Appendix A

Community Engagement Summary

Photo Credit: County of Napa

Napa County RCAAP Summary of Community Engagement Efforts

1 INTRODUCTION

The Napa County Regional Action and Adaptation Plan (RCAAP) is a multi-jurisdictional planning and engagement effort that aims to coordinate climate action and adaptation efforts and identify resource-sharing opportunities across the six jurisdictions in the County. While cities focus on reducing emissions in transportation and building energy, and adapting to climate change in urban areas, the County will focus on these items as well as reducing agricultural emissions, sequestering carbon, and supporting regional initiatives like diverting organics from landfills or enhancing wildfire resilience. Because emission reduction and climate adaptation strategies may differ across jurisdictions, feedback and engagement throughout the region are critical for developing the RCAAP.

Throughout the RCAAP planning process, the project team sought input from community members to support the RCAAP in the following ways:

- Guide the identification of key priorities for climate action and adaptation efforts.
- Tailor strategies to address specific local challenges and opportunities.
- Shape the RCAAP to ensure actions benefit all members of the community
- Ensure greater community support for implementation.

Community engagement for the RCAAP consisted of a variety of interrelated activities, including:

- Online survey
- Website: https://climateactionnapa.konveio.com/community-engagement-overview
- Coordinated press releases and social media posts
- Tabling at community events
- Community meetings
- Stakeholder group meetings
- Enhanced advertising of meetings of the Napa County Climate Action Committee
- Public hearings held by local municipalities (to be held during the final adoption phase)

The results of the primary community engagement activities, specifically the **online survey, focus groups, and community meetings**, are summarized in detail in this appendix.

2 ONLINE SURVEY

2.1 KEY INSIGHTS FROM SURVEY RESULTS

1. **Widespread Support:** Most respondents feel that climate change will negatively impact them, and that the government should take actions to help communities respond to and prepare for climate change. Many noted that a broad suite of actions will be necessary to respond to the scale of the challenge.

2. **Urgency is Needed:** There is significant pressure from respondents to accelerate climate action, with many concerned about the pace of progress.

3. **Economic and Development Concerns:** Respondents are concerned about the economic impacts of potential regulations to both individuals and small or local businesses. Several mentioned that they favor incentives over bans. Some noted that new development should be approached carefully so as not to strain the region's sustainability goals related to biodiversity protection, reducing vehicle miles traveled, and meeting electrification targets.

4. **Energy Grid:** Many respondents see the need for electrification to reduce greenhouse gas emissions and want support (incentives, better infrastructure) to transition away from natural gas, as well as assurance that the grid will be stable and reliable.

5. **Concern about Plastic:** Many respondents noted that they are concerned about how much plastic is part of daily life and desire for more efforts to reduce plastic use and improve plastic recycling.

6. **Desire for Education and Community Participation:** Many respondents noted that they see a need for more education in our communities regarding climate change's impacts and what individuals can do to help the community be resilient. Several noted that they want to take action and are looking for guidance.

7. **Focus on Ecosystem Health, Water, Fire:** Several respondents highlighted water management, forest health, biodiversity protection, and fire resiliency as critical areas that should receive more attention in Napa County.

8. **More Work Needed to Understand Opinions of Demographic Diversity of our Community:** Relative to the make-up of our community, respondents were relatively older, more frequently female and white, and less frequently of Hispanic/Latino/Spanish origin. Additional engagement is needed to better understand the opinions of community members in underrepresented demographic categories.

2.2 METHODS

To gather broad community input in an easily accessible manner, Napa County and the cities of American Canyon, Calistoga, Napa, and St Helena, along with the Town of Yountville, conducted the RCAAP on-line survey in partnership with Ascent and Napa County Resource Conservation District (Napa RCD).

The survey was launched on the RCAAP project website (https://climateactionnapa.konveio.com/) on May 15, 2024, and remained open until August 21, 2024. The team promoted the survey using a variety of approaches. The team posted and distributed flyers linking to the project site and survey in high-traffic public locations, such as community resource centers and libraries throughout all involved jurisdictions. The team created digital announcements about the survey and posted them on social media platforms like Instagram, Nextdoor, and Facebook via their official city, county and Napa RCD accounts to encourage resident engagement. Additionally, a link to the survey was included in various email newsletters, reaching audiences through county, city, and Napa RCD communications as well as partner organizations and stakeholders who amplified the message within their networks.

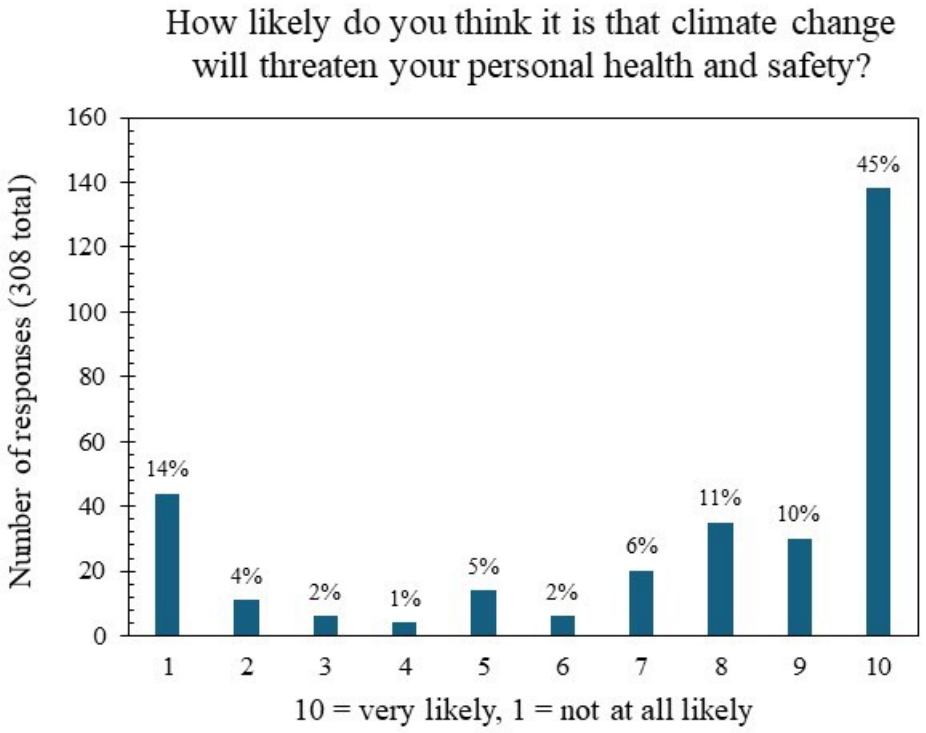
Responses to multiple choice questions were summarized in histograms, presented below. Responses to open response questions were coded based on subject matter, and comments that were repeated by at least five respondents were summarized in Results section below. All comments may be found in Attachment 1.

2.3 RESULTS

Between May 15 and Aug 21, 2024, 310 individuals provided responses to the RCAAP on-line survey. The survey questions and corresponding results are presented below.

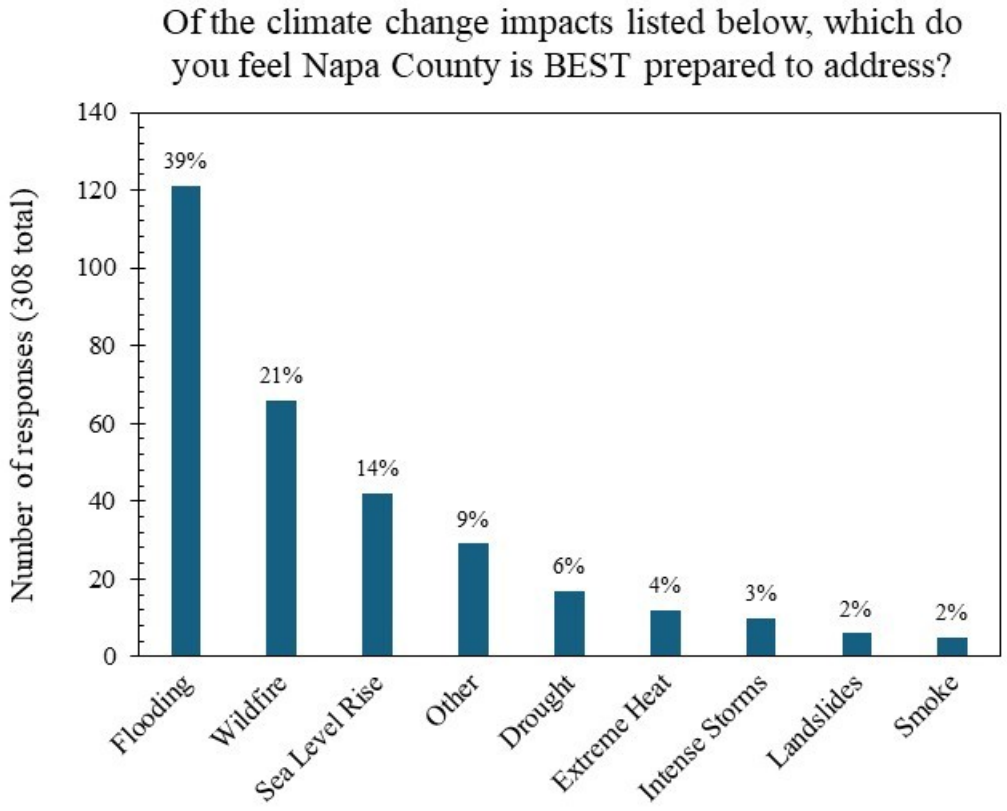
Question 1. How likely do you think it is that climate change will threaten your personal health and safety? (Rate from 1 to 10, with 1 being not at all likely and 10 being very likely)?

86% (n=229) of survey respondents thought that climate change will in some way threaten their health and safety; and 45% (n=138) of survey respondents thought that climate change was very likely to threaten their personal health and safety. In contrast, 14% (n=44) of respondents thought that climate change was not at all likely to impact their personal health or safety.



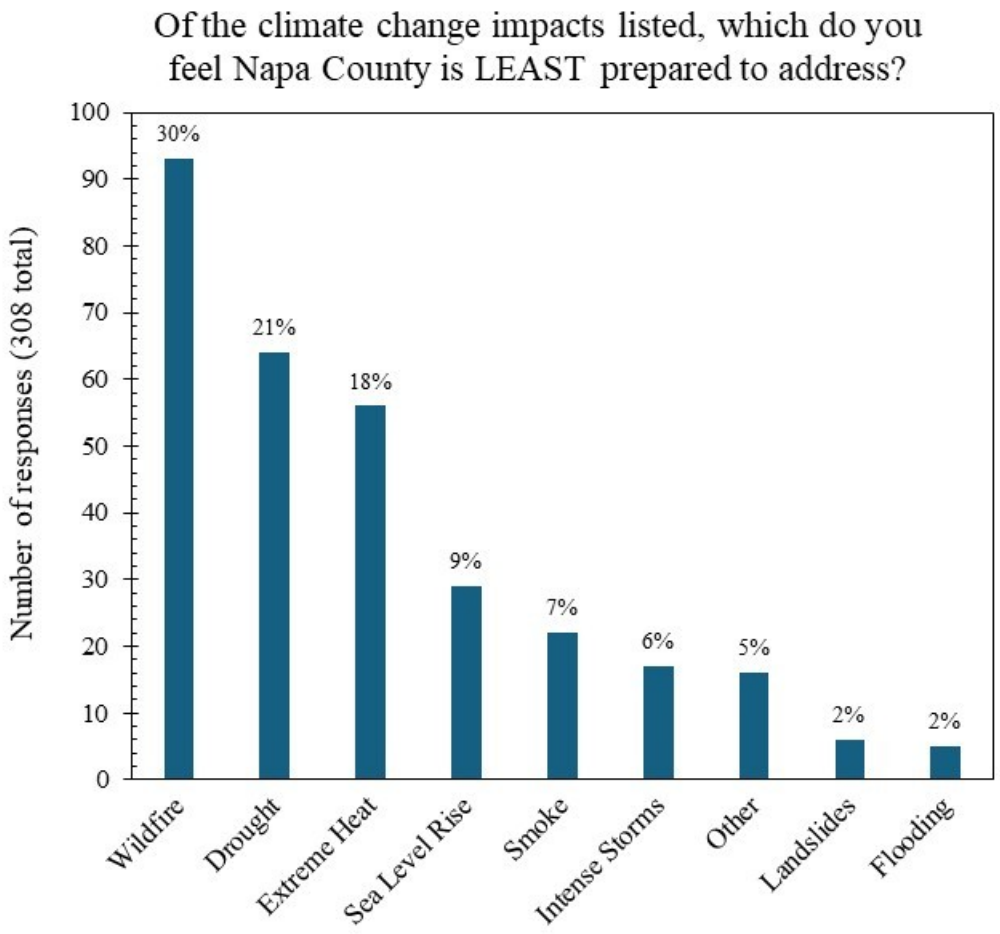
Question 2. Of the climate change impacts listed below, which do you feel Napa County is BEST prepared to address? (select one)

Survey respondents thought that Napa County was best prepared to address flooding, wildfire, and sea level rise. 74% (N=229) of survey respondents selected one of these three responses.



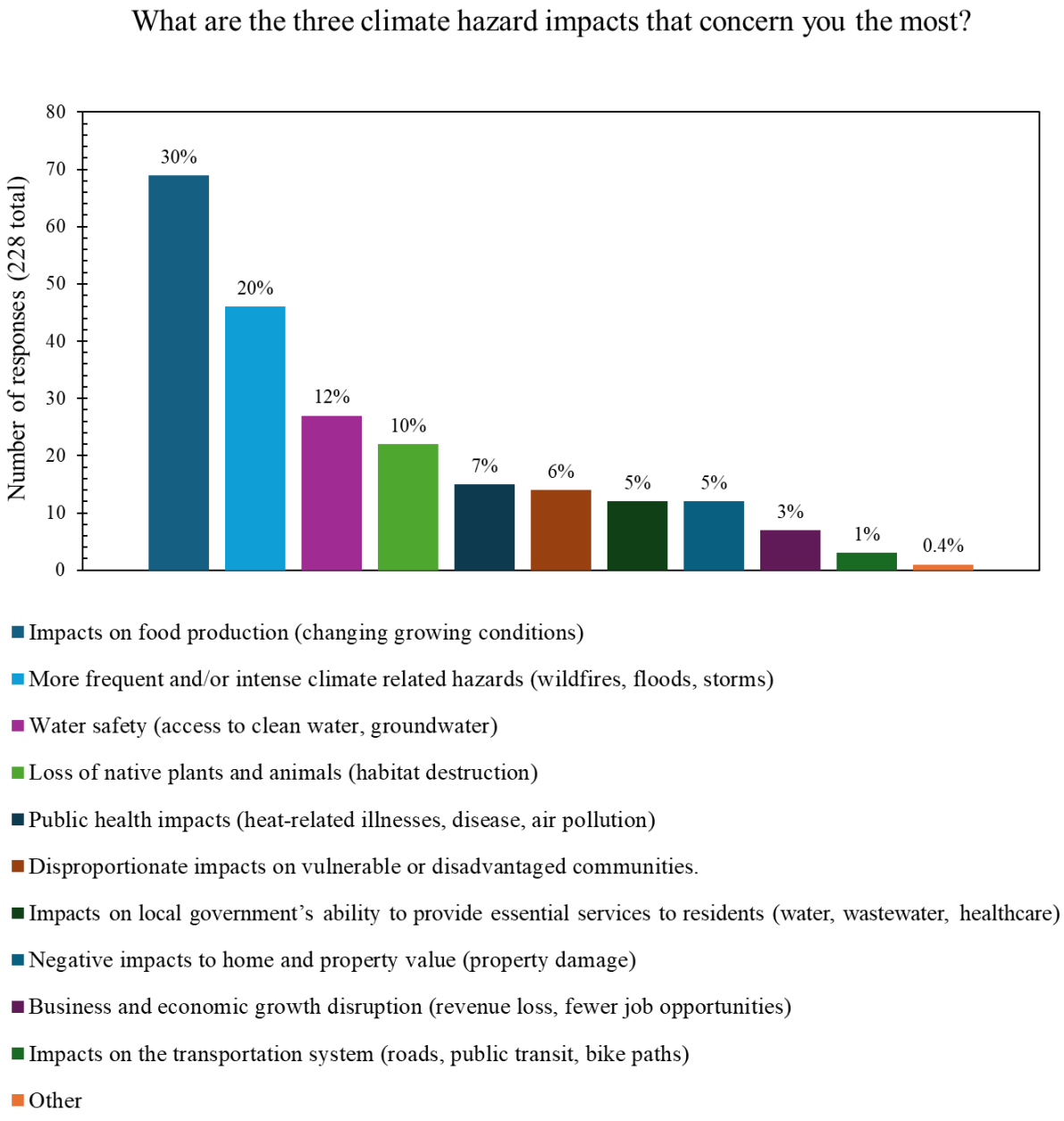
Question 3: Of the climate change impacts listed below, which do you feel Napa County is LEAST prepared to address? (select one)?

Survey respondents thought that Napa County was least prepared to address wildfire, drought, and extreme heat. 69% (N=212) of survey respondents selected one of these three responses.



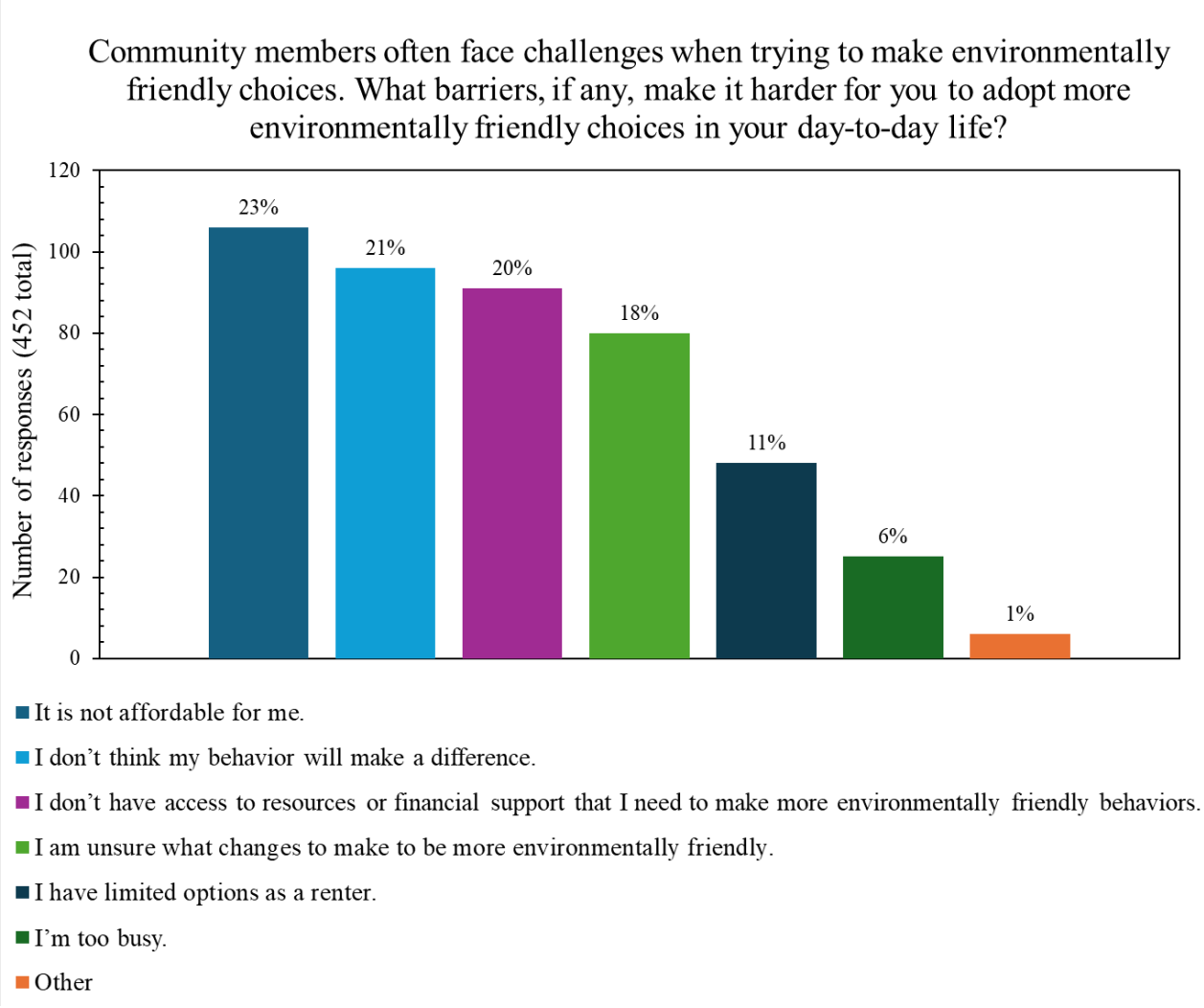
Question 4: What are the three climate hazard impacts that concern you the most?

The three most concerning climate hazards for survey respondents were 'Impacts on food production', 'More frequent and/or intense climate related hazards', and 'Water safety'. 62% of survey respondents selected one of these three options (N=142).



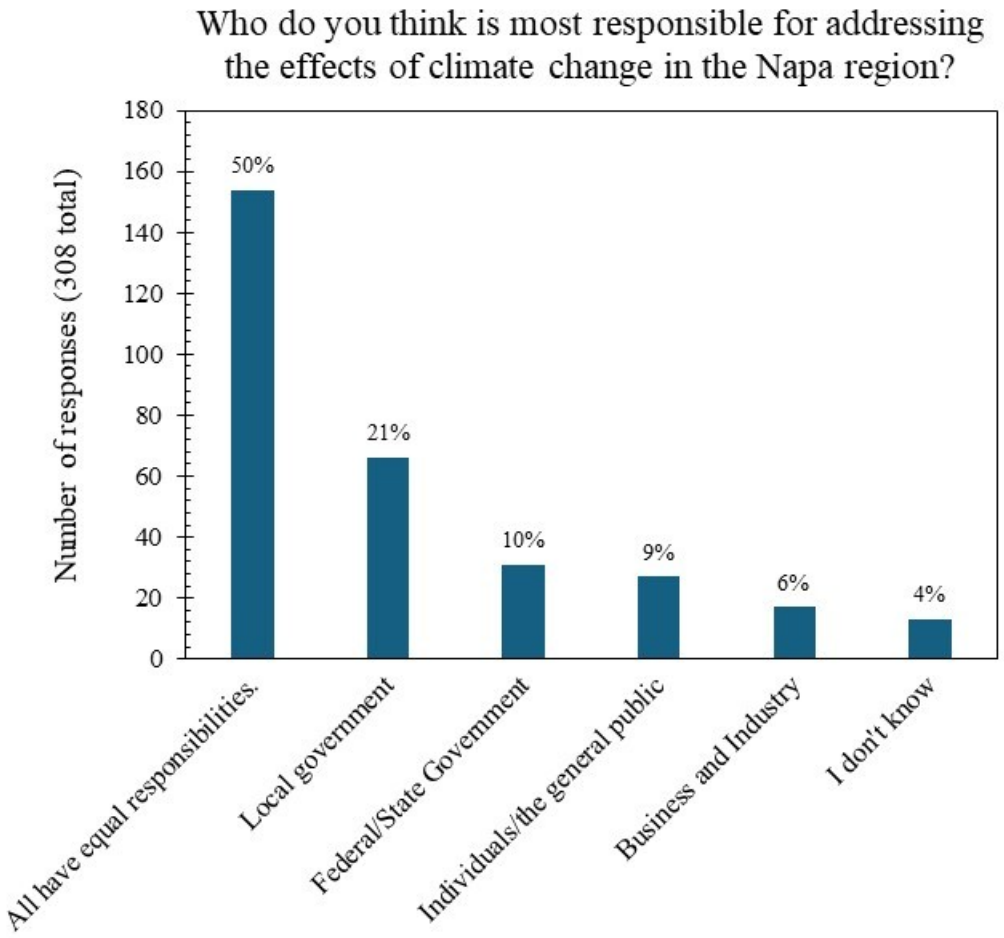
Question 5: Community members often face challenges when trying to make environmentally friendly choices. What barriers, if any, make it harder for you to adopt more environmentally friendly choices in your day-to-day life? (Select all that apply)

The three most common barriers identified by survey respondents were 'It is not affordable for me', 'I don't think my behavior will make a difference' and 'I don't have access to resources or financial support that I need to make more environmentally friendly behaviors'. 64% of responses identified one of these three barriers (N=293).



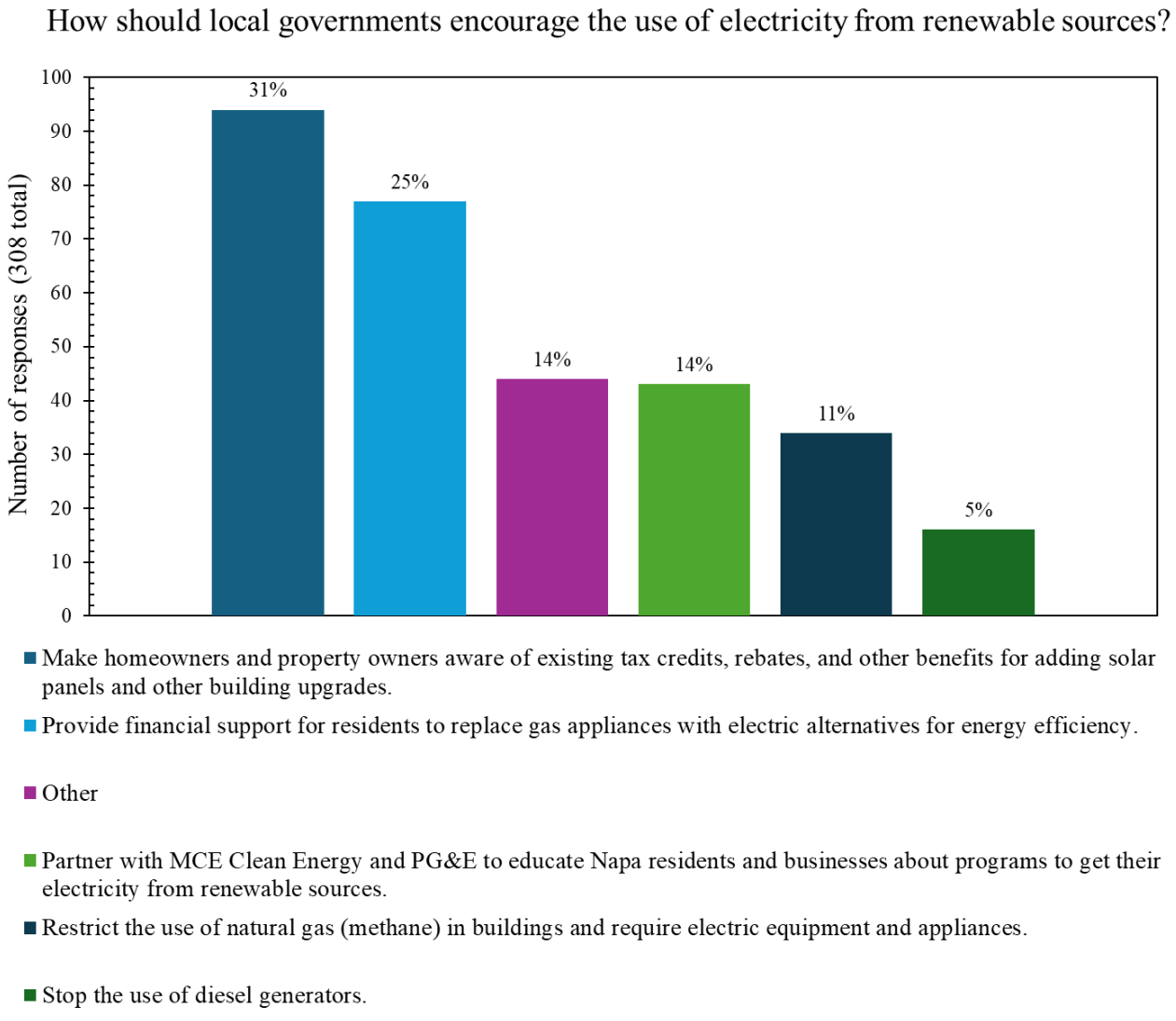
Question 6: Who do you think is most responsible for addressing the effects of climate change in the Napa region?

50% (N=154) of respondents think that local government, federal and state government, individuals/general public, and business and industry all have equal responsibility for addressing the effects of climate change in the Napa Region. The next most popular response was 'Local government' (N=66).



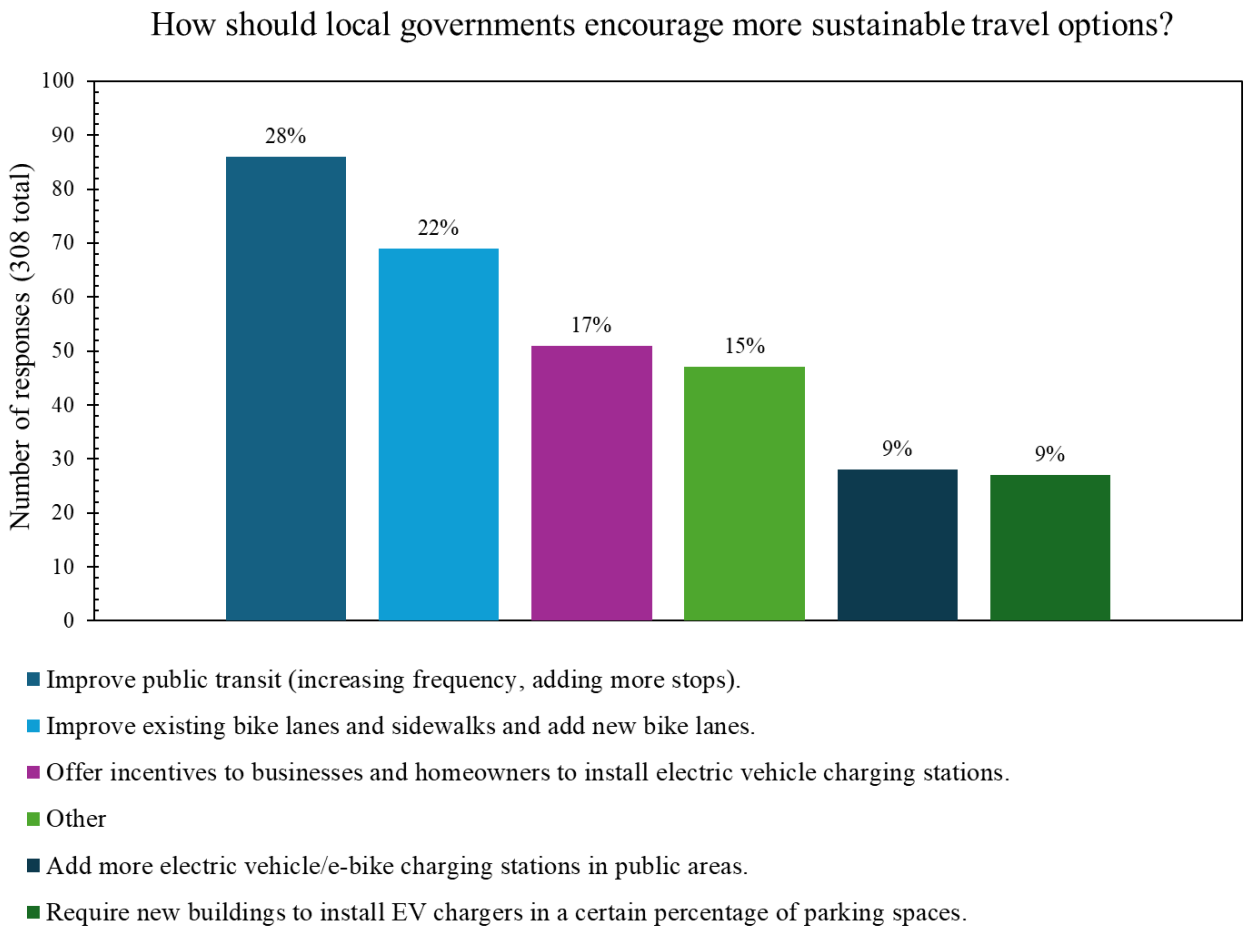
Question 7: How should local governments encourage the use of electricity from renewable sources? (select one)

Of the options provided for ways that governments should encourage the use of electricity from renewable sources, the most popular response (N=94) was 'Make homeowner and property owners aware of existing tax credits, rebates, and other benefits for adding solar panels and other building upgrades'. The second most popular response (N=77) was 'Provide financial support for residents to replace gas appliances with electric alternatives for energy efficiency'.



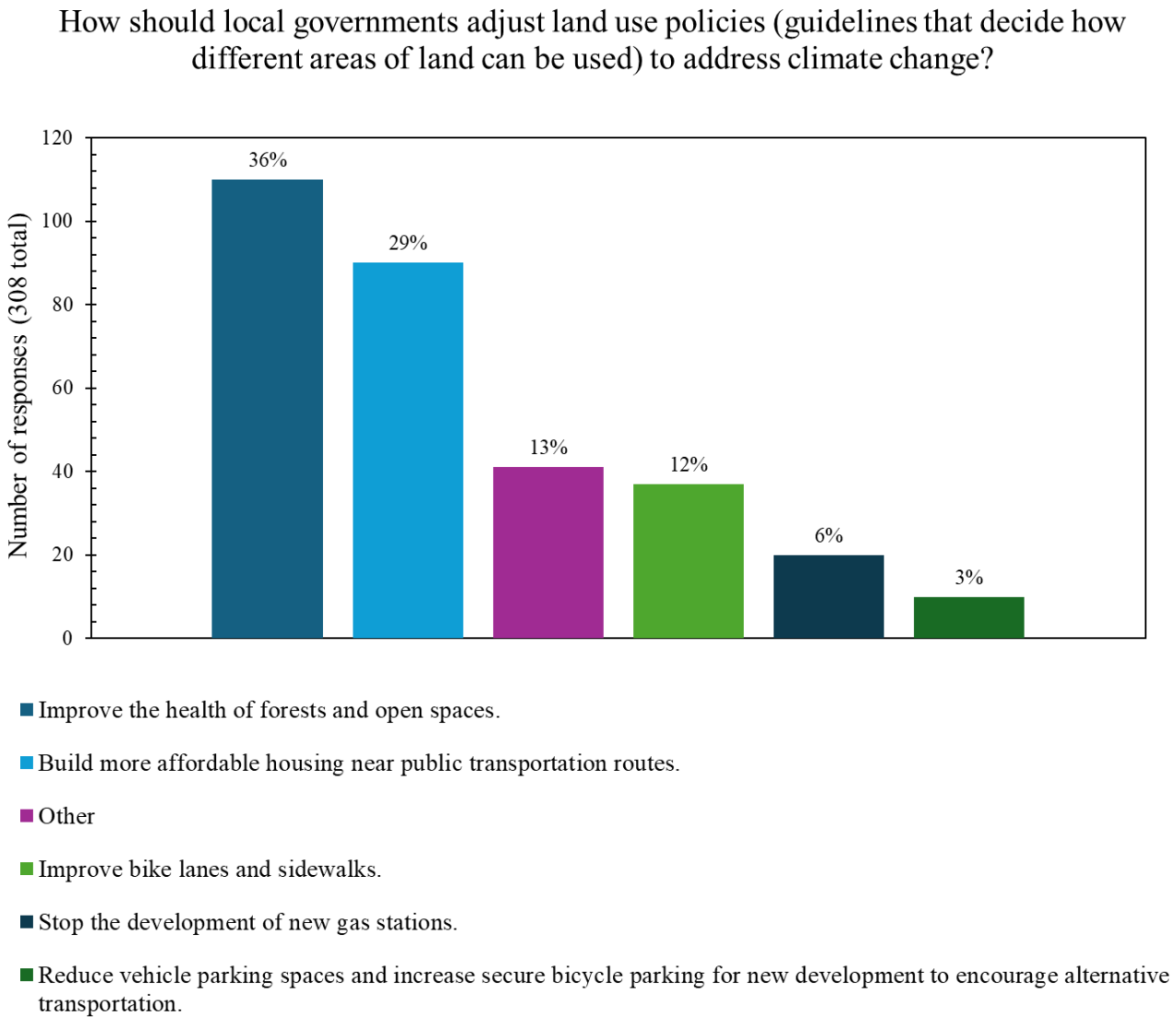
Question 8: How should local governments encourage more sustainable travel options? (select one)

Of the options provided for ways that governments should encourage more sustainable travel, 'Improve public transit (increasing frequency, adding more stops)' was the most popular selection (N=86). The second most popular selection (N=51) was 'Improve existing bike lanes and sidewalks and add new bike lanes'.



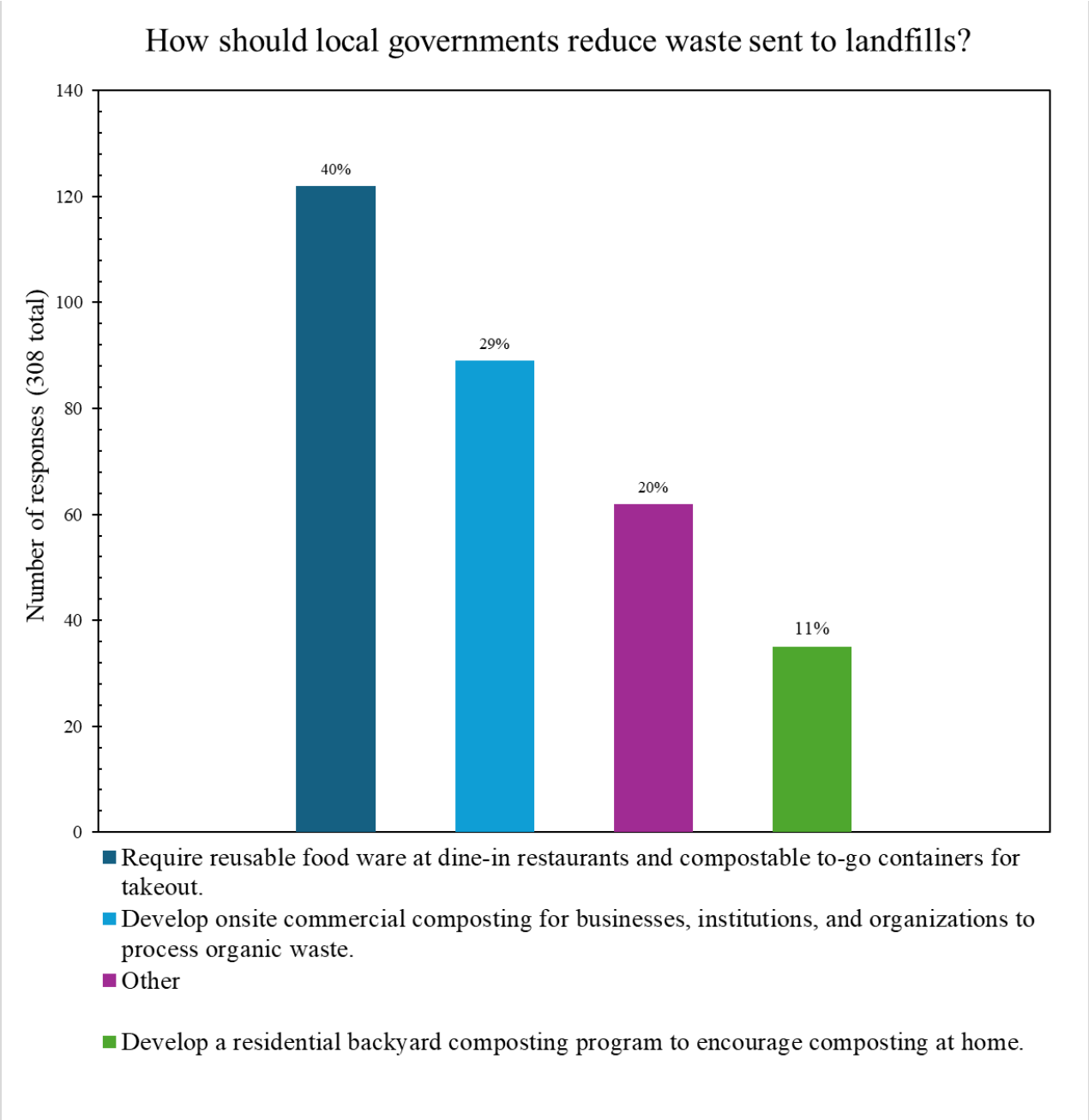
Question 9: How should local governments adjust land use policies (guidelines that decide how different areas of land can be used) to address climate change? (select one)

Of the options provided for ways that governments should adjust land use policies to address climate change, the most popular response 'Improve the health of forests and open spaces' (N=110). The second most popular response was 'Build more affordable housing near public transportation routes' (N=90).



Question 10: How should local governments reduce waste sent to landfills? (select one)

Of the options provided for ways that local government should reduce waste sent to landfills, the most popular response was 'Require reusable food ware at dine-in restaurants and compostable to-go containers for take-out' (N=122). The second most popular response was 'Develop on-site commercial composting for businesses, institutions, and organizations to process organic waste' (N=89).



Question 11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

Question 12: What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?

In response to Question 11, 162 survey respondents shared recommendations or comments on the RCAAP. In response to Question 12, 239 survey respondents shared questions or comments on the RCAAP. There was considerable overlap in the themes and ideas shared across Questions 11 and 12. The most popular themes, which were found in at least five responses, are summarized in the table below. See Attachment 1 for a full listing of responses.

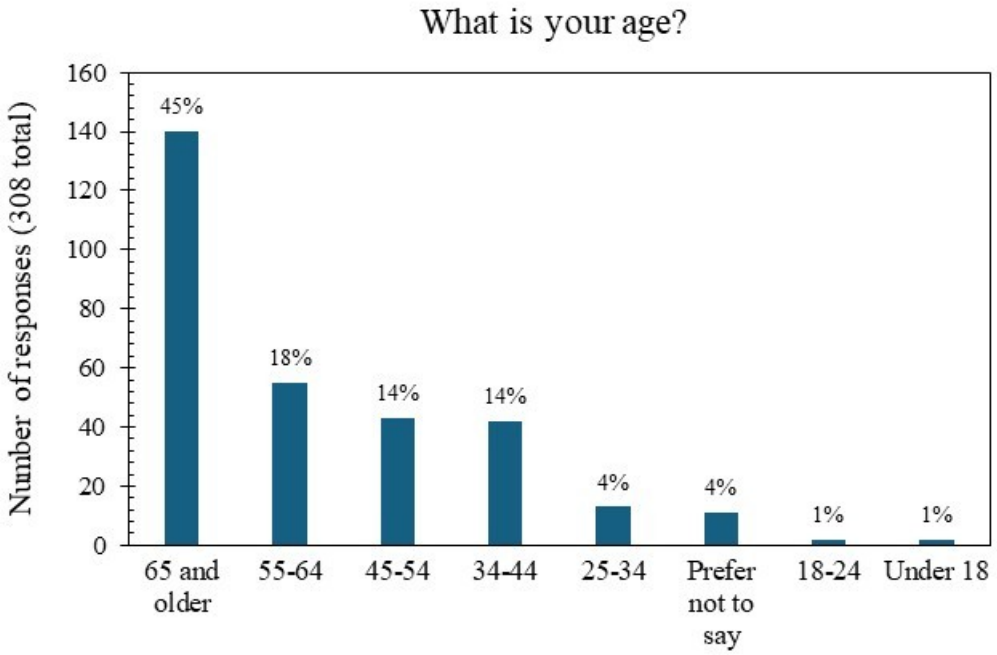
Category	Recurring Ideas	Supporting Quotes
Reducing Vehicle Miles Traveled	Promote sustainable commuting options, reduce vehicle reliance, provide accessible public transportation. Concern for costs and feasibility.	"Encourage more options to get tourist traffic off roadways, such as more/reasonably priced shuttle services." "Support the Wine Train to operate a commuter service for upvalley employees."
Waste Reduction and Recycling	Strengthen waste reduction efforts, particularly around single-use plastics and composting. Concern for increase costs for businesses.	"All plastic bags should be eliminated; reusable plastic bags are worse for the environment." "Provide more composting resources for yard waste and commercially compostable containers." "Stop vineyard burning, and focus on composting of all yard and stable waste."
Energy and Infrastructure	Expand renewable energy and improve energy infrastructure, especially related to EVs. Concerns about collaborating with PGE, as well as feasibility and costs.	"Mandate solar panel installation on large buildings and parking structures." "We need way more EV charging stations—our transit system needs a massive overhaul for the future." "Increase EV chargers around town, especially near affordable housing." "The increase in EVs demands infrastructure for renewable energy, not fossil fuels." "We seem to have a fragile electrical grid system, how is PG&E addressing the higher demand with folks going all electric?"
Biodiversity Conservation	Protect local habitats and biodiversity, and concern about continued development or perceived overdevelopment.	"Plant more native trees and remove unused lawns to create drought-resistant landscaping." "Prevent further development that threatens Napa's wetlands and biodiversity."
Community Engagement and Education	Educate and involve the community in sustainable practices. Create collaborative opportunities. Respondents expressed desire to help and be part of solution.	"Develop a messaging campaign for local media to remind residents of ways to reduce climate impact." "Provide expanded climate education in schools to engage the next generation." "Engagement efforts should target all residents, including non-English speakers."

Category	Recurring Ideas	Supporting Quotes
Economic and Policy Measures	Provide incentives and enforce penalties for businesses to adopt greener practices. Concerns that small businesses may be hurt by new regulations, or individuals will bear too much of the cost.	"Private jet travel is a huge impact—tax all jet traffic through Napa Airport." "Provide subsidies for housing upgrades like insulation and solar power." "Encourage businesses to reduce emissions but avoid heavy penalties that hurt small businesses."
Water and Agriculture	Facilitate water conservation and sustainable agricultural practices.	"Place limits on non-functional turf and promote water-smart landscaping for businesses." "Provide incentives to improve water reuse in vineyards and agricultural practices." "Prioritize water management as Napa's climate impact is aggravated by drought."
Urban Greening and Public Spaces	Increase green spaces and encourage native plant landscaping. Concerns about maintenance of infrastructure.	"Increase trees in downtown and low-income areas to create more shade." "Develop gardens and public green spaces from unused lots in Napa." "Use drought-resistant plants in public landscaping to support biodiversity and reduce water use."
Multifaceted Solutions Needed	Selected 'Other' in survey as way to share the opinion that they would like select "All of the above" as a response	"The answer should be 'all the above'' "When asked about the concerns I have regarding climate hazards, I picked 3 but it's really all of them. All of them would/do impact my life and all of them are very real climate related risks." "While I appreciate the need to prioritize, I do think it has to be a mix of those options and not just one."
Support for Climate Action and RCAAP	Respondents who supported or expressed approval for local climate efforts.	- "Thanks for working on this issue." "Glad to know it's being worked on and hope to see regular friendly information and encouragement for more Napans to become passionate in this most crucial community objective."
RCAAP should not be pursued	Climate is not a problem or local government should not focus on developing a plan	"I have not seen evidence that legislating/restricting land use can make a significant impact on climate change. I believe the cost to individuals, businesses and local economy will be far more detrimental than any theoretical benefit to the climate." "Humans can't control the weather."
Calls for Faster Action	The government needs to act more quickly on climate solutions.	- "Act fast. Please offer more opportunities to help." - "Move quicker, the climate crisis won't wait."
Concern about Wildfire	Reducing the risk of wildfire should be a top priority	"I realize that the RCAAP need to deal with local issues and have reasonable achievable goals. However, the county and local municipalities need to address issues around wild fire management. Wild fires are a big contributor to CO2 and other emmissions and have a direct impact on the population - loss of property, air quality, human health, the economy."

