

Appendix N Transportation Energy Use Calculations

Appendices

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Operation-Related Vehicle Fuel/Energy Usage

PROPOSED COMMUTE

Year	Gas		Diesel		CNG		Electricity	
	VMT	Gallons	VMT	Gallons	VMT	Gallons	VMT	kWh
Alternative 1	18,990,217	880,812	31,690,671	3,833,094	52,944	23,199	173,150	57,858
Alternative 2	25,819,273	1,073,379	29,187,258	3,557,796	49,543	21,708	248,787	83,132

Proposed Facilities

PROPOSED CONDITIONS

Vehicle type	Fleet percent	VMT	
		Total	
LDA	33.01%	16,803,822	16,803,822
LDT1	0.00%	0	0
LDT2	0.00%	0	0
MDV	0.00%	0	0
LHD1	0.00%	0	0
LHD2	11.97%	6,093,320	6,093,320
MHD	15.13%	7,703,400	7,703,400
HHD	39.89%	20,306,440	20,306,440
OBUS	0.00%	0	0
UBUS	0.00%	0	0
MCY	0.00%	0	0
SBUS	0.00%	0	0
MH	0.00%	0	0
	100.00%	50,906,982	50,906,982

Alternative 1

	SQFT	Cars	Total Trucks			Total	Daily VMT	Annual VMT		
			2axle	3axle	4+axle					
Building 1	1,500,000	1302	128	184	487	799				
Building 2	1,330,000	1154	113	163	432	708	Passenger	48,426	16,803,822	33%
Building 3	690,000	599	59	84	224	367	LHD2	17,560	6,093,320	12%
Building 4	465,000	404	40	57	151	248	MHD	22,200	7,703,400	15%
Building 5	231,000	201	20	28	75	123	HHD	58,520	20,306,440	40%
Building 6	200,000	780	79	39	94	212		146,706	50,906,982	100%
RD	64,000	721				721				
Park		56				56				
	4,480,000	5217	439	555	1463	2457				

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Unrefrigerated Warehouse-No Rail	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PROPOSED CONDITIONS

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent
LDA	98.08%	0.89%	0.00%	1.03%
LDT1	99.74%	0.03%	0.00%	0.23%
LDT2	99.05%	0.54%	0.00%	0.41%
MDV	97.81%	2.02%	0.00%	0.17%
LHD1	50.19%	49.81%	0.00%	0.00%
LHD2	29.07%	70.93%	0.00%	0.00%
MHD	9.53%	90.47%	0.00%	0.00%
HHD	0.02%	99.72%	0.26%	0.00%
OBUS	53.87%	46.13%	0.00%	0.00%
UBUS	35.23%	0.09%	64.26%	0.42%
MCY	100.00%	0.00%	0.00%	0.00%
SBUS	34.82%	65.18%	0.00%	0.00%
MH	70.73%	29.27%	0.00%	0.00%

<< Equal to T6 (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)

<< Equal to T7 (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)

<< Motor coach, all other buses, and OBUS (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)

PROPOSED CONDITIONS

Vehicle type	Gasoline			Diesel			CNG			Electricity	
	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	kWh
LDA	16,481,454	30.34	543,273	149,219	49.74	3,000	0	0	0	173,150	57,858
LDT1	0	25.71	0	0	25.36	0	0	0	0	0	0
LDT2	0	23.78	0	0	36.82	0	0	0	0	0	0
MDV	0	19.22	0	0	27.27	0	0	0	0	0	0
LHD1	0	10.58	0	0	20.56	0	0	0	0	0	0
LHD2	1,771,373	9.24	191,796	4,321,947	18.84	229,388	0	0	0	0	0
MHD	733,874	5.07	144,867	6,969,526	10.54	660,939	0	0	0	0	0
HHD	3,517	4.01	876	20,249,979	6.89	2,939,768	52,944	2.28	23,199	0	0
OBUS	0	5.02	0	0	9.05	0	0	0	0	0	0
UBUS	0	6.16	0	0	8.92	0	0	4.48	0	0	0
MCY	0	38.37	0	0	0.00	0	0	0	0	0	0
SBUS	0	8.89	0	0	7.45	0	0	0	0	0	0
MH	0	5.06	0	0	10.74	0	0	0	0	0	0
	18,990,217		880,812	31,690,671		3,833,094	52,944		23,199	173,150	57,858

