U.S. Department of Transportation

National Infrastructure Investments Grant Program

"TIGER Discretionary"

GRANT APPLICATION SUPPORTING DOCUMENTATION

BENEFIT-COST AND ECONOMIC IMPACT ANALYSIS

for

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

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

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A. Introduction

To assess the viability of the SORR for a TIGER III Discretionary Grant, a cost-benefit analysis was performed. The cost-benefit analysis assesses the benefits to society of the project relative to the costs of the project. The impacts to society which would occur if existing rail service ceased have been identified and provide an existing "base case" of benefits from current operations on the line. A conservative growth factor of 1.5% was used to project those benefits for 20 years and subsequently discounted 7% for use in determining the benefit/cost ratio. If the SORR is not rehabilitated and becomes inoperable, those benefits would immediately become negative impacts on society with the associated costs.

Possible additional traffic was forecast 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, these goods would travel in a northeast/southwest direction between Fort Stockton and Fort Worth[1].

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 for both the base case and alternate case and the net effect (or benefits) monetized. These benefits include:

Benefit #1 - The 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 - The reduction in air pollution: this benefit category captures the emissions quantities avoided that result from moving the freight by rail.

[1] Most of the existing SORR traffic currently moves through Fort Worth. It also is 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.

Benefit #3 - The 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 #4 - 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 #5 – 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 #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.

The FHWA's Highway Cost Allocation Study (updated May 2008) was used to determine some of the highway-related costs that would impact society if the SORR became inoperable between Sulphur Junction and Fort Stockton. 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,
- $0.038 for air pollution 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.

An analysis of the increased fuel use of shipping freight by truck vs rail was also performed. The AAR has also determined that railroads are four times more fuel efficient than trucks.[2]

The methodology used to determine fuel used by rail versus truck is:

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

1. # Cars Moved x 100 = Annual Tons[3]
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

In all calculations for this analysis a conservative diversion of 3.5 trucks per rail car was assumed, though other studies have used a 4-to-1 ratio. 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.

B. Benefits from Existing Rail Traffic

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 has received 404 carloads through the end of May, an average rate of 81 carloads per month, and continues receiving materials at and above that rate. This represents a 138% 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 2012, this analysis uses their current traffic level of 81 carloads per month, for a total of 972 carloads annually. Assuming that each railcar represents 3.5 truckloads of sand, there would be 3,402 truckloads of sand diverted from the roadways in the first year. The distance from Fort Stockton to Fort Worth is 798 miles round trip, which equates to 2,714,796 truck miles avoided annually between Fort Stockton and Fort Worth.

The impacts to the highway benefit categories over 20 years are shown below.

Benefit #1 – The analysis determined that 62,776,039 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 $9,134,447.

Benefit #2 – The analysis showed that if the existing materials had been transported by truck, those trucks would have emitted 507,279 tons of carbon dioxide (CO_2); while transporting the same freight by rail resulted in only 42,661 tons of CO_2 emissions. This represents a 91% reduction in CO_2 emissions from

[3] Assuming 100 tons per car, average.

shipping by rail[4]. The FHWA's methodology places a $2,733,142 impact on society from this pollution.

Benefit #3 – The highway congestion that would result from the diversion of the existing freight from rail to truck is valued at $1,582,345**.**

Benefit #4 - 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 impact would therefore be $564,984.

Benefit #5 – The increase in noise from diverting the freight from rail to truck is valued at $125,552 using the FHWA methodology.

Benefit #6 – The fuel used to transport the existing freight would increase by 12,843,710 gallons, with a cost increase of $38,012,675 (at $3 per gallon).

The data and results from the FHWA analysis of Benefits 1 through 5 are shown in Tables 1 and 2. The data and results from the fuel use analysis are shown in Table 3.

[4] These figures have been intentionally understated in order to provide a conservative estimate. Actual truck CO_2emissions are approximated at 0.654 lbs. per ton mile, while rail emissions are approximated at 0.055 lbs per ton mile. The calculations in this application use the figures as a flat "per mile" calculation and do not consider the actual tons being transported each mile, i.e., each truck or train equals 1 ton per mile. Assuming each truck contains 25 tons would make the results 25 times higher.