Category	Recurring Ideas	Supporting Quotes
Questions regarding next steps	Requesting information about how plan will be implemented, how actions will be prioritized, carried out, and monitored	"What improvements are scheduled to be accomplished first? We are FAR BEHIND where we should be with regard to climate change issues." "How will it have teeth? How will it ensure any action?"
Questions regarding engagement	Requesting information about how to stay engaged, how to learn about being part of climate solutions, how progress on RCAAP will be shared with community, and how information will be shared in an equitable way so as to ensure all pockets of community are involved	"How can we empower individuals to do more to help?" "Will progress of selected approaches be measured and reported to the public?" "How do we make sure that large corporations, businesses and wineries don't speak over the community? Is this information available in Spanish or other languages? What does transparency and accountability look like?"

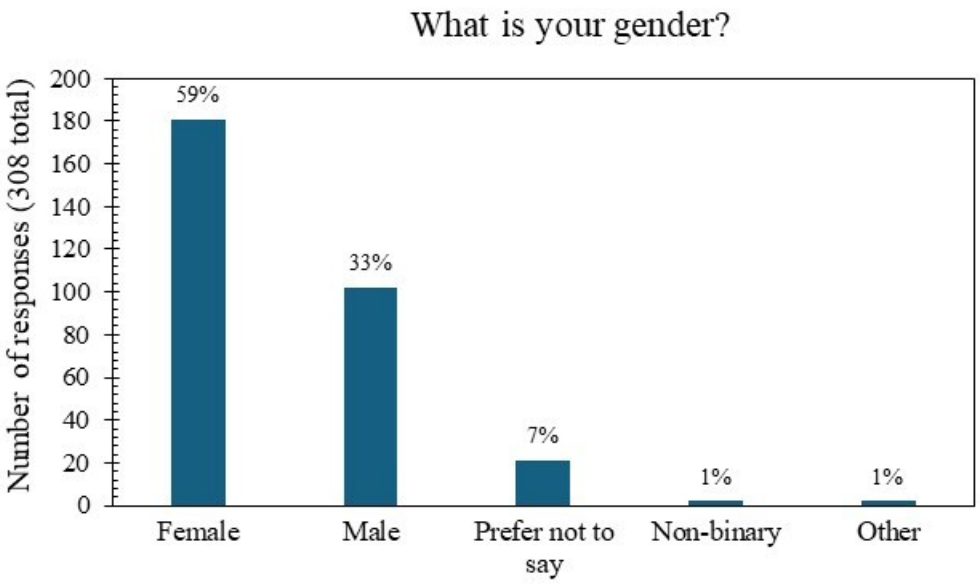
Question 13 Help us understand who is taking this survey to ensure that the responses reflect the diverse perspectives of the Napa region. What is your age?

The most common age category for respondents was 65 and older (N=140).



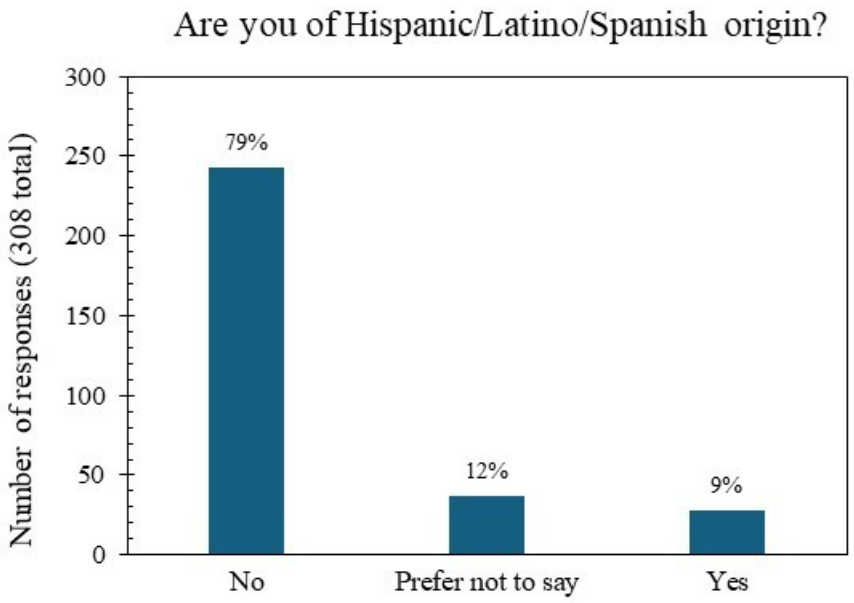
Question 14. What is your gender?

The majority of respondents (N=181) describe themselves as having Female gender.



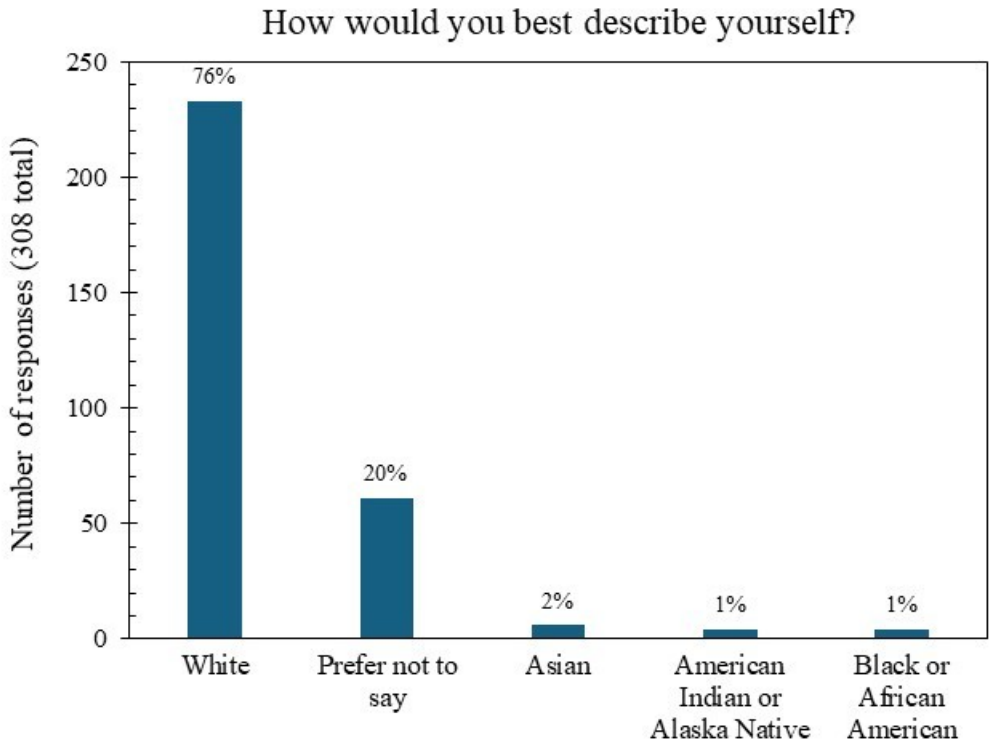
Question 15. Are you of Hispanic/Latino/Spanish origin?

The majority of respondents (N=243) describe themselves as not being of Hispanic/Latin/Spanish in origin.



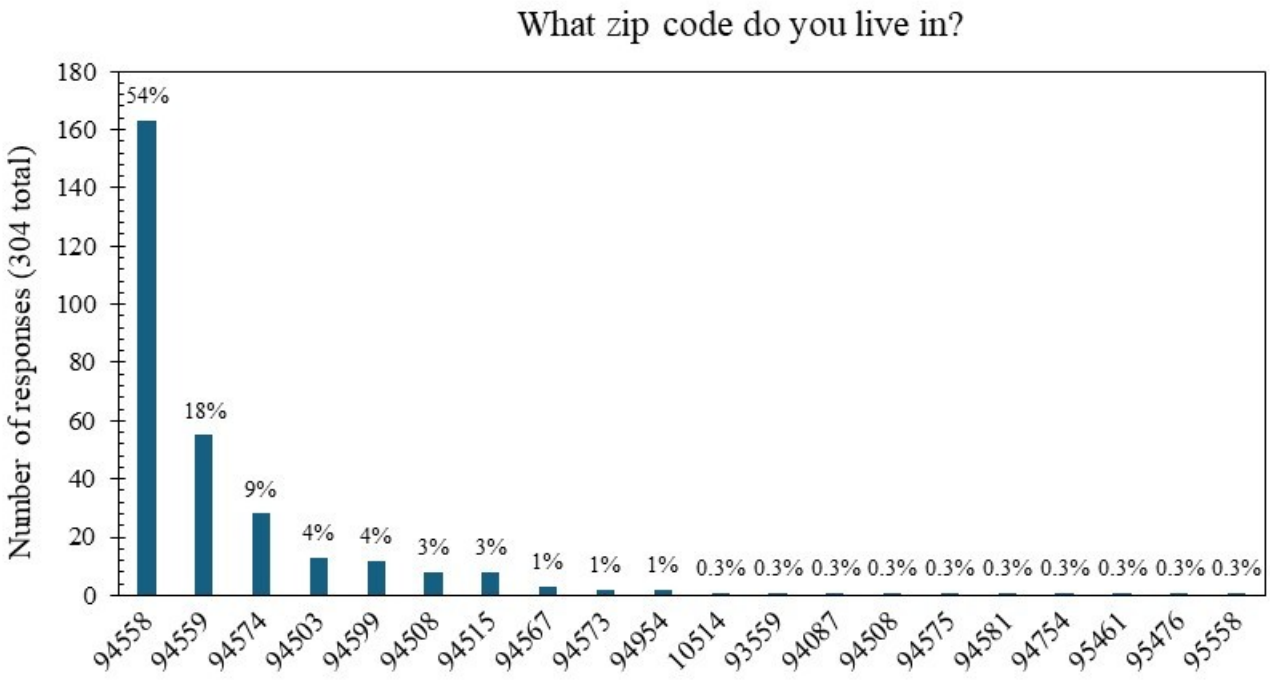
Question 16. How would you best describe yourself? (select all that apply)

OF the categories provided, the majority of respondents (N=233) would describe themselves as 'White'.



Question 17. What zip code do you live in?

The majority of respondents (N=163) reported that they lived in the 94558 zip code.



Attachment 1: Responses to Open-ended Questions (Questions 11 and 12) in the RCAAP Survey

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
Making environmentally friendly choices: The burden should be put on corporations and the banks that fund them, not consumers or even communities. I shouldn't have to spend twice as much for a cardboard container over a plastic container -- if I even have that choice. Corporations and big industries, including the wine industry, should be held accountable for their plastic, excessive waste, water use, pollution, underpaid workers, harm to the environment and biodiversity, etc. At the community/local government level, we can outright ban harmful products and practices and put pressure on corps, banks and larger governments. Napa is one of the few places that has a composting program-- that's a great example of not putting the burden on the individual. That's so much better than asking restaurants or consumers to do their own composting. However, people need more education and incentive to use the program. I'm tired of subsidizing other people's waste-- I pay for weekly trash pickup but could easily reduce pickups to once or twice a month, while neighbors have piles of junk in their cans every week. We need more incentives for people to use less energy, generate less trash, use fewer poisons, drive less, etc. We need more trees, especially native trees like oaks that provide shade and habitat for local wildlife. Trees and other vegetation reduce the urban heat effect, and provide small wildlife corridors. The city should install more bioswales, unpaved street islands with vegetation and trees, and use more permeable paving to allow more water to go into the ground, not run off to the ocean. Gutters should be permeable. Napa County needs some kind of transportation for people who commute from south county or Fairfield/Vallejo to the wineries. Traffic is appalling, low paid workers are spending hours a day in their cars. More carpooling? A tram, a cable car? Turn the wine train into a hop-on, hop-off shuttle?
Traffic! Traffic! Traffic! Stop building and expanding existing event centers that only serve to bring more traffic to the region. Traffic = GHG Emissions = Climate Change. Address the problem at its core instead of sticking band-aids all over the place.
I don't think anyone should be forced to change because the government think it's best . We need to go back to the basics ! Our family has been on the same water system for 140 years . Talk to the family and people who live in this valley . Get your heads out of the books !
Landfills work as far as I know, I have no problem with them, also stopping gas stations is a dumb idea and will only hurt lower income workers if it does anything. Also, we have to get away from punishing people and focus on attracting toward the positive. Make electric vehicles attractive, as opposed to punishing people for using gas. All that does is make it more expensive for people. Make it cheaper to use climate friendly equipment, not more expensive to use traditional equipment, and people will use it. Put charging stations everywhere, lower the cost of green energy, not raise the cost of fossil fuels.
A few years ago there were public transit buses running around Napa with clear glass windows. It was easy to see that there few to no passengers inside. Now they have blackened the windows so that we can not see how empty they are. Someone should review the ridership records to see if the cost to run the Transit System is wisely being spent. Perhaps the money could be better used in another manner.
Ban: additional gas stations, green waste burning, including removed grape vines and felled trees and educate the public about things they can do. Also, stop the deforestation of carbon sequestering land.
Replace "require" with "encourage " or "incentivise"

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

9. Local governments will not contribute much address climate change with any of these options. They would do better to educate and support the concept that over consumption, particularly of throw-away items, and a move away from the use of plastics wil contiribute more and in the hands of each individual.
10. Our compostables are already segregated into the green buckets forprocessing and reuse. If every household used the three buckets they are given to segregate their disposable they would be putting very little into the can for landfilling. And the other issue that only type 1,2 and some 5 type plastices are recycled at this time so that issue goes back to manufacturers and regulation.
5. you did not include this on the list to be answered but is is hard to address climate change when the options are minimal at personal level unless our vote can be counted to move governmental agencies and industry. And as a more direct item, San FRanciscso only allows compostable bags in the produce area. Safeway and othe stores have not embraced that cheap way to eliminate the use of throw away plastive bags.

8) It's not realistic to merely focus on EV infrastructure in the county or provide incentives for folks to convert to EV's when we do not have reliable utility infrastructure that provides constant electric service. EV's are proving to not work in extreme heat or during intense storms, not to mention that the range on most EV's is not sufficient for rural living in the mountains in the county. There are no alternative charging stations for EV's in rural parts of the county or even refueling options for CNG vehicles except in the City of Napa, and anyone living outside of the city limits is not going to trust unreliable alternatives. Local government should be working with utility companies to provide safe and reliable infrastructure in all reaches of the county while protecting our local flora and fauna (they've made a complete mess on Howell Mountain in particular) as well as investing in all alternatives including solar, not just EV's. During the intense storms earlier this year, some parts of the county were without power for an entire week. Residents are not going to care about converting to EV's if they can't even get power restored, especially with no heat or hot water in the dead of winter.
9) Local government should stop trying to come up with new ways to adjust land use policies and do more to protect the Ag Preserve, forests and open spaces we already have. In recent years, local government has explored adding dense affordable housing in rural and extremely rural areas no where near local transportation or services in order to comply with state guidelines. Local government needs to think with some common sense, focus more on protecting what we already have established, and address real needs and concerns of the community. So many people who work in Napa County cannot afford to live in Napa County and instead live in neighboring counties, commuting for more than an hour each way in some cases. You can't address GHG emissions in the county without addressing underlying issues. Without affordable housing in the county, there will be no reduction in GHG emissions. Barriers to affordable housing, the continued closure of public schools and limited family-friendly activities in the county are a huge part of the discussion but are not being addressed.

Climate changes are not catastrophic but gradual

This is a terribly written study. If you are asking for a survey of the public the default should not be that you are concerned about this or that, it should ask about what you are concerned about.

It assumes you are concerned that all of these things are a threat to the county today and asks us to prioritize the threats - rather than some options if people are not concerned about the things you list.

Item # 7
Fix community infrastructures that will handle the added electrical demands. Electrical vehicle (batteries) are creating their own set of issues to the environment that are not truthfully being addressed or reported.
9
I disagree with all of your suggested options. Housing near public transportation is a start.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

Action starts with government officials who understand why the 2030 net zero limit is non-negotiable, and who effectively lead in word and action. Public meetings routinely address the climate emergency and review the carbon budget with the same attention given to fiscal review. The RCAAP is made to use an integrated accounting system that provides both CO2e and CO2-forcing equivalents in order to prioritize emergency climate actions.

Protect the integrity of agricultural zoning! Napa County has been able to stave off development that the balance of the Bay Area has experienced due to our agricultural zoning. How is this option not even mentioned in this survey? Agriculture is not only an integral part of Napa County's history but also to achieving climate action goals. Greenhouse gas emissions from urban areas are much greater than those from agricultural lands on a per-acre basis and as California's population increases, pressures to convert agricultural croplands and rangelands to urban and suburban development also increase. Again, shocking that protecting Napa County agricultural zoning is noticeably absent from the land use policy question.

Provide incentives for businesses to support refillable products, such as shampoo, cleaning supplies, etc and concentrates where the majority of the standard product is water delivered in a plastic container

10 - Provide more support to local government staff who are already implementing SB 1383.

Local government actions have a de minimis effect on these issues. Yet want to create financial burdens for Napa residents. the goal seems to be making people invested in this feel good.

STOP construction permits for high-end homes and commercial buildings. Napa County needs AFFORDABLE HOUSING for the people who serve us; commuters add to air pollution, especially those who cannot afford EV's or hybrid vehicles. Begin a TRANSITION to food crops in place of vineyards; the world does not need a single additional bottle of wine, but we do need affordable, healthy food. Continue aggressively to remove dead trees and other vegetation that would be fuel for wildfires. Widen Silverado Trail north of Napa and Hwy 29 north of Yountville to AT LEAST two lanes each way for more reliable escape routes in case of wildfires or other emergencies. Impose limits on what PG&E can charge for electricity and gas; the current rates are outrageous. Make major investments in local energy-generating technology.

7- require solar panels on all new construction and major renovations.

Fast track permitting and entitlements for projects that meet a certain level of sustainability.

8- travel options? There should be a bus that travels up and down hwy29 for all of the winery workers to use to get to work. 80% of autos on the road during commute times have one person on them. Make them nice buses and make it free. Incentivize workers to use it.

9- beware of unintended consequences.

10- what's the main culprit here? I don't have enough info to know what could be effective or make an impact.

Question 3 Smoke I mean wood smoke from fireplaces. I cant open my house windows for months because people are burning wood which harms my health and has neg. physical effects on my body.

It seems any action taken by government, local, State, or Federal, will cost the individual money with little concern how that impacts us. As a senior on a fixed income it is a big concern considering the impact on climate change will be minuscule but the impact on our pocket book will be great. Rebates do no good if you can't afford the product.

Also, a couple of weeks ago the neighbors and I had a bear hanging around getting into garbage/recycle bins. He hit me twice and broke my fence climbing over. I was concerned about pets so contacted Fish and Game. Their suggestion, " Don't put food scraps in garbage/recycle bins". Go figure!

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
Improve public transportation to Solano and Alameda counties of which many residents commute.
I selected other because all of the available choices only reflect additional government regulations. There were no choices available reflecting the futility of Napa, or any county or state, having an impact on climate change. This is the definition of a rigged survey and should not be used to impact any choices made by local government.
The restrictions and requirements being put upon residents by federal, state and local governments and agencies are already unduly burdensome and excessively costly. We already have solar panels, separate our garbage, bring our own shopping bags and avoid plastic water bottles. Nothing we do in the USA will change the course of climate change. Whether I use a gas stove or an electric stove does not matter. The main focus of government action should be directed at encouraging or compelling countries like China and India to reduce their carbon footprint. Electric appliances and cars just shift our energy needs from one source to another. We need nuclear power to sustain our energy needs.
Build more charging stations. Banning new gas stations won't solve any climate problem any more than discouraging Drive-Thru restaurants. Has anyone noticed most new cars power down when the brake is applied at intersections? Also, how about building another roundabout/interchange at the Highway 29/12/121 intersection? That would help keep cars moving efficiently.
Focus more attention on multi-family building decarbonization. Develop local PV resources on all the warehouse roof area and parking lots. Enlist employers in helping their employees decarbonize/electrify where they live.
I think most realistic is that our counties have mandatory composting collection in place.
7.All the choices and reduce the power PGE has over us. They continue to make it more difficult to have home solar. 9.Better bike lanes and protected parking is good. The biggest thing is remove the profit motive behind land use decisions. 10.Vigorously educate the people about recycling. I have several neighbors and friends who don't know and don't care. Make reasonable but strict requirements about use of materials and recycling in construction and industry. I recently built an ADU and the waste and TOTAL lack of recycling by the crew was appalling to me.
#9 Change general plan land use designation from AWOS Agriculture Wateshed and openspace to two distinct designations. Ag and watershed and open space are two distinct functions. The watershed has not been given adequate protections and credit or tax breaks should be developed to protect forest lands from development. Preservation of forest is our simplest solution locally to reduce climate change.
7. Get rid of the PUC, overturn any decisions that were made to restrict the use of any and all commercially available energy sources. Overturn the horrible solar program that PG&E and the PUC put into place. 8.They shouldn't. Let the people decide how they wish to travel. Why must you choose for anyone. 9. They shouldn't. Taking away anyone's right to manage their own property is called theft and should be punished by jail time.
The climate is fine.
No
Fine businesses that do not recycle and compost correctly. Provide incentives for businesses to adopt environmentally friendly products and practices. Require winery and vineyards to farm organically, and provide them incentives for converting farm machinery and winery operations to electric. Provide incentives for residents to purchase expensive home battery systems to move them off the grid.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
waste management does not recycle everything that can be recycled. only recycle the profitable items like plastic bottles. Things like plastic wrap and paper do not get recycled (even though they can be) because they are not profitable.
All new buildings/homes/structures must be net zero emissions Incentivize old buildings/home/structures to upgrade to remove gas, install solar Reduce vanity water usage for lawns and create greater incentives to remove lawns for water conservation Establish limits based on natural resource constraints (water/land) for new buildings and housing. There are only so many people we can sustain. No more gas stations Better recycling options and e-waste facilities
Additional idea: Give Napa County easier access to BART or train transportation. We are so limited in how we access surrounding areas right now.
Some people do not have space or permission to set up a compost pile so the idea of communal compost piles that people can access is great. We need to remove all of these invasive trees - tulip, acacia - and Napa needs to stop it with the Chinese Pistachio for it's supposed drought resistance. PLANT MORE OAKS. PGE is damaging so many of them. CRISIS. I would plant them all along my property line but unfortunately: PGE transmission lines are in the way.
Disband PG&E. Create local energy producers based on local and resources available.
Producers of single use plastics should bear the burden and cost of disposing/recycling them. Not the consumer/tax payers. If people had more options besides single use plastics we would gladly use them. Producers are profiting and have little incentive to make more sustainable products.
Most if my others were really all of the above. Some were simply ignorance on my part of how to proceed.
Prepare a survey that let's community members prioritize some of the choices rather than limiting them to one. I realize this doesn't fit into your consultant's model of what they want to do, but it would be more meaningful. For example, although it would be appropriate to require electricity to be the primary fuel source for new builds, to require all homeowners to retrofit would be stupidly expensive. Or, we need both more EV chargers for non-Tesla vehicles AND we need apartments to have a certain number of chargers on premises.
I don’t believe that the changing climate is caused by humans. I believe that climate always has and always will change as God desires it to.
no time today to continue
humans can't control the weather.
Continue to protect the agriculture industry in Napa County
Continue to protect agriculture in Napa
Continue to protect agriculture in Napa County
I do not know what we are BEST able to handle. Seems like we are a bit late to the table to have planned for even half of the things that might happen. And things are going south sooner than predicted! We must STOP burning fossil fuels, period! And don’t make or use any more plastic!
6. Local government should concentrate on ways to improved quality of life such as road conditions and wildfire mitigation. 7. Napa should stop all efforts to force people to switch from natural gas to electricity

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

Create tax incentives to allow lower rent/costs associated with bringing sustainable businesses to napa county. Try to bring more plant-based restaurants to Napa County and provide education to residents to show these practices are the easiest to adjust to and help the environment.

Quit wasting taxpayers money on this garbage. We all know it's fake. It used to be "Global Warming", but since so many times that has been proven wrong, you have to change the name. This is just one more way people are getting suckered into giving their hard earned money to the government.

Most of these canned responses are "leading the witness". I don't see any actual answers to these questions that indicate that there is a successful outcome. Local governments should be encouraging climate friendly land use like farming in their general plans and zoning uses. Managed lands by good stewards are the only path forward to creating long term carbon sequestration on large scales. Housing should be paying for carbon offsets to permanent agriculture like vineyards and orchards which are climate positive. Help us electrify fleets. Help us go off grid with PG&E, help us change bad State laws that de-centivize real climate changes. I'm ripping out several acres of large scale Solar due to changes in the net-metering program. What an absolute joke that we have State laws in direct competition with eachother about Solar.
Create programs that are "carrots" not "sticks" and you will be successful.
Sadly the state of California has adopted a "stick" methodology for all environmental legislation and it is backfiring spectacularly. Engage business, engage landowners, engage stewards and offer real incentives like property tax breaks, Carl Moyer type programs, Williamson act type programs, etc and you will actually move the needle.
I and others have some unique projects to bring to this County, including hydrogen fuel cell wind machines, stationary generators, irrigation pumps, and onsite generated hydrogen to run charging for electric tractors. We need carrots to bring this tech to market locally and you can help.

Improve transportation north/south in Napa Valley to include ridesharing, and bike/rail/bus transport for commuters to reduce emissions.
Collaborate with other community organizations and residents from Calistoga to American Canyon that share the watershed of the Napa River to enhance fish and other animal populations, plant and soil integrity, forest management, riparian health and water quality and supply. Develop joint efforts for demonstrations of environmental stewardship, including programs and visible projects where residents can visit and volunteer. The Flood Control Project along the Harry Price Walkway is an excellent example. An Eco-Center, much like planned in American Canyon could be done in Napa and other NV communities.
Encourage more responsible use of building materials in new and remodel construction by interfacing with local suppliers, contractors, and elected officials.
Promote the use of heat pumps to reduce energy consumption and building improvements to reduce the need for heating and cooling dwellings.
Support the addition of trees that will reduce the heat island effect in cities and increase carbon sequestration. The Urban Forestry Management Plan is an example for these improvements that should be embraced. Residents should be educated and invited to assist with the next steps that balance the benefits of more canopy with the responsibility to maintain the additional tree coverage.
Restrict the use of vehicles in downtown Napa, with limited time allotted to delivery of goods to businesses, to encourage walking and cycling. The central part of downtown could be a pedestrian mall, with grants for additional parking at the periphery, and several streets could be blocked off permanently. This approach has been implemented successfully over time in Oslo, Norway in the Vision Zero campaign. If implemented here, Napa will become known also for its walkability, cycling, access to downtown, parks, and the reduction of greenhouse gases. This effort requires a bold vision for climate adaption.

1) Encourage residents to reduce trips down and up valley by consolidating appointments and shopping needs.
2) Make EV charging stations available upvalley to allow purchasing and driving EVs to be a solution.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
The way we raise animals has a significant carbon and methane footprint. Education about this and about transitioning to more plant-based diets is perhaps one of the more important things we can do. All of the ideas in #9 are very good suggestions.
It's not the governments job to get involved in everything. Some things are up to citizens and not the government
Plant more trees if possible encourage residents to plant trees on their property. Have a program that teaches people how to take care of their trees and if possible provide free trees to plant.
Make it required for EVERYONE IN GOVERNMENT to have read and understood the book, "Atlas Shrugged" by Ayan Rand. They must take a 100 question test and pass with 70% to take their seat in government.
Plan needs to incentivize mass transit options for Upvalley commuters (shuttle vans, rail).
10. Carrot and stick: Educate consumers and businesses about waste reduction. Institute a per garbage can and recycling can fee to incentivize over consumption.
Inform people exactly how much the Earth will cool down because of their sacrifices. Inform them exactly how much these practices will cost them.
On #9: I agree with more affordable housing, but not sure it is possible to get people into public transportation. Therefore building near a bus stop may not be necessary. I am not in favor of more bicycle lanes UNLESS something is done about the speed limits. I believe most limits are too high. The downtown is now at 20 mph and that is an amazing improvement. Also, the drop off areas at schools should be made into zones requiring 15 mph and maybe partially blocked from all vehicles. In the city of Alameda the entire island is at 25 mph and has been for decades. Napa has always used the excuse that the State of CA sets the traffic limits. Citizen groups in Napa have done a great job getting many streets reduced to 25 mph. I'd like to see more of it and where people are biking - better partitions. The 3 ft rule, I believe we voted into law, doesn't work on many streets with parked cars, etc. Sadly, there are many parents today that would not feel safe about having their children bike to school.
Restrict government officials from using air travel when a zoom meeting will accomplish goal.
Recommendation: In this and all related surveys, start with the declaration of a climate emergency and the 2030 net zero goal. Then, with survey respondents on the same page with the firm time limit in mind, solicit thoughts on how the community can take climate action. Thoughts gathered this way will be different - and more useful - than thoughts gathered in surveys soliciting climate actions within unfocused or open-ended timelines.
It is not helpful to choose only one option in each of the answers for question seven through 10. All of the options are viable and should be worked on simultaneously. This requires additional funding and focus on climate change mitigation issues by local and state government.
My "10" answer to the first question grows out of the fact that I manage an autoimmune health condition that is worsened when the body is under the stress of air pollutants, heat, smoke, etc. At this point in the climate emergency, and with the County's 2030 goal deadline quickly approaching, we must prioritize all of these options and ensure proper funding and support for their implementation. In future surveys, it would be helpful to let the public know about the 2030 goal already in place so that they understand that the County has already made a commitment to urgently address the climate crisis.
Reduce dump fees at landfills Make recycling easier. Encourage people to be more environmentally aware, but don't shove mandates down our throats. Mandates turn people against environmental policy.
Questions 7-10: All of the above is my "Other" choice

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

be aggressive and do everything possible like prohibiting single use plastic of all kinds

Rather than partnering with PG&E I think the public needs to deregulate the mammoth monopoly that has a focus on its own profits over public safety. A new direction completely. The Federal Government needs to deregulate HEMP from the DEA Drug Enforcment Agency to the USDA as an agricultural product. The solutions to climate crisis are available.

The legalization of hemp the end of all oil subsidies and production. Hemp cleans carbon out of the air as it grows, nitrogenates the soils, uses 60% less water than cotton and burns clean. It is renewable. sustainable and cleans the environment at all levels of growth, use and waste. It addresses all the threats to climate crisis. Focus on HEMP production for carbon absorption, and as a sustainable, biodegradable clean biofuel. It can replace everything US currently use oil, plastics, cotton and trees for. It is the sustainable answer to all our textile, construction, packaging and fuel needs. Also to add medicinal and food products.

Also, the production and use of Bokashi (Beneficial Microbials) or EM (Energized Microbials) to clean up microplastics and other pollutants in all the waterways including our own physical bodies. Microplastics are the greatest current threat to clean water and the physical health of all living beings. Our friends in Portland are in the forefront of this safe organic solutions to the rejuvenated health n and sustainability of clean waters around the world. MIT, Harvard and Stanford have recently studied their results and agree this is the solution to the renewed health of all our global rivers, creeks, lakes and oceans.

California and the US along with other industrialized nations must look to organic solutions rather than expensive unsustainable more toxic solutions to the mess that has been created.

Are most pressing issue for sustainability is water. We need a countywide water delivery plan.

The county needs to stop allowing deforestation and permitting vineyard development in the watershed. We need to carefully assess the cumulative impacts on the residents of Napa County of ongoing winery, hotel and resort development. A more careful survey of water use and aquifer recharge needs to be happening. In fact, a moratorium on future development should be declared until we sort out the traffic and housing issues. I'm not at all in favor of any more stoplights on Highway 29. We need more campaign finance reform to make sure that we eliminate pay-to-play which has impacted land-use decisions at the county level in the past. These decisions have all contributed to climate change....expanded parking lots, increased traffic, etc. BTW I have no challenges to any of the actions described and do my part.

Read LAFCO of Napa County reports prepared by consultants for hundreds of thousands of dollars and by staff for specific related information on all regions within Napa county.

Why not require all new buildings to be zero-net carbon? Why not require passive solar orientation for all new home construction? Ban gas blowers.
Where are the solar panels on County, city and school buildings? Electrify fleets to the extent possible. Ban drive-through fast food.
Locally, the first principle should be if you are trying to climb out of a hole, don't dig the hole deeper.

We need a train.

7) using electric appliances only helps if they're powered with clean electricity
10) increase/implement taxes on trash services

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
Before Napa requires the increased electrification of homes (and reduces dependence on gas), there should be a streamlined process for a) PG&E to upgrade transformers to accommodate the increase in amperage and b) a streamlined process for homeowners to access funding to replace outdated electrical panels i.e. 0% loan from housing authority to do upgrades. Napa should start with older, multi family dwellings (condos and apartments) who likely have Zinsco (fire hazard) electrical panels with less than 200 amps. A homeowner cannot be 100% electric if their panels aren't first upgraded. Skipping the step of ensuring people can afford a panel upgrade means an increased likelihood of people overloading old panels and causing fires.
Develop programs to encourage children to walk or ride bikes/scooters to school and restrict parents from driving them. The current practice trains kids to be auto-dependant & is detrimental to their health.
Local governments need to better educate the public on how they can reduce their emissions. For example, the County Climate Challenge was a good start to allow people to understand their carbon footprint, and then show different ways they could reduce it. But there was practically zero follow through by local and county governments to properly and effectively "market" the Climate Challenge to community members. That is a tremendous failure. Inclusion of educational policies for emission reductions for the community and businesses within the RCAAP should be a high priority.
For #5, I chose other because making the right/eco-concious choice is often not easy or convenient (and it's expensive). I think of purchasing food that is not wrapped in plastic or supporting organic/regenerative farming. I have to go out of my way to do this - it's not an easy option for the average consumer and that should stop.
All jurisdictions should ban the use of gas landscaping equipment as well as the water vehicles of similar nature on the Napa river:
Regulate and limit or prohibit non-functional turf grass, improve affordability so more families, teachers, and farmworkers can live near their jobs and avoid emissions-based commutes, enforce organic waste going to landfills, infill-based housing development, why don't we have anything like Sonoma Clean Power? Are new multi-unit housing developments outfitted with solar? School food waste is a huge problem, there are no waste reduction incentives or plans going on at NVUSD.
NA
I favor regulation, but want to make sure we have sufficient incentives/cost share/supports for renters/low-income folks whose housing costs will increase as owners make required changes.
Reduce single use plastic through lobbying and legislation to the state. Asking restaurants is great but will drive up costs that are already high. Did not understand the commercial businesses composting on site option
Have a look at Napa Valley Vintners climate report for vineyards.
** banning businesses and restaurants from using plastic cups / drinking straws / utensils / bags etc ** see Australia as an example - improving public transport, with more frequency, more stops (electric buses) - leveraging the railway line as a method of public transportation will reduce vehicles on the roads (increase safety as well an reduce congestion and traffic pollution) - better recycling programs and waste management (more transparency required here)
Accessible education is extremely important, perhaps we can have workshops in English and Spanish offered to adults and do the same at schools. The material can range from daily actions to how to get involved to where we are at and what we need to work towards.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
Yes, Start Praying , as there is not "Climate Change"... God is going to destroy this World sooner then you think, and usher in the New, once Satan has been destroyed!
Climate change is myth made up to tax us more. Govt can't fix the homeless or crime issue, but if we pay more in taxes, they can fix the weather? This is an absolute joke and the scientists are coming out about the falsifications of these so called reports. We as citizens do not need any more taxes thrown upon us.
none
stop over population
10. Continue with the food waste/ green waste program
I think we should place emphasis on addressing the role of local wineries in preserving Napa's wildlife and nature. Despite being integral to Napa's economy, I still think its important to address how techniques used by wineries (such as pesticides) damage our habitat and its inhabitants. I also think its crucial to recognize that if we want members of our community to adapt greener practices we need to provide them with the means to do so. Installing a lot of EV chargers sounds great, but it kind of brushes over the fact that most people don't have the means to use electric vehicles and alternative ways of transport. I would love to commute to school or work by public transportation, but that simply isn't a viable option for me and many others.
The contribution of Napa residents to global climate change is minuscule. We shouldn't be burdened with additional regulations that will make us unable to compete with other counties and the world.
Providing incentives is great, but far more effective when combined with penalties for not changing
Private jet travel is causing increasingly significant environmental impact. Impose/increase fees for all jet traffic through the Napa Airport. Encourage more options to get tourist traffic off roadways, such as more/reasonably priced shuttle services. Require the wine industry to pay 1 cent per bottle of wine produced annually to fund workforce housing developments for their workers to enable them to stop commuting into the Valley on a daily basis.
Provide subsidies to upgrade housing to make it more energy efficient including subside for solar panels, battery walls, insulation and other climate friendly solutions.
Compostable to-go containers and flatware are only commercially compostable and not actually compostable with our yard waste. Our composting facilities are not setup to compost these items. All plastic bags should be eliminated. Single use were replaced with reusable plastic bags at grocery stores. Everyone knows that these are also thrown in the trash (because our local recycling does not include plastic bags), these heavier bags are even worse for the environment than the single use ones they replaced.
Expand in school awareness of climate impact to get the next generation on board
Develop a messaging campaign for use on billboards, public media platforms, local newspapers reminding residents of things they can do to affect climate.
For sustainable travel options, we need a shared service from Napa to local airports so fewer residents and tourists are driving. Tourist driving in Napa should be minimized with more shuttle services to different towns and winery hubs.
Renter: I don't have many options. I drive an EV, don't consume beef, and avoid air travel.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

The climate has and always will change. Radical bans on the oil and gas will only hurt the overall economy and thus negatively impact working class people more than anyone else. Focusing on market based actions v. Legislating "green" energy based on arbitrary time frames will provide a stable economy for all. People who believe "the science is settled" do not understand science.

For question selected "other" since all options apply and should be done, this will help people with disabilities the most in dealing with climate change.

- undertake prescribed burns to prevent wildfire
- prioritize employing nature-based solutions for climate change hazard mitigation
- restore native flora in hills and and wetlands to improve biodiversity, flooding resistance (latter), and fire resistance (former)
- Repave local roads to improve fuel efficiency
- Pressure utilities to upgrade ailing equipment/infrastructure to prevent hazards

I don't see the need for the regional climate action and adaption plan to exist. It is a waste of taxpayers money and time. Assist businesses and residents to continue to recycle. I don't want someone looking at my garbage to see if I am recycling the "correct" garbage. Save the money and put it towards keeping our water and air clean and build more dams so we don't have a drought.

honestly, we need a major environmental catastrophe to thin the herd as it were... since the introduction of synthetic nitrogen the human population has risen far beyond the carrying capacity of the planet, so we need to either reduce the human population drastically or start sending people into space. the earth can't tolerate humans at this scale much longer

Require reusable containers for consumer items like detergent. Outlaw single use plastic of any kind.

While I appreciate the need to prioritize, I do think it has to be a mix of those options and not just one.

7. Ditch PG&E, find a better provider, or force them to keep their promises of burying electric lines and a moratorium on increased rates until they do.
8. The number of electric cars has increased approximately 4-fold in 3 years. I have only 4 chargers available to me at Factory outlets, and much of the time they dont work. We need much more infrastructure for electric vehicles.
9. Affordable housing is a must. Reject large developers building vacation rentals.
10. Improve plastic recycling programs, make it easier to separate materials if that will help.

All of the ideas in the list should be implemented as they aren't mutually esclusive and the finances could be worked out in a way that it could also become a revenue stream for the county (ie. Increase the EV parking spot supplied by clean energy (solar) by converting the top level of each garage structure (or area in a parking lot) to PV system. EV owners will be ok paying for fast charging their vehicles in those locations if that would be cheaper than slow charging at home.

A residential composting that provides the necessary tools,resources and rebates in exchange for switching to a smaller garbage bin.

Consider attracting new industries and partnerships that are able to add value to wood waste materials, such as conversion to biofuels, mass timber production, etc.

Infill development of underutilized public and private property. Purchase the Napa Oaks property and restore it into a parkland. Single family housing development wherever possible to reduce commuting. End the use of non-functional turf grass at commercial and business properties, require drought tolerant native plants or food producing crops in those spaces, this also reduces the need for gas powered turf mowing. Utilize grazing and burning for management of parklands.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
I do not believe Napa is adequately prepared for any of the major climate disasters
Provide electric bikes at a modest discount for high schoolers who live further than 1 mile from school. Electric buses are expensive. Two wind turbines could be placed near the new highway roundabouts that could help provide electrical power to the grid.
Not sure Napa is well prepared for any of these issues.
Encourage inner city transportation systems. The currant busses are always empty. Us a more tourist shuttle system
Item 8. Support the wine train to operate a commuter service for upvalley employees in AM and afternoon, coordinate Vine bus service with the train schedule at various stations to extend carless transportation reach. Have a similar service mid morning and mid afternoon for visitors to travel length of valley. Support a commuter bus or ferry/bus service from SF to Napa that also would coordinate with above train service. Item 10. Stop all open burning of vines as a method to dispose of vines. Support small composting on Ag lands that could take chipped vegetation waste from tree service companies and vyds removals, all horse stables need to send horse manure/stable bedding to a composter and not the landfill, reduce permitting fees for small scale composters. Support the production of biochar from forest waste generated by wild fire mitigation
#8 - focus on Senior access to travel options and funding #10 - Incentivize recycling by having more access to centers paying for things brought in and require the waste removal companies to educate more and offer more financial incentives
Napa should not “go it alone” on addressing climate change and mitigating GHG emissions but should rely on existing state and national initiatives for efficiency and to avoid duplication and confusion.
It is very frustrating to shop for groceries because it is impossible to avoid plastic and petrochemical products. Bread is in plastic bags, meat is wrapped in shrink wrap, peanut butter is in plastic and it is hard to find glass containers. Condiments, syrup, soft drinks, milk——Plastic, plastic, plastic. Replace grocery bags with biodegradable ones. Some stores try hard, but plastic is way too prevalent. It is even found in our circulatory system….
10. Lobby and legislate reduction in plastic and one-use packaging and products.
Electric automobiles will not help climate change IF we are using petroleum to generate the electricity. Therefore the source of power generation should be the main focus and the main financial investment made as a society (locally and nationally). Supporting electric autos with charging stations is important but the main and/or more focus needs to be on energy generation. Using Nuclear power is the best and quickest option to convert from oil, combined with wind, solar, et cetera. Our our transit system (local to national) is not set up for mass transit but for single auto use. Focus on power generation is the key!! Bicycles, mass transit, etc are important but not impactive. Impactive, hard choices are the best options.....
The answer should be ‘all the above’
Make solar panels, electric vehicles more affordable

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
Napa County is best positioned to meet GHG reduction goals by reducing the impacts of on-road transportation by: Supporting transit and transit-first policies Building more affordable housing with access to quality transit (quality transit needs to be supported by funding more frequent transit and later service hours for workers and community members) Investing in more/better biking and walking infrastructure that will encourage people to get out of vehicles, especially for short trips Support school bus transportation over driving students to schools Requiring all new housing developments to include support for EV charging
Encourage businesses to allow working remotely so people don't drive to work. Have community workspaces to work from that is close to homes and public transport.
Create a strong community engagement strategy with a big budget so that community members of non english languages can be considered and involved in the planning process of this Plan.
some of the answers should be "all of the above."
7. Other because government should force by law those most responsible for climate change-business and industry- to change their practices by a certain date/time in the near future without option for appeal or delay. Local governments can mandate that all electricity come from renewable sources by a certain date from the largest and most capable industries in the county (and carbon credit purchases should not be allowed as an option to effectively by-pass the requirement). Fines from those whom do not comply can be used in part to assist businesses whom otherwise could not afford or to fund development of affordable electrical utility. Napa County could also look to partner with already existing city water and sewer districts to use existing infrastructure to create sustainable public electrical utility district (i.e. like SMUD) by capturing energy sources there (i.e. from wastewater treatment plants, etc)
After recently experiencing public transportation throughout Italy, I feel the Bay Area, and California in general, needs to invest in public transportation infrastructure. I did not use a car throughout my travels. The train and Metro systems were easy to use and reliable. Allow electric scooters downtown. Additionally, more muti-family/multi-generational dwellings need to be increased throughout communities. These offer shared cost options for families as well as ways to support the elderly and young adults getting started in life. We have limited land available, and costs are driving young people out of Napa. Pool community supports/resources in a central location like the old Safeway building in downtown Napa, allowing access via public transportation (if it's improved), increasing access to services, add a community garden or small park, farmers market, charging stations for e-bikes, cooling/heating stations, etc. Seems like such a waste of a central piece of property. Reimagine property currently unused. Locals need more options in our community so that we do not have to drive outside of the County (and drive less). Less expensive restaurant options, family friendly places to go, etc.
Publish guidelines and resources for small landholders in the County.
Land use policy must be changed at local level by Board of Supervisors via the General Plan and Conservation Regulations. No more vineyard developments should occur that require removing an5 trees, grassland, chamise species or rick outcroppings, or wet meadows. The Planning Director should begin immediately drafting policy changers t preclude winery development on parcels less than 60 acres and . Wells should not be allowed within 500 four of surface waters including ephemeral drainages. No hold and haul winery waste trucking. No custom crush.

