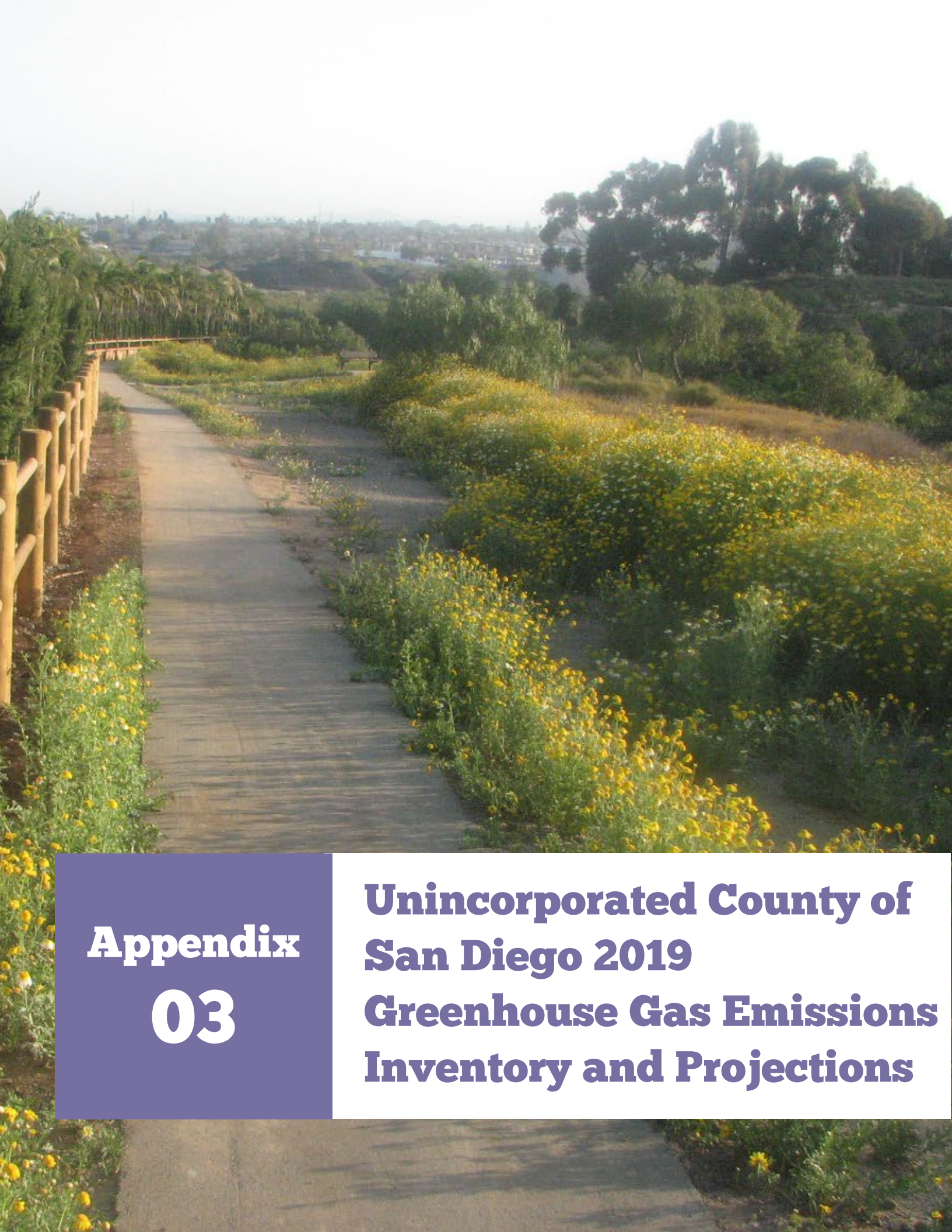

Appendix 03

Unincorporated County of San Diego 2019 Greenhouse Gas Emissions Inventory and Projections

Unincorporated County of San Diego 2019 Greenhouse Gas Emissions Inventory and Projections

October 2023

Prepared for the County of San Diego

Prepared by the Energy Policy Initiatives Center
University of San Diego and Ascent

About EPIC

The Energy Policy Initiatives Center (EPIC) is a non-profit research center of the University of San Diego School of Law that studies energy policy issues affecting California and the San Diego region. EPIC's mission is to increase awareness and understanding of energy- and climate-related policy issues by conducting research and analysis to inform decision makers and educating law students.

For more information, please visit EPIC's website at www.sandiego.edu/epic.

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October 2023

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A. County of San Diego Climate Action Plan Inventory Transportation Modeling Overview

B. Climate Action Plan Update - Population, Housing, and Employment Market Capacity Study for the Unincorporated Area

Energy Policy Initiatives Center (EPIC)
University of San Diego

1. Overview

This document presents a summary of the calendar year 2019 greenhouse gas (GHG) emissions from the unincorporated County of San Diego (the unincorporated county, or the county), and the 2025, 2030, 2035, 2040, 2045, and 2050 emissions projections. The 2019 GHG emissions inventory was developed using the Local Governments for Sustainability (ICLEI) U.S. Community Protocol for Reporting of Greenhouse Gas Emissions (U.S. Community Protocol), which includes methodologies for local governments to measure and report emissions. The emissions projections show changes in emissions over time from anticipated population, housing, and employment growth, as well as the future impact of Federal and California regulations, policies, and programs adopted as of 2022 that would reduce GHG emissions from future activities.

The inventory and projections include emissions from community activities and sources under the jurisdiction of the County of San Diego, and from County government operations. The emissions from County government operations are based on analysis performed for the County by Ascent. Some County operations occur outside of the boundaries of the unincorporated county (e.g., County buildings located in incorporated cities) and are included in the inventory and projections. Conversely, some community activities and sources take place within the boundaries of the unincorporated county but are not under the jurisdiction of the County (e.g., Tribal lands and Marine Corps Base Camp Pendleton) and are therefore excluded. This document includes the following sections:

- Section 2 describes the background sources and common assumptions used for the inventory and projections;
- Section 3 shows a summary of the 2019 GHG emissions inventory;
- Section 4 discusses the methods used to prepare each category of the 2019 inventory;
- Section 5 shows a summary of the 2025, 2030, 2035, 2040, 2045, and 2050 emissions projections; and
- Section 6 discusses the methods used to project each category of GHG emissions through 2050.

Rounding is used only for the final GHG value within the tables and figures throughout the document, for community-wide emissions and emissions from County government operations. Values are rounded to the nearest integer of a higher order of magnitude. Values are not rounded in the intermediary steps in the actual calculation. Because of rounding, some totals may not equal the exact values summed in any table or figure.

2. Background

2.1 Greenhouse Gases

The GHGs included in the emissions inventory and projections are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Each GHG has a different capacity to trap heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO_2 and expressed in carbon dioxide equivalents (CO_2e). The 100-year GWPs reported by the Intergovernmental Panel on Climate Change (IPCC) in the Fourth Assessment Report (AR4) were used to estimate GHG emissions, consistent with the approach used by the California Air Resources Board (CARB) in the 2000–2020 statewide GHG inventory.[1] The GWPs used in this inventory are provided in Table 1.

[1] IPCC: Fourth Assessment Report Climate Change 2007: Direct Global Warming Potentials (2013). CARB: GHG Global Warming Potentials.

Table 1 Global Warming Potentials

Greenhouse Gas	Global Warming Potential
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298
Source: IPCC 2013	

2.2 Categories of Community Emissions

The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol) requires a minimum of five basic emissions-generating activities to be included in a Protocol-compliant community-scale GHG inventory.[2] These activity categories are: electricity, stationary fuel combustion (natural gas and propane), on-road transportation, water and wastewater, and solid waste. GHG emissions were calculated by multiplying activity data (e.g., tons of solid waste) by an emission factor (e.g., pounds of CO_2e per unit of waste disposed). For these five categories, methods used in this inventory were based on the U.S. Community Protocol standard methods and modified with regional- or county-specific data when available, as discussed in Section 4 and Section 6. The community emissions categories included in this document are shown in Table 2.

In addition, GHG emissions from off-road transportation and agriculture were included in the inventory and projections, based on the methods and models used by CARB in the statewide GHG emission inventory or in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[3] Specified emission factors in the wastewater sector are from the CARB statewide GHG emissions inventory and 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table 2 Community Emissions Categories Included in This Document Compared with U.S. Community Protocol Requirements

Emissions Category	This Inventory and Projection	U.S. Community Protocol
On-Road Transportation	Included	Required
Electricity	Included	Required
Stationary Fuel Combustion	Included	Required
Natural Gas	Included	Required
Propane	Included	Required
Waste	Included	Required
Waste Facilities located in the Community	Included	Optional
Community Generated Waste	Included	Required
Off-Road Transportation	Included	Optional
Agriculture	Included	Optional
Water and Wastewater	Included	Optional

[2] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019).
[3] CARB: 2020-2020 GHG Inventory (2022 Edition). IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

2.2.1 Inclusion of County Operations

The inventory and projections also include emissions associated with County operations. County operations are added to the Unincorporated County inventory and projections because County operations exist to serve the interests of the community in the unincorporated county and the County has jurisdiction over both the unincorporated county and the government operations that serve it. The inclusion of both emissions in the unincorporated areas and from County operations provides a full picture of the GHG emissions for which the County can directly implement measures to reduce. Additional details on the contribution of County operational emissions to the Unincorporated County inventory are available in the *County of San Diego Local Government Operations Greenhouse Gas 2019 Inventory and Projections* (County of San Diego 2023).

The County's operations GHG inventory was compiled for the following emissions sectors, pursuant to the Local Government Operations Protocol (LGOP), Version 1.1.

- Airports
- Buildings & Other Facilities
- Employee Commute
- Landfills
- Public Lighting
- Solid Waste
- Vehicle Fleet
- Wastewater Facilities
- Water Pumping
- Water Use

GHG emissions from County operations can overlap with emissions-generating activities and sources included in the community-wide inventory and projections. County operations activities that occur within the unincorporated county are assumed to be accounted for in the community-wide inventory and projections for the unincorporated county because the methodology is based on location of the activity or source within physical boundaries. In addition, County employee vehicles trips start and/or end within the unincorporated county are also included in the community-wide inventory.

In general, County operations emissions occurring outside the unincorporated county include energy use and solid waste generation at County-owned and operated buildings, usually located in incorporated cities; employee commutes to those buildings; and emissions from some County-operated landfills. Table 3 provides further details on the portions of County operations that are assumed to be reflected in the community-wide emissions inventory and projections.

County operations activities located outside the unincorporated county, such as County buildings and facilities located within incorporated cities, are not accounted for in the community-wide inventory and projections, therefore, such operational emissions have been added to community-wide emissions in this report to present a more complete picture of total emissions within the jurisdiction of the County.

Table 3 County of San Diego Operations Emissions included in Community-Wide Emissions

County Operations Sector	Portion of County Operations Emissions included in Community-Wide Emissions	Reason
Airports	Part	All County airports except McClellan-Palomar and Gillespie Field are located in the unincorporated county.
Buildings & Other Facilities	Part	Only County government buildings and facilities located within the unincorporated county are included.
Employee Commute	Part	Only County employee commute trips that end and/or begin in the unincorporated county are included.
Landfills	Part	Four out of the 11 closed landfills operated by the County are located in the unincorporated county.
Public Lighting (Streetlights and Traffic Signals)	All	All County streetlights and traffic signals are located in the unincorporated county.
Solid Waste	None	A vast majority of County government buildings and facilities generating solid waste are located outside the unincorporated county (e.g., main offices)
Vehicle Fleet	All	Assumes vast majority of County government vehicle fleet operations occur in part or fully within the unincorporated county.
Wastewater Facilities	All	All County wastewater facilities are located in the unincorporated county.
Water Pumping	All	All County water pumping facilities are located in the unincorporated county.
Water Use	Part	Some County facilities using water are located in the unincorporated county.

Source: Ascent Environmental in 2023.

2.3 Jurisdiction Boundaries

In addition to private property and land owned by the County government, the unincorporated county also includes lands which are outside the County's land use jurisdiction and direct control, including tribal, military, State, and other Federally owned lands.[4] Tribal lands include the total land covered by 19 Tribal reservations in the county.[5] Military land includes the land covered by the Marine Corps Base Camp Pendleton (referred to as Camp Pendleton). State and other Federally owned lands include public lands, such as State parks, the Cleveland National Forest, and lands owned by the Federal Bureau of Land Management.[6]

[4] County of San Diego General Plan: Chapter 3 – Land Use Element.
[5] University of San Diego: Indian Reservations in San Diego County. In addition to the list, Pechanga Reservation is another tribe with only open space lands (no population) located in San Diego County.
[6] County of San Diego General Plan: Chapter 3 – Land Use Element.

This GHG inventory and projections cover emissions from the unincorporated county, but exclude GHG emissions from tribal and military lands located in the unincorporated county.[7] The emissions from State and other Federally owned lands, which are outside County's land use jurisdiction, are not excluded from this GHG inventory and projections, due to the infeasibility of separating the emissions-generating activities and sources on these lands, which are negligible as State and other Federal lands are predominantly undeveloped, uninhabited, and open space areas. [8]

2.4 DEMOGRAPHICS

The San Diego Association of Governments (SANDAG) estimates and forecasts population, housing, and employment for all jurisdictions in the San Diego region, including the unincorporated county. The most recent SANDAG Regional Growth Forecast is the Series 14 Growth Forecast with a base year of 2016. For the 2019 inventory, the County determined that the 2016 modeled housing unit estimates in the SANDAG Forecast reflected the number of dwelling units in 2020 in the unincorporated county, and minimal growth occurred between 2019 and 2020. Therefore, it was assumed the 2016 modeled data also reflects conditions in 2019 for the unincorporated county.[9] The population, housing, and employment modeled forecast selected was based on the SANDAG 2021 Regional Plan Environmental Impact Report (EIR) Alternative 2 growth assumption (DS39 scenario).[10, 11]

SANDAG estimates and forecast for population, housing, and employment include tribal and military population in the unincorporated county. As noted previously, these areas are outside of the County's jurisdiction. Population, housing, and employment from these areas to generate were removed from the SANDAG estimates and forecasts to create adjusted estimates and forecasts specific to the unincorporated areas under the County's jurisdiction. The number of civilian jobs in Camp Pendleton was also excluded from total civilian jobs in the unincorporated county.

2.4.1 Population Estimates and Projections

The population breakdown for the unincorporated county is provided in Table 4. The population used in this document is the unincorporated county population after subtracting the population in the tribal reservations and Camp Pendleton.

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[7] For certain emission categories, the activities from tribal and military lands were not included in the activity data received. The on-road transportation, electricity, and natural gas categories did not include tribal and military data. For water, wastewater, off-road transportation, and solid waste categories, which were estimated on a per capita, per housing or per job basis, it was therefore possible to exclude emissions from tribal and military populations. The exclusion of agriculture emissions into tribal and military emissions was not possible due to the availability of data.

[8] For the key emissions categories: (1) SANDAG's transportation model lacks detail to accurately reflect VMT associated with true uses on open space/park preserve (most federal and state land is coded as "open space/per preserve" in the SANDAG model), personal communication between Ascent and County, May 26, 2023; (2) SDG&E is unable to separate and provide the electricity and natural gas use in those lands, personal communication between EPIC and SDG&E, May 16, 2023, and (3) SANDAG's agricultural land use forecast lacks the granularity to identify the agricultural acreages in these lands, personal communication between EPIC and SANDAG, May 23, 2023.

[9] Fehr & Peers (April 10, 2023), *CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis* [Memorandum].

[10] Fehr & Peers (September 13, 2023), *County of San Diego Climate Action Plan Inventory Transportation Modeling Overview* [Memorandum].

[11] *Climate Action Plan Update - Population, Housing, and Employment Market Capacity Study for the Unincorporated Area*.

Table 4 Population Estimates and Projections (Unincorporated County of San Diego, 2019–2050)

Year	Unincorporated County[12]	Camp Pendleton[13]	Tribal Reservations[14]	Modified Unincorporated County
2016 (Used for 2019)	526,890	40,385	6,661	479,844
2025	537,374	40,385	6,661	490,328
2030	539,701	40,385	6,661	492,655
2035	542,028	40,385	6,661	494,982
2040	545,529	40,385	6,661	498,483
2045	549,030	40,385	6,661	501,984
2050	552,531	40,385	6,661	505,485

2016 estimates are representative of 2019 conditions based on dwelling unit construction in the unincorporated area. 2025, 2035, and 2050 projections are from SANDAG DS39 Scenario. Projections for other years were interpolated linearly.
Modified population = Unincorporated county population less Camp Pendleton and tribal reservation populations.
Fehr & Peers 2023, SANDAG 2022, U.S. Census Bureau, Energy Policy Initiatives Center, University of San Diego 2023

2.4.2 Housing Unit Estimates and Projections

The housing unit breakdown for the unincorporated county is provided in Table 5 (single-family units) and Table 6 (multi-family units). The housing units used in this document are the unincorporated county housing units after subtracting the units in the tribal reservations and Camp Pendleton.

Table 5 Single-family Housing Unit Estimates and Projections (Unincorporated County of San Diego, 2019–2050)

Year	Unincorporated County[15]	Camp Pendleton[16]	Tribal Reservations[17]	Modified Unincorporated County
2016 (Used for 2019)	154,363	7,238	1,838	145,287
2025	158,897	7,238	1,838	149,821
2030	161,184	7,238	1,838	152,108
2035	163,470	7,238	1,838	154,394
2040	164,505	7,238	1,838	155,429
2045	165,540	7,238	1,838	156,464
2050	166,575	7,238	1,838	157,499

2016 estimates are representative of 2019 conditions based on dwelling unit construction in the unincorporated area. 2025, 2035, and 2050 projections are from SANDAG DS39 Scenario. Projections for other years were interpolated linearly.
Modified total = Unincorporated county housing units less Camp Pendleton and tribal reservation housing units.
Fehr & Peers 2023, SANDAG 2022, Energy Policy Initiatives Center, University of San Diego 2023

[12] Base year 2016 estimates, and 2025, 2035, and 2050 projections from the SANDAG DS39 Scenario were developed by Fehr & Peers and provided to EPIC by Ascent, April 10, 2023.
[13] The Camp Pendleton base population was provided to EPIC by SANDAG, February 11, 2022.
[14] U.S. Census Bureau: 2020 Census, downloaded February 7, 2023. The 2020 Census population for the tribal population was used as a proxy for the 2019 tribal population. No population growth is assumed at tribal lands to be consistent with California Department of Finance and SANDAG growth forecast method.
[15] Base year 2016 estimates, and 2025, 2035, and 2050 projections from the SANDAG DS39 scenario were developed by Fehr & Peers and provided to EPIC by Ascent, April 10, 2023
[16] Camp Pendleton Base single-family units were provided to EPIC by SANDAG, February 11, 2022.
[17] Tribal reservation single-family units were provided to EPIC by SANDAG, February 11, 2022.

Table 6 Multi-family Housing Unit Estimates and Projections (Unincorporated County of San Diego, 2019–2050)

Year	Unincorporated County[18]	Camp Pendleton[19]	Tribal Reservations[20]	Modified Unincorporated County
2016 (Used for 2019)	24,628	-	116	24,512
2025	28,434	-	116	28,318
2030	29,841	-	116	29,725
2035	31,247	-	116	31,131
2040	32,106	-	116	31,990
2045	32,966	-	116	32,850
2050	33,825	-	116	33,709
2016 estimates are representative of 2019 conditions based on dwelling unit construction in the unincorporated area. 2025, 2035, and 2050 projections are from SANDAG DS39 Scenario. Projections for other years were interpolated linearly. Modified total = Unincorporated county housing units less Camp Pendleton and tribal reservation housing units. Fehr & Peers 2023, SANDAG 2022, Energy Policy Initiatives Center, University of San Diego 2023				

2.4.3 Employment Estimates and Projections

The employment numbers for the unincorporated county are provided in Table 7. The employment numbers used in this document are the unincorporated county employment values after subtracting the employment numbers in the tribal reservations and Camp Pendleton.

Table 7 Employment Estimates and Projections (Unincorporated County of San Diego, 2019–2050)

Year	Unincorporated County[21]	Camp Pendleton (Civilian Jobs Only)[22]	Tribal Reservations[23]	Modified Unincorporated County
2016 (Used for 2019)	161,065	4,503	17,131	139,432
2025	185,852	4,629	18,165	163,058
2030	196,012	4,792	18,216	173,004
2035	206,171	4,963	18,271	182,937
2040	215,538	5,103	18,304	192,131
2045	224,904	5,230	18,343	201,331
2050	234,271	5,324	18,375	210,572
2016 estimates are representative of 2019 conditions based on dwelling unit construction in the unincorporated area. 2025, 2035, and 2050 projections are from SANDAG DS39 Scenario. Projections for other years were interpolated linearly. Modified employment = Unincorporated county employment less Camp Pendleton and tribal reservation employment. Fehr & Peers 2023, SANDAG 2022, Energy Policy Initiatives Center, University of San Diego 2023				

[18] Base year 2016 estimates, and 2025, 2035, and 2050 projections from SANDAG 2021 Regional Plan EIR Alternative 2 (DS39) were develop by Fehr & Peers and provided to EPIC by Ascent, April 10, 2023.
[19] No multi-family units at Camp Pendleton Base, based on data provided to EPIC by SANDAG, February 11, 2022.
[20] *Id*.
[21] Base year 2016 estimates, and 2025, 2035, and 2050 projections from SANDAG 2021 Regional Plan EIR Alternative 2 (DS39) were developed by Fehr & Peers and provided to EPIC by Ascent, April 10, 2023.
[22] Camp Pendleton civilian jobs only, provided to EPIC by SANDAG, February 11, 2022.
[23] Tribal reservation jobs provided to EPIC by SANDAG, February 11, 2022.

3. SUMMARY OF THE 2019 GHG EMISSIONS INVENTORY

The total 2019 GHG emissions from the county, from community-wide activities and sources as well as County operations, were estimated at 2,984,000 metric tons CO_2e (MT CO_2e), distributed into the categories shown in Table 8 and Figure 1. All activity data and GHG emissions reported in this document are annual values, and all emission factors reported in this document are annual average values, unless stated otherwise.

Table 8 Total and Breakdown of 2019 GHG Emissions (Unincorporated County of San Diego, 2019)

Emissions Category	2019 GHG Emissions (MT CO_2e)	Percent of Total (%)
On-road Transportation	1,331,000	45%
Electricity	599,000	20%
Natural Gas	478,000	16%
Waste	193,000	6%
Agriculture	134,000	4%
Propane	121,000	4%
Off-road Transportation	71,000	2%
Water	39,000	1%
Wastewater	18,000	1%
Total	**2,984,000**	**100%**
Percentages may not add up to totals due to rounding. Energy Policy Initiatives Center, University of San Diego 2023		

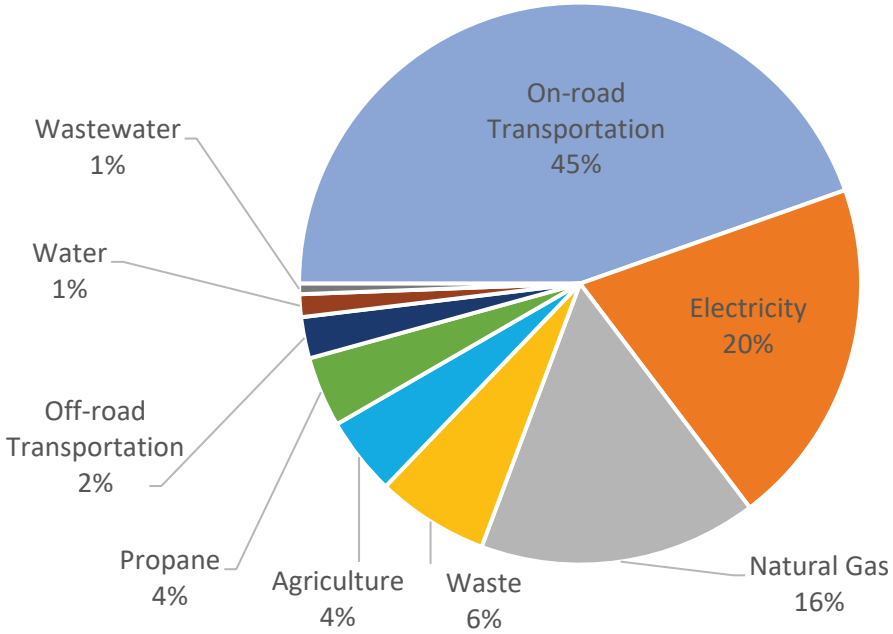

Figure 1 2019 GHG Emissions (Unincorporated County of San Diego, 2019)

4. Methods to Calculate the 2019 Emissions Inventory

4.1 On-road Transportation

4.1.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from County employee commutes that start and end outside of the unincorporated county, total on-road transportation emissions in 2019 are 1,331,000 MT CO_2e, with County employee commutes resulting in 19,000 MT CO_2e or 1% of all on-road transportation emissions. The inventory and projections report assumes that a majority of County vehicle fleet operations occur in part or fully within the unincorporated county, hence, emissions from County vehicle fleet operations are not added to the community on-road transportation emissions. Additionally, County employee commute emissions that were generated inside the unincorporated county are not added to on-road transportation emissions as doing so would double count emissions already captured in the communitywide VMT estimate (I-I trips). Only County employee commute emissions generated outside of the unincorporated county are added to on-road transportation emissions for estimating combined emissions.

4.1.2 Methods

The emissions associated with on-road transportation were calculated by multiplying the estimated county vehicle miles travelled (VMT) and the average vehicle emission rate in the San Diego region in 2019.

Annual VMT was estimated based on the average weekday VMT for the county provided by SANDAG using the Series 14 Growth Forecast and activity-based model (ABM2+). SANDAG uses ABMs to support development of Regional Plans and generate outputs related to the transportation system performance, including VMT. SANDAG updates the ABM with inputs from the Regional Growth Forecast and performs various model calibrations. Each Regional Growth Forecast is given a new Series number. The most recent forecast is the Series 14 Growth Forecast with a base year of 2016 and the most recent model is ABM2+. SANDAG provided the VMT estimates for 2016. The 2016 modeled housing unit estimates in the SANDAG Forecast reflected the number of dwelling units in the unincorporated county in 2020, and little growth occurred between 2019 and 2020.[24] As a result, SANDAG's modeled VMT estimate for 2016 is used to represent 2019 VMT levels in this GHG emissions inventory. Fehr & Peers adjusted the unincorporated county 2016 VMT provided by SANDAG to exclude military and tribal lands. [25]

SANDAG calculated VMT from ABM2+ for each local jurisdiction in the San Diego region, including the county, using the Origin-Destination (O-D) method.[26] The O-D VMT method is the preferred method in the U.S Community Protocol in *"TR.1 Emissions from Passenger Vehicles"* and *"TR.2 Emissions from*

[24] Fehr & Peers (April 10, 2023), *CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis* [Memorandum].
[25] 2016 VMT file was provide by Fehr & Peers to EPIC, February 13, 2023. SANDAG Activity Based Model 2+ Release v14.2.2, Final 2021 Regional Plan Networks, Policies, and Assumptions, Year 2016, Reference Scenario 458. Fehr & Peers developed a procedure to adjust County VMT provided by SANDAG for the County such that military and tribal lands were not included as part of the unincorporated county. Fehr & Peers (February 17, 2023), *Military and Tribal VMT Adjustment for the San Diego County CAP Model Scenarios* [Memorandum].
[26] SANDAG (2013): Vehicle Miles Traveled Calculation Using the SANDAG Regional Travel Demand Model. Technical White Paper.

Freight and Service Trucks" that estimates miles traveled based on where a trip originates and where it ends to attribute on-road emissions to cities and regions (Figure 2).[27]

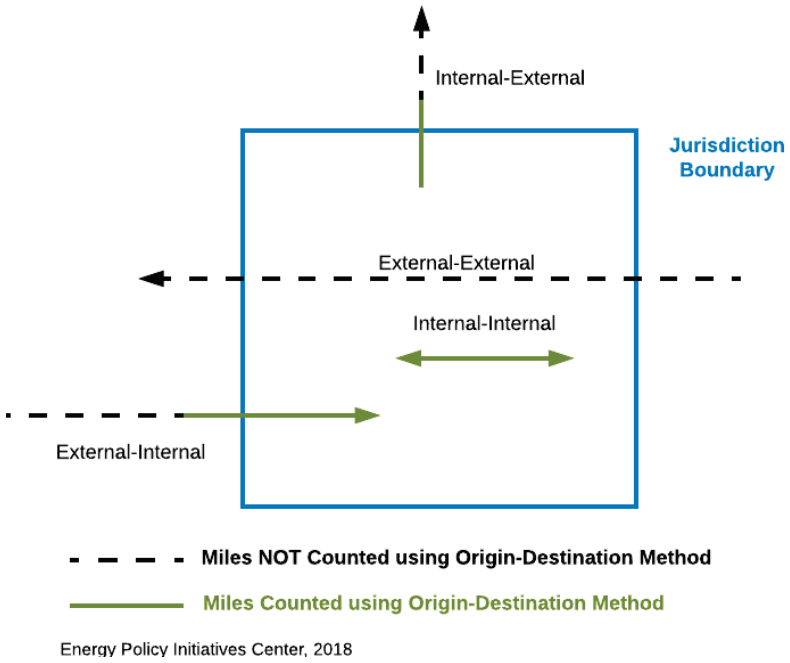

Figure 2 Components of O-D Method for VMT Calculation

O-D VMT allocated to the county includes all miles traveled for trips that originate and end within the County's jurisdictional boundaries (referred to as Internal-Internal), and half of the miles traveled for trips that either begin within the boundaries and end outside the boundaries (referred to as Internal-External), or vice versa (referred to as External-Internal). In accordance with the methodology, miles from trips that begin and end outside the boundaries that only pass through the county (referred to as External-External) are not included in the total county VMT. The total average weekday VMT were multiplied by 347 to adjust from average weekday VMT to average annual VMT, which accounts for travel on weekdays and weekends.[28]

The average weekday O-D VMT estimates for each trip type in 2016, used for 2019, provided by SANDAG, and the total VMT allocated to the county based on the U.S. Community Protocol methodology described above are given in Table 9.

[27] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix D: Transportation and Other Mobile Emission Activities and Sources.

[28] The conversion of 347 weekdays to 365 days per year as used by CARB. CARB: California's 2000–2014 Greenhouse Gas Emission Inventory Technical Support Document (2016 Edition), p. 41 (September 2016).

Table 9 O-D VMT Estimates by Trip Types and Total VMT provided by SANDAG (Unincorporated County of San Diego, 2016 Used for 2019)

Year	VMT by Trip Type (Miles/Weekday)		Total County VMT (100% * I-I + 50% * I-E/E-I) (Miles per Weekday)	Total County VMT (Miles per Year)
	Internal-Internal (I-I) Trips	External-Internal/Internal-External (I-E/E-I) Trips		
2016 (Use for 2019)	1,625,650	14,399,734	8,825,517	3,062,454,359
2016 estimates were representative of 2019 conditions based on dwelling unit construction history in the unincorporated county. VMT estimates from SANDAG Series 14 (Final 2021 Regional Plan and ABM2+) were adjusted for the County such that military and tribal lands were not included. The conversion factor from miles per weekday to miles per year is 347. Fehr & Peers 2023, Energy Policy Initiatives Center, University of San Diego 2023				

The average annual vehicle emission rate expressed in grams of CO_2e per mile driven (g CO_2e/mile) was derived from the statewide mobile source emissions model EMFAC2021 developed by CARB.[29] EMFAC2021 was run in the default activity mode to generate the total VMT and total vehicle GHG emissions for the San Diego region, which reflects the distribution of all vehicle model years, classes, and fuel types.[30] This GHG emissions inventory assumes that vehicles associated with county VMT had the same distribution of vehicle types as the vehicles in the San Diego region.

Total estimated VMT, the average vehicle emission rate, and corresponding GHG emissions from community-wide on-road transportation from 2019 are given in Table 10.

Table 10 Key Inputs and Community-wide GHG Emissions from On-Road Transportation (Unincorporated County of San Diego, 2019)

Calendar Year	Total County VMT (Miles per Year)	Average Vehicle Emission Rate (g CO_2e/mile)	GHG Emissions (MT CO_2e)
2019	3,062,454,359	428	1,312,000
GHG emissions for each category are rounded. Values are not rounded in the intermediary steps in the calculation. Energy Policy Initiatives Center, University of San Diego 2023.			

4.2 ELECTRICITY

4.2.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from purchased electricity for County buildings and other facilities and purchased electricity for County airports, total electricity emissions in 2019 are 599,000 MT CO_2e, with purchased electricity for County operations resulting in 19,200 MT CO_2e or 3% of all electricity emissions. Electricity emissions from County airports and government buildings located

[29] CARB: EMission FACtors model, EMFAC2021 v1.0.2, May 2, 2022, and EMFAC Emissions Inventory Web Database: On-Road Emissions.
[30] *Id.*

outside of the unincorporated county are added to the community-wide emissions from electricity use in the county for estimating combined emissions. Electricity emissions from County airports and government buildings located inside the unincorporated county are not added because the inventory and projections report assumes that those emissions are included in the emissions from electricity use in the unincorporated county using data provided by SDG&E.

4.2.2 Methods

Emissions from electricity use in the county were estimated using the *Built Environment (BE.2)* method from the U.S. Community Protocol.[31] The annual metered electricity sales to county customers were adjusted for transmission and distribution losses, and multiplied by the electricity emission factor, expressed in pounds of CO_2e per megawatt-hour (lbs CO_2e/MWh).

The local utility, San Diego Gas & Electric (SDG&E), provided the 2019 electricity sales to county customers by bundled and Direct Access (DA) supply for each customer class.[32] The electricity sales did not include: (1) any tribal reservation residential accounts, casinos or resorts; and (2) Camp Pendleton Marine Corps Base accounts. The transmission and distribution loss factor, 1.082, is the loss estimate for the entire SDG&E service territory (larger than San Diego region) and accounts for the loss between electricity generated for load and electricity sales.[33]

SDG&E and electric service providers (ESPs) for DA customers have different power mixes in their electricity supplies. The SDG&E 2019 bundled emission factor, 633 lbs CO2e/MWh, was calculated using the Federal Energy Regulatory Commission (FERC) Form 1 data, the California Energy Commission (CEC) Power Source Disclosure Program data on SDG&E-owned and purchased power, and EPA's Emissions and Generating Resource Integrated Database (eGRID) on specific power plant emissions.[34] In 2019, SDG&E had 31% renewables in its power mix and 7.8% of retail sales covered by retired unbundled renewable energy credits not reflected in the power mix.[35]

The DA emission factor, 836 lbs CO2e/MWh, is a default from the California Public Utilities Commission Decision 14-12-037.[36]

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[31] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix C: Built Environment Emission Activities and Sources.
[32] 2017–2019 aggregated metered electricity sales were provided by SDG&E to EPIC (March 1, 2021). SDG&E's bundled customers are those who receive both electric generation and electric delivery service from SDG&E (bundled service). Direct Access customers receive electric generation from an Electric Service Provider (not SDG&E), but electricity is delivered by SDG&E. SDG&E: Customer Choice Service Types.
[33] The loss factor is from the California Energy Commission's Energy Demand 2019 Forecast. For each forecast cycle, utilities provide the estimates, which remain relatively stable. Personal communication with CEC staff. March 23, 2020.
[34] FERC: Form 1- Electricity Utility Annual Report, report year 2019, downloaded on November 10, 2020. CEC: Power Source Disclosure Program. SDG&E 2019 power source disclosure report was provided by CEC staff to EPIC (August 3, 2020). U.S. EPA: eGRID 2019, released on February 23, 2021, downloaded on April 13, 2021.
[35] CEC: SDG&E 2019 Power Content Label (Version October 2020). Unbundled renewable energy credits, the renewable generation that was not delivered to serve retail sales, are not reflected in the power mix or GHG emissions intensity calculation based on the Regulations governing the Power Source Disclosure Program (effective May 4, 2020)
[36] Decision 14-12-037, December 18, 2014 in Rulemaking 11-03-012 (Filed March 24, 2011). The recommended emission factor is 0.379 MT CO_2e/MWh (836 lbs CO_2e/MWh).

The key inputs and GHG emissions from community-wide electricity in 2019 are shown in Table 11. In 2019, 56% of community-wide electricity emissions (322,000 MT CO_2e) were from the residential sector; and the remaining 44% of community-wide electricity emissions (257,000 MT CO_2e) were from the non-residential sector.

Table 11 Key Inputs and GHG Emissions from Electricity (Unincorporated County of San Diego, 2019)

Year	Electricity Sales - Bundled + DA (MWh)*	Transmission and Distribution Loss Factor	County-Specific Electricity Emission Factor (lbs CO_2e/MWh)	GHG Emissions (MT CO_2e)
2019	1,830,397	1.082	645	579,000

*Does not include sales to (1) any tribal reservation residential accounts, casinos or resorts; and (2) Camp Pendleton Marine Corps Base
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation.
Energy Policy Initiatives Center, University of San Diego 2021

4.3 Natural Gas

4.3.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from purchased natural gas for County buildings and other facilities and purchased natural gas for County airports, total natural gas emissions in 2019 are 478,000 MT CO_2e, with purchased natural gas for County operations resulting in 9,000 MT CO_2e or 2% of all natural gas emissions. Emissions from natural gas consumption at County airports and government building located outside of the unincorporated county are added to the emissions from natural gas end-use in the county for estimating combined emissions. Natural gas emissions from County airports and government buildings located inside the unincorporated county are not added because the inventory and projections report assumes that those emissions are included in the emissions from natural gas use in the county using data provided by SDG&E.

4.3.2 Methods

Emissions from natural gas end-use in the county were estimated using method *Built Environment (BE.1)* from the U.S. Community Protocol.[37] Natural gas end-use does not include the natural gas used for utility-level electric generation (UEG) because those emissions are included in the electricity category. SDG&E provided the annual natural gas sales to county customers. The natural gas sales do not include: (1) any tribal reservation residential accounts, casinos or resorts; (2) Camp Pendleton Marine Corps Base; and (3) natural gas use for UEG.[38]

To estimate emissions from natural gas end use, fuel use was multiplied by an emission factor for natural gas based on data from the CARB.[39] The key inputs and GHG emissions from community-wide natural gas in 2019 are shown in Table 12. In 2019, 42% of the community-wide natural gas end-use emissions (196,000 MT CO_2e) were from the residential sector; and the remaining 58% (23,000 MT CO_2e) were from the non-residential sector.

[37] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix C: Built Environment Emission Activities and Sources.
[38] 2017–2019 aggregated metered natural gas sales were provided by SDG&E to EPIC (March 1, 2021).
[39] Emission factor for natural gas: 0.0545 million metric tons CO_2e/million therm. CARB: Documentation of California's 2000–2018 GHG Inventory, last modified November 6, 2020.

Table 12 Key Inputs and GHG Emissions from Natural Gas (Unincorporated County of San Diego, 2019)

Calendar Year	Natural Gas Use* (Therms)	Natural Gas Emission Factor (MT CO_2e per Therm)	GHG Emissions (MT CO_2e)
2019	86,039,213	0.00545	469,000
*Does not include sales to (1) any tribal reservation residential accounts, casinos or resorts; and (2) Camp Pendleton Marine Corps Base GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation. Energy Policy Initiatives Center, University of San Diego 2021			

4.4 WASTE

4.4.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from landfill decomposition of solid waste generated at County buildings and facilities and emissions from closed landfills operated by the County that are located outside of the unincorporated county, total waste emissions in 2019 are 193,000 MT CO_2e, with County operations resulting in 22,000 MT CO_2e or 11% of all waste emissions. For combined emissions, all emissions from solid waste disposal in County facilities and emissions from landfills operated by the County but located outside of the unincorporated county are added to community-wide solid waste emissions. Emissions from landfills operated by the County and located inside the unincorporated county are not added because those emissions are included in the community solid waste emissions.

4.4.2 Methods

Emissions from the decomposition of organic material in waste disposed at landfills are broken down into two parts in the solid waste category: (1) CH_4 emissions from county-generated mixed waste in 2019, discussed in Section 4.4.1 ; and (2) CH_4 emissions from biodegradable waste that has been placed at landfills located within the County as of 2019, discussed in Section 4.4.2.[40] The total community-wide emissions from waste are provided in Table 13.

Table 13 Community-wide GHG Emissions from Waste (Unincorporated County of San Diego, 2019)

Calendar Year	Emissions from County Waste Disposal (MT CO_2e)	Emissions from In-Boundary Landfills (MT CO_2e)	Total Emissions from Waste (MT CO_2e)
2019	73,641	97,557	171,000
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation. Energy Policy Initiatives Center, University of San Diego 2021			

[40] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix E: Solid Waste Emission Activities and Sources - SW.1 Methane Emissions from Landfills and SW.4 community-Generated Waste Sent to Landfills.

4.4.3 Emissions from County Waste Disposal

This sub-category includes emissions from total waste disposed of in 2019 by county residents and businesses regardless of whether the landfills accepting the waste were inside or outside the County boundary. These emissions from waste disposal in the year 2019 were estimated using method *SW.4 Community-Generated Waste Sent to Landfills*, in the U.S. Community Protocol, based on waste generated by a community in a year and an emissions factor for mixed solid waste.

The 2019 waste disposal data reported to California Department of Resources Recycling and Recovery (CalRecycle) was modified to exclude the waste disposal from military lands. Waste disposal from Camp Pendleton Marine Base, sent to Las Pulgas and San Onofre landfills, was subtracted from the total. Waste disposal from tribal lands to Sycamore and Otay Landfills were not included in the total county tonnage reported to CalRecycle. In 2019, San Onofre Landfill did not accept any waste, however, the Landfill is not closed. The resulting waste disposal amount in 2019 is shown in Table 14.

Table 14 Modified Waste Disposal (Unincorporated County of San Diego, 2019)

Calendar Year	Waste Disposal from County Reported to CalRecycle (Short tons)	Waste Disposal at Las Pulgas Landfill* (Short tons)	Modified Waste Disposal from County (Short tons)
2019	522,021	24,744	497,277
*Disposal from Camp Pendleton was subtracted from total waste disposal to obtain the modified waste disposal amount County of San Diego 2021			

Because a waste composition study conducted for the county is not available, 2014 residential and commercial waste composition estimates from CalRecycle for the unincorporated county were used.[41] The EPA Waste Reduction Model (WARM) is used to determine the emission factor of each waste type. WARM is a life-cycle GHG model to assess and compare waste management options (e.g., landfilling, recycling, source reduction, composting), through the lifecycle of waste materials (from material extraction to disposal). However, pursuant to the U.S. Community Protocol, only emissions from the disposal and associated degradation of waste are included. Therefore, only the landfill emission factors in EPA WARM are used in the calculation. WARM reports the landfill CH_4 emission factor of each waste material in MT CO_2e/short ton, with and without Landfill Gas (LFG) recovery.

The mixed solid waste emission factor Is given in Table 15.[42] The landfill emission factors without LFG recovery are identified here; and the LFG recovery is applied later in the total emission calculation. The mixed waste emission factor is multiplied by the total waste disposed from the unincorporated county to calculate the total emissions without LFG recovery. The landfills in the San Diego region have LFG capture systems at the facilities. The LFG capture rate was assumed to be 85% based on San Diego Air Pollution Control District's landfill emissions reporting instructions, with a 10% oxidization rate based on the U.S. Community Protocol.[43] The emissions from county-generated waste are provided in Table 16.

[41] CalRecycle: Solid Waste Characterization Home. Based on a 2014 statewide waste study, materials for business grounds and residential stream, Unincorporated County of San Diego, downloaded April 13, 2021. California has a statewide 2018 waste characterization study, however, no jurisdictional estimates are available.
[42] EPA: Current WARM Tool – Version 15 (November 2020 Version), downloaded April 19, 2021.
[43] San Diego Air Pollution Control District: Emissions Inventory Request Instructions, accessed March 24, 2023. ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix E: Solid Waste Emission Activities and Sources - SW.1 Methane Emissions from Landfills and SW.4 Community-Generated Waste Sent to Landfills.

Table 15 Mixed Solid Waste Emission Factor (Unincorporated County of San Diego)

Material Class	2014 Waste Characterization Study - Unincorporated County		Landfills without LFG Recovery (MT CO_2e/ton)
	Distribution		
	Commercial	Residential	
Electronics	0.8%	1.1%	No Landfill Emissions
Glass	3%	2.0%	No Landfill Emissions
Household Hazardous Waste (HHW)	0.2%	0.6%	No Landfill Emissions
Inerts and Other	10%	13.8%	-
Asphalt Paving	*0.2%*	*0%*	*No Landfill Emissions*
Asphalt Roofing	*0.2%*	*0.7%*	*No Landfill Emissions*
Clean Dimensional Lumber	*1%*	*2.4%*	*0.15*
Clean Engineered Wood	*0.4%*	*1.4%*	*0.15*
Clean Pallets & Crates	*3%*	*0.7%*	*0.15*
Concrete	*1%*	*1.0%*	*No Landfill Emissions*
Gypsum Board	*0.5%*	*0.3%*	*No Landfill Emissions*
Other Wood Waste	*2%*	*4.1%*	*0.15*
Remainder/Composite Inerts and Other	*1.4%*	*0.8%*	*No Landfill Emissions*
Rock, Soil and Fines	*1%*	*2.5%*	*No Landfill Emissions*
Metal	3%	2.8%	No Landfill Emissions
Mixed Residue	1%	4.2%	0.53
Other Organic	43%	44.9%	-
Branches and Stumps	1%	2.3%	1.3
Carpet	1%	1.7%	No Landfill Emissions
Food	26%	19.1%	1.62
Leaves and Grass	4%	6.3%	0.55
Manures	0.1%	0%	No Landfill Emissions
Prunings and Trimmings	2%	5.6%	0.73
Remainder/Composite Organic	6%	5.4%	1.05
Textiles	3%	4.6%	1.05
Paper	25%	17.9%	-
Magazines and Catalogs	0.7%	0.7%	1.08
Newspaper	2.6%	1.9%	0.94
Other Miscellaneous Paper - Compostable	0.4%	0.2%	3.5
Other Miscellaneous Paper - Other	3.4%	4.1%	3.5
Other Office Paper	1.3%	0.5%	3.5
Paper Bags	0.4%	0.2%	2.36
Phone Books and Directories	0%	0%	0.94
Remainder/Composite Paper - Compostable	9%	7.6%	2.41
Remainder/Composite Paper - Other	2.8%	0.7%	2.41
Uncoated Corrugated Cardboard	2.9%	1.7%	2.36
White Ledger Paper	1.2%	0.3%	3.5
Plastic	13%	9.3%	No Landfill Emissions
Special Waste	2%	3.4%	No Landfill Emissions
Mixed Waste Emission Factor	**1.21**	**1.00**	**1.10**

The mixed waste emission factor was calculated based on the distribution of commercial and residential waste (47% and 53%, respectively) and their emission factors.
CalRecycle, EPA 2020, Energy Policy Initiatives Center, University of San Diego 2021

Table 16 Emissions from Waste Disposal (Unincorporated County of San Diego, 2019)

Calendar Year	Waste Disposed (Short Tons)	Mixed Waste Emission Factor (MT CO_2e/short Ton)	Oxidation Rate	Total GHG Emissions (MT CO_2e)	San Diego Regional Landfill CH_4 Capture Rate	Remaining GHG Emissions (MT CO_2e)
2019	497,277	1.10	10%	490,943	85%	73,641
Energy Policy Initiatives Center, University of San Diego 2021						

4.4.4 Emissions from In-Boundary Landfills

This sub-category includes the emissions from active and closed landfills within the County boundary, regardless of where the waste was generated, in accordance with method *SW.1 Methane Emissions from Landfills* in the U.S. Community Protocol.

The active landfills within the County boundary are Borrego Landfill and Otay Landfill. Otay Landfill is required to report annual emissions at the landfill through EPA's Greenhouse Gas Reporting Program (EPA MRR).[44] To avoid double counting with county-generated waste emissions, emissions from the Otay Landfill in 2019 were the emissions reported under EPA MRR (90,594 MT CO_2e) minus emissions from county waste disposed in 2019 estimated using CARB's Landfill Gas Tool (LGT, 395 MT CO_2e).[45] The Borrego Landfill is not subject to EPA MRR reporting, therefore, the LGT and the historical waste-in-place at the Landfill were used to estimate its 2019 emissions. Similarly, 2019 county-generated waste disposed at Borrego Landfill was not included in LGT to avoid double counting. The LGT does not include adjustments for landfill gas collection. The default values for the percent of anaerobically degradable carbon (ANDOC) in California were used in the LGT. GWPs from IPCC's Second Assessment Report (SAR) are embedded in the LGT, therefore the CO_2e landfill emissions output from the LGT was modified using GWPs from IPCC AR4 instead of the IPCC SAR, to be consistent with the rest of the document.[46] The emissions from active landfills are shown in Table 17.[47]

Table 17 Emissions from Active Landfills (Unincorporated County of San Diego, 2019)

Active Landfill	2019 Emissions (MT CO_2e)
Borrego Landfill	2,011
Otay Landfill – Modified*	90,199
Total Active Landfills	**92,210**
*Emissions reported under EPA MRR for Otay Landfill (90,594 MT CO_2e) were modified to remove emissions in 2019 from county's 2019 waste disposal there (395 MT CO_2e). Energy Policy Initiatives Center, University of San Diego 2023	

The closed landfills within the County boundary are Bonsall, Jamacha, Valley Center, and Viejas Landfills.[48] Other County-operated closed landfills outside the unincorporated county boundary are accounted for in the County's operations inventory. CH_4 and N_2O emissions for Bonsall, Jamacha, and Valley Center landfills were available from the County's Climate Reporting Information System (CRIS) reports.

[44] EPA: Greenhouse Gas Reporting Program, Otay Landfill 2019 emissions data downloaded on April 16, 2021.
[45] CARB: Landfill Gas Tool (updated September 24, 2021).
[46] The SAR GWP for CH_4 is 21, and the AR4 GWP for CH_4 is 25.
[47] The 1990–2019 waste disposal and 2000–2019 average daily cover (ADC) disposal at Otay Landfill, and 1990–2018 waste disposal and 2000–2009 ADC disposal at Borrego Landfill were downloaded from CalRecycle, April 19, 2021.
[48] Landfills with Gas Systems Data for San Diego County. County of San Diego Department of Public Works Inactive Waste Division. October 14, 2015.

CRIS reports fugitive, pilot light, and flared gas emissions for the Bonsall, Jamacha, and Valley Center landfills. For Viejas Landfill, the emissions were calculated using the LGT. The emissions from closed landfills are shown in Table 18.[49]

Table 18 Emissions from Closed Landfills in the Unincorporated County (Unincorporated County of San Diego, 2019)

Closed Landfill	2019 Emissions (MT CO_2e)
Bonsall Landfill	2,031
Jamacha Landfill	1,947
Valley Center Landfill	866
Viejas Landfill	503
Total Closed Landfills	**5,347**
County of San Diego 2021, Energy Policy Initiatives Center, University of San Diego 2023	

4.4.5 Emissions from Out-of-Boundary Landfills

This sub-category includes emissions from active and closed landfills located outside of the unincorporated county boundary which are operated by the County. However, out-of-boundary landfills only include landfills that are closed, as the County does not own or operate any active landfills. The closed landfills outside the County boundary are San Marcos, Poway, Palomar, Hillsborough, Gillespie, Encinitas, and Bell Junior High. Emissions from these landfills including emissions from purchased electricity, natural gas, fugitive emissions, pilot light, and flared gas are reported in the County's 2019 Local Government Operations GHG Inventory and Projections Report. The emissions from out-of-boundary landfills are shown in Table 19.

Table 19 Emissions from Landfills outside Unincorporated County (Unincorporated County of San Diego, 2019)

Out-of-Boundary Landfill	2019 Emissions (MT CO_2e)
San Marcos Landfill	9,484
Poway	4,821
Palomar	4,821
Hillsborough	726
Gillespie	1,189
Encinitas	1,707
Bell Junior High Landfill	555
Total Out-of-Boundary Landfills	**23,304**
Ascent Environmental, 2023	

[49] Emissions from CRIS were provided by County, April 22, 2021. The 1971–1979 waste disposal at Viejas Landfill are downloaded from CalRecycle, April 19, 2021.

4.5 PROPANE

4.5.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from purchased propane for County buildings and other facilities and purchased propane for County airports, total propane emissions in 2019 are 121,000 MT CO_2e, with purchased propane for County operations resulting in negligible GHG emissions. Propane emissions from County operations are generated from the use of propane in airports and government buildings located outside of the unincorporated county. Emissions generated from the use of propane in airports and government buildings located inside the unincorporated county are not added because these emissions are included in the emissions from propane end-use in the unincorporated county.

4.5.2 Methods

Emissions from propane end-use in the county were estimated using *Built Environment (BE.1)* from the U.S. Community Protocol and CARB statewide inventory.[50]

Unlike natural gas end-use, propane end-use data are not available from SDG&E. SDG&E's current natural gas infrastructure, as shown in Figure 3, does not cover the eastern two-thirds of the San Diego region, where much of the county is located.[51]

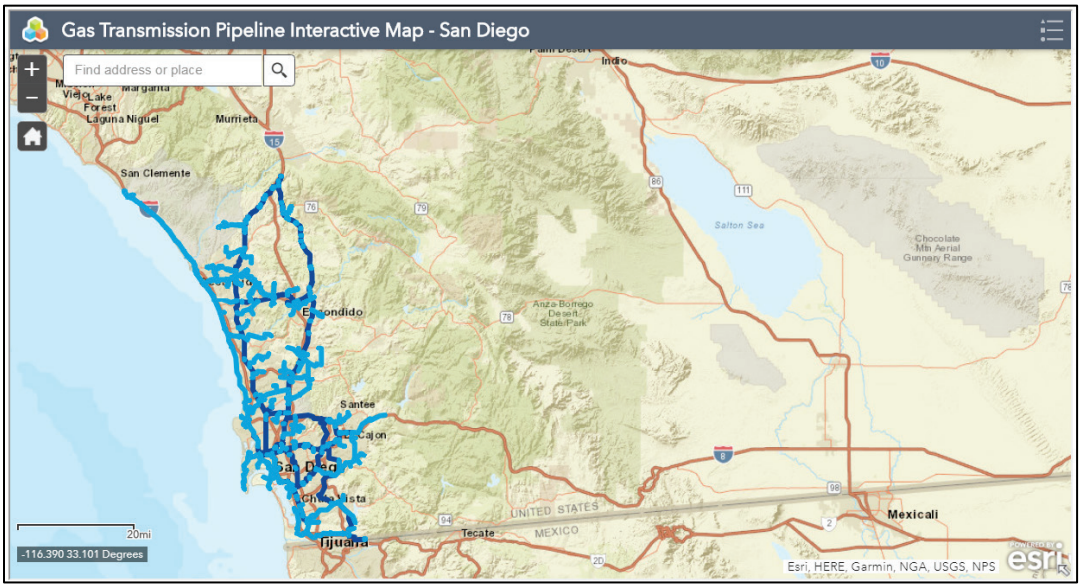


Figure 3 SDG&E High Pressure Gas Pipeline Map (Screenshot from SDG&E Website, Dark Blue: Transmission Pipeline, Light Blue: High Pressure Gas Distribution Main)

While Figure 3 does not indicate the actual extent to which natural gas is available through SDG&E service territory, for the residential sector, it is assumed that all households in San Diego region using propane as a heating fuel are in the unincorporated county.

[50] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix C: Built Environment Emission Activities and Sources.
[51] SDG&E: High Pressure Gas Pipeline Map.

The estimated number of households in San Diego region using propane as the heating fuel, and the space and water heating fuel amounts were provided by the Propane Education & Research Council (PERC) and shown in Table 20.[52]

Table 20 Propane End-Use in Residential Sector (Unincorporated County of San Diego, 2019)

Year	Number of Households Using Propane as Space Heating Fuel	Propane Use for Space Heating (Gallons)	Propane Use for Water Heating (Gallons)	Total Residential Propane Use (Gallons)
2019	38,275	15,442,000	3,235,811	18,677,811
It is assumed that all households in San Diego region using propane as the heating fuel are in the unincorporated county based on the SDG&E's natural gas infrastructure layout in Figure 3. Propane Education & Research Council, 2021				

For non-residential sectors, the California statewide retail propane sales by sector were allocated to San Diego region, then to the county, based on demographic and economic attributes in each sector, as shown in Table 21.[53]

Table 21 Propane End-Use in Non-Residential Sectors (2019)

Sector	California Retail Propane Sales (Million Gallons)	Allocation Factor	San Diego Region to California Ratio	Unincorporated County to San Diego Region Ratio	Unincorporated County Propane Use (Gallons)
Commercial	145	Commercial Jobs Ratio	9%	9%	1,073,451
Industrial	12	Manufacturing Jobs Ratio	9%	9%	91,403
Agricultural	51	Agricultural Land Ratio	2%	88%	1,029,457
				Non-residential Total	**2,194,310**
Propane Education & Research Council, 2020, Energy Policy Initiatives Center, University of San Diego 2023					

[52] 2010–2019 residential space heating (number of households), residential space heating demand propane equivalent, residential water heating demand propane equivalent in San Diego County (San Diego region) were provided to EPIC by the Propane Education & Research Council, PERC, April 2, 2021. PERC worked with each state propane agency to review and verify the list of propane retailers, collected the retail propane sales volumes from the retailers through a survey-based approach, and verified the data with the retailers and additional data sources. PERC: Annual Retail Propane Sales Report, Reporting Year 2019 (December 2020), pg. 23–29, accessed on April 21, 2021.

[53] PERC: Annual Retail Propane Sales Report, Reporting Year 2019 (December 2020), accessed on April 21, 2021. California Employment Development Department: 1990–2020 Employment by Industry Data, estimates through March 2021, accessed on April 21, 2021. In 2019, the total number of manufacturing jobs are 1,326,800 and 115,700 for statewide and San Diego region (San Diego County MSA), respectively. The total number of commercial (non-farm) jobs are 17,460,400 and 1,503,200 for statewide and San Diego region, respectively. The total number of agricultural (farm) jobs are 42,700 to 9,700 for statewide and San Diego region, respectively. The Unincorporated County to San Diego jobs region ratio was based on 2019 jobs estimates discussed in Section 2.4 and SANDAG Series 14 Growth Forecast (interpolated between 2018 estimates and 2020 forecast), downloaded from SANDAG Data Surfer, January 22, 2023. The agricultural land acreage projections (114,746 acres in the Unincorporated County, and 130,488 acres in the San Diego region) were based on SANDAG Series 14 Growth Forecast, provided by SANDAG to EPIC, August 31, 2022. As 2019 data were not available, 2025 agricultural land ratio was used as a proxy for 2019. In the SANDAG Land Use Codes, agricultural land includes orchard, vineyard, intensive agriculture, and field crops.

To estimate emissions from propane end-use, the sum of the residential and non-residential propane fuel use was multiplied by an emission factor for propane from CARB.[54] The key inputs and GHG emission from propane in 2019 are show in Table 22.

Table 22 Key Inputs and GHG Emissions from Propane (Unincorporated County of San Diego, 2019)

Year	Propane Use (Gallons)	Propane Emission Factor (Gram CO_2e per Gallon)	GHG Emissions (MT CO_2e)
2019	20,872,121	5,819	121,000
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation. Energy Policy Initiatives Center, University of San Diego 2021			

4.6 AGRICULTURE

4.6.1 Combined Emissions – Community-wide and County Operations

The GHG emissions from agriculture are broken down into four categories: agricultural equipment, enteric fermentation, manure management, and soil management. The total emissions from the agriculture sector are 134,000 MT CO_2e as shown in Table 23. The inventory for County operations emissions does not include any agricultural activities.

Table 23 GHG Emissions from Agriculture (Unincorporated County of San Diego, 2019)

Agricultural Emissions Category	GHG Emissions (MT CO_2e)
Agricultural Equipment	66,144
Enteric Fermentation	28,645
Manure Management	26,798
Soil Management	12,244
Total	**134,000**
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation. Energy Policy Initiatives Center, University of San Diego 2022	

Methods used to estimate emissions from each category are provided in Section 4.6.1 to Section 4.6.5.

4.6.2 Agriculture Equipment

Off-road mobile agriculture equipment, including diesel- and gasoline-fuel equipment, contributes to GHG emissions from the fuel combustion. CARB released the 2021 Agricultural Equipment Emissions Inventory with the latest available data on farm acreage, equipment population, activity, and overall sector fuel consumption.[55] The results were incorporated into OFFROAD2021, an online emissions inventory database for off-road equipment and vehicles, discussed in more detail in Section 4.7 Off-Road Transportation. The 2019 emissions from agricultural equipment are shown in Table 24, and not included in Section 4.7 Off-Road Transportation.[56]

[54] CARB: Documentation of California's 2000–2018 GHG Inventory, last modified November 6, 2020. 1A4b – Fuel Combustion – LPG. The propane emission factor is a constant.
[55] CARB: 2021 Agriculture Equipment Emission Inventory (August 2021). The types of agriculture equipment are shown in Table 16 of the CARB 2021 Agriculture Equipment Inventory.
[56] OFFROAD2021 v1.0.3 data were downloaded from CARB EMFAC database on August 23, 2022. Emissions in San Diego County (San Diego region) in CARB models were given in tons per day and converted to metric tons per year.

Table 24 GHG Emissions from Agriculture Equipment (Unincorporated County of San Diego, 2019)

Emissions Category	GHG Emissions (MT CO_2e)
San Diego Region - Agricultural Equipment (Diesel)	72,675
San Diego Region - Agricultural Equipment (Gasoline)	2,521
San Diego Region - Agricultural Equipment (Total)	75,195
Ratio of Agriculture Land Acreage – Unincorporated County to San Diego Region	88%
Unincorporated County of San Diego - Agricultural Equipment (Total)	66,144
CARB OFFROAD2021 v1.0.3 integrates data from the 2021 Agriculture Equipment Emission Inventory. Agricultural land acreages in the unincorporated county do not include the rural residential areas that may have small orchards or fields on the land. CARB 2022, Energy Policy Initiatives Center, University of San Diego 2022	

4.6.3 Diesel Irrigation Pumps

The agriculture equipment in Section 4.6.1 above is from the CARB 2021 Agriculture Equipment Inventory. Agricultural pumps, as stationary sources, are not included in the CARB 2021 Agriculture Equipment Inventory, because the Inventory covers self-propelled/mobile sources only. The San Diego Air Pollution Control District, which handles stationary source permits, was not able to isolate and provide agriculture diesel pump permit information from its database, therefore, agricultural pumps are not included in this report.[57]

4.6.4 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 U.S. Community Protocol.[58] This method multiplies animal-specific CH_4 emission factors with the specific livestock population to estimate the total emissions from enteric fermentation.

The livestock population was obtained from the 2019 Crop Statistics and Annual Report for the San Diego region.[59] For the animal types that were not reported in the 2019 Crop Statistics and Annual Report, livestock populations were estimated based on the population distribution in the National Agriculture Statistics Service (NASS).[60] Animal-specific CH_4 emission factors in California were obtained from the EPA 2019 U.S. Greenhouse Gas Inventory Report.[61]

The agricultural land acreage projections (114,746 acres in the Unincorporated County, and 130,488 acres in the San Diego region) are based on SANDAG Series 14 Growth Forecast, provided by SANDAG to EPIC, August 31, 2022. As 2019 data were not available, the 2025 agricultural land ratio was used as a proxy for 2019. In the SANDAG Land Use Codes, agricultural land includes orchards, vineyards, intensive agriculture, and field crops.

[57] Based on the response to a public records request submitted by EPIC, September 8, 2022.

[58] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019). Appendix G: Agricultural Livestock Emission Activities and Sources.

[59] County of San Diego Department of Agriculture, Weights and Measures. 2019 Crop Statistics and Annual Report, accessed May 10, 2021.

[60] United States Department of Agriculture (USDA): National Agricultural Statistics Service. 2014–2020, goats, hogs, sheep inventory, San Diego County, downloaded January 14, 2021.

[61] EPA: Annexes to the Inventory of U.S. GHG Emissions and Sinks 1990–2019 (April 2021), accessed June 10, 2021. Table A-159 Emission Factors for Cattle by Animal Type and State, and Table A-162 Emission Factors for Other livestock. CARB's California statewide inventory refers to the EPA U.S. GHG Emissions Inventory for the California emission factors.

