CITY OF LA MESA

CLIMATE ACTION PLAN

APPENDIX B – Reduction Quantification Methodology

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This appendix describes the assumptions and methodology used to estimate emissions reductions associated with implementation of the local CAP measures described in Chapter 3. Only those strategies with quantified reduction estimates provided in the CAP are presented here. Supporting tables may show emissions reduction totals that vary slightly from those presented in the CAP due to rounding.

In some instances, assumptions are described as "conservative" because they are based on the best available data at the time of CAP preparation, and greater emissions reductions may occur, but there is currently a lack of data available to fully substantiate increased reduction estimates. In these instances, the CAP is likely to underestimate emissions reduction potential.

Baseline and Mitigated Scenarios

Several of the emissions reduction calculations described throughout this section are based on a baseline scenario (e.g., how much energy would be consumed if the strategy *is not* implemented) and a mitigated scenario (e.g., how much energy would be consumed if the strategy *is* implemented). The difference between the baseline and mitigated scenarios represents a strategy's reduction potential (i.e., baseline scenario - mitigated scenario = reduction potential).

Energy Strategy Inputs

Calculations for energy strategies estimate electricity or natural gas savings. These energy savings (expressed as kWh and therms) were multiplied by energy emissions factors expressed as MT CO_2e/kWh and MT CO_2e/therm, as shown in Table B-1. The electricity emissions factor used in these calculations is based on SDG&E's reported RPS-eligible energy procurement through 2020, and assumes SDG&E's compliance with the RPS requirements for 50% of the utility's electricity to come from RPS-eligible, emissions-free sources by 2030. Using an estimated 2020 and 2035 electricity emissions factor (as opposed to the 2010 baseline factor used in the emissions inventory) allows the electricity-related reduction estimates to be combined with the reductions estimated to occur as a result of implementing the RPS (included in the emissions forecasts presented in Chapter 2 of the CAP), without double-counting reduction potential.

The 2020 electricity emissions factor was based on SDG&E's reported RSP procurement value of 45.2% for 2020.[1] The emissions factor was then calculated based on SDG&E's 2010 emissions factor and the increase in RPS procurement over the 2010 baseline, and shows that SDG&E's electricity portfolio would reduce its carbon-intensity from 736 lbs. CO_2e/MWh to approximately 450 lbs. CO_2e/MWh. The emissions inventory and reduction estimates are

[1] California Public Utilities Commission, accessed July 2017. Available online: <http://www.cpuc.ca.gov/RPS_Homepage/>

expressed as MT CO_2e/yr throughout the CAP, so the carbon-intensity values were converted from lbs. CO_2e/MWh to MT CO_2e/kWh, as shown in Table B-1.

The 2035 electricity emissions factor was estimated based on SDG&E's *Final 2016 Renewables Portfolio Standard Procurement Plan*, which shows the pathway toward an electricity portfolio that comprises 50% renewable sources by the 2030 RPS target year. AECOM conservatively assumed that the amount of renewables in 2035 would not be expanded beyond the current 2030 requirement (i.e., 50%). Combined cycle natural gas power plants were assumed to provide the remaining 50% of the electricity portfolio in 2035, based on the CEC's utility planning guidance.[2]

The natural gas emissions factor is consistent with that used in the CAP's emissions inventory (prepared by EPIC), which references the California Air Resources Board as the emissions factor source (see Appendix A).

Emissions reduction estimates were calculated by multiplying a measure's total energy savings by the associated emissions factors. Electricity and natural gas emissions reductions were then combined (where applicable) to estimate total emissions reductions, expressed as MT CO_2e/yr.

Table B-1
Energy Emissions Factors

Energy Type	Metric Tons CO_2e/kWh	Metric Tons CO_2e/therm
Electricity – 2020	0.000204[1]	-
Electricity – 2035	0.000202[2]	-
Natural Gas	-	0.005443

Source: AECOM 2017

[1] Estimated based on the 2010 SDG&E emissions factor of 736 lbs/MWh with a portfolio with 10% renewable energy sources, improving to the 2020 RPS requirement of 45% renewable energy sources: 736 / ((1-10%) / (1-55%)) = 449.8 lbs/MWH. Note that the 2010 electricity emissions factor used in the baseline inventory was derived from eGRID values, which are regional in nature, and was not an SDG&E-specific emissions factor. The 2010 SDG&E emissions factor was collected from the City of San Diego's Climate Action Plan Appendices for use in this equation (Available online: < https://www.sandiego.gov/sites/default/files/final_july_2016_cap_all_appendices.pdf>, pg. A-7) to provide a more context-specific estimate of how electricity emissions will change based on SDG&E's renewables procurement plan.

[2] Estimated based on *San Diego Gas & Electric Company Final 2016 Renewables Portfolio Standard Procurement Plan (Public Version)*, which shows a procurement pathway toward 50% RPS compliance; assumes remaining 50% of portfolio is met through combined-cycle natural gas generation. EPA natural gas fuel emissions factor is 0.050304 MT CO_2e/GJ (rounded), and EIA heat rate for combined cycle natural gas plants is 0.008 GJ/kWh, resulting in an emissions factor of 0.000404 MT CO_2e/kWh. If 50% of the electricity portfolio is emissions-free per RPS requirements, and the remainder is provided by combined cycle natural gas facilities as calculated herein, then the resulting electricity emissions factor is 0.000202 MT CO_2e/kWh (i.e., [50% * 0.0] + [50% * 0.000404])

[2] Pers. comm. between AECOM staff and Roseville Electric Utility staff, May 2017.

Note on Solid Waste Calculations

The three solid waste measures are each calculated based on the methane commitment methodology equations described in the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), and replicated in Appendix A – Emissions Inventory and Forecast Methodology. Specifically, the calculations follow Equation 8.3, and use the same default factors as described in Appendix A. The methodological descriptions of the measures in this appendix describe the process for calculating other inputs needed in the GPC equation. Please refer to Appendix A for a full description of the methane commitment method and its corresponding equations and default assumptions.

Reduction Quantification

E-1 Building Retrofit Program

This measure estimates the reduction in energy-related emissions (i.e., electricity and natural gas) resulting from retrofits to existing residential units and commercial properties.

SDG&E Energy Efficiency Programs

SDG&E provided energy savings related to residential and commercial efficiency programs that were installed in La Mesa homes, businesses, and municipal buildings from 2010 (the CAP's baseline year) through 2014 (the most current data available at the time of plan preparation). The data identified the utility program-related energy savings within the La Mesa community shown in Table B-2.

Table B-2
SDG&E Retrofit Energy Savings – 2010-2014

	Residential / Commercial	Municipal	Total	Savings/yr[1]
kWh/yr	17,637,178	231,623	17,868,801	3,527,436
therms/yr	152,260	-	152,260	30,452

Source: SDG&E, 2015

[1] Calculated as Residential/Commercial savings divided by 5 years of activity data

In addition to these past reductions that have already been realized since the CAP's 2010 baseline year, this measure estimates additional future building retrofits that could be implemented by 2020 and 2035. As described in Measure E-1, there are several retrofit-oriented programs available to La Mesa residents, including PACE financing programs that could drive additional program participation. Utility-sponsored programs are planned to continue into the near future through SDG&E and Energy Upgrade California, and new program could also be developed during the planning horizon of this CAP. This measure conservatively assumes that similar levels of program participation would occur through the 2020 and 2035 horizon years for residential and commercial customers, as was seen from 2010-2014 (see column Savings/yr in Table B-2).