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
More than three bins would help with recycling contamination. Educate the public on what is actually recyclable by providing explicit instructions on what items go in which bin. Knowing that aluminum cans and glass bottles end up in the landfill because bins are contaminated with Jon recyclable plastics is terrible
Reducing waste sent to landfills is more than just composting. Compost will need to be applied somewhere to be of any benefit. All forms of waste need to be addressed, in particular plastic and plastic packaging. Construction waste also needs to be addressed. Many contractors pile everything in their dump trailers, without regard to separating what is recoverable. It all goes straight to landfill. And most importantly, the connection between "stuff" and the consumption of "stuff" and climate changed needs to be realized. All those things one sees in stores, that often end up in landfill in 6 months or a year are major contributors to climate change, and it is something every individual can do something about. Consume mindfully and consume less!
Local governments insist that state and federal authorities improve recycling options perhaps with rewards such as grants Local governments advocate and insist that state and federal government support and require other renewable resources that gas or electric and make them affordable
1A for question 7- provide financial support for conversion from gas to electric appliances
9. More mixed-use zoning (esp when paired with medium to higher density residential locations) to create neighborhoods that have more everyday resources within walking/biking distance of residents (small grocery stores/bodegas, coffee places, laundromats, daycares, health care, etc.)
Increase the number of neighborhood parks through infill development.
10. encourage reduced packaging, and commercial recycling programs with greater sorting and incentives for reductions in waste.
7. Begin conversion to Hemp products. End oil subsides. And Hemp could become the sustainable, clean biofuels. Everything we use plastics, cotton, and wood for construction. It is imperative to deregulate Hemp production. To deregulate it from the DEA Drug Enforcement Agency to USDA US Dept of Agriculture. With deregulation and subsidies support conversion could happen in 6 months. The technology for all these mentioned uses are already developed or a few years from market ready! 8. streamline mass transit clean speed trains.
WTAF are we supposed to do with plastic bags at this point? There used to be a "recycle" point at the safeway in north Napa (though who knows what actually happen to them from there), but that's gone now. Maybe there's just nothing reasonable to do with them, but if the county figure out something to do (adding some sort of capacity to deal with them locally or partner with other locality/agency) that would be great.
#7. More solar panel panels on roof structures over parking areas like they have at Kaiser clinic.
8- don't think it's possible, we are a automobile, independent person state. 9. Allow more ADUs for rentals. Build some residential hotels for cheaper housing for homeless and elderly.nursing and retirement homes are very expensive. Lots of old people are on the streets. "Flop" houses weren't great but better than a tent on the street.
Stop putting the burden on businesses who are already struggling and just trying to keep their head above water. Offer incentives—stop over regulating because people just turn off/stop listening.
Light rail from Vallejo to at least Calistoga (as San Jose, Sacramento and LA have done) We used to have this decades ago. What happened?

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)
More charging stations around town. More solar installed around town. Better bike lanes. Plant more trees all over town street tres, at parks, along roadways…and remove lawns on businesses and by sidewalks that aren't used by anyone.
Climate change is a global problem which requires international policy response……not piecemeal litigation and ordinances
Promote biodiversity instead of our wine industry's monoculture Stop allowing big corporations to move in pushing locally owned businesses out. It's the locally owned businesses that care about our environment, not the big corporations. For example, can't believe that Starbucks was allowed to set up shop across from NV Roasting Company.
#s 8 & 10: all the above
Stop vineyard burning ASAP. Make vineyard owners separate the metal etc from the plants and dispose of the plants as yard waste.
There are no good answers yet for some of these questions, but reducing traffic in napa county would be a good start. No more new wineries in an industry that is no longer sustainable.
Keep government out of everything except to educate people and provide incentives.
7. Make PG&E responsible for their mistakes and not place price increases onto the customer. Genuinely look into solar panel use for businesses & residents, and invest in Geothermal energy. 8. Revisit BART expansion to all of North bay. Especially have more efficient, direct routes from Napa to Sonoma. The current transportation to get to Sonoma is very inconvenient for those needing to go directly there. Currently, it loops to Santa Rosa. Also, instead of Napa county misusing funds, improve roads in Napa!! There are so many potholes which also contributes to wear and tear of tires contributing to litter. Not to mention safety hazards. 9. Instead of tearing down land for more buildings, use current existing buildings for new business. Also, if looking to create more housing, tear down unused buildings to create housing. I've seen this done before in the south bay. This also creates more jobs, improves outdated infrastructures, and preserves land. 10. Encourage and remind people to bring their own take-out containers when dining out. Ban plastic use. Only provide compostable utensils when customers request it.
We need safer and more walkable/bikeable areas AND better public transportation. Downtown areas should be redesigned for walking and biking, while commuters going out of downtown areas can use public transportation. In downtown Napa, there should be 4 way stops at all intersections (as in other cities). As it stands, drivers must pull into intersections before they can see oncoming traffic, making downtown SUPER unfriendly to pedestrians and bicyclists. We also need to encourage better school bus services, possibly provided through other public transport. Downtown areas also need to continue to be zoned to offer services that residents needs within walking distance (stores that provide essentials rather than tasting rooms). All Napa needs more urban trees to provide habitat and mitigate heat
7. Also: Require large buildings and parking lots to install solar panels. 8. All of the above. 9. All of the above, plus facilitate/streamline permitting for renewable energy projects and improvements to the electrical grid

11. If you selected "other" in questions 7-10 or have additional ideas, please share any recommendations you may have for further actions that should be included in the Regional Climate Action and Adaptation Plan (RCAAP) to reduce climate impacts? (Optional)

I have not seen evidence that legislating/restricting land use can make a significant impact on climate change. I believe the cost to individuals, businesses and local economy will be far more detrimental than any theoretical benefit to the climate.

Provide funding for planting more trees and gardens, create more shad along streets and shade structures for public. Fund environmental summer camps for 7-18 years olds with transportation to and from so Lo income working parents can let their kids go too. Also create summer work internships for highschool students.

When asked about the concerns I have regarding climate hazards, I picked 3 but it's really all of them. All of them would/do impact my life and all of them are very real climate related risks.

Climate change is a total Globalist conspiracy.

Teach all students about climate change and give away bookmarks teaching about it.

Make affordable solar panels and more incentives for home upgrades.
Make sustainable travel options convenient and affordable.
Our streets and highways are full of garbage- especially low income areas such as Old Sonoma, Pueblo Ave and Freeway Drive. Why are there no trash cans for people to use? Why are the sreets not swept and business' responsible for their lots?
Napa really needs to clean up school sites off Pueblo and Freeway Drive more often. The streets and yards are dangerous for wild life. Napa city needs to develop islands on Pueblo Ave and other
low income areas with Native Plants to clean up the
area and invite nature in.

Napa should be a plastic cup and straw free city. Napa needs to add more green spaces in the down town , encourage green roof buildings , stop the growth to discourage too many cars coming here.

I would like to see a more concerned effort on the part of local officials to protect the animals & plants in the region, especially those that are considered endangered. It is painful for me,after over 36 years of living in American Canyon to see so much of our Open Space being taken away for the sake of "progress". There are different groups such as the Habitat Conservation Plan which is beneficial for wildlife and works with the contractors to build a more sustainable environment for the area. We should consider working with them.
The unopposed building of warehouses, eye sore housing on what appears to be an unstable hill, disingenuous petitions giving voters the idea they would have a say in environmental issues should stop.
My concern is the increased warehouse building very near the wetlands, bogus environmental reports after the lands have been graded for building, the worry that the east side of 29 will be a Warehouse Wonderland because the officials will discover yet another way to either circumvent the law to meet the needs of the developers. My understanding is, that if a utility road is put on the property along 29, the land use can be changed from ag to industrial.
I realize we cannot go back to the way things were 30 plus years ago, but please consider what the people want. I have spoken to plenty of people who are concerned and upset over traffic congestion,pollution, loss of Open Space and the loss of plant and animal life in this area. I am worried this gateway to Napa Valley will be the Inland Empire of the north.

I feel that electric vehicle charging stations are most important. Wineries and hotels have them for customers who own Teslas but there is little else for the public.
Businesses need support for the increased cost of compostable takeout containers.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
#9. also improve forests open spaces and public parks.
1) create online course. Require for DMV and voter registration. (I could do content see linked in) Eve L Howard 2) associate affordable housing with individual gardens, community garden and green space with trees 3) reward for low car mileage, energy use, water use, make solar panels less complex, incite new buyers to landscape low water, plant trees, small footprints, home pickups of toxic refuse-paint, batteries, etc.
Add Hemp production to the solution!!
Act fast. Please offer more opportunities to help.
added costs to locals while there are a lot of homes that are being used as second home and they sit empty 6 months of the year. These owners should pay more in property taxes.
Are planting oak trees in every corner of Napa included?
Are recycled items from households actually be recycled effectively?
Based on what I have read in the past, asking residents to take the burden of Climate Change is a fools gold proposition as their collective impact is really very small. I think the focus should be on Wine Industry and what should they be doing to affect climate change. Also our biggest users should ber reign in on their use of non-renewable sources. Residents can help and should do their share, but it should not be up to the residents to be responsible for it.
Best ways for people to get involved
Beyond Winter 2024, how will the efforts put forth in the RCAAP be monitored and maintained?
Biodiversity matters. Plants begin our ecosystems. The more we build, the worse state our planet is in. There are so many empty buildings that can be repurposed instead of building on open land.
Burdensome and annoying.
Can this be implemented quickly. IT seems that all of the plans to address Climate Change are not even set to start until years in the future. The time to address this crisis is NOW
Climate change is a Globalist conspiracy (of which RCAAP is apart of). All BULLSHEISS!
Climate change is a very broad subject with almost incalculable inputs - including planetary wobble, sun activity, but mostly it is caused by human activity in the short cycle and can be best thought of as equivalent to pollution. Human emissions, garbage/waste does not just vanish but re-distribute in the natural environment - think of micro plastics, CO2 to even land manipulation which causes issues like fracking. Whatever action is proposed in the attempt to abate climate change from human activity needs to prioritize the biggest impact over the smallest.
Climate change is incredibly serious and affects, and will affect in increasing ways, all aspects of our lives. Any entity, corporations, especially fossil fuel involved ones, politicians, and anyone else with the power to make big decisions, must be made to prioritize eliminating this threat over profit. We are so far from that and getting worse. This world has so much potential to be a good place for all, but that's being destroyed by ignorance, stupidity, and mostly greed of a relative few.
Climate change needs to be our #1 priority
Climate changes; always has and always will.
Community planting a tree and cleaning

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Concerning drought, the best way to get people's attention is through their wallet. Water conserving tips include putting a bucket in the shower to collect water while waiting for the water to become warm and putting a pitcher in the kitchen to collect water used to wash/scrub fruits and vegetables. Take fewer showers. Don't leave the water running while brushing your teeth; turn the faucet on when rinsing your mouth. The same applies to washing your hands, turn water on to wet hands but don't leave it on until ready to rinse hands. Only run the dishwasher and washing machine when there's a full load. As long as there is no salt, soap, or oil/grease, you can use the collected water for inside and outside plants. Citizens must take personal responsibility. Their water bills will be less which brings me back to getting people's attention through their wallet.
Consider enforcement when developing policies. Need to stop cutting down trees and allowing agriculture to burn their waste.
consider having a column in the Napa Valley Register and Napa Valley Features
Continue plan development and refinement by accessing community group meetings time like Rotary/Lions/and faith based groups
Continue providing information and education
Do not know much about it
Do the recommendations by the RCAAP to the board also include proposed changes to county ordinances and what the language would look like to support plan?
Do you have any belief, reliance, or expectation, that the free market/law enforcement could handle the problem of air and water pollution? Do you have any idea of the term "global air quality"? Do you have any idea of what a SCN "small scall nuclear reactor is"?
do your research. EVs are not the save all. taxes will go up since now people are not paying for gas taxes that will pay to fix roadways. EV drivers are not paying their share but their vehicles weigh much more than a conventional vehicle. The government/regulatory bodies play politics not do the research on what the consequences of their policies.
Don’t forget that there are real people who have to pay for whatever programs you come up with. There is a cost to everything. And it’s not just monetary.
Education is key
Eliminate waste by requiring businesses to take back their packaging. Have Recyclable MEAN it IS recyclable.
Enjoyed the survey
Explore other options for removing vineyard waste rather than burning it. Grinding grape trimmings and stumps for commercial selling or composting.
Fix the roads and sidewalks first!!! Stop building new housing. Too many people is at the root of the problem. The RCAAP is jousting at windmills!!!!
Focus on educating all residents, business owners, city and county government officials on what they can do in their landscapes and lifestyles to prepare for the future. This includes how to mitigate climate change through soil practices (especially for agricultural businesses and homeowners), what to plant that is sustainable in a hotter future in the valley. Require ALL NEW development (residential and businesses) to have solar on roofs, electric heating and A/C, living landscapes, and in general employ specific building code standards that reduce heat generation. Set achievable goals that the communities can measure for periodic recognition and possible financial award. Set goals and celebrate the work within each community through a visible thermometer of achievements, regular news updates, and a public celebration when goals are achieved. Help residents feel pride in accomplishing something together with actions that address our serious life-threatening climate impacts.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?

FROM: https://calclimateag.org/eco-friendly-farming-in-napas-atlas-peak/

I chose to grow grapes in Napa's high-elevation Atlas Peak volcanic appellation because it offers longer sun exposure and cooler nights, presenting a unique area for truly great wines. What I didn't realize was the many beneficial environmental aspects of Atlas Peak until 2 or 3 years of my ownership had passed. With the rising awareness about the environment, adopting eco-friendly farming practices geared to protecting our water sources, storing carbon, reducing greenhouse gas emissions, and maintaining soil health became a priority. Over these last years, I've embraced my responsibility to preserve our soil's health for our generation and the many generations to come.

As Franklin Delano Roosevelt once noted, "The nation that destroys its soil, destroys itself."

We all agree that we must dramatically cut our carbon dioxide emissions to help limit global warming and avoid future climate catastrophes. The interesting thing is that cutting carbon emissions and redirecting carbon into the soil actually benefits the quality, health, and production of wine.

The purity of fresh mountain rain explains why some high-elevation vineyards become award-winning year after year. Most Atlas Peak vineyards are dry farmed due to their volcanic soil's ability to retain fresh rainwater and maintain soil moisture for months. Thus, we don't irrigate much, relying on the purity of direct rainfall to nurture vines for much of the growing season. Amazingly, these very same volcanic rocks serve another equally important function, much like a sponge, they capture carbon dioxide.

We need many approaches to reduce gas emissions and remove carbon dioxide from the atmosphere. The Intergovernmental Panel on Climate Change report on mitigating climate change contains many such techniques and innovative approaches. Carbon dioxide removal, essentially pulling carbon dioxide from the atmosphere, is essential to combating climate change, according to the world's leading scientists. In farming vineyards, there are many responsible practices for removing carbon dioxide and preventing it from returning to the atmosphere. We deploy many of these so as to help us reach our own climate goals.

"After 15 years of doing research related to sustainable agriculture and soil ecology, it is exciting to witness the momentum that is building, especially in the wine industry, to mitigate climate change and build soil health. Given the large acreage of vineyards in California, I believe the industry can positively contribute toward the state's climate mitigation and adaptation targets and serve as a prototype for other commodities" stated Charlotte Decock, Ph.D. Assistant Professor of Soil Health & Fertility, California Polytechnic State University San Luis Obispo.

In a natural process called "weathering", our volcanic basalt rock terrain naturally absorbs carbon dioxide from the atmosphere. We've added additional exposed volcanic basalt rock to this natural weathering process. This is accomplished by relocating large amounts of stacked rocks where they surround our vineyards and absorb carbon dioxide.

The 2017 Atlas Peak fires, and several more recent Napa and Sonoma fires confirmed our need for reforestation so as to keep carbon absorbed and stored. Post fires we planted new oak trees and carbon sequestering coyote shrubs on the property so as to restore the capture of carbon dioxide. Turns out that while our vines, trees, and shrubs capture carbon dioxide as they grow, they also provide a natural fuel source in a process called "bioenergy generation," absorbing and holding carbon for a longer time. Our vines use sunlight, carbon dioxide from the atmosphere, and water for photosynthesis to produce oxygen and carbohydrates that our vineyard needs for energy, nutrients, and growth.

It all starts with the burning of biomass, such as vine cuttings left over from pruning, to produce biochar, a charcoal-like substance that stores carbon. Biochar is raked into the soil to keep carbon out of the atmosphere for long periods and improves our soil's health and sustainability. A recent Columbia Climate School scientific report

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
highlighted both positive and negative impacts of climate change on plant growth. By proactively building soil health, we are preparing our vineyards for changing climatic conditions, so that we can minimize negative impacts and capitalize on a potential CO2 fertilization effect. We practice no-till farming which slows the rate of soil carbon loss and increases soil carbon levels. Building our soil's organic matter, along with cover crops replenishing the soil nutrients, provides us with nature's fertilizer and healthier vines along with long-term carbon storage without impacting biodiversity. As a result of these environmentally best practices, we've completed Napa's Climate Adaptation Certification requirements. I take the time to really listen to Mother Nature as she whispers her secrets so as to maintain an environmentally sound habitat around our vineyard. We practice integrated pest management by welcoming falcons, owls, and hawks, added trees and shrubs as natural habitats that help to naturally control pests. These practices translate to greater biodiversity of a more sustainable ecosystem and our commitment to preserving our soil's health for the many generations to come. It all starts in the vineyard.
Get going
Getting rid of the wine industry, the fancy restaurants, resorts and VIP mentality and focusing on rebuilding grass roots local sustainable agriculture is the smartest thing to do. This playground for the rich thing that Napa has become is disgusting!
Glad to know it's being worked on and hope to see regular friendly information and encouragement for more Napans to become passionate in this most crucial community objective.
Good luck!
Government needs to do more. Businesses are doing something already. Except rein in oil companies through legislation.
Ground water usage needs to be monitored NOW!
Happy to see the collaborative effort among all five cities. Work with agencies that are providing environmental education for youth and incorporate climate action plan information. Create ways for youth to get involved.
How are businesses being monitored and who is enforcing SB 1383? Why are school districts not as support of initiatives like Safe Routes to School? Why do apartments not have green compost bins available for residents? How can public transportation be more affordable, more education, encouraging young adults to use (since its not cool right now)? How can we get more parks programming that is affordable and fun so people feel a sense of responsibility to keep their parks and opens spaces clean and protected in order to keep programming going? How can we educate people on more sustainable indigenous practices without culturally appropriating or not giving credit to indigenous wisdom?
How are measuring the effectiveness of these action plans?
How are we going to protect and increase the health of our forests and wildlands during this intense heat?
How are you going to encourage the public to reduce, recycle and renew?
How can individuals get involved?
How can local government enforce (these important and crucial) actions?
How can more people participate in climate action that otherwise do not engage with the county?
How can we empower individuals to do more to help?

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
How can we use our unique location, tourism and environment to leverage a plan that makes Napa a leader in eco-tourism solutions? The vine trail is a great start (10 years in the making). Reducing vehicular traffic by choice, not mandate, requires attractive alternatives. Getting tourists up and down the valley by train and electric bike/car/bus would be ideal. less traffic for locals too. more electric charging locations, more e-bike friendly solutions to encourage non-gas travel. --too bad we didn't keep main street pedestrian only. missed opportunity there, big time.
How can. Nonprofits collaborate to elevate the impact
How do we make sure that large corporations, businesses and wineries don't speak over the community? Is this information available in Spanish or other languages? What does transparency and accountability look like?
How does the RCAAP plan to address on-road transportation and its impacts on climate and climate resiliency?
How often will progress reports be provided?
How proactive and genuinely committed is this going to be taken?
How quickly can we make positive change to protect the environment? We don’t have much time!
How to we balance climate control, housing affordability and protecting our natural open spaces?
How will it have teeth? How will it ensure any action?
How will the public be kept informed?
How will you take action on the plan, are there plans in staff to hire the necessary staff to implement? How will we know if the results are successful?
I am concerned about the new housing being built in Napa. We should ensure there will be enough water for all residents before more development is approved.
I do not feel connected.
I do not have any questions at this time.
I don’t have any questions.
I don't know what to ask, but those in charge had better start soon, as in yesterday.
I don't think I have read the plan. Plus, some folks do not read well and a video talking about it would be helpful.
I feel we need to continue our work toward the goal of limiting our dependance on fossil fuels.
I haven't read it yet. Glad it is happening!
I hope this committee feels the urgency of Climate Change and therefore moves faster than others have.
I just want to be sure that we're taking the most action possible, then looking at that and pushing it even further. Climate change is an existential threat and should be treated with the utmost urgency and with all the power we all have at every level.
I keep abreast of what is going on climate wise.
I need more information.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
I realize that the RCAAP need to deal with local issues and have reasonable achievable goals. However, the county and local municipalities need to address issues around wild fire management. Wild fires are a big contributor to CO2 and other emmissions and have a direct impact on the population - loss of property, air quality, human health, the economy. Napa County and municipalities need greater enforcement of wild lands and personal property. We lost our home in the 2020 glass fire, not because our home had a defensible perimeter but the area around us had been allowed to be overgrown, not managed and and an enourmouse source of fuel. RCAAP would go a long way to addressing climate change bly dealing with the wild fire danger. Also the Napa valley is a tourist destination, bringing in cars from visitors and a steady sterea of vehicle for those who work in the vinyards and commercial support. Havving more EV stations would be nisce but will not substantially impact climate change. A lot of habits need to change
I selected a lower response to how climate change will impact me as I am older. But, I am extremely concerned for grandchildren.
I think it's too late to do much about climate change beyond enforcing what we are trying to do now..need incentive for people to comply. We have become a reward society after all. It isn't easy to recycle or compost when we haven't done that most of our lives.
I think one of the best things we can do as a community is to help educate our residents.
I think we need to do all we can to mitigate the effects of Climate Change. There are so many inventive ideas on how to correct our planet's overheating. It is a very serious problem. I hope we can leave a healthier environment where our children and grandchildren can live and thrive.
I truly believe in personal responsibility. I think each of us needs to be mindful in our actions to reduce unnecessary waste of natural resources.
I want to make sure that we don't silo climate change and the environment in their own little sphere. We are at the point where EVERYTHING is a climate change issue. And frankly, nothing else matters if we don't have a livable planet. Every decision should include the environmental cost of how we act, from the materials we use to build anything and everything, to the emissions that will be sent into the atmosphere through all stages of a project.
I wish more affordable housing was being built in Napa. There is a planned development in downtown Napa and not one livable dwelling is set aside for affordable housing in the whole development.
I wish the politicians would be more transparent about their beliefs and interests. When power and money are involved, politicians seem to forget who and what they are working for.
I would hope that we can get past the basics and start focusing on incentive programs that actually move the needle.
I would like to know more of who is on this committee ie politicians, citizens, businesses .
I would like to know what if any actual these possible edicts will have on the issues.
I'm really glad to have the opportunity to fill this out. I would like to know how this survey will influence the RCAAP, if at all.
I'd like to see more natives throughout the city of napa- to help clean up areas from litter, to bring wildlife and to lower carbons. Ex: Pueblo between California and Jefferson.
I'd like to see them actually DO something rather than talk about it. There is very little action going on towards change. Our priorities should all be about the climate crisis. We should require green design for all new building, native landscaping for all developments, wildlife conservation, and we need a public train to get us to the airports, major cities.
I'm very pleased with the focus on this issue and fully support earnest efforts to address.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Incentives for the reg public and businesses should be significant enough they will.
Incentivizing the replacement of appliances is the only way your going to get people to replace their appliences.
Is there a long-term plan on disposal of defunct solar panels and electrical car batteries from the all-electric vehicles? What is the expected cost of disposal per electric vehicle?
Is there a plan online?
Is there anyway I can get involved?
It is a waste of time and our money. Shut it down.
It is critical to (1) move quickly and purposefully ahead on climate change actions; (2) assure that the actions taken are quantifiable - this is difficult but essential in order for all of us to understand the impact of current actions on the future and the relative effectiveness of the actions we do take. The trope "we can't recycle our way out of the climate crisis" is true. However, we must find better ways to help everyone understand the impact of suggested or selected actions on the "bottom line" - i.e., what results are we aiming for, what are the critical targets, what are the scientifically sound mechanisms for meeting targets, what are the scientifically sound metrics for measuring progress or regress.
It is critically important that we protect our hillsides and forests from further degradation from development. This is important for water security and for not driving more traffic into our high and very high fire danger areas.
It is not appropriate to saddle business owners and property owner with the cost of programs aimed at climate change. There is already undue and disproportionate expense on property tax payers for education and public infrastructure and hospitals. Renters and owners should be equally impacted. Without science to prove that a certain incremental change will affect the planet, it is absurd to tax or penalize behavior locally. The government's job is to protect and plan and encourage, but it is not to engineer social change or punish. On a Federal level the USA should work with other nations to share data and solutions to climate change. But there is no proof that humans can change the planet cycles. Regionally transportation should be improved. And forest management practices should be improved. Local Fire protection and response should be improved.
It is unrealistic to require some property owners to go "all electric". Many older neighborhoods or country properties do not have the electrical infrastructure/capacity to provide the service. Prioritize local government to build more workforce housing. With the agricultural preserve in place the only option is to build up regardless of neighborhood pressures. As climate change advances, water will become the scarcest commodity. Do not allow further winery expansion in the drinking water watershed areas of Napa County. This natural resource must be protected for everyone and the future.
It was very hard to select just one option for questions 7-9. second choices: 7. Make homeowners aware of tax credits, rebates and other benefits for solar and other changes. 8. Offer incentives to install EV charging stations 9. Build homes near public transit.
It will take the CAC a decade to agree on anything meaningful/
It would be good to share with the community a timeline of next steps so we can all be accountable to moving the process forward
It would be nice for county and cities to put pools for public use and splash pads so we use less air conditioning.
It's a scam
It's a waste of our taxpayer money.
Its a joke. The rest of the world is doing nothing. Nothing American does will make the slightest difference…

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
It's a real. We are renters and don't have air conditioning nor are our windows double pane, and walls could be improved with better insulation. All that makes a difference.
Just please deal with climate change
Keep pursuing solutions.
Let the people make their own decisions
Let's get this done as quickly as possible so we can take action.
Local businesses need to be on the hook just as much as individual residents.
Local government needs to focus on how best to support the community in the joint effort of reducing GHG emissions, not just think up new restrictions or requirements that could have very harmful impacts on community businesses in particular. You want folks to buy more EV's, then infrastructure is required and financial incentives are required to make it a seamless transition. Everyone is sick and tired of paying crazy high utility bills without reliable utility infrastructure. We shouldn't bear the burden of utility company financial obligations as they are forced to pay for the damage done in our own community. Protect us from utility overreaching and overcharging the community. Local government also has to seriously address affordable housing in the county. What it costs to live in this county is insane and people just cannot afford it, yet there are investors and very wealthy who come to Napa County to buy up vacation homes and family homes that they flip into vacation rentals. Affordable housing for those who work in this county is crucial. Without support for the local community, local government won't have the respect of the community and won't care what local government thinks of some climate action adaptation plan. People aren't going to care about reducing GHG emissions if they're just trying to get by.
Locally, what are the highest impact options that residents can take to impact climate change (i.e., what's most worth our time and effort)?
Lost time and money: In the face of Climate Change, the City of Napa made a long term contract around the year 2018 to lay ground pipes for LNG (methane), as the main source for energy throughout the city of Napa. Methane as a GHG is written out of the RCAAP due to the high heat its emissions contributes to the atmosphere. Accordingly, due to the long term contract, the piped in LNG continues to be affixed to all residential and commercial building sites from 2018 up to the RCAAP 2024. The necessity of retrofits called for by the RCAAP is costly in time and money.
Make ALL budget expenditures public in. Biannual report to Napa residents.
Make e cars more feasible to purchase .
Make it better
Make recycling and compostinng more interesting to the public.
Make residents and renters in apartments have compost bins, segregate all recycles, no more plastic use in general
More street closures downtown and even in some suburban areas to promote more civic engagement and just plain happiness when there are less cars
Most people have no idea how far past overshoot we are. Way too many people consuming way too much. Business as usual is not sustainable. Pay people not to drive. Payment set at the avoided cost of actually permanently removing that amount of CO2 from the atmosphere.
Most people living on Zinfandel Lane have electricity shut-offs and no ACs in their old homes. How can you help people not loose all there groceries every time our electricity goes out? We garden and we store food in large freezers it's not just our frig.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Napa Co. has a long way to go to keep up with climate change action and adaptation, however Napa is posed to become a leader with enough uptake! As a small valley with plenty of money, there's many actions that could be taken to improve our mitigation efforts and restore biodiversity.
Napa local governments in general have been way too timid and behind the curve. Look to other local governments that have model plans and are way ahead of us such as, but not limited to: Santa Monica/Santa Cruz/Davis/Berkeley, etc. It's not rocket science , and we don't have to reinvent the wheel, when others have laid out a path more clearly.
Napa needs to do more to sustainably produce wine, protect its revenues and demonstrate how to be a model for others to follow.
Napa should have a Bay Area Rapid Transit (BART) station to encourage public transportation to other parts of the Bay Area, instead of having to drive or take the bus.
natural gas usage outweighs electricity in many ways
Need more roundabouts in the valley
None. Climate change isn't man made, it's inevitable. Stop hurting people financially so you can make yourselves feel good about having 4-5 cars.
None. Government will surely screw it up like most things undertaken.
Not impressed with this survey. It looks like it was written with the express purpose of getting the answers you want while glossing over the real issues that are impacting climate change. I.e. over- development when their is a clear lack of affordable housing so that people don't have to commute long distances to work. Also too much paving for new parking lots and expanded roads.....all lead to overheating and rainwater runoff into storm drains and not into the aquifer.
Nothing at the moment.
Nothing original or specific to Napa is suggested nor was any sensitivity to costs included.
Open space only contributes to large fires .
Our global climate emergency requires emergency countermeasures. Prioritize near term heat reduction action and heat reduction advocacy.
Our main issue is younger middle class families can’t afford Napa. Expand the job base, rent limits, taxes on rich, tax large footprints.
Our organization has submitted a proposal to CAL/MTA fund to convert to hemp growth and production asap. The current key barrier is the Federal govt still listing it as a drug. HEMP is not a drug until 1940s it was used for everything I described. The US was dupped into the self-destructive path of oil, forest and cotton production for the personal gain of land barons who created false campaigns to criminalize hemp and cannabis. California is the perfect place to lead the US in Hemp growing. The technology for hemp batteries, biofuels and construction is nearly ready for market 2025. The main current barrier is access to seed and plants. Hemp can grow from seed to harvest in 60 days. Currently seed has to be ordered from China or France. Countries that are fully committed to its production as the global solution to climate crisis and imminent global water crisis. To ignore the organic, safe solutions is beyond foolish it is fast forwarding our self-destruction.
People living in mobile home parks do not have the option to install solar and I think this needs to change as there are a significant number of MH parks in Napa county.
Perhaps put the brakes on tourism. The tide of weekend tourists has to stop impact our carbon footprint

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Please do more to educate the community about proper environmental choices and how to make these. Institute a no plastics and no styrofoam policy for food vendors (many do a good job already.)
Please emphasize the importance of active transportation and transit in the transportation approach. Simply switching to EVs will not save us from climate change and has a host of other environmental and social problems associated with it. We have to be able to drive less, which means we need to reallocate vehicle space to other modes. I also would be interested in how the plan ensures that electricity being used is coming from a clean source. How does this plan interact with the many other existing plans within the county, like General Plans, transportation plans, etc.?
Please read: I think that everyone should and I do, do everything I can to not pollute and reduce their (and my) "carbon footprint" (false term, fake science; but I'll use it anyway because that's the term the uneducated will understand). I do not want mandates forced upon us. I don't believe that banning gas appliances will amount to any significant change. The real changes will come when countries like China and India stop burning coal for power. We should be using nuclear power. And before you off on some crazy rant about nuclear, you should read up on the new nuclear plants. The new plants operate at a much cooler temperature and almost no chance of a melt down. Also they produce less nuclear waste and it can be recycled. Did you know that for much of Earths history the climate was much hotter than it is now? So in essence this cooler period that we are in now is unusual for our planet, climatically speaking. I remember that back in the 1970's all the scientists said that we were soon to be heading into a ice-age and we had to come up with ideas to warm the planet up. Then in the 1980's this Nasa scientist who had for years been taking temperature readings every year in the middle of a field, without any change. Then the next year he goes back and the field is a parking lot with that same thermometer in the middle, well low and behold the temperature is way hotter (go figure!) and he declares that the Earth is getting hotter and builds his career up on global warming (now called climate change). A volcano can put out more greenhouse gasses in one day than we do in a decade. Sure they can measure better now, but what they are measuring is just the natural cycle of the Earth. So that's the real story... Please try to find any history that hasn't been rewritten and read up on it.
Please set up a tree protection program. It is too easy for landowners to cut down heritage or valuable tree from their property because the don't line them, think they are too tall etc, City need to provide information to resident about the benefits of healthy tree are to our society. More protections need to be in place and permits required for cutting down heritage and old growth healthy trees on private property.
Pursuing a regional approach to climate action is critical, but as noted above, it is very concerning that protecting agricultural zoning is conspicuously missing from the discussion.
Question one can use a timeframe associated with it.
RCAAP will use 100yr GWP values to evaluate mitigation actions. We need to also use a more robust metric to determine what actions will actually have an impact in reducing heat. Measures to incentivize agriculture and lodging and warehousing should be prioritized.
role of vineyards and wineries in water consumption
See #11 above
See response to #11
Should reject any effort to force fuel use conversion. Many areas cannot rely on electricity and conversion is always expensive. There should be no government agency using MCE full green. It is money poorly spent.
Stop airplanes from filling our skies with chemicals. This practice is bad for people, animals and the lland.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Stop permitting construction of new private swimming pools! I know of quite a few recently constructed and cannot imagine a more wasteful use of our limited water resources.
Stop telling people how to live their lives. I'm more concerned by the so-called well-meaning idiots who are trying to force horrible ideals that haven't been shown to have any good effect then by anything I've seen coming with any type of climate change.
Stop trying to ram “Climate Change/Global Warming” down our throats. Less than 50 years ago the world was going to freeze over and we would run out of food. Al Gore and Greta said our coastlines would be under water by now. The “experts “ have always and will continue to be wrong!
Thank you for doing this.
Thank you for your work
Thank you!
Thanks for working on this issue.
That it doesn't include yet"early actions" of the principle Jim Wilson keeps repeating often: "First, do no harm."
The “Net Zero by 2030” is not a feasible goal for cities pr the County; there are no plans in place that could reach that goal. To set such a goal is an empty gesture. Banning new gas stations will not reduce gasoline consumption—another empty gesture.
The continuing operation of Clover Flat Land Fill and Upper Valley Disposal Service needs to be addressed. Unsafe, hazard that effects the groundwater and Napa River and tributaries with forever chemicals.
The county recognized the need to address climate change in 2007, followed a year later by beginning development of a climate action plan. In 2018 the civil grand jury issued a report detailing the (lack of) progress in completing that project. The Planning, Building and Environmental Services dept,, under the useless David Morrison,response was to pretty much ignore the conclusions and recommendations. The county, however, did take to heart the recommendation for a coordinated effort of the government entities throughout the county, hence the RCAAP. Yet, halfway through 2024 you’re still taking surveys! 18 years wasn’t enough time to complete an action plan?
The elephant in the room is two-fold : 1. Vehicle emissions - The county needs a two-pronged plan to (1) get more electric vehicles on the road (and infrastructure) and (2) provide a real public transportation option including parking at transportation hubs for transit within Napa County and to the adjacent counties. 2. Building emissions: Incentives for retrofitting existing buildings (commercial and residential) with solar and batteries, and incentives for new buildings to reduce the energy need. Everything else is minor. Until the county has the political will to do something about these two things - nothing will change. Napa County's Climate Action plan presentations to the public have said the same. The other issues will not make a difference.
The Federal and state government is creating an entire bureaucracy to create jobs and force existence of climate change.
The focus should be on how society is responsible for our limited resources and how changes will impact our children, grandchildren, and so on. We need public transportation, muti-generational housing, and to educate on the benefits and how climate change is not a hoax.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
The largest consumer of water by far are wineries and their related agriculture. Require their cooperation to reduce groundwater depletion
The list of concerns in question 4 did not include Climate Refugees/Climate Induced Migration. I answered question 2 and 3 as Other because I don't feel that I have a good idea of what Napa County is or isn't prepared for.
The plan should be based on shared opportunity and shared responsibility with actions that reach common goals rather than being used to penalize and blame our local businesses. The three E's should be reflected within the plan - and include environment, equity and economy. If our economy suffers, we can't do anything helpful for our environment or our neighbors. It's not just one dimensional, either/or, or mutually exclusive. We deserve better than that.
The plan will need to make sure that it properly addresses how to help people with dishabilles and seniors/aging population as they will be more affected & susceptible to climate change. They will likely need more detailed assistance in preparing for climate change and dealing with effects such as wildfires, smoke, extreme heat and weather.
The RCAAP addresses climate mitigation and climate adaptation. It should be acknowldeged that concurrent climate restoration action - massive global legacy GHG removals - needs to be part of the program, since net zero and net negative emissions very likely will not prevent global mean temperature from pushing past Paris Accord targets of 1.5 and 2.0degC above normal, an unconscionable failure that would create a level of heating lethal to many life forms.
The RCAAP must address the crisis with urgency. Major changes are needed now.
The RCAAP needs to focus on getting businesses in napa county to be more green and not using old methods. There are numerous ways to make napa county more sustainable. Focusing on making housing more affordable so people can live where they work will reduce car traffic and allow people to take transit, walk or bike to work. Requiring compostable packing will reduce waste, and promoting plant-based eating will reduce emissions from animal agriculture. I look forward to the efforts of this plan with all the government entities.
The real issue is world overpopulation not climate change. Nothing will be solved until the world’s human population is controlled.
The Regional Climate Action Plan refused to acknowledge the possibility that measures implemented to “address climate change” will definitely impose costs on local individuals, businesses and economies without any evidence of actual benefit or impact on climate, which is a complex network of local geographic conditions and planetary systems and forces. The cost benefit analysis of any of the proposed actions must be considered against the option of maintaining status quo and must include consideration of burdens and impacts on local populations of the projected policies.
The survey appears to be designed as a rationalization for imposing regulations that will negatively impact the local economy, increase taxes and have no effect, whatsoever, on climate change.
The term "climate change" and its variants (global warming/cooling, climate emergency/crisis) has become too politically charged and more often than not, I feel it's become another way for government to be more involved in people's day to day lives than it needs to be. I have recycled items for decades, I drive a fairly fuel-efficient car (can't afford an electric car and besides, there are not enough charging stations), I plant drought-resistant plants, I appreciate clean water and clean air. The Napa Valley is a beautiful place. Yet we are consistently told our environmental actions are not enough. We need to do much more and we have to change our behaviors "NOW" or the climate will get worse. Excuse me if I think the RCAAP is something of a farce with a goal to appease climate activists and alarmists who will never be totally satisfied with whatever decisions are ultimately made.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
The time for suggestions and providing info on alternatives has past-no one is paying attention (by design). The time for action is here. We must invest heavily in alternative modes of transportation, build pleasant bike trails not the harrowing designated lanes inches from speeding cars. We must provide money for people to make the transition—either to walk people through the process of getting federal/state grants and funding directly for all levels of income. Incentivize everyone and subsidize on a sliding scale that includes most people (a cut off for the people making over $250k) we must make the transition personal-we all benefit so we all participate —-everyone wins. There is really not so much denial now but apathy is a problem. Publicize wins, interview people who have successfully transitioned—repeat, repeat, repeat!
The water issue really must be addressed in an entirety. Those who say "oh I'm on well water"....it's the same aquifer that city water shares! And those who use less water than they are allocated should be REWARDED for this, not charged the same astronomical amount. There needs to be a financial incentive to make everyone conserve water.
There are so many gross polluters in business...how can we get those businesses to adopt sustainable green policies?
There needs to be more funding and more streamlined access to this funding for home hardening. Many structures in Napa have wood-siding (no longer allowed under building codes) and were built before sprinklers were required to extinguish home fires. Most homeowners cannot afford to replace wood siding and add sprinklers. Subsidizing or offering 0% loans starting with multi-family, older dwellings would save lives and property. This is especially important to preserve residential insurance as insurance companies have been canceling homeowners policies. What will happen to all of our property values (and taxes that fund public agencies) if our homes aren't preserved?
these are biased and leading questions and not at all representative of the most peoples thoughts
This is a collective change we need to make as a community. I think we are in pretty good shape to combat the things that come with climate change because we've gone through many of them already in my lifetime. Floods, quakes and fires. I think the only thing we aren't really prepared for is a mass evacuation event that would clog every exit to the Valley.
This is being used on the "People" as a scare tactic and its wrong to do that. People just need to start reading their Bibles as we ARE in the last days! My age, gender, and income has nothing to do with my answers to your questions.
This is important and vital work! Thank you!
This is so important, I wish changes or what is in this plan would be laid out and available in really easily digestible formats! I think that would help people give more feedback
This plan should be advertised in public places like parks and common area. There should be documented actions and initiative driven to stimulate local business.
Time is short and the prognosis for the planet is getting increasingly dire. It is time to act boldly and provide significant resources to do so.
Time to quit screwing* around with bamboo forks and compost. The number one issue in napa county is deforestation for wine grapes and wineries being built in the deep forests. RCD wake up it's time to be bold. Developers are killing us with their deep pockets egos.
Transportation is our single largest GHG contributor. Do whatever you can to get people out of their cars. Also, account for GHG other than CO2. Methane, troposheric ozone and black carbon must be addressed. Outlaw all wood burning. Outlaw all two stroke engines.
Transportation is responsible for almost 50% of GHGs. What is the CAC doing to change this in Napa?

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Transportation sector is a large GHG emitter with very few reliable and convenient public transportation options for locals. Napa also is unique in that much of our transportation emissions are by tourist outside of the area not directly governed by local ordinance. Increasing bike lane and public transportation for locals is key, as well as programs and group transportation for tourists.
Tree clearing by PGE is not being adequately addressed for its impacts in napa county. The regrowth of flammable invasive species following tree clearing is a real threat to our communities. Pacific Union College needs continued support to manage their forest for wildfire safety and carbon sink.
Try not to impose to many supposedly helpful rules and conditions on residents.
Turn the wine train into an affordable commuter train
Unfortunately, an necessity to build local resilience to climate change.
Up valley from Napa to Calistoga doesn't have enough alternative traffic patterns. It's only two main roads, Hwy 29 and the Silverado Trail. These roads are too congested. St. Helena is the only city with Main Street as the Hwy and they seem to be at a loss of how to mitigate any traffic. This valley has to grow to have residents and tourists. The wine train is prioritizing tourists and no one is prioritizing all the day laborers in cars or the residents that need to go ejsewgetr. It's all about the tourist. Let's start looking green and act like we mean it. Get a dedicated bus lane for the entire valley. Give the bus system priority or get some transportation on the tracks
Vineyards are a proven fire break. Enact them in areas not currently allowed the environment al group is winning on emotions and the BOS is not voting on facts.
Waste of time and money.
We all need to take actions now or it'll be too late...
We need to reduce greenhouse emissions to control climate change.
we need to slow accepting people from countries where they have a small carbon footprint and bring them in to a large common footprint country
We require more incentives to convert from using fossil fuels to clean energy in supporting our daily lives
We seem to have a fragile electrical grid system, is PG&E addressing the higher demand with folks going all electric?
We won't get there relying on citizens to stop using plastic straws. We need government to penalize high impact bad actors.
What "immediate actions," as stated in Napa's Climate Emergency Resolution, are already on the list? Time is ticking.
What are the biggest barriers to enacting climate-conscious legislation locally? What or who are the organizations that would lobby against changes towards public transit, greener energy, and walkable cities?
What are the climate benefits from Napa Valley's miles of vineyards? Do the vines themselves naturally keep the climate from drying, thus helping against ravaging fires across the areas of vineyards? If so, perhaps hold back from ripping out vineyards to give space for development of more resorts and hotels?
What are we waiting for ! Take action now.
What are you planning to do that will make any impact at all on the ever changing weather patterns? How can paying more money, getting rid of trees, lawns and all things green, help with any of this? I walk by my neighbor's yard and feel the heat from the rocked landscape. More trees, more plants, more lawns will reduce the heat.

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
What financial assistance programs are available to the individual home owner who finds the options too expensive. E.G. Upgrading of electrical system to accommodate EV etc.? Recent situation: Estimated cost $60K because PGE wants the gas standpipe and the electrical panel 3 feet apart, and to do so, would require digging up the street (125 ft) and connecting to the PGE supply line, new lines installed in conduit, whereas old line was just laid bare in the ground. PGE does not allow just tagging onto the old lines. Other alternative is to move the gas line…estimate $10K+.
What goals do you have to make bicycle riding more accessible to Napa from American Canyon.
What improvements are scheduled to be accomplished first? We are FAR BEHIND where we should be with regard to climate change issues.
What is local government actually doing? Are we looking at science and data rather than operating in emotional responses?
What is priority #1?
What is the impact of heavier electric vehicles on local roads?
What is the plan to improve public transportation via the train upvalley and/or between the Smart train?
What needs to happen to speed up beaurocracy in the state employees daily activities?
When will it be adopted and by whom
When will public meetings take place, regarding the RCAAP? There is nothing scheduled on the website, and June is half over.
When will the plan be completed. How long will it take to become effective. How long is the duration when if any are realignments made
While humans DO exacerbate any and all problems having to do with natural events, they are NOT necessarily responsible for them. World-wide cyclical changes in climate have occurred during the earth's evolution and they will continue to occur with OR without the presence of human kind. QED
While it's great to help individual community members adopt more environmentally friendly behaviors, government and businesses can have a far larger impact by changing their practices
Who is in support of this plan? What are specific goals that will be outlined in this plan?
Who makes this stuff up??
Why
Why are my taxes being used for something I do not believe in?
Why doesn't the city check buildings for code violations? Our apartment complex has electrical issues.
Why hasn't there been a larger effort behind engaging non-english speaking communities in Napa? Communities need support through engagement
Why is the bank of the river near Napa pipe being built upon? At high tide it will see flooding with heavy storms and we will all have to pay for the greed of the rich getting richer?

