to satisfy this requirement. If Lessee or FRA issue a "slow order", designate track as "excepted", or otherwise prohibit rail operations at speeds of 25 mph or greater, the Lessee must repair and rehabilitate the line within 60 days (unless Lessee and the State agree in writing to another deadline) so that FRA requirements allow rail operations at 25 mph or greater."

The cost of maintaining the project will be the responsibility of TXPF and its parent company, Groupo Mexico, which have adequate resources to meet this obligation. This will eliminate any future maintenance or rehabilitation requirements by the state and guarantee that the rail line will remain at 25 mph after the rehabilitation is complete, making this a sustainable project with financial feasibility and long-term benefits.

3. Project Funding

The construction and project management costs would be funded by a $100,000 contribution in state funds from TxDOT, a $200,000 contribution in local funds from the Fort Stockton Economic Development Corporation, $2,389,182 in private contributions from TXPF, and $5,843,611 in TIGER 2012 Discretionary Grant Funds, as shown in Table 12.

Funding Source	Participation	Total
TxDOT	1.2%	$ 100,000
Fort Stockton Economic Development Corp.	2.3%	$ 200,000
TXPF	28.0%	$2,389,182
TIGER	68.5%	$ 5,843,611
TOTAL	**100%**	**$8,532,793**

Table 12: Sources of Funds

D. Benefit – Cost Calculations

The rehabilitation of this section of the line is necessary in order to continue operations and provide safe and efficient rail service to existing customers. The Benefit/Cost

Analysis was based upon forecasted traffic and actual 2011 traffic on the SORR between Sulphur Junction and Fort Stockton. The traffic forecast was based upon a report entitled *"Potential Economic Impact of the South Orient Railroad"*, which was produced by Alliance Transportation Group for the Fort Stockton Economic Development Corporation in 2007. The report used data provided by the University of Texas' Center for Transportation Research and the Fort Stockton Economic Development Corporation. According to the report, the forecasted goods would travel in a northeast/southwest direction between Fort Stockton and Fort Worth[7]. The traffic forecast is considered to be conservative as it does not include the recent initiatives to ship unit trains of crude oil from Fort Stockton to Fort Worth. This proposed weekly traffic could add over 6,000 additional car loads to this section of the line annually.

A description of the baseline problem and the impacts of not rehabilitating the SORR is shown in the Project Impact Matrix on Table 13.

[7] Most of the existing SORR traffic currently moves through Fort Worth. Fort worth is also the closest point to Fort Stockton that has an adequate Interstate, U.S., and State highway system with rail connections, and was therefore used for determining Vehicular Miles Traveled in this analysis. The rail yard at San Angelo is near capacity serving customers in that area and therefore cannot be used as an alternative trans-loading site.

Baseline & Problem to Be Addressed	Change to Baseline/ Alternatives	Type of Impacts	Population Affected by Impacts	Economic Benefit	Summary of Results	Page Reference in BCA
Deteriorating Track Conditions Result in Cessation of Service from Sulphur Junction to Fort Stockton within 5 to 10 years	Diversion of freight from rail to truck causes increased highway maintenance	$0.127 increase in pavement maintenance per truck mile	Highway maintenance funds	Avoided highway maintenance costs from rail rehabilitation	**$35.5 million** in avoided highway maintenance costs if project completed	8, 9
	Diversion of freight from rail to truck causes increased congestion	$0.022 for congestion per truck mile	Vehicular drivers experiencing increased delays and vehicle/truck conflicts	Avoided congestion increase from rail rehabilitation	**$6.1 million** in avoided congestion costs if project completed	8, 9
	Diversion of freight from rail to truck causes safety impacts	$0.009 for crashes per truck mile	Public safety impacts from increased truck miles traveled	Avoided highway safety costs from rail rehabilitation	**$2.5 million** in avoided safety costs if project completed	8, 9
	Diversion of freight from rail to truck causes increased noise	$0.002 for noise pollution per truck mile	Noise increase in local communities	Avoided noise impacts from rail rehabilitation	**$0.55 million** in avoided noise costs if project completed	8, 9
	Diversion of freight from rail to truck causes increased emissions	$0.038 for air pollution per truck mile	Environment (all)	Avoided emissions increase from rail rehabilitation	**$11.6 million** in avoided emissions if project completed	8, 10
	Diversion of freight from rail to truck causes increased fuel use	$3.00 per gallon of fuel per truck mile	Shippers, receivers, economic, environmental	Avoided fuel costs from rail rehabilitation	**$147.9 million** in avoided fuel costs if project completed	8, 11

Table 13: Project Impact Matrix

The estimated impacts from avoided truck traffic show a savings of over $204 million over a 20 year period. The project will have positive direct and indirect impacts on the economy, employment levels, tax revenues, and highway costs. The discounted benefit/ cost analysis are summarized in Table 14.

