Memo

455 Capitol Mall, Suite 300
Sacramento, CA 95814
916.444.7301

Date: November 22, 2024

To: Brian Bordona, Jamison Crosby, and Ryan Melendez (County of Napa); and Deborah Elliott (City of Napa)

From: Brenda Hom, Erik de Kok, and Honey Walters (Ascent, Inc.)

Subject: **Napa County RCAAP: Greenhouse Gas Reduction Measures and Targets Technical Memorandum**

---

1 INTRODUCTION

This technical memorandum presents the estimated greenhouse gas (GHG) reduction potential of measures proposed for the Napa County Regional Climate Action and Adaptation Plan (RCAAP). A total of 46 proposed GHG reduction measures were originally identified and refined following extensive discussions with local and regional stakeholders earlier in 2024, and 18 of the 46 proposed measures have been quantified for their GHG reduction potential. This memorandum also includes and discusses three possible GHG reduction target pathways for the RCAAP based on locally-adopted resolutions, the State's 2022 Climate Change Scoping Plan, Assembly Bill (AB) 1279, and Senate Bill (SB) 32. The feasibility of achieving the three target pathways is assessed based on the potential of the measures to reduce emissions and in considering the feasibility of implementation actions previously identified that would be required to fully implement each measure.

The proposed GHG reduction measures were analyzed based on their potential to reduce regional emissions by 2030, 2035, and 2045, through reducing forecasted emissions and increasing carbon sequestration. These years align with the milestone years of the previously quantified emissions forecasts for the region and current regulations. Reductions beyond the scope of the emissions forecast, except for carbon sequestration, are not included in this analysis. All 18 quantified GHG reduction measures, including their associated implementing actions and related assumptions, and estimated GHG reductions, are summarized in this technical memorandum and will require review by the County and Cities to determine the feasibility of achieving the possible GHG reduction targets.

The Ascent team recommends that targets be selected for the years 2030 and 2045 that align with AB 1279 and the State's Scoping Plan anthropogenic (i.e., human-caused) emissions reduction targets to ensure that the RCAAP's targets and GHG reductions are based on substantial evidence and can thus be used for California Environmental Quality Act (CEQA) tiering and streamlining, consistent with CEQA Guidelines Section 15183.5. Because of Napa County's abundance of natural and working lands, an additional carbon neutrality by 2045 target pathway is recommended that would be additional to, but not replace, the Scoping Plan anthropogenic emissions reduction targets.

1.1 ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of eight parts:

- **Section 1: Introduction** presents the background and purpose behind the GHG reduction measure memorandum.
- **Section 2: Background** provides an overview of the RCAAP, the regulatory context for GHG reduction, a summary of the GHG inventory and forecast results, a brief discussion of why some short-lived climate pollutants (SLCPs) are excluded from this analysis, and potential pathways for GHG reduction targets that align with statewide targets and local priorities.
- **Section 3: GHG Reduction Target Pathways and Gap Analysis** compares the legislative-adjusted emissions forecasts to the potential GHG reduction targets and assesses the "gap" that would need to be closed with measures.
- **Section 4: GHG Measures Summary** introduces the individual qualitative and quantitative measures included in this memorandum and discusses the challenges of meeting the potential targets.
- **Section 5: GHG Reduction Quantification Assumptions and Methods** summarizes the data, methods, and assumptions used to estimate GHG emissions reductions for each quantified measure.
- **Section 6: Next Steps** discusses the next steps after completing the measure quantification.

2 BACKGROUND

Climate action planning includes steps that local jurisdictions, such as the County, Cities and Town in Napa, can take to reduce emissions to achieve specific GHG reduction targets. Once these targets are developed, local jurisdictions can plan to meet them by identifying GHG reduction measures, such as new policies, programs, education and outreach efforts, and other actions that, if implemented, will reduce emissions in the region. The RCAAP should include GHG reduction targets that are aligned with state, regional, and local policies applicable to the Napa region.

One of the primary goals of the RCAAP is to have a qualified GHG reduction plan, as defined in Section 15183.5(b) of the CEQA guidelines, through which future discretionary projects can streamline the analysis and mitigation of GHG emissions if environmental review is required. To ensure that the RCAAP is a qualified plan, the RCAAP must identify GHG reduction targets that are demonstrated through substantial evidence to reduce local GHG emissions below levels that would be considered cumulatively considerable and align with statewide plans and legislation for reducing GHG emissions. Jurisdictions have the ability to determine targets that are most appropriate for local conditions. However, they must be based on substantial evidence that demonstrates the targets can be feasibly achieved. The State's 2022 Climate Change Scoping Plan recommends that local targets support the State's implementation of strategies to reach the legislative targets established by AB 1279 and SB 32, which aim to reduce statewide anthropogenic emissions to 85 percent below 1990 levels by 2045 and carbon neutrality by 2045.

To achieve these targets, a set of aggressive measures that are both feasible and cost-effective must be identified to reduce emissions across all emissions sectors. These measures must include specific actions that can be implemented at the jurisdictional level through municipal actions, such as building energy retrofit programs for existing residential buildings or working with local waste collection entities to increase methane (CH_4) capture at local landfills. Because the targets are so ambitious, jurisdictions must reduce emissions across all emissions sectors.

This memorandum thus analyzes a series of GHG reduction target pathways that will help the RCAAP be consistent with the State's goals for reducing anthropogenic emissions by 2045, and it discusses the scale of measures that the County and Cities would need to take to achieve either local 2030 carbon neutrality goals or the 2045 carbon neutrality target set by the State under AB 1279. The policies informing the development of the GHG reduction targets are discussed in more detail below.

2.1 STATE POLICIES AND PLANS

In September 2016, Governor Jerry Brown signed SB 32, which mandates that California reduce its GHG emissions to 40 percent below 1990 levels by 2030. It builds upon previous legislation (AB 32), setting more ambitious targets and driving the state's transition towards a low-carbon economy.

In September 2022, Governor Gavin Newsom signed AB 1279, which requires the State of California to achieve net zero GHG emissions by 2045 and reduce direct anthropogenic GHG emissions 85 percent below 1990 levels by 2045.

In December 2022, the California Air Resources Board (CARB) released the 2022 Climate Change Scoping Plan. This plan outlines the State's comprehensive strategy to achieve its climate goals under AB 1279, focusing on reducing anthropogenic GHG emissions to 48 percent below 1990 levels by 2030 and 85 percent below 1990 by 2045. It includes a variety of measures across different sectors to accelerate GHG emission reductions, enhance carbon sequestration, and implement new carbon capture, utilization, and storage measures consistent with SB 905 (also signed into law in 2022) to achieve net-zero emissions (sometimes also referred to by CARB as “carbon neutrality”) by 2045.

2.2 REGIONAL GUIDANCE

The Bay Area Air Quality Management District (BAAQMD) 2022 CEQA Guidelines include guidance for local government development of qualified GHG reduction plans. It clarifies the requirements under CEQA Guidelines Section 15183.5 and recommends, consistent with AB 1279, that if local governments demonstrate a reduction of 40 percent below 1990 levels by 2030 and be able to demonstrate, they will “achieve as ambitious emissions reductions as technologically and financially feasible by 2045, minimizing the residual number of emissions needed to close the gap to carbon neutrality” (BAAQMD 2022).

2.3 LOCAL RESOLUTIONS AND PROCLAMATIONS

Compared to state and regional regulations and guidance, locally-adopted resolutions and proclamations in the region target carbon neutrality by 2030, which is far more aggressive than regional guidance, State law, and adopted statewide plans. In 2021 and early 2022, the Cities of American Canyon, St. Helena, Calistoga, and Napa, along with the County of Napa, adopted resolutions establishing goals to achieve carbon neutrality by 2030. The Town of Yountville also adopted a proclamation with the same goal. However, these goals were set prior to AB 1279 becoming law in October 2022 and CARB’s adoption of the 2022 Scoping Plan in December 2022.

Unlike the 2022 Scoping Plan, the feasibility of achieving the 2030 local carbon neutrality targets was not studied. Given that the State did extensive feasibility studies in developing the 2022 Scoping Plan to achieve the targets under AB 1279, it is generally unlikely that achieving carbon neutrality 15 years earlier would be feasible. However, the Request for Proposal (RFP) for the RCAAP clarified that the latest carbon neutrality should be achieved is by 2045. Achieving carbon neutrality in the region by 2045 would be consistent with State targets under AB 1279.

2.4 SUMMARY OF GHG EMISSIONS INVENTORY AND FORECASTS

Identifying 2030 and 2045 as potential target years served as a basis for the GHG forecast work, which estimated future emissions for 2030, 2035 (as an interim year), and 2045. In May 2024, Ascent completed the region's 2019 GHG inventory update and forecast for the years 2030, 2035, and 2045 for all jurisdictions within Napa County (Ascent 2024a). The forecast estimated that the region's emissions would decrease from 1.2 million metric tons of carbon dioxide equivalent ($MTCO_2e$) in 2019 by 55 percent to 547,000 $MTCO_2e$ by 2045 with currently adopted legislation and forecasted growth in the region. These updates were intended to establish a basis from which the region can determine its progress toward achieving its climate goals by reducing GHG emissions. Table 1 summarizes the region's GHG inventory and forecasts by emissions sector and year.

Table 1 Napa County Regional GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Sector	2019	2030	2035	2045
Agriculture	103,381	99,240	98,018	96,070
Building Energy	279,592	174,638	134,828	59,733
Imported Water	5,943	3,296	707	0
Off-Road Equipment	115,548	43,886	43,767	49,694
On-Road Transportation	472,677	307,817	201,923	71,157
Solid Waste	198,862	217,407	215,942	216,139
Wastewater	45,858	52,621	52,772	54,585
Total	**1,221,861**	**898,904**	**747,956**	**547,378**
Percent Change from 2019		-26%	-39%	-55%

Notes: BAU = Business-as-Usual, $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent 2024a.

Short-Lived Climate Pollutants Excluded

The values shown in Table 1 reflect carbon dioxide equivalents associated with Carbon Dioxide (CO_2), Methane (CH_4), and nitrous oxide (N_2O). A separate emissions inventory was conducted for specific types of SLCPs, such as black carbon, hydrofluorocarbons, perfluorocarbons, and fugitive CH_4 from natural gas pipeline leaks not captured in the inventory. These gases are also considered high global warming potential (GWP) gases with CO_2 equivalents several times higher than CO_2. The separate analysis, "Updated Final Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant Inventory Memorandum," dated August 27, 2024, found that, in Napa County for the year 2019, SLCPs account for 1.1 million $MTCO_2e$ using a 20-year lifetime (Ascent 2024b). SLCPs generally have shorter lifetimes in the atmosphere than CO_2, CH_4, and N_2O before they are either redeposited onto the earth's surface or generally oxidized in the atmosphere back into CO_2. In comparison, the GHGs addressed in the forecast and inventory are based on 100-year GWP factors. Because of this discrepancy in GWPs and because SLCPs, with the exception of CH_4, are not accounted for in the State's GHG reduction goals under AB 1279, SB 32, or the 2022 Scoping Plan, SLCPs (with the exception of CH_4) were not included in the region's main GHG inventory and forecast, as shown in Table 1. However, many of the measures proposed in this memorandum would have co-benefits of reducing SLCPs, especially black carbon, which primarily result from the combustion of gasoline and diesel fuels.

3 GHG REDUCTION TARGET PATHWAYS AND GAP ANALYSIS

This memorandum analyzes three potential pathways for providing reduction targets for the RCAAP, based on locally-adopted resolutions, and adjusting the local emissions profile to align with legislative statewide targets for both anthropogenic GHG emissions reductions and carbon neutrality:

- **2030 and 2045 Scoping Plan Anthropogenic Targets Pathway:** This pathway identifies the region's share of the State's Scoping Plan targets for statewide emissions sectors (i.e., anthropogenic GHG emissions sources) equivalent to 42 percent below 2019 levels by 2030 and 85 percent below 2019 levels by 2045, consistent with BAAQMD guidance and State targets under SB 32 and AB 1279. This targets pathway is demonstrated through substantial evidence to reduce local GHG emissions below levels consistent with statewide targets and suitable for use in CEQA "qualified" climate action plans for tiering and streamlining GHG emissions analyses under CEQA.
- **2030 Carbon Neutrality Target Pathway**: This target pathway aims for regional carbon neutrality by 2030, as set by locally-adopted resolutions in the region (i.e., net zero annual emissions by 2030). As noted previously, however, this target pathway is inconsistent with AB 1279 and the 2022 Scoping Plan. The State's 2022 Scoping Plan relies on carbon dioxide removals (CDR) through nature-based solutions and mechanical carbon capture, utilization, and sequestration to achieve carbon neutrality. Local jurisdictions can rely on a similar approach to achieving carbon neutrality, although using CDR to achieve carbon neutrality as soon as 2030 is practically infeasible, as discussed later in this memorandum. Nevertheless, local agencies can still leverage the abundance of natural and working lands in the county to support the State's CDR targets and to help achieve long-term countywide carbon neutrality through carbon removal, which, in the county, would primarily involve natural carbon sequestration.
- **2045 Carbon Neutrality Target Pathway**: This target pathway aims for regional carbon neutrality by 2045, consistent with the goals under the 2022 Scoping Plan and AB 1279. The interim targets under the Scoping Plan Anthropogenic Targets Pathway for 2030 and 2035 provide a gradual set of milestones in increasing anthropogenic emissions reductions leading up to the 2045 target. This approach also relies on the abundance of natural and working lands in the county that are consistent with the State's CDR targets and helps achieve long-term countywide carbon neutrality through carbon removal, which, in the county, would primarily involve natural carbon sequestration.

Based on 2019 levels and the emissions forecasts, the future emission reduction targets in 2030 and 2045 under these three target pathways are shown in Tables 2, 3, and 4. The Scoping Plan Anthropogenic Targets pathway reflects the GHG emissions reductions solely from anthropogenic sources that would need to be demonstrated through local GHG reduction measures for a given forecast year. The 2030 and 2045 Carbon Neutrality Target pathways utilize the additional carbon sequestration needed to reduce any remaining anthropogenic GHG emissions to zero. The following tables show the gap between future forecasted emissions under a legislative-adjusted business-as-usual scenario and the GHG reduction targets for 2030, 2035, and 2045. 2035 is included as an interim target.

Table 2 Emission Reductions Needed to Meet the Scoping Plan Anthropogenic Targets for 2030 and 2045

Year	RCAAP Anthropogenic GHG Reduction Target (Relative to 2019 Levels)	Legislative-Adjusted GHG Emissions Forecast ($MTCO_2e$)	Target Emissions Levels ($MTCO_2e$/yr)	Reductions from Legislative-Adjusted GHG Emissions Forecast Needed to Achieve Target ($MTCO_2e$/yr)
2019	--	1,221,861	1,221,861	--
2030	42%	898,904	709,685	189,219
2035	57%	747,956	520,547	227,410
2045	85%	547,378	178,836	368,542

Source: Calculated by Ascent in 2024. Note: Totals may not sum identically to what is presented due to rounding.