12. What questions or comments do you have about climate change or the Regional Climate Action and Adaptation Plan (RCAAP)?
Why is the focus on recyclable utensils for take out food?! The impact on the environment is minimal at best in this regard. People feel helpless and perhaps these non impactive ideas make them/us feel better but the focus needs to be on impactive solutions like energy generation!! All my food scraps to into yard waste, I minimize my plastic purchases, I use a hybrid vehicle, and more to minimize my impact. Individual household habits to minimalize climate impact is a better message than outlawing plastic forks and knives. Collaborating regionally to change power generation is a best practice solution. Manage up to local, state, and federal government for energy generation change!
Why not defund this organization and fix our current issues in Napa. Roads to start with, then our forest health, then the homeless and housing issues.
Wildfire management and affordable housing are my biggest concerns
Wildfires. The first responders to Wildfires should be aircraft capable of stopping the fire before it gets too big to be put out, so it can not produce massive amounts of air pollutants, burn up our houses, and result in dead people, as Napa County is famous for. About 3 years ago after the Glass fire some wealthy land owners offered to pay an experienced company to provide TWO aircraft to be stationed full time in Napa County during the fire season ready to get over the fire in just a few minutes to put the fire out quickly. They were float planes able to quickly scoop up water from lakes instead of having to waste time to return to the airport to reload. The Napa County Board of Supervisors shot this down because Cal Fire wanted the Glory and Money to fight the fire. NOTE: Not all fires are accessible from a road using a fire engine. Cal Fire has only a few airplanes and helicopters for a HUGE state. Some only able to carry less water than the offered float planes.
Will progress of selected approaches be measured and reported to the public?
Will the plan require that measures be carried out equitably? What are local jurisdictions required to do as part of the Plan, versus what will be optional?
Will this be unduly burdensome to businesses
work on an international level
Would it be possible to add in a section about habitat restoration and development in the plan. Adding native plant pollinator habitats or islands in city parks, for example. Requiring developers to install sustainable landscaping that doesn't require gas powered machinery to get "the look". A little soft and messy can be an acceptable, beautiful aesthetic, that will support many beneficial insects and other creatures, without the use of chemical inputs. Building urban forests will go a long way to make the cities and county more habitable, not to mention the improvement in mental and physical health for all. Demonstration sites would be a great way to start getting people involved and feel comfortable about creating habitats in their own yards and patios. Community plant exchanges would help keep the costs down too.
Would like a way to make recycling easier. The required washing of plastics going into recycling is prohibitive and could be done at a county level to increase ease and rate of recycling.
Would rather spend our funds on fixing our roads! Potholes are ridiculous!
You guys are doing a great job. We need more education in schools, especially in low income areas and in Spanish.

3 FOCUS GROUP MEETINGS

Stakeholders from diverse backgrounds in Napa County shared their experiences and perspectives on climate impacts and resilience in a series of six focus group meetings that took place over the course of three days in July 2024 (July 10, 11, and 12) and one day in August (August 8, 2024). Each meeting was approximately an hour and a half long and was attended by at least three community organizations. The goal was to create a space that could serve as a platform for collaboration amongst local organizations, agencies, and community members to explore the needs of the community and discuss ways the Napa County Regional Climate Action and Adaptation Plan (RCAAP) can best serve those needs.

3.1 PARTICIPATING ORGANIZATIONS

Organizations were invited to participate based on how they connect with frontline communities identified in the plan's Vulnerability Assessment. The groups were categorized into areas focused on Youth, Families, Public Health, Community Based Organizations, and Serving Multi-Language speaking audiences.

- American Canyon Community & Parks Foundation
- On the Move
- COPE
- Napa/Solano Agency on Aging
- Schools4ClimateAction
- VOICES
- Community Resources for Children
- ABODE
- First Five
- Suscol Intertribal Council
- Napa Farmer's Market
- Food Security Coalition
- Napa Valley College
- Napa Climate NOW!
- Farmworker Foundation
- COAD
- MENTIS - Teens Connect
- Boys & Girls Clubs of Napa Valley

3.2 CLIMATE ISSUES

Key climate-related issues identified include the profound effects of extreme weather on vulnerable populations, such as the elderly and those with mental health concerns, exacerbated by limited access to cooling centers and transportation during heatwaves. Disruptions in education due to climate-related school closures were also highlighted, underscoring the need for adaptable learning environments. In the past, successful collaborations between local organizations and governments have enabled effective responses, including the establishment of cooling centers and provision of rental assistance during crises. It was emphasized that initiatives integrating climate education into school programs and community centers could empower youth and families alike, while innovative solutions like eco-friendly supply distributions and pop-up green spaces could potentially aim to mitigate local climate impacts.

Participants emphasized the importance of equitable engagement, immediate action through small-scale projects, continuous and consistent community education from trusted sources, and improving resource accessibility (multi-language materials and workshops, access to information in a trusted space, etc.) to enhance climate resilience across Napa County. Many vulnerable communities have felt left out of planning process in the past due to language barriers, transportation and meeting access barriers, and a lack of clear directives when it comes to accessing resources and having a seat at the table for conversations like the ones that took place during the focus groups.

Below are the consolidated notes from the focus group conversations, categorized into common issues, biggest successes, and biggest takeaways. Additional quotes are provided that reflect the diverse perspectives and insights shared during meetings:

3.3 COMMON ISSUES

- **Extreme Weather Impact:** High temperatures exacerbate health risks, especially for vulnerable populations like seniors and those with mental health concerns. Lack of cooling spaces and transportation during heat waves poses significant challenges.

"With high temps, people need cooling in their housing. If they need to go to a cooling space, they need transportation - which is difficult to secure when it's very hot."

- **Educational and Operational Disruption:** Heat-related school closures disrupt learning environments, impacting both students' education and mental well-being.

"School AC went out, the district brought in a big fan, but the orchestra couldn't hear their instruments over the fan, and then couldn't play for a month."

"All of the drop-in centers get busier in high temps because people come in for AC but then there's a higher amount of people seeking services. It is a driver for folks to enter the space. The individuals we're serving are already under extreme toxic stress and excessive heat compounds that stress and makes it hard for people with mental health concerns to focus on getting better - extreme weather is just another unexpected element that prevents them from moving forward"

- **Community Resilience:** Challenges in disaster preparedness, including language barriers, highlight the need for improved communication and support systems.

"The biggest obstacle in disaster preparedness is language barriers. We have a long way to go in language access, but I was happy the county was willing to lean in with us."

- **Environmental Justice:** Marginalized communities face disproportionate impacts from climate hazards and often lack resources for adaptation and resilience.

"Napa lacks cool spaces to take children and youth, there's a limited variety of options in places to go and ways to get yourself there." "We need more seating at bus stops, protection from the elements, spaces that are less packed in… small waiting areas are hard for children and the elderly, even just lights that turn on in the evenings while you wait for your bus"

- **Youth Engagement:** There is a need for more inclusive educational programs and opportunities for youth involvement in climate action and policy.

"Kids are looking for opportunities... Investing in youth and including them in these processes gives them every opportunity to understand what having a career in climate work looks like."

3.4 BIGGEST SUCCESSES

- **Collaborative Partnerships:** Successful collaborations between local organizations, governments, and community groups have led to effective responses during emergencies, such as opening cooling centers and providing rental assistance.

"Another great partnership is the City of Napa and housing assistance - they were able to open up rental assistance... It was a great example of how we can partner to get things done quickly."

- **Educational Initiatives:** Integration of climate education into school wellness programs and community centers, empowering youth and families with knowledge and resources.

"There is an opportunity for partnership with schools across Napa County... Incorporating climate change education into wellness centers."

"We need to create climate workforce development opportunities for youth so they can see a clear path towards building the future they envision"

- **Innovative Solutions:** Implementation of sustainable practices and community-driven initiatives, like eco-friendly supplies distribution and pop-ups in green spaces, aimed at mitigating climate impacts.

"What would a climate adaptation starter kit look like? Sustainable alternatives and supplies that can help people get into the habit."

"We have dreams of helping our farmer's market vendors own electric powered generators and a place to plug them in, to move towards cleaner energy solutions"

3.5 KEY TAKEAWAYS

- **Equitable Engagement:** Ensuring climate action plans are inclusive and accessible through trusted messengers and community-driven approaches is crucial.

"People are hesitant to go to local governments because it might come with strings - but when it's coming from a trusted messenger it hits harder."

"I'd like to see better reporting with easy-to-understand language - let's get the metrics out"

"Having involvement and being invited to the table is a step in the right direction between local governments and CBOs."

- **Immediate Action**: Prioritizing small, implementable goals alongside larger strategies fosters community engagement and builds resilience.

"Drilling down on smaller implementable goals and projects... It's nice to feel like you're making an immediate difference."

"We depend on a microclimate for many of Napa's industries, but that climate is going"

- **Continuous Learning**: Ongoing education and awareness-building efforts are essential to combat misinformation and empower communities to adopt sustainable practices.

"Outreach can also include ways to combat misinformation... We need to celebrate the good work being done."

- **Resource Accessibility:** Addressing financial and logistical barriers to sustainable living practices that are promoted to individuals who want to take climate action, such as access to zero-emission transportation and affordable energy solutions, is critical for fostering resilience.

"Not everyone is tech savvy, sometimes people prefer a text link, or by flyer or paper."

4 COMMUNITY MEETINGS

The first phase of community meetings for the Napa County RCAAP were held in two sessions: (1) an in-person meeting was held on July 24, 2024 at the Yountville Community Center, and (2) a virtual meeting was hosted via Zoom on July 30, 2024. Both meetings covered the same topics and conducted similar activities to provide the community with multiple opportunities to engage. The in-person meeting was attended by 31 people and the virtual meeting was attended by 22. Each session followed a similar format, beginning with a presentation followed by a group activity. The presentation included a welcome and introductions, an overview of the RCAAP, information on climate vulnerabilities and the greenhouse gas (GHG) inventory, a strategy overview, and Q&A. After the presentation, a group activity was conducted to gather feedback on Napa Region's strengths and vulnerabilities around four key topics: infrastructure vulnerabilities, societal vulnerabilities, environmental vulnerabilities, and community strengths.

Primary topics of concern, based on attendee input during the activity, included:

- Lack of accessible and efficient public transit, and limited charging infrastructure for electric vehicles
- Extreme weather impacts on public health, especially for vulnerable populations
- Wildfire risks and related air quality issues
- Water supply concerns, including drought impacts and well water vulnerabilities
- Energy efficiency and affordability issues in buildings
- Limited access to parks, green spaces, and community gardens

The following summary provides more details on the information presented and attendee feedback received during the community meetings. This feedback will be used to ground truth strategy development and ensure alignment with community values.

4.1 WELCOME, INTRODUCTIONS, AND AGENDA REVIEW

Both meetings began with welcoming remarks to all participants, followed by an introduction of the agenda, project team roles, and meeting purpose before transitioning into the RCAAP overview portion of the presentation.

The workshop objectives were to:

- Educate participants about the RCAAP and work completed to date.
- Foster transparency and collaboration between Napa County residents and local jurisdictions involved in the RCAAP.
- Encourage the public to become familiar with the RCAAP's methods, timelines, and approaches.

- Offer an avenue for community input and share how it will be integrated into the planning process.
- Obtain community insights to inform actionable strategies that resonate with community values.

4.2 OVERVIEW OF THE NAPA RCAAP PROCESS

An overview of the Napa RCAAP was shared to provide foundational knowledge. This included definitions of key terms, a general description of what a climate action plan is, key jurisdictions involved, clarity on mitigation and adaptation, and the purpose of the RCAAP.

The purpose of the RCAAP is to:

- Develop a roadmap for reducing GHG emissions
- Identify existing and projected GHG emissions
- Set GHG reduction targets
- Establish policies and actions to meet reduction targets
- Integrate climate adaptation and resilience strategies
- Engage community members

The RCAAP is a multi-jurisdictional effort that includes the County of Napa, the Cities of American Canyon, Calistoga, Napa, St. Helena, and the Town of Yountville. By collaborating with Napa County and City staff, residents, businesses, and local organizations, the RCAAP will outline an implementation program to meet GHG emissions reduction goals and enact strategies to ensure climate change resiliency.

4.3 CLIMATE VULNERABILITY

At both meetings, Erik de Kok, Ascent's Project Manager, explained how climate change is affecting the Napa Region, as described in the Vulnerability Assessment prepared for the project. To illustrate these points, photos and examples of previous climate impacts experienced by the region were shared. Climate change impacts discussed included:

- Increased Temperatures and Extreme Heat
- Drought and Water Supply Issues
- Increased Wildfire Risk and Smoke Impacts
- Extreme Precipitation, Sea Level Rise, and Flooding
- Strain on Infrastructure and Energy Grid Resilience

Exercises were developed to gather feedback from attendees about the climate impacts presented. At the July 24 in-person meeting, an activity was posted at the entrance as attendees

arrived. Attendees were given three sticky dots to vote on the climate impacts they felt were of most concern. The results of the activity were:

- Increased Temperatures and Extreme Heat: 22 dots
- Drought and Water Supply Issues: 15 dots
- Increased Wildfire Risk and Smoke Impacts: 14 dots
- Strain on Infrastructure and Energy Grid Resilience: 11 dots
- Extreme Precipitation, Sea Level Rise, and Flooding: 3 dots

The July 30 virtual meeting had a similar exercise, but it was conducted virtually using Slido instead. Attendees were asked to vote for one impact on the screen that they felt was of most concern. 17 votes were captured, and the results were:

- Increased Temperatures and Extreme Heat: 5 votes
- Drought and Water Supply Issues: 2 votes
- Increased Wildfire Risk and Smoke Impacts: 9 votes
- Strain on Infrastructure and Energy Grid Resilience: 1 vote
- Extreme Precipitation, Sea Level Rise, and Flooding: 0 votes
- Other: 0 votes

4.4 GHG EMISSIONS INVENTORY

Erik presented on the 2019 GHG Emissions Inventory, helping define atmospheric gases and their global warming potential, the inventory boundary, and emissions sectors. These sectors include on-road transportation, building energy, solid waste, off-road equipment, agriculture, wastewater, and imported water.

4.5 GHG STRATEGY OVERVIEW

Erik also provided an overview of the GHG strategy focus areas to introduce preliminary strategies being considered in the RCAAP. Co-benefits communities were highlighted to demonstrate the potential positive impacts of these strategies. The presentation aimed to provide a brief introduction to support group activity conversations and encourage attendance at the CAC meetings, where more time was dedicated to discussing strategies in depth. The focus areas introduced during both meetings included building energy, transportation, water and solid waste, and agriculture and open space.

4.6 Q&A

After the presentation, attendees had the opportunity to ask questions. Both Ascent and Napa County and City staff provided answers. Ascent addressed technical questions, while County and City staff answered questions related to local jurisdiction operations. Key themes and issues raised during this portion of the meeting included:

- Concerns about short-lived climate pollutants like methane and black carbon. Some questioned the exclusion of black carbon from the inventory presentation, while others felt that incorrect global-warming potential values were used for methane.
- The importance of understanding the "cost of inaction" was emphasized by participants.
- Attendees requested clarification on how large polluters are accounted for in the inventory, including those covered by the Cap-and-Trade Program regulations.
- Participants expressed high concern about wildfire risks and suggested reassessing the wildfire vulnerability rating in the Climate Vulnerability Assessment, as they felt it was too low.
- Concerns about the absence of a 2030 Climate Carbon Neutral deadline on the GHG measure timeline.

4.7 COMMUNITY VULNERABILITIES AND STRENGTHS ACTIVITY

The community meetings revealed consistent topics across both meetings, despite modifications to simplify the July 30 virtual meeting activity based on feedback from July 24 attendees. Participants highlighted the importance of enhancing access to community education programs and creating opportunities for resource sharing. They also stressed the need for improved public transit, greater accessibility to parks and green spaces, and better bike infrastructure to reduce car dependency. Concerns about extreme heat, air quality, and wildfire risks were prevalent, with many calling for better protection and resource allocation for vulnerable populations. Meeting attendees also mentioned the importance of energy efficiency in buildings, expanding renewable energy adoption, and addressing water conservation and well concerns. The activity also recognized several strengths, including the Vine Trail, local sustainability initiatives, and strong community organizations.

For the in-person meeting on July 24, participants were divided into four groups to further discuss infrastructural, societal, and environmental vulnerabilities and strengths within the Napa Region. Within the groups, participants were presented with local features (e.g., roads, buildings, public transit, tourism, public health, recreation) and asked the following questions:

1. How does the feature impact public health and safety?
2. How will climate change affect the feature? Consider heat, flooding, drought, and wildfires.
3. Are there equity concerns? Which communities are most vulnerable?

4. What kinds of resources or support are needed to overcome challenges?

For the virtual meeting on July 30, participants were divided into three groups to discuss revised and more focused questions that also generated input on infrastructural, societal, and environmental vulnerabilities and strengths of features within the Napa Region. The questions included:

1. What concerns do you have about each features ability to reduce GHG emissions or adapt to climate change impacts such as extreme heat, flooding, drought, and wildfire

2. What resources or support are needed to address these concerns?

Topics discussed in each of the breakout groups for both in-person and virtual community meetings are listed below. Topics bolded were mentioned multiple times across all breakout groups.

4.8 IN-PERSON COMMUNITY MEETING (7.24.24)

Breakout Group #1

- Infrastructure Vulnerabilities
  - Indoor air quality is a concern, especially with gas appliances.
  - Need to promote public transit and its co-benefits – less time on the road, less opportunities for accidents, healthier air quality.
  - Low-income households can end up paying more for power and utilities.
  - **Lack of public transit accessibility.**
  - Need more money and resources to address infrastructure vulnerabilities, in general.
  - **Need to retrofit buildings to become more energy efficient and cool**.
- Societal Vulnerabilities
  - **Extreme heat can impact public health – especially vulnerable populations.**
  - Properties are not insurable due to climate risks.
- Environmental Vulnerabilities
  - Need more protection for urban and rural ecosystems.
  - **Need more urban access to public parks for shade, air quality, mental health reasons.**
  - Need more resilient and native tree and plant species.
  - Need to further implement the CWPP.

- Community Strengths
  - **Vine Trail expansion.**
  - Flood control projects.
  - Napa County Fire & Firewise focused on wildfire mitigation.
  - Sustainability culture within the county.

Breakout Group #2

- Infrastructure Vulnerabilities
  - **Public transit needs to be more accessible and desirable – more frequent service, improved connectivity, more shade amenities at stops.**
  - Need more walkable streets
  - Need more EV charging infrastructure at public spaces and multi-family housing.
  - More local solar arrays; PG&E needs to collaborate to reduce costs.
  - **Need more graywater, recycled water, water collection capabilities.**
- Societal Vulnerabilities
  - **More community gardens needed so people can access fresh local food.**
  - **Need more sustainable agricultural practices.**
  - Need more mental health services for children.
  - **Unhoused and low-income populations – hit hardest by climate change.**
  - **Tourism is extremely vulnerable to climate hazards, which in turn means tax revenue to support local government is vulnerable**
  - Need to be mindful of the balance of needing tourists while also not letting them overrun our resources.
- Environmental Vulnerabilities
  - Need a better understanding of where we should protect from development to prevent unintended consequences to water quality, wildfire risk, etc.
  - **Need more parks!**
  - Increase in temperature will impact biodiversity.
- Community Strengths
  - **Vine Trail provides safe places to bike.**
  - **Curbside composting program.**
  - **River restoration and improved relationship to the River as an asset**
  - Earth Day is a popular event that people can count on for sustainable messaging.
  - Climate change is becoming more "accepted" across the county; less deniers.

Breakout Group #3

- Infrastructure Vulnerabilities
  - Volatiles off building materials
  - Economic impact of fire on buildings
  - Insurance affordability
  - Electric vulnerability
  - Lack of bike paths and safe routes
  - Run off pollutants and plastics
  - Roads led to urban heat island
  - **Cooler pavement and trees needed**
- Societal Vulnerabilities
  - **Mental health impacts and safety concerns for those vulnerable**
  - **Air pollution impacts and worsens asthma in children**
  - Shaded needed for play structures and parks where kids play
  - Advocacy for kids and elderly
  - Ag workers work in extreme head conditions
  - Long term viability of grape growing
  - Exploring effective crop types that survive in extreme conditions
- Environmental Vulnerabilities
  - Multifamily houses near pollution sources
  - Ag practices are too close to sensitive populations
  - **Groundwater concerns/there are populations who rely exclusively on wells**
  - More maintenance of parks and recreational areas is needed
  - Consider nature-based solutions
  - Protect corridor
  - Extreme weather is impacts biodiversity
- Community Strengths
  - **Flood control project**
  - **Vine Trail**
  - **Napa Recycling and Waste Services (NRWS)**
  - Fire breaks
  - Napa Firewise
  - Gas station ban

- Bicycle Coalition
- Farmworkers Foundation
- **Napa RCD**
- Land Trust of Napa Co.
- Audubon Society
- Napa Climate Now
- Schools for climate action
- Parks and Open Space District
- Chipping program
- Climate Action Committee

Breakout Group #4

- Infrastructure Vulnerabilities
  - Mobile homes and parks need trees
  - **Napa buses are empty, encourage public transit use**
  - Shift towards locally owned/managed energy to address grid issues
  - Update a green building code to encourage shaded windows
  - Stop using black asphalt
  - South vs North Napa equity concerns about roads
  - Support multi-family housing
  - Decarbonize building and explore cool roof technology
  - **Well and access to water concerns in rural communities**
  - Install microgrid batteries and improve water storage so there is access to water
  - Wastewater treatment plans need to address concerns about sea level rise and flooding impacts.
- Societal Vulnerabilities
  - Develop wine and tourism industry to be more sustainable
  - Allow work from home and flexible hours to address traffic
  - Extend hours of cooling centers
  - Children and adults need more education around sustainability and climate change
  - Protect outside workers during heat waves and wildfires/smoke impacts
  - Heat can lower the quality of grapes
  - Educate migrant farmworkers

- Closing South Napa Middle school has displaced many low-income youth

- Environmental Vulnerabilities
  - Need more trash cans and clean ups
  - Seek funding from California Climate Action Corps and UC Ag Extensions
  - Poor air quality in South Napa
  - Replace government building landscape with native and drought tolerant plants
  - Address fire damage by removing burned trees and reforesting
  - Promote habitat preservation
  - Increase wild space and gardens for pollination
  - Cars near school sites contributes to local air pollution
  - Consider connectivity of natural resources
  - **More accessible cool spaces like parks**
  - Trails and accessible nature are needed in Lake Berryessa communities
  - Develop a Nature Community Conservation Plan
  - **Concerns about Black Carbon from Wildfires**
  - Water quality and access concerns in low-income communities
- Community Strengths
  - Napa is innovative
  - Great elected and staff
  - Volunteer fire department
  - Farmers markers
  - Napa RCD
  - Napa Farmworkers Foundation
  - Connolly Ranch
  - Land Trust Napa County
  - Lake Hennessey
  - **Vine Trail**
  - Open Space District
  - Community fire abatement resources
  - Great parks

4.9 VIRTUAL COMMUNITY MEETING (7.30.24)

Breakout Room #1

- Infrastructure Vulnerabilities
  - Napa County is car-focused, lacks mobility options.
  - **There needs to be a change in transportation culture; more focus is needed on active transportation infrastructure (e.g., bike facilities).**
  - Need denser and more mixed-use development to encourage multimodal transportation.
  - **High energy bills; need more energy efficiency in buildings.**
  - Need incentive/rebate opportunities for building retrofits.
  - Need to electrify building stock.
  - Investment in microgrids is needed to provide more redundancy/resiliency to power supply.
  - Adequate water supply and well water concerns, lack of water replenishment.
  - More emphasis needed on nature based solutions for the variety of co-benefits they offer.
- Societal Vulnerabilities
  - Emergency services can be expensive.
  - Climate change may move people out of the region, which will impact tax revenue.
  - **Smoke/extreme heat could negatively affect tourism which in turn affects tax revenue.**
  - For those who can't afford a gym and need outdoor spaces for exercise, it may become less accessible due to extreme heat.
  - Need more recreation access for those who have mobility issues; need more infrastructure for those with disabilities (in general).
  - Food may become more unaffordable as climate change worsens.
  - Agriculture will need to adapt to remain resilient (e.g., agriculture practices, crop mixes).
  - **Pilot community gardens; dedicate more land to local food production.**
- Environmental Vulnerabilities
  - Wildfires will continue to impact water and air quality; children are especially vulnerable to poor air quality.
  - **Need greater park accessibility; promote residential density nearby parks.**
  - "Safe Routes to Schools"

- Community Strengths
  - Various flood control projects.
  - There are a few protected bike lanes.
  - Strong waste/recycling programs.
  - More governmental entities focused on climate change.
  - Strong presence of community-based organizations (e.g., food bank, Napa RCD, non-profits).
  - **Successful river restoration work.**
  - **Vine Trail**

Breakout Room #2

- Infrastructure Vulnerabilities
  - Many houses without air conditioning or air purification, which are needed to protect from extreme heat and wildfire smoke; related cost barriers.
  - There are frequent landslides that disrupt roadways.
  - Difficult to communicate with PG&E when there are concerns.
  - Droughts can affect wells and well water.
  - Sea level rise a concern in American Canyon; industrial areas may be inundated.
  - Wildfire evacuations negatively affect schooling.
  - Need to promote more "cool roofs."
  - Integrate future climate projections into infrastructure improvements.
  - **Build out a more redundant water supply that conserves water; focus on rainwater catchment and water recycling systems.**
- Societal Vulnerabilities
  - Many people unable to evacuate during emergencies.
  - Not a large or diversified labor pool within the county; vulnerable to climate change.
  - **Extreme heat and wildfire smoke discourages tourism.**
  - Need plans to provide food for families during hazard events; many children rely on schools for food, but if they're closed, it's problematic.
  - One hospital is located in a high wildfire risk area.
  - Quality of wine is reduced from extreme heat.
  - **Need support for the most vulnerable people.**

- Environmental Vulnerabilities
  - Low-income neighborhoods have less access to tree canopy; environmental justice concern.
  - **Access to parks and recreation can be a lifeline for some communities; need more.**
  - Natural landscapes vulnerable to climate change; need more wetlands.
  - **Need more tree canopy, but need to do it responsibly to not increase wildfire risk.**
  - Need more fuel breaks that could serve as wildlife corridors (while also reducing wildfire risk).
- Community Strengths
  - **Vine Trail**
  - MCE doing great work with EV chargers and providing incentives.
  - Renewable energy at municipal facilities in American Canyon.
  - Lots of "thoughtful" development that emphasizes beauty.
  - Anaerobic digesters in Yountville.
  - Solar capabilities at schools.
  - **Composting is deeply engrained within the County ("a way of life").**
  - **Residents are extremely involved; strong community connections.**
  - Latinx outreach is improving.
  - Great school system and lots of playgrounds.
  - Land Trust of Napa County
  - Napa Green sustainability group.
  - **American Canyon wetland restoration.**

Breakout Room #3

- Infrastructure Vulnerabilities
  - Hard to understand MCE's plan options (for power).
  - Housing development in FHSZs.
  - Artificial turf can exacerbate heat island effect; need to ban it.
  - **Not a bike or pedestrian friendly county, overall.**
  - **Too many "hot surfaces;" need more cooling infrastructure (e.g., green roofs, cool pavement).**
  - Power line undergrounding is too costly of a wildfire solution; need more cost-effective options.

- Not enough sidewalks.
- Need more public transit options; make it more accessible and desirable to use.
- Need more permeable surfaces/green infrastructure.

- Societal Vulnerabilities
  - **Need more community gardens.**
  - Childcare availability is a big problem.
  - Challenges in reaching non-English speaking populations.
  - Outdoor workers/farmers exposed to extreme heat and wildfire smoke.
- Environmental Vulnerabilities
  - **Differing views on trees – benefits (heat reduction) vs. risks (wildfire)**
  - **Need greater park and recreation access.**
  - Droughts and over-extraction causing aquifer depletion – need to recharge.
  - **Need more momentum on water alternatives (graywater, recycled water).**
  - Knowledge deficit on nature/wildlife education.
- Community Strengths
  - **Compost programs**
  - Bike paths along Napa River
  - **Strong community institutions and organizations.**
  - Wetlands

5 PUBLIC DRAFT REVIEW PERIOD

The Draft RCAAP was available for public review and comment for 60 days, from August 1, 2025, to September 30, 2025. This review period provided community members, organizations, and other interested parties with multiple opportunities to review the draft plan and share their feedback.

During this period, the Draft RCAAP was accessible on the project website and promoted through social media, email updates, and direct outreach to community groups and organizations. Members of the public could submit input in several ways, including comments on the online draft document, email submissions, mailed letters, and in-person comments at community workshops and public hearings.

To maximize participation and transparency, the public review period included four open house workshops held across the county, public hearing presentations to each of the six participating jurisdictions' elected bodies, and ongoing engagement with the Climate Action Committee. The

following sections provide detailed summaries of engagement activities and input received during this critical phase of the RCAAP planning process.

5.1 WEBSITE AND ONLINE DOCUMENT REVIEW PLATFORM

Hosted on the Konveio platform, the project website served as the central hub for RCAAP information throughout the planning process, including hosting the Draft RCAAP during the public review period. Konveio's interactive tools supported collaborative review and strengthened public engagement with the planning document.

The Konveio platform enabled the public to engage directly with the Draft RCAAP through several features. Users could leave comments on specific pages, allowing for targeted feedback on sections, strategies, or content. All comments were visible to other users, promoting transparency and enabling community members to view and respond to each other's input. The platform also included a summary page with brief overviews and direct links to chapters and appendices, making it easy to navigate key sections without downloading the full document. An AI search feature helped users ask questions and obtain information and excerpts directly from the Draft RCAAP, and showed where they appeared in the document.

In addition to hosting the Draft RCAAP, the project website displayed all boards presented at the four open house workshops. These boards highlighted key topics, measures, and strategies discussed during the four in-person events. Although direct online engagement with the workshop boards was limited, the website provided an important way to make workshop content accessible to those unable to attend and served as a record of materials shared during the public review period.

5.2 PUBLIC INPUT METHODS

During the 60-day public review period, community members and organizations were invited to submit comments on the Draft RCAAP through multiple channels to ensure accessibility and accommodate different preferences for providing input.

- **Online Comments via Konveio** - Many commenters submitted feedback directly through the Konveio website, using the platform's page-level commenting feature to provide input on specific sections, strategies, or content within the Draft RCAAP. Comments were tied to particular pages, allowing for detailed, location-specific feedback. All comments submitted through Konveio were exported from the platform and compiled for review and response.
- **Email Submissions** - Comments were also accepted via email to the dedicated project inbox at RCAAP@countyofnapa.org. Email submissions came from individual community members, community-based organizations, and other interested parties. This method allowed commenters to provide more detailed feedback, attach supporting documents, or submit formal letters on behalf of organizations.

- **Mailed Comments** - Written comments submitted by mail were accepted throughout the review period. Mailed comments were primarily received from local organizations, providing an additional avenue for formal input on the Draft RCAAP.
- **Open House Workshop –** Four in-person open house workshops across Napa County presented high-level measures and actions on display boards, making Draft RCAAP concepts accessible for review and comment. Attendees provided feedback on post-it notes directly on the boards, enabling immediate dialogue, clarifying questions, and more informed input on plan strategies.

5.3 OPEN HOUSE WORKSHOPS

In August and September 2025, Napa County hosted four open house community workshops to inform the community about the Regional Climate Action and Adaptation Plan (RCAAP) and gather public feedback on summarized strategies and measures reflected in the Draft RCAAP. These workshops were held at the following locations:

- Yountville Community Center – August 20, 2025
- American Canyon Library – August 21, 2025
- Napa County Library, City of Napa – August 27, 2025
- Calistoga Community Center – September 17, 2025

5.3.1 Workshop Purpose

The workshops gave attendees an opportunity to review and comment on proposed greenhouse gas (GHG) reduction and climate adaptation measures across six focus areas: Building Energy, Transportation, Solid Waste, Water and Wastewater, Agriculture and Open Space, and Climate Adaptation Strategies. Participants learned about the draft plan's approach to reducing emissions and building climate resilience while providing input on specific measures. The overall purpose was to present Draft RCAAP concepts in a clear and accessible way while gathering meaningful feedback on community priorities and concerns.

5.3.2 Workshop Format

Each workshop was structured as an open house, allowing attendees to visit the four stations listed below at their own pace and in any order. Staff were posted at each station to answer questions and facilitate discussion.

- Station 1: Overview of the RCAAP, planning process, and key climate change concepts
- Station 2: GHG reduction strategies and measures
- Station 3: Climate adaptation strategies and measures
- Station 4: Local resources in Napa County and access to the Draft RCAAP platform

5.3.3 Feedback Activity

Stations 2 and 3 were the main components of the workshop, encouraging participants to share their input on strategies and measures using color-coded notes to convey sentiment. Green notes indicated strong support, yellow notes reflected conditional support with specific concerns or suggested modifications, and pink notes signaled opposition. All feedback was transcribed and organized by focus area, strategy, measure, sentiment, date, and comment.

The summary below provides an overview of key themes and feedback received during the community workshops. Bolded bullets indicate recurring input that was mentioned frequently by participants. This feedback will inform potential refinements to the RCAAP.

Building Energy
Building energy strategies received strong support overall, with participants emphasizing the importance of electrification, renewable energy adoption, and energy efficiency improvements. However, concerns emerged around implementation costs, equity considerations for low-income households, and the practicality of certain measures in Napa County's existing building stock and climate conditions.

Key Themes and Concerns
Solar Energy Support: Support for expanding solar installations across residential and commercial sectors.

- **Strong support for residential and commercial solar adoption with emphasis on making solar more accessible**
- Support for community solar programs and solar requirements for new construction to expand access beyond individual homeowners
- Questions raised about solar panel disposal and end-of-life recycling programs

Electrification and Implementation: General support for building electrification with questions about implementation approaches and feasibility in existing buildings.

- Support for building electrification strategies and all-electric requirements for new construction
- Questions about whether measures would be mandatory or voluntary and need for clarity on timelines and phased approaches
- Concerns about retrofitting older buildings with structural limitations and complexity of upgrades in existing homes, mobile homes, and historic properties

Energy Efficiency and Building Performance: Support for improving overall building energy performance through comprehensive efficiency measures.

- **Support for energy efficiency programs, building performance standards, weatherization programs, and home energy audits**

- Recognition that insulation and air sealing must be addressed as foundational measures before other upgrades

Equity and Access: Participants emphasized the importance of equitable access to energy efficiency programs for all residents.

- **Strong support for programs accessible to all socioeconomic levels with targeted assistance for vulnerable populations**
- Concerns that renters lack control over building improvements made by landlords, limiting their ability to benefit

Cost and Affordability: Participants identified financial barriers as a major obstacle to adopting building energy measures.

- Support for rebates, incentives, and financial assistance programs to reduce prohibitive upfront costs
- Concerns that costs are prohibitive for many residents, especially those on fixed incomes

Heat Pump Feasibility: Mixed feedback on heat pump technology with significant concerns about performance in Napa's hot climate.

- Concerns that heat pumps use excessive energy for cooling during hot summer months, potentially increasing energy costs
- Questions about whether heat pump technology is appropriate for Napa County's climate conditions
- Comments that homes need proper insulation and air sealing before heat pump installation

Natural Gas Phase-Out: Opposition and concerns about eliminating natural gas from buildings, particularly for cooking.

- Opposition to eliminating natural gas, with some preference for retaining gas stoves and cooking appliances
- Concerns about forced conversion, loss of consumer choice, and backup power during electrical outages

Transportation

Transportation strategies received strong support overall, particularly for expanding public transit, electric vehicle charging infrastructure, and bicycle and pedestrian facilities. Conditional support and concerns centered on ensuring equitable access for rural and low-income residents, addressing implementation challenges and costs, and the practicality of reducing vehicle miles traveled in Napa County's geography.

Key Themes and Concerns

Public Transit Expansion and Improvement: Strong support for expanding and improving public transit service throughout Napa County.

- **Strong support for expanding VINE bus service with increased frequency, extended hours, and more routes**
- **Support for improving transit connections between communities and employment centers**
- Support for transit access for farm workers and connections to vineyards and agricultural employment
- Concerns about feasibility of transit and questions about ridership levels, particularly in the unincorporated county and low-density areas

Electric Vehicle Charging Infrastructure: Widespread support for expanding EV charging station network with questions about placement and accessibility.

- **Strong support for expanding public EV charging stations throughout the county**
- Support for EV charging at workplaces, multi-family housing, and public destinations
- Questions about placement and ensuring equitable access to charging infrastructure

Active Transportation Infrastructure: Strong support for improving bicycle and pedestrian infrastructure for safety and accessibility.

- **Support for protected bike lanes, bike paths, and safe cycling infrastructure**
- **Support for improved sidewalks, crosswalks, and pedestrian infrastructure**
- Support for e-bike programs and micromobility options
- Concerns about bicycle and pedestrian safety on high-speed roads and need for traffic calming measures

Equity and Rural Access: Concerns about ensuring transportation options serve all residents, particularly in rural and low-income communities.

- Support for ensuring transportation equity and access for low-income residents, farm workers, and elderly populations
- Concerns that the strategies do not sufficiently address transportation challenges in rural and low-density areas, including access to transit and alternative travel options

Electric Vehicle Incentives and Affordability: Support for financial incentives with concerns about EV affordability.

- Support for rebates and incentives to make electric vehicles more affordable
- Concerns that EVs remain unaffordable for many residents even with incentives
- Need for targeted incentives and support for low-income households

Solid Waste

Solid waste strategies received strong support, with enthusiasm for expanding composting programs, improving waste education, and promoting waste reduction. Concerns centered on the need for better enforcement, adequate infrastructure for organics collection, and ensuring programs are accessible and easy to use for all residents.

Key Themes and Concerns

Composting and Organics Diversion: Strong support for expanding composting programs and food waste collection throughout the county.

- **Strong support for expanding residential and commercial composting programs**
- **Support for curbside organics collection and food waste diversion from landfills**
- Support for community composting sites and drop-off locations
- Questions about implementation timeline and accessibility in rural areas

Education and Outreach: Strong support for improving public education about waste reduction, recycling, and composting.

- **Support for education programs in schools to teach waste reduction and proper sorting**
- **Support for public awareness campaigns about recycling and composting**
- Support for clear signage and instructions at recycling/composting locations
- Need for education about what materials can be recycled or composted

Waste Reduction and Reusables: Support for strategies to reduce waste generation and promote reusable alternatives.

- **Support for reducing single-use plastics and promoting reusable containers**
- Support for reusable container programs at events and in businesses
- Support for "zero waste" initiatives and reducing overall waste generation
- Concerns about feasibility and consumer acceptance of reusable container programs

Landfill Diversion and Recycling: Support for strategies to maximize waste diversion from landfills through recycling and composting.

- **Support for maximizing landfill diversion and improving recycling programs**
- Support for construction and demolition waste diversion and salvage programs
- Recognition of importance of reducing methane emissions from landfills
- Support for mandating composting and recycling for businesses and multi-family housing
- Concerns about enforcement challenges and ensuring compliance with waste diversion requirements

Water and Wastewater

Water and wastewater strategies received strong support, with emphasis on expanding water conservation programs, increasing recycled water use, and promoting water-efficient landscaping. Concerns focused on the costs of infrastructure improvements, ensuring equitable access to conservation programs, and the feasibility of implementing water reuse systems.

Key Themes and Concerns

Water Conservation Programs and Efficiency: Strong support for comprehensive water conservation programs and efficiency measures.

- **Strong support for water conservation education and outreach programs**
- **Support for rebates and incentives for water-efficient appliances and fixtures**
- Support for water-wise landscaping programs and turf removal incentives
- Questions about effectiveness of voluntary conservation programs and need for enforcement

Recycled and Reclaimed Water Expansion: Strong support for expanding recycled water infrastructure and use.

- **Strong support for expanding recycled water infrastructure.**
- **Support for using recycled water for landscaping, irrigation, and industrial uses**
- Support for building out recycled water distribution to more areas
- Questions about costs of infrastructure expansion and timeline for implementation

Landscaping and Outdoor Water Use: Support for strategies to reduce outdoor water consumption through landscape changes.

- **Support for drought-tolerant and native plant landscaping**
- Support for turf removal programs and replacement with water-wise alternatives
- Support for efficient irrigation systems and smart controllers
- Questions about aesthetics and maintenance of drought-tolerant landscapes

Rainwater Capture and Stormwater Management: Support for rainwater harvesting and stormwater capture programs.

- Support for rainwater capture systems for residential and commercial properties
- Support for using captured stormwater for irrigation and groundwater recharge
- Support for green infrastructure and permeable surfaces

Infrastructure Improvements and Leak Reduction: Support for upgrading water infrastructure to reduce losses and improve efficiency.

- Support for fixing leaks in water distribution systems to reduce water loss

- Support for infrastructure upgrades to improve water system efficiency
- Questions about costs of infrastructure improvements and funding sources

Agriculture and Open Space

Agriculture and open space strategies received strong support for soil health improvements, carbon sequestration practices, and preserving agricultural lands. Concerns centered on the economic viability of implementing new practices, ensuring adequate technical and financial support for farmers, and balancing climate goals with agricultural productivity.

Key Themes and Concerns

Soil Health and Carbon Sequestration: Strong support for practices that improve soil health and sequester carbon in agricultural soils.

- **Strong support for composting, cover cropping, mulching, and practices that build soil organic matter**
- **Support for carbon sequestration in agricultural soils as a climate solution**
- Support for reducing tillage, no-till farming, and conservation agriculture practices
- Support for efficient irrigation and water management to improve soil moisture and health
- Questions about measurement and verification of carbon sequestration benefits

Tree Planting and Forest Management: Strong support for expanding tree planting and managing forests for carbon sequestration.

- **Support for planting trees on agricultural and open space lands for carbon storage**
- Support for forest management practices that enhance carbon storage and forest health
- Support for riparian restoration, windbreaks, and agroforestry systems
- Recognition of co-benefits including habitat, water quality, and erosion control

Open Space and Agricultural Land Preservation: Support for protecting agricultural lands and open spaces from development.

- **Support for preserving agricultural land and preventing conversion to development**
- Support for conservation easements and land protection programs to maintain working lands
- Recognition of importance of open space for climate resilience and ecosystem services

Regenerative Agriculture and Grazing Management: Support for regenerative agricultural approaches including improved grazing practices.

- **Support for regenerative agriculture practices that benefit both climate and soil health**
- Support for rotational grazing, managed grazing, and improved livestock management practices

- Support for integrating livestock with crop production and diversified farming systems
- Recognition that regenerative practices can improve long-term farm productivity and resilience

Education and Technical Assistance: Support for providing education and technical resources to farmers and ranchers.

- **Support for farmer and rancher education on sustainable and regenerative practices**
- Support for technical assistance, workshops, and resources to help implement new practices
- Need for demonstrated examples, case studies, and peer learning from local farms
- Support for extension services and expert guidance

Economic Viability and Financial Support: Concerns about costs of implementing agricultural practices and need for financial support.

- **Support for financial incentives, grants, and cost-share programs for farmers and ranchers**
- Concerns about economic burden on farmers and ranchers of implementing new practices without support
- Questions about whether practices are economically viable without significant subsidies or incentives
- Need to ensure practices don't reduce farm profitability or threaten agricultural viability

Climate Adaptation Measures

Climate adaptation strategies received feedback across six strategy focus areas. Participants emphasized the need for proactive planning, community education, infrastructure improvements, and measures to protect vulnerable populations from climate hazards, such as wildfires, drought, flooding, and extreme heat, while supporting grid resilience.

Key Themes and Concerns

Overall Climate Resilience: Support for building foundational climate resilience through education, preparedness, and coordinated planning, with some concerns about the effectiveness of voluntary approaches.

- **Support for climate education programs, raising awareness about climate risks and impacts, and educating the public about adaptation strategies**
- **Support for community emergency preparedness planning, response coordination, and building adaptive capacity across sectors**
- Support for cross-sector coordination, partnerships between agencies, and integrated planning approaches for climate resilience
- Support for protecting vulnerable populations, ensuring equitable access to adaptation resources, and prioritizing underserved communities

- Concerns about reliance on voluntary programs and questions about whether stronger requirements or mandates are needed

Adapt to Increased Wildfire Risks: Strong support for proactive wildfire risk reduction and community preparedness, with some concerns about potential air quality impacts from certain fire management practices.

- **Support for defensible space requirements, vegetation management around homes and communities, and clearing flammable materials**
- Support for fuel reduction projects, prescribed burns, forest thinning, and proactive forest management to reduce fire risk
- Support for community fire preparedness programs, evacuation planning, and ensuring residents know how to prepare for wildfires
- Support for protecting vulnerable communities from wildfire risks and ensuring equitable access to fire prevention resources and programs
- Concerns about prescribed burns and potential air quality impacts from smoke

Prepare for More Frequent Extreme Heat Events: Strong support for comprehensive heat protection focusing on vulnerable populations, urban cooling strategies, and workplace safety for outdoor workers.

- **Support for cooling centers, air-conditioned public spaces, shade structures, and heat refuges for vulnerable populations including elderly and low-income residents**
- **Support for urban greening, tree planting programs, increasing urban canopy, and creating shade to reduce urban heat island effects**
- Support for ensuring farm workers and outdoor workers have access to shade, water, heat protection measures, and resources during extreme heat
- Support for public education about heat risks, warning systems, and information about how to protect against extreme heat

Prepare for Extreme Precipitation, Flooding, and Sea-Level Rise: Strong support for nature-based and infrastructure solutions to manage flooding and protect at-risk communities from increased precipitation.

- **Support for green infrastructure, permeable surfaces, bioswales, rain gardens, and natural stormwater management solutions**
- Support for flood protection infrastructure, improving drainage systems, upgrading stormwater capacity, and managing increased runoff
- Support for wetland restoration, riparian buffers, and natural flood protection systems
- Support for protecting vulnerable communities from flooding impacts and ensuring flood preparedness in at-risk areas

Prepare for Drought Events: Strong support for multifaceted drought preparedness combining conservation, supply diversification, and sustainable water management across residential, agricultural, and groundwater systems.

- **Support for water conservation programs, public education about water use, drought-tolerant landscaping, and reducing overall water consumption**
- **Support for diversifying water supplies, expanding recycled water use, increasing water storage capacity, and developing alternative water sources**
- Support for water-efficient agriculture practices, improving irrigation efficiency, and helping farmers adapt to water scarcity
- Support for protecting groundwater resources, managing aquifer recharge, and ensuring sustainable groundwater management

Improve Energy Grid Resilience: Support for strengthening energy infrastructure to withstand climate impacts and ensure reliable power during emergencies, with questions about costs and implementation timelines.

- Support for grid improvements, modernizing infrastructure, undergrounding power lines, and hardening the grid against climate impacts
- Support for backup power systems, battery storage, microgrids for critical facilities, and ensuring power reliability during emergencies
- Support for distributed energy resources, renewable energy, and decentralized systems to improve overall grid resilience
- Questions about costs of grid improvements, funding sources, and timeline for implementation

5.4 PUBLIC COMMENT SUMMARY AND STATISTICS

The Draft RCAAP received input from community members, local organizations, and interested parties throughout the 60-day public review period. Comments varied widely in scope and detail, from targeted feedback on specific strategies to comprehensive organizational letters addressing multiple plan components. In total, there were over 700 comments received on the Draft RCAAP. Broken down more granularly, there were over 450 comments received across four community open house events; 191 comments received through the online comment tool; and over 115 comments received through letters or via email.

