Alameda Corridor
Air Quality Benefits

Background

The Alameda Corridor Air Quality Benefits report provides an assessment of the benefits comparing a “no project” condition to the current condition with the Alameda Corridor in place. The “no project” analysis considers train movements along the original rail routes compared to the Alameda Corridor route. The emissions analysis looks at train operations as well as the influence of train movements on street vehicles, such as blocking traffic when trains are passing through at-grade roadway crossings. The Alameda Corridor removed over 200 such at-grade crossings.

The report does not include the substantial benefits of moving more cargo by rail. The Alameda Corridor enables higher speed trains on a more direct route with greater capacity, and these improved operations have the potential to divert significant traffic volumes from trucks to trains. Every train calling at the Port has the potential to remove 750 truck trips, thereby reducing traffic on regional freeways such as the I-710. The physics of low friction steel-wheel operations and the ability to move many containers with locomotive power provides much improved efficiency and reduced emissions when compared to truck transport. The removal of trucks from regional freeways also reduces congestion and improves efficiency for commuter traffic. These benefits are not captured by the Alameda Corridor Air Quality Benefits report.

Methodology

The emissions benefit along the Alameda Corridor is based on the incremental difference between the air emissions that would have occurred from transporting a given amount of cargo from the San Pedro Bay to downtown Los Angeles (and vice versa) along the pre-existing rail corridor, compared to the air emissions that would occur by transporting the same amount of cargo along the existing Alameda Corridor. Direct air quality benefits from the Alameda Corridor are achieved through the consolidation of four 10 MPH rail lines into one 40 MPH rail line. The Alameda Corridor was constructed with more efficient tracks that impose a lower load on a locomotive's engine, resulting in decreases in locomotive exhaust emissions, decreases in train travel time, and decreases in locomotive fuel consumption. Additionally, the Alameda Corridor results in operational efficiencies associated with a more direct route, resulting in fewer traveled train miles. Further, the Alameda corridor was designed for an increase in corridor capacity (trains/day) compared to the pre-existing corridor, resulting in a diversion of cargo from truck to rail transportation and decreases in truck trips along regional surface streets and freeways. Lastly, the below grade construction of the Alameda corridor eliminates at-grade crossings of road traffic that existed along the pre-corridor rail lines.

Assumptions

1. The annual average TEUs moved along the corridor and the average daily trains per day are inputted by the user. It is assumed that 50% of the daily trains along the corridor are containerized from 2002-2013 and the 70% of daily trains are containerized from 2014 forward. This information is utilized in order to determine the average amount of TEUs transported per train along the pre-existing and current Alameda Corridor.
2. It is assumed that there are 1.75 TEUs per container. Each truck is assumed to carry one container.
3. The average one way truck trip distance from the San Pedro Bay to downtown Los Angeles (and vice versa) is assumed to be 25 miles based on satellite measurements. Its is assumed that a truck makes two truck trips per container move which would equate to a 50 mile roundtrip. It is assumed that the average truck speed is 35 mph. It is assumed there will be 5 minutes of idling at the bookends of each truck trip pursuant to California Air Resources Board's (CARB) idling regulation for heavy-duty diesel vehicles.
4. It is assumed that there are 4 locomotives per train. This assumption is based on the "Alameda Corridor Air Quality Benefits Final Report" (Weston Solutions, Inc. 2005).
5. The pre-existing corridor is assumed to have a capacity of 44 trains per day based on a train count provided by Digicon as noted in the "Alameda Corridor Air Quality Benefits Final Report" (Weston Solutions, Inc. 2005). For instances in which the pre-existing corridor's rail capacity would be reached, it is assumed that trucks would be utilized to transport TEUs that could not be accommodated along the corridor due to capacity restrictions.
6. It is assumed that the Alameda Corridor has the potential to operate 7 days a week, 52 weeks a year.
7. It is assumed that BNSF locomotives transport 52.4% of the Alameda Corridor's throughput and UP locomotives transport 47.6% of the throughput. This is based on the average percentage split in corridor TEU throughput by BNSF and UP from 2010-2016 as provided by ACTA.
8. The analysis utilizes the number of trips on each rail segment within the pre-existing corridor as analyzed within the "Alameda Corridor Air Quality Benefits Final Report" (Weston Solutions, Inc. 2005). This information was used in order to determine the percentage of total daily train trips on each rail segment within the pre-existing corridor.
9. Train travel times for the pre-corridor and existing corridor routes are based on analysis of BNSF and UP operating parameters, including time-in-notch while running and typical delay times as noted within the "Alameda Corridor Air Quality Benefits Final Report" (Weston Solutions, Inc. 2005).
10. Actual locomotive horsepower duty cycles were utilized to calculate the average daily power consumption within the pre-corridor and existing corridor routes, as noted within the "Alameda Corridor Air Quality Benefits Final Report" (Weston Solutions, Inc. 2005).
11. BNSF and UP emission rates for NOx were based on their 2016 CARB 98 Memorandum of Mutual Understanding submittal, which details the compliance summary of locomotives operating within the South Coast Air Basin. All other emission rates were derived from U.S. EPA tier based emission rates. The analysis utilized a BNSF and UP specific fleet average emission rate based on the percent of megawatt hours per tier within each individual fleet.
12. Truck emission rates were gathered by running CARB's Emission Factors (EMFAC) 2014 model for the Los Angeles region. Truck emission rates are representative of a diesel truck fleet with a 2011 average truck model year, consistent with the Port of Los Angeles' and Port of Long Beach's truck age distribution for calendar year 2016.
13. Passenger vehicle idling emission factors were generated for vehicle types (LDA, LDT1, LDT2, MDV) by running EMFAC 2014 pursuant to CARB guidance. Delay times for the without/with Alameda Corridor scenarios are based on 2012 traffic data as reported within the Alameda Corridor Air Quality Benefits Final Report (Weston Solutions, 2005).

