

Appendix F
Energy Appendix

Workbook Summary: contains the energy calculations performed to support the energy analysis found in the San Diego Forward PEIR section 4.6, Energy.

Tab Name	Tab #	Description
ToC	1	Table of contents summarizing the workbook's tabs
EIR Tables	2	Processed energy data that directly feeds into the tables of the EIR
Energy Data Summary	3	Precursor table to #2 with most of the same data but organized differently
Fuel All	4	Sum of #5 and #6
Fuel Light	5	Conversion of GHG Inventory light-duty vehicle VMT data into fuel data
Fuel Heavy	6	Conversion of GHG Inventory heavy-duty and other vehicle VMT data into fuel data
Op Days	7	VMT annualization factors to support #5 and #6 conversions
EMFAC Output	8	EMFAC output to create fleet mix and fuel type weighting to support #5 and #6 conversions
Misc.	9	Conversions and constants
Table 1	10	Appendix X. GHG Inventory. Population data
Table 2	11	Appendix X. GHG Inventory. Emission categories
Table 3	12	Appendix X. GHG Inventory. Existing light duty VMT
Table 4	13	Appendix X. GHG Inventory. Projected light duty VMT
Table 5	14	Appendix X. GHG Inventory. Light duty VMT reductions
Table 6	15	Appendix X. GHG Inventory. Existing light duty VMT
Table 7	16	Appendix X. GHG Inventory. Existing electricity
Table 8	17	Appendix X. GHG Inventory. Projected electricity
Table 9	18	Appendix X. GHG Inventory. Existing natural gas
Table 10	19	Appendix X. GHG Inventory. Projected natural gas
Table 11	20	Appendix X. GHG Inventory. Existing heavy duty and other VMT
Table 12	21	Appendix X. GHG Inventory. Projected heavy duty and other VMT
Table 13	22	Appendix X. GHG Inventory. Existing off-road transportation emissions
Table 14	23	Appendix X. GHG Inventory. Projected off-road transportation emissions
Table 15	24	Appendix X. GHG Inventory. Existing local water energy consumption.
Table 16	25	Appendix X. GHG Inventory. Existing imported water energy consumption.
Table 17	26	Appendix X. GHG Inventory. Proposed local and imported water energy consumption.

Category	2016		2025		2035		2050	
	Energy Use	Trillion Btu	Energy Use	Trillion Btu	Energy Use	Trillion Btu	Energy Use	Trillion Btu
Regional Growth and Land Use Change	--	123	--	122	--	126	--	129
Electricity (GWh)	18,842	64	17,475	60	18,078	62	18,191	62
Natural Gas (million therms)	585	59	629	63	648	65	671	67
Transportation Network Improvements and Programs	--	168	--	133	--	113	--	112
Vehicle, Gasoline (million gallons)	1,247	150	937	113	764	92	739	89
Vehicle, Diesel (million gallons)	123	17	132	18	135	19	145	20
Rail, Diesel (million gallons)	11	1	16	2	18	3	19	3
Total Construction (million gallons)	20	3	24	3	29	4	34	5
Total Energy Use	--	294	--	259	--	243	--	245
Per Capita Energy Use (MMBtu/person)	89		75		67		65	
Total Energy Use, Percent Change 2016 to Plan Year	--		-12%		-17%		-17%	
Per Capita Energy Use, Percent Change 2016 to Plan Year	--		-17%		-25%		-27%	

Table. Summary Energy Metrics.

Variable	Unit	Existing	Projected				
		2016	2025	2030	2035	2045	2050
Population	people	3,287,280	3,470,848	3,552,485	3,620,348	3,719,685	3,746,073
Vehicle, Gasoline	million gallons/yr	1,247	937	831	764	740	739
Vehicle, Diesel	million gallons/yr	123	132	133	135	141	145
Rail, Diesel	million gallons/yr	11	16	17	18	19	19
Construction/Mining, Diesel	million gallons/yr	20	24	27	29	32	34
Electricity	GWh/yr	18,842	17,475	18,029	18,078	18,158	18,191
Building	GWh/yr	17,843	16,242	16,746	16,751	16,761	16,766
Water	GWh/yr	999	1,233	1,283	1,327	1,397	1,425
Natural Gas	Million therms/yr	585	629	640	648	663	671
Total	Trillion Btu	294	259	250	243	244	245
Vehicle, Gasoline	Trillion Btu	150	113	100	92	89	89
Vehicle, Diesel	Trillion Btu	17	18	18	19	19	20
Rail, Diesel	Trillion Btu	1	2	2	3	3	3
Construction/Mining, Diesel	Trillion Btu	3	3	4	4	4	5
Electricity	Trillion Btu	64	60	62	62	62	62
Natural Gas	Trillion Btu	59	63	64	65	66	67
Per capita energy use	MMBtu/person	89	75	70	67	66	65
Total Energy Use, Percent Change from Existing to Proposed	%	n/a	-12%	-15%	-17%	-17%	-17%
Per Capita Energy Use, Percent Change from Existing to Proposed	%	n/a	-17%	-21%	-25%	-27%	-27%

Table. All Vehicle Fuel

Variable	2016	2025	2030	2035	2045	2050
Million gallons/yr	1,370	1,069	964	898	881	884
Gasoline	1,247	937	831	764	740	739
Diesel	123	132	133	135	141	145

Table. Heavy-Duty Trucks and Vehicles VMT Interim Calculations.

Variable	2016	2025	2030	2035	2045	2050
VMT/yr						
Gasoline	27,437,526,770	27,358,183,022	27,893,380,141	27,495,007,250	28,203,160,549	28,316,802,881
Diesel	256,573,419	354,959,139	379,721,125	381,593,100	396,374,490	398,830,015
Million gallons/yr						
Gasoline	1,183	888	785	718	696	694
Diesel	1,172	877	774	708	686	685
	11	11	11	10	10	10

Table. Passenger Cars and Light-Duty Vehicles VMT Interim Calculations.

Variable	2016	2025	2030	2035	2045	2050
VMT/weekday	79,810,087	79,864,963	81,478,678	81,193,649	83,299,109	83,644,722
VMT/yr	27,694,100,189	27,713,142,161	28,273,101,266	28,174,196,203	28,904,790,823	29,024,718,534
VMT avoided/weekday*	0	0	0	857,625	879,700	890,737
VMT avoided/yr*	0	0	0	297,595,853	305,255,784	309,085,638
Net VMT/yr	27,694,100,189	27,713,142,161	28,273,101,266	27,876,600,350	28,599,535,039	28,715,632,896

*From vanpool, carshare, pooled rides, and TDM ordinance

Table. Vehicle Categorization Schema

GHG Inventory Vehicle Category EMFAC Vehicle Categories

Light Duty LDA, LDT1, LDT2, MDV
 Heavy-Duty Trucks and Vehicles All other EMFAC vehicle categories

Table. Light Duty VMT by Vehicle Type

Sum of VMT	Column Labels					
Row Labels	2016	2025	2030	2035	2045	2050
LDA	17,504,808,098	20,650,975,214	21,683,016,594	22,446,609,398	23,597,830,662	24,095,139,627
LDT1	2,021,598,099	2,102,149,677	2,155,388,408	2,212,821,429	2,320,295,658	2,373,524,944
LDT2	6,642,125,276	6,146,130,486	6,134,462,457	6,217,847,390	6,469,428,511	6,596,119,561
MDV	4,385,144,715	4,054,059,988	4,027,173,817	4,087,653,387	4,264,985,307	4,344,998,081
Grand Total	30,553,676,188	32,953,315,366	34,000,041,276	34,964,931,604	36,652,540,138	37,409,782,214

% total							annualizer
2016	2025	2030	2035	2045	2050		
57.29%	62.67%	63.77%	64.20%	64.38%	64.41%	347	
6.62%	6.38%	6.34%	6.33%	6.33%	6.34%	347	
21.74%	18.65%	18.04%	17.78%	17.65%	17.63%	347	
14.35%	12.30%	11.84%	11.69%	11.64%	11.61%	347	
100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	347	

Sum of Fuel Consumption

Sum of Fuel Consumption	Column Labels					
Row Labels	2016	2025	2030	2035	2045	2050
LDA	641,579	582,144	536,268	515,339	517,935	527,168
LDT1	87,601	72,986	66,222	62,667	61,059	61,762
LDT2	322,698	223,184	190,644	174,868	169,219	170,891
MDV	253,027	177,586	150,664	138,558	134,298	135,266
Grand Total	1,304,904	1,055,899	943,798	891,431	882,510	895,087

mile/gal						
2016	2025	2030	2035	2045	2050	
27	35	40	44	46	46	
23	29	33	35	38	38	
21	28	32	36	38	39	
17	23	27	30	32	32	
23	31	36	39	42	42	

Annual gallons						
2016	2025	2030	2035	2045	2050	
581,532,052	489,572,313	445,939,671	415,251,908	408,451,630	409,008,278	
79,401,992	61,380,086	55,067,604	50,495,701	48,152,278	47,918,477	
292,495,830	187,693,304	158,531,866	140,905,811	133,448,566	132,587,449	
229,346,155	149,346,433	125,286,042	111,647,747	105,909,657	104,947,349	
1,182,776,029	887,992,137	784,825,183	718,301,167	695,962,131	694,461,553	