5.5 SUMMARY OF PUBLIC COMMENT THEMES

Public comments received during the 60-day review period reflected a range of perspectives on the Draft RCAAP's approach to climate mitigation and adaptation. Feedback addressed both specific strategy details and broader questions about the plan's development, priorities, and regional coordination. This list below summarizes key themes from public input, organized by general areas of support and concern:

- **Areas of Support**:
  - Nature-based solutions.
  - Community solar programs and solar requirements for new construction to expand access beyond individual homeowners.
  - Programs accessible to all socioeconomic levels with targeted assistance for vulnerable populations.
  - Improving transit connections between communities and employment centers
  - Improved sidewalks, crosswalks, and pedestrian infrastructure.
  - Education programs in schools for waste reduction and proper sorting.
  - Carbon sequestration in agricultural soils as a climate solution.
  - Planting trees on agricultural and open space lands for carbon storage.
  - Farmer and rancher education on sustainable and regenerative practices.
  - Community emergency preparedness planning, response coordination, and building adaptive capacity across sectors.
  - Green infrastructure, permeable surfaces, bioswales, rain gardens, and natural stormwater management solutions.
  - Water conservation programs, public education about water use, drought-tolerant landscaping, and reducing overall water consumption.
- **Area of Concern**:
  - Account for current and ongoing sustainability and climate action efforts.
  - Wildfire and controlled burn effects on air quality and ghg emissions.
  - Economic impacts on residents – high cost to implement home upgrades.
  - Need for more implementation details – prioritization and funding.
  - Equity and affordability evaluation and considerations.
  - Questions about emissions estimates.
  - Need to engage vulnerable communities.
  - Work with tribes that have cultural and historic ties to the region.

6 PUBLIC HEARINGS AND OFFICIAL BODIES

Throughout RCAAP development, public hearings and formal presentations provided key opportunities for policy direction, interagency coordination, and community input. The Climate Action Committee served as the main coordinating body for the six jurisdictions, while public hearings brought the Draft RCAAP before each jurisdiction's elected officials for public feedback and deliberation.

6.1 CLIMATE ACTION COMMITTEE

The Climate Action Committee (CAC) is a collaborative effort among the six participating jurisdictions in Napa County, focusing on addressing climate change. The CAC includes representatives from the County of Napa, the Cities of American Canyon, Calistoga, Napa, and St. Helena, and the Town of Yountville. In 2019, these six jurisdictions made a joint commitment to address climate change through coordinated regional action. In 2020, they formally established the CAC to guide climate planning efforts across the region.

The CAC consists of two elected officials from each of the six participating jurisdictions. The committee is administered and staffed by Napa County, which provides technical support, meeting coordination, and continuity across the regional planning effort.

Throughout the RCAAP planning process, the CAC met monthly on the last Friday of each month. The CAC played a key role in coordinating across jurisdictions, reviewing technical work and community input, and providing guidance on plan development to support the RCAAP's regional planning objectives.

6.2 PRESENTATIONS TO ELECTED BODIES

During the 60-day public review period for the Draft RCAAP, presentations were provided to the elected bodies of each participating jurisdiction. These presentations raised awareness of the Draft RCAAP, outlined opportunities for public input, provided decision-makers with updates on the draft plan's content and next steps, and created space for discussion on the regional climate planning effort. Using existing public meeting platforms supported project visibility and helped keep elected officials informed about the Draft RCAAP process.

6.3 NEXT STEPS

Following RCAAP adoption, community engagement transitions from planning to implementation. The plan's success relies on continued participation from communities, businesses, organizations, and partners to help advance climate action and adaptation solutions across Napa County.

Implementation will include coordination across the six jurisdictions and collaboration with community groups, property owners, developers, and regional agencies. Regional coordination with partners will facilitate regular sharing of updates on progress, funding opportunities, resources, and ways to participate. Many RCAAP strategies are also directly connected to communities, programs, and incentives, making clear and accessible communication essential for equitable participation.

Engagement will build on relationships established during the planning process while continuing to intentionally expand and reach communities that have been historically underrepresented. As implementation unfolds, ongoing community input will continue to shape climate strategies that respond to local needs and reflect the priorities of Napa County's diverse communities.

Appendix B

Greenhouse Gas Inventory Memorandum

Photo Credit: City of American Canyon

Memo

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Sacramento, CA 95814
916.444.7301

Date: November 29, 2022

To: David Morrison and Deborah Elliott (County of Napa)

From: Honey Walters and Brenda Hom (Ascent Environmental, Inc.)

Subject: Final Napa County Regional 2019 Community Greenhouse Gas Inventory Update Summary

INTRODUCTION

This document includes a 2019 communitywide greenhouse gas (GHG) inventory update for the Napa County region (region), including the 2019 GHG inventories for each of the six jurisdictions: American Canyon, Calistoga, the City of Napa, St. Helena, Yountville, and the unincorporated areas of Napa County (Unincorporated County). GHG emissions are attributed to each jurisdiction based on whether the emissions occur within, or originate from activities in, their jurisdictional boundary. The update year of 2019 was selected because this was the latest year in which data were most complete and excludes data anomalies due to the COVID-19 pandemic starting in 2020, such as reduced transportation emissions from increase telecommuting. The 2019 regional GHG inventory is an update to the 2005 regional inventory that was performed in the 2009 *Napa Countywide Community Climate Action Framework* (Napa County Transportation & Planning Agency [NCTPA] 2009). This effort differs from the draft Napa County Climate Action Plan (Napa County CAP) completed in 2018, which focuses on activities and emissions from the Unincorporated County only (County of Napa 2018). Quantification of the 2019 regional GHG inventory update is based on the International Council for Local Environmental Initiatives (ICLEI) methodologies, specifically, the *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions* Version 1.2 (Community Protocol). In addition, to provide locally relevant emissions, additional protocols were used to refine certain sectors (e.g., agriculture, off-road equipment). Consistent with this protocol and past inventories, the community GHG inventories are divided into seven emissions sectors, or sources of emissions:

- Building Energy – Including electricity and natural gas consumption in residential and non-residential buildings.
- On-road transportation – Including on-road vehicles, such as passenger cars, trucks, and buses.
- Off-road equipment – Including off-road equipment, such as construction equipment, waterborne vessels, and lawn and garden equipment. Excludes agricultural equipment.
- Agriculture – Including livestock emission from enteric fermentation and manure management, off-road agricultural equipment, stationary diesel equipment (e.g., irrigation pumps), fertilizer and pesticide use, and residue burning.
- Solid waste – Including methane emissions from annual generation of solid waste and from waste accumulated in place at landfills inside the Napa region.
- Imported Water – Including water imported from outside of the Napa region.
- Wastewater – Including methane and nitrous oxide emissions from treatment of wastewater generated in the region.

The regional inventory update relies on the best available and most up-to-date data and calculation methodologies to provide a foundation upon which the County of Napa (County) can coordinate with the incorporated cities and town and other relevant stakeholders to plan and act to reduce regional GHG emissions. This approach differs somewhat from the approach used to develop the past inventories in the region. For example, the 2019 regional inventory includes water- and wastewater-related emissions, which were not included in the 2005 regional inventory. A comparison is provided for informational purposes only and uses an adjusted 2019 inventory, matching the basic assumptions and range of emissions sources of the 2005 inventory, to provide a direct comparison.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of five parts:

- Section 1: **Regional Inventory Boundary** summarizes the scope of the inventory evaluated for the region.
- Section 2: **Summary of Inventory Results by Sector** summarizes the 2019 regional GHG emissions inventory and provides a comparison of 2019 emissions with past inventories from 2005 and 2014 by sector, including any differences in methodology and data.
- Section 3: **Summary of Inventory Results by Jurisdiction** summarizes the 2019 regional GHG emissions inventory by each jurisdiction, including insights into the reasons for any differences in methodology and data.
- Section 4: **Comparison with the 2005 Regional Inventory** compares the 2019 regional GHG emissions inventory to the 2005 regional inventory, adjusting for methodological differences.
- Section 5: **Data, Methods, and Assumptions** presents the methods and data used to develop the 2019 inventory. This includes details on what sources the inventory includes and excludes.

REGIONAL INVENTORY BOUNDARY

The inventory aims to estimate GHG emissions from sources within the six jurisdictions in the region, namely American Canyon, Calistoga, Napa, Saint Helena, Yountville, and Unincorporated. This inventory quantifies three main GHGs: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Other GHGs, such as hydrofluorocarbons and other short-lived climate pollutants, will be addressed in a separate memorandum. The region's inventory only includes emissions generated from sources and activities occurring within the boundaries of each jurisdiction; it does not account for GHG emissions generated from activities occurring outside of the respective jurisdiction, as a given jurisdiction does not have operational control of or authority over those sources.

Additionally, the regional inventory does not account for embedded or lifecycle GHG emissions. The regional inventory evaluates emissions using the production-based approach; therefore, the regional inventory does not consider the upstream emissions generated by the consumption of goods and services within the community.

The GHG emissions sectors and sources included and excluded in the region's 2019 community inventory are presented in Table 1 below. Table 1 identifies the protocol that provided the methodology for estimating GHG emissions from each emissions source. Emissions sources that identify multiple protocols used a combination of data and methods from those protocols. Fertilizer application and off-road vehicles and equipment calculations used methods consistent with Intergovernmental Panel on Climate Change (IPCC) and the Community Protocol but substituted locally specific data obtained from the California Air Resources Board (CARB). A detailed description of how each sector was quantified is discussed in Section 4.

Table 1 Summary of Sectors and Sources for the 2019 Napa County Regional GHG Inventory

Sector	Included	Excluded	Protocol(s)
Building Energy			
Electricity	Emissions associated with all electricity consumed within each jurisdiction	None	ICLEI
Natural Gas	Emissions from natural gas consumed within each jurisdiction	Emissions from propane and natural gas stationary source engines due to lack of readily variable data.	ICLEI
On-Road Transportation			
On-Road Transportation	Emissions from 100 percent of trips within each jurisdiction (internal-internal) and 50 percent of trips starting or ending outside each jurisdiction (internal-external and external-internal)	Emissions from 100 percent of pass-through trips starting and ending outside each jurisdiction (external-external)	ICLEI/ RTAC
Off-Road Equipment			
Off-Road Equipment	Emissions from off-road equipment within each jurisdiction	Emissions associated with aircraft operations were not included because they are outside of the control of the jurisdictions within the region. Entertainment equipment (e.g., filming equipment) were excluded due to its exclusion in CARB's OFFROAD2021 model, despite being included in the previous OFFROAD2007 model.	ICLEI/ CARB
Agriculture			
Livestock– Enteric Fermentation	Emissions from enteric fermentation from livestock within each jurisdiction	None	ICLEI
Livestock– Manure Management	Emissions associated with manure management practices within each jurisdiction	None	ICLEI
Fertilizer Application	Emissions associated with fertilizer use within each jurisdiction	Emissions associated with pesticide use within each jurisdiction.	CARB/ IPCC
Agricultural Off-Road Equipment	Emissions from agricultural off-road vehicles and equipment within each jurisdiction	None	ICLEI/ CARB
Agricultural Diesel Engines	Emissions from diesel fuel use for stationary engines (e.g., irrigation pumps) within each jurisdiction	None	CARB
Open Burning	None	No emissions from open burning of agricultural vegetative matter were reported for this year. Emissions from wildfires and prescribed forest fires are excluded as they occur apart from any jurisdictional control. This sector was not included in the 2005 inventory.[1]	None
Carbon storage and sequestration	None at this time	Emissions reductions or additions associated with changes to carbon sequestration or carbon storage rates in the region. These will be addressed in a separate memorandum.	

Sector	Included	Excluded	Protocol(s)
Solid Waste			
Community-Generated Solid Waste	Emissions from all waste generated by each jurisdiction	Emissions from waste generated outside of each jurisdiction but disposed of within the jurisdiction.	ICLEI
Waste-in-Place	Emissions from waste accumulated at landfills within each jurisdiction.	Emissions from waste accumulated at landfills outside each jurisdiction.	ICLEI
Wastewater Treatment			
Wastewater Treatment	Emissions associated with wastewater generated by each jurisdiction (including treatment in onsite septic systems and at centralized WWTPs)	Emissions from wastewater generated outside of each jurisdiction but treated within each jurisdiction (including treatment at centralized WWTPs)	ICLEI
Imported Water			
Imported Water	Emissions associated with imported water from outside the region	Disaggregated water usage-related emissions associated with each jurisdiction. These are assumed to be included in the building energy sector.	ICLEI

Notes: GHG = greenhouse gas; CARB = California Air Resources Board; ICLEI = ICLEI – Local Governments for Sustainability; VMT = vehicle miles traveled; RTAC = Regional Targets Advisory Committee; IPCC = Intergovernmental Panel on Climate Change; WWTP = wastewater treatment plant.

[1] Emissions from open burning are typically quantified using permit data obtained from the local air pollution control district (i.e., air quality management district), which specify the number of acres permitted for open burning operations. Bay Area Quality Management District (BAAQMD) only reported data for prescribed forest or open space burning. BAAQMD did not report any agricultural burning in Napa County in 2019.

Source: Ascent Environmental 2022.

SUMMARY OF INVENTORY RESULTS BY SECTOR

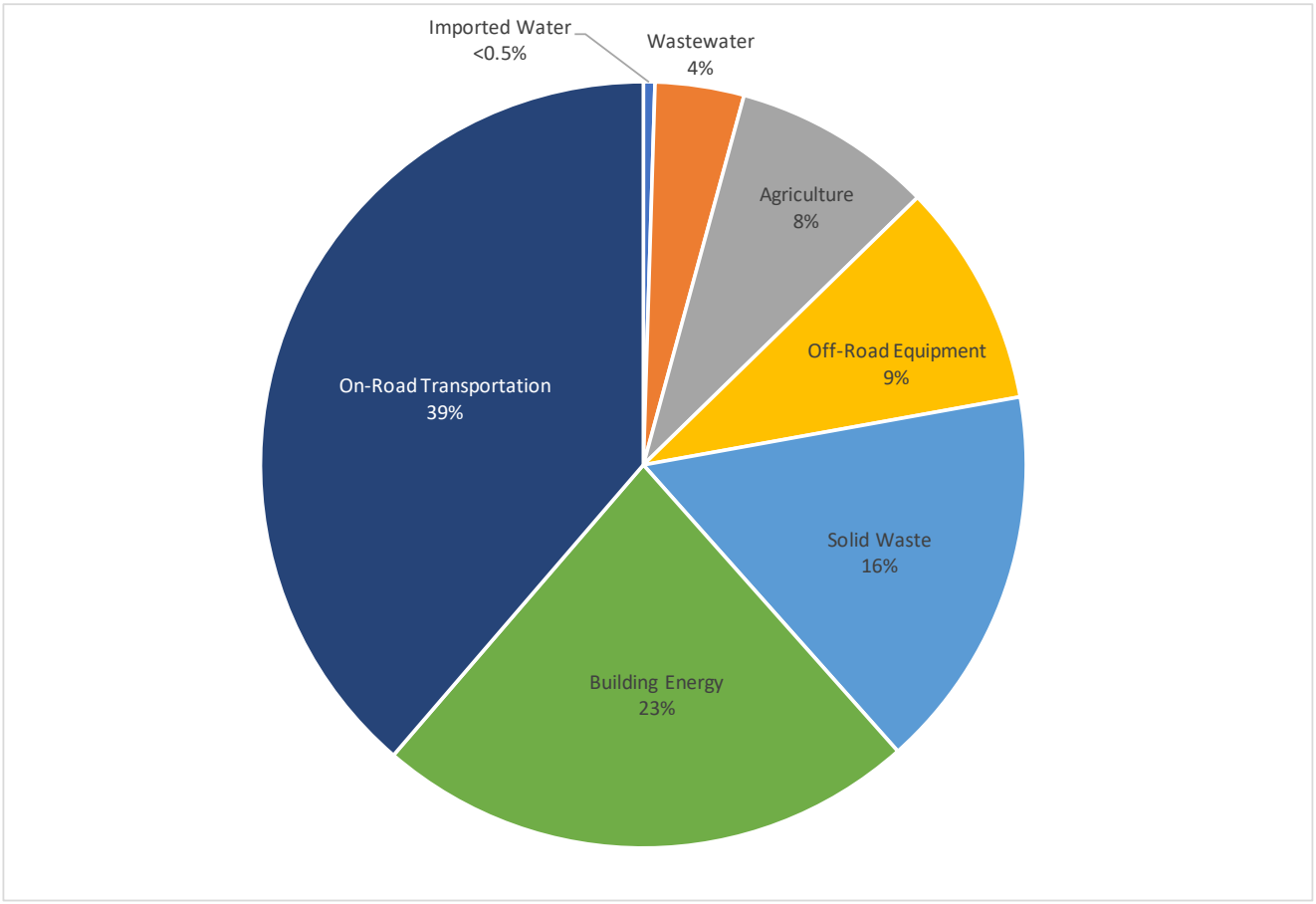
Based on the modeling conducted, the Napa County region generated approximately 1.2 million metric tons of carbon dioxide equivalents ($MTCO_2e$) in 2019. As shown in Figure 1, the top two emissions sectors in 2019 included on-road transportation (39 percent) and building energy use (23 percent), which together accounted for 62 percent of emissions in the region. Other sectors, include solid waste (16 percent), off-road equipment (9 percent), agriculture (8 percent), wastewater (4 percent), and imported water (0.5 percent). Emissions associated with water pumping within the region could not easily be disaggregated from 2019 electricity usage reports and thus, are included in the building energy sector. Table 2 details the emissions results from the 2019 GHG inventory update for the Napa County region. Attachment A presents the activity data used for each emissions sector. Emissions results by jurisdiction are addressed in Section 3. A comparison of emissions to the 2005 regional inventory is provided in Section 4. A detailed analysis of the background data and assumptions behind each individual sector is provided in Section 5.

Table 2 2019 Napa County Regional Greenhouse Gas Inventory by Sector ($MTCO_2e$/year)

Emissions Sector	2019 ($MTCO_2e$/year)	Percent of Total
On-Road Transportation	472,677	38.7%
Building Energy	279,592	22.9%
Solid Waste	198,862	16.3%
Off-Road Equipment	115,548	9.5%
Agriculture	103,381	8.5%
Wastewater	45,858	3.8%
Imported Water	5,943	0.5%
Total	1,221,861	100.0%

Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: Prepared by Ascent Environmental in 2022.



Source: Prepared by Ascent Environmental in 2022.

Figure 1 2019 Napa County Regional Greenhouse Gas Emissions Inventory by Emissions Sector

SUMMARY OF INVENTORY RESULTS BY JURISDICTION

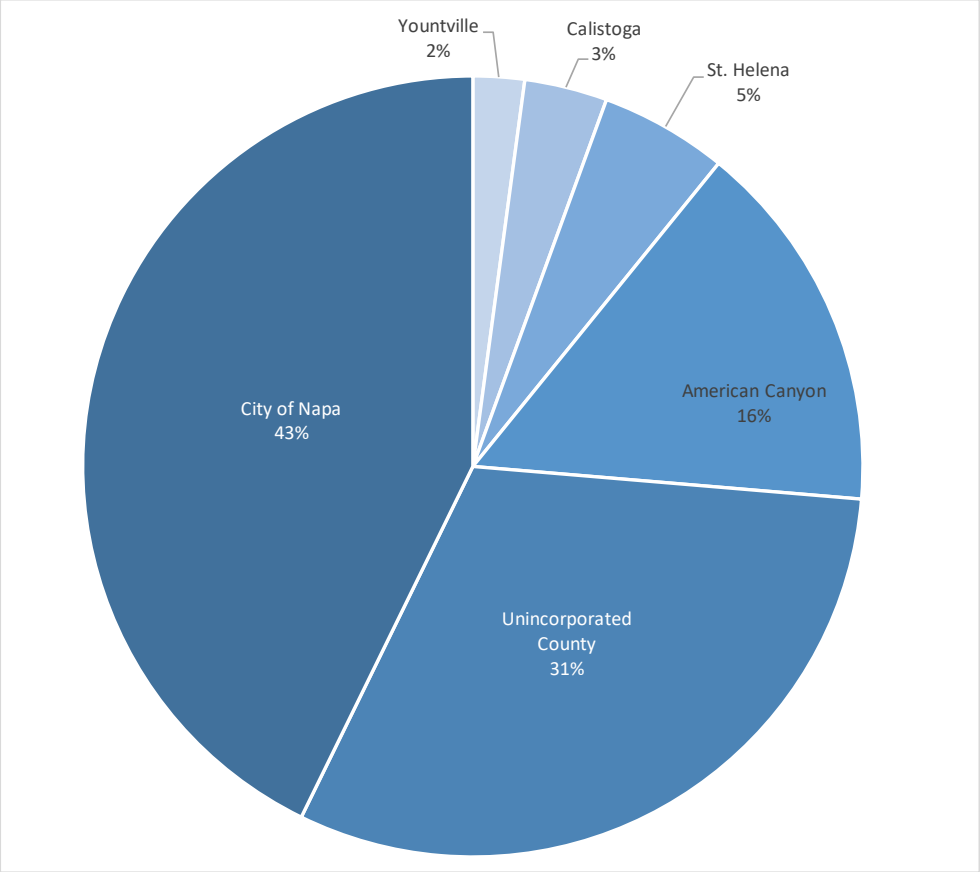
Across the six jurisdictions in the county, City of Napa accounted for 41 percent and the Unincorporated County accounted for 37 percent of emissions each in the region, for a total of 79 percent. American Canyon contributed 12 percent of the region's emissions; and St. Helena, Calistoga, and Yountville accounted for the remaining 9 percent. These results are shown in Figure 2 and Table 3.

Table 3 2019 Napa County Regional Greenhouse Gas Inventory by Jurisdiction ($MTCO_2e$/year)

Emissions Sector	2019 ($MTCO_2e$/year)	Percent of Total
City of Napa	522,363	43%
Unincorporated County	377,731	31%
American Canyon	189,156	15%
St. Helena	64,575	5%
Calistoga	41,990	3%
Yountville	26,047	2%
Total	1,221,861	100.0%

Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: Prepared by Ascent Environmental in 2022.



Source: Prepared by Ascent Environmental in 2022.

Figure 2 2019 Napa County Regional Greenhouse Gas Emissions Inventory by Jurisdiction

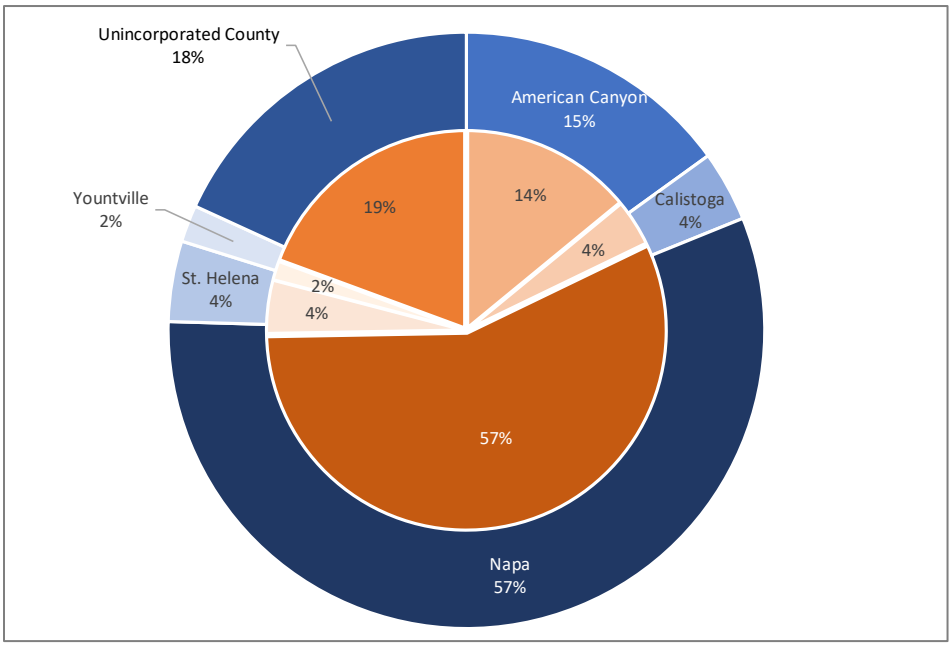
These results are consistent with the level of activity in each jurisdiction. Table 5 and Figures 4 and 6 show the breakdown of emissions by jurisdiction and emissions sector. Table 5 shows emissions normalized by population and employment. Figure 3 provides the population and employment by jurisdiction in 2019 to provide context.

Table 5 2019 Napa County Regional Greenhouse Gas Inventory by Jurisdiction and Sector ($MTCO_2e$/year)

Emissions Sector	American Canyon	Calistoga	Napa	St. Helena	Yountville	Unincorporated County	Total
On-Road Transportation	91,830	17,184	280,533	30,661	12,404	40,063	472,677
Building Energy	53,432	24,450	125,346	16,766	8,532	61,068	2279,592
Solid Waste	25,938	4,981	34,236	5,676	2,601	125,429	198,862
Off-Road Equipment	8,998	2,880	47,238	4,502	1,328	50,602	115,548
Agriculture	154	274	1,086	4,415	75	97,378	103,381
Wastewater	7,822	1,994	29,542	2,270	1,040	3,191	45,858
Imported Water	983	229	4,383	285	65	-	5,943
Total	189,156	41,990	522,363	64,575	26,047	377,731	1,221,861
Emissions per capita	9.0	7.9	6.6	10.6	9.3	15.1	8.8
Emissions per SP	7.0	5.1	4.0	5.4	6.7	6.8	5.2
Transportation Emissions per capita	2.5	2.7	1.6	2.8	3.1	2.4	2.0

Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year. SP = service population (population + jobs) (See Table 6).

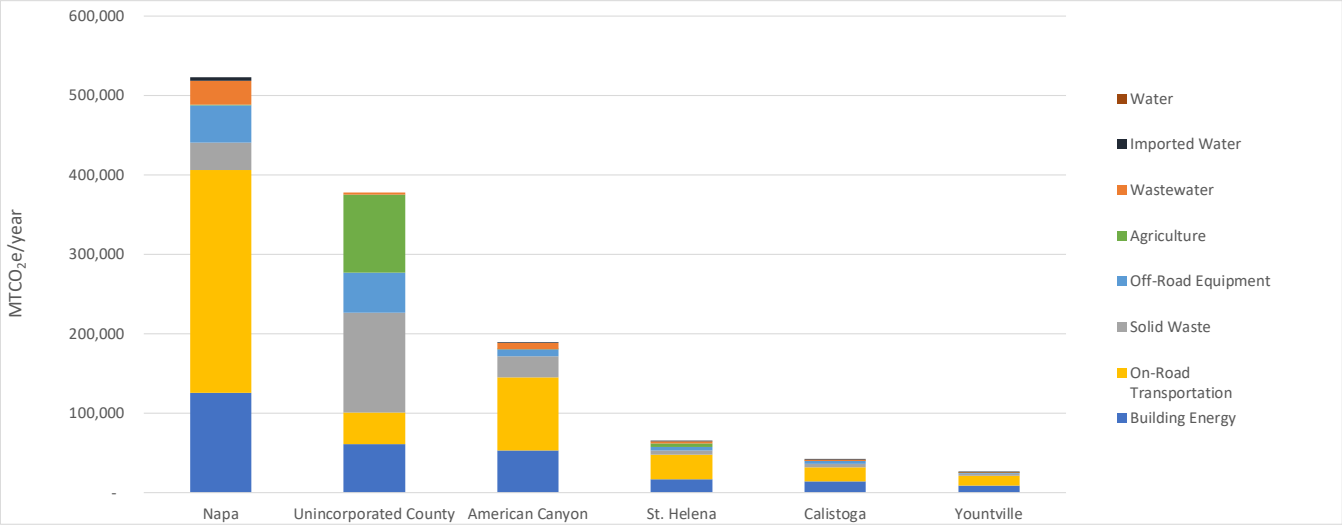
Source: Prepared by Ascent Environmental in 2022.



	American Canyon	Calistoga	Napa	St. Helena	Yountville	Unincorporated County	Total County
Jobs	10,000	2,700	40,500	3,100	1,100	13,800	71,200
Population	20,996	5,352	79,016	6,094	2,793	25,357	139,608

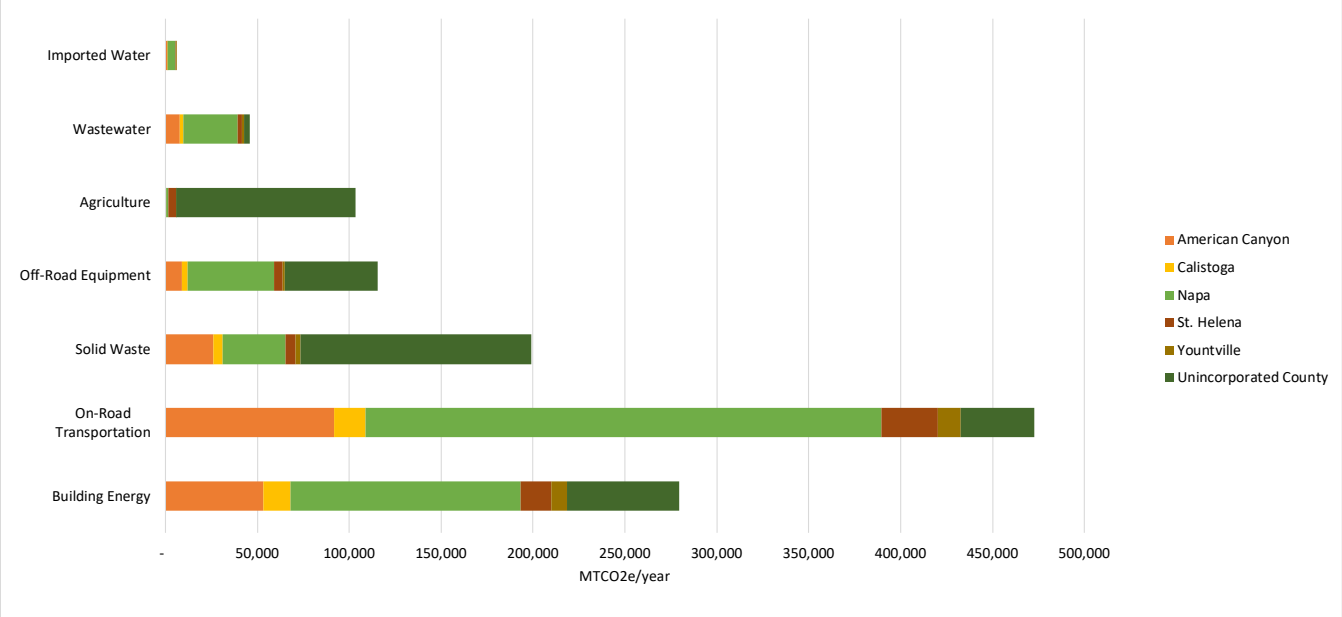
Source: Department of Finance (DOF) 2022, Employment Development Department (EDD) 2022.

Figure 3 2019 Napa County Regional Greenhouse Gas Emissions Inventory by Jurisdiction



Source: Prepared by Ascent Environmental in 2022.

Figure 4 2019 Napa County Regional Greenhouse Gas Emissions Inventory by Jurisdiction and Sector ($MTCO_2e$/year)



Source: Prepared by Ascent Environmental in 2022.

Figure 5 2019 Napa County Regional Greenhouse Gas Emissions Inventory by Sector and Jurisdiction ($MTCO_2e$/year)

As shown in Table 5 and Figure 4, emissions tend to be proportional to the level of economic activity in a jurisdiction (e.g., agricultural activity in the Unincorporated County, job and population centers in the City of Napa). For this reason, normalized emissions per capita and emissions per service population are also provided in Table 5, based on data available from Department of Finance (DOF) and the Employment Development Departments (EDD) and shown in Table 6. The region emitted 8.8 $MTCO_2e$ per capita per year in 2019. These normalized factors also show that Napa has the lowest GHG emissions per capita and per service population in the region (6.6 $MTCO_2e$ per capita); and St.

Helena has the highest GHG emissions per capita and service population (10.6 $MTCO_2e$ per capita) out of the incorporated jurisdictions. The Unincorporated County has the highest emissions per capita in the region (15.1.6 $MTCO_2e$ per capita), due mostly to the greater proportion of agricultural and industrial activity in that area against population.

HIGHLIGHTS BY JURISDICTION

Unincorporated County

The Unincorporated County emitted 377,731 $MTCO_2e$ in 2019 and has the highest emissions per capita (15.1 $MTCO_2e$/person/year) in the region. This is likely due two major reasons. First, the solid waste sector is understandably high with two large landfills located within the area. Second, winemaking and other agricultural adjacent activities are prevalent throughout the Unincorporated County, as evidenced by the large proportion of building energy-related and agricultural emissions attributable to the area (42 percent, combined) despite having a smaller population (shown in Figure 5). Building energy, agriculture, and solid waste accounted for 75 percent of the Unincorporated County's emissions in 2019. Emissions from solid waste, building energy, and agriculture overshadow emissions from on-road transportation, which only accounted for 11 percent of the area's emissions. Thus, the presence of solid waste landfills and high levels of agricultural activity contribute to the Unincorporated County's high emissions.

City of Napa

The City of Napa emitted higher emissions than the Unincorporated County in 2019 (522,363 $MTCO_2e$/year) and has lower emissions-per-capita (6.6 $MTCO_2e$/person/year). As the largest city in the region, the City of Napa is a major job and population center in the region, accounting for 57 percent of the jobs and population in the region in 2019, as shown in Figure 3. The City of Napa, thus, understandably accounts for the majority of the building energy and on-road transportation emissions in the region as jobs and population both generate vehicle trips through commuting and commerce. The city is also a major tourist destination with a prominent hospitality industry, further contributing to higher transportation and building emissions. The City of Napa accounted for 44 percent of regional building energy emissions and 59 percent of regional on-road transportation emissions. These two emissions sectors are also the largest sectors in the city's own inventory; building energy and on-road transportation accounted for 24 and 543 percent of the city's total emissions, respectively, for a total of 78 percent of the city's emissions in 2019, when rounded. As the population center, the City of Napa is also the largest emitter of wastewater emissions, accounting for 64 percent of total wastewater emissions.

American Canyon

American Canyon was the next largest emitter in the region, emitting 189,156 $MTCO_2e$/year in 2019 and with a slightly higher emissions-per-capita (9 $MTCO_2e$/person/year). American Canyon is the second largest city in the region but is about a quarter of the size of the City of Napa. Even so, American Canyon makes up about 19 percent of total on-road transportation emissions in the region. On-road transportation is also the largest sector in the city, accounting for 49percent of the city's emissions. This is possibly due to its location at the southern end of the county and subsequent proximity to other major job centers in the Bay Area, resulting in higher VMT associated with commuting.

St. Helena

St. Helena emitted 64,575 $MTCO_2e$/year in 2019, less than half of American Canyon's emissions in the same year. St. Helena accounted for 5 percent of the region's emissions. Despite this lower total emissions, St. Helena had the highest emissions-per-capita at 10.6 $MTCO_2e$/person/year. This could possibly be due to St. Helena's status as a major tourist destination. On-road transportation accounted for 47 percent of emissions generated by the city. As shown in Table 5, St. Helena has the highest transportation-related emissions per capita in the region, over 40

percent higher than the City of Napa. St. Helena is also the third smallest city in the region, with a population of 6,094.

Calistoga

Calistoga emitted 41,990 $MTCO_2e$/year in 2019, nearly half of St. Helena's emission in the same year. Calistoga only accounted for 3 percent of the region's emissions. Calistoga also had relatively low emissions per capita at 7.9 $MTCO_2e$/person/year despite it being the second smallest jurisdiction in the region with a population of 5,352. Its largest sectors were on-road transportation (41 percent) and building energy (34 percent), together accounting for 75 percent of the city's emissions.

Yountville

Yountville emitted 26,047 $MTCO_2e$/year in 2019 and only accounted for 2 percent of the region's emissions. Despite these low emissions, Yountville had the second highest emissions per capita at 9.3 $MTCO_2e$/person/year despite it being the smallest jurisdiction in the region with a population of 2,793. Like St. Helena, Yountville is also a major tourist destination, and a high proportion of its emissions are from on-road transportation (8 percent), which are nearly one and a half times that of emissions from building energy (33 percent). Together, on-road transportation and building energy accounted for 81 percent of the city's emissions.

COMPARISON WITH THE 2005 REGIONAL INVENTORY

The 2019 regional inventory updates a previous regional inventory conducted for the year 2005. However, due to differences in methodology and data sources, the following assumptions and data were adjusted to allow for a proper comparison between the two inventories. These adjustments are only to be considered for purposes of comparison with the 2005 inventory only. The formal results for the updated 2019 GHG inventory are presented in the previous three sections.

- The 2019 values were adjusted to the global warming potential (GWP) factors from IPCC's Second Assessment Report (SAR), consistent with the methodology used in the 2005 inventory (NCTPA 2009). This approach was necessary because the 2005 inventory did not make CH_4 and nitrous oxide (N_2O) emissions available for adjustment with newer GWP factors from IPCC's Sixth Assessment Report (AR6) (IPCC 2021).
- 2019 on-road transportation activity was modified to use vehicle miles travelled (VMT) from the California Department of Transportation's (Caltrans) Highway Performance Monitoring System (HPMS), the same source used in the 2005 inventory (Caltrans 2020). In contrast, the main 2019 inventory update is based on the Regional Targets Advisory Committee (RTAC) method, which accounts for VMT generated by the jurisdiction and excludes pass-through trips. Caltrans roadway VMT estimates are generally much higher than the RTAC method. Regional VMT data by origin and destination were not readily available for 2005. (See Section 4).
- Only sectors that were present and verifiable in the 2005 inventory were included in the comparison.
    - The comparison excludes water and wastewater emissions sectors evaluated in the 2019 inventory, but which were not included in the 2005 inventory.
    - Additionally, agricultural emissions are excluded. Although both the 2005 and 2019 inventories include an agricultural sector, the 2005 inventory did not specify how the agricultural emissions were derived. Without knowing the specific sub-sectors that were incorporated in the 2005 agricultural sector, a proper comparison could not be made between the two years.
    - Off-road equipment were modeled in 2005 using a much less sophisticated model (OFFROAD2007) compared to the one used for the 2019 inventory (OFFROAD2021). The 2005 offroad inventory consisted of lawn and garden equipment, industrial, and commercial equipment. 2019 includes all offroad

equipment types in CARB's OFFROAD2021 model, except agriculture. It is possible that the 2005 inventory included fewer vehicle types and lower activity overall than the 2019 inventory, but that is uncertain. Thus, off-road equipment emissions were excluded from this comparison.

After accounting for these adjustments, Table 6 and Figure 6 show the 2005 baseline inventory alongside the 2019 inventory, for comparison purposes only. Between 2005 and 2019, countywide emissions decreased by 27 percent. This decrease in emissions between 2005 and 2014 is due to a combination of factors including, but not limited to:

- Increased population, jobs, and visitors affecting increased activity levels (e.g., building energy use, vehicle travel).
- Greater reductions in energy emission factors and improvements in building energy efficiency (e.g., less polluting vehicles, building renovations, more renewables in the electricity portfolio).
- Adjustments in calculation methodologies (e.g., models, equations, and emission factors).
- Differences in data sources between the two inventories, including any changes in the way energy data were aggregated for the region.

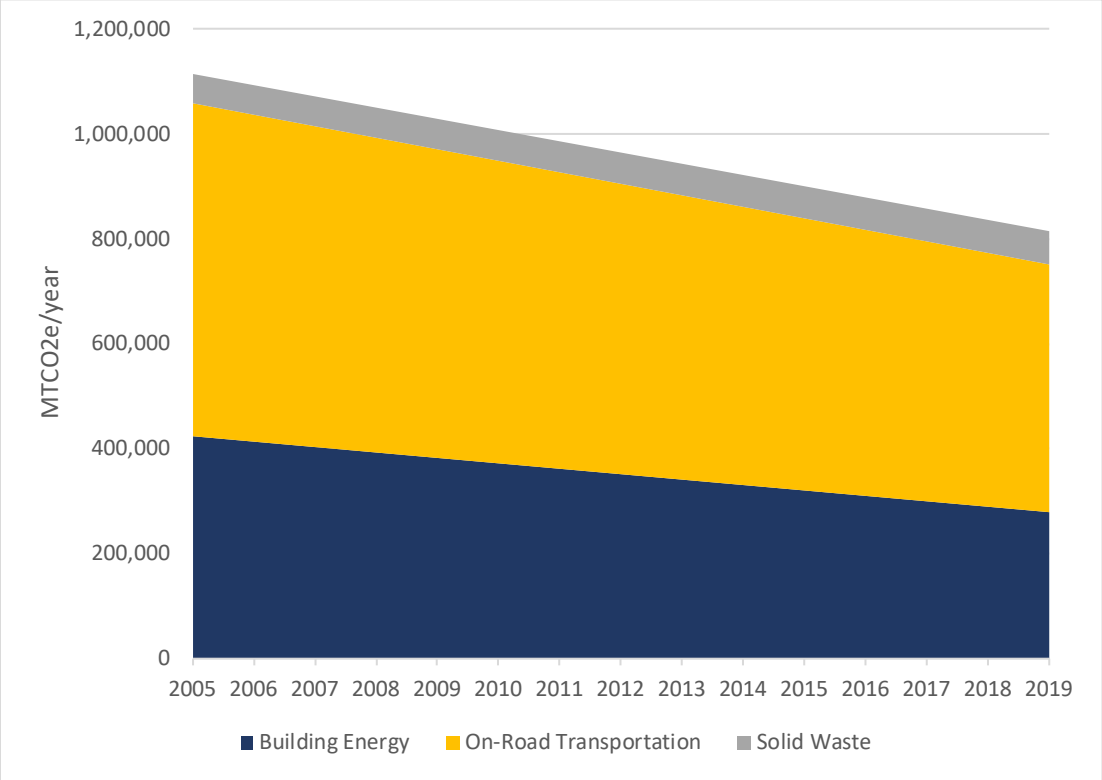
Table 6 Comparison of Napa County 2005 and 2019 Regional Greenhouse Gas Inventories by Sector (for comparison only) ($MTCO_2e$/year)

Emissions Sector	2005	2019	Percent Change	Primary Differences[1]
Building Energy	423,011	279,473	-34%	Reduced usage of both electric and natural gas. Decreased emission factors.
On-Road Transportation	636,724	471,259	-26%	Increases in regional VMT reported in Caltrans's HPMS data. Decreased in emissions pursuant to vehicle emissions standards.
Solid Waste	54,209	63,409	17%	Increased accumulation of waste in landfills.
Total	**1,113,944**	**814,141**	-27%	

Notes: The 2005 inventory did not include water and wastewater sectors. Therefore, for comparison purposes, those sectors are excluded from this comparison table. CARB = California Air Resources Board, VMT = vehicle miles travelled, HPMS = Highway Performance Monitoring System, RTAC = Regional Targets Advisory Committee.

[1] After adjusting the 2019 inventory to use GWP factors from IPCC's Second Assessment Report and other calculation methods.

Source: Prepared by Ascent Environmental in 2022. NCTPA 2009.



Note: Graph based on 2005 and 2019 emissions inventories. Emissions based on GWP factors using IPCC's Second Assessment Report. Emissions between 2005 and 2019 are interpolated. Excludes offroad, agriculture, water, and wastewater emissions. GWP = global warming potential, IPCC = Intergovernmental Panel on Climate Change.

Source: Prepared by Ascent Environmental in 2022.

Figure 6 Napa County Regional Greenhouse Gas Emissions Inventory from 2005 to 2019 (for comparison only)

As shown in Table 6 and Figure 6, the reductions in building energy and on-road transportation emissions together drive the overall reductions in emissions in the region. The on-road transportation sector continues to be the largest emissions sector in the region. These trends have been in contrast with population and job growth in the county. To provide context, between 2005 and 2019, the region's population increased by 7 percent and jobs increased by 4 percent, according to the DOF and EDD (DOF 2012, 2021; EDD 2022). Although both population and emissions increased in the region, the average GHG emissions per capita and per service population also decreased by 32 percent with the contribution of the state's renewable portfolio goals and expanded clean vehicle standards.

DATA, METHODS, AND ASSUMPTIONS

The basic calculation for estimating GHG emissions involves two primary inputs: activity data and emissions factors. Activity data refer to the relevant measurement of a community's activity resulting in emissions, and emissions factors represent the amount of a GHG emitted on a per unit of activity basis. Emissions factors are applied to activity data (i.e., the two values are multiplied together) to estimate GHG emissions. For example, in the residential energy sector, activity data of annual community electricity consumption in megawatt-hours (MWh) is multiplied by an emissions factor in pounds of GHG per MWh, which results in a pounds of GHG emissions value. This calculation-based methodology is used for estimating emissions from most sources in the region's inventory.

In addition to including new GHG emissions sectors and sources, the 2019 inventory update includes several changes to the data sources and emission factors used, along with changes in methods. These differences were necessary in cases where the original data sources used in the 2005 inventory were no longer available or have been updated. New methods that provide more accurate emissions estimates are available for sectors such as the on-road vehicles and solid waste sectors. The general approach used to estimate the region's 2019 GHG inventory is consistent with the latest guidance from the Community Protocol (ICLEI 2019). The calculations relied on activity data provided by each jurisdiction, sector-specific sources of information, and GWP factors from AR6 (IPCC 2021).

An overview of activity data and emissions factors for each emissions source, along with data sources, is shown in Table 8. Detailed methods are described in the following sections.

Table 8 2019 Napa County Regional GHG Inventory Summary of Activity Data and Emissions Factors

Sector/Source	Input Type	Description and Data Sources
Agriculture		
Livestock Management	Activity data	Livestock population data from the County of Napa Agricultural Commissioner's Office's 2019 Crop Report
	Emissions factor	Livestock-specific emissions factors from CARB, IPCC, and EPA
Fertilizer Application	Activity data	Fertilizer application data from CDFA's Fertilizer Tonnage Report 2019
	Emissions factor	Fertilizer emissions factors from IPCC 2006
Agricultural Equipment - Off-Road Equipment	Activity data	Off-road vehicles and equipment activity data and emissions factors from CARB's OFFROAD2021 model
	Emissions factor	
Agricultural Equipment – Diesel Engines	Activity data	Diesel-powered agricultural stationary engines (e.g., irrigation pumps) from BAAQMD permit data.
	Emissions factor	Napa County region-specific average emissions factor from CARB
On-Road Transportation		
On-Road Transportation	Activity data	Passenger VMT data from MTC's Regional Travel Demand Model via the VMT Data Portal. Commercial VMT from ratio of passenger to commercial VMT in CARB's EMFAC2021 model.
	Emissions factor	Napa County-specific emissions factors from CARB's EMFAC2021 model.
Building Energy		
Electricity	Activity data	Electricity consumption data from PG&E and MCE
	Emissions factor	MCE 2021 Impact Report
Natural Gas	Activity data	Natural gas consumption data from PG&E, supplemented by data from CEC for data not available due to the 15/15 rule[1].
	Emissions factor	Average emissions factors from TCR
Solid Waste		
Community-Generated Solid Waste	Activity data	Waste and ADC disposal data from the California Department of Resources Recycling and Recovery
	Emissions factor	Mixed municipal solid waste emissions factor from EPA
Waste-in-Place	Emissions Data	Direct methane and nitrous oxide fugitive emissions reports from in-boundary landfills from EPA.