Table 3 Emission Reductions and Carbon Sequestration Needed to Meet the 2030 Carbon Neutrality Target

Year	RCAAP GHG Reduction Target (Relative to 2019 Levels)	Legislative-Adjusted GHG Emissions Forecast ($MTCO_2e$)	Target Net-Emissions Levels ($MTCO_2e$/yr)	Reductions from Legislative-Adjusted GHG Emissions Forecast Needed to Achieve Target ($MTCO_2e$/yr)
2019	--	1,221,861	1,221,861	--
2030	100%	898,904	0	898,904
2035	100%	747,956	0	747,956
2045	100%	547,378	0	547,378

Source: Calculated by Ascent in 2024.

Table 4 Emissions Reductions and Carbon Sequestration Needed to Meet the 2045 Carbon Neutrality Target

Year	RCAAP GHG Reduction Target (Relative to 2019 Levels)	Legislative-Adjusted GHG Emissions Forecast ($MTCO_2e$)	Target Net-Emissions Levels ($MTCO_2e$/yr)	Reductions from Legislative-Adjusted GHG Emissions Forecast Needed to Achieve Target ($MTCO_2e$/yr)
2019	--	1,221,861	1,221,861	--
2030	42%	898,904	709,685	189,219
2035	57%	747,956	520,547	227,410
2045	100%	547,378	0	547,378

Source: Calculated by Ascent in 2024.

To meet the 2030 Carbon Neutrality Targets, the GHG reductions - through anthropogenic emissions reductions and carbon sequestration - must be enough to offset all emissions generated in 2030 and any forecasted emissions going forward. This is equally true for the 2045 Carbon Neutrality Target. Understanding the region's fair share of the State's GHG target reductions under the Scoping Plan and AB 1279 is less straightforward. The Scoping Plan Anthropogenic Targets pathway is based on the alignment of the emissions sectors in the county to those considered under the Scoping Plan, which is explained in Section 3.1. The development of the two carbon sequestration target pathways is discussed in Section 3.2.

The targets shown in Tables 2 and 4 are shown relative to the county's 2019 emissions baseline. For the Scoping Plan Anthropogenic Targets, estimating the GHG emissions reduction needed from the 2019 baseline requires translating the statewide target percentages relative to 1990 to the region's emissions profile. The analysis compares the State's 2019 emissions to future emissions targets for 2030 and 2045 identified in the 2022 Scoping Plan (CARB 2022a). The future emissions reduction targets in the Scoping Plan are 48 percent below statewide 1990 levels by 2030 and 85 percent below 1990 levels by 2045. When adjusted for the 2019 baseline, the Scoping Plan Anthropogenic Target targets a 42 percent reduction from 2019 levels by 2030, 57 percent by 2035, and 85 percent by 2045.

3.1 SCOPING PLAN ANTHROPOGENIC TARGET

To develop region-specific target reduction percentages for the Scoping Plan Anthropogenic Targets pathway, the 2022 Scoping Plan was reviewed to identify the emissions sectors in this statewide plan that are relevant and applicable to the Napa County region. The 2022 Scoping Plan includes modeling future anthropogenic emissions levels in seven key economic sectors, referred to as the AB 32 sectors. The emissions reduction trajectory of each applicable sector in the 2022 Scoping Plan is then applied to the region's emissions levels to calculate reduction levels and target percentages for the RCAAP.

The Scoping Plan includes guidance for jurisdictions setting local targets such that targets focus on emissions sources that are within the jurisdictional influence or control of the local government (2022 Scoping Plan Appendix D, p. 14):

> When establishing GHG reduction targets, jurisdictions should consider their respective share of the statewide reductions necessary to achieve the State's long-term climate target for each target year and how they can best support those overall goals. Jurisdictions should also evaluate their specific inventory profile when establishing targets consistent with the State's long-term climate targets and should tailor their specific inventory profile to ensure the sectors included in the State's targets align with those included in the local jurisdiction's inventory and target, recognizing each region's distinctive sources and profile. For example, as the State's long-term climate targets address all emissions sectors within the state, a jurisdiction without an airport or port in the transportation sector should "factor out" and remove these subsectors from the State's long-term climate target when establishing local reduction targets.

The analysis performed to derive regional GHG reduction targets from State targets and applicable statewide sectors is provided in the following subsections.

Statewide Sectors Applicable to the Napa County Region

A review of the 2022 Scoping Plan demonstrates that local jurisdictions in Napa County have direct or indirect jurisdiction or control over activities that generate emissions and can reasonably contribute to reductions in five of the seven emissions sectors included in the statewide sectors emissions inventory: agriculture, residential and commercial, electric power, high global warming potential (GWP), recycling and waste, and transportation. This review is summarized in Table 6.

Table 6 Scoping Plan Emissions Sectors Applicable to the Napa County Region

Emissions Sectors/Strategies – Scoping Plan	Applicable to the Napa County Region?
Agriculture	Yes
Residential and Commercial	Yes
Electric Power	Yes
High Global Warming Potential (GWP) Gases	No
Industrial	No
Recycling and Waste	Yes
Transportation	Yes

Five of the seven sectors listed in Table 6 apply to the Napa County region. CARB considers these sectors as direct physical sources of emissions. Agriculture, Recycling and Waste, and Transportation are all active economic sectors that directly emit emissions within the region. The Residential and Commercial sector, as characterized by CARB, includes only emissions from on-site fuel combustion (e.g., natural gas), which occurs at residential and commercial land uses. The Electric Power sector relates to emissions generated by electric power plants. Although major power plants are not active within the region, the grid-based electricity used by buildings and facilities in the region indirectly result in emissions at power plants that may be outside the region. The Industrial sector and High-GWP Gases are excluded for the following reasons. The County and Cities do not have jurisdictional control over large-scale petroleum refineries, GHG-emitting electric power plants, cement manufacturing facilities, or other large-scale industrial facilities that are considered in the 2022 Scoping Plan's "Industrial" emissions sector categorization, as these are covered under the State's Cap-and-Trade regulatory program. Additionally, high-GWP gases are included under the Short-Lived Climate Pollutants inventory, which are addressed outside the scope of the analysis and not included in this memorandum due to their incompatible GWP factors with the rest of the inventory. Hence, the industrial sector and high-GWP gases are excluded from the list of sectors/strategies applicable to the Napa County region.

By excluding these sectors under this approach, GHG reduction targets for the Napa County region can be established in proportion with statewide reductions for all sectors relevant to local jurisdictions to the extent feasible using available data. This target-setting approach is consistent with CARB's 2022 Scoping Plan guidance for setting locally-based targets. It is also consistent with the California Supreme Court decision in *Center for Biological Diversity v. California Department of Fish and Wildlife and Newhall Land and Farming (2015) 62 Cal.4th 204*, which determined that the approach of assessing a project's consistency with statewide emissions reduction goals must include a "reasoned explanation based on substantial evidence" that links the project's emissions (in this case, the project is the RCAAP, which covers regional community-wide emissions) to statewide emissions included in achieving statewide GHG reduction goals.

3.2 2030 AND 2045 CARBON NEUTRALITY TARGETS

Both the 2030 and 2045 Carbon Neutrality Targets build upon the Scoping Plan Anthropogenic Targets pathway discussed above, going beyond reducing only anthropogenic GHG emissions sources to assess the potential for carbon sequestration to achieve countywide carbon neutrality. As referenced above, the 2022 Scoping Plan recommends that jurisdictions focus efforts where there is jurisdictional control and significant influence. Napa County contains an abundance of natural and working lands that have the potential to provide enhanced carbon sequestration values to support statewide CDR targets. Because these targets would reduce emissions beyond the Scoping Plan Anthropogenic Targets, both Carbon Neutrality Targets exceed the minimum reductions that would be needed for a CEQA-qualified climate action plan.

4 GHG MEASURES SUMMARY

The RCAAP proposes 46 GHG reduction measures to reduce emissions from most sectors evaluated in the 2019 inventory sectors and forecasts, including on-road transportation, building energy use, off-road equipment, agriculture, solid waste, and water and wastewater. The GHG reduction measures also include carbon sequestration-related measures resulting in carbon removals outside the anthropogenic emissions inventory and forecast.

The measures are organized by emissions sector and strategy and are identified by numbers corresponding to each emissions sector (e.g., BE-1 for the first measure under the building energy emissions sector). Of the 46 measures, only 18 were quantified for their GHG reduction potential due to available data and methods limitations. These quantified measures are shown in Table 7 along with their estimated annual reductions in 2030, 2035, and 2045, corresponding to the forecast milestone years and targets. The annual estimated GHG reductions are shown relative to future forecasted emissions in each respective year (e.g., a 1,000 $MTCO_2e$ reduction in 2030 would be subtracted from the forecasted emissions in 2030). The measures in Table 7 and their respective estimated reductions are organized by sector and strategy and presented in descending order. Table 7 also shows the percentage of total annual reductions across all sectors associated with each measure (e.g., AG-6 accounts for 21 percent of the total reductions in 2030 from all measures). The estimated GHG emissions reductions shown are in positive units that are understood to be subtracted from future legislative-adjusted BAU emissions. The quantification assumptions and methods used to estimate these quantified emissions are discussed in Section 4.1.

Table 8 contains the gap analysis, comparing the results in Table 7 to the three target pathways and identifying any emission reduction gaps in achieving those targets. Figure 1 and Figure 2 compare the total GHG reduction measures to each target pathway. Figure 1 shows the anticipated reductions in anthropogenic emissions sources with the implementation of the measures. Figure 2 shows the additional net effect of carbon sequestration-related measures on total future emissions and compares that adjusted forecast with the Scoping Plan Targets (with carbon sequestration).

Table 7 Napa RCAAP GHG Reductions by Measure ($MTCO_2e$/year)

Strategy	Measure Number	Measure Name	2030	2035	2045
Agriculture and Open Space					
Increase Carbon Storage	AG-6	Accelerate Woodland and Forest Habitat Restoration and Stewardship in Rural Areas.	82,201[b] (21%)[a]	123,302[b] (21%)	164,403[b] (22%)
Reduce Emissions from Vineyard Management.	AG-7	Increase sustainability certification in vineyards across the county.	20,778[b] (5%)	63,556[b] (11%)	167,444[b] (22%)
Reduce GHGs from Agricultural Equipment	AG-1	Reduce fossil fuel consumption in field equipment.	24,760 (6%)	48,422 (8%)	52,715 (7%)
		Sector Sub-Total	**128,295**	**235,878**	**384,709**
Solid Waste					
Landfill Emissions	SW-4	Increase CH_4 capture capacity to 85 percent by 2035 at local landfills.	93,048 (23%)	98,772 (17%)	104,985 (14%)
Zero Waste	SW-1	Increase diversion of solid waste to achieve diversion of at least 80 percent of waste from landfills by 2035.	47,342 (12%)	56,974 (10%)	68,072 (9%)
		Sector Sub-Total	**78,453**	**113,341**	**140,390**
Building Energy					
Clean and Efficient Energy Use in Existing Buildings	BE-1	Develop a comprehensive energy retrofit program to transition existing residential and non-residential buildings to net zero carbon with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	38,703 (10%)	57,957 (10%)	36,412 (5%)
	BE-3	Increase renewable energy generation at existing land uses.	1,875 (<1%)	3,510 (1%)	0 (0%)
Zero Carbon Development	BE-5	Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction.	19,418 (5%)	18,428 (3%)	21,963 (3%)
		Sector Sub-Total	**59,996**	**79,895**	**59,996**
Wastewater/Water					
Wastewater Treatment	WW-1	Reduce fugitive CH_4 emissions from Wastewater Treatment Plants (WWTPs)	32,739 (8%)	43,227 (7%)	45,412 (6%)
		Sector Sub-Total	**32,739**	**43,227**	**45,412**
Off-Road Vehicles and Equipment					
Electrification and Clean Alternatives	OF-3	Zero carbon construction equipment - Community.	0 (0%)	5,944 (1%)	10,221 (1%)
	OF-2	Zero-Emission Loading Docks.	271 (<1%)	541 (<1%)	820 (<1%)
	OF-4	Zero carbon construction equipment - Municipal.	236 (<1%)	472 (<1%)	472 (<1%)
	OF-1	Reduce landscaping-related emissions.	290 (<1%)	149 (<1%)	12 (<1%)
		Sector Sub-Total	**797**	**7,106**	**11,525**

Strategy	Measure Number	Measure Name	2030	2035	2045
Transportation					
Low- and Zero-Emission Vehicles	TR-9	Increase availability of renewable diesel.	29,535 (7%)	59,637 (10%)	74,875 (10%)
Active Transportation	TR-10	Implement NVTA's Active Transportation Plan.	1,829 (<1%)	1,708 (<1%)	748 (<1%)
Transportation Demand Management (TDM)	TR-11	Expand Individual Trip TDM Programs.	3,689 (1%)	2,351 (<1%)	673 (<1%)
Reduce Commercial VMT	TR-2	Reduce emissions from winery wastewater hold-and-haul transportation.	520 (<1%)	415 (<1%)	215 (<1%)
Sector Sub-Total			35,573	64,111	76,511
Total GHG Reductions			**397,789**	**585,962**	**749,590**
Total GHG Reductions without Carbon Sequestration Measures[c]			**294,810**	**399,105**	**417,743**
Legislative-Adjusted Forecasted Emissions with Measure Reductions			**501,115**	**161,994**	**-202,212**
Legislative-Adjusted Forecasted Emissions with Measure Reductions (excluding carbon sequestration measures)			**604,095**	**348,852**	**129,635**
Total Reductions from Carbon Sequestration Measures[c] Only			*102,979*	*186,857*	*331,847*

Source: Modeled by Ascent in 2024.

Notes: A negative number indicates a net sequestration of CO_2. GHG = greenhouse gas, $MTCO_2e$ = metric tons of carbon dioxide equivalent, NVTA = Napa Valley Transportation Authority, TDM = transportation demand management, WWTP = wastewater treatment plant

[a] The percentage of total annual reductions across all sectors associated with each measure are shown in the parentheses in each cell of estimated reductions (e.g., AG-6 accounts for 21 percent of the total reductions in 2030 from all measures).

[b] These reductions are due to increased carbon sequestration.

[c] Refers to AG-6 and AG-7.