To avoid overlap with statewide reductions accounted for elsewhere, the electricity savings estimated to occur as a result of implementing AB 1109 Lighting Efficiency were subtracted from Measure E-1, as shown in Table B-3. AB 1109 does not affect natural consumption, so no deductions were made to future natural gas retrofit savings. Net energy savings shown in Table B-3 were multiplied by applicable emissions factors from Table B-1 to estimate total reductions from implementation of this measure.

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Table B-3 Estimated Future Retrofit Energy Savings – SDG&E				
	Residential / Commercial[1]	**AB 1109 Deductions**	**Net Energy Savings**	**Reductions (MT CO_2e/yr)**
		2010-2020		
kWh/yr	35,505,979	-31,472,931	4,033,048	823
therms/yr	304,519	-	304,519	1,658
Total	**-**	**-**	**-**	**2,480**
		2010-2035		
kWh/yr	88,417,514	-35,587,889	52,829,625	10,676
therms/yr	761,298	-	761,298	4,144
Total	**-**	**-**	**-**	**14,820**

[1] 2010-2020 savings values calculated as (total existing energy savings from Table B-2) + (savings/yr from Table B-2 * 5 years); 2010-2035 savings values calculated as (2010-2020 energy savings as shown above) + (savings/yr from Table B-2 * 15 years)

PACE Program Energy Efficiency

Residential energy efficiency retrofit participation data was collected from three PACE financing districts that operate in the City of La Mesa. Data was provided by HERO, Ygrene, and CaliforniaFIRST. Three other PACE programs operate within La Mesa, but have had no participation in the City to date or could not provide participation data in a format that would support accurate emissions reduction calculations. Therefore, emissions reductions from this measure could be higher than estimated if additional participation is occurring, but is not being actively monitored at present.

HERO provided total electricity and natural gas savings on an annual basis from 2010 through the 2nd quarter of 2017. Ygrene reported total electricity savings on an annual basis during the same time period, but did not provide natural gas savings (or had none to report). CaliforniaFIRST provided total electricity and natural gas savings in aggregate for the same time period (i.e., energy savings were not provided by year). Each PACE provider also included the total number of homes improved.

Following conversations with staff from HERO, future participation rates were estimated. Full participation in the HERO program is typically estimated as 1.0% of total eligible residential properties per year. Based on historic program performance and a recommendation from a HERO program analyst, a more conservative participation rate for La Mesa was selected as 0.7% of total eligible residential properties per year, or 110 projects per year (i.e., 15,709 total eligible properties * 0.7%). An average annual electricity and natural gas savings rate was calculated from the historic La Mesa participation data to estimate future energy savings from participation in HERO programs. Electricity savings were estimated as 930 kWh/yr per project and natural gas savings were estimated as 93 therms/yr per project. A 5% energy savings discount was also applied to the previous and future electricity and natural gas savings to avoid double counting with the energy retrofit programs captures in the previously presented SDG&E

data (see Table B-3). This discount factor was recommended by a HERO program analyst based on research conducted by HERO. Table B-4 shows the estimated energy savings and emissions reductions from continued participation in the HERO program.

Table B-4
Estimated Future Retrofit Energy Savings – HERO Program

Target Year	Homes Improved	kWh Savings	Therms Savings	Reductions ($MT\ CO_2e/yr$)
2010-2020				
2014-2017	273	254,199	25,315	-
2017-2020	330[1]	307,274	30,601	-
Total	603	561,473	55,916	-
Discounted	5%	533,400	53,121	-
Emissions Factor	-	0.000204	0.005443	-
Reductions	-	**109**	**289**	**398**
2010-2035				
2014-2017	273	254,199	25,315	-
2017-2035	1,979[1]	1,842,712	183,513	-
Total	2,252	2,096,912	208,829	-
Discounted	5%	1,992,066	198,387	-
Emissions Factor	-	0.000202	0.005443	-
Reductions	-	**403**	**1,080**	**1,482**

[1] Estimated as (2020-2017) * 110 projects per year and (2035-2017) * 110 projects per year, respectively.

Energy savings were similarly calculated for the Ygrene PACE program. Actual program energy savings were provided for 2015-2017, and a Ygrene program analyst agreed that a similar approach to forecasting future participation as described in the HERO program could be applied to the Ygrene program. Ygrene participation was approximately 5.75 projects per month (based on actual participation data), or 69 projects per year, which was used to estimate future participation levels. A 5% energy savings reduction was also applied to the Ygrene estimates to avoid double counting with the SDG&E program estimates. The Ygrene data provided only identified electricity savings from previous participation, so future program participation estimates also only include electricity savings. It is possible that actual future participation in Ygrene programs could result in natural gas savings, as well, that are not captured in these estimates. Future CAP monitoring and updates will help to capture this possibility, but this CAP conservatively does not include natural gas savings. Table B-5 shows the estimated energy savings and emissions reductions from continued participation in the Ygrene program.

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Table B-5 Estimated Future Retrofit Energy Savings – Ygrene Program		
Target Year	**Homes Improved**	**kWh Savings**
2010-2020		
2015-2017	133	123,841
2017-2020	207[1]	192,745
Total	340	316,585
Discounted	5%	300,756
Emissions Factor	-	0.000204
Reductions	-	**61**
2010-2035		
2015-2017	133	123,841
2017-2035	1,242[1]	1,156,467
Total	1,375	1,280,308
Discounted	5%	1,216,292
Emissions Factor	-	0.000202
Reductions	-	**246**

Source: AECOM 2017

[1] Estimated as (2020-2017) * 69 projects per year and (2035-2017) * 69 projects per year, respectively.

The CaliforniaFIRST PACE program also provided data on past participation. However, the data was aggregated at a very high level, and could not be accurately annualized to support the same type of future participation estimates as with the HERO and Ygrene data described above. To be conservative, the CAP only quantified the emissions reductions associated with past participation in this program and held those reductions constant through the 2020 and 2035 target years. Table B-6 shows the energy savings and reductions associated with actual participation in the CaliforniaFIRST program.

Table B-6 Estimated Future Retrofit Energy Savings – CaliforniaFIRST Program				
Target Year	**Homes Improved**	**kWh Savings**	**Therms Savings**	**Reductions ($MT\ CO_2e/yr$)[1]**
2015-2017	45	38,916	2,836	**23**
2020	45	38,916	2,836	**23**
2035	45	38,916	2,836	**23**

[1] 2020 electricity emissions factor is 0.000204 MT CO_2e/kWh, 2035 electricity emissions factor is 0.000202 MT CO_2e/kWh, and natural gas emissions factor is 0.005443 MT CO_2e/therm, as shown Table B-1.

Grossmont Hospital Co-Generation Facility Project

In 2016, a new co-generation (co-gen) facility went online at the Grossmont Hospital with a significant improvement in operational efficiency over the previous facility. Energy reductions associated with the new co-gen facility were estimated for the CAP based on conversations with, and data provided by a facility analyst. The new facility is larger than the previous one, and consumes a greater amount of natural gas, but is also able to generate a proportionally larger amount of electricity for use on-site. Energy reductions were quantified by calculating the net energy change from operational data before and after installation of the new co-gen facility (i.e., electricity and natural gas consumption for one year prior to and following co-gen facility installation). Reductions from this project total 1,236 MT CO_2e/yr.