Table. Light Duty VMT by Fuel Type

Sum of VMT	Column Labels						% total
Row Labels	2016	2025	2030	2035	2045	2050	
Gasoline	30,133,567,413	31,647,660,643	32,178,857,338	32,816,568,124	34,211,080,865	34,899,130,457	99%
LDA	17,195,958,298	19,693,709,795	20,349,257,066	20,875,961,037	21,819,898,206	22,268,918,337	99%
LDT1	2,018,319,387	2,068,157,775	2,096,866,975	2,137,374,131	2,227,693,366	2,276,962,980	99%
LDT2	6,611,005,270	6,008,096,843	5,934,881,159	5,978,993,214	6,195,837,105	6,314,421,711	99%
MDV	4,308,284,459	3,877,696,229	3,797,852,139	3,824,239,742	3,967,652,189	4,038,827,428	99%
Diesel	281,784,597	410,613,028	438,060,638	455,449,088	480,811,351	491,539,274	1%
LDA	177,688,482	239,541,619	250,948,659	258,947,446	272,242,576	278,038,817	1%
LDT1	1,275,292	558,366	295,891	294,476	311,309	319,108	1%
LDT2	26,094,546	50,651,982	56,875,566	60,088,853	64,076,415	65,649,184	1%
MDV	76,726,277	119,861,061	129,940,521	136,118,312	144,181,050	147,532,166	1%
Grand Total	30,415,352,010	32,058,273,670	32,616,917,976	33,272,017,212	34,691,892,216	35,390,669,731	

Table. Light Duty VMT by Fuel Type

Sum of VMT	Column Labels						% total
Row Labels	2016	2025	2030	2035	2045	2050	
Diesel	281,784,597	410,613,028	438,060,638	455,449,088	480,811,351	491,539,274	1%
LDA	177,688,482	239,541,619	250,948,659	258,947,446	272,242,576	278,038,817	1%
LDT1	1,275,292	558,366	295,891	294,476	311,309	319,108	1%
LDT2	26,094,546	50,651,982	56,875,566	60,088,853	64,076,415	65,649,184	1%
MDV	76,726,277	119,861,061	129,940,521	136,118,312	144,181,050	147,532,166	1%
Electricity	138,324,178	895,041,696	1,383,123,300	1,692,914,392	1,960,647,922	2,019,112,483	0%
LDA	131,161,318	717,723,801	1,082,810,869	1,311,700,915	1,505,689,880	1,548,182,473	3%
LDT1	2,003,421	33,433,536	58,225,542	75,152,822	92,290,983	96,242,856	4%
LDT2	5,025,460	87,381,661	142,705,732	178,765,322	209,514,990	216,048,667	5%
MDV	133,979	56,502,698	99,381,157	127,295,333	153,152,068	158,638,487	5%
Gasoline	30,133,567,413	31,647,660,643	32,178,857,338	32,816,568,124	34,211,080,865	34,899,130,457	99%
LDA	17,195,958,298	19,693,709,795	20,349,257,066	20,875,961,037	21,819,898,206	22,268,918,337	96%
LDT1	2,018,319,387	2,068,157,775	2,096,866,975	2,137,374,131	2,227,693,366	2,276,962,980	95%
LDT2	6,611,005,270	6,008,096,843	5,934,881,159	5,978,993,214	6,195,837,105	6,314,421,711	94%
MDV	4,308,284,459	3,877,696,229	3,797,852,139	3,824,239,742	3,967,652,189	4,038,827,428	93%
Grand Total	30,553,676,188	32,953,315,366	34,000,041,276	34,964,931,604	36,652,540,138	37,409,782,214	

EMFAC2011 Category	Operation Days (days/yr)
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LDA	347
LDT1	347
LDT2	347
LHD1	327
LHD2	327
MCY	347
MDV	347
MH	327
Motor Coach	292
OBUS	327
PTO	312
SBUS	327
T6 Ag	312
T6 CAIRP heavy	312
T6 CAIRP small	312
T6 instate construction heavy	312
T6 instate construction small	312
T6 instate heavy	312
T6 instate small	312
T6 OOS heavy	312
T6 OOS small	312
T6 Public	312
T6 utility	312
T6TS	327
T7 Ag	312
T7 CAIRP	312
T7 CAIRP construction	312
T7 NNOOS	312
T7 NOOS	312
T7 other port	312
T7 POLA	312
T7 Public	312
T7 Single	312
T7 single construction	312
T7 SWCV	312
T7 tractor	312
T7 tractor construction	312
T7 utility	312
T7IS	327
UBUS	327
All Other Buses	292

Source: <https://arb.ca.gov/emfac/emissions-inventory/a5a25cd71dfd245b33eb8fc3464ef085f405772f>

