APPENDIX A

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County of San Diego

2014 Greenhouse Gas Emissions Inventory and Projections

August 2017

Prepared for the County of San Diego

Prepared by the Energy Policy Initiatives Center and Ascent Environmental, Inc.

EPIC
ENERGY POLICY INITIATIVES CENTER
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ASCENT
ENVIRONMENTAL

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1 INTRODUCTION

This report provides a summary of the greenhouse gas (GHG) inventory and projections for the unincorporated portion of San Diego County and County municipal operations, including operations that may occur outside unincorporated areas. The baseline GHG inventory focuses on emissions generated in 2014, while the projections estimate annual emissions for 2020, 2030, 2040, and 2050. This inventory includes activities associated with land uses and municipal operations under the jurisdiction of the San Diego County Board of Supervisors. Some municipal operations may occur outside of the boundaries of the unincorporated area and are included in the inventory. Conversely, some land uses within the boundaries of the unincorporated area are not under the jurisdiction of the Board of Supervisors and are excluded.

This document also includes technical analyses conducted by Ascent Environmental, Inc.[1]

1.1 About this Document

This document describes the general method used to calculate the 2014 GHG emissions by sector for the Unincorporated County and project the Unincorporated County's emissions through 2050. Section 2 provides background sources and common assumptions used to estimate GHG emissions. Section 3 provides the results of the baseline GHG emissions inventory for the Unincorporated County in 2014. Section 4 provides details on the methods used for each sector, input data, and emission factors. Section 5 provides the results of the GHG emissions projections for the Unincorporated County for 2020, 2030, 2040, and 2050. Section 6 provides details on the methods and assumptions used to project GHG emissions.

2 BACKGROUND

This section describes the jurisdictional boundary, demographics, scope of GHGs, and emission categories used in estimating the baseline GHG inventory and projections.

2.1 Jurisdictional Boundary

This community baseline GHG emissions inventory and projections only cover emissions from land within the unincorporated area that are within the County's municipal land use jurisdiction and County-owned and operated facilities outside the boundaries of the unincorporated area. The unincorporated area contains lands that are outside the County's jurisdiction such as tribal and military lands.[2] Tribal lands include land covered by 19 Native American Reservations in the unincorporated area.[3] Military lands include the land covered by the Marine Corps Base Camp Pendleton (referred to as Camp Pendleton). Where possible, the baseline GHG emissions inventory excludes GHG emissions from tribal and military lands. In particular, emissions from tribal and military lands could not be disaggregated from the Agriculture emission sector.

The County of San Diego, which includes incorporated cities and the unincorporated area is referred to as "San Diego County". The areas within the unincorporated boundaries, over which the Board of Supervisors has land use jurisdiction, are referred to as the "unincorporated area". San Diego County as a jurisdictional entity is referred to as the "County" and its municipal operations are referred to as "County operations". County operations occurring outside the unincorporated area may occur in incorporated cities and outside San Diego County entirely, such as for employee commute trips, and are sometimes referred to as "non-unincorporated" County activities. Together, emissions associated with the unincorporated area and County operations are referred to as "Unincorporated County" emissions.

This inventory first quantifies emissions from the unincorporated area then adds on any County operations occurring outside the unincorporated area to quantify the Unincorporated County inventory and projections. See Section 2.4.1 for further explanation of the inclusion of County operations in this inventory and projections.

2.2 Demographics

The San Diego Association of Governments (SANDAG), San Diego's regional planning agency, projects and estimates population for all jurisdictions in the San Diego region.[4] These projections and estimates include tribal and military populations in the Unincorporated County population. However, for the purpose of this baseline GHG emissions inventory and projections, the population in the Native American reservations and Camp Pendleton is excluded. Additionally, civilian employment and housing units within Camp Pendleton and tribal lands were excluded from the number of households and jobs in the Unincorporated County.

SANDAG projections do not currently account for the County's most recently adopted general plan amendments (GPAs) as of August 2017 (i.e., amendments beyond the adopted 2011 General Plan and before public review of Draft CAP and Draft Supplemental Environmental Impact Report [August 2017]). Based on data provided by the County, these adopted GPA projects would result in additional population, job, and housing growth in the Unincorporated County beyond SANDAG's projections. The additional growth due to adopted GPA-related land use projects was added to SANDAG's projections for this report and assumed a linear growth rate from zero in 2014 to build-out values in 2050. Based on this criterion, GPA-related land use projects are limited to the list of projects shown on page 4 of the Appendix.

2.2.1 Population

The population breakdown for the Unincorporated County is provided in Table 1. The population used in this baseline GHG emissions inventory is the modified Unincorporated County population after subtracting the population in the Native American Reservations and Camp Pendleton. The modified Unincorporated County population in 2014 was 454,599. Population estimates and projections were available from SANDAG's Data Surfer online query tool, and GPA-related growth data were available from the County.

Table 1: Breakdown of Total Population in San Diego County

Year	Entire San Diego County[5]	Unincorporated County[6]	Camp Pendleton[7]	Native American Reservations[8]	GPA-Related Growth[9]	Modified Unincorporated County[10]
2014	3,192,457	498,159	36,859	6,701	0	454,599
2020	3,435,713	543,426	43,710	6,701	589	493,604
2030*	3,714,370	600,648	43,806	6,701	1,571	551,712
2040*	3,853,698	627,055	43,495	6,701	2,552	579,411
2050	4,068,759	647,233	43,506	6,701	3,534	600,560

* Interpolated. SANDAG estimates only provide projections for 2020, 2035, and 2050.

2.2.2 Jobs

There are no estimates from SANDAG on the number of civilian jobs in the Unincorporated County for 2014. The civilian jobs in 2014 are interpolated based on SANDAG Series 13 base year 2012 and projection year 2020 (Table 2). A modified jobs estimate for the Unincorporated County excludes jobs located in Camp Pendleton and tribal lands and includes additional jobs associated with GPAs not accounted for in SANDAG projections. The total modified number of commercial jobs was 69,648 and total number of industrial jobs was 16,094 in the Unincorporated County in 2014. The total modified

employment in the Unincorporated County would grow from 85,742 in 2014 to 129,788 in 2050, a 51 percent increase, primarily from commercial jobs.

2.2.3 Housing

The breakdown of housing units for the Unincorporated County is provided in Table 3. The GHG projections uses a modified version of Unincorporated County housing units that excludes housing units in Camp Pendleton and Native American reservations and includes additional housing anticipated from the GPA build out by 2050. The baseline GHG emissions inventory; however, did not require housing data to estimate emissions. The modified number of housing units in the Unincorporated County in 2014 was 163,354 and is projected to grow by 31 percent by 2050 to 213,486 housing units. Housing estimates and projections were available from SANDAG's Data Surfer online query tool, and GPA housing estimates were available from the County.

Table 2: Breakdown of Total Civilian Jobs in San Diego County

Year	Commercial Jobs[11]					
	Entire San Diego County	Unincorporated County	Camp Pendleton	Native American Reservation[12]	GPA-related Growth[13]	Modified Unincorporated County
2012	1,199,669	94,071	13,707	14,000	0	66,364
2014*	1,238,450	97,359	13,711	14,000	0	69,648
2020	1,354,791	107,221	13,722	16,000	171	77,670
2030	1,440,790	115,461	13,727	16,000	456	86,190
2040	1,535,622	126,990	13,730	16,000	741	98,001
2050	1,624,029	140,284	13,737	16,000	1,026	111,573
Year	Industrial Jobs[14]					
	Entire San Diego County	Unincorporated County	Camp Pendleton	Native American Reservation	GPA-related Growth[13]	Modified Unincorporated County
2012	147,300	15,488	24	NA	0	15,464
2014*	151,822	16,119	25	NA	0	16,094
2020	165,389	18,012	28	NA	17	18,001
2030	172,829	17,951[15]	28	NA	44	17,967
2040	179,534	18,165	30	NA	72	18,207
2050	183,432	18,145	30	NA	100	18,215

* Interpolated based on 2012 and 2020. NA = Not Available

Table 3: Breakdown of Total Housing Units in San Diego County

Year	Entire San Diego County[16]	Unincorporated County	Camp Pendleton	Native American Reservations	GPA-related Growth[13]	Modified Unincorporated County
2012	1,165,818	171,863	7,238	1,820	-	162,805
2014	1,186,785	172,459	7,238	1,867	-	163,354
2020	1,249,684	185,253	8,905	1,821	214	174,741
2030	1,346,417	203,081	8,905	1,823	572	192,925
2040	1,427,167	214,405	8,905	1,825	929	204,604
2050	1,491,935	222,932	8,905	1,827	1,286	213,486

2.3 Greenhouse Gases

The primary GHGs included in this inventory and projections are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Each GHG has a different capability of trapping heat in the atmosphere, known

as its global warming potential (GWP), which is normalized relative to CO_2 and expressed in carbon dioxide equivalent (CO_2e). In general, the 100-year GWPs reported by the Intergovernmental Panel on Climate Change (IPCC) are used to estimate GHG emissions. The GWPs used in this baseline GHG emissions inventory are from IPCC Fourth Assessment Report (AR4),[17] provided in Table 4.

Table 4: Global Warming Potentials Used in the Unincorporated County Inventory and Projections

Greenhouse Gas	Global Warming Potential (GWP)
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298

Source: IPCC 2007

2.4 Emission Sectors

The *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* published by ICLEI USA (referred to as the ICLEI Community Protocol) recommends including emissions from six source categories, or sectors, in a community-scale baseline GHG inventory.[18] These sectors are: electricity, natural gas, on-road transportation, solid waste, water, and wastewater. GHG emissions are calculated by multiplying activity data (e.g., kilowatt-hours of electricity, tons of solid waste) by an emission factor. For these sectors, methods used in this baseline GHG emissions inventory were based on ICLEI Community Protocol standard methods and modified with regional- or county-specific data when available.

GHG emissions from categories other than those recommended by the ICLEI Community Protocol were included to capture the specific conditions in the Unincorporated County. These additional categories include propane, agriculture, and off-road transportation (or equipment). For propane, data on propane consumption in the unincorporated area was not readily available and, thus, was estimated by applying the average ratio of propane to natural gas consumption in California using known natural gas data in the unincorporated area. Propane use in County operations was available from County records. For the agriculture and off-road sectors, methods used in this baseline GHG emissions inventory were based on methods used by the California Air Resources Board (ARB) in the statewide GHG emissions inventory for these sectors.[19]

2.4.1 Inclusion of County Operations

This inventory includes emissions associated with County operations as part of the Unincorporated County GHG inventory. County operations are included in the Unincorporated County inventory because County operations exist to serve the interests of community in the unincorporated portion of San Diego County and the County has jurisdiction over both the unincorporated portion of the San Diego County and the municipal operations serving that area.

Sources of GHG emissions from County operations consist of electricity and natural gas use at County-owned and operated facilities, including street lights and water pumps; fuel use in County vehicle fleet; fugitive CH_4 and pilot light emissions from County-owned and operated landfills; CH_4 emissions from solid waste generated by County employees; emissions from wastewater treatment; and emissions from employee commuting. County activities that occur within the unincorporated portion of San Diego County are assumed to be quantified in the higher-level inventory done for the unincorporated area. The inventory for the Unincorporated County, therefore, consists of emissions from the unincorporated area and County operation emissions occurring the incorporated areas, such as in the City of San Diego.

Most County operation emissions occurring in the incorporated areas include energy use at and solid waste generation from administration buildings, usually located in incorporated cities; employee commutes to those buildings; and some landfills. Table 5 provides further details on the portions of County operations that are either assumed to be included in the unincorporated area inventory. County operations not included in the unincorporated area inventory are added separately.

Additional detail on the contribution of municipal-level emissions to the Unincorporated County inventory is available in the *County Operations Greenhouse Gas Emissions Inventory and Projections Report* (County of San Diego 2017).

Table 5: Overlapping Emissions between County Operations and Unincorporated Area Sources in the Unincorporated County Inventory

County Operation or Facility	Portion of County Operations Assumed to be Included in the Unincorporated Area	Reason for Assumption
Airports	Part	All facilities except McClellan-Palomar and Gillespie Field are located in the unincorporated area.
Buildings & Other Facilities	Part	Only buildings located within the unincorporated area are included.
Employee Commute	Part	Only vehicle trips that end and/or begin in the unincorporated area are included.
Landfills	Part	Four out of the 11 closed landfills operated by the County are located in the unincorporated area.
Public Lighting (Streetlights and Traffic Signals)	All	All facilities are located in the unincorporated area.
Solid Waste	None	A vast majority of solid waste generated at County facilities are located outside the unincorporated area (e.g., main offices)
Vehicle Fleet	All	Assumes majority of County fleet operation occur in part or fully within the unincorporated area.
Wastewater Facilities	All	All facilities are located in the unincorporated area.
Water Pumping	All	All facilities are located in the unincorporated area.
Water Use at County Facilities	Part	Some water usage that occurs at County facilities are located in the unincorporated area.

Source: Ascent Environmental 2017

2.4.2 Excluded Emissions

2.4.2.1 Aircraft Emissions

GHG emissions from aircraft operation are outside the scope of this baseline GHG emissions inventory and are not included. Aircraft emissions are under the jurisdiction of the Federal Aviation Agency and are also considered indirect, or Scope 3, emissions under the ICLEI Community Protocol.

2.4.2.2 Stationary Source Emissions

GHG emissions from stationary sources other than the combustion of natural gas, agriculture, wastewater treatment, solid waste, and high GWP gases are excluded from the County's GHG inventory.

Emissions associated with electricity demand in the County are included in the County's inventory and quantified using SDG&E emission factors that represent both electricity generated locally and imported electricity. GHG emissions from other major stationary sources, such as cement production and petroleum refining, are excluded from the inventory because they cannot be controlled by the County.

3 SUMMARY OF BASELINE GREENHOUSE GAS EMISSIONS INVENTORY

In 2014, the total GHG emissions from the Unincorporated County were estimated at 3,211,505 metric tons CO_2e ($MTCO_2e$), distributed into nine sectors as shown in Figure 1. Adding the values in tables may not equal the reported total values due to rounding.

On-road transportation is the largest contributor to overall GHG emissions (45 percent), followed by electricity (24 percent), while propane use contributed the least (<1 percent). The emissions in each sector are presented in Table 6.

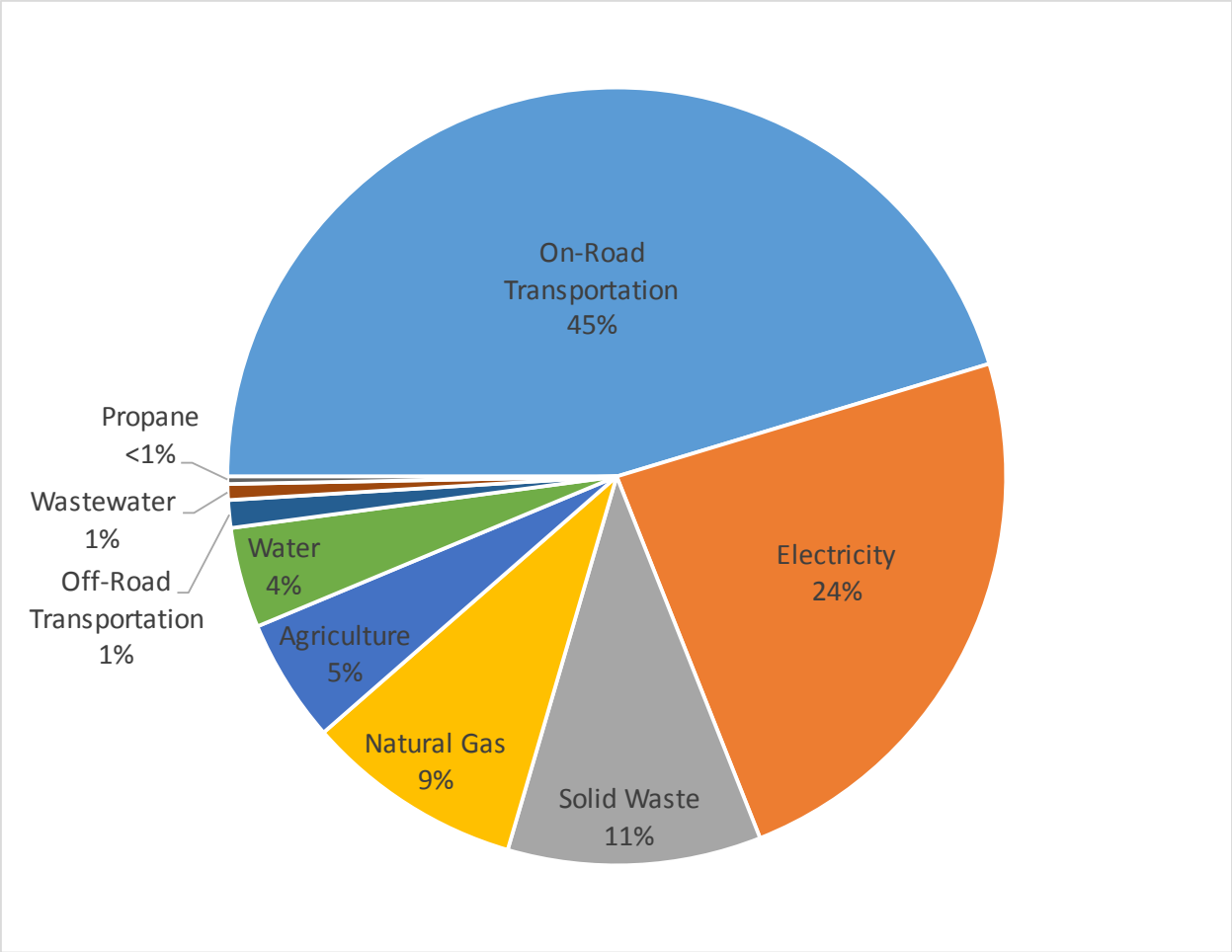


Figure 1: Breakdown of GHG Emissions (2014)

Table 6: Breakdown of GHG Emissions by Sector (2014)

Sector	GHG Emissions ($MTCO_2e$)
On-Road Transportation	1,456,060
Electricity	760,638
Solid Waste	338,107
Natural Gas	290,712
Agriculture	163,696
Water	134,269
Off-Road Transportation	36,927
Wastewater	21,183
Propane	9,914
Total	3,211,505

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

4 SUMMARY OF BASELINE GREENHOUSE GAS INVENTORY METHODS BY SECTOR

4.1 On-Road Transportation

Baseline GHG emissions from on-road transportation in the Unincorporated County were estimated based on the vehicle miles traveled (VMT) and the emissions rate associated with the vehicle fleet in 2014.

The total emissions from the on-road transportation sector were estimated at 1,456,060 $MTCO_2e$ in 2014 and shown in Figure 2 and Table 7. The VMT used, and methods to estimate the emission rate and emissions breakdown by vehicle class are provided in Table 7 and Sections 4.1.1 to 4.1.3.

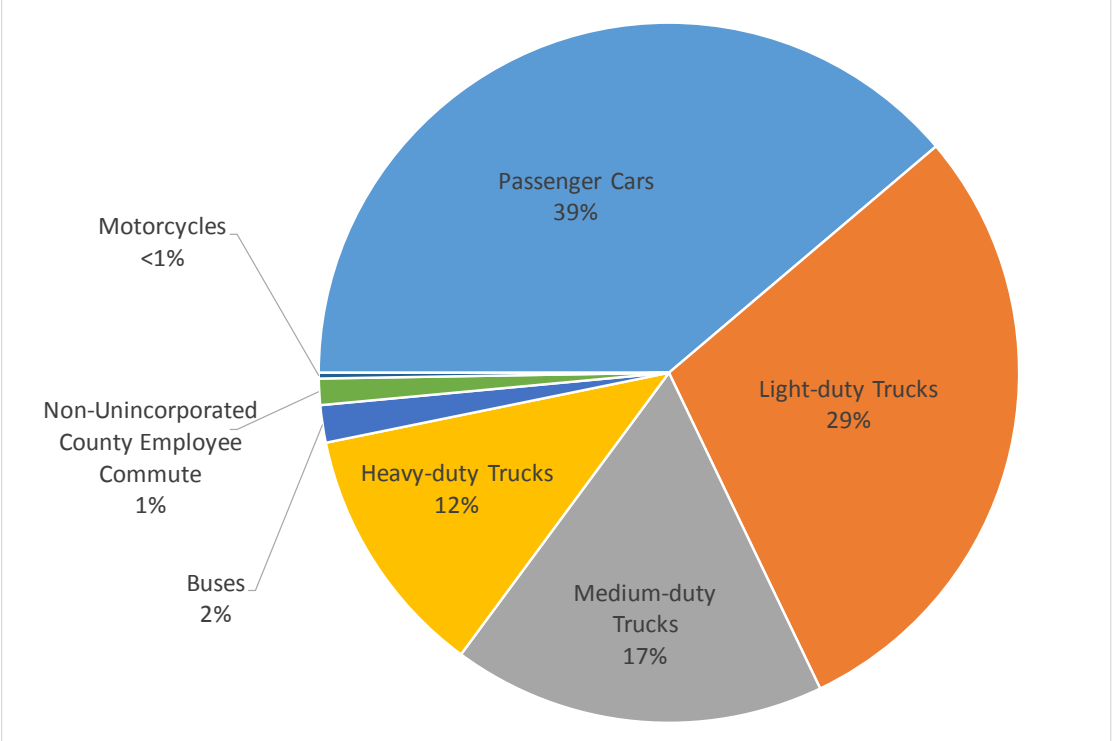


Figure 2: Breakdown of GHG Emissions from the On-Road Transportation Sector (2014)

Table 7: Breakdown of GHG Emissions from the On-Road Transportation Sector (2014)

Vehicle Category	GHG Emissions ($MTCO_2e$)
Passenger Cars	566,468
Light-duty Trucks	424,490
Medium-duty Trucks	251,486
Heavy-duty Trucks	170,414
Buses	25,223
Motorcycles	3,845
Non-Unincorporated County Employee Commute	14,134
Total GHG Emissions	1,456,060
Unincorporated Area Daily VMT (vehicle miles traveled per weekday)	8,803,406
Unincorporated Area Annual VMT (vehicle miles traveled per year)	3,084,713,386
Municipal Annual VMT (Vehicle miles traveled per year entirely outside of the Unincorporated County)	39,246,660
Unincorporated County Annual VMT	3,123,959,046
Average Unincorporated Area Emissions per Mile (g CO_2e per mile)	467
Average Passenger and Light-Duty Truck Emissions per Mile (g CO_2e per mile) (for employee commute calculations)	347

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent, VMT = vehicle miles travelled
Source: EPIC, 2016 and Ascent Environmental, 2017

4.1.1 Vehicle Miles Traveled

The VMT data in the Unincorporated County's land use jurisdiction (excluding tribal and military land) was provided by SANDAG based on its Series 13 activity-based model[20] and the Origin-Destination (O-D) method. The O-D VMT method is the preferred method proposed by the ICLEI Community Protocol that estimates miles traveled based on where a trip originates and where it ends to better attribute on-road emissions to cities and regions with policy jurisdiction over miles traveled (Figure 3).[21] This method is also consistent with recommendations of the Regional Targets Advisory Committee pursuant to Senate Bill 375.

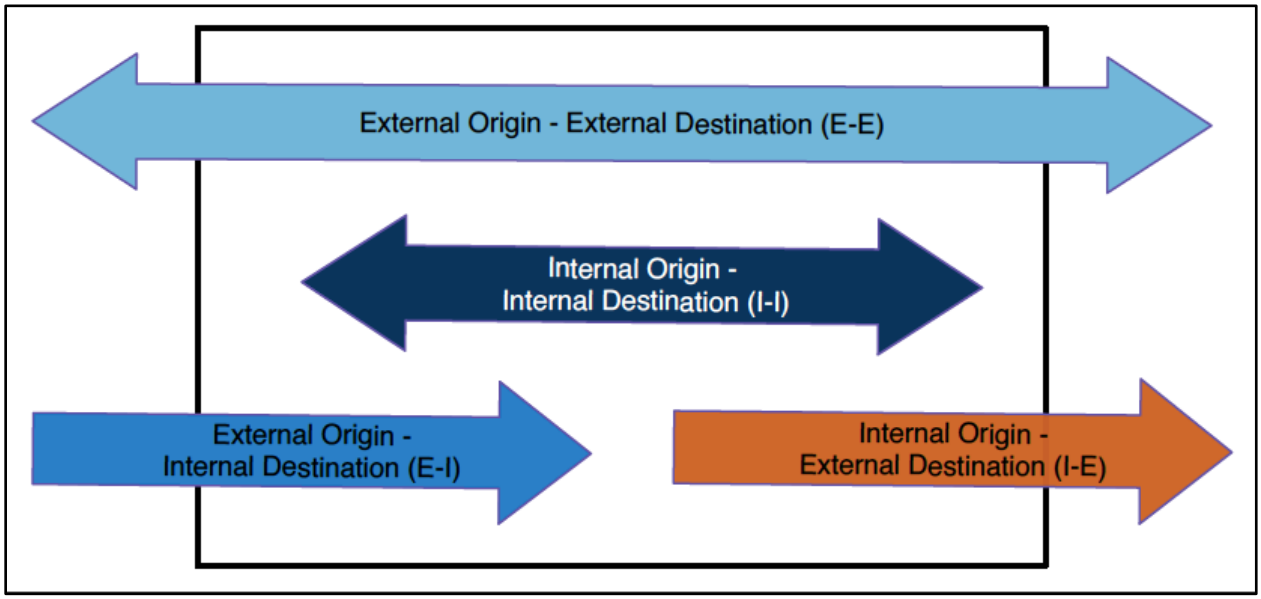


Figure 3: Components of Origin Destination Method for Calculation of Vehicle Miles Traveled

The O-D VMT data includes trips that originate and end within the boundary, in this case within the Unincorporated County land jurisdiction (referred to as Internal-Internal), and a portion of the trips that either begin within the boundary and end outside the boundary (referred to as Internal-External) or vice versa (referred to as External-Internal). 100 percent of Internal-Internal VMT and 50 percent of Internal-External/External-Internal trips were attributed to the Unincorporated County to evenly allocate miles from outside jurisdictions, consistent with ICLEI Community Protocol recommended methodology. VMT from trips that begin and end outside the designated boundary that were only passing through the Unincorporated County (referred to as External-External) were excluded. As shown on page 6 of the Appendix, 55.6 percent of VMT within the boundaries of the Unincorporated County are External-External trips. Emissions from External-External VMT were not allocated to the Unincorporated County. Series 13 O-D VMT data for each trip type in 2014 were provided by SANDAG.[22]

Thus, the total weekday VMT in 2014 associated with Unincorporated County activity was 8,803,406 miles/weekday (Table 8). This value was then multiplied by 0.96 to adjust from average weekday VMT to average daily VMT and multiplied again by 365 days per year to obtain an annual VMT of 3,084,713,386[23]. (Multiplying these values may not result in this annual VMT due to rounding.)

Table 8: Origin-Destination (O-D) VMT from Trips in Unincorporated County (2014)

Trip Type	VMT (miles/weekday)
Internal-Internal	1,980,624
External-Internal/Internal-External	13,645,564
100% Internal-Internal + 50% External-Internal/Internal-External	8,803,406

VMT = vehicle miles traveled
Source: SANDAG 2015

4.1.2 Vehicle Fleet Emission Rate

The emission rate in grams CO_2e/mile was derived from the statewide mobile source emissions inventory model EMFAC2014, developed by ARB.[24] EMFAC2014 was used to generate emission rates for the SANDAG metropolitan planning organization (MPO) jurisdiction for calendar year 2014 with all vehicle classes (EMFAC2011 Categories), model years, speed, and fuel types.[25] The fleet-wide CO_2/mile emission rate was calculated based on the distribution of VMT for each vehicle class and its emission rate.

EMFAC2014 also estimates the VMT share of electric vehicles for passenger vehicles and light-duty trucks weighing under 6,000 pounds (gross vehicle weight), but does not provide emission factors for such vehicles. Thus, electric vehicle emission factors were calculated separately based on SDG&E's 2014 emission factors per kWh and the average fuel economy of current electric light-duty passenger vehicles and low-weight light-duty trucks from the U.S. Department of Energy. Emissions associated with electric vehicle use are not included in the building electricity sector under Section 4.2 to prevent double counting.

Combining EMFAC2014 factors, SANDAG VMT data, and electric vehicle emission factors, the overall vehicle emissions rate in 2014 was 467 grams of carbon dioxide per mile (g CO_2e/mi). For passenger vehicles only, defined using light-duty auto (LDA) and light-duty truck (LDT1) in EMFAC2014 vehicle categories, the average emissions rate was 347 g CO_2e/mi.

4.1.3 Total Emissions and Emissions by Vehicle Fleet

The total emissions from on-road transportation, 1,456,060 $MTCO_2e$, in 2014 is broken down further by vehicle class using EMFAC2011 categories[26], provided in Table 7. It was assumed that the vehicle

category distribution in the Unincorporated County is the same as in San Diego County. Therefore, the countywide vehicle class distribution was applied to the Unincorporated County's on-road transportation emissions to obtain the pie chart of vehicle category emissions shown in Figure 2. Passenger car activity in the County contributed the most to total emissions in the on-road transportation sector at 39 percent (566,468 $MTCO_2e$), while motorcycles contributed the least at 0.3 percent (3,845 $MTCO_2e$).[27] The addition of County employee commute emissions contributed 1 percent (14,134 $MTCO_2e$). Employee commute emissions occurring wholly outside the unincorporated area are counted separately from community-level vehicle activity.

4.2 Electricity

GHG emissions from electricity consumption by the Unincorporated County were estimated using method "BE.2 Built Environment" from the ICLEI Community Protocol.[28] In general, annual electricity consumption in megawatt-hours (MWh) is multiplied by the electricity GHG emission factor, expressed in pounds of CO_2e per megawatt-hour (lb CO_2e/MWh) to calculate the total GHG emissions.

The total emissions from the electricity sector were estimated at 760,638 $MTCO_2e$ in 2014. The breakdown of emissions among four customer classes (residential, commercial, industrial, and agricultural) plus activity at County facilities located outside the Unincorporated County is provided in Figure 4 and Table 9.

Table 9 presents the breakdown of the emissions from the electricity sector by each source category in descending order.

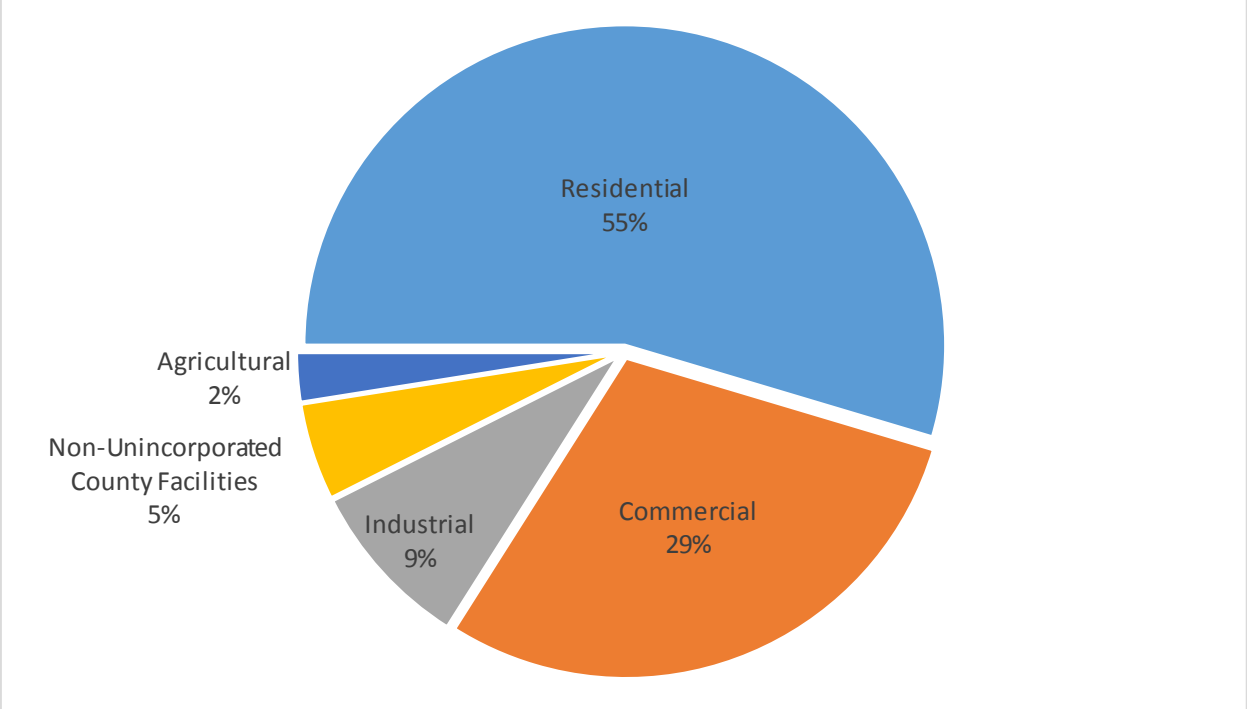


Figure 4: Breakdown of GHG Emissions from the Electricity Sector (2014)

Table 9: Breakdown of GHG Emissions from the Electricity Sector (2014)

Source Category	GHG Emissions ($MTCO_2e$)
Residential	415,441
Commercial	223,404
Industrial	65,269
Agricultural	19,051
Non-Unincorporated County Facilities	37,473
Total	760,638

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

Detailed methods used to estimate emissions from electricity consumption are provided in Sections 4.2.1 and 4.2.2.

4.2.1 Electricity Consumption

Electricity consumption in the Unincorporated County in 2014, excluding consumption in military land and casinos in tribal lands, was provided by the local utility, San Diego Gas & Electric (SDG&E), for four customer classes separately.[29] Several modifications were made to the consumption for this baseline GHG emissions inventory. First, the annual electricity consumption value was increased to account for transmission and distribution losses. This is done by multiplying total consumption by a loss factor[30] of 1.067.[31] Second, electricity consumption by residential customers was modified to exclude electricity use by residents in tribal lands and by civilian residents in military land.[32] Third, in order to avoid double counting, the portion of electricity consumption associated with water treatment and local distribution, calculated in Section 4.7.2, was subtracted from the electricity sector and attributed to the water sector.[33] After the modifications, the total electricity consumption in the unincorporated area was 2,397,452 MWh in 2014 and 2,496,327 MWh including County facilities located outside the Unincorporated County.

4.2.2 Electricity Emission Factor

For 2014, the electricity emissions factor in the SDG&E service territory was developed based on the specific mix of energy delivered to SDG&E bundled customers,[34] as well as that provided by other electricity providers – known as Direct Access (DA),[35] and their respective emission factors (lb CO_2e/MWh). The SDG&E bundled emissions factor was calculated using specific factors from Federal Energy Regulatory Commission (FERC) Form 1[36] and the California Energy Commission (CEC) Power Source Disclosure Program[37] for SDG&E owned and purchased energy, and the U.S. Environmental Protection Agency (EPA) Emissions and Generating Resource Integrated Database (eGRID)[38] for specific power plant emissions. The DA emissions factor used here is a default value adopted in California Public Utilities Commission (CPUC) Decision D.14-12-037.[39] In 2014, the overall electricity emission factor for all electricity delivered in the SDG&E service territory was 665 lb CO_2e/MWh.

Electricity consumption data for County facilities and operations in 2014 were available from electricity purchase records recorded in the Climate Registry Information System (CRIS) database. To calculate GHG emissions associated with electricity generation, the total electricity consumption was multiplied by the electricity GHG emissions factor in the San Diego Gas & Electric (SDG&E) service territory, expressed in lb CO_2e/MWh. In 2014, the County purchased its electricity through Direct Access (DA) agreements with SDG&E. The DA emissions factor used here is 0.379 $MTCO_2e$/MWh (836 lb CO_2e/MWh), a default value adopted in California Public Utilities Commission (CPUC) Decision D.14-12-037.

4.3 Natural Gas

GHG emissions from the combustion of natural gas for end-use applications, such as building heating and industrial applications, in the Unincorporated County were estimated using method "BE.1 Emissions" for Stationary Fuel Combustion from the ICLEI Community Protocol.[40] Annual natural gas consumption, expressed in million therms (MM Therms) is multiplied by a natural gas GHG emissions factor, measured in million metric ton CO_2e per million therm ($MMTCO_2e$/MM Therms), to calculate the total GHG emissions.