The San Diego regional enteric fermentation emissions were then scaled to the unincorporated county based on the ratio of agricultural land acreage in the unincorporate county to the region. Livestock population in the San Diego region, animal-specific CH_4 emission factors, and emissions from enteric fermentation are provided in Table 25.[62]

Table 25 GHG Emissions from Enteric Fermentation (Unincorporated County of San Diego, 2019)

Animal Type	Population (Head)	Emission Factor (kg CH_4/head/year)	GHG Emissions (MT CO_2e)
Dairy Cow	4,300	146	15,695
Beef Cow	3,700	100	9,250
Other Cattle	5,200	54	7,033
Sheep and Lamb	960	9	216
Goats	1,391	9	313
Hogs and Pigs	1,558	1.5	58
San Diego Region - Total			32,565
Ratio of Agriculture Land Acreage – Unincorporated County to San Diego Region			88%
Unincorporated County of San Diego - **Total**			28,645
Agricultural land acreages in the unincorporated county do not include rural residential areas that may have small orchards or fields on the land. County of San Diego, USDA, EPA 2021, Energy Policy Initiatives Center, University of San Diego 2022			

4.6.5 Manure Management

Manure, the natural byproduct of livestock, creates both CH_4 and N_2O emissions as it biodegrades. The emissions from manure management, including from 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 U.S. Community Protocol.[63] These methods use a combination of livestock population, animal type, and animal-specific manure management systems to estimate the emissions from manure management.

Livestock population and the type are the same as discussed in Section 4.6.3 Enteric Fermentation above. Animal-specific manure management systems in California were obtained from the EPA 2019 U.S. Greenhouse Gas Inventory Report for each animal type.[64] The sub-sections below describe emissions estimation methods for manure management by emission type CH_4 and N_2O, and the total emissions from manure management, combining CH_4, direct N_2O, and indirect N_2O emissions, are provided in Table 26. The San Diego regional manure management emissions were then scaled to the unincorporated county based on the ratio of agricultural land acreage in the unincorporate county to the region.

[62] The number of sheep and lamb, and the number of hogs and pigs are from the County 2019 Crop Statistics and Annual Report. The number of dairy cows, beef cows, and other cattle are from the USDA inventory. The number of goats is based on the number of sheep and lamb from County report, and the ratio of sheep and lamb to goat in the USDA inventory. The CH_4 emission factor for other cattle was the average of emission factors for cattle types except dairy cows and beef cows.

[63] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019). Appendix G: Agricultural Livestock Emission Activities and Sources.

[64] EPA: Annexes to the Inventory of U.S. GHG Emissions and Sinks 1990–2019 (April 2021), accessed June 10, 2021.

Table 26 GHG Emissions from Manure Management (Unincorporated County of San Diego, 2019)

Animal Type	Population	CH_4 Emissions (MT CO_2e)	Direct N_2O Emissions (MT CO_2e)	Indirect N_2O Emissions (MT CO_2e)	Total GHG Emissions (MT CO_2e)
Dairy Cow	4,300	21,375	696	1,062	23,132
Beef Cow	3,700	745	2,050	268	3,062
Other Cattle	5,200	294	2,701	353	3,348
Sheep and Lamb	960	14	24	3	41
Goats	1,391	13	13	1	27
Hogs and Pigs	1,558	416	416	22	855
				San Diego Region - Total	30,465
				Ratio of Agriculture Land Acreage – Unincorporated County to San Diego Region	88%
				Unincorporated County of San Diego - Total	26,798
Agricultural land acreages in the unincorporated county do not include the rural residential areas that may have small orchards or fields on the land. County of San Diego, USDA, EPA 2021, Energy Policy Initiatives Center, University of San Diego 2022					

4.6.5.1 CH_4 Emissions from Manure Management

Under method A.2.1, CH_4 emissions from manure management, the amount of methane produced depends on the type of animal, the animal's diet and the manure management system. The types and distribution of manure management system for each animal type are shown in Table 24 and Table 25. Methane emissions from each management system for each animal population is calculated separately, by multiplying the maximum CH_4 producing capacity per pound of manure with the CH_4 conversion factor for each management system. The maximum CH_4 producing capacity depends on the volatile solids in manure managed. For cattle, the amount of volatile solids produced is based on the number of cattle; for other animals, it is based on animal weight. The CH_4 emissions from cattle are shown in Table 27;[65] and the CH_4 emissions from other animals are shown in Table 28.[66]

[65] ICLEI Community Inventory Appendix G, Equation A.2.1.1a, A.2.1.1b, and A.2.1.2. For dairy cows and beef cows, distribution of manure by the waste management system is from the EPA report Table A-171; for other cattle, the distribution is from CARB's 2000–2018 GHG inventory, 3A2aii – Other Cattle. CH_4 conversion factors by waste management systems are from CARB's 2000–2019 GHG inventory, 3A2d – dairy cows. The CH_4 conversion factors are not available, and the default values from Table A.2.1.2 and Table A.2.1.3 in the ICLEI Community Inventory Appendix G were used.

[66] ICLEI Community Inventory Appendix G, Equation A.2.1.1a, A.2.1.1b, and A.2.1.2. For sheep and goats, the distribution of manure and CH_4 conversion factor by waste management system and CH_4 are from CARB's 2000–2018 GHG inventory, 3A2c – sheep and 3A2d – goat. For swine, the distribution is from the EPA report Table A-172 and the CH_4 conversion factors by waste management systems are from CARB's 2000–2019 GHG inventory, 3A2d – swine. The CH_4 conversion factors are not available, and the default values from Table A.2.1.2 and Table A.2.1.3 in the ICLEI Community Inventory Appendix G were used.

Table 27 Methane Emissions from Manure Management – Cattle (San Diego Region, 2019)

Waste Management System	Dairy Cow		Other Cattle		Beef Cow	
	Distribution of Manure	CH_4 Conversion Factor	Distribution of Manure	CH_4 Conversion Factor	Distribution of Manure	CH_4 Conversion Factor
Dry Lot	3%	1.5%	99%	1.5%	100%	1.5%
Pasture	5%	1.5%	2%	1.5%	0%	1.5%
Liquid Slurry	3%	33%	1%	33%	1%	45%
Daily Spread	0%	0.5%	0%	0%	0%	0%
Solid Storage	26%	4%	0%	0%	0%	0%
Anaerobic Lagoon	54%	74%	0%	74%	0%	0%
Deep Pit	9%	32%	0%	0%	0%	0%
Volatile Solids (VS) (kg/animal/yr.)	2,780		1,043		1,891	
Maximum CH_4 Producing Capacity per Pound of Manure (m^3/kg VS)	0.24		0.17		0.33	
Population	4,300		5,200		3,700	
GHG Emissions (MT CO_2e)	21,375		294		745	
Emissions are calculated based on ICLEI Community Inventory Appendix G, Equation A.2.1.1a, A.2.1.1b, and A.2.1.2. Energy Policy Initiatives Center, University of San Diego 2022						

Table 28 Methane Emissions from Manure Management – Other Animals (San Diego Region, 2019)

Waste Management System	Sheep		Goats		Swine	
	Distribution of Manure	CH_4 Conversion Factor	Distribution of Manure	CH_4 Conversion Factor	Distribution of Manure	CH_4 Conversion Factor
Dry Lot	31%	1.5%	8%	1.5%	0%	1%
Pasture	69%	1.5%	92%	1.5%	15%	0%
Liquid Slurry	0%	0%	0%	0%	28%	31%
Daily Spread	0%	0%	0%	0%	0%	0%
Solid Storage	0%	0%	0%	0%	0%	2%
Anaerobic Lagoon	0%	0%	0%	0%	29%	73%
Deep Pit	0%	0%	0%	0%	27%	31%
Maximum CH_4 Producing Capacity per Pound of Manure (m^3/kg VS)	0.36		0.17		0.48	
Average Volatile Solids (kg/day/1,000 kg animal mass)	8.3		9.5		5.4	
Typical Animal Mass (TAM, kg)	53		64		45	
Population	960		1,391		1,558	
GHG Emissions (MT CO_2e)	14		13		416	
Emissions are calculated based on ICLEI Community Inventory Appendix G, Equation A.2.1.1a, A.2.1.1b, and A.2.1.2. Energy Policy Initiatives Center, University of San Diego 2022						

4.6.5.2 Direct N_2O Emissions from Manure Management

Under method A.2.3, direct N_2O emissions from manure management, the N_2O emissions that are released directly from manure depend on the animal population, animal characteristics, and the type of manure management system. The types and distribution of manure management system for each animal type are shown in Table 27 and Table 28. Similar to the CH_4 emissions calculation, the Kjeldahl nitrogen (organic nitrogen in the form of either ammonia or ammonium) excreted by cattle is based on the number of cattle; for other animals, it is based on animal weight. Direct N_2O emissions from each management system for each animal population is calculated separately, by multiplying the daily rate of Kjeldahl nitrogen excreted with the N_2O conversion factor for each management system. The direct N_2O emissions from cattle are shown in Table 29;[67] and the direct N_2O emissions from other animals are shown in Table 30.[68]

Table 29 Direct N_2O Emissions from Manure Management – Cattle (San Diego Region, 2019)

Waste Management System	Dairy Cow		Other Cattle		Beef Cow	
	Distribution of Manure	Direct N_2O Emission Factor (kg N_2O-N/kg N excreted)	Distribution of Manure	Direct N_2O Emission Factor (kg N_2O-N/kg N excreted)	Distribution of Manure	Direct N_2O Emission Factor (kg N_2O-N/kg N excreted)
Dry Lot	3%	0.02	99%	0.02	100%	0.02
Pasture	5%	0	2%	0	0%	0
Liquid Slurry	3%	0.005	1%	0.005	1%	0.005
Daily Spread	0%	0	0%	0	0%	0
Solid Storage	26%	0.005	0%	0.005	0%	0.005
Anaerobic Lagoon	54%	0	0%	0	0%	0
Deep Pit	9%	0.002	0%	0.002	0%	0.002
The daily rate of Kjeldahl nitrogen excreted (kg N/animal/year)		155		56		59
Population		4,300		5,200		3,700
GHG Emissions (MT CO_2e)		696		2,701		2,050
Emissions are calculated based on the ICLEI Community Inventory Appendix G, Equation A.2.3.1a, A.2.3.1b, and A.2.3.2. Energy Policy Initiatives Center, University of San Diego 2022						

[67] ICLEI Community Inventory Appendix G, Equation A.2.3.1a, A.2.3.1b, and A.2.3.2. Direct N_2O emission factors are from CARB's 2000–2019 GHG inventory, 3A2d – dairy cows.

[68] ICLEI Community Inventory Appendix G, Equation A.2.1.1a, A.2.1.1b, and A.2.1.2. For sheep and goats, distributions of manure and CH_4 conversion factor by waste management system and CH_4 are from CARB's 2000–2019 GHG inventory, 3A2c – sheep and 3A2d – goat. For swine, the distribution is from the EPA report Table A-172 and the N_2O emission factors are from CARB's 2000–2019 GHG inventory, 3A2d – swine.

Table 30 Direct N_2O Emissions from Manure Management – Other Animals (San Diego Region, 2019)

Waste Management System	Sheep		Goats		Swine	
	Distribution of Manure	Direct N_2O Emission Factor (kg N_2O-N/kg N excreted)	Distribution of Manure	Direct N_2O Emission Factor (kg N_2O-N/kg N excreted)	Distribution of Manure	Direct N_2O Emission Factor (kg N_2O-N/kg N excreted)
Dry Lot	31%	0.02	8%	0.02	0%	0.01
Pasture	69%	0	92%	0	15%	0
Liquid Slurry	0%	0	0%	0	28%	0.005
Daily Spread	0%	0	0%	0	0%	0
Solid Storage	0%	0	0%	0	0%	0.005
Anaerobic Lagoon	0%	0	0%	0	29%	0
Deep Pit	0%	0	0%	0	27%	0.002
The daily rate of Kjeldahl nitrogen excreted (kg/day/1,000 kg animal mass)		0.45		0.45		0.54
Typical Animal Mass (TAM, kg)		53		64		45
Population		960		1,391		1,558
GHG Emissions (MT CO_2e)		24		11		12
Emissions are calculated based on the ICLEI Community Inventory Appendix G, Equation A.2.3.1a, A.2.3.1b, and A.2.3.2. Energy Policy Initiatives Center, University of San Diego 2022						

4.6.5.3 Indirect N_2O Emissions from Manure Management

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 indirect N_2O emissions from each management system for each animal population is calculated separately, by multiplying the nitrogen excreted, N_2O conversion factor, the nitrogen loss through runoff and leaching rates for each management system. The indirect N_2O emissions from cattle are shown in Table 31;[69] the indirect N_2O emissions from other animals are shown in Table 32.[70]

[69] ICLEI Community Inventory Appendix G, Equation A.2.4.2. The nitrogen loss through volatilization, runoff and leaching percentages are from the CARB 2000–2018 GHG inventory, 3A2d – dairy cows.

[70] ICLEI Community Inventory Appendix G, Equation A.2.4.2. The nitrogen loss through volatilization, runoff and leaching percentages are from the CARB 2000–2018 GHG inventory, 3A2c – sheep, 3A2d – goat, and 3A2d – swine.

Table 31 Indirect N_2O Emissions from Manure Management – Cattle (San Diego Region, 2019)

Waste Management System	Dairy Cow			Other Cattle			Beef Cow		
	Manure Distribution	Nitrogen Loss - volatilization (%)	Nitrogen Loss - runoff and leaching (%)	Manure Distribution	Nitrogen Loss - volatilization (%)	Nitrogen Loss - runoff and leaching (%)	Manure Distribution	Nitrogen Loss -volatilization (%)	Nitrogen Loss - runoff and leaching (%)
Dry Lot	3%	15%	2%	99%	23%	3.9%	100%	23%	3.9%
Pasture	5%	0%	0%	2%	0%	0%	0%	0%	0%
Liquid Slurry	3%	26%	0.8%	1%	26%	0%	1%	26%	0%
Daily Spread	0%	10%	0%	0%	0%	0%	0%	0%	0%
Solid Storage	26%	27%	0%	0%	0%	0%	0%	0%	0%
Anaerobic Lagoon	54%	43%	0.8%	0%	0%	0%	0%	0%	0%
Deep Pit	9%	24%	0%	0%	0%	0%	0%	0%	0%
Emission Factors (kg N2O-N/ kg N)	-	0.01	0.0075	-	0.01	0.0075	-	0.01	0.0075
N_excreted (kg N/year)			666,500			291,200			218,300
GHG Emissions (MT CO_2e)			1,062			353			268

Emissions are calculated based on the ICLEI Community Inventory Appendix G, Equation A.2.4.2
Energy Policy Initiatives Center, University of San Diego 2022

Table 32 Indirect N_2O Emissions from Manure Management – Other Animals (San Diego Region, 2019)

Waste Management System	Sheep			Goats			Swine		
	Manure Distribution	Nitrogen Loss - volatilization (%)	Nitrogen Loss - runoff and leaching (%)	Manure Distribution	Nitrogen Loss - volatilization (%)	Nitrogen Loss - runoff and leaching (%)	Manure Distribution	Nitrogen Loss - volatilization (%)	Nitrogen Loss - runoff and leaching (%)
Dry Lot	31%	23%	3.9%	8%	23%	0%	0%	0%	0%
Pasture	69%	0%	0%	92%	0%	0%	15%	0%	0%
Liquid Slurry	0%	0%	0%	0%	0%	0%	28%	26%	0.8%
Daily Spread	0%	0%	0%	0%	0%	0%	0%	0%	0%
Solid Storage	0%	0%	0%	0%	0%	0%	0%	45%	0%
Anaerobic Lagoon	0%	0%	0%	0%	0%	0%	29%	58%	0.8%
Deep Pit	0%	0%	0%	0%	0%	0%	27%	34%	0.0%
Emission Factors (kg N2O-N/ kg N)	-	0.01	0.0075	-	0.01	0.0075	-	0.01	0.0075
N_excreted (kg N/year)			8,278			14,624			13,716
GHG Emissions (MT CO_2e)			3			1			22
Emissions are calculated based on the ICLEI Community Inventory Appendix G, Equation A.2.4.2 Energy Policy Initiatives Center, University of San Diego 2022									

4.6.6 Soil Management

Application of synthetic fertilizer on agriculture land and nitrogen content in crop residue produces N_2O emissions in two ways: (1) direct N_2O emissions from the soils, and (2) indirect N_2O emissions from volatilization and leaching/runoff from land. In addition, urea fertilizer and liming applied to soil to reduce soil acidity and improve plant growth, produce CO_2 emissions.

The total emissions from soil management, combining N_2O and indirect N_2O emissions from fertilizer and crop residue, and CO_2 emissions from lime and urea, are provided in Table 33. The detailed methods used are described in Section 4.6.5.1 through Section 4.6.5.3. The San Diego regional soil management emissions were then scaled to the unincorporated county based on the ratio of agricultural land acreage in the unincorporate county to the region.

Table 33 GHG Emissions from Soil Management (Unincorporated County of San Diego, 2019)

Emissions From Soil Management	Synthetic Fertilizer Nitrogen Applied to Soils	Nitrogen in Crop Residue
Direct N_2O Emissions from Nitrogen (MT CO_2e)	10,014	173
Indirect N_2O Emissions from Nitrogen (MT CO_2e)	3,255	39
Total N_2O Emissions from N inputs (MT CO_2e)		13,480
Total CO_2 Emissions from Liming and Urea (MT CO_2e)		440
GHG Emissions from Soil Management (MT CO_2e)		13,920
Ratio of Agriculture Land Acreage – Unincorporated County to San Diego Region		88%
Unincorporated County of San Diego - Soil Management (MT CO_2e)		12,244
Agricultural land acreages in the unincorporated county do not include the rural residential areas that may have small orchards or fields on the land. Energy Policy Initiatives Center, University of San Diego 2022		

4.6.6.1 Direct and Indirect N_2O Emissions from Synthetic Fertilizer

The method to estimate direct and indirect N_2O emissions is based on the Tier 1 approach of direct N_2O emissions in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[71] The method uses default emission factors to (1) convert nitrogen applied to agricultural soils to N_2O emitted, (2)convert nitrogen volatized and re-deposited on soils to N_2O emitted, and (3)convert the proportion of nitrogen lost to leaching and runoff to N_2O emitted. Since 2017, instead of the IPCC Tier 1 approach, CARB has used a process-based denitrification-decomposition (DNDC) model to estimate direct and indirect N_2O emissions in the statewide GHG inventory, which accounts for both natural factors and farming practices that affect N_2O emissions from soil.[72] Because the DNDC model is not available at the local level, the IPCC Tier 1 approach is used here.

[71] IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 11, Section 11.2.1 Direct N_2O emissions and Section 11.2.2 Indirect N_2O Emissions, accessed July 21, 2021.
[72] CARB: Inventory Updates since the 2016 Edition of the Inventory (2017). CARB updated calculation in 2017, before 2017, the method is the same as the IPCC Tier 1 approach.

The California Department of Food & Agriculture (CDFA) releases the Fertilizing Materials Tonnage Report semi-annually, which summarizes California and county-level (regional-level) tonnage sales and distribution of commercial fertilizers and agricultural minerals. The 2019 tonnage of each synthetic fertilizer was multiplied by its nitrogen content based on the specific chemical content to estimate the total nitrogen applied to the soil.[73] If the specific chemical content of a fertilizer was not given, code 97 fertilizer with a 25-15-17 Nitrogen-Phosphorous-Potassium (NPK) composition was used. The nitrogen applied to soil in 2019 is provided in Table 34.[74]

Table 34 Nitrogen Applied to Soil from Fertilizer (San Diego Region, 2019)

Fertilizer Type (with Nitrogen Content)	2019 Fertilizer Tonnages	Proportion of Nitrogen*	2019 Nitrogen Tonnages
Ammonium Nitrate	1,018	0.335	341
Ammonium Nitrate solution	187	0.200	37
Ammonium Sulphate	367	0.210	77
Calcium Ammonium Nitrate	484	0.270	131
Calcium Nitrate	2,994	0.155	464
Nitrogen Solution 28%	138	0.280	39
Nitrogen Solution 32%	273	0.320	87
Urea	494	0.460	227
Nitrogen materials – other**	3,815	0.250	954
		Total	2,357

Farm use fertilizer only
*Proportion of nitrogen is based on the fertilizer's Nitrogen-Phosphorous-Potassium composition
**The fertilizer code is 97 (25-15-17 Nitrogen-Phosphorous-Potassium)
CDFA, Energy Policy Initiatives Center, University of San Diego 2022

The total nitrogen applied in Table 33 is then converted to direct and indirect N_2O emissions, based on the default emission factors to convert nitrogen applied to agricultural soils to N_2O emitted, nitrogen volatized and re-deposited on soils to N_2O emitted, and the proportion of nitrogen lost to leaching and runoff to N_2O emitted. The direct and indirect N_2O emissions, in CO2e, are shown in Table 35.

Table 35 Direct and Indirect N_2O Emissions from Synthetic Fertilizer (San Diego Region, 2019)

Key Inputs for Direct and Indirect N_2O Emissions Calculation	Factors and Results
Nitrogen in soils (tons per year)	2,357
Direct N_2O emissions	
Emitting Rate (N_2O -N emitted/N applied)	0.01
Direct N_2O emissions from nitrogen applied to managed soil ($MTCO_2e$)	10,014
Indirect N_2O emissions	
Volatilization rate (N volatilized/N applied)	0.1
Redeposited nitrogen emitted as N_2O	0.01
Leaching rate (N lost by leaching and runoff/N applied)	0.3
Leached nitrogen emitted as N_2O	0.0075
Indirect N_2O emissions from nitrogen applied to managed soil (MT CO_2e)	3,255
Total Direct and indirect N_2O emissions from nitrogen applied to managed soil ($MTCO_2e$)	13,269

Unit conversions and molecular weight ratio of N_2O to N_2 conversions are not shown in the table.
Energy Policy Initiatives Center, University of San Diego 2022

[73] CDFA: Fertilizing Materials Tonnage Report, accessed June 22, 2021.
[74] Portion of nitrogen is based on the fertilizer's Nitrogen-Phosphorous-Potassium composition using International Fertilizer Association's Fertilizer Converter.

4.6.6.2 Direct and Indirect N_2O Emissions from Crop Residue

Farms have N_2O emissions from crop residue and from crop burning activities. For crops, the nitrogen contents in above-ground and below-ground residue are different. The nitrogen content is calculated based on the ratio of above-ground/below-ground dry matter to harvested dry matter, and ratio of residue to above-ground/below-ground dry matter. Because the San Diego region does not have crops accounting for the majority of biomass burning (barley, corn, rice, wheat, almond, and walnut), this section only includes the emissions due to crop residue. Among the crops that have nitrogen content in their residue, only hay & oats are grown in the San Diego region.[75] The total nitrogen content in hay & oats residue is shown in Table 36.[76]

Table 36 Nitrogen in Crop Residue (San Diego Region, 2019)

Key Inputs to Estimate Nitrogen Content in Crop Residue	Factors and Results
Oats harvested area	758 ha (1,874 acres)
Oats harvested yield (tons/acre)	2
Dry matter fraction of harvested oats	0.89
Annual harvested dry matter (kg/ha)	3,990
Above-ground residue dry matter (Mg/ha)	4.52
Ratio of above-ground residue dry matter to harvested dry matter	1.133
N content of above ground residue	0.007
Ratio of below-ground residue to above-ground biomass	0.25
Ratio of below-ground residue dry matter to harvested dry matter	0.533
N content of below-ground residue	0.008
N in crop residue (tons)	41
Factors based on 2006 IPCC Guidelines for GHG Inventory, Ch. 11, Sec. 11.2.1–11.2, Equation 11.6, Equation 11.7, Table 11.2. County of San Diego, Energy Policy Initiatives Center, University of San Diego 2022	

The total nitrogen in crop residue, Table 33, is then converted to direct and indirect N_2O emissions. The method is the same as the method discussed in Section 4.6.5.1, but there is no nitrogen volatilization in crop residue. The direct and indirect N_2O emissions are shown in Table 37.

Table 37 Direct and Indirect N_2O Emissions from Crop Residue (San Diego Region, 2019)

Key Inputs for Direct and Indirect N_2O Emissions Calculation	Factors and Results
Nitrogen in soils (tons per year)	41
Direct N_2O emissions	
Emitting rate (N_2O -N emitted/N applied)	0.01
Direct N_2O emissions from nitrogen in crop residue (MT CO_2e)	173
Indirect N_2O emissions	
Leaching rate (N lost by leaching and runoff /N applied)	0.3

[75] County of San Diego Department of Agriculture, Weights and Measures. 2019 Crop Statistics and Annual Report, accessed May 10, 2021.

[76] IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 11, Section 11.2.1 Direct N_2O emissions and Section 11.2.2 Indirect N_2O Emissions, factors are based on Equation 11,6, Equation 11.7, and Table 11.2 accessed July 21, 2021.

Key Inputs for Direct and Indirect N_2O Emissions Calculation	Factors and Results
Leached nitrogen emitted as N_2O	0.0075
Indirect N_2O emissions from nitrogen in crop residue (MT CO_2e)	39
Total Direct and indirect N_2O emissions from nitrogen in crop residue (MT CO_2e)	212
Unit conversions and molecular weight ratio of N_2O to N_2 conversions are not show in the table. Energy Policy Initiatives Center, University of San Diego 2022	

4.6.6.3 CO_2 Emissions from Lime and Urea Application

Liming is used to reduce soil acidity and improve plant growth in agriculture land. Adding carbonates to soils in the form of lime leads to CO_2 emissions as the carbonated limes dissolve and release bicarbonate, which evolves into CO_2 and water. Similarly, adding urea ($CO(NH_2)_2$) to soils during fertilization releases bicarbonate and later evolves into CO_2 and water.

The CO_2 emissions from urea application and from liming are based on the total quantities of urea and lime applied and their respective emission factors. CO_2 emissions from liming material is calculated by multiplying the tonnage of liming material, emission factor of C to liming material, and the CO_2 to C conversion factor. Similarly, CO_2 emissions from urea is calculated by multiplying the tonnage of urea, emission factor of C to urea, and the CO_2 to C conversion factor. The CO_2 emissions are shown in Table 38.[77]

Table 38 CO_2 Emissions from Lime and Urea Application (San Diego Region, 2019)

Key Inputs for CO_2 Emissions from Lime and Urea Calculation	Factors and Results
Liming Material (tons)	267
Emission Factor (tons of C/tons of liming material) *	0.125
CO2 Emissions from Liming Material (MT CO_2e) *(a)*	111
Urea ($CO(NH_2)_2$,tons)	494
Emission factor (tons of C/tons of urea)	0.2
CO2 Emissions from Urea (MT CO_2e) *(b)*	329
CO2 Emissions from Liming and Urea (MT CO_2e) *(a + b)*	440
*Average of limestone and dolomite Factors are based on 2006 IPCC Guidelines for GHG Inventory, Chapter 11, Section 11.3–11.4, and Equation 11.12, Equation 11.13 CDFA, Energy Policy Initiatives Center, University of San Diego 2022	

[77] CDFA: Fertilizing Materials Tonnage Report, accessed June 22, 2021. Emission factors are from IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 11, Section 11.3.CO2 Emissions from Liming and Section 11.4 CO2 Emissions from Urea Fertilization, emission factors are based on Equation 11.2 and Equation 11.3, accessed July 21, 2021.

4.7 Off-Road Transportation

4.7.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from purchased diesel for emergency generators at County buildings and other facilities and purchased diesel for County airports, total off-road transportation emissions in 2019 are 71,000 MT CO_2e, with purchased diesel for County operations resulting in 100 MT CO_2e or less than 1% of all off-road transportation emissions. It is assumed that the majority of emissions from landscape equipment used in County facilities and construction emissions from Capital Improvement Projects are fully within the unincorporated county. Emissions from consumption of diesel used in generators at Airports and Government Building located outside of unincorporated county are added to emissions from off-road vehicles and equipment for estimating combined emissions. Emissions from consumption of diesel used at Airports and Government Building located inside unincorporated county are not added because these emissions are included in emissions from off-road vehicles and equipment in the county.

4.7.2 Methods

Emissions from off-road vehicles and equipment, both diesel and gasoline-fueled, are from the fuel combustion in internal combustion engines.

CARB released OFFROAD2021, an online emissions inventory database for off-road equipment and vehicles, in 2021, that generates off-road vehicles emissions by county (region), vehicle category, equipment type, horsepower (HP), and fuel type.[78] The previous comprehensive CARB off-road equipment and vehicle model was OFFROAD2007, released in 2007. After the release of OFFROAD2007, CARB developed category specific methods and inventory models for specific regulatory support, which replaced the results of specific vehicle categories in OFFROAD2007.OFFROAD2021 integrates data from several updated off-road models, such as SORE 2020, which generates emissions for off-road vehicles with engines less than or equal to 25 HP, RV 2018, which generates emissions for recreational vehicles, and other sector specific models.
Specific data on off-road vehicles for the county are not available, therefore, the emissions estimated in each vehicle category for the San Diego region were allocated to the county based on category-specific economic and demographic data, as discussed in Section 2.4 (Demographics). The key inputs and GHG emissions from off-road transportation in 2019 are show in Table 39.[79]

[78] CARB: Updates to CARB's Online Emissions Inventory Database for Off-Road Equipment and Vehicles. October 19, 2021.
[79] OFFROAD2021 v1.0.3 data were downloaded from CARB EMFAC database (Offroad Emissions) on August 23, 2022. Emissions in San Diego County (San Diego region) in CARB models were given in tons per day and converted to metric tons per year.

Table 39 Key Inputs and GHG Emissions from Off-Road Transportation (Unincorporated County of San Diego, 2019)

Vehicle Category	Emissions in San Diego Region (MT CO_2e)	Allocation Factor	Unincorporated County to San Diego Region Ratio	Emissions in Unincorporated County (MT CO_2e)
Lawn and Garden Equipment	50,353	Population	14%	7,233
Light Commercial Equipment	69,889	Commercial Jobs	9%	5,999
Transport Refrigeration Units	33,242	Commercial Jobs	9%	2,854
Airport Ground Support	16,120	Population	14%	2,316
Construction and Mining	177,469	Construction Jobs	25%	44,179
Industrial	89,626	Manufacturing Jobs	9%	7,829
Recreational Vehicles	2,855	Population	14%	410
			Total	**71,000**

Notes:
The unincorporated county to San Diego region ratios were based on 2019 population and jobs estimates discussed in Section 2.4, SANDAG 2019 regional Demographic and Socioeconomic Estimates (July 23, 2021 version), and 2019 regional projection in Series 14 Growth Forecast (interpolated between 2018 estimates and 2020 forecast), downloaded from SANDAG Data Surfer, January 22, 2023. Section 2.4 provides the total jobs estimates in the unincorporated county, while jobs estimates by type are used here. The unincorporated county to San Diego region ratios are: (1) population (479,844 to 3,340,302); (2) commercial jobs (119,592 to 1,393,149); (3) construction jobs (21,645 to 86,552); and (4) manufacturing jobs (9,858 to 112,861).
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation.
CARB OFFROAD2021 v1.0.3, Energy Policy Initiatives Center, University of San Diego 2023

4.8 WATER

4.8.1 Combined Emissions – Community-wide and County Operations

When accounting for the addition of GHG emissions from water use at County buildings and other facilities located outside of the unincorporated county, total off-road transportation emissions in 2019 are 39,000 MT CO_2e, with water use at County buildings and other facilities located outside of the unincorporated county resulting in negligible GHG emissions. Emissions from water used at County facilities located outside of the unincorporated county are added to emissions from water use in the community for estimating combined emissions, while emissions from water used at County facilities located inside the unincorporated county are included in the community water use related emissions.

4.8.2 Methods

Emissions from water supplied to county's residents and business are from energy used to supply and convey, treat, and distribute water. The emissions depend on the sources of water, distance of water conveyance, and the treatment processes before the end-use phase. Emissions from water were estimated based on Method WW.14 from the U.S. Community Protocol.[80] Method WW.14 accounts for each segment of the water cycle (upstream supply and conveyance, treatment, and local distribution) individually. Emissions in the water category are calculated based on the electricity use associated with each water cycle and the emission factor of the electricity used in each water cycle.

[80] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix F. Wastewater and Water Emission Activities and Sources.

Member agencies of the San Diego County Water Authority (SDCWA or the Water Authority), community water districts, or private water companies provide water services to the county. The water supply and associated energy use from each supplier are discussed in Section 4.8.1 and Section 4.8.2; and the emissions from energy used for water are discussed in Section 4.8.3. Energy use and associated emissions from the water end-use phase are not included in this category, as they are captured in the electricity, natural gas, or propane category.

4.8.3 Water Supply from SDCWA Member Agencies and Associated Energy Use

SDCWA has 24 member agencies that provide water in the San Diego region. Each member agency either purchases all water directly from the Water Authority or purchases a portion of the water from Water Authority with the rest from local supply sources, such as surface water or recycled water. These member agencies have all or part of their service area within the county. The water sources (Water Authority supply, and local supply if any) each member agency provides to the county are assumed to be the same as the water sources of the member agency's entire service area. Member agencies, service area population in the county, and the source of water supplied are provided in Table 40.[81]

Table 40 Water Supplied by San Diego County Water Authority Member Agencies (Unincorporated County of San Diego, 2019)

Water Authority Member Agencies	Service Area Population in the Unincorporated County*	Water Authority Supply** (Acre-feet)	Local Supply	
			Source of Local Supply	Local Supply** (Acre-feet)
Fallbrook Public Utility District	32,997	7,829	Surface, Recycled	746
Helix Water District	80,067	6,719	Surface	1,624
Lakeside Water District	32,058	2,761	Surface	638
Olivenhain Municipal Water District	26,907	8,339	Surface, Recycled	1,178
Otay Water District	71,783	9,105	Recycled	603
Padre Dam Municipal Water District	36,961	3,612	Surface, Recycled	279
Rainbow Municipal Water District	21,063	14,559	-	-
Ramona Municipal Water District	33,468	4,183	Surface, Recycled	395
Rincon Del Diablo Municipal Water District	13,539	346	Recycled	311
San Dieguito Water District	3	0.3	Surface	0.3
Santa Fe Irrigation District	6,852	2,046	Surface	1,177
South Bay Irrigation District	15,259	310	Ground, Surface	1,023
Vallecitos Water District	9,099	964	Desalination	300
Valley Center Municipal Water District	25,426	16,564	Surface	393
Vista Irrigation District	18,206	865	Surface	1,346
Yuima Municipal Water District	1,823	4,700	Groundwater, Surface	5,174
Total	**425,511**	**82,903**	-	**15,187**

*2018 population within each member agency's service area in the unincorporated county is based on GIS analysis
**Assumes that the ratio of Water Authority supply and local supply for the service area in the unincorporated county is the same as in the entire service area. Water supply is the average of fiscal year 2019 and 2020 supply
County of San Diego 2021, Energy Policy Initiatives Center, University of San Diego 2021

[81] Water supply and sources are from SDCWA Fiscal Year 2019 Annual Report and Fiscal Year 2020 Annual Report, accessed on January 11, 2021 and April 23, 2021, respectively. The county population covered by water and wastewater districts were provided by County based on GIS analysis (May 19, 2021). 2019 population data were not available, 2018 population data were used.

The energy needed to convey, treat, and distribute the Water Authority supply and local supply are different. The Water Authority supply comes from two sources: (1) the State Water Project, and (2) the Colorado River, through the Metropolitan Water District of Southern California (MWD). The upstream energy intensity of the Water Authority supply is provided in Table 41. [82]

Table 41 Upstream Energy Intensity of San Diego County Water Authority Supply

Water System Segment	2019 Energy Intensity (kWh per acre-foot)	Data Source
MWD Delivered Untreated* *(a)*	1,920	MWD 2020 UWMP 2020 Appendix 10
SDCWA conveyance** *(b)*	-32.6	SDCWA UWMP 2020 Draft Appendix I
SDCWA Untreated Subtotal (a+b)	*1,887*	-
SDCWA treatment*** *(c)*	112	SDCWA UWMP 2020 Draft Appendix I
SDCWA distribution**** *(d)*	7.7	SDCWA UWMP 2020 Draft Appendix I
SDCWA Treated Total (a+b+c+d)	2,005	-
Upstream Energy Intensity	**1,946**	Average of Treated (2,005) and Untreated (1,887)

* 2018 data
** Negative energy intensity indicates the process is primarily gravity flow with little to no energy use and produces electricity from water flowing through the pipeline
*** Energy use at SDCWA's Twin Oaks Valley Water Treatment Plant
**** Energy use at Valley Center Pump Station and other small facilities for treated water distribution
MWD = Metropolitan Water District of Southern California, SDCWA = San Diego County Water Authority, UWMP = Urban Water Management Plan
MWD 2021, SDCWA 2021, Energy Policy Initiatives Center, University of San Diego 2021

The energy associated with the local distribution of Water Authority supply is based on the water distribution energy intensity of each member agency. The upstream and local energy use of Water Authority supply is shown in Table 42.[83]

Table 42 Upstream and Local Energy Use of San Diego County Water Authority Supply (Unincorporated County of San Diego, 2019)

Water Authority Supply (Acre-feet)* *(a)*	82,903
Upstream Energy (kWh/Acre-foot)** *(b)*	1,946
Upstream Electricity Use (kWh) *(a * b)*	161,339,756
Local Distribution Energy Intensity (kWh/Acre-foot)*** *(c)*	139
Local Distribution Electricity use (kWh) *(a*c)*	11,541,164

*Calculated in Table 39
**Calculated in Table 40
***Weighted average of the local distribution energy intensity of member agencies providing water to the unincorporated county
Energy Policy Initiatives Center, University of San Diego 2021

[82] MWD: 2020 Urban Water Management Plan, June 2021, accessed on March 24, 2023. SDCWA: 2020 Urban Water Management Plan, May 2021, accessed on March 24, 2023. SDCWA also receives water from the Carlsbad Desalination Plant, however, the portion of water from the Plant of total Water Authority Supply is not available.
[83] The local distribution energy intensity of each member agency was collected from either the 2020 Urban Water Management Plan draft or from personal communication between EPIC and the member agency. If the distribution energy intensity is not available, the data from a nearby member agency is used. The weighted average is shown in the table.

For local water supply, the energy use depends on the water source, the member agency's water treatment process and distribution system. The treatment and distribution energy use of local supply is shown in Table 43.[84]

Table 43 Treatment and Distribution Energy Use of Local Water Supply (Unincorporated County of San Diego, 2019)

Local Water Supply (Acre-feet)* *(a)*	15,187
Local Water Treatment Energy Intensity (kWh/Acre-foot)** *(b)*	233
Local Water Treatment Electricity Use (kWh) *(a*b)*	3,544,632
Local Distribution Energy Intensity (kWh/Acre-foot)** *(c)*	102
Local Distribution Electricity use (kWh) *(a*c)*	1,553,885
*Calculated in Table 39 **Weighted average of local treatment and distribution energy intensity of agencies providing water to unincorporated county Energy Policy Initiatives Center, University of San Diego 2021	

4.8.4 Water Supply outside SDCWA Service Area and Associated Energy Use

For the population outside the SDCWA service area, it is assumed that water supply is local groundwater derived from on-site private wells, small community water systems, or private water companies. Among the water supply providers listed in Table 43, only the Campo Water Maintenance District is owned and operated by the County. The water districts, service area population in the county, and the water supplied are provided in Table 44.[85]

Table 44 Water Supply Outside San Diego County Water Authority Service Area (Unincorporated County of San Diego, 2019)

Water Districts	Service Area Population in the Unincorporated County*	Water Supplied** (Acre-feet/year)
Campo Water Maintenance District	790	105
Borrego Water District	3,720	494
Canbrake County Water District	126	17
Cuyamaca Water District	133	18
Descanso Community Services District	757	100
Jacumba Community Services District	505	67
Julian Community Services District	268	36
Majestic Pines Community Services District	1,240	165
Mootamai Municipal Water District	390	52
Pauma Municipal Water District	201	27
Questhaven Municipal Water District	2	0.3
San Luis Rey Municipal Water District	139	18
Wynola Water District	126	17
Total with Specified Water Districts	7,607	1,009

[84] Local treatment and distribution energy intensity of each member agency was collected from either 2020 Urban Water Management Plan draft or from personal communication between EPIC and the member agency. If the energy intensity is no available, the data from a nearby member agency or a member agency with similar system is used. The weighted averages are shown in the table.

[85] The population served and water flow at Campo Water Maintenance District were provided by County, January 28, 2021. County population covered by water and wastewater districts were provided by County based on GIS analysis (May 19, 2021). 2019 population data were not available, 2018 population data were used.

Water Districts	Service Area Population in the Unincorporated County*	Water Supplied** (Acre-feet/year)
Unspecified Water Supply	46,726	6,199
	Total	**7,208**

*2018 population within each member agency's service area in unincorporated county is based on GIS analysis
**For Campo Water Maintenance District, the service area population and water supplied were provided by the County directly. For other districts, the water supplied was calculated based on the service area population and Campo Water Maintenance District's per capita water use in 2019 (118 gallon per capita per day)
County of San Diego 2021, Energy Policy Initiatives Center, University of San Diego 2023

Because the groundwater pumping and treatment energy use at each water district is not available, the estimated energy intensity at Sweetwater Authority's National City Wells, a groundwater facility, is used to estimate the groundwater pumping and treatment energy use. The energy use of groundwater supply is shown in Table 45.[86]

Table 45 Energy Use of Groundwater Supply (Unincorporated County of San Diego, 2019)

Groundwater Supply (Acre-feet)*	7,208
Groundwater Pumping and Treatment Energy Intensity (kWh/Acre-foot)**	657
Groundwater Electricity Use (kWh)	4,735,586

*Calculated in Table 42
** 2018 groundwater pumping energy intensity at National City Wells
Energy Policy Initiatives Center, University of San Diego 2023

4.8.5 Emissions from Energy Used for Water

Emissions in the water category are calculated based on the electricity use associated with water supply, treatment, and distribution, as shown in Section 4.8.1 and Section 4.8.2, and the emission factor of the electricity use.

The California average electricity emission factor in eGRID2019, 455 lbs CO_2e/MWh, is applied to upstream electricity use; and the SDG&E bundled electricity emission factor for 2019, 633 lbs CO_2e/MWh, is applied to all local electricity use of the water districts within and outside SDCWA service area.[87] The key inputs and GHG emission from water in 2019 are shown in Table 46.

[86] The 2018 groundwater pumping energy intensity at National City Wells was provided by personal communications between EPIC and City of Chula Vista, March 4, 2019.
[87] U.S. EPA: eGRID 2019, released on February 23, 2021, downloaded on April 13, 2021. CAMX WECC emission factor. The SDG&E bundled emission factor is discussed in Section 4.2.

Table 46 Key Inputs and GHG Emissions from Water (Unincorporated County of San Diego, 2019)

Upstream Electricity Use (kWh)*	161,339,756
Upstream Electricity Emission Factor (lbs CO_2e/MWh)**	455
Upstream Emissions (MT CO_2e)	33,320
Local Electricity use (kWh)***	21,375,267
Local Electricity Emission Factor (lbs CO_2e/MWh)******	633
Distribution Emissions (MT CO_2e)	6,134
Total Emissions (MT CO_2e)	39,000

*Calculated in Table 40
** CAMX WECC emission factor in eGRID2019
***Sum of local energy use in Table 40, Table 41, and Table 43
***SDG&E 2019 bundled electricity emission factor
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation.
Energy Policy Initiatives Center, University of San Diego 2023

4.9 WASTEWATER

4.9.1 Combined Emissions – Community-wide and County Operations

Emissions from wastewater generated in the county are from the wastewater treatment process, and from fugitive and stationary sources. The emissions depend on the wastewater treatment plant (WWTP) operations and treatment processes. Emissions from wastewater were estimated based on Method WW.14 of the U.S. Community Protocol.[88] Total wastewater emissions in 2019 are 18,000 MT CO_2e. The inventory for County operations emissions does not include any emissions from wastewater treatment processes as all wastewater treatment facilities owned and operated by the County have aerobic operations and do not generate CH_4. Electricity emissions associated with these facilities are captured under the electricity sector.

San Diego County Sanitation District (SDCSD), member agencies of SDCWA, and individual wastewater districts provide centralized wastewater services to the county. In addition, communities with dispersed populations use on-site wastewater treatment. The population served and wastewater flow from each source are discussed in the Sections 4.9.1 to Section 4.9.4 below; and the emissions from wastewater are discussed in Section 4.9.5.

4.9.2 Wastewater Flow Collected by San Diego County Sanitation District

SDCSD, part of the County's Department of Public Works, collects wastewater within the communities of Campo, Julian, and Pine Valley, and treats the wastewater at nearby SDCSD-operated WWTPs. In addition, SDCWA collects and conveys wastewater from communities of Alpine, East Otay Mesa, Lakeside, Spring Valley, and Winter Gardens, through City of San Diego's Metropolitan Wastewater System, to the City's Point Loma Wastewater Treatment Plant (Point Loma WWTP) for treatment and

[88] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix F. Wastewater and Water Emission Activities and Sources.

disposal.[89] The service area population and wastewater flow to each treatment facility are provided in Table 47.[90]

4.9.3 Wastewater Flow Collected by SDCWA Member Agencies

Some of the SDCWA member agencies provide wastewater services in the county in addition to water services, even though the water and wastewater service areas may be different. The 2019 wastewater generated in each member agency's service area in the unincorporated county is calculated based on (1) the wastewater flow in each agency's entire service area, and (2) the ratio of service area population in the unincorporated county to the entire service area population. For these member agencies, the service area population and wastewater flow collected by each agency and the treatment facilities are provided in Table 48.[91]

Table 47 Wastewater Flow Collected by San Diego County Sanitation District (Unincorporated County of San Diego, 2019)

Wastewater Treatment Facilities	Service Area Population in the Unincorporated County*	Wastewater Flow** (Million gallons/year)
Rancho del Campo WWTP	945	19
Julian WWTP	315	11
Pine Valley WWTP	183	3.6
San Pasqual Academy WWTP	325	1.4
Heise Park WWTP	200	1.0
City of San Diego Point Loma WWTP	115,464	3,198
Total	**117,432**	**3,234**

WWTP – wastewater treatment plant
*Point Loma WWTP service area population in the unincorporated county is calculated based on the difference between San Diego County Sanitation District's 2018 population (2019 population data are not available) and the 2019 population served by the remaining WWTPs.
**The wastewater conveyed to Point Loma WWTP in 2019 was significantly higher than in previous years due to commercial development close to the border area.
County of San Diego 2021, Energy Policy Initiatives Center, University of San Diego 2021

[89] County of San Diego: San Diego County Sanitation District System Description.
[90] 2019 wastewater flow collected in SDCSD and its treatment facilities data were provided by County (January 28, 2021 and February 19, 2021). County population covered by water and wastewater districts were provided by County based on GIS analysis (May 19, 2021). 2019 population data were not available, 2018 population data were used as proxy.
[92] 2019 wastewater treatment facilities' annual influent and effluent flows were provided to EPIC by the San Diego Regional Water Quality Control Board (March 3, 2021). County population covered by water and wastewater districts were provided by County based on GIS analysis (May 19, 2021). 2019 population data were not available, 2018 population data were used as proxy.

Table 48 Wastewater Flow Collected by San Diego County Water Authority Member Agencies (Unincorporated County of San Diego, 2019)

SDCWA Member Agency	Wastewater Treatment Facilities	Service Area Population in the Unincorporated County**	Wastewater Flow*** (Million gallons/year)
Fallbrook Public Utility District	Fallbrook Plant #1 WRF	25,242	557
Helix Water District*	Point Loma WWTP	48,954	767
Olivenhain Municipal Water District	4S Ranch WRF	17,945	288
Otay Water District	Ralph W. Chapman WRF	12,806	254
Padre Dam Municipal Water District*	Padre Dam WRF	8,644	135
Rainbow Municipal Water District*	San Luis Rey WWTP	21,043	330
Ramona Municipal Water District	Santa Maria WRF San Vicente WRF	19,647	413
Vallecitos Water District	Meadowlark WRF	7,414	75
Valley Center Municipal Water District	Wood Valley Ranch WRF Lower Moosa Canyon WRF	25,408	129
	Total	**187,103**	**2,947**

WWTP – wastewater treatment plant, WRF – water reclamation facility or water recycling facility
*Flow treated at the facilities for these districts are not available or cannot be separated out. The average wastewater generated per capita (43 gallons per capita per day) and the service area population in unincorporated county of each district with data available is used to estimate the wastewater flow
**2018 population within each member agency's service area in unincorporated county is based on GIS analysis, wastewater service area of each agency may differ from water service area
***Assumes the per capita wastewater generated by each agency in the Unincorporated County is the same as the rest of the agency's service area
Energy Policy Initiatives Center, University of San Diego 2021

4.9.4 Wastewater Flow Collected by Individual Districts

Other individual wastewater agencies, including Community Service Districts and Sanitation Districts, collect wastewater flows from communities in the county. For these districts, the service area population and wastewater flow collected by each district and the treatment facilities are provided in Table 49.[92]

Table 49 Wastewater Flow Collected by Individual Agencies (Unincorporated County of San Diego, 2019)

Wastewater Districts	Wastewater Treatment Facilities	Service Area Population in the Unincorporated County**	Wastewater Flow*** (Million gallons/year)
Borrego Water District*	Rams Hill WWTF	3,720	102
Buena Sanitation District*	Encina WPCF	10,612	290

[92] 2019 wastewater treatment facilities' annual influent and effluent flows were provided to EPIC by the San Diego Regional Water Quality Control Board (March 3, 2021). County population covered by water and wastewater districts were provided by County based on GIS analysis (May 19, 2021). 2019 population data were not available, 2018 population data were used as proxy.

Wastewater Districts	Wastewater Treatment Facilities	Service Area Population in the Unincorporated County**	Wastewater Flow*** (Million gallons/year)
Fairbanks Ranch Community Services District	Fairbanks Ranch WPCF	1,500	47
Pauma Valley Community Services District	Pauma Valley Treatment Plant	1,014	0.5
Rancho Santa Fe Community Services District	Santa Fe Valley WRF Rancho Santa Fe WRF	9,153	179
Whispering Palms Community Services District	Whisperings Palms WPCF	2,941	92
	Total	**28,940**	**711**

WWTF – wastewater treatment facility, WRF – water reclamation facility or water recycling facility, WPCF = Water Pollution Control Facility

*Flow treated at the facilities for these districts are not available or cannot be separated out. The average wastewater generated per capita (75 gallons per capita per day) and the service area population in unincorporated county of each district with data available was used to estimate the wastewater flow (Pauma Valley Treatment Plant flow is not included in the average per capita calculation due to its low flow).

**2018 population within each member agency's service area in unincorporated county was based on GIS analysis, wastewater service area of each agency may differ from water service area

***Assumes the per capita wastewater generated in the unincorporated county of each agency is the same as the rest of the agency's service area

Energy Policy Initiatives Center, University of San Diego 2021

4.9.5 Wastewater Flow Treated at On-site Systems

Communities with dispersed population often treat wastewater on-site or near the origins. On-site wastewater treatment is commonly done through a septic system, or an underground wastewater treatment system. The population with septic systems is calculated based on the difference between the county population and the populations served by centralized districts discussed in the above Section 4.9.1 through Section 4.9.3. The estimated population and wastewater flow are provided in Table 50.

Table 50 Wastewater Flow Treated at On-site Systems (Unincorporated County of San Diego, 2019)

Wastewater Collection	Service Area Population in the Unincorporated County*	Wastewater Flow** (Million gallons/year)	Wastewater Flow (Gallons per capita per day)
Total	479,844	9,916	57
San Diego County Sanitation District	117,432	3,234	75
Individual Wastewater Districts	28,940	711	67
SDCWA Member Agencies	187,103	2,947	43
Septic Systems	**146,369**	**3,025**	**57**

*Population with septic systems is calculated based on the difference between total county population and the populations served by centralized districts

**Wastewater flow with septic system is calculated based on the population and the average gallons wastewater generated per capita per day of the centralized district

Energy Policy Initiatives Center, University of San Diego 2023

4.9.6 Emissions from Wastewater

Emissions from wastewater treatment depend on the treatment processes. A centralized conventional WWTP includes aerobic systems to degrade dissolved organics. Additional treatments include nitrification/denitrification (to oxidize or remove nitrogenous waste), anaerobic digestion (to degrade 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 at a centralized WWTP.

Among the WWTPs listed in Table 47 through Table 49, only Point Loma WWTP, Encina WPCF, and San Luis Rey WWTP use the anaerobic digestion process. The emissions from wastewater at these facilities are calculated based on the wastewater flow and the process emission factor (combustion of digester gas) from each facility. For all other centralized facilities, only the aerobic process is used. The Rancho Del Campo WWTP is the only plant that uses the nitrification/denitrification process.[93] The emissions were calculated based on population served, the U.S. Community Protocol Method WW.7, Method WW.8 for process emissions, and Method WW.12 for fugitive emissions.[94] For the wastewater treated at septic systems, CH_4 emissions were calculated based on the population served and the septic system emission factor. The key inputs and GHG emission from wastewater in 2019 are shown in Table 51.[95]

Table 51 Key Inputs and GHG Emissions from Wastewater (Unincorporated County of San Diego, 2019)

Wastewater Treated at WWTPs with Anaerobic Digestion				
Wastewater Treatment Facilities	Wastewater Flow (Million gallons/year)		Emission Factor* ($MT\ CO_2e$/million gallon)	GHG Emissions ($MT\ CO_2e$)
Point Loma WWTP	3,965		0.30	1,203
San Luis Rey WWTP	330		1.37	850
Encina WPCF	290			
Wastewater Treated at WWTPs without Anaerobic Digestion				
Wastewater Treatment Process	Population Served	Process Emissions ($MT\ CO_2e$)	Fugitive Emissions ($MT\ CO_2e$)	GHG Emissions ($MT\ CO_2e$)
With nitrification/denitrification	945	2	4	1,927
Without nitrification/denitrification	136,457	163	1,758	
Wastewater Treated with Septic Systems				
Population Served		Emission Factor ($g\ CH_4$ per person per day)		GHG Emissions ($MT\ CO_2e$)

[93] GHG sources and processes at County-owned facility provided by County (January 28, 2021 and February 19, 2021).
[94] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix F. Wastewater and Water Emission Activities and Sources.
[95] CARB: Documentation of California's 2000–2018 GHG Inventory, last modified November 6, 2020. 4D1 – Domestic Wastewater Treatment and Discharge.

146,369	10.7	14,291
	Total GHG Emissions (MT CO_2e)	**18,000**

WWTP – wastewater treatment plant, WPCF = Water Pollution Control Facility
*Point Loma WWTP's emission factor is based on 2019 total influent flow and reported GHG emissions at the facility. Encina WPCF's emission factor was based on a 2013 study and used as proxy for San Luis Rey WWTP, because both plants have similar wastewater treatment processes.
GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation.
Energy Policy Initiatives Center, University of San Diego 2023

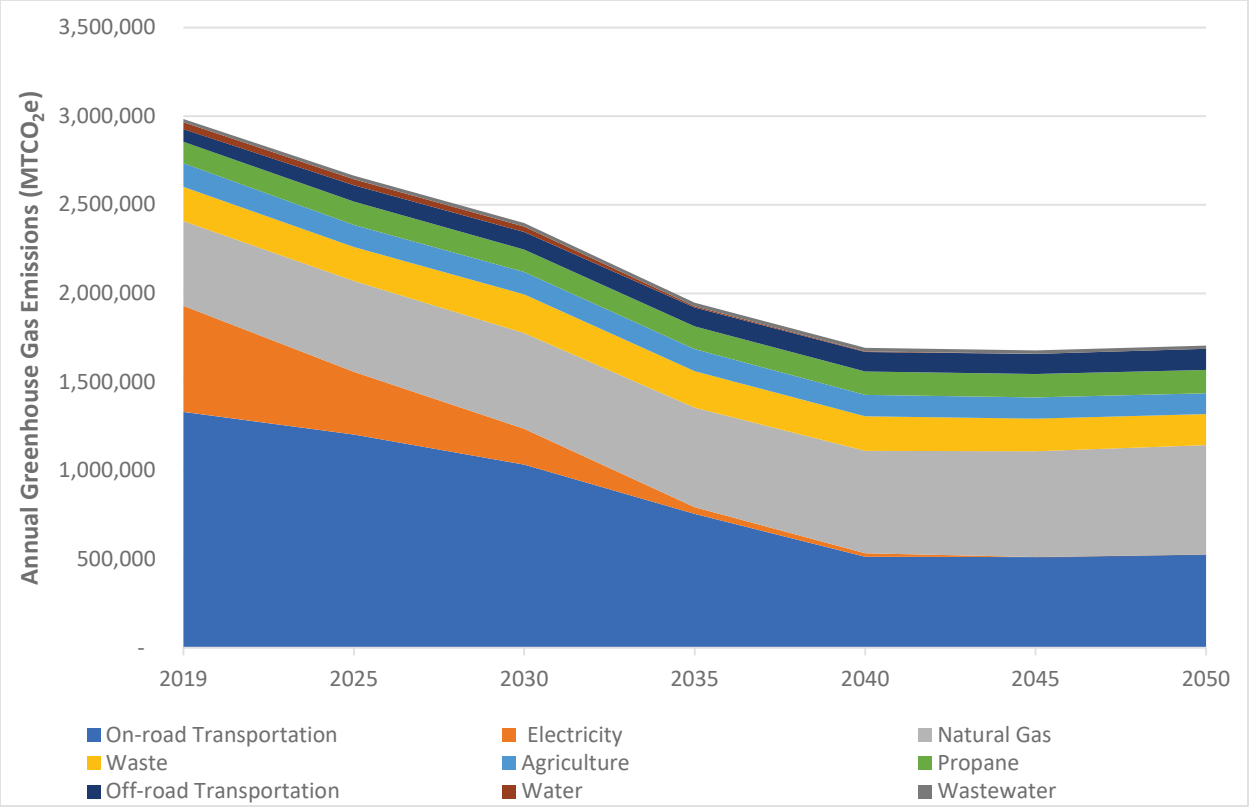
5. Emissions Projection Through 2050

The 2019 GHG emissions were projected through 2050 based on: (1) population, housing, and job growth in the county and (2) the future impact of adopted Federal and California regulations, policies, and programs in place in 2022 (i.e., at the end of the final calendar year) that reduce GHG emissions. The projections also account for growth in the County's government operations (see *County of San Diego Local Government Operations Greenhouse Gas 2019 Inventory and Projections* for more details). The total and distribution of projected emissions by category are presented in Table 52 and Figure 4. Note that projected GHG emissions for 2025 do not reflect County operations because year 2025 projections were not included in the *County of San Diego Local Government Operations Greenhouse Gas 2019 Inventory and Projections*.

Table 52 Total and Breakdown of Projected GHG Emissions (Unincorporated County of San Diego)

Emissions Category	Projected GHG Emissions (MT CO_2e)					
	2025	**2030**	**2035**	**2040**	**2045**	**2050**
On-road Transportation	1,204,000	1,033,000	756,000	513,000	512,000	527,000
Electricity	354,000	202,000	38,000	20,000	-	-
Natural Gas	512,000	540,000	561,000	579,000	597,000	616,000
Waste	192,000	219,000	206,000	194,000	184,000	175,000
Propane	131,000	127,000	129,000	131,000	132,000	133,000
Agriculture	125,000	127,000	124,000	122,000	120,000	118,000
Off-road Transportation	92,000	99,000	106,000	110,000	114,000	118,000
Water	35,000	31,000	8,000	4,000	-	-
Wastewater	19,000	19,000	19,000	19,000	19,000	19,000
Total	**2,664,000**	2,397,000	1,947,000	1,693,000	1,678,000	1,705,000

The projected GHG emissions include the impact of population, housing, and employment growth, as well as the future impact of adopted Federal and California Regulations, policies and programs that reduce GHG emissions as of 2022.
Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
Energy Policy Initiatives Center, University of San Diego 2023



Note: the projected GHG emissions include the anticipated impact of population, housing, and employment growth, as well as the future impact of adopted Federal and California Regulations, policies and programs that reduce GHG emissions as of 2022.

Figure 4 Total and Breakdown of Projected GHG Emissions (Unincorporated County of San Diego)

6. Methods to Project Emissions Through 2050

6.1 On-road Transportation

6.1.1 Federal and State Regulations Included in the Emissions Projection

6.1.1.1 Heavy-Duty Vehicle Regulations

The default outputs of CARB's Mobile Source Emissions Inventory EMFAC2021 model were used to determine the average vehicle emission rates for the San Diego region.[96] The average vehicle emission rates for the San Diego region were used as proxies for the county. The EMFAC2021 model outputs include effects of the following federal and State regulations related to tailpipe GHG emissions reductions that were adopted through 2020:

- Heavy-Duty Warranty Phase 1: amendments to the heavy-duty engine warranty regulations;
- Innovative Clean Transit: requirements for public transit agencies to transition to a 100% zero-emission bus fleet;
- Amendments to Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program: amendments to reduce PM from diesel-powered vehicles;
- Zero Emission Airport Shuttle Bus: requirements for airport shuttle fleets to fully transition to zero emission;

[96] CARB: EMission FACtors model, EMFAC2021 v1.0.2, May 2, 2022.

- Advanced Clean Truck: requirements for zero-emission truck/classis sales; and
- Heavy-Duty Omnibus: updates to heavy-duty NOx emissions standards.[97]

6.1.1.2 Light-Duty Vehicle: Advanced Clean Cars II Regulation

Existing federal and state regulations to reduce emissions from light-duty vehicles are included in the previous EMFAC2017 and carried over in EMFAC2021. No new light-duty vehicle regulations were modeled in EMFAC2021. EMFAC2021 does not include the effect of Advanced Clean Cars II (ACCII).

In August 2022, CARB adopted the ACCII regulations that established standards for new post-2026 model year light-duty vehicles. ACCII amended (1) the low-emission vehicle (LEV) regulations to strengthen standards for light-duty vehicles and trucks to reduce smog-forming emissions, and (2) the zero-emission vehicle (ZEV) regulations to require an increasing number of ZEVs to meet air quality and climate change emissions standards.[98] The ZEV amendments support Governor Newsom's Executive Order N-79-20 that requires all new passenger vehicles sold in California to be zero emissions by 2035.[99]

6.1.2 Projected Emissions from On-Road Transportation

Projected annual VMT was estimated based on the average weekday VMT for the county provided by SANDAG using the Series 14 Forecast and activity-based model (ABM2+). The VMT projection is based on the SANDAG DS39 growth assumption for the county. Weekday O-D VMT projections for each trip type in 2025, 2035, and 2050 are shown in Table 53, with linear interpolations in between.[100] Employee commute VMT projections assume that 2019 employee commute VMT levels were grow in proportion to growth in County employees. Employee commute projections include vehicle tailpipe emissions and indirect emissions from increased electric load from electric vehicles.

[97] CARB: EMFAC2021 Volume III Technical Document, Version 1.0.1 (April 2021). Section 1.3.5 Regulations and Policies includes a list of polices and regulations covered in EMFAC2021. The Technical Document discusses the federal SAFE Vehicle Rules and Actions, however, the latest EMFAC2021 v.1.0.2 does not include the impact of the SAFE Rule.
[98] CARB: Advanced Clean Cars II.
[99] *Id.*
[100] 2025, 2035, and 2050 VMT files were provided by Fehr & Peers to EPIC, February 13, 2023. SANDAG Activity Based Model 2+ Release v14.2.2, 2021 Regional Plan EIR Alternative 2, Year 2025 (Scenario 507), Year 2035 (Scenario 505), and Year 2050 (Scenario 506). Fehr & Peers developed a procedure to adjust County VMT provided by SANDAG for County such that military and tribal lands were not included as part of the Unincorporated County. Fehr & Peers (February 17, 2023), *Military and Tribal VMT Adjustment for the San Diego County CAP Model Scenarios* [Memorandum].

Table 53 Projected County VMT Through 2050

Year	Projected VMT by Trip Type (Miles/Weekday)		Total Projected County VMT (100% * I-I + 50% * I-E/E-I) (Miles per Weekday)	Total Projected County VMT (Miles per Year)
	Internal-Internal (I-I) Trips	External-Internal/Internal-External (I-E/E-I) Trips		
2025	1,564,362	15,051,380	9,090,052	3,154,247,996
2030	1,570,948	15,549,723	9,345,809	3,242,995,681
2035	1,577,533	16,048,065	9,601,566	3,331,743,367
2040	1,608,203	16,370,036	9,793,221	3,398,247,707
2045	1,638,873	16,692,007	9,984,876	3,464,752,048
2050	1,669,543	17,013,977	10,176,531	3,531,256,388

2025, 2035, and 2050 VMT projection from SANDAG Series 14 (DS39 and ABM2+) were adjusted for the County such that military and tribal lands were not considered as part of the county. The conversion factor from miles per weekday to miles per year is 347.
VMT in the rest of the forecast years are interpolated linearly. The conversion factor from miles per weekday to miles per year is 347.

