

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.

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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	--	167	--	132	--	111	--	109
Vehicle, Gasoline (million gallons)	1,234	148	932	112	750	90	723	87
Vehicle, Diesel (million gallons)	122	17	130	18	132	18	143	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	--	292	--	258	--	241	--	243
Per Capita Energy Use (MMBtu/person)	89		74		67		65	
Total Energy Use, Percent Change 2016 to Plan Year	--		-12%		-17%		-17%	
Per Capita Energy Use, Percent Change 2016 to Plan Year	--		-16%		-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	1,234	932	815	750	725	723
Vehicle, Diesel	million gallons/yr	122	130	132	132	138	143
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	292	258	248	241	241	243
Vehicle, Gasoline	Trillion Btu	148	112	98	90	87	87
Vehicle, Diesel	Trillion Btu	17	18	18	18	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	74	70	67	65	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	-16%	-22%	-25%	-27%	-27%

Table. All Vehicle Fuel

Variable	2016	2025	2030	2035	2045	2050
Million gallons/yr	1,356	1,062	947	882	863	866
Gasoline	1,234	932	815	750	725	723
Diesel	122	130	132	132	138	143

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

Variable	2016	2025	2030	2035	2045	2050
VMT/yr						
Gasoline	27,154,709,812	27,233,337,640	27,342,592,998	26,986,399,052	27,600,481,174	27,684,307,485
Diesel	253,928,745	353,339,330	372,223,091	374,534,314	387,904,278	389,921,589
Million gallons/yr						
Gasoline	1,171	884	769	705	681	679
Diesel	1,160	873	759	696	672	670
	11	11	10	10	9	9

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

Variable	2016	2025	2030	2035	2045	2050
VMT/weekday	78,987,431	79,500,510	79,869,787	79,707,577	81,537,871	81,796,296
VMT/yr	27,408,638,557	27,586,676,970	27,714,816,089	27,658,529,219	28,293,641,237	28,383,314,712
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	27,408,638,557	27,586,676,970	27,714,816,089	27,360,933,366	27,988,385,453	28,074,229,074

*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
	2016	2025	2030	2035	2045	2050
	57.29%	62.67%	63.77%	64.20%	64.38%	64.41%
	6.62%	6.38%	6.34%	6.33%	6.33%	6.34%
	21.74%	18.65%	18.04%	17.78%	17.65%	17.63%
	14.35%	12.30%	11.84%	11.69%	11.64%	11.61%
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Annual VMT					
	2016	2025	2030	2035	2045	2050
	15,702,953,556	17,287,844,213	17,674,708,459	17,756,082,264	18,216,160,523	18,281,312,817
	1,813,505,231	1,759,802,419	1,756,944,730	1,750,422,019	1,791,134,057	1,800,825,920
	5,958,419,204	5,145,197,515	5,000,449,776	4,918,542,832	4,994,024,660	5,004,566,354
	3,933,760,565	3,393,832,823	3,282,713,124	3,233,482,105	3,292,321,998	3,296,609,621
	27,408,638,557	27,586,676,970	27,714,816,089	27,658,529,219	28,293,641,237	28,383,314,712

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

	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
	575,537,812	487,338,216	437,134,075	407,651,630	399,815,517	399,969,793
	78,583,543	61,099,987	53,980,230	49,571,487	47,134,169	46,859,549
	289,480,879	186,836,791	155,401,471	138,326,839	130,626,991	129,657,460
	226,982,131	148,664,911	122,812,123	109,604,279	103,670,352	102,628,166
	1,170,584,364	883,939,904	769,327,900	705,154,236	681,247,028	679,114,969