Table B-7 summarizes the total reductions from these energy efficiency programs. Reductions in 2020 are estimated as 4,198 MT CO_2e/yr (rounded to 4,200 MT CO_2e/yr in the CAP), and reductions in 2035 are estimated as 17,807 MT CO_2e/yr (rounded to 17,810 MT CO_2e/yr in the CAP).

Table B-7
Retrofit Energy Savings Summary

Energy Efficiency Program	2020 Reductions (MT CO_2e/yr)	2035 Reductions (MT CO_2e/yr)
SDG&E	2,480	14,820
HERO PACE	398	1,482
Ygrene PACE	61	246
CaliforniaFIRST PACE	23	23
Grossmont Hospital Co-gen Facility	1,236	1,236
Total	**4,198**	**17,807**

Source: AECOM 2017

E-2 SHADE TREE PROGRAM

This measure is based on estimates of the energy savings associated with installing shade trees next to single-family residential units. The measure assumes that an equal number of shade trees would be planted from 2010 through the 2020 and 2035 target years until the total number of trees shown in the progress indicator table in Chapter 3 is achieved. The measure also assumes that the trees' ability to offset electricity use (through increased shade generation) increases as the trees get older and grow larger.

The measure calculated the total annual electricity savings in 2020 and 2035 associated with shade trees based on their relative age from the planting year (i.e., trees planted in 2010 offset more electricity by 2020 than those planted in 2019). Total electricity savings of approximately 11,000 kWh/yr by 2020 and 60,600 kWh/yr by 2035 were estimated. These savings were multiplied by the applicable electricity emissions factors from Table B-1 to calculate reductions of approximately 2 MT CO_2e/yr in 2020 (which was rounded down to <1 MT CO_2e/yr in the CAP) and 12 MT CO_2e/yr in 2035 (which was rounded down to 10 MT CO_2e/yr in the CAP).

E-3 Municipal Energy Efficiency Goal

As described in the CAP, the City participated in SANDAG's Energy Roadmap program to identify municipal energy efficiency opportunities based on building energy audits. The Roadmap identified near-term retrofit projects that, once implemented, will result in municipal energy and utility cost savings. The City also set a goal of 10% electricity savings, which could be achieved through implementation of the Energy Roadmap. The 2035 reductions assume that the electricity savings goal is doubled (i.e., 20% savings from the 2010 baseline levels), but that natural gas savings do not increase. Table B-8 presents the municipal energy savings estimated as part of the Roadmap program and their corresponding emissions reductions based on the energy emissions factors presented in Table B-1. Reductions of 32 MT CO_2e/yr are estimated for 2020 (rounded to 30 MT CO_2e/yr in the CAP), and 57 MT CO_2e/yr in 2035 (rounded to 60 MT CO_2e/yr in the CAP).

Table B-8
Measure E-3 Inputs

	Energy Savings	**Reductions (MT CO_2e/yr)**
	2020	
kWh/yr	124,000	25
therms/yr	1,275	7
Total	-	**32**
	2035	
kWh/yr	248,000	50
therms/yr	1,275	7
Total	-	**57**

E-4 Public Lighting

This measure estimates the reduction in electricity-related emissions resulting from the City's past installation of high-efficiency traffic signal bulbs (i.e., LED red and green bulbs) and on-going street light retrofits (i.e., high-efficiency induction lights). The City's 2005 municipal inventory identified electricity consumption from traffic signals/controllers and streetlights, which were used as a proxy to estimate current consumption levels. This is a conservative methodology since it is possible that the City has increased its traffic signal and/or street light system since 2005, which would increase the total electricity consumption that could be affected by this measure (and result in a higher reduction potential). However, at the time of CAP preparation, the 2005 municipal inventory provided the best available data related to this measure.

Table B-9 shows the total electricity consumed by these two lighting sources, and the underlying assumptions that 100% of associated lighting would be retrofitted to provide 50% electricity savings by the 2020 target year (and maintained at that energy consumption level through the

2035 horizon year). The 2020 and 2035 electricity emissions factor from Table B-1 were used to calculate total emissions reductions related to the lighting retrofits. Reductions of 168 MT CO_2e/yr are estimated for 2020 (rounded to 170 MT CO_2e/yr in the CAP), and 167 MT CO_2e/yr in 2035 (rounded to 170 MT CO_2e/yr in the CAP). The emissions reduction amount is slightly lower in 2035 than in 2020, even though the kWh savings is the same, because the 2035 emissions factor is lower than the 2020 factor.

Table B-9
Measure E-4 Inputs

2005 Municipal Inventory Sectors	**kWh/yr**
Traffic Signals/Controllers	581,090
Streetlights	1,069,794
Total	1,650,884
Measure Assumptions	**%**
Lights Retrofitted	100%
Electricity Savings	50%
Measure Results	**Values**
Mitigated Energy Use (kWh/yr)	825,442
2020 Reductions (MT CO2e/yr)	**168**
2035 Reductions (MT CO2e/yr)	**167**

E-5 SOLAR PHOTOVOLTAIC PROGRAM

This measure estimates the reduction in electricity-related emissions resulting from installation of grid connected photovoltaic (PV) systems in residential and commercial uses. The measure uses National Renewable Energy Laboratory (NREL) solar insolation data specific to the City's geographic location and climate to estimate future PV-related reductions.

This measure considers reductions resulting from solar PV systems already installed community-wide from 2010-2014, and potential additional community-wide installations to occur by 2020 and 2035.

Similar to the retrofit-related energy savings described in Measure E-1 above, SDG&E also provided data on the amount of solar PV generation capacity installed community-wide from 2010-2014. Based on this data, approximately 3.9 MW of solar capacity were installed during that timeframe, including 1.6 MW in the commercial sector and 2.3 MW in the residential sector. In addition, currently available tax credits, utility rebates, and financing programs make solar PV installations increasingly economically viable, which will likely lead to additional residential and non-residential installations in the future. The CAP conservatively based future PV installations on only the historic residential sector installation data to assume installation of another 2.5 MW of solar PV capacity by 2020 and 9.0 MW by 2035 (i.e., in addition to the capacity installed since 2010). Continued PV installations within the commercial sector would provide additional emissions reductions above those currently estimated in this measure.

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Table B-10 shows the inputs and calculations used to convert estimated installed solar PV capacity to electricity generation potential and emissions reductions. Reductions of 2,237 MT CO_2e/yr are estimated for 2020 (rounded to 2,240 MT CO_2e/yr in the CAP), and 4,663 MT CO_2e/yr in 2035 (rounded to 4,660 MT CO_2e/yr in the CAP).

Table B-10 Solar PV Generation Capacity	
2020	
MW Installed Capacity	6.13
kW per MW	1,000
Solar Hours per Day [1]	4.9
Days per Year	365
Electricity Generation Capacity (kWh/yr)	10,963,505
Electricity Emissions Factor [2]	0.000204
Reductions (MT CO_2e/yr)	**2,237**
2035	
MW Installed Capacity	12.90
kW per MW	1,000
Solar Hours per Day [1]	4.9
Days per Year	365
Electricity Generation Capacity (kWh/yr)	23,073,439
Electricity Emissions Factor [2]	0.000202
Reductions (MT CO_2e/yr)	**4,663**

[1] Solar Insolation data: National Renewable Energy Laboratory Renewable Resource Data Center, 2011
[2] From Table B-1

E-6 Solar Hot Water Heater Program

Solar thermal system installation data was collected from the California Solar Initiative – Solar Thermal dataset for years 2011-2016, as shown in Table B-11.