Fehr & Peers 2023, Energy Policy Initiatives Center, University of San Diego 2023

Federal and State policies and regulations through 2020 discussed in Section 6.1.1.1 reduce vehicle tailpipe emissions but add additional electric load from ZEVs through 2050. Using the EMFAC2021 default scenario, the percentage of miles driven by electric vehicles (e-VMT) of total VMT and the EV efficiency are calculated and applied to county VMT. The additional electric load from ZEVs are shown in Table 54.[101] The calculation method for the county-wide electricity emission factor is discussed in Section 6.2.2.

Table 54 Additional Electric Vehicle Load Through 2050 with Federal and State Regulations in EMFAC2021

Year	Ratio of e-VMT to Total VMT*	New County e-VMT**	Electric Vehicle Efficiency kWh/mile	Electricity Use from New County e-VMT (MWh)	County-wide Emission Factor*** (lb CO_2e/MWh)	Additional Emissions from Electric Load (MT CO_2e)
2025	5.1%	117,578,336	0.38	44,201	249	5,209
2030	7.7%	207,808,712	0.41	86,185	132	5,605
2035	10.1%	292,279,802	0.46	135,398	23	1,653
2040	11.6%	349,978,450	0.50	174,290	11	1,001
2045	12.4%	386,672,658	0.52	201,976	-	-
2050	12.8%	411,116,603	0.54	221,699	-	-

*EMFAC2021 default for San Diego County is applied to the unincorporated county
**New county e-VMT is the difference between the e-VMT in a forecast year and the 2019 baseline
***County-wide emission factor is based on grid electricity supply and behind-the-meter PV supply assumptions in Section 6.2.2
Results are from CARB EMFAC2021 model. The model includes all key federal and State regulations related to tailpipe GHG emissions reductions that were adopted through 2020.
e-VMT: electric vehicle miles traveled.
CARB 2022, Energy Policy Initiatives Center, University of San Diego 2023

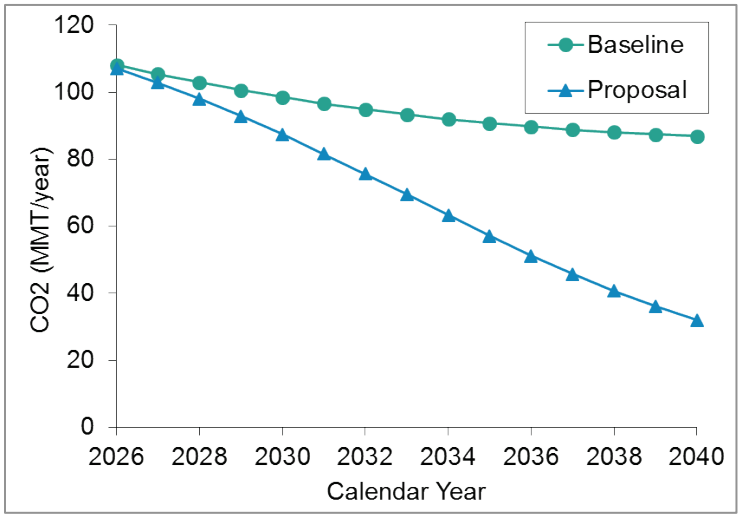
[101] CARB: EMission FACtors model, EMFAC2021 v1.0.2, May 2, 2022.

Using the EMFAC2021 default scenario, the average vehicle emission rate (g CO_2e/mile) for each target year is calculated based on the distribution of VMT for each vehicle class and its emission rate. The net projected emissions with the impact of federal and State polices and regulations through 2020 is the difference between vehicle tailpipe emissions and additional emissions from the electric load. The emissions through 2050 are shown in Table 55.

Table 55 Projected Emissions Through 2050 with Federal and State Regulations in EMFAC2021

Year	Total County VMT (Miles per Year)	Average Vehicle Emission Rate (g CO_2e/mile)	GHG Emissions (MT CO_2e)
2025	3,154,247,996	380	1,198,364
2030	3,242,995,681	343	1,111,344
2035	3,331,743,367	317	1,055,457
2040	3,398,247,707	302	1,027,554
2045	3,464,752,048	296	1,025,657
2050	3,531,256,388	296	1,044,035
Results are based on CARB EMFAC2021 model. The model includes all key federal and State regulations related to tailpipe GHG emissions reductions that were adopted through 2020. CARB 2022, Energy Policy Initiatives Center, University of San Diego 2023			

The latest version of EMFAC2021 does not include the impact of ACCII. The next version of EMFAC model, EMFAC202Y, will include the impact of ACCII, as well as other light-duty vehicle regulations and heavy-duty vehicle regulations passed after the adoption of EMFAC2021.[102] However, CARB estimated the anticipated statewide downstream tank-to-wheel CO_2 emission benefits of ACCII, starting 2026 through 2040 (Figure 5).



Note: Adapted from CARB October 2022 Public Workshop for the EMFAC202Y Model, Presentation Slide 36, the difference between baseline and proposal CO_2 emissions is due to projected Advanced Clean Car II Regulations

[102] CARB Presentation EMFAC202Y: An Update to California on-road Mobile Source Emissions Inventory (October 12, 2022).

Figure 5 Anticipated Light-Duty Emission Benefits from Advanced Clean Cars II Regulations – Project Statewide Downstream Tank-to-wheel Emissions

It should be noted that no San Diego regional emission benefits or additional electric load due to the ZEVs are available as of March 2023. For this document and projections, it is assumed that the impact of ACCII in the county will be the same as its impact statewide, and the benefits post-2040 will be the same as 2040 benefits.

Only light-duty vehicles are subject to ACCII, so the emissions benefits from ACCII were applied only to light-duty vehicles in the county. The additional electric load due to the new ZEVs from ACCII were not estimated due to lack of electricity load data. However, in 2045 when the electricity supply is mandated to be zero-emissions, any ZEV will have zero impact on electricity emissions. The total projected emissions from on-road transportation, including estimated ACCII effects only on ZEV emissions, are shown in Table 56.[103]

Table 56 Projected GHG Emissions from On-Road Transportation Through 2050

Year	% CO_2 LDV/CO_2e All Vehicles*	County LDV CO_2 - EMFAC21 (MT CO_2e)	Additional Electric Load - EMFAC21 (MT CO_2e)	County Non-LDV GHG - EMFAC21 (MT CO_2e)	County LDV CO_2 - EMFAC21 + ACCII Impact (MT CO_2e)	Community Emissions (MT CO_2e)	Non-unincorporated County Employee Commute Emissions (MT CO_2e)	Total Emissions (MT CO_2e)
2025	79.2%	949,304	5,209	249,060	949,304	1,204,000	--	1,204,000
2030	79.1%	879,222	5,605	232,122	780,263	1,018,000	15,000	1,033,000
2035	79.7%	841,355	1,653	214,102	529,267	745,000	11,000	756,000
2040	80.3%	825,595	1,001	201,959	303,686	507,000	6,000	513,000
2045	80.3%	823,192	-	202,465	302,802	505,000	7,000	512,000
2050	79.4%	829,442	-	214,593	305,101	520,000	7,000	527,000

*Results are based on CARB EMFAC2021 model. The model includes all key federal and State regulations related to tailpipe GHG emissions reductions that were adopted through 2020.
ACCII: Advanced Clean Cars II Regulations
LDV: light-duty vehicles with gross vehicle weight rating < 8,500 lbs.
The impact of ACCII is estimated based on the difference in CO_2 emissions between baseline and proposal scenario in Figure 5
Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
2025 Projections are not available for County operations.
CARB 2022, Energy Policy Initiatives Center, University of San Diego 2023

6.2 Electricity

6.2.1 State Regulations, Policies and Programs Included in the Projection

6.2.1.1 Renewables Portfolio Standard (RPS) – SB100 and SB1020

SB 100, the 100 Percent Clean Energy Act of 2018, adopts a 60% RPS for all of California's retail electricity suppliers by 2030. The legislation also provides goals for the intervening years before 2030

[103] CARB: EMission FACtors model, EMFAC2021 v1.0.2, May 2, 2022. CARB Presentation EMFAC202Y: An Update to California on-road Mobile Source Emissions Inventory (October 12, 2022). Data behind the CO_2 figure on Slide 36 were provided by CARB EMFAC team to EPIC, January 23, 2023.

and establishes a State policy requiring that "zero-carbon" resources supply 100% of all retail electricity sales to end-user customers and all State agencies by December 31, 2045.[104]

SB1020, the Clean Energy, Jobs, and Affordability Act of 2022, adopts two interim targets for all retail electricity sales to end-use customers, 90% renewable and zero-carbon electricity by 2035 and 95% renewable and zero-carbon electricity by 2040.[105] The statewide renewables and zero-carbon targets are shown in below Figure 6.

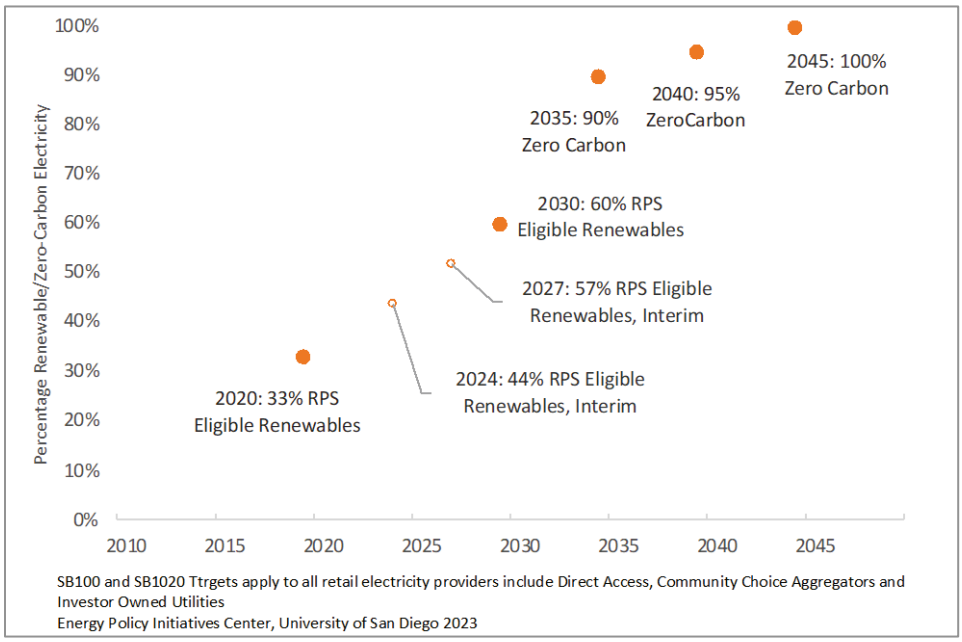


Figure 6 SB100 and SB1020 Renewables and Zero-Carbon Targets

6.2.1.2 California Solar Programs, Policies, and Mandates

California has several policies and programs to encourage customer-owned, behind-the-meter PV systems, such as the California Solar Initiative, New Solar Home Partnership, Net Energy Metering, and electricity rate structures designed for solar customers.[106] The California 2019 Building Energy Efficiency Standards, which went into effect on January 1, 2020, require all newly constructed single-family homes, low-rise multi-family homes, and detached accessory dwelling units (ADUs) to have PV systems installed, unless the building receives an exception.[107] The latest California 2022 Building Energy Efficiency

[104] SB 100 (de León): California Renewables Portfolio Standard Program: emissions of greenhouse gases (2017–2018). The interim RPS targets are 44 percent by 2024 and 52 percent by 2027 from eligible renewable energy resources.
[105] SB1020 (Laird): the Clean Energy, Jobs, and Affordability Act of 2022 (2021–2022).
[106] The energy demand forecast used in this document is based on CEC 2021 Integrated Energy Policy Report (2021 IEPR). The PV models used in 2021 IEPR included an extension of federal tax incentives but did not include the impact of the proposed Net Energy Metering change (NEM 3.0) from the California Public Utilities Commission (CPUC). The CPUC NEM 3.0 proceeding was in progress during the 2021 IEPR preparation. CEC: Final 2021 Integrated Energy Policy Report Volume IV: California Energy Demand Forecast (February 2022), accessed March 23, 2023.
[107] CEC: 2019 Building Energy Efficiency Standards – 2019 Residential Compliance Manual (December 2018). For the requirements on newly constructed single-family and low-rise multi-family homes, see Section 7.2 Prescriptive

Standards, which went into effect on January 1, 2023, expands the PV requirement to non-residential buildings. In addition, the 2022 Code encourages efficient electric heat pumps and establishes electric-ready requirements for new residential construction.[108]

The California Energy Demand 2021–2035 Forecast, developed by the CEC, has projections for PV capacity from behind-the-meter PV adoption in the SDG&E planning area through 2035, including the impact of the residential and non-residential PV mandates.
The baseline demand forecast provides three cases: high-demand, mid-demand, and low-demand. The PV projection from 2020–2035 in the SDG&E planning area mid-demand case is used to forecast the PV generation in the county.[109]

The California Distributed Generation (DG) Statistics database includes capacities of behind-the-meter PV systems interconnected in a jurisdiction in a given year for each of the three Investor-Owned Utility (IOU) planning areas, including SDG&E. The DG Statistics database also provides detailed information about the behind-the-meter PV systems installed in a jurisdiction from the start year of incentive programs through the current year. This provides a historical record used to determine the capacity in GHG inventory years and can also help determine trends in PV installation.

A comparison of the estimated capacity and electricity generation from PV systems in the county and in the SDG&E planning area is given in Table 57.[110]

Table 57 Behind-the-meter PV Capacity and Estimated Electricity Generation

Year	Unincorporated County*		SDG&E Planning Area**	Historical County to SDG&E Ratio of Electricity Generation from PV
	PV Capacity (MW)	Estimated Electricity Generation (GWh)	Estimated Electricity Generation (GWh)	
2016	206	325	1,140	28%
2017	245	386	1,431	27%
2018	293	462	1,733	27%
2019	358	565	2,085	27%

*Estimated electricity generation based on PV capacity and default 18% capacity factor.
**California Energy Demand Baseline 2021-2035 Forecast mid-demand case
California Distributed Generation Statistics 2021, CEC 2022, Energy Policy Initiatives Center, University of San Diego 2022

For future years, the electricity generation and capacity of behind-the-meter PV systems in the county are estimated based on the PV generation in CEC's mid-demand forecast for SDG&E's planning area, and the average ratio of PV generation in the county to that of SDG&E's planning area from 2014–2019 (30%). Because of California's solar programs, policies and mandates, the estimated PV capacity in 2035

Requirements for Photovoltaic System. For the requirements on newly constructed and detached ADU, see Section 9.3.5 Accessory Dwelling Units.

[108] CEC: 2022 Building Energy Efficiency Standards.

[109] CEC: California Energy Demand Forecast, 2021–2035 Baseline Forecast – Mid Demand Case, accessed September 16, 2022.

[110] The capacity of all interconnected PV systems in the Unincorporated County was from the California Distributed Generation Statistics NEM Currently Interconnected Data Set (current as of October 31, 2020), download date: January 25, 2021. National Renewable Energy Laboratory: Residential PV Resources Classes, Mean DC Capacity Factor.

in the county is projected to be 1,100 megawatts (MW). As there are no statewide PV projections beyond 2035, it is assumed that the PV capacity from State programs beyond 2035 will be fixed at 2035 levels. The trend of behind-the-meter PV in the county is shown in Figure 7.

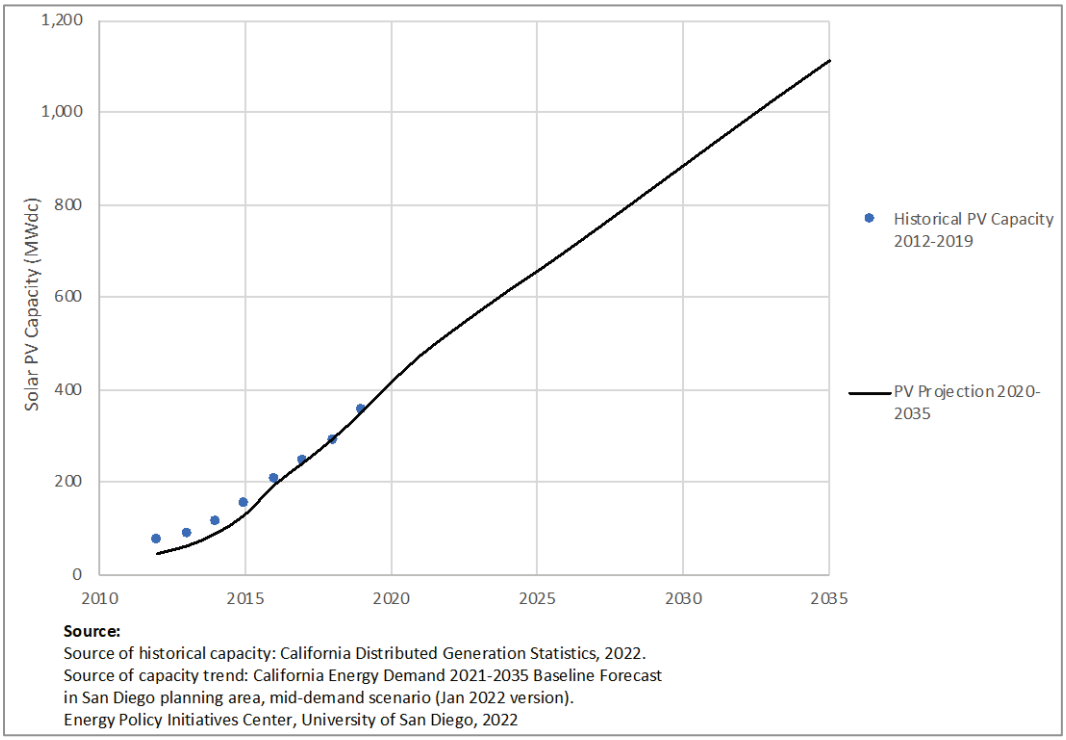


Figure 7 Behind-the-meter PV Historical and Projected Trend in San Diego (2012–2035)

6.2.1.3 California Energy Efficiency Programs

In September 2021, the California Public Utilities Commission (CPUC) adopted energy efficiency goals for ratepayer-funded energy efficiency programs (Decision 21-09-037). The adopted energy saving goals for SDG&E's service territory are given in the Decision on an annual basis from 2022 to 2032.[111] The sources of the energy savings include, but are not limited to, rebated technologies, building retrofits, behavior-based initiatives, and codes and standards.[112]

To evaluate the impact of the energy efficiency programs in the county, the total energy savings in SDG&E's service territory by 2032 are allocated to the county using a ratio of the County's natural gas and electricity demand to those of SDG&E's entire service territory. The 2019 ratios are 10% for electricity and 16.1% for natural gas.[113] The utility's energy efficiency goal is not estimated by the CPUC beyond 2032; therefore, it is assumed the annual electricity and natural gas savings post-2032 from energy efficiency programs will be the same as in 2032. SDG&E's service territory electricity savings

[111] CPUC: Decision 21-09-037, Adopting Energy Efficiency Goals for 2022-2032, accessed September 16, 2022. SDG&E's electricity service territory is larger than San Diego region.
[112] Guidehouse: 2021 Energy Efficiency Potential and Goals Study (April 23, 2021), accessed September 16, 2022. Rebated technologies are the energy efficiency technologies from the utility's historic incentive programs, including equipment and retrofits. Existing and future Codes and Standards included in the Study is discussed in Section 3.9 Codes and Standards.
[113] SDG&E's service territory demand is from California Energy Demand Forecast, 2021–2035 Baseline Forecast – Mid Demand Case, accessed September 16, 2022. 2019 is the latest year with historical data in both the County and SDG&E service territory.

were allocated accordingly to county, as shown in Table 58.[114]

Table 58 Estimated Electricity Savings from California Energy Efficiency Program

Year	Electricity Savings* (GWh)	
	SDG&E Service Territory	Allocation of Savings to County by Electric Demand
2025	1,114	115
2030	1,934	200
2035	2,175	225
2040	2,175	225
2045	2,175	225
2050	2,175	225
*Include transmission and distribution losses. SDG&E service territory savings are the cumulative based on the 2021-2035 annual saving goals in CPUC Decision 21-09-037. Energy Policy Initiatives Center, University of San Diego 2023		

6.2.2 Projected Emissions from Electricity

Electricity use through 2050 is projected using the 2019 baseline electricity use in residential and non-residential sectors, projected housing and employment growth, projected behind-the-meter PV growth, and electricity savings from California energy efficiency programs. The method is illustrated in Figure 8.

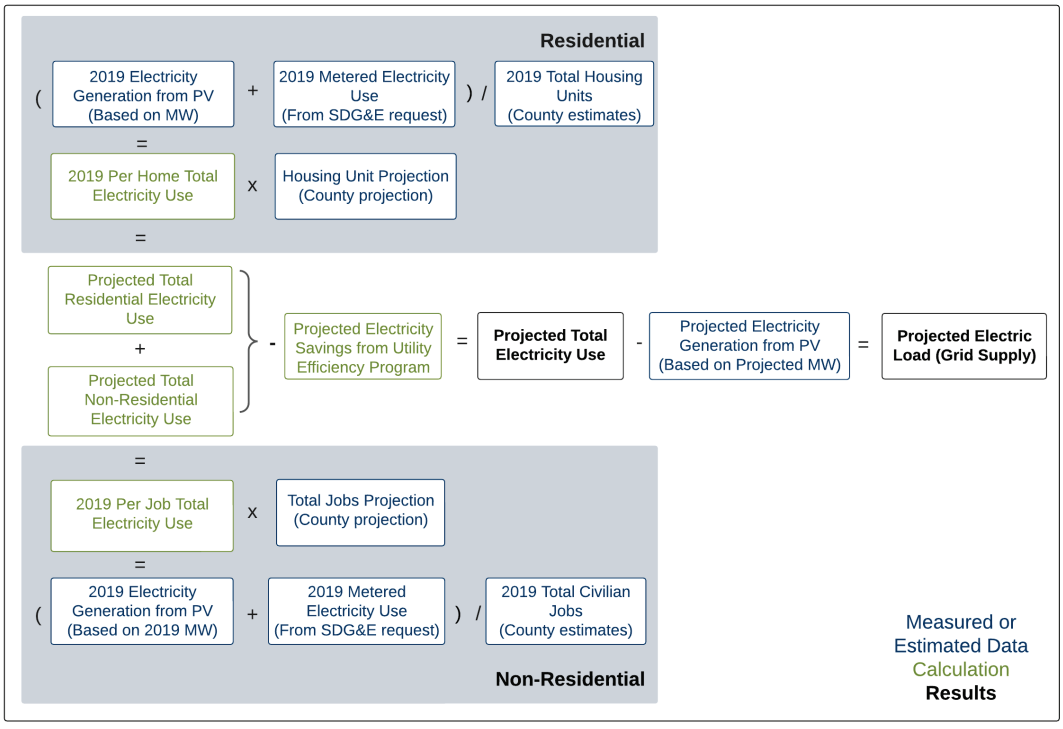


Figure 8 Method to Project Electricity Use and Grid Supply

[114] CPUC: Decision 21-09-037, Adopting Energy Efficiency Goals for 2022-2032, accessed September 16, 2022. The 2022 and beyond goals are given on an annual basis for each year from 2022 to 2032.

The electricity supplied by behind-the-meter PV is assumed to be 100% renewable with zero GHG emissions. All retail service providers supplying electricity through the grid will have to meet the RPS requirements as discussed in Section 6.2.1.1, and achieve 100% zero-carbon (i.e., zero GHG emissions) by 2045.[115] The projected emissions from electricity are provided in Table 59. Because County government buildings and facilities would purchase electricity from 100% renewable sources, County operations are projected to produce zero GHG emissions.

Table 59 Projected GHG Emissions from Electricity Through 2050

Year	Projected Total Electricity Use (GWh)	Projected Electricity Generated from Behind-the-meter Solar PV (GWh)	Projected Grid Electricity Supply (GWh)	Grid Supply Emission Factor (lb CO_2e/MWh)	County-wide Emission Factor (lb CO_2e/MWh)	GHG Emissions (MT CO_2e)
2025	2,509	1,035	1,474	489	287	354,000
2030	2,520	1,397	1,123	367	163	202,000
2035	2,591	1,756	835	92	30	38,000
2040	2,667	1,756	911	46	16	20,000
2045	2,744	1,756	988	-	-	-
2050	2,820	1,756	1,064	-	-	-

Forecast year data are projections based on future impact of State policies and programs and baseline year 2019 status. County-wide emission factor is calculated based on the percentage of electricity supplied by behind-the-meter PV and the grid, and their emission factors. Electricity generated from behind-the-meter PV is assumed to be 100% renewable and zero emissions.
Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
Energy Policy Initiatives Center, University of San Diego 2023

6.3 Natural Gas

6.3.1 State Regulations, Policies, and Programs

6.3.1.1 California Energy Efficiency Programs

Similar to methods for projecting electricity, described in Section 6.2.1.3, the adopted energy saving goals for SDG&E's service territory given in the CPUC Decision 21-09-037 are allocated to the county using a ratio of the county's natural gas demand to that of SDG&E's entire service territory. The utility's energy efficiency goal is not estimated by the CPUC beyond 2032; therefore, it is assumed the electricity and natural gas savings post-2032 from energy efficiency programs will be the same as in 2032. The natural gas savings from the energy efficiency programs are shown in Table 60.[116]

[115] SDG&E, electric suppliers, or local Community Choice Energy providers may provide electricity with renewable or zero carbon content beyond RPS requirements. These are taken into account as GHG reductions from a local measures, not part of these projections.
[116] CPUC: Decision 21-09-037, Adopting Energy Efficiency Goals for 2022-2032, accessed September 16, 2022. The 2022 and beyond goals are given on an annual basis for each year from 2022 to 2032.

Table 60 Estimated Natural Gas Savings from California Energy Efficiency Program

Year	Natural Gas Savings (Million Therms)	
	SDG&E Service Territory	Allocation of Savings to County by Natural Gas Demand
2025	12.5	1.5
2030	17.5	2.2
2035	17.5	2.2
2040	17.5	2.2
2045	17.5	2.2
2050	17.5	2.2
SDG&E service territory savings are cumulative based on 2021-2035 annual saving goals in CPUC Decision 21-09-037. Energy Policy Initiatives Center, University of San Diego 2023		

6.3.2 Projected Emissions from Natural Gas

Natural gas use through 2050 is projected using the 2019 baseline in the residential and non-residential sectors, projected housing and employment growth, and natural gas savings from the California Energy Efficiency Program. The natural gas emission factor is fixed through 2050. The projected emissions from natural gas are provided in Table 61.

Table 61 Projected GHG Emissions from Natural Gas Through 2050

Year	Projected Total Natural Gas Use (Million Therms)	Natural Gas Savings from Energy Efficiency Programs (Million Therms)	Modified Total Natural Gas Use (Million Therms)	Emission Factor (MT CO_2e/ Therm)	Community GHG Emissions (MT CO_2e)	County Operations Emissions (MT CO_2e)	Total GHG Emissions (MT CO_2e)
2025	95.5	1.5	94.0	0.00545	512,000	--	512,000
2030	99.5	2.2	97.3	0.00545	531,000	9,000	540,000
2035	103.4	2.2	101.2	0.00545	552,000	9,000	561,000
2040	106.7	2.2	104.5	0.00545	570,000	9,000	579,000
2045	110.0	2.2	107.9	0.00545	588,000	9,000	597,000
2050	113.3	2.2	111.2	0.00545	606,000	10,000	616,000
Forecast year data are projections based on future impact of State policies and programs and baseline year 2019 status. Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation. 2025 Projections are not available for County operations. Energy Policy Initiatives Center, University of San Diego 2023							

6.4 Waste

Emissions from the decomposition of organic material were projected in two parts: (1) CH_4 emissions from county-generated mixed waste through 2050; and (2) CH_4 emissions through 2050 from biodegradable waste that has been in placed at landfills located within the county as of 2019.[117]

[117] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix E: Solid Waste Emission Activities and Sources - SW.1 Methane Emissions from Landfills and SW.4 community-Generated Waste Sent to Landfills.

6.4.1 Projected Emissions from County Waste Disposal

The solid waste disposal projection through 2050 was based on the population growth in the county and county per capita solid waste disposed in 2019, 5.7 lbs per capita per day. The projected emissions from disposal were calculated by multiplying the disposal amount with the emission factor for mixed solid waste used for 2019.[118] The projected total waste disposal and corresponding GHG emissions from the solid waste category are given in Table 62.

Table 62 Projected Solid Waste Disposal and GHG Emissions from Solid Waste Through 2050

Calendar Year	Waste Disposal (Tons)	Mixed Waste Emission Factor (MT CO_2e/Short Ton)	Oxidation Rate	Projected Total GHG Emissions (MT CO_2e)	San Diego Regional CH_4 Capture Rate	Projected Remaining GHG Emissions (MT CO_2e)
2025	508,142	1.10	10%	501,670	85%	75,250
2030	510,553	1.10	10%	504,051	85%	75,608
2035	512,965	1.10	10%	506,431	85%	75,965
2040	516,593	1.10	10%	510,013	85%	76,502
2045	520,221	1.10	10%	513,595	85%	77,039
2050	523,850	1.10	10%	517,177	85%	77,577
Energy Policy Initiatives Center, University of San Diego 2023						

6.4.2 Projected Emissions from In-Boundary Landfills

For the closed Viejas Landfill, emissions through 2050 were projected using the IPCC first-order decay model and the default values for percentage of ANDOC in California embedded in the CARB Landfill Gas Tool.[119] For the other closed landfills (i.e., Bonsall, Jamacha, and Valley Center Landfills), the projected decay rate from Viejas Landfill is applied to these landfills' 2019 emissions. The projected emissions from closed landfills are shown in Table 63.

Table 63 Projected Emissions from Closed Landfills Though 2050

Year	Projected GHG Emissions (MT CO_2e)				
	Bonsall Landfill	Jamacha Landfill	Valley Center Landfill	Viejas Landfill	Total Closed Landfills
2025	1,798	1,724	766	445	4,734
2030	1,627	1,560	693	403	4,283
2035	1,472	1,411	627	365	3,876
2040	1,332	1,277	568	330	3,507
2045	1,206	1,155	514	299	3,173
2050	1,091	1,045	465	270	2,871
Energy Policy Initiatives Center, University of San Diego 2023					

[118] SB 1383, a bill that sets statewide goals to reduce disposal of organic waste in landfills, is implemented at the county and local level. The GHG reduction from reducing organic waste in landfills would be taken into account as part of any local actions to implement SB 1383, not as part of these projections.

[119] CARB: Landfill Gas Tool (updated September 24, 2021). The 2021 version of the CARB Landfill Gas Tool only shows results through 2024, EPIC calculated the emissions through 2050 using the same methods and assumptions as the ones in the Tool, January 24, 2023.

The future emissions in a forecast year were also estimated from the waste already in place at the active landfills, Borrego and Otay Landfills. For the Borrego landfill, no post-2019 waste disposal at the landfill was included because (1) Borrego landfill accepted waste only from the county and (2) all landfill emissions from future county-generated waste were included in Section 6.4.1. Because the Borrego Landfill is not subject to EPA MRR reporting, the waste-in-place at the Borrego Landfill through 2019 and IPCC first-order decay model were used to project emissions through 2050.

The Otay Landfill is required to report annual emissions at the landfill through the EPA MRR.[120] EPA MRR only provides a snapshot of the landfill emissions in a given year, but not projections. The change in emissions estimated using CARB LGT and IPCC first-order decay model was applied to the Otay MRR-reported 2019 emissions. Because Otay Landfill accepts waste from many jurisdictions in the San Diego region and is projected to close in 2028,[121] waste-in-place through 2028 was used in the landfill emissions projection.[122] The projected emissions from active landfills are shown in Table 64. The projected emissions peak around 2030 and then decrease through 2050, mostly due to the Otay Landfill closure in 2028.

Table 64 Projected Emissions from Active Landfills Though 2050

Year	Projected GHG Emissions (MT CO_2e)		
	Borrego Landfill	Otay Landfill	Total Active Landfills
2025	1,785	110,410	112,195
2030	1,615	119,519	121,133
2035	1,461	108,145	109,606
2040	1,322	97,854	99,176
2045	1,196	88,542	89,738
2050	1,082	80,116	81,198
Estimated closure year for Otay Landfill is 2028 based on EPA mandatory GHG reporting. Energy Policy Initiatives Center, University of San Diego 2023			

6.4.3 Projected Emissions from Out-of-Boundary Landfills

Out-of-boundary landfill emissions were forecasted using different scaling methods for different categories (Table 65). Electricity and natural gas use at out-of-boundary landfills was scaled to the anticipated County employee growth in 2030 through 2050. The CARB's LGT model was used to forecast emissions from landfills for which historical tonnage data was available. Historical tonnage data were readily available for the Encinitas, Palomar, and San Marcos. For other landfills, the rates of decay for these landfills were used to project emissions from the other out-of-boundary landfills owned and/or operated by the County. The emissions associated with the pilot light are not anticipated to change between 2019 and 2050 as this technology is not expected to advance in this timeframe. Flared gas emissions from County landfills were projected based on change in fugitive CH4 emissions from municipal landfills with landfill gas capture.

[120] EPA: Greenhouse Gas Reporting Program, Otay Landfill 2019 emissions data downloaded on April 16, 2021.
[121] EPA: Greenhouse Gas Reporting Program, Otay Landfill 2019 emissions data downloaded on April 16, 2021.
[122] CARB: Landfill Gas Tool (updated September 24, 2021). The 2021 version of the CARB Landfill Gas Tool only shows results through 2024. EPIC calculated the emissions through 2050 using the same methods and assumptions as the ones in the Tool, January 26, 2023. For post-2019 (2020-2028) annual waste disposal, an average of 2015-2019 (1,422,403 tons is used).

Table 65 Projected Emissions from Out-of-Boundary Landfills Though 2050

Year	Emissions from San Marcos Landfill (MT CO_2e)	Emissions from Poway Landfill (MT CO_2e)	Emissions from Palomar Landfill (MT CO_2e)	Emissions from Hillsborough Landfill (MT CO_2e)	Emissions from Gillespie Landfill (MT CO_2e)	Emissions from Encinitas Landfill (MT CO_2e)	Emissions from Bell Junior High Landfill (MT CO_2e)	Total Emissions from Out-of-Boundary Landfills (MT CO_2e)
2030	7,627	3,875	3,875	611	954	1,372	446	18,760
2035	6,907	3,508	3,508	566	863	1,242	404	16,998
2040	6,258	3,178	3,178	525	782	1,124	366	15,411
2045	5,667	2,877	2,877	488	707	1,018	331	13,965
2050	5,134	2,605	2,605	455	640	921	300	12,660
Ascent Environmental, 2023								

6.4.4 Total Projected Emissions from Waste

Total projected emissions from waste, calculated in Sections 6.4.1 and 6.4.2, are provided in Table 66.

Table 66 Projected GHG Emissions from Solid Waste Through 2050

Year	Emissions from County Waste Disposal (MT CO_2e)	Emissions from In-Boundary Landfills (MT CO_2e)	Community Emissions from Waste (MT CO_2e)	County Operations Emissions from Waste (MT CO_2e)	Total Emissions from Waste (MT CO_2e)
2025	75,250	116,928	192,000	--	192,000
2030	75,608	125,417	201,000	17,000	219,000
2035	75,965	113,482	189,000	17,000	206,000
2040	76,502	102,683	179,000	16,000	194,000
2045	77,039	92,911	170,000	14,000	184,000
2050	77,577	84,069	162,000	13,000	175,000
Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation. 2025 Projections are not available for County operations. Energy Policy Initiatives Center, University of San Diego 2023					

6.5 PROPANE

Propane through 2050 was projected using the 2019 baseline propane use in residential and non-residential sectors, projected housing and employment growth. The forecast method for each sector is shown in Table 67.

Table 67 Forecast Method for Propane Use

Sector	Forecast Method
Residential	Single-family Housing Unit Growth
Commercial	Commercial Jobs Growth
Industrial	Industrial Jobs Growth
Agricultural	Agricultural Land Growth

The propane emission factor used for the 2019 baseline is fixed through 2050. The projected emissions from propane are provided in Table 68.[123]

Table 68 Projected GHG Emissions from Propane Use Through 2050

Year	Projected Propane Use (Million Gallons)					Emission Factor (kg CO_2e/ Gallon)	Community GHG Emissions (MT CO_2e)	County Operations Emissions (MT CO_2e)	Total Propane Emissions (MT CO_2e)
	Comm.	Indust.	Ag.	Res.	Total				
2025	1.2	0.1	1.0	19.2	21.5	5,819	125,000	--	125,000
2030	1.3	0.1	1.0	19.5	21.9	5,819	127,000	-	127,000
2035	1.4	0.1	1.0	19.7	22.2	5,819	129,000	-	129,000
2040	1.5	0.1	1.0	19.9	22.5	5,819	131,000	-	131,000
2045	1.6	0.1	1.0	20.0	22.7	5,819	132,000	-	132,000
2050	1.6	0.1	1.0	20.1	22.9	5,819	133,000	-	133,000

Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
2025 Projections are not available for County operations. County operational emissions are zero when rounding for purposes of combining operational and community-wide emissions.
Comm. = Commercial; Indust. = Industrial; Ag. = Agricultural; Res. = Residential
County of San Diego 2022, Energy Policy Initiatives Center, University of San Diego 2023

6.6 Off-road Transportation

For off-road transportation, San Diego regional off-road emissions were allocated to the County based on vehicle category-specific allocation factors discussed in Section 4.7. The projected emissions from off-road transportation are provided in Table 69.[124]

Table 69 Projected GHG Emissions from Off-Road Transportation Through 2050

Year	Projected GHG Emissions (MT CO_2e)									
	Lawn and Garden	Light Comm.	TRUs	Airport GSE	C&M	Indust.	RVs	Total Community ($MTCO_2e$)	County Operations ($MTCO_2e$)	Total Emissions ($MTCO_2e$)
2025	7,631	7,584	3,174	2,575	61,410	9,248	458	92,000	--	92,000
2030	7,697	7,811	3,133	2,746	67,738	8,962	493	99,000	100	99,000
2035	7,757	8,642	3,591	2,957	73,461	9,531	529	106,000	100	106,000
2040	7,841	9,146	3,964	3,203	75,849	9,732	567	110,000	100	110,000
2045	7,922	9,630	4,394	3,214	78,454	9,757	608	114,000	100	114,000
2050	8,043	10,189	4,893	3,239	81,571	9,853	647	118,000	100	118,000

Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
Light Comm. = Light Commercial; TRUs = Truck Refrigeration Units; Airport GSE = Airport Ground Support Equipment; C&M = Construction and Mining; RVs = Recreational Vehicles.
2025 Projections are not available for County operations.
CARB OFFROAD2021 v1.0.3, Energy Policy Initiatives Center, University of San Diego 2023

[123] Housing and employment growth are discussed in Section 2.4 Demographics.
[124] OFFROAD2021 v1.0.3 data were downloaded from CARB EMFAC database on August 23, 2022. Emissions in San Diego County (San Diego region) in CARB models were given in tons per day and converted to metric tons per year.

6.7 AGRICULTURE

For emissions projections from agricultural equipment, San Diego regional agricultural equipment emissions from the OFFROAD2021 model projections were allocated to the county based on the ratio of county to region agricultural land acreage. CARB has embedded adopted regulations affecting off-road equipment emissions into the OFFROAD2021 model. For the sub-categories other than agricultural equipment, emissions were projected using the 2019 baseline emissions and projected agricultural land acreage in the county. The projected emissions from agriculture are provided in Table 70.[125] The projections for County operations emissions do not include any agricultural activities.

Table 70 Projected GHG Emissions from Agriculture Through 2050

Year	Agricultural Land (Acres)	Projected GHG Emissions (MT CO_2e)				
		Agricultural Equipment	Enteric Fermentation	Manure Management	Soil Management	Total
2025	114,746	63,269	28,645	26,798	12,244	131,000
2030	112,385	61,164	28,056	26,247	11,992	127,000
2035	110,023	59,214	27,466	25,695	11,740	124,000
2040	109,578	57,297	27,355	25,591	11,693	122,000
2045	109,132	55,515	27,244	25,487	11,645	120,000
2050	108,687	53,849	27,133	25,383	11,598	118,000

Agricultural land acreages in the unincorporated county do not include rural residential areas that may have small orchards or fields. Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
SANDAG, 2022, Energy Policy Initiatives Center, University of San Diego 2023

6.8 WATER

The water supply projection through 2050 was based on the population growth in the county and the 2019 per capita water use within and outside the SDCWA service areas. The water sources – groundwater for areas not covered by SDCWA and a mix of imported and local supply for SDCWA member agencies shown in Table 39 – were assumed to be the same through 2050.

The upstream energy intensity, and local water and distribution energy intensity described in Section 4.8.3 were assumed to be the same through 2050. However, for the electricity used to supply, treat, and distribute the water, the suppliers of the electricity have to meet the RPS mandates as discussed in Section 6.2.1.1 to achieve 100% renewable or zero-carbon emissions by 2045. The projected emissions from water are provided in Table 71.

[125] The agricultural land acreage projection is based on SANDAG Series 14 Growth Forecast, provided by SANDAG to EPIC, August 31, 2022. In the SANDAG Land Use Codes, agriculture land includes orchards, or vineyards, intensive agriculture, and field crops.

Table 71 Projected GHG Emissions from Water Through 2050

Year	Water Supply (Acre-feet)		Water Supply (GWh)		Emission Factor (lb CO_2e/MWh)		Community GHG Emissions (MT CO_2e)	County Operations Emissions (MT CO_2e)	Total GHG Emissions (MT CO_2e)
	SDCWA Member Agencies	Groundwater Outside SDCWA Service Area	Upstream Electricity Use	Local Treatment-Distribution Electricity Use	Upstream (Statewide Average)	Local Grid Supply			
2025	84,714	7,365	165	22	407	489	35,000	--	35,000
2030	85,116	7,400	166	22	367	367	31,000	--	31,000
2035	85,518	7,435	166	22	92	92	8,000	--	8,000
2040	86,123	7,488	168	22	46	46	4,000	--	4,000
2045	86,728	7,540	169	22	-	-	-	--	--
2050	87,333	7,593	170	23	-	-	-	--	--

Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
2025 Projections are not available for County operations. County operational emissions are zero when rounding for purposes of combining operational and community-wide emissions.
Energy Policy Initiatives Center, University of San Diego 2023

6.9 WASTEWATER

The wastewater flow to centralized wastewater treatment plants with anaerobic digestion, and population served by wastewater treatment plants without anaerobic digestion and on-site septic systems, were projected through 2050 based on the population growth in the county and the 2019 wastewater flow and population. The wastewater emission factors at the WWTPs with anaerobic digestion, fugitive and process emission factors at WWTPs without anaerobic digestions, and emission factors of septic systems, described in Section 4.9.5 and Table 50 were assumed to be the same through 2050. The projected emissions from wastewater are provided in Table 72. The projections for County operations emissions do not include any emissions from wastewater treatment processes.

Table 72 Projected GHG Emissions from Wastewater Through 2050

Year	Wastewater Treated at WWTPs with Anaerobic Digestion		Wastewater Treated at WWTPs Without Anaerobic Digestion		Wastewater Disposed in Septic System		Community GHG Emissions (MT CO_2e)
	Flow (Million Gallons/ year)	GHG* Emissions (MT CO_2e)	Population**	GHG Emissions (MT CO_2e)	Population	GHG Emissions (MT CO_2e)	
2025	4,685	2,098	140,404	1,969	149,567	14,603	19,000
2030	4,708	2,108	141,070	1,978	150,277	14,673	19,000
2035	4,730	2,118	141,737	1,988	150,987	14,742	19,000
2040	4,763	2,133	142,739	2,002	152,055	14,846	19,000
2045	4,797	2,148	143,742	2,016	153,122	14,950	19,000
2050	4,830	2,163	144,744	2,030	154,190	15,055	19,000

*Emissions are calculated based on projected wastewater flow (based on population) to and emission factors at Point Loma Wastewater Treatment Plant, San Luis Rey Wastewater Treatment Plant, and Encina Water Pollution Control Facility.
**Population served by wastewater treatment plants with and without nitrification/denitrification processes
Projected GHG emissions for each category are rounded. Values are not rounded in the intermediate steps in the calculation.
Energy Policy Initiatives Center, University of San Diego 2023

Appendix A

County of San Diego Climate Action Plan Inventory Transportation Modeling Overview

FEHR PEERS

Memorandum

Date: October 18, 2023

To: Meghan Kelly, County of San Diego

From: Katy Cole, Fehr & Peers

Subject: County of San Diego Climate Action Plan Update Inventory Transportation Modeling Overview

SD21-0394

The purpose of this memorandum is to document the technical analysis tool that is used to estimate Vehicle Miles Traveled (VMT) within the County of San Deigo Climate Action Plan Update (CAP Update) inventory. Transportation engineers/planners commonly use analysis tools called a "travel demand models" to estimate VMT. In the San Diego region, the San Diego Association of Governments (SANDAG) maintains a regional travel demand model. SANDAG has several versions of the regional travel demand model; this memorandum describes the model versions, and which one is appropriate to use for the CAP Update Inventory.

At the onset of the technical analysis for the CAP Update, County staff had planned to contract with the SANDAG Service Bureau to perform county specific modeling; however, SANDAG was unable to perform the work due to workload constraints and limitations with the model. At the time, SANDAG did not have a version of the model that could be customized and was experiencing delays of over a 12-18 months in performing model runs for member agencies. Instead, County and Fehr & Peers staff identified other options, using SANDAG's available "off-the-shelf" travel demand model data. This memorandum describes the model versions available "off-the-shelf," considerations/characteristics for each option, and ultimately the most appropriate option to use for CAP Update purposes.

VMT is an important input included in the development of a new baseline greenhouse gas (GHG) emissions inventory and projections which identifies the amount of GHG emissions associated with travel activities within the unincorporated area. As described herein, the SANDAG ABM 2+[1] model using land use data set ("DS") 39 for base year (2016), 2035, and 2050 was used to determine the total VMT estimates for the CAP Update.

The SANDAG ABM 2+ is determined to be the best tool in the San Diego region for analyzing existing and future VMT at a regional scale. This memorandum documents the evidence for using the SANDAG ABM

[1] The SANDAG ABM 2+ model uses "Series 14" land use assumptions. The version of the model used to perform the CAP Update analysis is SANDAG Series 14.3.0, Data Set 39.

2+ model DS 39 version for the CAP Update GHG inventory and the basis for the SEIR VMT modeling. As a cross-reference, the "CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis" Memorandum (Fehr & Peers, April 2023) documents that the 2016 SANDAG base year reasonably reflects the 2019 baseline used for the GHG inventory. The "CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis" documents that the number of residential dwelling units included in the 2016 SANDAG base year matches within a less then one-percent difference, the County's housing portal data through 2019. The County uses the housing portal to track construction of dwelling units and the number of units within the unincorporated area. Therefore, based on the comparison of the ABM 2+ 2016 dwelling units to the County housing portal data, the differences between the model data and County data are acceptable for the purposes of countywide VMT and GHG modeling (less than one-percent difference). The SANDAG ABM 2+ Model (Series 14.3.0) year 2016 is an appropriate tool to use to estimate VMT for the unincorporated county for 2019 conditions.

Selecting a Transportation Modeling Scenario for the CAP VMT Analysis

Background on the SANDAG Model

SANDAG builds and maintains a regional travel demand model that is used to forecast transportation metrics within the region. These metrics are in turn used by jurisdictions as consistent inputs for the evaluation of programs, plans, and projects. Travel demand models use input data such as land uses (population/employment) for each of the jurisdictions in the county, roadway and transportation network data, and socioeconomic information to understand existing and future travel behavior. The SANDAG model includes information for the entire San Diego County area, including the unincorporated area. The model is validated and calibrated to "base year" to represent regional existing conditions. As described above, a comparison of the residential dwelling units from the County's housing portal and the SANDAG ABM2+ model 2016 base year revealed that the SANDAG 2016 base year reasonably represents the residential land use in the unincorporated area in 2019.

The SANDAG travel demand model is a complex and robust tool that runs on a specific travel model software called "Emme 2" that requires specialized expertise in travel demand forecasting and significant computer processing power. The model cannot run on a standard computer, and it takes several days to completely run.

The SANDAG Model goes through major version changes every time a new SANDAG Regional Plan is adopted. The most recent version change is to the "Activity Based Model 2+" (ABM2+), which is the model that includes a scenario for the December 2021 SANDAG Regional Plan/Sustainable Community Strategy (SCS). As part of the development of the 2021 Regional Plan, SANDAG modeled several different scenarios using the ABM2+ model. SANDAG's model produces many outputs for each scenario, including the amount of daily VMT in the region; the daily regional VMT output can be processed to produce daily VMT for each local jurisdiction in the region, including the unincorporated area. The method used to determine the unincorporated area's allocation of daily VMT in the San Diego region is described later in this memorandum.

Each scenario includes different land use and regional growth forecast assumptions developed by SANDAG regarding the location and amount of future residential and non-residential growth in the region, the location and type of future transportation investments that would be made in the region (e.g., highway improvements, public transit infrastructure and operations) and assumptions about future transportation policies and behaviors that would be in place in the region (e.g., road usage charge, the costs of owning and operating a vehicle, the rate of teleworking by employees).

The land use and growth assumptions of the SANDAG model scenarios are available for the entire region and for each local jurisdiction, including the unincorporated area. SANDAG refers to the different land use and regional growth scenarios as "data sets" and assigns each data set an identification number for reference purposes. The 2021 Regional Plan model scenario land use assumption is referred to as Data Set (DS) 38 and the Regional Plan EIR Alternative 2 ("no build") scenario land use assumption is referred to as Data Set (DS) 39[2].

Model Scenarios

Fehr & Peers performed a detailed review of the SANDAG model assumptions in the scenarios modeled as part of the SANDAG 2021 Regional Plan (land use, transportation network, and policy) to identify the best available option for estimating baseline and future VMT in the unincorporated area for purposes of the CAP Update. The review determined which scenario has land use, transportation network, and transportation policy assumptions that align most closely with the County's 2011 General Plan, as amended (General Plan) and CAP Update baseline conditions. To determine the modeling scenario that aligns most closely with the County's General Plan we reviewed land use and growth assumptions that reflect reasonably foreseeable growth that is consistent with the General Plan (since the purpose of the CAP is to address GHG emissions resulting from the existing and future development associated with the General Plan) and existing and reasonably foreseeable transportation policies.

Fehr & Peers reviewed land use assumptions as summarized below. This information was used, in conjunction with other transportation and policy considerations, to determine the modeling scenario most appropriate for estimating VMT for the CAP Update. The following provides a summary of the land use assumptions from the SANDAG model versions and County sources:

- DS 38 SANDAG Model Growth between 2016 and 2035[3] = approximately 6,500 housing units
- DS 38 SANDAG Model Growth between 2016 and 2050[4] = approximately 7,900 housing units
- DS 39 SANDAG Model Growth between 2016 and 2035 = approximately 11,400 housing units

[2] The residential land use growth quantities provided in this memo include growth in the unincorporated area, excluding military and tribal land.

[3] Note that the SANDAG Model Base Year is 2016 and the CAP Baseline inventory year is 2019. Fehr & Peers documented that the SANDAG 2016 Base Year housing assumptions for the unincorporated area is approximately equal to the number of housing units in 2019; therefore, VMT data from the SANDAG Model Base Year (2016) can be used to directly estimate the VMT for the CAP baseline inventory. (*CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis Technical Memorandum, April 2023).* The CAP horizon year is 2045 and the SANDAG Regional Plan horizon year is 2050.

[4] The CAP horizon year is 2045 and the SANDAG Regional Plan horizon year is 2050.

- DS 38 SANDAG Model Growth between 2016 and 2035[5] = approximately 6,500 housing units
- DS 38 SANDAG Model Growth between 2016 and 2050[6] = approximately 7,900 housing units
- DS 39 SANDAG Model Growth between 2016 and 2035 = approximately 11,400 housing units
- DS 39 SANDAG Model Growth between 2016 and 2050 = approximately 15,300 housing units
- "Population, Employment, and Housing Projections 2020-2050 Report" (AECOM, October 2023) (AECOM Study) Growth between 2020-2035 = approximately 8,000-14,940 housing units
- AECOM Study Growth between 2020-2050 = approximately 12,250 – 23,000 housing units
- The County's General Plan has theoretical capacity for approximately 60,000 additional residential units; however, historical growth and research suggests that this capacity won't be achieved within the CAP Update horizon year. Based on the General Plan capacity, the AECOM study, and historical growth trends it is expected that growth in the unincorporated area will range between 6,700 units (the 2029 Regional Housing Needs Assessment "RHNA" allocation for the County) and approximately 15,000 units between 2019 and 2050. The SANDAG Data Set 39 is consistent with these forecasts and has reasonable growth rates between the forecast years.

Three model options were considered as VMT data sources for the CAP Update as described:

Option 1: Utilize Model Output from the SANDAG 2021 Regional Plan Sustainable Communities Strategy (2021 Regional Plan/SCS, DS 38) – This option was considered because it aligns with the adopted SANDAG 2021 Regional Plan and reflects SANDAG's vision for regional transportation conditions. However, the 2021 Regional Plan assumes less housing in the unincorporated area than could be developed under the adopted General Plan and less than predicted by the AECOM study. The SANDAG 2021 Regional Plan assumes approximately 7,900 additional units through 2050 (with most being constructed between the model base year (2016) and 2035) whereas the General Plan buildout capacity is approximately 60,000 units and the AECOM Study estimates approximately 12,250 – 23,000 units.

Also, the 2021 Regional Plan/SCS version of the model includes the Road User Charge as a funding source for the Regional Plan. The Road User Charge directly affects auto operating costs; including the Road User Charge results in lower VMT forecasts than scenarios without the Road User Charge. On September 23, 2022 the SANDAG Board directed SANDAG staff to prepare an amendment to the 2021 Regional Plan without the Road User Charge. The amendment is expected to be brought to the SANDAG Board of Directors for consideration on October 27, 2023 and is expected to move forward with removal of the Road User Charge. In addition, the SANDAG Board voted on September 22, 2023 against including the Road User Charge in the in-progress 2025 Regional Plan. The 2021 Regional Plan includes other policy

[5] Note that the SANDAG Model Base Year is 2016 and the CAP Baseline inventory year is 2019. Fehr & Peers documented that the SANDAG 2016 Base Year housing assumptions for the unincorporated area is approximately equal to the number of housing units in 2019; therefore, VMT data from the SANDAG Model Base Year (2016) can be used to directly estimate the VMT for the CAP baseline inventory. (*CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis Technical Memorandum, April 2023).* The CAP horizon year is 2045 and the SANDAG Regional Plan horizon year is 2050.

[6] The CAP horizon year is 2045 and the SANDAG Regional Plan horizon year is 2050.

and transportation network assumptions beyond the Road User Charge that further result in lower VMT, many of these assumptions rely upon public vote, funding, or SANDAG Board actions that are speculative.

Therefore, this scenario was dismissed because it does not represent reasonably foreseeable land use, transportation policy/network, and VMT under the County's adopted General Plan. Using this option would result in less VMT than predicted by the other options and less VMT than reasonably foreseeable.

Option 2: Utilize VMT Output from the 2021 Regional Plan EIR Alternative 2 (DS 39) – This option was considered because the land use, transportation network, and policy assumptions included in this model version aligned well with growth assumptions and reasonably foreseeable transportation network and policy expectations. The AECOM study suggests residential unit growth between 2020-2050 to be approximately 12,250 – 23,000 units. The housing growth assumed in the DS 39 model is approximately 15,300 between the model base year (2016) and 2050. In addition, the future transportation network assumptions in DS 39 are based on the 2019 Federal Regional Transportation Plan funded improvements, which are "transportation projects likely to be implemented if the proposed Plan [SANDAG 2021 Regional Plan] were not adopted. These consist of transportation projects with environmental clearance, that have full funding, are under construction, or are otherwise reasonably foreseeable based on current plans…"(SANDAG 2021 Regional Plan EIR, Chapter 6 Alternatives Analysis, Page 6-3).

This scenario was selected, as described in more detail below, because it assumes land use growth similar to the unincorporated growth expectations and importantly includes roadway network and policy assumptions that are not speculative.

Option 3: Combine Outputs, Using DS 38 for 2035 Data and DS 39 from 2050 Data – This option was considered because the residential land use growth trend aligns well with county expectations using DS 38 (SANDAG Regional Plan) for the model base year 2016 through 2035 but also allows consideration for more growth beyond 2035. For comparison purposes, the AECOM study suggests that approximately 8,000 – 14,940 residential units would be constructed between 2020-2035 and the DS 38 includes 6,500 residential units. Also, the AECOM study and the land use assumptions in DS 39 both suggest additional residential growth beyond 2035, whereas DS 38 has limited growth beyond 2035.

A shortcoming of this option is that there are major differences in the transportation network and policy assumptions between DS 38 and DS 39. DS 38 does not include the Road User Charge or major transportation investments beyond those that are likely to be implemented (demonstrated by having funding, environmental clearance, or are under construction).

Explained a different way, if all land use was held constant between DS 38 and DS 39, DS 38 would still result in less VMT than DS 39 attributed to the transportation network and policy assumptions (such as the Road User Charge).

Therefore, VMT results from the two models are not comparable and using one model version for one horizon year and one model version for a different horizon year is not appropriate. Therefore, this option was dismissed.

Table 1 below provides a comparison of the scenarios that were considered.

Table 1: SANDAG Model Scenarios Considered for the CAP Inventory and Projections

Option	Land Use and Growth Summary	Transportation Network Summary	Model Policy/Other Model Inputs[1]	Notes on Alignment with County General Plan
1. Utilize VMT Output Data from the 2021 Regional Plan/SCS	Uses Data Set 38: For the unincorporated area the housing growth is: • 2016-2035: 6,500 units • 2016-2050: 7,900 units	2021 Regional Plan Network (major investment/5 Big Moves)	• Includes road user charge. • Includes modest teleworking assumptions growing over time. • Auto Operating Costs = $0.2	The adopted 2021 Regional Plan has land use assumptions that are not consistent with the County General Plan, do not match historical housing growth trends and does not align with the AECOM study for expected land use growth. Additionally, the Regional Plan version of the model includes the Road User Charge as a funding source for the plan. The Road User Charge directly affects the auto operating cost; including the Road User Charge results in lower VMT forecasts than scenarios without the Road User Charge. On September 23, 2022, the SANDAG Board directed SANDAG staff to prepare an amendment to the 2021 Regional Plan without the Road User Charge. The amendment is expected to be brought to the SANDAG Board of Directors for consideration on October 27, 2023. In addition, the SANDAG Board voted on September 22, 2023 against including the Road User Charge in the in process 2025 Regional Plan. Since the land use is not reasonably foreseeable per the General Plan (there is no growth assumed beyond 2035) and the scenario includes the Road User Charge, this option was not selected for use in the CAP update because it would have resulted in less VMT for the unincorporated area than what would be reasonably foreseeable.

2. *Utilize VMT Outputs from the 2021 Regional Plan EIR Alternative 2*	**Uses Data Set 39: For the unincorporated area the housing growth is:** • **2016-2035: 11,400 units** • **2016-2050: 15,300 units**	**2019 Federal Regional Transportation Plan Network (near term investments in regional roadways and transit)**	• **Does not include the road user charge.** • **Includes modest teleworking assumptions growing over time.** • **Auto Operating Costs = $0.174**	**The land use assumptions contained in Data Set 39 are consistent with historical growth patterns in the unincorporated area and reflect reasonably foreseeable growth as demonstrated by the AECOM study that shows land use growth in the unincorporated area (12,250 – 23,000 units through 2050). Additionally, the modest transportation network and policy inputs included in this model are not speculative and include projects that are likely to be constructed that have funding, environmental clearance, or are currently being constructed. The result is higher VMT/GHG than the 2021 Regional Plan/SCS scenario. Choosing this data source results in more future VMT than choosing DS 38 resulting in greater GHG reduction strategies in the CAP .This option was utilized to estimate VMT for the CAP Update inventory.**
3. Utilize VMT Outputs from Combination of Off-the Shelf Regional Plan EIR Alt. 2 and Off-the Shelf Regional Plan	Use DS 38 for 2035 model year and DS 39 for 2050. For the unincorporated area the housing growth is: • 2016-2035: 6,500 units • 2016-2050: 15,300 units	See above, would mix assumptions	See above, would mix assumptions	Using data from two separate scenarios is problematic because of the difference in policy assumptions and transportation network assumptions. Both the policy assumptions and transportation network assumptions influence travel behavior and VMT. If land use is held constant in the travel demand model, scenarios run with different policy and transportation network assumptions would result in completely different VMT results. Therefore, the VMT resulting from scenarios with differing policy and transportation network assumptions are not comparable. It is not appropriate to use one set of assumptions for one forecast year and an alternate set of assumptions for a later forecast year unless it is reasonably foreseeable that the policy and/or transportation network assumptions would actually change between the model years. Since it is not reasonably foreseeable that the policy and network differences between the model scenarios would be different for different years, this option was not selected for use in the CAP update.

Notes: [1] Auto Operating Costs affect VMT, lower auto operating costs result in higher VMT (because it is less expensive to drive).
Source: Fehr & Peers, 2023

Reasons for Using the Regional Plan EIR Alternative 2 (Data Set 39) Model Scenario

Ultimately, as identified in Table 1, Option 2, the Regional Plan EIR Alternative 2 (DS 39) Model Scenario was selected as the best option to forecast existing and projected VMT in the CAP Update. Use of this model scenario offers the most accurate projections of VMT across the CAP Update timeline horizon because:

- The total housing growth in Data Set 39 is comparable to County forecasts based on historical growth, market expectations, and General Plan capacity.
- The future transportation network assumptions in DS 39 are based on the 2019 Federal Regional Transportation Plan funded improvements, which are "transportation projects likely to be implemented if the proposed Plan [SANDAG 2021 Regional Plan] were not adopted. These consist of transportation projects with environmental clearance, that have full funding, are under construction, or are otherwise reasonably foreseeable based on current plans…"(SANDAG 2021 Regional Plan EIR, Chapter 6 Alternatives Analysis, Page 6-3). Use of these assumptions provides more certainty than use of the 2021 Regional Plan/SCS scenario which includes major roadway and transit network investments that may not be implemented because identified funding sources are not guaranteed, for example funding generated by future fees/tax initiatives such as the Road User Charge.
- Use of the Regional Plan EIR Alternative 2 (Data Set 39) Model Scenario is also a more conservative estimate of VMT because of the transportation network assumptions which result in a higher amount of VMT being generated because it assumes fewer transportation network investments that would reduce VMT (such as regional transit/active transportation projects) and assumes a lower auto operating cost as compared to the 2021 Regional Plan. These assumptions result in more driving (because it is cheaper to drive) and less alternative mode use (because there are not high levels of investments directed at expanding the transit/bicycle/pedestrian network), resulting in higher VMT.
- The Road User Charge isn't included as a funding source. As noted, the SANDAG Board has directed removal of the Road User Charge and is not including it in the in progress 2025 Regional Plan.
- The modeling was performed by SANDAG and is well documented in the Regional Plan EIR. It reflects the latest modeling software that SANDAG is using (EMME using ABM2+).

Methodology for Determining Total VMT

Fehr & Peers utilized the Regional Plan EIR Alternative 2 (Data Set 39) Model Scenario output to determine VMT for the unincorporated area for use in the CAP Update inventory and projections. Total VMT and transportation metrics were evaluated for baseline 2019 and future 2035 and 2050 conditions using the "CAP" method[7] as follows:

[7] "The "CAP" method for estimating total VMT is used throughout California and is the ICLEI (ICLEI-Local Governments for Sustainability) recommended methodology. In addition, it is documented in the SANDAG Regional Climate Action Planning Framework (ReCAP), December 2020, Appendix I, Pages 18-21.

- Total VMT produced using the "CAP" method includes all internal VMT, ½ of internal to external VMT, and ½ of external to internal VMT. For example, all VMT originating from trips that start and end in the unincorporated area are included. One half of the VMT that originates in the unincorporated area but ends in one of the region's cities is included AND one half of the VMT that originates in one of the cities but ends in the unincorporated area is included. This also includes VMT associated with trips that start/end outside of the SANDAG model boundary (for example Riverside County) but are destined for/originate in the unincorporated area. These trips are treated the same as "XI" or "IX" trips.

