

PROJECT BENEFITS REPORT

SORRENTO VALLEY DOUBLE TRACK



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Sorrento Valley Double Track Project

SANDAG CIP 1239807

Report Prepared by:



For



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Sorrento Valley Double Track – Project Benefits Analysis

INTRODUCTION

The Sorrento Valley Double Track Project (“SVDT” or “Project”) was initiated in 2009¹ and opened to the public in May of 2015. It included the installation of 1.1 miles of passing track, raised the trackway above the 50-year flood level, and replaced two aged wooden trestle bridges. The additional passing track would allow for the holding of longer mid-day freight trains, which would allow passenger trains to pass. The higher elevation trackway would reduce shutdowns associated with flooding over the tracks during large storm events.

The Project was funded by a combination Federal, State and Local funds. The project was initiated with San Diego’s Local TransNet funds and Federal FTA 5307 funds. A portion of the construction phase was funded through the California Trade Corridor Improvement Fund (TCIF) as project 93 based on the agreement dated May 7, 2013, between the California Transportation Commission (CTC), California Department of Transportation (Caltrans), and SANDAG.

The Project Study Report and Project Benefits Form were included in the TCIF Agreement. The Project Benefits stated in the Agreement fall into one of the following six categories: Throughput, Reliability, Safety, Velocity, Congestion Reduction, and Emissions Reduction. All six benefit categories are discussed as part of the analysis below.

PURPOSE

The purpose of this analysis is to compare the Project or “Planned” Benefits, as stated in the Project’s Project Study Report and the TCIF Agreement, to actual results from post-Project operations (“Benefits Achieved”). For each of the six benefit categories mentioned above, this analysis will state the “Planned Benefit” followed by the actual “Benefit Achieved”.

It should be noted that many of the benefits stated in the TCIF Agreement are based on a conglomerate of corridor-wide projects and should not be assumed to be met until all projects in the planned LOSSAN 2030 mid-term service expansion¹ are constructed and open to public.

¹LOSSAN Corridor Prioritization Analysis – final project report by Cambridge Systematics Inc. July 2009

ANALYSIS

Benefit Category 1 – Throughput (Staging, Longer Trains, More Available Meets & Passes)

Planned Benefit 1a: The double track along with an associated turnout provides a location where freight trains can be held temporarily without impacting passenger operations. This provides the opportunity to increase the occasions to run longer trains of up to 6,000-ft during the mid-day period. These mid-day trains are needed to accommodate freight rail growth associated with prospective import vehicle cargo at the Port of San Diego National City Marine Terminal.

Benefit Achieved 1a: The Project added 5,800 linear feet of double track in Sorrento Valley (See redline in Figure 1 below). With the preexisting double track south of the Project, this equated to approximately 11,000 linear feet of continuous double track. This provides an additional layover location for a 6000-ft freight train.