Table B-11
Solar Thermal Installations – 2011-2016

Therms/yr savings	Budget Program	Approved Date
129	Single Family Residential	6/23/2011
118	Single Family Residential	7/11/2011
70	Single Family Residential	7/25/2013
414	Low Income Multifamily Residential	5/1/2014
363	Low Income Multifamily Residential	5/1/2014
363	Low Income Multifamily Residential	5/1/2014
363	Low Income Multifamily Residential	5/1/2014

Table B-11 Solar Thermal Installations – 2011-2016		
Therms/yr savings	**Budget Program**	**Approved Date**
414	Low Income Multifamily Residential	5/1/2014
699	Commercial Pools	2/26/2014
1,794	Commercial Pools	12/10/2014
88	Single Family Residential	7/21/2015
61	Single Family Residential	9/27/2016
4,876	**-**	**TOTAL**

Single-family residential system installations total 466 therms/yr savings for the five years of program data shown in Table B-11, for an approximate average of 93 therms in savings per program year. This measure assumes additional single-family residential systems will be installed to provide savings of 93 therms/yr.

As shown in Table B-12, total annual natural gas savings were estimated to be 5,156 therms/yr in 2020 and 6,274 therms/yr in 2035. Each value was multiplied by the natural gas emissions factor shown in Table B-1 to estimate total reductions of 28 MT CO_2e/yr in 2020 (rounded to 30 MT CO_2e/yr in the CAP), and 34 MT CO_2e/yr in 2035 (rounded to 30 MT CO_2e/yr in the CAP).

Table B-12 Estimated Future Solar Thermal Installations		
Timeframe	**Therms saved/yr**	**Reductions (MT CO_2e/yr)**
2010-2020	5,156	28
2010-2035	6,274	34

E-8 Zero Net Energy Construction

Zero net energy construction reductions were estimated for new residential construction forecast to occur after 2020 and new non-residential construction forecast to occur after 2030. Table B-13 shows the 2020 and 2035 activity data forecasts for residential and non-residential electricity (MWh) and natural gas (therms), which correspond to the emissions forecasts presented in the CAP and described in Appendix A.

For residential reductions from this measure, the difference between the 2035 and 2020 forecasts represents the new energy consumption that will be displaced through this measure. That is, new residential construction built after 2020 will achieve zero-net energy standards and will not consume this energy, as assumed in the inventory forecasts. The electricity savings were multiplied by the 2035 emissions factor and the natural gas savings were multiplied by the natural gas emissions factor shown in Table B-1.

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For non-residential reductions from this measure, the 2030 energy consumption values were interpolated between the 2020 and 2035 forecast levels. The difference between the 2035 and 2030 values represents the new energy consumption that will be displaced through this measure. The electricity savings were multiplied by the 2035 emissions factor and the natural gas savings were multiplied by the natural gas emissions factor shown in Table B-1.

Reductions from this measure total 8,471 MT CO_2e/yr, which was rounded to 8,470 MT CO_2e/yr in the CAP.

Table B-13
Measure C-9 Inputs

Residential					
	2020	2030	2035	New Consumption (2020-2035)	Emissions Reduction (MT CO_2e/yr)
Electricity (MWh)	153,891	-	168,698	14,807	2,992
Natural Gas (therms)	7,362,831	-	8,071,274	708,443	3,856
Subtotal	-	-	-	-	6,849
Non-Residential					
	2020	2030	2035	New Consumption (2030-2035)	Emissions Reduction (MT CO_2e/yr)
Electricity (MWh)	180,654	192,242	198,036	5,794	1,171
Natural Gas (therms)	2,586,941	2,752,882	2,835,853	82,971	452
Subtotal	-	-	-	-	1,623
Total	-	-	-	-	**8,471**

Source: AECOM 2017

E-9 Community Choice Aggregation (CCA) or Similar Program

This measure quantifies the additional reductions that could occur through development of a Community Choice Aggregation CCA program or similar clean electricity program that is available to all residents and businesses in La Mesa. The CCA reductions were calculated from the difference between the 2035 forecast electricity consumption estimate and the electricity savings from CAP measures and AB 1109. The resulting electricity consumption value represents the remaining electricity in 2035 that could be influenced by a CCA program. The CAP assumes that 80% of utility customers in La Mesa would participate in the CCA program, consistent with the participation assumptions used in the *City of San Diego Feasibility Study for* *a Community Choice Aggregate.*[3] The remaining electricity consumption was multiplied by 80% to determine the amount of electricity that would be purchased through the CCA program, which is assumed to provide 100% clean electricity to its customers by 2035. The CCA electricity consumption was multiplied by the 2035 electricity emissions factor from Table B-1 to avoid double counting reductions with the RPS program. The result is reductions totaling 37,235 MT CO_2e/yr in 2035, which was rounded to 37,240 MT CO_2e/yr in the CAP. See Table B-14.

Table B-14
CCA Program Demand Estimation

Electricity Programs	Electricity Consumption and Savings (kWh/yr)	Reductions (MT CO_2e/yr)[1]
2035 Forecast Consumption	366,734,222	-
AB 1109	-35,587,889	-
Retrofits - SDG&E	-52,829,625	-
Retrofits - PACE	-3,247,274	-
Muni Energy Efficiency	-248,000	-
Streetlights	-825,442	-
Solar PV	-23,073,439	-
ZNE	-20,601,267	-
Remaining Consumption	**230,321,286**	**46,543**
CCA Participation – 80%	184,257,029	**37,235**

[1] Based on 2035 electricity emissions factor from Table B-1

T-1 Bicycle and Pedestrian Infrastructure Development

This measure quantifies reductions resulting from increasing La Mesa's bicycle mode share through expansion of its bicycle infrastructure, primarily Class I and II bicycle facilities. Based on the City's Bicycle Facilities and Alternative Transportation Plan (Bicycle Plan), it was assumed that there were 12.8 miles of existing bike lanes within the community, and an additional 12.8 miles planned for future installation. It was assumed that the additional bike lanes would be completed by 2035. This would require 0.64 miles of new bike lanes to be completed each year (i.e., 2015-2035), and would result in 3.2 new miles by the CAP's 2020 target year.

Emissions reductions were calculated based on vehicle miles traveled (VMT) differences between the inventory forecast scenario and a mitigated scenario in which these VMT reductions are realized (see Table B-15). Methodology assembled by the California Air Pollution Control Officers Association (CAPCOA) based on academic research on travel demand was used to help quantify VMT reductions based on the proposed bicycle infrastructure

[3] Available online: <https://www.sandiego.gov/sites/default/files/san_diego_cca_feasibility_study_final_draft_main_report_7-11-17.pdf>

improvements.[4] A mode share study conducted by Dill and Carr was also used to help define assumptions regarding how additional bicycle lane installations translate into increased bicycle mode share. The methodology assumes that the ratio of additional bicycle lane mileage per community area correlates to increased bicycle mode share above levels reported in the 2010 US Census.