Total Loaded Railcars		Avg. Truckloads per Railcar		Equivalent Trucks		Route Mileage		Truck Mileage
972	**x**	**3.5**	**=**	**3,402**	**x**	**798**	**=**	**2,714,796**

Impacts to Highways from Freight Diversion

Costs for 80 kip 5-axle on rural interstate**

	Cents/truck-mile	$/Year
Pavement (loaded)	0.127	$344,779
Air pollution	0.038	$103,162
Congestion	0.022	$59,726
Crashes	0.009	$24,433
Noise pollution	0.002	$5,430
	Total annual cost =	**$537,530**
	Pavement only =	**$344,779**

****From FHWA's Highway Cost Allocation Study

*****Additional costs assumes a 1.5% annual increase in costs

Year	Pavement Only	Air Pollution	Congestion	Crashes	Noise	Truck Miles Avoided
2014	$344,779	$103,162	$59,726	$24,433	$5,430	2,714,796
2015	$349,951	$104,710	$60,621	$24,800	$5,511	2,755,518
2016	$360,449	$107,851	$62,440	$25,172	$5,594	2,796,851
2017	$371,263	$111,087	$64,313	$25,549	$5,678	2,838,803
2018	$382,401	$114,419	$66,243	$25,932	$5,763	2,881,386
2019	$393,873	$117,852	$68,230	$26,321	$5,849	2,924,606
2020	$405,689	$121,387	$70,277	$26,716	$5,937	2,968,475
2021	$417,860	$125,029	$72,385	$27,117	$6,026	3,013,003
2022	$430,395	$128,780	$74,557	$27,524	$6,116	3,058,198
2023	$443,307	$132,643	$76,793	$27,937	$6,208	3,104,071
2024	$456,606	$136,622	$79,097	$28,356	$6,301	3,150,632
2025	$470,305	$140,721	$81,470	$28,781	$6,396	3,197,891
2026	$484,414	$144,943	$83,914	$29,213	$6,492	3,245,859
2027	$498,946	$149,291	$86,432	$29,651	$6,589	3,294,547
2028	$513,915	$153,770	$89,025	$30,096	$6,688	3,343,966
2029	$529,332	$158,383	$91,695	$30,547	$6,788	3,394,125
2030	$545,212	$163,134	$94,446	$31,005	$6,890	3,445,037
2031	$561,568	$168,028	$97,280	$31,470	$6,993	3,496,712
2032	$578,415	$173,069	$100,198	$31,942	$7,098	3,549,163
2033	$595,768	$178,261	$103,204	$32,422	$7,205	3,602,401
Total 20 years	**$9,134,447**	**$2,733,142**	**$1,582,345**	**$564,984**	**$125,552**	**62,776,039**

Table 1: Avoided Highway Costs from SORR – Current Traffic Fort Stockton to Fort Worth

Base Case CO2 Impacts

Year	Carloads	Truck CO2	Rail CO2	Reduction Rail vs Truck
2014	972	507,279	42,661	464,618
2015	1,001	514,888	43,301	471,587
2016	1,031	522,612	43,951	478,661
2017	1,062	530,451	44,610	485,841
2018	1,094	538,407	45,279	493,129
2019	1,127	546,484	45,958	500,525
2020	1,161	554,681	46,647	508,033
2021	1,195	563,001	47,347	515,654
2022	1,231	571,446	48,057	523,389
2023	1,268	580,018	48,778	531,239
2024	1,306	588,718	49,510	539,208
2025	1,345	597,549	50,253	547,296
2026	1,386	606,512	51,006	555,506
2027	1,427	615,610	51,771	563,838
2028	1,470	624,844	52,548	572,296
2029	1,514	634,217	53,336	580,880
2030	1,560	643,730	54,136	589,593
2031	1,607	653,386	54,948	598,437
2032	1,655	663,186	55,773	607,414
2033	1,704	673,134	56,609	616,525
Total 20 years	**26,118**	**11,730,151**	**986,481**	**10,743,671**