Table. Light Duty VMT by Fuel Type

Sum of VMT	Column Labels					
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
LDA	17,195,958,298	19,693,709,795	20,349,257,066	20,875,961,037	21,819,898,266	22,268,918,337
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
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
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
Diesel	281,784,597	410,613,028	438,060,638	455,449,088	480,811,351	491,539,274
LDA	177,688,482	239,541,619	250,948,659	258,947,446	272,242,576	278,038,817
LDT1	1,275,292	558,366	295,891	294,476	311,309	319,108
LDT2	26,094,546	50,651,982	56,875,566	60,088,853	64,076,415	65,649,184
MDV	76,726,277	119,861,061	129,940,521	136,118,312	144,181,050	147,532,166
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					
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
LDA	177,688,482	239,541,619	250,948,659	258,947,446	272,242,576	278,038,817
LDT1	1,275,292	558,366	295,891	294,476	311,309	319,108
LDT2	26,094,546	50,651,982	56,875,566	60,088,853	64,076,415	65,649,184
MDV	76,726,277	119,861,061	129,940,521	136,118,312	144,181,050	147,532,166
Electricity	138,324,178	895,041,696	1,383,123,300	1,692,914,392	1,960,647,922	2,019,112,483
LDA	131,161,318	717,723,801	1,082,810,869	1,311,700,915	1,505,689,880	1,548,182,473
LDT1	2,003,421	33,433,536	58,225,542	75,152,822	92,290,983	96,242,856
LDT2	5,025,460	87,381,661	142,705,732	178,765,322	209,514,990	216,048,667
MDV	133,979	56,502,698	99,381,157	127,295,333	153,152,068	158,638,487
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
LDA	17,195,958,298	19,693,709,795	20,349,257,066	20,875,961,037	21,819,898,266	22,268,918,337
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
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
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
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

Table Heavy-Duty Trucks and Vehicles VMT Interim Calculations.

Table with 5 columns: Variable, 2016, 2015, 2010, 2005. Rows include VMT/weekday, VMT/yr, Gasoline, Diesel, Million gallons/yr, Gasoline, Diesel.

Table Heavy-Duty VMT by Vehicle Type

Table with 11 columns: Sum of VMT, Row Labels, 2016, 2015, 2010, 2005, 2005, 2010, 2015, 2020, % total, 2016, 2015, 2010, 2005, 2005, 2010, 2015, 2020, annualizer, 2016, 2015, 2010, 2005, 2005, 2010, 2015, 2020. Rows include MCY, MH, OBUS, SBUS, UBUS, All Other Buses, LHDI, LH2, Motor Coach, PTO, To Ag, To CARP heavy, To CARP small, To instate construction heavy, To instate construction small, To instate heavy, To instate small, To OOS heavy, To OOS small, To Public, To utility, To TNSOS, To Ag, To CARP, To CARP construction, To NNOS, To other part, To POLA, To Public, To Single, To single construction, To SWCV, To tractor, To tractor construction, To unit, TTIS, Grand Total.

Table with 11 columns: Sum of Fuel Consumption, Column Labels, 2016, 2015, 2010, 2005, 2005, 2010, 2015, 2020, m/gallon, 2016, 2015, 2010, 2005, 2005, 2010, 2015, 2020, Annual gallons, 2016, 2015, 2010, 2005, 2005, 2010, 2015, 2020. Rows include MCY, MH, OBUS, SBUS, UBUS, All Other Buses, LHDI, LH2, Motor Coach, PTO, To Ag, To CARP heavy, To CARP small, To instate construction heavy, To instate construction small, To instate heavy, To instate small, To OOS heavy, To OOS small, To Public, To utility, To TNSOS, To Ag, To CARP, To CARP construction, To NNOS, To other part, To POLA, To Public, To Single, To single construction, To SWCV, To tractor, To tractor construction, To unit, TTIS, Grand Total.