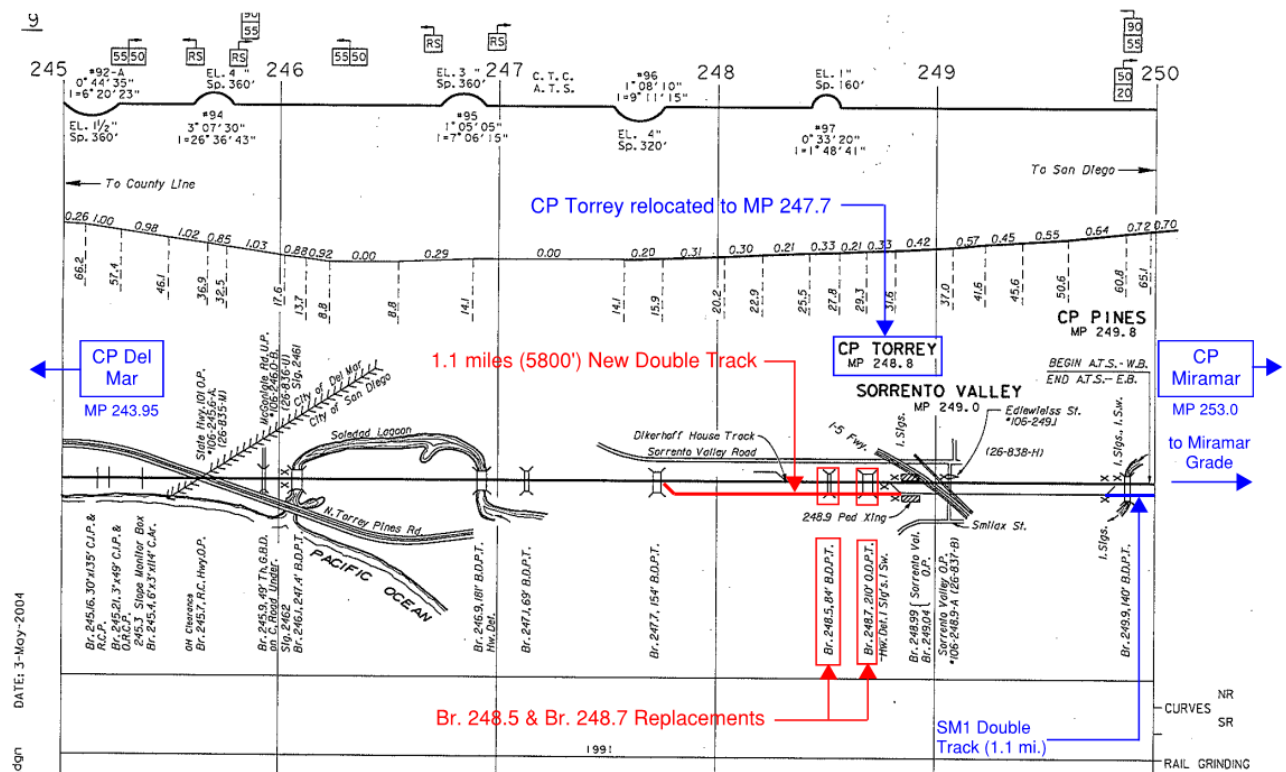


Figure 1 - 2009 Track Chart showing new Double Track Improvements and Track Control Points (CP) Torrey was moved from MP248.8 to MP 247.7 in the SVDT Project.

Planned Benefit 1b: The longer length of double track allows more flexibility in train meets and passes, allow a longer southbound approach to the steep (2.2%) Miramar Grade, and provide a longer segment of double track to allow northbound trains to safely stop before the single track begins.

Benefit Achieved 1b: The Project added 5,800 linear feet of double track that provides additional space for train meets and passes, allows a longer approach for southbound trains to accelerate toward the Miramar Grade (approximately 6,000 feet), and allows greater stopping distance for northbound trains coming out of the Miramar Grade.

Planned Benefit 1c: The Project serves to increase goods movement capacity within the San Diego/Border Trade Corridor. Existing freight train “carloads” are generated from regional consumption (primarily bulk), the Port of San Diego National City Marine Terminal (import auto), and Northern Baja California (bulk and vehicles loaded onto rail in San Diego). The Project helps to increase mainline capacity sufficiently to handle long term Port of San Diego demand, cross border bulk goods movement, and regional demand for heavy bulk commodities.

Benefit Achieved 1c: The Project provided a sufficient increase of double track and layover space to run additional freight trains should the market demand increase. For example, the freight operator BNSF has the operational capacity to 5 daily trains with the additional 5,800 feet of storage track.

Planned Benefit 1d: LOSSAN Rail Corridor Improvements increases freight train capacity from four to five trains per day, which is equivalent to 5,627 carloads per year. The Sorrento Valley Double Track Project in conjunction with the Sorrento to Miramar Phase 1 project allows for holding longer mid-day freight trains (6,000-ft trains instead of 4,400-ft trains).

Benefit Achieved 1d: The Project when combined with other TCIF projects has provided for increased freight capacity and increased freight movement along the LOSSAN Corridor with increased ability to layover 6,000-ft freight trains at the Sorrento Valley location and run five freight trains per day instead of four should the need arise.

Per the BNSF freight tonnage movement data in Table 1, BNSF has been moving more freight an average of 5% per year since 2009, and 6% post project from 2015 to 2016. This was achieved using longer trains on the additional passing tracks built with the TCIF projects in the LOSSAN Corridor.

Table 1 – BNSF Freight Tonnage Increases since 2009

Year	Tons / Year	% Increase	Notes on TCIF Projects
2009	3,111,805		Cambridge Report prepared, Project initiation.
2010	3,274,368	5%	TCIF program starts
2011	3,167,942	-3%	
2012	3,761,441	19%	
2013	3,963,546	5%	TCIF Agreement 93 for Construction of SVDT signed
2014	3,972,515	0%	SVDT Construction NTP issued 1/16/2014
2015	4,090,730	3%	May 2015 SVDT went into service
2016	4,338,150	6%	

Benefit Category 2 – Reliability

Planned Benefit 2a: The Project increases reliability on the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Corridor freight rail service by eliminating closures of the corridor due to minor flooding events at the Project Site. The Project rehabilitates and raises a vulnerable track segment which has been subject to flooding and closures in recent years. (See figure 2). The track profile and two associated bridges will be reconstructed above the 50-year storm event flood level elevation.

Benefit Achieved 2a: The Project reconstructed and raised Bridge 248.5 and Bridge 248.7 to be above its pre-project 5-year storm flood level to a 50-year storm flood level. Raising the bridges has increased reliability of the corridor with decreased shutdowns related to flooding in this area. (See figure 3).



Figure 2 - SVDT Bridge 248.7 Pre-Project Flooding Photo



Figure 3 - SVDT Bridge 248.7 Post-Project Photo

Planned Benefit 2b: The planned benefit of reduced variability and unpredictability of travel time from unanticipated train meets, maintenance, and work windows was anticipated to save on average at least 10 minutes per freight train. It should be noted that on-time performance for freight trains is not tracked by freight railroad operators. Many of the problems with reliability between 2012 and 2015 are related to the ongoing track construction projects and corresponding slow orders and the train traffic throughout the corridor. AMTRAK Surfliner’s on-time performance pre-project was at approximately 73.6%. (See Figure 4).