The total emissions from the natural gas sector were estimated at 290,712 $MTCO_2e$ in 2014. The breakdown of emissions between customer classes (residential, commercial/industrial/agricultural combined) and non-unincorporated County facilities is provided in Figure 5 and Table 10[41].

Table 10 provides a numerical breakdown of the emissions from the natural gas sector by source category.

Methods used in estimating emissions from the natural gas sector are provided in Sections 4.3.1 and 4.3.2.

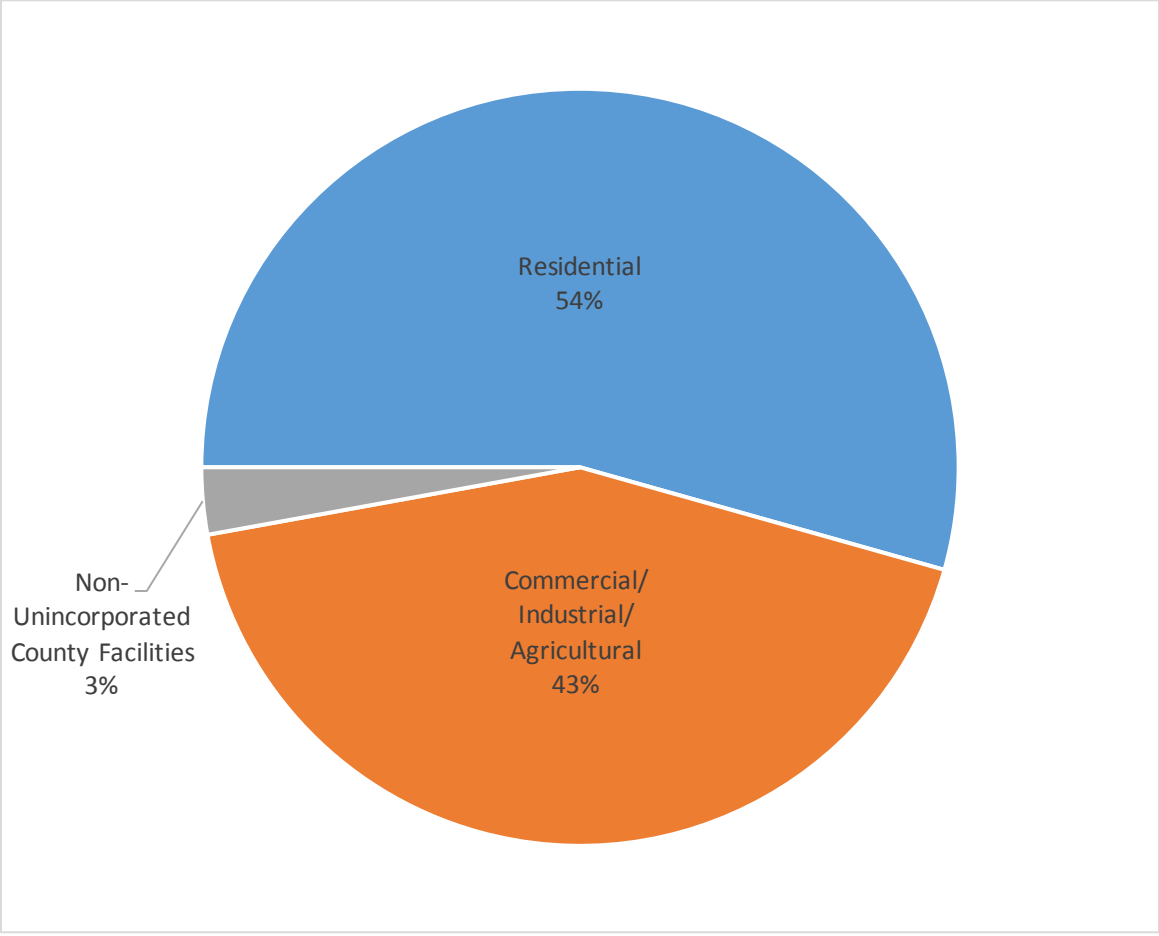


Figure 5: Breakdown of GHG Emissions from the Natural Gas Sector (2014)

Table 10: Breakdown of GHG Emissions from the Natural Gas Sector (2014)

Source Category	GHG Emissions ($MTCO_2e$)
Residential	157,936
Commercial/Industrial/Agricultural	124,469
Non-Unincorporated County Facilities	8,307
Total	290,712

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

4.3.1 Natural Gas Consumption

Natural gas consumption in the Unincorporated County in 2014, excluding consumption in military land and casinos in reservation lands, was provided by SDG&E for the residential and commercial/industrial/agricultural customer classes separately.[42] Similar to the modifications in the electricity sector, natural gas consumption for residential customers was modified to exclude the use by residents in tribal lands and civilian residences in Camp Pendleton.[43] After the modification, in 2014, the total natural gas consumption was 53.1 MM Therms. This includes 1.5 MM Therms used at County facilities located outside the unincorporated area.

4.3.2 Natural Gas Emissions Factor

The modified natural gas consumption was multiplied by its GHG emissions factor, expressed in $MMTCO_2e$/MM Therms. The natural gas emissions factor was calculated based on the heat content of natural gas, fuel CO_2, CH_4, and N_2O emissions from the latest Statewide Greenhouse Gas Inventory in 2015 developed by ARB,[44] and GWP for CH_4 and N_2O from Table 4. The natural gas emissions factor was 0.0055 $MMTCO_2e$/MM Therms.

4.4 Propane

GHG emissions from the combustion of propane for end-use applications, such as building heating, cooking, and emergency generation, in the Unincorporated County were estimated using method "BE.1 Emissions" for Stationary Fuel Combustion from the ICLEI Community Protocol.[45] Annual propane consumption, expressed in million therms (MM Therms) is multiplied by a propane GHG emissions factor, measured in million metric ton CO_2e per million therm ($MMTCO_2e$/MM Therms), to calculate the total GHG emissions.

The total emissions from the propane sector were estimated at 9,914 $MTCO_2e$ in 2014. The breakdown of emissions between the residential customer class and non-unincorporated County facilities is provided in Figure 6 and Table 11. Note that information on commercial and industrial propane usage was not readily available and is not included in this inventory.

Methods used in estimating emissions from the propane sector are provided in Sections 4.4.1 and 4.4.2.

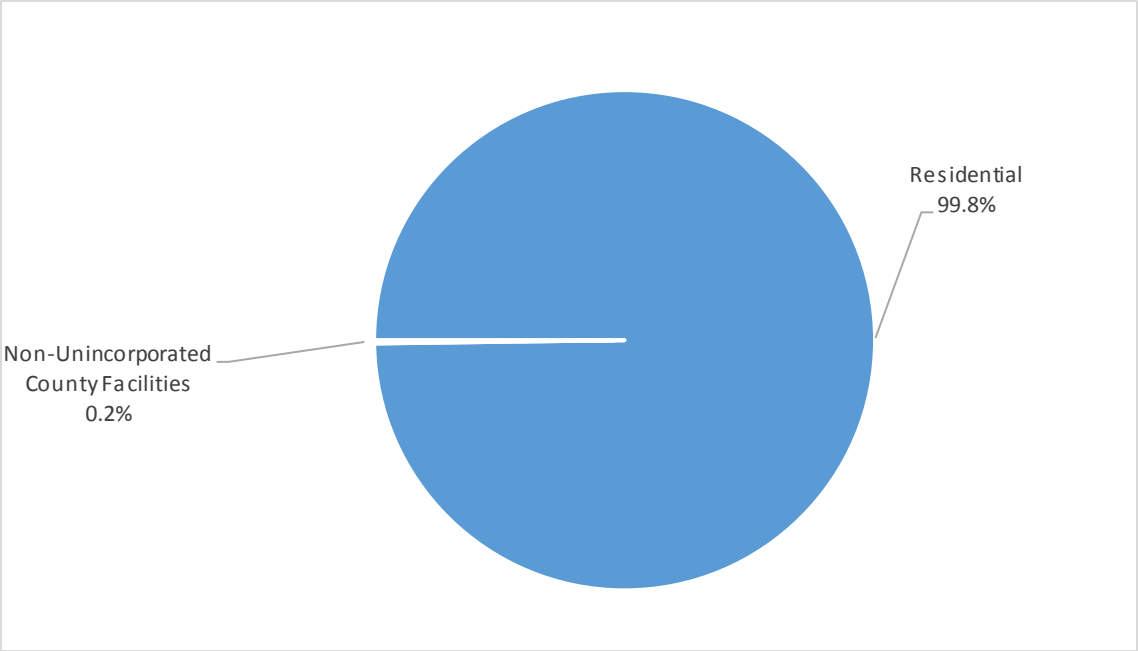


Figure 6: Breakdown of GHG Emissions from the Propane Sector (2014)

Table 11: Breakdown of GHG Emissions from the Propane Sector (2014)

Source Category	GHG Emissions ($MTCO_2e$)
Residential	9,893
Non-Unincorporated County Facilities	21
Total	9,914

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

4.4.1 Propane Consumption

Propane consumption in the Unincorporated County in 2014 was not available from SDG&E, though consumption at County facilities was provided by County staff. Propane consumption was estimated applying the average ratio of propane to natural gas consumption in California households to the total natural gas usage from the residential customer class shown in Section 4.3. This ratio was calculated from the Energy Information Agency's (EIA) 2009 Residential Energy Consumption Survey (RECS) (EIA 2009: Table CE2.5). Although, the EIA released the 2015 RCES, only the 2009 data had household fuel energy use by end use, while the 2015 version only tracks number of households using different fuels. From Table CE2.5 of the 2009 RCES, California households used 0.024 quadrillion BTU of propane and 0.439 quadrillion BTU of natural gas, for a propane-to-natural gas ratio of 0.05. Applying this ratio to the 28.8 MM Therms of natural gas used in the Unincorporated County resulted in a propane usage of 1.5 MM Therms of propane in 2014. This calculation assumes the statewide ratio of propane-to-natural gas usage also applies to the Unincorporated County.

EIA's Commercial Buildings Energy Consumption Survey does not track propane usage specifically and does not include propane as a major fuel type. Thus, without further data on propane usage, commercial and industrial propane usage is not included in this inventory.

Emissions from propane use at County facilities was provided by the County through the CRIS database, which reported a total liquid propane usage of 2,821 gallons in 2014 at facilities all located outside the unincorporated area.

4.4.2 Propane Emissions Factor

The calculated residential propane consumption was multiplied by its GHG emissions factor, expressed in $MTCO_2e$/MM Therms. The propane emissions factor was calculated based on a factor of 62.7 kg CO_2/MMBTU[46]. Propane emissions from County operations were calculated using emission factors for liquid propane from the 2015 Climate Registry Default Emission Factors.

4.5 Solid Waste

GHG emissions from the decomposition of organic material in waste disposed at landfills are broken down into two parts in the solid waste sector: CH_4 emissions from solid waste generated by the community in 2014, based on ICLEI Protocol method SW.4, and CH_4 emissions from solid waste that has been in place at landfills (waste-in-place) located within the unincorporated area or operated by the County, based on ICLEI Protocol method SW.1. Protocol method SW.4 estimates future emissions resulting from solid waste deposited in the baseline inventory year; and SW.1 estimates emissions in the baseline inventory year associated with waste disposal in previous years.[47] Due to the slow rate of emissions associated with decomposition of solid waste, this two-pronged approach also allows policy makers to target solid waste activity in a particular year, similar to other sectors (e.g., fuel combustion resulting in immediate emissions).

The total 2014 emissions from the solid waste sector in the Unincorporated County were estimated at 338,107 $MTCO_2e$. The breakdown between emissions from community waste disposed and waste-in-place is provided in Figure 7 and Table 12.

Table 12 provides a numerical breakdown of the emissions from the solid waste sector by source.

Methods used in estimating emissions from the solid waste sector are provided in Sections 4.5.1 and 4.5.2.

4.5.1 Community-Generated Waste Emissions

This subcategory includes emissions from total waste disposed in 2014 by the Unincorporated County regardless of whether the landfills accepting the waste are within or outside the Unincorporated County boundary. These emissions from waste disposal in the current year were estimated using method SW.4, Community-Generated Waste Sent to Landfills, in the ICLEI Community Protocol.[48] Protocol method SW.4 uses total waste (measured in wet short tons) generated by a community in a given year and an emissions factor for mixed solid waste[49] to estimate the total emissions. This emissions factor accounts for the CH_4 that would be generated through the duration of the waste's decomposition. The impact of recycling and composting diversion programs on emission reductions are captured in the baseline GHG emissions inventory as the waste disposed data already excludes waste diverted as a result of these programs. The recycling and diversion programs contribute to lowering the amount of community-generated waste sent to the landfills.[50]

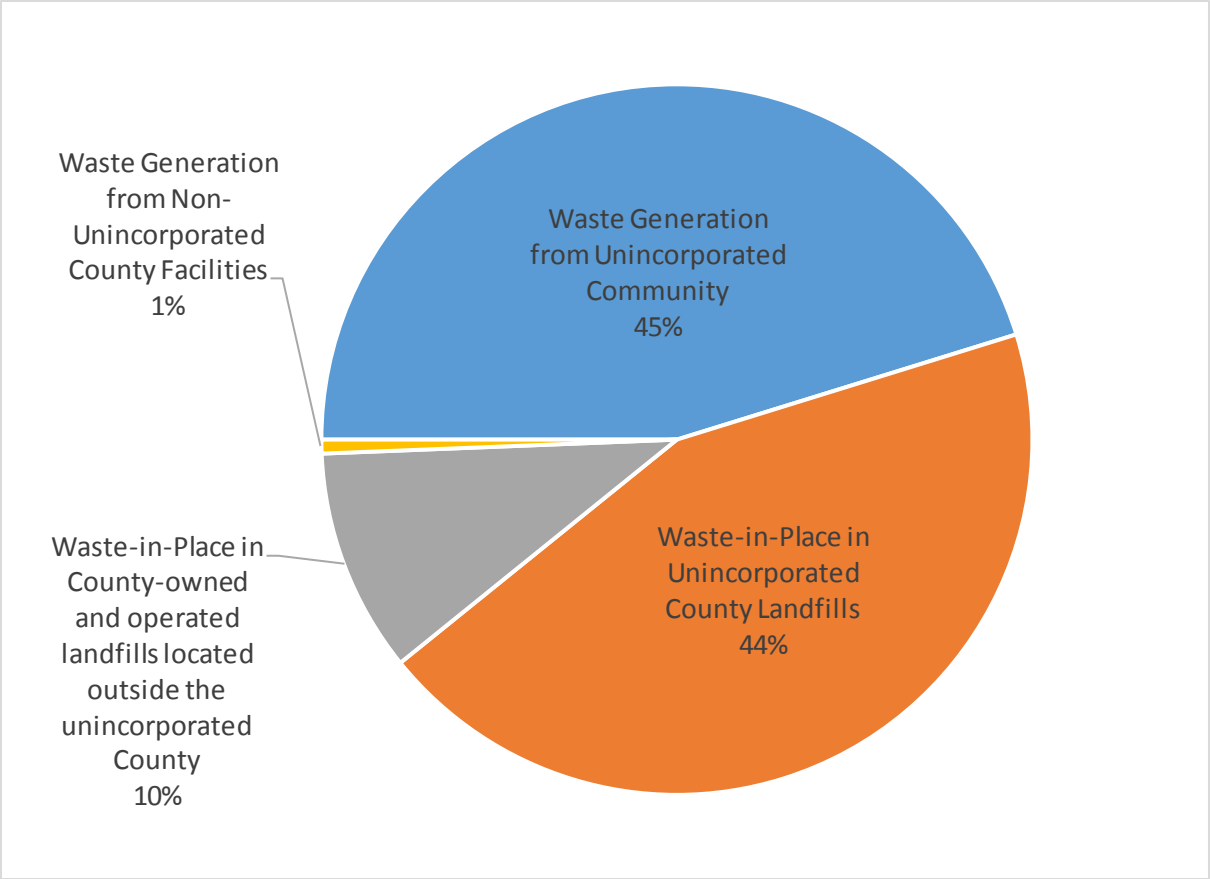


Figure 7: Breakdown of Emissions from the Solid Waste Sector (2014)

Table 12: Breakdown of Emissions from the Solid Waste Sector (2014)

Source	GHG Emissions ($MTCO_2e$)
Waste Generation from Unincorporated Community	152,841
Waste-in-Place in Unincorporated County Landfills	148,646
Waste-in-Place in County-owned and operated landfills located outside the Unincorporated Area	34,493
Waste Generation from Non-Unincorporated County Facilities	2,126
Total Emissions	338,107

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

For the Unincorporated County, solid waste disposal in 2014 was obtained from the California Department of Resources Recycling and Recovery (CalRecycle) Disposal Reporting System (DRS),[51] and modified to exclude the waste disposal from tribal and military lands. Waste disposal from Camp Pendleton (sent to Las Pulgas and San Onofre landfills) was subtracted from the total. Waste disposal from tribal lands (sent to Borrego, Otay, Sycamore, and West Miramar Sanitary landfills) was also subtracted from the total.[52] The modified waste disposal from the unincorporated area and non-unincorporated County facilities used in this baseline GHG emissions inventory was 450,208 and 5,762

wet short tons in 2014, respectively, for a total of 455,970 wet short tons. The breakdown of landfills accepting waste generated by the Unincorporated County is provided in Table 13.

Table 13: Breakdown of Waste Disposal (2014)

Landfill Accepting Waste from Unincorporated County	Solid Waste (wet short tons)
Antelope Valley Public Landfill	20
Azusa Land Reclamation Co. Landfill	128
Borrego Landfill*	2,552
Chiquita Canyon Sanitary Landfill	101
El Sobrante Landfill	3,083
Imperial Landfill	885
Lamb Canyon Sanitary Landfill	25
Olinda Alpha Sanitary Landfill	1,754
Otay Landfill*	173,057
Prima Deshecha Sanitary Landfill	737
Simi Valley Landfill & Recycling Center	418
Sycamore Landfill*	263,746
West Miramar Sanitary Landfill*	3,702
Non-Unincorporated County Facilities	5,762
Total	455,970

*Modified. Source: CalRecycle, County of San Diego 2015

The total waste disposal was multiplied by an emissions factor for mixed solid waste, 0.06 MT CH_4/wet short ton,[53] and converted to $MTCO_2e$. The landfill gas capture rate was assumed to be 75 percent with a 10 percent oxidization rate, based on ICLEI Community Protocol.[54] The total and per-capita solid waste disposal and total fugitive landfill gas emissions are provided in Table 14. Emissions from waste disposal by the unincorporated area in 2014 was estimated at 152,841 $MTCO_2e$ and 2,126 MTCO2e for non-unincorporated County facilities (see *County Operations Greenhouse Gas Emissions Inventory and Projections Report* for more details).

Table 14: Unincorporated County Solid Waste Disposal and Corresponding Emissions (2014)

Total Solid Waste Disposal (metric tons)	408,422
Per Capita Solid Waste Disposal (kg/person/day)	2.5
GHG Emissions ($MTCO_2e$)	152,841

kg = kilogram, GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC, 2016 Excludes non-unincorporated County facilities.

4.5.2 Waste-in-Place Landfill Emissions

Waste-in-place landfill emissions are defined as the CH_4 emitted in 2014 from decomposing waste accumulated in a landfill since its first opening through 2013. This section includes the emissions from active and closed landfills within the unincorporated area, regardless of where waste came from, as recommended by method "SW.1 Methane Emissions from Landfills" in the ICLEI Community Protocol.[55] Waste-in-place emissions from some of the Unincorporated County landfills are available from EPA's Mandatory Greenhouse Gas Reporting Program (EPA MRR), which requires facilities emitting more than 25,000 $MTCO_2e$ per year to report their operational emissions to the EPA.[56] For the active landfills that are required to report emissions to EPA MRR, the reported GHG emissions were adjusted to discount Unincorporated County waste deposited in these in-boundary landfills in 2014 accounted through SW.4. For active landfills and closed landfills that are not subject to the EPA MRR, an alternate approach from SW.1.1 in the ICLEI Community Protocol,[57] based on the first order decay (FOD) model[58] and the waste-in-place in the landfill,[59] was used.

The active landfills included in this section are the Otay Landfill and Borrego Landfill. They are the only active landfills located within the unincorporated area, but are owned and operated by Republic Services.[60] Both landfills accept waste from the Unincorporated County as well as from other jurisdictions. Bonsall, Jamacha, Valley Center, and Viejas Landfills represent the closed landfills within the unincorporated area; and Bell Junior High, Encinitas, Gillespie, Hillsborough, Palomar, Poway, and San Marcos landfills represent the closed landfills operated by the County but located outside of the unincorporated area.[61]

4.5.2.1 Active Landfills

The Otay Landfill is one of the six landfills in the San Diego region that have reported to EPA MRR since 2010.[62] The GHG emissions reported for 2014 were for fugitive landfill CH_4 emissions and emissions from stationary fuel combustion. For the Otay Landfill, the emissions from stationary combustion are from the distillate fuel used in a generator,[63] and fugitive CH_4 emissions from the landfill are based on the measured quantity of CH_4 collected and an EPA-estimated landfill gas collection efficiency.[64]

Otay landfill accepts waste from both within and outside the Unincorporated County. To avoid double counting with community-generated waste emissions, emissions emitted in 2014 from Unincorporated County waste deposited in 2014 was estimated using ARB's Landfill Emissions Tool (LET) (Version 1.3)[65] and subtracted from the EPA-reported emissions. The tool requires waste deposited (tons) and daily cover (tons) as inputs for the landfill, both of which were available from CalRecycle.[66] The default values for percent of anaerobically degradable carbon (ANDOC) in California were selected in the LET. GWPs from IPCC's Second Assessment Report (SAR) are embedded in the LET and no landfill collecting efficiency was assumed. The CO_2e landfill emissions output from the LET was modified by using GWPs from IPCC AR4 instead of SAR, to be consistent with the rest of the baseline GHG emissions inventory.

The total adjusted emissions from the Otay Landfill were 139,205 $MTCO_2e$ in 2014. The breakdown of emissions is provided in Table 15.

Table 15: Total Emissions and Breakdown for the Otay Landfill (2014)

Sources/Process	GHG Emissions ($MTCO_2e$)
Stationary Combustion Emissions	11
Fugitive Landfill Emissions	139,194
Total Emissions from Otay Landfill	139,205

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent Source: EPA, 2015. CalRecycle, 2015. Ascent, 2016.

The Borrego Landfill is not subject to EPA MRR reporting requirements due to its small size; as such, the alternate method SW.1.1 in the ICLEI Community Protocol was used. Emissions estimated using SW.1.1 are based on the FOD model and waste-in-place in the landfill.

LET was used as the FOD model in this section, using waste deposited tonnage and daily cover from CalRecycle data. For waste-in-place, annual waste accepted by the Borrego Landfill from 1990 to 1994 and 1995 to 2013 was available from ARB[67] and CalRecycle, respectively. Waste accepted in 2014 was omitted because Borrego Landfill only accepted waste from the Unincorporated County in that year, and emissions from community-generated waste is already included in the baseline inventory under Section 4.5.1.[68] Annual Alternative Daily Cover (ADC) was available from CalRecycle from 2000 to 2009.[69] Similar to assumptions for the Otay Landfill, the default values for percent of ANDOC in California were selected in LET, no landfill collecting efficiency was assumed, and the CO_2e landfill emissions output from LET was modified by using GWPs from IPCC AR4 instead of SAR. No landfill gas collection system was in place at

the Borrego Landfill in 2014,[70] so no modification was made. The total 2014 emissions from waste-in-place and ADC at the Borrego Landfill were estimated at 2,184 $MTCO_2e$.[71]

The total emissions from waste-in-place at active landfills in the unincorporated area in 2014 were estimated at 141,389 $MTCO_2e$ and are shown in Table 16.

Table 16: Breakdown of Waste-in-Place Emissions in Active Landfills (2014)

Sources	GHG Emissions ($MTCO_2e$)
Otay Landfill	139,205
Borrego Landfill	2,184
Total Emissions from waste-in-place in active landfills	141,389

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC, 2016

4.5.2.2 Closed Landfills[72]

CH_4 and N_2O emissions were available for Bell Junior High, Bonsall, Encinitas, Gillespie, Hillsborough, Jamacha, Palomar, Poway, San Marcos, and Valley Center landfills from the County's Climate Reporting Information System (CRIS).[73] CRIS reports that these emissions data are based on fugitive emissions from landfill gas, N_2O and unburned CH_4 emissions from flaring, and pilot light combustion. CO_2 emissions were also reported for flared landfill gas; however, these are considered biogenic and are excluded from the baseline GHG emissions inventory. According to CRIS, CO_2 emissions from pilot light usage, although minimal, may not be biogenic and were included in the baseline inventory. CH_4 emissions from fugitive landfill gas, as reported by CRIS, were calculated using Equation 9.1 of the Landfills with *Comprehensive LFG (Landfill Gas) Collection Systems* section from the 2010 *County Operations Protocol (LGOP)*.[74] Emissions data were not available for the Viejas Landfill in the CRIS database and were calculated separately, as described below.

Fugitive landfill CH_4 emissions from the Viejas Landfill were calculated using LET.[75] This model calculates CH_4 from a landfill for a given year based on rainfall, opening year, closure year, tons of annual waste disposed, and tons of ADC. The landfill is located in the unincorporated area, which has an average rainfall of less than 20 inches per year.[76] Also, the Viejas Landfill is assumed not to have any ADC applied during its operation.[77] A 2014 facility emissions report, which did not report CH_4 emissions, from the San Diego Air Pollution Control District noted that the Viejas Landfill opened in 1971, closed in 1979, and has a final landfill volume containing 46,000 tons.[78] Assuming that the landfill was closed due to saturated capacity and that waste was disposed at the landfill at equal rates during each year of operation, the LET estimates that the Viejas Landfill generated 24 metric tons of CH_4 in 2014. In addition, no landfill gas capture or flaring systems are currently installed at the Viejas Landfill;[79] therefore, this landfill generated no flaring or pilot light-related emissions in 2014. The final estimates of total emissions from waste-in-place at closed landfills are provided in Table 17.[80]

The total 2014 GHG emissions from the closed landfills operated by the County or located in the unincorporated area were estimated at 41,728 $MTCO_2e$.

Table 17: Emissions from Closed Landfills Operated by the County or Located in the Unincorporated Area (2014)

Landfills	$MTCO_2$	MT CH_4	MT N_2O	$MTCO_2e$
Bell Junior High Landfill	<1	17	<1	423
Bonsall	<1	113	<1	2,833
Encinitas	<1	95	<1	2,379
Gillespie	<1	46	<1	1,157
Hillsborough	<1	11	<1	267
Jamacha	<1	123	<1	3,079
Palomar	<1	162	<1	4,065
Poway	<1	33	<1	820
San Marcos Landfill	<1	1,014	<1	25,364
Valley Center Landfill	<1	30	<1	744
Viejas Landfill	0	24	0	598
Total	1	1,668	0.2	41,728

MT= metric tons, CO_2 = carbon dioxide, CH_4 = methane, N_2O = nitrous oxide, CO_2e = carbon dioxide equivalent
Source: IPCC 2007, CRIS, TCR 2014, Data compiled by Ascent Environmental in 2016

4.5.2.3 Emissions from Waste-In-Place

The total emissions from both active and closed landfills in the unincorporated area or operated by the County are provided in Table 18. Emissions from waste-in-place at landfills in the Unincorporated County in 2014 were estimated at 183,117 $MTCO_2e$.

Table 18: Emissions from Active and Closed Landfills Operated by the County or Located in the Unincorporated Area (2014)

Landfills	GHG Emissions ($MTCO_2e$)
Active Landfills	141,389
Closed Landfills	41,728
Total	183,117

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

4.6 Agriculture

The GHG emissions from agriculture are broken down into seven source categories: agricultural equipment, enteric fermentation, manure management, soil management, residue burning, rice cultivation, and diesel irrigation pumps. In 2014, there was no activity in residue burning and rice cultivation in San Diego County.[81] Due to the lack of specific agricultural data for the unincorporated area, the emissions from agriculture for all of San Diego County, including incorporated and unincorporated areas, were estimated first and scaled to the unincorporated area based on the acreage of agricultural land.[82] The total agricultural land area and GHG emissions in San Diego County and the unincorporated area are provided in Table 19. The 2014 GHG emissions from agriculture in the unincorporated area were estimated at 163,696 $MTCO_2e$. No municipal operations result in emissions from the agricultural sector.

Table 19: Agricultural Land and Emissions in the San Diego Region and Unincorporated County (2014)

Region	Agricultural Land (Acres)[83]	Agricultural Emissions ($MTCO_2e$)
San Diego County	108,879	182,927
Unincorporated Portion of San Diego County	97,432	163,696

$MTCO_2e$ = metric tons of CO_2 equivalent
Source: SANDAG, EPIC, 2016

The breakdown of agricultural emissions in each source sector is provided in Figure 8 and Table 20. Two source categories with no activity in San Diego County (residue burning and rice cultivation) are not shown.

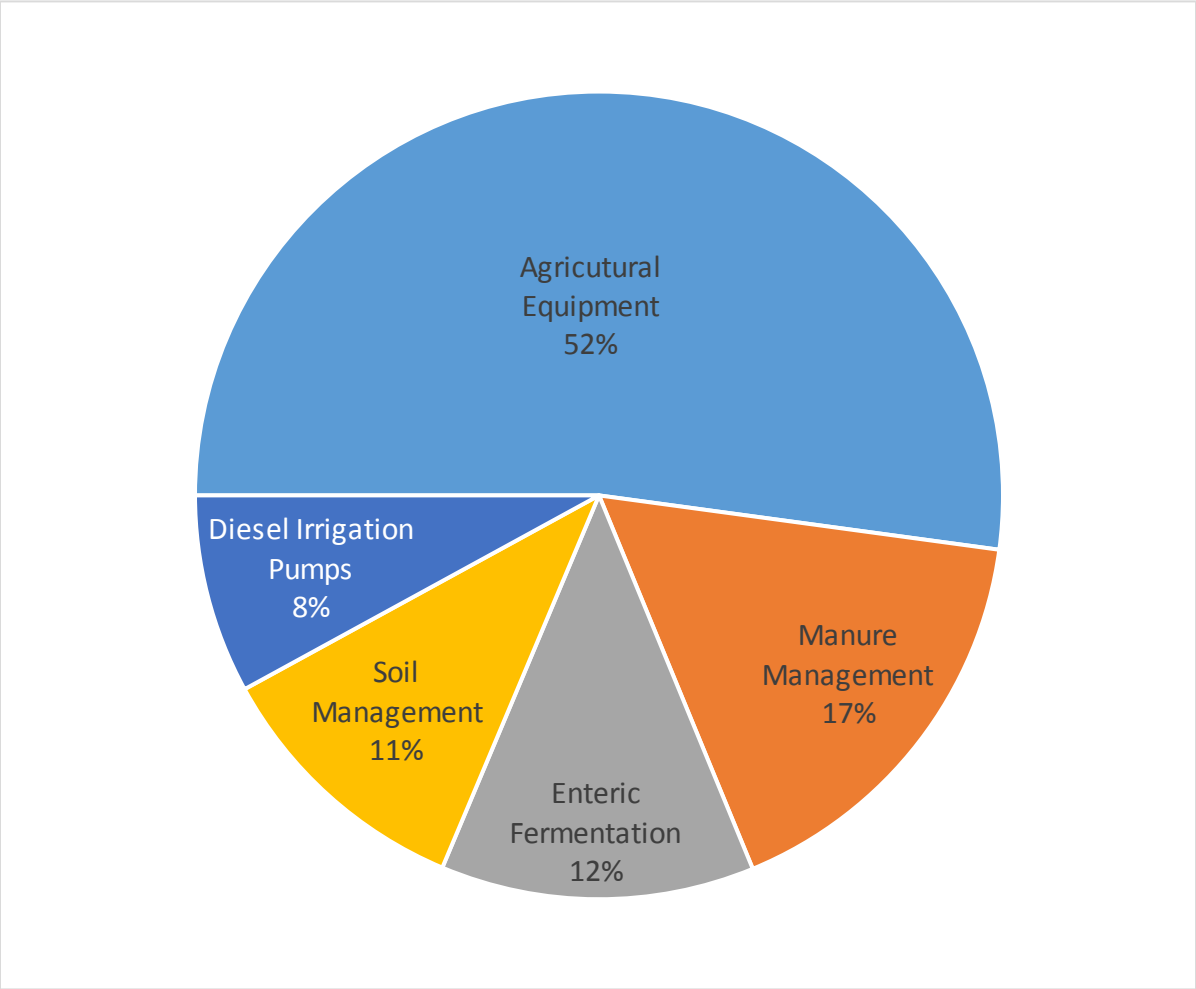


Figure 8: Breakdown of Emissions from the Agricultural Sector (2014)

Table 20: Breakdown of Emissions from the Agricultural Sector (2014)

Source	GHG Emissions ($MTCO_2e$)
Agricultural Equipment	86,087
Manure Management	27,462
Enteric Fermentation	20,724
Soil Management	17,655
Diesel Irrigation Pumps	11,768
Total	163,696

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

Methods used to estimate emissions from the agriculture sector are provided in the following Sections 4.6.1 to 4.6.6.

4.6.1 Agricultural Equipment

In-use off-road mobile agricultural equipment (both diesel and gasoline-fueled) contributes GHG emissions from fuel combustion in internal combustion engines.[84] The GHG emissions from agricultural equipment were estimated using ARB's 2007 OFFROAD model,[85] which calculates emissions from off-road sources statewide. ARB is currently replacing the OFFROAD model with several sector-specific models phased in over time. However, the in-use mobile agricultural equipment sector has not been updated. The 2007 OFFROAD model estimates that agricultural equipment in the San Diego region emitted 96,201 $MTCO_2e$ in 2014. Scaling these emissions by the ratio of agricultural acres between the unincorporated area and San Diego County available from SANDAG Series 13 data, the 2014 GHG emissions from agricultural equipment in the unincorporated area were estimated at 86,087 $MTCO_2e$.

4.6.2 Manure Management

The emissions from manure management, including stabilizing and storing manure, were estimated using method A.2.1 (CH_4), A.2.3 (direct N_2O), and A.2.4 (indirect N_2O) from the ICLEI U.S. Community Protocol.[86] These methods use the major livestock population, animal characteristics, and animal-specific manure management systems to estimate the emissions from manure management. Animal-specific manure management systems in California were obtained from the EPA 2014 U.S. Greenhouse Gas Inventory Report[87] for each animal type. In addition, Method A.2.4 estimates the indirect N_2O emissions associated with the nitrification-denitrification process of nitrogen remaining in the soil and from nitrogen lost through runoff and leaching. The fractions of nitrogen lost through volatilization, runoff and leaching for each type of manure management system were obtained from the EPA 2014 U.S. Greenhouse Gas Inventory Report,[88] which is consistent with IPCC default values. The direct nitrogen emitted as N_2O is 0.01 g/g, and the indirect N_2O emission rates are provided in Table 21 (the leached nitrogen emitted as N_2O and leaching rate are unitless).[89]

Table 21: Indirect Nitrogen Emission Rates from Nitrification-Denitrification Process and Leaching

Leached nitrogen emitted as N_2O (kg N_2O/kg N leached)	0.0075
Leaching Rate (fraction of applied N lost through leaching)	30%
Redeposited nitrogen emitted as N_2O (g/g)	0.01
Volatilization Rate (g/g)	0.1

kg = kilograms, g = grams, N_2O = nitrous oxide
Source: EPA 2015, ARB 2015

The breakdown of emissions from manure management for San Diego County and emissions scaled for the unincorporated area in 2014 are provided in Table 22. Unincorporated County emissions from manure management were scaled by the ratio of agricultural acres between the unincorporated area and San Diego County available from SANDAG Series 13 data. Accordingly, emissions from manure management in the unincorporated area were estimated at 27,462 $MTCO_2e$.

