Appendix 4.2-1 Air Quality Model Runs

Methodology Updates to River Crossing Marketplace Specific Plan Draft EIR

Construction Emissions

On-Road construction mobile emissions were revised to utilize EMFAC2017 instead of EMFAC2014. The construction schedule and trip rates shown in Table 1-1 are consistent with the DEIR. EMFAC2017 emission factors used in the analysis are shown in Table 1-2 and 1-3, with resulting on-road mobile source emissions shown in Table 1-4. Total emissions by construction phase, including off-road equipment, architectural coatings, and other construction emission sources are shown in Table 1-5. The maximum daily construction emissions were calculated by summing emissions from overlapping phases and identifying the maximum.

Operational Emissions

On-road operational mobile emissions were revised to utilize a combination of weekday, Saturday and Sunday trip rates, an updated fleet mix, EMFAC2017, and idling of passenger vehicles at the gas station. The revised trip rates and resulting vehicle miles traveled are presented in Table 2-1. Non-delivery vehicle (i.e., passenger vehicles) trip rates were developed based on the Traffic Impact Analysis and input from Kittelson and Associates. Delivery vehicle trip rates are based on the trip rates included in the Health Risk Assessment (HRA). The fleet mix (Table 2-2) was updated to separate the fleet mix into non-delivery and delivery vehicles to more accurately represent the potential emissions from the different types of vehicles. The non-delivery vehicles include all vehicle classes except Medium Heavy-Duty Trucks (MHDT) and Heavy Heavy-Duty Trucks (HHDT), while the delivery vehicles include MHDT and HHDT. Emission factors obtained from EMFAC2017 are shown in Table 2-3 through 2-9 for criteria pollutants (CAP) and Tables 2-12 through 2-14 for greenhouse gases (GHGs). A summary of the resulting emissions are shown in Tables 2-10 and 2-11 (CAP) and 2-15 (GHG).

The on-road mobile source emissions inventory changed due to updates in the following ways. The emissions increased due to the change on the weekend trip rates as the net effect resulted in higher trip rates than those used in the DEIR. However, the NO_X emissions from the mobile sources decreased due to updates to the project fleet mix to more accurately reflect the likely vehicles and the update to EMFAC2017. While the change to EMFAC2017 results in higher NOx emission rates for delivery vehicles (MHDT and HHDT) as compared to the DEIR, the NO_X running exhaust emission factors for non-delivery vehicles (e.g., LDA, LDT1, LDT2, etc.) are lower. The net effect is an overall decrease in the NOx emissions.

Other updates to the operational emissions include addition of transportation refrigeration unit (TRU) emissions and emissions from gasoline storage and dispensing. The TRU emission calculations are shown in Table 2-16 and gasoline storage and dispensing emissions are shown in Table 2-17. These calculations are based on the same assumptions as was previously prepared in the DEIR.

Table 1-1. Construction On-Road Vehicle Trips
River Crossing Marketplace Specific Plan
Shasta County, California

Project Component	Phase	Start Date[1]	End Date[1]	Total Days[1]	Worker Trip Rates[1] (one-way trips/day)	Vendor Trip Rates[1] (one-way trips/day)	Hauling Trip Rates[1] (one-way trips/phase)	Total Roundtrips per Day[2]		
								Worker	Vendor	Hauling
Onsite Construction	Site Preparation	6/1/2019	6/14/2019	10	13	0	0	7	0	0
	Grading	6/15/2019	10/1/2019	77	48	0	550	24	0	4
	Building Construction (On-site)	10/2/2019	12/31/2019	65	485	198	0	243	99	0
		1/1/2020	4/30/2020	87				243	99	0
	Paving (On-site)	10/2/2019	12/31/2019	65	10	0	420	5	0	1
		1/1/2020	4/30/2020	87				5	0	1
	Architectural Coating (On-site)	10/2/2019	12/31/2019	65	97	0	350	49	0	1
		1/1/2020	4/30/2020	87				49	0	1
Tree Hauling	Tree Hauling	6/1/2019	7/5/2019	25	32	0	1,000	16	0	20
Offsite Construction	Earthwork 1	6/1/2019	7/5/2019	25	18	0	740	9	0	15
	Utilities and Concrete 1	7/6/2019	8/9/2019	25	156	0	1,500	78	0	30
	Earthwork 2	8/10/2019	9/13/2019	25	18	0	740	9	0	15
	Paving-Electrical-Striping 1	8/10/2019	9/13/2019	25	13	0	1,800	7	0	36
	Utilities and Concrete 2	9/14/2019	10/18/2019	25	156	0	1,500	78	0	30
	Paving-Electrical-Striping 2	10/19/2019	11/22/2019	25	13	0	1,800	7	0	36
	Earthwork 3	11/23/2019	12/27/2019	25	18	0	740	9	0	15
	Utilities and Concrete 3	12/28/2019	12/31/2019	2	156	0	1,500	78	0	30
	Utilities and Concrete 3	1/1/2020	1/31/2020	23				78	0	30
	Paving-Electrical-Striping 3	2/1/2020	3/6/2020	25	13	0	1,800	7	0	36

Notes:

[1] Schedule and trip rates based on Project-specific data.

[2] The total roundtrips per day in each calendar year were estimated by assuming trips are evenly distributed across the construction phase.

Table 1-2. Construction On-Road Emissions Factors for Worker Trips
River Crossing Marketplace Specific Plan
Shasta County, California

Calendar Year	Vehicle Class	Emission Factors[1]											
		ROG						NO_x		CO		SO_x	
		Running Exhaust	Hot Soak	Running Losses	Starting	Resting Loss	Diurnal	Running Exhaust	Starting	Running Exhaust	Starting	Running Exhaust	Starting
		g/mile	g/trip					g/mile	g/trip	g/mile	g/trip	g/mile	g/trip
2019	LDA	0.019	0.16	0.29	0.37	0.06	0.09	0.071	0.265	0.972	2.674	0.003	0.001
	LDT1	0.040	0.27	0.93	0.52	0.12	0.18	0.148	0.342	1.620	2.957	0.003	0.001
	LDT2	0.042	0.26	0.88	0.64	0.12	0.17	0.207	0.536	1.735	3.596	0.004	0.001
	Workers[2]	0.030	0.21	0.60	0.48	0.09	0.13	0.12	0.35	1.32	2.98	0.00	0.00
2020	LDA	0.016	0.142	0.272	0.333	0.058	0.081	0.059	0.243	0.860	2.581	0.003	0.001
	LDT1	0.031	0.242	0.852	0.461	0.106	0.161	0.125	0.315	1.397	2.770	0.003	0.001
	LDT2	0.036	0.246	0.840	0.586	0.113	0.162	0.178	0.490	1.545	3.452	0.004	0.001
	Workers[2]	0.024	0.19	0.56	0.43	0.08	0.12	0.105	0.32	1.165	2.85	0.003	0.00

Table 1-2. Construction On-Road Emissions Factors for Worker Trips
River Crossing Marketplace Specific Plan
Shasta County, California

Calendar Year	Vehicle Class	Emission Factors[1]													
		PM_{10}				$PM_{2.5}$				CO_2		CH_4		N_2O	
		Running Exhaust	Tire Wear	Brake Wear	Starting	Running Exhaust	Tire Wear	Brake Wear	Starting	Running Exhaust	Starting	Running Exhaust	Starting	Running Exhaust	Starting
		g/mile			g/trip	g/mile			g/trip	g/mile	g/trip	g/mile	g/trip	g/mile	g/trip
2019	LDA	0.002	0.008	0.037	0.002	0.002	0.002	0.016	0.002	296.087	60.934	0.005	0.076	0.007	0.031
	LDT1	0.002	0.008	0.037	0.003	0.002	0.002	0.016	0.003	341.999	71.268	0.009	0.099	0.010	0.034
	LDT2	0.002	0.008	0.037	0.003	0.002	0.002	0.016	0.002	388.108	82.593	0.009	0.120	0.013	0.045
	Workers[2]	0.002	0.008	0.037	0.003	0.002	0.002	0.016	0.002	330.570	68.932	0.007	0.093	0.009	0.035
2020	LDA	0.002	0.008	0.037	0.002	0.002	0.002	0.016	0.002	288.202	59.284	0.004	0.070	0.006	0.030
	LDT1	0.002	0.008	0.037	0.003	0.002	0.002	0.016	0.003	333.997	69.313	0.007	0.090	0.009	0.032
	LDT2	0.002	0.008	0.037	0.003	0.002	0.002	0.016	0.002	376.114	80.168	0.008	0.111	0.012	0.043
	Workers[2]	0.002	0.008	0.037	0.002	0.002	0.002	0.016	0.002	321.629	67.012	0.006	0.085	0.008	0.034

Notes:

[1] Emission Factors calculated from EMFAC2017 Desktop Module. EMFAC2017 was run in emissions mode for Shasta County. The total county emissions were converted to emission factors using the total trips and VMT reported in EMFAC2017.

[2] Assumes 50% LDA, 25% LDT1, and 25% LDT2 vehicles, consistent with assumptions in CalEEMod. Worker vehicles are assumed to be only gasoline fueled due to the relatively low percentage of non-gasoline vehicles in worker fleets.

Abbreviations:

CH_4 - methane
CO - carbon monoxide
CO_2 - carbon dioxide
EMFAC - EMission FACtors model
g - grams
LDA - light duty automobiles
LDT - light duty trucks
N_2O - nitrous oxide
NO_x - nitrogen oxides
PM_{10} - particulate matter < 10 µg
$PM_{2.5}$ - particulate matter < 2.5 µg
ROG - reactive organic gases
SO_X - sulfur oxides

Table 1-3. Construction On-Road Emissions Factors for Hauling and Vendor Trips
River Crossing Marketplace Specific Plan
Shasta County, California

Calendar Year	Vehicle Class	Emission Factors[1]											
		ROG		NO_x		CO		SO_x		PM_{10}			
		Running Exhaust	Idling Exhaust	Running Exhaust	Idling Exhaust	Running Exhaust	Idling Exhaust	Running Exhaust	Idling Exhaust	Running Exhaust	Tire Wear	Brake Wear	Idling Exhaust
		g/mile	g/trip	g/mile	g/trip	g/mile	g/trip	g/mile	g/trip	g/mile			g/trip
2019	MHDT	0.359	0.293	4.864	18.215	0.887	4.535	0.011	0.016	0.144	0.012	0.130	0.076
	HHDT	0.189	0.618	4.714	8.422	0.646	8.002	0.014	0.015	0.091	0.036	0.061	0.009
	HHDT/MHDT[2]	0.274	0.455	4.789	13.319	0.766	6.268	0.013	0.015	0.118	0.024	0.096	0.042
2020	MHDT	0.283	0.232	4.458	16.769	0.725	4.425	0.011	0.016	0.110	0.012	0.130	0.052
	HHDT	0.134	0.600	4.230	8.064	0.497	8.125	0.014	0.014	0.069	0.036	0.061	0.005
	HHDT/MHDT[2]	0.209	0.416	4.344	12.417	0.611	6.275	0.012	0.015	0.089	0.024	0.096	0.029

Table 1-3. Construction On-Road Emissions Factors for Hauling and Vendor Trips
River Crossing Marketplace Specific Plan
Shasta County, California

Calendar Year	Vehicle Class	Emission Factors[1]									
		$PM_{2.5}$				CO_2		CH_4		N_2O	
		Running Exhaust	Tire Wear	Brake Wear	Idling Exhaust	Running Exhaust	Idling Exhaust	Running Exhaust	Idling Exhaust	Running Exhaust	Idling Exhaust
		g/mile			g/trip	g/mile	g/trip	g/mile	g/trip	g/mile	g/trip
2019	MHDT	0.138	0.003	0.056	0.072	1150.75	1687.73	0.017	0.014	0.181	0.000
	HHDT	0.087	0.009	0.026	0.009	1497.40	1534.18	0.009	0.029	0.235	0.000
	HHDT/MHDT[2]	0.112	0.006	0.041	0.041	1324.08	1610.95	0.013	0.021	0.208	0.000
2020	MHDT	0.105	0.003	0.056	0.050	1143.07	1675.03	0.013	0.011	0.180	0.000
	HHDT	0.066	0.009	0.026	0.005	1472.83	1511.17	0.006	0.028	0.232	0.000
	HHDT/MHDT[2]	0.085	0.006	0.041	0.028	1307.95	1593.10	0.010	0.019	0.206	0.000

Notes:

[1] Emission Factors calculated from EMFAC2017 Desktop Module. EMFAC2017 was run in emissions mode for Shasta County for all emission sources except idling. The total county emissions were converted to emission factors using the total trips and VMT reported in EMFAC2017. Idling emission factors were obtained from EMFAC2017 using the emission rate mode and converted from g/idle-hr to g/trip assuming 15 minutes of idling per trip.

[2] Assumes 50% HHDT and 50% MHDT vehicles, consistent with assumptions for vendor trips in CalEEMod®.