Benefit Achieved 2b: Although on-time performance for freight trains is not tracked by railroad operators, it is tracked by passenger operator AMTRAK. Per Figure 4, on-time performance for AMTRAK’s Pacific Surfliner has increased from 70.4% in 2012 to 77.5% in 2016.

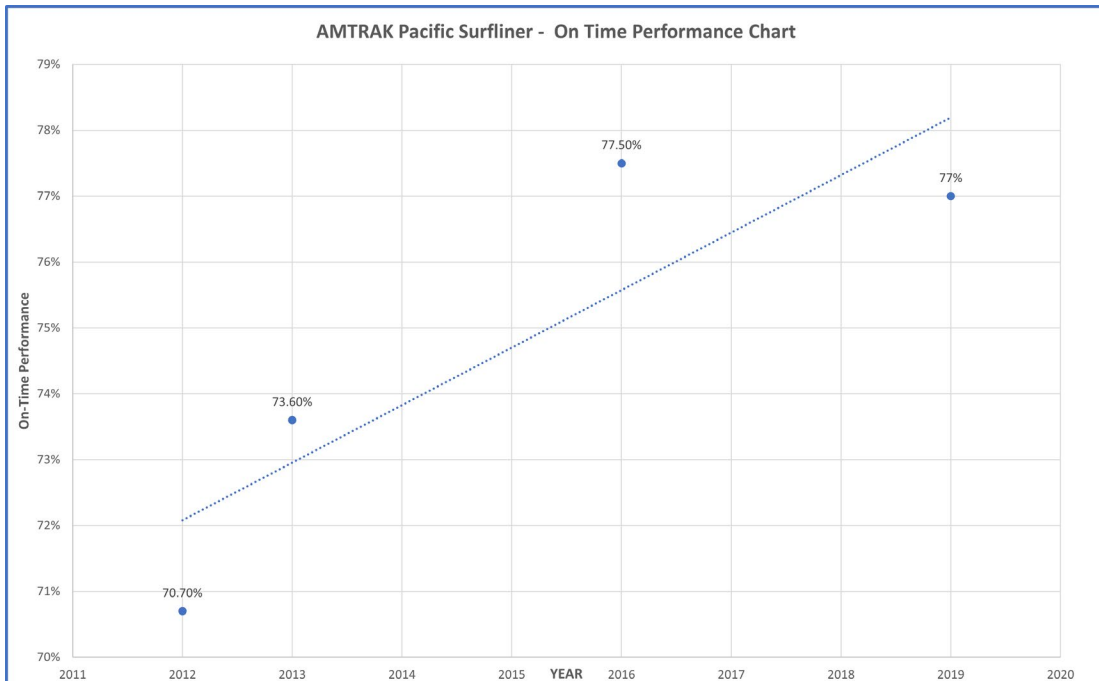


Figure 4 - AMTRAK Surfliner - On-Time Performance Chart

Benefit Category 3 – Safety

Planned Benefit 3: The rail improvement increases the safety of the public by reducing the impact of additional truck traffic on the regional highway network. The Project is projected to reduce up to 9,540 trips annually and thereby reduce injury crashes by up to one per year. The Project also reduces flooding over the track during storm events and thus improve safety and reliability. (See Planned Benefit 2a on flooding).

Benefit Achieved 3: With the addition of 5,800 feet of double track, the Project allowed for increased capacity for freight, which reduced the need to ship goods by truck. Per Table 2 below, in 2016, the Project resulted in a reduction of 54,504 truckloads. This is more than 500% of the Planned Benefit of 9,540 truck trip reductions and equates to 3,270,240 truck Vehicle Miles Travelled (VMT) → 54,504 trucks X 60-mile trips.

The National Highway Traffic Safety Administration (NHTSA) data² states that in 2016 there were 36.58 (35 injury crashes + 1.58 fatal crashes) truck related injury or fatality crashes nationally per 100 million VMT. See Appendix A. Since the Project eliminated 3,270,240 VMT in 2016, that equates to 1.2 eliminated crashes for Year 2016 ($\rightarrow 3.27\text{M VMT} \times 36.58 / 100\text{M VMT}$) and 17 eliminated total crashes by Year 2030 on a straight-line projection.

Table 2 – BNSF VMT

YEAR	Actual Truckloads* Removed	Actual VMT* Reduction	Actual Crash Reduction per year	Goal to be Met (Crashes per Year)	Benefit Achieved
2013	37,855	2,271,300	0.65	1.00	
2014	38,254	2,295,240	0.77	1.00	
2015	43,508	2,610,480	0.85	1.00	
2016	54,504	3,270,240	1.20	1.00	Yes

*Data received from SANDAG (assumes average 45,000lb truck load capacity); truck roundtrip = 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. This analysis does not consider any dead heading of trucks or additional trips made due to trucks not being fully loaded.

Benefit Category 4 – Velocity

Planned Benefit 4: Rail improvements are expected to increase freight train speeds from 20 mph to 24 mph.

Correction Note: Pre-Project freight speeds in Sorrento Valley was 55 mph on MT1 and 40 mph on MT2 in the pre-project condition. See 2009 SSNR Timetable 6 in Appendix B.