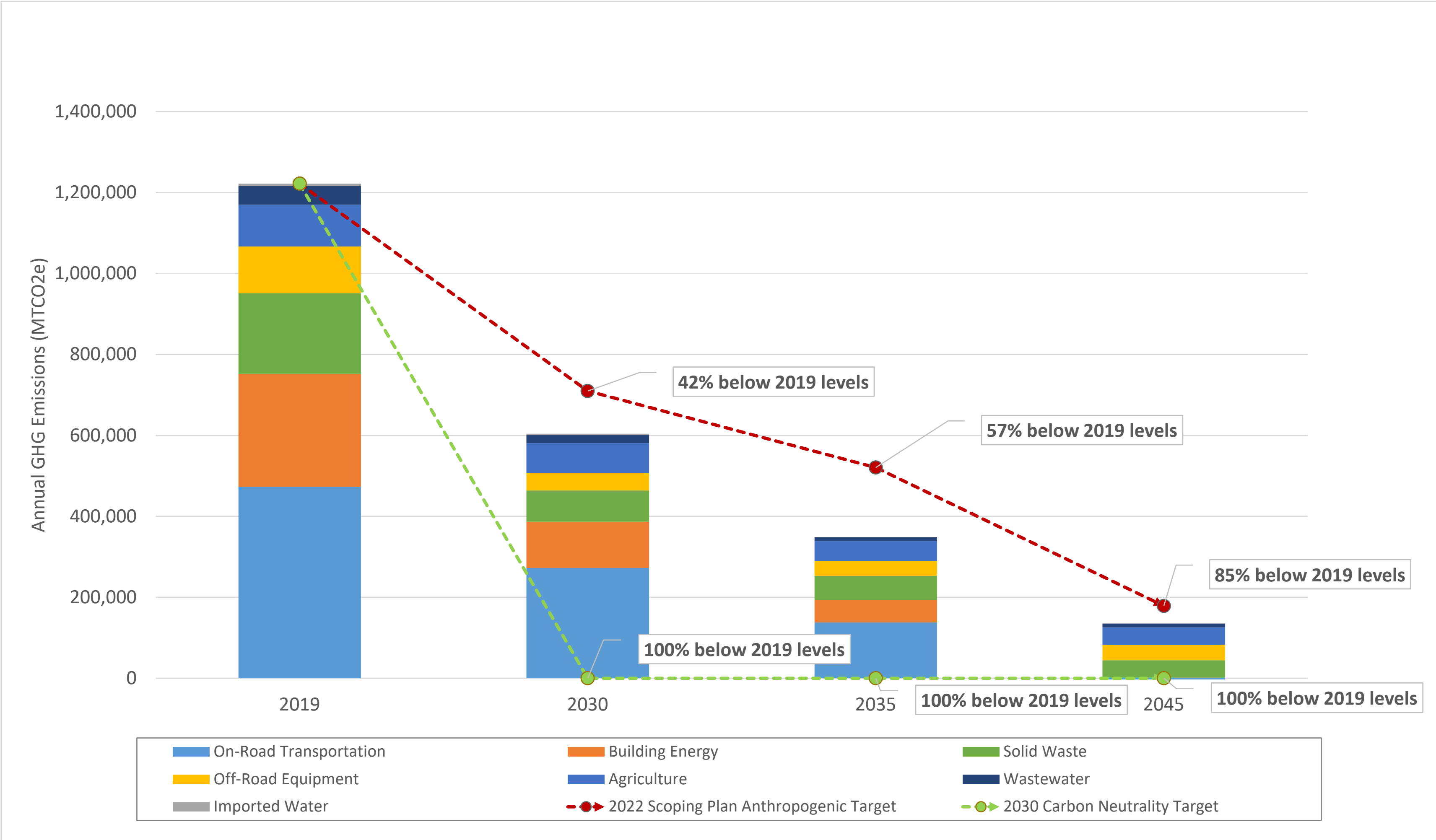
Table 8 Napa RCAAP Gap Analysis of GHG Reductions by Target Pathway ($MTCO_2e$/year)

Target Option	Target Analysis	2030	2035	2045
Scoping Plan Anthropogenic Target	Emissions Reductions Needed to Meet Target[b]	189,219	227,410	368,542
	Emissions Reductions from Measures (excluding carbon sequestration measures)	294,810	399,105	417,743
	Remaining Gap to Meet Target	0	0	0
	Targeted percent below 2019 levels	42%	57%	85%
	Achieved percent below 2019 levels with Measures	51%	71%	89%
	Scoping Plan Anthropogenic Target Met?	**Yes**	**Yes**	**Yes**
2030 Carbon Neutrality Target	Emissions Reductions Needed to Meet Target[a]	898,904	747,956	547,378
	Emissions Reductions from Measures	397,789	585,962	749,590
	Remaining Gap to Meet Target	501,115	161,994	0
	Targeted percent below 2019 levels	100%	100%	100%
	Achieved percent below 2019 levels with Measures	59%	87%	117%
	2030 Carbon Neutrality Target Met?	**No**	**No**	**Yes**
2045 Carbon Neutrality Target	Emissions Reductions Needed to Meet Target[b]	189,219	227,410	547,378
	Emissions Reductions from Measures	397,789	585,962	749,590
	Remaining Gap to Meet Target	0	0	0
	Targeted percent below 2019 levels	42%	57%	100%
	Achieved percent below 2019 levels with Measures	59%	87%	117%
	2045 Carbon Neutrality Target Met?	**Yes**	**Yes**	**Yes**

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalent

[a] These are equivalent to the legislative-adjusted forecast because this target pathway aims for carbon neutrality, or zero emissions, by 2030.

Source: Modeled by Ascent in 2024.



Note: CS = carbon sequestration, $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Modeled by Ascent in 2024.

Figure 1 RCAAP Target Pathways and GHG Reductions by Emissions Sector (Excluding Carbon Sequestration-Related Reductions)

Note: CS = carbon sequestration, $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Modeled by Ascent in 2024.

Figure 2 RCAAP Target Pathways (With Carbon Sequestration-Related Reductions)

4.1 SCOPING PLAN ANTHROPOGENIC TARGETS

Targets Achieved by 2030 and 2045

Based on the modeling conducted and the assumptions made, the 18 quantified measures have the potential to help the region meet the 2030 and 2045 targets under the Scoping Plan Anthropogenic Targets pathway without the need for additional carbon sequestration measures. As shown in Table 8, implementation of the measures would help reduce anthropogenic emissions in the county by 51 percent below 2019 levels by 2030, 71 percent below 2019 levels by 2035, and 89 below 2019 levels by 2045. This exceeds the locally-adjusted Scoping Plan targets of 42 percent below 2019 levels by 2030, 57 percent below 2019 levels by 2035, and 85 below 2019 levels by 2045. As shown in Table 2, future regional emissions would be consistent with the Scoping Plan Anthropogenic Targets if emissions are reduced to at least 85 percent below 2019 levels, or 179,000 $MTCO_2e$, by 2045 (Table 2). With the implemented measures, the region's emissions are expected to decline to 129,635 $MTCO_2e$ by 2045 (Table 7).

Between 2030 and 2045, six of the 18 measures (BE-1, TR-9, AG-1, SW-1, SW-4, and WW-1) would account for between 90 and 92 percent of annual emissions reductions across the quantified measures. The relative proportion of the contribution of the six measures to total annual reductions is shown in Table 9. As shown in Table 9, solid waste measures account for 30 to 40 percent of total reductions, exclusive of carbon sequestration-related reductions, highlighting the unique role of the solid waste sector in the county in helping the region meet the Scoping Plan Anthropogenic Targets. Other measures account for about 8 to 18 percent of total annual reductions.

The impact of solid waste measures in reducing future emissions is relatively higher than other sectors because solid waste is expected to account for a greater proportion of the region's emissions by 2045. Legislative actions are expected to reduce building energy and transportation-related emissions in the county by approximately 80 percent from 2019 levels. However, no legislative adjustments were applied to solid waste emissions forecasts, leading to the solid waste sector accounting for nearly 40 percent of emissions in 2045, whereas it was once only 16 percent of emissions in 2019. Additionally, the solid waste measures reduce a substantial amount of CH_4, a harmful SLCP with a GWP 27.9 times that of CO_2.

While a collaborative effort is needed to reduce emissions across all economic sectors in the region to meet the Scoping Plan Anthropogenic Targets, given the relative increase in the magnitude of the solid waste sector, reducing emissions from solid waste is crucial in meeting the target.

Table 9 Percent of Total Measure Reductions excluding Carbon Sequestration

Measure Number	Measure Description	2030	2035	2045
BE-1	Develop a comprehensive energy retrofit program to transition existing residential and non-residential buildings to net zero carbon with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	13%	15%	9%
TR-9	Increase availability of renewable diesel.	10%	15%	18%
AG-1	Reduce fossil fuel consumption in field equipment.	9%	12%	13%
SW-1	Increase diversion of solid waste to achieve diversion of at least 80 percent of waste from landfills by 2035.	16%	14%	16%
SW-4	Increase CH_4 capture capacity to 85 percent by 2035 at local landfills.	32%	25%	25%
WW-1	Reduce fugitive CH_4 emissions from Wastewater Treatment Plants (WWTPs)	11%	11%	11%
All other measures		10%	8%	8%
Total Percent of Reductions		**100%**	**100%**	**100%**

4.2 2030 CARBON NEUTRALITY TARGET

Gap Remains in 2030

Based on estimated GHG reductions from the currently-proposed quantifiable GHG reduction measures, the region would not be able to achieve carbon neutrality until 2045 at the earliest, missing the 2030 Carbon Neutrality Target. Closing the gap of 501,000 $MTCO_2e$ in 2030, as shown in Table 8, would require the State of California to commit to accelerate statewide reductions, currently projected to be completed by 2045 across all sectors in which the State has jurisdictional control, by at least 15 years earlier than the state's targets and assumed in the 2022 Scoping Plan, in addition to accelerating the implementation of the proposed local measures in the RCAAP. As discussed in the previous Forecast memorandum and shown in Table 1, legislative reductions are expected to reduce regional emissions from 899,000 to 547,000 $MTCO_2e$ between 2030 and 2045. These legislative reductions in 2045 include:

- 100% electricity is zero carbon,
- 70% of light-duty vehicles are zero-emission vehicles, and
- 90% of natural gas use in buildings is converted to electric.

Even if these legislative reductions could be achieved earlier (i.e., by 2030) and could be further reduced with the proposed measure reductions in 2030, there would be an additional gap of 150,000 $MTCO_2e$ to close. This would require accelerating carbon sequestration efforts to close this additional gap, equivalent to the annual sequestration of 2.8 million 1-year-old oak saplings or 2 million 5-year-old oak trees (iTree 2023). Immediate action would need to be taken to ensure that such reductions can be realized before 2030 and beyond 2030, such as allowing time for trees to be planted and grow and ensuring the health of the trees is monitored.

Additionally, for example, the pace and scale of local reductions would need to increase exponentially beyond the currently-proposed measures. For example, BE-1 would need to be modified to retrofit the entire existing building stock in the county (over 50,000 buildings) to eliminate natural gas usage entirely within five years. This would require significant upfront costs, along with extremely efficient coordination amongst the jurisdictions and stakeholder agencies, to immediately expand the regulatory reach of local codes and standards to require retrofits by a date certain or other aggressive regulatory triggers, along with full enforcement of such standards.

A carbon neutrality by 2030 target is not feasible to achieve with the currently proposed measures, including with carbon sequestration measures. This is consistent with the State's findings through its extensive analysis regarding the feasibility of attaining statewide carbon neutrality in the 2022 Scoping Plan. Based on this review, the State identified 2045, rather than 2030, as the most viable target date for achieving the statewide carbon neutrality goal, considering the associated costs and the time required for implementation.

4.3 2045 CARBON NEUTRALITY TARGET

Carbon Neutrality Achieved by 2045

Based on the modeling conducted and the assumptions made, the quantified measures proposed for the RCAAP would achieve the 2030 and 2045 targets under the Scoping Plan Target if carbon sequestration measures and associated "reductions" are included. As shown in Table 4, future regional emissions would be consistent with the Scoping Plan's carbon neutrality target if emissions are reduced to at least 100 percent below 2019 levels (Table 7). The proposed measures, with the carbon sequestration-related measures (AG-6 and AG-7), would meet and exceed the targets for 2030, 2035, and 2045 (Table 8).

The RCAAP's carbon sequestration-related measures account for nearly half of the estimated reductions in 2045 (Table 7). This highlights the importance of the role of natural and working lands in helping the region be consistent with statewide climate goals under AB 1279 and the 2022 Scoping Plan. This is also consistent with how the 2022 Scoping Plan relies on CDR to achieve its plan of meeting statewide carbon neutrality by 2045. Apart from carbon sequestration measures, as shown in Table 9, solid waste measures also make up a substantial proportion of emissions reductions. However, even at the state level, CARB still expects there to be residual emissions from anthropogenic sources in 2045 that can only be reduced to zero through CDR strategies, even after significant legislative reductions in transportation- and building-related emissions through policies such as the Zero Emission Vehicle mandates and zero-carbon electricity by 2045 under SB 100 (CARB 2022b:92).

5 GHG Reduction Quantification Assumptions and Methods

For the RCAAP to be CEQA-qualified, the estimated GHG reduction potential of the proposed measures must be based on substantial evidence (CEQA Section 15183.5(b)). This section and Attachment A support the substantiation of the estimated reductions summarized in Section 4.

Table 10 summarizes the quantification methods, assumptions, and data sources used to quantify the GHG reductions from the 18 quantified measures identified in Section 4. Detailed calculations and assumptions are available in Attachment A. Many of the measures separate reductions between existing and new activity. The definition of what is existing depends on when the measure is implemented. As of this current draft, most measures are assumed to be implemented by 2026 at the earliest. However, adjustments to these measure implementation timelines can change the estimated reductions from the proposed measures. Table 10 identifies the measures-specific targets and the definition of "existing" for relevant quantified measures.

Table 10 Summary of GHG Reduction Measure Primary Assumptions, Methods, and Data

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
AG-1	Reduce fossil fuel consumption in field equipment.	▸ For existing agricultural non-pump equipment greater than 25 hp: Assume 25% electrified by 2030, 50% by 2035, and 100% by 2045 ▸ For new agricultural non-pump equipment greater than 25 hp: Assume 50% are electric by 2030 and 100% by 2035 ▸ For existing irrigation pumps, 50% are to be replaced by 2030 and 100% by 2035. Of the replaced pumps, 20% are assumed to be grid-tied electric, 60% renewable diesel, and 20% solar with battery storage. ▸ For new irrigation pumps, 75% are assumed to be fueled by renewables by 2030 and 100% by 2035. By 2030, of the renewably-fueled pumps, 20% are assumed to be grid-tied electric, 60% renewable diesel, and 20% solar with battery storage. By 2035, of the renewably-fueled pumps, 30% are assumed to be grid-tied electric, 40% renewable diesel, and 30% solar with battery storage. By 2045, of the renewably-fueled pumps, 30% are assumed to be grid-tied electric, 40% renewable diesel, and 30% solar with battery storage. ▸ Implementation is assumed to occur in 2026; thus, existing equipment are considered those that have been purchased through 2025.	For non-pumps, equipment emissions forecasts by hp from CARB's OFFROAD2021 model were multiplied by the measure targets to estimate GHG reductions and balanced with any increases in emissions due to fuel switching. For irrigation pumps, emissions forecasts were multiplied by the measure targets to estimate GHG reductions and balanced with any increases in emissions due to fuel switching.	Napa RCAAP Forecasts
AG-6	Accelerate Woodland and Forest Habitat Restoration and Stewardship in Rural Areas.	▸ Assume 20% of areas affected by wildfire since 2017 are replanted with the same or similar vegetation types. ▸ Based on CALFIRE burn data, between 2017 and 2023, areas burned in the county consisted of 67% brush, 31% woodland, and 2% grass.	Acres burned by vegetation type and year were available from CALFIRE. Sequestration rates ($MTCO_2e$/acre/year) from the Regional Carbon Stock Inventory Report for Napa County were used to estimate the sequestration potential of the average burned vegetation type.	CALFIRE 2023:Table 16 Ascent 2023: Table 3
AG-7	Increase sustainability certification in vineyards across the county.	▸ Based on Napa Green data, approximately 2.2 $MTCO_2e$ are sequestered per certified acre per year. This is assumed to correlate to the outreach capabilities of 4.5	Estimated sequestration benefits per staff were calculated based on conversations with Ben Mackie of Napa Green and a Napa Green press release. These benefits were assumed to scale	Pers. comm., Ben Mackie 2024 Napa Green 2024