Source: EMFAC2017 (v1.0.3) Emissions Inventory

Region Type: County

Region: San Diego

Calendar Year: 2016, 2025, 2030, 2035, 2045, 2050

Season: Annual

Vehicle Classification: EMFAC2011 Categories

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

Region	Calendar Y	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	Fuel Consumption
San Diego	2016	All Other Buses	Aggregate	Aggregate	Diesel	632.57	8935151.903	1551567.696	1127.469884
San Diego	2016	LDA	Aggregate	Aggregate	Gasoline	1266609.588	17195958298	2062838229	637236.277
San Diego	2016	LDA	Aggregate	Aggregate	Diesel	12811.59844	177688482.4	20785433.13	4342.322442
San Diego	2016	LDA	Aggregate	Aggregate	Electricity	10580.71806	131161317.8	18616637.66	0
San Diego	2016	LDT1	Aggregate	Aggregate	Gasoline	163099.2886	2018319387	255389369.3	87542.78766
San Diego	2016	LDT1	Aggregate	Aggregate	Diesel	184.6174236	1275291.569	222638.1525	57.91930369
San Diego	2016	LDT1	Aggregate	Aggregate	Electricity	178.3081176	2003420.748	302903.5565	0
San Diego	2016	LDT2	Aggregate	Aggregate	Gasoline	501018.1334	6611005270	810482800.9	321819.27
San Diego	2016	LDT2	Aggregate	Aggregate	Diesel	1635.745032	26094545.76	2814366.55	878.4456999
San Diego	2016	LDT2	Aggregate	Aggregate	Electricity	384.3180677	5025460.323	689664.6553	0
San Diego	2016	LHD1	Aggregate	Aggregate	Gasoline	38986.8833	466185318.5	189936795.9	57870.39221
San Diego	2016	LHD1	Aggregate	Aggregate	Diesel	28052.57443	355051896.4	115387213.5	20823.08158
San Diego	2016	LHD2	Aggregate	Aggregate	Gasoline	5239.023081	63327686.39	25523539.55	9004.019734
San Diego	2016	LHD2	Aggregate	Aggregate	Diesel	8845.521604	116649963.2	36383829.65	7688.125672
San Diego	2016	MCY	Aggregate	Aggregate	Gasoline	76496.10058	246993424	53088293.8	6761.683836
San Diego	2016	MDV	Aggregate	Aggregate	Gasoline	328469.0614	4308284459	527728842.2	249655.2209
San Diego	2016	MDV	Aggregate	Aggregate	Diesel	4704.007685	76726277.47	8068981.05	3372.250737
San Diego	2016	MDV	Aggregate	Aggregate	Electricity	17.0157265	133979.1424	26068.40973	0
San Diego	2016	MH	Aggregate	Aggregate	Gasoline	14000.57285	40337490.49	458001.8596	8848.554342
San Diego	2016	MH	Aggregate	Aggregate	Diesel	3649.52793	12274701.9	119339.5633	1299.751577
San Diego	2016	Motor Coach	Aggregate	Aggregate	Diesel	176.61	6296746.663	752923.752	1076.4109
San Diego	2016	OBUS	Aggregate	Aggregate	Gasoline	1343.113707	25333771.03	8787477.227	5602.814757
San Diego	2016	PTO	Aggregate	Aggregate	Diesel	0	7957995.419	0	1733.139389
San Diego	2016	SBUS	Aggregate	Aggregate	Gasoline	104.1712449	1869670.92	136255.9883	217.2113937
San Diego	2016	SBUS	Aggregate	Aggregate	Diesel	2317.11	23594712.93	8743694.903	3055.259218
San Diego	2016	T6 Ag	Aggregate	Aggregate	Diesel	36.92	174597.4196	50683.776	19.5589275
San Diego	2016	T6 CAIRP heavy	Aggregate	Aggregate	Diesel	74.96046859	4641610.304	341459.9265	462.9139599
San Diego	2016	T6 CAIRP small	Aggregate	Aggregate	Diesel	38.69132489	644483.5154	176246.7232	67.89511699
San Diego	2016	T6 instate construction heavy	Aggregate	Aggregate	Diesel	746.5099714	14909859.12	1052982.078	1949.115595
San Diego	2016	T6 instate construction small	Aggregate	Aggregate	Diesel	2667.580742	38996365.04	3762728.992	5089.474501
San Diego	2016	T6 instate heavy	Aggregate	Aggregate	Diesel	2297.04	91671286.36	8270347.216	10380.29811
San Diego	2016	T6 instate small	Aggregate	Aggregate	Diesel	9806.75	141127325.7	35308583.03	16388.62704
San Diego	2016	T6 OOS heavy	Aggregate	Aggregate	Diesel	42.99669893	2660774.02	195858.563	265.3557266
San Diego	2016	T6 OOS small	Aggregate	Aggregate	Diesel	22.22493051	369895.5164	101239.0035	38.97121698
San Diego	2016	T6 Public	Aggregate	Aggregate	Diesel	2212.41	10410522.79	2093824.822	1560.501795
San Diego	2016	T6 utility	Aggregate	Aggregate	Diesel	300.34	1581764.408	1077619.92	196.8675076
San Diego	2016	T6TS	Aggregate	Aggregate	Gasoline	3585.063903	57719362.61	23455696.45	12823.06282
San Diego	2016	T7 Ag	Aggregate	Aggregate	Diesel	14.11	82011.80352	19370.208	14.28887027
San Diego	2016	T7 CAIRP	Aggregate	Aggregate	Diesel	1465.896431	91957822.59	6677451.424	14955.46875
San Diego	2016	T7 CAIRP construction	Aggregate	Aggregate	Diesel	170.5991616	10709881.32	240636.9191	2060.858976
San Diego	2016	T7 NNOOS	Aggregate	Aggregate	Diesel	1726.046016	112103588	7862484.814	17798.82789
San Diego	2016	T7 NOOS	Aggregate	Aggregate	Diesel	575.9658246	36129917.82	2623639.524	5982.244218
San Diego	2016	T7 other port	Aggregate	Aggregate	Diesel	439.85	22213311.74	1042972.32	4303.148018
San Diego	2016	T7 POLA	Aggregate	Aggregate	Diesel	202.46	7001685.348	480073.152	1409.107071
San Diego	2016	T7 Public	Aggregate	Aggregate	Diesel	1478.99	9335494.732	1399716.135	1992.630629
San Diego	2016	T7 Single	Aggregate	Aggregate	Diesel	2110.16	40078055.6	7597497.597	7080.38836
San Diego	2016	T7 single construction	Aggregate	Aggregate	Diesel	1322.027951	26569245.69	1864773.134	5269.4408
San Diego	2016	T7 SWCV	Aggregate	Aggregate	Diesel	896.7167489	11407253.98	1091124.94	5169.023308
San Diego	2016	T7 SWCV	Aggregate	Aggregate	Natural Gas	398.5732511	5028009.78	484983.932	2182.792408
San Diego	2016	T7 tractor	Aggregate	Aggregate	Diesel	2951.95	130872498.6	11696806.68	19816.50009
San Diego	2016	T7 tractor construction	Aggregate	Aggregate	Diesel	1023.733251	21917288.51	1444016.566	4374.404342
San Diego	2016	T7 utility	Aggregate	Aggregate	Diesel	120.53	762787.3663	432461.64	139.245151
San Diego	2016	T7IS	Aggregate	Aggregate	Gasoline	29.97103453	627583.4712	196088.97	173.3425858
San Diego	2016	UBUS	Aggregate	Aggregate	Gasoline	301.626309	10362860.46	394527.2122	2012.820298
San Diego	2016	UBUS	Aggregate	Aggregate	Diesel	25	859381.7791	32700	181.6428383
San Diego	2016	UBUS	Aggregate	Aggregate	Natural Gas	784.293125	28883695.73	1025855.407	7443.608444
San Diego	2025	All Other Buses	Aggregate	Aggregate	Diesel	563.3042773	8860062.319	1381672.731	931.1754905
San Diego	2025	LDA	Aggregate	Aggregate	Gasoline	1519467.966	19693709795	2490713882	577401.5542
San Diego	2025	LDA	Aggregate	Aggregate	Diesel	18671.09045	239541618.9	30359601.39	4742.135689
San Diego	2025	LDA	Aggregate	Aggregate	Electricity	46846.2012	717723800.8	80414742.39	0
San Diego	2025	LDT1	Aggregate	Aggregate	Gasoline	173946.4981	2068157775	275002758.2	72962.71422
San Diego	2025	LDT1	Aggregate	Aggregate	Diesel	88.98633906	558366.009	100913.3157	23.50039121
San Diego	2025	LDT1	Aggregate	Aggregate	Electricity	2074.792295	33433535.87	3618102.495	0
San Diego	2025	LDT2	Aggregate	Aggregate	Gasoline	487846.2103	6008096843	786637533.5	221832.8479
San Diego	2025	LDT2	Aggregate	Aggregate	Diesel	3717.387288	50651982.15	6245010.142	1350.672479
San Diego	2025	LDT2	Aggregate	Aggregate	Electricity	7882.174997	87381660.64	13732928.51	0
San Diego	2025	LHD1	Aggregate	Aggregate	Gasoline	33781.5608	396021132.3	164577439.3	45065.5205
San Diego	2025	LHD1	Aggregate	Aggregate	Diesel	33448.59921	404655004.5	137582405	21103.99727
San Diego	2025	LHD2	Aggregate	Aggregate	Gasoline	5525.568531	64423528.18	26919535.33	8392.196728
San Diego	2025	LHD2	Aggregate	Aggregate	Diesel	12294.59157	149820619.7	50570711.99	8754.398083
San Diego	2025	MCY	Aggregate	Aggregate	Gasoline	81028.57501	215042766.6	56233831.06	5905.180981
San Diego	2025	MDV	Aggregate	Aggregate	Gasoline	317946.1921	3877696229	507859711.6	173397.6427
San Diego	2025	MDV	Aggregate	Aggregate	Diesel	8729.716022	119861060.5	14550151.05	4188.142857
San Diego	2025	MDV	Aggregate	Aggregate	Electricity	4973.835827	56502698.5	8736059.09	0
San Diego	2025	MH	Aggregate	Aggregate	Gasoline	9512.058939	27096179.08	311168.745	5468.622403
San Diego	2025	MH	Aggregate	Aggregate	Diesel	3889.548074	11017868.49	127188.222	1095.732342
San Diego	2025	Motor Coach	Aggregate	Aggregate	Diesel	197.2277533	7638493.906	840821.3581	1135.868866
San Diego	2025	OBUS	Aggregate	Aggregate	Gasoline	1227.727046	19632699.48	8032546.615	3938.098775
San Diego	2025	PTO	Aggregate	Aggregate	Diesel	0	8957157.899	0	1678.294743