Table B-15
Community-wide VMT Reductions – Bicycle Infrastructure Improvements

Inventory Forecast Scenario – Vehicles Miles Traveled		
	Community Travel (miles)	Fuel Consumption (gallons)
Gasoline	158,288,534	8,500,995
Diesel	9,212,560	1,164,673
Total	167,501,094	9,665,668
Mitigated Scenario – Vehicles Miles Traveled		
	Community Travel (miles)	Fuel Consumption (gallons)
Gasoline	158,196,975	8,496,078
Diesel	9,207,231	1,163,999
Total	167,404,206	9,660,077
Inventory Forecast minus Mitigated Scenario		
	Community Travel (miles)	Fuel Consumption (gallons)
Gasoline	91,558.8	4,917
Diesel	5,328.8	674
Total	96,888	5,591

Sources:
CAPCOA. *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emissions Reductions from Greenhouse Gas Mitigation Measures.* August, 2010.
Dill, J and Carr, T. *Bicycle Commuting and Facilities in Major U.S. Cities: If You Build Them, Commuters Will Use Them*. 2003.

[4] For details, please see the 2010 document, "Quantifying Greenhouse Gas Mitigation Measures," available online at: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

T-3 Transportation Demand Management Program

Based on conversations with SANDAG traffic modelers, off-model GHG reductions were included in the CAP to fully capture the planned effect of regional transportation system improvements described in San Diego Forward: The Regional Plan. *Appendix C, Sustainable Communities Strategy Documentation and Related Information* includes estimates of daily VMT (DVMT) reductions associated with several programs and infrastructure improvements for 2020, 2035, and 2050.[5]

CAP Measure T-3 includes the DVMT reductions from carshare (Table 1 in Appendix C), vanpool, (Table 2), and carpool (Table 3) programs. CAP Measure T-5 includes the reductions from plug-in hybrid electric vehicles (Table 4). The total DVMT reductions from these programs were converted into VMT per year following the same approach used to prepare the transportation sector emissions (described in Appendix A).

La Mesa's share of these total annual VMT reductions was then calculated for the 2020 and 2035 target years based on the ratio of La Mesa's total VMT compared to the SANDAG regional total VMT for each year (i.e., 1.81% in 2020 and 1.85% in 2035). La Mesa's total VMT reductions per year are estimated as approximately 7.4 million in 2020 and 15.8 million in 2035. The proportional share of each SANDAG off-model program was also calculated to attribute GHG reductions among the applicable CAP measures.

La Mesa's VMT reductions were then split into gasoline and diesel based on the 2020 and 2035 output data from EMFAC2014. The VMT reductions from this measure were assumed to only apply to light-duty passenger vehicles, which correspond with the LDA vehicle classification in EMFAC2014. The ratio of gas to diesel VMT in LDA vehicles was calculated and applied to the total La Mesa VMT reductions.

The gasoline and diesel VMT were then subtracted from the total 2020 and 2035 VMT values used to calculate the emissions forecasts to determine the total reductions associated with implementation of these SANDAG programs. The ratio of each program's contribution to total VMT reductions in La Mesa was used to apportion total GHG reductions to the individual programs. See Table B-16 on the following page for the values used in this calculation. The three off-model programs included in this CAP measure have total reductions of 2,000 MT CO_2e/yr in 2020 and 2,719 MT CO_2e/yr in 2035 (which was rounded to 2,720 MT CO_2e/yr in the CAP).

[5] SANDAG. *Appendix C, Sustainable Communities Strategy Documentation and Related Information*. Available online: < http://www.sdforward.com/pdfs/RP_final/AppendixC-SustainableCommunitiesStrategyDocumntationandRelatedInformation.pdf>

Table B-16 SANDAG Off-Model VMT Reductions				
SANDAG Regional Share				
SANDAG Travel Model – Off-Model Programs	**2020 DVMT Reductions[1]**	**2035 DVMT Reductions[1]**	**2020 VMT/yr Reductions[2]**	**2035 VMT/yr Reductions[2]**
Table 1 - Carshare	369,536	1,028,398	129,485,414	360,350,659
Table 2 - Vanpool	678,339	972,797	237,689,986	340,868,069
Table 3 - Carpool	36,986	36,986	12,959,894	12,959,894
Table 4 - Plug-In Hybrid Electric Vehicles	82,418	411,126	28,879,267	144,058,550
Total	**1,167,279**	**2,449,307**	**409,014,562**	**858,237,173**
DVMT Totals				
	2020		**2035**	
La Mesa Total[3]	1,550,197		1,732,934	
SANDAG Region Total[3]	85,453,093		93,872,064	
La Mesa Proportion	1.81%		1.85%	
La Mesa's Share				
SANDAG Travel Model – Off-Model Programs	**2020 VMT/yr[4]**	**2035 VMT/yr[4]**	**2020 Share of Total VMT/yr**	**2035 Share of Total VMT/yr**
Table 1 - Carshare	2,348,983	6,652,287	32%	42%
Table 2 - Vanpool	4,311,913	6,292,627	58%	40%
Table 3 - Carpool	235,104	239,247	3%	2%
Table 4 - Plug-In Hybrid Electric Vehicles	523,896	2,659,406	7%	17%
Total	**7,419,897**	**15,843,567**	**100%**	**100%**
LDA Gas-to-Diesel VMT Ratio				
	2020 DVMT[5]	**2035 DVMT[5]**	**2020 VMT/yr**	**2035 VMT/yr**
LDA Gas	46,477,370	48,408,570	98.9%	98.6%
LDA Diesel	538,420	665,027	1.1%	1.4%
LDA Gas VMT Reductions	-	-	7,334,925	15,628,861
LDA Diesel VMT Reductions	-	-	84,972	214,706
Total LDA Reductions	**-**	**-**	**7,419,897**	**15,843,567**
GHG Reductions				
	2020 MT CO_2e/yr		**2035 MT CO_2e/yr**	
Table 1 - Carshare[6]	681		1,372	
Table 2 - Vanpool[6]	1,250		1,298	
Table 3 - Carpool[6]	68		49	

Table 4 - Plug-In Hybrid Electric Vehicles[6]	152	548
Total Reductions[7]	**2,152**	**3,268**

Source: AECOM 2017

[1] From SANDAG *Appendix C, Sustainable Communities Strategy Documentation and Related Information*. Available online: < http://www.sdforward.com/pdfs/RP_final/AppendixC-SustainableCommunitiesStrategyDocumntationandRelatedInformation.pdf>

[2] Calculated as DVMT * 0.96 * 365, per SANDAG staff guidance

[3] SANDAG 2020 and 2035 VMT estimates from the Series 13 model revenue-constrained scenario

[4] Calculated as SANDAG Regional Share of VMT/yr * 1.81% for 2020, and SANDAG Regional Share of VMT/yr * 1.85% for 2035 (per DVMT Totals section of Table B-16)

[5] From EMFAC2014 2020 and 2035 output files, respectively, for LDA_GAS and LDA_DSL vehicle types

[6] Calculated as Total Reductions * Share of Total VMT/yr (from La Mesa's Share section of Table B-16)

[7] Calculated using the same methodology as that used to estimate the transportation sector inventory, as described in Appendix A. The difference between the original emissions forecasts for 2020 and 2035 and the mitigated transportation emissions scenario (i.e., original VMT/yr estimates - VMT/yr reductions identified in this table) represents the total reductions from this measure.

T-4 Mixed-Use and Transit-Oriented Development

Senate Bill (SB) 743 directs the Governor's Office of Planning and Research (OPR) to identify a new metric and to recommend analysis methodology and thresholds for transportation analysis under CEQA. Rather than a focus on congestion, which is often described through an assessment of level of service (LOS), the impacts of transportation are attributable to travel demand, often measured as VMT. OPR selected VMT as the preferred metric and, as of the writing of this document, is still working to finalize guidance material that is anticipated to go into effect in 2019. Regardless of OPR's guidance, lead agencies such as La Mesa maintain the discretion to select methodology for analysis and define their own significance thresholds for transportation and all other impact analyses. Analysis and mitigation that focuses on VMT rather than LOS will have GHG reduction benefits.