Category	Benefit @ 7% Discount	Cost
Construction & Maintenance Cost		$10,123,865
Evaluated Benefits		
Highway Maintenance	$35,532,017	
Congestion	$6,127,559	
Safety	$2,518,017	
Noise	$558,511	
Emissions	$11,664,936	
Fuel	$147,948,048	
Total	**$204,349,088**	**10,123,865**

Table 14: Discounted Project Benefit/Cost Summary

The economic indicators for the project show a discounted return on investment of 2,070% over 20 years with a Benefit/Cost ratio of 20.7 to 1. A summary of the economic indicators is shown in Table 15.

Economic Indicators	Total	Discounted 7%	Discounted 3%
Total Costs	$ 10,123,865	$ 9,415,194	$ 9,820,149
Total Benefits	$ 219,730,329	$ 204,349,088	$ 213,138,419
NPV	$ 209,606,464	$ 194,933,894	$ 203,318,270
ROI	1,970%	2,070%	5,217%
B/C	20.7/1	20.71	20.7/1

Table 15: Economic Indicators

The project will maintain the rail line in a state of good repair through a contractual agreement that requires the lessee to keep the rail line in the improved condition once the project is completed. It will improve the long-term efficiency and reliability of this transportation resource and contribute to the economic competitiveness of the region and state. It will provide additional transportation choices for energy and other businesses in the region and avoid adverse environmental impacts by encouraging the diversion of freight from highway to rail and prevent the diversion of existing freight from highway to rail.

III. Job Creation & Near Term Economic Activity

A. Direct Construction Job Creation

The project promotes both short and long-term job creation and preservation of jobs by providing for the rehabilitation of an existing, deteriorating rail line that is expected to become inoperable within 5 to 10 years. According to the project schedule and manning estimates, a total of 251 construction related job positions will be manned during the 16 month construction period. Table 16 shows the estimated project schedule and jobs in each task category.

	2012										2013											
Task	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PSE Completion																						
Env. Clearance																						
TIGER Agreement																						
Project Letting																						
Contract Execution																						
Mobilization						8	8															
Rail Replacement								8	8	8	8	8	8	8	5							
Turnout Construction													5	5	5	5	5					
Ballast Delivery										4	4	4	4	4	4	4	4	4	4			
Surfacing & Regulating										3	3	3	3	3	3	3	3	3	3	3	3	
Grade Crossings												6	6	6								
Construction Management						2	2	3	4	4	4	4	4	4	4	4	4	4	2	2	2	1
Monthly Jobs						10	10	11	12	19	19	25	30	30	21	17	16	11	9	5	5	1

Table 16: Project Schedule & Jobs Created

The average salary of railroad construction workers is estimated to range from $26,819 to $50,488[8]. The mid point of these salaries is $38,653, which is well above the Pecos

[8] www.cbsalary.com

County average of $15,939. Actual salaries may vary based upon individual employer's pay scales and policies, but the overall average wage of these jobs is expected to significantly exceed the Pecos County average. It is also estimated that at least five (5) of these jobs will be entry-level laborer positions that will manned from the local communities, creating employment and on-the-job training opportunities in an Economically Disadvantaged Area. The contractor will coordinate with the Texas Workforce Commission in hiring local workers for these positions.

The construction jobs includes skilled positions such as project supervisors, machine operators, welders, carpenters, concrete workers, and general laborers. Personnel who are hired to fill vacant positions will receive on-track safety training, on-the-job rail worker training, and other training opportunities that will increase their skill set and may lead to further employment in the railroad construction industry.