San Diego	2025 SBUS	Aggregate	Aggregate	Gasoline	338.3875584	5657700.829	442610.9264	562.147249
San Diego	2025 SBUS	Aggregate	Aggregate	Diesel	2355.631184	24081028.62	8889055.925	2949.799399
San Diego	2025 T6 Ag	Aggregate	Aggregate	Diesel	33.10501267	84914.05645	45446.56139	9.520463774
San Diego	2025 T6 CAIRP heavy	Aggregate	Aggregate	Diesel	95.15954831	5543352.358	433470.7745	451.1097231
San Diego	2025 T6 CAIRP small	Aggregate	Aggregate	Diesel	51.85743694	802280.8979	236220.9967	70.77058475
San Diego	2025 T6 instate construction heavy	Aggregate	Aggregate	Diesel	722.3244737	14327558.02	1018867.469	1641.685895
San Diego	2025 T6 instate construction small	Aggregate	Aggregate	Diesel	2242.121803	37473371.04	3162602.195	4243.076484
San Diego	2025 T6 instate heavy	Aggregate	Aggregate	Diesel	3375.286924	137988971	12152507.06	12428.84448
San Diego	2025 T6 instate small	Aggregate	Aggregate	Diesel	11968.91474	188934381.7	43093320.39	18124.38937
San Diego	2025 T6 OOS heavy	Aggregate	Aggregate	Diesel	54.90145843	3201039.05	250087.1235	260.4340982
San Diego	2025 T6 OOS small	Aggregate	Aggregate	Diesel	30.1285727	463880.7751	137241.6744	40.94797511
San Diego	2025 T6 Public	Aggregate	Aggregate	Diesel	2494.029279	12208216.38	2360349.307	1569.514794
San Diego	2025 T6 utility	Aggregate	Aggregate	Diesel	329.1235539	1709573.601	1180895.311	175.7376843
San Diego	2025 T6TS	Aggregate	Aggregate	Gasoline	3848.928068	73232340.69	25182058.36	14328.22569
San Diego	2025 T7 Ag	Aggregate	Aggregate	Diesel	19.62275013	54481.7403	26938.11138	9.949420439
San Diego	2025 T7 CAIRP	Aggregate	Aggregate	Diesel	1944.733287	111411480.3	8858649.071	15264.47279
San Diego	2025 T7 CAIRP construction	Aggregate	Aggregate	Diesel	180.5612918	10291609.39	254688.901	1639.104362
San Diego	2025 T7 NNOOS	Aggregate	Aggregate	Diesel	2286.546631	135812157.2	10415677.21	17497.53289
San Diego	2025 T7 NOOS	Aggregate	Aggregate	Diesel	774.6757845	43772829.79	3528803.133	6156.120547
San Diego	2025 T7 other port	Aggregate	Aggregate	Diesel	554.4483313	30960898.9	1314707.883	4862.430535
San Diego	2025 T7 POLA	Aggregate	Aggregate	Diesel	256.2133664	11425324.6	607533.1344	1891.384175
San Diego	2025 T7 Public	Aggregate	Aggregate	Diesel	1491.919045	9434991.028	1411952.182	1762.256412
San Diego	2025 T7 Single	Aggregate	Aggregate	Diesel	2236.419762	45110037.57	8052087.884	6644.971422
San Diego	2025 T7 single construction	Aggregate	Aggregate	Diesel	1169.491076	25531589.95	1649613.79	4359.848329
San Diego	2025 T7 SWCV	Aggregate	Aggregate	Diesel	447.0093384	5698392.119	543920.963	2563.651912
San Diego	2025 T7 SWCV	Aggregate	Aggregate	Natural Gas	1151.00669	14623176.11	1400544.941	5636.897542
San Diego	2025 T7 tractor	Aggregate	Aggregate	Diesel	4111.835052	164645964.5	16292735.21	20408.34912
San Diego	2025 T7 tractor construction	Aggregate	Aggregate	Diesel	994.6787284	21061313.89	1403034.004	3628.260755
San Diego	2025 T7 utility	Aggregate	Aggregate	Diesel	130.1828545	823887.9997	467096.082	135.4865876
San Diego	2025 T7IS	Aggregate	Aggregate	Gasoline	16.62122221	706585.5041	108746.2744	160.9223488
San Diego	2025 UBUS	Aggregate	Aggregate	Gasoline	441.5686833	15170807.43	577571.8377	2562.950429
San Diego	2025 UBUS	Aggregate	Aggregate	Diesel	0	0	0	0
San Diego	2025 UBUS	Aggregate	Aggregate	Natural Gas	1184.772312	43542659.18	1549682.184	11392.56794
San Diego	2030 All Other Buses	Aggregate	Aggregate	Diesel	613.4794578	8973529.8	1504742.414	881.0571069
San Diego	2030 LDA	Aggregate	Aggregate	Gasoline	1642233.743	20349257066	2684428583	531835.1582
San Diego	2030 LDA	Aggregate	Aggregate	Diesel	19966.86312	250948659	32812167.43	4433.11656
San Diego	2030 LDA	Aggregate	Aggregate	Electricity	76256.60494	1082810869	129216024	0
San Diego	2030 LDT1	Aggregate	Aggregate	Gasoline	182473.2949	2096866975	288894784.1	66211.35793
San Diego	2030 LDT1	Aggregate	Aggregate	Diesel	28.12216079	295891.4267	42300.27726	10.62411782
San Diego	2030 LDT1	Aggregate	Aggregate	Electricity	3981.488616	58225542.01	6812094.696	0
San Diego	2030 LDT2	Aggregate	Aggregate	Gasoline	498608.6046	5934881159	803430289	189286.4972
San Diego	2030 LDT2	Aggregate	Aggregate	Diesel	4503.738581	56875566.37	7457806.885	1357.250999
San Diego	2030 LDT2	Aggregate	Aggregate	Electricity	14169.28609	142705731.7	24200794.27	0
San Diego	2030 LHD1	Aggregate	Aggregate	Gasoline	33194.36976	385679369.6	161716754.5	40677.93318
San Diego	2030 LHD1	Aggregate	Aggregate	Diesel	35932.03746	420853793.7	147797404	20248.90702
San Diego	2030 LHD2	Aggregate	Aggregate	Gasoline	5741.233774	65345327.19	27970216.01	7917.098383
San Diego	2030 LHD2	Aggregate	Aggregate	Diesel	13961.1029	161103819	57425487.45	8715.580944
San Diego	2030 MCY	Aggregate	Aggregate	Gasoline	83414.78362	209182424.3	57889859.83	5748.809004
San Diego	2030 MDV	Aggregate	Aggregate	Gasoline	319606.7094	3797852139	511355299	146620.1887
San Diego	2030 MDV	Aggregate	Aggregate	Diesel	10205.13272	129940521.2	16800257.31	4043.530356
San Diego	2030 MDV	Aggregate	Aggregate	Electricity	9702.140973	99381157.49	16666908.74	0
San Diego	2030 MH	Aggregate	Aggregate	Gasoline	8002.770737	23782012.42	261795.2794	4430.615056
San Diego	2030 MH	Aggregate	Aggregate	Diesel	3887.577657	10627090.06	127123.7894	996.0865154
San Diego	2030 Motor Coach	Aggregate	Aggregate	Diesel	239.5316429	8181736.253	1021171.3	1120.943752
San Diego	2030 OBUS	Aggregate	Aggregate	Gasoline	1198.728979	18665214.77	7842823.399	3436.785302
San Diego	2030 PTO	Aggregate	Aggregate	Diesel	0	9446264.252	0	1671.575918
San Diego	2030 SBUS	Aggregate	Aggregate	Gasoline	482.5880773	7793070.732	631225.2051	728.9238665
San Diego	2030 SBUS	Aggregate	Aggregate	Diesel	2105.939873	21668248.55	7946837.108	2474.059544
San Diego	2030 T6 Ag	Aggregate	Aggregate	Diesel	32.04637347	48803.21485	43993.26151	5.732670005
San Diego	2030 T6 CAIRP heavy	Aggregate	Aggregate	Diesel	107.1564036	5923099.18	488118.8496	427.2036764
San Diego	2030 T6 CAIRP small	Aggregate	Aggregate	Diesel	60.14519629	862684.1096	273973.3981	69.30189824
San Diego	2030 T6 instate construction heavy	Aggregate	Aggregate	Diesel	789.0022022	14969723.57	1112919.063	1662.532271
San Diego	2030 T6 instate construction small	Aggregate	Aggregate	Diesel	2524.906357	39152939.03	3561481.083	4079.26393
San Diego	2030 T6 instate heavy	Aggregate	Aggregate	Diesel	4379.210608	153797748.5	15767070.78	12829.18496
San Diego	2030 T6 instate small	Aggregate	Aggregate	Diesel	14321.15447	209375758.9	51562410.77	18495.17953
San Diego	2030 T6 OOS heavy	Aggregate	Aggregate	Diesel	61.70583852	3423821.636	281082.4356	246.7408467
San Diego	2030 T6 OOS small	Aggregate	Aggregate	Diesel	35.03517545	499339.3351	159592.2312	40.15614622
San Diego	2030 T6 Public	Aggregate	Aggregate	Diesel	2601.994143	12692317.27	2462527.255	1499.031417
San Diego	2030 T6 utility	Aggregate	Aggregate	Diesel	342.9929684	1779197.087	1230658.771	164.938996
San Diego	2030 T6TS	Aggregate	Aggregate	Gasoline	4351.311471	81097375.34	28468960.05	14660.60587
San Diego	2030 T7 Ag	Aggregate	Aggregate	Diesel	22.70735266	27212.90007	31172.65374	5.784421481
San Diego	2030 T7 CAIRP	Aggregate	Aggregate	Diesel	1911.363002	119286313	8706640.748	13954.52433
San Diego	2030 T7 CAIRP construction	Aggregate	Aggregate	Diesel	187.0642289	10752882.48	263861.553	1513.677836
San Diego	2030 T7 NNOOS	Aggregate	Aggregate	Diesel	2600.456402	145406332.9	11845599	16652.57439
San Diego	2030 T7 NOOS	Aggregate	Aggregate	Diesel	762.3278927	46867399.37	3472556.017	5632.869296
San Diego	2030 T7 other port	Aggregate	Aggregate	Diesel	584.8015982	34157513.51	1386681.55	4542.756859
San Diego	2030 T7 POLA	Aggregate	Aggregate	Diesel	272.5151157	14970929.38	646187.8423	2281.462465
San Diego	2030 T7 Public	Aggregate	Aggregate	Diesel	1473.856271	9317730.742	1394857.574	1583.015032
San Diego	2030 T7 Single	Aggregate	Aggregate	Diesel	2240.606031	47573274.93	8067160.279	6599.850433
San Diego	2030 T7 single construction	Aggregate	Aggregate	Diesel	1203.016045	26675923.65	1696902.096	4269.321863
San Diego	2030 T7 SWCV	Aggregate	Aggregate	Diesel	263.1127361	3354112.348	320155.5772	1501.026068
San Diego	2030 T7 SWCV	Aggregate	Aggregate	Natural Gas	1490.96442	18954349.09	1814205.507	6789.590249
San Diego	2030 T7 tractor	Aggregate	Aggregate	Diesel	4849.775432	179141087.5	19216750.17	20176.87648
San Diego	2030 T7 tractor construction	Aggregate	Aggregate	Diesel	1010.270128	22005288.44	1425026.294	3534.992722
San Diego	2030 T7 utility	Aggregate	Aggregate	Diesel	135.7250549	857838.917	486981.4971	127.6142521
San Diego	2030 T7IS	Aggregate	Aggregate	Gasoline	17.28435662	765560.334	113084.9082	155.2859303
San Diego	2030 UBUS	Aggregate	Aggregate	Gasoline	511.0058213	17556432.79	668395.6142	2696.265558
San Diego	2030 UBUS	Aggregate	Aggregate	Diesel	0	0	0	0