Table 22: Emissions from Manure Management for the San Diego Region and Unincorporated County (2014)

Emission Type	Annual GHG Emissions from Manure Management ($MTCO_2e$/year)	
	San Diego County	**Unincorporated County**
CH_4 Emissions from Manure (A.2.1)	25,945	23,218
Direct N_2O Emissions from Manure (A.2.3)	3,202	2,865
Indirect N_2O Emissions from Manure (A.2.4)	1,541	1,379
Total Emission from Manure Management	30,688	27,462

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent, CH_4 = methane, N_2O = nitrous oxide
Source: EPIC, 2016

4.6.3 Enteric Fermentation

The GHG emissions from enteric fermentation, a process that occurs in the stomach of ruminant animals that produces and releases CH_4, were estimated using method A.1, Enteric Fermentation from Domesticated Animal Production, from the ICLEI U.S. Community Protocol.[90] This method uses the animal-specific CH_4 emission factors to estimate total emissions from enteric fermentation. Livestock population was obtained from the 2014 Crop Statistics & Annual Report[91] for the San Diego region. For the animal types that are not reported in the 2014 Crop Statistics & Annual Report, livestock populations were estimated based on the population distribution in the National Agriculture Statistics Service (NASS) 2012.[92] Animal-specific emission factors in California were obtained from the EPA 2014 U.S. Greenhouse Gas Inventory Report.[93] Livestock population in the San Diego region and statewide CH_4 emission factors are provided in Table 23.

Table 23: Livestock Population and CH_4 Emissions from Enteric Fermentation in the San Diego Region (2014)

Animal Type	Population (head)	Emission Factor (kg CH_4/head/yr)	CH_4 Emissions (MT CH_4)
Dairy Cow	2,891	143	413
Beef Cow	1,545	95	147
Other Cattle	6,664	53	353
Sheep and Lamb	897	8	7
Goats	736	5	4
Hogs and Pigs	1,391	1.5	2
Total	14,124	Not Applicable	926

CH_4 = methane, MT = metric tons
Source: County of San Diego 2015, USDA 2012, EPA 2015, EPIC 2016.

Based on the information provided in Table 23, the total GHG emissions from enteric fermentation for the San Diego Region in 2014 were 23,159 $MTCO_2e$ (926 MT CH_4). Emissions from enteric fermentation in the unincorporated area in 2014 were estimated at 20,724 $MTCO_2e$, scaled by the ratio of agricultural acres between the unincorporated area and San Diego County available from SANDAG Series 13 data.

4.6.4 Soil Management

Emissions from soil management include direct N_2O emissions from fertilizer application and the indirect N_2O emissions from the processes affecting nitrogen remaining in soil or nitrogen lost through run off or leaching. These emissions were estimated using the 2015 updated California Inventory Methods from ARB.[94] This method uses the harvested crop acreages in a given year, multiplied by the crop-specific recommended nitrogen application rates, to estimate the total nitrogen applied to soil. Data on major crops in the San Diego Region and acres harvested were obtained from the 2014 Crop Statistics & Annual Report,[95] and their related nitrogen application rates were obtained from the University of California Davis (UC Davis) Extension cost studies.[96] If the nitrogen application rates were not available for the crops in year 2014 or the San Diego region, the best available data from UC Davis Extension cost studies were used. Crops, harvested acreages, and nitrogen application rates are provided in Table 24.

Table 24: Major Crops, Harvested Acreages, and Nitrogen Application Rates for the San Diego Region (2014)

Crop[97]	Harvested (Acres)	Nitrogen Application Rate (lb N/Acre)
Avocados	18,439	152.25
Bedding Plants, Color & Herbaceous Perennials	1,318	63
Foliage	773	63
Grapefruit	1,538	304
Grapes, wine	923	34
Hay, oat	3,847	62.5
Indoor Flowering and Foliage Plants, including poinsettia	863	63
Lemons	3,569	130
Miscellaneous Field Crops	2,504	113
Miscellaneous Fruits and Nuts	1,396	133
Miscellaneous Vegetables	1,370	104
Oranges	6,170	110
Ornamental Trees and Shrubs	5,303	63
Other Cut Flowers	1,356	63
Pasture, irrigated	1,533	88
Proteas	607	63
Strawberries	575	85
Tangerine, Tangelo	964	110
Tomatoes	1,720	164
Turf & Cut Christmas Trees	696	63
Wax Flowers	786	63
Other Crops[98]	3,779	106
Total Cropland	60,029	-

lb N = pounds of nitrogen
Source: County of San Diego 2015, UC Davis

Based on Table 24, soil management of crops in San Diego County required the application of 3,180 metric tons of nitrogen in 2014. The direct and indirect N_2O emissions from nitrogen applied to agricultural soils depends on a wide variety factors. The IPCC default direct nitrogen emission rate, 0.01 g N_2O /1 g N applied, was used per ARB inventory methods.[99] The indirect nitrogen emission rate,[100] including the emissions associated with nitrification-denitrification process of nitrogen remaining in the soil and from nitrogen lost through runoff and leaching is the same as the emission rate provided in Table 21.

The total direct and indirect emissions from soil management for the San Diego region in 2014 were 19,729 $MTCO_2e$ (28.3 MT N_2O). After scaling by agricultural land use, emissions from soil management in the Unincorporated County were estimated at 17,655 $MTCO_2e$, of which 75 percent is from direct emissions and 25 percent is from indirect emissions.

4.6.5 Residue Burning

The CO_2, CH_4, and N_2O emissions from open burning of agricultural biomass can be estimated using the California Inventory Methods from ARB.[101] This method uses the harvested acreages of six crops accounting for the majority of biomass burning in a given year, including corn, wheat, barley, walnut, almond, and rice, multiplied by the crop-specific emission factor in California to estimate the total emissions from residue burning. According to the County's Department of Agriculture, Weights, and Measures, even though the 2014 Crop Statistics & Annual Report does not report corn, wheat, and barley, these crops are still grown in San Diego County. However, unlike other counties, the corn, wheat,

and barley crop grown in San Diego County are not burned.[102] The County also does not grow walnut, almond, or rice crops. As such, in 2014 there were no GHG emissions due to residue burning in the Unincorporated County.

4.6.6 Rice Cultivation

Rice is not reported in the 2014 Crop Statistics & Annual Report,[103] as such, in 2014 there were no GHG emissions due to rice cultivation in San Diego County.

4.6.7 Diesel Irrigation Pumps

The GHG emission factor and quantification method for agricultural diesel irrigation pumps and number of pumps were obtained from ARB reports on diesel irrigation pumps[104]. Latest reports provided total diesel pumps in the San Diego Air Pollution Control District in 2003. According to these reports, approximately 178 portable and stationary pumps were estimated to operate in the County in 2003. The County's pump inventory in 2014 was assumed unchanged from 2003[105]. Scaling the County's pump inventory by the number of agricultural acres in unincorporated area, the unincorporated area's pump inventory is estimated at 159 pumps. ARB assumes an emission factor of 568.3 g CO_2 per brake-horsepower hour, an average pump horsepower of 130, and an average annual usage of 1,000 hours. ARB did not provide estimates for CH_4 and N_2O emissions. Operation of diesel irrigation pumps in 2014 resulted in approximately 11,768 $MTCO_2e$.

4.7 Water

The water supplied to a community's residents, businesses,[106] and agricultural lands contributes GHG emissions through energy used for extraction, conveyance, treatment, and distribution.[107] The amount of emissions depends on the sources of water, distance of water conveyance, and the water treatment processes. Emissions from water supplied to Unincorporated County in 2014 were estimated based on Method WW.14 from the ICLEI Community Protocol.[108] Method WW.14 accounts for each segment of the water cycle (groundwater extraction, upstream supply and conveyance, water treatment, and local water distribution) individually, using estimated energy intensities per unit of water for each segment of the water cycle. Energy consumption and the corresponding GHG emissions from the end-use phase, such as in hot water heaters or private well pumps, are already included in the electricity and natural gas sectors discussed in Section 4.2 and 4.3 and are not captured in the water sector. Annual electricity use in 2014 from pumping and treatment of water occurring within the unincorporated area – a total of 78,787 MWh – was subtracted from the electricity sector but captured in this sector to avoid double counting (Table 29). Water use at non-unincorporated County facilities was also included and assumed to have a local water supply source due to being located in incorporated cities.

The total emissions from the water sector in Unincorporated County were estimated at 134,269 $MTCO_2e$ in 2014. The breakdown of emissions in each segment of the water cycle is provided in Figure 9. The numerical breakdown of emissions in each segment of the water cycle is provided Table 25 in descending order. The vast majority (89 percent) of emissions from the water sector in 2014 were from upstream surface water. The methods used to estimate total water supplied to Unincorporated County and the GHG emissions are provided in Sections 4.7.1 and 4.7.2. See *County Operations Greenhouse Gas Emissions Inventory and Projections Report* for more details on the emissions calculations for water use at non-unincorporated County facilities.

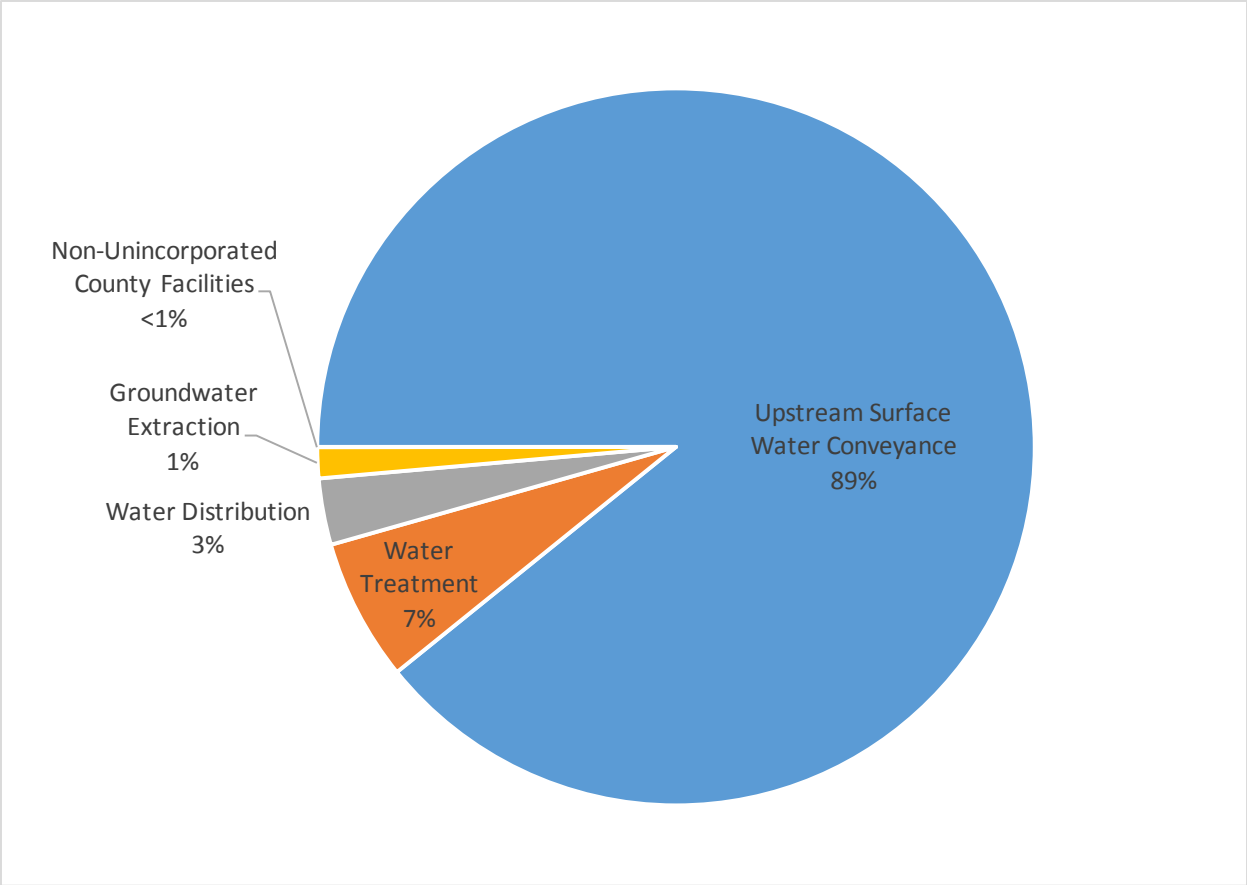


Figure 9: Breakdown of Emissions from the Water Sector (2014)

Table 25: Breakdown of Emissions from the Water Sector (2014)

Source	GHG Emissions ($MTCO_2e$)
Upstream Surface Water Conveyance	119,770
Water Treatment	8,589
Water Distribution	4,023
Groundwater Extraction	1,870
Non-Unincorporated County Facilities	16
Total	134,269

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

4.7.1 Water Supply

The total water supplied to the Unincorporated County was 45.6 billion gallons (275 gallons/person/day) in 2014, including agricultural applications (Table 26).[109] Non-unincorporated facilities used 183 million gallons per year in 2014. Sections 4.7.1.1 and 4.7.1.2 describe water supplied from San Diego County Water Authority (SDCWA) member agencies and from suppliers outside the SDCWA service area.

Table 26: Water Supplied and Sources (2014)

Total Water Supplied (million gallons/year)	45,678
Groundwater	*3,408*
Surface Water	*40,821*
Recycled Water	*1,449*
Modified Unincorporated County Population	454,599
Per Capita Water Supplied (gal/person/day)	275
Unincorporated Area Water Use (million gallons per year)	45,630
Water Use at Non-Unincorporated County Facilities (million gallons per year)	183
Unincorporated Area Water Use (million gallons per year)	45,755

Source: EPIC, 2016

4.7.1.1 Water Supply from SDCWA Member Agencies

SDCWA has 24-member agencies that provide water in the San Diego region, of which 16 member agencies provide water to the unincorporated area. The total water supplied from these 16 member agencies was 42,839 million gallons in 2014. The area population in the unincorporated area within the SDCWA member agencies service areas in 2014 was 408,688, or 90 percent of the total Unincorporated County population (454,599). The SDCWA member agencies, service area population, water supplied, and source of water supplied are provided in Table 27.

Table 27: Water Supplied to Unincorporated County from SDCWA Member Agencies (2014)

SDCWA Member Agency	Service Area Population[110]	Per Capita Water Supplied (gal/person/day)[111]	Water Supplied (million gallons/yr)[112]	Percent Breakdown of Water Sources for each Member Agency[113] (%)		
				Groundwater	Surface Water	Recycled Water
Fallbrook P.U.D.	33,859	360	4,453	0	94	6
Helix W.D.	79,672	117	3,398	0	100	0
Lakeside W.D.	30,597	121	1,351	15	85	0
Olivenhain M.W.D.	25,519	271	2,526	0	88	12
Otay W.D.	70,184	160	4,097	0	88	12
Padre Dam M.W.D.	36,433	132	1,751	0	91	9
Rainbow M.W.D.	20,198	1,029	7,583	0	100	0
Ramona M.W.D.	34,451	183	2,297	0	90	10
Santa Fe I.D.	6,751	560	1,380	0	100	0
South Bay I.D.	16,183	100	591	26	74	0
Vallecitos W.D.	7,902	164	473	0	100	0
Valley Center M.W.D.	26,305	1,061	10,184	0	100	0
Vista I.D.	18,662	145	988	0	100	0
Yuima M.W.D.	1,972	2,455	1,767	12	88	0
Total or Weighted Average	408,688†	287‡	42,839†	2‡	93‡	5‡

I.D. = Irrigation District, M.W.D. = Municipal Water District, P.U.D. = Public Utility District, W.D. = Water District, SDCWA = San Diego County Water Agency, † = total, ‡ = weighted average

Aside from estimates for Lakeside W.D., this approach in quantifying the water supplied to the Unincorporated County from SDCWA Member Agencies represents best available data. Adjustments were made as necessary where sufficient data were not available. The actual population served would likely be lower than the service area population due to the greater likelihood of unincorporated

residents and businesses using private wells. As such, the analysis presented for this sector is conservative. Additionally, the unincorporated area is more likely to have agricultural water customers that could affect per-capita water use. Table 27 shows a few agencies with very high per-capita consumption rates. This is likely due to some member agencies supplying water for agricultural purposes to areas with a relatively low population, such as for Rainbow M.W.D., Valley Center M.W.D., and Yuima M.W.D. service areas.

4.7.1.2 Water Supply outside SDCWA Service Area

For the population outside SDCWA service area, it is assumed that water supply is local groundwater and derived from on-site private wells, small community water systems or private water companies.[114] The total water supplied outside SDCWA service area was 2,840 million gallons in 2014. Among the water supply providers listed in Table 28, the Campo Hills Water System (Campo Water Maintenance District) is owned and operated by the County. Based on the difference between the total population in the Unincorporated County and the population in the SDCWA Service Area (Table 27), the population outside the SDCWA service area is 45,911. Among the population outside the SDCWA service area, the population that does not have specified water supply providers is 36,260. The providers, population they serve, and water supplied are provided in Table 28.

Table 28: Water Supply outside SDCWA Service Area (2014)

Water Supply Provider	Service Area Population[115]	Water Supplied (million gallons/year)
Campo Hills Water System (Campo Water Maintenance District)[116]	580	28
Borrego W.D.[117]	3,670	793
Canebrake County W.D.*[118]	71	3
Cuyamaca W.D.*	134	6
Descanso C.S.D.*	714	35
Jacumba C.S.D.*	389	19
Julian C.S.D.*	287	14
Majestic Pines C.S.D.*	1,045	51
Mootamai M.W.D.*	576	28
Pine Hills Mutual Water Company*	281	14
Pine Valley Mutual Water Company*	1,397	68
Questhaven M.W.D.*	7	0.3
Rancho Pauma Mutual Water Company*	227	11
San Luis Rey M.W.D.*	164	8
Wynola W.D.*	109	5
Unspecified Water Supply[119]	36,260	1,757
Total	45,911	2,840

*Service area population provided by County of San Diego, 2016
C.S.D. = Community Services District, M.W.D. = Municipal Water District, W.D. = Water District

4.7.2 Emissions from Water Supplied

The energy intensity per unit of water, annual volume of water use, calculated energy use, and estimated emissions for each segment of the water system is provided in Table 29. Table 29 also shows the amount of electricity use occurring within the Unincorporated County that was subtracted from the electricity sector but captured in this sector to avoid double counting. The total volume of water use at each segment of the water system was multiplied by the energy intensities specific to those segments to estimate total electricity consumption.

Table 29: Energy Use and Emissions for Each Segment of the Water System

Segment of Water System	MG[120]	kWh/MG	MWh	GHG Emissions ($MTCO_2e$)	Percent in Unincorporated County[121] (%)	Excluded Electricity Use (MWh)[122]
Surface Water						
Upstream Surface Water [123]	40,821	9,727	397,065	119,770	15	59,560
Conventional Water Treatment[124]		684	27,922	8,422	0	0
Groundwater						
Extraction[125]	3,408	1,819	6,199	1,870	95	5,889
Treatment						
No Conventional Water Treatment	3,254	0	0	0	0	0
Conventional Water Treatment	0	684	0	0	0	0
Advanced Water Treatment[126]	154	3,600	553	167	0	0
Local Water Supply Including Recycled Water						
Local Water Distribution[127]	45,678	292	13,338	4,023	100	13,338
Total			445,078	134,271	Not Applicable	78,787

MG = million gallons, kWh = kilowatt-hours, MWh = megawatt-hours, GHG = greenhouse gas, MTCO2e = metric tons of CO2 equivalent
Source: EPIC, 2016

4.7.2.1 Surface Water

For emissions from upstream surface water conveyance, surface water supplied (Table 26) was multiplied by the upstream surface water and conveyance energy intensity to obtain the electricity consumption. The electricity consumption was then multiplied by the SDG&E service territory electricity emission factor in 2014, which is the best available emissions factor for upstream electricity supply to estimate GHG emissions.

For water treatment, it is assumed that all the water treatment plants in the SDCWA service area, such as Metropolitan Water District's Robert A. Skinner Water Treatment Plant and Helix Water District's R.M. Levy Treatment Plant, have conventional water treatment processes. The total surface water supplied was multiplied by the conventional water treatment energy intensity to obtain the electricity consumption and GHG emissions. In 2014, 15 percent of the total surface water supply was treated at water treatment plants within the unincorporated area. The water treatment electricity consumption and GHG emissions are included in this sector and; therefore, were deducted from the electricity sector to avoid double counting.[128]

For local water distribution, the surface water supplied was multiplied by the local water distribution energy intensity to obtain the electricity consumption and GHG emissions. Local water distribution electricity consumption and associated GHG emissions are included in this sector and; therefore, were deducted from the electricity sector to avoid double counting.

4.7.2.2 Groundwater

For emissions from groundwater extraction, the total groundwater supplied (Table 26) was multiplied by the groundwater extraction energy intensity to obtain the electricity consumption and GHG emissions. For the groundwater supplied by suppliers or water districts located within the unincorporated area (95 percent of total groundwater supply),[129] the groundwater extraction electricity consumption and associated GHG are included in this sector and; therefore, were deducted from the electricity sector to avoid double counting.

Groundwater supply may go through different types of treatment as shown in Table 30. The energy intensity for advanced treatment (with reverse osmosis) was applied correspondingly to brackish

groundwater to obtain the electricity consumption and GHG emissions. Groundwater treatment electricity consumption and associated GHG emissions are outside the unincorporated area and are not captured in the electricity sector but are included in the water sector.

Table 30: Types of Treatment for Groundwater Supplied to Unincorporated County (2014)

Groundwater Treatment	Ground Water Supplied (million gallons)
No Conventional Water Treatment[130]	*3,254*
Conventional Water Treatment	*0*
Advanced Water Treatment[131]	*154*
Total	*3,408*

Source: EPIC, 2016

For local water distribution, total groundwater supplied was multiplied by the local water distribution energy intensity to obtain the electricity consumption and GHG emissions. Local groundwater distribution electricity consumption and associated GHG emissions are included in this sector and were deducted from the electricity sector to avoid double counting.

4.7.2.3 Recycled Water

Only the local water distribution energy intensity was applied to recycled water to obtain the electricity consumption and GHG emissions. It is assumed the recycled water supplied after tertiary treatment from water reclamation facilities is directly supplied for non-potable water use, including agricultural, golf course and landscape irrigation, with no further water treatment needed.[132] Local recycled water distribution electricity consumption and associated GHG emissions are included in this sector and; therefore, deducted from the electricity sector to avoid double counting.

4.8 Off-Road Transportation

Off-road motor vehicles and equipment (both diesel and gasoline-fueled) contribute GHG emissions to the Unincorporated County from fuel combustion in internal combustion engines. The GHG emissions from the off-road sector are broken down by activity sub-category (Table 31). The ARB released the model OFFROAD 2007[133] to calculate statewide and air-basin specific emissions from off-road sources. After the release of OFFROAD2007, ARB has been developing an inventory and model for each sub-category based on specific regulatory support. For example, a new 2011 Inventory Model[134] has been developed for In-Use Off-Road Equipment including construction and mining, industrial, airport ground support, and oil drilling, and the Recreational Equipment sector in OFFROAD2007 was replaced by RV2013.[135] In this section, new inventories and models were used if available, otherwise, OFFROAD2007 was used. It was assumed that all County-operated off-road activity is included in this estimate.

Due to the lack of specific data on the different sub-categories of vehicles and equipment in the Unincorporated County, the emissions or fuel consumption reported in the ARB models for San Diego County or the San Diego air basin were scaled to the Unincorporated County based on sub-category specific scaling factors. All activity sub-categories, model sources, and scaling factors used in this section are presented in Table 31.

Table 31: Off-Road Activity Sub-Category, Model Sources, and Scaling Factors

Sub-Category[136]	Model Source	Scaling factor
Lawn and Garden Equipment	OFFROAD2007	Population
Light Commercial Equipment	OFFROAD2007	Commercial Jobs
Transport Refrigeration Units	OFFROAD2007	Commercial Jobs
Airport Ground Support	In-Use Off-Road Equipment 2011 Inventory	Commercial Jobs
Construction and Mining	In-Use Off-Road Equipment 2011 Inventory	Commercial Jobs
Industrial	In-Use Off-Road Equipment 2011 Inventory	Industrial Jobs
Recreational Vehicles	RV2013	Population

Source: ARB, EPIC 2016

The total 2014 GHG emissions from the off-road transportation sector in the Unincorporated County were estimated at 36,927 $MTCO_2e$. The breakdown of emissions from each sub-category is provided in Figure 10 and Table 32 provides a numerical breakdown of the emissions from the off-road sector by sub-category in descending order.

Methods used to estimate emissions from the off-road transportation sector are provided in Sections 4.8.1 to 4.8.3.

4.8.1 Sub-Categories in OFFROAD2007 Model

OFFROAD2007 is used for sub-categories not captured by sector-specific inventories and models, including Lawn and Garden Equipment, Light Commercial Equipment, and Transport Refrigeration Units.[137] The 2014 CO_2 emissions from each sub-category in the San Diego air basin were reported in tons/day and converted to annual emissions by multiplying by 365 days per year. Based on Table 31, the scaling factor used for Lawn and Garden Equipment was population, as modified in Table 1, and the scaling factor used for both Light Commercial Equipment and Transport Refrigeration Units was commercial jobs, based on the modified number of jobs in Table 2. The GHG emissions in 2014 from Lawn and Garden Equipment, Light Commercial Equipment, and Transport Refrigeration Units in the Unincorporated County are provided in Table 33.

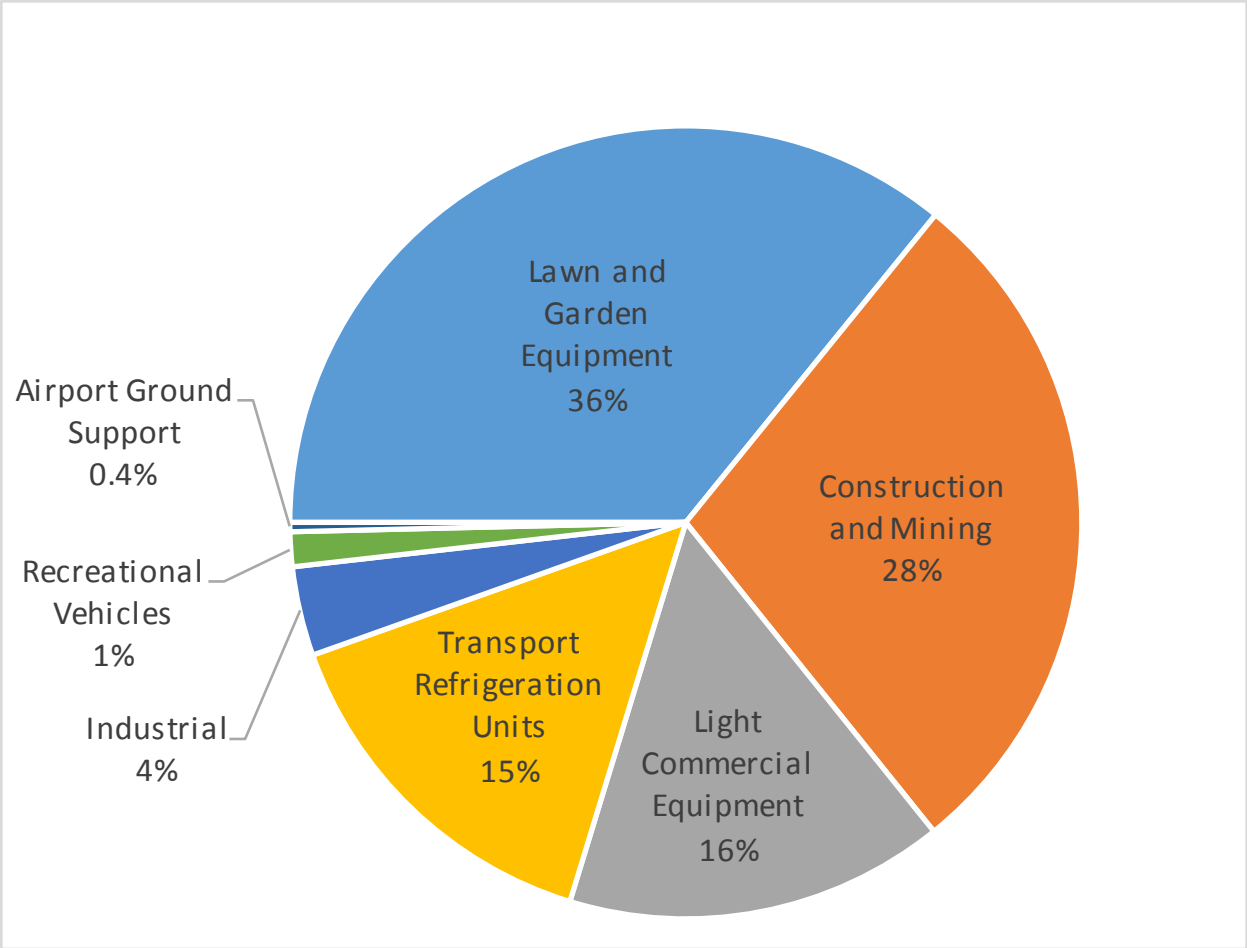


Figure 10: Breakdown of Emissions from the Off-Road Sector (2014)

Table 32: Breakdown of Emissions from the Off-Road Sector (2014)

Sub-Category	GHG Emissions ($MTCO_2e$)
Lawn and Garden Equipment	13,244
Construction and Mining	10,472
Light Commercial Equipment	5,726
Transport Refrigeration Units	5,480
Industrial	1,345
Recreational Vehicles	522
Airport Ground Support	139
Total	36,927

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

Table 33: Emissions from Off-Road Lawn and Garden Equipment, Light Commercial Equipment, and Transport Refrigeration Units (2014)

Sub-Category	San Diego Air Basin ($MMTCO_2e$)	Unincorporated Percent of Entire County (%)	Unincorporated County ($MTCO_2e$)
Lawn and Garden Equipment	0.0930	14	13,244
Light Commercial Equipment	0.1018	5.6	5,726
Transport Refrigeration Units	0.0974	5.6	5,480

$MMTCO_2e$ = million metric tons of CO_2 equivalent, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: ARB, SANDAG, EPIC 2016.

4.8.2 Sub-Categories in In-Use Off-Road Equipment 2011 Inventory

The sub-categories in the In-Use Off-Road Equipment 2011 Inventory are airport ground support, construction and mining, industrial, and oil drilling. In the 2011 Inventory, fuel consumption from each sub-category (lb/year) is reported for 2014. There is no fuel consumption reported from oil drilling in the San Diego air basin. For the other three sub-categories, fuel consumption in the San Diego air basin was converted to CO_2, CH_4, and N_2O emissions using fuel heat content and the emission factor for each gas.[138] The CO_2e emissions were calculated from each gas using GWP factors from Section 2.3.

The emissions from each sub-category for the San Diego air basin were scaled down to the Unincorporated County. Based on Table 31, the scaling factors used for Airport Ground Support and Construction and Mining were commercial jobs, and the scaling factor used for Industrial off-road sources was industrial jobs. In 2014, the total number of commercial jobs was 69,648 and the total number of industrial jobs was 16,094 in the Unincorporated County (Section 2.2). The number of commercial and industrial jobs in San Diego County (same as San Diego air basin) were calculated using the same method as described in Section 2.2. The GHG emissions in 2014 from Airport Ground Support, Construction and Mining, and Industrial in the Unincorporated County are provided in Table 34.

Table 34: Emissions from Activities in Airport Ground Support, Construction and Mining, and Industrial (2014)

Sub-Category	San Diego Air Basin ($MMTCO_2e$)	Unincorporated Percent of Entire County (%)	Unincorporated County ($MTCO_2e$)
Airport Ground Support	0.0025	5.6	139
Construction and Mining	0.1862	5.6	10,472
Industrial	0.0127	10.6	1,345

$MMTCO_2e$ = million metric tons of CO_2 equivalent, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: ARB, SANDAG, EPIC 2016.

4.8.3 Sub-Categories in RV2013

Recreational Vehicles included in RV2013 are all terrain vehicles, golf specialty, mini-bikes, and off-road motorcycles. [139] The 2014 CO2 emissions from recreational vehicles in San Diego County were reported in tons/day and converted to annual emissions by multiplying by 365 days per year. The scaling factor used for this sub-category was population. In 2014, the population in Unincorporated County and San Diego County was 454,599 and 3,192,457, respectively (See Section 2.2).[140] The GHG emissions in 2014 from recreational vehicles in the Unincorporated County are provided in Table 35.

Table 35: Emissions from Off-Road Recreational Vehicles (2014)

Sub-Category	San Diego County ($MMTCO_2e$)	Unincorporated Percent of Entire County (%)	Unincorporated County ($MTCO_2e$)
Recreational Vehicles	0.0037	14	522

$MMTCO_2e$ = million metric tons of CO_2 equivalent, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: ARB, SANDAG, EPIC 2016

4.9 Wastewater

The wastewater generated by community residents and businesses creates GHG emissions during the treatment processes, including process, stationary, and fugitive emissions. The emissions depend on the type of wastewater treatment plant (WWTP) and their treatment processes.

The total emissions from the wastewater sector in the Unincorporated County were estimated at 21,183 $MTCO_2e$ in 2014. The breakdown between emissions from wastewater is provided in Figure 11 and Table 36.

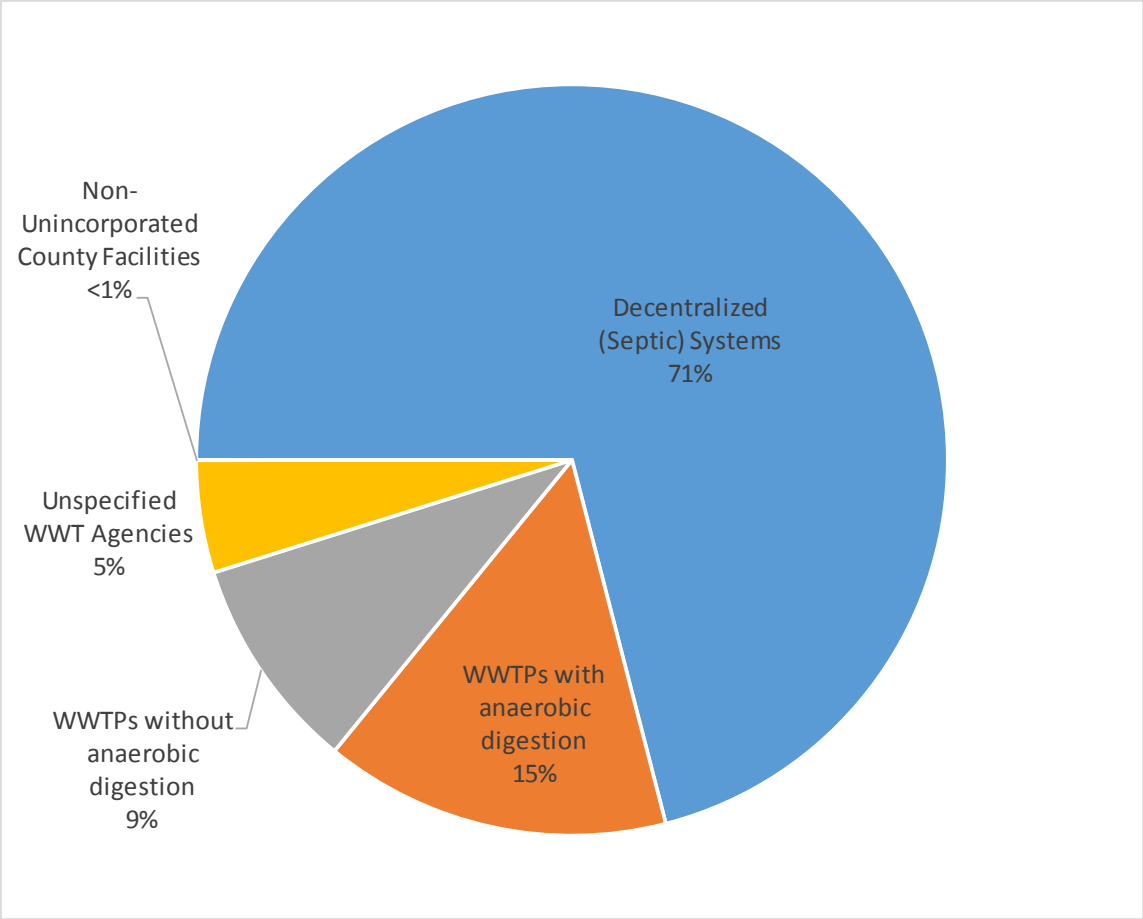


Figure 11: Breakdown of Emissions from the Wastewater Sector (2014)

Table 36 provides a numerical breakdown of the emissions from the wastewater sector by source in descending order.