Total VMT Generated (CAP)	All vehicle-trips are traced to the zone or zones of study. This includes internal to internal (II), 1/2 internal to external (IX), and 1/2 external to internal (XI) trips. May use final assignment origin-destination (OD) trip tables or production (P) and attraction (A) estimates multiplied by distance skims. When the model has multiple assignment periods, OD trip tables and congested skims from each period should be used.	

In addition, adjustments were made to account for military and tribal land, which is not within the County's land use jurisdiction. The *Military and Tribal VMT Adjustment for the San Diego County CAP Model Scenarios* (Fehr & Peers, February 2023) describes the process for the adjustment.

Conclusion

The Regional Plan EIR Alternative 2 (Data Set 39) Model Scenario was used as the basis for the CAP Update inventory. The Regional Plan EIR Alternative 2 (Data Set 39) Model Scenario represents existing conditions (2019 for the CAP Update inventory) and reasonably foreseeable growth through 2035 and 2050. Total VMT for the CAP Update inventory, using the "CAP" method[8], was determined from the model and adjustments were made to properly account for military and tribal lands.

[8] "The "CAP" method for estimating total VMT is used throughout California and is the ICLEI (ICLEI-Local Governments for Sustainability) recommended methodology. In addition, it is documented in the SANDAG Regional Climate Action Planning Framework (ReCAP), December 2020, Appendix I, Pages 18-21.

Appendix B

Climate Action Plan Update - Population, Housing, and Employment Market Capacity Study for the Unincorporated Area

County of San Diego

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October 12, 2023

CLIMATE ACTION PLAN UPDATE – POPULATION, HOUSING, AND EMPLOYMENT MARKET CAPACITY STUDY FOR THE UNINCORPORATED AREA

The primary objective of the County of San Diego (County) Climate Action Plan Update (CAP Update) is to reduce greenhouse gas (GHG) emissions generated from activities within the unincorporated county (community) and emissions generated by operating County facilities, including facilities and operations located within incorporated cities (County operations). As part of the CAP Update, both County operations and community GHG emissions inventories and projections are being updated. This memorandum describes the County's approach to developing GHG emissions projections for the CAP Update.

Climate Action Plan Background

On August 3, 2011 (1), the County Board of Supervisors (Board) approved a comprehensive General Plan Update. The Final Program Environmental Impact Report (Program EIR) prepared in support of the General Plan Update identified contributions to climate change as a potentially significant environmental impact. The General Plan Update made modifications to the County's land use through changes to the future development of the County by locating 80 percent of the future dwelling unit capacity toward the western third of the unincorporated areas, within the County Water Authority boundary, and reducing the overall development capacity by 15 percent.

While the General Plan Update focused development within the Village Core areas away from rural areas, the Program EIR still studied and proposed mitigation for the environmental impacts from future development allowed in all areas of unincorporated county reflected in the General Plan Update. Consequently, 19 separate mitigation measures were adopted to reduce the GHG emissions from activities within the unincorporated county, and County operations, to below a level of significance. One of the 19 measures, designated CC 1.2, called for the preparation of a Climate Action Plan (CAP). CC 1.2 reads: "Prepare a County Climate Change Action Plan with an update[d] baseline inventory of greenhouse gas emissions from all sources, more detailed

greenhouse gas emissions reduction targets and deadlines, and comprehensive and enforceable [greenhouse gas] emissions reduction measures that will achieve a 17% reduction in emissions from County operations from 2006 by 2020 and a 9% reduction in community emissions between 2006 and 2020. Once prepared, implementation of this plan will be monitored and progress reported on a regular basis." CC 1.2 was incorporated into the General Plan Update as Goal Conservation and Open Space (COS) 20 and Policy COS 20.1.

The County prepared and adopted a CAP and related environmental coverage on June 20, 2012 (4), which was subsequently challenged and found by the Appellate Court to be in violation of the California Environmental Quality Act (CEQA) and was rescinded by the Board on April 8, 2015 (3). A new CAP (2018 CAP) and related environmental coverage was prepared and adopted on February 14, 2018 (1). The 2018 CAP was challenged and invalidated in court. The Court ordered that the County prepare a new CAP and Supplemental EIR. As a result, the 2018 CAP was rescinded on September 30, 2020 (4) and on December 10, 2020, the County sent public notice that a CAP Update and Supplemental EIR will be prepared.

On January 13, 2021 (5), the Board approved new policy recommendations to guide the preparation of a CAP Update. The recommendations direct the Chief Administrative Officer to:

1. "Develop a Climate Action Plan for the County that is:
    a. comprehensive and legally enforceable;
    b. does not rely on the purchase of carbon offsets to meet emission reduction targets;
    c. uses updated data and modeling;
    d. sets clear goals and measurable metrics that show how we are ensuring environmental justice and equity;
    e. is shaped by community input; and
    f. will meet and exceed Senate Bill 32 GHG emissions reductions of 40% below the 1990 level by 2030 and establish actions to meet a goal of net zero carbon emissions by 2035-2045 (in line with Executive Order B-55-18)."
2. Conduct stakeholder engagement, hold public hearings, and undertake environmental review; and
3. Report back to the Board bi-monthly with progress.

Climate Action Plan Update Greenhouse Gas Emissions Inventory and Projections
The CAP Update is a mitigation measure for GHG emissions associated with existing and new development anticipated to occur as a result of build out under the County's General

Plan. A primary component of the CAP Update is the GHG emissions inventory which provides an estimate of GHG emissions that can be readily estimated, monitored, and reduced by County actions outlined in CAP measures (CAP Measures) that are within the County's jurisdictional influence. With the GHG emissions inventory in place, the CAP Update projects emissions through 2050 based on anticipated growth in the unincorporated county and the future impact of adopted federal and State regulations, policies, and programs in place during CAP Update development. Using these projections, GHG emissions reduction targets are established to identify the emissions levels needed to reach State legislative targets and Board direction.

To develop GHG emissions projections for the unincorporated area, population, housing, and job growth must be established to estimate future GHG emissions levels through 2050. As part of CAP Update development, the County hired a consultant, AECOM, to evaluate historic market trends since 2011 General Plan Update (General Plan) adoption and establish anticipated population, housing, and job growth based on these trends (Attachment A). In addition, the County hired a consultant, California Economic Forecast, to perform a peer review of the AECOM report and determine whether AECOM's findings adequately reflected historic and anticipated market trends for the unincorporated area (Attachment B). This approach would develop substantial evidence for anticipated population, housing, and job growth to be considered when establishing GHG projections through 2050 for the CAP Update. While some factors included in the attached reports, such as anticipated units included in Specific Plan areas, may have changed since the time of writing (2022), the analyses remain reflective of market conditions and provide a conservative estimate of anticipated population, housing, and job growth in the unincorporated area. By using a conservative estimate of growth (i.e., higher levels of growth) in the CAP Update GHG projections, the CAP would adequately mitigate for GHG emissions associated with new development anticipated to occur under the County's General Plan because higher growth forecasts result in greater GHG emissions reductions required to be mitigated through implementation of CAP Measures.

Climate Action Plan Update Greenhouse Gas Mitigation for General Plan Implementation

As detailed in the attached reports, historic market conditions determined that, through 2050, unincorporated area population, housing, and job growth would result in less growth than what is allowed under the County's General Plan. By using these reasonably foreseeable anticipated growth projections in the CAP Update GHG emissions projections, the CAP Update will mitigate emissions for growth expected to occur by 2050 based upon market conditions rather than what is allowed under full build out of the General Plan. Using growth projections that reflect market conditions which are lower than General Plan growth capacity will result in a realistic estimate of future GHG

emissions that would need to be mitigated through implementation of CAP Measures. If the County were to use growth projections based on General Plan growth capacity, greater GHG emissions reductions would need to be achieved through CAP Measure implementation, which could result in increased costs to the County, residents, and businesses in the unincorporated area.

As the CAP Update is implemented, the County will use its existing Housing Production and Capacity Portal (Portal) to monitor General Plan build out. The Portal tracks progress towards implementing the General Plan by illustrating housing production and land use capacity since 2011. The Portal uses building permit data, adjustments to General Plan land use capacity, and other land use information to determine remaining growth capacity of the General Plan on a quarterly basis. The Portal provides information on how much and where development is occurring and where there is General Plan development capacity remaining. The County will use the Portal to track development assumed within the CAP Update and this market study. If the actual build out of the General Plan reaches the market-based growth estimates used in the CAP Update GHG emissions projections, the County would evaluate options for updating how development projects analyze GHG emissions during CEQA review. The County may also update the CAP to reflect these changed conditions.

Information on the Portal, including number of dwelling units since 2011, number of dwelling units receiving discretionary approval since 2011, capacity remaining, as well as other tools and information can be found at the following link: https://www.sandiegocounty.gov/content/sdc/pds/HPCP-UA/HPCP-IT.html.

Attachments:
Attachment B1 – AECOM Report: “Population, Employment, and Housing Projections 2020-2050”
Attachment B2 - California Economic Forecast Report: “Peer Review of the Population, Employment, and Housing Projections 2020-2050”

Appendix B

Attachment B1

AECOM

Population, Employment, and Housing Projections 2020-2050

Unincorporated San Diego County
Draft Revised Final Report

County of San Diego / Planning & Development Services

October 2, 2023

Delivering a better world

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GENERAL AND LIMITING CONDITIONS

AECOM devoted effort consistent with (i) the level of diligence ordinarily exercised by competent professionals practicing in the area under the same or similar circumstances, and (ii) the time and budget available for its work to ensure that the data contained in this report is accurate as of the date of its preparation. This study is based on estimates, assumptions, and other information developed by AECOM from its independent research effort, general knowledge of the industry, and information provided by and consultations with the Client and the Client's representatives. No responsibility is assumed for inaccuracies in reporting by the Client, the Client's agents and representatives, or any third-party data source used in preparing or presenting this study. AECOM assumes no duty to update the information contained herein unless it is separately retained to do so pursuant to a written agreement signed by AECOM and the Client.

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This study is qualified in its entirety by, and should be considered in light of, these limitations, conditions, and considerations.

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Figures

Tables

1. Overview

The County of San Diego is seeking projections for population growth, housing growth, and employment growth in the unincorporated area. The projections will be used to estimate green house gas (GHG) emissions inventory and projections and support preparation of a Final Supplemental Environmental Impact Report (SEIR) for the County's Climate Action Plan (CAP).

As part of the preparation of the CAP update project, the County engaged AECOM in 2021 to prepare population, housing, and employment projections, which cover the period between 2020 and 2050. The projections are intended to reflect a realistic, market-based understanding of future growth. Based on historic and projected demographic trends and shifting market conditions, it is uncertain that the unincorporated areas of the county will ever reach full buildout of the capacity estimated in the General Plan.

The projections include two separate sets: a Base growth estimate and a High growth estimate. The Base growth estimate is driven by expected county-wide population growth, and the High growth estimate expands on the Base growth estimate by assuming absorption of all[1] qualified remaining entitled but unbuilt Specific Plan Area (SPA) units[2]. The projections are organized by geographical area, time period, and residential density category, as shown in Table 1.

Table 1. Organization of Data in Projections

Geography	Unincorporated San Diego County by Community Planning Area (24 total)
Categories	Population, Residential Units, Employment
Time Period	2020 to 2050 in five-year increments
Residential Type[3,4]	1. **Low-density**: below 2 units per acre (equivalent to County land use designation VR-2) 2. **Medium-low density**: between 2 and 7.3 units per acre (County land use designations VR 2, VR 7.3) 3. **Medium-high density**: between 7.3 and 15 units per acre, (County land use designations VR 7.3, VR 15) 4. **High-density**: between 15 and 30 units per acre (County land use designations VR 15, VR 30) 5. **Specific Plan Area (SPA)[5]**: including units in approved (or entitled) General Plan Amendment (GPA) projects in SPAs

The following report is organized into seven sections:

1. Overview
2. Considerations
3. Summary
4. Population Projections
5. Residential Projections
6. Employment Projections
7. Appendix

[1] The inventory of unbuilt SPA units represents total unbuilt units less units deemed unlikely to be developed, as discussed in Chapter 5 in the Marketable Site Supply section.
[2] In this report, "SPA" units refer to units entitled through both Specific Plan Areas and General Plan Amendments (GPAs). Both SPA- and GPA-initiated units, once adopted, are identified by the "SPA" land use designation. Historically, SPAs have been a major source of housing production in the unincorporated county.
[3] The residential density tiers were defined in consultation with County Staff to facilitate VMT analysis.
[4] Accessory Dwelling Units (ADUs) are not counted separately from the density categories of which they are a part. For more on how ADUs are treated by the projections, see the section below titled A Note on ADUs.
[5] SPA unit projections are separate from the other density categories. However, SPAs typically feature units at a wide range of densities.

2. Considerations

The following analysis uses available data largely collected in 2021 and early 2022 regarding historical trends, future growth projections, and current infrastructure and regulatory capacity to make forward-looking estimates. The estimates are subject to future economic conditions and other risks and uncertainties, and actual and future results and trends could differ materially from those set forth here due to factors that are beyond AECOM's ability to control or predict.

Some factors that could influence the volume, timing, and direction of future growth in the unincorporated area include the following:

- **Future Housing Policy**. The County is developing other policies related to housing development that could influence future growth. The projections contained in this report do not reflect any of these proposed initiatives that would incentivize or disincentivize future housing growth.
- **Environmental Risks.** Restrictions on development due to environmentally sensitive areas or court rulings could also impact the quantity and type of future housing development. The projections contained in this report do not reflect restrictions or rulings of this nature that would likely reduce the supply of developable sites.
- **Long-Term Market Impact of COVID-19 on commercial real estate.** The short-term spike of telework and e-commerce during the pandemic may have long-term and permanent impact on commercial and residential real estate. Recent studies have shown a short-term shift in housing demand away from neighborhoods with high population density because—it's theorized—the location benefits of compact development declined during the pandemic. The extent and permanence of this phenomenon is yet to be determined, as is its elasticity with respect to pricing and density and applicability to the 24 Community Planning Areas (CPAs) in the unincorporated county area.

3. Summary

Population Projections

Population for the unincorporated area between 2020 and 2050 is estimated to grow by 34,829 in the Base estimate for a total increase of 6.9% at an average annual growth rate of 0.22%. For the High estimate, population is estimated to grow by 63,695 for total increase of 12.6% at an annual growth rate of 0.40%. For further discussion of these projections, see Chapter 4 Population Projections.

Table 2. Population Growth Projections 2020-2050 Summary

Item	2020	2050	2020-50 # Change	2020-50 % Change	2020-50 Annual Growth Rate
Base Growth Estimate	505,675	540,504	34,829	6.89%	0.22%
High Growth Estimate	505,675	569,370	63,695	12.60%	0.40%

Source: AECOM

Housing Unit Projections

Housing unit inventory for the unincorporated areas between 2020 and 2050 is estimated to grow by 12,239 in the Base estimate for a total increase of 6.9% at an average annual growth rate of 0.22%. In the High estimate, inventory is estimated to grow by 23,431 units for a total increase of 13% and an annual growth rate of 0.42%. All additional growth in the High estimate relative to the Base estimate comes from growth of Specific Plan Area (SPA) units. In the Base estimate, SPAs are estimated to contribute 4,699 units and in the High estimate 15,459 units. For further discussion of these projections, see the Housing Unit Projections section below.

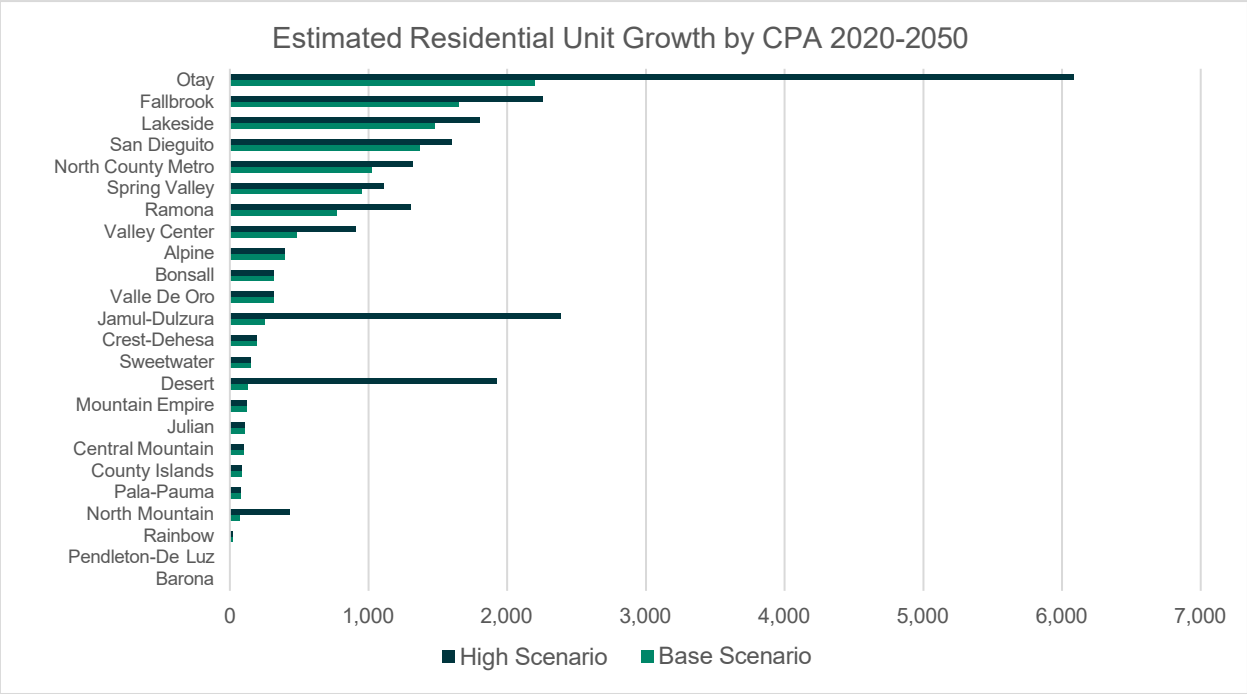
Table 3. Housing Growth Projections 2020-2050 Summary

Item	2020	2050	2020-50 # Change	2020-50 % Change	2020-50 Annual Growth Rate
Base Growth Estimate					
Total	176,610	188,849	12,239	6.9%	0.22%
Low Density	78,604	82,999	4,395	5.6%	0.18%
Medium Low Density	37,209	38,696	1,487	4.0%	0.13%
Medium High Density	16,089	17,138	1,049	6.5%	0.21%
High Density	15,189	15,798	609	4.0%	0.13%
SPA	29,520	34,219	4,699	15.9%	0.49%
High Growth Estimate					
Total	176,610	200,041	23,431	13%	0.42%
Low Density	78,604	83,413	4,809	6%	0.20%
Medium Low Density	37,209	38,964	1,755	5%	0.15%
Medium High Density	16,089	16,699	610	4%	0.12%
High Density	15,189	15,987	798	5%	0.17%
SPA	29,520	44,979	15,459	52%	1.41%

Source: AECOM

Estimated unit growth is distributed widely by CPA. In the Base estimate, Otay and Fallbrook are the largest contributors to unincorporated county growth. In the High estimate, Otay and its large inventory of planned unbuilt SPA units is the largest contributor by a significant margin. Other CPAs that contribute significantly more SPA growth in the High estimate include Jamul-Dulzura and Desert. The top-10 CPAs by growth in the Base estimate (from Otay to Bonsall, as shown in Figure 1) contribute 10,622 units between 2020 and 2050, equivalent to 87% of total forecast growth.

Figure 1: Residential Unit Growth Ranked by CPA 2020-2050: Base and High Growth Estimates



Source: AECOM

Residential growth is partitioned into four residential density tiers that broadly correspond to County land use designations. The Single-Family Large Lot category includes all units at 2 units per acre or lower, which corresponds to the VR 2 (Village Residential 2) land use designation. The Single-Family Large Lot category includes detached housing at between 2 and 7.3 dwelling units per acre (equivalent to VR 2 to VR 7.3). The Multifamily Lower Density category includes all units at between 7.3 and 15 units per acre (equivalent to VR 7.3 to VR 15). Units in this category may include condominium, small-lot-detached, duplex, triplex, and townhome typologies. The Multifamily Higher Density category includes all units at between 15 and the County's upper limit of 30 units per acre (equivalent to 15 to VR 30). Units in this category may include townhome or stacked flats typologies with surface or podium parking. The SPA (Specific Plan Area) category includes all units that have been entitled though the Specific Plan Area process. (Note, SPA units, while treated here as a separate category, may have units that range in density from large-lot detached to high density multifamily.)

In the Base estimate, as shown in Figure 2, SPA units make up the largest share, at 38%, followed by 36% for Single-Family Large Lot and 12% for Single-Family Small Lot. In the High estimate, addition of all entitled but unbuilt SPA units increases the category contribution significantly and diminishes the other categories accordingly.

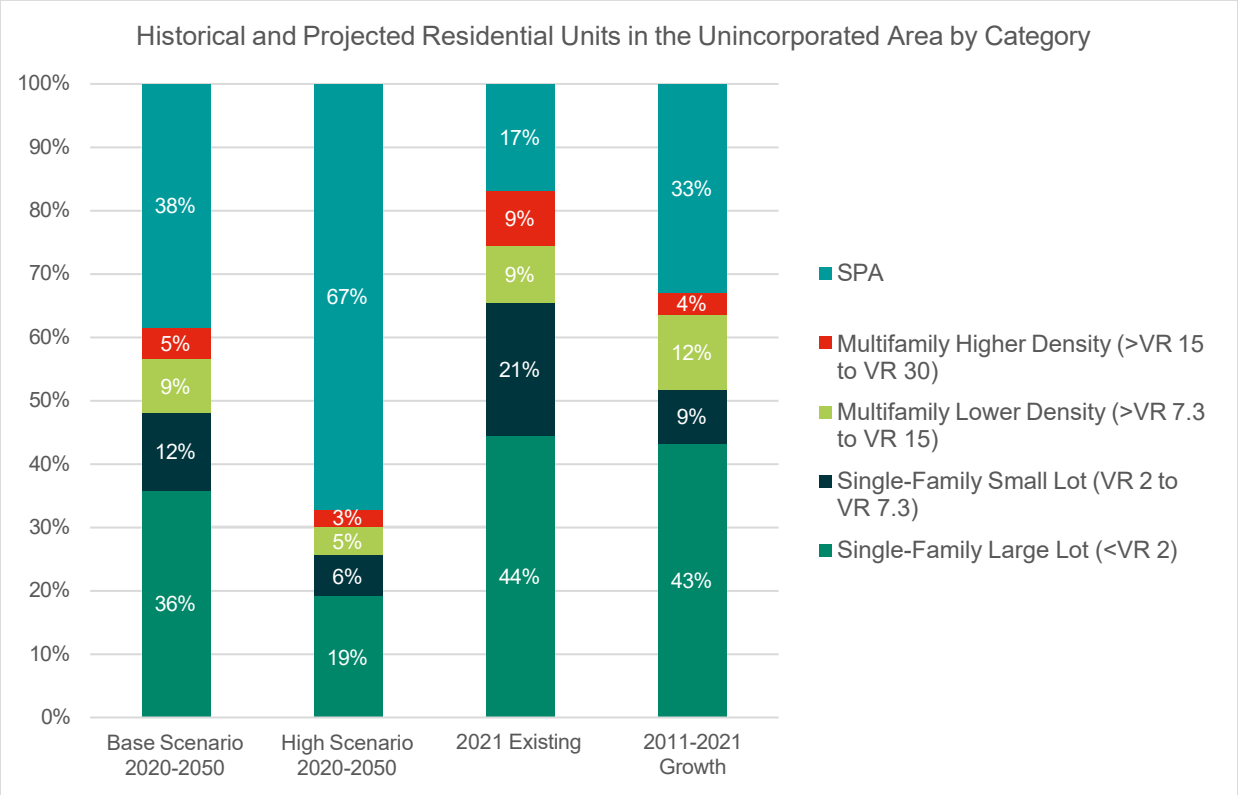
For context, Figure 2 also shows the existing (2021) category mix as well as the mix from the last ten years of growth (2011 to 2021). Historically, SPAs have always made a significant contribution to inventory in the unincorporated area (17% of total) and have seen even faster growth in the last 10 years (33% of total). This forecast anticipates even faster SPA growth, due primarily to the Otay CPA. Otay CPA includes the Otay Ranch Specific Plan Area, which for decades has been one of the fastest-growing planned communities in the nation. While nearly all Otay Ranch growth has occurred in the city of Chula Vista, future growth is expected to continue into the unincorporated area. (For further discussion of the Otay CPA population, housing and employment projections, see the Otay CPA Growth Forecast section below.)

Higher-density housing, as represented by the Multifamily Low Density and Multifamily High Density categories, has not been a significant contributor to unincorporated area housing inventory, with 18% share historically and 16% share of units built in the last ten years. The housing projections expect the share of these categories to continue to decline to 14% of total between 2020 and 2050 in the Base estimate.[6] This is attributable largely to consumer

[6] However, it is likely that a portion of growth characterized as "SPA" will include higher-density housing because, as noted above, SPAs typically include higher-density offerings in their unit mix.

preference for single-family housing in the unincorporated area, where generally lower housing costs make larger homes more affordable than in the incorporated jurisdictions.

Figure 2: Historical and Projected Residential Growth by Density Tier



Source: AECOM, County Housing Portal, County Assessor

Employment Projections

Employment in the unincorporated areas between 2020 and 2050 is estimated to grow by 21,165 in the Base estimate for a total increase of 19% at an average annual growth rate of 0.59%. This rate exceeds the estimated Base estimate growth rate for residential units, indicating a growing jobs/unit ratio attributable mainly to high expected employment growth in the Otay CPA. The East Otay Mesa Business Park Specific Plan, which is being developed as a major warehousing and logistics hub, is expected to import workers from nearby jurisdictions, from outside of San Diego County, and from across the border in Mexico. For the High estimate, employment is estimated to grow by 26,167 for a total increase of 23.7% at an annual growth rate of 0.71%. The assumed buildout of all entitled SPA units in this scenario is assumed to have a substantial spill-over impact on employment growth as well. For further discussion of employment projections, see the Employment Projections section below.

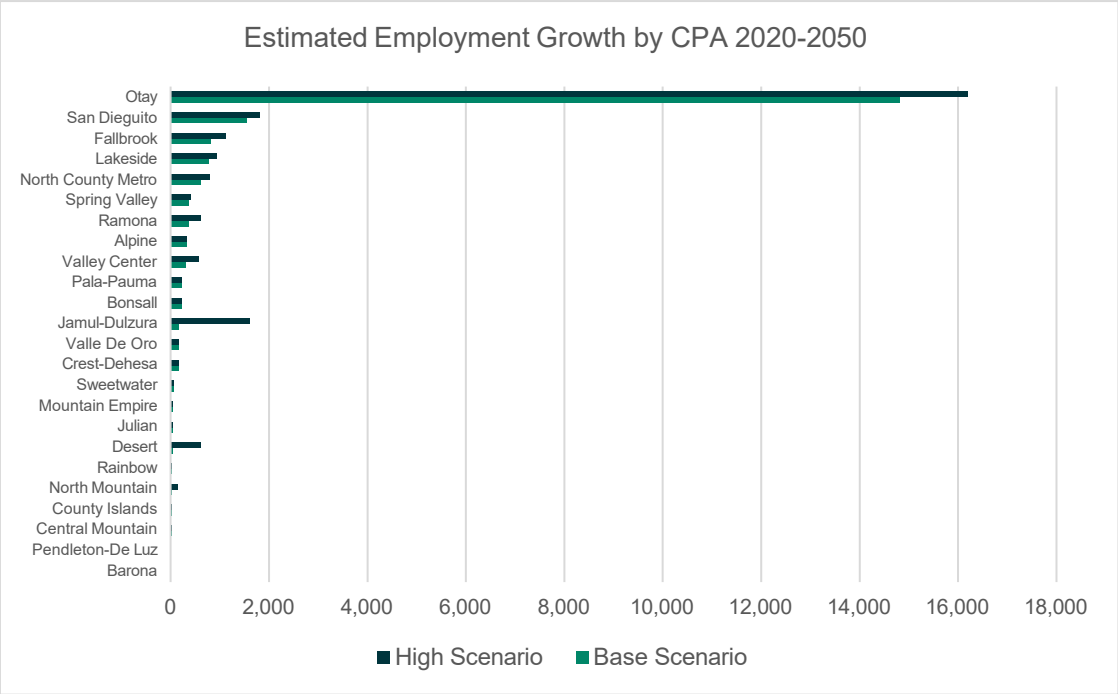
Table 4. Employment Growth Projections 2020-2050 Summary

Item	2020	2050	2020-50 # Change	2020-50 % Change	2020-50 Annual Growth Rate
Base Growth Estimate	110,636	131,801	21,165	19.13%	0.59%
High Growth Estimate	110,636	136,803	26,167	23.65%	0.71%

Source: AECOM

Estimated employment growth is distributed widely by CPA. In the Base estimate, Otay is the dominant source of new employment, with 70% of all new jobs expected between 2020 and 2050. San Dieguito is a distant second with 7% of all new jobs. The top-10 CPAs by growth in the Base estimate (from Otay to Pala Pauma, as shown in Figure 3) contribute 20,158 jobs between 2020 and 2050, equivalent to 95% of total forecast growth.

Figure 3: Employment Growth Ranked by CPA 2020-2050



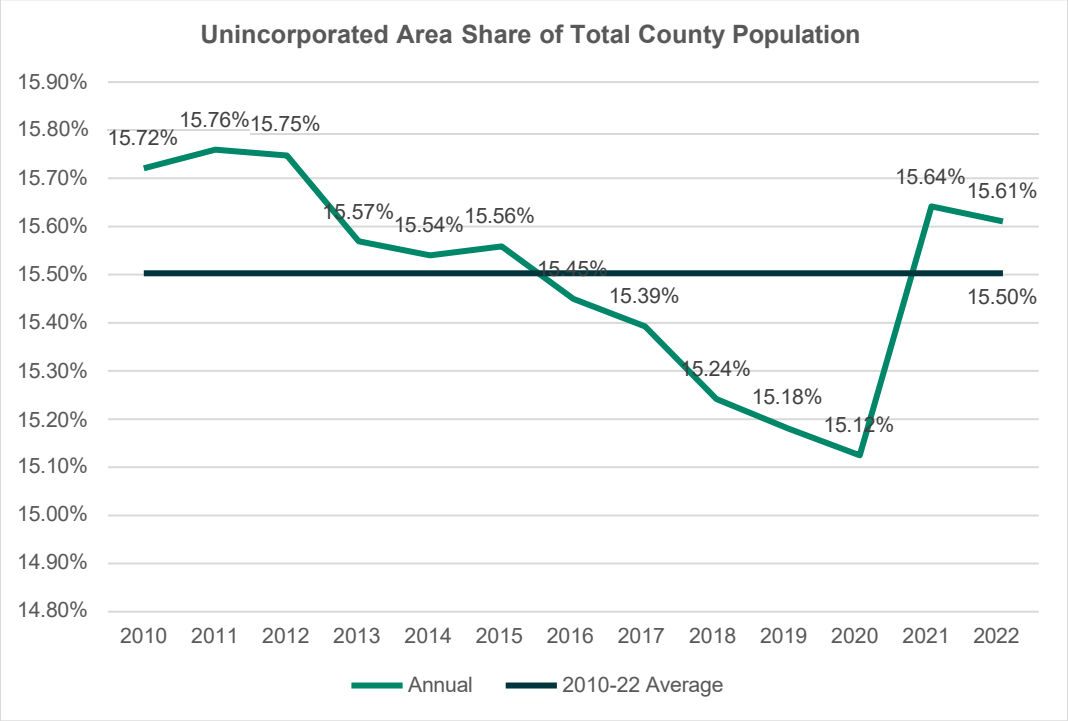
Source: AECOM

4. Population Projections

Projection for the Total Unincorporated Area

The unincorporated area population projection is derived from the California Department of Finance (DoF) schedule P2 for San Diego County, which estimates county population growth to the year 2060.[7] A portion of county growth is then allocated to the unincorporated area based on historical trends. As indicated by DoF schedule E-5 (Figure 4), the unincorporated area contributed between 15.12% and 15.76% of county population between 2010 and 2022. During this time, the incorporated area grew faster than the unincorporated area until the COVID-19 pandemic in 2020, when the trend reversed. To allocate a portion of total county growth to the unincorporated area, AECOM assumed a capture of 15.5% of county growth through 2050, which is the historical average contribution between 2010 and 2022. The 15.5% assumption is conservative as it balances the historical downward trend in unincorporated county share through 2020 with what may prove to be a permanent off-setting increase in the attractiveness of the unincorporated area attributable to the impact of remote work on commuting and residential settlement patterns.

Figure 4: Unincorporated Area Share of Total San Diego County Population



Source: California Department of Finance Schedule E-5, AECOM

To distribute population growth over time, AECOM derived compound annual growth rates (CAGR) at 10-year intervals (2020-2030, 2030-2040, 2040-2050) from the DoF P2 schedule and applied them to a 2020[8] base year population. This yielded an estimated population growth of 34,825 as shown in Table 5.

[7] The DoF P2 offered the most up-to-date set of regional growth estimates available at the time of the study. Source: California Department of Finance. Demographic Research Unit. Report P-2A: Total Population Projections, California Counties, 2010-2060 (Baseline 2019 Population Projections; Vintage 2020 Release), Sacramento: California. July 2021 (original lease from 03/05/21 referenced). www.dof.ca.gov/Forecasting/Demographics/Projections/

[8] 2020 base year population sourced from SANDAG (Current Estimates, July 21, 2021) to maintain consistency with the VMT and EIR analyses being conducted concurrently, which are also referencing SANDAG baseline data.

Table 5. Unincorporated Area Population Projection

	2020	2025	2030	2035	2040	2045	2050
Total Population	505,675	513,885	522,229	528,361	534,565	537,524	540,500
	2020-25	**2025-30**	**2030-35**	**2035-40**	**2040-45**	**2045-50**	**2020-50**
Incremental Population	8,210	8,344	6,132	6,204	2,959	2,976	34,825

Source: AECOM

Population Projections Allocated by CPA

Population projections are allocated to each CPA by applying population/unit ratios to residential unit projections. (For a description of how residential growth projections at the CPA level are derived from the area-wide population projection, see Chapter 5 Residential Unit Projections below.) The base year 2020 population/unit ratios for each CPA are based on 2020 SANDAG data[9]. These are then scaled so that the average population/unit for the entire unincorporated area falls at a rate of -0.05% per year, which is the historical average decline from 1990 to 2022. (For further discussion of these assumptions, see the section in Chapter 5. The resulting population/unit ratios are shown in Table 6.

Table 6. Population/Unit Ratios for Estimating Population Growth by CPA

SPA	2020	2025	2030	2035	2040	2045	2050
Alpine	2.66	2.66	2.67	2.67	2.67	2.67	2.67
Barona	2.69	2.69	2.69	2.69	2.69	2.69	2.69
Bonsall	2.53	2.53	2.54	2.54	2.54	2.54	2.54
Central Mountain	2.37	2.37	2.38	2.38	2.38	2.38	2.38
County Islands	3.45	3.46	3.47	3.47	3.48	3.47	3.47
Crest-Dehesa	2.74	2.75	2.75	2.75	2.75	2.75	2.75
Desert	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Fallbrook	2.64	2.64	2.65	2.65	2.65	2.65	2.65
Jamul-Dulzura	2.88	2.89	2.89	2.89	2.89	2.89	2.89
Julian	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Lakeside	2.69	2.69	2.70	2.70	2.70	2.70	2.70
Mountain Empire	2.60	2.60	2.60	2.60	2.61	2.61	2.61
North County Metro	2.75	2.75	2.75	2.75	2.75	2.75	2.75
North Mountain	2.20	2.20	2.20	2.20	2.20	2.20	2.20
Otay	1,347	1,347	64.58	24.18	12.15	8.31	6.59
Pala-Pauma	2.81	2.81	2.81	2.81	2.82	2.82	2.82
Pendleton-De Luz	5.79	5.79	5.79	5.79	5.79	5.79	5.79
Rainbow	2.89	2.89	2.89	2.89	2.89	2.89	2.89
Ramona	2.76	2.77	2.77	2.77	2.77	2.77	2.77
San Dieguito	2.73	2.73	2.73	2.74	2.74	2.74	2.74
Spring Valley	2.93	2.94	2.94	2.94	2.94	2.94	2.94
Sweetwater	2.79	2.79	2.79	2.79	2.79	2.79	2.79
Valle De Oro	2.67	2.67	2.67	2.67	2.67	2.67	2.67
Valley Center	2.60	2.60	2.60	2.60	2.60	2.60	2.60
Total	**2.863**	**2.863**	**2.863**	**2.863**	**2.862**	**2.862**	**2.862**

These ratios are applied to the Base residential growth projections (shown later in the report in Table 16) to generate the Base population projections shown in Table 7.

Table 7. Final Population Projections by CPA (Base Estimate)

SPA	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	317	306	209	182	46	37	1,097
Barona	0	0	0	0	0	0	0
Bonsall	242	238	159	139	33	30	841
Central Mountain	73	73	47	42	12	7	254
County Islands	92	88	58	54	10	10	312
Crest-Dehesa	160	154	104	91	22	19	550
Desert	54	53	36	31	7	6	187
Fallbrook	1,319	1,279	866	758	184	154	4,560
Jamul-Dulzura	220	216	145	126	29	26	762
Julian	63	61	40	36	10	8	218
Lakeside	1,210	1,169	796	693	169	141	4,178
Mountain Empire	97	93	63	57	13	10	333
North County Metro	849	826	559	490	119	102	2,945
North Mountain	49	46	32	27	7	7	168
Otay	0	379	753	1,491	1,816	2,020	6,459
Pala-Pauma	69	65	44	38	11	8	235
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	15	15	9	9	3	3	54
Ramona	646	627	423	370	89	72	2,227
San Dieguito	1,132	1,100	738	648	160	131	3,909
Spring Valley	844	818	557	487	119	97	2,922
Sweetwater	124	121	82	72	17	14	430
Valle De Oro	255	245	165	147	35	29	876
Valley Center	380	367	250	218	53	44	1,312
Total	**8,210**	**8,339**	**6,135**	**6,206**	**2,964**	**2,975**	**34,829**

Source: AECOM

Applying the ratios to the high residential growth projections (shown in Table 17) results in the High estimate Population growth projections shown in Table 8. (For further discussion of how the High estimate is determined, see the Residential Growth by CPA and Density Tier (High Estimate) section below.)

Table 8. Final Population Projections by CPA (High Estimate)

SPA	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	317	306	209	182	46	37	1,097
Barona	0	0	0	0	0	0	0
Bonsall	242	238	159	139	33	30	841
Central Mountain	73	73	47	42	12	7	254
County Islands	92	88	58	54	10	10	312
Crest-Dehesa	160	154	104	91	22	19	550
Desert	691	698	508	504	229	227	2,857
Fallbrook	1,720	1,682	1,162	1,056	323	294	6,237
Jamul-Dulzura	1,754	1,769	1,282	1,268	563	556	7,192
Julian	63	61	40	36	10	8	218
Lakeside	1,427	1,388	957	855	245	216	5,088
Mountain Empire	97	93	63	57	13	10	333
North County Metro	1,053	1,032	708	641	189	174	3,797
North Mountain	245	246	177	173	76	73	990
Otay	2,780	3,192	2,814	3,560	2,781	2,983	18,110
Pala-Pauma	69	65	44	38	11	8	235
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	15	15	9	9	3	3	54
Ramona	1,012	998	695	642	218	197	3,762
San Dieguito	1,294	1,264	858	767	215	186	4,584
Spring Valley	960	936	643	572	157	136	3,404
Sweetwater	124	121	82	72	17	14	430
Valle De Oro	255	245	165	147	35	29	876
Valley Center	656	647	455	423	150	143	2,474
Total	**15,099**	**15,311**	**11,239**	**11,328**	**5,358**	**5,360**	**63,695**

Source: AECOM

5. Residential Unit Projections

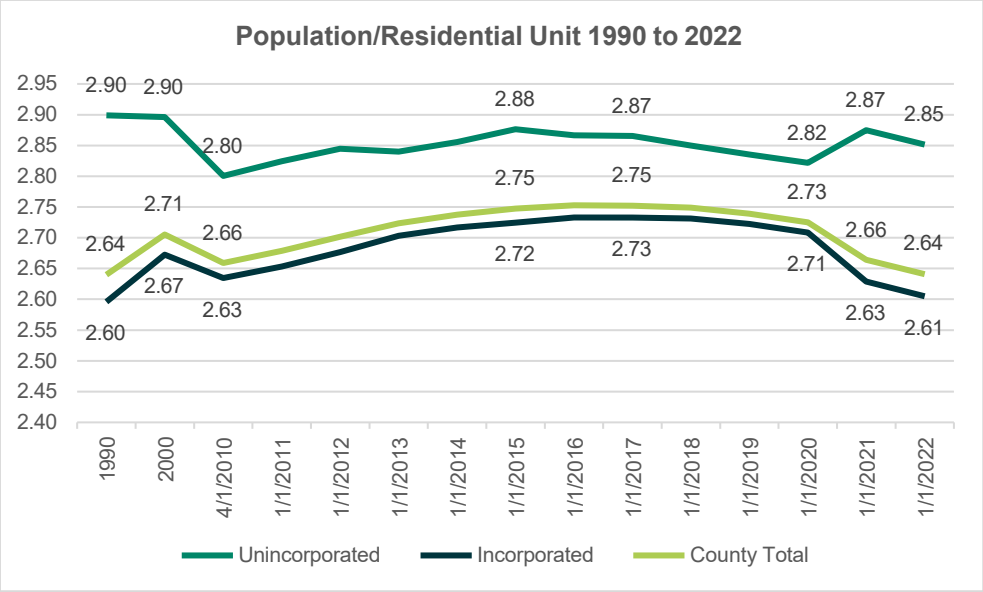
Residential unit projections are based on an estimate of total unincorporated county area demand based on population growth, an analysis of the supply of marketable development sites, and an assumed capture of housing demand per CPA based on historical patterns of residential development and other considerations. The three-step process (total unincorporated area housing demand, marketable site supply analysis, allocation to CPAs) is described further in the sections below.

Unincorporated Area Housing Demand

Total housing demand for the unincorporated county area is derived by applying population-to-unit ratios derived from historical trends to the population projections.

As shown in Figure 5, the unincorporated county area has historically had higher population/unit rates than the jurisdictions. From 2015 to 2020, population/unit ratios declined in both the incorporated and unincorporated areas, but in 2020, the rate of decline accelerated in the incorporated area while population/unit increased in the unincorporated area. This pattern of outmigration from populous coastal areas to more affordable inland areas was mirrored elsewhere in California during the initial phase of the COVID-19 pandemic. Even as the pandemic subsides, demographers expect this small shift between coastal and inland area populations to persist as more affordable housing opportunities inland and increased opportunity to work from home continue to attract in-migration.

Figure 5: Historical Population/Unit Ratios in San Diego County



Source: California Department of Finance Schedule E-5

At the same time, household sizes overall are expected to continue to decline as falling birthrates lead to smaller families and an aging overall population. To reflect this future decline, the housing projections assume a falling population/unit rate, calculated (as also noted in the Population Projections section above) as the average measured rate of change in population/unit in the unincorporated area between 1990 and 2022, which is an annual average decline of -0.05%. This rate is applied to the population projections to estimate housing growth in five-year increments as shown in Table 9. (The 2020 base year ratio is derived from 2020 SANDAG data.) This yields a total unit growth estimate of 12,239. This estimate indicates more units for the same population relative to the number of units needed if household size were not to decline.

Table 9. Residential Unit Growth Estimates

Item	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Draft Population Projection	8,210	8,344	6,132	6,204	2,959	2,976	34,825
Assumed Pop/Unit Ratio	2.86	2.85	2.84	2.84	2.83	2.82	2.85
Estimated Residential Units	**2,871**	**2,926**	**2,156**	**2,187**	**1,046**	**1,053**	**12,239**

Source: AECOM

Marketable Site Supply

To help allocate residential unit demand by CPA and by density category, AECOM conducted an analysis to determine a qualified supply of development sites. This qualified supply provides a way to constrain growth at the CPA level and by housing type and density where the supply of suitable sites is lower than estimated demand. The qualifying process entails screening a base set according to regulatory capacity, financial feasibility, infrastructure support, and physical site characteristics, as further described in the process below.

1. The **Base Set** is drawn from assessor data of all residential and residential mixed-use parcels in the unincorporated county Area. While assessor data and County Housing Production and Capacity portal data overlap considerably, AECOM used assessor data as the base set for the analysis, because it provides richer information about underlying land use designations, existing improvements, land and improvement values, and physical site characteristics. The Base Set is modified to **exclude several land use categories** that do not offer strong potential to increase residential unit capacity by 2050, as follows:

    - **Condominiums.** Condominium projects are assumed to be fully built out, and shared ownership of common areas makes site assembly challenging for redevelopment. Furthermore, the increase in density required to feasibly redevelop parcels already improved with condominium uses is typically well above the maximum 30 units per acre allowed in the unincorporated area.
    - **Mobile home parks.** Mobile parks are already built out at relatively high density, and redevelopment is unlikely to increase unit count significantly. In addition, tenant protections and RHNA requirements can cause redevelopment of a mobile home park to be prohibitively costly due to tenant relocation costs and the requirement that all lost units be replaced with new low-income units.
    - **Specific Plan Areas.** Built-out parcels in Specific Plan Areas (SPAs) are typically bound by Covenants, Conditions, and Restrictions (CCRs) that limit redevelopment potential that would increase density. (Note: unbuilt SPA capacity is treated differently and added later in this analysis.)

2. **Financial Feasibility Filters** eliminate parcels with characteristics that make financially feasible development challenging. The financial feasibility filters eliminate 74% of the Base Set, equivalent to 178,000 potential units. The filters include improvement ratios, replacement unit ratios, and parcel size, which are described further below:

    - **Improvement Ratio**[10]: All parcels with improvement ratios equal to or greater than 1.0 (i.e., where improvement value is equivalent to land value) are eliminated to exclude those that may already be substantially or fully improved. Parcels with high improvement ratios typically require major up-zoning to be feasible for redevelopment. While it is likely that improvement ratios will fluctuate slightly by 2050 due to shifting market conditions that both increase and decrease the value of improvements relative to land, too few will cross the 1.0 threshold to impact the overall findings meaningfully.
    - **Replacement Unit Ratio**[11]: All parcels with a Replacement Unit Ratio of less than 3.0 are eliminated, which removes parcels without capacity to replace an existing unit with more than two units. This is a proxy for development feasibility, which assumes that redeveloping a residential property will require, at minimum, tripling the number of units on site.[12]

[10] Improvement ratio is defined as improvement value from the County Assessor divided by land value
[11] Replacement unit ratio is defined as allowable units per land use designation divided by existing units.
[12] Note: Replacement Unit Ratio does not specifically consider ADUs as an alternative. For a discussion of the potential for ADUs to increase unit capacity, see the section A Note on ADUs below.

- **Feasible Parcel Size**: All parcels zoned for 15 dwelling unit per acre (DU/AC) or greater, smaller than 0.5 acres are eliminated because higher-density projects in non-urban areas typically require larger sites for feasible housing products.

3. **Infrastructure Support Filters** excludes parcels that lack the underlying infrastructure for near-term development, specifically with respect to road and water infrastructure. The infrastructure filters eliminate another 5% from the qualified set, equivalent to 13,000 potential units and include the following:

   - **Road Infrastructure** filter excludes parcels that do not intersect a road or are more than one-quarter mile from a freeway, highway, arterial, or connector road[13].

   - **Waterline** filter excludes parcels outside of the waterline with designated density greater than 7.3 DUAC, per County directive prohibiting multifamily development outside the waterline.

4. **Physical Site Capacity Filters** excludes parcels or lower the parcel development capacity on parcels on steep slopes, defined by the County as having a gradient greater than 25%. The physical site capacity filters eliminate another 1% of the Base Set, equivalent to 2,800 potential units and include the following:

   - **SR-designated parcels**: Allowable density and buildable area is reduced, per County guidelines, where slope gradient is greater than 25%.

   - **RL-designated parcels** are eliminated where unbuilt unit capacity is located on a parcel smaller than 6,000 square feet at 25% or higher grade, which is needed to accommodate both unit and access road.[14]

   - **VR-designated parcels** are all included regardless of slope grade, which is consistent with County guidelines.

5. **Adjustments to Specific-Plan Area Capacity:** AECOM conducted a separate analysis to qualify entitled but unbuilt Specific Plan Area (SPA) units as marketable. Although entitled, some unbuilt SPA capacity is less feasible due to factors related to market trends and infrastructure support.[15] The marketability of unbuilt SPA capacity is evaluated in a multi-step process, as follows:

   Assembled a Master Set of entitled but unbuilt SPA capacity using data from the County Assessor and General Plan GIS layers, which was further adjusted and validated by reviewing adopted Specific Plan/General Plan Amendment documents and a County-maintained index of SPA projects. This unbuilt capacity totals 16,703 units located in 12 of 24 CPAs, as shown in

   - .

   - **Reviewed SPA development trends** in the unincorporated area to understand development patterns by project, by CPA, by unit type, and by rate of absorption. Data for the trend analysis was drawn primarily from building permit data. The analysis revealed a range of activity at different SPA projects with some very active and others inactive and containing unused entitlements going back decades. (See Table 47 in the Appendix for full summary of SPA inventory and growth). Building permit data extends back to 2010 and provides a reliable assessment of new, active, and dormant projects.

   - **Eliminate inactive projects** from qualified capacity by classifying unbuilt SPA capacity by activity level, referencing the development trend analysis conducted in the prior step. SPA projects entitled before 2011 but inactive with no new development since 2011 are removed from qualified capacity.[16]

[13] The quarter-mile assumption is based on prior AECOM experience in San Diego County. While larger subdivisions are typically required to provide off-site road infrastructure, most of these occur in SPA projects, which are not subject to this filter. For projects considered by this filter, such off-site costs are typically cost-prohibitive beyond a quarter mile from the existing street network. Consequently, these parcels were removed from the marketable supply due to low probability of development.
[14] RL threshold from AECOM, based on prior experience with development feasibility in RL areas.
[15] As noted in an earlier footnote, in this report, “SPA” units refer to units entitled through both Specific Plan Amendments and General Plan Amendments (GPAs). Both SPA- and GPA-initiated units, once adopted, are identified by the “SPA” land use designation. Historically, SPAs have been a major source of housing production in the unincorporated county.
[16] The inactivity screen also eliminated over 1,000 entitled units at Desert - Rams Hill in Borrego Springs from qualified capacity, as only one unit in the project was built during the 2011-2020 period.

- **Eliminate additional qualified SPA capacity from Jacumba Valley Ranch,** in Mountain Empire, where development of 1,244 entitled units is on permanent hold because the area has been leased for solar power generation through 2050.

As a result of these adjustments, unbuilt SPA capacity is reduced by 3,437 units, from 16,703 to 13,266. In addition to the reduction in Mountain Empire units noted above, 1,449 entitled SPA units are eliminated from the Desert SPA, 358 from North Mountain, 233 from San Dieguito, and 153 from North County Metro.

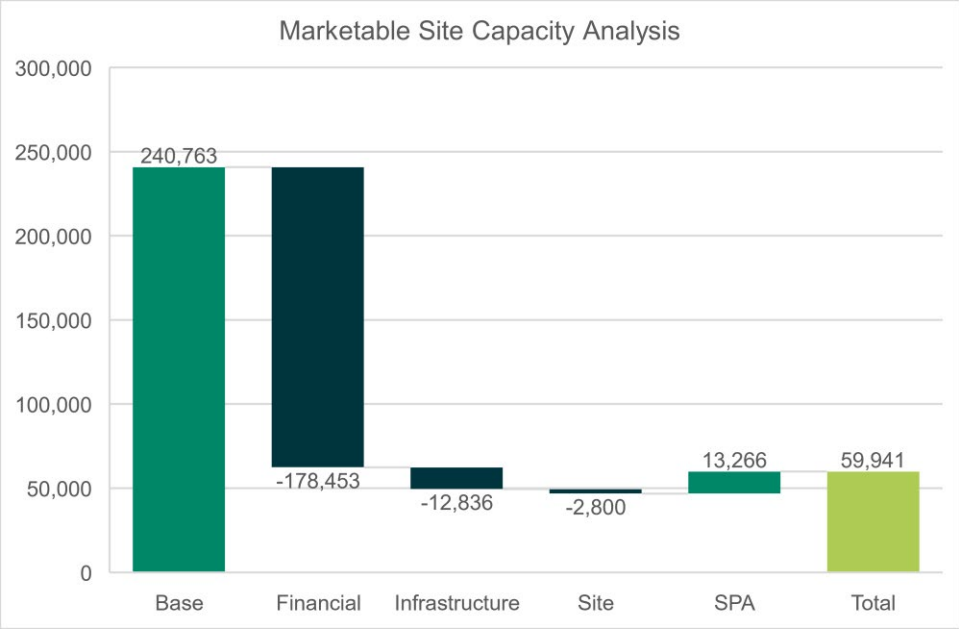
Table 10. Total Unbuilt SPA Capacity

	Master Set of Unbuilt SPA Units	Marketable Set of Unbuilt SPA Units
Desert	1,811	362
Fallbrook	1,273	1,273
Jamul-Dulzura	2,209	2,209
Lakeside	421	421
Mountain Empire	1,244	0
North County Metro	694	541
North Mountain	358	0
Otay	6,082	6,082
Ramona	542	542
San Dieguito	1,276	1,043
Spring Valley	340	340
Valley Center	453	453
Total	**16,703**	**13,266**

Source: AECOM

Applying the five filters to a base set of parcels representing approximately 241,000 potential units results in a reduction of approximately 75%, yielding a marketable capacity of 59,924 units, as shown in Figure 4.

Figure 4. Marketable Site Supply Analysis



Source: AECOM

These potentially marketable units can further be distributed by density type, as shown in Table 11, and by CPA, as shown in Table 12. The CPAs of North County Metro, Otay, and Desert have the largest number of marketable sites.

Buildable capacity from the County Housing Production and Capacity Portal, shown for comparison in Table 12, shows strong overlap between the two approaches. Major differences are tied to the estimation methodologies: where the County Housing Production and Capacity Portal focuses mainly on the capacity of vacant and unimproved lots, the Qualified Capacity analysis includes improved lots that can be redeveloped and eliminates lots that for economic, infrastructure, and site considerations present significant development challenges.

Table 11: Marketable Site Capacity Estimate by Category

Marketable Capacity by Residential Category		
	Marketable Units	Share of Total
Low Density (<VR 2)	26,186	44%
Medium-Low Density (VR 2 to VR 7.3)	9,790	16%
Medium-High Density (>VR 7.3 to VR 15)	4,403	7%
High-Density (>VR 15 to VR 30)	6,295	11%
SPA	13,266	22%
Total	**59,941**	**100%**

Source: AECOM

Table 12: Marketable Site Capacity Estimate and Housing Portal Capacity by CPA

Marketable Capacity by CPA		
	Marketable Capacity[1]	Housing Portal[2]
Alpine	6%	5%
Barona	0%	0%
Bonsall	5%	3%
Central Mountain	1%	1%
County Islands	2%	0%
Crest-Dehesa	1%	1%
Desert	10%	13%
Fallbrook	10%	9%
Jamul-Dulzura	6%	6%
Julian	1%	1%
Lakeside	7%	5%
Mountain Empire	2%	5%
North County Metro	13%	16%
North Mountain	1%	2%
Otay	10%	5%
Pala-Pauma	2%	3%
Pendleton-De Luz	0%	1%
Rainbow	1%	1%
Ramona	6%	8%
San Dieguito	4%	2%
Spring Valley	2%	1%
Sweetwater	1%	1%
Valle De Oro	1%	1%
Valley Center	9%	10%
Total Unincorporated	**59,941**	**61,255**

Source: (1) AECOM, (2) County of San Diego

A Note on ADUs

California State Legislation AB345 and SB9 include provisions supporting production of Accessory Dwelling Units (ADUs). The legislation allows single family lots to be subdivided without discretionary review or rezoning for higher density, enabling single-family lots to support up to four units. Early data from ADU applications in different California jurisdictions suggests that the legislation has stimulated growing interest in ADUs.

However, the housing projections in this report do not treat ADUs as a separate category or density tier, because insufficient data exists at this moment to forecast where—by CPA or land use designation—ADUs will be constructed.. Finally, because the housing forecast is based primarily on expected population growth, it is reasonable to assume that ADUs that do enter the housing supply will displace rather than supplement production in other housing categories.

Residential Growth by CPA and Density Tier (Base Estimate)

The 12,239 residential units of estimated residential growth in the unincorporated county area is allocated by CPA and by density tier using a three-step process:

1. Prepare a growth forecast for the Otay CPA
2. Apply capture rates based on historical trends for the other 23 (non-Otay) CPAs
3. Adjust growth allocations by filtering estimates through the marketable site supply analysis

A discussion of each step follows below.

Otay CPA Growth Forecast

The Otay CPA has the strongest potential among the 24 CPAs for residential growth through 2050. Currently, the CPA has no residential uses and a small number of commercial uses, but Otay Ranch just west in the City of Chula Vista has been one of the fastest growing residential areas in the country, producing over 10,000 units since the middle 1990s. With growth moving rapidly from west to east through Chula Vista, development should soon arrive in the Otay CPA. An ambitious commercial development plan for a large warehouse and logistics center in Otay CPA should also have a positive impact on residential development.

Three specific plan areas guide growth within the Otay CPA:

- **The East Otay Mesa Business Park Specific Plan** (EOMSP) is programmed primarily as an industrial and business center with an additional portion set aside for mixed-use residential, low-density residential, and conservation uses. The Plan Area, which occupies a strategic border location near the Otay Mesa Port of Entry with Mexico, has attracted several major commercial projects. Demand in the SPA has been estimated for between 17.6 and 24 million square feet of industrial space.[17]
- **The Otay Ranch Resort Village Specific Plan** is a mixed-use community featuring a hotel-anchored resort, single-family residential uses, and a relatively small quantity of office and commercial uses. The location is largely undeveloped and will require construction of three entrance roads for access and substantial grading to create development pads.[18]
- **The Otay Ranch Village 14 and Planning Areas 16/19 Project** is a mixed-use community featuring a village core and 1,119 residential units[19].

Total residential development capacity of the three plan areas is 6,215 units, as shown in Table 13.

[17] *Assessment Of Most Marketable Uses, East Otay Specific Plan,* Meyers Research and Metro Study, December 2020
[18] Due to project changes since the development of this study, the inclusion of some of these projects follows a conservative approach that would result in increased GHG emissions that would be mitigated under the County's CAP. For example, the status of Village 13 is uncertain, as an application has been submitted to LAFCO to annex the properties to the City of Chula Vista.
[19] A proposed project amendment would increase residential units by 147 to 1,266

Table 13: Otay CPA Specific Plans (As of July 2022)[20]

SPA	Program	Residential Units
East Otay Mesa Business Park Specific Plan	Industrial, office, mixed-use village	3,158
The Otay Ranch Resort Village Specific Plan	Village 13: Resort, mixed-use residential/commercial, single-family residential	1,938
Otay Ranch Village 14 and Planning Areas 16/19	Village 14/ Planning Areas 16 & 19:	1,119
Total		**6,215**

Source: The County of San Diego

In addition to potential Otay CPA units, Otay Ranch in Chula Vista adds a potential pipeline of 14,213 units, as shown in Table 14. Combined with the potential Otay CPA units, the greater Otay Mesa area has potential capacity for 20,428 units.

Table 14: Otay Ranch Residential Pipeline and Area Supply

Village	Status	Units
Village 2	Under Development	2,101
Village 3	Under Development	360
Village 8 W	Under Development	2,092
Eastern Urban Center	Under Development	1,039
Freeway Commercial	Under Development	313
Subtotal Under Development		**5,905**
Village 8 E	Entitled	2,609
Village 9	Entitled	3,959
Village 10	Entitled	1,740
Subtotal Entitled		**8,308**
Total Chula Vista Otay Ranch Pipeline		**14,213**
Total Otay CPA Entitlements		**6,215**
Total Potential Area Supply		**20,428**

Source: City of Chula Vista, County of San Diego

From the mid-1990s through 2021, Otay Ranch in Chula Vista added an average of 380 units per year. From 2011 to 2021, growth was even faster, at approximately 480 units per year. Given the continuing appeal of the Otay Ranch area, growth is likely to continue within the range of these historical rates to support between 11,400 and 14,300 units by 2050. The sites in Chula Vista are likely to capture most of this growth due to location, infrastructure, and regulatory advantages over sites within the Otay CPA:

- **Location:** Chula Vista's site supply is closer to the San Diego urban core than the County's supply. The distance from the eastern edge of the Otay Ranch development to downtown San Diego is approximately 17 miles, compared to 23 miles from the proposed village at East Otay Mesa Business Park, 23 miles from proposed Village 13, and 23 miles from proposed Village 14.
- **Infrastructure:** Both the Otay Ranch Resort Village Specific Plan and the Otay Ranch Village 14 and Planning Areas 16/19 are greenfield opportunities that will require substantial infrastructure including drainage, sewerage, roads, and water facilities. By comparison, the Otay parcels in Chula Vista are largely graded and served by finished infrastructure.
- **Regulatory:** In October 2021, a Superior Court judge vacated County approval of the Village 13, Village 14, and Planning Areas 16 & 19 projects due to insufficient protection from wildfire risk. To continue development, the developers must first prepare and re-submit a new mitigation plan, which will delay the projects substantially.

For the Base Growth Estimate, AECOM has assumed that residential growth will follow the recent 2011-2021 annual rate, resulting in approximately 14,300 units by 2050, as shown in Table 15. To distribute this growth, AECOM

[20] While the status of some of these projects may have changed since the study's development, this analysis is intended to reflect market conditions in the unincorporated county. These projects are still representative of these market conditions.

assumed, based on the factors noted above, that neighborhoods in Chula Vista are likely to absorb most of the demand in the coming years, as these developments are both better connected to infrastructure and amenities and directly adjacent to the historical path of residential growth. From this, AECOM assumed Chula Vista will build most of its proposed units by 2050 (85%) for a total of 12,100 units, leaving 2,200 units of growth potential to be absorbed by neighborhoods in the Otay CPA. For these, AECOM assumed 35% capture of proposed units in each of the three main Otay planning areas. The High Growth Estimate assumes that all proposed units (6,215) will be built.

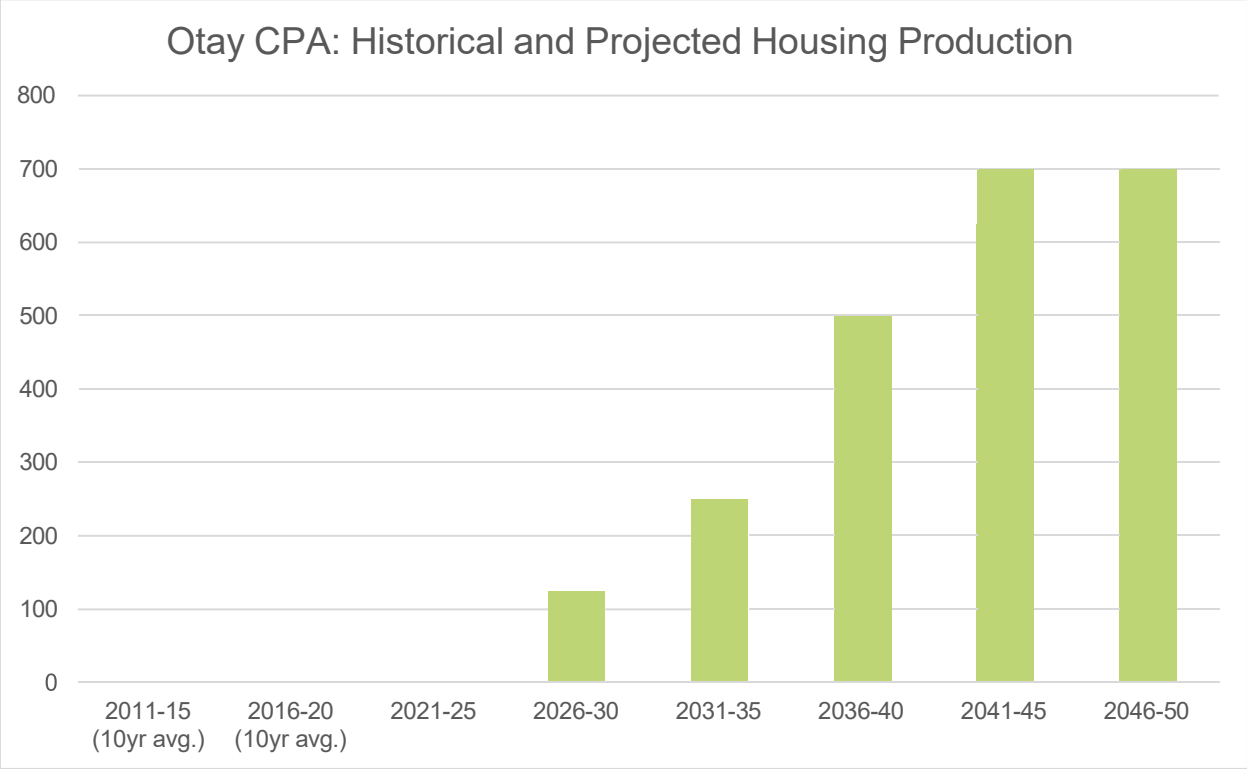
Table 15: Otay Ranch Estimated 2020-2050 Residential Build-Out

Area	Proposed Units	Capture 2020-2050	2020-2050 Buildout (Rounded)
Chula Vista	**14,200**	**85%**	**12,100**
Unincorporated San Diego County			
East Otay Mesa Business Park Specific Plan	3,158	35%	1,100
The Otay Ranch Resort Village 13 Specific Plan	1,938	35%	700
Otay Ranch Village 14 and Planning Areas 16/19	1,119	35%	400
Subtotal Unincorporated Area	**6,215**	**35%**	**2,200**
Total	**20,415**	**70%**	**14,300**

Source: AECOM

This growth is assumed to occur in Otay CPA starting in 2026 and increase steadily through 2050, as shown in Figure 6.

