APPENDIX E: EMISSIONS FROM BALLAST MATERIALS HAULING

Memorandum

To: Harry Boxler, HSR

From: Keith Cooper, ICF
David Ernst, ICF
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Date: August 9, 2017

Re: High Speed Rail Los Angeles to Anaheim Section: Estimates of Onroad Emissions from Ballast Materials Hauling

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Introduction

Construction of the Los Angeles to Anaheim section will require an estimated 200,000 cubic yards (cy) of railroad sub-ballast and ballast material to serve as the foundation for the track alignment (STV, 2017). This memorandum describes the methods used to: (1) estimate a plausible scenario of material hauling that could occur; and (2) calculate criteria pollutant and greenhouse gas (GHG) emissions associated with the material hauling activities.

There is one Build Alternative under consideration, and one quarry under consideration. The CEMEX USA quarry in Azusa, CA averages 26 road miles from the four Los Angeles to Anaheim section stations, and this distance was taken as representative of the travel distance for material deliveries throughout the alignment.

The information contained in this memo is intended to be used as an initial estimate of criteria pollutant and GHG emissions associated with truck trips from material hauling that would occur within the South Coast Air Basin (SCAB). The actual quantities associated with material hauling activities for the Los Angeles to Anaheim section are not known at this time, but this memo represents a reasonable estimate of these activities given currently available information.

Criteria Pollutant and Greenhouse Gas Emissions Analysis

The criteria pollutants evaluated were carbon monoxide (CO), nitrogen oxide (NO_X), particulate matter with a diameter of 10 micrometers or less (PM_{10}), particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$), reactive organic gases (ROG), and sulfur dioxide (SO_2). CO_2 emissions were also evaluated.

The Calfornia Air Resources Board (2015) EMFAC2014 model was used to calculate emission factors, exprerssed in grams per vehicle-mile traveled (VMT). Emissions were calculated by multiplying EMFAC2014 emission factors by annual vehicle miles traveled (VMT) to estimate tons per year emissions, and by daily VMT to estimate pounds per day emissions. It was assumed that 50,000 cy of ballast materials would be hauled each year from 2024 to 2027, inclusive. Haul-truck capacity was assumed to be 16 cy, and the average one-way distance was assumed to be 26 miles. The daily emissions estimates assume that annual ballast hauling would occur over six months. Modeling results are provided below in Table 1.

Table 1. Ballast and Sub-Ballast Hauling Emissions within the SCAB

Construction Year	Emissions						
	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2 [1]
Annual Emissions (tons per year)							
2024	<1	<1	<1	<1	<1	<1	178.1
2025	<1	<1	<1	<1	<1	<1	177.3
2026	<1	<1	<1	<1	<1	<1	176.7
2027	<1	<1	<1	<1	<1	<1	176.1
Daily Emissions (pounds per day)							
2024	<1	2	<1	<1	<1	<1	N/A
2025	<1	2	<1	<1	<1	<1	N/A
2026	<1	2	<1	<1	<1	<1	N/A
2027	<1	2	<1	<1	<1	<1	N/A

[1] The units for CO_2 are metric tons, not short tons.
Emissions calculation worksheet attached.

The tons per year and pounds per day emissions estimates are just one component of total Los Angeles to Anaheim section construction emissions. As such, these emissions estimates must be added to the remaining Los Angeles to Anaheim section construction emissions components to arrive at total SCAB tons per year and pounds per day emissions.

References

Calfornia Air Resources Board. (2015, May 15). EMFAC2014 Emissions Factor Model. Sacramento, CA.

STV. (2017, March). Los Angeles to Anahiem Section Construction Assumptions. Los Angeles, CA.

Attachment

Los Angeles to Anaheim Section Criteria Pollutant and Greenhouse Gas Emissions Calculation Worksheet for Ballast Hauling Emissions

ATTACHMENT
HSR Los Angeles to Anaheim Section
Criteria Pollutant and GHG Emissions Calculation Worksheet for Ballast Hauling Emissions

Emission Factors
EMFAC2014 (v1.0.7) Emission Rates
Region Type: Air Basin
Region: South Coast
Calendar Year2: 2024 - 2027
Season: Annual
Vehicle Classification: EMFAC2011 Categories
VehClass: T6 CAIRP heavy
Units: g/mile for RUNEX

CalYr	ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2_5_RUNEX	CO2_RUNEX
2024	0.03206	0.70233	0.16874	0.01046	0.00280	0.00267	1,096.21028
2025	0.03189	0.67826	0.16787	0.01041	0.00278	0.00266	1,091.36737
2026	0.03168	0.65484	0.16677	0.01037	0.00276	0.00264	1,087.16250
2027	0.03145	0.63269	0.16554	0.01034	0.00274	0.00262	1,083.56131

Truck Travel Inputs

Annual Ballast Used (cy):	50,000	
Haul-truck Capacity (cy):	16	
Annual Trips:	3,125	
Daily Trips:	25	(assumes 6-month duration and 5-day work week)
Round-trip Length:	52	miles

	Annual Emissions (US tons per year)						CO_2 (metric
Year	ROG	NO_X	CO	SO_X	PM10	PM2.5	tons per year)
2024	0.0057	0.1258	0.0302	0.0019	0.0005	0.0005	178.1
2025	0.0057	0.1215	0.0301	0.0019	0.0005	0.0005	177.3
2026	0.0057	0.1173	0.0299	0.0019	0.0005	0.0005	176.7
2027	0.0056	0.1133	0.0297	0.0019	0.0005	0.0005	176.1

	Daily Emissions (pounds per day)					
Year	ROG	NO_X	CO	SO_X	PM10	PM2.5
2024	0.092	2.013	0.484	0.030	0.008	0.008
2025	0.091	1.944	0.481	0.030	0.008	0.008
2026	0.091	1.877	0.478	0.030	0.008	0.008
2027	0.090	1.813	0.474	0.030	0.008	0.008