Proposed Facilities

PROPOSED CONDITIONS			
Vehicle type	Fleet percent	VMT	
		Total	
LDA	43.66%	24,144,260	24,144,260
LDT1	0.00%	0	0
LDT2	0.00%	0	0
MDV	0.00%	0	0
LHD1	0.00%	0	0
LHD2	9.04%	4,996,800	4,996,800
MHD	12.95%	7,162,080	7,162,080
HHD	34.36%	19,001,720	19,001,720
OBUS	0.00%	0	0
UBUS	0.00%	0	0
MCY	0.00%	0	0
SBUS	0.00%	0	0
MH	0.00%	0	0
	100.00%	55,304,860	55,304,860

Alternative 2							
	Cars	2axle	3ale	4+axle	Total Trucks	Total	
Building 1	1,500,000	1302	128	184	487	799	2101
Building 2	1,330,000	1154	113	163	432	708	1862
Building 3	690,000	599	59	84	224	367	966
Building 4	465,000	404	40	57	151	248	652
Building 5	231,000	201	20	28	75	123	324
BP	170,000	2115					2115
Retail	25,000	944					944
RD	64,000	721					721
Park		56					56
	4,475,000	7496	360	516	1369	2245	9741
Trip Length		9.3	40	40	40	40	
VMT		69,580	14,400	20,640	54,760	89,800	249,180

	Daily VMT	Annual VMT	
Passenger	69,580	24,144,260	44%
LHD2	14,400	4,996,800	9%
MHD	20,640	7,162,080	13%
HHD	54,760	19,001,720	34%
	159,380	55,304,860	100%

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Unrefrigerated Warehouse-No Rail	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PROPOSED CONDITIONS				
Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent
LDA	98.08%	0.89%	0.00%	1.03%
LDT1	99.74%	0.03%	0.00%	0.23%
LDT2	99.05%	0.54%	0.00%	0.41%
MDV	97.81%	2.02%	0.00%	0.17%
LHD1	50.19%	49.81%	0.00%	0.00%
LHD2	29.07%	70.93%	0.00%	0.00%
MHD	9.53%	90.47%	0.00%	0.00%
HHD	0.02%	99.72%	0.26%	0.00%
OBUS	53.87%	46.13%	0.00%	0.00%
UBUS	35.23%	0.09%	64.26%	0.42%
MCY	100.00%	0.00%	0.00%	0.00%
SBUS	34.82%	65.18%	0.00%	0.00%
MH	70.73%	29.27%	0.00%	0.00%

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<< Motor coach, all other buses, and OBUS (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)

PROPOSED CONDITIONS												
Vehicle type	VMT	Gasoline		Diesel		CNG		Electricity		VMT	kWh	
		mpg	Gallons	mpg	Gallons	mpg	Gallons	m/kWh				
LDA	23,681,071	30.34	780,591	214,402	49.74	4,310	0	0	0	248,787	2.99	83,132
LDT1	0	25.71	0	0	25.36	0	0	0	0	0	2.99	0
LDT2	0	23.78	0	0	36.82	0	0	0	0	0	2.99	0
MDV	0	19.22	0	0	27.27	0	0	0	0	0	2.99	0
LHD1	0	10.58	0	0	20.56	0	0	0	0	0	0.00	0
LHD2	1,452,606	9.24	157,281	3,544,194	18.84	188,108	0	0	0	0	0.00	0
MHD	682,304	5.07	134,687	6,479,776	10.54	614,494	0	0	0	0	0.00	0
HHD	3,291	4.01	820	18,948,887	6.89	2,750,883	49,543	2.28	21,708	0	0.00	0
OBUS	0	5.02	0	0	9.05	0	0	0	0	0	0.00	0
UBUS	0	6.16	0	0	8.92	0	0	4.48	0	0	0.00	0
MCY	0	38.37	0	0	0.00	0	0	0	0	0	0.00	0
SBUS	0	8.89	0	0	7.45	0	0	0	0	0	0.00	0
MH	0	5.06	0	0	10.74	0	0	0	0	0	0.00	0
	25,819,273		1,073,379	29,187,258		3,557,796	49,543		21,708	248,787		83,132