Figure 6: Otay CPA Residential Growth Projection 2020-2050 (Base Estimate)



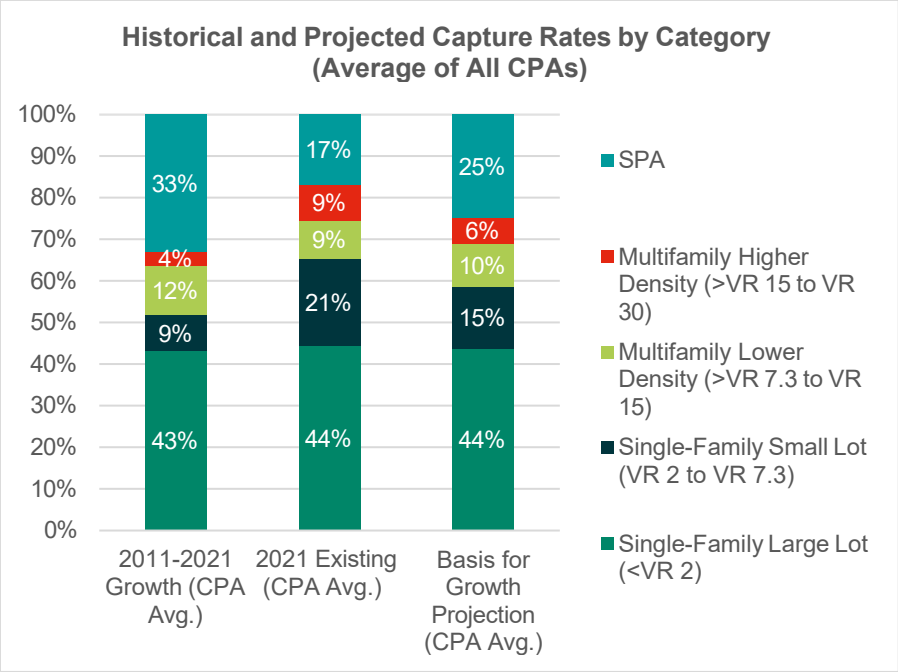
Source: AECOM

Allocation to Other CPAs Based on Historical Trends

As discussed above, total housing demand for the unincorporated county area is estimated at 12,239 units through 2050. Deducting the estimated 2,200 Otay CPA units leaves 10,039 units to be allocated across the other 23 CPAs. The allocation is conducted by applying capture rates based on historical trends: share of total inventory by CPA and density tier (historical fair share) and share of recent growth (2011-2021) by CPA and density tier. By weighting the

historical fair share and recent growth shares equally, long-term and short-term activity is reflected in the projection. Fair share, recent growth, and projection basis rates are shown in Figure 7.

Figure 7. Historical and Projected Residential Mix by Density Tier



Source: County Assessor, AECOM

Check Against Supply of Marketable Sites

The draft projections resulting from the prior steps are then checked against qualified supply (as shown in Table 11 and Table 12). Where the draft projections exceed qualified supply, excess demand is re-directed to the closest CPA with available capacity. A total of 558 units are re-directed in this way, with Pendleton-De Luz and Valle De Oro CPAs seeing the most redirected units. For example, the draft forecast for Pendleton-De Luz indicates demand for 212 single-family large lot units. However, because all future residential growth in the CPA is expected to be military housing (and not counted in this forecast), this demand is redirected to Bonsall (25% of the 212 units) and Fallbrook (75%). For Valle De Oro, forecast demand exceeds capacity for multifamily lower density (by 8 units) and multifamily higher density (by 42 units). This demand is redirected to the County Islands CPA. For a summary of all demand exceeding marketable site supply and how it is re-directed, see Table 46 in the Appendix.

Final Projections

The adjusted final Base estimate housing projections by CPA are shown in Table 16. For further breakdown by residential type, see Table 31, Table 33, Table 35, Table 37, and Table 39 in the Appendix. For charts showing incremental housing growth for 2000-2050 for the top-10 CPAs, see the Appendix section titled Incremental Housing Growth 2000-2050 for the Top 10 CPAs.

Table 16: Final Base Residential Unit Growth Projection by CPA

SPA	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	112	109	75	66	17	14	393
Barona	0	0	0	0	0	0	0
Bonsall	90	89	60	53	13	12	317
Central Mountain	29	29	19	17	5	3	102
County Islands	25	24	16	15	3	3	86
Crest-Dehesa	55	53	36	32	8	7	191
Desert	36	35	24	21	5	4	125
Fallbrook	471	459	313	277	69	58	1,647
Jamul-Dulzura	72	71	48	42	10	9	252
Julian	31	30	20	18	5	4	108
Lakeside	423	411	282	248	62	52	1,478
Mountain Empire	35	34	23	21	5	4	122
North County Metro	291	285	194	172	43	37	1,022
North Mountain	21	20	14	12	3	3	73
Otay	0	125	250	500	625	700	2,200
Pala-Pauma	23	22	15	13	4	3	80
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	5	5	3	3	1	1	18
Ramona	220	215	146	129	32	26	768
San Dieguito	391	382	258	229	58	48	1,366
Spring Valley	271	264	181	160	40	33	949
Sweetwater	42	41	28	25	6	5	147
Valle De Oro	90	87	59	53	13	11	313
Valley Center	138	134	92	81	20	17	482
Total	**2,871**	**2,924**	**2,156**	**2,187**	**1,047**	**1,054**	**12,239**

Source: AECOM

Residential Growth by CPA and Density Tier (High Estimate)

The Base Growth estimate reflects a market- and trend-based understanding of housing growth in which only a portion of marketable SPA capacity is built out, based on historical patterns. However, it is arguable that all SPA projects could develop to their full entitled capacity by 2050.

Adopted SPA projects offer some advantages to developers and builders over other kinds of projects. SPA sites are already entitled, which can expedite the development process and allow builders to exploit market opportunities quickly. SPA projects are typically large and offer scale economies that lower per-unit costs. SPA projects allow greater control in master planning, landscape design, residential design, and provision of community amenities, which can increase marketability and consumer appeal. SPA projects are well known to residents, as they have long contributed a large proportion of unincorporated area growth (23% of all unincorporated area units as of 2021 and 33% of units developed between 2011 and 2021). Finally, entitled SPA units may be exempt from future regulatory policies that could influence the cost and location of housing development over the 2020-2050 period. Such policies may include restrictions on development in rural areas because of environmental sensitivity or fire-hazards. A pool of entitled SPA sites exempt from new housing policies could absorb displaced growth from the unincorporated area and incorporated San Diego County jurisdictions.

In order to consider a scenario where all potential SPA units are built out, AECOM developed a High growth estimate. The High growth estimate adds buildout of all entitled unbuilt SPA units not included in the Base estimate (excepting those shown in as non-viable). As such, the High estimate is additive to the Base Estimate. This High estimate and the Base estimate together describe a broad range of potential outcomes.

As a result of adding all remaining marketable unbuilt SPA capacity, totaling 10,758 units, total estimated residential growth in the High estimate reaches 22,997 units as shown in Table 17.

Table 17: Final High Residential Growth Projection by CPA

Item	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	112	109	75	66	17	14	393
Barona	0	0	0	0	0	0	0
Bonsall	90	89	60	53	13	12	317
Central Mountain	29	29	19	17	5	3	102
County Islands	25	24	16	15	3	3	86
Crest-Dehesa	55	53	36	32	8	7	191
Desert	458	465	341	342	159	159	1,924
Fallbrook	614	604	420	386	121	111	2,256
Jamul-Dulzura	573	581	424	424	193	192	2,387
Julian	31	30	20	18	5	4	108
Lakeside	499	488	339	306	90	80	1,802
Mountain Empire	35	34	23	21	5	4	122
North County Metro	361	356	246	225	68	63	1,319
North Mountain	105	106	77	76	34	33	431
Otay	911	1,052	934	1,194	957	1,034	6,082
Pala-Pauma	23	22	15	13	4	3	80
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	5	5	3	3	1	1	18
Ramona	345	342	240	224	78	71	1,300
San Dieguito	447	439	300	271	78	68	1,603
Spring Valley	308	302	209	188	53	46	1,106
Sweetwater	42	41	28	25	6	5	147
Valle De Oro	90	87	59	53	13	11	313
Valley Center	238	236	167	157	57	55	910
Total	**5,396**	**5,494**	**4,051**	**4,109**	**1,968**	**1,979**	**22,997**

Illustration: San Dieguito Housing Projections

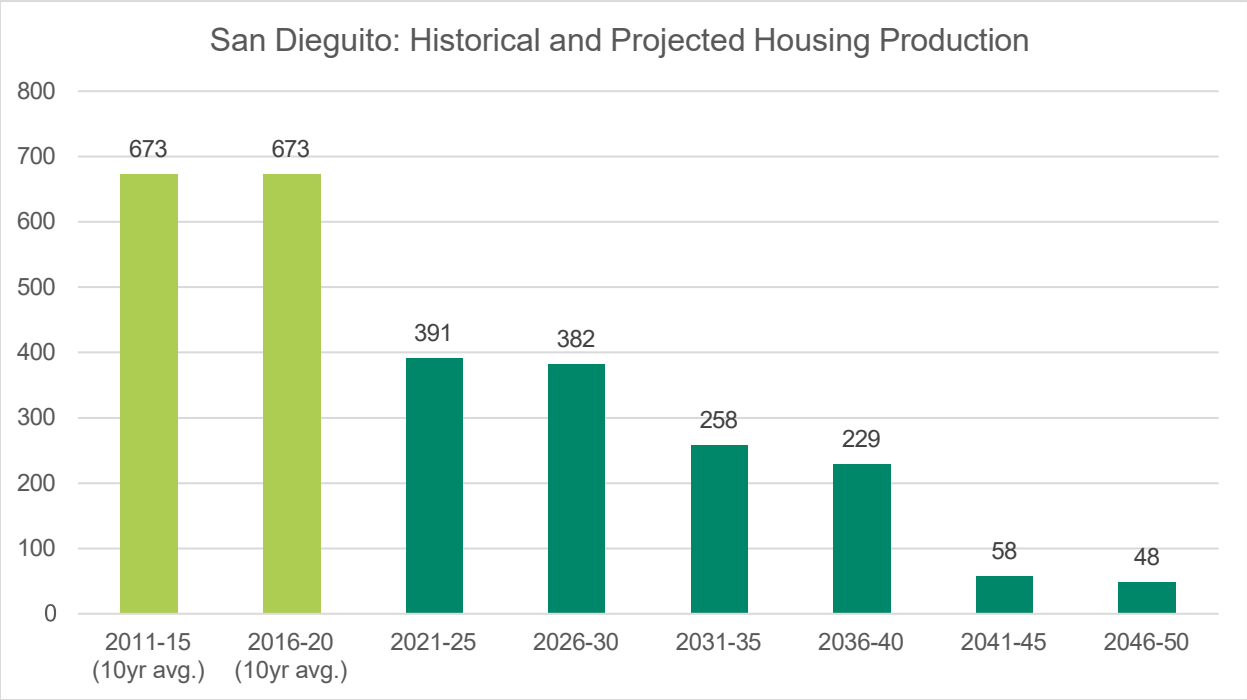
This section uses the San Dieguito CPA to illustrate how estimated housing growth is allocated to each CPA.

In 2021, San Dieguito contributed 13,599 units of housing supply to the unincorporated area. Of these, SPA units are the largest category (8,063 units, 4.5% of the total unincorporated area), followed by single family large lot (4,798, 2.7%), multifamily lower density (341, 0.2%), single family small lot (315, 0.2%), and multifamily higher density (83, 0.05%).

Between 2011 and 2021, San Dieguito added 1,345 units, equivalent to 20.8% of the total growth in the unincorporated area during that time. Of these, SPA units comprised the largest share, totaling 1,047 units and 16.2% of total unincorporated area growth, followed by single family large lot (222, 3.4%), multifamily lower density (57, 0.9%), single family small lot (13, 0.2%), and multifamily higher density (6, 0.1 %).

By applying a 50/50 weighting to both the historical fair share and recent growth trends to estimate capture of total unincorporated area growth, the draft San Dieguito housing forecast yields 1,425 units. However, in two housing categories, forecast growth exceeds the marketable site supply—by 6 units for single-family small lot and 54 units for multifamily lower density. This excess growth potential is redirected to North County Metro, which has marketable site capacity in both categories. After adjusting for these excess units, the final San Dieguito growth forecast totals 1,366 units, which is equivalent to 11.2% of all forecast growth in the unincorporated county area between 2020 and 2050. The resulting sixty-year growth trend for San Dieguito is shown in Figure 8.

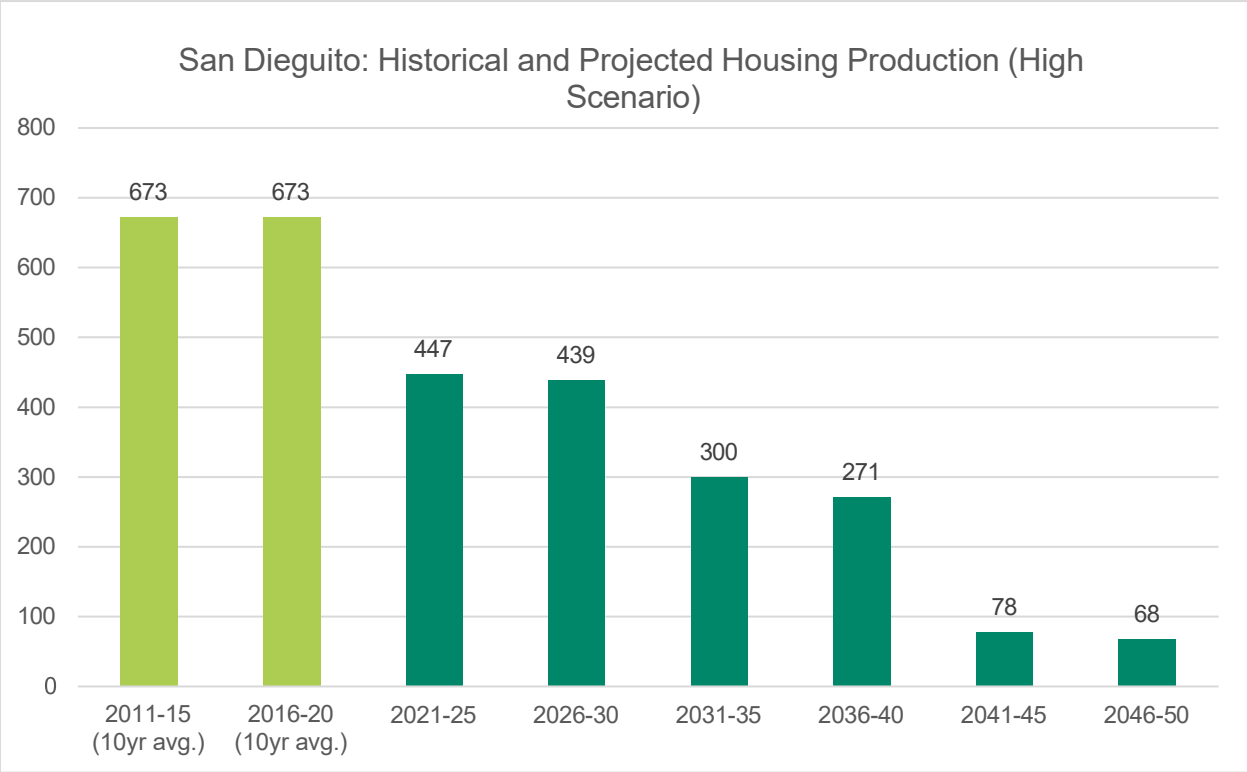
Figure 8. Illustration: Housing Growth Allocation Analysis for San Dieguito CPA (Base estimate)



Source: The County of San Diego, AECOM

Adding the 237 remaining unbuilt SPA units in San Dieguito increases the final San Dieguito growth forecast to 1,603 units in the High estimate, which is equivalent to 7% of all growth in the unincorporated county area between 2020 and 2050. The resulting growth trend for San Dieguito is shown in Figure 9.

Figure 9. Illustration: Housing Growth Allocation Analysis for San Dieguito CPA (High Estimate)



Source: The County of San Diego, AECOM

6. Employment Projections

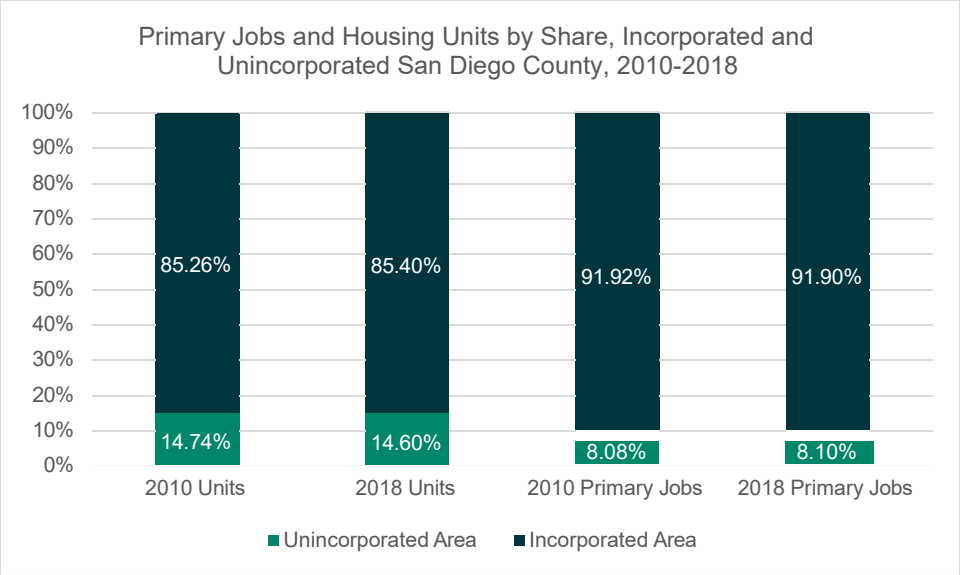
The quantity and location of employment is a meaningful contributor to GHG emissions. To forecast employment growth in the unincorporated county area, AECOM combined two separate analyses. For all CPAs but the Otay CPA, AECOM assumed that employment growth is tied to residential growth and historic ratios of jobs to housing. For Otay, AECOM prepared a separate analysis and referenced recent market research anticipating considerable job growth for the CPA. Both approaches are discussed further below.

(Please note that the employment projections in this report exclude military jobs. Military employment reflects Department of Defense decisions about deployment rather than socioeconomic and regulatory trends. Military employment is overwhelmingly concentrated in Pendleton de Luz CPA. Most statistical agencies exclude non-civilian jobs from their employment forecasts, while SANDAG forecasts static growth in Pendleton de Luz through 2050.)

Employment to Residential Unit Trends

In both 2010 and 2018, as shown in Figure 10, the unincorporated county area contributed approximately 15% of all of San Diego County residential units and 8% of the jobs. The stability of these rates reflects the historical role the unincorporated area has played within the county in supporting residential communities that export workers to concentrated job centers largely outside of the unincorporated area.

Figure 10. County Housing Unit and Jobs Contributions by Area, 2010-2018



Sources: U.S. Census Bureau, SANDAG

However, existing employment in the unincorporated County varies greatly by CPA, as shown in

Table 18. In general, areas with the highest residential development also saw the largest job increases. From 2010 to 2018, total employment in the unincorporated areas of the county grew by approximately 15,000 jobs. A large share of this growth was concentrated in CPAs with larger populations, such as San Dieguito and North County Metro, although rural communities that opened or expanded resort/casinos, such as Barona, Jamul-Dulzura, and Alpine, saw considerable growth as well. Otay, which is discussed further below, also saw considerable growth due to the large warehousing and industrial complex under development there.

Table 18: Historic Employment Growth: 2010- 2018

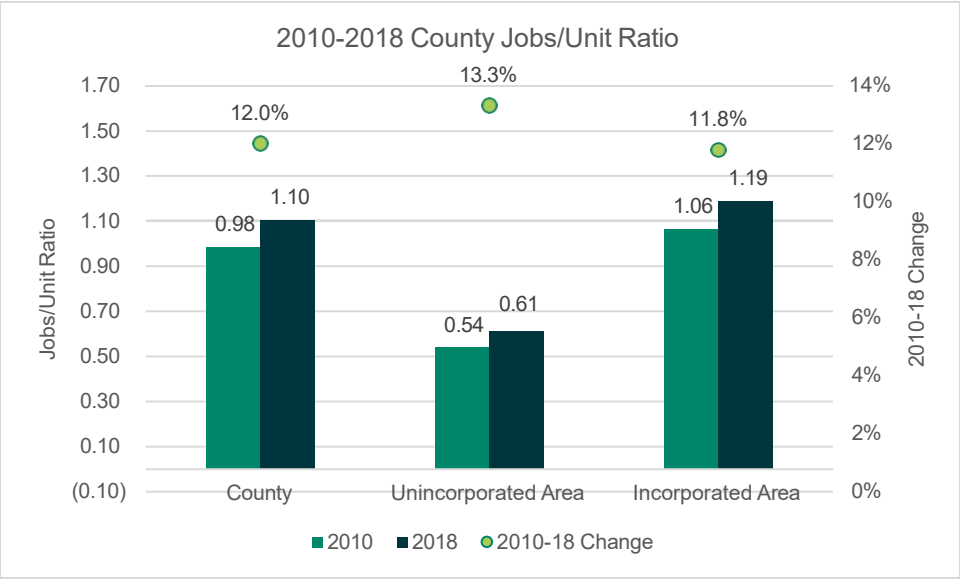
CPA	2018		Growth 2010-18	
	#	Share of Total	#	Annual Rate

Alpine	5,541	5%	1,217	3.1%
Barona	3,046	3%	2,849	40.8%
Bonsall	2,915	3%	57	0.2%
Central Mountain	410	0%	-113	-3.0%
County Islands	180	0%	-279	-11.0%
Crest-Dehesa	3,096	3%	-749	-2.7%
Desert	1,135	1%	-567	-4.9%
Fallbrook	8,263	8%	272	0.4%
Jamul-Dulzura	2,035	2%	826	6.7%
Julian	760	1%	20	0.3%
Lakeside	14,918	14%	171	0.1%
Mountain Empire	1,185	1%	-22	-0.2%
North County Metro	9,552	9%	2,394	3.7%
North Mountain	581	1%	-353	-5.8%
Otay	3,127	3%	1,002	4.9%
Pala-Pauma	5,327	5%	993	2.6%
Pendleton-De Luz	2,083	2%	906	7.4%
Rainbow	1,188	1%	-743	-5.9%
Ramona	5,974	6%	1,149	2.7%
San Dieguito	13,536	13%	3,214	3.4%
Spring Valley	7,887	7%	277	0.4%
Sweetwater	1,839	2%	530	4.3%
Valle De Oro	7,986	7%	1,470	2.6%
Valley Center	4,416	4%	528	1.6%
Total Unincorporated	**106,980**	**100%**	**15,049**	**1.9%**

Source: LEHD

Even with this employment growth in the unincorporated area, the incorporated area still maintained a significantly higher jobs/residential unit ratio. As shown in Figure 11, the incorporated area had a 1.19 jobs/unit ratio in 2018, compared to a 0.61 rate for the unincorporated area. This means that for every unit in the incorporated area, there are 1.19 full-time jobs, compared with 0.61 jobs in the unincorporated area. Also notable is the fact that for both the incorporated and unincorporated areas, the jobs/housing ratio increased, which suggests that San Diego County is importing an increasing number of workers from outside the county and that housing growth is not keeping up.

Figure 11. County Jobs/Unit Ratio 2010-2018



Sources: U.S. Census Bureau, LEHD Origin-Destination Employment Statistics, SANDAG, AECOM

Each CPA varies significantly in the ratio of jobs to housing units, as shown in Table 19, from 0.18 in the rural Central Mountain to 12.48 in Barona, which is driven by the CPA's casino. Table 19 also shows the ratio can fluctuate widely by CPA over time, as new residential developments and employment entities spring up in areas with low existing inventory. However, for the larger CPAs such as Lakeside, Spring Valley, and Fallbrook, the ratios remain more stable over time.

On the basis of this broader observed stability, the employment forecast assumes that for all CPAs excepting Otay, the current jobs/residential unit ratio provides a reasonable basis for forecasting long-term employment growth. For the current ratio, AECOM used the 2020 values shown in Table 19.

Table 19: Jobs/Housing Unit Ratio by CPA: 2010-2020

	2010[1]	2018[1]	2020[2]
Alpine	0.66	0.83	0.83
Barona	0.98	12.48	10.61
Bonsall	0.74	0.72	0.71
Central Mountain	0.24	0.18	0.18
County Islands	0.77	0.30	0.27
Crest-Dehesa	1.08	0.85	0.83
Desert	0.48	0.31	0.32
Fallbrook	0.50	0.51	0.49
Jamul-Dulzura	0.38	0.62	0.67
Julian	0.43	0.42	0.43
Lakeside	0.53	0.53	0.52
Mountain Empire	0.40	0.39	0.39
North County Metro	0.45	0.60	0.61
North Mountain	0.61	0.36	0.33
Otay	303.57	521.17	521.17
Pala-Pauma	2.20	2.68	2.83
Pendleton-De Luz	0.16	0.28	0.30
Rainbow	2.73	1.60	1.54
Ramona	0.39	0.47	0.47
San Dieguito	0.94	1.06	1.13
Spring Valley	0.37	0.38	0.38
Sweetwater	0.28	0.40	0.42
Valle De Oro	0.42	0.51	0.53
Valley Center	0.59	0.64	0.64
Total Unincorporated	**0.54**	**0.61**	**0.62**

Source: SANDAG, U.S. Census, AECOM

(1) SANDAG for units, U.S. Census Bureau, LEHD Origin-Destination Employment Statistics for primary employment

(2) SANDAG for units, AECOM for employment, based on LEHD 2018 primary employment projected to 2020 using historical 2002-2018 average employment growth per CPA.

Otay Employment Projections

The East Otay Mesa Business Park Specific Plan offers great potential for the expansion of employment and business activities in the Otay CPA. This potential is complemented to a lesser degree by the Specific Plans for The Otay Ranch Resort Village and for Otay Ranch Village 14 and Planning Areas 16/19, which propose a resort and complementary neighborhood commercial and civic uses for the anticipated residential buildout.

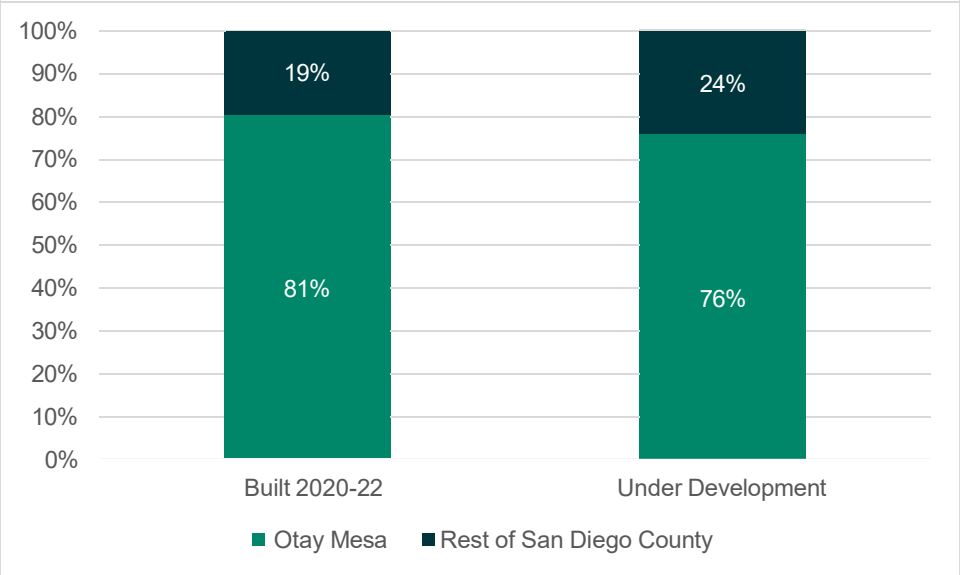
While the Otay CPA has historically hosted little employment outside the operation of detention facilities, the East Otay Mesa Business Park Specific Plan allows for a mix of heavy and light industrial, R&D, office, and other mixed uses[21]. Located east of the Otay Mesa Community Planning Area in the City of San Diego and north of the US-

[21]County of San Diego Otay Mesa Specific Plan https://www.sandiegocounty.gov/content/dam/sdc/pds/advance/specificplans/(3-17-21)%20PDS2020-SPA-20-002%20FINAL.pdf

Mexico Border, the plan has drawn steady and growing interest for industrial land uses, including manufacturing, R&D, warehousing, and logistics.

Proximity to current and proposed border entry points and other major industrial and commercial centers in the incorporated cities, as well as access to well-developed transportation infrastructure make this SPA a highly desirable area for trade-supporting commercial development. The Otay Mesa industrial submarket has seen addition of approximately 5 million square feet of industrial space since 2020, which represents approximately 80 percent of all new industrial space in the San Diego Region. According to CoStar and shown in Figure 10, there are approximately 3.1 million square feet of industrial space in the current development pipeline (proposed and under construction), which is 76 percent of all industrial space under development.

Figure 12: Recent Industrial Growth and Development Pipeline (Square Feet)



Source: CoStar

Amazon opened its largest regional distribution center here in 2021 and now employs over 1,500 workers. Other proposed projects including Otay Crossings, California Crossings, Landmark at Otay, and Majestic Sunroad Center sites. Citing this activity, a market feasibility study by Meyers Research produced in 2020 for the County estimates future demand of between 17.6 million and 24 million square feet of industrial space in the SPA.[22]

Using the Meyers study as a basis, AECOM developed the employment projections shown in Table 20 for the East Otay Mesa Business Park Specific Plan area. To extend the forecast beyond the 20 years assumed by the Meyers study, AECOM applied the same annual absorption rate for years 21 through 30. However, in the High estimate, the forecast industrial build-out exhausts the land area potential for the SPA, and so industrial build-out is capped at the regulatory limit. This results in a Base employment estimate of 14,080 and a High estimate of 14,958[23]. From a land use perspective, the Base estimate uses 73% of the land area (94% of total designated as industrial, 4% of total designated as office/commercial), and the High estimate use 78% (100% of industrial, 6% of office/commercial).

Employment projections for the two other SPAs in the Otay CPA, the Otay Ranch Resort Village Specific Plan and the Otay Ranch Village 14 and Planning Areas 16/19, are also shown in in Table 20. These add employment of 88 in the Base estimate and 281 in the High estimate from a hotel use, a small quantity of neighborhood commercial, and accompanying police and fire department uses. The Base scenario, as with the residential unit projections, assumes a 35% buildout of regulated capacity, and the High scenario a 100% buildout.

[22] Meyers Research and Metro Study, “Assessment of the Most Marketable Uses East Otay Mesa Specific Plan” (2020) https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/EOMBusinessParkSPA/Pre-PC/EOMSP%20Market%20Study%20Final.pdf

[23] The original High uncapped industrial forecast yielded estimated employment of 19,448, which would have exceeded the available land area in the SPA designated for industrial use by 30%.

Table 20: Otay CPA Employment Forecast 2020-2050

	Employment Density[1]	Base Estimate[2]	High Estimate[3,4]
East Otay Mesa Business Park Specific Plan			
Industrial[5]			
Heavy Industrial	2,000 sq.ft./FTE	5,144	5,465
Mixed Industrial	2,000 sq.ft./FTE	5,441	5,780
Light Industrial	1,500 sq.ft./FTE	3,495	3,713
Subtotal Industrial		**14,080**	**14,958**
Commercial[5]			
District Commercial	500 sq.ft./FTE	13	19
Technology Business Park	350 sq.ft./FTE	637	963
Subtotal Office and Commercial		**650**	**982**
The Otay Ranch Resort Village Specific Plan			
Commercial and Civic[6]		**64**	**182**
Otay Ranch Village 14 and Planning Areas 16/19			
Commercial and Civic[7]		**24**	**69**
TOTAL		**14,818**	**16,191**

Source: Meyers Research and AECOM

(1) Employment Density assumptions from AECOM, based on recent trends

(2) "Base" industrial and commercial projections based on 20-year annual absorption rate for the "Realistic" scenario forecast by Meyers Research extended for 30 years through 2050.

(3) "High" industrial projections based on 20-year annual absorption rate for the "Optimistic" scenario forecast by Meyers Research but extended for 30 years through 2050 and capped at the SPA designated industrial capacity

(4) "High" office and commercial projections based on 20-year annual absorption rate for the "Optimistic" scenario forecast by Meyers Research extended for 30 years through 2050.

(5) Industrial and Office allocation in proportion with SPA land use designations

(6) Includes 200-key hotel, 20,000 sq.ft. of commercial, 500-student school, police and fire. Base/High at 35%/100% buildout

(7) Includes 10,000 sq.ft. of commercial, 500-student school, police and fire. Base/High at 35%/100% buildout

Final Employment Projections

Combining projections from the Jobs/Unit analysis and the separate Otay analysis yield total estimated employment growth of 21,165 in the Base Scenario and 26,167 in the High Scenario, as shown in Table 21.

Table 21: Final Employment Growth Estimate and Jobs/Housing Unit Ratio by CPA: 2020-2050

	Base		High	
	Primary Jobs	Jobs/Unit Ratio	Primary Jobs	Jobs/Unit Ratio
Alpine	326	0.83	326	0.83
Barona	0	10.61	0	10.61
Bonsall	227	0.71	227	0.71
Central Mountain	18	0.18	18	0.18
County Islands	23	0.27	23	0.27
Crest-Dehesa	158	0.83	158	0.83
Desert	40	0.32	615	0.32
Fallbrook	814	0.49	1,116	0.49
Jamul-Dulzura	169	0.67	1,604	0.67
Julian	47	0.43	47	0.43
Lakeside	776	0.52	946	0.52
Mountain Empire	47	0.39	47	0.39
North County Metro	625	0.61	806	0.61
North Mountain	24	0.33	141	0.33
Otay	14,818	8.56	16,191	3.33
Pala-Pauma	227	2.83	227	2.83
Pendleton-De Luz	0	0.30	0	0.30
Rainbow	28	1.54	28	1.54
Ramona	360	0.47	609	0.47
San Dieguito	1,542	1.13	1,810	1.13
Spring Valley	363	0.38	424	0.38
Sweetwater	61	0.42	61	0.42
Valle De Oro	166	0.53	166	0.53
Valley Center	307	0.64	580	0.64
Total Unincorporated	**21,165**	**0.70**	**26,167**	**0.69**

Source: AECOM

7. Appendix

Military Installations and Tribal Lands

The military population is concentrated in the Pendleton de Luz CPA, where Camp Pendleton is located. The housing projections include the addition of 170 Large Lot Single Family units outside the Camp Pendleton. However, on-base population growth, which occurs solely at the discretion of the Department of Defense, is not included in the population projections.

DoF population projections cover areas in which tribal lands are located. Consequently, the projections include native groups, which are not broken out separately. Likewise, the AECOM population projections also do not treat the tribal population separately from the whole.

Population Projections

Table 22. Cumulative Population by CPA 2020-2050 Base Estimate

Population (Base)	2020-2050 Cumulative by Year							2020-2050 Change		
	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	17,882	18,199	18,505	18,714	18,896	18,942	18,979	1,097	6.1%	0.20%
Barona	771	771	771	771	771	771	771	0	0.0%	0.00%
Bonsall	10,341	10,583	10,821	10,980	11,119	11,152	11,182	841	8.1%	0.26%
Central Mountain	5,497	5,570	5,643	5,690	5,732	5,744	5,751	254	4.6%	0.15%
County Islands	2,040	2,132	2,220	2,278	2,332	2,342	2,352	312	15.3%	0.48%
Crest-Dehesa	10,068	10,228	10,382	10,486	10,577	10,599	10,618	550	5.5%	0.18%
Desert	5,030	5,084	5,137	5,173	5,204	5,211	5,217	187	3.7%	0.12%
Fallbrook	44,212	45,531	46,810	47,676	48,434	48,618	48,772	4,560	10.3%	0.33%
Jamul-Dulzura	9,533	9,753	9,969	10,114	10,240	10,269	10,295	762	8.0%	0.26%
Julian	3,552	3,615	3,676	3,716	3,752	3,762	3,770	218	6.1%	0.20%
Lakeside	75,992	77,202	78,371	79,167	79,860	80,029	80,170	4,178	5.5%	0.18%
Mountain Empire	7,968	8,065	8,158	8,221	8,278	8,291	8,301	333	4.2%	0.14%
North County Metro	44,348	45,197	46,023	46,582	47,072	47,191	47,293	2,945	6.6%	0.21%
North Mountain	3,704	3,753	3,799	3,831	3,858	3,865	3,872	168	4.5%	0.15%
Otay	8,081	8,081	8,460	9,213	10,704	12,520	14,540	6,459	79.9%	1.98%
Pala-Pauma	5,680	5,749	5,814	5,858	5,896	5,907	5,915	235	4.1%	0.14%
Pendleton-De Luz	43,767	43,767	43,767	43,767	43,767	43,767	43,767	0	0.0%	0.00%
Rainbow	2,160	2,175	2,190	2,199	2,208	2,211	2,214	54	2.5%	0.08%
Ramona	35,616	36,262	36,889	37,312	37,682	37,771	37,843	2,227	6.3%	0.20%
San Dieguito	35,534	36,666	37,766	38,504	39,152	39,312	39,443	3,909	11.0%	0.35%
Spring Valley	61,232	62,076	62,894	63,451	63,938	64,057	64,154	2,922	4.8%	0.16%
Sweetwater	12,700	12,824	12,945	13,027	13,099	13,116	13,130	430	3.4%	0.11%
Valle De Oro	41,666	41,921	42,166	42,331	42,478	42,513	42,542	876	2.1%	0.07%
Valley Center	18,301	18,681	19,048	19,298	19,516	19,569	19,613	1,312	7.2%	0.23%
Total	**505,675**	**513,885**	**522,224**	**528,359**	**534,565**	**537,529**	**540,504**	**34,829**	**6.9%**	**0.22%**

Table 23: Incremental Population Growth 2020-2050 in Five-Year Increments Base Estimate

Population (Base)	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	317	306	209	182	46	37	1,097
Barona	0	0	0	0	0	0	0
Bonsall	242	238	159	139	33	30	841
Central Mountain	73	73	47	42	12	7	254
County Islands	92	88	58	54	10	10	312
Crest-Dehesa	160	154	104	91	22	19	550
Desert	54	53	36	31	7	6	187
Fallbrook	1,319	1,279	866	758	184	154	4,560
Jamul-Dulzura	220	216	145	126	29	26	762
Julian	63	61	40	36	10	8	218
Lakeside	1,210	1,169	796	693	169	141	4,178
Mountain Empire	97	93	63	57	13	10	333
North County Metro	849	826	559	490	119	102	2,945
North Mountain	49	46	32	27	7	7	168
Otay	0	379	753	1,491	1,816	2,020	6,459
Pala-Pauma	69	65	44	38	11	8	235
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	15	15	9	9	3	3	54
Ramona	646	627	423	370	89	72	2,227
San Dieguito	1,132	1,100	738	648	160	131	3,909
Spring Valley	844	818	557	487	119	97	2,922
Sweetwater	124	121	82	72	17	14	430
Valle De Oro	255	245	165	147	35	29	876
Valley Center	380	367	250	218	53	44	1,312
Total	**8,210**	**8,339**	**6,135**	**6,206**	**2,964**	**2,975**	**34,829**

Table 24. Cumulative Population by CPA 2020-2050 High Estimate

Population (High)	2020-2050 Cumulative by Year							2020-2050 Change		
	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	17,882	18,199	18,505	18,714	18,896	18,942	18,979	1,097	6.1%	0.20%
Barona	771	771	771	771	771	771	771	0	0.0%	0.00%
Bonsall	10,341	10,583	10,821	10,980	11,119	11,152	11,182	841	8.1%	0.26%
Central Mountain	5,497	5,570	5,643	5,690	5,732	5,744	5,751	254	4.6%	0.15%
County Islands	2,040	2,132	2,220	2,278	2,332	2,342	2,352	312	15.3%	0.48%
Crest-Dehesa	10,068	10,228	10,382	10,486	10,577	10,599	10,618	550	5.5%	0.18%
Desert	5,030	5,721	6,419	6,927	7,431	7,660	7,887	2,857	56.8%	1.51%
Fallbrook	44,212	45,932	47,614	48,776	49,832	50,155	50,449	6,237	14.1%	0.44%
Jamul-Dulzura	9,533	11,287	13,056	14,338	15,606	16,169	16,725	7,192	75.4%	1.89%
Julian	3,552	3,615	3,676	3,716	3,752	3,762	3,770	218	6.1%	0.20%
Lakeside	75,992	77,419	78,807	79,764	80,619	80,864	81,080	5,088	6.7%	0.22%
Mountain Empire	7,968	8,065	8,158	8,221	8,278	8,291	8,301	333	4.2%	0.14%
North County Metro	44,348	45,401	46,433	47,141	47,782	47,971	48,145	3,797	8.6%	0.27%
North Mountain	3,704	3,949	4,195	4,372	4,545	4,621	4,694	990	26.7%	0.79%
Otay	8,081	10,861	14,053	16,867	20,427	23,208	26,191	18,110	224.1%	4.00%
Pala-Pauma	5,680	5,749	5,814	5,858	5,896	5,907	5,915	235	4.1%	0.14%
Pendleton-De Luz	43,767	43,767	43,767	43,767	43,767	43,767	43,767	0	0.0%	0.00%
Rainbow	2,160	2,175	2,190	2,199	2,208	2,211	2,214	54	2.5%	0.08%
Ramona	35,616	36,628	37,626	38,321	38,963	39,181	39,378	3,762	10.6%	0.34%
San Dieguito	35,534	36,828	38,092	38,950	39,717	39,932	40,118	4,584	12.9%	0.41%
Spring Valley	61,232	62,192	63,128	63,771	64,343	64,500	64,636	3,404	5.6%	0.18%
Sweetwater	12,700	12,824	12,945	13,027	13,099	13,116	13,130	430	3.4%	0.11%
Valle De Oro	41,666	41,921	42,166	42,331	42,478	42,513	42,542	876	2.1%	0.07%
Valley Center	18,301	18,957	19,604	20,059	20,482	20,632	20,775	2,474	13.5%	0.42%
Total	505,675	520,774	536,085	547,324	558,652	564,010	569,370	63,695	12.6%	0.40%

Table 25: Incremental Population Growth 2020-2050 in Five-Year Increments High Estimate

Population (High)	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	317	306	209	182	46	37	1,097
Barona	0	0	0	0	0	0	0
Bonsall	242	238	159	139	33	30	841
Central Mountain	73	73	47	42	12	7	254
County Islands	92	88	58	54	10	10	312
Crest-Dehesa	160	154	104	91	22	19	550
Desert	691	698	508	504	229	227	2,857
Fallbrook	1,720	1,682	1,162	1,056	323	294	6,237
Jamul-Dulzura	1,754	1,769	1,282	1,268	563	556	7,192
Julian	63	61	40	36	10	8	218
Lakeside	1,427	1,388	957	855	245	216	5,088
Mountain Empire	97	93	63	57	13	10	333
North County Metro	1,053	1,032	708	641	189	174	3,797
North Mountain	245	246	177	173	76	73	990
Otay	2,780	3,192	2,814	3,560	2,781	2,983	18,110
Pala-Pauma	69	65	44	38	11	8	235
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	15	15	9	9	3	3	54
Ramona	1,012	998	695	642	218	197	3,762
San Dieguito	1,294	1,264	858	767	215	186	4,584
Spring Valley	960	936	643	572	157	136	3,404
Sweetwater	124	121	82	72	17	14	430
Valle De Oro	255	245	165	147	35	29	876
Valley Center	656	647	455	423	150	143	2,474
Total	**15,099**	**15,311**	**11,239**	**11,328**	**5,358**	**5,360**	**63,695**

Residential Projections

All Units

Table 26. Cumulative Residential Growth by CPA 2020-2050 Base Estimate

Residential (Base)	2020-2050 Cumulative by Year							2020-2050 Change		
All Units	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	6,721	6,833	6,942	7,017	7,083	7,100	7,114	393	5.8%	0.19%
Barona	287	287	287	287	287	287	287	0	0.0%	0.00%
Bonsall	4,088	4,178	4,267	4,327	4,380	4,393	4,405	317	7.8%	0.25%
Central Mountain	2,318	2,347	2,376	2,395	2,412	2,417	2,420	102	4.4%	0.14%
County Islands	591	616	640	656	671	674	677	86	14.6%	0.45%
Crest-Dehesa	3,671	3,726	3,779	3,815	3,847	3,855	3,862	191	5.2%	0.17%
Desert	3,540	3,576	3,611	3,635	3,656	3,661	3,665	125	3.5%	0.12%
Fallbrook	16,765	17,236	17,695	18,008	18,285	18,354	18,412	1,647	9.8%	0.31%
Jamul-Dulzura	3,308	3,380	3,451	3,499	3,541	3,551	3,560	252	7.6%	0.25%
Julian	1,843	1,874	1,904	1,924	1,942	1,947	1,951	108	5.9%	0.19%
Lakeside	28,228	28,651	29,062	29,344	29,592	29,654	29,706	1,478	5.2%	0.17%
Mountain Empire	3,064	3,099	3,133	3,156	3,177	3,182	3,186	122	4.0%	0.13%
North County Metro	16,154	16,445	16,730	16,924	17,096	17,139	17,176	1,022	6.3%	0.20%
North Mountain	1,686	1,707	1,727	1,741	1,753	1,756	1,759	73	4.3%	0.14%
Otay	6	6	131	381	881	1,506	2,206	2,200	36666.7%	21.76%
Pala-Pauma	2,021	2,044	2,066	2,081	2,094	2,098	2,101	80	4.0%	0.13%
Pendleton-De Luz	7,560	7,560	7,560	7,560	7,560	7,560	7,560	0	0.0%	0.00%
Rainbow	747	752	757	760	763	764	765	18	2.4%	0.08%
Ramona	12,892	13,112	13,327	13,473	13,602	13,634	13,660	768	6.0%	0.19%
San Dieguito	13,036	13,427	13,809	14,067	14,296	14,354	14,402	1,366	10.5%	0.33%
Spring Valley	20,874	21,145	21,409	21,590	21,750	21,790	21,823	949	4.5%	0.15%
Sweetwater	4,553	4,595	4,636	4,664	4,689	4,695	4,700	147	3.2%	0.11%
Valle De Oro	15,606	15,696	15,783	15,842	15,895	15,908	15,919	313	2.0%	0.07%
Valley Center	7,051	7,189	7,323	7,415	7,496	7,516	7,533	482	6.8%	0.22%
Total	176,610	179,481	182,405	184,561	186,748	187,795	188,849	12,239	6.9%	0.22%

Table 27: Incremental Residential Growth 2020-2050 in Five-Year Increments Base Estimate

Residential (Base) *All Units*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	112	109	75	66	17	14	393
Barona	0	0	0	0	0	0	0
Bonsall	90	89	60	53	13	12	317
Central Mountain	29	29	19	17	5	3	102
County Islands	25	24	16	15	3	3	86
Crest-Dehesa	55	53	36	32	8	7	191
Desert	36	35	24	21	5	4	125
Fallbrook	471	459	313	277	69	58	1,647
Jamul-Dulzura	72	71	48	42	10	9	252
Julian	31	30	20	18	5	4	108
Lakeside	423	411	282	248	62	52	1,478
Mountain Empire	35	34	23	21	5	4	122
North County Metro	291	285	194	172	43	37	1,022
North Mountain	21	20	14	12	3	3	73
Otay	0	125	250	500	625	700	2,200
Pala-Pauma	23	22	15	13	4	3	80
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	5	5	3	3	1	1	18
Ramona	220	215	146	129	32	26	768
San Dieguito	391	382	258	229	58	48	1,366
Spring Valley	271	264	181	160	40	33	949
Sweetwater	42	41	28	25	6	5	147
Valle De Oro	90	87	59	53	13	11	313
Valley Center	138	134	92	81	20	17	482
Total	**2,871**	**2,924**	**2,156**	**2,187**	**1,047**	**1,054**	**12,239**

Table 28. Cumulative Residential Growth by CPA 2020-2050 High Estimate

Residential (High)	2020-2050 Cumulative by Year							2020-2050 Change		
All Units	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	6,721	6,833	6,942	7,017	7,083	7,100	7,114	393	5.8%	0.19%
Barona	287	287	287	287	287	287	287	0	0.0%	0.00%
Bonsall	4,088	4,178	4,267	4,327	4,380	4,393	4,405	317	7.8%	0.25%
Central Mountain	2,318	2,347	2,376	2,395	2,412	2,417	2,420	102	4.4%	0.14%
County Islands	591	616	640	656	671	674	677	86	14.6%	0.45%
Crest-Dehesa	3,671	3,726	3,779	3,815	3,847	3,855	3,862	191	5.2%	0.17%
Desert	3,540	3,998	4,463	4,804	5,146	5,305	5,464	1,924	54.4%	1.46%
Fallbrook	16,765	17,379	17,983	18,403	18,789	18,910	19,021	2,256	13.5%	0.42%
Jamul-Dulzura	3,308	3,881	4,462	4,886	5,310	5,503	5,695	2,387	72.2%	1.83%
Julian	1,843	1,874	1,904	1,924	1,942	1,947	1,951	108	5.9%	0.19%
Lakeside	28,228	28,727	29,215	29,554	29,860	29,950	30,030	1,802	6.4%	0.21%
Mountain Empire	3,064	3,099	3,133	3,156	3,177	3,182	3,186	122	4.0%	0.13%
North County Metro	16,154	16,515	16,871	17,117	17,342	17,410	17,473	1,319	8.2%	0.26%
North Mountain	1,686	1,791	1,897	1,974	2,050	2,084	2,117	431	25.6%	0.76%
Otay	6	917	1,969	2,903	4,097	5,054	6,088	6,082	10136%	25.95%
Pala-Pauma	2,021	2,044	2,066	2,081	2,094	2,098	2,101	80	4.0%	0.13%
Pendleton-De Luz	7,560	7,560	7,560	7,560	7,560	7,560	7,560	0	0.0%	0.00%
Rainbow	747	752	757	760	763	764	765	18	2.4%	0.08%
Ramona	12,892	13,237	13,579	13,819	14,043	14,121	14,192	1,300	10.1%	0.32%
San Dieguito	13,036	13,483	13,922	14,222	14,493	14,571	14,639	1,603	12.3%	0.39%
Spring Valley	20,874	21,182	21,484	21,693	21,881	21,934	21,980	1,106	5.3%	0.17%
Sweetwater	4,553	4,595	4,636	4,664	4,689	4,695	4,700	147	3.2%	0.11%
Valle De Oro	15,606	15,696	15,783	15,842	15,895	15,908	15,919	313	2.0%	0.07%
Valley Center	7,051	7,289	7,525	7,692	7,849	7,906	7,961	910	12.9%	0.41%
Total	**176,610**	**182,006**	**187,500**	**191,551**	**195,660**	**197,628**	**199,607**	**22,997**	**13.0%**	**0.41%**

Table 29: Incremental Residential Growth 2020-2050 in Five-Year Increments High Estimate

Residential (High) *All Units*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	112	109	75	66	17	14	393
Barona	0	0	0	0	0	0	0
Bonsall	90	89	60	53	13	12	317
Central Mountain	29	29	19	17	5	3	102
County Islands	25	24	16	15	3	3	86
Crest-Dehesa	55	53	36	32	8	7	191
Desert	458	465	341	342	159	159	1,924
Fallbrook	614	604	420	386	121	111	2,256
Jamul-Dulzura	573	581	424	424	193	192	2,387
Julian	31	30	20	18	5	4	108
Lakeside	499	488	339	306	90	80	1,802
Mountain Empire	35	34	23	21	5	4	122
North County Metro	361	356	246	225	68	63	1,319
North Mountain	105	106	77	76	34	33	431
Otay	911	1,052	934	1,194	957	1,034	6,082
Pala-Pauma	23	22	15	13	4	3	80
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	5	5	3	3	1	1	18
Ramona	345	342	240	224	78	71	1,300
San Dieguito	447	439	300	271	78	68	1,603
Spring Valley	308	302	209	188	53	46	1,106
Sweetwater	42	41	28	25	6	5	147
Valle De Oro	90	87	59	53	13	11	313
Valley Center	238	236	167	157	57	55	910
Total	**5,396**	**5,494**	**4,051**	**4,109**	**1,968**	**1,979**	**22,997**

Single Family Large Lot (<VR 2)

Table 30. Cumulative Residential Growth by CPA 2020-2050 Base and High Estimates

Residential (Base & High)	2020-2050 Cumulative by Year							2020-2050 Change		
SF Large Lot (<VR 2)	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	4,754	4,833	4,910	4,963	5,010	5,022	5,032	278	5.8%	0.19%
Barona	287	287	287	287	287	287	287	0	0.0%	0.00%
Bonsall	2,832	2,903	2,973	3,020	3,062	3,072	3,081	249	8.8%	0.28%
Central Mountain	2,054	2,079	2,104	2,121	2,136	2,140	2,143	89	4.3%	0.14%
County Islands	0	0	0	0	0	0	0	0	NA	NA
Crest-Dehesa	3,314	3,369	3,422	3,458	3,490	3,498	3,505	191	5.8%	0.19%
Desert	2,278	2,301	2,323	2,338	2,351	2,354	2,357	79	3.5%	0.11%
Fallbrook	9,020	9,233	9,441	9,583	9,708	9,739	9,765	745	8.3%	0.26%
Jamul-Dulzura	3,289	3,340	3,390	3,424	3,454	3,461	3,467	178	5.4%	0.18%
Julian	1,747	1,778	1,808	1,828	1,846	1,851	1,855	108	6.2%	0.20%
Lakeside	3,660	3,722	3,782	3,823	3,859	3,868	3,876	216	5.9%	0.19%
Mountain Empire	2,687	2,722	2,756	2,779	2,800	2,805	2,809	122	4.5%	0.15%
North County Metro	3,414	3,516	3,616	3,684	3,744	3,759	3,772	358	10.5%	0.33%
North Mountain	1,686	1,707	1,727	1,741	1,753	1,756	1,759	73	4.3%	0.14%
Otay	0	0	0	0	0	0	0	0	NA	NA
Pala-Pauma	1,437	1,455	1,472	1,484	1,494	1,497	1,499	62	4.3%	0.14%
Pendleton-De Luz	7,560	7,560	7,560	7,560	7,560	7,560	7,560	0	0.0%	0.00%
Rainbow	617	622	627	630	633	634	635	18	2.9%	0.10%
Ramona	5,953	6,089	6,222	6,312	6,392	6,412	6,429	476	8.0%	0.26%
San Dieguito	4,599	4,687	4,773	4,831	4,883	4,896	4,907	308	6.7%	0.22%
Spring Valley	954	971	988	999	1,009	1,011	1,013	59	6.2%	0.20%
Sweetwater	2,980	3,012	3,043	3,064	3,083	3,088	3,092	112	3.8%	0.12%
Valle De Oro	6,799	6,869	6,937	6,983	7,024	7,034	7,043	244	3.6%	0.12%
Valley Center	6,683	6,806	6,926	7,008	7,080	7,098	7,113	430	6.4%	0.21%
Total	**78,604**	**79,861**	**81,087**	**81,920**	**82,658**	**82,842**	**82,999**	**4,395**	**5.6%**	**0.18%**

Table 31: Incremental Residential Growth Single Family Large Lot 2020-2050 in Five-Year Increments Base and High Estimates

Residential(Base, High) *(<VR 2)*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	79	77	53	47	12	10	278
Barona	0	0	0	0	0	0	0
Bonsall	71	70	47	42	10	9	249
Central Mountain	25	25	17	15	4	3	89
County Islands	0	0	0	0	0	0	0
Crest-Dehesa	55	53	36	32	8	7	191
Desert	23	22	15	13	3	3	79
Fallbrook	213	208	142	125	31	26	745
Jamul-Dulzura	51	50	34	30	7	6	178
Julian	31	30	20	18	5	4	108
Lakeside	62	60	41	36	9	8	216
Mountain Empire	35	34	23	21	5	4	122
North County Metro	102	100	68	60	15	13	358
North Mountain	21	20	14	12	3	3	73
Otay	0	0	0	0	0	0	0
Pala-Pauma	18	17	12	10	3	2	62
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	5	5	3	3	1	1	18
Ramona	136	133	90	80	20	17	476
San Dieguito	88	86	58	52	13	11	308
Spring Valley	17	17	11	10	2	2	59
Sweetwater	32	31	21	19	5	4	112
Valle De Oro	70	68	46	41	10	9	244
Valley Center	123	120	82	72	18	15	430
Total	**1,257**	**1,226**	**833**	**738**	**184**	**157**	**4,395**

Single Family Small Lot (VR 2 to VR 7.3)

Table 32. Cumulative Residential Growth by CPA Single Family Small Lot 2020-2050 Base and High Estimate

Residential (Base & High)	2020-2050 Cumulative by Year							2020-2050 Change		
SF Small Lot (VR 2-7.3)	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	136	143	150	155	159	160	161	25	18.4%	0.56%
Barona	0	0	0	0	0	0	0	0	NA	NA
Bonsall	359	374	389	399	408	410	412	53	14.8%	0.46%
Central Mountain	264	268	272	274	276	277	277	13	4.9%	0.16%
County Islands	564	569	574	577	580	581	582	18	3.2%	0.10%
Crest-Dehesa	0	0	0	0	0	0	0	0	NA	NA
Desert	815	825	835	842	848	850	851	36	4.4%	0.14%
Fallbrook	2,139	2,169	2,198	2,218	2,236	2,240	2,244	105	4.9%	0.16%
Jamul-Dulzura	0	0	0	0	0	0	0	0	NA	NA
Julian	96	96	96	96	96	96	96	0	0.0%	0.00%
Lakeside	9,491	9,612	9,730	9,811	9,882	9,900	9,915	424	4.5%	0.15%
Mountain Empire	353	353	353	353	353	353	353	0	0.0%	0.00%
North County Metro	1,515	1,545	1,574	1,594	1,612	1,616	1,620	105	6.9%	0.22%
North Mountain	0	0	0	0	0	0	0	0	NA	NA
Otay	0	0	0	0	0	0	0	0	NA	NA
Pala-Pauma	584	589	594	597	600	601	602	18	3.1%	0.10%
Pendleton-De Luz	0	0	0	0	0	0	0	0	NA	NA
Rainbow	130	130	130	130	130	130	130	0	0.0%	0.00%
Ramona	5,562	5,612	5,661	5,694	5,723	5,730	5,736	174	3.1%	0.10%
San Dieguito	302	306	310	312	314	315	315	13	4.3%	0.14%
Spring Valley	11,612	11,726	11,837	11,913	11,980	11,997	12,011	399	3.4%	0.11%
Sweetwater	1,013	1,023	1,033	1,040	1,046	1,047	1,048	35	3.5%	0.11%
Valle De Oro	2,256	2,276	2,295	2,308	2,320	2,323	2,325	69	3.1%	0.10%
Valley Center	17	17	17	17	17	17	17	0	0.0%	0.00%
Total	**37,209**	**37,634**	**38,049**	**38,331**	**38,581**	**38,644**	**38,696**	**1,487**	**4.0%**	**0.13%**

Table 33: Incremental Residential Growth 2020-2050 Single Family Small Lot in Five-Year Increments Base and High Estimate

Residential(Base, High) *(VR 2-7.3)*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	7	7	5	4	1	1	25
Barona	0	0	0	0	0	0	0
Bonsall	15	15	10	9	2	2	53
Central Mountain	4	4	2	2	1	0	13
County Islands	5	5	3	3	1	1	18
Crest-Dehesa	0	0	0	0	0	0	0
Desert	10	10	7	6	2	1	36
Fallbrook	30	29	20	18	4	4	105
Jamul-Dulzura	0	0	0	0	0	0	0
Julian	0	0	0	0	0	0	0
Lakeside	121	118	81	71	18	15	424
Mountain Empire	0	0	0	0	0	0	0
North County Metro	30	29	20	18	4	4	105
North Mountain	0	0	0	0	0	0	0
Otay	0	0	0	0	0	0	0
Pala-Pauma	5	5	3	3	1	1	18
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0	0
Ramona	50	49	33	29	7	6	174
San Dieguito	4	4	2	2	1	0	13
Spring Valley	114	111	76	67	17	14	399
Sweetwater	10	10	7	6	1	1	35
Valle De Oro	20	19	13	12	3	2	69
Valley Center	0	0	0	0	0	0	0
Total	**425**	**415**	**282**	**250**	**63**	**52**	**1,487**

Multifamily Lower Density (VR 7.3 – VR 15)

Table 34. Cumulative Residential Growth Multifamily Lower Density by CPA 2020-2050 Base and High Estimate

Residential (Base & High)	2020-2050 Cumulative by Year							2020-2050 Change		
MF Lower Density (VR 7.3 - 15)	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	1,042	1,062	1,081	1,094	1,106	1,109	1,111	69	6.6%	0.21%
Barona	0	0	0	0	0	0	0	0	NA	NA
Bonsall	396	400	404	407	409	410	411	15	3.8%	0.12%
Central Mountain	0	0	0	0	0	0	0	0	NA	NA
County Islands	12	15	18	20	22	22	22	10	85.2%	2.07%
Crest-Dehesa	0	0	0	0	0	0	0	0	NA	NA
Desert	114	114	114	114	114	114	114	0	0.0%	0.00%
Fallbrook	1,010	1,022	1,034	1,042	1,049	1,051	1,053	43	4.3%	0.14%
Jamul-Dulzura	0	0	0	0	0	0	0	0	NA	NA
Julian	0	0	0	0	0	0	0	0	NA	NA
Lakeside	7,567	7,713	7,855	7,952	8,038	8,059	8,077	510	6.7%	0.22%
Mountain Empire	21	21	21	21	21	21	21	0	0.0%	0.00%
North County Metro	331	364	396	418	437	442	446	115	34.8%	1.00%
North Mountain	0	0	0	0	0	0	0	0	NA	NA
Otay	0	0	0	0	0	0	0	0	NA	NA
Pala-Pauma	0	0	0	0	0	0	0	0	NA	NA
Pendleton-De Luz	0	0	0	0	0	0	0	0	NA	NA
Rainbow	0	0	0	0	0	0	0	0	NA	NA
Ramona	443	455	466	474	481	483	484	41	9.2%	0.30%
San Dieguito	327	327	327	327	327	327	327	0	0.0%	0.00%
Spring Valley	4,643	4,707	4,769	4,812	4,850	4,859	4,867	224	4.8%	0.16%
Sweetwater	0	0	0	0	0	0	0	0	NA	NA
Valle De Oro	182	182	182	182	182	182	182	0	0.0%	0.00%
Valley Center	0	6	12	16	20	21	22	22	NA	NA
Total	**16,089**	**16,389**	**16,680**	**16,880**	**17,057**	**17,101**	**17,138**	**1,049**	**6.5%**	**0.21%**