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
		full-time equivalent staff, assuming staff efficiency remains constant. ▶ By 2030, staffing across all sustainability certification programs in the region is assumed to be at least 10 FTE staff. This is assumed to increase to 15 and 20 by 2035 and 2045, respectively.	up based on increased staffing, limited by the total number of vineyard acreage in the county.	
BE-1	Develop a comprehensive energy retrofit program to transition existing residential and non-residential buildings to net zero carbon with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	▶ For existing residential and non-residential buildings, 25% are assumed to be retrofit to net zero carbon by 2030, 50% by 2035, and 100% by 2045. ▶ Implementation is assumed to start in 2026, thus existing buildings are considered those that have been built through 2025.	Measure targets were applied to forecasted existing building energy use. Usage through 2025 was interpolated between the 2019 inventory and 2030 forecast data.	Napa RCAAP Forecasts
BE-3	Increase renewable energy generation at existing land uses.	▶ For existing residential buildings, 20% of all households will have solar with battery storage by 2030 and 45% by 2035. 80% of annual grid power is assumed to be offset for each home with solar with battery storage. As of 2024, approximately 14% of households currently have on-site solar, based on PG&E interconnection application and census data. ▶ For existing non-residential buildings, existing non-residential solar capacity is expected to increase by 38% by 2030, 58% by 2035, and 74% by 2045.	The estimated growth in solar on existing non-residential buildings was based on doubling the current ratio of non-residential solar capacity (kW) to the number of jobs in the county. Between 1994 and July 2024, 46,392 kW of solar was installed on non-residential buildings in the county. Reductions from BE-1 were discounted from this calculation to avoid double counting.	California Distributed Generation Statistics 2024 Census 2024
BE-5	Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction.	▶ 90% of new residential buildings are expected to be zero-carbon by 2030, 92% by 2035, and 97% by 2045. ▶ 90% of new non-residential buildings are expected to be zero-carbon by 2030 and into the future. ▶ Implementation is assumed to occur in 2026; thus, new buildings are considered those that are built after 2025.	Measure targets were applied to forecasted new building energy use. Energy usage through 2025 was interpolated between the 2019 inventory and 2030 forecast data. Increased electricity usage due to the conversion from natural gas appliances was included.	Napa RCAAP Forecasts
OF-1	Reduce landscaping-related emissions.	▶ By 2030, 100% of all new landscaping equipment are assumed to be electric.	Forecasted emissions from lawn and garden equipment are expected to decrease	Napa RCAAP Forecasts CARB 2020

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
			dramatically under SORE AB1346, which anticipates a 2/3 decrease in emissions by 2030 from 2019. This was calculated using CARB's SORE2020 model. Thus, this measure does not expect additional reduction opportunities from existing equipment by 2030. Increased electricity usage from the electrification of fossil-fueled equipment was accounted for.	
OF-2	Zero-Emission Loading Docks.	▶ 33% of loading docks are electrified by 2030, 66% by 2035, and 100% by 2045. No docks are assumed to have been electrified in 2019. ▶ CARB assumes that TRUs spend one-third of their operating time while stationary, which is assumed to occur at a dock.	TRU emission forecasts for the county from the OFFROAD 2021 model were multiplied by 33% to capture the time spent at docks and then multiplied again by the dock electrification targets.	Napa RCAAP Forecasts CARB 2021a:21
OF-3	Zero carbon construction equipment - Community.	▶ 60% of construction equipment used at the community level are expected to use ZEV technology by 2035 and 100% by 2045. No targets are set for 2030.	Measure targets are multiplied by forecasted construction emissions to get reductions in community-wide construction equipment. Measure discounts reductions from OF-4 to avoid double counting.	Napa RCAAP Forecasts
OF-4	Zero carbon construction equipment - Municipal.	▶ 50% of construction equipment used at the municipal level are expected to use ZEV technology by 2030 and 100% by 2035.	Measure targets are multiplied by future forecasted construction emissions to get reductions in municipal construction equipment.	Napa RCAAP Forecasts
TR-2	Reduce emissions from winery wastewater hold-and-haul transportation.	▶ 20,000,000 gallons of winery wastewater are trucked from Napa to EBMUD annually. ▶ Each truck carries an average of 6,000 gallons of wastewater. ▶ The average trip distance is 50 mi to EMBUD or 15 mi to NapaSan from the county center. ▶ 5% of winery wastewater delivered to EMBUD is to be diverted to NapaSan or other local facility by 2030, 10% by 2035, and 20% by 2045. ▶ For the remaining wastewater trucks still delivering to EBMUD, it is assumed that 15% of the fleet is converted to electric by 2030, 30% by 2035, and 75% by 2045.	Measure calculated the reductions based on the difference in truck VMT between trucking from the center of the county to EBMUD (50 mi) or NapaSan (15 mi). For the remaining VMT to EBMUD, the calculations assumed that all trucks would use either electricity or renewable diesel as fuel starting in 2030. Renewable diesel is 70% less carbon-intensive than conventional diesel.	See Attachment A

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
		▸ 100% of the remainder of the fleet that is not electrified would use renewable diesel starting in 2030.		
TR-9	Increase the availability of renewable diesel.	▸ 20% of fueling stations in the county to sell renewable diesel by 2030, 40% by 2035, and 50% by 2050 ▸ Because renewable diesel is made from biogenic sources, the CO_2 emissions from the combustion of renewable diesel is also assumed to be from biogenic sources. The ICLEI protocol recommends that biogenic CO_2 emissions be excluded from inventories because they are part of short-term carbon cycle (ICLEI 2013).	Currently, only two percent of the gas stations in the county sell renewable diesel. A 76-station selling renewable diesel in Sonoma County reported selling an average of 30,000 gallons of renewable diesel per month. This sale rate was used to calculate annual renewable diesel sales for the targeted number of stations.	ICLEI 2013:5 Zander 2022
TR-10	Implement NVTA's Active Transportation Plan.	▸ 7% of commute VMT is assumed to be by active mode (e.g., bicycle or pedestrian) by 2030, 10% by 2035, and 15% by 2045. The NVTA countywide bike plan targets a 10% bicycle mode share by 2035.	Based on MTC's mode split for Napa commute trips and average trip lengths by mode from the 2020 Napa Valley Travel Behavior Study and the 2022 National Household Survey, the region's current commute VMT mode share for active modes is 0.6%, as of 2021. This measure only applies to commute-related travel because the current mode share amongst non-commute trips is unknown. Thus, actual reductions could be underestimated if active transportation improvements also affect non-commute travel.	MTC & ABAG 2024 NVTA 2020
TR-11	Expand Individual Trip TDM Programs.	▸ Employers with more than 50 employees, 50% of employees would be eligible for a Commute Trip Reduction program, assuming mandatory implementation, by 2030 and into the future.	Calculation methods were based on CAPCOA T-6 measure from CAPCOA's GHG reduction handbook. These calculations used average commute-related VMT per job calculated from NVTA's Travel Survey results and forecasted employment.	CAPCOA 2021 NVTA 2020 Napa RCAAP Forecasts
SW-1	Increase solid waste diversion to divert at least 80 percent of waste from landfills by 2035.	▸ Increase Napa's waste diversion rate from 51% in 2019 to 75% in 2030, 80% in 2035, and 85% in 2045.	Current diversion rates were calculated using data from CalRecycle.	Napa RCAAP Forecasts CalRecycle 2019
SW-4	Increase CH_4 capture capacity to 85 percent by 2035 at local landfills.	▸ The CH_4 capture rate at in-boundary landfills (Clover Flat and American Canyon) will increase to at least 80% by 2030, 85% by 2035, and 95% by 2045.	In addition to increasing CH_4 capture, news of the change to CFL's closure date to 2027 was received after the completion of the forecast. Initially, the forecast assumed CFL would close	CARB 2021b Napa RCAAP Forecasts

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
			in 2056 and, thus, continue to receive waste and grow its waste-in-place emissions through 2045. With the earlier closure of CFL, waste-in-place emissions would decline a few years after closure in 2027 rather than after 2056. The reduced future emissions through 2045 associated with the earlier closure are accounted for here in this measure as an alternative to updating the forecast. These calculations were based on the first-order decay model available from CARB. The measure used the same methodology as the forecast to calculate future waste-in-place emissions, except for the adjusted CH_4 capture rate.	
WW-1	Reduce fugitive CH_4 emissions from Wastewater Treatment Plants (WWTPs)	▸ NapaSan's current waste-to-energy system was not accounted for in the forecasts and is instead included in this measure. CH_4 reductions from this system are assumed to occur in all forecast years. ▸ According to comments received from American Canyon Water Reclamation Facility (WRF), WRF is looking into a high-strength waste project that will be used to capture CH_4 emissions. This measure assumes such a project would be complete by 2035. Thus, reductions are assumed to begin in 2035.	Forecasts used population-based methods and assumed both wastewater treatment facilities treated via lagoons.	Napa RCAAP Forecasts Phillips, pers. comm., 2024

Notes: AMBAG = Association of Bay Area Governments, CALFIRE = California Department of Forestry and Fire Protection, CalRecycle = California Department of Resources Recycling and Recovery, CAPCOA = California Air Pollution Control Officers Association, CARB = California Air Resources Board, CO_2 = carbon dioxide, CH_4 = methane, CFL = Cover Flat Landfill, EMBUD = East Bay Municipal Utility District, GHG = greenhouse gas, ICLEI = Local Governments for Sustainability, kW = kilowatt hours, pers.comm. = personal communication, mi = miles, MTC = Metropolitan Transportation Commission, $MTCO_2e$ = metric tons of carbon dioxide equivalent, NapaSan = Napa Sanitation District, NVTA = Napa Valley Transportation Authority, RCAAP = Napa County Regional Climate Action and Adaptation Plan, TRU = transportation refrigeration unit, VMT = Vehicle Miles Traveled, WWTP = wastewater treatment plant, ZEV = zero-emission vehicle.

Source: Compiled by Ascent in 2024.

6 NEXT STEPS

County and City staff should review and comment on this memo and provide direction to Ascent regarding how the possible GHG target pathways should be treated in the RCAAP moving forward. Following Ascent's revisions to the draft memo, staff will report back to the Napa County Climate Action Committee to present the memo's findings and staff's recommendation regarding the GHG reduction targets for 2030 and 2045 and confirm that the estimated reductions relative to the target pathways selected are appropriate for including in the Draft RCAAP.

The proposed GHG reduction measures' cost and funding analysis is still underway, and once completed, the results will be presented to staff separately.

7 REFERENCES

Ascent. 2023. *Regional Carbon Stock Inventory Report for Napa County*. Table 3. Acres from Ascent calculations based on GIS runs.

———. 2024a (May 28). *Napa County RCAAP: Final Greenhouse Gas Emissions Forecast Update (2019-2045)*. Sacramento, CA. Letter memorandum to David Morrison, Brian Bordona, Jamison Crosby, and Ryan Melendez of County of Napa; and Deborah Elliott of City of Napa, Napa, CA.

———. 2024b (August 27). *Updated Final Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant Inventory Memorandum*. Letter memorandum to David Morrison of County of Napa.

BAAQMD. See Bay Area Air Quality Management District

Bay Area Air Quality Management District. 2022. *California Environmental Quality Act Air Quality Guidelines, Appendix C: Guidance for GHG Reduction Strategies*. Available: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/appendix-c-ghg-reduction-strategies_final_edits-for-ascent-pdf.pdf?rev=8e5bb7d8ad504dd6accd3c04e58bdf87&sc_lang=en. Accessed March 5, 2024.

California Air Resources Board. 2020. *2020 Emissions Model for Small Off-Road Engines – SORE2020*. Available: https://ww2.arb.ca.gov/sites/default/files/2020-09/SORE2020_Technical_Documentation_2020_09_09_Final_Cleaned_ADA.pdf. Accessed November 1, 2024.

———. California Air Resources Board. 2021a. *Appendix H: 2021 Update to Emissions Inventory for Transport Refrigeration Units*. Available: https://ww2.arb.ca.gov/sites/default/files/barcu/board/rulemaking/tru2021/apph.pdf. Accessed November 1, 2024.

———. 2021b. CARB's Landfill Gas Tool. Available: https://ww2.arb.ca.gov/resources/documents/carbs-landfill-gas-tool. Accessed November 1, 2024.

———. 2022a (November). *2022 Scoping Plan for Achieving Carbon Neutrality*. Available: https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf. Accessed November 1, 2024.

———. 2022b (November). *2022 Scoping Plan for Achieving Carbon Neutrality*. 92. Available: https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf. Accessed November 1, 2024.

California Department of Forestry and Fire Protection. 2023. Statistics. Available: https://www.fire.ca.gov/our-impact/statistics?os=v&ref=app. Accessed November 1, 2024.

California Distributed Generation Statistics 2024. Download Data. Available: https://www.californiadgstats.ca.gov/downloads. Accessed November 1, 2024.

CALFIRE. *See* California Department of Forestry and Fire Protection.

California Department of Resources Recycling and Recovery. 2019. *Jurisdiction Diversion/Disposal Rate Summary*. Available: https://www2.calrecycle.ca.gov/LGCentral/DiversionProgram/JurisdictionDiversionPost2006. Accessed November 1, 2024.

CalRecycle. *See* California Department of Resources Recycling and Recovery.

CAPCOA. *See* California Air Pollution Control Officers Association.

California Air Pollution Control Officers Association. 2021 (December). *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.* Available: https://www.caleemod.com/handbook/full_handbook.html. Accessed November 1, 2024.

CARB. *See* California Air Resources Board.

California Code of Regulations. (2020). *California Environmental Quality Act (CEQA) guidelines*. § 15183.5.

Census. *See* U.S. Census Bureau.

ICLEI. *See* ICLEI – Local Governments for Sustainability USA.

ICLEI – Local Governments for Sustainability USA. 2013 (July). U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.1. Appendix F: Wastewater and Water Emission Activities and Sources.

iTree 2023. i-Tree Eco (version 6.0.32) [Computer software]. Available: https://mytree.itreetools.org/#/. Accessed November 1, 2024.

Mackie, Ben. Vineyard Program Manager of Napa Green. October 4, 2024—teams Meeting with Brenda Hom and Erik de Kok regarding details about Napa Green staff and effectiveness of programs.

Metropolitan Transportation Commission and Association of Bay Area Governments.2024. Vital Signs: Transportation. Available: https://vitalsigns.mtc.ca.gov/indicators/commute-mode-choice?chart=SGlzdG9yaWNhbFRyZW5kRm9yQ29tbXV0ZU1vZGVDaG9pY2U/. Accessed November 1, 2024.

MTC & ABAG. *See* Metropolitan Transportation Commission and Association of Bay Area Governments.

Napa Green. 2024 (September 17). Napa Green Celebrates Over 80 Vineyards & 40 Growers Certified as Regenerative, Climate Smart Napa Green Vineyards. Available: https://world.einnews.com/pr_news/744235967/napa-green-celebrates-over-80-vineyards-40-growers-certified-as-regenerative-climate-smart-napa-green-vineyards. Newswires. *Newsmatics Inc.* dba EIN Presswire. Accessed November 1, 2024.

Napa Valley Transportation Authority. 2020. *Napa Valley Travel Behavior Study*. Available: https://nvta.ca.gov/wp-content/uploads/2024/05/NapaValley_TBS_Document_final-May-2020.pdf. Accessed November 1, 2024.