Alameda Corridor
Air Quality Benefits

Calendar Year	2020
ACTA TEU Throughput	4,487,607
Analysis Period	Annual

Emissions (tons/day)

Source	*Emissions without Alameda Corridor*							
	ROG	HC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2
Locomotives	0.05	0.04	0.19	0.80	0.03	0.03	0.001	73.90
Trucks	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00
Passenger Vehicle Crossing Delay	0.01	0.01	0.07	0.01	0.001	0.000	0.000	43.47
Total	**0.05**	**0.05**	**0.27**	**0.81**	**0.030**	**0.029**	**0.001**	**117.37**
Source	*Current Emissions with Alameda Corridor*							
	ROG	HC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2
Locomotives	0.03	0.03	0.14	0.58	0.02	0.02	0.000	53.65
Trucks	--	--	--	--	--	--	--	--
Passenger Vehicle Crossing Delay	0.000	0.000	0.005	0.000	3.56E-05	3.28E-05	2.94E-05	2.94
Total	**0.03**	**0.03**	**0.14**	**0.58**	**0.022**	**0.021**	**0.001**	**56.59**
Emissions Benefit	*0.02*	*0.02*	*0.12*	*0.22*	*0.009*	*0.008*	*0.001*	*60.78*

Emissions (tons/year)

Source	*Emissions without Alameda Corridor*							
	ROG	HC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2
Locomotives	16.90	16.05	70.29	292.03	10.80	10.48	0.25	26,974.11
Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Passenger Vehicle Crossing Delay	1.86	2.46	27.11	2.39	0.19	0.18	0.16	15,867.62
Total	**18.76**	**18.51**	**97.39**	**294.42**	**10.99**	**10.65**	**0.41**	**42,841.73**
Source	*Current Emissions with Alameda Corridor*							
	ROG	HC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2
Locomotives	12.30	11.68	51.03	212.98	7.86	7.62	0.18	19,582.06
Trucks	--	--	--	--	--	--	--	--
Passenger Vehicle Crossing Delay	0.13	0.17	1.83	0.16	0.01	0.01	0.01	1,073.62
Total	**12.42**	**11.84**	**52.86**	**213.15**	**7.87**	**7.63**	**0.19**	**20,655.69**
Emissions Benefit	*6.34*	*6.67*	*44.53*	*81.28*	*3.12*	*3.02*	*0.22*	*22,186.04*

Alameda Corridor Transportation Authority