Abbreviations:

CH_4 - methane
CO - carbon monoxide
CO_2 - carbon dioxide
EMFAC - EMission FACtors model
g - grams
HHDT - heavy heavy-duty trucks
MHDT - medium heavy-duty trucks
N_2O - nitrous oxide
NO_x - nitrogen oxides
PM_{10} - particulate matter < 10 µg
$PM_{2.5}$ - particulate matter < 2.5 µg
ROG - reactive organic gases
SO_X - sulfur oxides

Table 1-4. Construction On-Road Emissions
River Crossing Marketplace Specific Plan
Shasta County, California

Year	Construction Phase	Trip Type	Daily Round Trips[1]	Daily VMT[2] (miles)	Emissions[3] (lbs/day)										Emissions[3] (MT/year)		
									PM_{10}			$PM_{2.5}$					
					ROG	NO_x	CO	SO_x	Exhaust, Tire Wear, and Brake Wear	Entrained Road Dust	Total	Exhaust, Tire Wear, and Brake Wear	Entrained Road Dust	Total	CO_2	CH_4	N_2O
2019	Site Preparation	Worker	7	140	0.053	0.048	0.495	0.001	0.015	0.026	0.040	0.006	0.004	0.010	0.5	0.000	0.000
	Grading	Worker	24	518	0.194	0.179	1.829	0.004	0.054	0.094	0.148	0.023	0.014	0.037	13.5	0.001	0.000
		Hauling	4	143	0.069	1.617	0.329	0.005	0.059	0.339	0.399	0.039	0.051	0.090	17.3	0.000	0.003
	Building Construction (On-site)	Worker	243	5,238	1.960	1.808	18.480	0.039	0.543	0.954	1.497	0.229	0.143	0.372	114.7	0.005	0.004
		Vendor	99	1,445	1.072	21.075	5.179	0.047	0.775	2.720	3.495	0.526	0.408	0.934	145.1	0.001	0.020
	Paving (On-site)	Worker	5	108	0.040	0.037	0.381	0.001	0.011	0.020	0.031	0.005	0.003	0.008	2.4	0.000	0.000
		Hauling	1	55	0.027	0.626	0.127	0.002	0.023	0.131	0.154	0.015	0.020	0.035	5.7	0.000	0.001
	Architectural Coating (On-site)	Worker	49	1,048	0.392	0.362	3.696	0.008	0.109	0.191	0.299	0.046	0.029	0.074	22.9	0.001	0.001
		Hauling	1	46	0.022	0.521	0.106	0.002	0.019	0.109	0.129	0.012	0.016	0.029	4.7	0.000	0.001
2020	Building Construction (On-site)	Worker	243	5,238	1.763	1.561	16.501	0.037	0.542	0.954	1.496	0.228	0.143	0.371	149.4	0.006	0.005
		Vendor	99	1,445	0.846	19.262	4.685	0.046	0.679	2.720	3.399	0.434	0.408	0.842	191.9	0.002	0.026
	Paving (On-site)	Worker	5	108	0.036	0.032	0.340	0.001	0.011	0.020	0.031	0.005	0.003	0.008	3.1	0.000	0.000
		Hauling	1	55	0.020	0.564	0.110	0.002	0.020	0.131	0.152	0.012	0.020	0.032	7.4	0.000	0.001
	Architectural Coating (On-site)	Worker	49	1,048	0.353	0.312	3.300	0.007	0.108	0.191	0.299	0.046	0.029	0.074	29.9	0.001	0.001
		Hauling	1	46	0.017	0.470	0.092	0.001	0.017	0.109	0.126	0.010	0.016	0.027	6.2	0.000	0.001
2019	Tree Hauling	Worker	16	346	0.129	0.119	1.219	0.003	0.036	0.063	0.099	0.015	0.009	0.025	2.9	0.000	0.000
		Hauling	20	500	0.262	5.939	1.417	0.017	0.208	1.188	1.396	0.136	0.178	0.314	20.3	0.000	0.003
2019	Earthwork 1	Worker	9	194	0.073	0.067	0.686	0.001	0.020	0.035	0.056	0.009	0.005	0.014	1.6	0.000	0.000
		Hauling	15	592	0.287	6.702	1.365	0.019	0.246	1.407	1.653	0.160	0.211	0.371	23.3	0.000	0.003
	Utilities and Concrete 1	Worker	78	1,685	0.630	0.582	5.944	0.012	0.175	0.307	0.482	0.074	0.046	0.120	14.2	0.001	0.001
		Hauling	30	1,200	0.581	13.586	2.766	0.039	0.499	2.851	3.350	0.325	0.428	0.753	47.2	0.000	0.007
	Earthwork 2	Worker	9	194	0.073	0.067	0.686	0.001	0.020	0.035	0.056	0.009	0.005	0.014	1.6	0.000	0.000
		Hauling	15	592	0.287	6.702	1.365	0.019	0.246	1.407	1.653	0.160	0.211	0.371	23.3	0.000	0.003
	Paving-Electrical-Striping 1	Worker	7	140	0.053	0.048	0.495	0.001	0.015	0.026	0.040	0.006	0.004	0.010	1.2	0.000	0.000
		Hauling	36	1,440	0.697	16.303	3.319	0.047	0.599	3.422	4.020	0.390	0.513	0.903	56.7	0.000	0.008
	Utilities and Concrete 2	Worker	78	1,685	0.630	0.582	5.944	0.012	0.175	0.307	0.482	0.074	0.046	0.120	14.2	0.001	0.001
		Hauling	30	1,200	0.581	13.586	2.766	0.039	0.499	2.851	3.350	0.325	0.428	0.753	47.2	0.000	0.007
	Paving-Electrical-Striping 2	Worker	7	140	0.053	0.048	0.495	0.001	0.015	0.026	0.040	0.006	0.004	0.010	1.2	0.000	0.000
		Hauling	36	1,440	0.697	16.303	3.319	0.047	0.599	3.422	4.020	0.390	0.513	0.903	56.7	0.000	0.008
	Earthwork 3	Worker	9	194	0.073	0.067	0.686	0.001	0.020	0.035	0.056	0.009	0.005	0.014	1.6	0.000	0.000
		Hauling	15	592	0.287	6.702	1.365	0.019	0.246	1.407	1.653	0.160	0.211	0.371	23.3	0.000	0.003
	Utilities and Concrete 3	Worker	78	1,685	0.630	0.582	5.944	0.012	0.175	0.307	0.482	0.074	0.046	0.120	1.1	0.000	0.000
		Hauling	30	1,200	0.581	13.586	2.766	0.039	0.499	2.851	3.350	0.325	0.428	0.753	3.8	0.000	0.001
2020	Utilities and Concrete 3	Worker	78	1,685	0.567	0.502	5.308	0.012	0.174	0.307	0.481	0.073	0.046	0.119	12.7	0.001	0.000
		Hauling	30	1,200	0.435	12.256	2.389	0.039	0.439	2.851	3.290	0.267	0.428	0.695	42.7	0.000	0.006
	Paving-Electrical-Striping 3	Worker	7	140	0.047	0.042	0.442	0.001	0.015	0.026	0.040	0.006	0.004	0.010	1.2	0.000	0.000
		Hauling	36	1,440	0.522	14.707	2.866	0.046	0.527	3.422	3.948	0.321	0.513	0.834	55.7	0.000	0.008

Notes:

[1] Daily round trips obtained from Table 1-1.

[2] Daily VMT is calculated assuming a one-way trip length of 10.8 miles for workers, 7.3 miles for vendors, and 20 miles for hauling based on CalEEMod® defaults for Shasta County. Hauling trip length of 12.5 miles for tree hauling is based on Project-specific data.

[3] Emissions calculated using trip and VMT data in this table and emission factors from Table 1-2 and 1-3. Vendor trips use emission factors for the MHDT/HHDT fleet mix. Haul trips use emission factors for HHDT trucks, consistent with CalEEMod® default assumptions.

Abbreviations:

CH_4 - methane
CO - carbon monoxide
CO_2 - carbon dioxide
lb - pound
NO_x - nitrogen oxides
PM_{10} - particulate matter < 10 µg
$PM_{2.5}$ - particulate matter < 2.5 µg
ROG - reactive organic gases
VMT - vehicle miles travelled

Table 1-5. Maximum Daily Construction Emissions
River Crossing Marketplace Specific Plan
Shasta County, California

Phase Name	Calendar Year	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
		(lbs/day)					
Onsite Construction							
Site Preparation	2019	0.48	3.74	11.53	0.02	0.22	0.18
Grading	2019	1.41	9.99	36.11	0.06	1.79	0.67
Building Construction	2019	3.68	31.87	41.50	0.11	5.50	1.80
Building Construction	2020	3.24	29.63	39.01	0.11	5.39	1.70
Paving	2019	0.35	1.13	1.59	0.00	0.21	0.07
Paving	2020	0.33	1.05	1.53	0.00	0.21	0.06
Architectural Coating	2019	37.68	2.24	5.63	0.01	0.52	0.20
Architectural Coating	2020	37.63	2.14	5.22	0.01	0.52	0.20
Tree Hauling	2019	0.39	6.06	2.64	0.02	1.50	0.34
Offsite Construction							
Earthwork 1	2019	3.98	50.95	27.85	0.07	4.83	2.09
Utilities and Concrete 1	2019	3.29	38.35	22.95	0.08	4.79	1.76
Earthwork 2	2019	3.98	50.95	27.85	0.07	4.83	2.09
Paving-Electrical-Striping 1	2019	2.73	27.67	14.36	0.06	4.77	1.57
Utilities and Concrete 2	2019	3.29	38.35	22.95	0.08	4.79	1.76
Paving-Electrical-Striping 2	2019	2.73	27.67	14.36	0.06	4.77	1.57
Earthwork 3	2019	3.98	50.95	27.85	0.07	4.83	2.09
Utilities and Concrete 3	2019	3.29	38.35	22.95	0.08	4.79	1.76
Utilities and Concrete 3	2020	2.97	35.08	21.81	0.08	4.64	1.62
Paving-Electrical-Striping 3	2020	2.47	25.24	13.80	0.06	4.63	1.43

Table 1-5. Maximum Daily Construction Emissions
River Crossing Marketplace Specific Plan
Shasta County, California

Phase Name	Calendar Year	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Overlapping Phases							
Site Prep + Tree Hauling + Earthwork 1	2019	4.85	60.75	42.02	0.11	6.54	2.61
Grading + Tree Hauling + Earthwork 1	2019	5.78	66.99	66.60	0.16	8.11	3.10
Grading + Earthwork 1	2019	5.39	60.93	63.96	0.14	6.62	2.76
Grading + Utilities and Concrete 1	2019	4.70	48.34	59.06	0.15	6.58	2.43
Grading + Earthwork 2 + Paving-Electrical-Striping 1	2019	8.12	88.60	78.32	0.20	11.39	4.33
Grading + Utilities and Concrete 2	2019	4.70	48.34	59.06	0.15	6.58	2.43
Building Construction + Paving + Architectural Coating + Utilities and Concrete 2	2019	45.00	73.59	71.67	0.21	11.02	3.83
Building Construction + Paving + Architectural Coating + Paving-Electrical-Striping 2	2019	44.44	62.90	63.09	0.19	11.00	3.64
Building Construction + Paving + Architectural Coating + Earthwork 3	2019	45.68	86.18	76.57	0.20	11.06	4.16
Building Construction + Paving + Architectural Coating + Utilities and Concrete 3 (2019)	2019	45.00	73.59	71.67	0.21	11.02	3.83
Building Construction + Paving + Architectural Coating + Utilities and Concrete 3 (2020)	2020	44.17	67.91	67.58	0.21	10.76	3.57
Building Construction + Paving + Architectural Coating + Paving-Electrical-Striping 3	2020	43.68	58.06	59.57	0.19	10.74	3.39
Building Construction + Paving + Architectural Coating	2020	41.21	32.82	45.77	0.13	6.11	1.95
Maximum Daily Emissions	**2019**	**45.68**	**88.60**	**78.32**	**0.21**	**11.39**	**4.33**
	2020	**44.17**	**67.91**	**67.58**	**0.21**	**10.76**	**3.57**

Abbreviations:

CO - carbon monoxide
lb - pound
NO_x - nitrogen oxides
PM_{10} - particulate matter < 10 µg
$PM_{2.5}$ - particulate matter < 2.5 µg
ROG - reactive organic gases

Table 2-1. Trip Lengths and Vehicle Miles Traveled by Operational Mobile Sources
River Crossing Marketplace Specific Plan
Shasta County, California

Trip Type		Average One-Way Trip Length[1] (miles)	Weekday Daily Trips[2] (one-way trips/ day)	Saturday Daily Trips (one-way trips/ day)	Sunday Daily Trips (one-way trips/ day)	Peak Daily Trips[3] (one-way trips/ day)	Peak Daily VMT[4] (miles/year)	Annual Trips[5] (one-way trips/ year)	Annual VMT[4] (miles/ year)
Costco Warehouse and Gas Station[6]	Primary	7.7	5,249	6,286	3,935	6,286	48,197	1,901,481	14,579,415
	Diverted	1.9	3,800	2,640	1,652	2,640	5,060	1,214,984	2,328,942
	Pass-By	0.10	3,016	3,646	2,282	3,646	365	1,095,432	109,543
Commercial Retail[7]	Primary	7.3	2,192	5,126	3,851	5,126	37,645	1,038,916	7,629,799
	Diverted[8]	1.8	796	1,310	984	1,310	2,405	327,044	600,453
	Pass-By[8]	0.10	298	491	369	491	49	122,498	12,250
Fast Food with Drive Thru Window[9]	Primary	7.3	1,721	2,504	1,882	2,504	18,400	677,253	4,976,726
	Diverted	1.8	0	0	0	0	0	0	0
	Pass-By	0.10	1,653	2,406	1,808	2,406	241	650,561	65,056
Costco Wholesale Trucks[10]	Primary	7.3	20	20	20	20	146	7,300	53,290
Costco Wholesale Fuel Delivery Trucks[10]	Primary	7.3	6	6	6	6	44	2,190	15,987
Major Retail Building Trucks[10]	Primary	7.3	5	5	5	5	33	1,669	12,181
Total			**18,756**	**24,440**	**16,794**	**24,440**	**112,586**	**7,039,328**	**30,383,642**

Notes:

[1] Average trip length for primary, diverted, and pass-by trip types is assumed to be equal to the CalEEMod® default trip lengths for Shasta County. Truck trip length is assumed to be 7.3 miles based on the CalEEMod® default for commercial-nonwork trips in Shasta County.