Benefit Achieved 4: The Project provided to maintain the MT1 Freight Speed limit at 55 MPH and for the increase in the MT2 freight speed limit from 40 mph to 55 mph. This is confirmed per the NCTD San Diego Subdivision Maximum Authorized Speed for Trains 2020 (Appendix C). [It would appear the planned benefit was incorrectly stated]

Benefit Category 5 – Congestion Reduction

Planned Benefit 5: The increased rail capacity eliminates up to 9,540 truck trips annually and reduce 1,144,880 truck VMT by 2030.

Benefit Achieved 5: Per the TCIF-93 close out report for SVDT, the Project reduced highway truck traffic congestion by increasing freight capacity. More freight on rails equals less truck trips thereby reducing highway congestion. This is proven by BNSF freight tonnage statistics as shown in Table 3 below.

Per the Table there was a steady increase in freight tonnage between 2011 and 2016. Based on an average truckload of 22.5 tons (45,000 pounds), a freight tonnage increase of 215,000 tons over the 2009 baseline is needed to meet the Planned Benefit of eliminating 9,540 truck trips per year. According to the Table, this

² <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812891>

benefit was met from 2012 to 2016. Specifically, the pre-project in 2015 to post project 2016 there were an additional 10,996 diverted truckloads.

For truck VMT reduction, and assuming one truck trip equals the distance from the from 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. (60 miles), 9,540 diverted truckloads are needed to meet the Planned Benefit of eliminating 1,144,880 truck VMT per year. According to the Table, this benefit was met in from 2012 to 2016.

Table 3 – BNSF ANNUAL TONNAGE and VMT

YEAR	BNSF Tons* Over Baseline (2009)	Truckloads Removed from Highway (Annual over 2009)			Truck VMT Reduction (Annual over 2009)		
		Actual Truckloads* Removed	Goal to be Met	Benefit Achieved	Actual VMT* Reduction	Goal to be Met	Benefit Achieved
2011	56,137	2,495	9,540	No	623,750	2,385,000	No
2012	649,636	28,873	9,540	Yes	7,218,250	2,385,000	Yes
2013	851,741	37,855	9,540	Yes	9,463,750	2,385,000	Yes
2014	860,710	38,254	9,540	Yes	9,563,500	2,385,000	Yes
2015	978,925	43,508	9,540	Yes	10,877,000	2,385,000	Yes
2016	1,226,345	54,504	9,540	Yes	13,626,000	2,385,000	Yes

*Data received from SANDAG (assumes average 45,000 lb. truck load capacity); truck roundtrip = 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. This analysis does not consider any dead heading of trucks or additional trips made due to trucks not being fully loaded.

Benefit Category 6 – Emissions Reduction

Planned Benefit 6: The reduction of 9,540 trucks by 2030 is projected to result in the following emissions reductions: NOx 200 lbs./day, CO2 1.32 million lbs./day, PM10 260 lbs./day, and CO 500 lbs./day.). [It would appear the planned benefit was incorrectly calculated]

Based off the current SANDAG modeling in Appendix D, the reduction of 9,540 trucks by 2030 is calculated in the tables below resulting in the reduction of emissions: NOx 30 lbs./day, CO2 6,302 lbs./day, PM10 1.2253 lbs./day, and CO 5.7765 lbs./day.

Since the emissions reduction benefits included in the TCIF grant application were estimated to 2030, the current report is progress to date. In addition, current emissions modeling tools have updated calculations compared to the tools used for the 2007 TCIF applications, so there might be inconsistencies in doing direct comparisons. The SANDAG Transportation Analysis & Modeling TCIF GHG Reduction Estimates memo in Appendix D should therefore be considered a standalone analysis based on data provide by the rail operator and should not be directly compared to the original TCIF application or the closeout sheets.

Benefit Achieved 6: Per the TCIF-93 close out report, the operational flexibility and ability to house freight trains, provided by this Project, allows for more freight on rails and reduces highway truck traffic, resulting in lower emissions. This truck traffic reduction has been measured against the 2009 baseline and was determined to be 54,504 truckloads in 2016. Per Table 4 below, this truckload reduction equates to a CO2 Emission Reduction of approximately 33,982 pounds per day in 2016.

Table 4 – CO2 Emission Reductions

YEAR	Freight Tons Over Baseline (2009)	Annual Diverted Truckloads* (trips)	Annual CO2 Emission Reductions**(pounds)	Annual CO2 Emission Reductions lbs./day***
2011	56,137	2,495	556,098	1,701
2012	649,636	28,873	6,413,534	19,613
2013	851,741	37,855	8,156,768	24,944
2014	860,710	38,254	8,092,952	24,749
2015	978,925	43,508	9,023,123	27,594
2016	1,226,345	54,504	11,112,199	33,982
TOTAL	4,786,057	212,714	44,972,571	

*Data received from SANDAG (assumes average 45,000lb truck load capacity); truck roundtrip = 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. This analysis does not consider any dead heading of trucks or additional trips made due to trucks not being fully loaded.

**Used the CO2 emissions factors from EMFAC2017 and was specifically limited to the 'TI-Tractor' vehicle type, which is for tractor trailer rigs.