81 cars per month

Table 2: Avoided Air Quality Impacts from SORR – Current Traffic Fort Stockton to Fort Worth

Base Case Fuel Impacts

Route Mileage = 798

Year	Rail Tons*	Rail Fuel (gals)**	Truck Fuel (gals)**	Reduction Rail vs Truck	Cost Savings @ $3/gal base
2014	97,200	161,595	646,380	484,785	$1,454,355
2015	100,116	164,019	656,076	492,057	$1,476,170
2016	103,119	168,939	675,758	506,818	$1,498,313
2017	106,213	174,008	696,031	522,023	$1,543,262
2018	109,399	179,228	716,912	537,684	$1,589,560
2019	112,681	184,605	738,419	553,814	$1,637,247
2020	116,062	190,143	760,572	570,429	$1,686,364
2021	119,544	195,847	783,389	587,542	$1,736,955
2022	123,130	201,723	806,890	605,168	$1,789,064
2023	126,824	207,774	831,097	623,323	$1,842,736
2024	130,629	214,007	856,030	642,022	$1,898,018
2025	132,588	220,428	881,711	661,283	$1,954,958
2026	136,566	227,041	908,162	681,122	$2,013,607
2027	140,663	233,852	935,407	701,555	$2,074,015
2028	144,883	240,867	963,469	722,602	$2,136,236
2029	149,229	248,093	992,373	744,280	$2,200,323
2030	153,706	255,536	1,022,145	766,608	$2,266,333
2031	158,317	263,202	1,052,809	789,607	$2,334,323
2032	163,067	271,098	1,084,393	813,295	$2,404,352
2033	167,959	279,231	1,116,925	837,694	$2,476,483
Total 20 years	**2,591,894**	**4,281,237**	**17,124,947**	**12,843,710**	**$38,012,675**
			Discounted 7%		**$35,351,788**

* Calculation based upon current Sulphur Junction to Fort Stockton traffic averaging 972 cars per year at 100 tons per car

**Using the AAR's statistics: 97,200 tons x 798 miles = 77,565,600 ton-miles; divided by 480 miles per ton = 161,595 gallons of fuel used by rail.
Trucking fuel is therefore 161,595 x 4 = 646,380

Table 3: Avoided Fuel Increases from SORR – Current Traffic Fort Stockton to Fort Worth

C. Benefits from Projected Rail Traffic

Several 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[5] (ATG) were used to project possible traffic increases on the SORR.

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 4.

Commodity	Carloads	Equivalent Trucks
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	**3,808**	**13,328**

Table 4: Projected Carloads and Truck Equivalency based on 3.5 Carloads/truck

According to the report, these goods would travel in a northeast/southwest direction between Fort Stockton and Fort Worth. Truck traffic would most likely use U.S. 67, which has a single lane in each direction for the majority of this rural route. The SORR parallels U.S. 67 in the region and can provide a rail alternative for the movement of goods in the corridor. The diversion of 13,328 trucks from highway to rail on this rural route would have a positive impact on vehicular safety in the region. These volumes would increase over time as economic conditions improved.

The information presented in the report was used to determine some of the benefits a result of the moving this freight by rail versus truck. The analysis again used the FHWA's Highway Cost Allocation Study (updated May 2008) methodology. A conservative diversion of 3.5 trucks per rail car was again assumed. Table 5 shows that the railcars that could be moved

[5] See "Potential Economic Impact of the South Orient Railroad" at http://www.txdot.gov/business/rail/tiger3.htm for additional information.

from Fort Worth to Fort Stockton represent over 7.2 million vehicle-miles-traveled by trucks on an annual basis. This freight would also impact sustainability from CO_2 emissions which would be 1089% higher if shipped by truck.