[2] Weekday daily trips were obtained from daily trip values provided in Table 10 of the Traffic Impact Analysis.

[3] Peak daily trips represent the primary, diverted, and pass-by trips associated with the maximum total daily weekday, Saturday, or Sunday trips.

[4] Estimated as a product of average trip length and number of trips.

[5] Annual trips are calculated using the weekday, Saturday, and Sunday trips and 365 days per year.

[6] Costco Warehouse and Gas Station Saturday and Sunday daily trip types calculated based on Costco midday Saturday peak trip type data presented in Traffic Impact Analysis Appendix E.

[7] Weekday daily trips were derived using fitted curve trip rate data provided in Trip Generation Manual, 9th Edition and applied to proposed building size. Saturday and Sunday pass-by rate based on 26% Saturday pass-by rate documented in Trip Generation Manual, 9th Edition.

[8] Non-primary trips for Commercial Retail were allocated to diverted and pass-by trips using the CalEEMod® default trip distribution for the Strip Mall land use presented in CalEEMod® Appendix D, Table 4.3.

[9] Weekday daily trips were derived using trip rate data provided in Trip Generation Manual, 9th Edition and applied to proposed building size. Saturday and Sunday pass-by rate based on assumed 49% pass-by rate similar to weekday AM peak hour rate documented in Trip Generation Manual, 9th Edition.

[10] The number of truck trips are based on Project-specific truck delivery trip rates.

Abbreviations:

CalEEMod® - CALifornia Emissions Estimator MODel
VMT - vehicle miles traveled

Table 2-2. Operational Mobile Source Fleet Mixes
River Crossing Marketplace Specific Plan
Shasta County, California

Vehicle Class	Fuel Type	CalEEMod® Default[1]	EMFAC VMT[2]	CalEEMod® Default by Fuel Type[3]	Costco Warehouse and Gas Station[4]	Commercial Retail[5]	Fast-Food with Drive Thru Window[5]	Costco Wholesale Trucks[6]	Costco Wholesale Fuel Delivery Trucks[6]	Major Retail Building Trucks[7]
LDA	Gas	47%	3,471,506	45.6%	50.1%	54.2%	54.2%	0%	0%	0%
	Dsl		38,949	0.5%	0.6%	0.6%	0.6%	0%	0%	0%
	Elec		41,364	0.5%	0.6%	0.6%	0.6%	0%	0%	0%
LDT1	Gas	5%	377,967	5.0%	5.4%	5.9%	5.9%	0%	0%	0%
	Dsl		193	0.0%	0.0%	0.0%	0.0%	0%	0%	0%
	Elec		724	0.0%	0.0%	0.0%	0.0%	0%	0%	0%
LDT2	Gas	18%	1,367,490	18.0%	19.7%	21.3%	21.3%	0%	0%	0%
	Dsl		6,813	0.1%	0.1%	0.1%	0.1%	0%	0%	0%
	Elec		4,958	0.1%	0.1%	0.1%	0.1%	0%	0%	0%
MDV	Gas	14%	1,066,384	14.0%	15.4%	16.6%	16.6%	0%	0%	0%
	Dsl		29,232	0.4%	0.4%	0.5%	0.5%	0%	0%	0%
	Elec		1,636	0.0%	0.0%	0.0%	0.0%	0%	0%	0%
LHDT1	Gas	5%	132,396	1.7%	1.9%	0%	0%	0%	0%	0%
	Dsl		238,609	3.1%	3.4%	0%	0%	0%	0%	0%
LHDT2	Gas	1%	14,873	0.2%	0.2%	0%	0%	0%	0%	0%
	Dsl		61,046	0.8%	0.9%	0%	0%	0%	0%	0%
OBUS	Gas	0%	4,656	0.1%	0.1%	0%	0%	0%	0%	0%
	Dsl		3,003	0.0%	0.0%	0%	0%	0%	0%	0%
UBUS	Gas	0%	707	0.0%	0.0%	0%	0%	0%	0%	0%
	Dsl		1,928	0.0%	0.0%	0%	0%	0%	0%	0%
MCY	Gas	1%	47,828	0.6%	0.7%	0%	0%	0%	0%	0%
SBUS	Gas	0%	831	0.0%	0.0%	0%	0%	0%	0%	0%
	Dsl		8,966	0.1%	0.1%	0%	0%	0%	0%	0%

Table 2-2. Operational Mobile Source Fleet Mixes
River Crossing Marketplace Specific Plan
Shasta County, California

Vehicle Class	Fuel Type	CalEEMod® Default[1]	EMFAC VMT[2]	CalEEMod® Default by Fuel Type[3]	Costco Warehouse and Gas Station[4]	Commercial Retail[5]	Fast-Food with Drive Thru Window[5]	Costco Wholesale Trucks[6]	Costco Wholesale Fuel Delivery Trucks[6]	Major Retail Building Trucks[7]
MH	Gas	0%	9,099	0.1%	0.1%	0%	0%	0%	0%	0%
	Dsl		4,063	0.1%	0.1%	0%	0%	0%	0%	0%
MHDT	Gas	1%	13,866	0.2%	0%	0%	0%	0%	0%	0%
	Dsl		96,190	1.3%	0%	0%	0%	0%	0%	50%
HHDT	Gas	7%	33	0.0%	0%	0%	0%	0%	0%	0%
	Dsl		571,037	7.5%	0%	0%	0%	100%	100%	50%

Notes:

[1] CalEEMod® default fleet mix for Shasta County.

[2] VMT obtained from EMFAC2017 default activity output for Shasta County.

[3] CalEEMod® default by fuel type calculated using the default fleet mix and the EMFAC VMT distribution for Shasta County.

[4] The fleet mix for the Costco Warehouse and Gas Station assumes that any vehicle class except for MHDT and HHDT may visit the facility to refuel.

[5] The fleet mix for the commercial retail and fast-food with drive thru window land uses assumes all vehicles visiting that location are passenger-type vehicles (LDA, LDT1, LDT2, or MDV).

[6] All Costco Wholesale trucks and fuel delivery trucks are assumed to be diesel-fueled HHDT.

[7] Major retail building trucks are assumed to be 50% diesel-fueled MHDT and 50% diesel-fueled HHDT.

Abbreviations:

CalEEMod® - CALifornia Emissions Estimator MODel
Dsl - diesel
Elec - electric
LDA - Light Duty Automobile
LDT - Light-Duty Truck
LHD - Light-Heavy Duty truck
HHDT - Heavy-Heavy Duty truck
MDV - Medium-Duty Vehicle
MH - Motor Home
MHD - Medium-Heavy Duty truck
OBUS - Other Buses
UBUS - Urban Buses
MCY - Motorcycle
SBUS - School Bus

Table 2-3. Operational Mobile Source CAP Emission Factors - Running Exhaust, Running Loss, Tire Wear, and Brake Wear (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	EMFAC VMT Output[1] (miles/day)	EMFAC Emissions Output[1,2] (tons/day)					
			VOC[3]	NO_x	CO	SO_x	PM_{10}[4]	$PM_{2.5}$[4]
LDA	Gas	3,471,506	0.19	0.21	4.32	0.01	0.18	0.07
LDA	Dsl	38,949	0.00	0.01	0.01	0.00	0.00	0.00
LDA	Elec	41,364	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Gas	377,967	0.06	0.05	0.75	0.00	0.02	0.01
LDT1	Dsl	193	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Elec	724	0.00	0.00	0.00	0.00	0.00	0.00
LDT2	Gas	1,367,490	0.23	0.25	3.01	0.01	0.07	0.03
LDT2	Dsl	6,813	0.00	0.00	0.00	0.00	0.00	0.00
LDT2	Elec	4,958	0.00	0.00	0.00	0.00	0.00	0.00
MDV	Gas	1,066,384	0.18	0.21	2.59	0.01	0.05	0.02
MDV	Dsl	29,232	0.00	0.00	0.01	0.00	0.00	0.00
MDV	Elec	1,636	0.00	0.00	0.00	0.00	0.00	0.00
LHDT1	Gas	132,396	0.13	0.06	0.38	0.00	0.01	0.01
LHDT1	Dsl	238,609	0.06	1.03	0.28	0.00	0.03	0.02
LHDT2	Gas	14,873	0.01	0.00	0.02	0.00	0.00	0.00
LHDT2	Dsl	61,046	0.01	0.17	0.06	0.00	0.01	0.00
OBUS	Gas	4,656	0.00	0.00	0.01	0.00	0.00	0.00
OBUS	Dsl	3,003	0.00	0.02	0.00	0.00	0.00	0.00
UBUS	Gas	707	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Dsl	1,928	0.00	0.00	0.00	0.00	0.00	0.00
MCY	Gas	47,828	0.18	0.05	1.27	0.00	0.00	0.00
SBUS	Gas	831	0.00	0.00	0.00	0.00	0.00	0.00
SBUS	Dsl	8,966	0.00	0.08	0.00	0.00	0.01	0.00
MH	Gas	9,099	0.00	0.01	0.04	0.00	0.00	0.00
MH	Dsl	4,063	0.00	0.03	0.00	0.00	0.00	0.00
MHDT	Gas	13,866	0.01	0.01	0.05	0.00	0.00	0.00
MHDT	Dsl	96,190	0.03	0.45	0.08	0.00	0.03	0.02
HHDT	Gas	33	0.00	0.00	0.00	0.00	0.00	0.00
HHDT	Dsl	571,037	0.08	2.52	0.31	0.01	0.10	0.06

EMFAC Vehicle Class	Fuel Type	Running Exhaust, Running Loss, Tire Wear and Brake Wear Emission Factors[5] (grams/mile)					
		VOC[3]	NO_x	CO	SO_x	PM_{10}[4]	$PM_{2.5}$[4]
LDA	Gas	0.051	0.055	1.129	0.003	0.05	0.02
LDA	Dsl	0.025	0.160	0.322	0.002	0.06	0.03
LDA	Elec	0.000	0.000	0.000	0.000	0.04	0.02
LDT1	Gas	0.141	0.115	1.797	0.004	0.05	0.02
LDT1	Dsl	0.256	1.090	1.416	0.004	0.23	0.20
LDT1	Elec	0.000	0.000	0.000	0.000	0.04	0.02
LDT2	Gas	0.149	0.166	1.997	0.004	0.05	0.02
LDT2	Dsl	0.022	0.075	0.173	0.003	0.05	0.03
LDT2	Elec	0.000	0.000	0.000	0.000	0.04	0.02
MDV	Gas	0.153	0.174	2.200	0.005	0.05	0.02
MDV	Dsl	0.021	0.107	0.306	0.004	0.05	0.03
MDV	Elec	0.000	0.000	0.000	0.000	0.04	0.02
LHDT1	Gas	0.914	0.441	2.588	0.010	0.09	0.04
LHDT1	Dsl	0.227	3.921	1.048	0.006	0.13	0.08
LHDT2	Gas	0.438	0.286	1.055	0.012	0.10	0.04
LHDT2	Dsl	0.182	2.513	0.854	0.006	0.13	0.07
OBUS	Gas	0.274	0.596	2.247	0.018	0.14	0.06

Table 2-3. Operational Mobile Source CAP Emission Factors - Running Exhaust, Running Loss, Tire Wear, and Brake Wear (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Running Exhaust, Running Loss, Tire Wear and Brake Wear Emission Factors[5] (grams/mile)					
		VOC[3]	NO_x	CO	SO_x	PM_{10}[4]	$PM_{2.5}$[4]
OBUS	Dsl	0.387	5.132	1.073	0.013	0.29	0.20
UBUS	Gas	0.029	0.193	0.280	0.016	0.12	0.05
UBUS	Dsl	0.001	0.972	0.114	0.012	0.14	0.06
MCY	Gas	3.410	1.023	24.059	0.002	0.02	0.01
SBUS	Gas	0.353	1.083	4.076	0.009	0.76	0.32
SBUS	Dsl	0.134	7.677	0.343	0.011	0.82	0.38
MH	Gas	0.176	0.645	3.806	0.018	0.14	0.06
MH	Dsl	0.166	6.233	0.635	0.010	0.32	0.23
MHDT	Gas	0.409	0.695	3.231	0.018	0.14	0.06
MHDT	Dsl	0.283	4.220	0.725	0.011	0.25	0.16
HHDT	Gas	0.210	2.036	21.146	0.019	0.08	0.03
HHDT	Dsl	0.134	4.008	0.497	0.014	0.17	0.10
Weighted Emission Factor for Non-Truck Vehicles[6]							
Costco Warehouse and Gas Station		0.14	0.29	1.67	0.00	0.05	0.02
Commercial Retail		0.09	0.10	1.51	0.00	0.05	0.02
Fast Food with Drive Thru Window		0.09	0.10	1.51	0.00	0.05	0.02
Weighted Emission Factor for Trucks[6]							
Costco Wholesale Trucks		0.13	4.01	0.50	0.01	0.17	0.10
Costco Wholesale Fuel Delivery Trucks		0.13	4.01	0.50	0.01	0.17	0.10
Major Retail Building Trucks		0.21	4.11	0.61	0.01	0.21	0.13

Notes:

[1] Data obtained from EMFAC2017 for default emissions activity for Shasta County.