***327 effective days used, not 365. The 327 effective annual days for commercial activity was researched by USD EPIC for the 2008 San Diego County GHG inventory.

Per Table 5 below, this truckload reduction equates to a NOx Emission Reduction of approximately 172 pounds per day in 2016.

Table 5 – BNSF Annual NOx Emission Reductions

YEAR	Freight Tons Over Baseline (2009)	Annual Diverted Truckloads* (trips)	Annual NOx Emission Reductions**(pounds)	Annual NOx Emission Reductions lbs./day***
2011	56,137	2,495	5,248	172
2012	649,636	28,873	56,105	185
2013	851,741	37,855	60,713	161
2014	860,710	38,254	52,755	160
2015	978,925	43,508	52,288	174
2016	1,226,345	54,504	56,796	172
TOTAL	4,786,057	212,714	300,225	

*Data received from SANDAG (assumes average 45,000lb truck load capacity); truck roundtrip = 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. This analysis does not consider any dead heading of trucks or additional trips made due to trucks not being fully loaded.

**Used the NOx emissions factors from EMFAC2017 and was specifically limited to the 'TI-Tractor' vehicle type, which is for tractor trailer rigs.

***327 effective days used, not 365. The 327 effective annual days for commercial activity was researched by USD EPIC for the 2008 San Diego County GHG inventory.

Per Table 6 below, this truckload reduction equates to a PM10 Emission Reduction of approximately 7 pounds per day in 2016.

Table 6 – BNSF Annual PM10 Emission Reductions

YEAR	BNSF Tons Over Baseline (2009)	Annual Diverted Truckloads* (trips)	Annual PM10 Emission Reductions** (pounds)	Annual PM10 Emission Reductions lbs./day***
2011	56,137	2,495	232	1
2012	649,636	28,873	2,418	7
2013	851,741	37,855	2,637	8
2014	860,710	38,254	2,163	7
2015	978,925	43,508	2,123	6
2016	1,226,345	54,504	2,288	7
TOTAL	4,786,057	212,714	12,587	

*Data received from SANDAG (assumes average 45,000lb truck load capacity); truck roundtrip = 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. This analysis does not consider any dead heading of trucks or additional trips made due to trucks not being fully loaded.

**Used the PM10 emissions factors from EMFAC2017 and was specifically limited to the 'TI-Tractor' vehicle type, which is for tractor trailer rigs.

***327 effective days used, not 365. The 327 effective annual days for commercial activity was researched by USD EPIC for the 2008 San Diego County GHG inventory.

Per Table 7 below, this truckload reduction equates to a CO Emission Reduction of approximately 33 pounds per day in 2016.

Table 7 – BNSF Annual CO Emission Reductions

YEAR	BNSF Tons Over Baseline (2009)	Annual Diverted Truckloads* (trips)	Annual CO Emission Reductions** (pounds)	Annual CO Emission Reductions lbs./day***
2011	56,137	2,495	1,280	4
2012	649,636	28,873	13,127	40
2013	851,741	37,855	13,719	42
2014	860,710	38,254	10,911	33
2015	978,925	43,508	10,441	32
2016	1,226,345	54,504	10,803	33
TOTAL	4,786,057	212,714	64,283	

*Data received from SANDAG (assumes average 45,000lb truck load capacity); truck roundtrip = 10th Ave Marine Terminal to the San Diego/Orange County boundary via 1-5. This analysis does not consider any dead heading of trucks or additional trips made due to trucks not being fully loaded.

**Used the CO emissions factors from EMFAC2017 and was specifically limited to the 'TI-Tractor' vehicle type, which is for tractor trailer rigs.

***327 effective days used, not 365. The 327 effective annual days for commercial activity was researched by USD EPIC for the 2008 San Diego County GHG inventory.

CONCLUSION

The project benefits are summarized in Table 8 below. It should be noted that the emissions reduction benefits included in the TCIF grant application were estimated to 2030 and the current report is progress to date. In addition, current emissions modeling tools have updated calculations compared to the tools used for the 2007 TCIF applications, so there might be inconsistencies in doing direct comparisons. The SANDAG Transportation Analysis & Modeling TCIF GHG Reduction Estimates memo in Appendix D should therefore be considered a standalone analysis based on data provided by the freight rail operator.