The wages earned were estimated by multiplying the number of jobs (15) by the average wages earned ($38,653) in 16 months (1.3 years). The wages of the construction managers and inspectors were determined by multiplying the average number of jobs (3.17) by the average wages earned ($38,653) in 17 months (1.4 years). Table 17 shows the direct job creation impact from the project.

Jobs	Number	Avg. Wage	Years	Total
Construction	15	$38,653	1.30	$ 753,774
Management & Inspection	3	$38,653	1.41	$ 172,767
Total	18			$ 926,541

Table 17: Direct Job Creation Impacts

These jobs would be created quickly since the project is ready to let in 2012, and the resultant fiscal impacts to the region would begin immediately thereafter.

B. Direct Non-Construction Job Creation and Job Retention

The Tex-Sand Corporation opened Tex-Sand trans-loading facility late in 2009. Tex-Sand uses this intermodal facility to transfer fracture sand from rail cars to truck for delivery to mining locations. This created 144 new jobs in Fort Stockton that are staffed by Fort Stockton residents. According to Tex-Sand's management, the wages of these employees average $2,910 per month. As noted earlier, the average wage in Pecos County is $1,328 per month ($15,939 annually). Tex-Sand employees therefore earn 219% above the average wage for Pecos County. These jobs may be lost if the line becomes inoperable. Tex-Sand would most likely do the trans-load at existing facilities in the Fort Worth area, which is not an economically distressed area. It is possible that no new jobs would be created in Fort Worth as a result of integrating Tex-Sand into an existing, sizable facility. It is essential that the SORR be rehabilitated in order to retain

these existing jobs.

Tex-San was contacted regarding the impacts to their operations if the SORR is rehabilitated between Sulphur Junction and Fort Stockton, resulting in improved track speeds and increased capacity. Tex-San projected that an additional 144 jobs would be created if train service increased as a result of the track rehabilitation. These jobs would also average $2,910 per month.

C. Indirect Job Creation & Economic Impacts

The project's procurement plan is likely to create follow-on jobs and near-term economic activity for manufacturers and suppliers. All materials and capital equipment used on the project will be purchased from U.S. manufacturers, creating additional jobs. The project's job creation impact from the construction expenditures on the economy of the United States was estimated, based on the employment impact multiplier recommended by the Council of Economic Advisors (CEA), which estimates that 1 job year is created for every $76,923 in transportation infrastructure spending.

Based upon that methodology, the indirect job benefits created was estimated by dividing $8.5 million (project expenditures) by $76,923

CEA Job Creation Impact: $8.5 million / $76,923 = 110 job years created.

In addition, AAR studies indicate that every dollar invested in freight-rail infrastructure created by investment tax incentives[9] generates more than three dollars in total economic output due to investment, purchases and employment occurring among upstream suppliers. The expenditure of $8,532,793 for freight rail infrastructure rehabilitation in the project would therefore result in over $25.5 million in economic output from this region.[10] The majority of the funds will be expended in Pecos County, which is an economically distressed county as defined by the Federal Highway Administration.[11]

AAR Economic Output: $8,532,793 (project) x $3 (output) = $25,598,379

The direct and indirect jobs created and economic impacts from the project are shown in Table 18.

[9] The same level of impact can be assumed from the use of TIGER 2012 federal grant investments in rail infrastructure projects.

[10] http://www.aar.org/Home/AAR/IndustryInformation/InfrastructureTaxIncentive/~/media/AAR/PositionP

[11] *See* U.S. DEP'T. OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION, ECONOMICALLY DISTRESSED AREAS PLANNING, ENVIRONMENT, REALTY (HEP), http://hepgis.fhwa.dot.gov/hepgis_v2/GeneralInfo/Map.aspx.