San Diego	2045 T6 instate small	Aggregate	Aggregate	Diesel	18004.96953	251582142.8	64825753.86	20044.65379
San Diego	2045 T6 OOS heavy	Aggregate	Aggregate	Diesel	78.37822674	4017270.154	357028.4984	269.1501344
San Diego	2045 T6 OOS small	Aggregate	Aggregate	Diesel	45.44282511	587257.7175	207001.1569	44.21910132
San Diego	2045 T6 Public	Aggregate	Aggregate	Diesel	2850.455162	13794338.22	2697670.762	1401.820778
San Diego	2045 T6 utility	Aggregate	Aggregate	Diesel	377.1489303	1960611.647	1353210.362	166.6855942
San Diego	2045 T6TS	Aggregate	Aggregate	Gasoline	5548.102099	92658229.94	36299101.56	15273.51997
San Diego	2045 T7 Ag	Aggregate	Aggregate	Diesel	8.811886625	2404.427997	12096.95796	0.940755572
San Diego	2045 T7 CAIRP	Aggregate	Aggregate	Diesel	2156.806611	140007084.1	9824685.476	14215.40794
San Diego	2045 T7 CAIRP construction	Aggregate	Aggregate	Diesel	337.9790179	18414794.79	476732.8798	2338.608368
San Diego	2045 T7 NNOOS	Aggregate	Aggregate	Diesel	3357.556672	170661782	15294342.15	18253.76675
San Diego	2045 T7 NOOS	Aggregate	Aggregate	Diesel	857.0370741	55008826.13	3903975.28	5716.770918
San Diego	2045 T7 other port	Aggregate	Aggregate	Diesel	799.972335	42398389.95	1896894.401	4866.264439
San Diego	2045 T7 POLA	Aggregate	Aggregate	Diesel	371.0181754	24178833.86	879758.2976	2850.064127
San Diego	2045 T7 Public	Aggregate	Aggregate	Diesel	1496.993116	9463422.584	1416754.284	1283.252225
San Diego	2045 T7 Single	Aggregate	Aggregate	Diesel	2235.158064	55504628.35	8047545.221	6460.447018
San Diego	2045 T7 single construction	Aggregate	Aggregate	Diesel	1919.592182	45683718.84	2707661.306	6196.850888
San Diego	2045 T7 SWCV	Aggregate	Aggregate	Diesel	51.65125821	658440.6575	62849.25099	290.7905501
San Diego	2045 T7 SWCV	Aggregate	Aggregate	Natural Gas	2044.450461	26006701.6	2487687.321	8226.471478
San Diego	2045 T7 tractor	Aggregate	Aggregate	Diesel	5477.218601	213594831	21702930.98	19727.89121
San Diego	2045 T7 tractor construction	Aggregate	Aggregate	Diesel	1627.180163	37685046.01	2295202.495	5017.025957
San Diego	2045 T7 utility	Aggregate	Aggregate	Diesel	149.5872623	946294.6804	536719.0971	113.9099102
San Diego	2045 T7IS	Aggregate	Aggregate	Gasoline	21.76573987	862100.3333	142404.8779	153.0014319
San Diego	2045 UBUS	Aggregate	Aggregate	Gasoline	633.834548	21776412.67	829055.5887	3157.203959
San Diego	2045 UBUS	Aggregate	Aggregate	Diesel	0	0	0	0
San Diego	2045 UBUS	Aggregate	Aggregate	Natural Gas	1700.640583	62501809.44	2224437.882	16353.06901
San Diego	2050 All Other Buses	Aggregate	Aggregate	Diesel	668.515373	9330794.001	1639734.507	827.9993474
San Diego	2050 LDA	Aggregate	Aggregate	Gasoline	1984769.241	22268918337	3230721558	522747.8755
San Diego	2050 LDA	Aggregate	Aggregate	Diesel	24757.05275	278038816.7	40317047.1	4420.392371
San Diego	2050 LDA	Aggregate	Aggregate	Electricity	131719.3089	1548182473	215433032.7	0
San Diego	2050 LDT1	Aggregate	Aggregate	Gasoline	215573.5634	2276962980	342157146.5	61752.21002
San Diego	2050 LDT1	Aggregate	Aggregate	Diesel	30.21544177	319108.0756	47927.79281	9.622552946
San Diego	2050 LDT1	Aggregate	Aggregate	Electricity	8579.835995	96242855.76	13798138.68	0
San Diego	2050 LDT2	Aggregate	Aggregate	Gasoline	573677.8344	6314421711	927099504.2	169509.4685
San Diego	2050 LDT2	Aggregate	Aggregate	Diesel	5933.293957	65649183.72	9618831.453	1381.683687
San Diego	2050 LDT2	Aggregate	Aggregate	Electricity	26782.84924	216048666.8	43662098.94	0
San Diego	2050 LHD1	Aggregate	Aggregate	Gasoline	37220.56344	408900464.3	181331616.3	38672.98555
San Diego	2050 LHD1	Aggregate	Aggregate	Diesel	45579.04691	480596484.8	187477952.4	20480.65912
San Diego	2050 LHD2	Aggregate	Aggregate	Gasoline	6935.191989	72415549.94	33786956.9	7857.45102
San Diego	2050 LHD2	Aggregate	Aggregate	Diesel	18810.36348	189667380.5	77371701.88	9150.231571
San Diego	2050 MCY	Aggregate	Aggregate	Gasoline	97544.93542	218678705.2	67696185.18	6030.656882
San Diego	2050 MDV	Aggregate	Aggregate	Gasoline	365954.7073	4038827428	587913781.2	131245.4078
San Diego	2050 MDV	Aggregate	Aggregate	Diesel	13299.44946	147532165.7	21427361.47	4020.588341
San Diego	2050 MDV	Aggregate	Aggregate	Electricity	19881.93485	158638487.3	32284479.27	0
San Diego	2050 MH	Aggregate	Aggregate	Gasoline	7428.153399	22652360.9	242997.7764	3683.815351
San Diego	2050 MH	Aggregate	Aggregate	Diesel	3787.416703	10164140.77	123848.5262	826.4474703
San Diego	2050 Motor Coach	Aggregate	Aggregate	Diesel	278.5000184	10080993.07	1187301.279	1222.589517
San Diego	2050 OBUS	Aggregate	Aggregate	Gasoline	1273.243951	19419144.56	8330346.244	3191.463397
San Diego	2050 PTO	Aggregate	Aggregate	Diesel	0	11570747.56	0	1682.583997
San Diego	2050 SBUS	Aggregate	Aggregate	Gasoline	1060.500402	15707250.86	1387134.526	1346.72196
San Diego	2050 SBUS	Aggregate	Aggregate	Diesel	1953.477463	20193025.37	7371514.919	1748.845545
San Diego	2050 T6 Ag	Aggregate	Aggregate	Diesel	4.358011937	202.6367926	5982.678787	0.108469511
San Diego	2050 T6 CAIRP heavy	Aggregate	Aggregate	Diesel	144.6690838	7289844.512	658996.6103	490.1920567
San Diego	2050 T6 CAIRP small	Aggregate	Aggregate	Diesel	81.9592414	1063966.136	373340.7364	80.15038862
San Diego	2050 T6 instate construction heavy	Aggregate	Aggregate	Diesel	1381.065848	29196253.69	1948048.441	2796.699048
San Diego	2050 T6 instate construction small	Aggregate	Aggregate	Diesel	4996.50376	76362074.1	7047767.762	7067.113208
San Diego	2050 T6 instate heavy	Aggregate	Aggregate	Diesel	6563.181803	201791908.7	23630320.91	14697.06242
San Diego	2050 T6 instate small	Aggregate	Aggregate	Diesel	19148.16736	264242921.2	68941765.34	20944.80728
San Diego	2050 T6 OOS heavy	Aggregate	Aggregate	Diesel	83.05815047	4215418.349	378346.487	283.433587
San Diego	2050 T6 OOS small	Aggregate	Aggregate	Diesel	48.2981979	616284.1792	220007.9511	46.49625207
San Diego	2050 T6 Public	Aggregate	Aggregate	Diesel	2913.74673	14103244.2	2757569.902	1406.925989
San Diego	2050 T6 utility	Aggregate	Aggregate	Diesel	386.5910021	2009260.222	1387088.516	170.9268071
San Diego	2050 T6TS	Aggregate	Aggregate	Gasoline	5833.186337	94818511.45	38164298.26	15554.42597
San Diego	2050 T7 Ag	Aggregate	Aggregate	Diesel	6.394001405	407.3170204	8777.685129	0.468804961
San Diego	2050 T7 CAIRP	Aggregate	Aggregate	Diesel	2284.858289	146913498.7	10407986.48	14956.42998
San Diego	2050 T7 CAIRP construction	Aggregate	Aggregate	Diesel	389.0692146	20971922.64	548797.6391	2668.969864
San Diego	2050 T7 NNOOS	Aggregate	Aggregate	Diesel	3568.65276	179080282.9	16255927.05	19375.77605
San Diego	2050 T7 NOOS	Aggregate	Aggregate	Diesel	908.3344705	57722368.69	4137645.18	6015.494026
San Diego	2050 T7 other port	Aggregate	Aggregate	Diesel	853.9405871	45145869.6	2024863.92	5184.548121
San Diego	2050 T7 POLA	Aggregate	Aggregate	Diesel	419.0447928	27200593.23	993639.0126	3163.588099
San Diego	2050 T7 Public	Aggregate	Aggregate	Diesel	1517.302813	9591877.038	1435975.38	1250.83754
San Diego	2050 T7 Single	Aggregate	Aggregate	Diesel	2327.839541	58272597.49	8381239.014	6582.676164
San Diego	2050 T7 single construction	Aggregate	Aggregate	Diesel	2187.337235	52027482.71	3085326.377	6876.421412
San Diego	2050 T7 SWCV	Aggregate	Aggregate	Diesel	19.63915009	250356.2419	23896.91783	109.2583901
San Diego	2050 T7 SWCV	Aggregate	Aggregate	Natural Gas	2150.18011	27352773.7	2616339.158	8547.35176
San Diego	2050 T7 tractor	Aggregate	Aggregate	Diesel	5804.709355	224292263.2	23000580.35	20466.34343
San Diego	2050 T7 tractor construction	Aggregate	Aggregate	Diesel	1867.644035	42918092.69	2634386.373	5609.293922
San Diego	2050 T7 utility	Aggregate	Aggregate	Diesel	153.3617708	969890.5235	550262.0337	114.5129468
San Diego	2050 T7IS	Aggregate	Aggregate	Gasoline	22.76642075	881373.3173	148951.9487	155.5805149
San Diego	2050 UBUS	Aggregate	Aggregate	Gasoline	660.5303423	22693589.93	863973.6877	3290.228262
San Diego	2050 UBUS	Aggregate	Aggregate	Diesel	0	0	0	0
San Diego	2050 UBUS	Aggregate	Aggregate	Natural Gas	1772.268031	65134255.8	2318126.585	17041.8263