NVTA. *See* Napa Valley Transportation Authority.

Phillips, Pam. Environmental Services Manager. City of American Canyon. July 5, 2024—Word document comment received from P. Phillips of the City of American Canyon regarding the proposed measure under WW-1 on the Napa RCAAP GHG Measures Matrix document.

U.S. Census Bureau. 2024. QuickFacts. Napa County, California. Available: https://www.census.gov/quickfacts/fact/table/napacountycalifornia/PST040222. Accessed November 1, 2024.

Zander, William. 2022 (September 7) *California drivers embrace renewable diesel from San Francisco Refinery*. Authored for Phillips 66. Available: https://www.phillips66.com/newsroom/drivers-embrace-76-renewable-diesel-from-rodeo/. Accessed November 1, 2024.

Attachment A

GHG Quantification Spreadsheets

Napa Regional Climate Action and Adaptation Plan - GHG Reduction Quantification
GHG Strategy Quantification Summary

Last Updated: 11/1/2024

Emissions Sector	Strategy	Measure Number	Measure	2030	2035	2045
Building Energy	Clean and Efficient Energy Use in Existing Buildings	BE-1	Develop a comprehensive energy retrofit program to transition existing residential and non-residential buildings to net zero carbon with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	38,703	57,957	36,412
		BE-3	Increase renewable energy generation at existing land uses.	1,875	3,510	-
	Zero Carbon Development	BE-5	Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction.	19,418	18,428	21,963
Transportation	Active Transportation	TR-10	Implement NVTA's Active Transportation Plan.	1,829	1,708	748
	Low- and Zero-Emission Vehicles	TR-9	Increase availability of renewable diesel.	29,535	59,637	74,875
	Reduce Commercial VMT	TR-2	Reduce emissions from winery wastewater hold-and-haul transportation.	520	415	215
	Transportation Demand Management (TDM)	TR-11	Expand Individual Trip TDM Programs.	3,689	2,351	673
Off-Road Vehicles and Equipment	Electrification and Clean Alternatives	OF-1	Reduce landscaping-related emissions.	290	149	12
		OF-2	Zero-Emission Loading Docks.	271	541	820
		OF-3	Zero carbon construction equipment - Community.	-	5,944	10,221
		OF-4	Zero carbon construction equipment - Municipal.	236	472	472
Agriculture and Open Space	Increase Carbon Storage.	AG-6	Accelerate Woodland and Forest Habitat Restoration and Stewardship in Rural Areas.	82,201	123,302	164,403
	Reduce Emissions from Vineyard Management.	AG-7	Increase sustainability certification in vineyards across the county.	20,778	63,556	167,444
	Reduce GHGs from Agricultural Equipment	AG-1	Reduce fossil fuel consumption in field equipment.	25,316	49,020	52,862
Solid Waste	Landfill Emissions	SW-4	Increase methane capture capacity to 85 percent by 2035 at local landfills.	93,048	98,772	104,985
	Zero Waste	SW-1	Increase diversion of solid waste to achieve diversion of at least 80 percent of waste from landfills by 2035.	47,342	56,974	68,072
Wastewater/Water	Wastewater	WW-1	Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)	32,739	43,227	45,412
Total emissions reductions from measures				**397,789**	**585,962**	**749,590**
			Legislative-Adjusted Business-As-Usual Emissions	898,904	747,956	547,378
			2045 Carbon Neutrality Target	709,685	520,547	-
			Reductions Needed to Meet Targets with Carbon Sequestration	189,219	227,410	547,378
			Emissions with measures	501,115	161,994	(202,212)
			Emissions Gap	(208,570)	(358,552)	(202,212)
			Scoping Plan Target Met?	Yes	Yes	Yes
			Carbon Neutrality Achieved?	No	No	Yes
			Scoping Plan Target Emissions (no carbon sequestration)	709,685	520,547	178,836
			Reductions Needed to Meet Targets without Carbon Sequestration	189,219	227,410	368,542
			Reductions w/o sequestration	294,810	399,105	417,743
			Emissions with measures	604,095	348,852	129,635
			Target Met w/o Sequestration?	Yes	Yes	Yes
			Carbon Neutrality Achieved?	No	No	No

BE-1

Develop a comprehensive energy retrofit program to transition existing residential and non-residential buildings to net zero carbon with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.

Retrofit Existing RESIDENTIAL buildings.	**2019**	**2030**	**2035**	**2045**
Electricity Use in Residential Buildings built as of 2019 (kWh) [1]	330,775,954	394,601,580	408,934,674	426,452,899
Natural Gas Use in Residential Buildings built as of 2019 (therms) [1]	20,764,456	11,410,421	7,516,453	2,086,778
Electricity Use in Residential Buildings built between 2020 and 2025 (kWh) [2]		15,535,517	15,535,517	15,535,517
Natural Gas Use in Residential Buildings between 2020 and 2025 (therms) [2]		1,123,270	1,123,270	1,123,270
Electricity Use in Existing Residential Buildings built as of 2025 (kWh) [2]		410,137,096	424,470,190	441,988,416
Natural Gas Use in Residential Buildings built as of 2025 (therms) [2]		12,533,690	8,639,722	3,210,047
Leg-Adjusted Electricity emissions factor (gCO2e/kWh)	73	20	20	-
Natural gas emissions factor (MTCO2e/therm)	0.00532	0.00532	0.00532	0.00532
Electricity-Related Emissions in Existing Residential Buildings (MTCO2e)	24,262	8,163	8,444	-
Natural Gas-Related Emissions in Existing Residential Buildings (MTCO2e)	110,505	66,702	45,979	17,083
Total Emissions from Existing Residential Buildings (MTCO2e)	134,768	74,865	54,423	17,083
Leg-Adjusted BAU Change in Emissions from 2019		-44%	-60%	-87%
Percent of existing residential buildings retrofit to net zero carbon		25%	50%	100%
EMISSIONS REDUCTIONS FROM RETROFIT OF EXISTING RESIDENTIAL BUILDINGS				
Reduced Natural Gas (therms)		3,133,423	4,319,861	3,210,047
Natural gas emissions factor (MTCO2e/therm)		0.005	0.005	0.005
GHG reductions from new development natural gas savings (MTCO2e)		16,676	22,990	17,083
EMISSIONS INCREASES FROM RETROFIT OF EXISTING RESIDENTIAL BUILDINGS				
Increased electricity needed to offset natural gas heating (MWh) [4][5]		16,712	23,039	17,120
Existing electricity use (MWh)		102,534,274	212,235,095	441,988,416
Total New Electricity Use (MWh)		102,550,986	212,258,134	442,005,536
Electricity emissions factor (Assuming net zero through solar/battery) (gCO2e/kWh)		0	0	0
New Electricity Use Emissions (MTCO2e)		0	0	0
Leg-Adj BAU Electricity Use Emissions from affected buildings (MTCO2e)		2,041	4,222	-
Net Change in GHG emissions from electricity use due to retrofits (MTCO2e)		-2,041	-4,222	-
GHG Reductions from Residential Buildings (MTCO2e)		18,716	27,211	17,083

Retrofit existing NONRESIDENTIAL buildings.	**2019**	**2030**	**2035**	**2045**
Electricity Use in Existing Non-Residential Buildings built as of 2019 (kWh) [1]	595,884,890	710,865,213	736,685,935	755,607,287
Natural Gas Use in Existing Non-Residential Buildings built as of 2019 (therms) [1]	19,000,273	10,440,972	6,877,842	1,888,556
Electricity Use in Non-Residential Buildings built between 2020 and 2025 (kWh) [2]		48,039,311	48,039,311	48,039,311
Natural Gas Use in Non-Residential Buildings between 2020 and 2025 (therms) [2]		1,743,317	1,743,317	1,743,317
Electricity Use in Existing Residential Buildings built as of 2025 (kWh) [2]		758,904,524	784,725,246	803,646,599
Natural Gas Use in Non-Residential Buildings built as of 2025 (therms) [2]		12,184,290	8,621,159	3,631,873
Leg-Adjusted Electricity emissions factor (gCO2e/kWh)		20	20	-
Natural gas emissions factor (MTCO2e/therm)		0.00532	0.00532	0.00532
Electricity-Related Emissions in Existing Non-Residential Buildings (MTCO2e)		15,104	15,610	-
Natural Gas-Related Emissions in Existing Non-Residential Buildings (MTCO2e)		64,843	45,880	19,328
Total Emissions from Existing Non-Residential Buildings (MTCO2e)		79,947	61,490	19,328
Leg-Adjusted BAU Change in Emissions from 2019		-41%	-54%	-86%
Percent of existing Non-Residential buildings retrofit to net zero carbon.		25%	50%	100%
EMISSIONS REDUCTIONS FROM RETROFIT OF EXISTING Non-Residential BUILDINGS				
Reduced Natural Gas (therms)		3,046,072	4,310,580	3,631,873
Natural gas emissions factor (MTCO2e/therm)		0.005	0.005	0.005
GHG reductions from new development natural gas savings (MTCO2e)		16,211	22,940	19,328

EMISSIONS INCREASES FROM RETROFIT OF EXISTING Non-Residential BUILDINGS			
Increased electricity needed to offset natural gas heating (MWh) [4][5]	21,969	31,089	26,194
Existing electricity use (MWh)	189,726,131	392,362,623	803,646,599
Total New Electricity Use (MWh)	189,748,100	392,393,713	803,672,793
Electricity emissions factor (Assuming net zero through solar/battery) (gCO2e/kWh)	0	0	0
New Electricity Use Emissions (MTCO2e)	0	0	0
Leg-Adj BAU Electricity Use Emissions from affected buildings (MTCO2e)	3,776	7,805	-
Net Change in GHG emissions from electricity use due to retrofits (MTCO2e)	-3,776	-7,805	-
Net GHG Reductions from NonResidential Buildings (MTCO2e)	19,987	30,745	19,328
Total Net Change in Electricity Use (kWh)	38,680,930	54,128,671	43,314,588
Net GHG Reductions (MTCO2e)	**38,703**	**57,957**	**36,412**

Sources:

[1] Forecasts account for the impact of the Zero NOx Rule on existing buildings built as of 2019. This results in increased electricity usage due to the ban on NOx emitting appliances. Forecasts are based on BAAQMD's staff report on the impacts of the Zero NOx rule on electricity demand. E3 2022. Electric Infrastructure Impacts from Proposed Zero NOx Standards (Page 12. Figure 2) (https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20221220_sr_appd_rg09040906-pdf.pdf?la=en)

[2] Note that for buildings built between 2020 and 2025, the emissions forecasts are based on Title 24 legislative adjustments and assume those building are, on average, built to the 2022 Energy Code and do not apply the Zero NOx adjustments. The data used to estimate the energy usage could not be further disaggregated to identify energy use by appliance, which would have been necessary to apply the Zero NOx adjustment. The energy use in buildings built between 2020 and 2025 are based on the forecasted emissions from new construction between 2019 and 2030, based on demographic growth forecasts, and scaleddown to account for the first five-year period of cosntruction.

[4] U.S. DOE 2024. Furnaces and Boilers. Available: https://www.energy.gov/energysaver/furnaces-and-boilers

[5] EPA 2023. ENERGY STAR Most Efficient 2024. (Air Source Heat Pumps. Assumed a conservative SEER rating of 15. Converted to Coefficient of Performance (COP) by multiplying by 0.293. A COP of 2 = 200% efficiency.)
https://www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Most%20Efficient%202024%20Final%20Criteria%20Memo%20-%20Revised_12-2023.pdf#:~:text=URL%3A%20https%3A%2F%2Fwww.energystar.gov%2Fsites%2Fdefault%2Ffiles%2Fasset%2Fdocument%2FENERGY%2520STAR%2520Most%2520Efficient%25202024%2520Final%2520Criteria%2520Memo%2520

SEER to COP conversion from: https://www.sciencedirect.com/topics/engineering/seasonal-energy-efficiency-ratio#:~:text=SEER%20is%20very%20similar%20to,per%20unit%20of%20work%20energy.)

Calculations for estimating effective efficiency of transition of residential buildings from natural gas infrastructure to electric	
Assumed average efficiency of natural gas heating (conservative) [4]	80%
Assumed average efficiency of electric heating for non-residential buildings[5]	440%
MWh per therm conversion	0.0293
Number of therms of electricity needed to produce the same amount of heat as one therm of natural gas.	0.18

Calculations for estimating effective efficiency of transition of non-residential buildings from natural gas infrastructure to electric	
Assumed average efficiency of natural gas heating (conservative) [4]	80%
Assumed average efficiency of electric heating for non-residential buildings[5]	325%
MWh per therm conversion	0.0293
Number of therms of electricity needed to produce the same amount of heat as one therm of natural gas.	0.25

BE-3
Increase renewable energy generation at existing land uses.

Residential Land Uses			**2030**	**2035**	**2045**
Forecasted Residential Electricity Use in Existing Buildings built through 2025 (kWh) [2]			410,137,096	424,470,190	441,988,416
Renewable Electricity Covered under other measures (kWh)					
BE-1			*102,550,986*	*212,258,134*	*442,005,536*
Remaining Electricity Use Forecast in Existing Buildings built through 2025 (kWh) [2]			307,586,111	212,212,056	-17,120
Existing Solar Installations (kW DC) (From 1994 to 7/2024)	kW [3]	Estimated kWh per year [4]			
Residential	58,182	92,559,929			
Number of Residential Installations in Napa County (between 1994 and 7/2024) [3]	7,937				
Number of Households in Napa County [6]	55,468				
Percent of Existing Households with Solar [7]	14%				
Additional percent of households to Install Solar per year (starting in 2026) (w/ battery storage)			5%	5%	0%
Percent of All Existing Households with Solar with measure			34%	59%	59%
Percent of All Existing Households adding Solar under Measure starting in 2026 [8]			20%	45%	45%
Average Capacity of On-Site Renewable Generation (% of grid power offset across one year)[1]			80%	80%	80%
Residential Grid Electricity Use Reduced by Solar under Measure (kWh)			49,213,778	76,396,340	(6,163)
Emissions Factor (g CO2e/kWh)			20	20	-
Electricity emissions reductions from Renewables in Existing Residential Land Uses (MTCO2e)			979	1,520	0

Non-Residential Land Uses			**2030**	**2035**	**2045**
Forecasted Non-Residential Electricity Use in Existing Buildings built through 2025 (kWh) [2]			710,865,213	736,685,935	755,607,287
Renewable Electricity Covered under other measures (kWh)					
BE-1			*189,748,100*	*392,393,713*	*803,672,793*
Adjusted Electricity Use Forecast in Existing Buildings (kWh) [2]			521,117,112	344,292,222	-48,065,506

Existing Solar Installations (kW DC) (From 1994 to 7/2024)	kW [3]	Estimated kWh per year [4]
Non-Residential	46,392	73,803,611

Employment in Napa County [6]	65,151			
kW to Job Ratio as of 2022/2023	0.71			
Average annual kW added per job (since 1994)	0.03			
Forecasted Employment		114,219	112,868	110,335
Target Average Annual kW added per job (starting in 2026) *(Double of current rate)*		0.06	0.06	0.06
Cumulative kW added per Job since 2026 under Measure		0.25	0.56	1.18
Added Non-Residential kW of Solar under Measure		28,289	62,898	129,804
Percent increase from existing		38%	58%	74%
kWh from Added Solar		45,004,669	100,062,444	206,502,627
Emissions Factor (g CO2e/kWh)		20	20	-
Electricity emissions reductions from Renewables in Existing Non-Residential Land Uses (MTCO2e)		896	1,990	0
GHG Reductions (MTCO2e)		**1,875**	**3,510**	**-**