Estimated Additional VMT Due to Modal Shift from Rail To Highway												
South Orient Railroad from San Angelo to Fort Stockton												
Annual		**Total Loaded Railcars**		**Avg. Truckloads per Railcar**		**Total Trucks**			**Route Mileage***		**Truck Mileage**
Inbound		**1,208**	**x**	**3.5**	**=**	**4,228**		**x**	**798**	**=**	**3,373,944**
Outbound		**2,600**	**x**	**3.5**	=	**9,100**		**x**	**798**	**=**	**7,261,800**
									Total	**=**	**10,635,744**

Table 5: Estimated Annual Avoided Truck VMT in Corridor

The 20 year impacts to the highway benefit categories from the forecasted traffic listed are shown below.

Benefit #1 – The analysis projected that 245,937,404 truck miles traveled would be added to the highway system from this potential traffic if the SORR becomes inoperable between Sulphur Junction and Fort Stockton. The added highway maintenance costs from this traffic totalled $35,785,981.

Benefit #2 – The analysis showed that if the projected materials are transported by truck, those trucks will emit 45,955,161 tons of carbon dioxide (CO_2); while transporting the same freight by rail resulted in only 3,864,731 tons of CO_2 emissions. This represents a 91% reduction in CO_2 emissions from shipping by rail[6]. The FHWA's methodology places a $10,707,616 impact on society from this pollution.

Benefit #3 – The highway congestion that would result from the diversion of the existing freight from rail to truck is valued at $6,199,146**.**

[6] These figures have been intentionally understated in order to provide a conservative estimate. Actual truck CO_2emissions are approximated at 0.654 lbs. per ton mile, while rail emissions are approximated at 0.055 lbs per ton mile. The calculations in this application use the figures as a flat "per mile" calculation and do not consider the actual tons being transported each mile, i.e., each truck or train equals 1 ton per mile. Assuming each truck contains 25 tons would make the results 25 times higher.

Benefit #4 - Highway accidents from the transportation of this projected and freight was $2,213,437.

Benefit #5 – The increase in noise from this additional freight moving by truck is valued at $491,875 using the FHWA methodology.

Benefit #6 – The fuel used to transport the existing freight would increase by 25,516,645 gallons, at an additional cost of $76,549,935 (at $3 per gallon).

In addition, on July 28, 2011, Senate Bill 1436 was filed in the U.S. Congress. Sec. 2 (a)(8) states that every dollar invested in the Nation's infrastructure yields at least $5.70 in economic benefits from reduced delays, improved safety, and reduced vehicular operating costs, which would result in $107,060,364 in benefits. This document has taken a conservative approach and those calculations have not been included in this analysis.

The data and results from the FHWA analysis of Benefits 1 through 5 for projected traffic are shown in Tables 6 & 7. The data and results from the fuel use analysis are shown in Table 8.

Total Loaded Railcars		Avg. Truckloads per Railcar		Equivalent Trucks		Route Mileage		Truck Mileage
3,808	**x**	**3.5**	**=**	**13,328**	**x**	**798**	**=**	**10,635,744**

Impacts to Highways from Freight Diversion

Costs for 80 kip 5-axle on rural interstate**

	Cents/truck-mile	$/Year
Pavement (loaded)	0.127	$1,350,739
Air pollution	0.038	$404,158
Congestion	0.022	$233,986
Crashes	0.009	$95,722
Noise pollution	0.002	$21,271
	Total annual cost =	**$2,104,877**
	Pavement only =	**$1,350,739**