Table 36: Breakdown of Emissions from the Wastewater Sector (2014)

Source	GHG Emission ($MTCO_2e$)
Decentralized (Septic) Systems	15,036
WWTPs with anaerobic digestion	3,158
WWTPs without anaerobic digestion	1,962
Unspecified Wastewater Treatment (WWT) Agencies	1,025
Non-Unincorporated County Facilities	2
Total	21,183

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

The methods used to estimate total wastewater flow from the unincorporated area and GHG emissions are provided in Sections 4.9.1 and 4.9.2. Section 4.9.1 describes the wastewater flow and collecting agencies responsible for treating wastewater from the unincorporated area. Section 4.9.2 describes the various wastewater processes and the specific unincorporated area emissions associated with each. Wastewater generated by non-unincorporated County facilities are assumed to be treated by "Unspecified Wastewater Treatment Agencies". See *County Operations Greenhouse Gas Emissions*

Inventory and Projections Report for more details on the emissions calculations from wastewater generated at non-unincorporated County facilities.

4.9.1 Wastewater Flow and Collecting Agencies

This section describes the various wastewater collecting agencies that serve the Unincorporated County. In addition to County-run facilities, there are individual wastewater treatment agencies, SDCWA member agencies, and private septic systems serving the unincorporated area. Populations not served by either of these entities are assumed to be served by generic agencies outside the Unincorporated County. Table 37 lists the wastewater collecting agencies, population served or service area population, and total wastewater flow associated with the agencies or systems. Emissions estimates based on service area population are conservative in that a portion of the population residing in a service area may not actually be served by the associated wastewater collecting agency.

Table 37: Wastewater Flow and Population by Collecting Agency (2014)

Wastewater Collecting Agency	Population Served or Service Area Population[141]	Wastewater Flow (million gallons/year)
County of San Diego, Department of Public Works	49,968	4,051
Individual Water Agencies	28,182	906
SDCWA Member Agencies	172,312	3,362
Septic Systems	154,000	5,116
Other Wastewater Agencies	50,137	1,665
Total	454,599	15,101

4.9.1.1 County of San Diego, Department of Public Works

The Wastewater Management Section of the County's Department of Public Works is responsible for the operation and maintenance of the County's five sanitation districts and four maintenance districts.[142] Wastewater collected within Campo, Julian, and Pine Valley Sanitation and Maintenance Districts is transmitted and treated at five county-maintained wastewater treatment plants (Table 38).[143] Wastewater collected from the remaining districts is transferred through the City of San Diego's Metropolitan Wastewater System, to the City's Point Loma Wastewater Treatment Plant (Point Loma WWTP) for treatment and disposal. The population served and wastewater flow for each treatment facility in 2014 are provided in Table 38.[144]

Table 38: Wastewater Flow Collected by County of San Diego's Department of Public Works (2014)

Treatment Facility	Population Served	Wastewater Flow (million gallons/year)
County-Maintained WWTPs	1,968	30
Heise Park WWTP	*200*	*1*
Julian WWTP	*315*	*8*
Pine Valley WWTP	*183*	*3*
Rancho del Campo WWTP	*945*	*16*
San Pasqual Academy WWTP	*325*	*2*
City of San Diego's Point Loma WWTP	48,000	4,021
Total	49,968	4,051

Totals may not add due to rounding. WWTP = wastewater treatment plant
Source: County of San Diego, 2015

4.9.1.2 Individual Wastewater Agencies

Other individual wastewater agencies, including Community Service Districts (CSD) and Sanitation Districts, collect wastewater flows from communities in the unincorporated area (Table 39).

Table 39: Wastewater Flows Collected by Individual Wastewater Agencies (2014)

Wastewater Agency	Treatment Facility[145]	Service Area Population[146]	Wastewater Flow[147] (million gallons/year)
Borrego W.D.	Rams Hill WWTF	3,670	25
Buena Sanitation Maintenance District	Encina WPCF	10,736	386
Fairbanks Ranch CSD	Fairbanks Ranch WPCF	1,579	53
Pauma Valley CSD	Pauma Valley Treatment Plant	1,029	19
Rancho Santa Fe CSD	Santa Fe Valley WRF Rancho Santa Fe WRF	8,528	306
Whispering Palms CSD	Whispering Palms WPCF	2,640	117
Total		28,182	906

Totals may not add due to rounding. W.D. = water district, CSD = Community Service District, WPCF = Water Pollution Control Facility, WRF = Water Reclamation/Recycling Facility, WWTF = Wastewater Treatment Facility
Source: EPIC, 2016

4.9.1.3 SDCWA Member Agencies

Nine SDCWA member agencies provide wastewater services to the Unincorporated County (Table 40).

Table 40: Wastewater Flow Collected by SDCWA Member Agencies (2014)

Wastewater Agency[148]	Treatment Facility[149]	Service Area Population[150]	Wastewater Flow[151] (million gallons/year)
Fallbrook P.U.D.	Fallbrook Plant #1 WRF	26,081	754
Helix W.D.	Point Loma WWTP	31,672	618
Olivenhain M.W.D.	4S Ranch WRF	17,242	413
Otay W.D.	Ralph W. Chapman WRF	16,142	402
Padre Dam M.W.D.	Padre Dam WRF	8,152	159
Rainbow M.W.D.	San Luis Rey WWTP	20,198	394
Ramona M.W.D.	Santa Maria WRF San Vicente WRF	20,261	380
Vallecitos W.D.	Meadowlark WRF	6,259	118
Valley Center M.W.D.	Wood Valley Ranch WRF Lower Moosa Canyon WRF	26,305	124
Total		172,312	3,362

Totals may not add due to rounding. P.U.D. = public utility district, W.D. = water district, M.W.D. = municipal water district, WRF = Water Reclamation/Recycling Facility, WWTP = Wastewater Treatment Plant.
Source: EPIC, 2016.

4.9.1.4 Decentralized Wastewater Treatment System

Rural communities with dispersed population typically adopt a decentralized approach to wastewater treatment. The treatment and discharge is often on-site or near the origins. Septic systems, considered underground wastewater treatment systems, are commonly used as on-site treatment systems.[152] In the San Diego region (San Diego-Carlsbad Metropolitan Statistical Area),[153] the population estimated to be served by on-site septic systems is 154,000.[154] As a conservative approach, it is assumed that all persons served by septic systems in the San Diego region are in the unincorporated area. Based on the per capita wastewater generated (91 gallons/person/day) from Sections 4.9.1.1 to 4.9.1.3, the volume of wastewater treated at decentralized wastewater treatment systems was 5,116 million gallons in 2014.

4.9.1.5 Unspecified Wastewater Collecting Agencies

For the rest of the population (50,137)[155] not covered by specified agencies or decentralized treatment systems, it is assumed that wastewater flows are collected through other agencies and collection systems surrounding the unincorporated area (not listed in Table 38 to Table 40).[156] Based on the per capita wastewater generated (91 gallons/person/day) from Sections 4.9.1.1 to 4.9.1.3, the volume of wastewater treated at unspecified wastewater systems was 1,665 million gallons in 2014.

4.9.2 Emissions from Wastewater Treatment

Emissions from wastewater treatment depend on the treatment processes. Treatment levels and processes vary in different WWTPs. A centralized conventional WWTP includes aerobic systems to degrade dissolved organics. Additional treatments include nitrification/denitrification (oxidization or removal of nitrogenous waste), anaerobic digestion (degradation of organics to produce digester gas) and combustion of digester gas. A decentralized wastewater treatment system, such as a septic system, only includes physical settling and biological activities without other processes typically used at a centralized WWTP. A summary of emissions from each wastewater treatment process is shown in Figure 11 and Table 36.

4.9.2.1 Emissions from Wastewater Treated at Conventional WWTPs with Anaerobic Digestion

From Table 38 to Table 40, the facilities that have anaerobic digesters in place are Point Loma WWTP, Encina Water Pollution Control Facility (WPCF), and San Luis Rey WWTP.[157] For the wastewater treated at Point Loma WWTP, the emissions factor for wastewater treatment process at Point Loma WWTP ($MTCO_2e$/million gallon) was calculated as follows: in 2014, Point Loma WWTP treated 50,815 million gallons of wastewater[158] with total GHG emissions of 22,888 $MTCO_2e$, based on reports from ARB's Mandatory Reporting Rule. It resulted in an emissions factor of 0.45 $MTCO_2e$/million gallons which consists of emissions from a) direct CO_2 from combustion of anaerobic digester gas, b) CH_4 and N_2O emissions from digester gas combustion, and c) fossil fuel emissions from complete combustion.[159] In 2014, the total volume of wastewater sent to the Point Loma WWTP for treatment from the Unincorporated County was collected by the County's Department of Public Works and from the rest of Helix W.D.'s service area in the Unincorporated County. Combining the total Unincorporated County wastewater sent to the Point Loma WWTP, with the calculated emissions factor resulted in emissions of 2,090 $MTCO_2e$.

For wastewater treated at the Encina WPCF, the emissions factor for wastewater treatment processes at Encina WPCF was applied. In 2013, the latest year with data available, the Encina WPCF treated 8,317 million gallons of wastewater with total GHG emissions of 11,359 $MTCO_2e$, resulting in an emissions factor of 1.37 $MTCO_2e$/million gallon.[160] In 2014, the total wastewater flow sent to the Encina WPCF for treatment from the Unincorporated County was collected by the Buena Sanitation District, resulting in GHG emissions of 529 $MTCO_2e$.

For wastewater treated at the San Luis Rey WWTP, the wastewater emissions factor for the Encina WPCF was used as a proxy as they have the same level of treatment and similar treatment processes. In 2014, the total wastewater sent to the San Luis Rey WWTP for treatment from the Unincorporated County was collected by Rainbow M.W.D., resulting in GHG emissions of 540 $MTCO_2e$.

In 2014, total GHG emissions from WWTPs with anaerobic digestion were estimated at 3,158 $MTCO_2e$.

4.9.2.2 Emissions from Wastewater Treated at Conventional WWTPs without Anaerobic Digestion

For centralized WWTPs other than Point Loma WWTP, Encina WPCF, and San Luis Rey WWTP, it is assumed that no anaerobic digesters are in place, only aerobic processes.[161] For GHG emissions from this wastewater, the process emissions were estimated based on Method WW.7 (Process N_2O Emission with Nitrification/Denitrification) or Method WW.8 (Process N_2O Emission without Nitrification/Denitrification), and fugitive emissions were estimated based on Method WW.12 (N_2O emissions from effluent discharge) from the ICLEI Community Protocol.[162]

For Methods WW.7 and WW.8, process N_2O emissions were calculated based on the total population served by the WWTPs (139,856)[163] and an emission factor (7 g N_2O/person equivalent/year for a WWTP with nitrification/denitrification or 3.2 g N_2O/person equivalent/year for a WWTP without nitrification/denitrification).[164] For WW.12, effluent N_2O emissions were calculated based on total population, average total nitrogen per person in California and an emission factor for river or ocean discharge.[165]

In 2014, total GHG emissions from WWTPs without anaerobic digestion were estimated at 1,962 $MTCO_2e$.

4.9.2.3 Emissions from Wastewater Treated at Decentralized Systems

For wastewater treatment at decentralized systems (septic systems), GHG emissions were estimated based on Method WW.11 (Methane Emissions from Septic Systems) from ICLEI Community Protocol.[166] Methane (CH_4) emissions were calculated based on the total population served by septic systems (154,000) in San Diego County and a septic system CH_4 emission factor (10.7 g CH_4/person/day).[167] The actual number of persons served by septic systems in the unincorporated area is unknown and some septic systems may actually serve populations in incorporated cities. Illegal septic systems may also be in place. In light of these uncertainties, this estimate assumes a conservative approach and attributes the entire region's emissions from septic systems to the Unincorporated County. Based on this approach, in 2014, total GHG emissions from septic systems were estimated at 15,036 $MTCO_2e$.

4.9.2.4 Emissions from Wastewater Collected by Unspecified Agencies

It is assumed that the wastewater collected by unspecified agencies is treated at centralized WWTPs. The per-capita emissions from wastewater treatment for all known agencies, including the County's Department of Public Works, individual wastewater facilities, and SDCWA member agencies, is 0.02 $MTCO_2e$/person/year; that number was used as a proxy to estimate the wastewater emissions from unspecified collecting agencies. In 2014, total GHG emissions from unspecified wastewater collecting agencies were estimated at 1,027 $MTCO_2e$ for the Unincorporated County, 2 $MTCO_2e$ of which are associated with non-unincorporated County facilities.

5 SUMMARY OF GREENHOUSE GAS EMISSIONS PROJECTIONS TO 2020, 2030, 2040, AND 2050

Business-as-usual, or BAU, emissions projections provide the County with an assessment of how the Unincorporated County's emissions would change over time accounting for anticipated growth without further action from the County. The BAU projections also include legislative actions at the State and federal levels that would affect emissions without any local action, such as through regulatory requirements to increase vehicle fuel efficiency or renewable energy sources. These legislative-adjusted projections provide the County with the information needed to focus efforts on certain emissions sectors and sources that have the most GHG reduction opportunities.

Despite the anticipated growth in the Unincorporated County, as shown in Section 2, BAU GHG emissions generated by the Unincorporated County are expected to decrease by 6 percent by 2020, 12 percent by 2030, 11 percent by 2040, and seven percent by 2050 from 2014 levels (Table 41). GHGs would decrease over time independent of County actions due to the effect of existing state and federal regulations on GHG emissions, either through vehicle technology, energy efficiency standards or other policy mechanisms. Emissions projections, distributed into the same nine sectors analyzed for the baseline GHG emissions inventory, are presented in Figure 12 and Table 41. Figure 12 illustrates the contribution of each sector to total annual emissions from 2014 through 2050. Emissions from non-

unincorporated County facilities are projected using County-specific plans. See *County Operations Greenhouse Gas Emissions Inventory and Projections Report* for more details on projection assumptions and methodology for emissions from County operations.

Table 41 provides a numerical breakdown of the emissions projections for the Unincorporated County by sector in descending order.

Based on the estimates shown in Table 41, on-road transportation will continue to be the largest contributor to overall GHG emissions through 2050 despite an overall reduction in vehicle emissions. The reduction in vehicle emissions is largely due to legislative reductions from improvements in vehicle efficiency and fuels, even though SANDAG anticipates VMT in the Unincorporated County to increase over time. (Additional details related to the on-road transportation sector are discussed in Section 6.1.) Similarly, emissions from electricity use would continue to be the second largest sector in the Unincorporated County. Emissions from electricity would also decline over time, despite a population increase, due to legislative reductions increasing building energy efficiency and renewable electricity generation.

Without legislative reductions, the Unincorporated County's emissions would, instead, increase proportionally with growth. However, as mentioned, several existing legislative reductions would limit the Unincorporated County's emissions growth, causing the projected emissions reduction. The legislative reductions and scaling methods used to project emissions are discussed in detail in Section 6.

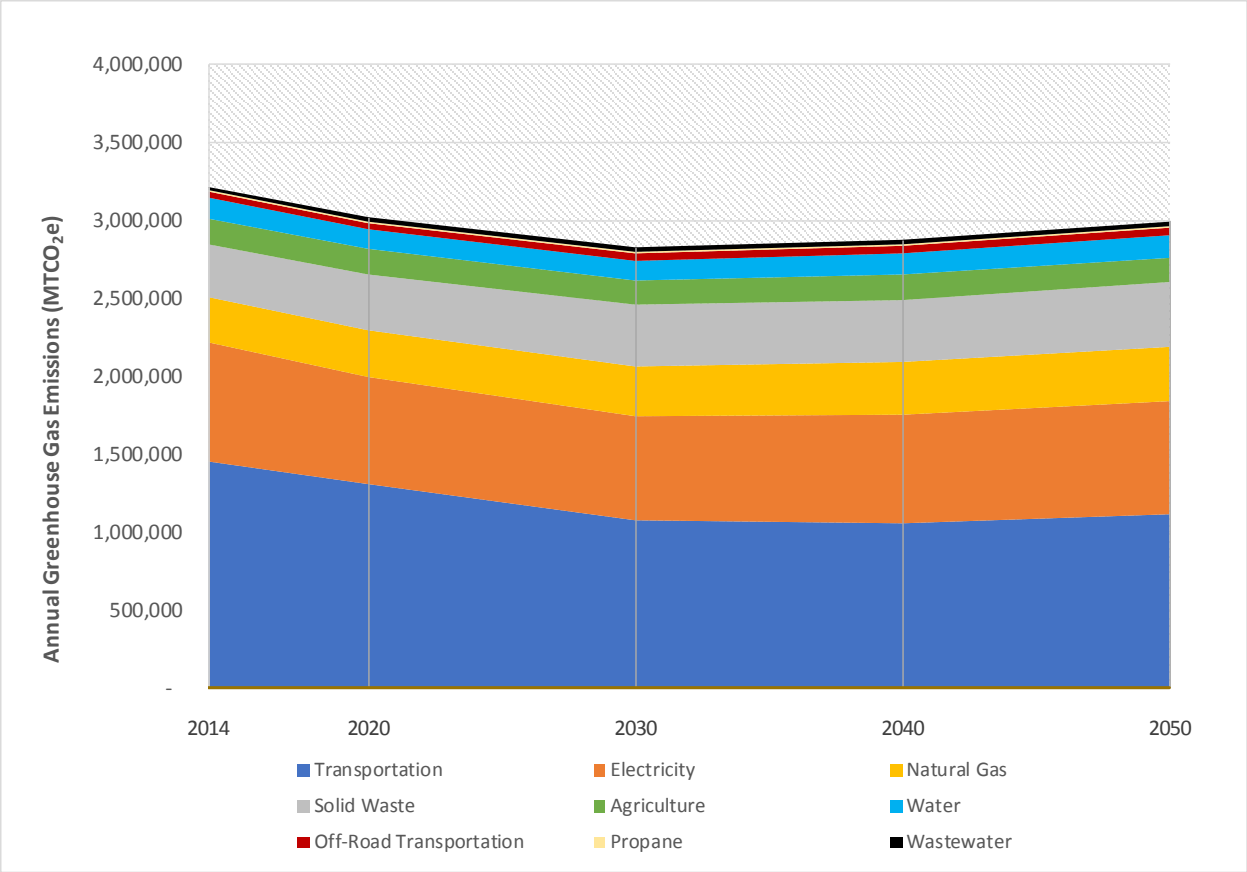


Figure 12: Projections of GHG Emissions with Legislative Reductions by Sector (2014 through 2050)

Table 41: Projections of GHG Emissions with Legislative Reductions (2014 through 2050)

Sector	GHG Emissions ($MTCO_2e$)				
	2014	2020	2030	2040	2050
On-Road Transportation	1,456,060	1,306,679	1,081,223	1,061,287	1,116,114
Electricity	760,638	690,144	661,266	692,408	723,503
Solid Waste	338,107	358,651	389,610	402,089	411,298
Natural Gas	290,712	302,017	323,008	336,836	353,041
Agriculture	163,696	161,376	160,136	159,264	158,760
Water	134,269	125,616	128,104	134,536	139,446
Off-Road Transportation	36,927	40,815	43,938	46,877	49,733
Wastewater	21,183	23,001	25,708	26,999	27,985
Propane	9,914	10,372	11,055	11,381	11,629
Total	3,211,505	3,018,671	2,824,049	2,871,675	2,991,507
Percent change from 2014 levels	0%	-6%	-12%	-11%	-7%
Modified Unincorporated Population	454,599	493,604	551,712	579,411	600,560
Service Population†	540,341	589,275	655,869	695,619	730,348
GHG Emissions per Capita	7.1	6.1	5.1	5.0	5.0
GHG Emissions per Service Population	5.9	5.1	4.3	4.1	4.1

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent, †= jobs + residents
Source: Ascent Environmental, 2017

6 SUMMARY OF GREENHOUSE GAS PROJECTIONS METHODS BY SECTOR

BAU projections described in this section for 2020, 2030, 2040, and 2050 are generally aligned with the State's GHG reduction target years established in key State legislation and policies, including Assembly Bill (AB 32), Senate Bill (SB 32), Executive Order B-30-15, and Executive Order S-03-05. Estimated BAU emissions projections were based on predicted growth in existing demographic units, including population, jobs, and household growth between 2014 and 2050 for San Diego County (see Section 2) as well as County plans for municipal operation (see *County Operations Greenhouse Gas Emissions Inventory and Projections Report* for more details). Projected emissions also account for anticipated changes in future emissions factors due to State and federal policies that would occur with or without County action, which can be referred to as "legislative adjustments" to the projections.

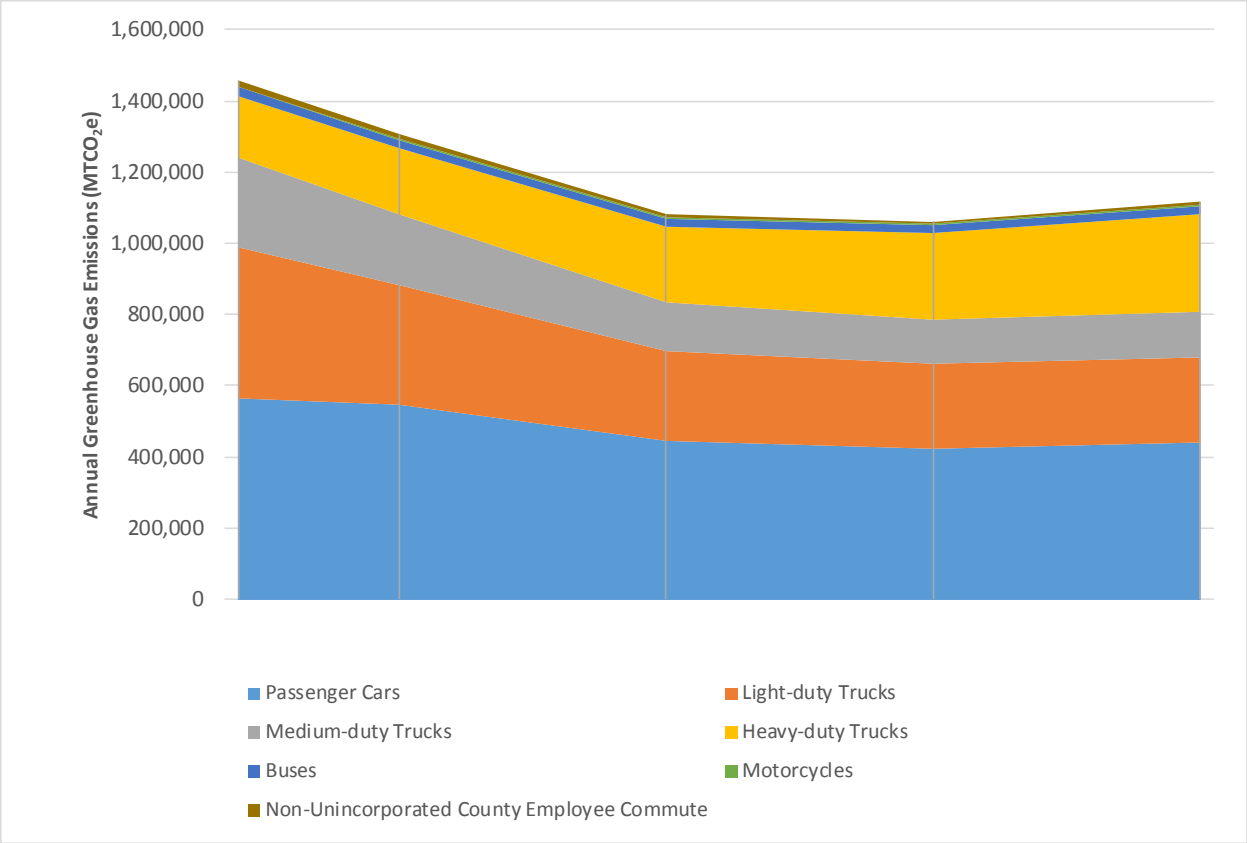
To project GHG emissions in future years, different methods were used depending on the emissions sector. For example, residential building energy emissions were scaled using housing unit projections and agricultural emissions subsectors were scaled by the anticipated change in agricultural lands in San Diego County. The forecast assumptions and methods for each sector are described in the following sections.

6.1 On-Road Transportation

Between 2014 and 2050, GHG emissions from on-road transportation in the Unincorporated County would gradually decrease by 23 percent from 1,456,060 $MTCO_2e$ to 1,116,114 $MTCO_2e$, accounting for VMT growth projected by SANDAG. Figure 13 and Table 42 show the projected emissions from the on-road transportation sector by vehicle class for 2014, 2020, 2030, 2040, and 2050. The VMT used, and methods to estimate the emission rate and emissions are provided in Sections 6.1.1 to 6.1.3.

Table 42 provides a numerical breakdown of the emissions projections for the on-road transportation sector by vehicle category in descending order.

Emissions from on-road transportation were calculated by multiplying VMT projections from SANDAG with the respective projected vehicle emission factors and percent mode shares from EMFAC for each projection year and vehicle category, provided in the sections that follow. Table 43 summarizes the methods and applied legislative reductions used to project on-road transportation emissions.



Source: Ascent Environmental, 2017

Figure 13: On-Road Transportation Emissions Projections (2014 – 2050)

Table 42: On-Road Transportation Emissions Projections (2014 – 2050)

Vehicle Category	GHG Emission ($MTCO_2e$)				
	2014	2020	2030	2040	2050
Passenger Cars	566,468	545,136	445,193	424,805	439,280
Light-duty Trucks	424,490	339,167	252,296	235,615	241,624
Medium-duty Trucks	251,486	196,366	137,402	126,275	127,472
Heavy-duty Trucks	170,414	188,280	213,639	242,276	274,347
Buses	25,223	22,115	20,295	20,482	21,331
Motorcycles	3,845	3,654	3,710	3,886	4,066
Non-Unincorporated County Employee Commute	14,134	11,962	8,689	7,948	7,992
Total	1,456,060	1,306,679	1,081,223	1,061,287	1,116,114
Percent Change from 2014 levels		-10%	-26%	-27%	-23%

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

Table 43: On-Road Transportation Emissions Forecast Methods and Legislative Reductions

Forecast Methods		
Source Category	Forecasted Activity Data	Applied Legislative Reductions
Unincorporated County	VMT for 2020 through 2050 provided by SANDAG in collaboration with the County of San Diego.	Applied EMFAC emission factors account for legislative reductions from Advanced Clean Cars, Pavley Clean Car Standards, Tractor-Trailer Greenhouse Gas Regulation, and adopted fuel efficiency standards for medium- and heavy-duty vehicles. Electricity-related emissions from electric vehicles scaled by changes to the future renewable mix under RPS and SB350 (See Section 6.2.2).
Non-Unincorporated County Employee Commute	Employee commute scaled by forecasted number of employees based on County facility expansion plans	

VMT = vehicles miles traveled, SANDAG = San Diego Association of Governments, EMFAC = Emissions FACtors model
Source: Ascent Environmental, 2017

6.1.1 SANDAG Transportation Activity Projections

Based on discussions with the County, SANDAG provided adjusted Series 13 projections for Internal-Internal, Internal-External, and External-Internal daily weekday VMT within the Unincorporated County land jurisdiction for 2020, 2030, 2040, and 2050. Using the same methods as described in Section 4.1.1, Table 44 shows the anticipated change in VMT by trip type in future years.

Table 44: SANDAG Forecasted O-D VMT from Trips (2014-2050)

Trip Type	2014	2020	2030	2040	2050
Internal-Internal	1,980,624	2,077,605	2,220,681	2,431,376	2,613,142
Internal-External/ External-Internal	13,645,564	14,343,115	15,803,292	16,583,851	17,291,337
Total Weekday VMT/day	8,803,406	9,249,162	10,122,327	10,723,301	11,258,810
Annual VMT[168]	3,084,713,386	3,240,906,504	3,546,863,373	3,757,444,822	3,945,087,154
Percent Change from 2014 levels		5%	15%	22%	28%

VMT = vehicles miles traveled
Source: SANDAG 2016

6.1.2 Reduction in Vehicle Emission Factors

State and federal policies and associated regulations incorporated in the on-road vehicle emission projections include:

- **Tractor-Trailer Greenhouse Gas (TTGHG) Regulation (State):** Establishes stricter fuel efficiency standards in heavy-duty tractors by requiring EPA certification and low rolling resistance tires, reducing GHG emissions.
- **Pavley Clean Car Standards (State):** Establishes GHG emission reduction standards for model years 2009 through 2016 that are more stringent than federal corporate average fuel economy (CAFE) standards.
- **Advanced Clean Cars (State):** Establishes GHG emission reduction standards for model years 2017 through 2025, that are more stringent than CAFE standards (State).
- **Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (federal):** Establishes fuel efficiency standards for medium and heavy-duty engines and vehicles.
- **Renewable Portfolio Standards and SB350 (State):** Reduces the emissions associated with each kWh of electricity generated due to greater future share of renewable energy sources, thereby reducing emission factors associated with electric vehicle use.

These policies are included in EMFAC2014's current and projected emission factor estimates and off-model estimates for electric vehicle emission factors. Low Carbon Fuel Standard regulation – which aims

to incentivize greater state-wide use of fuels that have low carbon intensities, or CO_2e emissions per unit of energy from their upstream production, refinery, and distribution –was excluded in EMFAC2014 projections because most of the emissions benefits originate from upstream fuel production. Table 45 shows the effect of these regulations on vehicle emission factors per mile by year and vehicle category, as estimated by off-model calculations and EMFAC2014 for San Diego County. Consistent with the methodology used for the baseline GHG emissions inventory, EMFAC's default CO_2 emission factors were scaled to CO_2e factors to account for the contribution of CH_4 and N_2O vehicle emissions.

Table 45: EMFAC 2014 Vehicle Emission Factors for San Diego County (g CO_2e/mi)

Vehicle Category	2014	2020	2030	2040	2050
Passenger Cars (Diesel)	337	286	217	200	198
Passenger Cars (Gasoline)	343	292	222	202	200
Passenger Cars (Electric)	97	83	76	76	76
Light Duty Trucks under 6,000 GVW (Diesel)	426	395	259	220	211
Light Duty Trucks under 6,000 GVW (Gasoline)	399	353	259	223	214
Light Duty Trucks under 6,000 GVW (Electric)	124	107	98	98	98
Other Light Duty Trucks	504	432	316	283	279
Medium-duty Trucks	613	539	392	344	332
Heavy-duty Trucks	1,604	1,507	1,396	1,379	1,375
Buses	1,739	1,589	1,438	1,383	1,371
Motorcycles	177	182	186	187	187
Passenger Vehicle Weighted Average (used to calculate County employee commute emissions)	347	291	207	185	183
All Vehicles (Weighted Average)	467	399	302	280	281

Note: Passenger vehicle averages based on passenger cars and light duty trucks under 6,000 GVW. 2050 values are slightly higher than 2040 due to EMFAC2014 assuming a slightly higher percentage of heavy-duty trucks in 2050. GVW = gross vehicle weight
Source: EMFAC2014

As shown above, future emission factors across nearly all vehicle categories, except for motorcycles, are anticipated to decline between 2014 and 2050, under currently implemented vehicle regulations, due to improvements in vehicle and fuel efficiency. Motorcycle emission factors are not anticipated to change in future years mainly due to the current lack of regulations affecting motorcycle efficiencies. Also, the slight increase in overall emissions factor between 2040 and 2050 is due to a half a percent increase in the share of heavy-duty trucks between the same years.

6.1.3 Shift in Vehicle Mode Share

Through the EMFAC2014 model, ARB estimates that the mode share of vehicles will shift in the future in San Diego County. The percentage of passenger vehicle VMT is anticipated to increase from 54 to 62 percent between 2014 and 2050 while the percentage of light-duty and medium-duty truck VMT is anticipated to decline from 42 to 32 percent within the same time frame. Because the EMFAC model does not break down vehicle mode share by unincorporated jurisdictions, it is assumed that the Unincorporated County would have the same vehicle mode share as San Diego County. Table 46 shows the percent breakdown of VMT by vehicle class and calendar year.

Table 46: Percent of Annual Vehicle Miles Traveled by Vehicle Class and Year in San Diego County

Vehicle Class	Percent of Annual VMT by Vehicle Class and Year (%)				
	2014	2020	2030	2040	2050
Passenger Cars	53.6	58.8	61.6	61.7	61.5
Diesel	0.5	0.7	0.7	0.7	0.7
Gasoline	53.0	56.5	53.3	51.6	51.3
Electric	0.2	1.7	7.6	9.4	9.5
Light-duty Trucks under 6,000 GVW	5.4	4.3	3.7	3.6	3.6
Diesel	0.007	0.004	0.002	0.002	0.002
Gasoline	5.3	4.3	3.7	3.6	3.6
Electric	0.002	0.002	0.002	0.002	0.002
Other Light-duty Trucks	23	21	19	19	19
Medium-duty Trucks	13.3	11.2	9.9	9.8	9.7
Heavy-duty Trucks	3.4	3.9	4.3	4.7	5.1
Buses	0.5	0.4	0.4	0.4	0.4
Motorcycles	0.7	0.6	0.6	0.6	0.6

VMT = vehicle miles traveled, GVW = gross vehicle weight
Source: EMFAC2014

The EMFAC2014 model also projects a greater percentage of passenger electric vehicles through 2050. Table 47 shows the percent breakdown of annual VMT by fuel type: gasoline, diesel, and electric.

Table 47: Percent of Annual Vehicle Miles Traveled by Fuel Type and Year in San Diego County

Fuel Type	Percent of Annual VMT by Fuel Type and Year (%)				
	2014	2020	2030	2040	2050
Gasoline	94.1	92.1	85.9	83.8	83.3
Diesel	5.7	6.2	6.5	6.8	7.2
Electric	0.2	1.7	7.6	9.4	9.5

VMT = vehicle miles traveled
Source: EMFAC2014

6.2 Electricity

Between 2014 and 2050, electricity emissions in the Unincorporated County, together representing the building energy sector, would decrease by 5 percent from 760,638 to 723,503 $MTCO_2e$ per year, despite growth in San Diego County's housing and employment levels. Figure 14 and Table 48 shows the projected emissions from electricity generation by source category for 2014, 2020, 2030, 2040, and 2050. Total emissions from electricity would decrease then increase due to the near future increases in renewable energy which are not anticipated to improve past 2030 and the long-term growth in the County.