[2] Sum of running exhaust, running loss, tire wear, and brake wear emissions obtained from EMFAC2017 for default summer emissions activity.

[3] For purposes of this analysis VOC is assumed to be equal to ROG.

[4] PM emissions are a sum of exhaust, tire wear, and brake wear.

[5] Emission factors for EMFAC vehicle classes are estimated as a ratio of the EMFAC emissions output and EMFAC VMT output.

[6] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate VMT-based emission factors.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
EMFAC - EMission FACtors model
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds
VMT - vehicle miles traveled

Conversion Factor:

907184.7 grams per ton

Table 2-4. Operational Mobile Source CAP Emission Factors - Running Exhaust, Running Loss, Tire Wear, and Brake Wear (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	EMFAC VMT Output[1] (miles/day)	EMFAC Emissions Output[1,2] (tons/day)					
			VOC[3]	NO_x	CO	SO_x	PM_{10}[4]	$PM_{2.5}$[4]
LDA	Gas	3,471,506	0.20	0.25	3.08	0.01	0.18	0.07
LDA	Dsl	38,949	0.00	0.01	0.01	0.00	0.00	0.00
LDA	Elec	41,364	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Gas	377,967	0.06	0.06	0.55	0.00	0.02	0.01
LDT1	Dsl	193	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Elec	724	0.00	0.00	0.00	0.00	0.00	0.00
LDT2	Gas	1,367,490	0.24	0.30	2.20	0.01	0.07	0.03
LDT2	Dsl	6,813	0.00	0.00	0.00	0.00	0.00	0.00
LDT2	Elec	4,958	0.00	0.00	0.00	0.00	0.00	0.00
MDV	Gas	1,066,384	0.19	0.25	1.98	0.01	0.05	0.02
MDV	Dsl	29,232	0.00	0.00	0.01	0.00	0.00	0.00
MDV	Elec	1,636	0.00	0.00	0.00	0.00	0.00	0.00
LHDT1	Gas	132,396	0.14	0.08	0.35	0.00	0.01	0.01
LHDT1	Dsl	238,609	0.06	1.11	0.28	0.00	0.03	0.02
LHDT2	Gas	14,873	0.01	0.01	0.02	0.00	0.00	0.00
LHDT2	Dsl	61,046	0.01	0.18	0.06	0.00	0.01	0.00
OBUS	Gas	4,656	0.00	0.00	0.01	0.00	0.00	0.00
OBUS	Dsl	3,003	0.00	0.02	0.00	0.00	0.00	0.00
UBUS	Gas	707	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Dsl	1,928	0.00	0.00	0.00	0.00	0.00	0.00
MCY	Gas	47,828	0.20	0.07	1.36	0.00	0.00	0.00
SBUS	Gas	831	0.00	0.00	0.00	0.00	0.00	0.00
SBUS	Dsl	8,966	0.00	0.08	0.00	0.00	0.01	0.00
MH	Gas	9,099	0.00	0.01	0.04	0.00	0.00	0.00
MH	Dsl	4,063	0.00	0.03	0.00	0.00	0.00	0.00
MHDT	Gas	13,866	0.01	0.01	0.05	0.00	0.00	0.00
MHDT	Dsl	96,190	0.03	0.48	0.08	0.00	0.03	0.02
HHDT	Gas	33	0.00	0.00	0.00	0.00	0.00	0.00
HHDT	Dsl	571,037	0.08	2.72	0.31	0.01	0.10	0.06

EMFAC Vehicle Class	Fuel Type	Running Exhaust, Running Loss, Tire Wear and Brake Wear Emission Factors[5] (grams/mile)					
		VOC[3]	NO_x	CO	SO_x	PM_{10}[4]	$PM_{2.5}$[4]
LDA	Gas	0.052	0.066	0.805	0.003	0.05	0.02
LDA	Dsl	0.025	0.173	0.322	0.002	0.06	0.03
LDA	Elec	0.000	0.000	0.000	0.000	0.04	0.02
LDT1	Gas	0.155	0.139	1.322	0.003	0.05	0.02
LDT1	Dsl	0.256	1.178	1.416	0.004	0.23	0.20
LDT1	Elec	0.000	0.000	0.000	0.000	0.04	0.02
LDT2	Gas	0.162	0.199	1.457	0.004	0.05	0.02
LDT2	Dsl	0.022	0.081	0.173	0.003	0.05	0.03
LDT2	Elec	0.000	0.000	0.000	0.000	0.04	0.02
MDV	Gas	0.165	0.210	1.683	0.004	0.05	0.02
MDV	Dsl	0.021	0.116	0.306	0.004	0.05	0.03
MDV	Elec	0.000	0.000	0.000	0.000	0.04	0.02
LHDT1	Gas	0.971	0.557	2.410	0.010	0.09	0.04
LHDT1	Dsl	0.227	4.225	1.048	0.006	0.13	0.08
LHDT2	Gas	0.469	0.360	0.984	0.012	0.10	0.04
LHDT2	Dsl	0.182	2.708	0.854	0.006	0.13	0.07
OBUS	Gas	0.281	0.756	2.095	0.018	0.14	0.06
OBUS	Dsl	0.387	5.539	1.073	0.013	0.29	0.20
UBUS	Gas	0.031	0.244	0.261	0.016	0.12	0.05

Table 2-4. Operational Mobile Source CAP Emission Factors - Running Exhaust, Running Loss, Tire Wear, and Brake Wear (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Running Exhaust, Running Loss, Tire Wear and Brake Wear Emission Factors[5] (grams/mile)					
		VOC[3]	NO_x	CO	SO_x	PM_{10}[4]	$PM_{2.5}$[4]
UBUS	Dsl	0.001	0.972	0.114	0.012	0.14	0.06
MCY	Gas	3.825	1.334	25.861	0.002	0.02	0.01
SBUS	Gas	0.411	1.385	3.779	0.009	0.76	0.32
SBUS	Dsl	0.134	8.302	0.343	0.011	0.82	0.38
MH	Gas	0.168	0.825	3.524	0.018	0.14	0.06
MH	Dsl	0.166	6.730	0.635	0.010	0.32	0.23
MHDT	Gas	0.419	0.883	2.997	0.018	0.14	0.06
MHDT	Dsl	0.283	4.557	0.725	0.011	0.25	0.16
HHDT	Gas	0.195	2.586	19.700	0.019	0.08	0.03
HHDT	Dsl	0.134	4.324	0.497	0.014	0.17	0.10
Weighted Emission Factor for Non-Truck Vehicles[6]							
Costco Warehouse and Gas Station[8]		0.15	0.32	1.30	0.00	0.05	0.02
Commercial Retail[8]		0.10	0.12	1.11	0.00	0.05	0.02
Fast Food with Drive Thru Window		0.10	0.12	1.11	0.00	0.05	0.02
Weighted Emission Factor for Trucks[6]							
Coscto Wholesale Trucks		0.13	4.32	0.50	0.01	0.17	0.10
Costco Wholesale Fuel Delivery Trucks		0.13	4.32	0.50	0.01	0.17	0.10
Major Retail Building Trucks		0.21	4.44	0.61	0.01	0.21	0.13

Notes:

[1] Data obtained from EMFAC2017 for default emissions activity for Shasta County.

[2] Sum of running exhaust, running loss, tire wear, and brake wear emissions obtained from EMFAC2017 for default winter emissions activity.

[3] For purposes of this analysis VOC is assumed to be equal to ROG.

[4] PM emissions are a sum of exhaust, tire wear, and brake wear.

[5] Emission factors for EMFAC vehicle classes are estimated as a ratio of the EMFAC emissions output and EMFAC VMT output.

[6] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate VMT-based emission factors.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
EMFAC - EMission FACtors model
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds
VMT - vehicle miles traveled

Conversion Factor:

907184.74 grams per ton

Table 2-5. Operational Mobile Source CAP Emission Factors - Starting Exhaust, Hot Soak, Diurnal Loss, and Resting Loss (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	EMFAC Vehicle Trips Output[1] (trips/day)	EMFAC Emissions Output[1] (tons/day)								
			VOC[2]				NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
			Starting Exhaust	Hot Soak	Diurnal	Resting Loss	Starting Exhaust				
LDA	Gas	410,424	1.21E-01	8.52E-02	1.12E-01	7.28E-02	1.03E-01	9.55E-01	2.61E-04	9.89E-04	9.10E-04
LDA	Dsl	4,542	0	0	0	0	0	0	0	0	0
LDA	Elec	5,010	0	2.70E-05	9.00E-05	4.60E-05	0	0	0	0	0
LDT1	Gas	46,313	1.88E-02	1.74E-02	2.56E-02	1.54E-02	1.51E-02	1.15E-01	3.44E-05	1.47E-04	1.35E-04
LDT1	Dsl	44	0	0	0	0	0	0	0	0	0
LDT1	Elec	84	0	4.51E-07	1.47E-06	7.52E-07	0	0	0	0	0
LDT2	Gas	173,631	8.94E-02	6.45E-02	9.54E-02	6.02E-02	8.81E-02	5.37E-01	1.49E-04	4.91E-04	4.51E-04
LDT2	Dsl	722	0	0	0	0	0	0	0	0	0
LDT2	Elec	707	0	3.81E-06	1.26E-05	6.43E-06	0	0	0	0	0
MDV	Gas	141,344	8.54E-02	4.84E-02	7.63E-02	5.09E-02	7.93E-02	5.67E-01	1.48E-04	4.30E-04	3.97E-04
MDV	Dsl	3,309	0	0	0	0	0	0	0	0	0
MDV	Elec	232	0	1.25E-06	4.12E-06	2.11E-06	0	0	0	0	0
LHDT1	Gas	60,645	1.15E-02	2.05E-02	1.57E-03	5.61E-04	3.54E-02	1.37E-01	1.29E-05	4.32E-05	3.98E-05
LHDT1	Dsl	89,863	0	0	0	0	0	0	0	0	0
LHDT2	Gas	6,270	9.89E-04	1.30E-03	9.41E-05	3.58E-05	3.78E-03	1.20E-02	1.49E-06	2.64E-06	2.43E-06
LHDT2	Dsl	20,982	0	0	0	0	0	0	0	0	0
OBUS	Gas	2,015	3.62E-04	9.08E-05	1.92E-05	6.37E-06	7.24E-04	7.28E-03	5.94E-07	5.00E-07	4.60E-07
OBUS	Dsl	437	0	0	0	0	5.47E-04	0	0	0	0
UBUS	Gas	26	7.05E-06	2.32E-06	5.45E-07	2.39E-07	1.69E-05	1.01E-04	1.53E-08	3.43E-09	3.15E-09
UBUS	Dsl	86	0	0	0	0	0	0	0	0	0
MCY	Gas	15,173	2.87E-02	3.07E-02	8.04E-02	4.45E-02	4.13E-03	1.37E-01	1.03E-05	6.29E-05	5.96E-05
SBUS	Gas	70	2.80E-05	2.21E-05	7.48E-06	2.08E-06	3.74E-05	6.72E-04	3.79E-08	6.34E-08	5.83E-08
SBUS	Dsl	3,318	0	0	0	0	1.57E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MH	Gas	112	1.89E-05	2.08E-05	7.12E-04	1.99E-04	3.75E-05	3.84E-04	3.30E-08	6.09E-08	5.62E-08
MH	Dsl	48	0	0	0	0	0	0	0	0	0
MHDT	Gas	5,704	1.48E-03	9.82E-04	7.09E-05	2.72E-05	2.29E-03	3.25E-02	2.53E-06	3.68E-06	3.38E-06
MHDT	Dsl	14,425	0	0	0	0	0	0	0	0	0
HHDT	Gas	3	2.66E-08	4.27E-08	3.04E-09	1.34E-09	1.16E-07	3.04E-05	1.49E-09	1.26E-09	1.16E-09
HHDT	Dsl	47,770	0	0	0	0	0	0	0	0	0