****From FHWA's Highway Cost Allocation Study

*****Additional costs assumes a 1.5% annual increase in costs

Year	Pavement Only	Air Pollution	Congestion	Crashes	Noise	Truck Miles Avoided
2014	$1,350,739	$404,158	$233,986	$95,722	$21,271	10,635,744
2015	$1,371,001	$410,221	$237,496	$97,158	$21,591	10,795,280
2016	$1,412,131	$422,527	$244,621	$98,615	$21,914	10,957,209
2017	$1,454,495	$435,203	$251,960	$100,094	$22,243	11,121,568
2018	$1,498,129	$448,259	$259,518	$101,596	$22,577	11,288,391
2019	$1,543,073	$461,707	$267,304	$103,119	$22,915	11,457,717
2020	$1,589,365	$475,558	$275,323	$104,666	$23,259	11,629,583
2021	$1,637,046	$489,825	$283,583	$106,236	$23,608	11,804,026
2022	$1,686,158	$504,520	$292,090	$107,830	$23,962	11,981,087
2023	$1,736,743	$519,655	$300,853	$109,447	$24,322	12,160,803
2024	$1,788,845	$535,245	$309,879	$111,089	$24,686	12,343,215
2025	$1,842,510	$551,302	$319,175	$112,755	$25,057	12,528,363
2026	$1,897,785	$567,841	$328,750	$114,447	$25,433	12,716,289
2027	$1,954,719	$584,877	$338,613	$116,163	$25,814	12,907,033
2028	$2,013,361	$602,423	$348,771	$117,906	$26,201	13,100,369
2029	$2,073,761	$620,496	$359,234	$119,674	$26,594	13,297,148
2030	$2,135,974	$639,110	$370,011	$121,469	$26,993	13,496,605
2031	$2,200,053	$658,284	$381,112	$123,291	$27,398	13,699,055
2032	$2,266,055	$678,032	$392,545	$125,141	$27,809	13,904,540
2033	$2,334,037	$698,373	$404,321	$127,018	$28,226	14,113,108
Total 20 years	**$35,785,981**	**$10,707,616**	**$6,199,146**	**$1,213,437**	**$491,875**	**245,937,404**

Table 6: Avoided Highway Costs from SORR – Projected Traffic Fort Stockton to Fort Worth

Projected Pollution Impacts

Year	Carloads*	Truck CO2	Rail CO2	Reduction Rail vs Truck
2014	3808	1,987,365	167,133	1,820,232
2015	3922	2,017,175	169,640	1,847,535
2016	4040	2,047,433	172,185	1,875,248
2017	4161	2,078,144	174,767	1,903,377
2018	4286	2,109,316	177,389	1,931,927
2019	4415	2,140,956	180,050	1,960,906
2020	4547	2,173,071	182,751	1,990,320
2021	4683	2,205,667	185,492	2,020,175
2022	4824	2,238,752	188,274	2,050,477
2023	4969	2,272,333	191,098	2,081,235
2024	5118	2,306,418	193,965	2,112,453
2025	5271	2,341,014	196,874	2,144,140
2026	5429	2,376,129	199,827	2,176,302
2027	5592	2,411,771	202,825	2,208,947
2028	5760	2,447,948	205,867	2,242,081
2029	5933	2,484,667	208,955	2,275,712
2030	6111	2,521,937	212,090	2,309,848
2031	6294	2,559,766	215,271	2,344,495
2032	6483	2,598,163	218,500	2,379,663
2033	6677	2,637,135	221,777	2,415,358
Total 20 years	**102,322**	**45,955,161**	**3,864,731**	**42,090,430**

Table 7: Avoided Air Quality Impacts from SORR – Projected Traffic Fort Stockton to Fort Worth

Projected Fuel Impacts

Route Mileage = 798

Year	Rail Tons*	Rail Fuel (gals)	Truck Fuel (gals)	Reduction Rail vs Truck	Cost Savings @ $3/gal base
1	380,800	316,540	1,266,160	949,620	$2,848,860
2	392,224	326,036	1,304,145	978,109	$2,934,326
3	403,991	335,817	1,343,269	1,007,452	$3,022,356
4	416,110	345,892	1,383,567	1,037,675	$3,113,026
5	428,594	356,269	1,425,074	1,068,806	$3,206,417
6	441,452	366,957	1,467,826	1,100,870	$3,302,610
7	454,695	377,965	1,511,861	1,133,896	$3,401,688
8	468,336	389,304	1,557,217	1,167,913	$3,503,738
9	482,386	400,983	1,603,934	1,202,950	$3,608,851
10	496,858	413,013	1,652,052	1,239,039	$3,717,116
11	511,763	425,403	1,701,613	1,276,210	$3,828,630
12	519,440	438,165	1,752,662	1,314,496	$3,943,489
13	535,023	451,310	1,805,241	1,353,931	$4,061,793
14	551,074	464,850	1,859,399	1,394,549	$4,183,647
15	567,606	478,795	1,915,181	1,436,385	$4,309,156
16	584,634	493,159	1,972,636	1,479,477	$4,438,431
17	602,173	507,954	2,031,815	1,523,861	$4,571,584
18	620,238	523,192	2,092,770	1,569,577	$4,708,732
19	638,845	538,888	2,155,553	1,616,664	$4,849,993
20	658,011	555,055	2,220,219	1,665,164	$4,995,493
Total 20 years	**10,154,253**	**8,505,548**	**34,022,193**	**25,516,645**	**$76,549,935**