To estimate the potential benefit of the City's SB 743 implementation, the City used estimates of land use change developed by SANDAG (which are used consistently throughout the CAP). The 2010 (baseline) VMT per capita in La Mesa was multiplied by the anticipated number of new residents added between 2017 and 2020. This yields an estimate of potential new VMT attributable to new development entitled between 2017 and 2020. OPR draft guidance suggests a threshold of a 15% reduction in VMT compared to regional or citywide average VMT per capita or per service population. Again, La Mesa can develop its own guidance for analyzing VMT impacts of new development, but the draft OPR guidance was used for the purposes of estimating VMT reduction potential in the near term (between 2017 and 2020). The City multiplied 15% by the estimated new VMT attributable to new development to estimate the amount of VMT that could be avoided through implementation of this program. The result is a reduction of 20,000 DVMT or approximately 7.0 million VMT/yr.

As with the calculations used to quantify Measure T-3 Transportation Demand Management Program, the VMT reductions were split into gas and diesel fuel. The VMT reductions were then

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subtracted from the LDA (light-duty passenger) vehicle fuel estimates according to their fuel type (i.e., gas and diesel) to calculate the change in overall emissions. Implementation of this measure is estimated to reduce GHG emissions by 1,892 MT CO_2e/yr, which was rounded to 1,890 MT CO_2e/yr in the CAP. See Measure T-3 for more detail on this quantification approach, and Table B-17 for the supporting information used in this calculation.

Table B-17
Measure T-4 Inputs – 2020

	2020 DVMT Reductions[1]	**2020 VMT/yr Reductions**[2]
	20,000	7,008,000
LDA Gas-to-Diesel VMT Ratio		
	2020 DVMT[3]	**2020 VMT/yr**
LDA Gas	46,477,370	98.9%
LDA Diesel	538,420	1.1%
LDA Gas VMT Reductions	-	6,927,745
LDA Diesel VMT Reductions	-	80,255
Total LDA VMT Reductions	**-**	7,008,000
	2020 MT CO_2e/yr	
Total Reductions[4]	**1,892**	

Source: AECOM 2017

[1] Derived from a 15% reduction in DVMT from new residents added between 2017 and 2020.

[2] Calculated as DVMT * 0.96 * 365, per SANDAG staff guidance

[3] From EMFAC2014 2020 output file for LDA_GAS and LDA_DSL vehicle types

[4] Calculated using the same methodology as that used to estimate the transportation sector inventory, as described in Appendix A. The difference between the original emissions forecast for 2020 and the mitigated transportation emissions scenario (i.e., original VMT/yr estimates - VMT/yr reductions identified in this table) represents the total reductions from this measure.

The 2035 reductions from this measure are calculated based on achievement of the per capita VMT reduction target established in Table 3-3 of the CAP, which calls for a 6% per capita VMT reduction from 2010 baseline levels by 2035. The resulting target is approximately 23.6 DVMT/capita. This would require reductions of approximately 83.36 million VMT per year in 2035. The GHG reductions attributed to this mitigated VMT scenario were calculated using the same methodology used to prepare the transportation sector emissions and forecasts (see Appendix A). The difference between the CAP's 2035 transportation sector emissions forecast and the mitigated transportation emissions from implementation of this measure would result in GHG reductions of 23,075 MT CO_2e/yr. See Table B-18 on the following page for the supporting information used in this calculation.

Table B-18 Measure T-4 Inputs – 2035		
	2010	**2035**
Population[1]	57,361	68,682
VMT/yr[2]	505,111,707	651,871,405
DVMT/capita	25.1	27.1
Target DVMT/capita[3]	-	23.6
Reduction Needed (DVMT/capita)	-	3.5
Reduction Needed (VMT/yr)	-	83,356,956
Mitigated VMT	-	568,514,449
GHG Reductions[4]	**-**	23,075

Source: AECOM 2017

[1] SANDAG

[2] SANDAG traffic model, Series 13 results

[3] Calculated as 6% reduction from 2010 baseline DVMT/capita

[4] Calculated using the same methodology as that used to estimate the transportation sector inventory, as described in Appendix A. The difference between the original emissions forecast for 2020 and the mitigated transportation emissions scenario (i.e., original VMT/yr estimates - VMT/yr reductions identified in this table) represents the total reductions from this measure.

T-5 Alternative Refueling Infrastructure Development

This measure includes SANDAG's off-model reductions related to expansion of plug-in hybrid electric vehicle use in the region. See the methodological description in Measure T-3 Transportation Demand Management Program and Table B-16 for supporting calculations (this measure includes reductions associated with the Table 4 – Plug-In Hybrid Electric Vehicles rows from Table B-16). The off-model program included in this CAP measure has total reductions of 152 MT CO_2e/yr in 2020 and 548 MT CO_2e/yr in 2035 (which were rounded to 150 and 550 MT CO_2e/yr in the CAP, respectively).

T-6 Municipal Fleet Transition

This measure estimates reductions associated with transitioning the municipal fleet towards alternative fuel vehicles. As described in the CAP, the City analyzed alternative fuel vehicle opportunities within its municipal fleet through the Energy Roadmap Program. This analysis identified five potential opportunities for vehicle fleet transitions toward alternative fuel options. Of those five opportunities, it was assumed that two could be pursued prior to the CAP's 2020 target year, while the other three would require additional refueling infrastructure development before CNG or propane vehicles could be pursued. The CAP conservatively assumes that no further municipal fleet transition occurs beyond the 2020 target year.

Table B-19 shows the inputs used to estimate emissions reductions from pursuing the two identified vehicle replacement options. The measure assumes that a 1998 Ford Taurus and a

1996 Ford Explorer are replaced with hybrid electric vehicle options. Total reductions of 5.2 MT CO_2e/yr were calculated, which were rounded to 10 for use in the CAP.

Table B-19 Measure T-6 Inputs					
Replacement Vehicle Inputs[1]					
Alt Fuel Vehicle	**Mileage**	**MPG (Old)**	**MPG (New)**	**Gallons Displaced (Gasoline)**	**Emissions Reduced (MT CO_2e/yr)**
Hybrid Electric	10,000	22	42	216.5	2.0
Hybrid Electric	6,000	10.3	25	342.5	3.2
				Total	**5.2**
Global Warming Potentials[2]					
CO_2			1		
CH_4			28		
N_2O			265		
Emissions Factors[3]					
Motor Gasoline		8.81		kg CO_2/gallon	
1998 Passenger Vehicle					
N_2O		0.0393		g/mile	
CH_4		0.0249		g/mile	
1996 Light-Duty Truck					
N_2O		0.0871		g/mile	
CH_4		0.0452		g/mile	

[1] City of La Mesa Energy Roadmap, Appendix D, pg. D-8.

[2] IPCC (https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html)

[3] California Climate Action Registry. 2009. General Reporting Protocol Version 3.1.

W-1 Urban Water Management Plan Programs

Senate Bill X7-7 established a goal to reduce per capita water consumption by 20% by December 31, 2020. The Helix Water District 2015 Urban Water Management Plan (UWMP) identifies the district's adopted per capita water targets to comply with this legislation. During CAP preparation, staff from Helix noted that the district has already exceeded its adopted 2020 target of 114 gallons per capita per day (gpcd), and has a goal to permanently maintain the levels achieved as of 2015 and stated in the District's 2015 UWMP (i.e., 103 gpcd).