Table 2-5. Operational Mobile Source CAP Emission Factors - Starting Exhaust, Hot Soak, Diurnal Loss, and Resting Loss (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Starting Exhaust, Hot Soak, Diurnal, and Resting Loss Emission Factors[3] (grams/trip)								
		VOC[2]				NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
		Starting Exhaust	Hot Soak	Diurnal	Resting Loss	Starting Exhaust				
LDA	Gas	0.27	0.19	0.25	0.16	0.23	2.11	0.001	0.002	0.002
LDA	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDA	Elec	0.00	0.00	0.02	0.01	0.00	0.00	0.000	0.000	0.000
LDT1	Gas	0.37	0.34	0.50	0.30	0.30	2.26	0.001	0.003	0.003
LDT1	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDT1	Elec	0.00	0.00	0.02	0.01	0.00	0.00	0.000	0.000	0.000
LDT2	Gas	0.47	0.34	0.50	0.31	0.46	2.80	0.001	0.003	0.002
LDT2	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDT2	Elec	0.00	0.00	0.02	0.01	0.00	0.00	0.000	0.000	0.000
MDV	Gas	0.55	0.31	0.49	0.33	0.51	3.64	0.001	0.003	0.003
MDV	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MDV	Elec	0.00	0.00	0.02	0.01	0.00	0.00	0.000	0.000	0.000
LHDT1	Gas	0.17	0.31	0.02	0.01	0.53	2.05	0.000	0.001	0.001
LHDT1	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LHDT2	Gas	0.14	0.19	0.01	0.01	0.55	1.74	0.000	0.000	0.000
LHDT2	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
OBUS	Gas	0.16	0.04	0.01	0.00	0.33	3.28	0.000	0.000	0.000
OBUS	Dsl	0.00	0.00	0.00	0.00	1.13	0.00	0.000	0.000	0.000
UBUS	Gas	0.25	0.08	0.02	0.01	0.60	3.58	0.001	0.000	0.000
UBUS	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MCY	Gas	1.71	1.84	4.81	2.66	0.25	8.19	0.001	0.004	0.004
SBUS	Gas	0.36	0.29	0.10	0.03	0.49	8.74	0.000	0.001	0.001
SBUS	Dsl	0.00	0.00	0.00	0.00	0.43	0.00	0.000	0.000	0.000
MH	Gas	0.15	0.17	5.79	1.62	0.31	3.12	0.000	0.000	0.000
MH	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MHDT	Gas	0.24	0.16	0.01	0.00	0.36	5.18	0.000	0.001	0.001
MHDT	Dsl	0.00	0.00	0.00	0.00	1.20	0.00	0.000	0.000	0.000
HHDT	Gas	0.01	0.01	0.00	0.00	0.04	10.35	0.001	0.000	0.000
HHDT	Dsl	0.00	0.00	0.00	0.00	1.85	0.00	0.000	0.000	0.000
Weighted Emission Factor for Non-Truck Vehicles[4]										
Costco Warehouse and Gas Station		0.35	0.25	0.37	0.23	0.31	2.40	0.00	0.00	0.00
Commercial Retail		0.36	0.25	0.35	0.23	0.32	2.48	0.00	0.00	0.00
Fast Food with Drive Thru Window		0.36	0.25	0.35	0.23	0.32	2.48	0.00	0.00	0.00
Weighted Emission Factor for Trucks[4]										
Costco Wholesale Trucks		0.00	0.00	0.00	0.00	1.85	0.00	0.00	0.00	0.00
Costco Wholesale Fuel Delivery Trucks		0.00	0.00	0.00	0.00	1.85	0.00	0.00	0.00	0.00
Major Retail Building Trucks		0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.00	0.00

Notes:

[1] Data obtained from EMFAC2017 for default summer emissions activity for Shasta County.

[2] For purposes of this analysis VOC is assumed to be equal to ROG.

[3] Emission factors for EMFAC vehicle classes are estimated as a ratio of the EMFAC emissions output and EMFAC trip output.

[4] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate trip-based emission factors.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
EMFAC - EMission FACtors model
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds

Conversion Factor:

907184.74 grams per ton

Table 2-6. Operational Mobile Source CAP Emission Factors - Starting Exhaust, Hot Soak, Diurnal Loss, and Resting Loss (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	EMFAC Vehicle Trips Output[1] (trips/day)	EMFAC Emissions Output[1] (tons/day)								
			VOC[2]				NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
			Starting Exhaust	Hot Soak	Diurnal	Resting Loss	Starting Exhaust				
LDA	Gas	410,424	1.78E-01	6.38E-02	1.24E-02	4.49E-03	1.23E-01	1.43E+00	2.71E-04	9.89E-04	9.10E-04
LDA	Dsl	4,542	0	0	0	0	0	0	0	0	0
LDA	Elec	5,010	0	2.70E-05	3.06E-06	0.00E+00	0	0	0	0	0
LDT1	Gas	46,313	2.80E-02	1.23E-02	2.69E-03	8.99E-04	1.79E-02	1.74E-01	3.57E-05	1.47E-04	1.35E-04
LDT1	Dsl	44	0	0	0	0	0	0	0	0	0
LDT1	Elec	84	0	4.51E-07	4.99E-08	0.00E+00	0	0	0	0	0
LDT2	Gas	173,631	1.33E-01	4.69E-02	1.04E-02	3.69E-03	1.04E-01	8.14E-01	1.55E-04	4.91E-04	4.51E-04
LDT2	Dsl	722	0	0	0	0	0	0	0	0	0
LDT2	Elec	707	0	3.81E-06	4.27E-07	0.00E+00	0	0	0	0	0
MDV	Gas	141,344	1.27E-01	3.67E-02	8.50E-03	3.16E-03	9.41E-02	8.43E-01	1.54E-04	4.30E-04	3.97E-04
MDV	Dsl	3,309	0	0	0	0	0	0	0	0	0
MDV	Elec	232	0	1.25E-06	1.40E-07	0.00E+00	0	0	0	0	0
LHDT1	Gas	60,645	1.32E-02	1.60E-02	1.64E-04	3.45E-05	4.09E-02	1.65E-01	1.34E-05	4.32E-05	3.98E-05
LHDT1	Dsl	89,863	0	0	0	0	0	0	0	0	0
LHDT2	Gas	6,270	1.13E-03	9.87E-04	1.06E-05	2.45E-06	4.36E-03	1.44E-02	1.53E-06	2.64E-06	2.43E-06
LHDT2	Dsl	20,982	0	0	0	0	0	0	0	0	0
OBUS	Gas	2,015	4.22E-04	7.28E-05	2.52E-06	4.44E-07	8.39E-04	9.16E-03	6.26E-07	5.00E-07	4.60E-07
OBUS	Dsl	437	0	0	0	0	5.47E-04	0	0	0	0
UBUS	Gas	26	9.26E-06	1.82E-06	7.50E-08	2.17E-08	1.97E-05	1.60E-04	1.63E-08	3.43E-09	3.15E-09
UBUS	Dsl	86	0	0	0	0	0	0	0	0	0
MCY	Gas	15,173	4.40E-02	1.79E-02	6.55E-03	1.42E-03	4.97E-03	1.80E-01	1.15E-05	6.29E-05	5.96E-05
SBUS	Gas	70	4.38E-05	1.72E-05	8.07E-07	1.12E-07	4.49E-05	1.49E-03	5.12E-08	6.34E-08	5.83E-08
SBUS	Dsl	3,318	0	0	0	0	1.57E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MH	Gas	112	2.21E-05	1.71E-05	8.12E-05	1.18E-05	4.35E-05	4.87E-04	3.47E-08	6.09E-08	5.62E-08
MH	Dsl	48	0	0	0	0	0	0	0	0	0
MHDT	Gas	5,704	1.70E-03	7.37E-04	7.10E-06	1.50E-06	2.64E-03	3.95E-02	2.65E-06	3.68E-06	3.38E-06
MHDT	Dsl	14,425	0	0	0	0	0	0	0	0	0
HHDT	Gas	3	3.05E-08	1.71E-08	2.21E-10	2.97E-11	1.34E-07	3.68E-05	1.59E-09	1.26E-09	1.16E-09
HHDT	Dsl	47,770	0	0	0	0	0	0	0	0	0

EMFAC Vehicle Class	Fuel Type	Starting Exhaust, Hot Soak, Diurnal, and Resting Loss Emission Factors[3] (grams/trip)								
		VOC[2]				NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
		Starting Exhaust	Hot Soak	Diurnal	Resting Loss	Starting Exhaust				
LDA	Gas	0.39	0.14	0.03	0.01	0.27	3.17	0.001	0.002	0.002
LDA	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDA	Elec	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDT1	Gas	0.55	0.24	0.05	0.02	0.35	3.42	0.001	0.003	0.003
LDT1	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDT1	Elec	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDT2	Gas	0.70	0.25	0.05	0.02	0.55	4.25	0.001	0.003	0.002
LDT2	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LDT2	Elec	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MDV	Gas	0.82	0.24	0.05	0.02	0.60	5.41	0.001	0.003	0.003
MDV	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MDV	Elec	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LHDT1	Gas	0.20	0.24	0.00	0.00	0.61	2.47	0.000	0.001	0.001
LHDT1	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
LHDT2	Gas	0.16	0.14	0.00	0.00	0.63	2.08	0.000	0.000	0.000
LHDT2	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
OBUS	Gas	0.19	0.03	0.00	0.00	0.38	4.12	0.000	0.000	0.000
OBUS	Dsl	0.00	0.00	0.00	0.00	1.13	0.00	0.000	0.000	0.000
UBUS	Gas	0.33	0.06	0.00	0.00	0.69	5.66	0.001	0.000	0.000

Table 2-6. Operational Mobile Source CAP Emission Factors - Starting Exhaust, Hot Soak, Diurnal Loss, and Resting Loss (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

		Starting Exhaust, Hot Soak, Diurnal, and Resting Loss Emission Factors[3] (grams/trip)								
		VOC[2]				NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
EMFAC Vehicle Class	Fuel Type	Starting Exhaust	Hot Soak	Diurnal	Resting Loss	Starting Exhaust				
UBUS	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MCY	Gas	2.63	1.07	0.39	0.08	0.30	10.78	0.001	0.004	0.004
SBUS	Gas	0.57	0.22	0.01	0.00	0.58	19.34	0.001	0.001	0.001
SBUS	Dsl	0.00	0.00	0.00	0.00	0.43	0.00	0.000	0.000	0.000
MH	Gas	0.18	0.14	0.66	0.10	0.35	3.96	0.000	0.000	0.000
MH	Dsl	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000
MHDT	Gas	0.27	0.12	0.00	0.00	0.42	6.28	0.000	0.001	0.001
MHDT	Dsl	0.00	0.00	0.00	0.00	1.20	0.00	0.000	0.000	0.000
HHDT	Gas	0.01	0.01	0.00	0.00	0.05	12.54	0.001	0.000	0.000
HHDT	Dsl	0.00	0.00	0.00	0.00	1.85	0.00	0.000	0.000	0.000
Weighted Emission Factor for Non-Truck Vehicles[4]										
Costco Warehouse and Gas Station		0.51	0.18	0.04	0.01	0.37	3.58	0.001	0.002	0.002
Commercial Retail		0.53	0.18	0.04	0.01	0.38	3.73	0.001	0.002	0.002
Fast Food with Drive Thru Window		0.53	0.18	0.04	0.01	0.38	3.73	0.001	0.002	0.002
Weighted Emission Factor for Trucks[4]										
Costco Wholesale Trucks		0.00	0.00	0.00	0.00	1.85	0.00	0.000	0.000	0.000
Costco Wholesale Fuel Delivery Trucks		0.00	0.00	0.00	0.00	1.85	0.00	0.000	0.000	0.000
Major Retail Building Trucks		0.00	0.00	0.00	0.00	1.52	0.00	0.000	0.000	0.000

Notes:

[1] Data obtained from EMFAC2017 for default winter emissions activity for Shasta County.

[2] For purposes of this analysis VOC is assumed to be equal to ROG.

[3] Emission factors for EMFAC vehicle classes are estimated as a ratio of the EMFAC emissions output and EMFAC trip output.