Calculation based on 3,808 carload projection at 100 tons per car
from ATG report

**Using the AAR's statistics: 380,800 tons x 798 miles = 151,939,200 ton-miles;
divided by 480 miles per ton = 316,540 gallons of fuel used by rail.
Trucking fuel is therefore 316,540 x 4 = 1,266,160

**Table 8: Avoided Fuel Increases from SORR – Projected Traffic
Fort Stockton to Fort Worth**

II. Project Costs

A. Project Development Costs

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.

B. Project Construction Costs

The construction and project management costs would be funded by a 19.76% contribution in state funds from TxDOT, 27% in private contributions from TXPF, and 53.24% in TIGER III Discretionary Grant Funds.

The project estimate and uses of funds are shown in Table 9.

Description	Unit	Unit Cost	Quantity	Total
Rail	Linear Foot	$61	132,211	$8,064,871
Crossties Installation	Each	$75	40,560	$3,042,000
Ballast	Ton	$50	8,100	$405,000
Surfacing & Regulating	Mile	$6,000	16.00	$75,120
Timber Grade Crossings	Linear Foot	$700	68	$47,600
Turnouts - Complete	Each	$43,000	4	$172,000
Bridges & Drainage	See Below			$526,500
Subtotal				$12,333,091
Engineering & Contingencies	7%			$863,316
Mobilization	8%			$986,647
Total				$14,183,055

Bridge Repairs Detail	BRG	Cost
Brace bents 3,4,5,6,7	870.9	$7,500
Shim gaps, bent 5, piles 3 & 4		$1,000
Brace bents 2 & 3	875.7	$3,000
Shim gaps, bent 2, piles 3 & 4		$1,000
Shim gaps, bent 3, piles 3 & 4		$1,000
Replace #4 stringer span 2		$3,500
Replace #5 stringer, span 5		$3,500
Replace bridge	877.6	$500,000
Open Culvert	882.18	$3,000
Open Culvert	882.5	$3,000
TOTAL		$526,500

Table 9: Project Estimate and Uses of Funds

C. 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% growth (in contrast to the 1.5% growth for rail traffic and benefits) to reflect the average inflation rate for the last 10 years[7]. Table 10 shows the annual calculated maintenance costs.

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 10: Estimated Maintenance Costs for Project Area

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

As Table 9 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.

III. Benefit – Cost Analysis

A. Introduction

The 20 year Project Benefits[8] calculations from Tables 1 and 3 were added to determine the total benefits from the project with "current" traffic levels and subsequently discounted by 3% and 7%. The benefits derived from the "Current" traffic are presented separately to determine the benefit – cost ratio based on actual traffic currently moving on the line. The 20 year Project Benefits calculations from Tables 6 and 8 were added to determine the total benefits from the "projected" traffic that was forecast by Alliance Transportation Group in 2007. The potential benefits that could be derived from the "Projected" traffic are presented separately to determine the cost-benefit ration if that traffic developed. A benefit-cost ration was also calculated with an assumed reduction of 75% in projected traffic.

[8] Benefits 1 – 6 identified in Section I – Project Benefits

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.