Table. Conversions and Constants

Conversion or Constant	Value	Source
Light duty weekdays per year	347	Appendix X of EIR. Original source: EMFAC2017.
btus per gallon, gasoline	120,286	U.S. EIA. 2021. https://www.eia.gov/energyexplained/units-and-calculators/
btus per gallon, diesel	137,381	U.S. EIA. 2021. https://www.eia.gov/energyexplained/units-and-calculators/
MWh to GWh	0.001	Conversion
kWh to GWh	0.000001	Conversion
Imported Treated Water Energy Intensity (kWh/acre-foot)	1,862	Appendix X of EIR.
Imported Untreated Water Energy Intensity (kWh/acre-foot)	1,817	Appendix X of EIR.
Avg Local Water Energy Intensity (kWh/acre-foot)	522	Appendix X of EIR.
kWh to Btu	3,412	Conversion
Therm to Btu	99,976	Conversion
Trillion	1,000,000,000,000	Standard
Million	1,000,000	Standard
btu to MMBtu	1,000,000	Conversion
Transport fuels CO2 content (gram/gallon)	10,210	TCR. 2021. https://www.theclimaterestory.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
Diesel construction/mining equipment CH4 content (gram/gallon)	0.20	TCR. 2021. https://www.theclimaterestory.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
Diesel construction/mining equipment N2O content (gram/gallon)	0.47	TCR. 2021. https://www.theclimaterestory.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
Diesel construction/mining equipment CO2e content (gram/gallon)	10,355	Calculation
Diesel rail CH4 content (gram/gallon)	0.80	TCR. 2021. https://www.theclimaterestory.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
Diesel rail N2O content (gram/gallon)	0.26	TCR. 2021. https://www.theclimaterestory.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
Diesel rail CO2e content (gram/gallon)	10,210	Calculation
CO2 GWP	1	Appendix X of EIR. Original Source: AR4
CH4 GWP	25	Appendix X of EIR. Original Source: AR4
N2O GWP	298	Appendix X of EIR. Original Source: AR4
MT to gram	1,000,000	Conversion

Table X.2: Demographic Estimates and Projections in the San Diego Region

Demographic Estimates and Projections in the San Diego Region				
Year	Population	Jobs	Manufacturing Jobs*	Housing Units
2016	3,287,280	1,646,419	109,234	1,182,983
2025	3,470,848	1,761,747	116,046	1,288,216
2030	3,552,485	1,842,250	121,359	1,351,366
2035	3,620,348	1,921,475	126,618	1,409,866
2045	3,719,685	2,044,625	134,848	1,460,855
2050	3,746,073	2,086,318	137,503	1,471,299

*Manufacturing jobs are included in jobs.

2016 population and housing data are estimates. The rest are projections based on SANDAG Series 14 Regional Growth Forecast (2021 Regional Plan)

Source: SANDAG 2020, 2021

Table X.3: Summary of 2016 Greenhouse Gas Inventory and Greenhouse Gas Projections

Summary of 2016 Greenhouse Gas Inventory and Greenhouse Gas Projections												
Greenhouse Gas Emissions (MMT CO ₂ e)												
Emissions Category	grams CO ₂ e						mil gal diesel/yr					
	2016	2025	2030	2035	2045	2050	2016	2025	2030	2035	2045	2050
Passenger Cars and Light-Duty Vehicles* (No SAFE Rule Impact)	10.5	8.0 (7.8)	7.4 (6.9)	6.5 (5.9)	6.4 (5.7)	6.4 (5.7)						
Electricity	5.3	3.4	1.9	1.3	0.2	0.2						
Natural Gas	3.1	3.3	3.4	3.4	3.5	3.6						
Industrial	2.1	2.2	2.3	2.4	2.5	2.5						
Heavy-Duty Trucks and Vehicles	1.8	1.7	1.7	1.7	1.7	1.7						
Other Fuels	1.1	1.4	1.4	1.5	1.5	1.5						
Off-Road Transportation	0.62	0.72	0.79	0.83	0.91	0.95						
Solid Waste	0.59	0.62	0.64	0.65	0.67	0.67						
Water	0.24	0.28	0.22	0.15	-	-						
Aviation	0.21	0.29	0.32	0.34	0.40	0.43						
Rail	0.11	0.17	0.18	0.19	0.20	0.20	1.10E+11	1.70E+11	1.80E+11	1.90E+11	2.00E+11	2.00E+11
Wastewater	0.07	0.08	0.08	0.08	0.08	0.08						
Agriculture	0.05	0.06	0.06	0.06	0.06	0.06						
Marine Vessels	0.05	0.06	0.06	0.06	0.08	0.08						
Soil Management	0.05	0.04	0.04	0.04	0.04	0.04						
Total* (Total: No SAFE Rule Impact)	26	22 (22)	20 (20)	19 (18)	18 (18)	18 (18)						

MMT – million metric tons, SAFE Rule – Federal Safer Affordable Fuel-Efficiency Vehicles Rule, April 2020
 *Includes GHG impact of SAFE Rule
 2016 is an inventory year, the rest are forecast years. The GHG emissions projections include the impact of federal and State regulations and regional policies and programs to reduce GHG emissions.

Source: Energy Policy Initiatives Center, University of San Diego 2021

Table X.4: Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles

Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles	
VMT (Miles per weekday)*	79,810,087
CO ₂ Emissions (Tons per weekday)**	32,805
Conversion Factor (Tons CO ₂ per weekday to MT CO ₂ e per year)	319
GHG Emissions (MT CO ₂ e)	10,468,161
GHG Emissions (MMT CO₂e)	10.5

*SANDAG ABM14.2.0 VMT **EMFAC2017 model run with custom VMT inputs from ABM14.2.0 Passenger car and light-duty vehicles are EMFAC2017 vehicle classes LDA, LDT1, LDT2, and MDV.