Table: Heavy Duty and Other VMT by Fuel Type

Sum of VMT Row Labels	Column Labels					% total
	2016	2015	2014	2013	2012	
Gasoline	912,757,168	816,983,740	809,866,787	821,753,174	859,251,932	40%
MCV	246,993,424	215,042,767	209,182,424	209,007,858	215,307,911	218,678,705
MH	40,337,490	27,096,179	23,782,012	22,380,204	22,284,999	22,652,361
OBUS	1,869,671	5,657,701	7,793,071	9,937,289	14,400,188	15,707,251
UBUS	10,362,860	15,170,807	17,556,433	19,942,058	21,776,413	22,693,590
LHD1	466,185,318	396,021,132	385,679,370	387,701,490	402,112,119	408,900,464
LHD2	63,327,686	64,423,528	65,345,327	66,913,335	70,695,852	72,415,550
TETS	57,719,363	73,232,341	81,097,375	86,512,233	92,658,230	94,818,511
TTIS	627,583	706,586	765,560	810,713	862,100	881,373
Diesel	1,859,949,877	1,633,802,733	1,743,773,754	1,858,135,509	2,091,339,342	2,197,852,447
MH	12,274,702	11,017,868	10,627,090	10,381,901	10,127,035	10,164,141
SBUS	23,594,713	24,081,029	21,668,249	19,537,166	19,957,657	20,193,025
UBUS	859,382	0	0	0	0	0
All Other Buses	8,935,152	8,860,062	8,973,530	8,902,817	9,119,115	9,330,794
LHD1	355,051,896	404,655,004	420,853,794	439,113,157	468,726,434	480,596,485
LHD2	116,649,963	149,820,620	161,103,819	170,750,858	184,856,037	189,667,380
Motor Coach	6,296,747	7,638,494	8,181,736	8,657,400	9,607,012	10,080,993
PTO	7,957,995	8,957,158	9,446,264	9,927,143	11,021,133	11,570,748
T6 Ag	174,597	84,914	48,803	21,625	2,372	203
T6 CAIRP heavy	4,641,610	5,543,352	5,923,099	6,263,015	6,947,221	7,289,845
T6 CAIRP small	644,484	802,281	862,684	913,596	1,013,928	1,063,966
T6 instate construction h	14,909,859	14,327,558	14,969,724	17,787,539	25,636,325	29,196,254
T6 instate construction s	38,996,365	37,473,371	39,152,939	46,522,864	67,051,169	76,362,074
T6 instate heavy	91,671,286	137,988,971	153,797,748	167,062,963	191,123,786	201,791,909
T6 instate small	141,127,326	188,934,382	209,375,759	224,622,358	251,582,143	264,242,621
T6 OOS heavy	2,660,774	3,201,039	3,423,822	3,621,232	4,017,270	4,215,418
T6 OOS small	369,896	463,881	499,339	529,016	587,258	616,284
T6 Public	10,410,523	12,208,216	12,692,317	13,098,757	13,794,338	14,103,244
T6 utility	1,581,764	1,709,574	1,779,197	1,846,478	1,960,612	2,069,260
TT Ag	82,012	54,482	27,213	14,417	2,404	407
TT CAIRP	91,957,823	111,411,480	119,286,313	126,193,867	140,007,084	146,913,499
TT CAIRP construction	10,709,881	10,291,609	10,752,882	12,776,944	18,414,795	20,971,923
TT NOOS	112,103,588	135,812,157	145,406,333	153,824,799	170,661,782	179,080,283
TT NOOS	36,129,918	43,772,830	46,867,399	49,581,536	55,008,826	57,722,369
TT other port	22,213,312	30,960,899	34,157,514	36,904,512	42,398,390	45,145,870
TT POLA	7,001,685	11,425,325	14,970,929	17,972,429	24,178,834	27,200,593
TT Public	9,335,495	9,434,991	9,317,731	9,300,547	9,463,423	9,591,877
TT Single	40,078,056	45,110,038	47,573,275	49,995,077	55,504,628	58,272,597
TT single construction	26,569,246	25,531,590	26,675,924	31,697,247	45,683,719	52,027,483
TT SWCV	11,407,254	5,698,392	3,354,112	2,012,445	658,441	250,356
TT tractor	130,872,499	164,645,965	179,141,088	191,263,605	213,594,831	224,292,263
TT tractor construction	21,917,289	21,061,314	22,005,288	26,147,438	37,685,046	42,918,093
TT utility	762,787	823,888	857,839	890,763	946,295	969,891
Grand Total	2,777,707,045	2,450,786,473	2,553,640,541	2,679,888,683	2,950,591,273	3,074,019,397