Sector/Source	Input Type	Description and Data Sources
Off-Road Vehicles and Equipment		
Off-Road Vehicles and Equipment	Emissions Data	County-level off-road vehicles and equipment emissions data from CARB's OFFROAD2021 model
Wastewater Treatment		
Wastewater Treatment	Activity data	Population data in the region and population served by septic tanks
	Emissions factor	Emissions factors based on population-based factors for centralized wastewater treatment and septic systems from ICLEI
Water Supply		
Water Supply	Activity data	Water consumption data by source from each jurisdiction
	Emissions factor	Energy intensity factors from 2015 CPUC Water/Energy Cost-Effectiveness Analysis.

Notes: MTC = Metropolitan Transportation Commission; CARB = California Air Resources Board; CEC = California Energy Commission; CPUC = California Public Utilities Commission; EPA = U.S. Environmental Protection Agency; ICLEI = ICLEI – Local Governments for Sustainability; IPCC = Intergovernmental Panel on Climate Change; District; PG&E = Pacific Gas and Electric Company; MCE = Marin Clean Energy; TCR = The Climate Registry; VMT = vehicle miles traveled; ADC = alternative daily cover; BAAQMD = Bay Area Air Quality Management District; CEC = California Energy Commission

[1] For privacy reasons, the 15/15 rule pertains to the anonymization of customer energy use data in the case that the aggregated data consists of either less than 15 members or one of the members uses more than 15 percent of aggregated energy use (California Public Utilities Commission Decision No. 97-10-031).

Source: Ascent Environmental 2022.

Additionally, demographic data related to population, jobs, and housing in the unincorporated County were obtained from DOF and EDD (DOF 2021, EDD 2022).

Global Warming Potentials

GHG emissions other than CO_2 generally have a stronger insulating effect and thus, a greater ability to warm the Earth's atmosphere through the greenhouse effect. This effect is measured in terms of a pollutant's GWP factor. CO_2 has a GWP factor of one while all other GHGs have GWP factors measured in multiples of one relative to the GWP of CO_2. This conversion of non-CO_2 gases to one unit enables the reporting of all emissions in terms of carbon dioxide equivalent (CO_2e), which allows for the consideration of all gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to climate change. The standard unit for reporting emissions is $MTCO_2e$.

Consistent with the best available science, these inventories use GWP factors published in the Sixth Assessment Report from IPCC, where CH_4 and nitrous oxide (N_2O) have GWP factors of 27.9 and 273, respectively (IPCC 2021). These values represent the GWP of GHG on a 100-year time horizon. This means that CH_4 is approximately 28 times stronger than CO_2 and N_2O is 273 times stronger than CO_2 in their potential to warm Earth's atmosphere over the course of 100 years. In comparison, the SAR, used in the development of the 2005 inventory, reported GWP's of 21 and 310 for CH_4 and N_2O, respectively. The use of 100-year GWP values is consistent with CARB methods and reflects the long-term planning horizon of the CAP.

BUILDING ENERGY SECTOR

Based on GHG emissions modeling conducted, residential and non-residential building energy use in 2019 resulted in 279,592 $MTCO_2e$ in 2019. This sector comprised approximately 23 percent of the region's emissions, resulting in the largest emissions sector in the inventory. These emissions were a result of electricity and natural gas energy use at

buildings and facilities. The building energy sector consumed 926,660,844 megawatt-hours (MWh) of electricity and 39 million therms of natural gas. This estimate includes a negative credit for electricity consumption from electric vehicle charging to avoid double-counting with the on-road vehicle sector.

Marin Clean Energy (MCE), a community choice aggregation (CCA) program that offers additional renewable electricity options to northern Bay Area counties, began enrollment of customers in the region in 2015. Through automatic enrollment, customers are allowed to either increase their renewable mix for an additional fee or opt out of the program. Those opting out would have, by default, PG&E's resource mix (MCE 2015). In 2019, 85 percent of electricity use in the region was purchased from MCE, with 5 percent purchased from MCE's Deep Green option (Herrick, pers. comm., 2022). In this year, MCE customers had a 60 percent renewable mix and 90 percent GHG-free mix offered through their Light Green option and a 100 percent renewable mix through their Deep Green and Local Sol options (MCE 2022, MCE 2020a). According to MCE's Emissions Factor Certification report, Light Green power was estimated to have an emissions factor of 197 lb CO_2e/MWh (MCE 2020b). Combined with the 5 percent of customer purchased with Deep Green, the average MCE 2019 emissions factor was 187 lb CO_2e/MWh.

In 2019, 15 percent of electricity use in the region was purchased from PG&E. PG&E supplied its customers electricity with a renewable mix of 28.5 percent, with 1.5 percent from geothermal sources (which generate some GHGs) (California Energy Commission [CEC] 2020). 2019 was an anomalous year for PG&E in that the utility reported that the remaining 71.5 percent of electricity supplied in that year were from GHG-free sources, consisting of large hydroelectric and nuclear sources, for a total of 99 percent GHG-free sources for PG&E in 2019 (CEC 2020). For context, in 2018 and 2020, 15 to 16 percent of PG&E's electricity was generated from natural gas (CEC 2019, 2021). Based on the distribution of participation in MCE in the region in 2019, 99.5 percent of the region's electricity use was generated with GHG-free sources, resulting in a regional average emission factor of 21 lb CO_2e/MWh. This analysis is detailed in Table 9.

Table 9 2019 Napa County Regional Utility Participation (Percent of Electricity Use per Jurisdiction)

Jurisdiction	PG&E		MCE Light Green		MCE Deep Green	
	Electricity Use (MWh)	Percent of Electricity Use	Electricity Use (MWh)	Percent of Electricity Use	Electricity Use (MWh)	Percent of Electricity Use
American Canyon	26,616	25.6%	74,747	71.9%	2,582	2.5%
Calistoga	1,939	6.9%	25,980	92.7%	112	0.4%
Napa	64,494	17.4%	290,725	78.4%	15,462	4.2%
St. Helena	6,457	10.7%	39,121	65.1%	14,516	24.2%
Yountville	1,137	2.7%	30,644	74.0%	9,625	23.2%
Unincorporated County	37,411	11.6%	284,955	88.4%	138	0.0%
Total	138,054	14.9%	746,172	80.5%	42,435	4.6%

Notes: PG&E = Pacific Gas and Electric, MCE = Marin Clean Energy.

Source: Data compiled by Ascent Environmental in 2022 based on information provided by MCE (Herrick, pers. comm., 2022).

PG&E supplied the natural gas consumption in the region for 2019 through the Community Inventory reports request. However, some non-residential natural gas data was not available from PG&E due to the California Public Utilities Commission's (CPUC) 15/15 Rule, which, for privacy reasons prevents utilities from releasing energy consumption data for aggregated datasets where either there are less than 15 members, or one member makes up more than 15 percent of the aggregated consumption (CPUC Decision No. 97-10-031). In the case of the data requested from by PG&E, non-residential natural gas use was incomplete for American Canyon, Calistoga, and the Unincorporated County due to the 15/15 Rule. To estimate the missing natural gas consumption data for these three jurisdictions, total 2019 countywide gas consumption data for Napa County available from CEC's California Energy Consumption

Database was scaled down to each of these cities based on their respective non-residential electricity consumption in 2019 as provided by MCE (CEC 2022, Herrick, pers. comm., 2022). This approach assumes that the relative natural gas consumption between the three cities is proportional to each city's electricity usage.

Due to the lower emissions from electricity consumption, GHG emissions from the use of natural gas accounted for approximately 76 percent of total emissions from the building energy sector. Approximately 48 percent of building natural gas emissions were from non-residential customers, contributing a total of 101,116 $MTCO_2e$ in 2019. Natural gas use in residential buildings generated 110,505 $MTCO_2e$, or approximately 52 percent of total building natural gas emissions.

Table 10 presents emission factors used to quantify emissions from electricity and natural gas use. Tables 11 and 12 presents building electricity and natural gas use and associated emissions by jurisdiction, respectively.

Table 10 2019 Napa County Regional GHG Inventory: Building Energy Emission Factors

Emission Factor	Unit	Source
Electricity – PG&E (99% GHG-Free)		
18.7	lb CO_2/MWh	TCR 2020
3.1	lb CH_4/GWh	eGrid 2019 (EPA 2021)
0.4	lb N_2O/GWh	eGrid 2019 (EPA 2021)
20.7	lb CO_2e/MWh	Calculated
Electricity – MCE Light Green (90% GHG-Free[1])		
197	lb CO_2e/MWh	MCE 2020b
Electricity – MCE Deep Green (100% GHG- Free)		
0.0	lb CO_2/MWh	MCE 2022
0.0	lb CH_4/GWh	MCE 2022
0.0	lb N_2O/GWh	MCE 2022
0.0	lb CO_2e/MWh	Calculated
Natural Gas		
5.31	kg CO_2/therm	TCR 2020
0.47	g CH_4/therm	TCR 2020
0.01	g N_2O/therm	TCR 2020
5.32	kg CO_2e/therm	Calculated

Notes: CH_4 = CH_4; CO_2 = carbon dioxide; eGrid = Emissions & Generation Resource Integrated Database; EPA = U.S. Environmental Protection Agency; GHG = greenhouse gas; GWh = gigawatt-hours; kg = kilograms; lb = pounds; MT = metric tons; MWh = megawatt-hours; N_2O = nitrous oxide; PG&E = Pacific Gas and Electric; MCE= Marin Clean Energy; TCR = The Climate Registry.

Source: CEC 2020, MCE 2020b, MCE 2022, EPA 2021, TCR 2020; data compiled by Ascent Environmental 2022.

Table 11 2019 Napa County Regional GHG Inventory: Building Electricity Use and GHG Emissions by Jurisdiction

Jurisdiction	Electricity Use (MWh/yr)			GHG Emissions ($MTCO_2e$/yr)		
	Residential	Non-Residential	Total	Residential	Non-Residential	Total
American Canyon	35,398	68,547	103,945	2,811	4,117	6,929
Calistoga	12,053	15,979	28,032	957	1,383	2,340
Napa	159,409	211,272	370,681	12,703	13,881	26,583
St. Helena	18,667	41,427	60,094	1,434	2,122	3,556
Yountville	6,472	34,934	41,406	507	2,242	2,749
Unincorporated County	98,777	223,726	322,503	7,869	17,945	25,814
Total	330,776	595,885	926,661	26,281	41,690	67,971

Notes: Totals in columns may not add due to rounding. PG&E provided electricity use for 2019 by zip codes. These data were apportioned to each jurisdiction by the relative population in each zip code. MCE provided electricity use directly by jurisdiction.

MWh = megawatt-hours; MT = metric tons; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; PG&E=Pacific Gas and Electric; MCE= Marin Clean Energy.

Source: Data provided by Ascent Environmental in 2022 based on data provided by MCE and PG&E.

Table 12 2019 Napa County Regional GHG Inventory: Building Natural Gas Use and GHG Emissions by Jurisdiction

Jurisdiction	Natural Gas Use (therms/yr)			GHG Emissions ($MTCO_2e$/yr)		
	Residential	Non-Residential	Total	Residential	Non-Residential	Total
American Canyon	2,586,683	6,151,215	8,737,898	13,766	32,736	46,502
Calistoga	841,698	1,433,884	2,275,582	4,479	7,631	12,110
Napa	12,195,705	6,362,268	18,557,973	64,904	33,859	98,763
St. Helena	1,201,456	1,280,652	2,482,108	6,394	6,815	13,209
Yountville	449,392	637,351	1,086,743	2,392	3,392	5,783
Unincorporated County	3,489,522	3,134,903	6,624,425	18,571	16,683	35,254
Total	20,764,456	19,000,273	39,764,729	110,505	101,116	211,622

Notes: Totals in columns may not add due to rounding. PG&E provided natural gas use for 2019 by zip code. These data were apportioned to each jurisdiction by the relative population in each zip code.

MT = metric tons; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; PG&E=Pacific Gas and Electric.

Source: Data provided by Ascent Environmental in 2022 based on data provided by PG&E and TCR.

WASTEWATER GENERATION

Based on modeling conducted, wastewater generation in 2019 resulted in emissions of approximately 45,858 $MTCO_2e$, or 3 percent of total emissions, primarily from fugitive CH_4. All wastewater generated within each jurisdiction is treated in a number of methods: (1) conveyed to other wastewater treatment facilities in the region through sewer systems or (2) treated on-site via a septic tank system.

This sector accounts for the CH_4 and N_2O emissions from wastewater treatment processes. Wastewater treatment facilities are located wholly within the region and not exported outside of the area. Thus, the electricity use at those facilities is captured in the building energy sector and is excluded from the wastewater sector. These emissions are summarized in Table 13.

Table 13 2019 Napa County Regional Wastewater Methane Emissions by Source

Wastewater Treatment Process Emissions					
Wastewater Source	Population Served	$MTCO_2/yr$	$MTCH_4/yr$	MTN_2O/yr	$MTCO_2e/yr$
Septic	24,459	0	106	0	2,961
WWTP	230,299	0	1,533	0	42,897
Total	*254,757*	0	*1,639*	*0*	*45,858*

Notes: Totals may not add due to rounding. MG = million gallons; MT = metric tons; CH_4 = methane; CO_2e = carbon dioxide equivalent, MGD = million gallons per day.

Source: Data provided by Ascent Environmental in 2022.

Domestic Wastewater

Domestic wastewater CH_4 emissions were based on average population-generated wastewater rates from:

- equations WW.11 (alt) for septic systems and WW.6 (alt) and WW.8 for sewer systems from the Community Protocol;
- the County's estimate of the percent of the population that are serviced by sewer connections and septic connections; and
- the 2019 population estimates for each jurisdiction, available from the California Department of Finance.

Across all jurisdictions, it is estimated that approximately 90 percent of the region's population is served by centralized wastewater treatment facilities and while the other 10 is served by on-site septic tanks for wastewater treatment. Table WW.15.1 from the Community Protocol shows that California's average wastewater generation factor is 100 gallons per day per capita (ICLEI 2019). Using this factor, the region is estimated to have generated 9.3 billion gallons of wastewater in 2019.

IMPORTED WATER

Based on modeling conducted, water imports into the region accounted for 5,943 $MTCO_2e$ in 2019, less than one percent of the region's 2019 GHG inventory. These resulted from GHG emissions from electricity generation required to deliver and treat water outside the region. Water conveyance within the region is assumed to be accounted for under the electricity usage reports from MCE and PG&E. Each of the six jurisdictions in the region provided total water volume deliveries to their jurisdiction in 2019 broken out by water source and type of water (e.g., recycled, potable). Water conveyance and treatment energy rates per gallon vary by water source and type. These factors were available from a 2015 Water-Energy Cost Effectiveness Analysis released by the California Public Utilities Commission (CPUC) (CPUC 2015). Water conveyed from the State Water Project (SWP) in the San Francisco Bay water region requires 926 kWh per acre feet, which is between 2 and 90 times more energy than water sourced from local surface water, depending on the local source (e.g., groundwater, local deliveries) (CPUC 2015). Based on data collected, all the water imported to the region was sourced from the SWP and resulted in the usage of approximately 28.8 GWh outside of the region in 2019. Average eGRID CAMX emission factors were applied to this usage to get total emissions from imported water use. Results are shown below in Table 14 and 15 below.

Table 14 2019 Napa County Regional Imported Water and Energy Use by Jurisdiction

Jurisdiction	State Water Project (MG/year)	MWh/Year
American Canyon	661	4,759
Calistoga	154	1,109
Napa	2,948	21,224
St. Helena	191	1,378
Yountville	43	313
Unincorporated County	0	0
Total	**3,998**	**28,783**

Notes: MG = million gallons, MWh = megawatt hours

Source: Data compiled by Ascent Environmental in 2022.

SOLID WASTE

Based on modeling conducted, the solid waste sector was responsible for approximately 198,862 $MTCO_2e$, or 16 percent of the region's 2019 GHG inventory. The Community Protocol recommends that community GHG inventories include emissions from both solid waste facilities located in the community (i.e., "waste-in-place") and waste generated by the community. Waste-in-place CH_4 emissions from landfill gas (LFG) generated at solid waste facilities located within the region accounted for 114,619 $MTCO_2e$, or 57 percent of emissions from the solid waste sector. CH_4 emissions from decay of waste generated annually by residences and businesses in the region accounted for 84,243 $MTCO_2e$, or 42 percent of emissions from the solid waste sector. Table 15 summarizes emissions from the solid waste sector.

LFG is a mix of gases, primarily composed of CH_4, generated from decomposing organic waste and waste chemical reactions and evaporation in landfills. If a landfill has an impermeable membrane that covers a portion or all of the landfill (i.e., cover-and-capture), it can harvest the LFG and prevent CH_4 emissions from being released into the atmosphere. Once captured, a landfill can either convert the CH_4 to CO_2 through flaring or use it as a fuel for other energy-related applications. For the two landfills in the region, LFG generation and flaring rates for 2019 were available from EPA's Facility-Level Information on Greenhouse Gases (FLIGHT) database (EPA 2022). Any CO_2 emissions from flaring were not counted toward the region's inventory because the IPCC considers any CO_2 emissions from flaring or fugitive emissions to be of biogenic origin and not significant to overall solid waste emissions (IPCC 2006).

Table 15 2019 Napa County Regional GHG Inventory: Solid Waste Generation Emissions by Jurisdiction

Jurisdiction	Waste Generation			Waste-in-Place		$MTCO_2e$
	Annual Waste Tonnage	Annual ADC Tonnage	$MTCH_4$	$MTCH_4$	MTN_2O	
American Canyon	68,529	657	930	0	0	25,938
Calistoga	12,519	1,092	179	0	0	4,981
Napa	50,755	41,501	1,227	0	0	34,236
St. Helena	14,254	1,243	203	0	0	5,675
Yountville	6,533	570	93	0	0	2,601
Unincorporated County	28,105	761	4,495	4,108	<1	125,429
Total	180,695	45,824	7,127	4,108	<1	198,862

Notes: ADC = Alternative Daily Cover, $MTCH_4$ = metric tons of methane, MTN_2O = metric tons of nitrous oxide, $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data provided by Ascent Environmental 2022 based on data from EPA 2022.

Waste in Place

The only landfills located within the region are the American Canyon Sanitary Landfill (ACSL) and the Clover Flat Landfill near Calistoga, both located in the Unincorporated County. While Clover Flat is open and currently accepting waste, ASCL closed in 1995 and currently has an active LFG collection system. According to FLIGHT, in 2019, the American Canyon landfill generated 2,574 $MTCH_4$ in fugitive CH_4 emissions from accumulated waste at the landfill in 2019 (EPA 2022). Clover Flat also has an active LFG collection system but does not anticipate closure of the landfill until 2053. In 2019, Clover Flat generated 1,534 $MTCH_4$ in fugitive CH_4 emissions (EPA 2022). CH_4 emissions from closed landfills generally decrease overtime due to the gradual reduction in organic decomposition.

Waste Generation

For emissions related to annual solid-waste generation from the community in the region, CH_4 emissions are also generated from organic decomposition. The release of CH_4 emissions from community-generated waste depends on which landfill the waste is disposed at as the LFG management systems differ.

ON-ROAD VEHICLES

Based on modeling conducted, on-road vehicle usage in the region resulted in 472,677 $MTCO_2e$ in 2019, or 39 percent of the County's inventory. On-road vehicle emissions are primarily the result of exhaust from the combustion of gasoline, diesel, and natural gas fuels, based on average 2019 fleet-wide emission factors for Napa County available from EMFAC2021. On-road passenger vehicle activity was based on the annual VMT associated with trips that begin or end in the region. Origin and destination-based daily VMT data by jurisdiction were obtained from average weekday VMT from MTC's VMT Data Portal and (MTC 2015, Brazil pers. comm., 2022). It was assumed that vehicle trips included 100 percent of vehicle trips that both originate from and end in the unincorporated area (i.e., fully internal trips), 50 percent of trips that either end in or depart from the unincorporated area (i.e., internal-external or external-internal trips), and zero percent of vehicle trips that are simply passing through the area (i.e., external-external, or "pass-through," trips). This passenger vehicle trip accounting method is consistent with the method recommended to CARB in 2010 by the RTAC (established through the Sustainable Communities and Climate Protection Act of 2008 [Senate Bill 375]).

MTC provided passenger vehicle VMT only. To estimate VMT from commercial vehicles (e.g., medium and heavy duty trucks), EMFAC2021 was used to calculate a ratio between passenger VMT and non-passenger VMT. Direct VMT and

emissions from EMFAC are not typically used in GHG inventories as they are based on odometer data rather than the RTAC method. The calculated passenger-non-passenger ratio was then applied to the VMT from MTC to estimate non-passenger VMT.

Table 16 shows total annual VMT by vehicle fuel type and associated emissions estimates for the region.

Table 16 2019 Napa County Regional GHG Inventory: On-Road Vehicle Fleet Activity and Emissions by Jurisdiction

Jurisdiction	VMT/yr	$MTCO_2$/yr	$MTCH_4$/yr	MTN_2O/yr	$MTCO_2e$/yr
American Canyon	197,342,562	89,970	5	6	91,830
Calistoga	36,929,027	16,836	1	1	17,184
Napa	602,862,651	274,850	15	19	280,533
St. Helena	65,890,979	30,040	2	2	30,661
Yountville	26,656,274	12,153	1	1	12,404
Unincorporated County	86,095,646	39,252	2	3	40,063
Total	1,015,777,139	463,100	26	32	472,677

Notes: VMT = vehicle miles traveled; kWh = kilowatt-hour; MT = metric tons; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent.

Source: MTC 2022, Brazil, pers. comm., 2022; data compiled by Ascent Environmental 2022.

MTC provided vehicle travel information for the region based on their regional travel demand model under Plan Bay Area 2040. MTC provided average daily weekday VMT estimates in 2019. These were multiplied by annualization factors recommended by MTC (353.29 days per year for all jurisdictions except the City of Napa, which uses 340.84 days per year) to estimate annual VMT to account for lower VMT during weekends, holidays, and summer periods (Brazil, pers. comm., 2022). Emissions from electricity use in electric vehicles were assumed to be included in the building energy inventory.

OFF-ROAD VEHICLES

Based on modeling conducted, off-road vehicles operating in the region emitted approximately 115,548 $MTCO_2e$ in 2019, or 9 percent of the region's 2019 inventory. These emissions were the result of fuel combustion in off-road vehicles and equipment used in construction, industry, and recreation and were available from CARB's OFFROAD2021 model. Unfortunately, the OFFROAD2021 model only provides emissions detail at the State, air basin, or county level. Napa County emissions data from OFFROAD2021 were apportioned to each jurisdiction area using custom scaling factors depending on the off-road equipment type, as shown in Table 18. For example, due to the likely correlation between commercial activity and employment, each jurisdiction's portion of emissions from light commercial equipment in the County is assumed to be proportional to the number of jobs in the region as compared to the County as a whole. On the other hand, emissions from pleasure craft are assumed to occur entirely within the County because the majority of navigable waterways in the County are located in the unincorporated area. Further details on how OFFROAD emissions from each fleet type were scaled to the unincorporated area are discussed below. Note that, although reported by the OFFROAD model, emissions from agricultural equipment included separately in the agriculture sector and are excluded from the off-road vehicles sector.

Emissions from locomotives (e.g., Napa Valley Wine Train) are not included in the OFFROAD model and were also excluded from the regional inventory at this time. The estimated annual emissions and scaling factors were used to apportion the offroad emissions to each jurisdiction are presented in Table 17 below by fleet type.

Table 17 2019 Napa County Regional GHG Inventory: Off-Road Emissions by Fleet Type

Off-Road Fleet Type	$MTCO_2/yr$	$MTCH_4/yr$	MTN_2O/yr	$MTCO_2e/yr$	Percent	Jurisdiction: Countywide Scaling Method
Airport Ground Support	<1	<1	<1	<1	0%	All assumed to occur in the Unincorporated County
Commercial Harbor Craft	135	<1	<1	140	0%	Employment
Construction and Mining	12,250	1	<1	12,294	11%	Service Population
Industrial	5,366	2	<1	5,490	5%	Employment
Lawn and Garden Equipment	23,608	35	15	28,726	25%	Population
Light Commercial Equipment	23,132	6	4	24,282	21%	Employment
Pleasure Craft	26,792	19	6	28,896	25%	All assumed to occur in the Unincorporated County
Portable Equipment	9,721	3	1	10,088	9%	Employment
Railyard Operations	383	<1	0	383	0%	Employment
Recreational Equipment	1,904	5	2	2,687	2%	Population
Transport Refrigeration Units	2,551	<1	<1	2,561	2%	Service Population
Total	**105,841**	**71**	**28**	**115,548**	100%	

Notes: MT = metric tons; CO_2 = carbon dioxide; CH_4 = CH_4; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas.

Source: Data provided by Ascent Environmental in 2022, based on modeling from OFFROAD2021.

All commercial and industrial off-road emissions were scaled from countywide estimates by the unincorporated percentage of jobs in 2019. Emissions related to lawn and garden and recreational equipment were scaled by population. Countywide emissions from pleasure craft and airport ground support were assumed to entirely occur in the unincorporated areas.

AGRICULTURE

Based on modeling conducted, emissions from the agriculture sector accounted for approximately 103,381 $MTCO_2e$ from agricultural activity such as off-road equipment, diesel-powered agricultural engines (e.g., irrigation pumps), and stationary equipment, direct emissions from livestock, and fertilizer use. This sector accounted for 8 percent of regional emissions. Fuel combustion in off-road farm equipment and fertilizer application made up 46 percent and 21 percent of total emissions from the sector, respectively. Other emissions estimated for this sector were from fertilizer use, lime application, and diesel-powered agricultural engines (e.g., irrigation pumps). These emissions are summarized in Table 18 below.

Table 18 2019 Napa County Regional GHG Inventory: Agriculture Emissions by Source

Source	$MTCO_2/yr$	$MTCH_4/yr$	MTN_2O/yr	$MTCO_2e/yr$	Percent
Agricultural Equipment	130	0	0	47,682	46%
Fertilizer Application	452	-	79	21,948	21%
Diesel Engines	15,417	-	-	15,417	15%
Livestock	-	650	1	18,334	18%
Total	**15,999**	**650**	**80**	**103,381**	**100%**

Notes: MT = metric tons; CO_2 = carbon dioxide; CH_4 = CH_4; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas.

[1] Pesticide application emissions were less than 0.5 MT.

Source: Data compiled by Ascent Environmental in 2022.

GHG emissions associated with farming equipment were obtained from CARB's OFFROAD2021 model. Farming equipment emissions reported for Napa County are assumed to occur entirely within the region. GHG emissions from fertilizers primarily result from their nitrogen content and the application of urea and lime. Data regarding tonnage of nitrogen and lime were obtained from CDFA's *2019 Fertilizer Tonnage Report* (CDFA 2020). Based on this report, 1,718 tons of nitrogen and 1,132 tons of lime were sold in Napa County in 2019. These amounts were used to estimate GHG emissions. These values include a small percentage of non-farm fertilizer sales which were included to allow for complete accounting of fertilizer use as an emissions source in the region. Emissions factors and quantification methods for GHG emissions associated with fertilizer application were obtained from IPCC (IPCC 2006). Using IPCC's methodologies, approximately 21,994 $MTCO_2e$ were emitted from fertilizer application in 2019. A detailed breakdown of fertilizer emissions by type is shown in Table 19.

Table 19 2019 Agricultural Fertilizer Application Emissions in Napa County

Material	Material (Tons)	CO_2e Emissions ($MTCO_2e$/year)
Nitrogen	1,718	21,496
Liming Materials	1,132	452
Total	**2,850**	**21,948**

Notes: CO_2e = carbon dioxide equivalent. Non-farm fertilizer use was excluded. See the Attachment A for more details.

Source: CFDA 2019, Data modeled by Ascent Environmental in 2022.

According to BAAQMD, there were 131 diesel engines with valid permits in 2019 (Henderson, pers. comm., 2022). These engines are primarily remote irrigation or defrosting equipment which either pump or spray water for their respective purposes. To estimate their emissions, emission factors were quantified from a CARB diesel irrigation report, which estimated that, in 2006, there were 147 diesel irrigation pumps operating in Napa County which emitted an average of 28.4 tons of CO_2 per day, or 0.193 tons of CO_2 per day per pump (CARB 2006). Although this reference is 16 years old, CARB has not released more recent descriptions of their methodology in quantifying this sector. Applying this rate to the total number of permitted diesel engines in the county and multiplying it by 365 days per year resulted in an estimate of 15,417 $MTCO_2$ from the operation of diesel irrigation pumps in 2019.

With respect to livestock emissions, CH_4 and nitrous oxide emissions are released through enteric fermentation (a type of digestion process) and exposure of manure produced by these animals. The 2019 Napa County Crop Report provided estimates of total heads of cattle, calves, goats, and sheep and lambs in the county. All livestock-generated GHG emissions were estimated using population-based emission factors and quantification methods identical to those by CARB in the statewide 2019 GHG inventory.

With the exception of agricultural diesel engines, all sources of agricultural emissions were apportioned to each jurisdiction based on relative proportion of agricultural acres in the region. These acres are presented in Table 20. Agricultural diesel engines were scaled to each jurisdiction based on the engine permit location data provided by BAAQMD.

Table 20 Agricultural Acres by Jurisdiction

Jurisdiction	Agricultural Acres
American Canyon	95
Calistoga	168
Napa	392
St. Helena	1,100
Yountville	46
Unincorporated County	52,213
Total	**54,014**

Source: Malito, pers. comm., 2022.

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Attachment A

Table A-1 2019 Napa County Regional GHG Inventory – Base Activity Data

Emissions Sector	Sub-Sector	Unit	American Canyon	Calistoga	Napa	St. Helena	Yountville	Unincorporated County	Total
Building Energy	Residential	kWh	35,398,348	12,052,911	159,409,155	18,666,598	6,471,730	98,777,212	330,775,954
		therm	2,586,683	841,698	12,195,705	1,201,456	449,392	3,489,522	20,764,456
	Non-Residential	kWh	68,546,637	15,978,620	211,271,867	41,427,420	34,934,080	223,726,266	595,884,890
		therm	6,151,215	1,433,884	6,362,268	1,280,652	637,351	3,134,903	19,000,273
On-Road Transportation	Countywide	VMT	197,342,562	36,929,027	602,862,651	65,890,979	26,656,274	86,095,646	1,015,777,139
Solid Waste	Waste Generation	Tons of Waste	68,529	12,519	50,755	14,254	6,533	28,105	180,695
	Waste Generation	Tons of ADC	657	1,092	41,501	1,243	570	761	45,824
	Waste-in-Place (Clover Flat Landfill)	Reported Annual Methane ($MTCH_4$)	0	0	0	0	0	2,574	2,574
	Waste-in-Place (American Canyon Landfill)	Reported Annual Methane ($MTCH_4$)	0	0	0	0	0	1,534	1,534
Off-Road Equipment	See Note 1								
Agriculture	Agricultural Offroad	See Note 1							
	Fertilizer Application	tons of lime	2	4	8	23	1	1,094	1,132
		tons of nitrogen	3	5	12	35	1	1,661	1,718
	Diesel Engines	No. of engines	0	0	7	41	0	193	241
	Livestock	Calves	4	8	18	52	2	2,461	2,546
		Cattle	10	18	42	117	5	5,558	5,750
		Goats	0	1	1	4	0	193	200
		Sheep and Lambs	3	5	12	35	1	1,643	1,700
Wastewater	Centralized WWTP	Population Served	20,996	5,348	79,300	6,094	2,793	618	115,149
	Septic Tanks	Population Served	0	0	0	0	0	24,459	24,459
Imported Water	State Water Project	MG/year	661	154	2,948	191	43	0	3,998

Note: kWh = kilowatt hours, VMT = vehicle miles travelled, ADC = alternative daily cover, $MTCH_4$ = metric tons of methane, WWTP = wastewater treatment plant, MG = million gallons.

[1] Off-road emissions were directly obtained from CARB's OFFROAD 2021 model and apportioned to each jurisdiction.

Source: Compiled by Ascent Environmental 2022.

Appendix C

Regional Carbon Stock Inventory Report

Photo Credit: County of Napa

REGIONAL CARBON STOCK INVENTORY REPORT FOR NAPA COUNTY

AUGUST 2023

Report Organization

This report outlines the draft results of a carbon stock and sequestration analysis prepared for Napa County. The carbon stock analysis includes an inventory of existing carbon stored in vegetation and soils throughout the entire county within the jurisdictions of American Canyon, Calistoga, the City of Napa, St. Helena, Yountville, and the unincorporated areas of Napa County. All jurisdictions within Napa County are hereafter referred to collectively as the county or Napa County. The carbon sequestration analysis evaluates the annual rate of carbon dioxide emissions sequestered by vegetation and soil throughout the county.

This report is organized into four key parts:

INTRODUCTION

Provides information about the importance of carbon stock and sequestration in climate mitigation and resilience planning.

DATA AND METHODS

Outlines the specific data, methods, and sources used for the analysis.

SUMMARY OF RESULTS

Presents the findings of this carbon stock and sequestration analysis.

CONCLUSION

Describes the implications of the analysis for future climate mitigation and resilience planning in Napa County.

Key Terms

The following key terms are used throughout this technical memorandum and are defined as such:

Carbon Pool: A system which has the capacity to accumulate or release carbon, considered to be a reservoir. Examples include forest biomass, wood products, soils, and the atmosphere (Intergovernmental Panel on Climate Change [IPCC] 2000).

Carbon Sequestration: The process of increasing the carbon content of a carbon pool other than the atmosphere (IPCC 2000).

Carbon Stock: The absolute quantity of carbon held within a pool at a specified time (IPCC 2000).

Soil Carbon: Included inorganic and organic carbon, it constitutes 75 percent of terrestrial carbon (Ecological Society of America 2000).

Soil Organic Matter: A mixture of carbon compounds consisting of decomposing plant and animal tissue and carbon associated with soil minerals and microbes (Ecological Society of America 2000).

Natural Lands: Lands consisting of forests, grasslands, deserts, freshwater and riparian systems, wetlands, coastal and estuarine areas, watersheds, wildlands, or wildlife habitats, or lands used for recreational purposes such as parks, urban and community forests, greenbelts, trails, and other similar open-space lands. For purposes of this paragraph, "parks" includes, but is not limited to, areas that provide public green space (California Public Resources Code 9001.5).

Working Lands: Lands used for farming, grazing, or the production of forest products (California Public Resources Code 9001.5).

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Section 1. Introduction

1.1 CLIMATE CHANGE AND CARBON SEQUESTRATION

Carbon dioxide (CO_2), the most commonly produced greenhouse gas (GHG), acts as a global insulator for absorbing infrared radiation that is emitted by Earth and re-emitting it back down causing the planet's climate to warm at an unprecedented rate, an impact known as global climate change. Global climate change is the driver of more extreme weather patterns, increases in sea level, rapid melting of the polar ice caps, and other impacts to biological resources and humans. As GHG concentrations in the atmosphere have increased from the combustion of fossil fuels and other anthropogenic (i.e., human-caused) activities, the effects of global climate change have intensified.

Climate change mitigation involves reducing the sources of GHG emissions into the atmosphere and climate change adaptation involves reducing the impacts due to the hazards and risks posed by climate change. In recent years, there has been more attention shown to the potential of carbon sequestration as both a climate change mitigation and climate change adaptation strategy. Carbon sequestration is the process of capturing and storing atmospheric CO_2 (USGS, n.d.a). Biologic carbon sequestration refers to the accumulation of atmospheric CO_2 in vegetation, woody products, soils, and aquatic environments (USGS, n.d.b). This type of sequestration can occur on both natural lands (the original landscape before colonial human disturbance) and working lands (lands that are used to produce goods). The amount of CO_2 that is stored by vegetation or soils on these lands is known as carbon stock. Land use changes have direct impacts on the amount of CO_2 that is stored and sequestered within vegetation and soils in the county. New development that converts grasslands, forests, shrublands, or other natural land covers to urban land uses reduces the carbon sequestration potential of county lands. Reforesting or afforesting barren, unproductive lands to preserve them from development will have the opposite effect, increasing the county's carbon sequestration potential. This inextricable link between land use and carbon

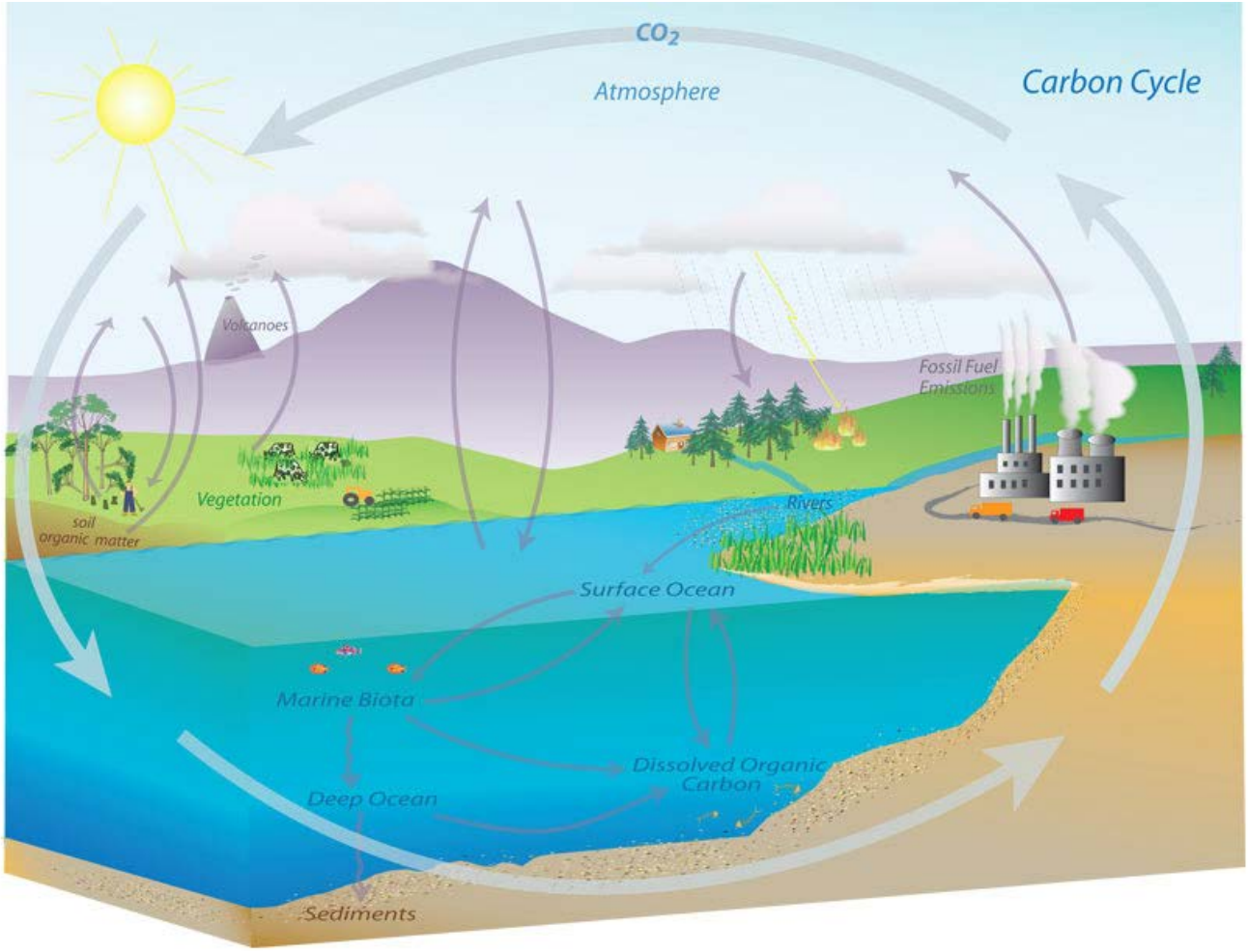
sequestration highlights the need for thoughtful land use planning that minimizes losses to current carbon stock and maximizes preservation/enhancements.

Biologic carbon sequestration in natural and working lands hold a prominent place in California's path toward carbon neutrality. Understanding the magnitude and nature of existing carbon stock and potential future sequestration opportunities from natural and working lands will be an important advancement in climate mitigation and resilience planning in Napa County. As stated in the California Air Resources Board's (CARB's) 2022 Scoping Plan for Achieving Carbon Neutrality, we must "re-envision our natural and working lands—forests, shrublands/chapparal, croplands, wetlands, and other lands—to ensure they play as robust a role as possible in incorporating and storing more carbon in trees, plants, soil, and wetlands that cover 90 percent of the state's 105 million acres while also thriving as a healthy ecosystem" (CARB 2022:2).

1.2 BIOLOGICAL CARBON SEQUESTRATION

The process of biological carbon sequestration is an integral part of the naturally occurring carbon cycle which occurs when plants, animals, and ecosystems take up CO_2. A carbon pool refers to the ability of a system to store and release carbon. The carbon cycle is depicted in Figure 1.

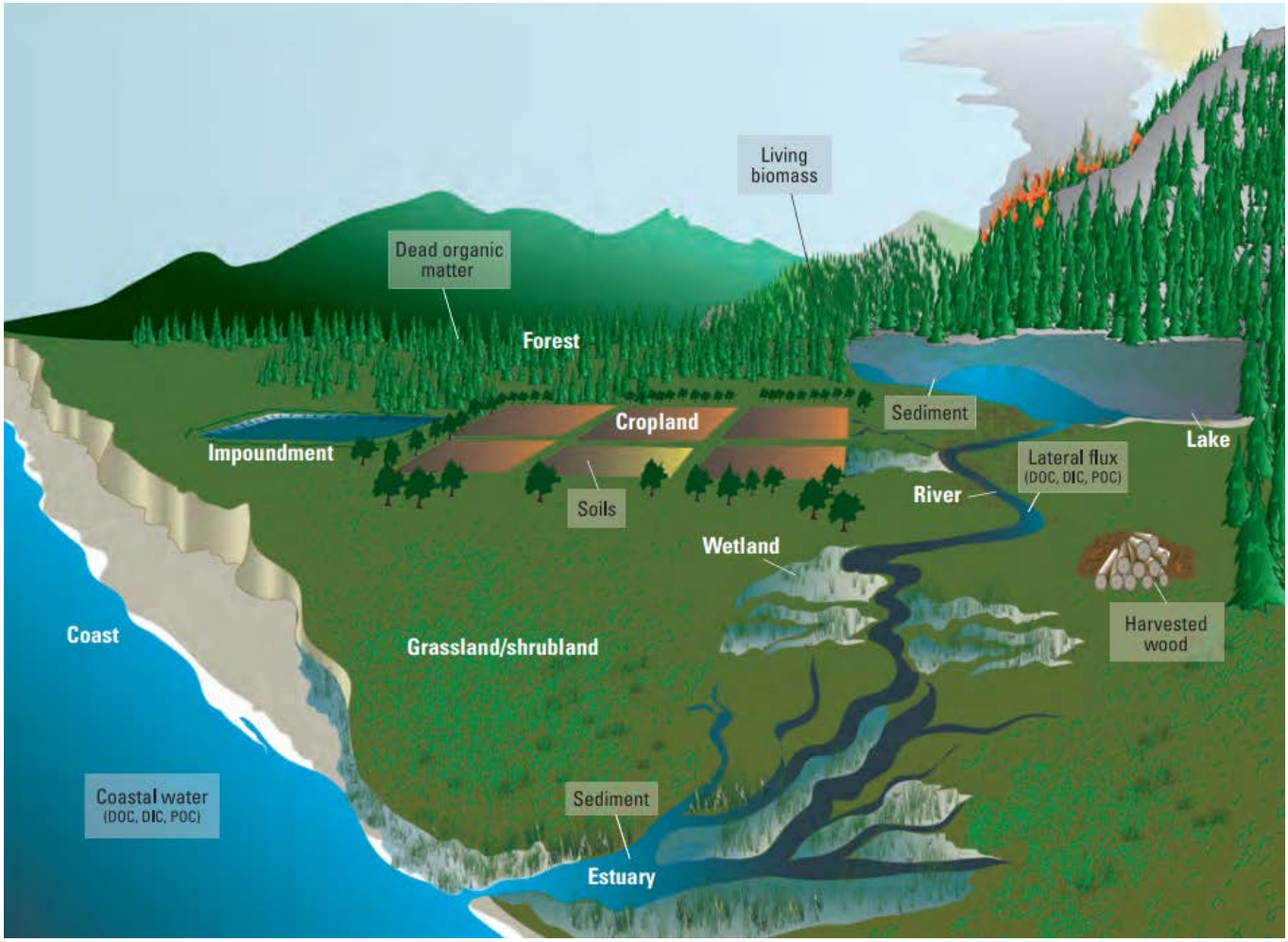
Figure 1 The Carbon Cycle



Source: NOAA 2019.

Shown in Figure 2 are examples of natural and working lands that serve as carbon pools. The forest ecosystem is a carbon pool because it stores carbon in individual trees and vegetation and can release this carbon in the event of a wildfire. If a system can store more carbon than it releases, it is classified as a carbon sink.