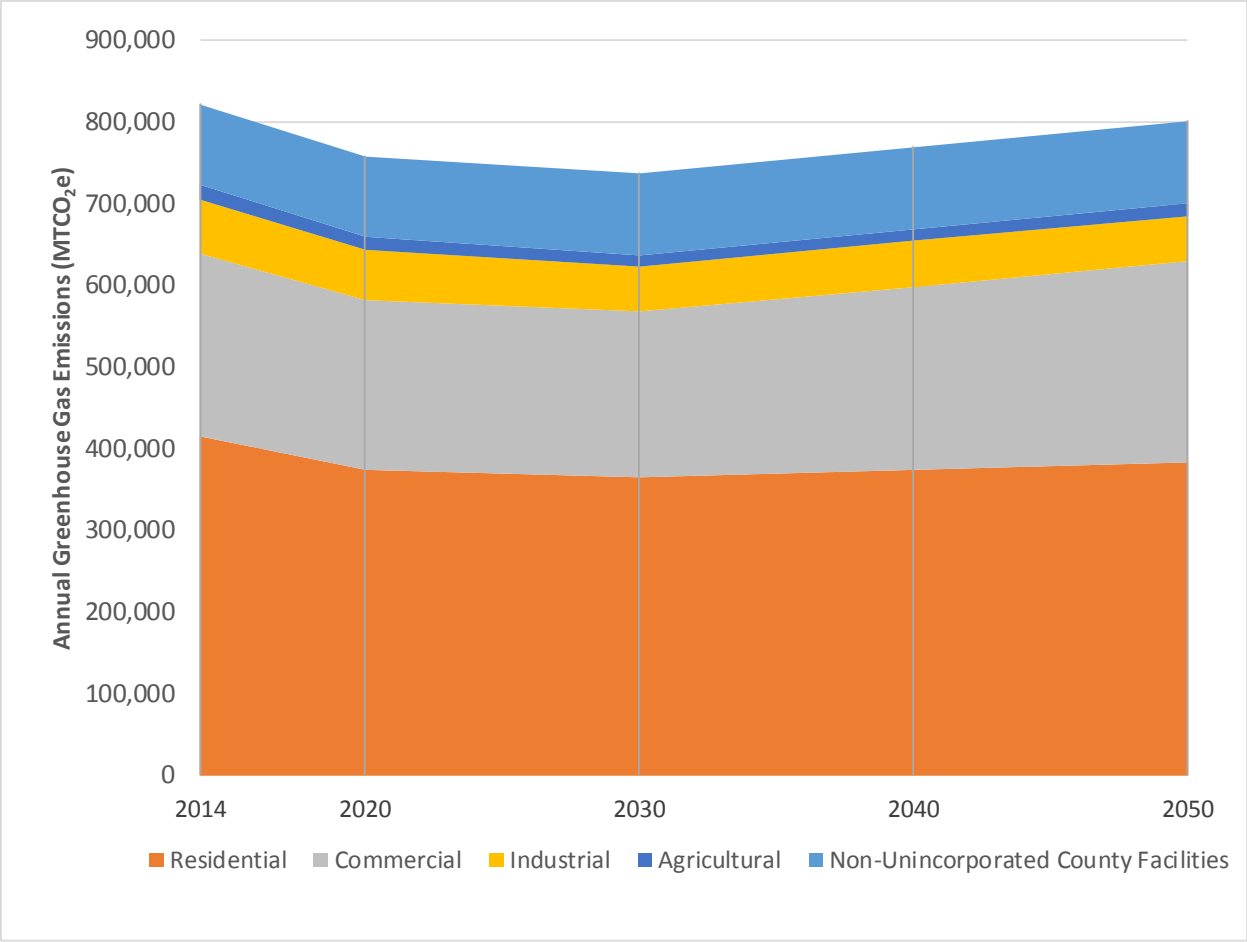


Figure 14: Electricity Emissions Projections (2014-2050)

Table 48: Electricity Emissions Projections (2014-2050)

Source Category	2014	2020	2030	2040	2050
			$MTCO_2e$/yr		
Residential	415,441	374,543	364,280	375,026	383,231
Commercial	223,404	207,237	203,372	223,179	245,938
Industrial	65,269	60,669	55,284	55,793	55,809
Agricultural	19,051	16,182	14,652	14,572	14,526
Non-Unincorporated County Facilities	37,473	31,513	23,678	23,838	23,999
Electricity Total	760,638	690,144	661,266	692,408	723,503
Percent Change from 2014 levels		-9%	-13%	-9%	-5%

$MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

Emissions from future electricity were estimated by multiplying anticipated electricity use with projected emission factors. Anticipated electricity use was projected in two parts. First, residential electricity use was scaled by the growth in population; and commercial and industrial usage was scaled by employment numbers; and agricultural usage was scaled using agricultural land estimates. Second, the level of electricity use was adjusted to reflect California's energy efficiency targets. Electricity emission factors are also anticipated to decline based on current regulations. Table 49 summarizes the

scaling factors and legislative reductions used to scale electricity emissions by source category. Note that electricity use in electric vehicles are addressed under the on-road transportation sector.

Table 49: Electricity Emissions Forecast Methods and Legislative Reductions by Source Category

Source Category	Forecast Methods	
	Scaling Factor from 2014 Energy Use	Applied Legislative Reductions
Residential	Population	Assumes a 45.2% renewable mix through 2020 due to SDG&E exceeding 2020 targets, based on CPUC reports[169]. Assumes a 50% renewable mix by 2030 per SB 350, continuing through 2050 assuming no further legislation. Accounts for improvements in new construction under Title 24 building energy codes.
Commercial and Industrial	Employment	
Agriculture	Agricultural Land	Assumes a 45.2% renewable mix through 2020 due to SDG&E exceeding 2020 targets, based on CPUC reports. Assumes no improvements in energy efficiency.
Non-Unincorporated County Facilities	County facility expansion plans	Assumes a 33% renewable mix through 2020 for the direct access electricity purchased by the County per 2020 statewide target. Assumes a 50% renewable mix by 2030 per SB 350, continuing through 2050 assuming no further legislation. Accounts for improvements in new construction under Title 24 building energy codes. Does not account for improvements to existing buildings.

SDG&E = San Diego Gas and Electric, CPUC = California Public Utilities Commission, SB = Senate Bill
Source: Ascent Environmental, 2017

The assumptions supporting energy efficiency and electricity emission factor adjustments are described in the following sections.

6.2.1 Improvements in Energy Efficiency

California has two major policies that would affect the energy efficiency of buildings in future years. The State's Title 24 Building Energy Efficiency Standards and Senate Bill (SB) 350 would affect energy efficiency rates in new construction and existing buildings, respectively. The 2016 Title 24 standards were adopted in December 2015 and are currently in effect as of January 2017. The California Energy Commission (CEC) estimates that new residential buildings built to these standards would be 28 percent more efficient than buildings built to the 2013 Title 24 standard[170]. The 2013 Title 24 standards were also estimated to result in residences that would be 25 percent more efficient that those built to the 2008 Title 24 standards.

All new construction taking place between 2015 and 2050 is assumed to use 46 and 34 percent less energy than current residential and commercial land uses, respectively. This method reflects the combined energy efficiency improvement of the 2016 Title 24 code above the 2013 code and the 2013 code above the 2008 code. This approach assumes that the average current building was constructed to meet the 2008 Title 24 standards, and would mean that actual future energy use from new construction would be lower than projected because the majority of current buildings were built prior 2008 and were subject to lower energy efficiency standards. Any underestimates of the 46 and 34 percent energy improvements in new residential and commercial construction over existing energy use reductions, respectively, would be slightly balanced by the overestimates in energy improvements in the buildings build between 2013 and 2016 that are subject to the 2013 Title 24 standard only. However, buildings build between 2013 and 2016 make up a small percentage of the entire building inventory in the County, thus this approach is conservative in that actual emissions from building energy use would be lower than projected.

SB 350, in addition to targeting a 50 percent renewable mix in California electricity by 2030, targets a cumulative doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030 with annual targets established by CEC. SB 350's energy efficiency goals are applicable to both existing building stock and new construction, but would have the most impact on existing building stock. The energy efficiency aspect of SB350 is not included in the emissions forecasts to avoid double counting with County efforts that may also promote improvements in energy efficiency in existing buildings as part of the Climate Action Plan pursuant to this document.

Projections of future building energy use account for changes in Title 24 policies. Title 24 would continue to improve building energy efficiencies in new construction into the future, so reductions due to Title 24 standards would likely be much higher than 46 and 34 percent from current residential and commercial energy usage rates, respectively.

Based on the anticipated changes in housing units, employment, and building energy efficiency in new buildings, electricity use would increase by 5 percent by 2020 and 22 percent by 2050 from 2014 levels. The anticipated changes in electricity use by source category are shown in Table 50.

Table 50: Forecasted Electricity Use (2014-2050)

Electricity Use (MWh)					
Source Category	2014	2020	2030	2040	2050
Residential	1,377,278	1,441,090	1,536,155	1,581,472	1,616,071
Commercial	740,635	797,363	857,613	941,136	1,037,112
Industrial	216,381	233,428	233,131	235,275	235,344
Agricultural	63,159	62,264	61,785	61,449	61,254
Non-Unincorporated County Facilities	98,875	99,281	99,959	100,637	101,314
Total	2,496,327	2,633,427	2,788,644	2,919,968	3,051,096
Percent Change from 2014 levels		5%	12%	17%	22%

MWh = megawatt-hours
Source: Ascent Environmental, 2017

6.2.2 Changes in Electricity Emission Factors

Emissions from the building energy sector would see gradual declines into the future without additional County actions, even with population increase, due to State measures already in place. SDG&E's electricity service was 36.4 percent renewable in 2014[171]. California public utilities are required to reach a 33 percent renewable mix by 2020 and a 50 percent renewable mix by 2030, pursuant to statewide legislation of the Renewable Portfolio Standard and SB 350. According the CPUC, as of May 2017 SDG&E is under contract with the procurement of enough renewable sources to achieve a 45.2 percent renewable mix by 2020[172]. Assuming that SDG&E's non-renewable emission factors do not change, the utility's emission factors in 2020 and 2030 would be 573 lb CO_2e/MWh and 523 lb CO_2e/MWh, respectively. Emission factors in 2040 and 2050 were assumed to equal 2030 emission factors given that there is no current legislation addressing electricity generation emissions past 2030.

6.3 Natural Gas

Between 2014 and 2050, natural gas emissions in the unincorporated area would increase by 21 percent from 290,712 to 353,041 $MTCO_2e$ per year, despite growth in San Diego County's housing and employment levels and anticipated improvements in energy efficiency. Figure 15 and Table 51 show the projected natural gas emissions by source category for 2014, 2020, 2030, 2040, and 2050.

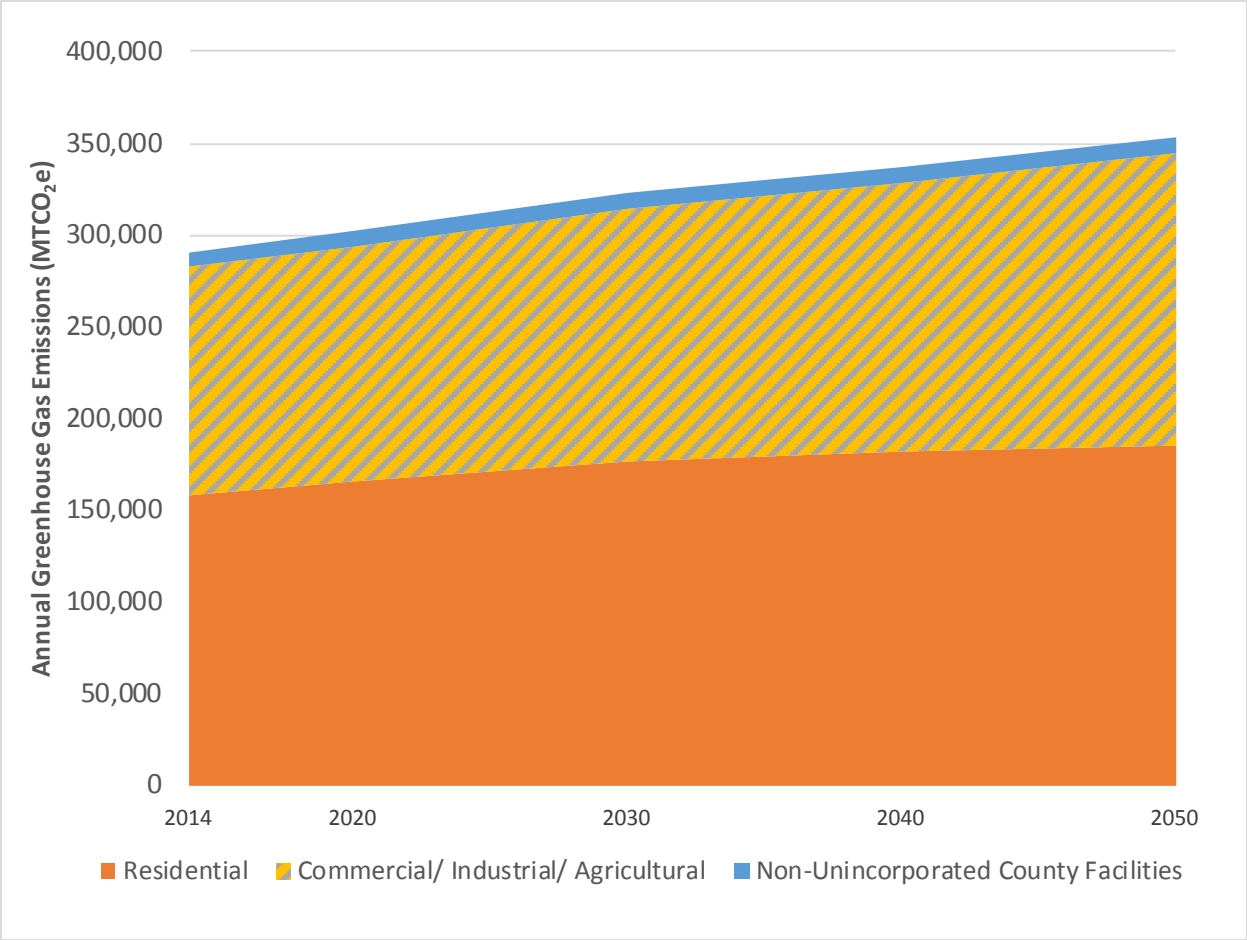


Figure 15: Natural Gas Emissions Projections (2014-2050)

Table 51: Natural Gas Emissions Projections (2014-2050)

Source Category	2014	2020	2030	2040	2050
			$MTCO_2e$/yr		
Residential	157,936	165,253	176,154	181,351	185,319
Commercial/Industrial/ Agricultural	124,469	128,428	138,471	147,056	159,246
Non-Unincorporated County Facilities	8,307	8,336	8,383	8,429	8,476
Natural Gas Total	290,712	302,017	323,008	336,836	353,041
Percent Change from 2014 levels		4%	11%	16%	21%

$MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

Emissions from future natural gas use were estimated by multiplying anticipated natural gas use with natural gas emission factors. Future anticipated natural gas was projected in two parts. First, residential natural gas use was scaled by the growth in housing units and commercial, industrial, and agricultural usage was scaled by employment numbers. Second, the level of natural gas was adjusted to reflect California's energy efficiency targets. Unlike electricity, natural gas emission factors would stay constant using the same emission factors presented in Section 4.3.2. Table 52 summarizes the scaling factors and legislative reductions used to scale natural gas emissions by source category.

Table 52: Natural Gas Emissions Forecast Methods and Legislative Reductions by Source Category

Source Category	Forecast Methods	
	Scaling Factor from 2014 Energy Use	Applied Legislative Reductions
Residential	Housing Units	Accounts for 2016 Title 24 energy efficiency gains for new construction.
Commercial/ Industrial/ Agriculture	Employment	
Non-Unincorporated County Facilities	County's facility expansion plans	

SDG&E = San Diego Gas and Electric, SB = Senate Bill
Source: Ascent Environmental, 2017

The assumptions supporting energy efficiency adjustments are described in the following section.

6.3.1 Improvements in Energy Efficiency

As described in Section 6.2.1, projections of future building energy use account for the effect of Title 24 policies on new construction. The assumptions behind forecasted energy efficiency in new and existing buildings described in Section 6.2.1 are assumed to also apply to natural gas usage.

Based on the anticipated changes in housing units, employment, and building energy efficiency, natural gas use would have a different trend with an increase of 4 percent by 2020 and 21 percent by 2050 from 2014 levels. The anticipated changes in energy use by energy source and source category are shown in Table 53.

Table 53: Forecasted Natural Gas Use (2014-2050)

Natural Gas Use (therms)					
Source Category	2014	2020	2030	2040	2050
Residential	28,860,437	30,197,611	32,189,665	33,139,266	33,864,286
Commercial/Industrial/ Agricultural	22,744,894	23,468,371	25,303,618	26,872,341	29,099,846
Non-Unincorporated County Facilities	1,518,056	1,523,204	1,531,783	1,540,363	1,548,942
Total	53,123,387	55,189,185	59,025,065	61,551,970	64,513,074
Percent Change from 2014 levels	0%	4%	11%	16%	21%

MWh = megawatt-hours
Source: Ascent Environmental, 2017

6.4 Propane

Between 2014 and 2050, propane emissions in the unincorporated area would increase by 17 percent from 9,914 to 11,629 $MTCO_2e$ per year. Figure 16 projects the propane emissions for residential and non-unincorporated County facilities for 2014, 2020, 2030, 2040, and 2050. Commercial and industrial propane usage was not included due to insufficient data.

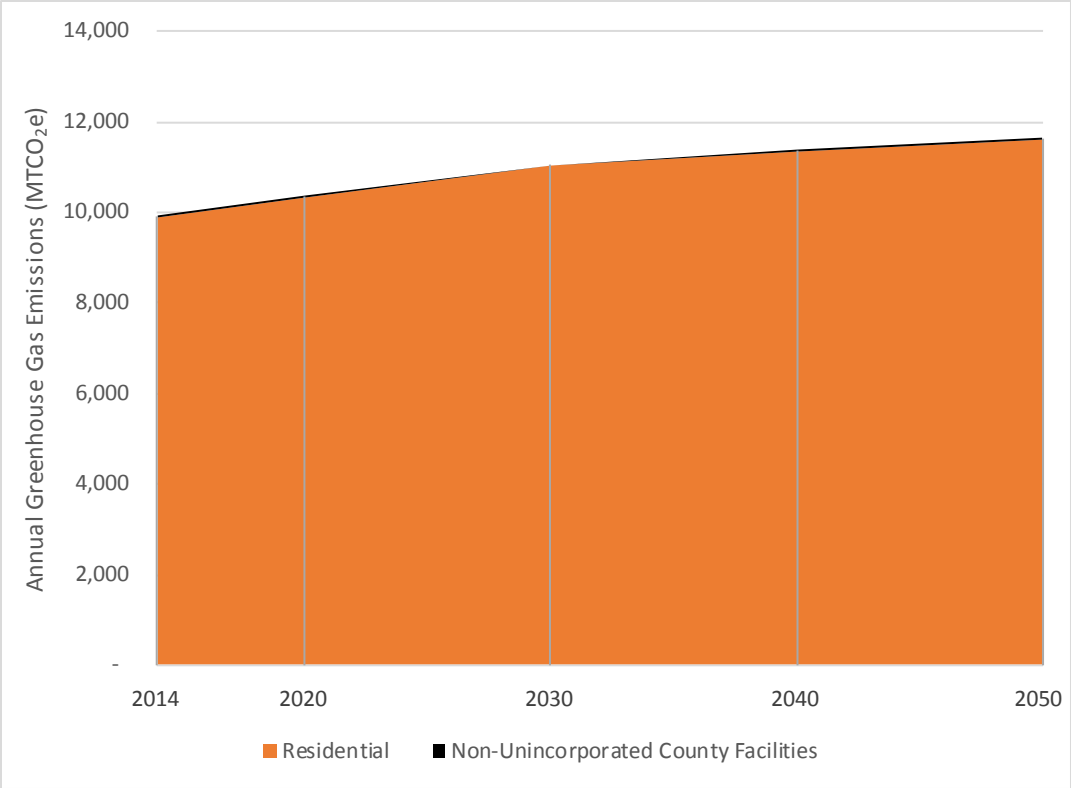


Figure 16: Propane Emissions Projections (2014-2050)

Table 54 projects the propane emissions for residential and non-unincorporated County facilities for 2014, 2020, 2030, 2040, and 2050 and shows the percent change in total propane emissions relative to 2014.

Table 54: Forecasted Propane Use (2014-2050)

Propane Use (therms)					
Source Category	2014	2020	2030	2040	2050
Residential	1,577,792	1,650,894	1,759,799	1,811,714	1,851,350
Non-Unincorporated County Facilities	107,819	108,420	109,024	109,631	110,242
Propane Total	1,685,610	1,759,314	1,868,823	1,921,345	1,961,592
Percent Change from 2014 levels		5%	12%	15%	17%

MWh = megawatt-hours
Source: Ascent Environmental, 2017

Emissions from future propane were estimated by scaling 2014 emissions by various factors depending on the source category. Like natural gas, propane emission factors would stay constant using the same emission factors presented in Section 4.4.2. Table 55 summarizes the scaling factors and legislative reductions used to scale propane emissions by source category.

Table 55: Propane Emissions Forecast Methods and Legislative Reductions by Source Category

Source Category	Forecast Methods	
	Scaling Factor from 2014 Energy Use	Applied Legislative Reductions
Residential	Housing Units	Accounts for 2016 Title 24 energy efficiency gains for new construction.
Non-Unincorporated County Facilities	County's facility expansion plans	None

SDG&E = San Diego Gas and Electric, SB = Senate Bill
Source: Ascent Environmental, 2017

The anticipated improvements in energy efficiency and its effects on residential propane usage is reflected in Section 6.3.1 because residential propane use was scaled from residential natural gas usage.

6.5 Solid Waste

Between 2014 and 2050, solid waste emissions in the Unincorporated County would increase by 22 percent from 338,107 to 411,298 $MTCO_2e$ per year, consistent with growth in Unincorporated County's housing and employment levels and employee growth at County facilities. Table 56 shows the projected emissions from the solid waste sector by emissions source for 2014, 2020, 2030, 2040, and 2050. Figure 17 and Table 56 break down waste-in-place emissions by landfill. This level of detail is shown because the methods used to scale the waste-in-place emissions vary depending on whether the landfill is open or closed. See *County Operations Greenhouse Gas Emissions Inventory and Projections Report* for more details on the assumptions and methodology behind the projections for solid waste emissions from non-unincorporated County facilities.

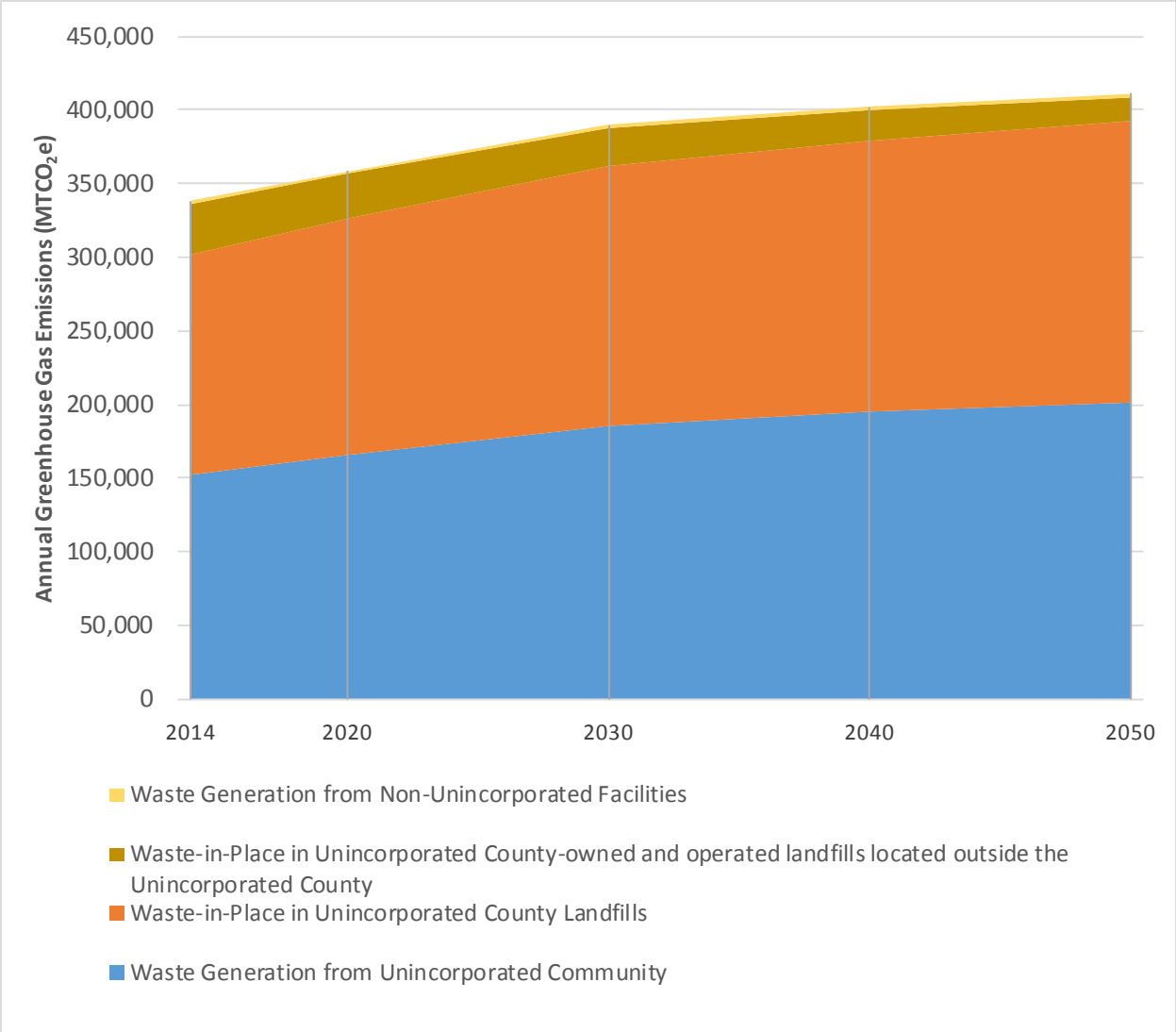


Figure 17: Solid Waste Emissions Projections (2014-2050)

Table 56: Solid Waste Emissions Projections for the Unincorporated County (2014-2050)

Emissions Source	GHG Emissions ($MTCO_2e$)				
	2014	2020	2030	2040	2050
Waste Generation from Unincorporated Community	152,841	165,955	185,492	194,804	201,915
Waste-in-Place in Unincorporated County Landfills	148,646	159,956	176,864	184,524	190,316
Waste-in-Place in Unincorporated County-owned and operated landfills located outside the Unincorporated County	34,493	30,588	25,058	20,520	16,782
Waste Generation from Non-Unincorporated Facilities	2,126	2,153	2,197	2,241	2,285
Total Waste Emissions	338,107	358,651	389,610	402,089	411,298
Percent Change from 2014 levels	0%	6%	15%	19%	22%

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

The projections shown in Table 56 account for the decay rate of waste-in-place at landfills associated with the Unincorporated County and for the anticipated population growth affecting overall waste disposal in the Unincorporated County. The projections assume that current landfill gas (LFG) capture systems will continue to operate into the future. Table 57 breaks down the waste-in-place emissions projections by landfill.

Table 57: Breakdown of Waste-in-Place Emissions by Landfill

Landfill	In Unincorporated Area?	GHG Emissions ($MTCO_2e$)				
		2014	2020	2030	2040	2050
Open Landfills						
Otay Landfill	No	139,205	151,149	168,942	177,424	183,900
Borrego Landfill	Yes	2,184	2,371	2,651	2,784	2,885
Closed Landfills						
Bell Junior High Landfill	No	423	375	307	252	206
Bonsall	Yes	2,834	2,513	2,059	1,686	1,379
Encinitas	No	2,380	2,110	1,729	1,416	1,158
Gillespie	No	1,158	1,027	841	689	563
Hillsborough	No	268	237	194	159	130
Jamacha	Yes	3,081	2,732	2,237	1,832	1,500
Palomar	No	4,067	3,607	2,955	2,419	1,979
Poway	No	820	727	596	488	399
San Marcos	No	25,378	22,504	18,436	15,097	12,347
Valley Center	Yes	744	660	541	443	362
Viejas	Yes	598	530	435	356	291
Total Waste-in-Place Emissions		183,139	190,543	201,922	205,044	207,098
Percent Change from 2014 levels		0%	4%	10%	12%	13%

Table 58 summarizes the methods and legislative reductions used to project emissions from the solid waste sector. Section 6.5.2 discusses how the projections account for future LFG capture projects.

Table 58: Solid Waste Emissions Forecast Methods and Legislative Reductions by Source

Waste Emissions Source	Forecast Method	
	Scaling Factor from 2014 Emissions	Applied Legislative Reductions
Solid Waste Generation (Unincorporated Area)	Population	Assumes existing LFG capture continues through 2050.
Solid Waste Generation (Non-Unincorporated County Facilities)	Employee growth based on County facility expansion plans	Assumes existing LFG capture continues through 2050.
Waste-in-Place		
Open Landfills	Population	Assumes existing LFG capture continues through 2050.
Closed Landfills		
Jamacha Landfill	CH_4 emissions decay based on historical landfill tonnage and closure date using data from EPA's facility level GHG database and ARB's Landfill Emissions Tool to forecast emissions.	Assumes any existing LFG capture continues through 2050.
San Marcos Landfill		
Viejas Landfill		
All Other County-Operated Landfills	Average decay rate in CH_4 emissions from Jamacha and Viejas Landfills	Assumes existing LFG capture continues through 2050.

LFG = landfill gas
Source: Ascent Environmental, 2017

A discussion of how the waste diversion target, decay rates, and LFG capture rates are accounted for in the projections is presented in the following sections.

6.5.1 Landfill Gas Decay in Closed Landfills

Over time, CH_4 emissions produced by closed landfills decrease as the finite organic matter within the landfills is slowly converted to CH_4. The ARB's LET models the decay in organic matter, rate of conversion to CH_4, and subsequent reduction in CH_4 emissions before and after closure of a landfill. In order to calculate emissions, this model requires historical annual tonnage data. Jamacha, San Marcos, and Viejas landfills were the only closed landfills that had readily available historical tonnage disposal data. The rates of decay for Jamacha, San Marcos, and Viejas landfills were used to project emissions from the other eight closed landfills. Based on these results, emissions from currently closed landfills would decrease by approximately 51 percent from 2014 to 2050 due to the reduction in organic matter over time.

The actual emissions projections from LET were not used due to the inconsistency between LET's results and estimated emissions from CRIS for the baseline GHG emissions inventory. The inconsistency between the CRIS and LET emissions estimates is due to the difference between LET's theoretical approach based on historical waste tonnage and CRIS' empirical approach, using LFG collection rates available directly from the Jamacha, San Marcos, and Viejas landfills and Equation 9.1 from the LGOP. The decay rates for Jamacha, San Marcos, and Viejas landfills are provided in Table 59.

Note that Viejas, San Marcos, and Jamacha landfills have very similar decay rates, as shown in Table 59.

Table 59: Forecasted Methane Emissions Decay Rate from ARB's Landfill Emissions Tool (Percent relative to 2014) - For comparison purposes only

Landfill	Percent of 2014 CH_4 Emissions Generated per Year (%)				
	2014	2020	2030	2040	2050
Jamacha	100	89	73	59	49
San Marcos	100	89	73	59	49
Viejas	100	89	73	60	49
Average	100	89	73	59	49

Source: Ascent Environmental 2017

6.5.2 Landfill Gas Capture Projects

Projected solid waste emissions assume that current landfill gas capture activity at participating landfills will continue into the future. Among the landfills within the Unincorporated County and those that receive waste from the unincorporated area, only Borrego, Viejas, and Imperial Waste landfills do not have LFG capture systems installed. According to Section 95462(b) of ARB's Landfill Methane Control Measure (LMCM), closed or inactive landfills containing less than 450,000 tons of waste-in-place are exempted from LFG capture requirements. Borrego and Imperial Waste landfills each contain less than 450,000 tons of waste according to EPA's Landfill Methane Outreach Program (LMOP)[173]. Although the two landfills were open at the time ARB's LMCM became effective in 2010, neither landfill currently operates a LFG capture system nor is either included in the LMOP's candidate landfill project list. Due to the relatively small size of Borrego and Imperial Waste landfills, it is assumed that neither landfill will install a LFG capture system through 2050.

Given these assumptions, the current LFG capture rates at all landfills associated with the Unincorporated County are assumed to stay constant through 2050.

6.6 Agriculture

Between 2014 and 2050, agricultural emissions in the Unincorporated County would decrease by three percent from 165,696 to 158,760 $MTCO_2e$ per year. 2014 emissions were scaled by the anticipated change in agricultural acres in the Unincorporated County according to SANDAG projections. Figure 18 and Table 60 shows the projected emissions from each agricultural emissions source for 2014, 2020, 2030, 2040, and 2050. SANDAG's projections of agricultural acres in the Unincorporated County are provided in Table 62.

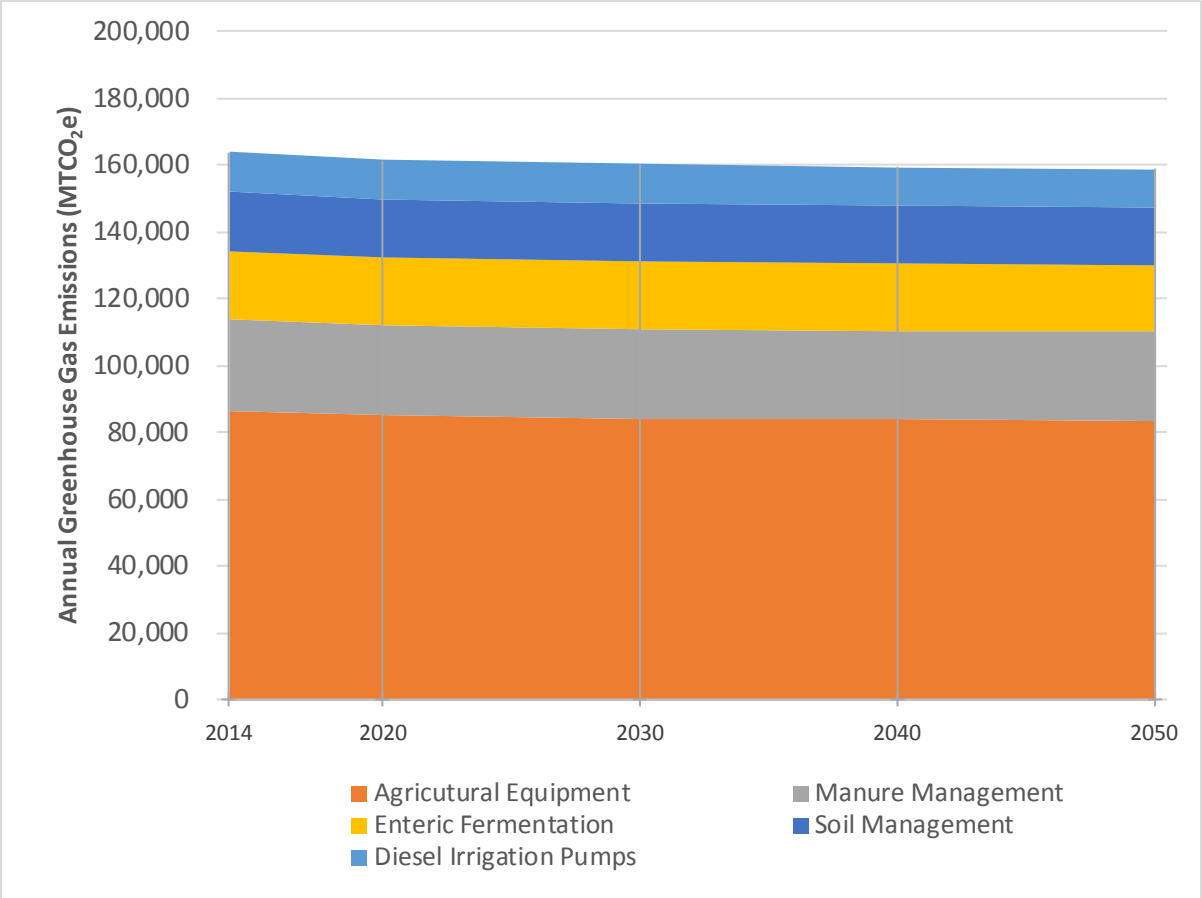


Figure 18: Agricultural Emissions Projections (2014-2050)

Table 60: Agricultural Emissions Projections (2014-2050)

Emissions Sources	GHG Emissions ($MTCO_2e$)				
	2014	2020	2030	2040	2050
Agricultural Equipment	86,087	84,867	84,215	83,756	83,491
Manure Management	27,462	27,073	26,865	26,719	26,634
Enteric Fermentation	20,724	20,430	20,273	20,163	20,099
Soil Management	17,655	17,404	17,271	17,177	17,122
Diesel Irrigation Pumps	13,150	12,964	12,864	12,794	12,754
Total	165,078	162,739	161,488	160,609	160,101
Percent Change from 2014 levels	0%	-1%	-2%	-3%	-3%

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

No applicable legislative reductions that would limit future agricultural emissions were assumed. Table 61 summarizes the methods and legislative reductions used to project emissions from the agricultural sector.

Table 61: Agricultural Emissions Forecast Methods and Legislative Reductions

Forecast Methods	
Scaling Factor from 2014 Emissions	Applied Legislative Reductions
Agricultural acres in the Unincorporated County	None

Source: Ascent Environmental, 2017

Some caveats with using agricultural acres as the scaling factor for all agricultural emissions include loss of detail associated with crop-specific acreage forecasts, which were not available, and insensitively to changes in off-road engine technology. With respect to crop- and livestock-related emissions, such as fertilizer application and manure management, applying this scaling method across all sources of agricultural emissions does not allow for a refined analysis because the projected agricultural acres were not available at the crop-level detail. Thus, manure management and enteric fermentation emissions could not be scaled by the change in rangeland and emissions associated with fertilizer use for certain crops could not be scaled by changes to those crop acreages. With respect to emissions from agricultural equipment, ARB's 2007 OFFROAD model does not assume additional regulations past Tier 4 engine requirements which would have been phased in by 2015. The OFFROAD model has not been updated regarding agricultural equipment.[174] Also, the OFFROAD model does not take into account recent SANDAG projections. Despite these limitations, scaling 2014 agricultural equipment, fertilizer, and livestock emissions by projected agricultural acres specific to the region would reflect the overall trend in agricultural emissions due to overall agricultural activity, assumed to be proportional to agricultural area.