Appendix C: Evidence Used to Define the Average Number of KWH Required to Displace a Gallong of Gasoline

Table A 3: Evidence from U.S. Department of Energy and U.S. Environmental Protection Agency's fuel economy website^[32]

Vehicle	Model year	Electric consumption	Gasoline fuel economy	Number of kWh that are equivalent to 1 gallon
Ford Fusion Energi & Ford C-Max Energi	2013	0.34 kWh per mile	43 mpg	14.6
Chevrolet Volt	2013	0.35 kWh per mile	37 mpg	12.9
Chevrolet Volt	2012	0.36 kWh per mile	37 mpg	13.3
Fisker Karma	2012	0.62 kWh per mile	20 mpg	12.4
Toyota Prius	2013	0.29 kWh per mile & 0.2 gal	50 mpg	13.1
Average for five models	-	-	-	13.3 +/- 0.8

Table A 5: Average power consumption per mile traveled over time for different PEV categories

Year range	2012- 2020	2020-2030	2030-2040	2040-2050	2050
Efficiency improvement per year	0.3%	0.8%	0.9%	0.9%	
Year	2012	2020	2030	2040	2050
Relative energy efficiency	1.000	0.976	0.901	0.823	0.752

https://www.fhwa.dot.gov/environment/climate_change/mitigation/publications_and_tools/ev_deployment/page08.cfm

EMFAC Fuel Usage: Year 2020

Vehicle type	Gasoline			Diesel			Natural Gas		Electricity	
	VMT/day	Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day
All other buses	0	0	#DIV/0!	15,870	1,536	10.33	0	0	#DIV/0!	0
LDA	29,235,242	963,671	30.34	264,688	5,321	49.74	0	0	#DIV/0!	307,138
LDT1	2,948,933	114,714	25.71	1,017	40	25.36	0	0	#DIV/0!	6,794
LDT2	9,472,450	398,328	23.78	51,585	1,401	36.82	0	0	#DIV/0!	38,975
LHD1	706,742	66,779	10.58	701,344	34,117	20.56	0	0	#DIV/0!	0
LHD2	110,129	11,924	9.24	268,702	14,261	18.84	0	0	#DIV/0!	0
MCY	268,056	6,987	38.37	0	0	#DIV/0!	0	0	#DIV/0!	0
MDV	7,762,870	403,976	19.22	159,966	5,865	27.27	0	0	#DIV/0!	13,736
MH	53,432	10,551	5.06	22,107	2,059	10.74	0	0	#DIV/0!	0
Motor coach	0	0	#DIV/0!	8,048	1,235	6.52	0	0	#DIV/0!	0
OBUS	27,934	5,567	5.02	0	0	#DIV/0!	0	0	#DIV/0!	0
PTO	0	0	#DIV/0!	41,533	8,433	4.92	0	0	#DIV/0!	0
SBUS	18,788	2,113	8.89	35,173	4,723	7.45	0	0	#DIV/0!	0
T6	100,055	19,751	5.07	950,216	90,111	10.54	0	0	#DIV/0!	0
T7	643	160	4.01	3,700,338	537,192	6.89	9,675	4,239	2.28	0
UBUS	22,881	3,712	6.16	59	7	8.92	41,729	9,318	4.48	272
Total	50,728,155	2,008,232	25.26	6,220,646	706,302	8.81	51,403	13,557	3.79	366,914

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EMFAC2017 (v1.0.2) Emissions Inventory