B. Benefits – Costs from Existing Rail Traffic

The estimated avoided costs for continuing to move existing traffic by rail total over $52.1 million for the 20 year period. The project has a Return-On-Investment (ROI) of 230% and a benefit cost ratio of 3.3 to 1 when considering only the existing traffic levels with a modest growth. The discounted project benefits are shown in Table 11. The detailed benefits and costs are shown in Table 12.

Economic Indicators	Total	Discounted 7%	Discounted 3%
Total Costs[9]	$ 15,774,127	$ 14,669,938	$ 15,300,903
Total Benefits	$ 52,153,145	$ 48,502,425	$ 50,588,551
NPV	$ 36,379,018	$ 33,832,487	$ 35,287,648
ROI	230%	230%	230%
B/C	3.30/1	3.30/1	3.30/1

Table 11: Discounted Project Benefit/Cost Summary for Existing Traffic

Description	Category	Effects	Benefit	Cost
Track Rehabilitation	State of Good Repair	Preservation of Service, increased track speed		$14,183,055
Track Maintenance[10]	State of Good Repair	Preservation of Service, increased track speed		$1,591,072
Highway Maintenance (current traffic)	Sustainability	Avoided 20 yr highway maintenance, current traffic	$9,134,447	
Air Pollution (current)	Sustainability	Avoided 20 yr pollution, current traffic	$2,733,142	
Congestion (current traffic)	Safety	Avoided 20 yr highway congestion, current traffic	$1,582,345	
Crashes (current traffic)	Safety	Avoided 20 yr highway crashes, current traffic	$564,984	
Noise (current traffic)	Sustainability	Avoided 20 yr noise impacts, current traffic	$125,552	
Fuel (current traffic)	Economic Competitiveness	Avoided 20 yr fuel usage, current traffic	$38,012,675	
Total Current		**Benefit/Cost = 3.30 / 1**	**$ 52,153,145**	**$15,774,127**

Table 12: Benefit – Cost Calculations Current Rail Traffic

[9] Total Costs = $14,183,055 (project) + $1,591,072 (maintenance)
[10] 20 year annualized track maintenance at $5,000 per mile for 12.52 miles, with 1.5% growth. This cost will remain the responsibility of TXPF in accordance with their contractual obligations.

C. Benefits – Costs from Projected Rail Traffic

The estimated avoided costs for moving the projected traffic by rail total over $131 million for the 20 year period. The project has a ROI of 736% and a benefit cost ration of 8.36 to 1 when considering all the projected traffic with a 1.5% growth factor. The discounted benefits from projected traffic are shown in Table 13. The detailed benefits and costs are shown in Table 14.

Economic Indicators	Total	Discounted 7%	Discounted 3%
Total Costs	$ 15,774,127	$ 14,669,938	$ 15,300,903
Total Benefits	$ 131,947,990	$ 122,711,631	$ 127,989,550
NPV	$ 116,173,863	$ 108,041,693	$ 112,688,647
ROI	736%	736%	736%
B/C	8.36/1	8.36/1	8.36/1

Table 13: Discounted Project Benefit/Cost Summary for Projected Traffic

Highway Maintenance (projected traffic)	Sustainability	Avoided 20 yr highway maintenance, projected traffic	$35,785,981	
Air Pollution (projected traffic)	Sustainability	Avoided 20 yr pollution, projected traffic	$10,707,616	
Congestion (projected traffic)	Safety	Avoided 20 yr highway congestion, projected traffic	$6,199,146	
Crashes (projected traffic)	Safety	Avoided 20 yr highway crashes, projected traffic	$2,213,437	
Noise (projected traffic)	Sustainability	Avoided 20 yr noise impacts, projected traffic	$491,875	
Fuel (projected traffic)	Economic Competitiveness	Avoided 20 yr fuel usage, projected traffic	$76,549,935	
Total Projected		**Benefit/Cost = 8.36 / 1**	**$131,947,990**	**$15,774,127**

Table 14: Benefit – Cost Calculations Projected Rail Traffic

The forecasting of traffic for transportation project planning and development is an accepted practice throughout both the public and private sectors and ATG's projected traffic on the SORR is based upon reasonable assumptions and acceptable methodology. As with all forecasts, it is unlikely that the traffic that develops would exactly match the projections. Actual traffic could exceed projections or not meet the projections, and it should be noted that ATG did not include frac-sand in their calculations as that potential traffic was non-existent in 2007. However, if the forecast was drastically lower than ATG's estimate and the actualized benefits were 75% lower than projected, the benefit/cost ratio would still be 2.09 / 1, as shown in Table 15.