6.6.1 Agricultural Acreage Projections

SANDAG's projections of agricultural acres in the unincorporated area is presented in Table 62.

Table 62: Forecasted Agricultural Acres in the Unincorporated Area

Year	Agricultural and Extractive Land Uses[175]	Percent Change from 2014 levels
2012	97,892	0%
2014*	97,432	0%
2020	96,051	-1%
2030*	95,313	-2%
2040*	94,794	-3%
2050	94,494	-3%

* Interpolated. SANDAG estimates only provide estimates for 2012, 2020, 2035, and 2050.
Source: SANDAG 2013

6.7 Water

Between 2014 and 2050, water-related emissions in the Unincorporated County would increase by 4 percent from 134,269 to 139,446 $MTCO_2e$ per year, despite a 32 percent increase in population over the same period. This change reflects an increase in water consumption proportional to population growth in the Unincorporated County in combination with lower electricity emissions factors related to the Renewable Portfolio Standards (RPS) and SB 350 legislative actions described in Section 6.2.2. Figure 19 and Table 63 show the projected emissions from each water supply activity source for 2014, 2020, 2030, 2040, and 2050. Projected population growth in the Unincorporated County and electricity emissions factors are available in Sections 2.2.1 and 6.2.2, respectively.

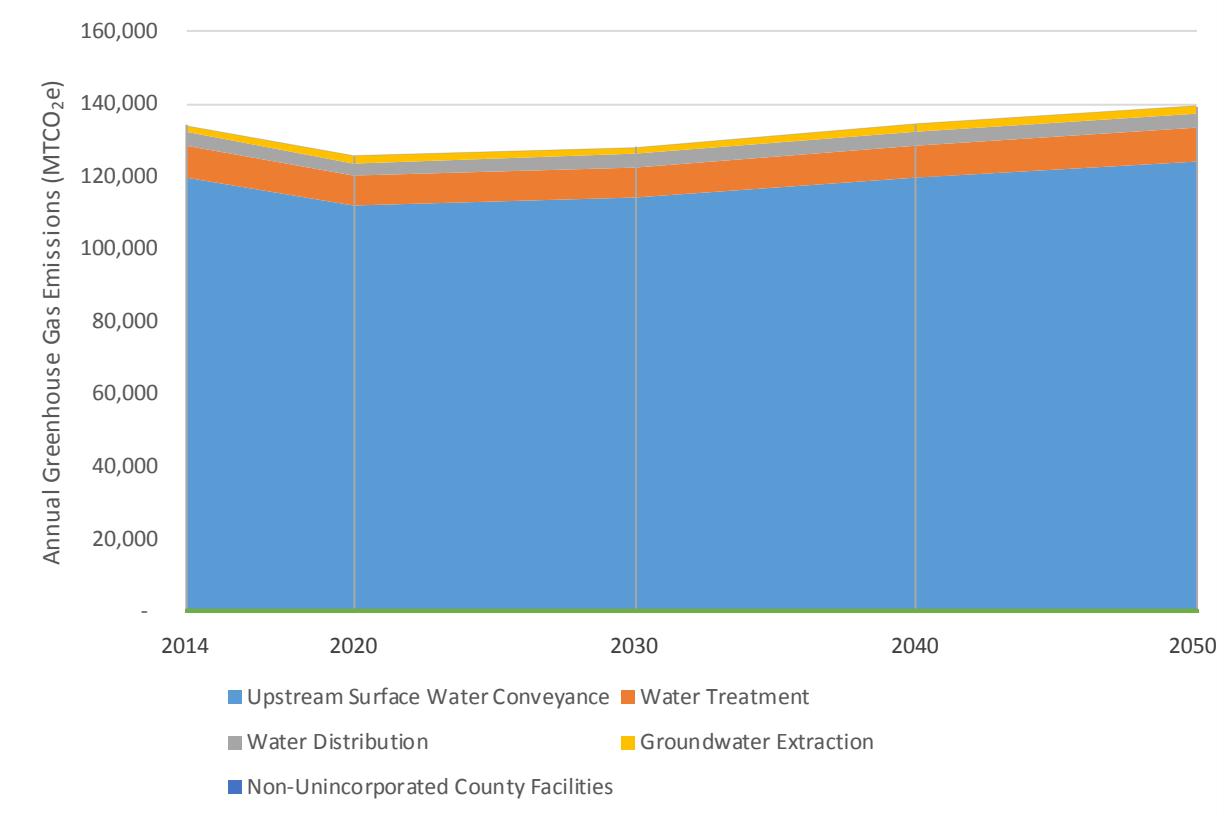


Figure 19: Water Emissions Projections (2014-2050)

Table 63: Water Emissions Projections (2014-2050)

Water Supply Activity	GHG Emissions ($MTCO_2e$)				
	2014	2020	2030	2040	2050
Upstream Surface Water Conveyance	119,770	112,053	114,274	120,011	124,391
Water Treatment	8,589	8,036	8,195	8,606	8,920
Water Distribution	4,023	3,764	3,839	4,031	4,178
Groundwater Extraction	1,870	1,749	1,784	1,874	1,942
Non-Unincorporated County Facilities	16	14	13	13	14
Total	134,269	125,616	128,104	134,536	139,446
Percent Change from 2014 levels	0%	-6%	-5%	0%	4%

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

Table 64 summarizes the methodology used to project water-related emissions. Consistent with the methodology used to estimate 2014 emissions from the water sector, it was assumed that all water supply would use electricity from SDG&E consistent with the assumptions used in Section 4.7.2.

Table 64: Water Emissions Forecast Methods and Legislative Reductions

Forecast Methods		
Source Category	Scaling Factor from 2014 Water Energy Use	Applied Legislative Reductions
Unincorporated Area	Population	Assumes a 45.2% and 50% renewable mix by 2020 and 2050, respectively, for SD&GE emission factors per RPS and SB 350 State targets
Non-Unincorporated County Facilities	Employee growth based on County facility expansion plans	

SDG&E = San Diego Gas and Electric, RPS = Renewable Portfolio Standards, SB = Senate Bill
Source: Ascent Environmental, 2017

6.8 Off-Road Transportation

Between 2014 and 2050, off-road transportation emissions in the Unincorporated County would increase by 35 percent from 36,927 to 49,733 $MTCO_2e$ per year. This change reflects an increase in equipment usage proportional to population and job growth in the Unincorporated County. Figure 20 and Table 65 show the projected emissions from each off-road vehicle category for 2014, 2020, 2030, 2040, and 2050. Projected population and job growth in the Unincorporated County are available in Sections 2.2.1 and 2.2.2, respectively. All County municipal off-road operations are assumed to be included in this projection.

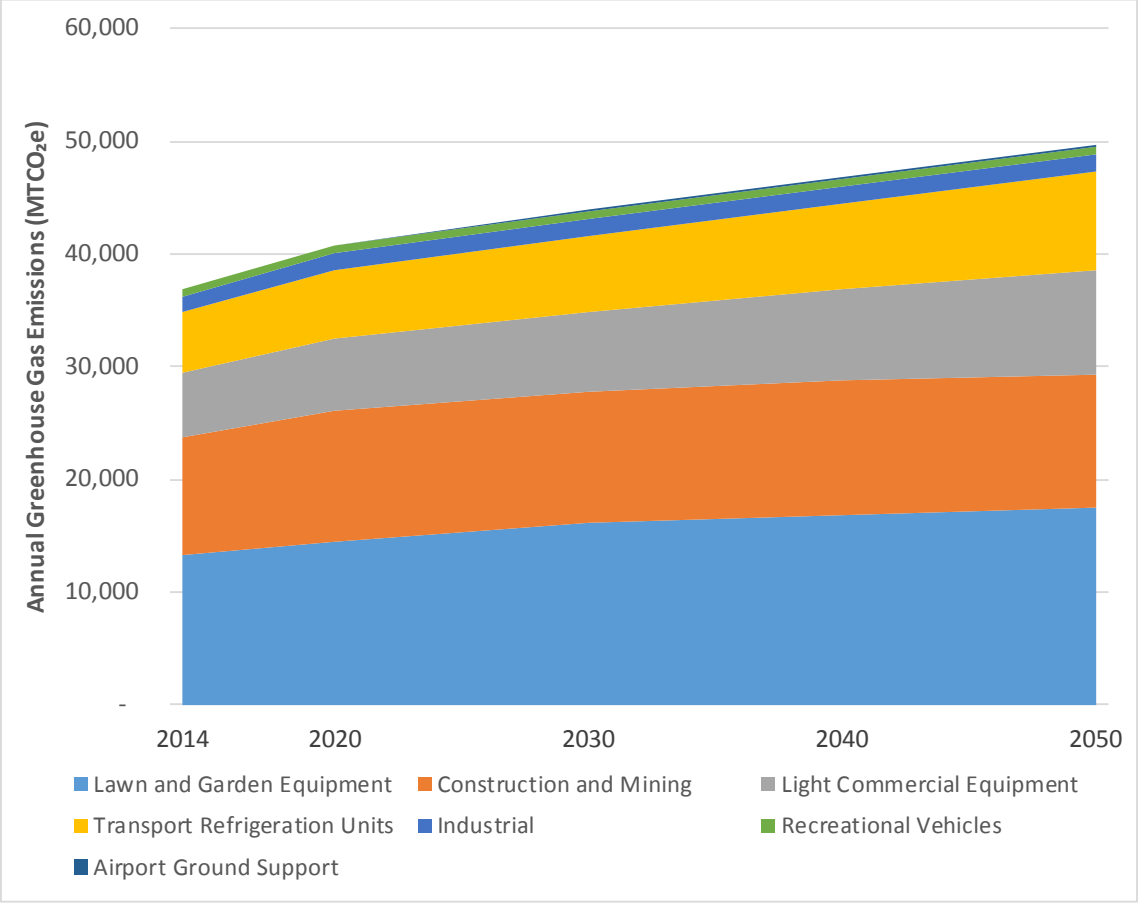


Figure 20: Off-Road Emissions Projections for the Unincorporated County (2014-2050)

Table 65: Off-Road Emissions Projections (2014-2050)

Off-Road Vehicle Categories	GHG Emissions ($MTCO_2e$)				
	2014	2020	2030	2040	2050
Lawn and Garden Equipment	13,244	14,380	16,073	16,880	17,496
Construction and Mining	10,472	11,713	11,692	11,848	11,853
Light Commercial Equipment	5,726	6,385	7,085	8,056	9,172
Transport Refrigeration Units	5,480	6,111	6,781	7,710	8,778
Industrial	1,345	1,505	1,502	1,522	1,522
Recreational Vehicles	522	567	634	665	690
Airport Ground Support	139	155	172	195	222
Total	36,927	40,815	43,938	46,877	49,733
Percent Change from 2014 levels	0%	11%	19%	27%	35%

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent
Source: EPIC 2016, Ascent Environmental 2017

Table 66 summarizes the methodology used to project off-road emissions. Off-road emissions are scaled to future years by either population, commercial jobs or industrial jobs, depending on the off-road subcategory.

Table 66: Off-Road Emissions Forecast Methods and Legislative Reductions

Sub-Category	Forecast Methods	
	Scaling Factor from 2014 Emissions	Applied Legislative Reductions
Lawn and Garden Equipment	Population	None
Construction and Mining	Commercial Jobs	None
Light Commercial Equipment	Commercial Jobs	None
Transport Refrigeration Units	Commercial Jobs	None
Industrial	Industrial Jobs	None
Recreational Vehicles	Population	None
Airport Ground Support	Commercial Jobs	None

Source: Ascent Environmental 2017

No legislative reductions were applied to off-road projections, because the OFFROAD model does not assume additional regulations past Tier 4 engine requirements which would have been phased in by 2015. As discussed in Section 4.6.1, the OFFROAD model has not been updated. Also, the OFFROAD model does not taken into account recent SANDAG projections. Due to these limitations, scaling 2014 off-road equipment emissions by population and jobs depending on the sub-category was deemed to be more accurate than using OFFROAD model projections.

6.9 Wastewater

Between 2014 and 2050, wastewater-related emissions in the Unincorporated County would increase by 32 percent from 21,183 to 27,985 $MTCO_2e$ per year. This change reflects an increase in wastewater production proportional to population growth in the Unincorporated County. Figure 21 and Table 67 show the projected emissions from each wastewater emissions source for 2014, 2020, 2030, 2040, and 2050. Projected population in the Unincorporated County is available in Section 2.2.1. See the *County Operations Greenhouse Gas Emissions Inventory and Projections Report*for more details on the contribution of County facilities to the Unincorporated County's wastewater-related emissions.

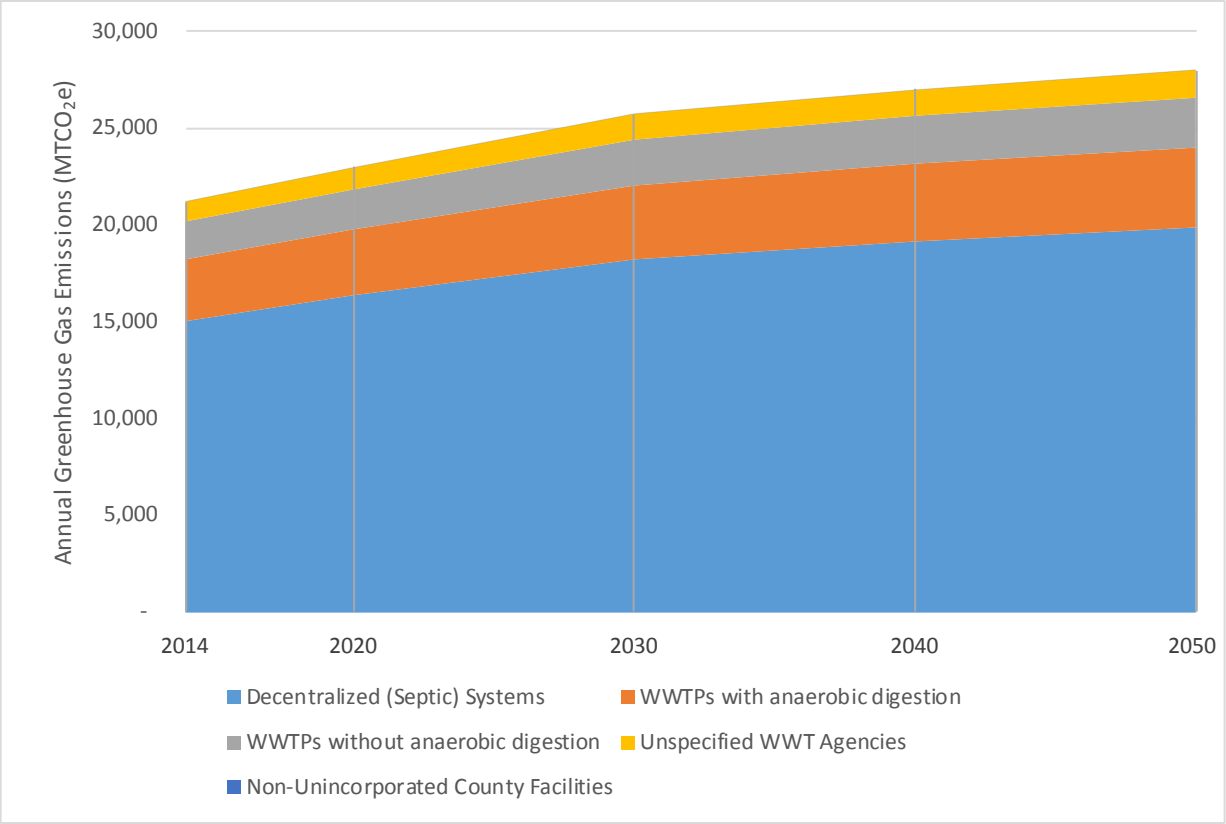


Figure 21: Wastewater Emissions Projections (2014-2050)

Table 67: Wastewater Emissions Projections (2014-2050)

Wastewater Emissions Source	GHG Emissions ($MTCO_2e$)				
	2014	2020	2030	2040	2050
Decentralized (Septic) Systems	15,036	16,326	18,248	19,164	19,864
WWTPs with anaerobic digestion	3,158	3,429	3,833	4,025	4,172
WWTPs without anaerobic digestion	1,962	2,130	2,381	2,500	2,591
Unspecified WWT Agencies	1,025	1,113	1,244	1,306	1,354
Non-Unincorporated County Facilities	2	2	3	3	3
Total	21,183	23,001	25,708	26,999	27,985
Percent Change from 2014 levels	0%	9%	21%	27%	32%

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent, WWTP = wastewater treatment plant, WWT = wastewater treatment
Source: EPIC 2016, Ascent Environmental 2017

Table 68 summarizes the methodology used to project wastewater emissions. Because the methodology used to calculate wastewater emissions for the baseline GHG emissions inventory was based on population, future wastewater emissions were also assumed to increase in direct proportion to population growth. No legislative reductions are currently in place that would specifically limit future GHG emissions from wastewater systems.

Table 68: Wastewater Emissions Forecast Methods and Legislative Reductions

Forecast Methods		
Source Category	Scaling Factor from 2014 Emissions	Applied Legislative Reductions
Unincorporated Area	Population	None
Non-Unincorporated County Facilities	Employee growth based on County facility expansion plans	None

Source: Ascent Environmental 2017

7 REFERENCES

[1] The closed landfills section 4.5.2.2 and GHG projections in Section 5 and Section 6 were prepared by Ascent Environmental and incorporated into this document. The rest of the inventory was prepared by EPIC.

[2] County of San Diego General Plan. Chapter 3 – Land Use Element. http://www.sandiegocounty.gov/pds/gpupdate/docs/LUE.pdf Download Date: 11/02/2015

[3] For a list of Indian Reservations in San Diego County, see http://www.sandiego.edu/native-american/reservations.php. In addition to the list, Pechanga Reservation is another tribe with only open space lands (no population) located in San Diego County.

[4] SANDAG. Data Surfer. http://datasurfer.sandag.org/

[5] The 2014 total county-wide population is from SANDAG's 2014 Estimates. The SANDAG Population Estimates are released annually and modified based on *E-5 Population and Housing Estimates for Cities, Counties and the State*, California Department of Finance. The 2020-2050 total unmodified population is from SANDAG's Series 13 Forecast. SANDAG Series 13 is forecasted from 2012 as the base year. This total population includes household population and group quarters population (college, military and other). SANDAG Data Surfer. Download Date: 02/23/2016

[6] The 2014 total unmodified population is from SANDAG's 2014 Estimates. The SANDAG Population Estimates are released annually and modified based on *E-5 Population and Housing Estimates for Cities, Counties and the State*, California Department of Finance. The 2020-2050 total unmodified population is from SANDAG's Series 13 Forecast. SANDAG Series 13 is forecasted from 2012 as the base year. This total population includes household population and group quarters population (college, military and other). SANDAG Data Surfer. Download Date: 02/24/2016 for projections and 05/24/2016 for 2014 estimates.

[7] Camp Pendleton is a Community Plan Area (CPA) in San Diego County. The 2014 population is from SANDAG 2014 Estimates and the 2020-2050 population is from SANDAG Series 13 Forecast for Pendleton-De Luz (CPA). The population in Pendleton-De Luz includes those in Group Quarters - Military and Households and excludes non-base population, based on San Diego County calculations. SANDAG Data Surfer. Download Date: 02/17/2016

[8] The population in the Native American Reservations was calculated by summing up the population in each reservation based on U.S. Census 2010 and kept constant from 2014 to 2050. U.S. Census 2010 data are from United State Census Bureau. http://www.census.gov/2010census/ Download Date: 10/20/2015

[9] The County provided total additional dwelling units assumed to occur at a 2050 build-out year. Values for 2020 through 2040 were interpolated assuming no GPA projects were built in 2014. Conversion of housing units to population assumed an average household size of 2.7 persons per dwelling unit. The additional 2050 housing units due to the GPAs are shown in Table 3.

[10] The modified population is calculated by deducting population from Camp Pendleton and Native American Reservations from and adding the additional population attributable to the County's GPAs to the total Unincorporated County population.

[11] The number of civilian jobs is from SANDAG Series 13, Unincorporated County and Pendleton-De Luz (CPA). The employment types included in commercial jobs are all except construction, manufacturing, and agriculture.

[12] The number of Native American Reservation jobs is based on data analysis provided by SANDAG on 6/28/16.

[13] The County provided total additional commercial square feet assumed to be built by 2050. Values for 2020 through 2040 were interpolated assuming no GPA projects were built in 2014. Conversion of commercial square feet to employment assumed a density of 500 square feet per employee for "Other Commercial" land use types, according to County estimates. The additional 2050 housing units due the GPAs are shown in Table 3. (SANDAG. 2013. Series 13: 2050 Regional Growth Forecast. Accepted by the SANDAG Board of Directors on October 15, 2013. http://www.sandag.org/index.asp?classid=12&subclassid=84&projectid=503&fuseaction=projects.detail)

[14] SANDAG Series 13. The employment types included in industrial jobs are construction and manufacturing. Industrial jobs were not available for tribal lands. Agricultural jobs were not included as they were not used in calculating the GHG inventory. Instead, agricultural lands were used to scale emissions in the GHG inventory.

[15] The drop in forecasted industrial jobs in 2030 was reported in SANDAG's Series 13 data.

[16] The 2014 total county-wide population is from SANDAG's 2014 Estimates. The SANDAG Population Estimates are released annually and modified based on *E-5 Population and Housing Estimates for Cities, Counties and the State*, California Department of Finance. The 2020-2050 total unmodified population is from SANDAG's Series 13 Forecast. SANDAG Series 13 is forecasted from 2012 as the base year. This total population includes household population and group quarters population (college, military and other). SANDAG Data Surfer. Download Date: 02/23/2016

[17] IPCC Fourth Assessment Report: Climate Change 2007. Direct Global Warming Potentials. (2013) https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

[18] ICLEI – Counties for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). http://icleiusa.org/tools/ghg-protocols/

[19] California Air Resources Board (ARB). California Greenhouse Gas Emission Inventory – 2015 Edition. (2015) http://www.arb.ca.gov/cc/inventory/data/data.htm

[20] SANDAG provided an adjusted VMT estimate for 2014 and future years, based on their Series 13 model, on July 5, 2016. http://www.sandag.org/index.asp?subclassid=120&fuseaction=home.subclasshome

[21] ICLEI – Counties for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix D: Transportation and Other Mobile Emission Activities and Sources.

[22] Communication with SANDAG. 2014 O-D VMT Data received by Ascent Environmental on 07/05/2016.

[23] The "5 to 7 day conversion" factor for VMT for freeways and highways, was provided through SANDAG by Caltrans, Kim Sturmer (2009).

[24] California Air Resources Board. Mobile Source Emissions Inventory. EMFAC2014 (2015). http://www.arb.ca.gov/msei/msei.htm

[25] EMFAC2014 Web Database. Emission Rates for SANDAG, Calendar Year 2014. Download Date: 09/15/2015 http://www.arb.ca.gov/emfac/2014/ The vehicle classes in EMFAC2014 are the same as in EMFAC2011.

[26] Users of EMFAC2014 have the choice of selecting either EMFAC2011 or EMFAC2007 categories.

[27] The EMFAC2011 Vehicle Categories (used in EMFAC2014) classifies passenger cars as cars of all types using all fuel types and designated as LDA. LDTs are light duty trucks divided into LDT1 and LDT2, where LDT1 includes gas, diesel and electric fuel trucks while LDT2 does not include electric fuel vehicles. Medium duty trucks, MDTs, include medium duty vehicles, MDVs, (5751-8500 lb) and motor homes. Heavy duty trucks, HDTs, are those that weigh from 8,500 to 60,000 lb. http://www.arb.ca.gov/msei/modeling.htm

[28] ICLEI – Counties for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix C: Built Environment Emission Activities and Sources. http://icleiusa.org/tools/ghg-protocols/

[29] Communication with SDG&E. Data provided to EPIC on 01/08/2016.

[30] The transmission and distribution loss factor is used to scale end-use demand or retail sales to produce net energy for load. L. Wong. *A review of transmission losses in planning studies.* CEC Staff Paper. (2011) http://www.energy.ca.gov/2011publications/CEC-200-2011-009/CEC-200-2011-009.pdf

[31] California Energy Commission (CEC). *California Energy Demand 2015-2025 Final Forecast Mid-Case Final Baseline Demand Forecast Forms.* SDG&E Mid. The transmission and distribution loss factor, 1.067, is calculated based on the ratio of net energy for load (total sales + net losses) and total sales in 2014 from SDG&E Form 1.2 Mid. http://www.energy.ca.gov/2014_energypolicy/documents/demand_forecast_cmf/Mid_Case/ Download Date: 06/23/15.

[32] To develop a per-capita residential electricity consumption rate for 2014, the residential electricity consumption data provided by SDG&E was divided by the total population in the Unincorporated County excluding Camp Pendleton (460,516). The per-capita electricity consumption is 2,869 kWh/person/year. The per capita consumption was applied to the total modified population used in this inventory (454,599) to calculate the total consumption in the residential customer class, which excludes both military and tribal residential customers.

[33] For the method used to calculate electricity consumption associated with the water category, see Section 4.7.2: Emissions from Water Supplied.

[34] SDG&E bundled power includes the electricity from SDG&E owned power plants and the electricity from its net procurements.

[35] Direct Access (DA) power includes the electricity customers purchased from electric service providers (ESPs) but using SDG&E transmission and distribution services. http://www.sdge.com/customer-choice/electricity/direct-access-faq

[36] Federal Energy Regulatory Commission (FERC). Form 1 - Electricity Utility Annual Report. http://www.ferc.gov/docs-filing/forms/form-1/viewer-instruct.asp. Download Date: 07/20/2015

[37] California Energy Commission (CEC) Power Source Disclosure Program under Senate Bill 1305. http://www.energy.ca.gov/sb1305/ SDG&E annual report (2010-2014) provided by CEC staff to EPIC on 08/07/2015.

[38] U.S. EPA. eGRID 2012. (2015) http://www2.epa.gov/energy/egrid Download Date: 10/09/2015

[39] Decision 14-12-037, December 18, 2014 in Rulemaking 11-03-012 (Filed March 24, 2011). http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M144/K130/144130487.pdf. The Decision adopts an emission factor of 0.379 $MTCO_2e$/MWh) for direct access electricity purchased from all investor-owned utilities, publicly owned utilities and energy service providers other than PG&E. EPIC converted the emission factor 0.379 $MTCO_2e$/MWh to 836 lb CO_2e/MWh as the DA emission factor.

[40] ICLEI 2012. See Note 28.

[41] Natural gas use was not available separately by commercial, industrial, and agricultural customers due to privacy restrictions from SDG&E.

[42] Communication with SDG&E. Data provided to EPIC on 01/08/2016. See previous endnote.

[43] Similar to the electricity category, to develop a per capita residential natural gas consumption rate for 2014, the residential natural gas consumption data provided by SDG&E was divided by the total population in the Unincorporated County excluding Camp Pendleton (461,300). The per capita natural gas consumption is 63.6 therms/person/year. The per capita consumption was applied to the total modified population used in this inventory (454,599) to calculate total consumption in the residential customer class, which excludes both military and tribal residential customers.

[44] ARB. *Documentation of California's Greenhouse Gas Inventory.* Fuel Combustion – Natural Gas. (2015) http://www.arb.ca.gov/cc/inventory/doc/docs1/1a1ai_instategenerationutilityowned_fuelcombustion_naturalgas_ch4_2013.htm

[45] ICLEI 2012. See Note 28.

[46] Propane Education & Research Council. Propane Reduces Greenhouse Gas Emissions: A Comparative Analysis. (2007), https://www.arb.ca.gov/cc/scopingplan/submittals/other/climatechangestudy_final.pdf

[47] ICLEI – Counties for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix E: Solid Waste Emission Activities and Sources. http://icleiusa.org/tools/ghg-protocols/

[48] ICLEI, 2012. See Note 47.

[49] ICLEI Community protocol. Appendix E: Solid Waste Emission Activities and Sources. Table SW.5 CH_4 Yield for Solid Waste Components.

[50] ICLEI, 2012. See Note 47.

[51] CalRecycle. Disposal Reporting System (DRS): Jurisdiction Disposal and Alternative Daily Cover (ADC) Tons by Facility. http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx Download Date: 09/29/2015

[52] County of San Diego. Department of Public Works. Solid Waste Planning and Recycle Division. Data provided to EPIC on 10/02/2015.

[53] ICLEI, 2012. Table SW.5. See Note 49.

[54] ICLEI, 2012. See Note 47.

[55] ICLEI, 2012. See Note 47.

[56] EPA. Greenhouse Gas Reporting Program GHG MRR Final Rule. http://www2.epa.gov/ghgreporting/ghg-mrr-final-rule

[57] ICLEI – Counties for Sustainability USA. U.S. Community Protocol (2012). Appendix E: Solid Waste Emission Activities and Sources. SW.1.1 Alternative Method – Methane Emissions from Landfills

[58] IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 3: Solid Waste Disposal. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf

[59] Waste-in-place is the amount of waste in the landfill at the point in time from which landfill gas generation is estimated, ICLEI Community Protocol. Appendix E. See Note 47.

[60] Communication with County of San Diego, Department of Public Works, Solid Waste Planning and Recycle Division. 10/02/2015

[61] Landfills with Gas Systems Data for San Diego County. County of San Diego Department of Public Works Inactive Waste Division. 10/14/2015

[62] EPA. Facility Level Information on Greenhouse Gases Tool (FLIGHT). http://ghgdata.epa.gov/ghgp/main.do Download Date: 10/07/2015

[63] Communication with Tom Gardner. Republic Services. 10/20/2015

[64] Based on the EPA MRR, emissions from solid waste landfills must be calculated in two ways: FOD model (Equation HH-6) and the actual measured quantity of methane (Equation HH-8). The larger value is reported in most cases. For Otay Landfill, emissions from Equation HH-8 was the larger and reported value. http://www.ccdsupport.com/confluence/display/ghgp/Detailed+Description+of+Data+for+Certain+Sources+and+Processes

[65] ARB. Landfill Methane Control Measure. Landfill Emissions Tool Version 1.3 (2011) http://www.arb.ca.gov/cc/landfills/landfills.htm Download Date: 10/05/2015

[66] The Landfill Emissions Tool inputs for this assume a one-time deposit of 173,057 tons of waste from Table 13 and 18,754 tons of daily cover in 2014 as reported by CalRecycle.

[67] Communication with Larry Hunsaker. ARB. Data provided to EPIC on 03/20/2008.

[68] CalRecycle. See Note 51. The waste from Unincorporated County accepted by Borrego Landfill in 2014, 2,552 wet short tons, was excluded.

[69] CalRecycle. See Note 51. ADC tonnages were not reported in CalRecycle for Borrego Landfill from 2010 to 2014.

[70] Communication with Tom Gardner. Republic Services. 10/20/2015

[71] Since there is no reported measured quantity of methane (similar to HH-8 in EPA MRR) for the Borrego Landfill, emissions were calculated using the FOD Model (HH-6 in EPA MRR) as the best available method and the method suggested by ICLEI.

[72] The closed landfill section was prepared by Ascent Environmental.

[73] County of San Diego Government Operations Emissions Inventory – Calendar Year 2014. 2014. Climate Registry Information System (CRIS).

[74] County Operations Protocol Version 1.0 (2008) http://www.arb.ca.gov/cc/protocols/localgov/archive/final_lgo_protocol_2008-09-25.pdf

[75] ARB. See Note 65.

[76] Western Regional Climate Center. 2009. Climatological Summary of the San Diego International Airport Station. Available: http://www.wrcc.dri.edu/summary/san.ca.html. Accessed February 5, 2016.

[77] Communication with County of San Diego, Department of Public Works, Landfill Management. 01/29/2016 – email to Poonam Boparai of Ascent regarding alternative daily cover at Viejas Landfill.

[78] San Diego Air Pollution Control District. 2014. Facility Emissions 2014 Emissions Inventory Report. Facility ID: 88189A

[79] Landfills with Gas Systems Data for San Diego County. County of San Diego Department of Public Works Inactive Waste Division. 10/14/2015

[80] Numbers may not add up due to rounding.

[81] 2014 Crop Statistics & Annual Report. County of San Diego. Department of Agriculture, Weights and Measures. 2014 (Released September 2015). Based on the *2014 Crop Statistics& Annual Report*, no rice cultivation activities were reported in San Diego County and none of the six crops accounting for the majority of residue burning were reported in San Diego County.

[82] SANDAG Series 13 Forecast. Land Use – Agricultural and Extractive (Interpolated for 2014). http://datasurfer.sandag.org/ . Download date: 07/05/2016

[83] Interpolated between 2012 and 2020 values reported in SANDAG's Series 13 dataset, dated October 2013.

[84] The types of agricultural equipment include both gas and diesel engine 2-wheel tractors, agricultural tractors, combines, balers, agricultural mowers, sprayers, tillers, swathers, hydro power units, and other agricultural equipment. Diesel-powered agricultural irrigation pumps are included under the "hydro power units" equipment category. List from OFFROAD2007 Model. Air Resources Board. http://www.arb.ca.gov/msei/categories.htm, download date: 09/10/2015

[85] Air Resources Board. OFFROAD2007 Model. http://www.arb.ca.gov/msei/categories.htm download date: 09/10/2015

[86] ICLEI 2012. See Note 90.

[87] EPA 2014. See Note 93.

[88] EPA 2014. See Note 93.

[89] ARB. Documentation of California's Greenhouse Gas Inventory (8th Edition, Last Updated on 04-24-2015). IPCC 3C5 - Aggregate Sources and Non-CO2 Emissions Sources on Land - Indirect N_2O Emissions from Managed Soils http://www.arb.ca.gov/cc/inventory/doc/docs3/3c5_agsoilmanagement_indirect_fertilizernitrogen_syntheticfertilizers_n2o_2013.htm

[90] ICLEI – Counties for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix G: Agricultural Livestock Emission Activities and Sources. http://icleiusa.org/tools/ghg-protocols/

[91] 2014 Crop Statistics & Annual Report. County of San Diego. Department of Agriculture, Weights and Measures. 2014 (Released September 2015).

[92] United States Department of Agriculture (USDA). National Agricultural Statistics Service. All Inventory, 2012 Census Agriculture - San Diego County http://quickstats.nass.usda.gov

[93] EPA U.S. Greenhouse Gas Inventory Report: 1990-2013. Annex 3. (2014) http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2015-Annex-3-Additional-Source-or-Sink-Categories.pdf

[94] Air Resources Board. California's 2000-2013 Greenhouse Gas Emissions Inventory. Method Updates Since 2014 Edition of the Inventory (June 2015). http://www.arb.ca.gov/cc/inventory/doc/methods_00-13/2013_ei_method_update.pdf

[95] 2014 Crop Statistics & Annual Report. See Note 91.

[96] UC Davis. Agricultural & Resource Economics. http://coststudies.ucdavis.edu/en/current/

[97] Does not include rangelands. Unlike irrigated pasture land, rangelands primarily consist of native vegetation and are assumed to have no nitrogen fertilizer application.

[98] "Other Crops" should not be confused with "Miscellaneous Field Crops", "Miscellaneous Fruits and Nuts", and "Miscellaneous Vegetables". These latter crop types are specifically named as such in the San Diego County's 2014 Crop Report. "Other Crops" accounts for less than 10% of total non-rangeland agricultural acreage and includes crop types that are not listed in Table 2423, but are included in the 2014 Crop Report. Nitrogen application rates for "Other Crops" represents a weighted average application rate.