Table: Heavy Duty and Other VMT by Fuel Type

Sum of VMT Row Labels	Column Labels					% total
	2016	2015	2014	2013	2012	
Diesel	1,859,949,877	1,633,802,733	1,743,773,754	1,858,135,509	2,091,339,342	2,197,852,447
MH	12,274,702	11,017,868	10,627,090	10,381,901	10,127,035	10,164,141
SBUS	23,594,713	24,081,029	21,668,249	19,537,166	19,957,657	20,193,025
UBUS	859,382	0	0	0	0	0
All Other Buses	8,935,152	8,860,062	8,973,530	8,902,817	9,119,115	9,330,794
LHD1	355,051,896	404,655,004	420,853,794	439,113,157	468,726,434	480,596,485
LHD2	116,649,963	149,820,620	161,103,819	170,750,858	184,856,037	189,667,380
Motor Coach	6,296,747	7,638,494	8,181,736	8,657,400	9,607,012	10,080,993
PTO	7,957,995	8,957,158	9,446,264	9,927,143	11,021,133	11,570,748
T6 Ag	174,597	84,914	48,803	21,625	2,372	203
T6 CAIRP heavy	4,641,610	5,543,352	5,923,099	6,263,015	6,947,221	7,289,845
T6 CAIRP small	644,484	802,281	862,684	913,596	1,013,928	1,063,966
T6 instate construction h	14,909,859	14,327,558	14,969,724	17,787,539	25,636,325	29,196,254
T6 instate construction s	38,996,365	37,473,371	39,152,939	46,522,864	67,051,169	76,362,074
T6 instate heavy	91,671,286	137,988,971	153,797,748	167,062,963	191,123,786	201,791,909
T6 instate small	141,127,326	188,934,382	209,375,759	224,622,358	251,582,143	264,242,621
T6 OOS heavy	2,660,774	3,201,039	3,423,822	3,621,232	4,017,270	4,215,418
T6 OOS small	369,896	463,881	499,339	529,016	587,258	616,284
T6 Public	10,410,523	12,208,216	12,692,317	13,098,757	13,794,338	14,103,244
T6 utility	1,581,764	1,709,574	1,779,197	1,846,478	1,960,612	2,069,260
TT Ag	82,012	54,482	27,213	14,417	2,404	407
TT CAIRP	91,957,823	111,411,480	119,286,313	126,193,867	140,007,084	146,913,499
TT CAIRP construction	10,709,881	10,291,609	10,752,882	12,776,944	18,414,795	20,971,923
TT NOOS	112,103,588	135,812,157	145,406,333	153,824,799	170,661,782	179,080,283
TT NOOS	36,129,918	43,772,830	46,867,399	49,581,536	55,008,826	57,722,369
TT other port	22,213,312	30,960,899	34,157,514	36,904,512	42,398,390	45,145,870
TT POLA	7,001,685	11,425,325	14,970,929	17,972,429	24,178,834	27,200,593
TT Public	9,335,495	9,434,991	9,317,731	9,300,547	9,463,423	9,591,877
TT Single	40,078,056	45,110,038	47,573,275	49,995,077	55,504,628	58,272,597
TT single construction	26,569,246	25,531,590	26,675,924	31,697,247	45,683,719	52,027,483
TT SWCV	11,407,254	5,698,392	3,354,112	2,012,445	658,441	250,356
TT tractor	130,872,499	164,645,965	179,141,088	191,263,605	213,594,831	224,292,263
TT tractor construction	21,917,289	21,061,314	22,005,288	26,147,438	37,685,046	42,918,093
TT utility	762,787	823,888	857,839	890,763	946,295	969,891
Gasoline	912,757,168	816,983,740	809,866,787	821,753,174	859,251,932	876,166,951
MCV	246,993,424	215,042,767	209,182,424	209,007,858	215,307,911	218,678,705
MH	40,337,490	27,096,179	23,782,012	22,380,204	22,284,999	22,652,361
OBUS	1,869,671	5,657,701	7,793,071	9,937,289	14,400,188	15,707,251
UBUS	10,362,860	15,170,807	17,556,433	19,942,058	21,776,413	22,693,590
LHD1	466,185,318	396,021,132	385,679,370	387,701,490	402,112,119	408,900,464
LHD2	63,327,686	64,423,528	65,345,327	66,913,335	70,695,852	72,415,550
TETS	57,719,363	73,232,341	81,097,375	86,512,233	92,658,230	94,818,511
TTIS	627,583	706,586	765,560	810,713	862,100	881,373
Natural Gas	33,911,706	58,165,835	69,344,137	79,410,686	88,508,511	92,487,029
UBUS	28,883,696	43,542,659	50,389,788	57,236,917	62,501,809	65,134,256
TT SWCV	5,028,010	14,623,176	18,954,349	22,173,769	26,066,702	27,352,774
Grand Total	2,306,618,751	2,508,952,308	2,622,984,678	2,759,299,369	3,039,899,784	3,166,586,427