Region Type: County

Region: RIVERSIDE

Calendar Year: 2023

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	CalYr	VehClass	MdYr	Speed	Fuel	Population	VMT	Trips	Fuel_Consumption
RIVERSIDE		2020 All Other Buses	Aggregated	Aggregated	DSL	277.8289224	15870.4822	2333.762948	1.535608545
RIVERSIDE		2020 LDA	Aggregated	Aggregated	GAS	727415.2858	29235242.23	3442919.026	963.6714084
RIVERSIDE		2020 LDA	Aggregated	Aggregated	DSL	6210.83018	264687.7649	29733.10403	5.321149244
RIVERSIDE		2020 LDA	Aggregated	Aggregated	ELEC	7992.09117	307137.6042	40374.46511	0
RIVERSIDE		2020 LDT1	Aggregated	Aggregated	GAS	78434.222	2948932.75	355713.2573	114.713676
RIVERSIDE		2020 LDT1	Aggregated	Aggregated	DSL	46.19775392	1016.736464	151.3369337	0.040093804
RIVERSIDE		2020 LDT1	Aggregated	Aggregated	ELEC	173.8901824	6793.548124	881.5290588	0
RIVERSIDE		2020 LDT2	Aggregated	Aggregated	GAS	240265.9878	9472449.657	1123919.05	398.3276907
RIVERSIDE		2020 LDT2	Aggregated	Aggregated	DSL	1114.907475	51585.18205	5535.541831	1.40092881
RIVERSIDE		2020 LDT2	Aggregated	Aggregated	ELEC	1188.93567	38974.86389	6058.045922	0
RIVERSIDE		2020 LHD1	Aggregated	Aggregated	GAS	21163.22926	706741.5496	315300.5827	66.77851313
RIVERSIDE		2020 LHD1	Aggregated	Aggregated	DSL	19824.04677	701344.3456	249361.5697	34.11712096
RIVERSIDE		2020 LHD2	Aggregated	Aggregated	GAS	3298.967893	110129.1354	49149.70615	11.92424736
RIVERSIDE		2020 LHD2	Aggregated	Aggregated	DSL	753.39075	268702.4944	95012.15347	14.26139467
RIVERSIDE		2020 MCY	Aggregated	Aggregated	GAS	35084.23807	268055.9886	70168.47614	6.986853972
RIVERSIDE		2020 MDV	Aggregated	Aggregated	GAS	208408.5299	7762869.654	956409.001	403.9760935
RIVERSIDE		2020 MDV	Aggregated	Aggregated	DSL	3638.339407	159965.6856	17849.82506	5.864927732
RIVERSIDE		2020 MDV	Aggregated	Aggregated	ELEC	409.4714036	13735.95798	2101.179448	0
RIVERSIDE		2020 MH	Aggregated	Aggregated	GAS	6522.373746	53431.65093	652.4982695	10.55071085
RIVERSIDE		2020 MH	Aggregated	Aggregated	DSL	2593.765323	22106.73762	259.3765323	2.058655852
RIVERSIDE		2020 Motor Coach	Aggregated	Aggregated	DSL	63.03055432	8048.493449	920.2460931	1.23507476
RIVERSIDE		2020 OBUS	Aggregated	Aggregated	GAS	590.9645011	27934.48085	11824.01774	5.567183109
RIVERSIDE		2020 PTO	Aggregated	Aggregated	DSL	0	41532.97681	0	8.433277991
RIVERSIDE		2020 SBUS	Aggregated	Aggregated	GAS	460.0487654	18788.34799	1840.195062	2.112908754
RIVERSIDE		2020 SBUS	Aggregated	Aggregated	DSL	1109.224938	35173.04661	12800.30199	4.722933675
RIVERSIDE		2020 T6 Ag	Aggregated	Aggregated	DSL	7.744418516	183.9145384	34.07544147	0.019541032
RIVERSIDE		2020 T6 CAIRP heavy	Aggregated	Aggregated	DSL	141.1313051	28013.83045	2060.517055	2.426465392
RIVERSIDE		2020 T6 CAIRP small	Aggregated	Aggregated	DSL	74.78303917	3954.660547	1091.832372	0.364421433
RIVERSIDE		2020 T6 instate construction heavy	Aggregated	Aggregated	DSL	1008.880091	68591.89994	4561.107665	6.684679541
RIVERSIDE		2020 T6 instate construction small	Aggregated	Aggregated	DSL	2379.250271	121460.3239	10756.49797	11.69863178
RIVERSIDE		2020 T6 instate heavy	Aggregated	Aggregated	DSL	2191.556184	278787.2866	25290.25452	25.43918053
RIVERSIDE		2020 T6 instate small	Aggregated	Aggregated	DSL	8615.34863	413320.9155	99419.92871	39.77336183
RIVERSIDE		2020 T6 OOS heavy	Aggregated	Aggregated	DSL	80.68116342	16072.77399	1177.944986	1.392224121
RIVERSIDE		2020 T6 OOS small	Aggregated	Aggregated	DSL	43.75408735	2297.705659	638.8096753	0.211836729
RIVERSIDE		2020 T6 Public	Aggregated	Aggregated	DSL	945.754886	14248.23147	2868.789818	1.763309089