Table 35: Incremental Residential Growth 2020-2050 Multifamily Lower Density in Five-Year Increments Base and High Estimate

Residential(Base, High) *(VR 7.3-15)*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	20	19	13	12	3	2	69
Barona	0	0	0	0	0	0	0
Bonsall	4	4	3	2	1	1	15
Central Mountain	0	0	0	0	0	0	0
County Islands	3	3	2	2	0	0	10
Crest-Dehesa	0	0	0	0	0	0	0
Desert	0	0	0	0	0	0	0
Fallbrook	12	12	8	7	2	2	43
Jamul-Dulzura	0	0	0	0	0	0	0
Julian	0	0	0	0	0	0	0
Lakeside	146	142	97	86	21	18	510
Mountain Empire	0	0	0	0	0	0	0
North County Metro	33	32	22	19	5	4	115
North Mountain	0	0	0	0	0	0	0
Otay	0	0	0	0	0	0	0
Pala-Pauma	0	0	0	0	0	0	0
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0	0
Ramona	12	11	8	7	2	1	41
San Dieguito	0	0	0	0	0	0	0
Spring Valley	64	62	43	38	9	8	224
Sweetwater	0	0	0	0	0	0	0
Valle De Oro	0	0	0	0	0	0	0
Valley Center	6	6	4	4	1	1	22
Total	**300**	**291**	**200**	**177**	**44**	**37**	**1,049**

Multifamily Higher Density (VR 15 – VR 30)

Table 36. Cumulative Residential Growth Multifamily Higher Density by CPA 2020-2050 Base and High Estimate

Residential (Base & High)	2020-2050 Cumulative by Year							2020-2050 Change		
MF Higher Density (VR 15-30)	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	659	665	671	675	678	679	680	21	3.2%	0.10%
Barona	0	0	0	0	0	0	0	0	NA	NA
Bonsall	0	0	0	0	0	0	0	0	NA	NA
Central Mountain	0	0	0	0	0	0	0	0	NA	NA
County Islands	16	33	49	60	70	72	74	58	370.5%	5.30%
Crest-Dehesa	0	0	0	0	0	0	0	0	NA	NA
Desert	0	0	0	0	0	0	0	0	NA	NA
Fallbrook	2,434	2,460	2,485	2,502	2,517	2,521	2,524	90	3.7%	0.12%
Jamul-Dulzura	0	0	0	0	0	0	0	0	NA	NA
Julian	0	0	0	0	0	0	0	0	NA	NA
Lakeside	6,258	6,324	6,388	6,432	6,471	6,481	6,489	231	3.7%	0.12%
Mountain Empire	0	0	0	0	0	0	0	0	NA	NA
North County Metro	405	418	431	440	448	450	452	47	11.6%	0.37%
North Mountain	0	0	0	0	0	0	0	0	NA	NA
Otay	0	0	0	0	0	0	0	0	NA	NA
Pala-Pauma	0	0	0	0	0	0	0	0	NA	NA
Pendleton-De Luz	0	0	0	0	0	0	0	0	NA	NA
Rainbow	0	0	0	0	0	0	0	0	NA	NA
Ramona	591	610	629	642	653	656	658	67	11.3%	0.36%
San Dieguito	80	82	84	85	86	86	86	6	7.5%	0.24%
Spring Valley	2,774	2,798	2,821	2,837	2,851	2,855	2,858	84	3.0%	0.10%
Sweetwater	560	560	560	560	560	560	560	0	0.0%	0.00%
Valle De Oro	1,362	1,362	1,362	1,362	1,362	1,362	1,362	0	0.0%	0.00%
Valley Center	50	52	53	54	55	55	55	5	10.0%	0.32%
Total	**15,189**	**15,364**	**15,533**	**15,649**	**15,751**	**15,777**	**15,798**	**609**	**4.0%**	**0.13%**

Table 37: Incremental Residential Growth 2020-2050 in Five-Year Increments Base and High Estimate

Residential(Base, High) *(VR 15-30)*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	6	6	4	3	1	1	21
Barona	0	0	0	0	0	0	0
Bonsall	0	0	0	0	0	0	0
Central Mountain	0	0	0	0	0	0	0
County Islands	17	16	11	10	2	2	58
Crest-Dehesa	0	0	0	0	0	0	0
Desert	0	0	0	0	0	0	0
Fallbrook	26	25	17	15	4	3	90
Jamul-Dulzura	0	0	0	0	0	0	0
Julian	0	0	0	0	0	0	0
Lakeside	66	64	44	39	10	8	231
Mountain Empire	0	0	0	0	0	0	0
North County Metro	13	13	9	8	2	2	47
North Mountain	0	0	0	0	0	0	0
Otay	0	0	0	0	0	0	0
Pala-Pauma	0	0	0	0	0	0	0
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0	0
Ramona	19	19	13	11	3	2	67
San Dieguito	2	2	1	1	0	0	6
Spring Valley	24	23	16	14	4	3	84
Sweetwater	0	0	0	0	0	0	0
Valle De Oro	0	0	0	0	0	0	0
Valley Center	2	1	1	1	0	0	5
Total	**175**	**169**	**116**	**102**	**26**	**21**	**609**

SPA

Table 38. Cumulative SPA Residential Growth by CPA 2020-2050 Base Estimate

Residential (Base)	2020-2050 Cumulative by Year							2020-2050 Change		
SPA	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	130	130	130	130	130	130	130	0	0.0%	0.00%
Barona	0	0	0	0	0	0	0	0	NA	NA
Bonsall	500	500	500	500	500	500	500	0	0.0%	0.00%
Central Mountain	0	0	0	0	0	0	0	0	NA	NA
County Islands	0	0	0	0	0	0	0	0	NA	NA
Crest-Dehesa	357	357	357	357	357	357	357	0	0.0%	0.00%
Desert	333	336	339	341	343	343	343	10	3.0%	0.10%
Fallbrook	2,161	2,351	2,536	2,662	2,774	2,802	2,825	664	30.7%	0.90%
Jamul-Dulzura	19	40	61	75	87	90	93	74	383.0%	5.39%
Julian	0	0	0	0	0	0	0	0	NA	NA
Lakeside	1,252	1,280	1,307	1,326	1,342	1,346	1,349	97	7.7%	0.25%
Mountain Empire	3	3	3	3	3	3	3	0	0.0%	0.00%
North County Metro	10,490	10,603	10,714	10,789	10,856	10,873	10,887	397	3.8%	0.12%
North Mountain	0	0	0	0	0	0	0	0	NA	NA
Otay	6	6	131	381	881	1,506	2,206	2,200	36667%	21.76%
Pala-Pauma	0	0	0	0	0	0	0	0	NA	NA
Pendleton-De Luz	0	0	0	0	0	0	0	0	NA	NA
Rainbow	0	0	0	0	0	0	0	0	NA	NA
Ramona	343	346	349	351	353	353	353	10	2.9%	0.10%
San Dieguito	7,729	8,026	8,316	8,513	8,687	8,731	8,768	1,039	13.4%	0.42%
Spring Valley	890	942	993	1,028	1,059	1,067	1,073	183	20.6%	0.63%
Sweetwater	0	0	0	0	0	0	0	0	NA	NA
Valle De Oro	5,005	5,005	5,005	5,005	5,005	5,005	5,005	0	0.0%	0.00%
Valley Center	301	308	315	320	324	325	326	25	8.3%	0.27%
Total	**29,520**	**30,234**	**31,057**	**31,782**	**32,702**	**33,432**	**34,219**	**4,699**	**15.9%**	**0.49%**

Table 39: Incremental Residential SPA Growth 2020-2050 in Five-Year Increments Base Estimate

Residential (Base) *(SPA)*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	0	0	0	0	0	0	0
Barona	0	0	0	0	0	0	0
Bonsall	0	0	0	0	0	0	0
Central Mountain	0	0	0	0	0	0	0
County Islands	0	0	0	0	0	0	0
Crest-Dehesa	0	0	0	0	0	0	0
Desert	3	3	2	2	0	0	10
Fallbrook	190	185	126	112	28	23	664
Jamul-Dulzura	21	21	14	12	3	3	74
Julian	0	0	0	0	0	0	0
Lakeside	28	27	19	16	4	3	97
Mountain Empire	0	0	0	0	0	0	0
North County Metro	113	111	75	67	17	14	397
North Mountain	0	0	0	0	0	0	0
Otay	0	125	250	500	625	700	2,200
Pala-Pauma	0	0	0	0	0	0	0
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0	0
Ramona	3	3	2	2	0	0	10
San Dieguito	297	290	197	174	44	37	1,039
Spring Valley	52	51	35	31	8	6	183
Sweetwater	0	0	0	0	0	0	0
Valle De Oro	0	0	0	0	0	0	0
Valley Center	7	7	5	4	1	1	25
Total	**714**	**823**	**725**	**920**	**730**	**787**	**4,699**

Table 40. Cumulative Residential SPA Growth by CPA 2020-2050 High Estimate

Residential (High)	2020-2050 Cumulative by Year							2020-2050 Change		
SPA	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	130	130	130	130	130	130	130	0	0.0%	0.00%
Barona	0	0	0	0	0	0	0	0	NA	NA
Bonsall	500	500	500	500	500	500	500	0	0.0%	0.00%
Central Mountain	0	0	0	0	0	0	0	0	NA	NA
County Islands	0	0	0	0	0	0	0	0	NA	NA
Crest-Dehesa	357	357	357	357	357	357	357	0	0.0%	0.00%
Desert	333	758	1,191	1,510	1,833	1,987	2,142	1,809	543.6%	6.40%
Fallbrook	2,161	2,494	2,824	3,057	3,278	3,358	3,434	1,273	58.9%	1.56%
Jamul-Dulzura	19	541	1,072	1,462	1,856	2,042	2,228	2,209	11433.0 %	17.15%
Julian	0	0	0	0	0	0	0	0	NA	NA
Lakeside	1,252	1,356	1,460	1,536	1,610	1,642	1,673	421	33.6%	0.97%
Mountain Empire	3	3	3	3	3	3	3	0	0.0%	0.00%
North County Metro	10,490	10,673	10,855	10,982	11,102	11,144	11,184	694	6.6%	0.21%
North Mountain	0	84	170	233	297	328	358	358	NA	NA
Otay	6	917	1,969	2,903	4,097	5,054	6,088	6,082	101367%	25.95%
Pala-Pauma	0	0	0	0	0	0	0	0	NA	NA
Pendleton-De Luz	0	0	0	0	0	0	0	0	NA	NA
Rainbow	0	0	0	0	0	0	0	0	NA	NA
Ramona	343	471	601	697	794	840	885	542	158.2%	3.21%
San Dieguito	7,729	8,082	8,429	8,668	8,884	8,948	9,005	1,276	16.5%	0.51%
Spring Valley	890	979	1,068	1,131	1,190	1,211	1,230	340	38.2%	1.08%
Sweetwater	0	0	0	0	0	0	0	0	NA	NA
Valle De Oro	5,005	5,005	5,005	5,005	5,005	5,005	5,005	0	0.0%	0.00%
Valley Center	301	408	517	597	677	715	754	453	150.3%	3.11%
Total	**29,520**	**32,759**	**36,152**	**38,772**	**41,614**	**43,265**	**44,977**	**15,457**	**52.4%**	**1.41%**

Table 41: Incremental Residential SPA Growth 2020-2050 in Five-Year Increments High Estimate

Residential (High) *(SPA)*	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	0	0	0	0	0	0	0
Barona	0	0	0	0	0	0	0
Bonsall	0	0	0	0	0	0	0
Central Mountain	0	0	0	0	0	0	0
County Islands	0	0	0	0	0	0	0
Crest-Dehesa	0	0	0	0	0	0	0
Desert	425	433	319	323	154	155	1,809
Fallbrook	333	330	233	221	80	76	1,273
Jamul-Dulzura	522	531	390	394	186	186	2,209
Julian	0	0	0	0	0	0	0
Lakeside	104	104	76	74	32	31	421
Mountain Empire	0	0	0	0	0	0	0
North County Metro	183	182	127	120	42	40	694
North Mountain	84	86	63	64	31	30	358
Otay	911	1,052	934	1,194	957	1,034	6,082
Pala-Pauma	0	0	0	0	0	0	0
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0	0
Ramona	128	130	96	97	46	45	542
San Dieguito	353	347	239	216	64	57	1,276
Spring Valley	89	89	63	59	21	19	340
Sweetwater	0	0	0	0	0	0	0
Valle De Oro	0	0	0	0	0	0	0
Valley Center	107	109	80	80	38	39	453
Total	**3,239**	**3,393**	**2,620**	**2,842**	**1,651**	**1,712**	**15,457**

Employment Projections

Table 42. Cumulative Employment Growth by CPA 2020-2050 Base Estimate

Employment (Base)	2020-2050 Cumulative by Year							2020-2050 Change		
	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	5,571	5,664	5,754	5,816	5,871	5,885	5,897	326	5.8%	0.19%
Barona	3,046	3,046	3,046	3,046	3,046	3,046	3,046	0	0.0%	0.00%
Bonsall	2,922	2,987	3,050	3,093	3,131	3,141	3,149	227	7.8%	0.25%
Central Mountain	406	411	417	420	423	424	424	18	4.4%	0.14%
County Islands	157	163	170	174	178	179	179	23	14.6%	0.45%
Crest-Dehesa	3,046	3,092	3,136	3,166	3,192	3,199	3,205	158	5.2%	0.17%
Desert	1,132	1,143	1,155	1,162	1,169	1,171	1,172	40	3.5%	0.12%
Fallbrook	8,291	8,523	8,750	8,905	9,042	9,076	9,105	814	9.8%	0.31%
Jamul-Dulzura	2,223	2,271	2,319	2,351	2,379	2,386	2,392	169	7.6%	0.25%
Julian	801	814	827	836	844	846	848	47	5.9%	0.19%
Lakeside	14,815	15,037	15,253	15,401	15,531	15,564	15,591	776	5.2%	0.17%
Mountain Empire	1,189	1,203	1,216	1,225	1,233	1,235	1,236	47	4.0%	0.13%
North County Metro	9,871	10,049	10,223	10,342	10,447	10,473	10,496	625	6.3%	0.20%
North Mountain	551	558	564	569	573	574	575	24	4.3%	0.14%
Otay	4,071	6,541	9,010	11,480	13,950	16,419	18,889	14,818	364.0%	5.25%
Pala-Pauma	5,728	5,793	5,855	5,898	5,935	5,946	5,954	227	4.0%	0.13%
Pendleton-De Luz	2,282	2,282	2,282	2,282	2,282	2,282	2,282	0	0.0%	0.00%
Rainbow	1,147	1,154	1,162	1,167	1,171	1,173	1,174	28	2.4%	0.08%
Ramona	6,039	6,142	6,242	6,311	6,371	6,386	6,398	360	6.0%	0.19%
San Dieguito	14,718	15,160	15,591	15,882	16,141	16,206	16,260	1,542	10.5%	0.33%
Spring Valley	7,994	8,098	8,199	8,269	8,330	8,345	8,358	363	4.5%	0.15%
Sweetwater	1,890	1,907	1,924	1,936	1,946	1,949	1,951	61	3.2%	0.11%
Valle De Oro	8,255	8,302	8,348	8,379	8,407	8,414	8,420	166	2.0%	0.07%
Valley Center	4,493	4,581	4,666	4,725	4,777	4,789	4,800	307	6.8%	0.22%
Total	**110,636**	**114,921**	**119,160**	**122,833**	**126,368**	**129,106**	**131,801**	**21,165**	**19.1%**	**0.59%**

Table 43: Incremental Employment Growth 2020-2050 in Five-Year Increments Base Estimate

Employment (Base)	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	93	90	62	55	14	12	326
Barona	0	0	0	0	0	0	0
Bonsall	64	64	43	38	9	9	227
Central Mountain	5	5	3	3	1	1	18
County Islands	7	6	4	4	1	1	23
Crest-Dehesa	46	44	30	27	7	6	158
Desert	12	11	8	7	2	1	40
Fallbrook	233	227	155	137	34	29	814
Jamul-Dulzura	48	48	32	28	7	6	169
Julian	13	13	9	8	2	2	47
Lakeside	222	216	148	130	33	27	776
Mountain Empire	14	13	9	8	2	2	47
North County Metro	178	174	119	105	26	23	625
North Mountain	7	7	5	4	1	1	24
Otay	2,470	2,470	2,470	2,470	2,470	2,470	14,818
Pala-Pauma	65	62	43	37	11	9	227
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	8	8	5	5	2	2	28
Ramona	103	101	68	60	15	12	360
San Dieguito	441	431	291	259	65	54	1,542
Spring Valley	104	101	69	61	15	13	363
Sweetwater	17	17	12	10	2	2	61
Valle De Oro	48	46	31	28	7	6	166
Valley Center	88	85	59	52	13	11	307
Total	4,285	4,239	3,673	3,535	2,738	2,695	21,165

Table 44. Cumulative Employment Growth by CPA 2020-2050 High Estimate

Employment (High)	2020-2050 Cumulative by Year							2020-2050 Change		
	2020	2025	2030	2035	2040	2045	2050	#	%	CAGR
Alpine	5,571	5,664	5,754	5,816	5,871	5,885	5,897	326	5.8%	0.19%
Barona	3,046	3,046	3,046	3,046	3,046	3,046	3,046	0	0.0%	0.00%
Bonsall	2,922	2,987	3,050	3,093	3,131	3,141	3,149	227	7.8%	0.25%
Central Mountain	406	411	417	420	423	424	424	18	4.4%	0.14%
County Islands	157	163	170	174	178	179	179	23	14.6%	0.45%
Crest-Dehesa	3,046	3,092	3,136	3,166	3,192	3,199	3,205	158	5.2%	0.17%
Desert	1,132	1,278	1,427	1,536	1,645	1,696	1,747	615	54.4%	1.46%
Fallbrook	8,291	8,594	8,893	9,101	9,291	9,351	9,406	1,116	13.5%	0.42%
Jamul-Dulzura	2,223	2,608	2,998	3,283	3,568	3,698	3,827	1,604	72.2%	1.83%
Julian	801	814	827	836	844	846	848	47	5.9%	0.19%
Lakeside	14,815	15,077	15,333	15,511	15,672	15,719	15,761	946	6.4%	0.21%
Mountain Empire	1,189	1,203	1,216	1,225	1,233	1,235	1,236	47	4.0%	0.13%
North County Metro	9,871	10,092	10,309	10,460	10,597	10,639	10,677	806	8.2%	0.26%
North Mountain	551	585	620	645	670	681	692	141	25.6%	0.76%
Otay	4,071	6,770	9,468	12,167	14,865	17,564	20,262	16,191	397.7%	5.50%
Pala-Pauma	5,728	5,793	5,855	5,898	5,935	5,946	5,954	227	4.0%	0.13%
Pendleton-De Luz	2,282	2,282	2,282	2,282	2,282	2,282	2,282	0	0.0%	0.00%
Rainbow	1,147	1,154	1,162	1,167	1,171	1,173	1,174	28	2.4%	0.08%
Ramona	6,039	6,200	6,360	6,473	6,578	6,614	6,647	609	10.1%	0.32%
San Dieguito	14,718	15,223	15,718	16,057	16,363	16,451	16,528	1,810	12.3%	0.39%
Spring Valley	7,994	8,112	8,228	8,308	8,380	8,400	8,418	424	5.3%	0.17%
Sweetwater	1,890	1,907	1,924	1,936	1,946	1,949	1,951	61	3.2%	0.11%
Valle De Oro	8,255	8,302	8,348	8,379	8,407	8,414	8,420	166	2.0%	0.07%
Valley Center	4,493	4,645	4,795	4,901	5,001	5,038	5,073	580	12.9%	0.41%
Total	**110,636**	**116,002**	**121,337**	**125,878**	**130,290**	**133,568**	**136,803**	**26,167**	**23.7%**	**0.71%**

Table 45: Incremental Employment Growth 2020-2050 in Five-Year Increments High Estimate

Employment (High)	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2020-50
Alpine	93	90	62	55	14	12	326
Barona	0	0	0	0	0	0	0
Bonsall	64	64	43	38	9	9	227
Central Mountain	5	5	3	3	1	1	18
County Islands	7	6	4	4	1	1	23
Crest-Dehesa	46	44	30	27	7	6	158
Desert	146	149	109	109	51	51	615
Fallbrook	304	299	208	191	60	55	1,116
Jamul-Dulzura	385	390	285	285	130	129	1,604
Julian	13	13	9	8	2	2	47
Lakeside	262	256	178	161	47	42	946
Mountain Empire	14	13	9	8	2	2	47
North County Metro	221	218	150	137	42	38	806
North Mountain	34	35	25	25	11	11	141
Otay	2,699	2,699	2,699	2,699	2,699	2,699	16,191
Pala-Pauma	65	62	43	37	11	9	227
Pendleton-De Luz	0	0	0	0	0	0	0
Rainbow	8	8	5	5	2	2	28
Ramona	162	160	112	105	37	33	609
San Dieguito	505	496	339	306	88	77	1,810
Spring Valley	118	116	80	72	20	18	424
Sweetwater	17	17	12	10	2	2	61
Valle De Oro	48	46	31	28	7	6	166
Valley Center	152	150	106	100	36	35	580
Total	**5,366**	**5,335**	**4,541**	**4,411**	**3,278**	**3,236**	**26,167**

Application of Marketable Site Capacity Constraints

Table 46: Summary of Where Forecast Demand Exceeded Draft Projections

Community Plan Area and Housing Type	Unit Demand Exceeding Marketable Site Supply	CPA Where Excess Demand Redirected
Alpine		
SPA	5	Lakeside
Barona		
Single-Family Large Lot (<VR 2)	6	Lakeside
Bonsall		
SPA	17	Fallbrook
Crest-Dehesa		
Single-Family Small Lot (VR 2 to VR 7.3)	2	Alpine
Multifamily Higher Density (>VR 15 to VR 30)	2	Spring Valley
SPA	12	Lakeside
Desert		
Multifamily Lower Density (>VR 7.3 to VR 15)	3	Alpine
Multifamily Higher Density (>VR 15 to VR 30)	2	Fallbrook
Jamul-Dulzura		
Single-Family Small Lot (VR 2 to VR 7.3)	1	Alpine
Multifamily Lower Density (>VR 7.3 to VR 15)	1	Alpine
Julian		
Single-Family Small Lot (VR 2 to VR 7.3)	5	Ramona
Multifamily Higher Density (>VR 15 to VR 30)	1	Ramona
Mountain Empire		
Single-Family Small Lot (VR 2 to VR 7.3)	12	Desert
Multifamily Lower Density (>VR 7.3 to VR 15)	1	Ramona
North Mountain		
Multifamily Lower Density (>VR 7.3 to VR 15)	2	Valley Center
Multifamily Higher Density (>VR 15 to VR 30)	1	Valley Center
Pendleton-De Luz		
Single-Family Large Lot (<VR 2)	212	25% Bonsall, 75% Fallbrook
Rainbow		
Single-Family Small Lot (VR 2 to VR 7.3)	4	Fallbrook
San Dieguito		
Single-Family Small Lot (VR 2 to VR 7.3)	6	North County Metro
Multifamily Lower Density (>VR 7.3 to VR 15)	54	North County Metro
Sweetwater		
Multifamily Higher Density (>VR 15 to VR 30)	16	County Islands
Valle De Oro		
Multifamily Lower Density (>VR 7.3 to VR 15)	8	County Islands
Multifamily Higher Density (>VR 15 to VR 30)	42	County Islands
SPA	143	50% Spring Valley, 50% Jamul
TOTAL	**558**	

Table 47: SPA Summary

CPA	SPA	Total Inventory	Units Built 2011-2021	Pipeline	Unbuilt Capacity	Development Status	Summary Description
Alpine	Alpine Highlands	121	0	0	0	Built Out	Small Lot Development. Built out.
Bonsall	Champagne Gardens	0	0	0	0	Dormant	Mixed-use residential and commercial development approved in 1999. No development has yet occurred.
Bonsall	Lake Rancho	0	0	0	0	Built Out	Open space area spills over into Bonsall, but all units built are in Fallbrook.
Bonsall	Vista Valley	169	0	0	0	Built Out	Several large lot SFR and more small lot SFR at 4,000-5,000 square foot lots built around a Country Club. Built out.
Crest-Dehesa	Singing Hills	362	0	0	0	Built Out	Mix of Large and Small Lot SFR built around a golf course and open space. Built out.
Crest-Dehesa	Conrock					Built Out	Non-residential development.
Desert	Borrego	102	0	0	732	Dormant	Mostly Undeveloped GPA. 100 MFR units built on a single lot, which has become a hotel. Three other large lots remain vacant. No development since 1998.
Desert	Mesquite Trails	0	0	0	0	Dormant	Proposed residential development for SFR and mobile lots with community facilities. Proposed in 1976, EIR in 1993 found significant impacts. No development has yet occurred.
Desert	Rams Hill	268	1	1	1,079	Active	Residential, hotel, country club, golf course, entitled for 1,300 units, proposed in 1980, has 268 built units, with 1 unit built in the past 10 years.
Fallbrook	CampusPark	658	580	104	93	Active	Mostly built out, with 93 more units of capacity, likely small lot and detached condos. Eventually to add commercial and educational uses.
Fallbrook	Campus Park West	0	0	0	283	In Development	Recently approved expansion of Campus Park to include 283 SFR and detached condos.
Fallbrook	Lake Rancho	757	0	0	17	Built Out	SFR and mobile homes with community facilities. Ongoing turnover with new mobile homes, seen in building permit data, but minimal net new units.
Fallbrook	Meadowood	0	0	0	844	In Development	Ground broken for future 844 homes in 2021, likely to be fully built out based on location and historical growth trajectory.
Fallbrook	Pala Mesa	431	51	22	36	Active	Nearly fully built out GPA with active pipeline and recent home construction.
Fallbrook	Peppertree Park	218	0	0	0	Built Out	SFR Neighborhood with open space and community center or school. Built out.
Fallbrook	Sycamore Ranch	243	1	2	0	Built Out	SFR Neighborhood built around a Golf Course/Country Club. Built out, but 3 ADUs built recently.
Jamul-Dulzura	Otay Ranch	0	0	0	2,209	In Development	Major residential development with limited commercial uses. 2,209 Future units in Otay Ranch, extension of Chula Vista and Otay CPA Otay Ranch Concept.
Lakeside	East County Square	191	0	0	4	Built Out	SFR and commercial uses, including a big-box anchored retail center. Built out.
Lakeside	Greenhills Ranch	33	31	0	79	Active	SFR at 2.5 DU/AC and open space, phase 1 is built out and phase 2 will be subject to further amendments. Remaining capacity of 79 in phase 2.
Lakeside	High Meadows	23	16	3	224	Active	SFR development on lots ranging from 1/2 acre to 5 acres. Only a small portion of the 248 total have been built. Active development.
Lakeside	Lake Jennings	409	2	2	0	Built Out	SFR and Mobile Development. Built out.
Lakeside	Los Coches	232	3	1	0	Built Out	SFR Development. Built out.
Lakeside	Quail Canyon	171	2	0	0	Built Out	SFR Development. Built out.
Lakeside	USDRIP	234	1	0	114	Active	County Initiated Multi-use SPA
Mountain Empire	Jacumba Valley	3	0	0	1,244	Dormant	Solar power project, no units can be developed until after 2050.
North County Metro	Hidden Meadows	827	9	2	255	Active	SFR development including a country club and golf course, upzoned in 1988 to allow for 1083 units, 255 remaining unbuilt capacity. Active development.
North County Metro	Mountain Gate	3	0	0	153	Dormant	Large Lot SFR on active agricultural land planned, 153 units yield, entitled since 2001. Project has been dormant.
North County Metro	Sugarbush	45	45	0	0	Built Out	Small 45-unit SFR development. Built out.
North County Metro	Welk Resort	1,016	75	1	286	Active	Resort, mobile homes, condos, SFR SPA, wild, still some SFR capacity. Active development.
North Mountain	Warner Springs	0	0	0	358	Dormant	Entitled for SFR, no development has occurred, entitled since 1983, 358 units of capacity. Dormant.
Otay	East Otay	16	0	0	3,218	In Development	Large mixed-use, mostly industrial, includes village with 3,128 units entitled.
Otay	Otay Ranch	0	0	0	2,924	In Development	Two villages, 13 and 14, entitled for 2,924. There is also office space, commercial space, parks and recreational facilities in a large planned development.
Ramona	Holly Oaks	90	0	0	0	Built Out	SFR built out.
Ramona	Montecito Ranch	1	0	0	417	In Development	Future development site for SFR, school, institution, lots of open space, approved 2010, 417 future units. Greenfield undeveloped.
Ramona	Mt Woodson Ranch	196	0	0	0	Built Out	SFR development. Built out.
Ramona	Rancho San Vicente	241	0	0	0	Built Out	SFR development. Built out.
Ramona	Cummings Ranch	0	0	0	125	In Development	Recently approved 125 large lot SFR.
San Dieguito	4S Ranch	5,463	0	0	55	Active	Huge, multiple phases, stages and sizes, nearly built out, 55 units remaining. Active development.
San Dieguito	Cielo del Norte	2	0	0	122	Active	Entitled but mostly unbuilt, 2 units built with 122 remaining. Active development.
San Dieguito	El Apajo	48	3	0	0	Built Out	SFR 47 units built. Built out.

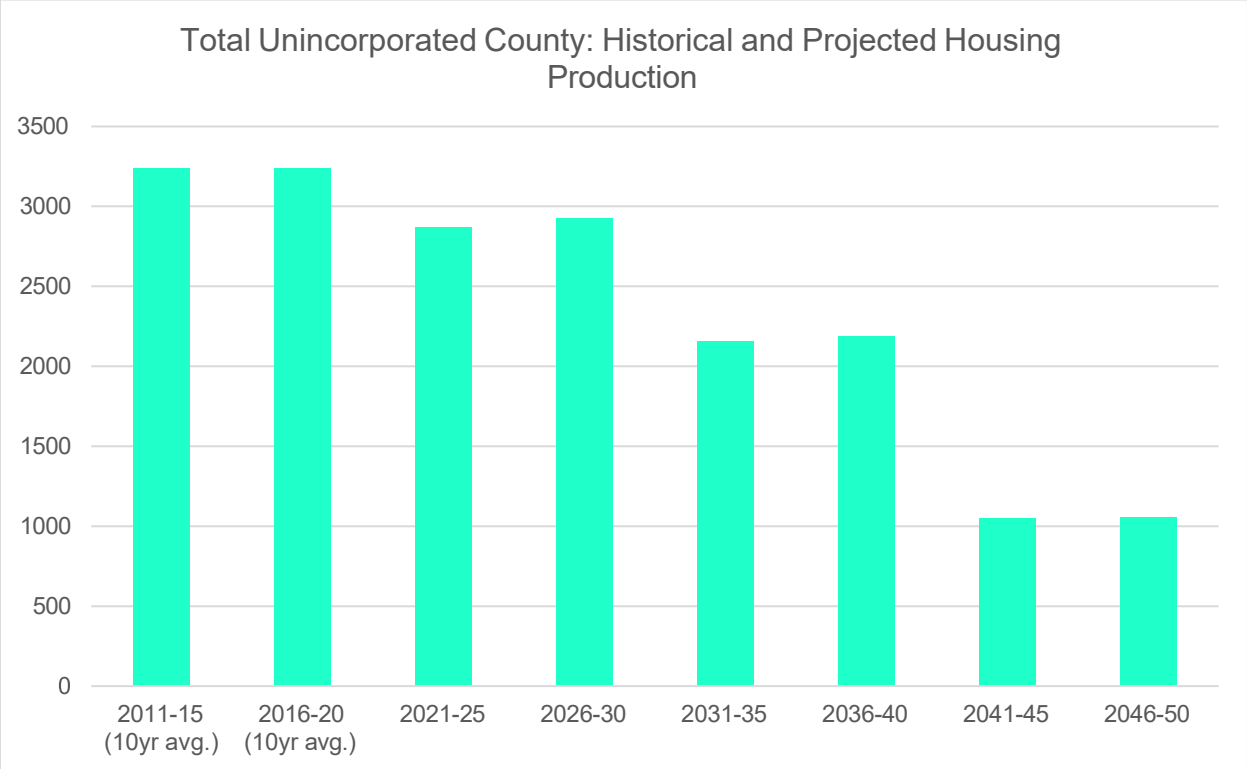
San Dieguito	Fairbanks Ranch	649	14	5	0	Built Out	One of the original SFR GPA projects. Very high-end, large lot homes. Built out.
San Dieguito	HarmonyGrove	699	597	92	39	Active	Building and almost built out, pending the Harmony Grove South approval, 39 units at current capacity. Still Active development.
San Dieguito	HarmonyGrove Village S.	0	0	0	453	In Development	Recently approved project to add 453 units of SFR (small and large) and MFR (low density) along with community facilities.
San Dieguito	Rancho Cielo	235	109	10	93	Active	SFR mostly built out, perhaps another phase or preserved land, 93 units left.
San Dieguito	Rancho Santa Fe	102	0	0	0	Built Out	SFR development. Built out.
San Dieguito	Santa Fe Creek	39	6	0	5	Active	SFR. Nearly built out with 5 more units of remaining capacity. Active development.
San Dieguito	Santa Fe Valley	991	243	120	123	Active	Large multi-phase GPA project is mostly built. 123 remaining units across different subareas. Active development.
San Dieguito	Valiano	0	0	0	326	In Development	Recently approved project to add 326 SFR at varying densities.
Spring Valley	Pointe Spring	853	88	0	0	Active	County GPA.
Spring Valley	Sweetwater Place	0	0	0	122	In Development	Recently approved 122 small lot SFR on infill vacant space.
Spring Valley	Sweetwater Vista	0	0	0	218	In Development	Recently approved 218 small lot SFR or detached condos on infill commercial space.
Valle De Oro	Rancho San Diego	4,956	2	0	0	Built Out	Large, legacy GPAs, mostly SFR but also quite a lot of MFR and commercial, mixed-use development with multiple lot sizes and building types. Built out.
Valley Center	Champagne Gardens	1	0	0	0	Dormant	Complications with Entitlements and EIR, but no units and stalled development. Dormant.
Valley Center	Live Oak Ranch	1	0	0	148	Dormant	Entitled for 148 units, unclear status with EIR. Dormant.
Valley Center	Orchard Run	0	0	0	300	Active	SFR development, stalled for many years, construction has begun, 300 units to be completed.
Valley Center	Woods Valley Ranch	287	16	0	5	Active	SFR almost completely built out, 5 units remaining.
Total		**21,386**	**1,895**	**365**	**16,703**		

Incremental Housing Growth 2000-2050 for the Top 10 CPAs

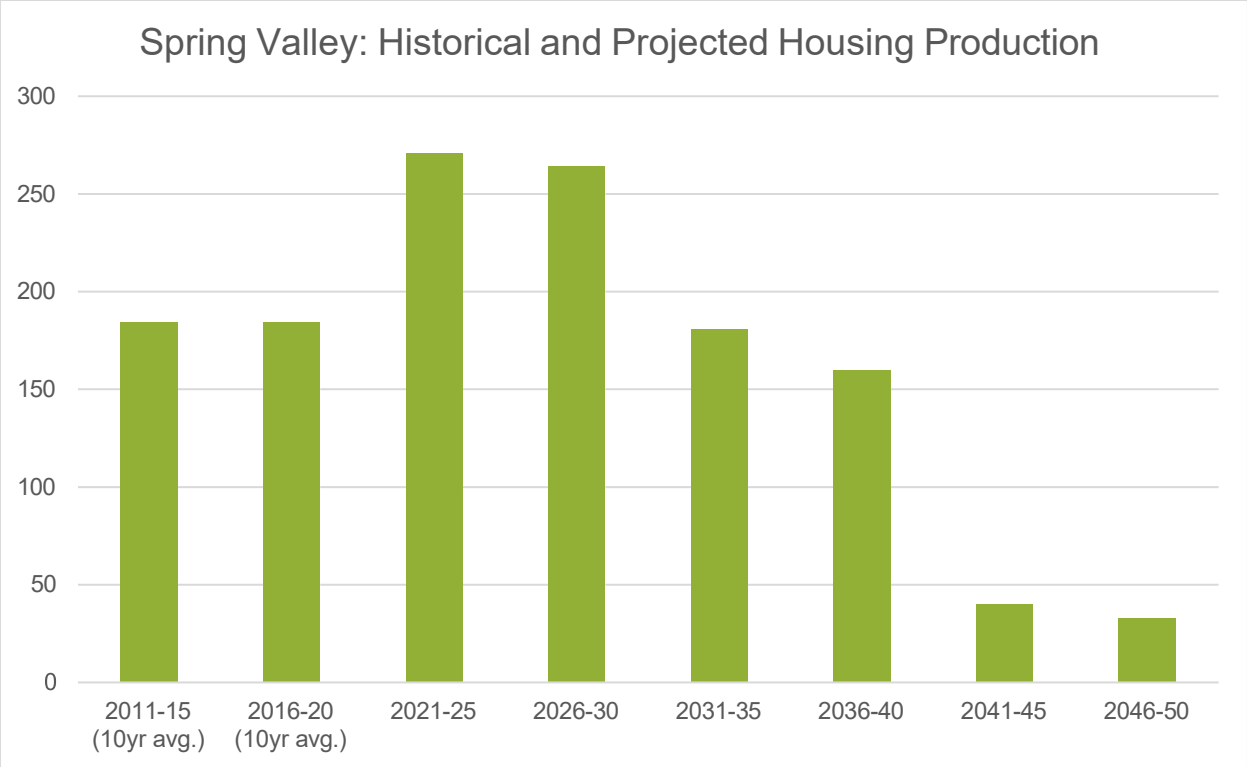
The following charts show recent historical (2000-2020) and projected Baseline (2020-2050) housing unit growth in 5-year increments for the total unincorporated county area as well as the top-10 CPAs by total housing inventory (excluding number eight Pendleton De-Luz, which has no forecast growth).

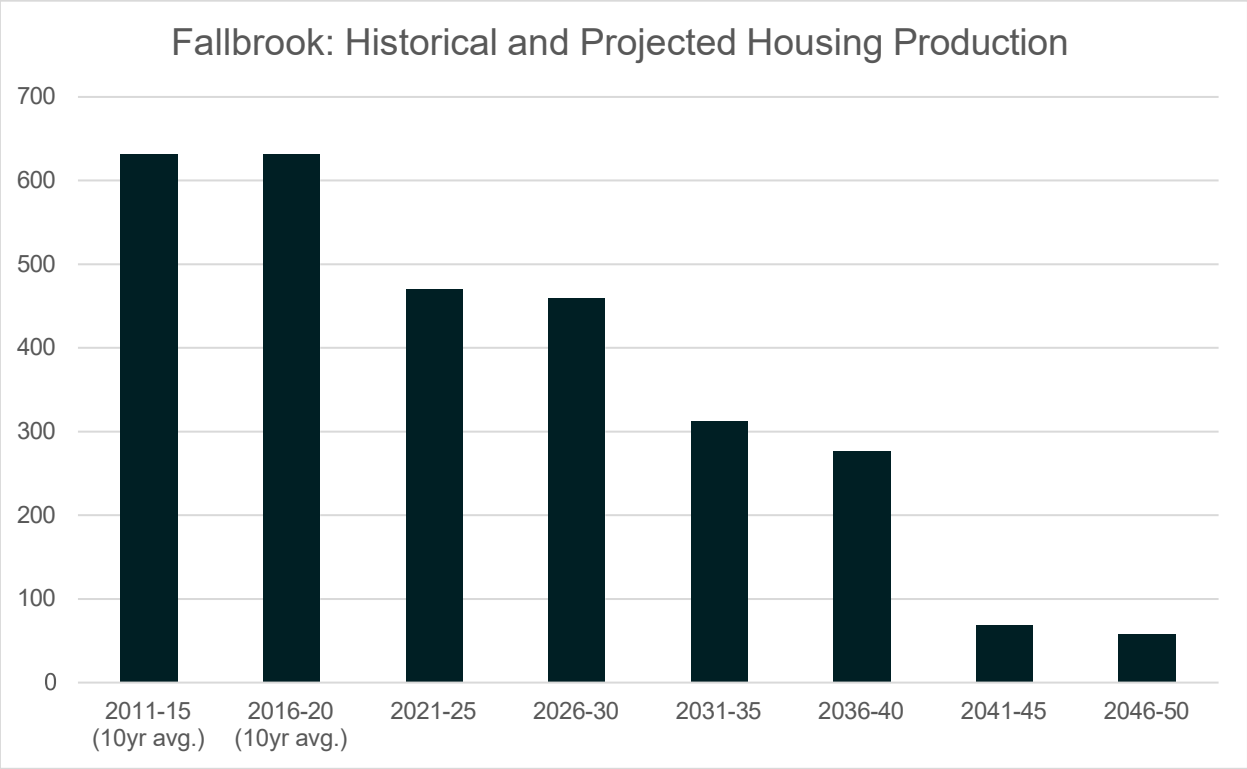
The top-10 CPAs by 2020 housing inventory are:

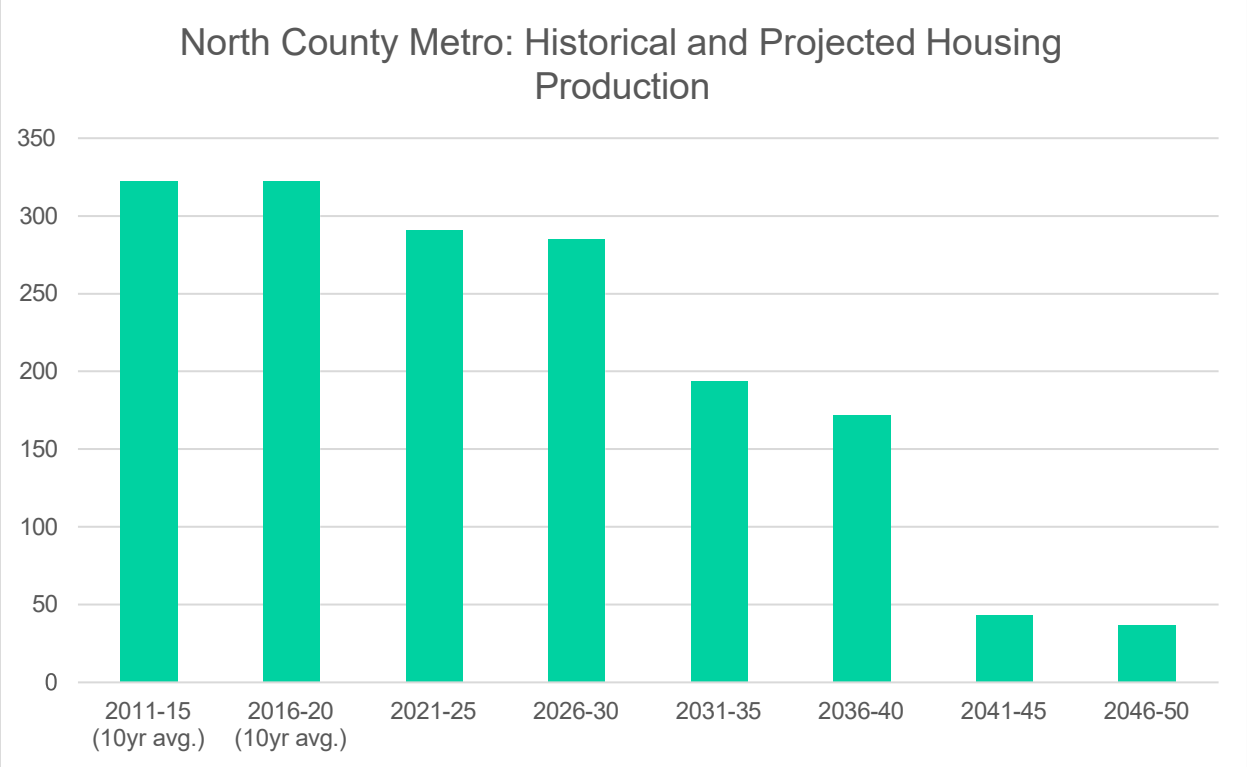
1. Lakeside
2. Spring Valley
3. Fallbrook
4. North County Metro
5. Valle de Oro
6. San Dieguito
7. Ramona
8. Pendleton De-Luz (not shown below, as there is no projected growth in this CPA)
9. Valley Center
10. Alpine

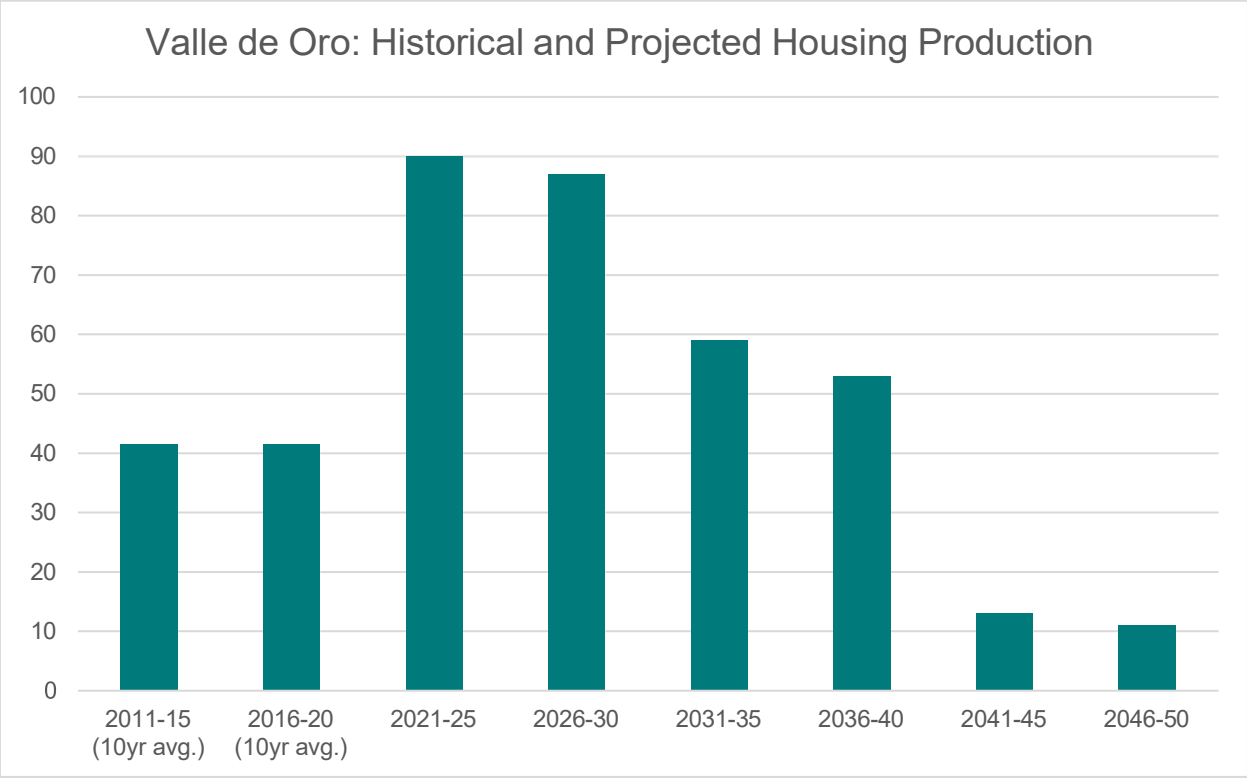


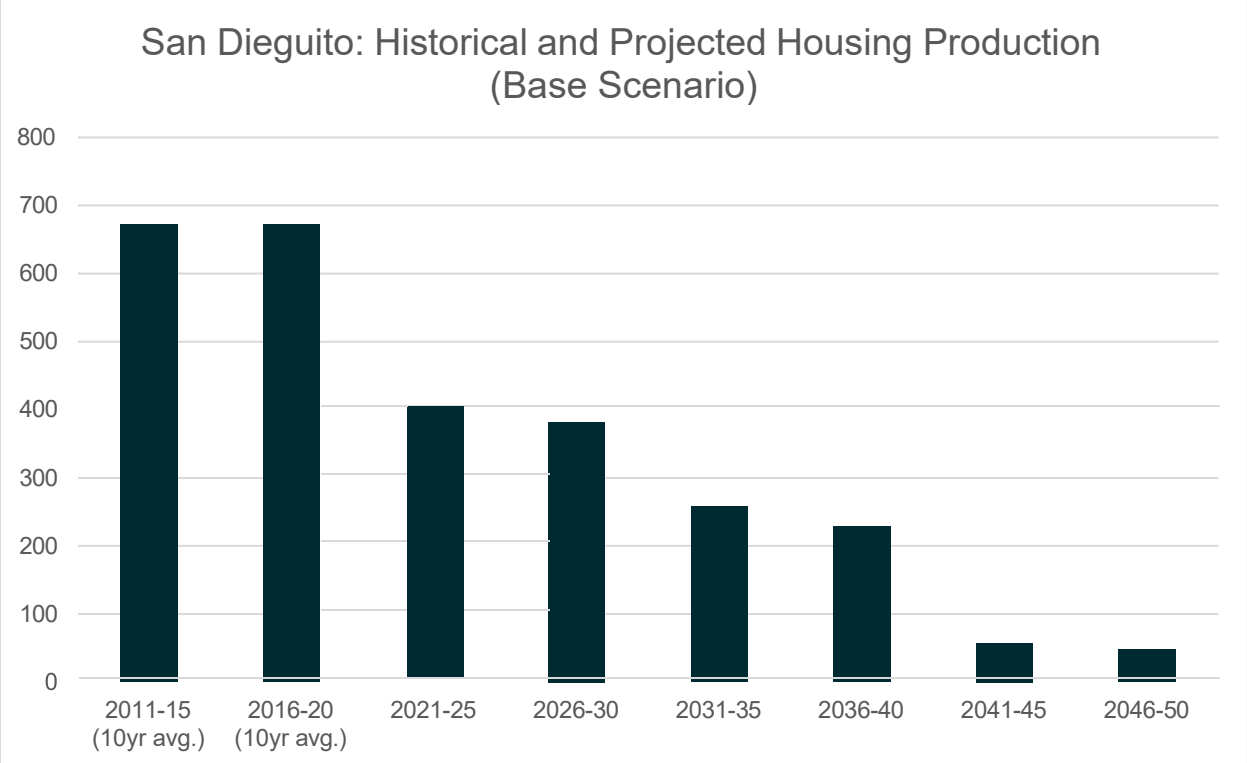

Lakeside: Historical and Projected Housing Production
450
400
350
300
250
200
150
100
50
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50

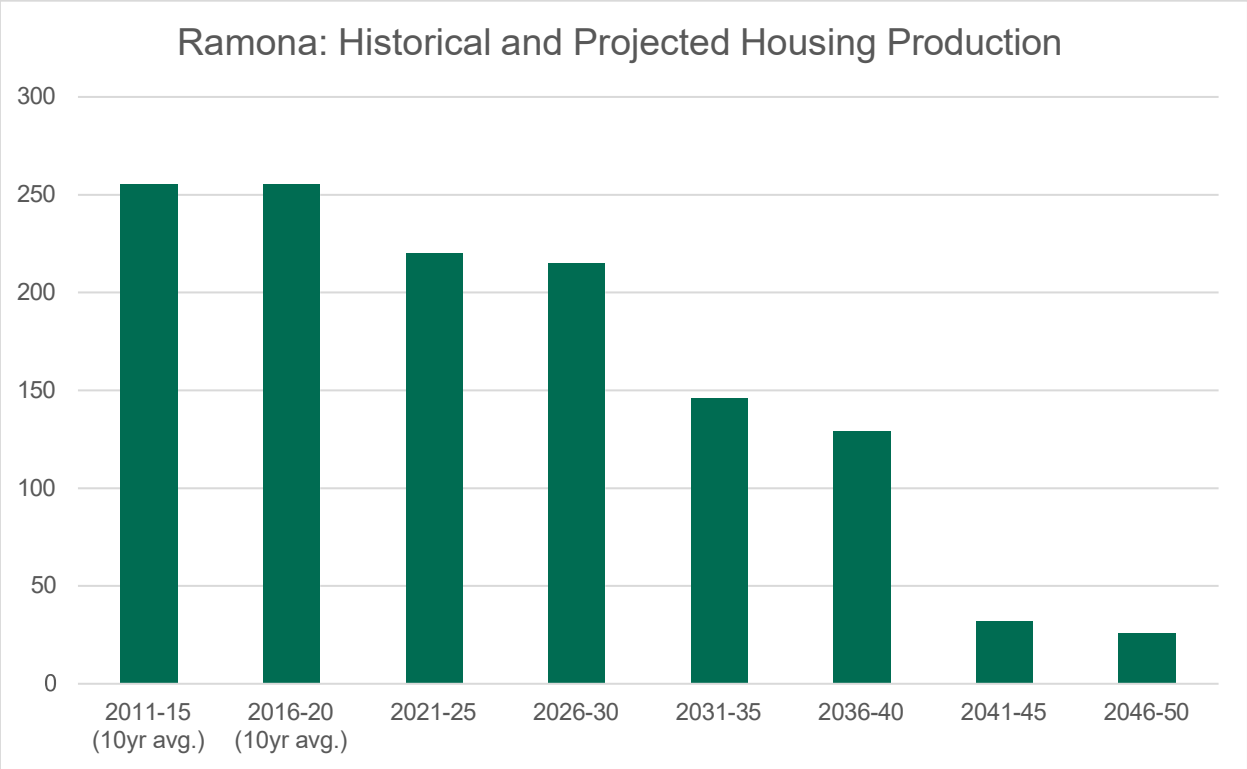

Spring Valley: Historical and Projected Housing Production
300
250
200
150
100
50
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50

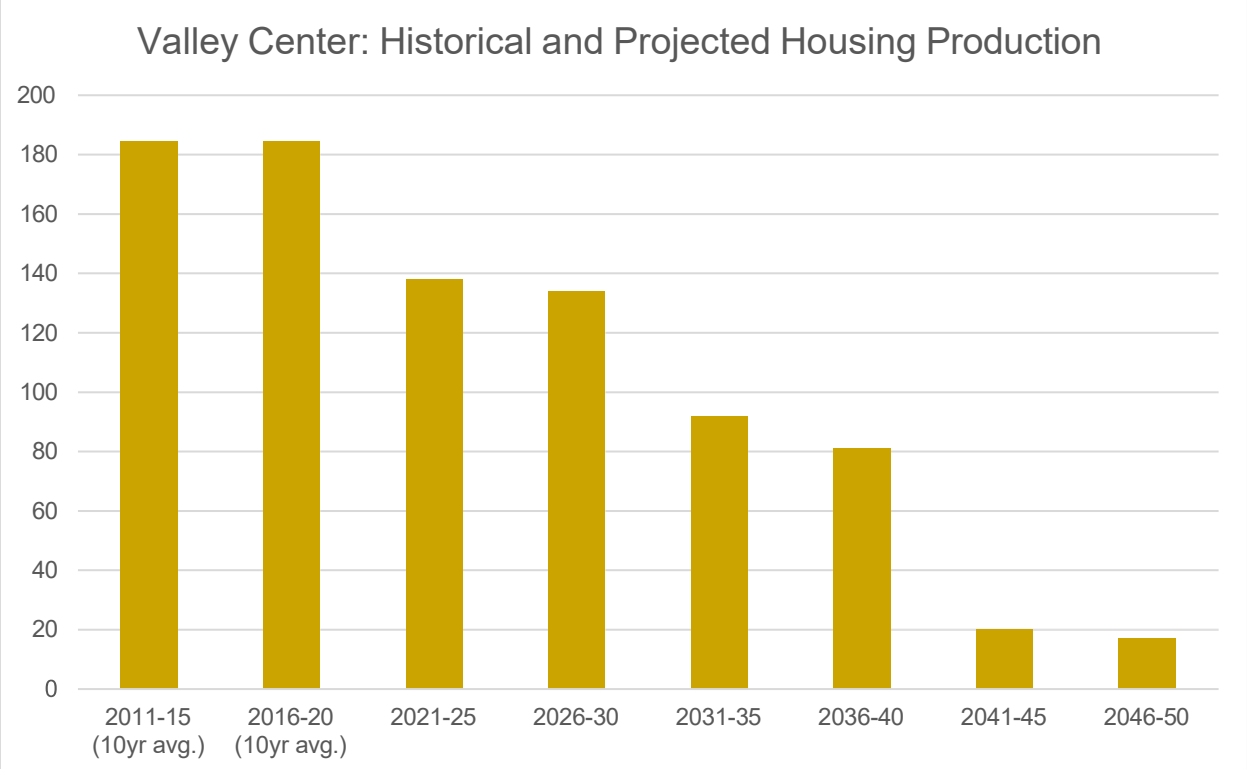

Fallbrook: Historical and Projected Housing Production
700
600
500
400
300
200
100
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50

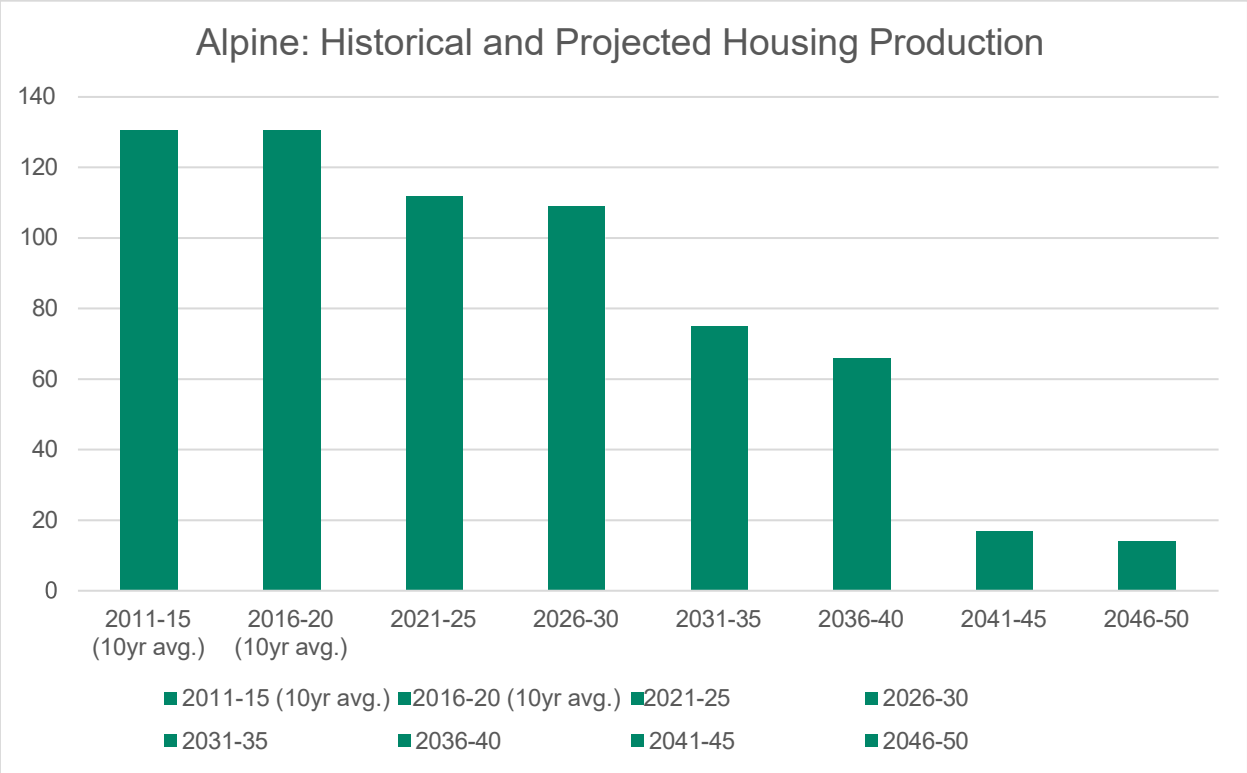

North County Metro: Historical and Projected Housing Production
350
300
250
200
150
100
50
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50


Valle de Oro: Historical and Projected Housing Production
100
90
80
70
60
50
40
30
20
10
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50


San Dieguito: Historical and Projected Housing Production (Base Scenario)
800
700
600
500
400
300
200
100
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50


Ramona: Historical and Projected Housing Production
300
250
200
150
100
50
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50


Valley Center: Historical and Projected Housing Production
200
180
160
140
120
100
80
60
40
20
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50


Alpine: Historical and Projected Housing Production
140
120
100
80
60
40
20
0
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50
2011-15 (10yr avg.)
2016-20 (10yr avg.)
2021-25
2026-30
2031-35
2036-40
2041-45
2046-50

Glossary of Acronyms

CAGR: Compound Annual Growth Rate

CAP: Climate Action Plan:

CCR: Covenants, Conditions, Restrictions

CEQA: California Environmental Quality Act

CPA: Community Plan Area

DUAC: Dwelling Units per Acre

EIR: Environmental Impact Report

GPA: General Plan Amendment

SPA: Specific Plan Area

VMT: Vehicle Miles Traveled

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Appendix B

Attachment B2

Peer Review of the Population, Employment, and Housing Projections 2020-2050

COUNTY CONTRACT NUMBER 566060

Prepared for

For the County of San Diego
Planning and Development Services

Prepared by

The California Economic Forecast
5385 Hollister Avenue, Suite 207
Santa Barbara, CA 93111
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FINAL REPORT

October 2023

The California Economic Forecast
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To: Meghan Kelly
County of San Diego
Planning and Development Services
5510 Overland Avenue, Suite 310
San Diego, CA 92123-1204

From: Mark Schniepp

RE: Peer Review, Contract Number *566060*

I have attached the final report on the peer review of the AECOM report.

Our review of the study involved a thorough analysis of the data, the assumptions, the methodology and the final projections. We addressed a number of issues associated with the study while still in draft status. These issues were all subsequently resolved.

We can now confirm that the report's methodology is reasonable, is an extension of the historical data, and that the projections can be explained by demographic forces in place, or by the constraints imposed by market capacity within the Community Planning Areas of San Diego County.

Sincerely,

Mark Schniepp
Principal

Executive Summary

This document details our peer review of the AECOM report for the unincorporated area of San Diego County, hereafter referred to in this document as the "Report."

Our review evaluated the Report's assumptions regarding housing supply and demand, and the methodology for determining projections for housing growth in the unincorporated area, disaggregated by community planning area, through 2050.

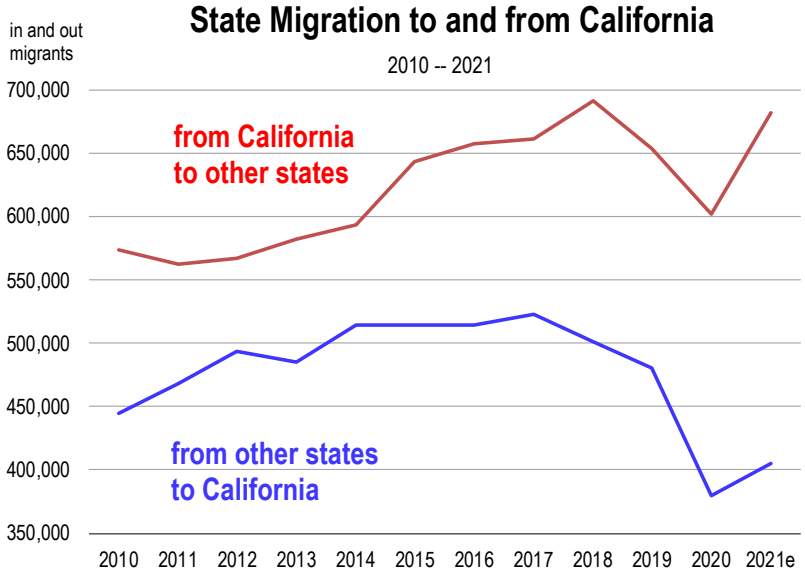


Figure 1: State In and Out Migration

The consensus of current forecasts for population, housing, and job creation call for slower growth in California's coastal counties, including San Diego County.

Slower growth is not limited to the unincorporated area but also to the metro areas which principally dominate the coastal zone of the County. These trends have been in place for many years but they have accelerated over the last four years as the annual inflow of migrants to California has plunged.