Sources:

[1] https://www.energysage.com/solar/grid-tied-solar-vs-solar-battery-backup/ (states 95% off grid, but we assume 80% to be conservative to account for winter months. Larger systems can be OF-grid during the winter but are less cost effective)
[2] Forecasts account for the impact of the Zero Nox Rule on existing homes
[3] California's Distributed Generation Statistics. Interconnected Project Sites Data Set. PGE. NAPA County. (7/31/2024)
[4] Based on the kW inputs for Napa County into NREL's PV Watts Calculator
[5] Google's Environmental Insights Explorer. 2024. https://insights.sustainability.google/places/ChIJMU8qI_IPhIARfMUQoxvSFP4?ty=2023&hl=en-US
[6] https://www.census.gov/quickfacts/fact/table/napacountycalifornia/PST040222
[7] Note that this is a rough estimate and does not account for the fact that one multifamily solar installation can account for multiple households

BE-5
Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction

Eliminate the use of natural gas in new development by 01/01/2026.		**2023**	**2026**	**2030**	**2035**	**2045**
RESIDENTIAL	**2015 [5]**		**[4]**			
Number of households (South County: Napa, American Canyon)	34,000		35,603	36,186	36,914	38,371
Number of households (North County: St. Helena, Yountville, Calistoga, Unincorporated County)	16,000		16,050	16,069	16,091	16,137
Total Households			51,653	52,254	53,006	54,509
Growth From 2030					1%	4%
New Housing Units (2023-2031) per RHNA allocation [7]				3,844	3,899	4,010
Total Housing Units [6] [7]		56,049	57,696	59,893	59,948	60,059
New housing units starting in 2026				2,197	2,252	2,362
Emissions Reductions from Natural Gas						
Gas usage in new residential buildings from 2019 (therms)				2,471,193	2,532,215	3,736,222
Gas usage in new residential buildings built between 2020 and 2025 (therms) (forecasted)				1,123,270	1,123,270	1,123,270
Gas usage in new residential buildings built after 2025 (therms)				1,347,923	1,408,945	2,612,952
Target Zero Carbon Building Rate				90%	92%	97%
Reduced natural gas usage (therms)				1,213,131	1,300,926	2,534,564
Natural gas emissions factor (MTCO2e/therm)				0.00532	0.00532	0.00532
GHG reductions from natural gas savings in residential land uses built after 2025 (MTCO2e)				6,456	6,923	13,489
Emissions Reductions from Renewable Electricity						
Electricity usage in new residential buildings from 2019 (kWh)				105,686,485	90,975,232	71,747,602
Electricity usage in new residential buildings built between 2020 and 2025 (kWh) (forecasted)				15,535,517	15,535,517	15,535,517
Electricity usage in new residential buildings built after 2025 (kWh)				90,150,968	75,439,715	56,212,086
Total electricity needed to offset natural gas heating (kWh) (Informational Only)				*6,470,055*	*6,938,296*	*13,517,719*
Total new electricity use (kWh) (Informational Only)				*96,621,023*	*82,378,011*	*69,729,805*
Electricity emissions factor (Assuming net zero through solar/battery) (gCO2e/kWh)				0	0	0
New Electricity Use Emissions (MTCO2e)				0	0	0
Leg-Adj Emission Factor (gCO2e/kWh)				20	20	0
Leg-Adj BAU Electricity Use Emissions from affected buildings (MTCO2e) [8]				1,794	1,501	-
GHG reductions from on-site renewable electricity use in residential land uses built after 2025 (MTCO2e)				1,794	1,501	-
NON-RESIDENTIAL				**2030**	**2035**	**2045**
Emissions Reductions from Natural Gas						
Gas usage in new non-residential buildings from 2019 (therms)				3,835,298	3,653,681	3,512,606
Gas usage in new non-residential buildings built between 2020 and 2025 (therms) (forecasted)				1,743,317	1,743,317	1,743,317
Gas usage in new non-residential buildings built after 2025 (therms)				2,091,981	1,910,363	1,769,289
Target Zero Carbon Building Rate				90%	90%	90%
Reduced natural gas usage (therms)				1,882,783	1,719,327	1,592,360
Natural gas emissions factor (MTCO2e/therm)				0.00532	0.00532	0.00532
GHG reductions from natural gas savings in non-residential land uses built after 2025 (MTCO2e)				10,020	9,150	8,474
Emissions Reductions from Renewable Electricity						
Electricity usage in new non-residential buildings from 2019 (kWh)				105,686,485	90,975,232	71,747,602
Electricity usage in new non-residential buildings built between 2020 and 2025 (kWh) (forecasted)				48,039,311	48,039,311	48,039,311
Electricity usage in new non-residential buildings from 2026 (kWh)				57,647,174	42,935,920	23,708,291
Total electricity needed to offset natural gas heating (kWh)				*13,579,255*	*12,400,358*	*11,484,628*
Total new electricity use (kWh) (Informational Only)				*71,226,428*	*55,336,278*	*35,192,919*
Electricity emissions factor (Assuming net zero through solar/battery) (gCO2e/kWh)				0	0	0
New Electricity Use Emissions (MTCO2e)				0	0	0
Leg-Adj Emission Factor (gCO2e/kWh)				20	20	0
Leg-Adj BAU Electricity Use Emissions from affected buildings (MTCO2e) [8]				1,147	854	-
GHG reductions from on-site non-renewable electricity use in residential land uses built after 2025 (MTCO2e)				1,147	854	-
Net GHG Reductions (MTCO2e)				**19,418**	**18,428**	**21,963**

Sources:
[1] U.S. DOE 2024. Furnaces and Boilers. Available: https://www.energy.gov/energysaver/furnaces-and-boilers
[2] EPA 2023. ENERGY STAR Most Efficient 2024. (Air Source Heat Pumps. Assumed a conservative SEER rating of 15. Converted to Coefficient of Performance (COP) by multiplying by 0.293. A COP of 2 = 200% efficiency.) https://www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Most%20Efficient%202024%20Final%20Criteria%20Memo%20-%20Revised_12-2023.pdf#:~:text=URL%3A%20https%3A%2F%2Fwww.energystar.gov%2Fsites%2Fdefault%2Ffiles%2Fasset%2Fdocument%2FENERGY%2520STAR%2520Most%2520Efficient%25202024%2520Final%2520Criteria%2520Memo%2520 *SEER to COP conversion from: https://www.sciencedirect.com/topics/engineering/seasonal-energy-efficiency-ratio#:~:text=SEER%20is%20very%20similar%20to,per%20unit%20of%20work%20energy.)*
[4] interpolated between 2015 and 2050
[5] Plan Bay Area 2050 (See Attachment 2 of the Forecast Memo)
[6] Census https://urldefense.com/v3/__https:/www.census.gov/quickfacts/fact/table/napacountycalifornia/PST040222__;!!B5cixuoO7ltTeg!FzemxvnrMu6m8gxvsWIO0sq-IqtDKYdKg8EfljaFbpGzcO1Vho0Jl6D18-VtCW0hl-OxoMv1CrWuCe3JP3czf7cY$
[7] https://abag.ca.gov/sites/default/files/documents/2021-12/Final_RHNA_Allocation_Report_2023-2031-approved_0.pdf (Table 4)
[8] This calcuation only accounts for the "Electricity Usage in building built after 2025" and not the new electricity needed due to conversion from natural gas. This is because the reductions associated with using on-site renewables is subtracted from the leg-adjusted forecast, which does not account for the increased electricity use from electrification of appliances.

Calculations for estimating effective efficiency of transition of residential buildings from natural gas infrastructure to electric	
Assumed average efficiency of natural gas heating (conservative) [1]	80%
Assumed average efficiency of electric heating for non-residential buildings[2]	440%
MWh per therm conversion	0.0293
Number of therms of electricity needed to produce the same amount of heat as one therm of natural gas.	0.18

Calculations for estimating effective efficiency of transition of non-residential buildings from natural gas infrastructure to electric	
Assumed average efficiency of natural gas heating (conservative) [1]	80%
Assumed average efficiency of electric heating for non-residential buildings[2]	325%
MWh per therm conversion	0.0293
Number of therms of electricity needed to produce the same amount of heat as one therm of natural gas.	0.25

TR-2
Reduce emissions from winery wastewater hold-and-haul transportation.

	2019	2030	2035	2045
Diversion from EBMUD				
Gallons of winery wastewater trucked from Napa per year to EBMUD (gal) [1]	20,000,000			
Percent of winery wastewater diverted from EMBUD to local treatment at Napa San		5%	10%	20%
Gallons of winery wastewater trucked diverted to local treatment (gal)		1,000,000	2,000,000	4,000,000
Average Wastewater Gallons hauled per truck (gal) [2]	6,000			
Total truck trips per year diverted		333	667	1,333
Average miles from Napa to EBMUD (mi)	50			
Average miles from Napa to NapaSan (mi)	16			
Total annual miles from Napa to EBMUD - Offset (mi)		16,667	33,333	66,667
Total annual miles from Napa to NapaSan - Added (mi)		5,333	10,667	21,333
Difference in Truck VMT (mi)		11,333	22,667	45,333
EMFAC Vehicle Type	T7 Utility			
Truck Emissions factor after ACC2/ACF (g CO2e/mi)		1,604	1,241	626
Emissions Reduced due to Diversion (MTCO2e)		18	28	28
Conversion of Fleet to Electric				
Remaining gallons of winery wastewater trucked to EBMUD (gal)		19,000,000	18,000,000	16,000,000
Average Wastewater Gallons hauled per truck (gal) [2]	6,000			
Total truck trips per year		6,333	6,000	5,333
Average miles from Napa to EBMUD (mi)	50			
Total Truck VMT (mi)		316,667	300,000	266,667
Percent of Fleet converted to Electric (under forecasts)		7%	22%	57%
Percent of Fleet converted to Electric (under measure)		15%	30%	75%
Additional Truck VMT converted to Electric Under Measure		26,224	23,619	47,520
EMFAC Vehicle Type	T7 Utility			
Diesel Truck Emissions factor (g CO2e/mi)		1,773	1,739	1,700
Offset Diesel Emissions (MTCO2e)		47	41	81
Truck EV efficiency factor (kWh/mi) [3]		5	5	5
Electricity Emissions Factor (g CO2e/kWh)		20	20	-
New Electricity Emissions (MTCO2e)		2.61	2.35	-
Emissions Reduction (MTCO2e)		44	39	81
Conversion of Fleet to Renewable Diesel				
Percent of fleet using Renewable Diesel under Measure (Assume 100% of remainder to use renewable diesel)		85%	70%	25%
Truck VMT to Use Renewable Diesel		269,167	210,000	66,667
Fuel Economy (mi/gal) [4]		5.98	6.13	6.40
Fuel Use (gal)		45,046.12	34,262.50	10,419.20
Emissions offset with Renewable Diesel per Gallon (g CO2e/gal)	10,160			
Emission Reduction (MTCO2e)		458	348	106
GHG Reductions (MTCO2e)		**520**	**415**	**215**

Sources:

[1] Estimated based on "Internal Review of Napa Sanitation District's Capacity to Received Trucked Winery Waste" Oct 2014 and 2019 "Winery Wastewater Management Update" presentation to Napa San Board of Directors.

https://www.bing.com/ck/a?!&&p=8af0617fd26975b0JmltdHM9MTcyNzY1NDQwMCZpZ3VpZD0wMzAzOGEzNS1jMmI1LTY0ZGMtMTI2Mi05ZWM3YzM1NzY1MDQmaW5zaW
Q9NTI2MQ&ptn=3&ver=2&hsh=3&fclid=03038a35-c2b5-64dc-1262-

[2] Based on calculation from "Internal Review of Napa Sanitation District's Capacity to Received Trucked Winery Waste" Oct 2014 and maximum capacity of tanker trucks.

[3] https://betterenergy.org/blog/the-medium-and-heavy-duty-electric-vehicle-market-plugging-into-the-future-part-
i/#:~:text=The%20energy%20usage%20required%20for%20medium-%20and%20heavy-duty,to%200.4%20kWh%20per%20mile%20for%20light-duty%20EVs.

[4] Calculated from EMFAC 2021 for diesel T7 Utility Class 8 trucks for 2030, 2035, and 2045 in Napa County

TR-9
Increase availability of renewable diesel.

		2030	2035	2045
	2024			
Existing Number of Stations with Renewable Diesel[1]	1			
Existing Number of Stations with Diesel	41			
Percent of Diesel Stations selling RD	2%			
Percent of stations selling RD in the county beginning in 2026 [2]		20%	40%	50%
RD gallons sold per station per month (Sonoma wine country example) [3]	30,000			
Emissions offset with Renewable Diesel per Gallon (g CO2/gal)[4]	10,160			
Target Gallons of Renewable Diesel sold per Year (gal)		2,952,000	5,904,000	7,380,000
Gallons of RD used in TR-2 for Hold and Haul Winery Waste (gal)		45,046	34,262	10,419
Adjusted Target Gallons of Renewable Diesel sold per Year (gal)		2,906,954	5,869,738	7,369,581
GHG Reductions (MTCO2e)		**29,535**	**59,637**	**74,875**

Sources:

[1] https://afdc.energy.gov/stations#/analyze?region=US-CA&show_map=true&country=US&access=public&access=private&fuel=RD&lpg_secondary=true&hy_nonretail=true&ev_levels=all

[2] Not necessarily brand new stations

[3] https://www.phillips66.com/newsroom/drivers-embrace-76-renewable-diesel-from-rodeo/

[4] Per ICLEI Community Protocol, biogenic CO2 emissions should not be included in a GHG inventory. All renewable diesel comes from biogenic sources. (ICLEI 2013: Appendix F: Page 5)

TR-10
Implement NVTA's Active Transportation Plan.

	2019	2030	2035	2045
Annual passenger vehicle miles traveled (VMT)	944,367,693	1,114,891,221	1,204,569,915	1,383,927,302
Commute VMT (estimated in TR-11) [5]		116,484,884	115,106,696	112,523,691
NVTA Target Bicycle/Ped Mode Share (10% by 2040) [1] [2]		7%	10%	15%

Napa Countywide Trip Mode Split (Work commute only) [3]	2019
Drive Alone	75.8%
Carpool	10.0%
Transit	1.6%
Walk	3.3%
Work From Home	6.3%
Other/Bike	3.1%
Walk/Bike/Other (Combined)	6.4%

Average One-Way Trip Length by Mode (mi) [4]	2019
Drive Alone	13.00
Carpool	15.00
Transit	7.00
Walk	1.00
Work From Home	0.00
Other/Bike	1.00

Percent VMT by Mode (calculated)	2019
Drive Alone	85.5%
Carpool	13.0%
Transit	1.0%
Walk	0.3%
Work From Home	0.0%
Other/Bike	0.3%

	2030	2035	2045
Increased Percentage of Bike/Ped VMT compared to existing conditions	6%	9%	14%
Annual VMT Reduction with the Implementation of NVTA's Active Transportation Plan	7,507,365	10,871,743	16,253,964
Passenger vehicle emissions factor (g CO2e/mile)	244	157	46
GHG Reductions (MTCO2e)	**1,829**	**1,708**	**748**

Sources:

[1] https://nvta.ca.gov/planning-and-projects/planning/regional/napa-countywide-bike-plan/ targets 10% mode share of all trips by 2035

[2] NVTA anticipates that they will target 10% of all trips to be bike or ped by 2040.