Table 8 – Project Benefits Summary

Benefit Category	Category Description	Planned Benefit	Needed	Achieved	Met
1a	Throughput	Freight Staging	6,000' Track	11,000'	Yes
1b	Throughput	Acceleration / Deceleration	More Length	5,800' more	Yes
1c	Throughput	Meet Future Demand	More Capacity	1 extra Freight	Yes
1d	Throughput	Incr. Capacity	1 Extra Freight	1 extra Freight	Yes
2a	Reliability	Reduce flooding	Raised track	5' Track Raise at Bridge (3' above the 50-year flood level)	Yes
2b	Reliability	Better on time performance	Raised track	5' Track Raise at Bridge (3' above the 50-year flood level)	Yes
3	Safety	Reduce Truck Crashes by 1/yr.	Reduced Accident rate	Reduced Truck Crashes estimated at 1.2/yr.	Yes
4	Velocity	Freight Speed: 20-24mph	More Double Track	Speeds @ 55mph	Yes
5	Congestion Reduction	Reduction 9,540 truck trips Reduction 1,144,880 track VMT	Longer trains to reduce truck trips	Reduced 54,504 trucks (2016) Reduced 13.6 Million VMT (2016)	Yes Yes
6	Emissions Reduction (by 2030)	<u>2030 target</u> Reduction NOx 200 lb./day Reduction CO2 1.32M lb./day Reduction PM10 260 lb./day Reduction CO 500 lb./day	Longer trains to reduce truck trips	<u>Progress to 2016</u> Reduced NOx 172 lb./day Reduced CO2 33,982 lb./day Reduced PM10 7 lb./day Reduced CO 33 lb./day	TBD TBD TBD TBD

APPENDIX A – NHSTA Truck Accident Data

Large Trucks Involved in Fatal and Injury Crashes, and Involvement Rates, 2009–2018

Year	Number of Large Trucks Involved	Number of Large Trucks Registered	Involvement Rate per 100,000 Registered Large Trucks	Large-Truck Miles Traveled (millions)	Involvement Rate per 100 Million Large-Truck Miles Traveled
Fatal Crashes					
2009	3,211	10,973,214	29.26	288,306	1.11
2010	3,494	10,770,054	32.44	286,527	1.22
2011	3,633	10,270,693	35.37	267,594	1.36
2012	3,825	10,659,380	35.88	269,207	1.42
2013	3,921	10,597,356	37.00	275,017	1.43
2014	3,749	10,905,956	34.38	279,132	1.34
2015	4,075	11,203,184	36.37	279,844	1.46
2016	4,562	11,498,561	39.67	287,895	1.58
2017	4,804	12,229,216	39.28	297,593	1.61
2018	4,862	13,233,910	36.74	304,864	1.59
Injury Crashes					
2009	53,000	10,973,214	487	288,306	19
2010	58,000	10,770,054	541	286,527	20
2011	63,000	10,270,693	609	267,594	23
2012	77,000	10,659,380	719	269,207	28
2013	73,000	10,597,356	690	275,017	27
2014	88,000	10,905,956	811	279,132	32
2015	87,000	11,203,184	779	279,844	31
2016†	102,000	11,498,561	888	287,895	35
2017†	107,000	12,229,216	873	297,593	36
2018†	112,000	13,233,910	848	304,864	37

Sources: FARS 2009–2017 Final File, 2018 FARS ARF; NASS GES 2009–2015 and CRSS 2016–2018; Vehicle miles traveled and registered vehicles – Federal Highway Administration
 †CRSS estimates and NASS GES estimates are not comparable due to different sample designs. Refer to end of document for more information about CRSS.

APPENDIX B - 2009 SSNR Timetable 6

SDNR Timetable #6 SAN DIEGO SUBDIVISION

WESTWARD <i>Read Down</i>			San Diego Subdivision MP 228.4 to MP 250.6 <i>Radio Channel 58 - 59</i>		EASTWARD <i>Read Up</i>		
Maximum Authorized Speeds (Passenger - Freight)		Track Diagram	STATIONS <i>Speed Zone Shown in Italic</i>		Mile Post	Approx. Distance	Rule 6.3 Method of Operation
MT or MT-1	Timeout		MT-2 or Siding				
50 - 20			<i>250.6 - 250.0</i>		250.6	0.6	CTC
					250.0		
	40		CP PINES		249.8	4.0	CTC - ATS <i>Controlled Siding Length 467 ft.</i>
90 - 55		40	SORRENTO VALLEY..... S	<i>250.0 245.8</i>	249.0		
	40		CP TORREY		248.8		
BFO 475 55 - 50					245.8		
			<i>245.8 - 244.6</i>		245.8	0.2	
90 - 55			<i>244.6 - 244.6</i>		244.6	1.0	CTC - ATS
80 - 55			<i>244.6 - 244.4</i>		244.6	0.2	
50 - 45			<i>244.4 - 244.1</i>		244.4	0.3	
					244.1		
65 - 55	20		CP DEL MAR	<i>244.1</i>	243.9	0.6	CTC - ATS <i>Controlled Siding Length 267 ft.</i>
		20			243.3		
90 - 55 BFO 475	20		CP CROSBY	<i>243.3</i>	243.3	1.3	CTC - ATS
					242.2		
	60 - 40		CP VALLEY	<i>242.2</i>	242.2	1.1	2 MT - CTC ATS <i>MT-1 Only</i>
70 - 50		60 - 40	SOLANA BEACH..... S	<i>242.2</i>	241.8		
	60 - 40		CP CRAVEN	<i>241.1</i>	241.1		
90 - 55					241.1		CTC - ATS
	60 - 40		CP CARDIFF	<i>238.8</i>	239.7	2.3	2 MT - CTC ATS <i>MT-2 Only</i>
70 - 55		90 - 55			238.8		
	60 - 40		CP SWAMI	<i>238.8</i>	238.0	1.4	CTC - ATS
80 - 55			ENCINITAS..... S	<i>237.4</i>	237.7		
90 - 55					237.4		
	60 - 40		CP PONTO		234.3	9.0	2 MT - CTC ATS <i>MT-2 Only</i>
79 - 55		90 - 55	POINSETTIA..... S	<i>232.4</i>	233.3		
	40		CP FARR	<i>228.4</i>	231.4		
90 - 55					228.4		CTC - ATS
			CARLSBAD VILLAGE..... S		229.2		
					228.4		