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>

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	2030 UBUS	Aggregate	Aggregate	Natural Gas	1371.078999	50389787.95	1793371.331	13184.06118
San Diego	2035 All Other Buses	Aggregate	Aggregate	Diesel	611.6771106	8902816.636	1500321.617	837.5436453
San Diego	2035 LDA	Aggregate	Aggregate	Gasoline	1743038.203	20875961037	2842907795	511050.6015
San Diego	2035 LDA	Aggregate	Aggregate	Diesel	21358.48464	258947446.4	35007747.16	4288.130467
San Diego	2035 LDA	Aggregate	Aggregate	Electricity	99028.05263	1311700915	165476703.5	0
San Diego	2035 LDT1	Aggregate	Aggregate	Gasoline	190874.4617	2137374131	302680483.3	62656.84504
San Diego	2035 LDT1	Aggregate	Aggregate	Diesel	26.57831443	294476.2194	41796.41903	9.671032483
San Diego	2035 LDT1	Aggregate	Aggregate	Electricity	5624.399908	75152821.93	9425523.145	0
San Diego	2035 LDT2	Aggregate	Aggregate	Gasoline	514959.2047	5978993214	829882591.5	173533.6939
San Diego	2035 LDT2	Aggregate	Aggregate	Diesel	4992.107416	6008853.42	8195051.638	1334.189582
San Diego	2035 LDT2	Aggregate	Aggregate	Electricity	19320.86035	178765322.1	32380707.24	0
San Diego	2035 LHD1	Aggregate	Aggregate	Gasoline	33746.39232	387701490.4	164406105	38827.39072
San Diego	2035 LHD1	Aggregate	Aggregate	Diesel	38715.06475	439113156.7	159244687.2	20010.61999
San Diego	2035 LHD2	Aggregate	Aggregate	Gasoline	6005.465647	66913335	29257504.23	7712.263847
San Diego	2035 LHD2	Aggregate	Aggregate	Diesel	15477.50558	170750857.9	63662828.7	8776.328315
San Diego	2035 MCY	Aggregate	Aggregate	Gasoline	87039.41453	209007857.8	60405353.68	5751.324124
San Diego	2035 MDV	Aggregate	Aggregate	Gasoline	328931.1203	3824239742	526886718.9	134613.2829
San Diego	2035 MDV	Aggregate	Aggregate	Diesel	11266.00447	136118312	1836906.58	3944.559574
San Diego	2035 MDV	Aggregate	Aggregate	Electricity	13614.9908	127295332.7	22901405.49	0
San Diego	2035 MH	Aggregate	Aggregate	Gasoline	7284.507707	22380204.1	238298.6834	3919.626496
San Diego	2035 MH	Aggregate	Aggregate	Diesel	3866.456944	10381900.92	126433.1421	926.3165331
San Diego	2035 Motor Coach	Aggregate	Aggregate	Diesel	248.0662509	8657399.649	1057556.041	1123.929641
San Diego	2035 OBUS	Aggregate	Aggregate	Gasoline	1214.404945	18547993.54	7945385.224	3223.319692
San Diego	2035 PTO	Aggregate	Aggregate	Diesel	0	9927143.199	0	1659.375738
San Diego	2035 SBUS	Aggregate	Aggregate	Gasoline	632.5586018	9937288.729	827386.6512	895.9174119
San Diego	2035 SBUS	Aggregate	Aggregate	Diesel	1879.159687	19537166.46	7091074.216	2008.387691
San Diego	2035 T6 Ag	Aggregate	Aggregate	Diesel	28.6470221	21624.56314	39326.63194	2.829650429
San Diego	2035 T6 CAIRP heavy	Aggregate	Aggregate	Diesel	117.3429093	6263015.081	534520.4203	428.3917038
San Diego	2035 T6 CAIRP small	Aggregate	Aggregate	Diesel	66.148717	913595.9401	301320.6357	69.92927553
San Diego	2035 T6 instate construction heavy	Aggregate	Aggregate	Diesel	902.5365107	17787538.62	1273063.732	1914.057872
San Diego	2035 T6 instate construction small	Aggregate	Aggregate	Diesel	2999.446004	46522864.1	4230838.175	4558.137604
San Diego	2035 T6 instate heavy	Aggregate	Aggregate	Diesel	5141.515468	167062962.6	18511701.21	13291.54904