RIVERSIDE	2020 T6 utility	Aggregated	Aggregated	DSL	196.7702952	3284.32372	2262.858395	0.33784165
RIVERSIDE	2020 T6TS	Aggregated	Aggregated	GAS	1903.946376	100055.3653	38094.15909	19.7509587
RIVERSIDE	2020 T7 Ag	Aggregated	Aggregated	DSL	9.338038061	123.7615746	41.08736747	0.021128599
RIVERSIDE	2020 T7 CAIRP	Aggregated	Aggregated	DSL	4840.835747	876340.9986	70676.20191	126.7529546
RIVERSIDE	2020 T7 CAIRP construction	Aggregated	Aggregated	DSL	267.8783059	49270.15757	1211.067406	6.699270197
RIVERSIDE	2020 T7 NNOOS	Aggregated	Aggregated	DSL	5293.042112	1068354.529	77278.41484	150.1969554
RIVERSIDE	2020 T7 NOOS	Aggregated	Aggregated	DSL	1902.769615	344299.2293	27780.43639	51.01274795
RIVERSIDE	2020 T7 POLA	Aggregated	Aggregated	DSL	2605.471108	319284.9224	19801.58042	50.6223539
RIVERSIDE	2020 T7 Public	Aggregated	Aggregated	DSL	1005.824588	20378.95431	3051.001247	3.466692737
RIVERSIDE	2020 T7 Single	Aggregated	Aggregated	DSL	2810.253533	209168.373	32429.93614	30.39704643
RIVERSIDE	2020 T7 single construction	Aggregated	Aggregated	DSL	1733.064904	122230.1986	7835.119051	18.26592018
RIVERSIDE	2020 T7 SWCV	Aggregated	Aggregated	DSL	109.7200992	4482.836317	427.9083868	2.216750153
RIVERSIDE	2020 T7 SWCV	Aggregated	Aggregated	NG	238.4864107	9674.658788	930.0970016	4.239186025
RIVERSIDE	2020 T7 tractor	Aggregated	Aggregated	DSL	4306.941661	582999.442	54698.15909	82.01363299
RIVERSIDE	2020 T7 tractor construction	Aggregated	Aggregated	DSL	1434.771532	100829.1526	6486.546312	15.12010059
RIVERSIDE	2020 T7 utility	Aggregated	Aggregated	DSL	126.8959356	2575.299292	1459.30326	0.406808573
RIVERSIDE	2020 T7IS	Aggregated	Aggregated	GAS	9.095523545	642.6381397	181.9832351	0.16015376
RIVERSIDE	2020 UBUS	Aggregated	Aggregated	GAS	162.5145119	22881.1992	650.0580478	3.711979171
RIVERSIDE	2020 UBUS	Aggregated	Aggregated	DSL	1.105797941	58.57190354	4.423191762	0.006566327
RIVERSIDE	2020 UBUS	Aggregated	Aggregated	ELEC	5.058469431	271.5303965	20.23387772	0
RIVERSIDE	2020 UBUS	Aggregated	Aggregated	NG	304.7651534	41728.61338	1219.060614	9.317742056