As described in Appendix A, the water sector emissions were forecast based on the City's service population growth forecasts (i.e., population plus employment growth). The result is future water consumption estimates of approximately 109 gpcd in 2020 and 108 gpcd in 2035. The 2020 target year reductions for this measure were quantified based on the difference between the 2020 forecast consumption estimate and the Helix Water District's soft goal to maintain 2015 per capita water consumption levels. As shown in Table B-20, the result is a reduction of approximately 6 gpcd, or 140 million gallons per year (MG/yr). The same emissions rate per MG of water consumption from the baseline inventory was applied to the water savings estimate to calculate GHG reductions. 2020 emissions reduction were estimated as 448 MT CO_2e/yr, which was rounded to 450 MT CO_2e/yr in the CAP.

The CAP sets a water conservation target for 2035 that is 20% below the 2010 baseline year per capita water consumption levels. This would result in water savings of 20 gpcd or 494 MG/yr, as shown in Table B-20. This target would provide GHG reductions of approximately 1,585 MT CO_2e/yr, which was rounded to 1,590 MT CO_2e/yr in the CAP.

Table B-20
Measure W-1 Inputs

	2010	2020	2035	Units
Water Consumption	2,318	2,476	2,714	MG/yr
Population	57,361	62,136	68,682	Persons
Water Consumption	110.70	109.16	108.26	gpcd
Water Consumption Target	-	103.00	88.56	gpcd
Water Savings	-	6.16	19.70	gpcd
Water Savings	-	139.66	493.76	MG/yr
GHG Reductions[1]	-	448	1,585	MT CO_2e/yr

[1] Calculated as water savings in MG/yr * 3.2109 MT CO_2e/MG, where the emissions factor per MG of water was derived from the City's 2010 baseline GHG inventory by dividing water sector emissions by MG of water consumed.

SW-1 Food Scrap and Yard Waste

As described in Appendix A, an inventory of the community's organic waste was created using CalRecycle waste volume and characterization data and the methane commitment method. Solid waste measure reductions were estimated by calculating the changes in the emissions forecast model that would occur from implementation of the CAP measures.

This measure assumes that 5% of food scraps and compostable paper waste are diverted from landfills by 2020. The measure further assumes that 85% of residential and commercial landscape waste is diverted from the solid waste stream, either through on-site composting/mulching or disposal in green waste bins. These calculations are also based on an EPA default landfill gas collection assumption of 75% methane capture efficiency.

The City's 2010 waste inventory was modeled using community-wide waste disposal data collected from CalRecycle. As described in Appendix A, the 2010 baseline waste disposal rate, calculated as metric tons per service population (MT/SP), was held constant to estimate waste disposal volumes in 2020 and 2035 (i.e., MT/SP disposal rate from 2010 * 2020 and 2035 SP values). In lieu of a City-specific waste characterization study, it was assumed that the City's waste composition is comparable to that of the statewide average (as represented in the State

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Waste Characterization Study). The 2020 and 2035 solid waste emissions forecasts were based on CalRecycle's *2014 Disposal-Facility-Based Characterization of Solid Waste in California* report. See Appendix A for further description of the methane commitment method, CalRecycle's waste characterization studies, and the calculation of La Mesa's solid waste emissions scenarios for 2010, 2020, and 2035.

Table B-21 shows the emissions reductions inputs for calculation of this measure. The CalRecycle waste characterization studies are organized into waste material types and sub-types. The waste sub-types that are affected by this measure are shown in Table B-21, along with their corresponding characterization total (i.e., their share of the total waste stream). The baseline scenario shows the characterization of the sub-types as listed in the CalRecycle 2014 statewide characterization study. The mitigated scenario shows the characterization of each sub-type following implementation of this measure. As shown, the food sub-type will be reduced by 5% in the mitigated scenario. The remaining sub-types (Leaves and Grass, Prunings and Trimmings, Manures, and Remainder/Composite Organic) are combined into the Garden and Park waste type category for calculation of the emissions forecasts (as described in Appendix A), and would be reduced by 85% in the mitigated scenario. The Tons columns are calculated by multiplying the Characterization columns by the 2020 disposal estimate of 41,394 MT. The methane emissions columns are calculated based on the methane commitment methodology equations described in the GPC and replicated in Appendix A. Specifically, the calculations follow Equation 8.3, using the same default factors as described in Appendix A. The Emissions columns then convert metric tons of methane into MT CO_2e using a global warming potential (GWP) value of 28 for methane from the UN IPCC 5th Assessment Report. The difference in the baseline and mitigated scenarios totals 2,009 MT CO_2e/yr, which is rounded to 2,010 MT CO_2e/yr in the CAP.

Table B-21
Measure SW-1 Inputs

Waste Sub-Types	Characterization (% of Total Waste)[1]	Tons (MT)[2]	Methane Emissions (MT)[3]	Emissions (MT CO_2e)[4]
Baseline Scenario				
Food	0.165	6,830	92	2,582
Leaves and Grass	0.034	1,407	25	709
Prunings and Trimmings	0.028	1,159	21	584
Manures	0.007	290	5	146
Remainder/Composite Organic	0.037	1,532	28	772
Subtotal	**-**	**11,218**	**171**	**4,793**
Mitigated Scenario				
Waste Sub-Types	**Characterization (% of Total Waste)[5]**	**Tons (MT)**	**Methane Emissions (MT)**	**Emission (MT CO_2e)**
Food	0.15675	6,489	88	2,453
Leaves and Grass	0.0051	211	4	106

Table B-21 Measure SW-1 Inputs				
Prunings and Trimmings	0.0042	174	3	88
Manures	0.00105	43	1	22
Remainder/Composite Organic	0.00555	230	4	116
Subtotal	**-**	**7,147**	**99**	**2,784**
Baseline Scenario – Mitigated Scenario				
Difference	-	-	-	**2,009**

Source: AECOM 2017

[1] *2014 Disposal-Facility-Based Characterization of Solid Waste in California,* CalRecycle 2015. Prepared by Cascadia Consulting Group. Available online at: <http://www.calrecycle.ca.gov/Publications/Documents/1546/20151546.pdf>

[2] Calculated as solid waste disposal tonnage (41,394) * Baseline Characterization value

[3] Calculated using methane commitment method Equation 8.3 as shown in Appendix A – Emissions Inventory and Forecast Methodology, where MSW_x (mass of solid waste sent to landfill in inventory year) = values shown in Baseline Scenario - Tons column of Table B-21 above.

[4] Calculated as Baseline Methane Emissions * methane GWP of 28

[5] Calculated based on Measure SW-1 assumptions: Food sub-type is reduced by 5% from Baseline Characterization value, and the remaining waste sub-types, which together comprise the Garden and Park category, are reduced by 85%.

SW-2 Construction and Demolition Waste Diversion Program

This measure assumes community-wide compliance with the City's requirement for 75% of construction and demolition (C&D) waste to be diverted from landfills. A similar methodology as described in Measure SW-1 above was applied to calculate reductions from implementation of this measure using the methane commitment method.