[99] Air Resources Board. Direct N_2O Emissions from Managed Soils (April 2015). http://www.arb.ca.gov/cc/inventory/doc/docs3/3c4_agsoilmanagement_direct_fertilizernitrogen_syntheticfertilizers_n2o_2013.htm

[100] Air Resources Board. Indirect N2O Emissions from Managed Soils (April 2015). http://www.arb.ca.gov/cc/inventory/doc/docs3/3c5_agsoilmanagement_indirect_fertilizernitrogen_syntheticfertilizers_n2o_2013.htm

[101] Air Resources Board. California's 2000-2012 Greenhouse Gas Emissions Inventory. Technical Support Document. (May 2014). http://www.arb.ca.gov/cc/inventory/doc/methods_00-12/ghg_inventory_00-12_technical_support_document.pdf

[102] County of San Diego. Department of Agriculture, Weights & Measures. Staff Communication. 5/13/2016. and 2014 Crop Statistics & Annual Report. See Note 91.

[103] 2014 Crop Statistics & Annual Report. See Note 91.

[104] Air Resources Board. Fuel Consumption Methodologies for Agricultural Irrigation Engines (category 052042-12000000). (2003). http://www.arb.ca.gov/ei/areasrc/FULLPDF/FULL1-1.pdf. Accessed October 27, 2015.

Air Resources Board. Rulemaking to Consider Proposed Amendments to the Stationary Diesel Engine Control Measure - Appendix D: Emission Inventory Methodology Agricultural Irrigation Pumps - Diesel. (2006). http://www.arb.ca.gov/regact/agen06/append.pdf. Table 2. Accessed January 13, 2016.

[105] Table D-2 in Air Resources Board. Rulemaking to Consider Proposed Amendments to the Stationary Diesel Engine Control Measure - Appendix D: Emission Inventory Methodology Agricultural Irrigation Pumps - Diesel. (2006). http://www.arb.ca.gov/regact/agen06/append.pdf. Table 2. Accessed January 13, 2016.

[106] Including industrial and commercial sectors and non-unincorporated County facilities.

[107] Emissions from end-use energy by homes and businesses, generally to heat water, represents the largest amount of energy associated with the water cycle and are included in the natural gas and electricity categories.

[108] ICLEI – Countys for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix F. Wastewater and Water Emission Activities and Sources.

[109] Data in Table 26 was compiled based on different sources as discussed in Sections 4.7.1.1 and 4.7.1.2.

[110] County of San Diego. Department of Planning & Development Services. Geographic Information System (GIS). 02/02/2016. For SDCWA Member Agencies, populations in their services areas in the Unincorporated County are from GIS analysis.

[111] Water supply includes agricultural use. For Lakeside W.D., total water supplied was provided through personal communication with Jeanne Swaringen. Lakeside W.D. Data provided to EPIC on 11/04/2015. Per capita water use in Lakeside W.D. is calculated based on the total water supplied and residing population. For other member agencies, per capita water use is calculated based on total water supplied in 2014 and the estimated population in each member agency's service area, which may include both unincorporated and incorporated areas. SDCWA 2014 Annual Report. Water Sources and Supply Fiscal Year 2013-2014. http://sdcwa.org/annualreport/2014/sites/default/files/SDCWA_2014_ar.pdfDownload Date: 11/05/2015

[112] Total water supplied to the Unincorporated County is calculated based on population (Note 110) and per capita water supplied (Note 111) except Lakeside W.D., which was provided directly. Water supply includes agricultural use. Download Date: 11/05/2015

[113] Water source in each member agency was extracted from its 2010 Urban Water Management Plan (UWMP), water source supply. Groundwater supply includes purchased groundwater and district-owned groundwater wells. Surface water supply includes all SDCWA imported water and local surface water supply. Recycled water supply includes purchased recycled water and recycled water from district-owned water reclamation facility. For a list of UWMPs refer to http://www.water.ca.gov/urbanwatermanagement/2010uwmps/

[114] SANDAG. Final Environmental Impact Report for San Diego Forward. Section 4.16 – Water Supply. http://www.sdforward.com/pdfs/EIR_final/Section%204.16%20Water%20Supply.pdf

[115] Population that resides within an agency's service area. Not all persons residing within a given service area purchase water from the agency serving that area.

[116] County of San Diego. Department of Public Works. Wastewater Management Division. 10/21/2015. Campo Hills Water System is owned and operated by the County's Department of Public Works.

[117] County of San Diego. Department of Planning & Development Services. Geographic Information System (GIS). 02/02/2016. Population in Borrego W.D. Service Area was based on GIS analysis. Water supplied was provided by Jerry Rolwing. Borrego W.D. Data provided to EPIC on 10/26/2015.

[118] County of San Diego. Department of Planning & Development Services. Geographic Information System (GIS). 02/02/2016. For the water supply providers indicated by (*), populations in the service areas were based on GIS analysis. Water use was calculated based on the population in each provider's service area and the per capita water use from Campo Water Maintenance District Data (132.8 gal/person/day).

[119] The population served by unspecified water supply was estimated based on the difference between total population in Unincorporated County (454,599) and populations served by all known water supply providers including in and outside the SDCWA service area (418,339). Water consumption was calculated based on the population and the per capita water consumption from the Campo Water Maintenance District Data (132.8 gal/person/day).

[120] The numbers in this column are not intended to be summed. Water volumes should not be added here because each represent the volume of water related to a specific action, which could either be extraction, conveyance, distribution, or treatment. For every gallon of water used by the County, that gallon would have gone through multiple stages of conveyance and treatment, depending on its source.

[121] Represents the percent of electricity physically used within the Unincorporated County associated with a particular segment of the water system. These percentages are explained in Sections 4.7.2.1, 4.7.2.2, and 4.7.2.3.

[122] Represents the water-related electricity use within the Unincorporated County that is excluded from the electricity sector but captured in the water sector.

[123] California Energy Commission (CEC). Navigant, *Refining Estimates of Water-Related Energy Use in California.* 2006

[124] Conventional water treatment processes include coagulation/flocculation, sedimentation, filtration and disinfection. Energy intensity of standard treatments were calculated based on data from the City of San Diego's three Water Treatment Plants, provided to EPIC in 2014. (Value for 2010)

[125] California Public Utility Commission (CPUC). *Embedded Energy in Water Studies 1, 2 and 3.* Groundwater Energy Use (2011) Convert from Energy Intensity for South Coast Hydrologic Region, 593 kWh/AF. http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/Embedded+Energy+in+Water+Studies1_and_2.htm

[126] The advanced water treatment refers specifically to the energy requirement for brackish groundwater desalination with reverse osmosis. The source water salinity in the San Diego region is 1,000-3,000 mg/L, the average of energy intensity between 3,000-4,200 kWh/million gallons was used. WaterReuse Research Foundation. *Implications of Future Water Supply Sources for Energy Demands.* (2012) Table 4.5. http://www.pacinst.org/wp-content/uploads/2013/02/report19.pdf

[127] This represents the average energy intensity for local water distribution from City of San Diego's three water treatment plants. City of San Diego. See Note 124.

[128] The water treatment plants located within Unincorporated County boundaries are R.M. Levy Water Treatment Plant located in Lakeside (treats surface water from Helix W.D. and Lakeside W.D.) and R.E Badger Filtration Plant located in Rancho Santa Fe (treats surface water from Santa Fe I.D.). Helix W.D. 2010 UWMP and Santa Fe I.D. 2010 UWMP. http://www.water.ca.gov/urbanwatermanagement/2010uwmps/

[129] The only groundwater supply that is outside the Unincorporated County boundaries is the groundwater from the South Bay I.D., Sweetwater Authority 2010 Urban Water Management Plan. http://www.sweetwater.org/Modules/ShowDocument.aspx?documentid=3748

[130] It was assumed all water supplied outside the SDCWA service area (including unspecified supply) did not undergo the standard treatment process. The assumption was made based on treatment information obtained from several water suppliers. In Borrego W.D., the only treatment performed is chlorination at the wellhead (communication with Borrego W.D.). This is the same for other water suppliers, such as Cuyamaca W.D. (http://www.cuyamacawaterdistrict.org/). The groundwater supplied by Yuima M.W.D. only goes through disinfection (chlorine) at the wellhead (Yuima M.W.D. 2014 Consumer Confidence Report). The groundwater supplied by Lakeside goes through dual media filtration treatment to remove iron and manganese (communication with Jeanne Swaringen, Lakeside W.D.). No water district has a standard water treatment for its groundwater supply.

[131] The groundwater supply that goes through advanced treatment is the groundwater supplied by the South Bay I.D., from the brackish groundwater (Sweetwater Valley Groundwater Basin), treated at the Richard A. Reynolds Desalination Facility with Reverse Osmosis. The groundwater amount was calculated based on total water supplied and water source mix of the South Bay I.D. (Sweetwater Authority). Sweetwater Authority 2010 Urban Water Management Plan. http://www.sweetwater.org/Modules/ShowDocument.aspx?documentid=3748

[132] For recycled water use refer to Fallbrook P.U.D., Olivenhain M.W.D., Ramona M.W.D., Otay W.D., and Padre Dam M.W.D. 2010 UWMPs. http://www.water.ca.gov/urbanwatermanagement/2010uwmps/

[133] ARB. Off-Road Motor Vehicles. OFFROAD 2007. http://www.arb.ca.gov/msei/categories.htm Download date: 10/30/2015

[134] ARB. Off-Road Diesel Equipment. In-Use Off-Road Equipment (Construction and Mining, Industrial, Airport Ground Support, and Oil Drilling) http://www.arb.ca.gov/msei/categories.htm Download date: 10/30/2015

[135] ARB. Off-Road Gasoline-Fueled Equipment. Recreational Vehicles. RV2013 (Inventory Model Database). http://www.arb.ca.gov/msei/categories.htm Download date: 10/30/2915

[136] The sub-categories listed in this table are not the comprehensive off-road mobile sources listed by ARB (http://www.arb.ca.gov/msprog/offroad/offroad.htm), as some of the sub-categories are not relevant to the Unincorporated County, such as commercial marine vessels, or there are no CO_2 emissions reported in the category specific inventory, such as cargo handling equipment. Agricultural equipment is included in the agriculture category.

[137] List of Equipment included in the sub-categories is in ARB Overview: OFFROAD Model http://www.arb.ca.gov/msei/offroad/pubs/offroad_overview.pdf Download Date: 10/30/2015

[138] ARB. Documentation of California's Greenhouse Gas Inventory (8th edition). Category: Transportation: Off Road. http://www.arb.ca.gov/cc/inventory/doc/docs1/1a3eii_offroad_construction&miningequ_fuelcombustion_distillate_n2o_2013.htm

[139] ARB. Off-Highway Recreational Vehicles (OHRV) Regulation. (2014) http://www.arb.ca.gov/msprog/offroad/orrec/ab1085compliance.htm

[140] SANDAG. Data Surfer. 2014 Estimates – Region. http://datasurfer.sandag.org/ Download Date: 02/19/2016

[141] Population served was only available from the County of San Diego, Department of Public Works. Population estimates for all other wastewater collection entities represent a residing service area population.

[142] List of County's sanitation and maintenance districts, see County of San Diego Sewer System Management Plan. (2010) http://www.sandiegocounty.gov/content/dam/sdc/dpw/WASTEWATER/SewerSystemMgtPlan_Jun2010.pdf

[143] County of San Diego. Department of Public Works. Treatment Plants. http://www.sandiegocounty.gov/content/sdc/dpw/wasteh2o/TreatmentPlants.html

[144] County of San Diego. Department of Public Works. Wastewater Management Section. 10/21/15. Wastewater flow, population served and treatment facilities data.

[145] SANDAG San Diego Forward: The Regional Plan Program Environmental Impact Report. 4.14 Public Services and Utilities. http://www.sdforward.com/pdfs/EIR_final/Section%204.14%20Public%20Services%20and%20Utilities.pdf

146 County of San Diego. Department of Planning & Development Services. Geographic Information System (GIS). 02/02/2016. Populations in the services areas in the Unincorporated County are from GIS analysis and represents the residing population. A portion of the population located in the service area may not be served by any of the listed wastewater agencies.

147 The wastewater collected by the Borrego W.D. was provided from communication with Jerry Rolwing, Borrego W.D. Data provided to EPIC on 10/26/2015. The wastewater collected by the Fairbanks Ranch CSD, Pauma Valley CSD and Whispering Palms CSD was estimated based on the average MGD from each treatment facility's monthly monitoring report in 2014. Monitoring reports were requested from the California Regional Water Quality Control Board (CRWQCB) San Diego Region by EPIC. Data was provided to EPIC on 11/12/2015 and 12/02/2015. For the Buena Sanitation Maintenance District and Rancho Santa Fe CSD, wastewater flows were calculated based on population served and the per capita wastewater generated (98.5 gal/person/day) from the above three CSDs (Fairbanks Ranch, Pauma Valley and Whispering Palms).

148 The names of SDCWA member agencies that collect and/or treat wastewater from the Unincorporated County are based on their 2010 UWMPs (See Note 113) and SANDAG San Diego Forward 4.14 Public Services and Utilities (See Note 145).

149 The Helix W.D. does not collect, treat or discharge wastewater within its service area. However, nine other districts provide wastewater collection services within its boundaries, including the County of San Diego (unincorporated area) and other districts that provide service to the unincorporated area. All wastewater is conveyed and treated at the City of San Diego's Point Loma WWTP. Helix UWMP 2010 (http://www.water.ca.gov/urbanwatermanagement/2010uwmps/). Wastewater collected by Rainbow M.W.D. is conveyed and treated at the City of Oceanside's San Luis Rey WWTP. Communication with the City of Oceanside (Information provided to EPIC in 2015). For agencies other than Helix W.D. and Rainbow M.W.D., the treatment facility is based on that reported in SANDAG's San Diego Forward (See Note 145).

150 County of San Diego. Department of Planning & Development Services. Geographic Information System (GIS). 02/02/2016. Populations in the services areas in the Unincorporated County are from GIS analysis and represents the residing population. A portion of the population located in the service area may not be served by a member agency. For a SDCWA member agency that provides both water and wastewater service, the water and the wastewater service areas may not be the same, therefore, the population in each service area may not be the same. The population for the Helix W.D. service area was modified by subtracting the population served by the County of San Diego (flow treated at Point Loma, 48,000) from the total population in the Helix W.D. service area (GIS analysis, 79,672).

151 Wastewater flows, other than in Padre Dam M.W.D., Helix W.D. and Rainbow M.W.D., were estimated based on the average MGD from each treatment facility's monthly monitoring report in 2014. Monitoring reports were requested from the California Regional Water Quality Control Board (CRWQCB) San Diego Region by EPIC. Data provided to EPIC on 11/12/2015 and 12/02/2015. For Padre Dam M.W.D., Helix W.D. and Rainbow M.W.D., wastewater flows were calculated based on population served and the per capita wastewater generated (53.5 gal/person/day) from other SDCWA member agencies.

152 U.S. Environmental Protection Agency (EPA). Septic Systems. http://www.epa.gov/septic. For a septic system, wastewater is treated through physical settling and biological activities only.

153 Metropolitan Statistics Area (MSA) is a geographical area with a population of 50,000 or more, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. http://www.labormarketinfo.edd.ca.gov/msa/sdiego.html#DEF. San Diego County (referred to as San Diego region in this inventory) comprises the San Diego-Carlsbad MSA.

154 ICLEI Community Protocol. Appendix F. See Note 108. Box WW.11(alt).1 Septic Systems in Metropolitan Area. San Diego, CA MSA. Original data source from US Census Bureau, based on housing units with septic system and average number of people per household.

155 Subtract population covered by the County's Department of Public Works (49,968), individual wastewater facilities (28,182), SDCWA member agencies (172,312) and septic systems (154,000) from the total population in Unincorporated County (454,599).

156 For other wastewater collection agencies and systems surrounding the Unincorporated County, refer to SANDAG San Diego Forward 4.14 Public Services and Utilities. See Note 145.

157 Wastewater treatment process in Point Loma WWTP (http://www.sandiego.gov/mwwd/facilities/ptloma/index.shtml) and in Encina WPCF (http://www.encinajpa.com/protecting-the-pacific/water-pollution-control-facility). Treatment processes at San Luis Rey WWTP were provided by the City of Oceanside to EPIC in 2015.

158 City of San Diego, Public Utilities. *2014 Annual Reports and Summary Point Loma Wastewater Treatment Plant & Ocean Outfall.* (2015) http://www.sandiego.gov/mwwd/pdf/pm/2014annualpl.pdf

159 ARB. Mandatory GHG Reporting – Reported Emissions. 2014 GHG Facility and Entity Emissions. http://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm Download Date: 11/10/2015

160 Total wastewater treated and emissions from wastewater processes were provided by Encina Wastewater Authority. Encina WPCF estimates show a higher emission rate per million gallons treated than at Point Loma WWTP due to potential methodological differences

in the respective facility's emissions calculations. Data from Encina WPCF includes emissions from nitrification, whereas data from Point Loma WWTP is based on their report to ARB. ARB does not require emissions from nitrification to be reported from WWTPs. Data provided to EPIC in 2014.

161 For Fairbanks Ranch CSD, Fallbrook P.U.D., Pauma Valley CSD, Rancho Santa Fe CSD and Whispering CSD, information on their wastewater treatment processes were from facility inspection reports requested from the California Regional Water Quality Control Board (CRWQCB) San Diego Region by EPIC. Data provided to EPIC on 11/12/15 and 12/02/15. For Rams Hill WWTF (Borrego WD), information was available directly from the Borrego WD. Data provided to EPIC on 10/26/2015. For SDCWA member agencies, information on their wastewater treatment processes were from inspection reports (CRWQCB), district websites or 2010 UWMPs.

162 ICLEI 2012. Appendix F. See Note 108.

163 Populations served by the Point Loma WWTP (79,672), Encina WPCF (10,736) and San Luis Rey WWTP (20,198) were subtracted from the total population in the Unincorporated County served by a centralized WWTP (250,462).

164 ARB. 2014. *Technical Support Document for the 2000-2012 California's Greenhouse Gas Emissions Inventory.* Annex 4C. Wastewater Treatment and Discharge (IPCC 4D). http://www.arb.ca.gov/cc/inventory/doc/methods_00-12/annex_4c_wastewater_treatment_and_discharge.pdf

165 ARB. 2014. See Note 164.

166 ICLEI 2012. Appendix F. See Note 108.

167 ARB. Documentation of California's Greenhouse Gas Inventory (8th Edition). 2015. IPCC 4D1 Domestic Wastewater Treatment and Discharge. Septic Systems. http://www.arb.ca.gov/cc/inventory/doc/docs4/4d1_wastewatertreatment_domesticwastewater_septicsystems_californiapopulation_ch4_2013.htm

168 Total weekday VMT was multiplied by 0.96 then 365 to calculate annual VMT. See Section 4.1.1.

169 California Public Utilities Commission. California Renewables Portfolio Standard (RPS). http://www.cpuc.ca.gov/RPS_Homepage/ (Accessed May 26, 2016)

170 2016 Building Energy Efficiency Standards. Frequently Asked Questions. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_FAQ.pdf. (Accessed January 26, 2016)

171 See note 169

172 California Public Utilities Commission. California Renewables Portfolio Standard (RPS). http://www.cpuc.ca.gov/RPS_Homepage/ (Accessed May 26, 2016 and May 25, 2017)

173 EPA. Landfill Methane Outreach Program. Candidate Landfills. https://www3.epa.gov/lmop/projects-candidates/candidates.html (Accessed July 8, 2016)

174 ARB. Mobile Source Emissions Inventory – Categories. http://www.arb.ca.gov/msei/categories.htm (Accessed July 12, 2016)

175 SANDAG Series 13 Unincorporated San Diego County Forecast

Appendix

2014 Greenhouse Gas Emissions Inventory and Projections Calculations

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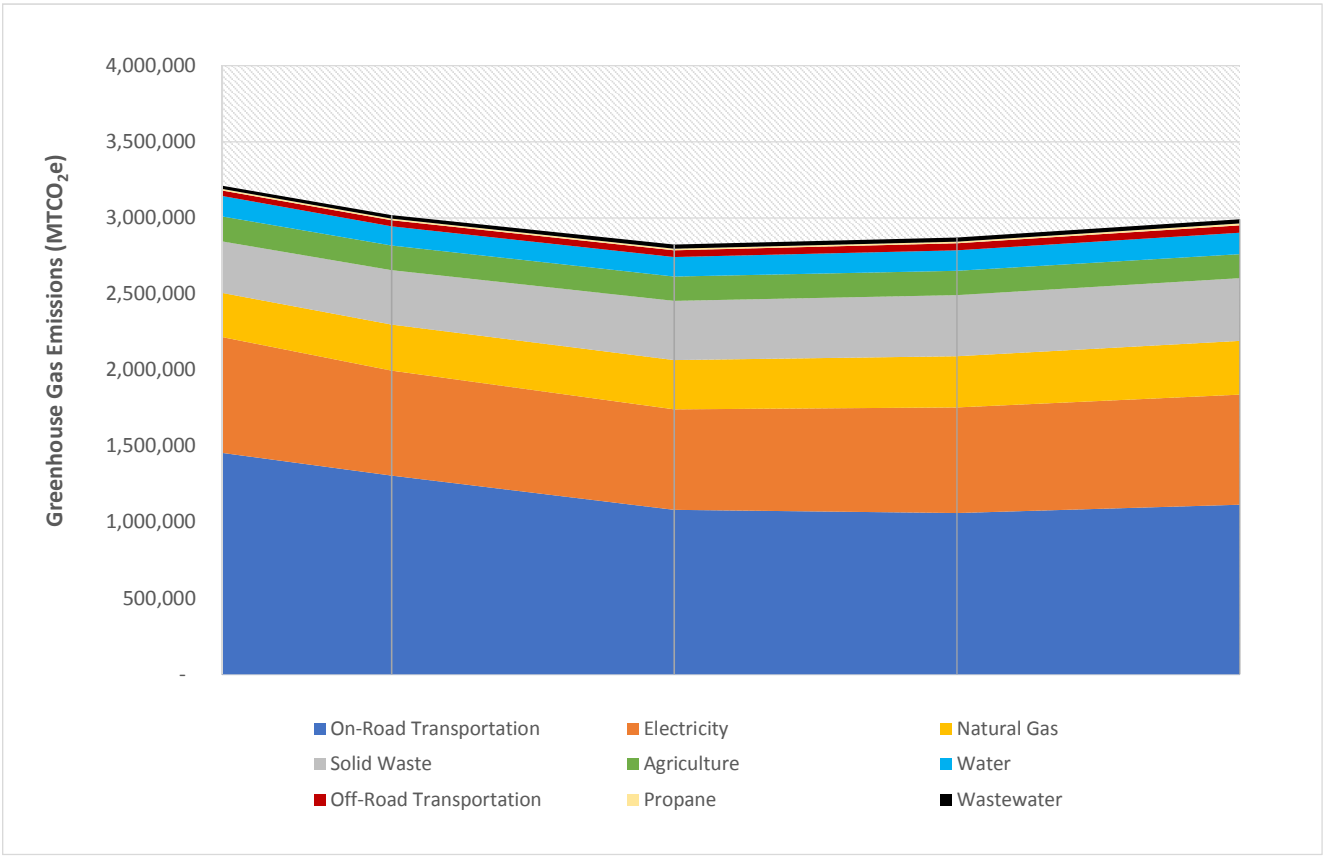
	2014	2020	2030	2040	2050
Total Without Any Legislative Reductions	3,211,505	3,407,168	3,723,596	3,961,517	4,220,560
On-Road Transportation	1,456,060	1,306,679	1,081,223	1,061,287	1,116,114
Electricity	760,638	690,144	661,266	692,408	723,503
Solid Waste	338,107	358,651	389,610	402,089	411,298
Natural Gas	290,712	302,017	323,008	336,836	353,041
Agriculture	163,696	161,376	160,136	159,264	158,760
Water	134,269	125,616	128,104	134,536	139,446
Off-Road Transportation	36,927	40,815	43,938	46,877	49,733
Wastewater	21,183	23,001	25,708	26,999	27,985
Propane	9,914	10,372	11,055	11,381	11,629
Unincorporated San Diego County Emissions with Legislative Reductions	3,211,505	3,018,671	2,824,049	2,871,675	2,991,507
Legislative Reductions	0	388,498	899,547	1,089,842	1,229,053
Percent Change from 2014 with Legislative Reductions (%)	0%	-6%	-12%	-11%	-7%
Percent Change from 2014 without Legislative Reductions (%)	0%	6%	16%	23%	31%



TOTAL UNINCORPORATED EMISSIONS DETAIL

With Legislative Reductions

SECTOR	SUBSECTOR	2014	2020	2030	2040	2050	Scaling Method	Legislative Reduction
Electricity	Residential	415,441	374,543	364,280	375,026	383,231	Population, Energy Efficiency Improvements	Building Energy Efficiency Standards under Title 24, SB350, RPS targets
Electricity	Commercial	223,404	207,237	203,372	223,179	245,938	Commercial Jobs, Energy Efficiency Improvements	Building Energy Efficiency Standards under Title 24, SB350, RPS targets
Electricity	Industrial	65,269	60,669	55,284	55,793	55,809	Industrial Jobs, Energy Efficiency Improvements	Building Energy Efficiency Standards under Title 24, SB350, RPS targets
Electricity	Agricultural	19,051	16,182	14,652	14,572	14,526	Agricultural Land, no Energy Efficiency Improvements	Building Energy Efficiency Standards under Title 24, SB350, RPS targets
Electricity	Non-Unincorporated County Facilities	37,473	31,513	23,678	23,838	23,999	County's 5-year plan through 2020. Assumed growth rate continues through 2050.	Building Energy Efficiency Standards under Title 24, SB350, RPS targets
Natural Gas	Residential	157,936	165,253	176,154	181,351	185,319	Population, Energy Efficiency Improvements	Building Energy Efficiency Standards under Title 24, SB350
Natural Gas	Commercial/ Industrial/ Agricultural	124,469	128,428	138,471	147,056	159,246	Commercial and Industrial Jobs, Energy Efficiency Improvements	Building Energy Efficiency Standards under Title 24, SB350
Natural Gas	Non-Unincorporated County Facilities	8,307	8,336	8,383	8,429	8,476	County's 5-year plan through 2020. Assumed growth rate continues through 2050.	Building Energy Efficiency Standards under Title 24, SB350
Propane	Residential	9,893	10,351	11,034	11,359	11,608	Scaled from ratio between propane/lpg and natural gas use in residential households	Building Energy Efficiency Standards under Title 24, SB350
Propane	Non-Unincorporated County Facilities	21	21	21	21	21	scaled based on employee growth	Building Energy Efficiency Standards under Title 24, SB350
Transportation	Passenger Cars (Diesel)	4,945	6,059	5,505	5,386	5,598	SANDAG VMT forecasts, Municipal Employee Forecast based on anticipated building additions	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Passenger Cars (Gasoline)	560,888	534,441	419,150	392,659	405,116	SANDAG VMT forecasts, Municipal Employee Forecast based on anticipated building additions	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Passenger Cars (EV Only)	635	4,636	20,538	26,760	28,567	SANDAG VMT forecasts	Emission factors based on RPS targets and 2014 MY fuel efficiencies from U.S. Department of Energy
Transportation	LDT1 (Diesel)	93	56	19	17	17	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	LDT1 (Gasoline)	65,842	49,033	34,120	30,276	30,326	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	LDT1 (EV Only)	6	5	5	6	6	SANDAG VMT forecasts	Emission factors based on RPS targets and 2014 MY fuel efficiencies from U.S. Department of Energy
Transportation	Other Light Duty Trucks	358,549	290,073	218,151	205,316	211,276	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Medium-duty Trucks	251,486	196,366	137,402	126,275	127,472	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Heavy-duty Trucks	170,414	188,280	213,639	242,276	274,347	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Buses	25,223	22,115	20,295	20,482	21,331	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Motorcycles	3,845	3,654	3,710	3,886	4,066	SANDAG VMT forecasts	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Transportation	Non-Unincorporated County Employee Con	14,134	11,962	8,689	7,948	7,992	Addition in employees between 2014 and 2020 trending into the future.	EMFAC 2014 emission factors (ACC, Pavley, etc.)
Solid Waste	Waste Generation	152,841	165,955	185,492	194,804	201,915	Population	None
Solid Waste	Waste Generation from County Facilities ou	2,126	2,153	2,197	2,241	2,285	Empoloyee Growth	None
Solid Waste	Waste In Place	183,139	190,543	201,922	205,044	207,098	Natural Decay Rate for Closed Landfills and Population for Open Landfills	None
Water	Upstream Surface Water Conveyance	119,770	112,053	114,274	120,011	124,391	Population and RPS. Using statewide RPS targets only.	SB350 and RPS targets for eletricity generation
Water	Water Treatment	8,589	8,036	8,195	8,606	8,920	Population and RPS for SDGE	SB350 and RPS targets for eletricity generation
Water	Water Distribution	4,023	3,764	3,839	4,031	4,178	Population and RPS for SDGE	SB350 and RPS targets for eletricity generation
Water	Groundwater Extraction	1,870	1,749	1,784	1,874	1,942	Population and RPS for SDGE	SB350 and RPS targets for eletricity generation
Water	Non-Unincorporated County Facilities	16	14	13	13	14	Employee growth and RPS for SDGE	SB350 and RPS targets for eletricity generation
Wastewater	Decentralized (Septic) Systems	15,036	16,326	18,248	19,164	19,864	Population	SB350 and RPS targets for eletricity generation
Wastewater	WWTPs with anaerobic digestion	3,158	3,429	3,833	4,025	4,172	Population	None
Wastewater	WWTPs without anaerobic digestion	1,962	2,130	2,381	2,500	2,591	Population	None
Wastewater	Unspecified WWT Agencies	1,025	1,113	1,244	1,306	1,354	Population	None
Wastewater	Non-Unincorporated County Facilities	2	2	3	3	3	Population	None
Offroad	Lawn and Garden Equipment	13,244	14,380	16,073	16,880	17,496	Population	None
Offroad	Construction and Mining	1,345	1,505	1,502	1,522	1,522	Commercial Jobs	None
Offroad	Light Commercial Equipment	10,472	11,713	11,692	11,848	11,853	Commercial Jobs	None
Offroad	Transport Refrigeration Units	5,726	6,385	7,085	8,056	9,172	Commercial Jobs	None
Offroad	Industrial	522	567	634	665	690	Industrial Jobs	None
Offroad	Recreational Vehicles	139	155	172	195	222	Population	None
Offroad	Airport Ground Support	5,480	6,111	6,781	7,710	8,778	Commercial Jobs	None
Agriculture	Agricutural Equipment	86,087	84,867	84,215	83,756	83,491	Agricultural acres	None
Agriculture	Manure Management	27,462	27,073	26,865	26,719	26,634	Agricultural acres	None
Agriculture	Enteric Fermentation	20,724	20,430	20,273	20,163	20,099	Agricultural acres	None
Agriculture	Soil Management	17,655	17,404	17,271	17,177	17,122	Agricultural acres	None
Agriculture	Diesel Irrigation Pumps	11,768	11,601	11,512	11,449	11,413	Agricultural acres	None
TOTAL		3,211,505	3,018,671	2,824,049	2,871,675	2,991,507		

San Diego County Unincorporated Area - POPULATION*							
SANDAG - Series 13 Regional Growth Estimate & SANDAG Population Estimates							
Population	**2014 (Population Estimate)**	**2015 (Population Estimate)**	**2012 (Series 13 Base Year)**	**2020 Forecast**	**2030 Forecast**	**2040 Forecast**	**2050 Forecast**
Total Population for the Unincorporated Area	498,159	504,330	495,267	543,426	600,648	627,055	647,233
Total Household Population for the Unincorporated Area	473,744	477,744	468,619	510,768	567,086	592,960	612,581
Occupied Housing Units	163,342	164,420	162,371	173,535	192,106	202,856	209,407
Persons per Household (HH pop / Occupied Housing Units)	2.90	2.91	2.89	2.94	2.95	2.92	2.93
Total Population for Pendleton-De Luz CPA	37,643	40,116	38,966	44,700	44,867	44,642	44,722
Total Population in the Pendleton-De Luz CPA but not on Camp Pendleton	784	787	794	990	1,061	1,147	1,216
Total Camp Pendleton Population within the Pendleton-De Luz CPA minus non-base Population**	36,859	39,329	38,172	43,710	43,806	43,495	43,506
Total Population for Native American Reservations (U.S. Census 2010)**	6,701	6,701	6,701	6,701	6,701	6,701	6,701
Modified Unincorporated County Population Totals (Total Unincorporated County Population minus Camp Pendleton Base Population & Native American Reservations Population)**	**454,599**	**458,300**	**450,394**	**493,015**	**550,141**	**576,859**	**597,026**

***DATA Source: Rachel T. Cortes (Regional Models Analyst), SANDAG, 6/22/16, SANDAG's 2014 & 2015 Population Estimates & Series 13 Forecast, SANDAG Data Surfer.**

**** Note: Cells highlighted in Yellow represent San Diego County calculations (6/27/16).**

San Diego County Unincorporated Area - HOUSING*							
SANDAG - Series 13 Regional Growth Estimate & SANDAG Population Estimates							
Housing	**2014 (Housing Units Estimate)**	**2015 (Housing Units Estimates)**	**2012 (Series 13 Base Year)**	**2020 Forecast**	**2030 Forecast**	**2040 Forecast**	**2050 Forecast**
Total Housing Units for the Unincorporated Area	172,459	173,246	171,863	185,253	203,081	214,405	222,932
Single-Family	135,113	135,800	134,245	146,436	164,009	173,480	178,110
Single-Family - Detached	115,766	116,459	N/A	N/A	N/A	N/A	N/A
Single-Family - Multiple-Unit Attached	19,347	19,341	N/A	N/A	N/A	N/A	N/A
Multiple-Family	25,082	25,047	25,313	26,851	27,183	29,257	33,218
Mobile Homes and Other	12,264	12,399	12,305	11,966	11,889	11,668	11,604
Total Housing Units for Indian Reservations***	1,867	1,868	1,820	1,821	1,823	1,825	1,827
Single-Family	1,775	1,776	1,696	1,697	1,699	1,701	1,703
Single-Family - Detached	1,566	1,567	N/A	N/A	N/A	N/A	N/A
Single-Family - Multiple-Unit Attached	209	209	N/A	N/A	N/A	N/A	N/A
Multiple-Family	27	27	59	59	59	59	59
Mobile Homes and Other	65	65	65	65	65	65	65
Total Housing Units for the Pendleton-De Luz CPA	7,536	7,537	7,534	9,266	9,292	9,327	9,351
Single-Family	6,861	6,862	6,858	6,923	6,949	6,984	7,008
Single-Family - Detached	298	299	N/A	N/A	N/A	N/A	N/A
Single-Family - Multiple-Unit Attached	6,563	6,563	N/A	N/A	N/A	N/A	N/A
Multiple-Family	675	675	676	2,343	2,343	2,343	2,343
Mobile Homes and Other	0	0	0	0	0	0	0
Total Housing Units for the Pendleton-De Luz CPA but not on Camp Pendleton	298	299	296	361	387	422	446
Single-Family	298	299	295	360	386	421	445
Single-Family - Detached	298	299	N/A	N/A	N/A	N/A	N/A
Single-Family - Multiple-Unit Attached	0	0	N/A	N/A	N/A	N/A	N/A
Multiple-Family	0	0	1	1	1	1	1
Mobile Homes and Other	0	0	0	0	0	0	0
Total Camp Pendleton Housing Units within the Pendleton-De Luz CPA minus non-base housing**	7,238	7,238	7,238	8,905	8,905	8,905	8,905
Single-Family	6,563	6,563	6,563	6,563	6,563	6,563	6,563
Single-Family - Detached	0	0	N/A	N/A	N/A	N/A	N/A
Single-Family - Multiple-Unit Attached	6,563	6,563	N/A	N/A	N/A	N/A	N/A
Multiple-Family	675	675	675	2,342	2,342	2,342	2,342
Mobile Homes and Other	0	0	0	0	0	0	0

***DATA Source: Rachel T. Cortes (Regional Models Analyst), SANDAG, 6/22/16, SANDAG's 2014 & 2015 Housing Estimates & Series 13 Forecast, SANDAG Data Surfer.**

**** Note: Cells highlighted in Yellow represent San Diego County calculations (7/1/16). The Total Housing Units 2020 Forecast was corrected per SANDAG's Data Surfer Report.**

*****DATA Source: Rachel T. Cortes (Regional Models Analyst), SANDAG, 7/12/16, SANDAG's 2014 & 2015 Housing Estimates & Series 13 Forecast, SANDAG Data Surfer. Per Phone Call with Ms. Cortes on 7/12/16, use 2014 housing figures and keep those constant for the 2020, 2030, 2040, and 2050 forecast years. Currently, the forecast years shown on the table use the 2012 housing total as a base year and keep that constant for the forecast years.**

San Diego County Unincorporated Area - EMPLOYMENT*						
SANDAG - Series 13 Regional Growth Estimate & SANDAG Employment Estimates						
Population	2012 (SANDAG Estimate)	2014 Employment Estimate**	2020 Forecast	2030 Forecast	2040 Forecast	2050 Forecast
Total Employment for the Unincorporated Area	160,562	164,368	175,784	183,676	195,154	208,227
Total Employment on Indian Reservations (approx geography)	14,000	14,000	16,000	16,000	16,000	16,000
Total Employment for Pendleton-De Luz CPA	58,215	58,217	58,223	58,224	58,225	58,227
Civilian Employment	13,891	13,893	13,899	13,900	13,901	13,903
Military Employment	44,324	44,324	44,324	44,324	44,324	44,324
Total Employment in the Pendleton-De Luz CPA but not on Camp Pendleton (approx. geography)	200	200	200	200	200	200
Civilian Employment	200	200	200	200	200	200
Military Employment	0	0	0	0	0	0
Total Camp Pendleton Employment for the Pendleton-De Luz CPA minus non-base employment (approx. geography)**	58,015	58,017	58,023	58,024	58,025	58,027
Civilian Employment	13,691	13,693	13,699	13,700	13,701	13,703
Military Employment	44,324	44,324	44,324	44,324	44,324	44,324

***DATA Source: Rachel T. Cortes (Regional Models Analyst), SANDAG, 6/28/16, SANDAG's 2014 & 2015 Employment Estimates & Series 13 Forecast, SANDAG Data Surfer.**

**** Note: Cells highlighted in Yellow represent San Diego County calculations (7/1/16). The "2014 Employment Estimate" totals were based on EPIC's recommended approach of subtracting the 2012 Employment Estimate from the 2020 Forecast, dividing this figure by 8 (difference in years from 2012 to 2020), multiplying the total by 2 (years of growth for 2013 and 2014), and adding the 2012 Employment Estimate to equal the 2014 Employment Estimate. Per SANDAG, this extrapolation approach is accurate. The 2014 Indian Reservation Employment Estimate was kept constant for 2014 as recommended by SANDAG.**

SERIES 13 REGIONAL GROWTH FORECAST

San Diego County Unincorporated Area

POPULATION AND HOUSING

	2012	2020	2035	2050	2012 to 2050 Change* Numeric	Percent
Total Population	495,267	543,426	617,570	647,233	151,966	31%
Household Population	468,619	510,768	583,744	612,581	143,962	31%
Group Quarters Population	26,648	32,658	33,826	34,652	8,004	30%
Civilian	9,850	15,860	17,028	17,854	8,004	81%
Military	16,798	16,798	16,798	16,798	0	0%
Total Housing Units	171,863	185,253	209,506	222,932	51,069	30%
Single Family	134,245	146,436	169,961	178,110	43,865	33%
Multiple Family	25,313	26,851	27,671	33,218	7,905	31%
Mobile Homes	12,305	11,966	11,874	11,604	-701	-6%
Occupied Housing Units	162,371	173,535	198,819	209,407	47,036	29%
Single Family	125,997	136,894	161,335	167,227	41,230	33%
Multiple Family	25,324	25,883	26,862	32,051	6,727	27%
Mobile Homes	11,050	10,758	10,622	10,129	-921	-8%
Vacancy Rate	5.5%	6.3%	5.1%	6.1%	0.6	11%
Single Family	6.1%	6.5%	5.1%	6.1%	0.0	0%
Multiple Family	0.0%	3.6%	2.9%	3.5%	3.5	0%
Mobile Homes	10.2%	10.1%	10.5%	12.7%	2.5	25%
Persons per Household	2.89	2.94	2.94	2.93	0.0	1%

HOUSEHOLD INCOME (real 2010 dollars, adjusted for inflation)

Income Forecast Under Review

This forecast was accepted by the SANDAG Board of Directors in October 2013 for distribution and use in planning and other studies. This forecast represents one possibility for future growth in the San Diego region. It is intended to represent a likely prediction of future growth, but it is not intended to be a prescription for growth. The Series 13 Regional Growth Forecast represents a combination of economic and demographic projections, existing land use plans and policies, as well as potential land use plan changes that may occur in the region between 2030 and 2050. In general, growth between 2012 and 2030 is based on adopted land use plans and policies, and growth between 2030 and 2050 includes alternatives that may, in some cases, reach beyond existing adopted plans.