Source: CARB 2016, 2017; SANDAG 2021; Energy Policy Initiatives Center, University of San Diego 2021

Table X.5: Projected Greenhouse Gas Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles after Federal and State Regulations

Projected Greenhouse Gas Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles after Federal and State Regulations					
Projection Year	2025	2030	2035	2045	2050
VMT (Miles per weekday)*	79,864,963	81,478,678	81,193,649	83,299,109	83,644,722
CO ₂ Emissions (Tons per weekday)**	24,532	21,672	19,784	19,232	19,056
Conversion Factor (Tons CO ₂ per weekday to MT CO ₂ e per year)	318	318	317	317	318
GHG Emissions (MT CO ₂ e)	7,793,133	6,880,756	6,280,927	6,106,409	6,050,681
GHG Emissions (MMT CO ₂ e)	7.8	6.9	6.3	6.1	6.1

*2025, 2030, 2035, and 2050 VMT direct outputs of SANDAG ABM14.2.0, 2045 VMT is interpolated linearly between 2040 and 2050 VMT

**EMFAC2017 model run with custom VMT inputs from SANDAG ABM14.2.0, 2045 CO₂ emissions are interpolated linearly between 2040 and 2050

Source: CARB 2016, 2017; SANDAG 2021; Energy Policy Initiatives Center, University of San Diego 2021

Table X.7: Projected Greenhouse Gas Reductions from SANDAG Shared Mobility Strategies

Projected Greenhouse Gas Reductions from SANDAG Shared Mobility Strategies		
Projection Year	2035	2050
Vehicle Trips Avoided		
Vanpool Strategy (Trips avoided per weekday)*	7,152	7,644
Pooled Rides Strategy (Trips avoided per weekday)*	2,108	2,074
Transportation Demand Management Ordinance Strategy (Trips avoided per weekday)*	43,779	65,824
Total (Trips avoided per weekday)	53,040	75,542
Total (Trips avoided per year)**	18,404,726	26,212,919
GHG Emissions per Trip Start (Grams CO ₂ e per trip)***	46	42
GHG Reduction due to Trips Avoided (MT CO ₂ e)	839	1,095
Vehicle Miles Avoided		
Vanpool Strategy (Miles avoided per weekday)*	308,326	329,148
Carshare (Miles avoided per weekday)*	179,225	-
Pooled Rides Strategy (Miles avoided per weekday)*	11,839	11,636
Transportation Demand Management Ordinance Strategy (Miles avoided per weekday)*	358,235	549,952
Total (Miles avoided per weekday)	857,625	890,737
Total (Miles avoided per year)**	297,595,853	309,085,638
GHG Emissions per Mile (Grams CO ₂ e per mile)***	217	201
GHG Reduction due to Miles Avoided (MT CO ₂ e)	64,464	62,145
Total (Trips + Miles Avoided)		
GHG Reduction from Shared Mobility Strategies (MT CO ₂ e)	65,302	63,240
GHG Reduction from Shared Mobility Strategies (MMT CO ₂ e)	0.07	0.06

*GHG reduction from the programs and program design are described in 2021 Regional Plan Appendix S. The carshare strategy does not have trips avoided or miles avoided in 2050

**347 weekdays per year, EMFAC2017 assumptions for passenger car and light-duty vehicle classes: LDA, LDT1, LDT2, and MDV

***Based on the total number of trips, VMT, start exhaust (EMFAC2017 process STARTEX), and running exhaust (EMFAC2017 process RUNEX) CO₂e emissions from LDA, LDT1, LDT2, and MDV vehicle classes (EMFAC2017 model run with ABM14.2.0 inputs)

Table. Interpolated miles avoided/yr.

Year	Miles Avoided/yr
2035	857,625
2050	890,737
2045	879,700

Source: CARB 2016, 2017; SANDAG 2021; Energy Policy Initiatives Center, University of San Diego 2021

Table X.10: Projected Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles with SAFE Rule Impact

Projected GHG Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles after Federal and State Regulations with SAFE Rule Impact					
Projection Year	2025	2030	2035	2045	2050
VMT (Miles per weekday)*	79,864,963	81,478,678	81,193,649	83,299,109	83,644,722
Adjusted CO ₂ Emissions (Tons per weekday)**	25,282	23,175	21,732	21,548	21,449
Conversion Factor (Tons CO ₂ per weekday to MT CO ₂ e per year)	318	317	317	317	318
GHG Emissions after Federal and State Regulations (MT CO ₂ e)	8,029,070	7,353,905	6,899,075	6,841,355	6,810,213
GHG Emissions after Federal and State Regulations (MMT CO ₂ e)	8.0	7.4	6.9	6.8	6.8
GHG Reduction from SANDAG EV Strategies (MMT CO ₂ e)***	N/A	N/A	-0.38	-0.33	-0.31
GHG Reduction from SANDAG Shared Mobility Strategies (MMT CO ₂ e)***	N/A	N/A	-0.07	-0.07	-0.07
GHG Emissions (MMT CO₂e)	8.0	7.4	6.5	6.4	6.4

*2025, 2030, 2035 and 2050 VMT direct outputs of SANDAG ABM14.2.0, 2045 VMT is interpolated linearly between 2040 and 2050 VMT

**EMFAC2017 model run with custom VMT inputs from SANDAG adjusted with SAFE Rule impact, as shown in Table X.9, 2045 CO₂ adjusted emissions are interpolated linearly between 2040 and 2050 adjusted emissions

***GHG reductions from EV strategies (Table X.6) and from EV strategies (Table X.7) with SAFE Rule adjustment factors (Table X.9), 2045 GHG reductions are interpolated linearly between 2035 and 2050 GHG reductions

Source: CARB 2017, 2020; SANDAG 2021; Energy Policy Initiatives Center, University of San Diego 2021

Table X.11: Key Inputs and 2016 Greenhouse Gas Emissions from Electricity

Key Inputs and 2016 Greenhouse Gas Emissions from Electricity	
Electricity Sales – Bundled (MWh)	14,482,332
Electricity Sales – Direct Access (MWh)	3,360,561
Transmission and Distribution Loss Factor	1.082
SDG&E Electricity Emission Factor (lbs CO ₂ e/MWh)	527
Direct Access Electricity Emission Factor (lbs CO ₂ e/MWh)	836
GHG Emissions (MT CO ₂ e)	5,121,950
GHG Emissions associated with Electricity for Water Treatment – Excluded (MT CO ₂ e)	-58,925
GHG Emissions Associated with Natural Gas Used at On-site Self-serve Electric Generation – Added (MT CO ₂ e)	204,014
GHG Emissions (MT CO ₂ e)	5,267,039
GHG Emissions (MMT CO₂e)	5.3

Source: CEC 2020, SDG&E 2018, Energy Policy Initiatives Center, University of San Diego 2020

Table X.13: Projected Electricity Sales of Electric Retail Providers

Projected Electricity Sales of Retail Electricity Providers					
Retail Electricity Supplier	2025	2030	2035	2045	2050
Projected Electricity Sales (GWh)					
San Diego Community Power*	7,408	7,189	7,459	8,031	8,333
SDG&E Bundled and Clean Energy Alliance	5,775	6,403	6,137	5,573	5,275
ESPs for Direct Access	3,059	3,154	3,155	3,157	3,158

*Estimated based on the projected demand through 2030 in SDCP Implementation Plan and SDG&E Planning Area electricity sales in CEC 2020–2030 energy demand forecast, 2021 version

Source: Energy Policy Initiatives Center, University of San Diego 2020

Table X.15: Key Inputs and 2016 Greenhouse Gas Emissions from Natural Gas

Key Inputs and 2016 Greenhouse Gas Emissions from Natural Gas	
Natural Gas Sales (Therms)	585,460,937
Natural Gas Emission Factor (MT CO ₂ e/Therm)	0.00545
GHG Emissions (MT CO ₂ e)	3,192,578
GHG Emissions Associated with Heat Output from Utility-level Co-generation Plants – Included (MT CO ₂ e) (1)	118,239
GHG Emissions from Natural Gas used to Generate Electricity for Sales to Utility – Excluded (MT CO ₂ e)* (2)	-3,593
GHG Emissions from Natural Gas Used at On-site Self-serve Electric Generation – Excluded (MT CO ₂ e) (3)	-204,014
Total Adjustment (MT CO ₂ e) (1+2+3)	-89,369
GHG Emissions (MT CO ₂ e)	3,103,209
GHG Emissions (MMT CO₂e)	3.1

* Does not include power plants generating electricity for utility sales only

Source: CARB 2019, SDG&E 2018, Energy Policy Initiatives Center, University of San Diego 2020

Table X.16: Projected Greenhouse Gas Emissions from Natural Gas

Projected GHG Emissions from Natural Gas					
Projection Year	2025	2030	2035	2045	2050
Projected Natural Gas Sales (therms)*	628,689,290	640,276,291	647,766,840	663,011,857	670,768,387
Natural Gas Emission Factor (MT CO ₂ e/therm)	0.00545	0.00545	0.00545	0.00545	0.00545
GHG Emissions from Natural Gas Sales (MT CO ₂ e)	3,428,892	3,492,088	3,532,942	3,616,089	3,658,393
Total Adjustment for Co-generation Plants (MT CO ₂ e)**	-89,369	-89,369	-89,369	-89,369	-89,369
GHG Emissions (MT CO ₂ e)	3,339,523	3,402,719	3,443,573	3,526,720	3,569,024
GHG Emissions (MMT CO₂e)	3.3	3.4	3.4	3.5	3.6

*Estimated based on CEC 2020–2030 energy demand forecast, 2020 version

**Calculated in Table X.15

Source: Energy Policy Initiatives Center, University of San Diego 2020

Table X.19: Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Heavy-Duty Trucks and Vehicles

Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Heavy-Duty Trucks and Vehicles	
VMT (Miles per weekday)*	4,885,875
CO ₂ Emissions (Tons per weekday)**	5,935
Conversion Factor (Tons CO ₂ per weekday to MT CO ₂ e per year)	300
GHG Emissions (MT CO ₂ e)	1,781,508
GHG Emissions (MMT CO₂e)	1.8

*SANDAG ABM14.2.0 VMT **EMFAC2017 model run with custom VMT inputs from SANDAG

Heavy-duty trucks and vehicles are EMFAC2017 vehicle categories except LDA, LDT1, LDT2, and MDV. Conversion factors are different for each vehicle class.