[4] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate trip-based emission factors.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
EMFAC - EMission FACtors model
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds

Conversion Factor:

907184.7 grams per ton

Table 2-7. Operational Mobile Source CAP Emission Factors - Idling (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Idling Emission Factors for Fuel Trucks[1] (grams/idle-minute)					
		VOC[2]	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
LDA	Gas	0.005	0.004	0.080	0.0003	0.0005	0.0004
LDA	Dsl	0.010	0.009	0.150	0.0002	0.0018	0.0018
LDA	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
LDT1	Gas	0.008	0.008	0.136	0.0003	0.0006	0.0005
LDT1	Dsl	0.045	0.033	0.193	0.0004	0.0311	0.0298
LDT1	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
LDT2	Gas	0.010	0.012	0.148	0.0004	0.0005	0.0005
LDT2	Dsl	0.011	0.007	0.090	0.0003	0.0011	0.0010
LDT2	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
MDV	Gas	0.011	0.012	0.172	0.0005	0.0005	0.0005
MDV	Dsl	0.009	0.008	0.159	0.0004	0.0012	0.0012
MDV	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
LHDT1	Gas	0.319	0.028	2.537	0.0008	0.0000	0.0000
LHDT1	Dsl	0.053	1.216	0.438	0.0006	0.0136	0.0130
LHDT2	Gas	0.320	0.028	2.566	0.0010	0.0000	0.0000
LHDT2	Dsl	0.053	1.199	0.438	0.0010	0.0133	0.0127
OBUS	Gas	0.331	0.029	2.566	0.0017	0.0000	0.0000
OBUS	Dsl	0.054	1.000	0.467	0.0011	0.0041	0.0040
UBUS	Gas	0.000	0.000	0.000	0.0000	0.0000	0.0000
UBUS	Dsl	0.000	0.000	0.000	0.0000	0.0000	0.0000
MCY	Gas	0.526	0.053	2.390	0.0002	0.0004	0.0004
SBUS	Gas	0.362	0.103	2.772	0.0016	0.0006	0.0006
SBUS	Dsl	0.049	2.366	0.184	0.0021	0.0098	0.0094
MH	Gas	0.026	0.040	0.372	0.0017	0.0005	0.0004
MH	Dsl	0.053	0.683	0.111	0.0008	0.0197	0.0188
MHDT	Gas	0.416	0.041	4.616	0.0026	0.0000	0.0000
MHDT	Dsl	0.015	1.134	0.266	0.0011	0.0030	0.0028
HHDT	Gas	0.000	0.000	0.000	0.0000	0.0000	0.0000
HHDT	Dsl	0.042	0.521	0.529	0.0010	0.0003	0.0003
Weighted Emission Factor for Non-Truck Vehicles[3]							
Costco Warehouse and Gas Station		0.020	0.064	0.197	0.0004	0.0011	0.0010
Commercial Retail		0.007	0.007	0.113	0.0003	0.0005	0.0005
Fast Food with Drive Thru Window		0.007	0.007	0.113	0.0003	0.0005	0.0005
Weighted Emission Factor for Trucks[3]							
Costco Wholesale Trucks		0.042	0.521	0.529	0.0010	0.0003	0.0003
Costco Wholesale Fuel Delivery Trucks		0.042	0.521	0.529	0.0010	0.0003	0.0003
Major Retail Building Trucks		0.028	0.828	0.398	0.0010	0.0016	0.0016

Notes:

[1] Data obtained from EMFAC2017 project-level summer output for Shasta County. When idling emission rates were not output by EMFAC2017, emission rates are equivalent to the running exhaust emission rate in grams per mile at 5 mph, multiplied by the speed correction factor of 2.5 mph.

[2] For purposes of this analysis VOC is assumed to be equal to ROG.

[3] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate idling emission factors.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
EMFAC - EMission FACtors model
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
mph - miles per hour
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds

Conversion Factor:

60 minutes per hour

Table 2-8. Operational Mobile Source CAP Emission Factors - Idling (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Idling Emission Factors for Fuel Trucks[1] (grams/idle-minute)					
		VOC[2]	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
LDA	Gas	0.004	0.005	0.064	0.0003	0.0005	0.0004
LDA	Dsl	0.010	0.010	0.150	0.0002	0.0018	0.0018
LDA	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
LDT1	Gas	0.007	0.011	0.111	0.0003	0.0006	0.0005
LDT1	Dsl	0.045	0.036	0.193	0.0004	0.0311	0.0298
LDT1	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
LDT2	Gas	0.008	0.016	0.120	0.0004	0.0005	0.0005
LDT2	Dsl	0.011	0.008	0.090	0.0003	0.0011	0.0010
LDT2	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
MDV	Gas	0.010	0.016	0.151	0.0004	0.0005	0.0005
MDV	Dsl	0.009	0.009	0.159	0.0004	0.0012	0.0012
MDV	Elec	0.000	0.000	0.000	0.0000	0.0000	0.0000
LHDT1	Gas	0.319	0.028	2.537	0.0008	0.0000	0.0000
LHDT1	Dsl	0.053	1.216	0.438	0.0006	0.0136	0.0130
LHDT2	Gas	0.320	0.028	2.566	0.0010	0.0000	0.0000
LHDT2	Dsl	0.053	1.199	0.438	0.0010	0.0133	0.0127
OBUS	Gas	0.331	0.029	2.566	0.0017	0.0000	0.0000
OBUS	Dsl	0.056	0.974	0.596	0.0010	0.0060	0.0057
UBUS	Gas	0.000	0.000	0.000	0.0000	0.0000	0.0000
UBUS	Dsl	0.000	0.000	0.000	0.0000	0.0000	0.0000
MCY	Gas	0.593	0.071	2.892	0.0002	0.0004	0.0004
SBUS	Gas	0.359	0.124	2.752	0.0016	0.0006	0.0006
SBUS	Dsl	0.050	2.322	0.234	0.0020	0.0107	0.0102
MH	Gas	0.024	0.052	0.345	0.0017	0.0005	0.0004
MH	Dsl	0.053	0.742	0.111	0.0008	0.0197	0.0188
MHDT	Gas	0.479	0.038	8.772	0.0023	0.0000	0.0000
MHDT	Dsl	0.016	1.096	0.335	0.0010	0.0043	0.0041
HHDT	Gas	0.000	0.000	0.000	0.0000	0.0000	0.0000
HHDT	Dsl	0.037	0.560	0.559	0.0010	0.0004	0.0004
Weighted Emission Factor for Non-Truck Vehicles[3]							
Costco Warehouse and Gas Station		0.019	0.066	0.182	0.0003	0.0011	0.0010
Commercial Retail		0.006	0.010	0.093	0.0003	0.0005	0.0005
Fast Food with Drive Thru Window		0.006	0.010	0.093	0.0003	0.0005	0.0005
Weighted Emission Factor for Trucks[3]							
Costco Wholesale Trucks		0.037	0.560	0.559	0.0010	0.0004	0.0004
Costco Wholesale Fuel Delivery Trucks		0.037	0.560	0.559	0.0010	0.0004	0.0004
Major Retail Building Trucks		0.027	0.828	0.447	0.0010	0.0023	0.0022

Notes:

[1] Data obtained from EMFAC2017 project-level winter output for Shasta County. When idling emission rates were not output by EMFAC2017, emission rates are equivalent to the running exhaust emission rate in grams per mile at 5 mph, multiplied by the speed correction factor of 2.5 mph.

[2] For purposes of this analysis VOC is assumed to be equal to ROG.

[3] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate idling emission factors.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
EMFAC - EMission FACtors model
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
mph - miles per hour
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds

Conversion Factor:

60 minutes per hour

Table 2-9. Entrained Road Dust Emission Factors for Operational Mobile Sources
River Crossing Marketplace Specific Plan
Shasta County, California

Entrained Road Dust Emission Factor[1] (lb/VMT)	
PM_{10}	**$PM_{2.5}$**
0.00066	0.00016

Notes:

[1] Emission factor calculated following guidance in the CalEEMod® User's Guide, Appendix A, which is based on AP-42, Section 13.2.1 for vehicles traveling on paved roads. The equation is:

$EF = k \times (sL)^{0.91} \times (W)^{1.02}$, where:

0.0022 = k_{PM10} (lb/VMT), PM_{10} particle size multiplier

0.00054 = $k_{PM2.5}$ (lb/VMT), $PM_{2.5}$ particle size multiplier

0.1 = sL (g/m^2), silt loading (CalEEMod Default)

2.4 = W (tons), mean vehicle weight (CalEEMod Default)

Abbreviations:

CalEEMod - California Emissions Estimator Model

EF - emission factor

lb - pounds

PM_{10} - particulate matter less than 10 microns in aerodynamic diameter

$PM_{2.5}$ - particulate matter less than 2.5 microns in aerodynamic diameter

VMT - vehicle miles traveled

Table 2-10. Maximum Daily Criteria Air Pollutant Emission Estimates for Operational Mobile Sources (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

Mobile Source Activity		Trip Type	Trip Distance[1] (miles)	Peak Daily Trips[1] (one-way trips/day)	Peak Daily VMT[2] (miles/day)	Idle Duration[3] (minutes/ round trip)	Maximum Daily Emissions (lb/day)					
							VOC[4]	NO_x[5]	CO[5]	SO_x[5]	PM_{10}[6]	$PM_{2.5}$[6]
Costco Warehouse and Gas Station	Off-Site	Primary[7]	7.6	6,286	47,569	--	22.77	32.13	191.57	0.42	36.98	10.15
		Diverted[8]	1.8	2,640	4,796	--	1.47	3.02	17.64	0.04	3.73	1.02
	On-Site	Primary[9]	0.1	6,286	629	10	5.65	7.00	32.60	0.04	0.58	0.22
		Diverted[9]	0.1	2,640	264	10	2.37	2.94	13.69	0.02	0.24	0.09
		Pass-By[9]	0.1	3,646	365	10	3.28	4.06	18.91	0.02	0.34	0.13
Commercial Retail	Off-Site	Primary[7]	7.2	5,126	37,133	--	14.33	10.25	137.95	0.30	28.38	7.64
		Diverted[8]	1.7	1,310	2,274	--	0.47	0.52	7.59	0.02	1.74	0.47
	On-Site	Primary[9]	0.1	5,126	513	--	3.51	1.95	15.73	0.01	0.40	0.12
		Diverted[9]	0.1	1,310	131	--	0.90	0.50	4.02	0.00	0.10	0.03
		Pass-By[9]	0.1	491	49	--	0.34	0.19	1.51	0.00	0.04	0.01
Fast Food with Drive Through	Off-Site	Primary[7]	7.2	2,504	18,150	--	7.00	5.01	67.43	0.15	13.87	3.73
		Diverted[8]	1.7	0	0	--	0.00	0.00	0.00	0.00	0.00	0.00
	On-Site	Primary[9]	0.1	2,504	250	--	1.72	0.95	7.69	0.00	0.20	0.06
		Diverted[9]	0.1	0	0	--	0.00	0.00	0.00	0.00	0.00	0.00
		Pass-By[9]	0.1	2,406	241	--	1.65	0.91	7.38	0.00	0.19	0.06
Costco Wholesale Trucks	Off-Site	Primary[7]	7.2	20	144	--	0.04	1.31	0.16	0.00	0.15	0.06
	On-Site	Primary[9]	0.1	20	2.0	15	0.01	0.23	0.18	0.00	0.00	0.00
Costco Wholesale Fuel Delivery Trucks	Off-Site	Primary[7]	7.2	6	43	--	0.01	0.39	0.05	0.00	0.04	0.02
	On-Site	Primary[9]	0.1	6	0.6	15	0.00	0.07	0.05	0.00	0.00	0.00

Table 2-10. Maximum Daily Criteria Air Pollutant Emission Estimates for Operational Mobile Sources (Summer)
River Crossing Marketplace Specific Plan
Shasta County, California

Mobile Source Activity		Trip Type	Trip Distance[1] (miles)	Peak Daily Trips[1] (one-way trips/day)	Peak Daily VMT[2] (miles/day)	Idle Duration[3] (minutes/ round trip)	Maximum Daily Emissions (lb/day)					
							VOC[4]	NO_x[5]	CO[5]	SO_x[5]	PM_{10}[6]	$PM_{2.5}$[6]
Major Retail Building Trucks	Off-Site	Primary[7]	7.2	5	33	--	0.02	0.31	0.04	0.00	0.04	0.01
	On-Site	Primary[9]	0.1	5	0.5	15	0.00	0.07	0.03	0.00	0.00	0.00
Total Emissions							**65.6**	**71.8**	**524.2**	**1.0**	**87.0**	**23.8**

Notes:

[1] Data obtained from Table 2-1. The off-site trip distance is equivalent to the average trip length minus the on-site distance of 0.1 miles.

[2] VMT is calculated as the product of the trip distance and peak daily trips shown in this table.

[3] Idle duration for passenger vehicles visiting the gas station is estimated as 10 minutes, based on Pleasanton Emissions Analysis. Truck idle duration is 15 minutes, assuming 5 minutes at arrival, 5 minutes at loading area, and 5 minutes at exit.

[4] VOC emissions include running exhaust, running loss, hot soak, diurnal, resting loss, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-3, 2-5, and 2-7 along with peak daily VMT and peak daily trips.

[5] NO_X, CO, and SO_X emissions include running exhaust, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-3, 2-5, and 2-7 along with peak daily VMT and peak daily trips.

[6] PM_{10} and $PM_{2.5}$ emissions include running exhaust, tire wear, brake wear, fugitive dust, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-3, 2-5, 2-7, and 2-9 along with peak daily VMT and peak daily trips.

[7] Off-site primary trip emissions include travel emissions (running exhaust, running loss, tire wear, brake wear, and fugitive dust), off-site evaporative emissions (hot soak, diurnal, and resting loss) using the number of round trips (i.e., half of the one-way trips), and off-site starts using the number of round trips.

[8] Off-site diverted and pass-by trip emissions include travel emissions (running exhaust, running loss, tire wear, brake wear, and fugitive dust).

[9] On-site emissions include travel emissions (running exhaust, running loss, tire wear, brake wear, and fugitive dust), on-site evaporative emissions (hot soak, diurnal, and resting loss) using the number of round trips (i.e., half of the one-way trips), on-site starts using the number of round trips, and idling exhaust using the number of round trips.