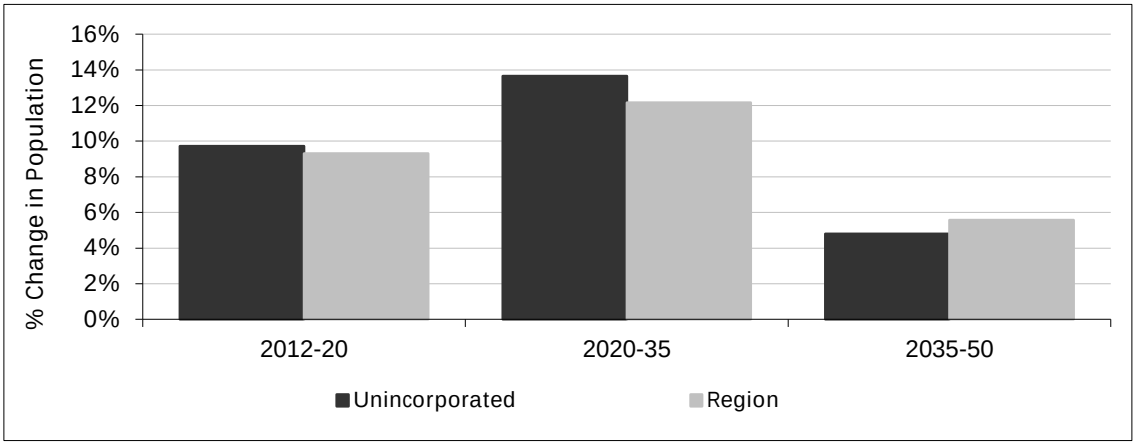
POPULATION BY AGE

	2012	2020	2035	2050	2012 to 2050 Change* Numeric	Percent
Total Population	495,267	543,426	617,570	647,233	151,966	31%
Under 5	31,198	37,640	38,639	42,016	10,818	35%
5 to 9	31,310	35,551	38,426	41,820	10,510	34%
10 to 14	32,832	32,915	37,764	39,306	6,474	20%
15 to 17	21,717	19,266	23,239	22,625	908	4%
18 to 19	19,169	16,190	18,286	16,960	-2,209	-12%
20 to 24	46,315	49,272	51,109	50,113	3,798	8%
25 to 29	32,177	36,432	35,712	37,899	5,722	18%
30 to 34	27,502	29,949	31,076	34,867	7,365	27%
35 to 39	26,165	31,110	34,085	35,001	8,836	34%
40 to 44	29,374	28,847	37,302	34,215	4,841	16%
45 to 49	32,464	29,818	36,835	35,504	3,040	9%
50 to 54	36,370	32,987	38,215	39,032	2,662	7%
55 to 59	33,896	36,655	33,877	41,585	7,689	23%
60 to 61	12,166	15,078	12,753	14,961	2,795	23%
62 to 64	17,053	21,365	19,393	23,121	6,068	36%
65 to 69	21,887	30,832	32,214	36,403	14,516	66%
70 to 74	14,732	25,225	33,576	30,195	15,463	105%
75 to 79	11,089	15,178	28,258	24,191	13,102	118%
80 to 84	8,526	8,748	18,724	18,703	10,177	119%
85 and over	9,325	10,368	18,087	28,716	19,391	208%
Median Age	36.0	37.3	40.1	40.4	4.4	12%

POPULATION BY RACE AND ETHNICITY

	2012	2020	2035	2050	2012 to 2050 Change* Numeric	Percent
Total Population	495,267	543,426	617,570	647,233	151,966	31%
Hispanic	135,671	167,410	223,695	270,114	134,443	99%
Non-Hispanic	359,596	376,016	393,875	377,119	17,523	5%
White	290,964	297,731	294,672	262,919	-28,045	-10%
Black	18,256	21,126	25,014	27,895	9,639	53%
American Indian	6,189	5,091	3,079	2,119	-4,070	-66%
Asian	26,024	30,255	43,164	51,759	25,735	99%
Hawaiian / Pacific Islander	2,059	2,453	3,112	3,817	1,758	85%
Other	943	1,095	1,161	1,205	262	28%
Two or More Races	15,161	18,265	23,673	27,405	12,244	81%

GROWTH TRENDS IN TOTAL POPULATION



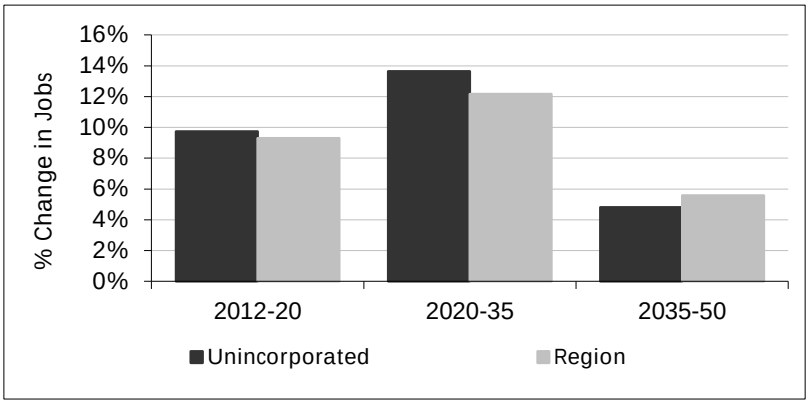
EMPLOYMENT

	2012	2020	2035	2050	2012 to 2050 Change* Numeric	Percent
Jobs	160,562	175,784	188,612	208,227	47,665	30%
Civilian Jobs	116,238	131,460	144,288	163,903	47,665	41%
Military Jobs	44,324	44,324	44,324	44,324	0	0%

LAND USE[1]

	2012	2020	2035	2050	2012 to 2050 Change* Numeric	Percent
Total Acres	2,284,386	2,284,386	2,284,386	2,284,386	0	0%
Developed Acres	512,703	571,856	658,567	691,826	179,123	35%
Low Density Single Family	168,390	222,084	304,164	333,264	164,874	98%
Single Family	38,189	40,714	45,741	48,109	9,920	26%
Multiple Family	1,761	2,122	2,155	2,373	612	35%
Mobile Homes	2,717	2,530	2,055	1,888	-829	-31%
Other Residential	2,026	2,052	2,041	2,038	12	1%
Mixed Use	0	9	40	133	133	--
Industrial	6,289	5,321	5,722	6,549	260	4%
Commercial/Services	12,701	15,373	15,744	16,744	4,043	32%
Office	173	221	252	296	123	72%
Schools	2,011	2,037	2,063	2,083	72	4%
Roads and Freeways	27,677	28,994	28,994	28,994	1,317	5%
Agricultural and Extractive[2]	97,892	96,051	94,944	94,494	-3,398	-3%
Parks and Military Use	152,879	154,348	154,652	154,863	1,984	1%
Vacant Developable Acres	393,077	333,948	247,237	213,978	-179,100	-46%
Low Density Single Family	370,763	317,063	235,132	205,899	-164,864	-44%
Single Family	11,648	10,187	6,541	4,410	-7,238	-62%
Multiple Family	168	166	155	106	-62	-37%
Mixed Use	15	14	6	1	-13	-92%
Industrial	3,006	2,765	2,378	1,558	-1,448	-48%
Commercial/Services	4,379	2,282	2,031	1,333	-3,046	-70%
Office	99	83	68	41	-58	-59%
Schools	53	23	19	0	-53	-100%
Parks and Other	2,532	951	493	215	-2,317	-92%
Future Roads and Freeways	415	415	415	415	0	0%
Constrained Acres	1,378,582	1,378,582	1,378,582	1,378,582	0	0%
Employment Density[3]	5.5	5.7	6.1	6.4	0.9	16%
Residential Density[4]	0.8	0.7	0.6	0.6	-0.2	-29%

GROWTH TRENDS IN JOBS



Notes:

1 - Figures may not add to total due to independent rounding.
2 - This is not a forecast of agricultural land, because the 2050 Regional Growth Forecast does not account for land that may become agricultural in the future. Also, some types of development that occur on agricultural land, such as low density single family residential, may allow for the continuation of existing agricultural use.
3 - Civilian jobs per developed employment acre (industrial, retail, office, schools, and half of mixed use acres).
4 - Total housing units per developed

SAN DIEGO COUNTY - ADOPTED & IN-PROCESS GENERAL PLAN AMENDMENTS (GPAs) - March 28, 2017 (by BC)

Project Common Name	Change DU	Change Commercial (sq. ft.)	Change Industrial (sq. ft.)	Community Plan Area	Notes
ADOPTED GPAs (as of March 28, 2017)					
San Dieguito CPA GPA	0	0	0	San Dieguito	Text corrections, no change in densities.
San Dieguito Specific Plan Area and Community Plan	0	0	0	San Dieguito	This GPA corrects consistencies with the GP Land Use map, San Dieguito Community Plan, and approved specific plans. The project does not result in a change in density.
Housing Element Update	0	0	0	Countywide	This is an amendment to the General Plan's Housing Element.
2013 General Plan Clean-Up	(390)	0	0	Various	Added 9 acres of commercial and 11 acres of industrial.
Very Low Complexity PSRs	49	0	0	Various	
Quarry Road and Elkelton Place	0	0	0	Spring Valley	This is an amendment to the Mobility element- the classification of Elkelton Place and the addition of Quarry Road.
Otay Business Park	0	0	0	Various	Mobility Element only.
2015 General Plan Clean Up	(325)	0	0	Various	Added 1 acre of commercial, 90.4 acres of public/semi-public, 2.5 acres of land were taken from commercial and added as village residential land, and added an additional 0.9 acres of VR-7.3.
Grand Tradition	(17)	0	0	Fallbrook	Added 8.3 acres of commercial.
Forest Conservation Initiative (GPA 12-004)	1,488	0	0	Various	Adding 329 acres of commercial & decreasing 16 acres of industrial
Community Plan Update- Campo/ Lake Morena	0	0	0	Campo/ Lake Morena	Reduction of the existing Cameron Corners Village Boundary by approximately 258 acres and the expansion of the Lake Morena Village Boundary by approximately 135 acres.
Community Plan Update- Pine Valley	0	0	0	Pine Valley	The new Pine Valley Community Plan and amendments to the Central Mountain Sub-regional Plan are proposed to comply with the maintenance requirements of the General Plan.
Local Coastal Program	0	0	0	San Dieguito	No Land Use Changes
Agricultural Promotion Ordinance	0	0	0	Countywide	Mobility Element GPA
Project Common Name	**Change DU**	**Change Commercial (sq. ft.)**	**Change Industrial (sq. ft.)**	**Community Plan Area**	**Notes**
Housing Element & Safety Element Update	0	0	0	Countywide	Housing Element and Safety Element - No Land Use Changes
COUNTY-INITIATED SUBTOTAL	**805**	**0**	**0**		
Meadowood	308	0	0	Fallbrook	Added elementary school site.
Campus Park West	173	513,000	120,000	Fallbrook	Acreage according to Minute Order the lot is 116 Acres. 2011 DU numbers provided by Dennis Campbell.
PRIVATE-INITIATED SUBTOTAL	**481**	**513,000**	**120,000**		
TOTAL ADOPTED GPAs	**1,286**	**513,000**	**120,000**		

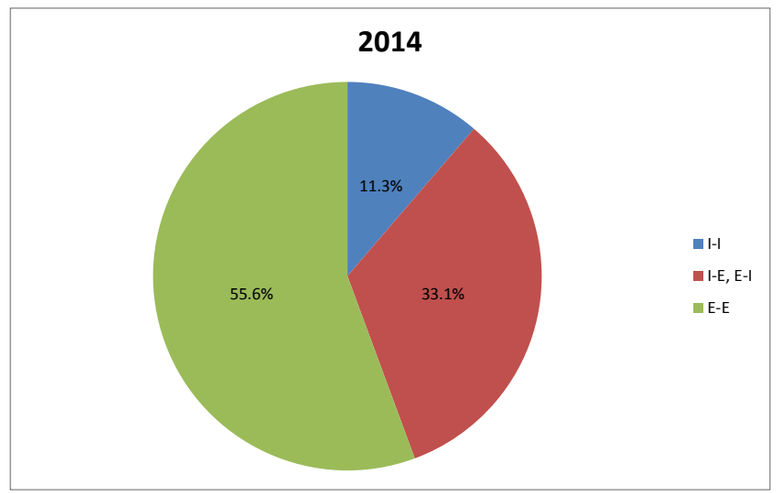
IN-PROCESS GPAs					
Project Common Name	**Change DU**	**Change Commercial (sq. ft.)**	**Change Industrial (sq. ft.)**	**Community Plan Area**	**Notes**
Active Transportation Plan	0	0	0	Countywide	Mobility Element Only
Property Specific Requests (PSR)	1,826	0	0	Various	Adding 72.5 acres of commercial & adding 13.5 acres of industrial
2017 General Plan Clean-Up	(528)	0	0	Various	Density Reduction
Climate Action Plan	0	0	0	Countywide	Conservation and Open Space Element Only
Community Plan Updates (Alpine, Twin Oaks & Valley Center)	0	0	0	Alpine, Twin Oaks & Valley Center	No Land Use Changes
LU 1.2	0	0	0	Countywide	Potential GPA
COUNTY-INITIATED SUBTOTAL	**1,298**	**0**	**0**		
Harmony Grove South	279	5,000	0	San Dieguito	10 private parks, community gardens, and commercial civic use
Lake Jennings Marketplace	(195)	76,000	0	Lakeside	
Lilac Hills Ranch	1,636	90,000	0	Valley Center / Bonsall	school, senior center, mixed-use areas & parks
Lilac Plaza	36	22,000	0	Valley Center	
Newland Sierra	2,036	(1,927,116)	0	Twin Oaks Valley / Bonsall	school & 1,200 acres of biological open space
Otay 250	3,158	78,000	(1,249,000)	East Otay Mesa	78,000 SF commercial & 765,000 Industrial
Otay Ranch Village 13	(128)	40,000	0	Otay Ranch - GDP	200-room Resort & school, mixed-use, school, private-public park & public safety site
Otay Ranch Village 14 and Planning Areas 16 & 19	(594)	(22,670)	0	Otay Ranch - GDP	Mixed-use, school, private-public park & public safety site
Rancho Librado	42	0	0	San Dieguito	recreational facilities & man-made pond
Star Ranch	343	27,194	0	Campo	
Skyline Retirement Center	0	0	0	Valle de Oro	retirement facility, assisted living and independent living
Sweetwater Place	122	0	0	Spring Valley	
Sweetwater Vistas	218	(628,000)	0	Spring Valley	resort & commercial uses. Revised plan proposes 218 units.
Valiano	208	0	0	San Dieguito	
Warner Ranch	769	0	0	Pala-Pauma Valley	
Warner Springs Resort	692	(93,900)	0	North Mountain	existing resort with 248 cottages that are to be rehabbed, adding 97 cottages and 150-site RV spaces, rehabbing existing resort and airport on site
PRIVATELY-INITIATED SUBTOTAL	**8,622**	**(2,333,492)**	**(1,249,000)**		
TOTAL IN-PROCESS GPAs	**9,920**	**(2,333,492)**	**(1,249,000)**		

Ascent Population, Employment, and Housing Calculations from GPA Data Added on 3/28/2017

	Value	Notes	Source
Floor area per employee (sqft/employee)	500	Other Commercial	SANDAG
Floor area per employee (sqft/employee)	1,200	Light Industrial - General	
Persons per Dwelling Unit	3	Calculated	
Population in 2050	612,581	San Diego Unincorporated Area - Household	SANDAG Series 13 forecast
Housing Units in 2050	222,932	San Diego Unincorporated Area	SANDAG Series 13 forecast

GPA Added Population in 2050	3,534
GPA Added Commercial Employment in 2050	1,026
GPA Added Industrial Employment in 2050	100
GPA Added Housing Units in 2050	1,286

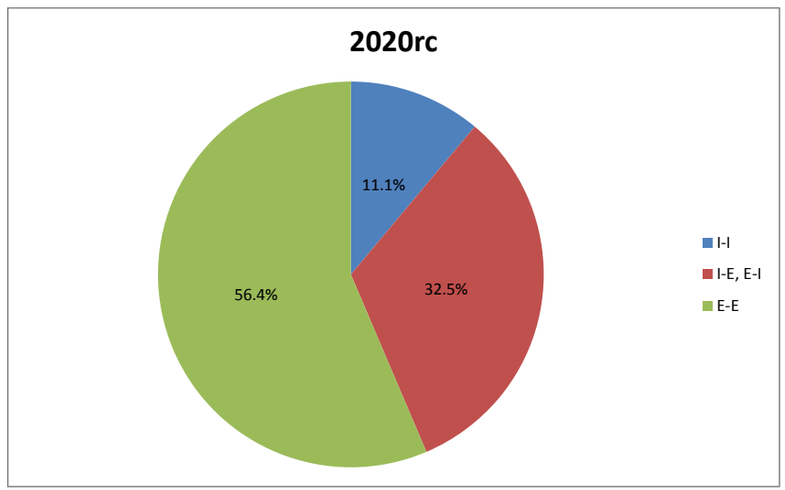
2014					
JURISDICTION	**TOTAL VMT**	**TOTAL County of San Diego VMT**	**Two Trip End County of San Diego VMT**	**One Trip End County of San Diego VMT**	**NON-County of San Diego VMT**
		I-I, I-E and E-I	**I-I**	**I-E and E-I**	**E - E**
CARLSBAD TOTAL	3,144,918	139,814	-	139,814	3,005,104
CHULA VISTA TOTAL	3,546,478	257,089	-	257,089	3,289,389
CORONADO TOTAL	392,014	9,051	-	9,051	382,963
DEL MAR TOTAL	79,059	3,639	-	3,639	75,420
EL CAJON TOTAL	1,816,118	836,389	-	836,389	979,729
ENCINITAS TOTAL	1,920,718	97,579	-	97,579	1,823,139
ESCONDIDO TOTAL	2,771,768	662,372	-	662,372	2,109,396
External TOTAL	235,306	11,625	-	11,625	223,681
IMPERIAL BEACH TOTAL	88,030	1,940	-	1,940	86,090
LA MESA TOTAL	1,582,388	515,712	-	515,712	1,066,676
LEMON GROVE TOTAL	745,722	323,694	-	323,694	422,028
NATIONAL CITY TOTAL	1,553,726	136,097	-	136,097	1,417,629
OCEANSIDE TOTAL	2,927,580	265,016	-	265,016	2,662,564
POWAY TOTAL	851,885	267,398	-	267,398	584,487
SAN DIEGO TOTAL	37,127,940	3,416,644	-	3,416,644	33,711,296
SAN MARCOS TOTAL	1,846,998	272,549	-	272,549	1,574,449
SANTEE TOTAL	907,995	354,298	-	354,298	553,697
SOLANA BEACH TOTAL	533,353	31,447	-	31,447	501,906
Unincorporated TOTAL	17,551,904	7,785,684	1,980,624	5,805,060	9,766,220
VISTA TOTAL	1,597,052	238,151	-	238,151	1,358,901
REGIONWIDE TOTAL	81,220,952	15,626,188	1,980,624	13,645,564	65,594,764



Unincorporated County VMT	
	2014
RTAC VMT/day	8,803,406
RTAC Average VMT/day	8,451,270
RTAC Average VMT/year	3,084,713,386

2020 Revenue Constrained

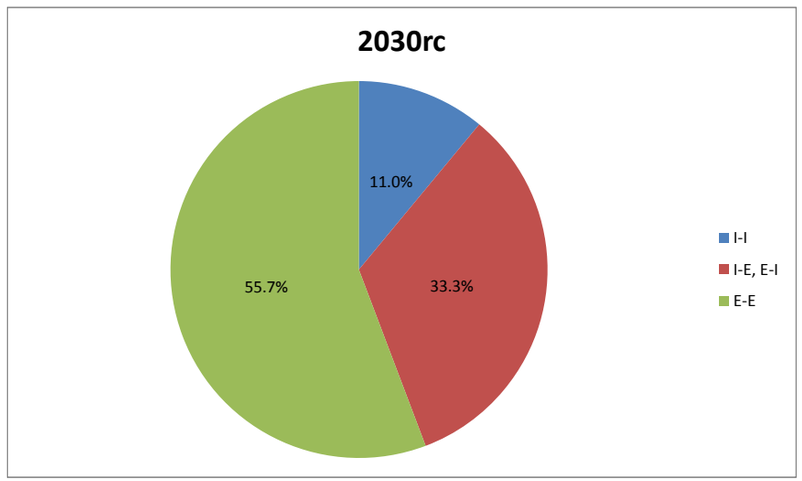
JURISDICTION	TOTAL VMT	TOTAL County of San Diego VMT	Two Trip End County of San Diego VMT	One Trip End County of San Diego VMT	NON-County of San Diego VMT
		I-I, I-E and E-I	I-I	I-E and E-I	E - E
CARLSBAD TOTAL	3,528,338	150,739	-	150,739	3,377,599
CHULA VISTA TOTAL	3,923,612	333,975	-	333,975	3,589,637
CORONADO TOTAL	375,290	9,215	-	9,215	366,075
DEL MAR TOTAL	76,846	3,253	-	3,253	73,593
EL CAJON TOTAL	1,826,681	851,074	-	851,074	975,607
ENCINITAS TOTAL	2,075,730	100,341	-	100,341	1,975,389
ESCONDIDO TOTAL	2,946,344	702,371	-	702,371	2,243,973
External TOTAL	232,506	13,786	-	13,786	218,720
IMPERIAL BEACH TOTAL	84,253	2,022	-	2,022	82,231
LA MESA TOTAL	1,599,071	521,404	-	521,404	1,077,667
LEMON GROVE TOTAL	738,270	322,784	-	322,784	415,486
NATIONAL CITY TOTAL	1,577,884	144,193	-	144,193	1,433,691
OCEANSIDE TOTAL	3,103,945	286,563	-	286,563	2,817,382
POWAY TOTAL	899,898	282,037	-	282,037	617,861
SAN DIEGO TOTAL	38,618,913	3,586,978	-	3,586,978	35,031,935
SAN MARCOS TOTAL	1,954,357	289,556	-	289,556	1,664,801
SANTEE TOTAL	958,856	376,750	-	376,750	582,106
SOLANA BEACH TOTAL	575,262	33,738	-	33,738	541,524
Unincorporated TOTAL	18,734,276	8,166,910	2,077,605	6,089,305	10,567,366
VISTA TOTAL	1,621,429	243,031	-	243,031	1,378,398
REGIONWIDE TOTAL	85,451,761	16,420,720	2,077,605	14,343,115	69,031,041



Unincorporated County VMT	2020 Revenue Constrained
RTAC VMT/day	9,249,162
RTAC Average VMT/day	8,879,196
RTAC Average VMT/year	3,240,906,504

2030 Revenue Constrained

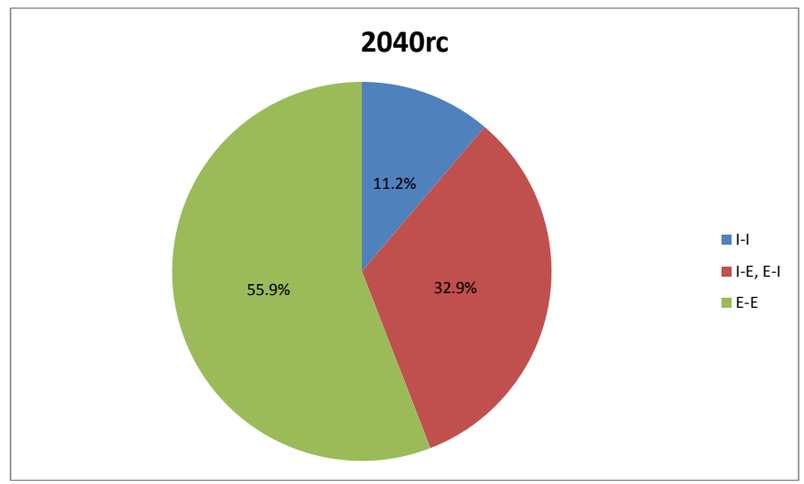
JURISDICTION	TOTAL VMT	TOTAL County of San Diego VMT	Two Trip End County of San Diego VMT	One Trip End County of San Diego VMT	NON-County of San Diego VMT
		I-I, I-E and E-I	I-I	I-E and E-I	E-E
CARLSBAD TOTAL	3,635,368	165,446	-	165,446	3,469,922
CHULA VISTA TOTAL	4,505,810	379,967	-	379,967	4,125,843
CORONADO TOTAL	378,210	9,714	-	9,714	368,496
DEL MAR TOTAL	77,011	3,509	-	3,509	73,502
EL CAJON TOTAL	1,969,314	944,895	-	944,895	1,024,419
ENCINITAS TOTAL	2,130,463	109,004	-	109,004	2,021,459
ESCONDIDO TOTAL	3,116,442	761,951	-	761,951	2,354,491
External TOTAL	262,483	16,002	-	16,002	246,481
IMPERIAL BEACH TOTAL	87,636	2,110	-	2,110	85,526
LA MESA TOTAL	1,748,182	597,665	-	597,665	1,150,517
LEMON GROVE TOTAL	779,885	335,488	-	335,488	444,397
NATIONAL CITY TOTAL	1,739,904	159,827	-	159,827	1,580,077
OCEANSIDE TOTAL	3,303,362	326,055	-	326,055	2,977,307
POWAY TOTAL	940,052	302,632	-	302,632	637,420
SAN DIEGO TOTAL	41,423,825	3,914,614	-	3,914,614	37,509,211
SAN MARCOS TOTAL	2,208,990	338,785	-	338,785	1,870,205
SANTEE TOTAL	1,028,657	413,560	-	413,560	615,097
SOLANA BEACH TOTAL	592,611	34,946	-	34,946	557,665
Unincorporated TOTAL	20,185,046	8,933,900	2,220,681	6,713,219	11,251,146
VISTA TOTAL	1,683,890	273,903	-	273,903	1,409,987
REGIONWIDE TOTAL	91,797,141	18,023,973	2,220,681	15,803,292	73,773,168



Unincorporated County VMT	2030 Revenue Constrained
RTAC VMT/day	10,122,327
RTAC Average VMT/day	9,717,434
RTAC Average VMT/year	3,546,863,373

2040 Revenue Constrained

JURISDICTION	TOTAL VMT	TOTAL County of San Diego VMT	Two Trip End County of San Diego VMT	One Trip End County of San Diego VMT	NON-County of San Diego VMT
		I-I, I-E and E-I	I-I	I-E and E-I	E-E
CARLSBAD TOTAL	3,782,152	178,620	-	178,620	3,603,532
CHULA VISTA TOTAL	4,726,303	401,818	-	401,818	4,324,485
CORONADO TOTAL	373,773	8,434	-	8,434	365,339
DEL MAR TOTAL	76,267	3,430	-	3,430	72,837
EL CAJON TOTAL	2,046,993	971,125	-	971,125	1,075,868
ENCINITAS TOTAL	2,211,256	116,354	-	116,354	2,094,902
ESCONDIDO TOTAL	3,227,512	809,701	-	809,701	2,417,811
External TOTAL	291,867	20,081	-	20,081	271,786
IMPERIAL BEACH TOTAL	92,939	2,386	-	2,386	90,553
LA MESA TOTAL	1,816,475	608,360	-	608,360	1,208,115
LEMON GROVE TOTAL	801,300	338,947	-	338,947	462,353
NATIONAL CITY TOTAL	1,815,194	166,298	-	166,298	1,648,896
OCEANSIDE TOTAL	3,446,548	345,692	-	345,692	3,100,856
POWAY TOTAL	987,393	329,595	-	329,595	657,798
SAN DIEGO TOTAL	42,867,376	3,992,223	-	3,992,223	38,875,153
SAN MARCOS TOTAL	2,317,966	383,658	-	383,658	1,934,308
SANTEE TOTAL	1,062,392	422,670	-	422,670	639,722
SOLANA BEACH TOTAL	620,804	36,269	-	36,269	584,535
Unincorporated TOTAL	21,705,009	9,574,682	2,431,376	7,143,306	12,130,327
VISTA TOTAL	1,889,082	304,884	-	304,884	1,584,198
REGIONWIDE TOTAL	96,158,601	19,015,227	2,431,376	16,583,851	77,143,374

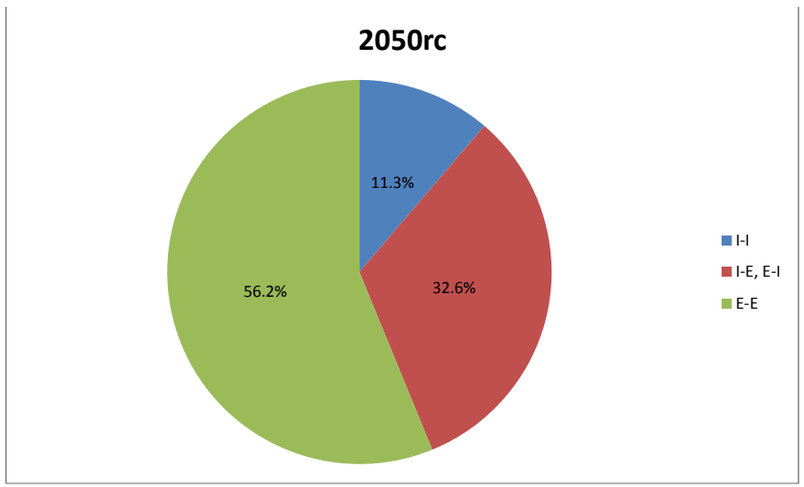


Unincorporated County VMT

	2040 Revenue Constrained
RTAC VMT/day	10,723,301
RTAC Average VMT/day	10,294,369
RTAC Average VMT/year	3,757,444,822

2050 Revenue Constrained

JURISDICTION	TOTAL VMT	TOTAL County of San Diego VMT	Two Trip End County of San Diego VMT	One Trip End County of San Diego VMT	NON-County of San Diego VMT
		I-I, I-E and E-I	I-I	I-E and E-I	E-E
CARLSBAD TOTAL	3,774,852	180,718	-	180,718	3,594,134
CHULA VISTA TOTAL	4,916,560	530,779	-	530,779	4,385,781
CORONADO TOTAL	371,103	9,006	-	9,006	362,097
DEL MAR TOTAL	75,714	3,465	-	3,465	72,249
EL CAJON TOTAL	2,139,911	1,015,240	-	1,015,240	1,124,671
ENCINITAS TOTAL	2,226,895	118,118	-	118,118	2,108,777
ESCONDIDO TOTAL	3,232,522	787,092	-	787,092	2,445,430
External TOTAL	332,460	25,912	-	25,912	306,548
IMPERIAL BEACH TOTAL	86,789	2,283	-	2,283	84,506
LA MESA TOTAL	1,926,064	630,765	-	630,765	1,295,299
LEMON GROVE TOTAL	895,872	359,297	-	359,297	536,575
NATIONAL CITY TOTAL	1,855,393	159,538	-	159,538	1,695,855
OCEANSIDE TOTAL	3,417,688	340,753	-	340,753	3,076,935
POWAY TOTAL	1,026,983	363,237	-	363,237	663,746
SAN DIEGO TOTAL	43,453,164	4,032,057	-	4,032,057	39,421,107
SAN MARCOS TOTAL	2,317,329	386,472	-	386,472	1,930,857
SANTEE TOTAL	1,112,491	451,038	-	451,038	661,453
SOLANA BEACH TOTAL	625,928	36,709	-	36,709	589,219
Unincorporated TOTAL	23,207,117	10,167,267	2,613,142	7,554,125	13,039,850
VISTA TOTAL	1,909,766	304,733	-	304,733	1,605,033
REGIONWIDE TOTAL	98,904,601	19,904,479	2,613,142	17,291,337	79,000,122



Unincorporated County VMT

	2050 Revenue Constrained
RTAC VMT/day	11,258,810
RTAC Average VMT/day	10,808,458
RTAC Average VMT/year	3,945,087,154