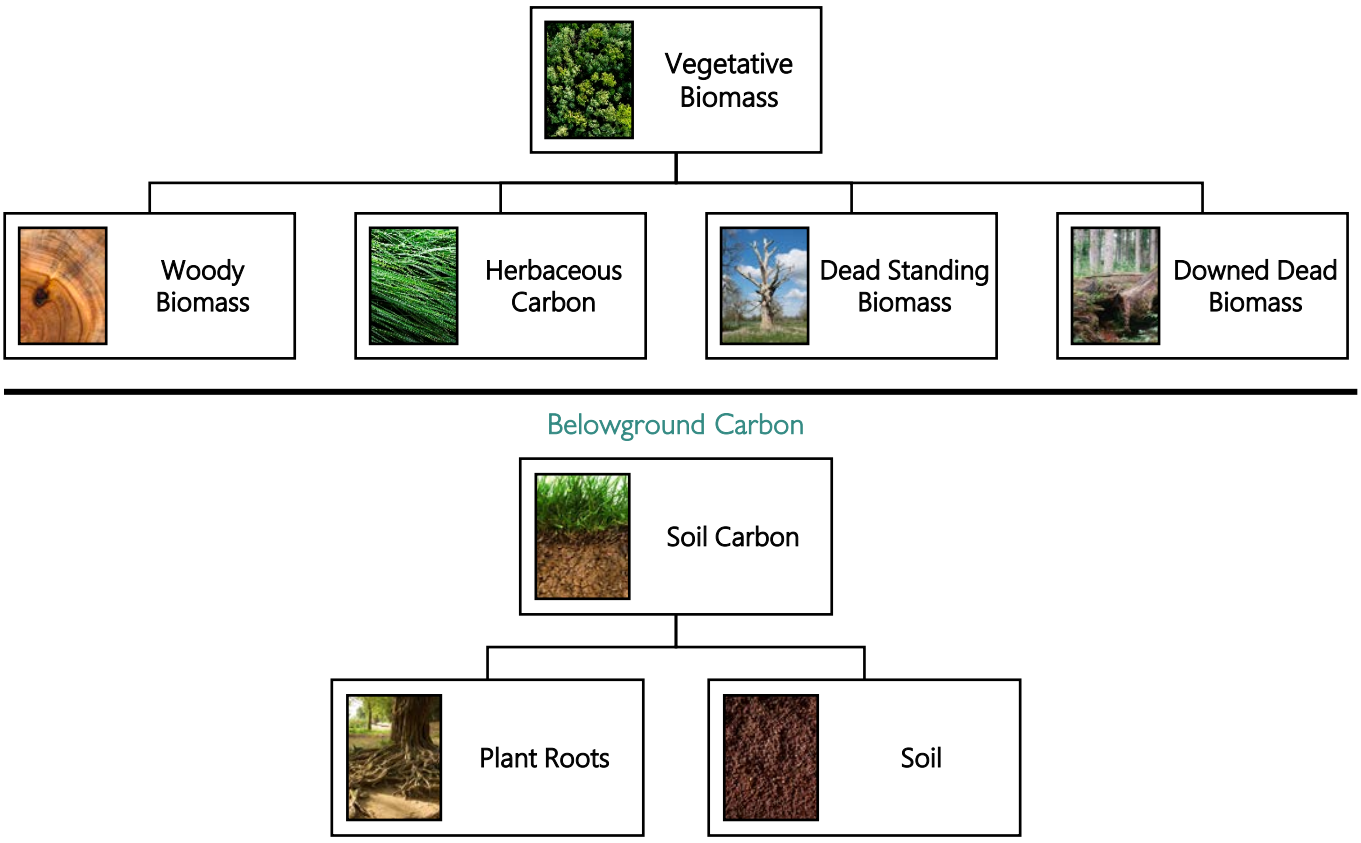
Figure 2 Natural and Working Lands Carbon Pools



Source: Zhu et al. 2010.

Ecosystems like forests, grasslands, and rangelands are known to capture 25 percent of global carbon emissions (UC Davis 2019). In order to assess the amount of carbon stored through biological sequestration, it is important to assess both aboveground and belowground carbon pools. The anatomy of a carbon stock inventory is depicted in Figure 3.

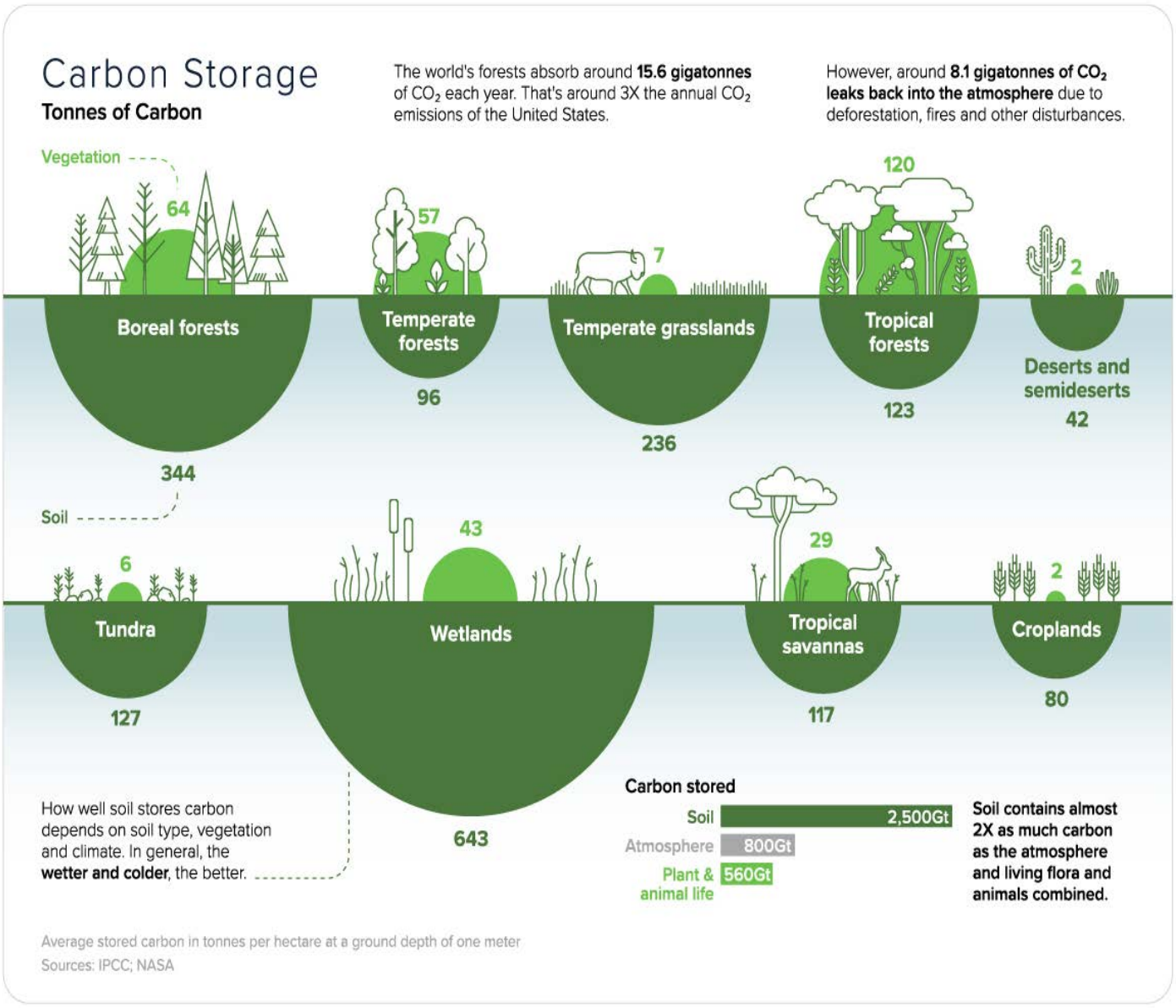
Figure 3 Types and Sources of Carbon included in a Carbon Stock Inventory



Source: Developed by Ascent in 2022.

Different ecosystems have different proportions of carbon in both aboveground and belowground pools. For example, while forests tend to have more aboveground carbon, grasslands include a large proportion of carbon belowground (Figure 4).

Figure 4 Comparative Carbon Storage Capacity Between Ecosystems



Source: Visual Capitalist 2022.

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Section 2. Carbon Stock & Sequestration Inventory

2.1 ABOVEGROUND CARBON STORAGE

Aboveground carbon is the amount of carbon stored within vegetative biomass (i.e., the mass of any given organism) that is above the soil. Vegetation uses photosynthesis to take CO_2 out of the atmosphere and then stores the carbon in the biomass. Aboveground carbon includes woody biomass in trunks, branches, and shoots as well as herbaceous carbon in leaves, flowers, fruiting bodies, and grasses. Additionally, aboveground carbon includes the carbon in leaf litter, dead standing biomass, and downed dead biomass. Approximately 45-50 percent of the dry biomass weight (excluding water content) of the vegetation is equivalent to its carbon stock (McGroddy et al. 2004; Schlesinger 1991).

2.2 BELOWGROUND CARBON STORAGE

Belowground carbon is the carbon stored within plant roots and soil. Plant root carbon stock is estimated the same way as aboveground carbon: estimating biomass by using the dry weight of the materials and converting the biomass to carbon. In soil, carbon is primarily stored as soil organic matter (SOM). SOM is a mixture of carbon compounds consisting of decomposing plant and animal tissue and carbon associated with soil minerals, and microbes. Within SOM, approximately 58 percent is soil organic carbon (SOC) which represents the distinct carbon pool in the soil (Lal 2004). Overall, soil carbon (i.e., organic and inorganic carbon) constitutes approximately 75 percent of the carbon in terrestrial environments, which is three times the amount stored in living plants and animals. Soils represent a massive sink potential for CO_2 from the atmosphere, although soil carbon can either be stored in the soil for millennia or can be quickly released back into the environment due to decomposition.

2.3 CARBON STOCK AND CARBON SEQUESTRATION

Carbon stock values are presented in terms of metric tons of carbon (MT C) (Figure 4). Carbon sequestration values are presented in terms of metric tons of carbon dioxide equivalent per year (MT CO_2e/year). Carbon stock is the amount of carbon stored at a given point in time, whereas carbon sequestration is the active exchange of carbon to and from the atmosphere and is thereby represented as a rate.

2.4 RELEVANCE OF CARBON SEQUESTRATION

In April 2019, the State of California prepared the Draft California 2030 Natural and Working Lands Climate Change Implementation Plan (NWLIP), in response to CARB's Resolution 17-46. The objectives of the NWLIP are to integrate climate goals into State-funded natural and working land conservation, restoration, and management programs; enhance natural and working lands' resilience to climate impacts, sequester carbon, and reduce GHG emissions; and identify next steps to address policy challenges facing natural and working lands (CalEPA, CNRA, CDFA, CARB, and SGC 2019). In October 2020, Governor Gavin Newsom highlighted the importance of California's natural and working lands for carbon sequestration through the signing of Executive Order N-82-20, which set a target of conserving 30 percent of the state's lands by 2030.

CARB's 2022 Scoping Plan for Achieving Carbon Neutrality states that reducing GHG emissions from and increasing sequestration on natural and working lands is crucial to the State's long-term climate change strategy to meet the requirements of Assembly Bill (AB) 1279 of 2022, which set forth a statewide target to achieve net zero GHGs no later than 2045 (CARB 2022). California has developed a Natural and Working Lands Climate Smart Strategy, which evaluates nature-based climate solutions, outlines regional opportunities for climate smart land management, and identifies options to track nature-based climate action and measure progress (CNRA 2022).

In addition, AB 1757 of 2022 requires the California Natural Resources Agency to set natural carbon sequestration targets and determine nature-based solutions to reduce GHG emissions to support achieving carbon neutrality no later than 2045. AB 1757 also requires CARB to develop standard methods to consistently track GHG emissions and reductions, carbon sequestration, and other benefits from natural and working lands.

Carbon stock inventories for cities and counties within California are imperative in understanding how to increase carbon sequestration statewide. These inventories can provide a baseline to improve upon into the future and can inform projects that will increase carbon removal from the atmosphere, as directed by AB 1279 and AB 1757.

Napa County, for example, has the benefits of its natural and working lands through arable land that produce food, wine, recreational amenities, tourism, and wildlife habitat. Historically, land has been converted from natural and working lands into agricultural land within the county. The consequences of lost natural lands and their impacts on carbon stock have not been evaluated. Management practices can affect a soil's potential to be either a source or a sink of carbon. For example, conservation farming practices such as reduced tillage, cover cropping, and crop rotation can be used to increase soil carbon compared to conventional practices (Ecological Society of America 2000).

This report seeks to provide a baseline estimate for the carbon that is already stored in the county's vast natural and working lands. Additionally, the analysis provides an annual rate of carbon sequestered by these lands.

2.5 DATA AND METHODS

2.5.1 Data Sources

VEGETATIVE CARBON

To estimate the carbon stock and sequestration in Napa County, a GIS-based analysis was performed using the best available data for land cover (i.e., vegetation), ownership types, and soil. The following data sources were used for vegetative carbon:

- County of Napa's GIS Department
- US Fish and Wildlife Service's National Wetlands Inventory (NWI)
- California Protected Areas Database and California Conservation Easement Database

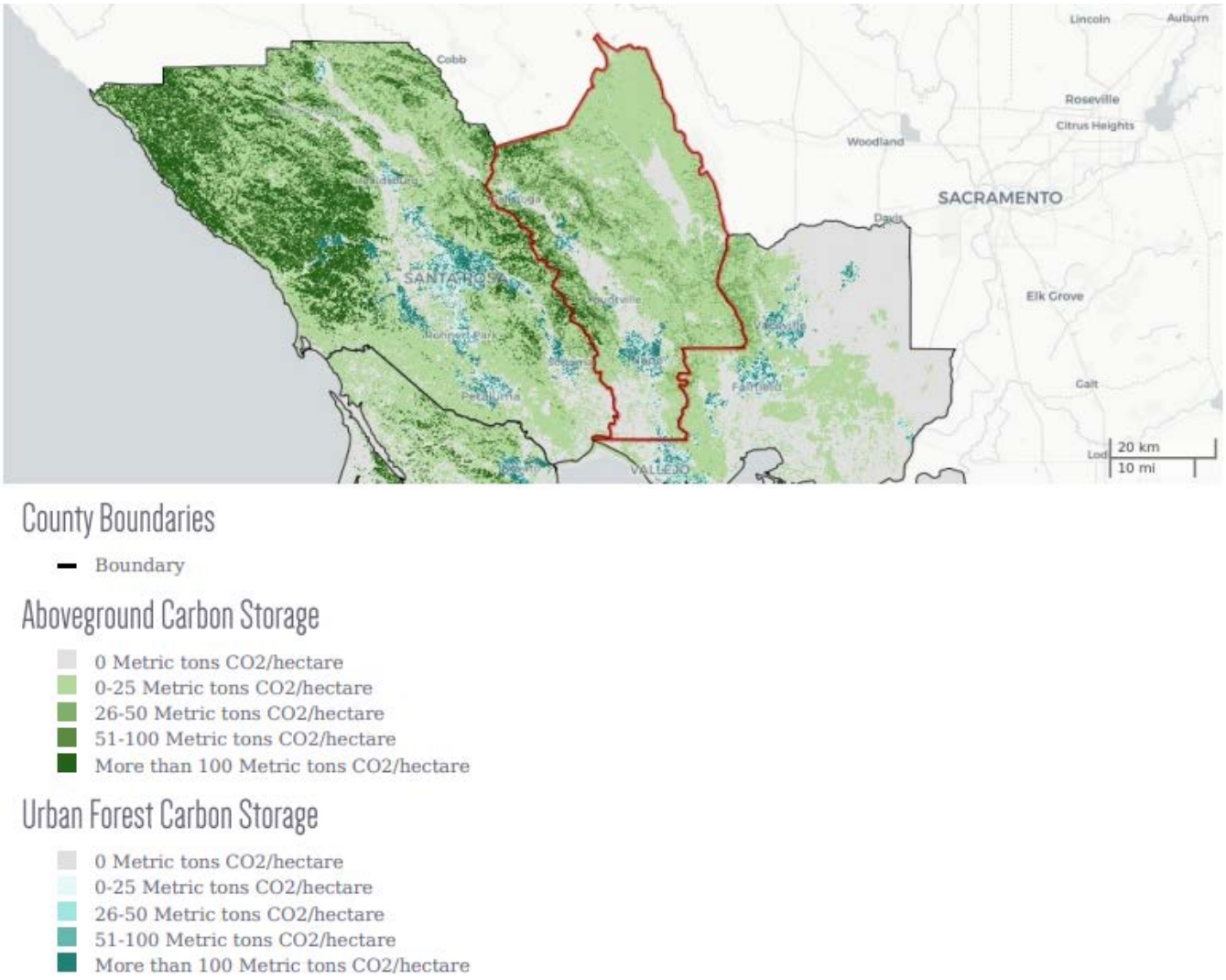
Each source has data that is mapped; this is often referred to as a layer. For this analysis, multiple layers were overlapped in order to determine approximate land cover type across the county and assign corresponding sequestration values. The County of Napa's GIS Department's publicly available ArcGIS online data sources includes land cover vegetation data with categories such as Blue Oak woodland, Coastal Sage Scrub, and Coast Redwood, which are all prominent species in the natural landscapes of Napa County.

These data were then intersected with a Napa County-generated publicly available data layer of agricultural uses. This agricultural layer was used to identify vineyards and orchards and superseded the Napa County vegetation layer so as to not double county carbon stored by these types of vegetation. Both data layers from the County are described in greater detail in the section on data sources below.

Next, these GIS layers were intersected with the US Fish and Wildlife Service's National Wetlands Inventory (NWI). In the areas where the NWI layer overlapped with the land cover layer or the agricultural layer, these layers were removed because NWI is considered the most specific for this land cover type. The NWI contains more than 35 million wetland and deepwater features for all of the US. The data are updated twice a year and provides information on the status, extent, characteristics, and functions of wetland, riparian, and deepwater habitats which is used in this analysis. Wetlands are identified using aerial imagery based on vegetation, visible hydrology, and geography. A margin of error is inherent in the use of this imagery as it is not based on detailed on-the-ground inspection of individual wetland sites (USFWS n.d.).

To estimate vegetative carbon sequestration, additional GIS data layers for land ownership types (e.g., federal agencies, state agencies, private) from the California Protected Areas Database and California Conservation Easement Database were used. These land ownership types, in combination with land cover types and acreage values, were linked to vegetative carbon sequestration values from the CALAND Report to generate MT CO_2e/year estimates for carbon sequestered throughout the county.

Figure 5 Map of Aboveground Carbon Storage in Napa County



Source: Bay Area Greenprint n.d.

SOIL CARBON

Soil carbon stock was estimated using the US Department of Agriculture's Natural Resources Conservation Service's (NRCS's) SSURGO dataset, which provides soil type data throughout the state, inclusive of Napa County. Data are collected from soil surveys performed throughout the county, and therefore, is considered to be specific to the area of this analysis. Measurements of bulk density, soil organic matter, and soil depth are used in quantifying the amount of carbon within each soil type present within the county. These carbon stock values were then multiplied by the acreage of each soil type in order to account for carbon held within soils. The land cover data layers which were intersected for the vegetative carbon method, as outlined above, were also used to specify the soil carbon stored within each land cover type.

Figure 6 Map of Soil Carbon Storage in Napa County

Source: Bay Area Greenprint n.d.

2.5.2 Carbon Stock and Sequestration Quantification

Once land use cover types and acreages were obtained for the county, carbon storage and sequestration rates were applied to understand the carbon already stored in vegetation and soil (i.e., carbon storage), as well as the rate of additional carbon that could be taken up by vegetation and soil on an annual basis (i.e., carbon sequestration).

VEGETATIVE CARBON

The acreages of each land cover type from the GIS analysis described above were linked to carbon stock values found in scientific literature. These carbon stock and sequestration values were used in the analysis to multiply by the acreage of each land cover type. Where values for carbon stock or sequestration could not be found for specific land cover types, land cover types were combined into more general categories. For example, the land cover layer from Napa County identified a "Chamise Alliance" comprised of Sclerophyllous shrubland and Wedgeleaf Ceanothus. Because specific carbon stock and sequestration values were not available for these species, they were combined into a broader category of "shrubland," for which carbon stock and sequestration values were available. Where possible, literature values that are regionally specific were used.

Carbon stock values for agricultural land cover types were used from scientific reports prepared for CARB and the California Environmental Protection Agency (Saah et al. 2016). Values for orchards and vineyards were calculated by averaging the carbon stock rates for different crops that fall under the orchard category and varietals of wine grapes found in Napa County. Carbon stock values for forest land cover types were provided by the California Forest Carbon Plan (Forest Climate Action Team 2018) and woodland carbon stock values were provided by An Inventory of Carbon and California Oaks (Gaman 2008).

Other carbon stock values for Riparian woodland, mixed shrubland, grassland, chapparal, and urban environments came from scientific literature values that are specific to the vegetation types found in Napa County.

Vegetative carbon sequestration rates from the CALAND Report were used to generate MT CO_2e/year estimates for carbon sequestered throughout the county on an annual basis for all land cover types. The CALAND Report provides annual net carbon exchanges in live vegetation and soil without interventions, and under a historical climate. A positive number indicates that carbon was taken up by vegetation and soil (i.e., carbon sequestration or a carbon sink), while a negative number indicates carbon was released by vegetation and soil (i.e., carbon emissions or a carbon source).

The sources and rates for metric tons of carbon per acre by vegetation/land cover type are presented in Table 1 below.

Table 1 Vegetation Carbon Stock Values by Land Cover Type

Ecosystem	Land Cover Type	Vegetation (MT C/acre)	Source
Agricultural Lands	Vineyard	1.78	Saah 2016
	Orchard	3.95	
Forests	Coast Redwood	122.4	Forest Climate Action Team 2018
	Douglas-fir	72.1	
	Mixed conifer	57.4	
	Douglas-fir/ponderosa pine	48.15	
	Coast Live Oak/ Blue Oak	18.21	Gaman 2008
	Blue Oak	12.55	
	Mixed Oak	29.14	
	Black Oak	21.04	
	Interior Live Oak/ Blue Oak	16.99	
	Coast Live Oak	23.87	
	Valley Oak	9.71	
	Canyon Live Oak	54.63	
	Interior Live Oak	21.45	
	Oregon Oak	24.69	
	Tanbark oak	49.78	
Grasslands/Shrublands	Riparian woodland	45.71	Dybala et al. 2018
	Mixed shrubland	16.18	Brown et al. 2004
	Grassland	1.416	Bolman et al. 2018
	Chamise chaparral	8.56	

Ecosystem	Land Cover Type	Vegetation (MT C/acre)	Source
	Mixed chaparral	14.01	
	Coastal sage scrub	6.40	
Developed	Urban	3.448	Bjorkman et al. 2015
Wetland	Estuarine and Marine Deepwater	7.5	USGS 2012

Notes: C=carbon; MT= metric tons.

Source: Compiled by Ascent in 2023.

Soil Carbon

The soil carbon stock inventory was conducted using the NRCS's gSSURGO dataset of soil types through Napa County. Each soil type's carbon stock was calculated first by identifying the soil mass per acre, which was measured by horizon depth and the bulk density of the soil types. The soil mass was then converted to soil organic matter with a percentage of 58, provided by a soil scientist. Each soil type's carbon value was averaged on a per acre basis and was multiplied by the acreage of each soil type found in the county.

Soil carbon sequestration was calculated by applying sequestration rates from the CALAND Report. These rates are sorted by ownership, region, and land cover type. As discussed above, a positive number indicates carbon was taken up by the soil, while a negative number means that carbon was lost from the soil.

2.6 SUMMARY OF RESULTS

2.6.1 Carbon Stock Results

Based on the modeling conducted, existing carbon stock by vegetation and soils on natural and working lands countywide is approximately 16,805,044 MT C. Table 2 and Figure 7 display the total carbon storage for vegetation and soils in the county by vegetation/land cover type and jurisdiction. It is important to note that the carbon stock values provided in Table 2 and Figure 7 include all landowner types in the county. These include the US Forest Service, US Bureau of Land Management, National Park Service, US Department of Defense, other federal government lands, California State lands, local government, private, and conservation easements. To provide a comprehensive estimate of carbon storage on lands located in the county, all landowners were included.

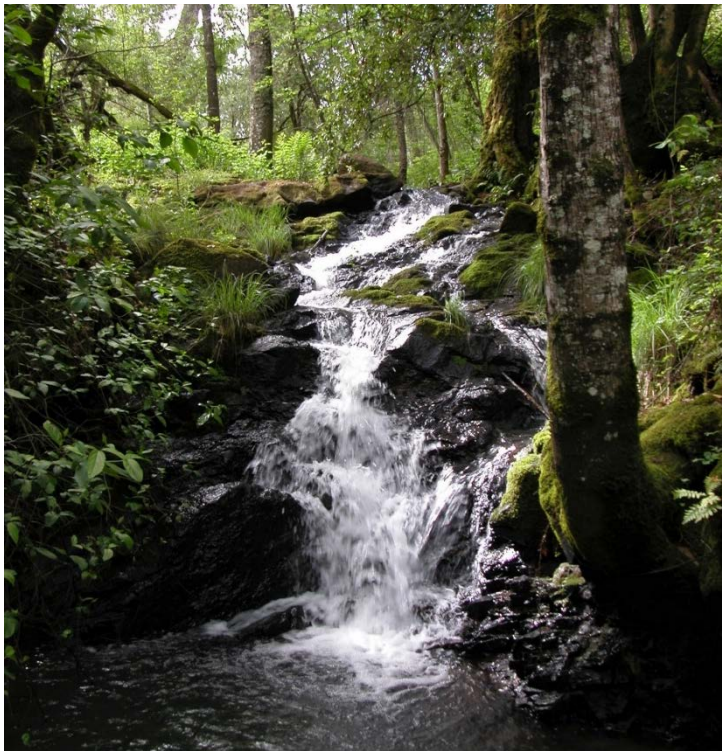


Table 2 Napa County Carbon Stock by Vegetation/Land Cover Type

Jurisdiction	Vegetation/Land Cover Type	Vegetation Carbon Stock (MT C)	Soils Carbon Stock (MT C)	Total Carbon Stock (MT C)
American Canyon	Wetlands	1,249	3,503	4,752
	Cultivated	14	119	133
	Forest	NA[1]	NA[1]	NA[1]
	Grassland	1,600	19,415	21,014
	Other Lands[1]	-	2,054	2,054
	Shrubland	NA[1]	NA[1]	NA[1]
	Urban	8,538	41,325	49,863
	Woodland	389	132	522
	Subtotal	*11,791*	*66,547*	*78,338*
Calistoga	Wetlands	181	850	1,031
	Cultivated	400	7,216	7,617
	Forest	9,546	1,306	10,852
	Grassland	234	5,519	5,753
	Other Lands[1]	-	1,033	1,033
	Shrubland	75	53	128
	Urban	2,920	28,753	31,672
	Woodland	7,365	4,464	11,829
	Subtotal	*20,722*	*49,192*	*69,914*
City of Napa	Wetlands	5,144	16,383	21,527
	Cultivated	727	7,282	8,009
	Forest	NA[1]	NA[1]	NA[1]
	Grassland	1,252	19,149	20,401
	Other Lands[1]	NA[1]	6,483	6,483
	Shrubland	NA[1]	NA[1]	NA[1]
	Urban	30,425	164,281	194,706
	Woodland	22,223	11,703	33,926
	Subtotal	*59,771*	*225,281*	*285,052*
St. Helena	Wetlands	389	825	1,214

Jurisdiction	Vegetation/Land Cover Type	Vegetation Carbon Stock (MT C)	Soils Carbon Stock (MT C)	Total Carbon Stock (MT C)
	Cultivated	1,977	29,244	31,221
	Forest	9,417	1,707	11,124
	Grassland	367	6,999	7,366
	Other Lands[1]	NA[1]	1,207	1,207
	Shrubland	48	42	91
	Urban	3,891	27,959	31,850
	Woodland	14,392	6,106	20,498
	Subtotal	***30,481***	***74,090***	***104,571***
Yountville	Wetlands	100	330	429
	Cultivated	99	970	1,068
	Forest	4,375	1,372	5,747
	Grassland	16	225	241
	Other Lands[1]	NA[1]	260	260
	Shrubland	311	603	915
	Urban	1,906	11,104	13,010
	Woodland	5,412	4,120	9,532
	Subtotal	***12,219***	***18,984***	***31,203***
Unincorporated	Wetlands	128,980	346,567	475,547
	Cultivated	92,055	1,100,623	1,192,678
	Forest	2,622,248	466,235	3,088,483
	Grassland	87,209	1,244,457	1,331,666
	Other Lands[1]	NA[1]	198,827	198,827
	Shrubland	497,912	580,279	1,078,191
	Urban	48,012	263,887	311,898
	Woodland	5,200,964	3,357,410	8,558,374
	Subtotal	***8,677,381***	***7,558,284***	***16,235,664***
All Jurisdictions	Wetlands	136,043	368,456	504,499
	Cultivated	95,272	1,145,454	1,240,726
	Forest	2,645,587	470,619	3,116,206

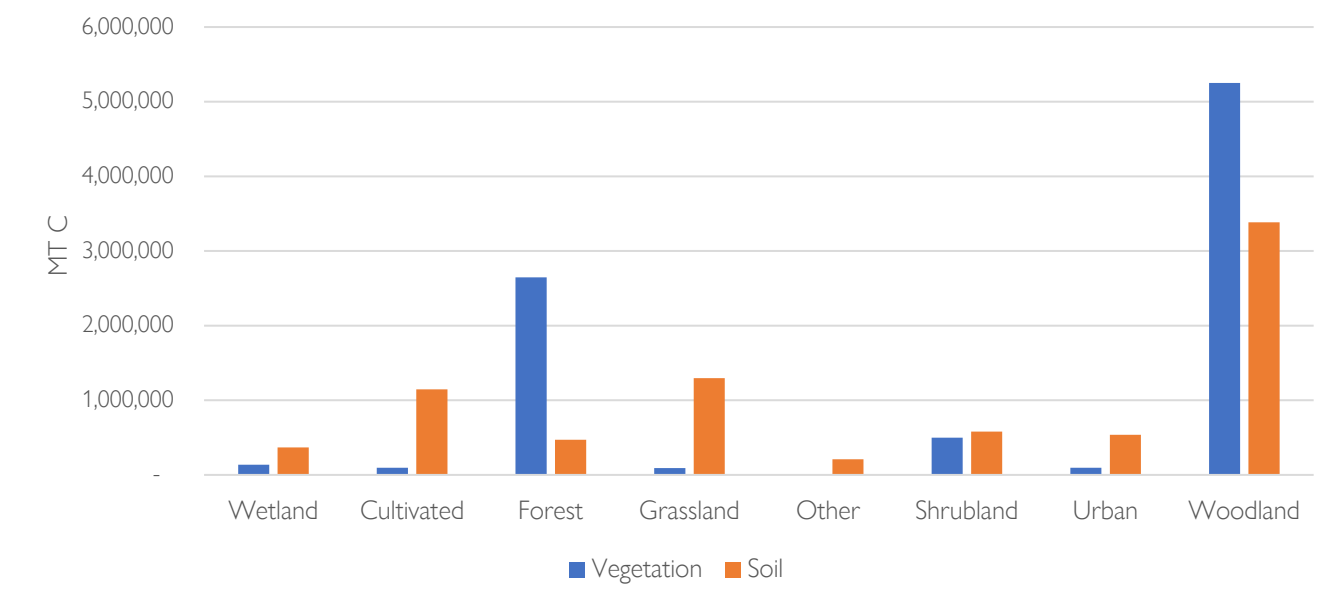
Jurisdiction	Vegetation/Land Cover Type	Vegetation Carbon Stock (MT C)	Soils Carbon Stock (MT C)	Total Carbon Stock (MT C)
	Grassland	90,678	1,295,763	1,386,441
	Other Lands[1]	NA[1]	209,864	209,864
	Shrubland	498,347	580,977	1,079,324
	Urban	95,692	537,309	633,000
	Woodland	5,251,048	3,383,935	8,634,983
	Carbon Stock Total	**8,812,667**	**7,992,377**	**16,805,044**

Notes: C=carbon; MT= metric tons; NA = not available.

1 Land cover type not shown in spatial data used for this analysis. There may be carbon held where NA values are listed.

Source: Prepared by Ascent in 2023.

Figure 7 Napa County Carbon Stock by Land Cover Type (MT C)



Notes: C = carbon; MT = metric tons.

Source: Prepared by Ascent in 2023.

2.6.2 Carbon Sequestration Results

Table 3 displays the total carbon sequestration for vegetation/land cover type based on the rates provided in the CALAND Report and using acreages by land cover type derived from the GIS analysis described above. Based on the modeling conducted, carbon sequestered by vegetation and soils on natural and working lands ranges between a minimum of 5,347 MT CO_2e/year and a maximum of 1,295,292 MT CO_2e/year. In comparison, the amount of emissions generated by all jurisdictions within Napa County was reported as 1,221,816 MTCO_2e/year in 2019 (Ascent 2022). Minimum and maximum values are reported to show the error margin between estimates of carbon sequestration in both soils and vegetation. The CALAND Report includes carbon sequestration values based on land cover type, ownership, and region for both soil and vegetation. To provide a comprehensive estimate of carbon sequestration on lands located within the county, all landowner types and jurisdictions were analyzed, and the results are presented in Table 3.

Table 3 Napa County Carbon Sequestration by Vegetation/Land Cover Type[1]

Vegetation/ Land Cover Type	Vegetation Carbon Sequestration (MT CO_2e/year)	Soil Carbon Sequestration (MT CO_2e/year)	Total Carbon Sequestration (MT CO_2e/year)	Vegetation Carbon Sequestration (MT CO_2e/ year)	Soil Carbon Sequestration (MT CO_2e/year)	Total Carbon Sequestration (MT CO_2e/year)
	Minimum			Maximum		
Wetlands	0	5,652	**5,652**	0	71,865	**71,865**
Cultivated	0	-5,467	**-5,467**	0	35,142	**35,142**
Forest	238,887	26,048	**264,935**	315,529	64,168	**379,697**
Grassland	0	-334,950	**-334,950**	0	-88,747	**-88,747**
Other Lands[2]	0	0	**0**	0	0	**0**
Shrubland	45,101	14,549	**59,650**	90,202	26,188	**116,389**
Urban	71,808	0	**71,808**	76,891	0	**76,891**
Woodland	988,321	-1,044,513	**-56,192**	1,437,859	-733,804	**704,055**
Total	**1,344,117**	**-1,338,680**	**5,437**	**1,920,481**	**-625,189**	**1,295,292**

Notes: CO_2e= carbon dioxide equivalent; MT= metric tons; NA = not applicable.

[1] Negative values indicate a source of carbon dioxide emissions.

[2] Land cover types not shown in spatial data used for this analysis. There may be carbon held where NA values are listed.

Source: Prepared by Ascent in 2023.

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Section 3. Conclusion

This analysis is a baseline assessment of carbon storage and sequestration on natural and working lands in Napa County. Based on the availability and granularity of data, there is a margin of error in these estimates, but it still provides an important consideration in climate action planning in the region: there are highly productive lands that store and continually sequester carbon and these lands should be conserved and enhanced to increase the potential for future sequestration. To assess future carbon sequestration and storage levels would be challenging due to both changes in land use and climate change, which is discussed in further detail below.

The results of this analysis can be incorporated into climate action planning efforts and can lead to the development of strategies, measures, and actions to enhance carbon sequestration and provide credit for land management activities that promote carbon sequestration.

3.1.1 Carbon Stock and Sequestration Forecast Considerations

To consider future carbon stock held in natural and working lands in Napa County requires spatial datasets that include future climate-related impacts and future land use development patterns consistent with general plans and regional land use plans. Developing these estimates quantitatively is challenging for several reasons.

First, future land use data are currently not available in a GIS format that covers all jurisdictions within Napa County that would allow an analysis to compare existing land uses with future land uses. Without this spatial data, it is unknown what land cover types may be disturbed or removed to accommodate new development, and therefore, the associated carbon loss is unknown. If such data were available in the future, it could be incorporated into this analysis to provide such projections of future carbon stock.

Second, climate-related impacts such as wildfire can be expected to impact existing carbon stock and future sequestration opportunities. The impact of wildfires on carbon sequestration in ecosystems includes both the immediate release of GHG emissions from the burning of biomass, as well as the long-term combined effects of decomposing biomass after a wildfire, and regenerating vegetation which increases the uptake of carbon (USGS

2012:13). Predicting future wildfire severity and locations would require extensive modeling and analysis that is outside the scope of this effort. From available wildfire projection data, it is estimated that the average area burned in Napa County is 1,342 acres per year through 2050 (California Energy Commission 2023). This, however, does not consider vegetation management and treatment programs that may be occurring throughout the county between now and 2050.

Fuels and forest treatments such as prescribed burning, animal grazing, and thinning from below have the negative impact of removing carbon stock from natural and working lands. However, these types of treatments may provide benefits to reduce GHG emissions associated with a wildfire event.

These considerations make future carbon stock estimates challenging to conduct at a local scale with currently available data. It is important to note that although future carbon stock estimates have been completed by CARB as part of the 2022 Scoping Plan, these estimates are provided at a statewide level and are not able to be downscaled to a jurisdiction-wide level. The enactment of AB 1757 will continue to play a large role in the future of sequestration quantification and target setting and could eventually be incorporated into future climate action planning efforts in Napa County.

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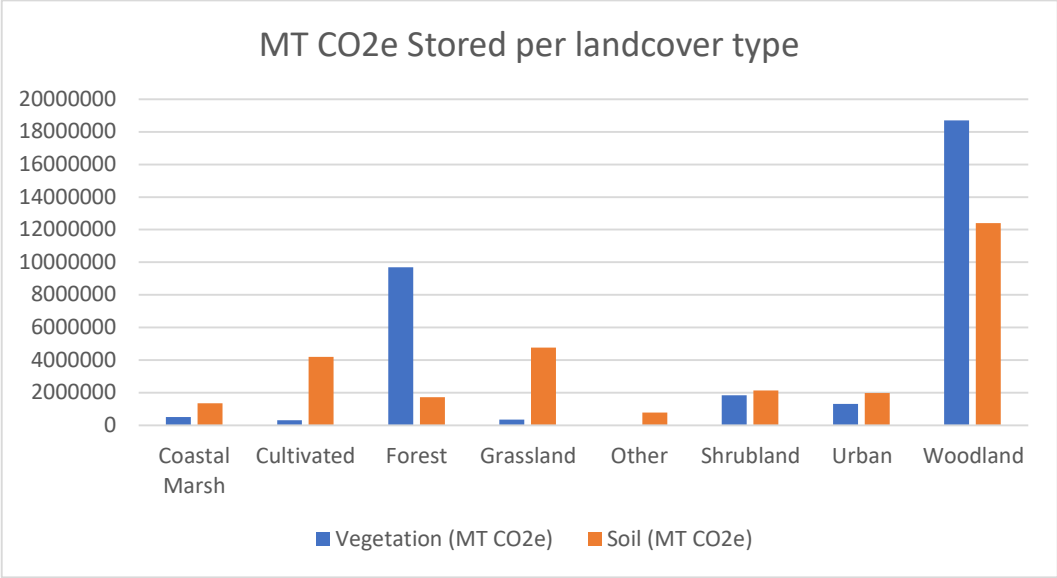
Attachment A

Carbon Stock and Sequestration Calculations

Carbon stored in each landcover type

	Vegetation (MT CO2e)	Soil (MT CO2e)	Total (MT CO2e)
Coastal Marsh	498824.4057	1351005.59	1849829.995
Cultivated	312251.1012	4199997.175	4512248.277
Forest	9699755.489	1725603.549	11425359.04
Grassland	333771.9327	4751131.006	5084902.939
Other	0	769501.9504	769501.9504
Shrubland	1827052.055	2130250.142	3957302.197
Urban	1301514.578	1970131.429	3271646.007
Woodland	18708447.33	12407762.36	31116209.69
Total	32,681,616.89	58,610,766.39	61,987,000.09



MT CO2e stored and sequestered by Vegetation in each jurisdiction

Row Labels	Sum of Carbon stored in vegetation (MT CO2e)	Sum of Carbon Seq in vegetation (MTCO2e)
American Canyon	43033.12803	5374.789733
Coastal Marsh	4581.315992	0
Cultivated	46.35803228	0
Grassland	5888.880238	0
Other	0	0
Urban	31672.39333	5328.049331
Woodland	844.1804431	46.74040274
Calistoga	73095.76401	4734.236766
Coastal Marsh	665.2971689	0
Cultivated	1325.891116	0
Forest	35002.68092	981.487758
Grassland	861.8062962	0
Other	0	0
Shrubland	274.512999	6.385365893
Urban	10830.37839	2462.742778
Woodland	24135.19712	1283.620864
Napa	207418.3474	29620.87526
Coastal Marsh	18860.41833	0
Cultivated	2384.023558	0
Grassland	4607.620341	0
Other	0	0
Shrubland	7.24061E-05	4.25127E-06
Urban	112859.2452	25633.55814
Woodland	68707.03996	3987.317125
St Helena	108018.7557	6913.354901
Coastal Marsh	1425.281086	0
Cultivated	6478.204081	0
Forest	34529.72803	964.3170763
Grassland	1351.438864	0
Other	0	0
Shrubland	177.1996961	7.790952872
Urban	14434.03587	3282.18612
Woodland	49622.86809	2659.060752
Unincorporated	#N/A	1582238.255
Coastal Marsh	472926.8667	0
Cultivated	301692.8597	0
Forest	#N/A	274637.5575
Grassland	321004.1577	0
Other	0	0
Shrubland	1825459.024	67593.36268
Urban	178094.1037	36035.48772
Woodland	22932609.94	1203971.847
(blank)	#N/A	0
Yountville	47084.20061	3417.369628
Coastal Marsh	365.2264372	0
Cultivated	323.7646316	0
Forest	16043.28129	624.7618872
Grassland	58.02925345	0
Other	0	0
Shrubland	1141.318737	43.7563446
Urban	7068.869359	1607.40524
Woodland	22083.7109	1141.446156
Grand Total	**26989087.34**	**1,632,299**

MT CO2e stored and sequestered by Soil in each jurisdiction

Row Labels	Sum of MTCO2e stored in soil	Sum of MTCO2e Seq in soil
American Canyon	**244004.4536**	**-3413.97455**
Coastal Marsh	12842.55538	355.967168
Cultivated	435.9351452	2.050262589
Grassland	71186.50093	-3737.732666
Other	7529.920928	0
Urban	151524.1079	0
Woodland	485.4333144	-34.25931429
Calistoga	**180371.4809**	**-1234.547334**
Coastal Marsh	3115.00407	51.69343252
Cultivated	26459.05653	58.14791601
Forest	4787.327859	141.5417534
Grassland	20234.92436	-546.9972923
Other	3787.948726	0
Shrubland	193.6430509	1.922475753
Urban	105426.3742	0
Woodland	16367.20203	-940.8556195
Napa	**826029.9042**	**-4268.689538**
Coastal Marsh	60070.33893	1465.450041
Cultivated	26701.13582	112.9482328
Grassland	70213.04505	-2924.503871
Other	23771.40864	0
Shrubland	0.00036312	1.27995E-06
Urban	602364.0223	0
Woodland	42909.95309	-2922.583942
St Helena	**271663.0301**	**-2247.407453**
Coastal Marsh	3024.370105	110.744002
Cultivated	107228.8063	308.0081835
Forest	6258.675306	138.278634
Grassland	25662.43518	-857.7721036
Other	4426.771901	0
Shrubland	155.4242557	2.34566323
Urban	102516.7439	0
Woodland	22389.80328	-1949.011832
Unincorporated	**27713706.29**	**-968884.33**
Coastal Marsh	1270744.842	35896.30631
Cultivated	4035617.259	14267.16927
Forest	1709528.105	44299.33576
Grassland	4563007.434	-203248.5344
Other	729032.2497	0
Shrubland	2127688.45	20305.32074
Urban	967584.0574	0
Woodland	12310503.9	-880403.9277
Yountville	**69608.03547**	**-741.8893014**
Coastal Marsh	1208.478931	28.37800771

Cultivated	3554.982897	15.38016942
Forest	5029.440407	74.65615078
Grassland	826.6667241	-36.83176214
Other	953.6504889	0
Shrubland	2212.623867	13.17395321
Urban	40716.12367	0
Woodland	15106.06848	-836.6458203
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Grand Total	**29305383.2**	**(980,791)**

Carbon (MTCO2e) Stored per Jurisdiction

Row Labels	Sum of Carbon stored in vegetation (MT CO2e)	Sum of MTCO2e stored in soil	Total
American Canyon	**127492.6785**	**244004.4536**	
Coastal Marsh	4581.315992	12842.55538	17423.87
Cultivated	46.35803228	435.9351452	482.2932
Grassland	5888.880238	71186.50093	77075.38
Other	0	7529.920928	7529.921
Urban	116131.9438	151524.1079	267656.1
Woodland	844.1804431	485.4333144	1329.614
Calistoga	**100534.1715**	**180371.4809**	280905.7
Coastal Marsh	665.2971689	3115.00407	3780.301
Cultivated	1325.891116	26459.05653	27784.95
Forest	35002.68092	4787.327859	39790.01
Grassland	861.8062962	20234.92436	21096.73
Other	0	3787.948726	3787.949
Shrubland	274.512999	193.6430509	468.156
Urban	39711.33096	105426.3742	145137.7
Woodland	22692.65209	16367.20203	39059.85
Napa	**504640.1997**	**826029.9042**	1330670
Coastal Marsh	18860.41833	60070.33893	78930.76
Cultivated	2384.023558	26701.13582	29085.16
Grassland	4607.620341	70213.04505	74820.67
Other	0	23771.40864	23771.41
Shrubland	7.24061E-05	0.00036312	0.000436
Urban	413816.644	602364.0223	1016181
Woodland	64971.49334	42909.95309	107881.4
St Helena	**140947.7571**	**271663.0301**	412610.8
Coastal Marsh	1425.281086	3024.370105	4449.651
Cultivated	6478.204081	107228.8063	113707
Forest	34529.72803	6258.675306	40788.4
Grassland	1351.438864	25662.43518	27013.87
Other	0	4426.771901	4426.772
Shrubland	177.1996961	155.4242557	332.624
Urban	52924.72297	102516.7439	155441.5
Woodland	44061.1824	22389.80328	66450.99
Unincorporated	**31745376.96**	**27713706.29**	59459083
Coastal Marsh	472926.8667	1270744.842	1743672
Cultivated	301692.8597	4035617.259	4337310
Forest	9614179.798	1709528.105	11323708

Grassland	321004.1577	4563007.434	4884012
Other	0	729032.2497	729032.2
Shrubland	1825459.024	2127688.45	3953147
Urban	653010.7852	967584.0574	1620595
Woodland	18557103.47	12310503.9	30867607
Yountville	**62625.12644**	**69608.03547**	132233.2
Coastal Marsh	365.2264372	1208.478931	1573.705
Cultivated	323.7646316	3554.982897	3878.748
Forest	16043.28129	5029.440407	21072.72
Grassland	58.02925345	826.6667241	884.696
Other	0	953.6504889	953.6505
Shrubland	1141.318737	2212.623867	3353.943
Urban	25919.1508	40716.12367	66635.27
Woodland	18774.35529	15106.06848	33880.42