Impact	Category	Value
Construction Jobs	**Direct Benefit**	**$753,774**
Engineering & Construction Management Jobs	**Direct Benefit**	**$172,767**
Current job retention (trans-loading facility)	**Direct Benefit**	**$420,000**
Projected job creation (trans-loading facility)	**Direct Benefit**	**$420,000**
Economic Output	**Indirect Benefit**	**$25,598,379**
Total		**$ 27,364,920**

Table 18: Direct and Indirect Economic Impacts

D. Forecasted Job Creation & Economic Impacts

An economic stimulus analysis was performed by Alliance Transportation Group (ATG) based on commodities that might become cargo and the number of carloads per year was projected based on that information. The IMPLAN model was then used to generate forecasts of the proposed project's impacts. The analysis assumed that only a portion of the SORR commodities would be stimulated by the railroad's improvement, with the remainder being a redirection of existing supply. New output for goods already in production, including agricultural products, was assumed at twenty percent of the amount shipped. Some shipped commodities will require consolidation, storage, and distribution, which subsequently requires physical infrastructure. It was assumed that between 1 and 5 percent of the commodities' total estimated value would account for this expense.

Rail transport costs were entered as a direct economic impact for each forecast year. The cost is highly dependent on the distance that individual commodities must travel. In finding the cost of rail freight movement beyond the reach of the SORR required referencing UPRR (Union Pacific Railroad) online rates, which tended to be very high. Finally, the estimates of rail transport costs included fuel surcharges, but did not include any other fees that a shipper might encounter.

The IMPLAN economic impact analysis that was performed demonstrates that improvements to the SORR will produce benefits that will significantly exceed the costs. These benefits will be seen across all segments of the economy, from workers to companies to government. The consistency in output after Year 3 also indicates that the expanded output has permanence and is not simply a product of investment. Given the positive benefits that could accrue as a result of improvements to the SORR, funding the project will capitalize on economic prospects.

The model estimated that the rehabilitated SORR would create 807 jobs nationally and generate $25,718,051 in federal, state, and local taxes by the 5th year after the project was completed.[12] ATG's findings using the Implan model are shown in Tables 19 and 20.

[12] See *"Potential Economic Impact of the South Orient Railroad"* for a more detailed description of the IMPLAN model and results.

Baseline Scenario				
Year	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1	1146.8	213.7	443.0	1803.4
2	218.7	54.5	100.2	373.4
3	406.3	124.4	227.5	758.2
4	440.8	131.0	240.2	812.0
5	438.6	130.6	238.4	807.6

Table 19: Estimated Economic Impact of the Improved South Orient Railroad on the Study Area Federal, State, and Local Employment

Year	Employee Compensation	Proprietary Income	Household Expenditures	Corporations	Indirect Business Tax	Total
1	$8,170,997	$963,199	$8,911,339	$2,652,151	$6,324,345	$27,022,032
2	$3,243,064	$346,238	$3,455,495	$1,291,042	$2,728,465	$11,064,304
3	$6,603,788	$636,665	$6,881,980	$3,155,266	$5,977,761	$23,255,461
4	$7,407,128	$738,904	$7,775,134	$3,401,624	$6,598,453	$25,921,243
5	$7,340,054	$734,200	$7,709,215	$3,379,040	6,555,543	$25,718,051

Table 20: Estimated Economic Impact of the Improved South Orient Railroad on the State of Texas Federal, State, and Local Taxes

Further information regarding the Implan model and the logic and the assumptions behind these benefit calculations are provided in the *Potential Economic Impact of the South Orient Railroad* which is provided as supporting documentation at http://www.txdot.gov/business/rail/tiger2012.htm.

IV. Benefit – Cost Analysis Summary

The project provides significant benefits for the region as well as the state and nation. The various categories of benefits have been detailed in the previous sections of this application. The estimated impacts from avoided truck traffic show a savings of over $204 million over a 20 year period. The project will have positive direct and indirect impacts on the economy, employment levels, tax revenues, and highway costs. The economic indicators for the project show a discounted return on investment of 2,070% over 20 years with a Benefit/Cost ratio of 20.7 to 1.

The project will create 251 construction jobs, up to 144 jobs at TexSand in Fort Stockton

and additional jobs from new rail-oriented businesses that locate in Fort Stockton. Numerous local, regional, and national jobs would also be created as shown in the CEA and IMPLAN calculations.

The estimated avoided costs for continuing to move existing traffic by rail total over $204.3 million for the 20 year period. The project has a Return-On-Investment (ROI) of 1,970% and a benefit cost ratio of 20.7 to 1.

The spreadsheets used in performing benefit-cost analysis calculations are available for review at http://www.txdot.gov/business/rail/tiger2012.htm.htm,"Benefit-Cost Workbook."