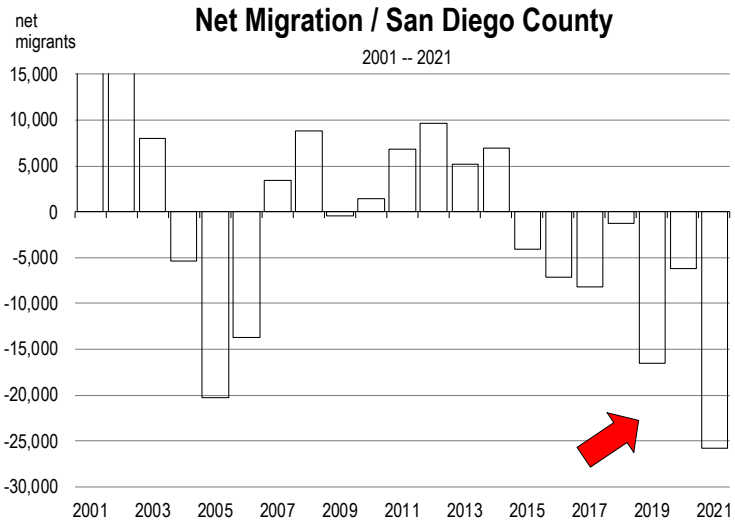


Figure 2: Net Migration San Diego County

The outflow of population from San Diego County mirrors the statewide numbers. The Department of Finance estimates of net migration (which is equal to gross incoming populations less gross outgoing populations) has been negative for the County for the last seven consecutive years, escalating to record negative levels in 2021.

That said, an implied conclusion of the Report is that the growth of population and housing will decline over the forecast period, consistent with recent history and the forecasts for coastal California.[1] Though housing demand currently is strong in California and new housing permits have increased, the longer term forecast does not indicate a departure from the most recent evidence indicative of San Diego County.

We are in concurrence with the Report that growth projections of population, employment and housing will be markedly lower over the longer term forecast, and less housing will be required than was built historically.

Factors that impact the housing forecast

Household Size

Household size (or the population-to-units ratio) is moving lower. The ratio has been moving lower for years and the forecast based on demographic trends is for household size to continue moving lower. The Report uses household size to project population in the unincorporated area. Whereas there is a clear observed decline in the ratio between 2000 and 2021 for the unincorporated area of the county, the projections to 2050 incorporate this trajectory in the Housing Study, for all community planning areas.

A reduced forecast of housing through 2050 is likely despite fewer occupants per house which by itself would increase the need for more housing units. Consequently, key determining factors of housing demand are the extent of forecasted population growth, and the extent to which household sizes diminish over time. This is a pure mathematical exercise that the Report authors have considered in the derivation of their housing unit projections.[2]

Accessory Dwelling Units (ADUs): California Assembly Bill 345 and State Bill 9

These new laws enable the building of accessory units and duplexes on single family zoned parcels, with only a ministerial approval process. They were legislated for the sole purpose of increasing housing supply in California. We suggested that a narrative should be added

[1] See Bank of the West forecast "California Economic Outlook Report-December 2021," January 2022, https://www.bankofthewest.com/alpha/wealth-management/insights/economic-report/california-economic-outlook-report-december-2021.html or Southern California Association of Governments "Demographics and Growth Forecast," Technical Report, September 2020, https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579

[2] See page 17 of the Housing Study.

to address why (or why not) these two laws are not relevant factors in the forecast of housing supply in San Diego County over the next 30 years.[3]

We suggested that a more expanded narrative---perhaps as an appendix---for the housing forecasts for the CPAs be added to the main housing report. When we delve into the details of the forecasts for each CPA, the forecasts might not always appear consistent with the history on home building over the last 10 years. The Housing Study includes charts of housing growth projections for the largest ten community planning areas. It also addresses reasons why the 2020 to 2050 forecast might appear different from the 2010 to 2020 actual period of housing production. In the case of San Dieguito, this occurs because of constraints associated with the marketable supply.[4]

The following chart which shows recent historical (2000-2020) and projected (2020-2050) housing unit growth in 5-year increments for the total unincorporated County area, is indicative of the projections for housing for each of the CPAs, excluding Otay.[5]

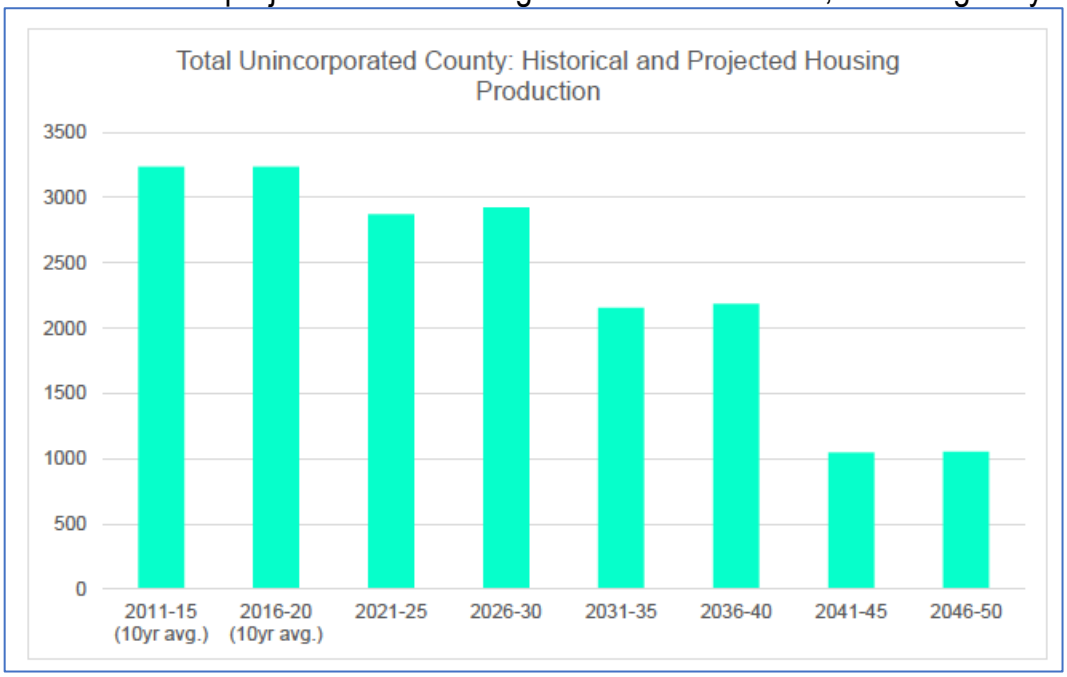


Figure 3: Housing Study projection of housing production, entire unincorporated area

The Otay CPA is programmed for greater growth in housing and commercial buildout over the 2020 to 2050 period than was built historically. Consequently, housing projections are highest in Otay than in other unincorporated county CPAs.

[3] See pages 21-22 of the Report.
[4] Report, page 28
[5] Report, page 66. The total unincorporated area is the sum of housing unit projections in the CPAs.

Employment projections

Employment is linked to housing growth. The historical number of jobs per housing unit in the unincorporated area of the county is 0.62, a ratio that has increased marginally since 2010. With the onset of housing growth, there will be an increase in population and in the demand for jobs by that population. The approach to forecasting employment by applying the historical jobs-to-housing rate is reasonable.

Higher demand for workers by employers in San Diego County will be filled by residents commuting from Riverside County in the north (and in particular Temecula and Murrieta), and Mexico to the south.

Historically, these two locations have been the source of significant additions to total San Diego County employment.

Alternative Corroborating Forecast

We produce a forecast of economic and demographic indicators for San Diego County every year. Using that countywide forecast, we produced a sub-county forecast for the unincorporated area of San Diego County.

Our independent forecasts could then be compared to the Report forecasts of population, housing units, and employment.

The comparison is made, not to ascertain which forecast is higher or lower, but to evaluate if the forecasts, each prepared independently and with different methodologies, ultimately generate similar (and therefore corroborating) results.

The forecast comparison is a validation of the reasonableness of the assumptions made and the data used, as well as the robustness of the methodologies.

Table of Contents

Report Peer Review

Introduction

The analysis by AECOM to generate a forecast for housing units, population and employment for the unincorporated Community Planning Areas of San Diego County follows a fundamental supply and demand approach.

Regarding the ability of the County to accommodate housing supply, not only is land the critical element, but buildable land or the feasibility of the land to facilitate housing production was a dominating factor of the methodology.

In summary, the forecast for housing determines population. But the forecast for housing or population is independent of employment. Our review first focuses on population, goes to housing supply, housing demand, and then onto employment.

Population

In the Housing Study, population per unit (or average household size) ratios over time are used to produce the population projection.[6] This assumption is both necessary and realistic in view of the actual trend over time in average household size for unincorporated San Diego County.

Data from the Department of Finance for the unincorporated area of San Diego County shows household population per occupied unit (or average household size) relatively steady over time, from 2.87 in the most recent year (2021) to a high of 2.96 back in 2004. (the red line in Figure 4. However, the simple ratio of population to all housing stock (the blue line), which is the relevant ratio for this study, represents a much more volatile and declining movement in the ratio over the same time period, from 2.95 to 2.77.

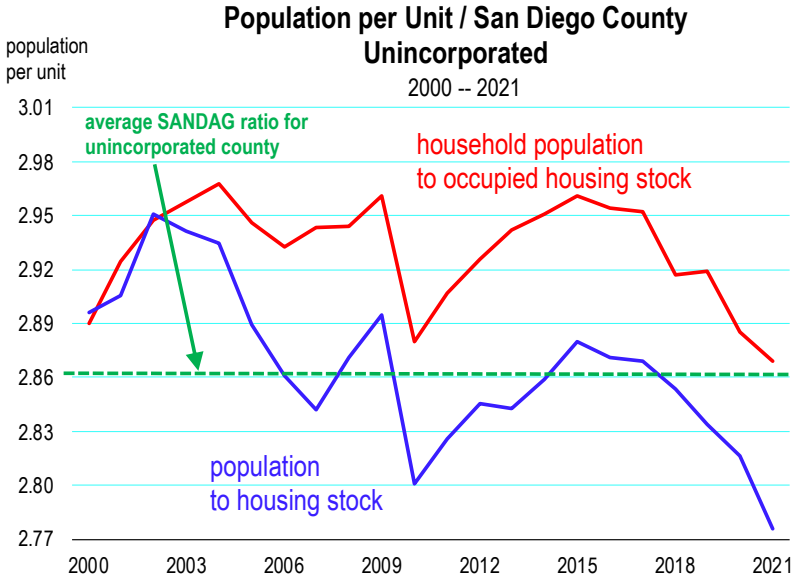


Figure 4: Household size / San Diego County Unincorporated

[6] Page 17 of the Housing Study

For either measure, the trend in the series' is decidedly lower. A lower ratio (holding housing stock constant) would lead to a lower population forecast over time.

Consider these scenarios of population per unit ratio:

High Growth Housing unit projection: 23,431

Population per unit	Population forecast
2.86	67,013
2.72	63,695 (Report forecast)
2.60	60,921

The resulting effect of varying assumptions about the household size ratio result in meaningful changes to the population forecast, if the housing unit projection is held constant. The Report correctly incorporates diminishing average household sizes over time in the projection of population through 2050.

Household sizes are likely going to move lower over the next 10 years in tandem with an aging population. Our forecast of average household size for San Diego County (completed for Cal Trans last September 2021) is shown in Figure 5. The ratio of population to housing stock declines over the entire forecast. This is consistent with most of the coastal county projections in California. The decline occurs because population growth slows faster than housing growth, households are getting older, and fertility rates continue to decline.

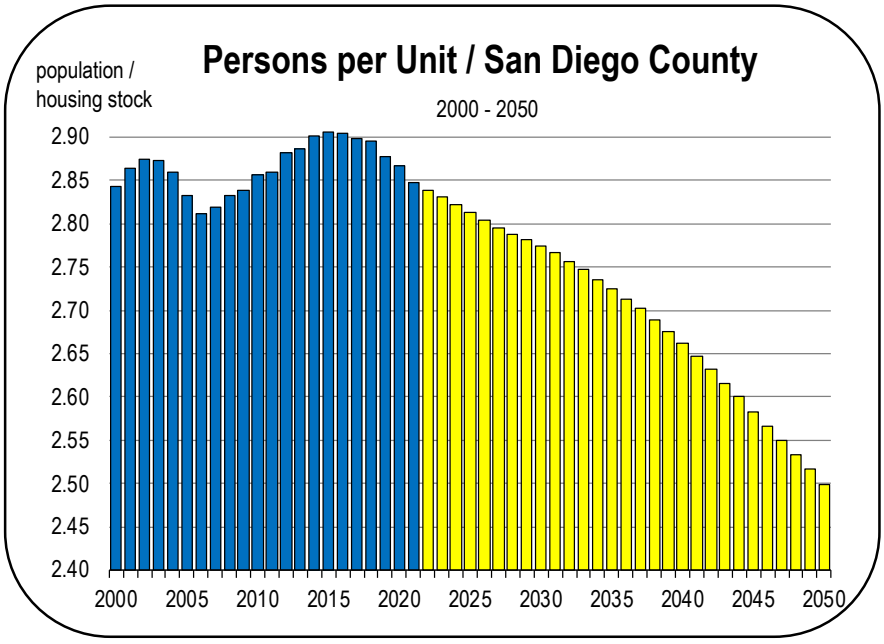
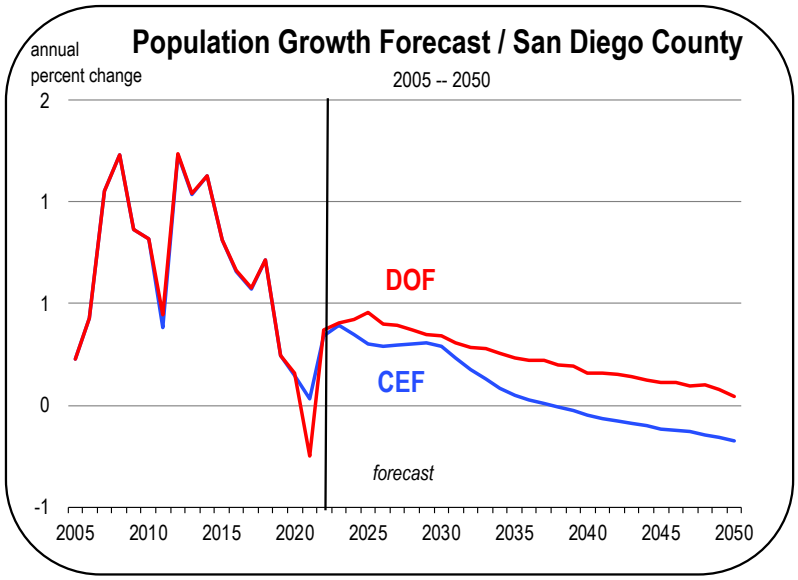


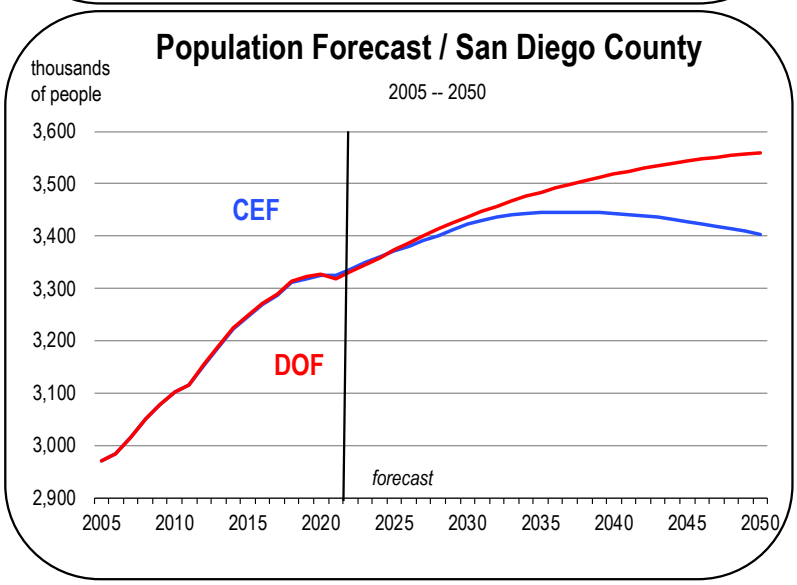
Figure 5: Household size - actual (blue) and forecast (yellow)

Our own population projection (CEF) shows a modest increase over time in San Diego County, that is actually lower than the latest Department of Finance (DOF) forecast. The population forecast for San Diego County is led by a rising fertile age population through 2035 producing a positive natural population increase.[7],[8]

The Report's population projection for unincorporated San Diego County is originally dependent on the Department of Finance projection for the County and/or entirely dependent on housing supply.[9] Consequently, our principal scrutiny focuses on the housing production forecast over time.

We provide a direct comparison of the population forecast from the Report with our forecast in the last section of this report.





Figures 6 and 7: Population Growth and Level for San Diego County

Housing Supply

The Report takes the approach that residential unit production over time is limited by the marketable supply of feasible development sites in the unincorporated areas of San Diego County.

[7] After 2035, net out-migration is strong enough to offset a shrinking though still positive natural increase and population is therefore forecast to decline. The DOF series also has the natural rate turning negative but their net migration forecast remains significantly positive for the entire period through 2050, a trend that defies history.

[8] Housing stock increases slightly faster than population in view of the potential for continued high rise development in downtown San Diego, ADU units, more housing in the North Metro area and in the Chula Vista sphere of influence.

[9] See section 4.1.2 on page 13 of the Report.

The determination of the feasible, qualified, or marketable set of housing starts with the "Base Set" of all residential parcels in the unincorporated area. The data originate with the County Assessor.

A "Qualified Supply" of development sites was determined from a myriad of screening criteria. These criteria, used to establish a potential (called "marketable") inventory of residential development units, are discussed and described in detail on pages 13-16 of the housing study. A relatively elaborate filtering process was devised to qualify the Base Set of 180,000 potential buildable units as indicated by the General Plan, as marketable. What ultimately is buildable after application of the filters results in about one-third the number of the General Plan units, the Base Set, or the total unit capacity.

Application of the filters reduced the Base Set to 59,938 units.

As part of our principal review, we indicated that we would:

Evaluate the myriad of assumptions associated with the filters that constrain the base set of residential capacity through 2050.[10] A principal question we have is do these filters truly limit future capacity ?

We reviewed all of the filters. Their application appeared to be consistent with feasible marketability criteria including :

(1) access to infrastructure
(2) where land values would not support improvement
(3) where parcel sizes were not sufficient in size to support the prescribed zoning
(4) where parcel slope was too steep, and
(5) where capacity was eliminated because of long term inactivity in specific plan areas.

In answer to our principal question: Is capacity truly limited, the exercise did not result in a substantially reduced "qualified supply" that would meaningfully interrupt housing demand. The nearly 60,000 units that emerged as marketable capacity after the filters were applied represent a large enough volume of potential supply that should not constrain future plausible housing development in the unincorporated area. This is because under any reasonable scenario, this many housing units would not be built because projected population growth would never support this quantity. How do we know? Because historical

[10] The Initial questions that we had concerned the assumptions made about the myriad of Marketable Site Supply filters, including the financial feasibility filters, those associated with the specific plan areas, and the exclusion of entitled projects because of "inactivity," or the non-consideration of ADU units.

population growth in the unincorporated area of San Diego County shows a diminishing trend that appears to be structural and not cyclical.[11]

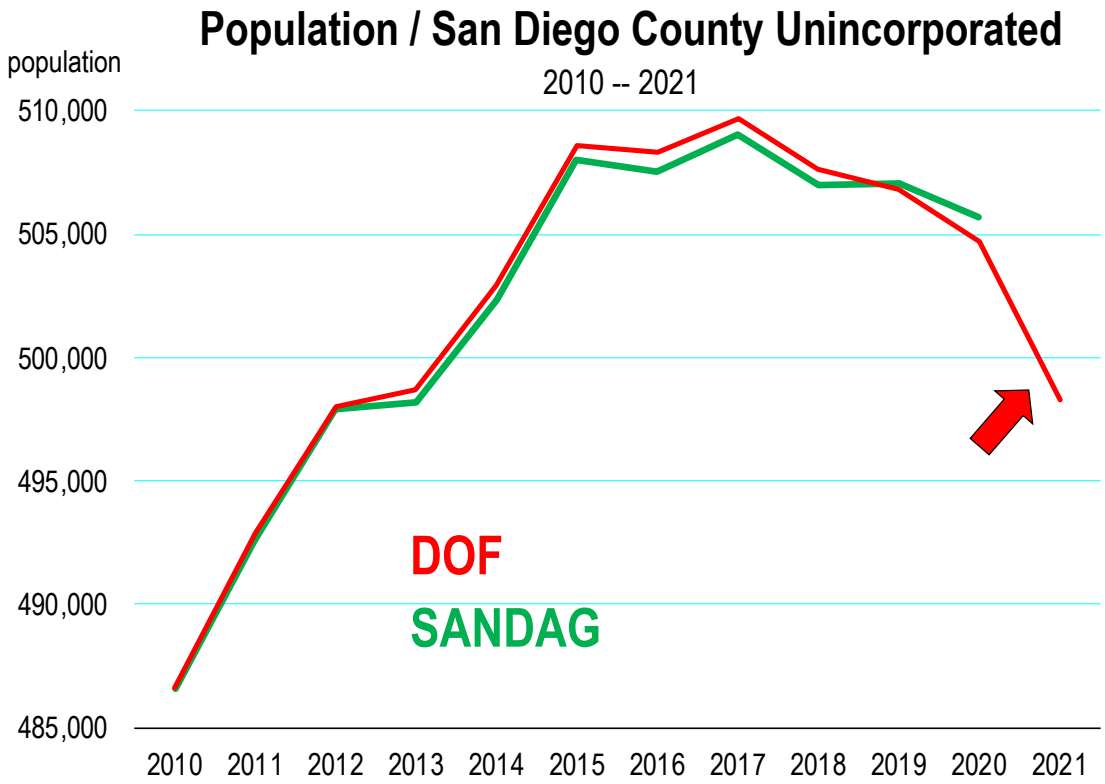


Figure 8: San Diego County unincorporated area population
Source: SANDAG and Department of Finance, 2021

Furthermore, the factors that have led to a decline in population in the unincorporated area of the County are not anticipated to reverse. As we demonstrated above, population forecasts by the Department of Finance and ourselves show diminishing population growth over the indefinite future, resulting in total population levels that would accommodate much lower housing production, of about half of the marketable or qualified capacity that was estimated in the Report. Consequently, this part of the study's methodology should pose no effective constraint on the housing forecast.

However, a constraint might be reached if the qualified supply in a particular CPA limits the number of units that are projected to be demanded in that CPA over the forecast. Demand is based originally on population, total units, and then historical allocation to each CPA. In the interests of transparency, the authors of the Report have addressed this with an

[11] It is "structural" due to age demographics, a steadily declining fertility rate, a corresponding decline in the natural population increase (births less deaths) and continuing low or negative net in-migration. See Appendix A.

appendix providing visuals of actual housing units produced and the 2020-2050 forecasts for the ten largest CPAs, and narrative indicating how housing growth is allocated to each CPA.[12]

Accessory Dwelling Units (ADUs) and Duplexes

California legislature AB345 was approved on September 28, 2021 by the Governor. ADUs now have the potential of becoming a significant issue for housing development going forward, The extent of what can be built under much less stringent local zoning criteria may have meaningful potential to augment total housing supply in many areas of California, including the unincorporated area of San Diego County.[13]

Commensurate with AB345, SB9 was also signed into law by the Governor. It allows for only ministerial approval of housing development of two dwelling units (duplexes) on sing-family zoned parcels. It also allows for lot splits and therefore up to 4 homes per original parcel.

The unincorporated area is more accommodative of single family detached housing under traditionally lower density conditions. Demand for ADUs may or may not represent a meaningful factor. The Report authors have addressed this issue with a Note on ADUs where the significance of them for the future is principally dismissed based on anecdotal evidence, and assumption.[14]

Housing units for the Unincorporated County and the Community Planning Areas

The methodology for determining housing units in the unincorporated area follows a particularly granular approach. The determination of housing demand for the entire unincorporated area of the County is a bottoms up approach, occurring by CPA based on a myriad of factors. The housing demand for each of the 24 CPAs is then summed or aggregated to yield the unincorporated total. It is that unincorporated total that provides the most credible basis for our review.

Total units for the unincorporated area are determined using the Base forecast for population. Over the 30 year period 2020 to 2050, population is forecast to rise by 34,829.

[12] See page 27 in the Report, and appendix pages 66 to 71.
[13] While San Diego County may have an ADU ordinance that predates AB345, the new law is much less restrictive and negates many local zoning ordinances, making it easier for homeowners to build an accessory unit.
[14] See pages 21-22 in the Report

This increment to population principally comes from the forecast of San Diego County population produced by the Department of Finance.

The housing unit forecast for 2050 is derived from the need by this population for housing. If there are an average of 2.85 people per house over the forecast period, then housing need or demand is determined by:

35,183 / 2.85 = 12,239

If the average household size declines faster over time, then the housing need will rise. Conversely, if it rises, the housing need declines.

We originally recommended that the base forecast incorporate a declining average household size over time. The 2020 ratio based on actual data is 2.86, and the previous data back to 2015 show much higher ratios of people per unit. Figure 9 presents the persons per housing unit ratio for the unincorporated area from 2010 to 2020 and how that ratio moves over the forecast in the Report. The authors state:

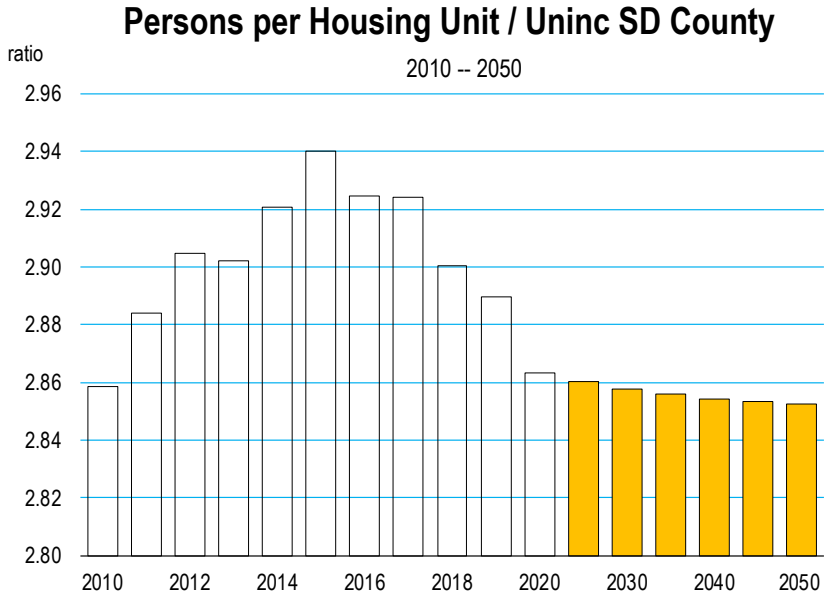


Figure 9: Average Household Size, Unincorporated San Diego County
Source: SANDAG, San Diego County PDS, California Economic Forecast

> . . . . . household sizes overall are expected to continue to decline as falling birthrates lead to smaller families and an aging overall population. To reflect this future decline, the housing projections assume a falling population/unit rate . . [15]

Due to demographic trends, there is a likelihood that the ratio will continue to decline at a faster rate than the Report forecast implies, as part of the longer term trend that has been in place since 2015, This is the case in our countywide forecast shown in Figure 5 above.

[15] Page 17 in the Housing Study

This is a consideration that the authors of the Report do acknowledge. Looking at how the population-per-unit ratio moves for a random sample of five CPAs, it is clear that the ratio declines over time, albeit minimally for the Spring Valley CPA.

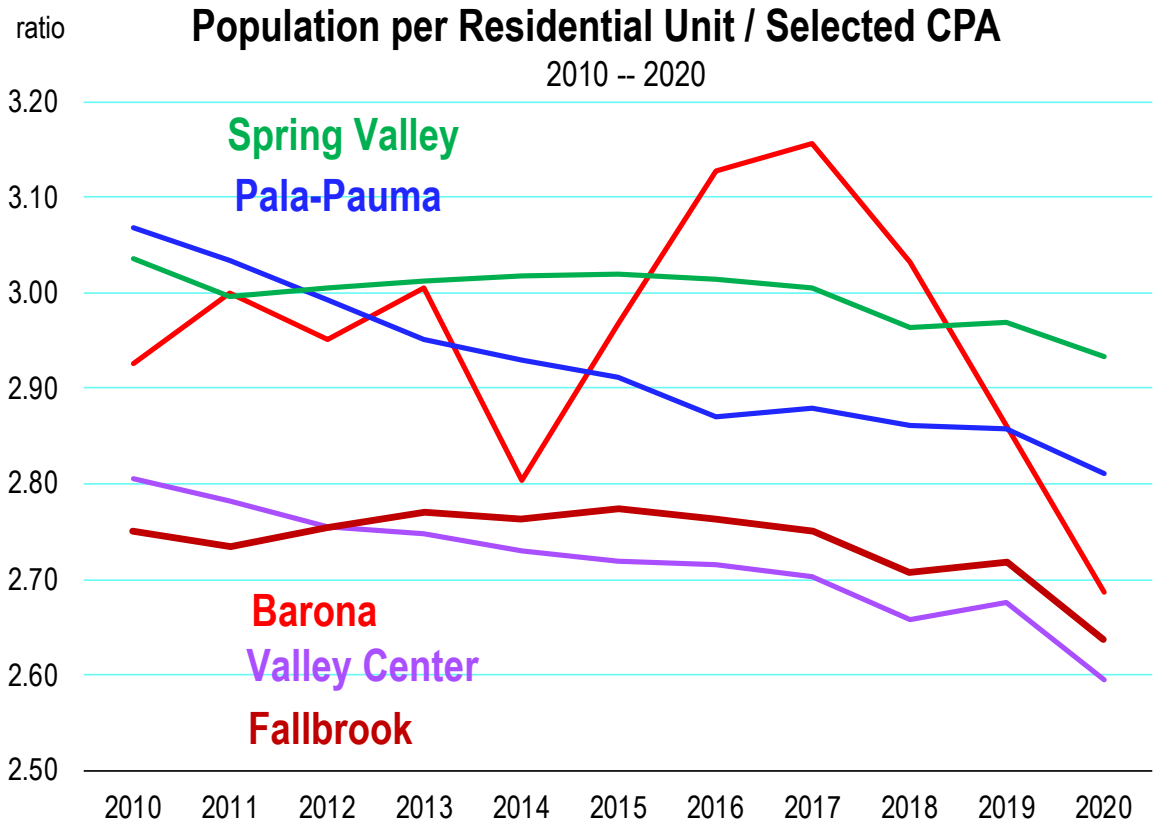


Figure 10: Average Household Size by Selected CPA

The 12,239 units that are forecast to be produced over 30 years to 2050 are allocated to each CPA by application of the population per unit specific to each CPA. The Population forecast for the CPA is the fair share of the unincorporated total population forecast, shown above to be 35,183

The housing units for each CPA are further adjusted by a myriad of factors including zoning and Specific Plan Area units that are entitled and likely to be built. This "likely to be built" is based on one evaluation by AECOM which tends to be conservative. However, because the High Growth Scenario provides an alternative higher production of housing units, a range of likely housing units to be built defines a broader range for the housing forecast.

We are not concerned with the allocation of total units by density category. The housing study determined how housing production in a particular CPA would be distributed based on zoning and historical precedent. This is a reasonable approach.

Appendix B presents the visual representation of the housing forecast for the 10 largest CPAs, and Otay. In most cases, the forecast of new housing per year appears consistent with historical precedent combined with the general trend of diminishing population growth (which is indicative of the entire county---both incorporated and unincorporated).

Over the last 10 years, the number of new residential units per year averaged 204 in the San Dieguito CPA. However, the forecast of housing averages 42 units per year from 2021 to 2050. The Spring Valley, Pendleton, and Alpine areas appear to have a more auspicious forecast for housing than their recent history would by itself predict. The authors of the Report do explain these potential anomalies, specifically illustrating the case for the San Dieguito CPA.[16]

Otay is the only "oddball" case. Curiously, no housing units were built over the 2010 to 2020 period, but thousands are forecast for the 2020 to 2050 period. Clearly, the forecast is supported by SPA capacity and current active project momentum there. The Report pays considerable attention to this in describing the current and future buildout potential in Otay.[17]

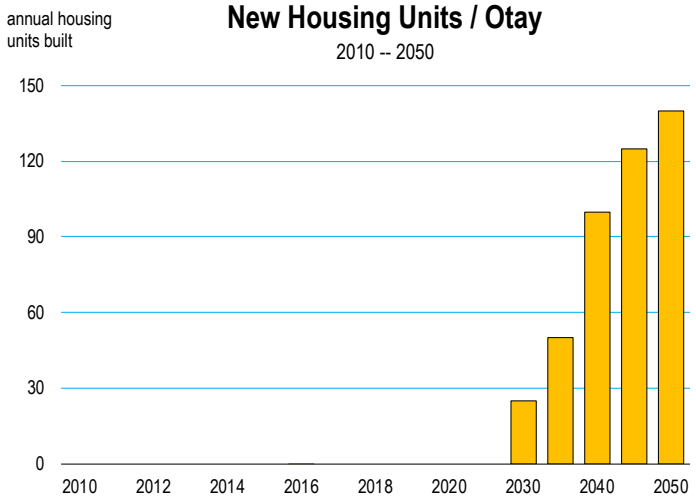


Figure 11: Annual Average Housing unit forecast for Otay

High Growth Estimate

The High Growth estimate adds all SPA housing unit capacity (that was omitted from the Base Growth scenario) back into the CPAs with the assumption that SPA units are entitled, feasible, marketable, and less likely to be blocked by lawsuit or new obstructive housing policies in the future.

An increase in supply would normally be absorbed by a reduction in price. There would not necessarily be an offset to other area housing if additional housing could be expanded.[18]

[16] Page 28 of the Housing Study
[17] Pages 10 and 22-24 in the Report.
[18] However, housing prices would likely have to decline precipitously for demand to materially increase. This is not likely in view of production, land, labor, and entitlement costs indicative of the home building environment in California.

While we agree that the Base Growth and the High Growth scenarios form a reasonable range of potential outcomes, we also understand that the High Growth boundary could go higher, rather than represent an effective *upper bound* of housing unit growth projections for the unincorporated area of San Diego County. However (1) population growth would have to increase, and/or (2) home prices would have to decline.

Neither of those conditions is forecast to occur short term or long term.

Consequently, a materially higher growth scenario for housing is not likely. Therefore, while we are not advocating for a change to the High Growth Scenario, we understand that it represents a relaxation of an assumption that would offer more supply to the marketplace, as would a faster decline in the population-to-housing unit ratio over time, or an alternative higher growth forecast for population.

One of the principal arguments being made in California today is that populations are leaving California in record numbers, due largely to the lack of affordable housing. Figure 1 clearly demonstrates this. The SANDAG forecast for population from which the demand for housing is based, assumes this trend will continue over the long run. For planning purposes, this assumption is fair, but subject to valid debate nevertheless.[19]

Employment Projections

The Report uses the more inclusive definition of employment for unincorporated San Diego County and all of the Community Planning Areas. This aligns more closely with the conventional employment data series generated monthly and annually by the State of California.[20]

The employment forecast (Figure 12) is a plausible extension of the historical change in employment over time (green arrow versus purple arrow), accounting for a slower population growth forecast and a slower employment growth that aligns with the greater countywide forecast (Figure 13).

[19] See any number of sources for this: https://www.movingapt.com/top-reasons-why-people-are-moving-out-of-california/ https://www.movingapt.com/top-reasons-why-people-are-moving-out-of-california/ https://www.cnbc.com/2018/03/19/californians-fed-up-with-housing-costs-and-taxes-are-fleeing-state.html

[20] Labor Market Information Division, Employment Development Department. Data for San Diego County and all counties can be found here: https://www.labormarketinfo.edd.ca.gov/data/employment-by-industry.html

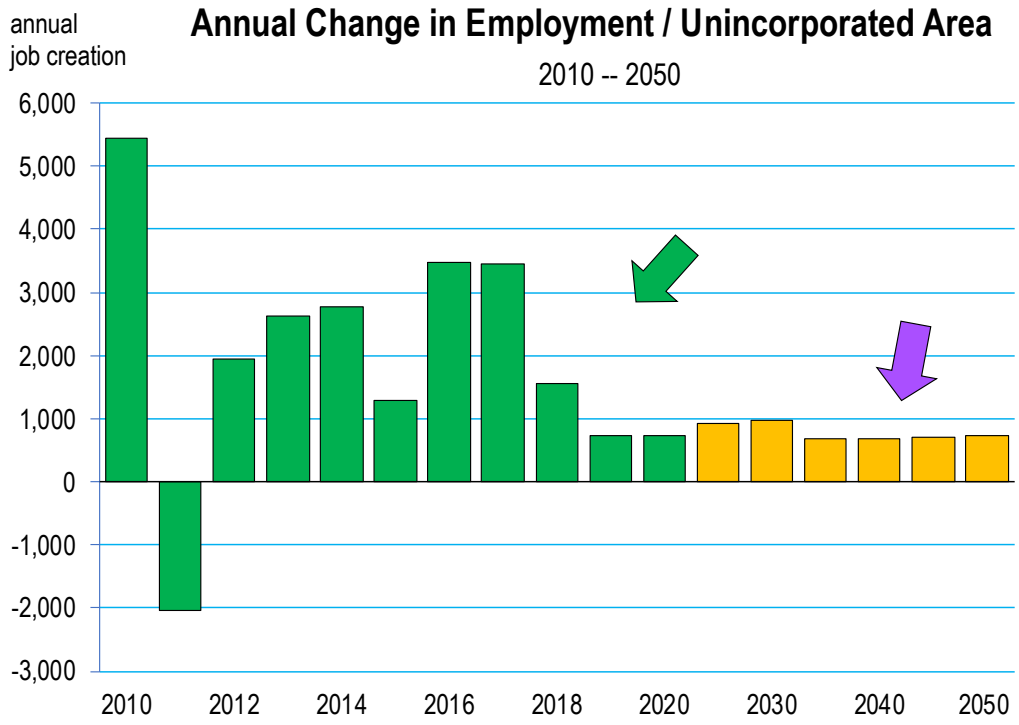


Figure 12: Unincorporated San Diego County Employment Change through 2050

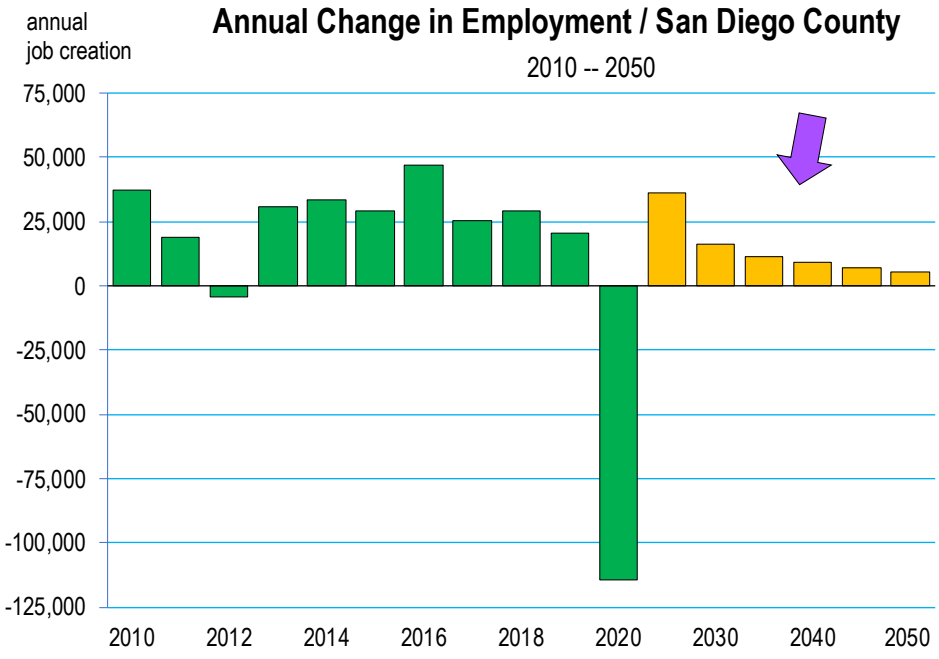


Figure 13: San Diego County Employment Change through 2050

Consider that from 2010 to 2020, the unincorporated County created 16,508 jobs while the entire County created 116,095. The unincorporated County represented 14.2 percent of total job creation in the County over this time period.

From 2020 to 2050, the unincorporated County is forecast to create 26,157 jobs in the High Growth Scenario while the entire County is forecast to create 430,650 jobs. The unincorporated County represents 6.1 percent of total job creation in the County over the forecast. Consequently, the historical share by the unincorporated County is low compared to job creation historically.

This result can be explained by a number of factors, including constraints on marketable capacity of new housing, the decline in population growth, an aging population, and less demand for workers over time due to slowing population growth and technology.

The Housing Study uses the actual unincorporated jobs to housing ratio for 2020 as the basis for the employment projections in each CPA:

$$\text{Employment in CPA}(I, t) = \text{J/H ratio}(i) * \text{HUP}(i,t)$$

where i = 1 to 23 CPAs (excluding Otay), t = time: 2020 to 2050
J/H ratio(i) = jobs to housing ratio for each i that prevailed in 2020
HUP(i,t) = housing unit production for each ith CPA over t

and

$$\frac{\sum \text{Employment in CPA}(i) \text{ over all } i + \text{Otay employment}}{\text{total employment in the unincorporated area}}$$

Otay employment was projected independently based on a myriad of factors associated with the auspicious growth potential for the region.

This approach to employment projections is reasonable because it is congruent with the population and housing projections. Methodologically, they are linked. The assumption of a constant jobs to housing ratio over time could be debated but does not effectively produce a materially different employment forecast if relaxed over a reasonable range of possible values.

Alternative Independent Forecast of Unincorporated San Diego County

We have presented an alternative forecast for San Diego County, and in particular, the unincorporated area of the County, for population, employment, and new residential units, including the attendant (and cumulative) housing stock from 2021 to 2050.

The forecast is produced using our long term econometric model for San Diego County. The model has been operative and producing forecasts for San Diego annually since 2000, as part of our annual assignment for the California Department of Transportation.[21]

The model used here has been updated with recent 2021 data and a more recent exogenous forecast from the UCLA Anderson Forecast, reflecting the long term economic forecast trend for the U.S. and California.

Population

The forecast of population at the county level is derived from the following accounting identity:

$$Pop(t) = Pop(t-1)+B(t)-D(t)+NIP(t)$$

Where Pop = population
B=births
D=deaths
NIP=net in-migrating populations
t = time period t

Population this year is equal to population last year plus births occurring last year to this year minus deaths occurring from last year to this year plus new net migrants coming into the region from last year to this year.

NIP = net migrants = gross migration into the county less gross migration out of the county

The components of that identity are individually forecast in the larger San Diego Countywide econometric forecasting model. The general specifications for the components of population are as follows:

[21] The last 3 years of the forecasts for every county in the state can be found here: https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/data-analytics-services/transportation-economics/long-term-socio-economic-forecasts-by-county

Births = f(population aged 25 to 44, birthrate in California)
Deaths = f(population aged 75 and over, deaths last year)
NIP = f(job opportunities, the unemployment rate, housing stock)
f(*) = some mathematical function or relation of, measured with error

The birth forecast is driven by the fertile age population and the general trend in the overall state birthrate over time. Deaths is driven by the oldest age population. Net migration responds to economic factors in the county, including employment growth, the rate of unemployment, and the growth of housing.

The forecasts are shown here.

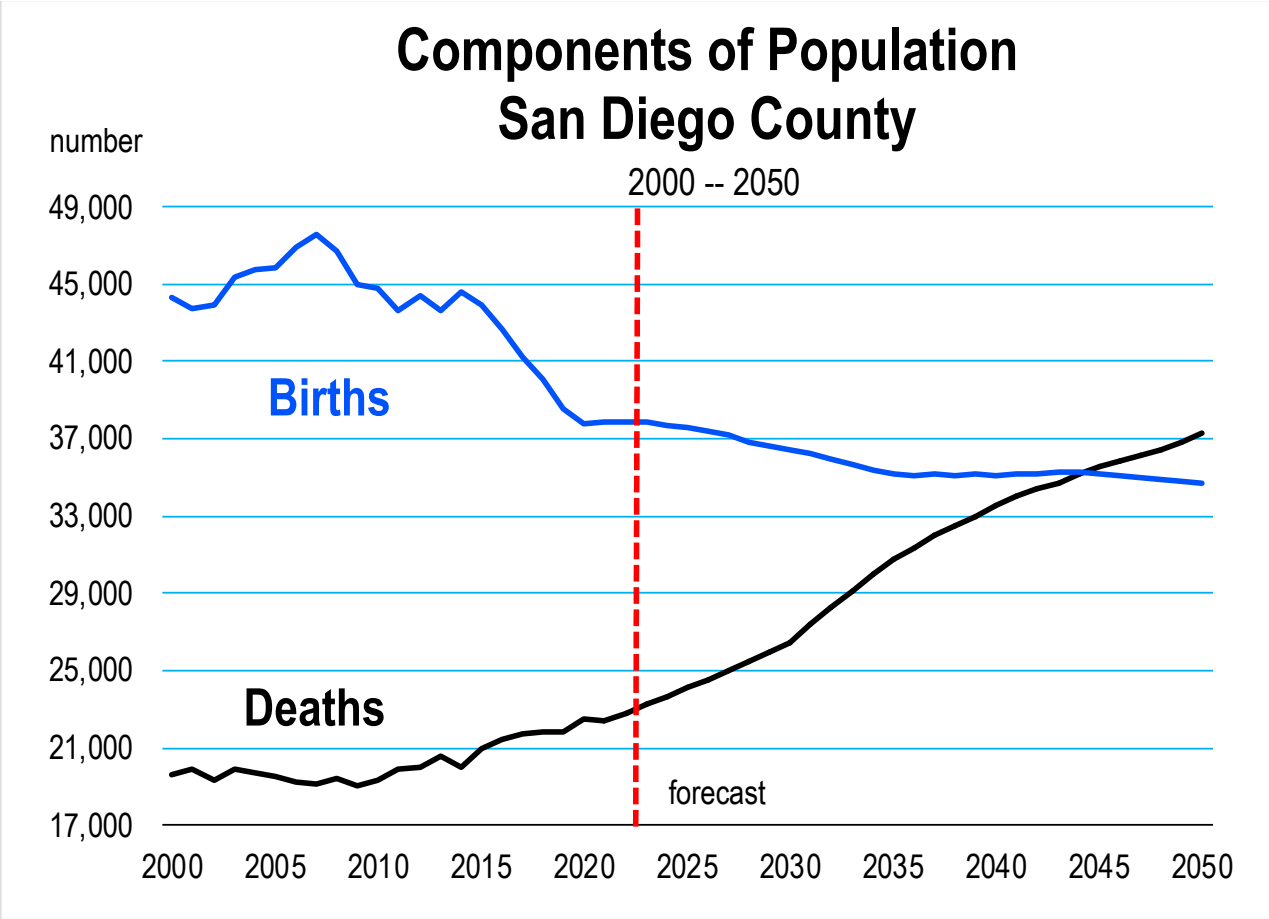


Figure 14: San Diego County Births and Deaths, History and Forecast through 2050

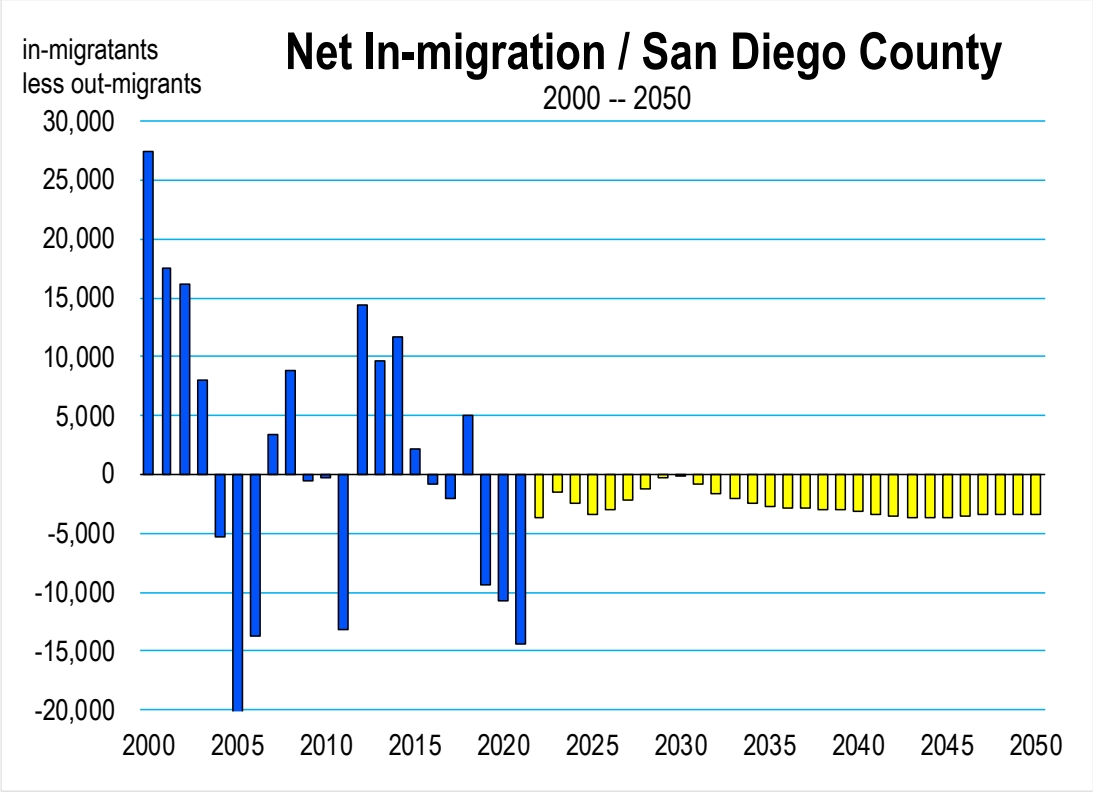


Figure 15: San Diego County Net In-migration, History and Forecast through 2050

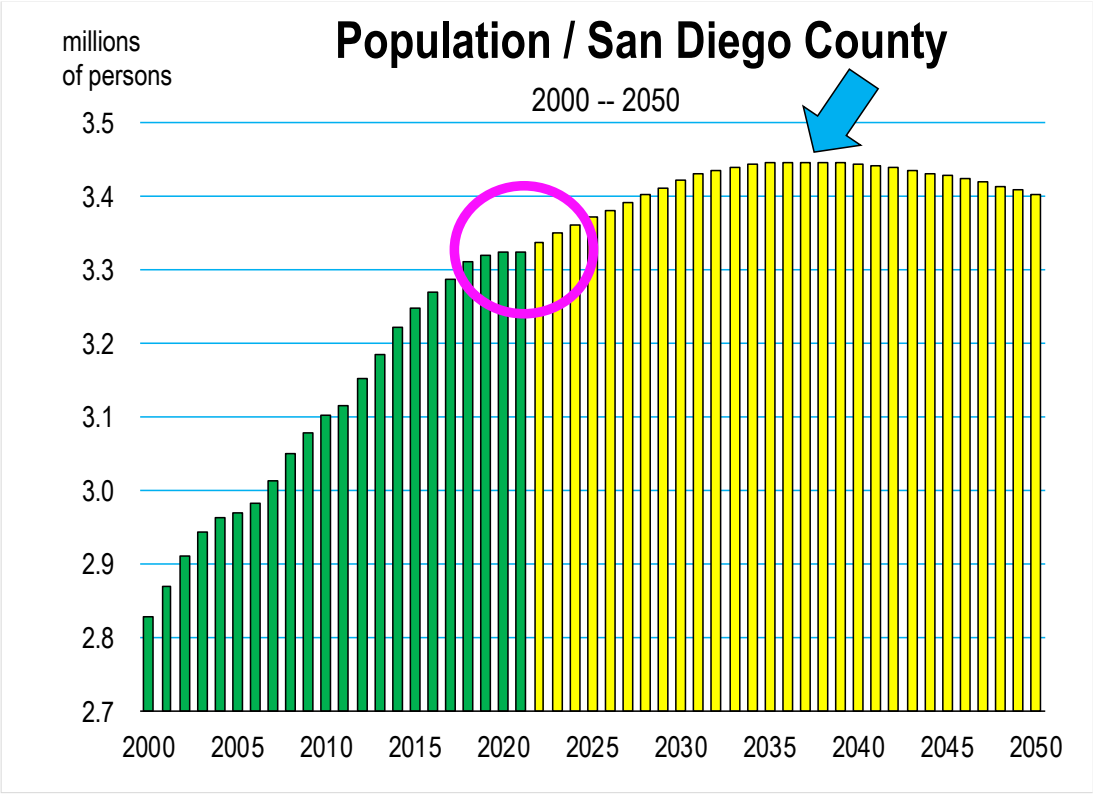


Figure 16: San Diego County Population, History and Forecast through 2050

The resulting population forecast is shown above in Figure 16. The diminishing growth in population observed in 2020 and 2021(**purple circle**) is due to the pandemic's impact on (1) disabling new migration into the county, and (2) increasing deaths. With recovery of the economy in 2022 and beyond, population growth improves principally because the level of out-migration subsides (Figure 15).

The **blue arrow** shows the point at which population growth goes to zero in the County, due principally to the decline in the natural rate of population growth as the number of deaths is converging on births and net migration remains negative. This occurs in the year 2038.

Our forecast of county-wide population (CEF) is lower than the Department of Finance forecast of the 2020 to 2050 time period (see Figure 7 on page 3), principally due to the net migration component.

The DOF forecast (DOF) is positive averaging 6,800 net migrants per year for 30 years. Yet over the previous 10 years, net migration in San Diego County averaged only 729 people per year. Our forecast (CEF) of net migration is an extension of the downward trend that has been in place since 2014. Out-migration was heightened by the pandemic in 2020 and 2021, but also by sharply rising home prices. The net migration forecast for 2022 and beyond fstays negative, consistent with lower population growth in general in California, less housing, much less affordable housing, fewer jobs, and a generally slower economic growth forecast.

The two juxtaposed forecasts are presented in Figure 17.

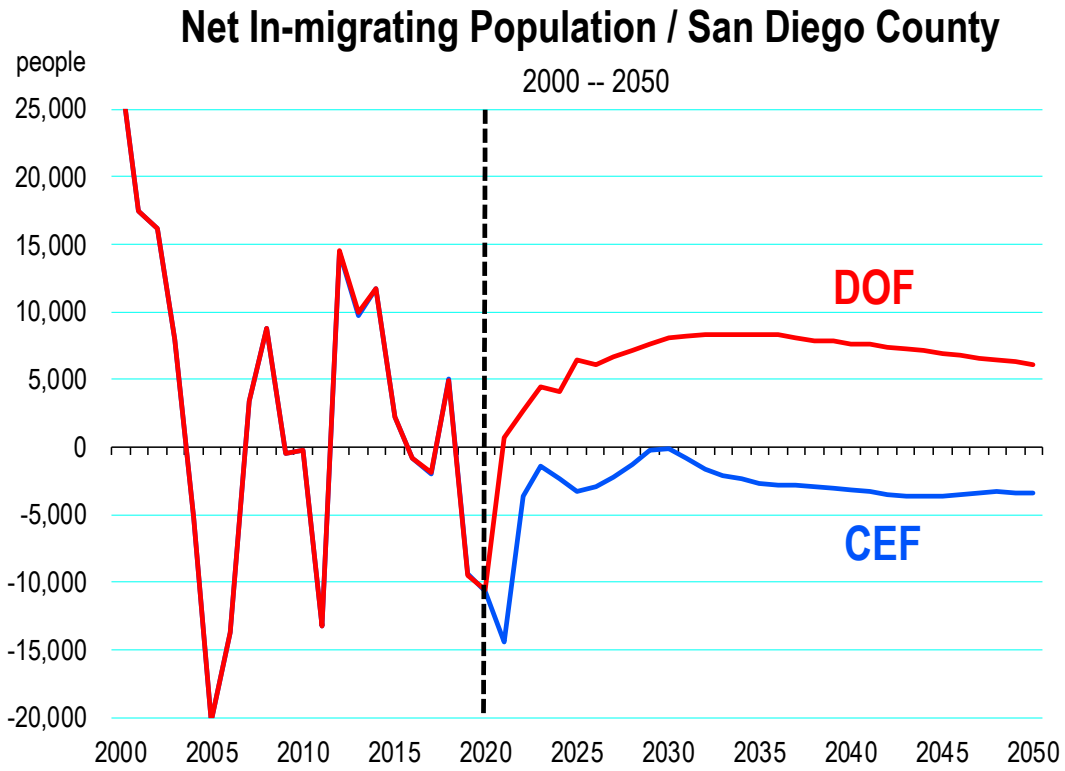


Figure 17: San Diego County Net Migration Forecast: CEF and DOF

As is the case for the entire state, population in San Diego County is likely to plateau during the forecast period, and gradually decline until natural population growth turns positive again.

Our county-wide population forecast is used to produce a forecast for the unincorporated area. The ratio of unincorporated population to total county population averages 0.156 over the 2000 to 2021 period, moving in a relatively tight range of between 0.150 and 0.158. Figure 18 shows this trend expressed in percent:

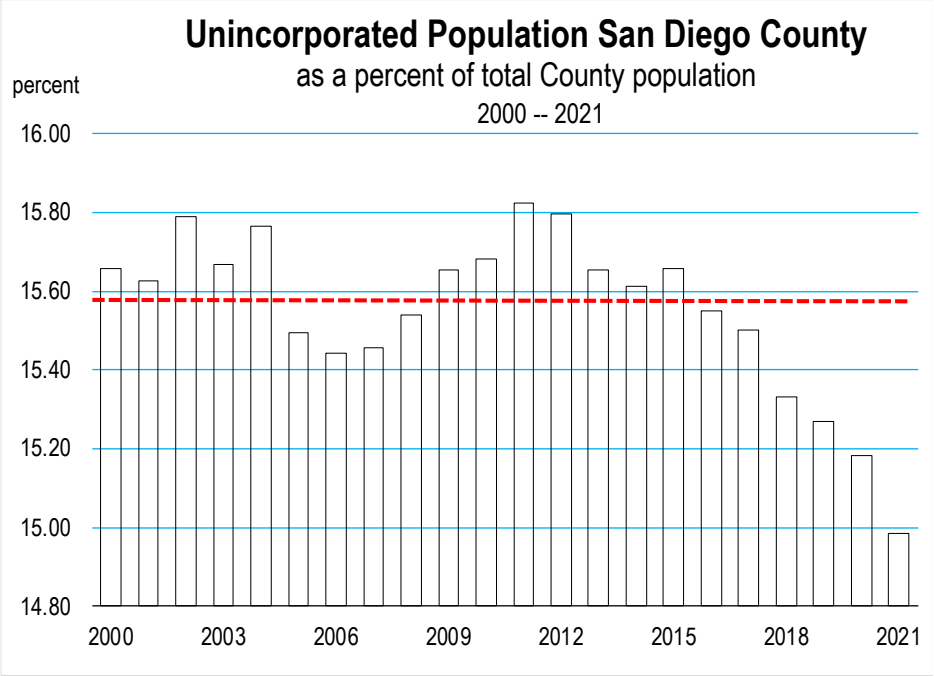


Figure 18: Percent of Total County Population in Unincorporated Area

The red line represents the 21 year average, or 15.55 percent. The proportion of the population in the unincorporated area of San Diego County was moving in a relatively constant manner through 2016, but has departed from that trend since then, declining at a relatively swift rate. This departure from the trend is either due to (1) actual slower growth of population in the unincorporated, area (2) relatively faster growth in the incorporated areas, or (3) measurement error of the unincorporated area population by SANDAG (and DOF) during inter-census years.

Actual slower growth for unincorporated San Diego County is clearly explicit in the most recent Department of Finance population estimates.

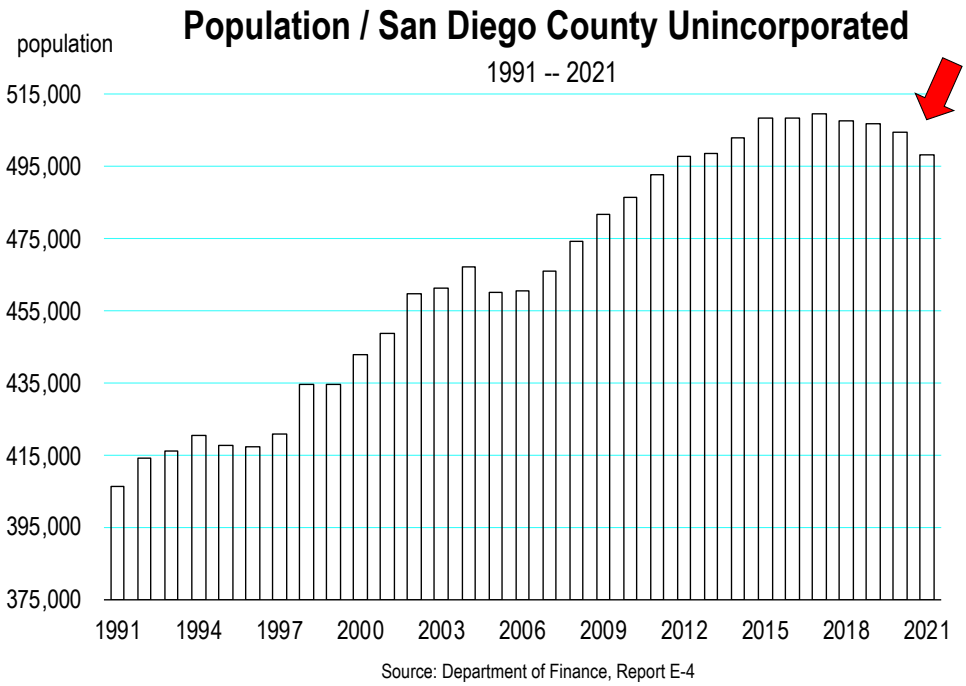


Figure 18: Percent of Total County Population in Unincorporated Area

Observing the ratio of unincorporated population to total county population over time provides us with information useful for constructing a regression equation to predict the unincorporated population. A constant ratio would imply that a simple linear regression of the unincorporated population against county population would generate a reasonable forecast. The fact that the ratio is not constant, deviating from 2016 onward (Figure 18), tells us that an adjustment to the regression equation is necessary.

In the absence of knowing the causal factors that caused the recent deviation, we include a binary variable into the regression that adjusts for 2017 to 2021 and then forward through 2050. This adjustment factor, which we label DUM17ON takes the value of 1 for 2017 to 2050 and 0 for the rest of the historical time period. The implicit assumption associated with adding this factor to the equation is that this deviation will persist through the forecast period.

The regression model is therefore:

Popuninc(t) = a + b*POPJUL(t) + c*DUM17ON(t)

Where Popuninc is the unincorporated population of San Diego County,
POPJUL is the population of San Diego County,
DUM17ON is the adjustment factor that captures and extends the 2017 to 2021 deviation in the growth of population between the unincorporated area and the entire county,
t = annual time, 2000 to 2021, and
a, b, and c are the estimated parameters or coefficients.

The results of the regression are very statistically sound, with a goodness of fit statistic (R^2) of 0.987.[22] The unincorporated county population moves in tandem with the county population forecast. The adjustment factor indicates that the unincorporated population trend will deviate from county population (as it had between 2016 and 2021) by an average of 9,663 people per year.

This equation is used to forecast the unincorporated population. The principal driver is of course the county population forecast. The forecast for the unincorporated population follows closely the countywide forecast of population.