[3] https://vitalsigns.mtc.ca.gov/indicators/commute-mode-choice?chart=SGlzdG9yaWNhbFRyZW5kRm9yQ29tbXV0ZU1vZGVDaG9pY2U

[4] Average based on Microsoft Co-Pilot minimum and maximum results, citing the 2020 Napa Valley Travel Behavior Study and NHTS's 2022 National Household Survey.

[5] No information is currently available about the mode split for non-work trips in Napa County. As a conservative assumption, the reductions estimated in this measure only apply to work trips.

TR-11

Expand Individual Trip TDM Programs.

	2019	2030	2035	
Emissions from on-road transportation (passenger vehicles) (MTCO2e)		198,492	125,869	3
Annual VMT from passenger vehicles		814,869,162	801,151,840	787,4
Workforce population in Napa Region (Number of Jobs)	97,452	114,219	112,868	11
Number of Employees in Businesses with Greater than 50 employees [3]	35,907			
Percent of Workforce in Businesses with Greater than 50 employees	37%			
Estimated Workforce in Businesses with Greater than 50 employees		42,085.19	41,587.26	40,
CAPCOA T-6 Assumptions (Implement Commute Trip Reduction Marketing (Mandatory Implementation) [1]				
Percent of Employees Eligible for Program		50%	50%	
Percent Reduction in Employee Commute Trips [1]		26%	26%	
Adjustment from vehicle trips to VMT (unitless)		1	1	
Percent Reduction in Commute VMT		13%	13%	

NVTA Travel Survey (2020) [2]

Day of Week Total Napa County Trip Variation (Vehicle trips)	
Weekday	353,000
Friday	359,000
Saturday	285,000
Sunday	280,000
Work-Related Trips by Day of Week	
Weekday	22%
Friday	19%
Saturday	10%
Sunday	10%
Average Napa County-Generated One-Way Trip Length Miles by Day of Week	
Weekday	8.5
Friday	8.7
Saturday	9.5
Sunday	9.7
Work-Related VMT by Day of Week (Calculated)	
Weekday	1,320,220.0
Friday	1,186,854.0
Saturday	541,500.0
Sunday	543,200.0
Average Work-Related Daily VMT	1,078,919.14
Working Days per Year	250
Annual Work-Related VMT	269,729,786
Average Car Commute Miles per Year Per Job (mi/job/year)	2,768

	2030	2035	
Commute Miles per Year in Napa	116,484,884	115,106,696	112,5
Reduced Commute Miles under ON-11	15,143,035	14,963,870	14,6
Reduction in VMT with TR measures (miles)	**15,143,035**	**14,963,870**	**14,6**
Average Passenger Miles Emissions Factor (gCO2e/mi)	**243.59**	**157.11**	
GHG Reductions from TR-11 (MTCO2e)	**3,689**	**2,351**	

Sources:

[1] CAPCOA, 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity-Final Draft.

[2] https://nvta.ca.gov/wp-content/uploads/2024/05/NapaValley_TBS_Document_final-May-2020.pdf

[3] EDD 2024. Table 4: Number of Businesses, Number of Employees, and Third Quarter Payroll by Size Category (Private Industry). 3rd Quarter 2023. https://labormarketinfo.edd.ca.gov/LMID/Size_of_Business_Data.html

OF-1
Reduce landscaping-related emissions.

		2019	2030	2035	2045
Forecasted Landscaping Equipment Emissions (MTCO2e) [1]		28,726	290	149	12
Existing Landscaping Equipment					
Average Landscaping Equipment Lifespan (years)	11				
Landscaping equipment emissions from existing equipment (MTCO2e) [2]		28,726	-	-	-
Target electrification rate for existing landscaping equipment [3]			25%	0%	0%
Reduction in landscaping equipment emissions from existing equipment (MTCO2e)			-	-	-
New Landscaping Equipment					
Forecasted New Landscaping equipment emissions (MTCO2e)			290	149	12
Target electrification rate under SORE AB 1346 [4]			67%	87%	99%
Target electrification rate under Measure			100%	100%	100%
Reduction in landscaping equipment emissions from SORE regulations (MTCO2e)			290	149	12
GHG reductions from zero-emission landscaping equipment (MTCO2e)			290	149	12
Additional emissions from electricity use					
Gasoline Emission Factors (MTCO2e per gal)			0.00810	0.00810	0.00810
Reduced Gasoline usage due to transition (gal)			35,800	18,389	1,479
kWh per gal conversion [5]	0.03				
Electricity required to charge transitioned construction equipment (kwh)			504	259	21
Charged amount (MWh)			0.50	0.26	0.02
Electricity emissions factor (gCO2e/kWh)			20	20	-
Additional GHG emissions from zero-emission construction equipment (MTCO2e)			0.01	0.01	-
Reduced GHG Emissions (MTCO2e)			**290**	**149**	**12**

Sources:

[1] Note that forecasted emissions from lawn and garden equipment are expected to decrease dramatically under SORE AB1346, which anticipates a 2/3 decrease in emissions by 2030 from 2019.

[2] Based on the assumption that 9.09% of existing equipment would be aged out per year.

[3] Landscaping equipment are only assumed to last 10-15 years. It is assumed that by 2030 all existing landscaping equipment as of 2019 will have been turned over to electric models.

[4] Calculated from CARB's SORE 2020 Model assuming all small offroad lawn equipment are zero emissions starting in Model Year 2024.

[5] Convertunits.com

[6] https://www.nrdc.org/bio/madhur-boloor/electric-vehicle-basics#:~:text=Electric%20motors%20convert%20over%2085,for%20a%20gas%20combustion%20engine.

Background Data and Calculations

Calculations for estimating effective efficiency of transition of landscaping equipment from gasoline to electric	
Assumed average efficiency of gasoline engines (conservative) [6]	40%
Assumed average efficiency of electric motors [6]	85%
Number of kBTU of electricity needed to produce the same amount of work as one kBTU of gasoline in a motor	0.47

OF-2
Zero-Emission Loading Docks.

Offset Transportation Refrigeration Unit and Auxilary Power Unit Emissions through electrifying loading docks [1]		**2019**	**2030**	**2035**	**2045**
TRU Emissions in Napa County (Applies to attached units only) (MTCO2e)		2,561	2,486	2,694	3,182
Percent of Time TRUs are operated while truck is stationary [2] [3]	33%				
Percent of Loading Docks in the Region that are Electrified [4]		0%	33%	66%	100%
Emissions Reduced from Requiring TRUs to be Plugged in (MTCO2e)			271	541	820
Reduced GHG Emissions (MTCO2e)			**271**	**541**	**820**

Sources:

[1] Methodology based on measure description in the CAPCOA GHG Handbook. CAPCOA 2021. Handbook for Analyzing GHG Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity

[2] CARB 2021. TRU Emissions Inventory. Page 21. Table 8. https://ww2.arb.ca.gov/sites/default/files/barcu/board/rulemaking/tru2021/apph.pdf

[3] Assume that stationary TRU operation only occurs at loading docks

[4] There is on-going regulatory activity to reduce emissions from TRUs. CARB's recent TRU regulations were overturned in April 2024. They had required that 15% of TRU trailers and truck mounted TRUs would be Zero Emissions starting at the end of 2023. Requirements for TRU trailers were overturned. The effect of these regulations are not reflected in the forecast. [a][b]

Additional References

https://ndustrial.io/etrus-poised/

"California has mandated that by the end of 2023, truck-mounted TRU owners must begin replacing 15% of their fleet each year with Zero Emissions models."

[a] https://ww2.arb.ca.gov/news/carb-approves-new-requirements-further-reduce-air-pollution-transport-refrigeration-units-and

[b] https://www.freightwaves.com/news/court-kills-carbs-30-reefer-truck-fee-but-refrigeration-unit-rules-intact

OF-3 Zero carbon construction equipment - Community.					
		2019	**2030**	**2035**	**2045**
Construction Emissions in Napa County (MTCO2e)		12,294	11,166	11,184	11,009
Population of Construction Equipment in Napa County		1,131	1,209	1,245	1,295
Percent of Construction Emissions Attributed to Community [1]	96%				
Percent of Construction Equipment using ZEV technology		0%	0%	60%	100%
Number of ZEV Construction Equipment		0	0	747	1295
Emissions Reduced Construction Equipment (MTCO2e)			-	6,416	10,694
Reductions from OF-4			-	472	472
Reduced GHG Emissions (MTCO2e)			**-**	**5,944**	**10,221**

Sources:

[1] Given limited resources, construction emissions occuring at the municipal level are estimated based on the ratio of municipal to all employees in the county. Calculated from estimates in OF-4.

OF-4
Zero carbon construction equipment - Municipal.

		2019	2030	2035	2045
Construction Emissions in Napa County (MTCO2e)		12,294	11,166	11,184	11,009
Municipal Employee Estimate by Jurisdiction as of 2023 [1]					
Calistoga	145				
St. Helena	129				
Yountville	79				
Napa	644				
American Canyon	148				
County of Napa	1790				
Total	2935				
Total Jobs in the county in 2023[2]	69,400				
Percent of Construction Emissions Attributed to Municipalities [3]	4%				
Percent of Construction Equipment using ZEV technology		0%	50%	100%	100%
Emissions Reduced Construction Equipment (MTCO2e)			236	472	472
Reduced GHG Emissions (MTCO2e)			**236**	**472**	**472**

Sources:

[1] https://publicpay.ca.gov/Reports/Cities/City.aspx?entityid=283&year=2023 + https://publicpay.ca.gov/Reports/Counties/County.aspx?entityid=28&year=2023

[2] EDD 2023. Napa County Profile. https://labormarketinfo.edd.ca.gov/cgi/databrowsing/localAreaProfileQSMoreResult.asp?menuChoice=localAreaPro&criteria=unemployment+rate&categoryType=employment&geogArea=0604000055&area=Napa+County&timeseries=unemployment+rateTimeSeries

[3] Given limited resources, construction emissions occuring at the municipal level are estimated based on the ratio of municipal to all employees in the county.

AG-1
Reduce fossil fuel consumption in field equipment.

	2019	2030	2035	2045
NON-PUMP AGRICULTURAL EQUIPMENT				
Forecasted Non-Irrigation Pump Agricultural Equipment Emissions (MTCO2e) [1]	47,682	42,981	41,211	38,194
Percent of Emissions from Equipment <25 hp [1]		2%	2%	2%
Percent of Emissions from Equipment >25 hp [1]		98%	98%	98%
Emissions from Equipment <25hp (MTCO2e) (Small off-road equipment covered under SORE Regulations AB 1346)		821	798	761
Emissions from Equipment >25hp (MTCO2e)		42,160	40,412	37,433
Existing Agricultural Equipment (>25 hp) [2]				
Number of >25hp Equipment Population from 2019 or older equipment countywide [3]		1,693	1,278	702
Percent of >25hp Equipment Emissions from 2019 or older equipment countywide (MTCO2e) [3]	100%	52%	37%	18%
Emissions from Existing Equipment (MTCO2e)		21,858	15,048	6,869
Target electrification rate for existing Agricultural equipment		25%	50%	100%
Number of affected equipment		423	639	702
Reduced Emissions from Existing Equipment		5,464	7,524	6,869
Diesel Emissions Factor (kg CO2e/gal) [5]		10.19	10.19	10.19
Quantity of Diesel Displaced (gal)		536,258	738,378	674,093
Additional Electricity Use				
Quantity of Diesel Displaced (kBTU)		74,054,681	101,966,513	93,089,059
Additional Electricity Used (kWh) [6]		8,440,167	11,621,336	10,609,554
g CO2e/kWh		20	20	-
Additional Electricity Emissions (MTCO2e)		168	231	-
Net Change in Existing Agricultural Equipment		5,296	7,293	6,869
New Agricultural Equipment (>25hp) [2]				
Number of Forecasted New Agricultural equipment		977	1,298	1,707
Forecasted New Agricultural equipment emissions (MTCO2e)		20,302	26,162	31,325
Target electrification rate for new Agricultural equipment		50%	100%	100%
Number of affected equipment		488	1,298	1,707
Reduced Emissions from Existing Equipment		10,151	26,162	31,325
Diesel Emissions Factor (kg CO2e/gal) [5]		10.19	10.19	10.19
Quantity of Diesel Displaced (gal)		996,185	2,567,466	3,074,130
Additional Electricity Use				
Quantity of Diesel Displaced (kBTU)		137,568,447	354,554,781	424,522,754
Additional Electricity Used (kWh) [6]		15,678,963	40,409,349	48,383,745
g CO2e/kWh		20	20	-
Additional Electricity Emissions (MTCO2e)		312	804	-
Net Change in New Agricultural Equipment		9,839	25,359	31,325

AGRICULTURAL IRRIGATION PUMPS

		2019	2030	2035	2045
Forecasted Irrigation Pump Equipment Emissions (MTCO2e)		15,417	15,616	15,852	16,303
Lifespan of a diesel irrigation pump (years) (between 15-20 years)	17.5				
Percent of existing pumps aged out per year	6%				
Percent of existing pumps still in operation			37%	9%	0%
Emissions from Existing Irrigation Pumps (MTCO2e)			5,800.35	1,358.77	-
Emissions from New Irrigation Pumps (MTCO2e)			9,815.98	14,493.51	16,302.89
Replacement of Existing Equipment Emissions					
Targeted Replacement Percentage of Existing Equipment still in operation			50%	100%	0%
Estimated Breakdown by Alternative Fuel Type					
Electric (Grid-Tied)			20%	20%	0
Renewable Diesel			60%	60%	0
Solar with Battery Storage			20%	20%	0
Emissions by Alternative Fuel Type					
Emissions offset by Electric Equipment (MTCO2e)			580.04	271.75	-
Diesel Emissions Factor (kg CO2e/gal) [5]			10.19	10.19	10.19
Quantity of Diesel Displaced (gal)			56,922	26,669	-
Quantity of Diesel Displaced (kBTU)			7,860,657	3,682,810	-
Additional Electricity Used (kWh)			895,896	419,738	-
g CO2e/kWh			20	20	-
Additional Electricity Emissions (MTCO2e)			18	8	-
Net Change in Emissions (MTCO2e)			**562**	**263**	**-**
Emissions offset by Renewable Diesel (MTCO2e)			1,740.11	815.26	-
Diesel Emissions Factor (kg CO2e/gal) [5]			10.19	10.19	10.19
Quantity of Diesel Displaced (gal)			170,766	80,006	-
Emissions offset with Renewable Diesel per Gallon (g CO2e/gal) (from TR-9)	10,160				
Net Change in Emissions (MTCO2e)			**1,735**	**813**	**-**
Emissions offset by Solar with Battery Storage (MTCO2e)			580.04	815.26	-
Additional Electricity Emissions (Assumed to be Zero)			-	-	-
Net Change in Emissions (MTCO2e)			**580**	**815**	**-**
Subtotal of Emissions Reductions from Replacement of Existing Equipment (MTCO2e)			2,877	1,892	-

Offset New Pump Emissions				
Targeted Replacement Percentage of New Pumps		75%	100%	100%
Estimated Breakdown by Alternative Fuel Type				
Electric (Grid-Tied)		20%	30%	40%
Renewable Diesel		60%	40%	10%
Solar with Battery Storage		20%	30%	40%
Emissions by Alternative Fuel Type				
Emissions offset by Electric Pumps (MTCO2e)		1,472.40	4,348.05	6,521.15
Diesel Emissions Factor (kg CO2e/gal) [5]		10.19	10.19	10.19
Quantity of Diesel Displaced (gal)		144,494	426,698	639,956
Quantity of Diesel Displaced (kBTU)		19,953,976	58,924,961	88,374,917
Additional Electricity Used (kWh)		2,274,196	-	-
g CO2e/kWh		20	20	-
Additional Electricity Emissions (MTCO2e)		45	-	-
Net Change in Emissions (MTCO2e)		**1,427**	**4,348**	**6,521**
Emissions offset by Renewable Diesel (MTCO2e)		4,417.19	5,797.40	1,630.29
Diesel Emissions Factor (kg CO2e/gal) [5]		10.19	10.19	10.19
Quantity of Diesel Displaced (gal)		433,483	568,931	159,989
Emissions offset with Renewable Diesel per Gallon (g CO2e/gal) (from TR-9)	10,160			
Net Change in Emissions (MTCO2e)		**4,404**	**5,780**	**1,625**
Emissions offset by Solar with Battery Storage (MTCO2e)		1,472.40	4,348.05	6,521.15
Additional Electricity Emissions (Assumed to be Zero)		-	-	-
Net Change in Emissions (MTCO2e)		**1,472**	**4,348**	**6,521**
Subtotal of Emissions Reductions from New Pumps Requirements (MTCO2e)		7,304	14,476	14,668
Reduced GHG Emissions from Ag Equipment (MTCO2e)		**15,136**	**32,652**	**38,194**
Reduced GHG Emissions from Irrigation Pumps (MTCO2e)		**10,181**	**16,368**	**14,668**
Reduced GHG Emissions (MTCO2e)		**25,316**	**49,020**	**52,862**

Sources:

[1] Calculated from OFFROAD2021.