Abbreviations:

CO - carbon monoxide
lb - pounds
NO - nitrogen monoxide
NO_2 - nitrogen dioxide
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds
VMT - vehicle miles traveled

Conversion Factor:

453.592 grams/lb

Table 2-11. Maximum Daily Criteria Air Pollutant Emission Estimates for Operational Mobile Sources (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

Mobile Source Activity		Trip Type	Trip Distance[1] (miles)	Peak Daily Trips[1] (one-way trips/day)	Peak Daily VMT[2] (miles/day)	Idle Duration[3] (minutes/ round trip)	Maximum Daily Emissions (lb/day)					
							VOC[4]	NO_x[5]	CO[5]	SO_x[5]	PM_{10}[6]	$PM_{2.5}$[6]
Costco Warehouse and Gas Station	Off-Site	Primary[7]	7.6	6,286	47,569	--	20.70	36.39	161.39	0.37	36.98	10.15
		Diverted[8]	1.8	2,640	4,796	--	1.57	3.41	13.77	0.04	3.73	1.02
	On-Site	Primary[9]	0.1	6,286	629	10	6.34	7.62	39.25	0.03	0.58	0.22
		Diverted[9]	0.1	2,640	264	10	2.66	3.20	16.48	0.01	0.24	0.09
		Pass-By[9]	0.1	3,646	365	10	3.68	4.42	22.76	0.02	0.34	0.13
Commercial Retail	Off-Site	Primary[7]	7.2	5,126	37,133	--	12.46	12.22	111.84	0.27	28.38	7.64
		Diverted[8]	1.7	1,310	2,274	--	0.50	0.62	5.56	0.02	1.74	0.47
	On-Site	Primary[9]	0.1	5,126	513	--	4.14	2.31	22.32	0.01	0.40	0.12
		Diverted[9]	0.1	1,310	131	--	1.06	0.59	5.70	0.00	0.10	0.03
		Pass-By[9]	0.1	491	49	--	0.40	0.22	2.14	0.00	0.04	0.01
Fast Food with Drive Through	Off-Site	Primary[7]	7.2	2,504	18,150	--	6.09	5.97	54.66	0.13	13.87	3.73
		Diverted[8]	1.7	0	0	--	0.00	0.00	0.00	0.00	0.00	0.00
	On-Site	Primary[9]	0.1	2,504	250	--	2.02	1.13	10.90	0.00	0.20	0.06
		Diverted[9]	0.1	0	0	--	0.00	0.00	0.00	0.00	0.00	0.00
		Pass-By[9]	0.1	2,406	241	--	1.94	1.08	10.47	0.00	0.19	0.06
Costco Wholesale Trucks	Off-Site	Primary[7]	7.2	20	144	--	0.04	1.41	0.16	0.00	0.15	0.06
	On-Site	Primary[9]	0.1	20	2.0	15	0.01	0.25	0.19	0.00	0.00	0.00

Table 2-11. Maximum Daily Criteria Air Pollutant Emission Estimates for Operational Mobile Sources (Winter)
River Crossing Marketplace Specific Plan
Shasta County, California

Mobile Source Activity		Trip Type	Trip Distance[1] (miles)	Peak Daily Trips[1] (one-way trips/day)	Peak Daily VMT[2] (miles/day)	Idle Duration[3] (minutes/ round trip)	Maximum Daily Emissions (lb/day)					
							VOC[4]	NO_x[5]	CO[5]	SO_x[5]	PM_{10}[6]	$PM_{2.5}$[6]
Costco Wholesale Fuel Delivery Trucks	Off-Site	Primary[7]	7.2	6	43	--	0.01	0.42	0.05	0.00	0.04	0.02
	On-Site	Primary[9]	0.1	6	0.6	15	0.00	0.07	0.06	0.00	0.00	0.00
Major Retail Building Trucks	Off-Site	Primary[7]	7.2	5	33	--	0.02	0.33	0.04	0.00	0.04	0.01
	On-Site	Primary[9]	0.1	5	0.5	15	0.00	0.07	0.03	0.00	0.00	0.00
Total Emissions							**63.6**	**81.7**	**477.8**	**0.9**	**87.0**	**23.8**

Notes:

[1] Data obtained from Table 2-1. The off-site trip distance is equivalent to the average trip length minus the on-site distance of 0.1 miles.

[2] VMT is calculated as the product of the trip distance and peak daily trips shown in this table.

[3] Idle duration for passenger vehicles visiting the gas station is estimated as 10 minutes, based on Pleasanton Emissions Analysis. Truck idle duration is 15 minutes, assuming 5 minutes at arrival, 5 minutes at loading area, and 5 minutes at exit.

[4] VOC emissions include running exhaust, running loss, hot soak, diurnal, resting loss, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-4, 2-6, and 2-8 along with peak daily VMT and peak daily trips.

[5] NO_X, CO, and SO_X emissions include running exhaust, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-4, 2-6, and 2-8 along with peak daily VMT and peak daily trips.

[6] PM_{10} and $PM_{2.5}$ emissions include running exhaust, tire wear, brake wear, fugitive dust, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-4, 2-6, 2-8, and 2-9 along with peak daily VMT and peak daily trips.

[7] Off-site primary trip emissions include travel emissions (running exhaust, running loss, tire wear, brake wear, and fugitive dust), off-site evaporative emissions (hot soak, diurnal, and resting loss) using the number of round trips (i.e., half of the one-way trips), and off-site starts using the number of round trips.

[8] Off-site diverted and pass-by trip emissions include travel emissions (running exhaust, running loss, tire wear, brake wear, and fugitive dust).

[9] On-site emissions include travel emissions (running exhaust, running loss, tire wear, brake wear, and fugitive dust), on-site evaporative emissions (hot soak, diurnal, and resting loss) using the number of round trips (i.e., half of the one-way trips), on-site starts using the number of round trips, and idling exhaust using the number of round trips.

Abbreviations:

CO - carbon monoxide
lb - pounds
NO - nitrogen monoxide
NO_2 - nitrogen dioxide
NO_x - nitrogen oxide compounds (NO + NO_2)
PM - particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ROG - reactive organic gases
SO_x - sulfur oxide compounds
VOC - volatile organic compounds
VMT - vehicle miles traveled

Conversion Factor:

453.592 grams/lb

Table 2-12. Operational Mobile Source GHG Emission Factors - Running Exhaust
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	EMFAC VMT Output[1] (miles/day)	EMFAC Running Exhaust Emissions Output[2] (tons/day)		
			CO_2	N_2O	CH_4
LDA	Gas	3,471,506	1,103	0.023	0.015
LDA	Dsl	38,949	9	0.001	0.00005
LDA	Elec	41,364	0	0	0
LDT1	Gas	377,967	139	0.004	0.003
LDT1	Dsl	193	0	0.000	0.00000
LDT1	Elec	724	0	0	0
LDT2	Gas	1,367,490	567	0.018	0.012
LDT2	Dsl	6,813	2	0.000	0.00001
LDT2	Elec	4,958	0	0	0
MDV	Gas	1,066,384	536	0.015	0.011
MDV	Dsl	29,232	13	0.002	0.00003
MDV	Elec	1,636	0	0	0
LHDT1	Gas	132,396	152	0.004	0.004
LHDT1	Dsl	238,609	154	0.024	0.00277
LHDT2	Gas	14,873	19	0.000	0.000
LHDT2	Dsl	61,046	44	0.007	0.00057
OBUS	Gas	4,656	10	0.000	0.000
OBUS	Dsl	3,003	4	0.001	0.00006
UBUS	Gas	707	1	0.000	0.000
UBUS	Dsl	1,928	3	0.000	0.00015
MCY	Gas	47,828	12	0.004	0.020
SBUS	Gas	831	1	0.000	0.000
SBUS	Dsl	8,966	12	0.002	0.00006
MH	Gas	9,099	19	0.000	0.000
MH	Dsl	4,063	5	0.001	0.00003
MHDT	Gas	13,866	28	0.001	0.000
MHDT	Dsl	96,190	121	0.019	0.00139
HHDT	Gas	33	0	0.000	0.000
HHDT	Dsl	571,037	927	0.146	0.00393

EMFAC Vehicle Class	Fuel Type	Running Exhaust Emission Factors[3] (grams/mile)		
		CO_2	N_2O	CH_4
LDA	Gas	288	0.006	0.0038
LDA	Dsl	221	0.035	0.0012
LDA	Elec	0	0	0
LDT1	Gas	334	0.009	0.0069
LDT1	Dsl	423	0.067	0.0119
LDT1	Elec	0	0	0
LDT2	Gas	376	0.012	0.0080
LDT2	Dsl	294	0.046	0.0010
LDT2	Elec	0	0	0
MDV	Gas	456	0.013	0.0093
MDV	Dsl	404	0.063	0.0010
MDV	Elec	0	0	0
LHDT1	Gas	1,041	0.027	0.0252
LHDT1	Dsl	586	0.092	0.0105
LHDT2	Gas	1,183	0.020	0.0117
LHDT2	Dsl	653	0.103	0.0085
OBUS	Gas	1,853	0.032	0.0197
OBUS	Dsl	1,357	0.213	0.0180
UBUS	Gas	1,663	0.020	0.0051
UBUS	Dsl	1,284	0.202	0.0709
MCY	Gas	219	0.068	0.3716
SBUS	Gas	892	0.056	0.0381
SBUS	Dsl	1,188	0.187	0.0062
MH	Gas	1,861	0.040	0.0279

Table 2-12. Operational Mobile Source GHG Emission Factors - Running Exhaust
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Running Exhaust Emission Factors[3] (grams/mile)		
		CO_2	N_2O	CH_4
MH	Dsl	1,071	0.168	0.0077
MHDT	Gas	1,821	0.036	0.0264
MHDT	Dsl	1,143	0.180	0.0131
HHDT	Gas	1,923	0.112	0.0484
HHDT	Dsl	1,473	0.232	0.0062
Weighted Emission Factors for Non-Truck Vehicles[4]				
Costco Warehouse and Gas Station		367	0.014	0.009
Commercial Retail		335	0.009	0.006
Fast Food with Drive Thru Window		335	0.009	0.006
Weighted Emission Factors for Trucks[4]				
Costco Wholesale Trucks		1,473	0.232	0.006
Costco Wholesale Fuel Delivery Trucks		1,473	0.232	0.006
Major Retail Building Trucks		1,308	0.206	0.010

Notes:

[1] Data obtained from EMFAC2017 for default emissions activity for Shasta County.

[2] Running exhaust emissions obtained from EMFAC2017 for default annual emissions activity.

[3] Emission factors for EMFAC vehicle classes are estimated as a ratio of the EMFAC emissions output and EMFAC VMT output.

[4] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate VMT-based emission factors.

Abbreviations:

CH_4 - methane
CO_2 - carbon dioxide
EMFAC - EMission FACtors model
GHG - greenhouse gas
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
N_2O - nitrous oxide

Conversion Factor:

907,184.74 grams per ton

Table 2-13. Operational Mobile Source GHG Emission Factors - Starting Exhaust
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	EMFAC Vehicle Trips Output[1] (trips/day)	EMFAC Starting Exhaust Emissions Output[1,2] (tons/day)		
			CO_2	N_2O	CH_4
LDA	Gas	410,424	2.68E+01	1.34E-02	3.15E-02
LDA	Dsl	4,542	0	0	0
LDA	Elec	5,010	0	0	0
LDT1	Gas	46,313	3.54E+00	1.66E-03	4.57E-03
LDT1	Dsl	44	0	0	0
LDT1	Elec	84	0	0	0
LDT2	Gas	173,631	1.53E+01	8.16E-03	2.13E-02
LDT2	Dsl	722	0	0	0
LDT2	Elec	707	0	0	0
MDV	Gas	141,344	1.53E+01	6.97E-03	1.97E-02
MDV	Dsl	3,309	0	0	0
MDV	Elec	232	0	0	0
LHDT1	Gas	60,645	1.33E+00	2.74E-03	2.32E-03
LHDT1	Dsl	89,863	0	0	0
LHDT2	Gas	6,270	1.53E-01	3.02E-04	2.10E-04
LHDT2	Dsl	20,982	0	0	0
OBUS	Gas	2,015	6.17E-02	5.80E-05	7.40E-05
OBUS	Dsl	437	0	0	0
UBUS	Gas	26	1.60E-03	1.74E-06	2.00E-06
UBUS	Dsl	86	0	0	0
MCY	Gas	15,173	1.09E+00	2.54E-04	4.57E-03
SBUS	Gas	70	4.57E-03	3.34E-06	6.18E-06
SBUS	Dsl	3,318	0	0	0
MH	Gas	112	3.42E-03	3.80E-06	4.44E-06
MH	Dsl	48	0	0	0
MHDT	Gas	5,704	2.62E-01	1.74E-04	2.79E-04
MHDT	Dsl	14,425	0	0	0
HHDT	Gas	3	1.56E-04	6.08E-09	5.46E-09
HHDT	Dsl	47,770	0	0	0

EMFAC Vehicle Class	Fuel Type	Starting Exhaust Emission Factors[3] (grams/trip)		
		CO_2	N_2O	CH_4
LDA	Gas	59	0.030	0.070
LDA	Dsl	0	0	0
LDA	Elec	0	0	0
LDT1	Gas	69	0.032	0.090
LDT1	Dsl	0	0	0
LDT1	Elec	0	0	0
LDT2	Gas	80	0.043	0.111
LDT2	Dsl	0	0	0
LDT2	Elec	0	0	0
MDV	Gas	98	0.045	0.126
MDV	Dsl	0	0	0
MDV	Elec	0	0	0
LHDT1	Gas	20	0.041	0.035
LHDT1	Dsl	0	0	0
LHDT2	Gas	22	0.044	0.030
LHDT2	Dsl	0	0	0
OBUS	Gas	28	0.026	0.033
OBUS	Dsl	0	0	0
UBUS	Gas	57	0.062	0.071
UBUS	Dsl	0	0	0
MCY	Gas	65	0.015	0.273
SBUS	Gas	59	0.043	0.080

Table 2-13. Operational Mobile Source GHG Emission Factors - Starting Exhaust
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type	Starting Exhaust Emission Factors[3] (grams/trip)		
		CO_2	N_2O	CH_4
SBUS	Dsl	0	0	0
MH	Gas	28	0.031	0.036
MH	Dsl	0	0	0
MHDT	Gas	42	0.028	0.044
MHDT	Dsl	0	0	0
HHDT	Gas	53	0.002	0.002
HHDT	Dsl	0	0	0
Weighted Emission Factors for Non-Truck Vehicles[4]				
Costco Warehouse and Gas Station		65	0.033	0.084
Commercial Retail		70	0.035	0.088
Fast Food with Drive Thru Window		70	0.035	0.088
Weighted Emission Factors for Trucks[4]				
Costco Wholesale Trucks		0	0	0
Costco Wholesale Fuel Delivery Trucks		0	0	0
Major Retail Building Trucks		0	0	0

Notes:

[1] Data obtained from EMFAC2017 for default annual emissions activity for Shasta County.