SD 4
July 1, 2009

APPENDIX C - SAN DIEGO SUBDIVISION SPECIAL INSTRUCTIONS - ITEM #1
 SAN DIEGO SUBDIVISION MAXIMUM AUTHORIZED SPEED FOR TRAINS in
 2020

Milepost Location Between:			Main		MT1		MT2	
			Passenger	Freight	Passenger	Freight	Passenger	Freight
209.16	and	216.38			90	55	90	55
216.38	and	218.09	90	55				
218.09	and	223.84			90	55	90	55
223.84	and	225.23			70	55	70	55
225.23	and	225.53	70	55				
225.53	and	225.98	55	50				
225.98	and	226.71			55	55	55	55
226.71	and	226.80			90	55	90	55
226.80	and	228.37			90	55	90	55
228.37	and	229.47	90	55				
229.47	and	234.44			90	55	90	55
234.44	and	237.42	90	55				
237.42	and	238.04	80	55				
238.04	and	239.47			70	55		
238.04	and	238.73					80	55
238.73	and	239.47					90	55
239.47	and	241.10			90	55	90	55
241.10	and	242.24			70	50	60	40
242.24	and	243.47	90	55				
243.47	and	244.11	65	55				
244.11	and	244.39	50	45				
244.39	and	245.52	80	55				
245.52	and	245.76	55	50				
245.76	and	247.77	90	55				
247.77	and	249.63			60	55	60	55
249.63	and	250.24			50	20	50	20
250.24	and	251.00			40	20	40	20
251.00	and	252.97	25	20				

252.97	and	253.48			50	45	50	45
253.48	and	255.44			65	55	65	55
255.44	and	256.63			79	55	79	55
256.63	and	257.91			70	55	70	55
257.91	and	258.28	55	45				
258.28	and	258.51	35	30				
258.51	and	259.10	70	55				
259.10	and	260.64	75	55				
260.64	and	262.39			75	55	75	55
262.39	and	262.80			70	55	70	55
262.80	and	264.00			75	55	75	55
264.00	and	265.69			65	40	65	40
265.69	and	267.20			50	30	50	30
267.20	and	267.30			20	10	20	10
267.30	and	267.70	All Tracks		Passenger		Freight	
					15		10	
267.70			Begin BNSF Territory					

Appendix D - SANDAG Transportation Analysis & Modeling TCIF GHG Reduction Estimates

SANDAG Transportation Analysis & Modeling TCIF GHG Reduction Estimates

Background:

As part of the Data & Modeling group's effort to assist in providing information that will help inform other departments, an evaluation was requested pertaining to increased BNSF freight throughput and estimated CO₂, NO_x, PM₁₀, & CO reductions.

It was requested that BNSF freight throughput from 2009 (baseline) through 2016 would be used as a proxy to calculate the potential increase in heavy duty tractor trailer trips out of San Diego county had the TCIF program, in full, not been implemented. Annual emissions reductions as well as a cumulative reduction were calculated assuming all additional BNSF tonnage would have been fulfilled by heavy duty tractor trailers in addition to a more conservative, adjusted reduction which would account for market factors that may have suppressed freight trips outright without TCIF.

Results: (approximate)

YEAR	BNSF Tons Over Baseline (2009)	Annual Diverted Truckloads (trips)	Annual CO ₂ Emission Redcutions (pounds)	1/3 Market Adjustment	1/2 Market Adjustment
2010	162,563	7,225	1,617,897	1,078,603	808,949
2011	56,137	2,495	556,098	370,734	278,049
2012	649,636	28,873	6,413,534	4,275,711	3,206,767
2013	851,741	37,855	8,156,768	5,437,873	4,078,384
2014	860,710	38,254	8,092,952	5,395,328	4,046,476
2015	978,925	43,508	9,023,123	6,015,446	4,511,562
2016	1,226,345	54,504	11,112,199	7,408,170	5,556,099
TOTAL	4,786,057	212,714	44,972,571	29,981,864	22,486,285

YEAR	BNSF Tons Over Baseline (2009)	Annual Diverted Truckloads (trips)	Annual NO _x Emission Redcutions (pounds)	1/3 Market Adjustment	1/2 Market Adjustment
2010	162,563	7,225	16,320	10,880	8,160
2011	56,137	2,495	5,248	3,499	2,624
2012	649,636	28,873	56,105	37,404	28,053
2013	851,741	37,855	60,713	40,476	30,357
2014	860,710	38,254	52,755	35,170	26,377
2015	978,925	43,508	52,288	34,859	26,144
2016	1,226,345	54,504	56,796	37,864	28,398
TOTAL	4,786,057	212,714	300,225	200,151	150,113