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.theclimateregistry.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.theclimateregistry.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.theclimateregistry.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.theclimateregistry.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.theclimateregistry.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	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
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*	26	22	20	19	18	18
(Total: No SAFE Rule Impact)		(22)	(20)	(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

grams CO ₂ e						mil gal diesel/yr					
2016	2025	2030	2035	2045	2050	2016	2025	2030	2035	2045	2050
1.10E+11	1.70E+11	1.80E+11	1.90E+11	2.00E+11	2.00E+11	11	16	17	18	19	19

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)*	78,987,431
CO ₂ Emissions (Tons per weekday)**	32,605
Conversion Factor (Tons CO ₂ per weekday to MT CO ₂ e per year)	319
GHG Emissions (MT CO ₂ e)	10,404,317
GHG Emissions (MMT CO₂e)	10.4

*SANDAG ABM14.2.2 VMT **EMFAC2017 model run with custom VMT inputs from ABM14.2.2 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

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)*	79,500,510	79,869,787	79,707,577	81,537,871	81,796,296
CO ₂ Emissions (Tons per weekday)**	24,510	21,321	19,510	18,916	18,738
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)	7,786,162	6,769,475	6,193,868	6,006,111	5,949,948
GHG Emissions (MMT CO ₂ e)	7.8	6.8	6.2	6.0	5.9

(MMT CO₂e)

*2025, 2030, 2035, and 2050 VMT direct outputs of SANDAG ABM14.2.2, 2045 VMT is interpolated linearly between 2040 and 2050 VMT

**EMFAC2017 model run with custom VMT inputs from SANDAG ABM14.2.2, 2045 CO₂ emissions are interpolated linearly between 2040 and 2050

***Conversion factors vary slightly by year

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

Table. Interpolated miles avoided/yr.