[2] Greenhouse gas starting exhaust emissions for HHDT are zero, as reported by EMFAC.

[3] Emission factors for EMFAC vehicle classes are estimated as a ratio of the EMFAC emissions output and EMFAC trip output.

[4] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate trip-based emission factors.

Abbreviations:

CH_4 - methane
CO_2 - carbon dioxide
EMFAC - EMission FACtors model
GHG - greenhouse gas
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
N_2O - nitrous oxide

Conversion Factor:

907,184.74 grams per ton

Table 2-14. Operational Mobile Source GHG Emission Factors - Idling
River Crossing Marketplace Specific Plan
Shasta County, California

EMFAC Vehicle Class	Fuel Type[1]	Idling Emission Factors for Trucks[2] (grams/idle-minute)		
		CO_2	N_2O	CH_4
LDA	Gas	27	0	0.001
LDA	Dsl	23	0	0.000
LDA	Elec	0	0	0.000
LDT1	Gas	31	0	0.001
LDT1	Dsl	43	0	0.002
LDT1	Elec	0	0	0.000
LDT2	Gas	35	0	0.002
LDT2	Dsl	30	0	0.001
LDT2	Elec	0	0	0.000
MDV	Gas	43	0	0.002
MDV	Dsl	39	0	0.000
MDV	Elec	0	0	0.000
LHDT1	Gas	79	0	0.041
LHDT1	Dsl	67	0	0.002
LHDT2	Gas	91	0	0.042
LHDT2	Dsl	108	0	0.002
OBUS	Gas	166	0	0.043
OBUS	Dsl	110	0	0.003
UBUS	Gas	0	0	0.000
UBUS	Dsl	0	0	0.000
MCY	Gas	17	0	0.064
SBUS	Gas	156	0	0.048
SBUS	Dsl	218	0	0.002
MH	Gas	171	0	0.004
MH	Dsl	87	0	0.002
MHDT	Gas	232	0	0.056
MHDT	Dsl	112	0	0.001
HHDT	Gas	0	0	0.000
HHDT	Dsl	101	0	0.002
Weighted Emission Factor for Non-Truck Vehicles[4]				
Costco Warehouse and Gas Station		34.9	0	0.003
Commercial Retail		31.4	0	0.001
Fast Food with Drive Thru Window		31.4	0	0.001
Weighted Emission Factor for Trucks[4]				
Costco Wholesale Trucks		101	0	0
Costco Wholesale Fuel Delivery Trucks		101	0	0
Major Retail Building Trucks		106	0	0

Notes:

[1] Data obtained from EMFAC2017 project-level output for Shasta County.

[2] Data obtained from EMFAC2017project-level output. N_2O emissions are zero, as reported by EMFAC. Passenger vehicle emission rates are equivalent to the running exhaust emission rate in grams per mile at 5 mph, multiplied by the speed correction factor of 2.5 mph.

[3] Passenger vehicles are assumed to be gasoline-fueled. Fuel delivery trucks are assumed to be diesel-fueled.

[4] Emission factors for EMFAC vehicle classes are weighted based on project-specific fleet mix to estimate idling emission factors for trucks.

Abbreviations:

CH_4 - methane
CO_2 - carbon dioxide
EMFAC - EMission FACtors model
GHG - greenhouse gas
LDA - Light Duty Automobile
LDT - Light-Duty Truck
HHDT - Heavy-Heavy Duty truck
MDV - medium-duty vehicle
N_2O - nitrous oxide

Conversion Factor:

60 minutes/hour

Table 2-15. Annual Greenhouse Gas Emission Estimates for Operational Mobile Sources
River Crossing Marketplace Specific Plan
Shasta County, California

Mobile Source Activity		Trip Type	Trip Distance[1] (miles)	Annual Trips[1] (one-way trips/year)	Annual Average VMT[2] (miles/year)	Idle Duration[3] (minutes/ round trip)	GHG Emissions[4] (MT/yr)			
							CO_2	N_2O	CH_4	CO_2e^2
Costco Warehouse and Gas Station	Off-Site	Primary[6]	7.6	1,901,481	14,389,267	--	5,340	0.23	0.208	5,415
		Diverted[7]	1.8	1,214,984	2,207,444	--	810	0.03	0.020	819
	On-Site	Primary[8]	0.1	1,901,481	190,148	10	463	0.03	0.106	476
		Diverted[8]	0.1	1,214,984	121,498	10	296	0.02	0.068	304
		Pass-By[8]	0.1	1,095,432	109,543	10	267	0.02	0.061	274
Commercial Retail	Off-Site	Primary[7]	7.2	1,038,916	7,525,908	--	2,561	0.08	0.089	2,588
		Diverted[8]	1.7	327,044	567,748	--	190	0.01	0.003	192
	On-Site	Primary[8]	0.1	1,038,916	103,892	0	71	0.02	0.046	78
		Diverted[8]	0.1	327,044	32,704	0	22	0.01	0.015	24
		Pass-By[8]	0.1	122,498	12,250	0	8	0.00	0.005	9
Fast Food with Drive Through	Off-Site	Primary[7]	7.2	677,253	4,909,001	--	1,670	0.06	0.058	1,688
		Diverted[8]	1.7	0	0	--	0	0.00	0.000	0
	On-Site	Primary[8]	0.1	677,253	67,725	0	46	0.01	0.030	51
		Diverted[8]	0.1	0	0	0	0	0.00	0.000	0
		Pass-By[8]	0.1	650,561	65,056	0	44	0.01	0.029	49
Costco Wholesale Trucks	Off-Site	Primary[6]	7.2	7,300	52,560	--	77	0.01	0.0003	81
	On-Site	Primary[8]	0.1	7,300	730	15	7	0.00	0.0001	7

Table 2-15. Annual Greenhouse Gas Emission Estimates for Operational Mobile Sources
River Crossing Marketplace Specific Plan
Shasta County, California

Mobile Source Activity		Trip Type	Trip Distance[1] (miles)	Annual Trips[1] (one-way trips/year)	Annual Average VMT[2] (miles/year)	Idle Duration[3] (minutes/ round trip)	GHG Emissions[4] (MT/yr)			
							CO_2	N_2O	CH_4	CO_2e[2]
Costco Wholesale Fuel Delivery Trucks	Off-Site	Primary[6]	7.2	2,190	15,768	--	23	0.00	0.0001	24
	On-Site	Primary[8]	0.1	2,190	219	15	2	0.00	0.0000	2
Major Retail Building Trucks	Off-Site	Primary[6]	7.2	1,669	12,014	--	16	0.00	0.0001	16
	On-Site	Primary[8]	0.1	1,669	167	15	2	0.00	0.0000	2
Total Emissions[5]							**11,917.1**	**0.6**	**0.7**	**12,100**

Notes:

[1] Data obtained from Table 2-1. The off-site trip distance is equivalent to the average trip length minus the on-site distance of 0.1 miles.

[2] VMT is calculated as the product of the trip distance and peak daily trips shown in this table.

[3] Idle duration for passenger vehicles visiting the gas station is estimated as 10 minutes, based on Pleasanton Emissions Analysis. Truck idle duration is 15 minutes, assuming 5 minutes at arrival, 5 minutes at loading area, and 5 minutes at exit.

[4] Includes emissions from running exhaust, starting exhaust, and idling exhaust. Emissions were estimated using emission factors from Tables 2-12, 2-13, and 2-14 along with annual average VMT and annual average trips.

[5] CO_2e estimated based on Global Warming Potentials for 100-year time horizon for CO_2, N_2O, and CH_4 as presented in the Intergovernmental Panel on Climate Change Fourth Assessment Report.

[6] Off-site primary trip emissions include travel emissions (running exhaust) and off-site starts using the number of round trips(i.e., half of the one-way trips).

[7] Off-site diverted and pass-by trip emissions include travel emissions (running exhaust).

[8] On-site trip emissions include travel emissions (running exhaust), on-site starts using the number of round trips (i.e., half of the one-way trips), and idling exhaust using the number of round trips.

Abbreviations:

CH_4 - methane
CO_2 - carbon dioxide
CO_2e - carbon dioxide equivalents
lbs - pounds
MT - metric tonnes
N_2O - nitrous oxide
VMT - vehicle miles traveled
yr - year

Conversion Factors:

2204.62 lb/MT
453.592 g/lb

Global Warming Potentials

CO_2	1
CH_4	25
N_2O	298

Table 2-16. TRU Emission Calculations
River Crossing Marketplace Specific Plan
Shasta County, California

VOC[1]	NO_x[1]	CO[2]	SO_x	PM_{10}[3]	$PM_{2.5}$[3]	CO_2[4]
Emission Factor (g/bhp-hr)						Emission Factor (g/hr)
0.12	2.75	4.1	--	0.02	0.02	19,715
Maximum Daily Emissions (lb/day)						Annual Average Emissions (MT/year)
0.005	0.106	0.158	--	0.001	0.001	17.99

Notes:

[1] Emission factors are only for the TRU engine in each truck. VOC and NO_X emission factors based on Table D-8 of the Carol Moyer Program Guidelines. Available at: https://ww3.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmpgl_3_27_13.pdf. Accessed: October 2019.

[2] CO emission factors based on Tier 4 Final emission factors. Available at: https://www.dieselnet.com/standards/us/nonroad.php. Accessed: October 2019.

[3] PM_{10} and $PM_{2.5}$ emission factors based on Table 3 of CARB ATCM for In-Use Diesel-Fueled Transport Refrigeration Units, for Ultra-Low Emission TRUs. Available at: https://ww3.arb.ca.gov/regact/trude03/fro1.pdf. Accessed: October 2019.

[4] CO_2 emission factor based on NREL emission estimates for a TRU running at high speed on CARB fuel with a diesel particulate filter. Available at: https://www.nrel.gov/docs/fy10osti/46598.pdf. Accessed: October 2019.

[5] TRU load factor based on CARB Diesel Risk Reduction Program, Appendix VII. Available at: https://ww3.arb.ca.gov/diesel/documents/rrpapp7.pdf. Accessed: October 2019.

Constants:

Horsepower	25	bhp
Load Factor [5]	0.28	
TRU Cycle Duration	15	minutes
Number of Trucks with TRUs	10	

Conversion Factors:

453.592	g/lb
1000000	g/MT
60	min/hr
365	day/year

Table 2-17. Gasoline Dispensing Facility Emissions
River Crossing Marketplace Specific Plan
Shasta County, California

VOC Emission Factor for EVR System[1] (lb/1,000 gallons)								Annual Throughput (gallons/year)	Emissions (lb/day)
Phase II Fueling (EVR)			Bulk Transfer Losses	Pressure Driven Losses	Spillage	Hose Permeation	Total		
Non-ORVR	ORVR	Weighted[2]							
0.42	0.021	0.12	0.15	0.024	0.24	0.009	**0.54774**	20,000,000	**30.0**

Notes:

[1] Emission factors obtained from Table I-I of CARB Revised Emission Factors for Gasoline Marketing Operations at California Gasoline Dispensing Facilities. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/gdfumbrella.pdf. Accessed: October 2019.

[2] Weighted Phase II fueling factor assumes that 74% of vehicles wall be ORVR, based on Attachment 1 of CARB Revised Emission Factors for Gasoline Marketing Operations at California Gasoline Dispensing Facilties. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/attachment1.pdf. Accessed: October 2019.

Abbreviations:

CARB - California Air Resources Board
EVR - enhanced vapor recovery
lb - pounds
ORVR - onboard refueling vapor recovery