[22] See Appendix C for the statistical results of the regression

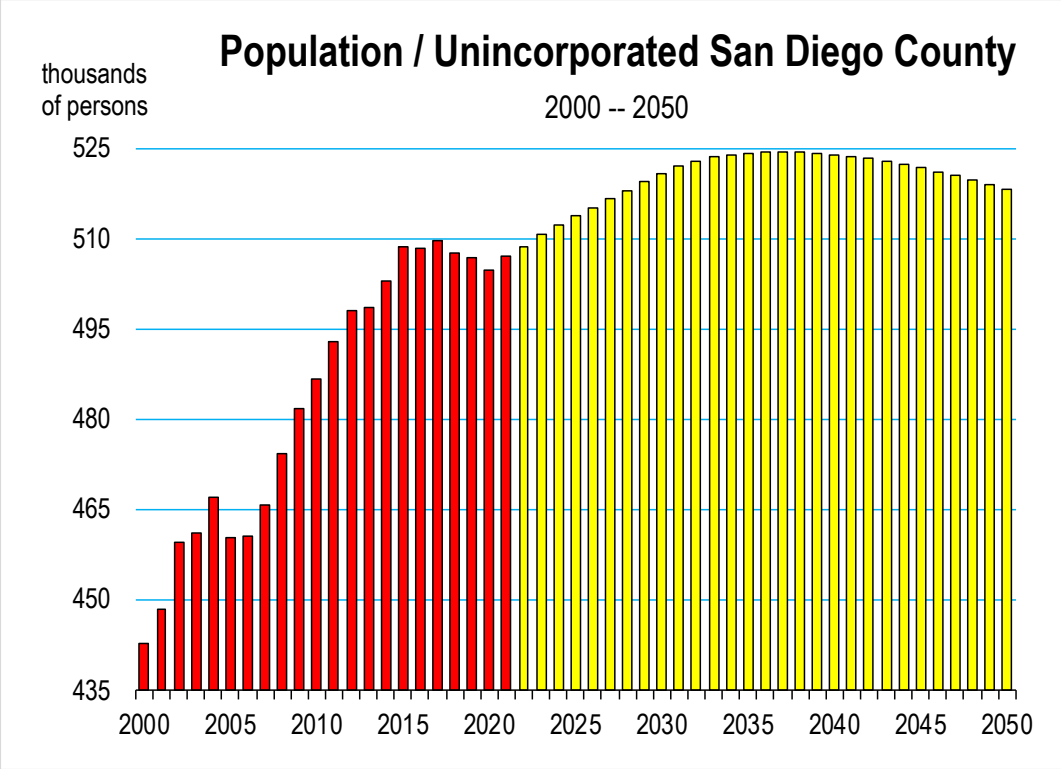


Figure 19: Percent of Total County Population in Unincorporated Area

Between 2020 and 2050, the unincorporated county population rises from 504,709 to 518,134, a net increase of 13,425 people. In the peak year, 2037, the population gain from 2020 is an increase 19,633 persons.

The annual change in this forecast series is shown in Figure 20. The forecast follows and extends the annual actual trend line **(in green)** that represents diminishing growth over time.

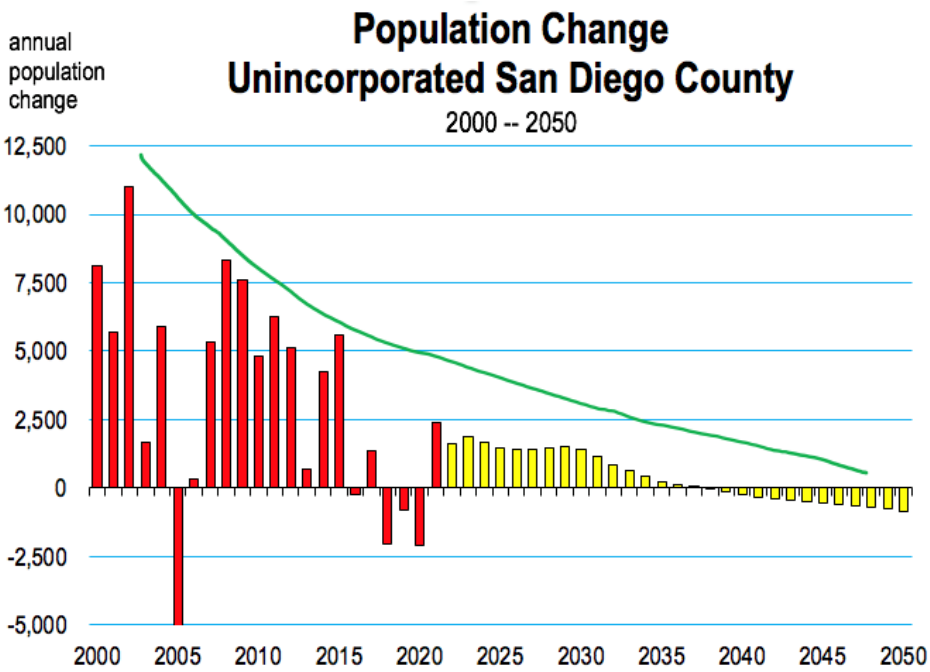


Figure 20: Annual change in the Unincorporated County Population

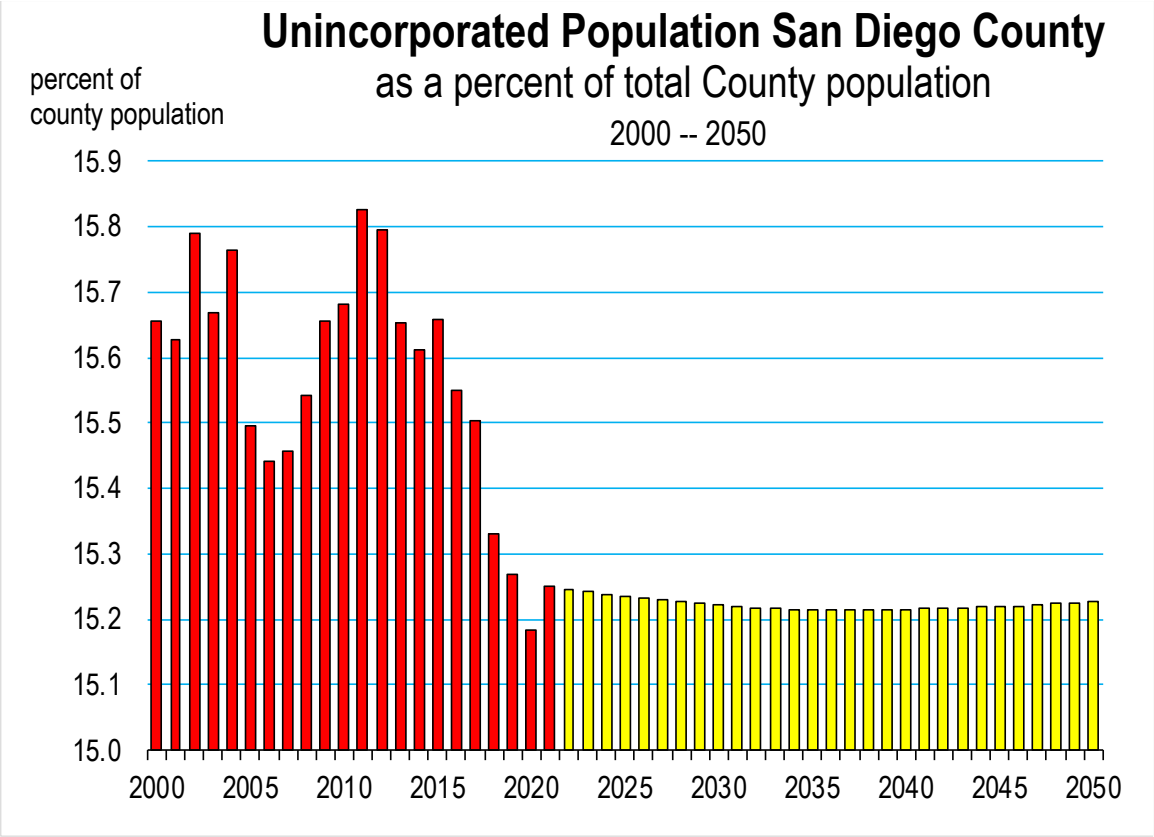


Figure 21: Ratio: population in unincorporated area to total county area, CEF Forecast

The ratio of the unincorporated population and the countywide population over the forecast is shown above in Figure 21. Our approach is tops down. The ratio of the Housing Study unincorporated population projection to the countywide Department of Finance population projection is shown in Figure 22. The AECOM followed a bottoms up derivation.

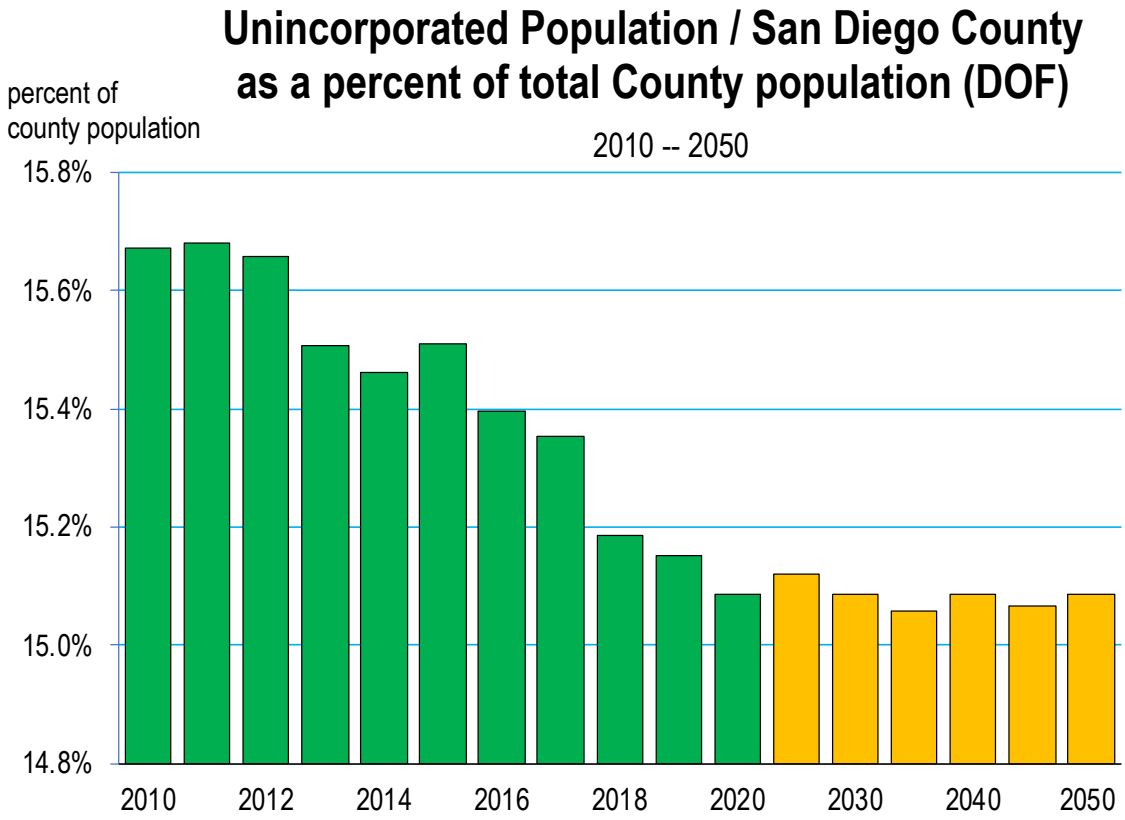


Figure 22: Ratio: population in unincorporated area to total county area, Report Forecast

Clearly, the forecasted ratios are similar, further validating the Report forecast of the unincorporated population, because the two independent forecasts behave similarly over time.

Our forecast (Figure 19) of the population and the incremental change from 2020 to 2050 in the unincorporated area of San Diego County, along with the forecasts from the Housing Study, are presented here:

Total Population and Incremental Population Forecast
Unincorporated San Diego County

	Report	California Economic Forecast
Actual 2020	505,675	505,675
Base Growth Case 2050	540,504	518,134
Increment 2020-2050	34,825	13,425
High Growth Case 2050	569,370	not estimated
Increment 2020-2050	63,695	not estimated

In summary, our population forecast peaks in 2037 due to the extent of net out-migration of county residents from both the incorporated and unincorporated areas, offsetting the natural increase in population, which eventually turns negative itself (Figure 14).

Housing Units or Housing Stock

Data for total housing stock was obtained from both the Department of Finance (DOF) and SANDAG. DOF data spans the 2000 to 2021 period; SANDAG estimates are from 2009 to 2020. The DOF numbers for the 2000 to 2009 period are less consistent with the subsequent 10 year period, whereas the SANDAG series with 5,000 fewer units per year than the DOF series, shows a less dramatic departure from the DOF series in 2010. Consequently, that is the series used in the forecast. It is also the series that AECOM adopted in the Report.

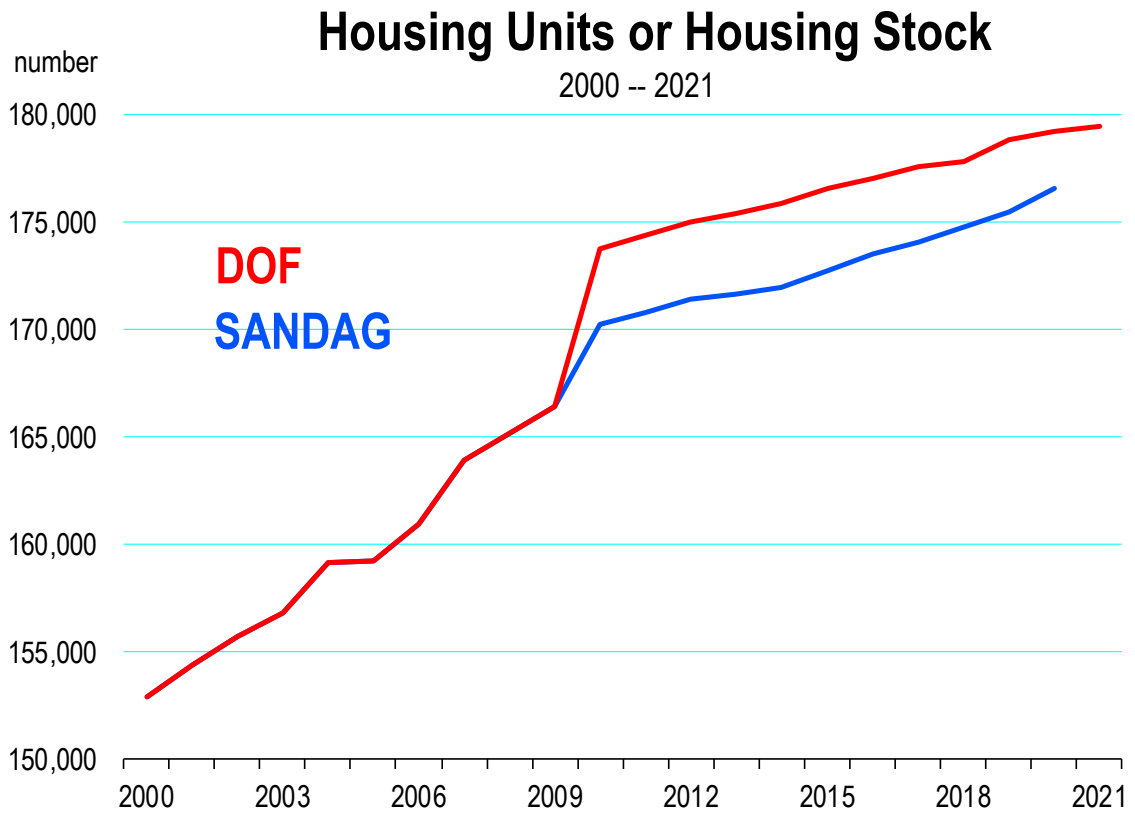


Figure 23: Total Housing Units (or Housing Stock)
Department of Finance and San Diego Association of Governments

The ratio of unincorporated housing stock to total county housing stock represents a relatively stable relationship over time (compared to population).

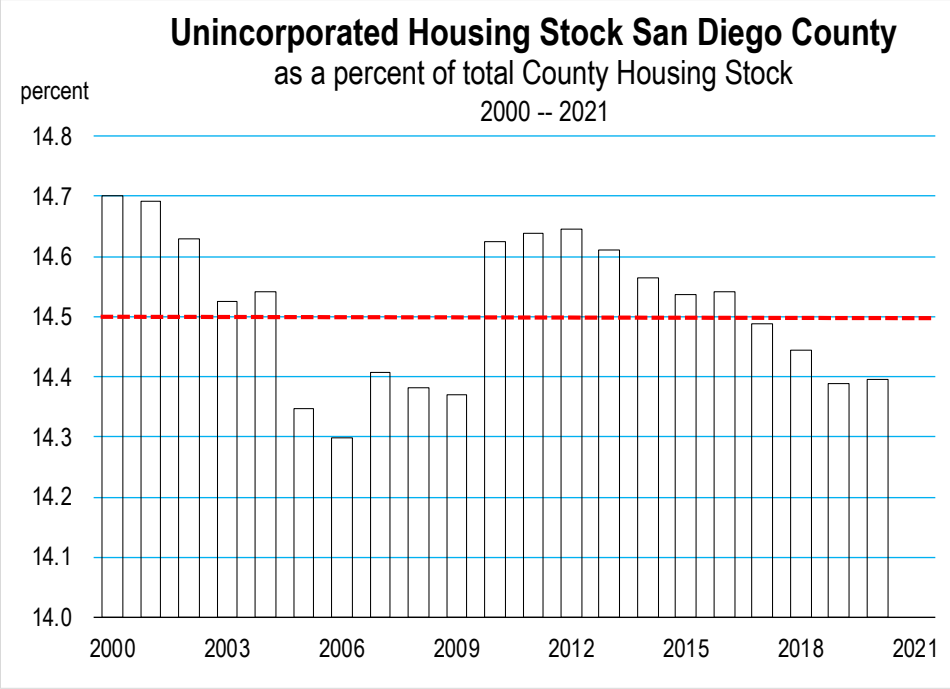


Figure 24: Ratio: Unincorporated Housing Stock to Total County Housing Stock

Note that over this series, because we are mixing the 2000 to 2009 DOF series with the 2010 to 2020 SANDAG series, there is a measurement error with housing stock, likely in the earlier period.[23]

The average value over the 20 year period is 14.5 percent (**red line** in Figure 24). We used the same approach in the housing stock forecast for the unincorporated area as the population forecast. A regression equation was constructed with the housing stock for the unincorporated area as the response or dependent variable, and county housing stock as the independent variable.

Because of the slight discontinuity in the data series beginning in 2010, an adjustment was added to the model as a compensatory factor.

The estimated regression equation is presented in Appendix C. The fit of the equation is 99.5 percent, implying that nearly all of the variation over time in the unincorporated county housing stock series can be explained by total county housing stock and the data

[23] Presumably, the 2001 to 2009 estimates for San Diego County housing stock were not backward-adjusted when the 2010 census estimate was released which indicated a higher level of housing stock than previously estimated from 2005 to 2009. You can see that year 2000 and the subsequent years' ratio estimates that are closer to the 2000 census year are more in line with the 2010 census estimate. The departure largely is limited to the 2005 to 2009 period.

adjustment. In other words, as the entire county goes, so goes the unincorporated area of the county. They move in lock-step.

The forecast is show in Figure 25. Total housing stock in 2050 is forecast at 199,144 units, or the addition of 23,679 units from 2021 to 2050.

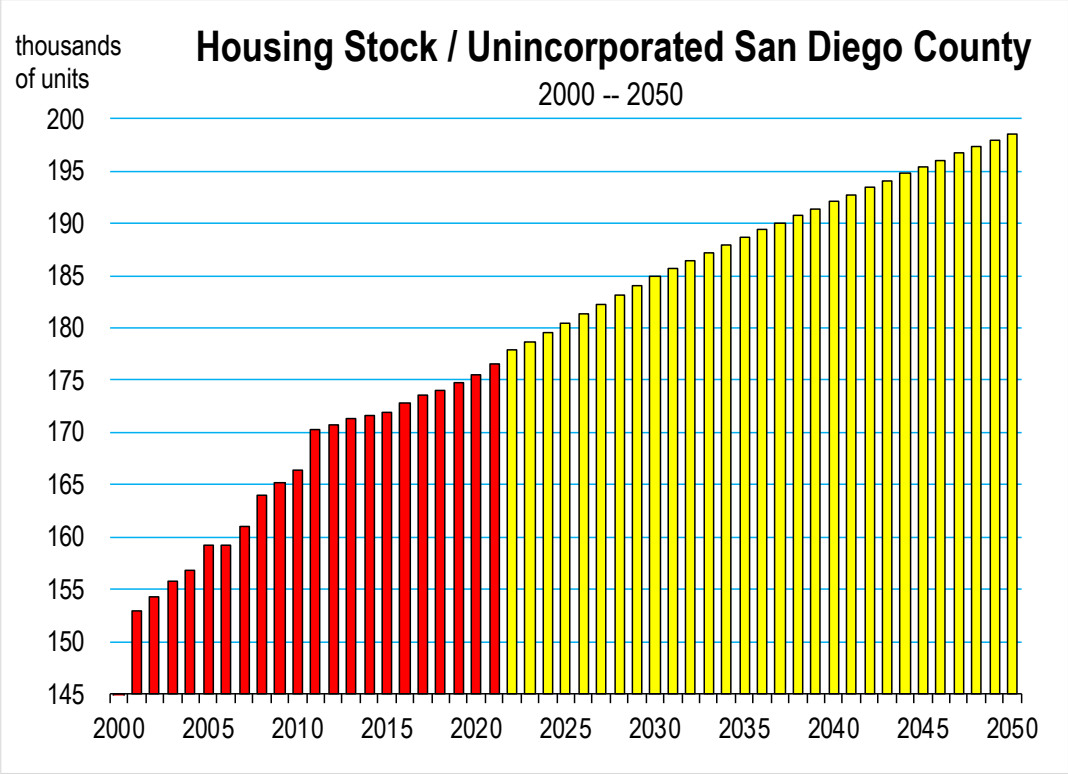


Figure 25: Ratio: Unincorporated Housing Stock to Total County Housing Stock

The change in the housing stock (or new housing stock units per year) is presented in Figure 25.

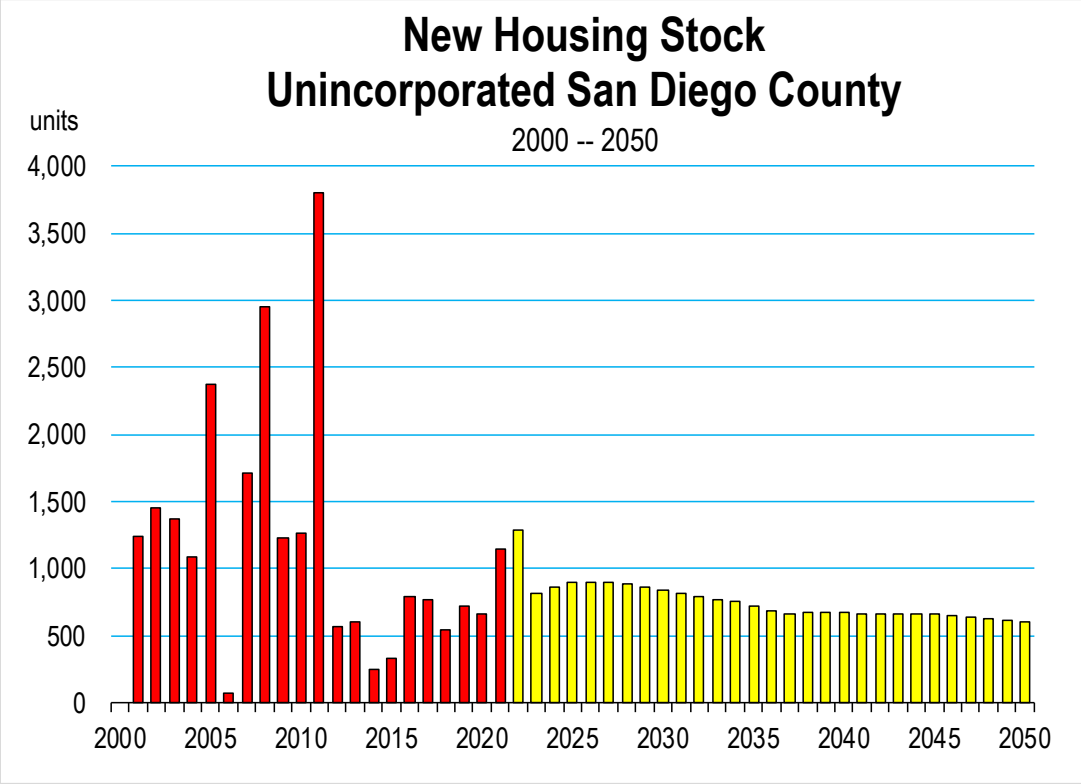


Figure 26: Ratio: Unincorporated Housing Stock to Total County Housing Stock

Dividing the unincorporated county population forecast by the unincorporated county housing stock forecast yields the following average household size, or population-per-unit ratio over time:

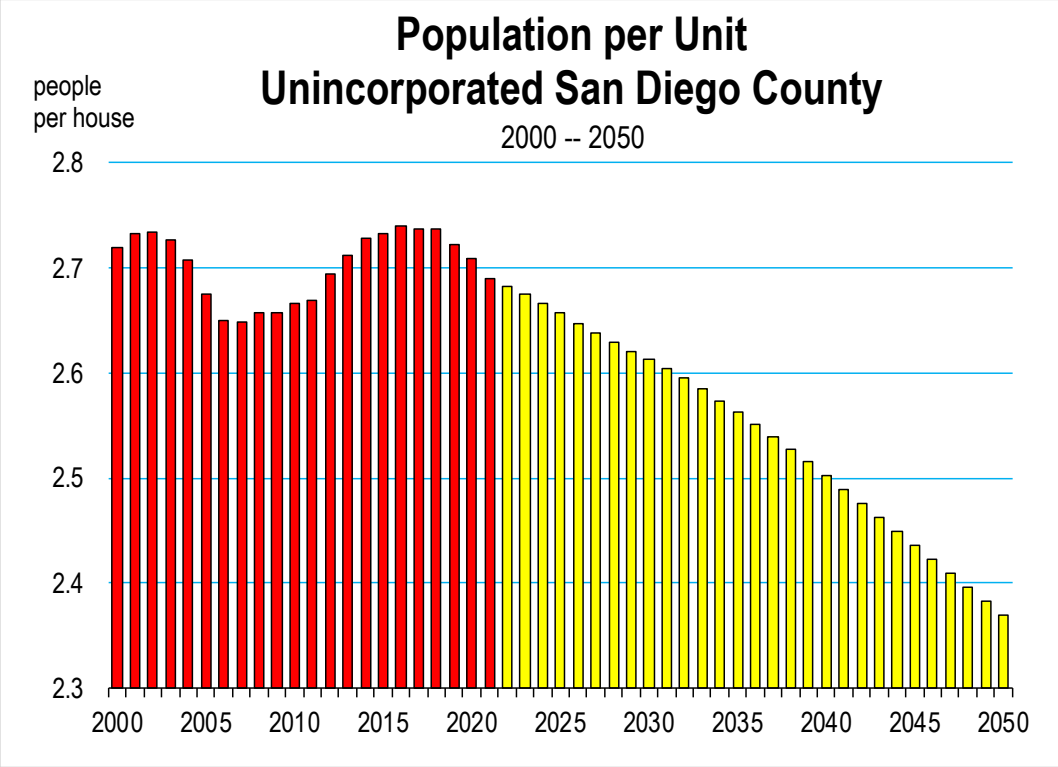


Figure 27: Ratio: Unincorporated Housing Stock to Total County Housing Stock

The decline in the ratio is consistent with the longer term county-wide trend, and what is being observed in other counties in recent years. As populations age, household sizes decline as children grow up and move away. Much fewer births since 2010 will necessarily lead to a much smaller fertile age cohort over the forecast (unless the trend in net migration dramatically reverses). Furthermore, because the birthrate is in decline, family sizes will be smaller.[24]

Our forecast of new housing units in the unincorporated area of San Diego County over the 2021 to 2050 period, along with the forecasts from the Report, are presented here:

Forecast of Housing Units built 2021-2050

	Report	California Economic Forecast
Base Growth Case	12,239	23,679
High Growth Case	23,431	not estimated

[24] See Appendix A

The housing unit forecast for the High Growth Case in the Report is nearly akin to the CEF forecast. Otherwise, the Base Growth Case is associated with more modest production of housing over the next 28 years.

Our independent forecast provides some corroborative evidence that the forecasts in the Report present a reasonable range of housing production for the unincorporated county area through 2050.

Employment

The approach adopted here to forecast employment in the unincorporated area is based on the premise that employment in the unincorporated area (as a share of total county employment) remains constant over time. The historical data tends to confirm this notion. Since 2010, the share of actual employment in the unincorporated area has been remarkably constant, averaging 7.17 percent of total county employment. See the **red trend** line below. The exception to the empirical observation of constancy occurs in 2020.

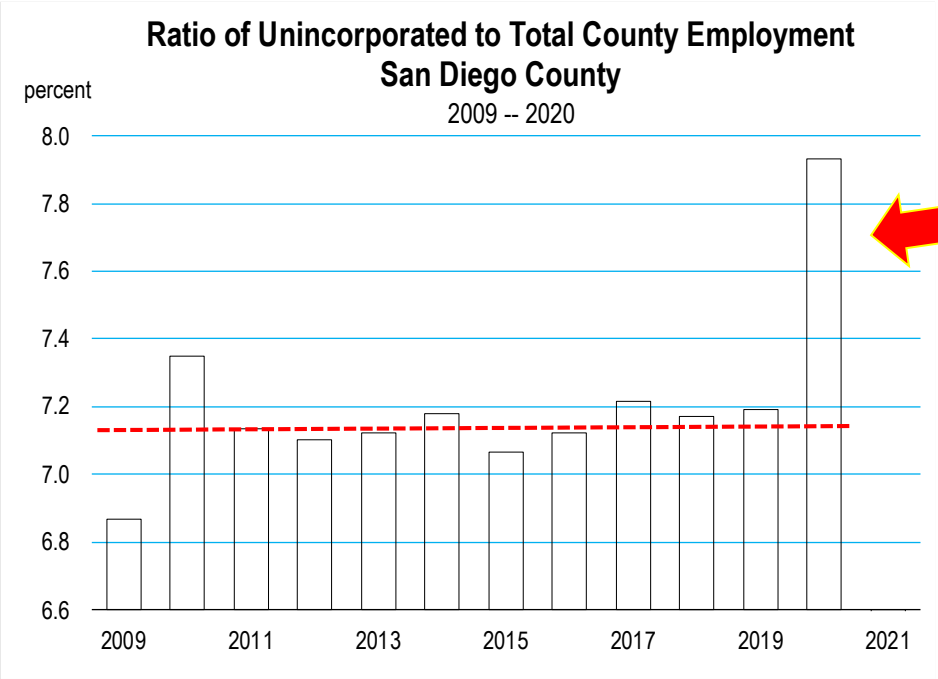


Figure 28: Ratio: Unincorporated Employment to Total County Employment

The 2020 estimate (**red arrow**) for employment is out of context from the rest of the historical data, due likely to this being the pandemic year when employment within the cities collapsed during the lockdowns. Consequently, we disregard this datapoint. The average

share for the unincorporated area is stable enough from the previous history to assume a similar share of total county employment will be likely over the forecast.

A forecast was generated for the unincorporated area from knowledge of total county employment over the forecast. We update our forecasts of total San Diego County employment annually. The forecast is determined as a bottoms up approach where each industry is forecast and then summed to obtain total employment.[25]

The current employment forecast for San Diego County is presented in Figure 29.

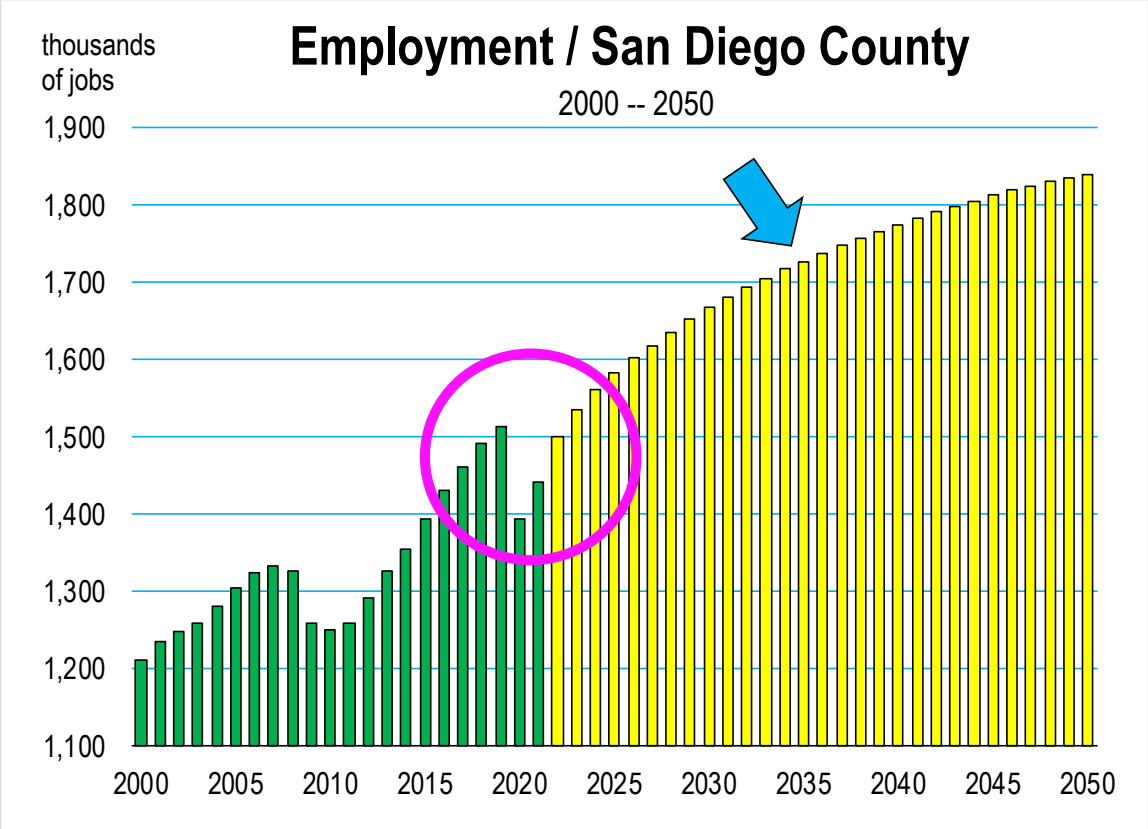


Figure 29: San Diego County Total Employment Forecast to 2050

Following the precipitous employment decline due to the pandemic **(purple circle)**, a recovery occurs and county employment fully recovers by 2023. The forecast has the

[25] Our industry classifications are two-digit NAICs sectors. Each employment sector is modeled using factors of the macro economy that would influence or cause variation in a particular industry's labor market over time A detailed explanation of the forecast methodology for county level employment can be found here: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/data-analytics-services/transportation-economics/socioeconomic-forecasts/2021/2021-pdf/methodology-update-2021-a11y.pdf

growth of new jobs diminishing over time **(as the blue arrow implies),** which is consistent with the diminishing population forecast growth over time (Figures 19 and 20).

Total employment does not decline at any point over the forecast as does population because jobs in the county are not exclusively tied to the resident population.

While there may be increased demand for workers by employers in San Diego County, the resident population will provide labor services *in addition to* commuters from Riverside County in the north (and in particular Temecula and Murrieta), and Mexico to the south.[26]

The resulting unincorporated county forecast is presented in Figure 30.

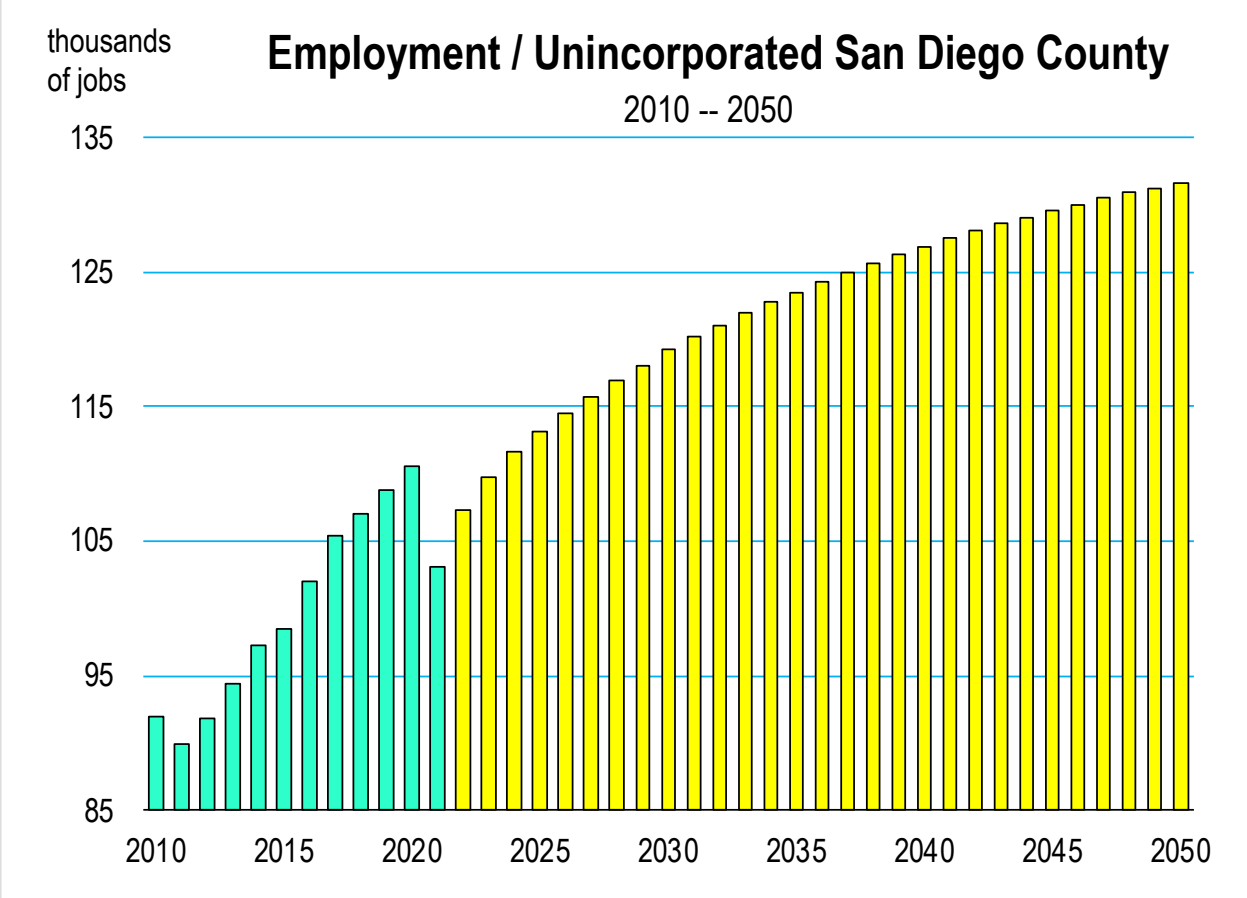


Figure 30: Unincorporated San Diego County Total Employment Forecast to 2050

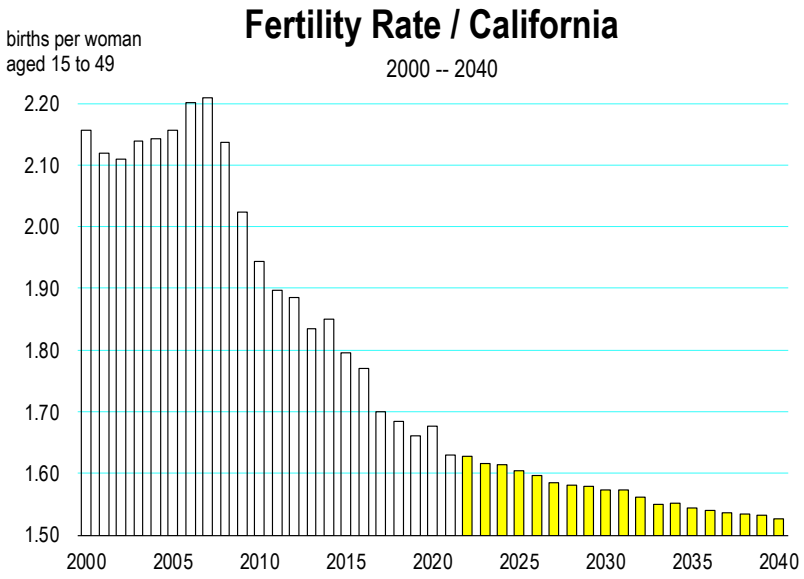
[26] In April 2022, the total number of people crossing the San Ysidro Port included 2.0 million passengers in autos, 620,000 pedestrians, and 16,500 bus passengers. Approximately the same number enter San Diego County from Mexico each month that return to Mexico.
https://explore.dot.gov/views/BorderCrossingData/Monthly?%3Aembed=y&%3AisGuestRedirectFromVizportal=y
From Riverside County, there is a net commute of 35,000 residents into San Diego County per day.
https://www.labormarketinfo.edd.ca.gov/file/commute-maps/sandiego2013.pdf

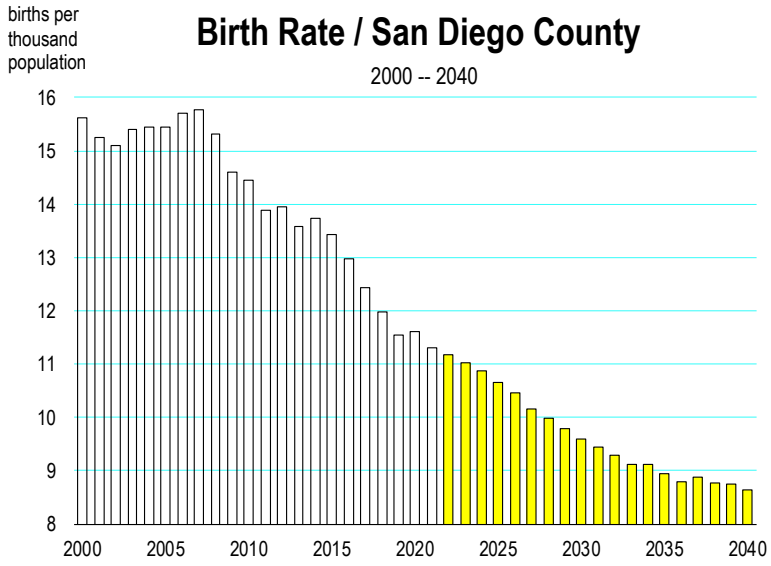
Between 2020 and 2050, employment rises from 110,636to 131,895, a gain in employment of just over 21,000 jobs. Our independent forecast of employment in the terminal year 2050 is nearly identical with the Housing Study forecast.

Total and Incremental Employment Forecasts
Unincorporated San Diego County

	Report	California Economic Forecast
Actual 2020	110,636	110,636
Base Growth Case 2050	131,801	131,895
Increment 2020-2050	21,165	21,259
High Growth Case 2050	136,803	not estimated
Increment 2020-2050	26,167	not estimated

Appendix A

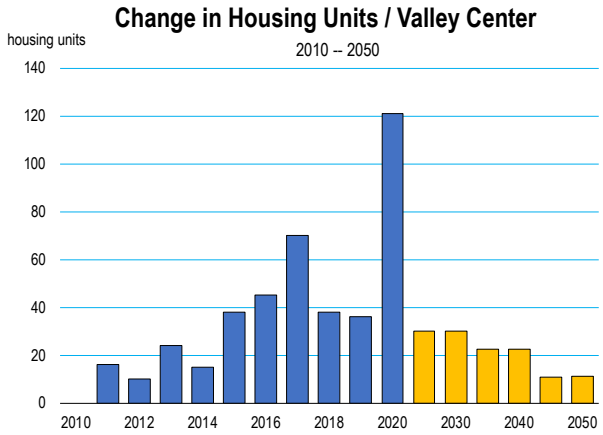


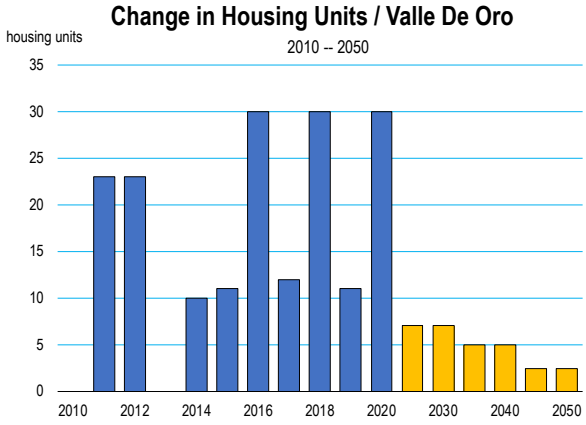


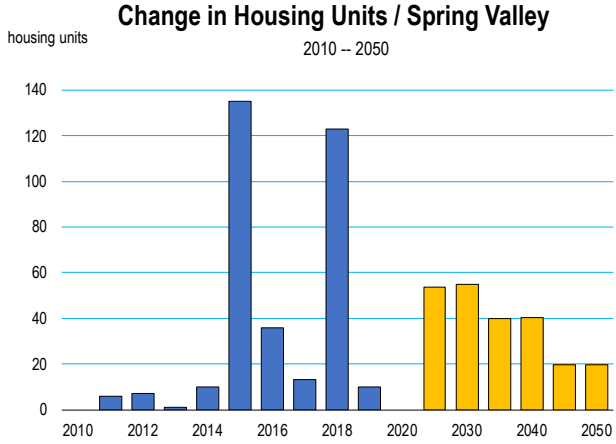
Report P-Births and Report P-2A, July 2021, Department of Finance
https://www.dof.ca.gov/forecasting/demographics/projections/
Source: Walter Schwarm, Chief Demographer, California Department of Finance, Recent Trends and Projections, 31st Annual Demographic Workshop, June 11, 2020, Figure 3.
https://scag.ca.gov/sites/main/files/file-attachments/walterschwarm.pdf?1604614050

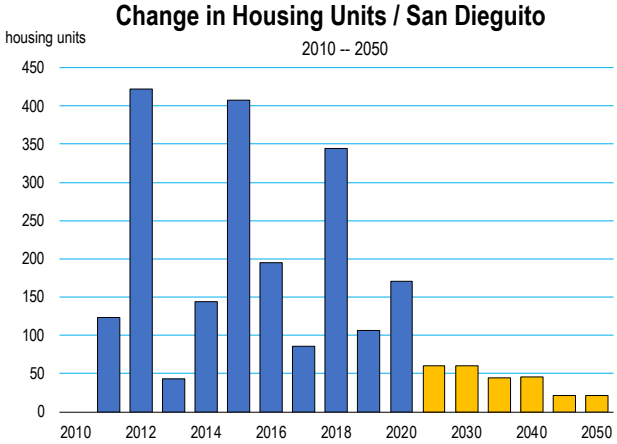
Appendix B

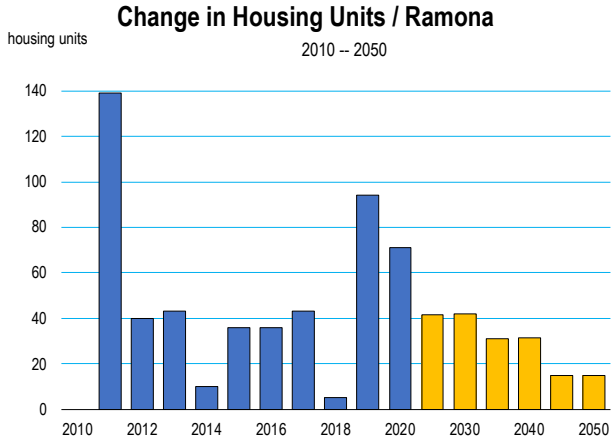
Annual housing unit forecasts (orange) for 10 largest CPAs

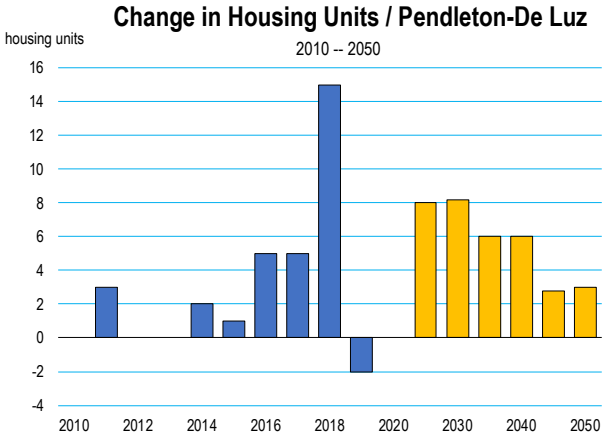


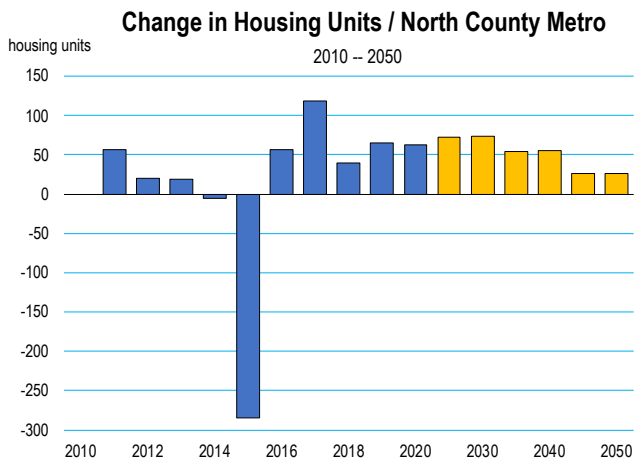


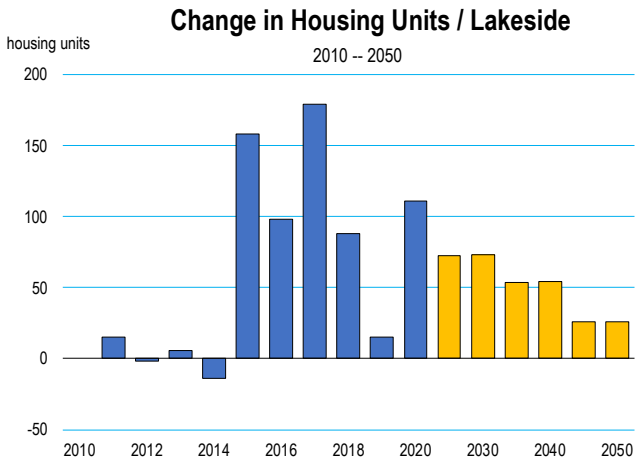


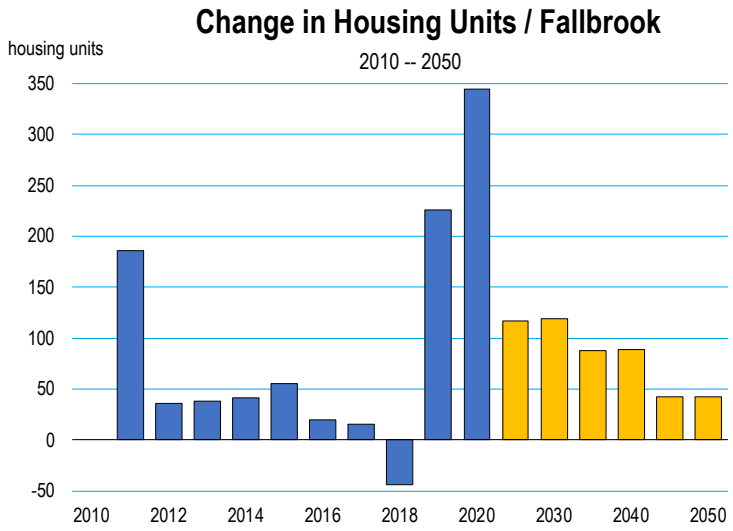


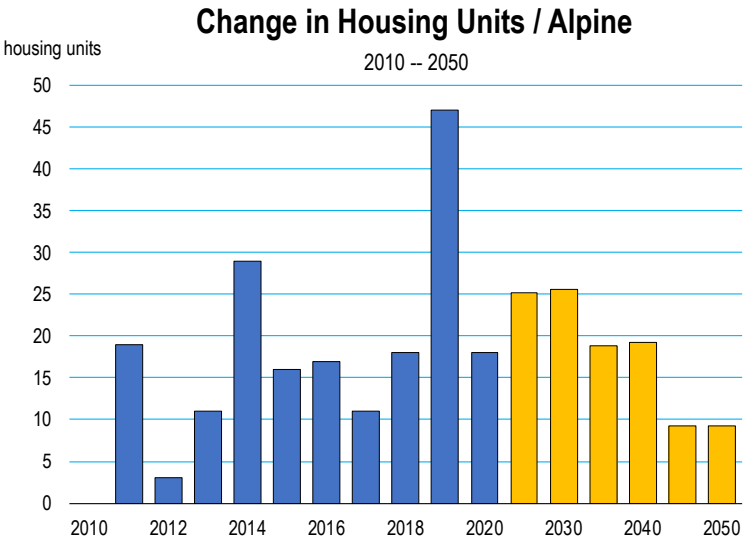





Change in Housing Units / North County Metro
housing units
2010 -- 2050
150
100
50
0
-50
-100
-150
-200
-250
-300
2010
2012
2014
2016
2018
2020
2030
2040
2050


Change in Housing Units / Lakeside
housing units
2010 -- 2050
200
150
100
50
0
-50
2010
2012
2014
2016
2018
2020
2030
2040
2050


Change in Housing Units / Fallbrook
housing units
2010 -- 2050
350
300
250
200
150
100
50
0
-50
2010
2012
2014
2016
2018
2020
2030
2040
2050


Change in Housing Units / Alpine
housing units
2010 -- 2050
50
45
40
35
30
25
20
15
10
5
0
2010
2012
2014
2016
2018
2020
2030
2040
2050

Appendix C

Dependent Variable:	**Population, unincorporated area**			
Method: Least Squares				
Date: 03/02/22 Time: 14:20				
Sample (adjusted): 1990 2021				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	42690.39	9974.093	4.28	0.0002
POPJUL	0.14	0.003	41.53	0
DUM17ON	-9663.56	2488.737	-3.88	0.0005
R-squared	0.9877	Mean dependent var		463331.8
Adjusted R-squared	0.987	S.D. dependent var		36414.5
S.E. of regression	4178.043	Akaike info criterion		19.6
Sum squared resid	50.6E7	Schwarz criterion		19.7
Log likelihood	-310.634	F-statistic		1162.9
Durbin-Watson stat	0.984	Prob(F-statistic)		0

Dependent Variable:	**Housing Stock, unincorporated area**			
Method: Least Squares				
Date: 03/02/22 Time: 14:10				
Sample (adjusted): 2000 2020				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	42434.27	4323.348	9.82	0
HS	0.11	0.004	27.10	0
DUM10ON	4024.09	428.069	9.40	0
R-squared	0.9953	Mean dependent var		166581.7
Adjusted R-squared	0.99	S.D. dependent var		7735.3
S.E. of regression	559.29	Akaike info criterion		15.6
Sum squared resid	56.3E6	Schwarz criterion		15.8
Log likelihood	-161.04	F-statistic		1903.8
Durbin-Watson stat	1.38	Prob(F-statistic)		0.0

Period of Analysis, review, and completion

A draft review was conducted between January 15 and February 19. The analysis incorporated data provided by AECOM, San Diego County PDS, the latest SANDAG population and employment forecast, our own comprehensive databank on San Diego County, and conversations with Meghan Kelly, Andrew Kaplan and Nathan Schmitt.

A final draft review and report was completed on July 21, 2022. The final review incorporated changes made by AECOM in response to the draft report, revised data for employment, and general revisions within their Report to (1) correct for typos and (2) provide further narrative to clarify methodology. This version dated August 15, 2022 (which corrects minor miscellaneous issues or typos) represents our Final Report.

The California Economic Forecast

The company incorporated in 2004 after becoming an independent consulting firm in 2000. The principal, Mark Schniepp, was the Director of the UCSB Economic Forecast Project from 1986 to 2000. Schniepp was also the senior economist for the State of California Controllers office from 1999 to 2003.

The California Economic Forecast has been monitoring, evaluating, and forecasting the regional economies of California since 2000. We have developed forecasting models for every county in the State of California. The forecasts include employment, population, net in-migration, personal income, consumer spending and the potential for new development. Mathematical models have been developed to forecast home sales and prices at the County and sub-county level.

We have particular expertise in housing markets, housing market fundamentals including housing supply and demand, and how those two forces have evolved by region in California over time. We annually produce projections of in-migration, housing sales, new housing development, and housing values for all California counties.

We have conducted numerous housing market studies and produced updated forecasts for real estate clients in California including the Construction Industry Research Board, The California Association of Realtors, Newhall Land, FivePoint Communities, The Irvine Company, and Associations of Realtors in Ventura, Santa Barbara, and Los Angeles Counties.

We have specialized in monitoring the new development process in California, and we have tracked all principal new development in the state for the last 6 years which has provided us an intrinsic understanding of the entitlement process and where the growth of housing and commercial development is occurring throughout the state.

The company participates in annual economic forecast conferences in the Santa Clarita Valley, Orange County, Ventura County and Santa Barbara County. At times, much of the content features both the new residential development sector and the existing housing sector for the local region. The conferences are often sponsored by the local Associations of Realtors®.[27]

The forecasting models have undergone significant revision and update over time. This includes the regional forecasting model for all Southern California Counties, including San Diego County.

The forecasts have been used extensively by Cal Trans and Kaiser Permanente every year over the last 15 years. The model has also been used to produce a published forecast for the UCLA Anderson Forecast publication and presentation for the San Diego County economy. Forecast conferences with UCLA have been conducted at UC San Diego.

[27] Santa Barbara Association of Realtors, Conejo-Simi Valley-Moorpark Association of Realtors, Ventura County Coastal Association of Realtors, Southland Regional Association of Realtors.

Appendix C

CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis

FEHR PEERS

Memorandum

Date: April 10, 2023

To: Andrew Martin, Ascent

From: Katy Cole and Andrew Scher, Fehr & Peers

Subject: CAP VMT Modeling Assumptions: Use of SANDAG Series 14.3.0 Model Year 2016 for County Baseline VMT Analysis

SD21-0394

This memorandum provides documentation of assumptions for modeling vehicle miles traveled (VMT) for the update to the County's Climate Action Plan (CAP). Specifically, the memorandum summarizes Fehr & Peers' comparison of SANDAG ABM 2+ Model assumptions for dwelling units and households in the unincorporated county to dwelling unit data the County has recorded in its Housing Production and Capacity Portal, referred to as the "housing portal." The purpose of this comparison is to identify whether modeled results for the number and distribution of dwelling units in the unincorporated county in Year 2016 from SANDAG's ABM 2+ Model appropriately reflect the number and distribution of dwelling unit data the County has recorded for the unincorporated area in its housing portal for 2020. This comparison was requested by the County to help inform whether the SANDAG ABM 2+ Model 2016 VMT outputs appropriately represent 2019 unincorporated county VMT as part of the County's CAP Update.

Comparison of County Housing Portal to SANDAG ABM 2+ Model

Methodology

The County provided Fehr & Peers with dwelling unit data for the unincorporated county from their housing portal. Using the County's housing portal data, Fehr & Peers estimated 2020 dwelling unit totals for each community plan area (CPA) in the unincorporated county by taking the sum of the 2012 dwelling unit totals, units built between January 2012 and January 2021 (excluding units on lands outside of County jurisdiction), and units that are part of projects with in-process grading permits as of January 2021 (excluding units on lands outside of County jurisdiction). The estimated 2020 dwelling unit total for the unincorporated area from the

County's housing portal was then compared to the total dwelling units for the unincorporated area assumed in the 2016 baseline year of the SANDAG ABM 2+ Model (Series 14.3.0).

Results of the Comparison

Table 1 shows the how the number of dwelling units in the model for 2016 compared to the number of dwelling units from the County housing portal for 2020. There is less than one percent difference between the total dwelling units in the Model and the total dwelling units recorded in the County's housing portal. This indicates that both the model and County housing portal accurately reflect 2020 dwelling units, and the baseline model assumptions are built upon a solid data foundation. This also indicates that little growth occurred in the unincorporated county between 2019 and 2020, so the 2016 model also reflects conditions in 2019 for the unincorporated county.

Table 1: Model Units/Households and County Housing Portal Units Comparison

Comparison	Model	Portal	Difference	% Difference
2016 Model Dwelling Units vs. 2020 Portal Dwelling Units	178,991	179,235	244	<1%

Attachment A shows how the number of dwelling units in the 2016 model compares to the number of dwelling units from the County housing portal for 2020 for each community plan area (CPA).

Some larger differences between the model and housing portal for some CPAs may be a result of TAZs not following CPA boundaries. Unit totals for a TAZ were assigned to the CPA within which the majority of the TAZ lies. Overestimates and underestimates by CPA in the model will not significantly change VMT results given that VMT will be calculated for CAP work at the countywide level rather than the CPA level.

Conclusion

Based on our comparison of the ABM 2+ 2016 dwelling unit assumptions to the 2020 County housing portal data, the differences between the model data and County data are acceptable for the purposes of countywide VMT and GHG modeling. Therefore, the SANDAG ABM 2+ Model (Series 14.3.0) year 2016 is an appropriate tool to use to estimate VMT for the unincorporated county for 2019 conditions. The VMT estimates will support development of the baseline GHG inventory for the updated County CAP.

Attachment A: Model Units and County Units Comparison

CPA	Comparison between 2012 Model Units and 2012 Portal Units				Comparison between 2020 Model Units and 2020 Portal Units (2012 Units Plus Units Built Since or Under Construction)				Comparison between 2020 Model Households and 2020 Portal Units			
	2012 Model Units	2012 Portal Units	Diff	% Diff	2020 Model Units	2020 Portal Units	Diff	% Diff	2020 Model Households	2020 Portal Units	Diff	% Diff
Alpine	6508	6554	-46	-1%	7308	6800	508	7%	6464	6800	-336	-5%
Barona	202	202	0	0%	202	202	0	0%	202	202	0	0%
Bonsall	3688	3905	-217	-6%	4150	4136	14	0%	3974	4136	-162	-4%
Borrego Springs	2496	2596	-100	-4%	2702	2616	86	3%	1748	2616	-868	-50%
Boulevard	827	834	-7	-1%	868	855	13	1%	740	855	-115	-16%
Central Mountain	3	6	-3	-100%	9	6	3	33%	7	6	1	14%
County Islands	855	596	259	30%	926	614	312	34%	871	614	257	30%
Crest - Dehesa	3568	3585	-17	0%	3806	3691	115	3%	3711	3691	20	1%
Cuyamaca	250	228	22	9%	282	247	35	12%	236	247	-11	-5%
Descanso	630	714	-84	-13%	646	740	-94	-15%	630	740	-110	-17%
Desert	1154	969	185	16%	1024	994	30	3%	557	994	-437	-78%
Fallbrook	15887	16151	-264	-2%	17402	17454	-52	0%	16554	17454	-900	-5%
Hidden Meadows	3506	3180	326	9%	3507	3296	211	6%	3008	3296	-288	-10%
Jacumba	409	404	5	1%	372	409	-37	-10%	320	409	-89	-28%
Jamul	3293	3305	-12	0%	4035	3429	606	15%	3937	3429	508	13%
Julian	1696	1722	-26	-2%	1935	1778	157	8%	1543	1778	-235	-15%
Lake Morena / Campo	1224	1321	-97	-8%	1319	1367	-48	-4%	1310	1367	-57	-4%
Lakeside	27473	27587	-114	0%	29517	28455	1062	4%	28264	28455	-191	-1%
Mountain Empire	121	49	72	60%	152	49	103	68%	134	49	85	63%
North County Metro	11653	11583	70	1%	12583	12071	512	4%	12148	12071	77	1%
North Mountain	1063	1247	-184	-17%	1163	1272	-109	-9%	1036	1272	-236	-23%
Otay	8	7	1	13%	9	7	2	22%	9	7	2	22%
Pala - Pauma	2039	1986	53	3%	2366	2020	346	15%	2243	2020	223	10%
Palomar Mountain	492	290	202	41%	466	301	165	35%	341	301	40	12%
Pendleton - De Luz	7770	7534	236	3%	9418	7549	1869	20%	8088	7549	539	7%
Pine Valley	1249	1251	-2	0%	1391	1270	121	9%	1221	1270	-49	-4%
Potrero	364	375	-11	-3%	416	378	38	9%	417	378	39	9%
Rainbow	707	716	-9	-1%	845	738	107	13%	844	738	106	13%
Ramona	12499	12555	-56	0%	13361	13044	317	2%	13006	13044	-38	0%
San Dieguito	11927	11870	57	0%	13045	13625	-580	-4%	12139	13625	-1486	-12%
Spring Valley	20402	20546	-144	-1%	21374	20956	418	2%	19952	20956	-1004	-5%
Sweetwater	4683	4718	-35	-1%	4832	4786	46	1%	4621	4786	-165	-4%
Tecate	45	55	-10	-22%	44	55	-11	-25%	43	55	-12	-28%
Twin Oaks	1204	969	235	20%	1336	1011	325	24%	1316	1011	305	23%
Valle De Oro	15497	15581	-84	-1%	15483	15711	-228	-1%	15015	15711	-696	-5%
Valley Center	6621	6664	-43	-1%	8002	7303	699	9%	7871	7303	568	7%
Total	**172013**	**171855**	**158**	**0%**	**186296**	**179235**	**7061**	**4%**	**174520**	**179235**	**-4715**	**-3%**