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

*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 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)*	79,500,510	79,869,787	79,707,577	81,537,871	81,796,296
Adjusted CO ₂ Emissions (Tons per weekday)**	25,259	22,799	21,431	21,194	21,091
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)	8,021,827	7,234,851	6,803,306	6,728,821	6,696,674
GHG Emissions after Federal and State Regulations (MMT CO ₂ e)	8.0	7.2	6.8	6.7	6.7
GHG Reduction from SANDAG EV Strategies (MMT CO ₂ e)***	N/A	N/A	-0.37	-0.34	-0.31
GHG Reduction from SANDAG Shared Mobility Strategies (MMT CO ₂ e)***	N/A	N/A	-0.08	-0.08	-0.08
GHG Emissions (MMT CO₂e)	8.0	7.2	6.4	6.3	6.3

*2025, 2030, 2035 and 2050 VMT direct outputs of SANDAG ABM14.2.2, 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

****GHG emissions after the impact of federal and State regulations (BAU emissions), SANDAG EV Strategies and SANDAG Shared Mobility Strategies

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 CO₂e)	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)*	4,834,783
CO ₂ Emissions (Tons per weekday)**	5,866
Conversion Factor (Tons CO ₂ per weekday to MT CO ₂ e per year)	300
GHG Emissions (MT CO ₂ e)	1,761,445
GHG Emissions (MMT CO₂e)	1.8

*SANDAG ABM14.2.2 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)*	5,245,381	5,640,701	5,912,387	6,377,437	6,573,289
CO ₂ Emissions (Tons per weekday)**	5,620	5,618	5,548	5,649	5,714
Conversion Factor (MT CO ₂ e per year/ Tons per weekday)	299	299	299	299	299
GHG Emissions (MT CO ₂ e)	1,682,590	1,681,227	1,659,696	1,690,091	1,709,802
GHG Emissions (MMT CO₂e)	1.7	1.7	1.7	1.7	1.7

*SANDAG ABM14.2.2 VMT **EMFAC2017 model run with custom VMT inputs from SANDAG ABM14.2.2

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)*	5,245,381	5,640,701	5,912,387	6,377,437	6,573,289
CO ₂ Emissions (Tons per weekday)**	5,620	5,618	5,548	5,649	5,714
Conversion Factor (MT CO ₂ e per year/ Tons per weekday)	299	299	299	299	299
GHG Emissions (MT CO ₂ e)	1,682,590	1,681,227	1,659,696	1,690,091	1,709,802
GHG Emissions (MMT CO₂e)	1.7	1.7	1.7	1.7	1.7

*SANDAG ABM14.2.2 VMT **EMFAC2017 model run with custom VMT inputs from SANDAG ABM14.2.2

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				24	27	29	32	34

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					% of Water Treated	Local Weighted kWh/Acre-Foot
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	10%	5.69
R.E. Badger Filtration Plant	Santa Fe ID	12,685	44	558,346	3%	1.28
Combined Miramar, Otay and Alvarado WTP*	City of San Diego	163,823	56	9,151,144	38%	21.03
Escondido-Vista WTP	Escondido + Vista ID	30,678	47	1,441,875	7%	3.30
David C. McCollum WTP	Olivenhain MWD	21,301	142	3,018,745	5%	6.93
Richard A. Reynolds Ground Water Desalination Facility	Sweetwater Authority	1,855	1,174	2,178,583	0%	4.99
Robert A. Perdue WTP	Sweetwater	13,347	141	1,879,760	3%	4.31
Lester J. Berglund WTP	City of Poway	10,329	208	2,150,666	2%	4.92
Robert A. Weese WFP	City of Oceanside	11,878	29	348,546	3%	0.79
Mission Basin Groundwater	City of Oceanside	2,997	1,257	3,766,499	1%	8.63
Twin Oaks Valley WTP	SDCWA	79,538	33	2,661,602	18%	6.02
Carlsbad Desalination Plant**	SDCWA	45,107	4,397	198,335,919	10%	454.58
Total Water Treatment Electricity Use (kWh)				227,985,529	436,305	522.48
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		

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