Source: CARB 2016, 2017; SANDAG 2021; Energy Policy Initiatives Center, University of San Diego 2021

Table X.20: Key Inputs and Projected Greenhouse Gas Emissions from On-Road Transportation – Heavy-Duty Trucks and Vehicles

Key Inputs and Projected Greenhouse Gas Emissions from On-Road Transportation – Heavy-Duty Trucks and Vehicles					
Projection Year	2025	2030	2035	3045	2050
VMT (Miles per weekday)*	5,308,169	5,687,090	6,022,658	6,482,166	6,691,132
CO ₂ Emissions (Tons per weekday)**	5,640	5,607	5,599	5,675	5,733
Conversion Factor (MT CO ₂ e per year/ Tons per weekday)	299	299	299	299	299
GHG Emissions (MT CO ₂ e)	1,688,305	1,677,676	1,674,691	1,697,570	1,715,365
GHG Emissions (MMT CO₂e)	1.7	1.7	1.7	1.7	1.7

*SANDAG ABM14.2.0 VMT **EMFAC2017 model run with custom VMT inputs from SANDAG ABM14.2.0

Source: CARB 2016, 2017; SANDAG 2021; Energy Policy Initiatives Center, University of San Diego 2021

2016 Greenhouse Gas Emissions from Off-Road Transportation

Subcategories	GHG Emissions (MMT CO ₂ e)	grams CO ₂ e	mil gal diesel/yr
Agriculture	0.010		
Airport Ground Support	0.017		
Cargo Handling Equipment	0.002		
Construction and Mining	0.204	2.04E+11	20
Industrial	0.097		
Lawn	0.052		
Light Commercial	0.071		
Military Tactical Support	0.022		
Pleasure crafts	0.066		
Portable Equipment	0.068		
Recreational Vehicles	0.003		
Transportation Refrigeration Unit	0.008		
Total	0.62		

Source: CARB: ORION 2017, SORE 2020, PC2014 Pleasure Craft model, RV 2018 Recreational Vehicle model; Energy Policy Initiatives Center, University of San Diego 2020

Projected Greenhouse Gas Emissions from Off-Road Transportation

Projection Year	grams CO ₂ e					mil gal diesel/yr				
	2025	2030	2035	2045	2050	2025	2030	2035	2045	2050
Agriculture (MMT CO ₂ e)	0.005	0.005	0.005	0.005	0.005					
Airport Ground Support (MMT CO ₂ e)	0.02	0.02	0.02	0.03	0.03					
Cargo Handling Equipment (MMT CO ₂ e)	0.004	0.005	0.006	0.006	0.006					
Construction and Mining (MMT CO ₂ e)	0.25	0.28	0.30	0.33	0.35	2.50E+11	2.80E+11	3.00E+11	3.30E+11	3.50E+11
Industrial (MMT CO ₂ e)	0.11	0.11	0.11	0.12	0.12					
Lawn (MMT CO ₂ e)	0.060	0.061	0.063	0.065	0.066					
Light Commercial (MMT CO ₂ e)	0.090	0.095	0.099	0.11	0.11					
Military Tactical Support (MMT CO ₂ e)	0.022	0.022	0.022	0.022	0.022					
Pleasure Crafts (MMT CO ₂ e)	0.074	0.079	0.085	0.097	0.104					
Portable Equipment (MMT CO ₂ e)	0.081	0.090	0.099	0.121	0.133					
Recreational Vehicles (MMT CO ₂ e)	0.004	0.004	0.004	0.005	0.005					
Transportation Refrigeration Unit (MMT CO ₂ e)	0.010	0.010	0.011	0.012	0.012					
Total (MMT CO₂e)	0.72	0.79	0.83	0.91	0.95					

Source: CARB: ORION 2017, SORE 2020, PC2014 Pleasure Craft model, RV 2018 Recreational Vehicle model; Energy Policy Initiatives Center, University of San Diego 2020

Table X.29: 2016 Upstream Emissions from Water Supply

2016 Upstream Emissions from Water Supply		
Water Source	Imported Treated Water	Imported Raw Water
Water Demand (Acre-feet)	138,312	282,726
Energy Intensity (kWh/Acre-foot)*	1,862	1,817
California Average Electricity Emission Factor (lbs CO ₂ e/MWh)*	530	530
Upstream GHG Emissions (MT CO ₂ e)		185,411

*Includes water conveyance from the State Water Project & Colorado River to Metropolitan Water District and SDCWA system. The difference between energy intensity for treated and raw water is the water treatment energy intensity. **eGRID 2016 CAMX subregion emission factor.
 Source: Energy Policy Initiatives Center, University of San Diego 2020

Imported Treated Water (kWh)	257,536,944
Imported Raw Water (kWh)	513,713,142
Local Treated Water (kWh)	227,985,529
All Water (GWh)	999

Table X.30: 2016 Emissions from Local Water Treatment

2016 Emissions from Local Water Treatment				
Water Treatment Plant	Plant Operator	Water Treated (Acre-feet)	Water Treatment Energy Intensity (kWh/Acre-foot)	Water Treatment Electricity Use (kWh)
R.M Levy WTP	Helix WD	42,767	58	2,493,844
R.E. Badger Filtration Plant	Santa Fe ID	12,685	44	558,346
Combined Miramar, Otay and Alvarado WTP*	City of San Diego	163,823	56	9,151,144
Escondido-Vista WTP	Escondido + Vista ID	30,678	47	1,441,875
David C. McCollum WTP	Olivenhain MWD	21,301	142	3,018,745
Richard A. Reynolds Ground Water Desalination Facility	Sweetwater Authority	1,855	1,174	2,178,583
Robert A. Perdue WTP	Sweetwater	13,347	141	1,879,760
Lester J. Berglund WTP	City of Poway	10,329	208	2,150,666
Robert A. Weese WFP	City of Oceanside	11,878	29	348,546
Mission Basin Groundwater	City of Oceanside	2,997	1,257	3,766,499
Twin Oaks Valley WTP	SDCWA	79,538	33	2,661,602
Carlsbad Desalination Plant**	SDCWA	45,107	4,397	198,335,919
Total Water Treatment Electricity Use (kWh)				227,985,529
SDG&E Electricity Emission Factor (lbs CO ₂ e/MWh)				527
Transmission and Distribution Loss Factor				1.082
Local Treatment GHG Emissions (MT CO ₂ e)				58,925

% of Water Treated Local Weighted kWh/Acre-Foot

10%	5.69
3%	1.28
38%	21.03
7%	3.30
5%	6.93
0%	4.99
3%	4.31
2%	4.92
3%	0.79
1%	8.63
18%	6.02
10%	454.58
436,305	522.48

<-- local water treatment energy intensity to assume for projected emissions

ID: irrigation district; WD: water district; WFP: water filtration plant; WTP: water treatment plant
 *The electricity use and energy intensity include both water treatment and conveyance from nearby reservoirs for City of San Diego WTPs and both water extraction and treatment for Sweetwater Authority's brackish water desalination plant. The data associated with water treatment cannot be separated out.
 **The water treated at the plant includes SDCWA wholesale water and local supply for individual SDCWA member agencies that have separate contracts with the plant. The energy intensity is the high efficiency estimate from the Plant's Environmental Impact Report (2008).

Source: Energy Policy Initiatives Center, University of San Diego 2020

Table X.33: Projected Greenhouse Gas Emissions from Water

Projected Greenhouse Gas Emissions from Water					
Projection Year	2025	2030	2035	2045	2050
Projected Upstream Emissions					
Imported Treated Water (Acre-feet)	170,707	177,593	183,634	193,411	193,411
Imported Raw Water (Acre-feet)	348,945	363,020	375,368	395,354	406,000
California Average Emission Factor (lbs CO ₂ e/MWh)	493	370	249	—	—
Upstream Emissions (MT CO ₂ e)*	212,754	166,002	115,863	—	—
Projected Local Emissions					
Water Treated at Local Water Treatment Plants (Acre-feet)	538,496	560,218	579,273	610,115	626,544
San Diego Region Emission Factor (lbs CO ₂ e/MWh)	493	370	249	—	—
Local Emissions (MT CO ₂ e)**	68,048	53,095	37,058	—	—
Projected Total Emissions					
Total (Upstream + Local) Emissions (MT CO ₂ e)	280,803	219,097	152,921	—	—
Total Emissions (MMT CO₂e)	0.28	0.22	0.15	—	—

*Assume upstream energy intensities 1,862 kWh/acre-foot for imported treated water and 1,817 kWh/acre-foot for imported untreated water remain unchanged (Table X.29).

**Assume energy intensities at local water treatment plants remain unchanged (Table X.30).

Source: Energy Policy Initiatives Center, University of San Diego 2020

Imported Treated Water (kWh)	317,856,434	330,678,166	341,926,508	360,131,282	360,131,282
Imported Raw Water (kWh)	634,033,065	659,607,340	682,043,656	718,358,218	737,702,000
Local Treated Water (kWh)	281,351,833	292,701,081	302,656,882	318,771,121	327,354,898
All Water (GWh)	1,233	1,283	1,327	1,397	1,425