This calculation assumes that CalRecycle's 2014 waste characterization study results reflect a baseline condition in which the State's 50% construction and demolition (C&D) waste diversion requirements are achieved. Table B-22 shows how the marginal additional C&D tonnage reductions were estimated. Based on the waste type categories in the waste characterization study, it was assumed that this measure would affect the lumber and gypsum board sub-types. The scenario represents 50% diversion achievement for the waste types shown, and the corresponding tonnage is calculated by multiplying the total 2020 solid waste disposal value (41,394 MT) by the waste characterization ratios for lumber and gypsum (13.7% and 1.3%, respectively). The 75% diversion scenario shows the total tonnage of each waste sub-type that would remain if this measure is implemented (i.e., 50% of the 50% scenario is diverted). The difference between the 50% and 75% scenarios is the marginal increase in waste diversion to occur after implementing this measure.

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Table B-22 Measure SW-2 Inputs			
Waste Sub-Types[1]	**50% Diversion Scenario (MT)**[2]	**75% Diversion Scenario (MT)**[4]	**Additional Diversion (MT)**[5]
Lumber	5,671	2,836	2,836
Gypsum Board	538	269	269

Source: AECOM 2017

[1] Waste sub-types from *2014 Disposal-Facility-Based Characterization of Solid Waste in California,* CalRecycle 2015. Prepared by Cascadia Consulting Group. Available online at: <http://www.calrecycle.ca.gov/Publications/Documents/1546/20151546.pdf>

[2] Calculated as total 2020 waste disposal * waste characterization ratios for each waste sub-type. 2020 waste total is 41,394 MT. Lumber characterization is 13.7%. Gypsum Board characterization is 1.3%. See Appendix A – Emissions Inventory and Forecast Methodology for further detail on the waste disposal calculations. See note 1 above for link to CalRecycle waste characterization study.

[3] Calculated as 50% diversion scenario * 50%

[4] Calculated as 50% diversion scenario - 75% diversion scenario (results are rounded)

The emissions reductions associated with diverting the additional waste shown in Table B-22 are estimated using the methane commitment method described in Appendix A and represented in Table B-23. The Lumber waste sub-type in Table B-22 corresponds to the Wood waste type in Table B-23 and described in the emissions inventory calculations in Appendix A. Similarly, the Gypsum Board sub-type corresponds to the Paper/Cardboard waste type. The methane emissions column is calculated based on the methane commitment methodology equations described in the GPC and replicated in Appendix A. Specifically, the calculations follow Equation 8.3, using the same default factors as described in Appendix A. The Emissions column converts metric tons of methane into MT CO_2e using a GWP value of 28 for methane from the UN IPCC 5th Assessment Report. Implementation of this measure will result in reductions of 3,344 MT CO_2e/yr, which is rounded down to 3,340 MT CO_2e/yr in the CAP.

Table-23 Measure SW-2 Calculations			
Waste Types[1]	**Tons (MT)**[2]	**Methane Emissions (MT)**[3]	**Emissions (MT CO_2e)**[4]
Paper/Cardboard	269	10	271
Wood	2,836	110	3,073
Total	3,105	120	**3,344**

Source: AECOM 2017

[1] Waste types used in calculating solid waste baseline and forecast emissions. See Appendix A – Emissions Inventory and Forecast Methodology for further information.

[2] From Table B-22, where Gypsum Board corresponds with Paper/Cardboard and Lumber corresponds with Wood.

[3] Calculated using methane commitment method Equation 8.3 as shown in Appendix A – Emissions Inventory and Forecast Methodology, where MSW_x (mass of solid waste sent to landfill in inventory year) = values shown in Tons column.

[4] Calculated as Methane Emissions * methane GWP of 28

SW-3 75% WASTE DIVERSION GOAL

This measure assumes that 75% of the total 2035 forecast solid waste stream is diverted from landfills. Table B-24 shows the 2035 forecast waste disposal by waste type in metric tons, and a 75% waste diversion reduction applied to each of those categories. The total emissions from each scenario were calculated using the methane commitment method, as described in Appendix A. The difference between the forecast and mitigated scenario is 17,052 MT CO_2e/yr, which was rounded to 17,050 MT CO_2e/yr in the CAP.

Table B-24
Measure SW-3 Inputs

Waste Type	2035 Forecast Landfill Waste Composition (MT)	2035 Mitigated Scenario Landfill Waste Composition (MT)
Paper/Cardboard	8,213	2,053
Textiles	2,541	635
Food	7,487	1,872
Garden and Park	4,810	1,202
Wood	7,033	1,758
Rubber and Leather	45	11
Plastics	4,719	1,180
Metal	1,407	352
Glass	1,134	284
Other	7,986	1,997
Total	45,377	11,344
Emissions (MT CO_2e/yr)[1]	22,736	5,684
Difference (MT CO_2e/yr)	-	**17,052**

Source: AECOM 2017

[1] Calculated using the methane commitment method as described in Appendix A – Emissions Inventory and Forecast Methodology

GI-1 URBAN FOREST MASTER PLAN

This measure estimates reductions associated with the carbon sequestration potential of new trees planted as part of City landscaping requirements and development agreements. The calculations are based on extrapolating the carbon potential of a typical tree planting palette. The measure assumes that nearly 500 net new trees will be planted community-wide from 2010-2020. Trees planted to achieve implementation of this Urban Forest Program measure might be found in decorative landscaping, new City street planting strips, or parks and recreation areas.

A sample plant palette was created, including Lemon Bottlebrush, Brazilian Pepper, Victorian Box, Sweetgum, and Carob. There are myriad tree palette options, and the tree types included

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in this measure's calculations may not correlate exactly with those selected for planting in the community. Carbon sequestration rates specific to the species and age of the sample plant palette were collected from the Center for Urban Forest Research (CUFR) Tree Carbon Calculator and used to calculate the annual sequestration potential of the trees from 2010 – 2020. For purposes of the calculation it was assumed that an equal number of trees will be planted each year, though the exact number of trees planted per year may vary.

GI-2 EXPANDED URBAN FORESTRY PROGRAM

This measure estimates the carbon sequestration potential of expanding the City's urban forest. Based on an October 2016 San Diego Tree Canopy Assessment presentation using 2014 LiDAR data, the San Diego region has 13% existing tree canopy, 21% of area that is not suitable for tree canopy, and 66% for additional possible tree canopy.[6] The assessment lists La Mesa's existing canopy as approximately 18% of the City area, and shows a possible tree canopy in the City ranging from 48%-83%.

The i-Tree software program (developed by the USDA Forest Service) shows a total area of approximately 5,835 acres in the City. This corresponds to existing canopy coverage of 1,050 acres. La Mesa's maximum coverage was assumed to be 66% (the mid-point of the possible range shown in the Tree Canopy Assessment), or 3,851 acres. The increase in urban tree canopy under this maximum scenario would be 2,801 acres (i.e., 3851-1,050). Calculations for this measure assume 50% of the maximum urban forest coverage could be achieved by the 2035 target year, or 1,400 additional acres of urban forest by 2035.

The carbon sequestration potential of the new urban forest was calculated based on inputs from the i-Tree Canopy module, which assume a carbon sequestration potential of 9,970.817 lbs/acre/year.[7] Based on this assumption, 1,400 new acres of urban forest would sequester nearly 14 million lbs of CO_2/year, or 6,333 MT CO_2e/yr, which is rounded to 6,300 MT CO_2e/yr in the CAP.

[6] https://www.sandiego.gov/sites/default/files/san_diego_tree_canopy_assessment_05oct2016.pdf

[7] USDA Forest Service i-Tree Canopy tool: https://canopy.itreetools.org/report.php