Economic Indicators	Total	Discounted 7%	Discounted 3%
Total Costs	$ 15,774,127	$ 14,669,938	$ 15,300,903
Total Benefits	$ 32,986,997	$ 30,677,907	$ 127,989,550
NPV	$ 17,212,870	$ 16,007,969	$ 88,682,163
ROI	109%	109%	109%
B/C	2.09/1	2.09/1	2.09/1

Table 15: Discounted Project Benefit/Cost Summary for Projected Traffic with Assumed 75% Reduced Benefits from Unrealized Traffic

IV. 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 239 construction related job positions will be manned during the 16 month construction period. An additional 54 construction management and inspection positions will be manned for 16 months. Table 16 shows the estimated project schedule and jobs in each task category.

		2012											2013										
Task	D	J	F	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											5	5	5	5	5	5	5							
Turnout Construction															4	4	4	4	4					
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								
Bridge Construction										6	6	6	6	6	6	6	6	6						
Bridge Repairs											4	4	4	4	4									
Construction Management								2	2	3	4	4	4	4	4	4	4	4	4	4	2	2	2	1
Monthly Jobs								10	10	9	19	26	26	32	36	32	26	21	15	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[11]. The mid point of these salaries is $38,653, which is well above the Pecos 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.

[11] www.cbsalary.com

The number of construction jobs estimated for the project was divided by the months in the schedule to determine the average jobs per month. In the short term, it is estimated that the project will create an average of 15 construction jobs monthly in the region over a period of 16 months, based upon previous rehabilitation projects on other sections of the SORR. This 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 average 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	3.17	$38,653	1.41	$ 172,767
Total	18.17			$ 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 will 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 10.8 jobs are created per $1 million of government expenditures[12].

Based upon that methodology, the indirect job benefits created was estimated by multiplying $14 million (project expenditures) by 10.8 (jobs created), which in turn was multiplied by the average wage ($38,653) for the annual impact.

CEA Job Creation Impact: $14 (million) x 10.8 (jobs created) x $38,543 = $5,827,701.

In addition, AAR studies indicate that every dollar invested in freight-rail infrastructure created by investment tax incentives[13] generates more than three dollars in total economic output due to investment, purchases and employment occurring among upstream suppliers. The expenditure of $14,183,055 for freight rail infrastructure rehabilitation in the project would therefore result in over $42,54 million in economic output from this region.[14] The majority of the funds will be expended in Pecos County, which is an economically distressed county as defined by the Federal Highway Administration.[15]

AAR Economic Output[16]: $14,183,055 (project) x $3 (stimulus) = $42,549,165

[12] http://research.upjohn.org/cgi/viewcontent.cgi?article=1000&context=empl_research&sei-redir=1#search=%22council%20economic%20advisors%20employment%20impact%20multiplier%22

[13] The same level of impact can be assumed from the use of TIGER 3 federal grant investments in rail infrastructure projects.

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

[15] *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.

[16] On July 28, 2011, Senate Bill 1436 was filed in the U.S. Congress. Sec. 2 (a)(8) states that every dollar invested in the Nation's infrastructure yields at least $5.70 in economic benefits from reduced delays,

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

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**
Indirect Job Creation	**Indirect Benefit**	**$5,827,701**
Economic Output	**Indirect Benefit**	**$42,549,165**
Total		**$ 50,143,407**

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.

improved safety, and reduced vehicular operating costs, which would result in an additional $107,060, 364 in benefits.

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.[17] ATG's findings using the Implan model are shown in Tables 19 and 20.

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 www.txdot.gov/business/rail/tiger.htm.

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