YEAR	BNSF Tons Over Baseline (2009)	Annual Diverted Truckloads (trips)	Annual PM10 Emission Redcuts (pounds)	1/3 Market Adjustment	1/2 Market Adjustment
2010	162,563	7,225	726	484	363
2011	56,137	2,495	232	155	116
2012	649,636	28,873	2,418	1,612	1,209
2013	851,741	37,855	2,637	1,758	1,318
2014	860,710	38,254	2,163	1,442	1,081
2015	978,925	43,508	2,123	1,415	1,061
2016	1,226,345	54,504	2,288	1,525	1,144
TOTAL	4,786,057	212,714	12,586	8,391	6,293

YEAR	BNSF Tons Over Baseline (2009)	Annual Diverted Truckloads (trips)	Annual CO Emission Redcuts (pounds)	1/3 Market Adjustment	1/2 Market Adjustment
2010	162,563	7,225	4,002	2,668	2,001
2011	56,137	2,495	1,280	853	640
2012	649,636	28,873	13,127	8,752	6,564
2013	851,741	37,855	13,719	9,146	6,860
2014	860,710	38,254	10,911	7,274	5,455
2015	978,925	43,508	10,441	6,960	5,220
2016	1,226,345	54,504	10,803	7,202	5,402
TOTAL	4,786,057	212,714	64,283	42,856	32,141

Discussion:

- The analysis considered in this memo should not be compared to any previously reported figures or data submitted as part of the TCIF application or closeout sheets. This is a standalone analysis based on BNSF throughput data.
- Due to the same market factors that made forecasting increased demand a challenge in the original 2008 TCIF submission, it is recommended that the 1/3rd or 1/2 market adjustments be considered for use.
- The market adjustments should be considered due to the risk involved with asserting that *all* increased BSNF freight tonnage would have ended up on the highway system.
- The diverted truck trips and diverted VMT were used by assuming a 45,000lb cargo capacity per fully loaded truck, making the trip from 10th Ave Marine Terminal to the San Diego/Orange County boundary via I-5.
- This analysis does not consider any deadheading of trucks or additional trips made due to trucks not being fully loaded.

Discussion (cont.)

- This analysis used the emission factors from EMFAC2017 and was specifically limited to the, 'T7-Tractor' vehicle type. Which is for tractor trailer rigs.
- If one wishes to convert any of these annual figures to daily, it is strongly recommended that 327 effective days be used, not 365. The 327 effective annual days for commercial activity was researched by USD EPIC for the 2008 San Diego County GHG inventory

Figures:

Year	Annual BNSF Throughput (tons)	BNSF Tons Over Baseline (2009)	Annual Diverted LOSSAN Truckloads ^α (trips)	1/3 Market Truckload Adjustment ^δ	1/2 Market Truckload Adjustment ^γ	Annual Diverted LOSSAN Truck VMT ^β (miles)	1/3 Market Truck VMT Adjustment ^δ	1/2 Market Truck VMT Adjustment ^γ	Tractor Trailer CO2 Emissions ^Δ (pounds/mile)	Tractor Trailer NOx Emissions ^Δ (pounds/mile)	Tractor Trailer PM10 Emissions ^Δ (pounds/mile)	Tractor Trailer CO Emissions ^Δ (pounds/mile)
2009	3,111,805	--	--			--			--	--	--	--
2010	3,274,368	162,563	7,225	4,817	3,613	433,501	289,002	216,751	3.73	3.76E-02	1.68E-03	9.23E-03
2011	3,167,942	56,137	2,495	1,663	1,247	149,699	99,800	74,849	3.71	3.51E-02	1.55E-03	8.55E-03
2012	3,761,441	649,636	28,873	19,249	14,436	1,732,363	1,154,914	866,181	3.70	3.24E-02	1.40E-03	7.58E-03
2013	3,963,546	851,741	37,855	25,237	18,928	2,271,309	1,514,214	1,135,655	3.59	2.67E-02	1.16E-03	6.04E-03
2014	3,972,515	860,710	38,254	25,503	19,127	2,295,227	1,530,159	1,147,613	3.53	2.30E-02	9.42E-04	4.75E-03
2015	4,090,730	978,925	43,508	29,005	21,754	2,610,467	1,740,320	1,305,233	3.46	2.00E-02	8.13E-04	4.00E-03
2016	4,338,150	1,226,345	54,504	36,336	27,252	3,270,253	2,180,180	1,635,127	3.40	1.74E-02	7.00E-04	3.30E-03
	TOTAL	4,786,057	212,714	141,810	106,357	12,762,819	8,508,588	6,381,409	--	--	--	--

Remarks: α - Truckload assumes fully laden capacity of 45,000lbs

β - Assumes one fully laden truck traveling from 10th Av Marine Terminal to SD/Orange County line (~60 miles)

Δ - CO2 total exhaust / VMT from EMFAC2017 for T7-Tractor vehicle class for that fleet year

δ - Assumes that 1/3 of additional tonnage over 2009 would have been suppressed without TCIF

γ - Assumes that 1/2 of additional tonnage over 2009 would have been suppressed without TCIF