[2] Based on equipment with models years of 2019 or older.

[3] Measure focuses on equipment over 25hp. Those under 25 Hp are covered under the SORE regulations AB 1346

[4] Convertunits.com

[5] https://www.eia.gov/environment/emissions/co2_vol_mass.php

[6] https://www.tnelectric.org/2020/08/25/electric-farming-equipment-is-an-energy-trend-to-watch/

Background Data and Calculations

Calculations for estimating effective efficiency of transition of equipment from diesel to electric	
Assumed average efficiency of diesel agricultural engines [6]	35%
Assumed average efficiency of electric motors [6]	90%
Number of kBTU of electricity needed to produce the same amount of work as one kBTU of diesel in a motor	0.39

Resources:

https://www.farm-equipment.com/articles/20408-ag-prepares-for-electric-powered-future

https://calstart.org/achieving-zero-emissions-in-construction-agricultural-equipment/

AG-6
Accelerate Woodland and Forest Habitat Restoration and Stewardship in Rural Areas.

Target restoration of 20% of trees affected by wildfire since 2017.

Acres burned in Wildfire by Year in Napa County by Vegetation Type [1]	**Total**	**Brush**	**Grass**	**Timber**	**Woodland**	**Other**
2017	98,786	29	2,037	-	96,720	-
2018	2,784	5	2,572	2	204	1
2019	653	1	652	-	-	-
2020	213,211	213,067	133	8	3	-
2021	210	11	198	-	1	-
2022	581	-	580	1	-	-
2023	134	-	133	1	-	-
Total	316,359	213,113	6,305	12	96,928	1
Breakdown of Total (Percent)		67%	2%	0%	31%	0%

Carbon Sequestrataion Rate per Acre of Vegetation in Napa [2]

CALFIRE Vegetation Type	Carbon Storage Report Equivalent Land Cover	Min Vegetation Sequestration Rate (MT CO2e/ year)	Max Vegetation Sequestration Rate (MT CO2e/ year)	Median Sequestration Rate (MT CO2e/ year)	Acres	Median Sequestration Rate per acre (MT CO2e/ year)
Brush	Shrubland	45,101	90,202	67651.30	49,023	1.38
Grass	Grassland	-	-	0.00	64,311	0.00
Timber	Forest	238,887	315,529	277208.12	42,816	6.47
Woodland	Woodland	988,321	1,437,859	1213090.03	222,760	5.45
Other	Cultivated	-	-	0.00	52,629	0.00

Weighted Average Annual CO2 Sequestration per Displaced Vegetation due to Wildfire (MT CO2/acre) [3]	2.60			
		2030	**2035**	**2045**
Target Percent of Acres to be Restored		10%	15%	20%
Acres to be restored		31,636	47,454	63,272
Total CO2e sequestered (MTCO2e)		82,201	123,302	164,403
Reduced GHG Emissions (MTCO2e)		**82,201**	**123,302**	**164,403**

Sources:
[1] CALFIRE Wildfire Activity Statistics (2017-2023). Table 16. https://www.fire.ca.gov/our-impact/statistics?os=v&ref=app
[2] Ascent 2023. Regional Carbon Stock Inventory Report for Napa County. Table 3. Acres from Ascent calculations based on GIS runs.

AG-7
Increase sustainability certification in vineyards across the county.

		2030	2035	2045
Napa Green 2024 Statistics [1]				
Number of Vineyard Acres Certified	5,000			
MT of CO2e Sequestered per Year	11,000			
Number of Napa Green Full Time Staff [2]	4.5			
Estimated MTCO2e Sequestered per Certified Acre per Year	2.20			
Number of Acres Certified between 2022 and 2024 [2]	1,667			
Estimated Acres Certified per Year	833			
Estimated Acres Certified per Year per Staff	185			
Total Number of Cropland Acres in 2023 (Acres)	46,801			
Total Number of Vineyard Acres in 2023 (acres)	46,245			
Percent of Cropland that is Vineyard	98.8%			
Forecasted Growth in Total Cropland in the Unincorporated County (Acres)		58,124	59,229	61,440
Forecasted Growth in Total Vineyard in the Unincorporated County (Acres)		57,433	58,525	60,710
Targeted Cross-Program Staffing (not limited to Napa Green)		10	15	20
Estimated Future Acres Certified under Current Staff Capacity and Funding		8,333	12,500	20,833
Estimated Future Acres Certified under Increased Staff Capacity and Funding [4]		14,444	33,889	81,111
New Acres Certified under Increased Staff Capacity and Funding		9,444	28,889	76,111
Percent of future vineyard cropland (for comparison purposes)		**25%**	**58%**	**134%**
Reduced GHG Emissions (MTCO2e)		**20,778**	**63,556**	**167,444**

Sources:

[1] https://world.einnews.com/pr_news/744235967/napa-green-celebrates-over-80-vineyards-40-growers-certified-as-regenerative-climate-smart-napa-green-vineyards

[2] Pers comm Ben Mackie. 10/4/2024 Teams Meeting with Brenda Hom and Erik de Kok. Ben mentioned that they a have 4 full time staff now with one part time social media staff.

[3] 2023 Napa Crop Report. https://www.countyofnapa.org/DocumentCenter/View/32400/2023-Agricultural-Crop-Report---English?bidId=

[4] Pers comm Ben Mackie. 10/4/2024 Teams Meeting with Brenda Hom and Erik de Kok. Ben mentioned that 2/3 of the vineyards that underwent certification when the program started were early adopters who had already begun implementing sustainability strategies.

SW-1
Increase Solid Waste Diversion

	2019		2030	2035	2045
Solid Waste Generation Emissions (MTCO2e)			97,027	96,511	98,263
Statewide Diversion Rate [1]	41%				
Statewide Disposal Rate per Day (pounds per person per day) [1]	6.4				

CalRecycle Disposal Rate Per Day (pounds per resident per day) [2]	Disposal Rate	Population [3]
Napa	4.2	77,637
American Canyon	3.9	21,641
Unincorporated Napa County	10.3	23,038
Average Per Capita Disposal Rate	5.3	

	2019	2030	2035	2045
Napa Waste Diversion Targets [4]	51%	75%	80%	85%
Increased waste diversion		24%	29%	34%
Adjusted forecasted emissions from solid waste (MTCO2e)		49,685	39,537	30,191
Countywide Population Forecast		156,842	157,066	164,054
Tonnage of Disposal per Year under Diversion Rate		151,690	151,907	158,665
Total Tonnage Generated under Diversion Rate		310,706	311,150	324,994
Tonnage Disposed under Measure		77,677	62,230	48,749
Reduced Tonnage		74,014	89,677	109,916
Reduced GHG Emissions (MTCO2e)		**47,342**	**56,974**	**68,072**

Notes:

From CalRecycle 2021: CalRecycle estimates that California’s overall waste generation in 2021 was about 76.7 million tons. Of that total waste generation, 46 million tons went to disposal and disposal-related activities, including about 41.5 million tons sent to landfill.

Sources:

[1] State of Disposal and Recycling for Calendar Year 2022. CalRecycle 2023. Available: https://calrecycle.ca.gov/reports/stateof/

[2] CalRecycle Jurisdiction Diversion/Disposal Rate Summary
(2007 - Current) - Napa. Available: https://www2.calrecycle.ca.gov/LGCentral/DiversionProgram/JurisdictionDiversionPost2006
No data available for Calistoga, St. Helena, and Yountville

[3] 2022 Population from California Department of Finance. Table E-4.
https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fdof.ca.gov%2Fwp-content%2Fuploads%2Fsites%2F352%2FForecasting%2FDemographics%2FDocuments%2FE-4_2024_InternetVersion.xlsx&wdOrigin=BROWSELINK

[4] 2022 values calculated by scaling the Napa rate by the disposal rates between Statewide and Napa in 2022.

SW-4
Increase Solid Waste Diversion

		2019	2030	2035	2045
Waste in Place Emissions Forecast (MTCO2e)			120,380	119,431	117,876
Clover Flat Landfill (MTCO2e)			80,295	83,161	88,181
American Canyon Landfill (MTCO2)			40,085	36,270	29,695
Increased Methane Capture at American Canyon Landfill					
Existing Assumed Methane Capture Rate	75%				
Assumed Flare CH4 destruction efficiency	99%				
Oxidation factor	0.1				
Estimated Waste in Place emissions without methane capture (MTCO2e) [1]			40,085	36,270	29,695
Targeted Methane Capture Rate			80%	85%	95%
Estimated Waste in Place emissions with increased methane capture (MTCO2e) [1]			9,420	6,123	1,704
Reduction in Waste in Place emissions from increased methane capture at American Canyon Landfill (MTCO2e)			30,665	30,147	27,992
Reduced Landfill Gas Emissions due to Clover Flat LandFill Closure in 2027 [3]					
Reduced Emissions from Waste-in-Place at CFL due to earlier closure					
Modeled CFL Closure Year	2056				
Updated CFL Closure Year	2027				
		2019	**2030**	**2035**	**2045**
Methane Decay Rate for Clover Flat Landfill (for scaling only) (MTCH4) (open from 1963 until 2027) [2]		23,064	24,378	22,058	18,060
Clover Flat Landfill Estimated Waste in Place Emissions (MTCH4)		2,574	2,720	2,461	2,015
Clover Flat Landfill Estimated Waste in Place Emissions (MTCO2e)		71,804	75,896	68,674	56,225
Clover Flat Landfill (percent change from 2019)			6%	-4%	-22%
Originally Forecasted Waste In Place Emissions (MTCH4)		2,574	2,875	2,875	2,875
Originally Forecasted Waste In Place Emissions (MTCO2e)		71,804	80,219	80,219	80,219
Originally Forecasted Waste In Place Acitivity Growth Rates compared to 2019			12%	16%	23%
Difference in Waste In Place emissions due to earlier closure of CFL (MTCH4)			155	414	860
Difference in Waste In Place emissions due to earlier closure of CFL (MTCO2e)			4,323	11,546	23,994
Increased Methane Capture at CFL (2027 Closure)					
Existing Assumed Methane Capture Rate	75%				
Assumed Flare CH4 destruction efficiency	99%				
Oxidation factor	0.1				
Estimated Waste in Place emissions without methane capture with 2027 Closure Date (MTCO2e)			75,896	68,674	56,225
Targeted Methane Capture Rate			80%	85%	95%
Estimated Waste in Place emissions with increased methane capture (MTCO2e) [1]			17,836	11,594	3,226
Reduction in Waste in Place emissions from increased methane capture at CFL (MTCO2e)			58,060	57,080	53,000
Reduced GHG Emissions (MTCO2e)			**93,048**	**98,772**	**104,985**

Sources:

[1] ICLEI 2010. Local Government Operations Protocol (Equation 9.1). Note that forecasted methane emissions were based on emissions reports for the landfills rather than calculated using this equation.

[2] Relative trends based on first order decay model in CARB's Landfill Gas Tool using annual historical disposal data from EPA's FLIGHT tool (updated September 24, 2021)
https://ww2.arb.ca.gov/resources/documents/carbs-landfill-gas-tool
Caveat: CARB's Landfill Gas Tool does not account for waste characterization in more recent years after 2004. Use of the tool is limited between the year 1900 and the current year. Year 1900 was used as a proxy for the first year of landfill opening. Methane results are used for comparison purposes only.

[3] News of the change to CFL's closure date was received after the completion of the forecast. Originally, the forecast assumed CFL would close in 2056, thus continue to receive waste and grow its waste in place emissions through 2045. With the earlier closure of CFL, waste in place emissions would decline a few years after closure instead. The reductions associated with the earlier closure, compared to the forecast are accounted for here in this measure, as an alternative to updating the forecast.

WW-1
Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs).

Reduce emissions from Napa San and American Canyon Water Reclamation Facility		**2030**	**2035**	**2045**
NapaSan Waste to Energy [1][2]				
Forecasted methane emissions for the City of Napa (MTCO2e)		32,849	33,431	36,091
Population served		88,676	89,311	97,200
Digester Gas (ft3/person/day)	1			
F_CH4	0.65			
Density of Methane (g/m3)	662			
Destruction Efficiency	0.99			
Methane from Incomplete Combustion of Digester Gas (MTCO2e)		110	111	121
GHG Reductions from NapaSan [3] (MTCO2e)		32,739	33,321	35,971
American Canyon **(assumed completion by 2035)** [4]				
Forecasted emissions for the City of American Canyon			9,938	9,471
Population served			26,021	24,405
Digester Gas (ft3/person/day)	1			
F_CH4	0.65			
Density of Methane (g/m3)	662			
Destruction Efficiency	0.99			
Methane from Incomplete Combustion of Digester Gas (MTCO2e)			32	30
GHG Reductions from NapaSan [3] (MTCO2e)			9,906	9,441
Reduced GHG Emissions (MTCO2e)		**32,739**	**43,227**	**45,412**

Sources:

[1] NapaSan's current waste to energy facilitiy was not modeled in the inventory or forecasts. This measure credits the reductions from NapaSan's current efforts.

[2] Measure modeling based on Equation 10.2 of the 2010 ICLEI Local Government Operations Protocol.

[3] Based on the population of City of Napa only. NapaSan has some service areas outside the city. Those reductions are excluded.