Carbon Sequestration by Land Cover

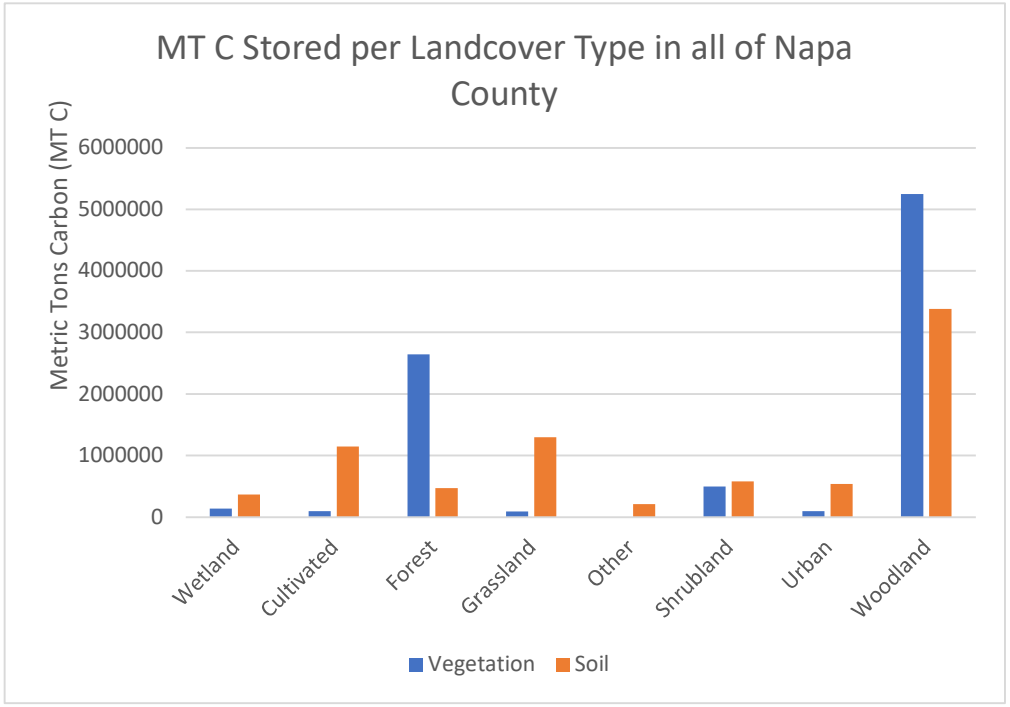
Vegetation/ Land Cover Type	Vegetation Carbon Sequestration (MT CO_2e/year)	Soil Carbon Sequestration (MT CO_2e/year)	Total Carbon Sequestration (MT CO_2e/year)	Vegetation Carbon Sequestration (MT CO_2e/ year)	Soil Carbon Sequestration (MT CO_2e/year)	Total Carbon Sequestration (MT CO_2e/year)
	Minimum			Maximum		
Wetlands	0	5,652	5,652	0	71,865	71,865
Cultivated	0	-5,467	-5,467	0	35,142	35,142
Forest	238,887	26,048	264,935	315,529	64,168	379,697
Grassland	0	-334,950	-334,950	0	-88,747	-88,747
Other Lands[1]	0	0	0	0	0	0
Shrubland	45,101	14,549	59,650	90,202	26,188	116,389
Urban	71,808	0	71,808	76,891	0	76,891
Woodland	988,321	-1,044,513	-56,192	1,437,859	-733,804	704,055
Total	1,344,117	-1,338,680	5,437	1,920,481	-625,189	1,295,292

MT C stored in Vegetation and Soils within each jurisdiction and totals

Row Labels	Sum of Carbon stored in vegetation (MT C)	Sum of MT C stored in soil	Total
American Canyon	**11,791**	**66,547**	**78,338**
Coastal Marsh	1,249	3,503	4,752
Cultivated	14	119	133
Grassland	1,600	19,415	21,014
Other	-	2,054	2,054
Urban	8,538	41,325	49,863
Woodland	389	132	522
Calistoga	**21,025**	**49,192**	**70,217**
Coastal Marsh	181	850	1,031
Cultivated	400	7,216	7,617
Forest	9,546	1,306	10,852
Grassland	234	5,519	5,753
Other	-	1,033	1,033
Shrubland	75	53	128
Urban	2,920	28,753	31,672
Woodland	7,668	4,464	12,132
Napa	**59,771**	**225,281**	**285,052**
Coastal Marsh	5,144	16,383	21,527
Cultivated	727	7,282	8,009
Grassland	1,252	19,149	20,401
Other	-	6,483	6,483
Shrubland	0	0	0
Urban	30,425	164,281	194,706
Woodland	22,223	11,703	33,926
St Helena	**30,481**	**74,090**	**104,571**
Coastal Marsh	389	825	1,214
Cultivated	1,977	29,244	31,221
Forest	9,417	1,707	11,124
Grassland	367	6,999	7,366
Other	-	1,207	1,207
Shrubland	48	42	91
Urban	3,891	27,959	31,850
Woodland	14,392	6,106	20,498
Unincorporated	**8,677,381**	**7,558,284**	**16,235,664**
Coastal Marsh	128,980	346,567	475,547
Cultivated	92,055	1,100,623	1,192,678
Forest	2,622,248	466,235	3,088,483
Grassland	87,209	1,244,457	1,331,666
Other	-	198,827	198,827
Shrubland	497,912	580,279	1,078,191
Urban	48,012	263,887	311,898
Woodland	5,200,964	3,357,410	8,558,374
Yountville	**12,219**	**18,984**	**31,203**
Coastal Marsh	100	330	429
Cultivated	99	970	1,068
Forest	4,375	1,372	5,747
Grassland	16	225	241
Other	-	260	260
Shrubland	311	603	915
Urban	1,906	11,104	13,010
Woodland	5,412	4,120	9,532
Grand Total	**8,782,189**	**7,992,377**	**16,774,566**

Total MT C By Land Cover

	Vegetation	Soil	Total
Wetland	136,043	368,456	504,499
Cultivated	95,272	1,145,454	1,240,726
Forest	2,645,587	470,619	3,116,206
Grassland	90,678	1,295,763	1,386,441
Other	0	209,864	209,864
Shrubland	498,347	580,977	1,079,324
Urban	95,692	537,309	633,000
Woodland	5,251,048	3,383,935	8,634,983
	8,812,667	7,992,377	16,805,044



CALAND - Land Cover Lookup

Land Cover	Caland Land Cover Type
Developed	Urban
Wetland	Coastal Marsh
Grassland	Grassland
Other	Other
Coast Live Oak	Woodland
Mixed Oak	Woodland
Douglas-fir	Forest
Mixed Conifer	Forest
Riparian Woodland	Woodland
Mixed Shrubland	Shrubland
Coast Live Oak/Blue C	Woodland
Vineyard	Cultivated
Coastal Sage Scrub	Shrubland
Chamise Chaparral	Shrubland
Mixed Chaparral	Shrubland
Canyon Live Oak	Woodland
Blue Oak	Woodland
Douglas-fir/Ponderos	Forest
Orchard	Cultivated
Coast Redwood	Forest
Valley Oak	Woodland
Oregon Oak	Woodland
Interior Live Oak	Woodland
Interior Live Oak/Blue	Woodland
Black Oak	Woodland
Tanbark Oak	Woodland
Mixed-conifer	Forest

Land Cover	Carbon Storage Factor (MT CO2e/acre)	Carbon Storage Factor MT C/acre	Source
Agriculture			
Coast Redwood	448.8	122.4	https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2
Douglas-fir	264.3667	72.1	
Mixed Conifer	210.4667	57.4	
Douglas-fir/ponderosa pine	176.55	48.15	
Developed	12.79	3.448	https://escholarship.org/uc/item/8r83z5wb
Grassland	5.19	1.416	https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=db068c7c3fc0d3c9cc9b3a0f73a9745d96a25235
Coast Live Oak/Blue Oak	66.7732	18.21087273	https://californiaoaks.org/wp-content/uploads/2016/04/CarbonResourcesFinal.pdf
Blue Oak	45.9993	12.54526364	
Mixed Oak	106.837	29.13736364	
Black Oak	77.1602	21.04369091	
Interior Live Oak/Blue Oak	62.32165	16.99681364	
Coast Live Oak	87.5471	23.87648182	
Valley Oak	35.6124	9.712472727	
Canyon Live Oak	200.32	54.63272727	
Interior Live Oak	78.644	21.44836364	
Oregon Oak	90.5148	24.68585455	
Tanbark Oak	182.514	49.77654545	
Other			
Riparian woodland	100.9018	45.71	https://www.uvm.edu/seagrant/sites/default/files/files/publication/DybalaEtAl_2018_Carbon%20storage%20riparian%20forests.pdf

Land Cover	Carbon Storage Factor MT C/acre
Agriculture	
Coast Redwood	122.4
Douglas-fir	72.1
Mixed Conifer	57.4
Douglas-fir/ponderosa pine	48.15
Developed	3.448
Grassland	1.41
Coast Live Oak/Blue Oak	18.21087273
Blue Oak	12.54526364
Mixed Oak	29.13736364
Black Oak	21.04369091
Interior Live Oak/Blue Oak	16.99681364
Coast Live Oak	23.87648182
Valley Oak	9.712472727
Canyon Live Oak	54.63272727
Interior Live Oak	21.44836364
Oregon Oak	24.68585455
Tanbark Oak	49.77654545
Other	
Riparian woodland	45.71

Mixed shrubland	59.32667	16.18744	https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=db068c7c3fc0d3c9cc9b3a0f73a9745d96a25235
Chamise chaparral	31.38667	8.560000909	https://bioone.org/journals/madro%c3%b1o/volume-
Mixed chaparral	51.37	14.01	
Coastal sage scrub	23.50333	6.409999091	
Wetland	27.5	7.5	https://pubs.usgs.gov/pp/1797/pdf/PP1797_WholeDocument.pdf
Vineyard	5.845	1.7869	https://dokumen.tips/documents/tech
Orchard	14.01	3.9533	

Mixed shrubland	16.18744
Chamise chaparral	8.560000909
Mixed chaparral	14.01
Coastal sage scrub	6.409999091
Wetland	7.5
Vineyard	1.7869
Orchard	3.9533

Land Type	Region	Ownership	Net Carbon Exchange Vegetation Mg C ha-1 y-1	Net Carbon Exchange Soil Mg C ha-1 y-1	Data Source	Vegetation Carbon Sequestration (MT CO2e/acre/yr) (Number)	Vegetation Carbon Sequestration (MT CO2e/acre/yr) (±Range)	Soil Carbon Sequestration (MT CO2e/acre/yr) (Number)	Soil Carbon Sequestration (MT CO2e/acre/yr) (±Range)	Vegetation Carbon Sequestration (MT CO2e/acre/yr) (Min)	Soil Carbon Sequestration (MT CO2e/acre/yr) (Min)	Vegetation Carbon Sequestration (MT CO2e/acre/yr) (Max)	Soil Carbon Sequestration (MT CO2e/acre/yr) (Max)
Water	All	All	NA1	0	[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ice	All	All	NA1	0	[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barren	All	All	0	0	[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sparse	All	All	0	0	[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Desert	All	All	0	0.76 ± 0.07	[1]	0.00	0.00	1.13	0.10	0.00	1.02	0.00	1.23
Shrubland	All	All	0.93 ± 0.313	0.28 ± 0.08	[1]	1.38	0.46	0.42	0.12	0.92	0.30	1.84	0.53
Grassland	All	All	0	-2.22 ± 1.29	[1]	0.00	0.00	-3.29	1.91	0.00	-5.21	0.00	-1.38
Savanna	All	All	3.67 ± 0.684	-2.69 ± 0.475	[1]	5.45	1.01	-3.99	0.70	4.44	-4.69	6.45	-3.29
Woodland	All	All	3.67 ± 0.684	-2.69 ± 0.475	[1]	5.45	1.01	-3.99	0.70	4.44	-4.69	6.45	-3.29
Meadow	All	All	0	0.95 ± 0.25	[1]	0.00	0.00	1.41	0.37	0.00	1.04	0.00	1.78
Coastal Marsh	All	All	0	1.44 ± 1.23	[1]	0.00	0.00	2.14	1.83	0.00	0.31	0.00	3.96
Fresh Marsh	All	All	NA1	3.37 ± 0.33	[1]	0.00	0.00	5.00	0.49	0.00	4.51	0.00	5.49
Cultivated	Non-Delta	All	0	0.19 ± 0.26	[1]	0.00	0.00	0.28	0.39	0.00	-0.10	0.00	0.67
Urban	Central Coast	All	1.45 ± 0.046	0	[1]	2.15	0.06	0.00	0.00	2.09	0.00	2.21	0.00
Urban	Central Valley	All	0.95 ± 0.0066	0	[1]	1.41	0.00	0.00	0.00	1.41	0.00	1.41	0.00
Urban	Delta	All	0.95 ± 0.0066	0	[1]	1.41	0.00	0.00	0.00	1.41	0.00	1.41	0.00
Urban	Deserts	All	0.20 ± 0.016	0	[1]	0.30	0.01	0.00	0.00	0.28	0.00	0.31	0.00
Urban	Eastside	All	0.70 ± 0.016	0	[1]	1.04	0.01	0.00	0.00	1.02	0.00	1.05	0.00
Urban	Klamath	All	0.70 ± 0.016	0	[1]	1.04	0.01	0.00	0.00	1.02	0.00	1.05	0.00
Urban	North Coast	All	1.96 ± 0.076	0	[1]	2.91	0.10	0.00	0.00	2.80	0.00	3.01	0.00
Urban	Sierra Cascades	All	0.70 ± 0.016	0	[1]	1.04	0.01	0.00	0.00	1.02	0.00	1.05	0.00
Forest	Central Coast	Other federal	1.82 ± 0.128,9	0.71 ± 0.3010	[1]	2.70	0.18	1.05	0.45	2.52	0.61	2.88	1.50
Forest	Central Coast	U.S. Bureau of Land Management	0.44 ± 0.268,9	0.71 ± 0.3010	[1]	0.65	0.39	1.05	0.45	0.27	0.61	1.04	1.50
Forest	Central Coast	U.S. Department of Defense	0.44 ± 0.268,9	0.71 ± 0.3010	[1]	0.65	0.39	1.05	0.45	0.27	0.61	1.04	1.50
Forest	Central Coast	Conservation Easement Protected	1.85 ± 0.428,9	0.71 ± 0.3010	[1]	2.75	0.62	1.05	0.45	2.12	0.61	3.37	1.50
Forest	Central Coast	Local Government	2.62 ± 0.828,9	0.71 ± 0.3010	[1]	3.89	1.22	1.05	0.45	2.67	0.61	5.10	1.50
Forest	Central Coast	National Park Service	0.44 ± 0.268,9	0.71 ± 0.3010	[1]	0.65	0.39	1.05	0.45	0.27	0.61	1.04	1.50
Forest	Central Coast	Private	2.03 ± 0.398,9	0.71 ± 0.3010	[1]	3.01	0.58	1.05	0.45	2.43	0.61	3.59	1.50
Forest	Central Coast	State Government	2.62 ± 0.828,9	0.71 ± 0.3010	[1]	3.89	1.22	1.05	0.45	2.67	0.61	5.10	1.50
Forest	Central Coast	USFS (non-wilderness)	0.74 ± 0.358,9	0.71 ± 0.3010	[1]	1.10	0.52	1.05	0.45	0.58	0.61	1.62	1.50
Forest	Central Valley	U.S. Bureau of Land Management	0	0.71 ± 0.3010	[1]	0.00	0.00	1.05	0.45	0.00	0.61	0.00	1.50
Forest	Central Valley	U.S. Department of Defense	0	0.71 ± 0.3010	[1]	0.00	0.00	1.05	0.45	0.00	0.61	0.00	1.50
Forest	Central Valley	Conservation Easement Protected	1.26 ± 0.808,9	0.71 ± 0.3010	[1]	1.87	1.19	1.05	0.45	0.68	0.61	3.06	1.50
Forest	Central Valley	Local Government	0.79 ± 0.958,9	0.71 ± 0.3010	[1]	1.17	1.41	1.05	0.45	-0.24	0.61	2.58	1.50
Forest	Central Valley	Private	1.15 ± 0.748,9	0.71 ± 0.3010	[1]	1.71	1.10	1.05	0.45	0.61	0.61	2.80	1.50
Forest	Central Valley	State Government	0.79 ± 0.958,9	0.71 ± 0.3010	[1]	1.17	1.41	1.05	0.45	-0.24	0.61	2.58	1.50
Forest	Delta	U.S. Bureau of Land Management	0.00 ± 0.002	0.71 ± 0.3010	[1]	0.00	0.00	1.05	0.45	0.00	0.61	0.00	1.50
Forest	Delta	U.S. Department of Defense	0	0.71 ± 0.3010	[1]	0.00	0.00	1.05	0.45	0.00	0.61	0.00	1.50
Forest	Delta	Conservation Easement Protected	1.26 ± 0.808,9	0.71 ± 0.3010	[1]	1.87	1.19	1.05	0.45	0.68	0.61	3.06	1.50
Forest	Delta	Local Government	0.79 ± 0.958,9	0.71 ± 0.3010	[1]	1.17	1.41	1.05	0.45	-0.24	0.61	2.58	1.50
Forest	Delta	Private	1.15 ± 0.748,9	0.71 ± 0.3010	[1]	1.71	1.10	1.05	0.45	0.61	0.61	2.80	1.50
Forest	Delta	State Government	0.79 ± 0.958,9	0.71 ± 0.3010	[1]	1.17	1.41	1.05	0.45	-0.24	0.61	2.58	1.50
Forest	Deserts	U.S. Bureau of Land Management	0.05 ± 0.038,9	0.71 ± 0.3010	[1]	0.07	0.04	1.05	0.45	0.03	0.61	0.12	1.50
Forest	Deserts	U.S. Department of Defense	0.05 ± 0.038,9	0.71 ± 0.3010	[1]	0.07	0.04	1.05	0.45	0.03	0.61	0.12	1.50
Forest	Deserts	Conservation Easement Protected	0.32 ± 0.148,9	0.71 ± 0.3010	[1]	0.47	0.21	1.05	0.45	0.27	0.61	0.68	1.50
Forest	Deserts	Local Government	0.41 ± 0.358,9	0.71 ± 0.3010	[1]	0.61	0.52	1.05	0.45	0.09	0.61	1.13	1.50
Forest	Deserts	National Park Service	0.05 ± 0.038,9	0.71 ± 0.3010	[1]	0.07	0.04	1.05	0.45	0.03	0.61	0.12	1.50
Forest	Deserts	Private	0.27 ± 0.118,9	0.71 ± 0.3010	[1]	0.40	0.16	1.05	0.45	0.24	0.61	0.56	1.50
Forest	Deserts	State Government	0.41 ± 0.358,9	0.71 ± 0.3010	[1]	0.61	0.52	1.05	0.45	0.09	0.61	1.13	1.50
Forest	Deserts	USFS (non-wilderness)	0.65 ± 0.158,9	0.71 ± 0.3010	[1]	0.96	0.22	1.05	0.45	0.74	0.61	1.19	1.50
Forest	Eastside	U.S. Bureau of Land Management	0.20 ± 0.058,9	0.71 ± 0.3010	[1]	0.30	0.07	1.05	0.45	0.22	0.61	0.37	1.50
Forest	Eastside	U.S. Department of Defense	0.20 ± 0.058,9	0.71 ± 0.3010	[1]	0.30	0.07	1.05	0.45	0.22	0.61	0.37	1.50
Forest	Eastside	Conservation Easement Protected	0.50 ± 0.218,9	0.71 ± 0.3010	[1]	0.74	0.31	1.05	0.45	0.43	0.61	1.05	1.50
Forest	Eastside	Local Government	1.32 ± 1.528,9	0.71 ± 0.3010	[1]	1.96	2.26	1.05	0.45	-0.30	0.61	4.21	1.50
Forest	Eastside	National Park Service	0.20 ± 0.058,9	0.71 ± 0.3010	[1]	0.30	0.07	1.05	0.45	0.22	0.61	0.37	1.50
Forest	Eastside	Private	1.21 ± 0.308,9	0.71 ± 0.3010	[1]	1.80	0.45	1.05	0.45	1.35	0.61	2.24	1.50
Forest	Eastside	State Government	1.32 ± 1.528,9	0.71 ± 0.3010	[1]	1.96	2.26	1.05	0.45	-0.30	0.61	4.21	1.50
Forest	Eastside	USFS (non-wilderness)	0.74 ± 0.118,9	0.71 ± 0.3010	[1]	1.10	0.16	1.05	0.45	0.93	0.61	1.26	1.50
Forest	Klamath	U.S. Bureau of Land Management	3.00 ± 0.858,9	0.71 ± 0.3010	[1]	4.45	1.26	1.05	0.45	3.19	0.61	5.71	1.50
Forest	Klamath	U.S. Department of Defense	3.00 ± 0.858,9	0.71 ± 0.3010	[1]	4.45	1.26	1.05	0.45	3.19	0.61	5.71	1.50
Forest	Klamath	Conservation Easement Protected	2.38 ± 0.308,9	0.71 ± 0.3010	[1]	3.53	0.45	1.05	0.45	3.09	0.61	3.98	1.50
Forest	Klamath	Local Government	1.36 ± 0.798,9	0.71 ± 0.3010	[1]	2.02	1.17	1.05	0.45	0.85	0.61	3.19	1.50
Forest	Klamath	National Park Service	3.00 ± 0.858,9	0.71 ± 0.3010	[1]	4.45	1.26	1.05	0.45	3.19	0.61	5.71	1.50

Forest	Klamath	Private	2.74 ± 0.248,9	0.71 ± 0.3010	[1]	4.07	0.36	1.05	0.45	3.71	0.61	4.42	1.50
Forest	Klamath	State Government	1.36 ± 0.798,9	0.71 ± 0.3010	[1]	2.02	1.17	1.05	0.45	0.85	0.61	3.19	1.50
Forest	North Coast	USFS (non-wilderness)	2.61 ± 0.178,9	0.71 ± 0.3010	[1]	3.87	0.25	1.05	0.45	3.62	0.61	4.13	1.50
Forest	North Coast	U.S. Bureau of Land Management	5.18 ± 1.888,9	0.71 ± 0.3010	[1]	7.69	2.79	1.05	0.45	4.90	0.61	10.48	1.50
Forest	North Coast	U.S. Department of Defense	5.18 ± 1.888,9	0.71 ± 0.3010	[1]	7.69	2.79	1.05	0.45	4.90	0.61	10.48	1.50
Forest	North Coast	Conservation Easement Protected	4.11 ± 0.628,9	0.71 ± 0.3010	[1]	6.10	0.92	1.05	0.45	5.18	0.61	7.02	1.50
Forest	North Coast	Local Government	5.98 ± 1.538,9	0.71 ± 0.3010	[1]	8.87	2.27	1.05	0.45	6.60	0.61	11.14	1.50
Forest	North Coast	National Park Service	5.18 ± 1.888,9	0.71 ± 0.3010	[1]	7.69	2.79	1.05	0.45	4.90	0.61	10.48	1.50
Forest	North Coast	Private	4.91 ± 0.458,9	0.71 ± 0.3010	[1]	7.29	0.67	1.05	0.45	6.62	0.61	7.95	1.50
Forest	North Coast	State Government	5.98 ± 1.538,9	0.71 ± 0.3010	[1]	8.87	2.27	1.05	0.45	6.60	0.61	11.14	1.50
Forest	North Coast	USFS (non-wilderness)	7.94 ± 5.158,9	0.71 ± 0.3010	[1]	11.78	7.64	1.05	0.45	4.14	0.61	19.42	1.50
Forest	Sierra Cascades	U.S. Bureau of Land Management	1.48 ± 0.188,9	0.71 ± 0.3010	[1]	2.20	0.27	1.05	0.45	1.93	0.61	2.46	1.50
Forest	Sierra Cascades	U.S. Department of Defense	1.48 ± 0.188,9	0.71 ± 0.3010	[1]	2.20	0.27	1.05	0.45	1.93	0.61	2.46	1.50
Forest	Sierra Cascades	Conservation Easement Protected	1.20 ± 0.128,9	0.71 ± 0.3010	[1]	1.78	0.18	1.05	0.45	1.60	0.61	1.96	1.50
Forest	Sierra Cascades	Local Government	2.55 ± 0.828,9	0.71 ± 0.3010	[1]	3.78	1.22	1.05	0.45	2.57	0.61	5.00	1.50
Forest	Sierra Cascades	National Park Service	1.48 ± 0.188,9	0.71 ± 0.3010	[1]	2.20	0.27	1.05	0.45	1.93	0.61	2.46	1.50
Forest	Sierra Cascades	Private	2.09 ± 0.148,9	0.71 ± 0.3010	[1]	3.10	0.21	1.05	0.45	2.89	0.61	3.31	1.50
Forest	Sierra Cascades	State Government	2.55 ± 0.828,9	0.71 ± 0.3010	[1]	3.78	1.22	1.05	0.45	2.57	0.61	5.00	1.50
Forest	Sierra Cascades	USFS (non-wilderness)	2.45 ± 0.118,9	0.71 ± 0.3010	[1]	3.64	0.16	1.05	0.45	3.47	0.61	3.80	1.50
Forest	South Coast	U.S. Bureau of Land Management	0.05 ± 0.038,9	0.71 ± 0.3010	[1]	0.07	0.04	1.05	0.45	0.03	0.61	0.12	1.50
Forest	South Coast	U.S. Department of Defense	0.05 ± 0.038,9	0.71 ± 0.3010	[1]	0.07	0.04	1.05	0.45	0.03	0.61	0.12	1.50
Forest	South Coast	Conservation Easement Protected	0.32 ± 0.148,9	0.71 ± 0.3010	[1]	0.47	0.21	1.05	0.45	0.27	0.61	0.68	1.50
Forest	South Coast	Local Government	0.41 ± 0.358,9	0.71 ± 0.3010	[1]	0.61	0.52	1.05	0.45	0.09	0.61	1.13	1.50
Forest	South Coast	National Park Service	0.05 ± 0.038,9	0.71 ± 0.3010	[1]	0.07	0.04	1.05	0.45	0.03	0.61	0.12	1.50
Forest	South Coast	Private	0.27 ± 0.118,9	0.71 ± 0.3010	[1]	0.40	0.16	1.05	0.45	0.24	0.61	0.56	1.50
Forest	South Coast	State Government	0.41 ± 0.358,9	0.71 ± 0.3010	[1]	0.61	0.52	1.05	0.45	0.09	0.61	1.13	1.50
Forest	South Coast	USFS (non-wilderness)	0.65 ± 0.158,9	0.71 ± 0.3010	[1]	0.96	0.22	1.05	0.45	0.74	0.61	1.19	1.50
Seagrass	Ocean	Other Federal	NA1	0.45 ± 0.45	[1]	0.00	0.00	0.67	0.67	0.00	0.00	0.00	1.34
Other					[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[1] CALAND v3 Technical Documentation (Appx B)
https://data.cnra.ca.gov/dataset/bb90d8db-39ca-4972-b19a-b613c1575cb0/resource/66e1ec60-0cff-4bda-95bb-e34816e1c68b/download/caland_technical_documentation_v3_june2019.pdf

Cultivated	Delta	All	0	-2.82 ± 2.51	[1]	0.00	0.00	-4.18	3.72	0.00	-7.91	0.00	-0.46

Table 5.3. Minimum and maximum estimates of carbon stored in the Western United States in 2005, by carbon pool for each ecoregion and ecosystem.

[Only soil organic carbon (SOC) in the top 20 cm of the soil layer was calculated. km2, square kilometers; max, maximum; min, minimum; TgC, teragrams of carbon or 1012 grams of carbon].

Ecoregion	Ecosystem	Area (km2)	Live biomass (TgC)		Soil (TgC)		Dead biomass (TgC)		Total (TgC)		MT C/acre Vegetation (min)	MT C/acre Vegetation (max)	MT C/acre Soil (min)	MT C/acre Soil (max)
			Min	Max	Min	Max	Min	Max	Min	Max				
Western Cordillera	Forests	546,533	3,304.6	3,689.4	1,599.5	1,887.7	1,398.0	2,348.2	6,648.2	7,557.6	35	45	12	14
Western Cordillera	Grasslands/shrublands	277,874	71.5	148.6	629.1	718.9	0.0	222.5	745.8	1,090.0	1	5	9	10
Western Cordillera	Agricultural lands	16,722	0.1	2.4	64.4	65.3	0.0	8.1	67.7	72.6	0	3	16	16
Western Cordillera	Wetlands	3,656	4.7	5.2	13.8	18.4	2.4	5.7	23.2	28.8	8	12	15	20
Western Cordillera	Other lands	27,469	0.2	0.4	1.9	43.9	0.0	0.7	2.9	44.1	0	0	0	6
Western Cordillera	Total	872,253	3,381.1	3,846.0	2,308.7	2,734.2	1,400.4	2,585.2	7,487.7	8,793.1	22	30	11	13
Marine West Coast Forest	Forests	64,601	696.0	829.8	398.7	416.4	235.8	336.2	1,347.6	1,510.5	58	73	25	26
Marine West Coast Forest	Grasslands/shrublands	4,542	1.7	4.0	19.1	23.4	0.0	6.0	20.7	32.7	2	9	17	21
Marine West Coast Forest	Agricultural lands	10,418	0.1	1.5	61.1	64.6	0.0	6.0	65.9	67.2	0	3	24	25
Marine West Coast Forest	Wetlands	588	2.3	2.8	3.0	3.8	0.4	1.0	5.6	7.1	19	26	21	26
Marine West Coast Forest	Other lands	15,262	0.0	1.0	4.0	28.4	0.0	2.2	7.0	28.4	-	1	1	8
Marine West Coast Forest	Total	95,411	700.1	839.0	485.8	536.6	236.2	351.5	1,446.9	1,645.9	40	50	21	23
Cold Deserts	Forests	97,180	269.4	293.6	179.6	213.5	131.7	222.2	638.8	685.1	17	21	7	9
Cold Deserts	Grasslands/shrublands	804,658	275.1	371.8	960.1	1,191.0	0.0	519.6	1,370.9	2,066.1	1	4	5	6
Cold Deserts	Agricultural lands	81,191	0.1	12.9	222.0	254.3	0.0	41.9	234.9	296.3	0	3	11	13
Cold Deserts	Wetlands	4,635	2.6	3.7	14.9	20.0	1.9	5.3	21.0	27.9	4	8	13	17
Cold Deserts	Other lands	68,392	0.0	0.3	2.7	49.0	0.0	0.3	3.0	49.0	-	0	0	3
Cold Deserts	Total	1,056,055	547.2	682.4	1,379.3	1,727.9	133.6	789.4	2,268.6	3,124.4	3	6	5	7
Warm Deserts	Forests	8,084	20.1	22.7	7.3	10.4	8.7	19.8	39.9	49.8	14	21	4	5
Warm Deserts	Grasslands/shrublands	403,390	120.4	193.5	300.3	418.1	0.0	204.1	470.7	815.7	1	4	3	4
Warm Deserts	Agricultural lands	11,334	0.0	2.0	10.7	25.4	0.0	8.6	12.6	35.5	-	4	4	9
Warm Deserts	Wetlands	326	0.2	0.3	0.3	0.5	0.0	0.6	0.5	1.1	2	11	4	6
Warm Deserts	Other lands	42,150	0.0	0.2	0.8	18.4	0.0	0.2	0.9	18.9	-	0	0	2
Warm Deserts	Total	465,285	140.6	218.6	319.4	472.8	8.8	233.3	524.6	921.0	1	4	3	4
Mediterranean California	Forests	29,945	250.9	296.0	56.9	85.7	88.3	119.0	424.9	469.8	46	56	8	12
Mediterranean California	Grasslands/shrublands	74,294	28.1	37.2	125.9	179.9	0.0	62.9	154.0	279.8	2	5	7	10
Mediterranean California	Agricultural lands	41,046	0.0	7.4	94.2	146.6	0	35.1	101.6	188.4	-	4	9	14
Mediterranean California	Wetlands	910	0.5	0.9	4.4	5.0	0.4	1.5	5.8	7.0	4	11	20	22
Mediterranean California	Other lands	23,259	0.0	0.4	3.9	31.2	0.0	0.3	4.3	31.2	-	0	1	5
Mediterranean California	Total	169,455	279.5	341.8	285.3	448.4	88.7	218.8	690.5	976.3	9	13	7	11

Source: USGS 2012. https://pubs.usgs.gov/pp/1797/pdf/PP1797_WholeDocument.pdf

	Map Unit Symbol	Component Name - Local Phase				g/cc	g/cc	g/cc	pct	pct	pct								
						Moist Bulk Density Range (lov	Moist Bulk Density Ran	Moist Bulk Density Range (Hig	Organic Matter Range (lo	Organic Matter Range	Organic matter Range (h	**Soil Carbon Calculations (from Carbon Cycle Institute)**							
AREASYMBOL	MUSYM	Muname	horizon depth low	horizon depth high	Horizon Thickness (in)	Moist bulk density low	Med Density	moist bulk density high	organic matter low	Med OM	organic matter high	**depth interval (inches)**	**depth interval (cm)**	**soil mass per area (g/cm2)**	**soil mass per area (g/acre)**	**soil mass per area (metric ton/acre)**	**mass of soil organic matter per acre (metric ton OM per acre)**	**mass of soil carbon per acre (metric ton C/acre)**	**mass of soil carbon per acre (metric ton CO2e/acre)**
CA550	100:	Aiken	0	8	8.00	1.4	1.45	1.5	2	5	8	8.00	20.32	29.5	1192370546	1192	17.3	10.0	36.8
CA550	100:	Aiken	8	14	6.00	1.4	1.45	1.5	0.5	0.75	1	6.00	15.24	22.1	894277909	894	13.0	7.5	27.6
CA550	100:	Aiken	14	44	30.00	1.35	1.4	1.45	0.5	0.75	1	30.00	76.2	106.7	4317203700	4317	60.4	35.1	128.5
CA550	101:	Aiken	0	8	8.00	1.4	1.45	1.5	2	5	8	8.00	20.32	29.5	1192370546	1192	17.3	10.0	36.8
CA550	101:	Aiken	8	14	6.00	1.4	1.45	1.5	0.5	0.75	1	6.00	15.24	22.1	894277909	894	13.0	7.5	27.6
CA550	101:	Aiken	14	44	30.00	1.35	1.4	1.45	0.5	0.75	1	30.00	76.2	106.7	4317203700	4317	60.4	35.1	128.5
CA550	102:	Aiken	0	8	8.00	1.4	1.45	1.5	2	5	8	8.00	20.32	29.5	1192370546	1192	17.3	10.0	36.8
CA550	102:	Aiken	8	14	6.00	1.4	1.45	1.5	0.5	0.75	1	6.00	15.24	22.1	894277909	894	13.0	7.5	27.6
CA550	102:	Aiken	14	44	30.00	1.35	1.4	1.45	0.5	0.75	1	30.00	76.2	106.7	4317203700	4317	60.4	35.1	128.5
CA550	103:	Bale	0	24	24.00	1.4	1.45	1.5	1	2	3	24.00	60.96	88.4	3577111637	3577	51.9	30.1	110.3
CA550	103:	Bale	24	60	36.00	1.4	1.45	1.5	0.5	0.75	1	36.00	91.44	132.6	5365667456	5366	77.8	45.1	165.5
CA550	104:	Bale	0	24	24.00	1.3	1.375	1.45	1	2	3	24.00	60.96	83.8	3392088622	3392	46.6	27.1	99.2
CA550	104:	Bale	24	60	36.00	1.4	1.45	1.5	0.5	0.75	1	36.00	91.44	132.6	5365667456	5366	77.8	45.1	165.5
CA550	105:	Bale	0	24	24.00	1.3	1.375	1.45	1	2	3	24.00	60.96	83.8	3392088622	3392	46.6	27.1	99.2
CA550	105:	Bale	24	60	36.00	1.4	1.45	1.5	0.5	0.75	1	36.00	91.44	132.6	5365667456	5366	77.8	45.1	165.5
CA550	106:	Bale	0	24	24.00	1.4	1.45	1.5	1	2	3	24.00	60.96	88.4	3577111637	3577	51.9	30.1	110.3
CA550	106:	Bale	24	60	36.00	1.4	1.45	1.5	0.5	0.75	1	36.00	91.44	132.6	5365667456	5366	77.8	45.1	165.5
CA550	106:	Bale	0	24	24.00	1.3	1.375	1.45	1	2	3	24.00	60.96	83.8	3392088622	3392	46.6	27.1	99.2
CA550	106:	Bale	24	60	36.00	1.4	1.45	1.5	1	3	5	36.00	91.44	132.6	5365667456	5366	77.8	45.1	165.5
CA550	107:	Boomer	0	2	2.00	0.25	0.27	0.29	50	60	70	2.00	5.08	1.4	55506905	56	0.1	0.1	0.3
CA550	107:	Boomer	2	6	4.00	1.18	1.265	1.35	3	4.5	6	4.00	10.16	12.9	520120255	520	6.6	3.8	14.0
CA550	107:	Boomer	6	13	7.00	1.37	1.385	1.4	2	2.5	3	7.00	17.78	24.6	996554521	997	13.8	8.0	29.4
CA550	107:	Boomer	13	24	11.00	1.31	1.41	1.51	0.6	0.8	1	11.00	27.94	39.4	1594281652	1594	22.5	13.0	47.8
CA550	107:	Boomer	24	36	12.00	1.49	1.525	1.56	0.3	0.4	0.5	12.00	30.48	46.5	1881067327	1881	28.7	16.6	61.0
CA550	107:	Boomer	36	46	10.00	1.51	1.52	1.53	0.2	0.25	0.3	10.00	25.4	38.6	1562416577	1562	23.7	13.8	50.5
CA550	108:	Boomer	0	2	2.00	0.25	0.27	0.29	50	60	70	2.00	5.08	1.4	55506905	56	0.1	0.1	0.3
CA550	108:	Boomer	2	6	4.00	1.18	1.265	1.35	3	4.5	6	4.00	10.16	12.9	520120255	520	6.6	3.8	14.0
CA550	108:	Boomer	6	13	7.00	1.37	1.385	1.4	2	2.5	3	7.00	17.78	24.6	996554521	997	13.8	8.0	29.4
CA550	108:	Boomer	13	24	11.00	1.31	1.41	1.51	0.6	0.8	1	11.00	27.94	39.4	1594281652	1594	22.5	13.0	47.8
CA550	108:	Boomer	24	36	12.00	1.49	1.525	1.56	0.3	0.4	0.5	12.00	30.48	46.5	1881067327	1881	28.7	16.6	61.0
CA550	108:	Boomer	36	46	10.00	1.51	1.52	1.53	0.2	0.25	0.3	10.00	25.4	38.6	1562416577	1562	23.7	13.8	50.5
CA550	109:	Boomer	0	2	2.00	0.25	0.27	0.29	50	60	70	2.00	5.08	1.4	55506905	56	0.1	0.1	0.3
CA550	109:	Boomer	2	6	4.00	1.18	1.265	1.35	3	4.5	6	4.00	10.16	12.9	520120255	520	6.6	3.8	14.0
CA550	109:	Boomer	6	13	7.00	1.37	1.385	1.4	2	2.5	3	7.00	17.78	24.6	996554521	997	13.8	8.0	29.4
CA550	109:	Boomer	13	24	11.00	1.31	1.41	1.51	0.6	0.8	1	11.00	27.94	39.4	1594281652	1594	22.5	13.0	47.8
CA550	109:	Boomer	24	36	12.00	1.49	1.525	1.56	0.3	0.4	0.5	12.00	30.48	46.5	1881067327	1881	28.7	16.6	61.0
CA550	109:	Boomer	36	46	10.00	1.51	1.52	1.53	0.2	0.25	0.3	10.00	25.4	38.6	1562416577	1562	23.7	13.8	50.5
CA550	110:	Boomer	0	4	4.00	1.3	1.375	1.45	1	2	3	4.00	10.16	14.0	565348104	565	7.8	4.5	16.5
CA550	110:	Boomer	4	44	40.00	1.3	1.375	1.45	0.5	0.75	1	40.00	101.6	139.7	5653481036	5653	77.7	45.1	165.3
CA550	110:	Forward	0	4	4.00	0.85	0.875	0.9	2	3	4	4.00	10.16	8.9	359766975	360	3.1	1.8	6.7
CA550	110:	Forward	4	35	31.00	0.85	0.875	0.9	0.5	1.25	2	31.00	78.74	68.9	2788194056	2788	24.4	14.2	51.9
CA550	110:	Felta	0	7	7.00	1.4	1.45	1.5	1	2	3	7.00	17.78	25.8	1043324228	1043	15.1	8.8	32.2
CA550	110:	Felta	7	26	19.00	1.3	1.35	1.4	0.5	0.75	1	19.00	48.26	65.2	2636577974	2637	35.6	20.6	75.7
CA550	110:	Felta	26	60	34.00	1.35	1.425	1.5	0.5	0.75	1	34.00	86.36	123.1	4980202840	4980	71.0	41.2	150.9
CA550	111:	Boomer	0	4	4.00	1.3	1.375	1.45	1	2	3	4.00	10.16	14.0	565348104	565	7.8	4.5	16.5
CA550	111:	Boomer	4	44	40.00	1.3	1.375	1.45	0.5	0.75	1	40.00	101.6	139.7	5653481036	5653	77.7	45.1	165.3
CA550	111:	Forward	0	4	4.00	0.85	0.875	0.9	2	3	4	4.00	10.16	8.9	359766975	360	3.1	1.8	6.7
CA550	111:	Forward	4	35	31.00	0.85	0.875	0.9	0.5	1.25	2	31.00	78.74	68.9	2788194056	2788	24.4	14.2	51.9
CA550	111:	Felta	0	7	7.00	1.4	1.45	1.5	1	2	3	7.00	17.78	25.8	1043324228	1043	15.1	8.8	32.2
CA550	111:	Felta	7	26	19.00	1.3	1.35	1.4	0.5	0.75	1	19.00	48.26	65.2	2636577974	2637	35.6	20.6	75.7
CA550	111:	Felta	26	60	34.00	1.35	1.425	1.5	0.5	0.75	1	34.00	86.36	123.1	4980202840	4980	71.0	41.2	150.9
CA550	112:	Bressa	0	10	10.00	1.45	1.5	1.55	0.5	1.75	3	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	112:	Bressa	10	33	23.00	1.35	1.4	1.45	0.5	0.75	1	23.00	58.42	81.8	3309856170	3310	46.3	26.9	98.5
CA550	112:	Dibble	0	9	9.00	1.45	1.5	1.55	0.5	0.75	1	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	112:	Dibble	9	34	25.00	1.3	1.35	1.4	0.5	0.75	1	25.00	63.5	85.7	3469181545	3469	46.8	27.2	99.6
CA550	113:	Bressa	0	10	10.00	1.45	1.5	1.55	0.5	1.75	3	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	113:	Bressa	10	33	23.00	1.35	1.4	1.45	0.5	0.75	1	23.00	58.42	81.8	3309856170	3310	46.3	26.9	98.5
CA550	113:	Dibble	0	9	9.00	1.45	1.5	1.55	0.5	0.75	1	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	113:	Dibble	9	34	25.00	1.3	1.35	1.4	0.5	0.75	1	25.00	63.5	85.7	3469181545	3469	46.8	27.2	99.6
CA550	114:	Bressa	0	10	10.00	1.45	1.5	1.55	0.5	1.75	3	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	114:	Bressa	10	33	23.00	1.35	1.4	1.45	0.5	0.75	1	23.00	58.42	81.8	3309856170	3310	46.3	26.9	98.5
CA550	114:	Dibble	0	9	9.00	1.45	1.5	1.55	0.5	0.75	1	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	114:	Dibble	9	34	25.00	1.3	1.35	1.4	0.5	0.75	1	25.00	63.5	85.7	3469181545	3469	46.8	27.2	99.6
CA550	115:	Bressa	0	10	10.00	1.45	1.5	1.55	0.5	1.75	3	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	115:	Bressa	10	33	23.00	1.35	1.4	1.45	0.5	0.75	1	23.00	58.42	81.8	3309856170	3310	46.3	26.9	98.5
CA550	115:	Dibble	0	9	9.00	1.45	1.5	1.55	0.5	0.75	1	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	115:	Dibble	9	34	25.00	1.3	1.35	1.4	0.5	0.75	1	25.00	63.5	85.7	3469181545	3469	46.8	27.2	99.6
CA550	116:	Clear Lake, drained	0	6	6.00	1.23	1.275	1.32	1.5	2	2.5	6.00	15.24	19.4	786347817	786	10.0	5.8	21.3
CA550	116:	Clear Lake, drained	6	26	20.00	1.25	1.31	1.37	1	1.25	1.5	20.00	50.8	66.5	2693112784	2693	35.3	20.5	75.0
CA550	116:	Clear Lake, drained	26	36	10.00	1.25	1.31	1.37	1	1.25	1.5	10.00	25.4	33.3	1346556392	1347	17.6	10.2	37.5
CA550	116:	Clear Lake, drained	36	60	24.00	1.25	1.32	1.39	0.5	0.75	1	24.00	60.96	80.5	3256405077	3256	43.0	24.9	91.4

CA550	117:	Clear Lake	0	18	18.00	1.5	1.55	1.6	1	1.5	2	18.00	45.72	70.9	2867856744	2868	44.5	25.8	94.5
CA550	117:	Clear Lake	18	69	51.00	1.25	1.325	1.4	0.5	0.75	1	51.00	129.54	171.6	6946072382	6946	92.0	53.4	195.7
CA550	118:	Cole	0	8	8.00	1.26	1.36	1.46	2	3.5	5	8.00	20.32	27.6	1118361339	1118	15.2	8.8	32.3
CA550	118:	Cole	8	18	10.00	1.31	1.345	1.38	2	3	4	10.00	25.4	34.2	1382533090	1383	18.6	10.8	39.5
CA550	118:	Cole	18	32	14.00	1.27	1.32	1.37	1.5	2.25	3	14.00	35.56	46.9	1899569628	1900	25.1	14.5	53.3
CA550	118:	Cole	32	41	9.00	1.41	1.445	1.48	0.8	1	1.2	9.00	22.86	33.0	1336791289	1337	19.3	11.2	41.1
CA550	118:	Cole	41	48	7.00	1.42	1.445	1.47	0.5	0.65	0.8	7.00	17.78	25.7	1039726558	1040	15.0	8.7	32.0
CA550	118:	Cole	48	60	12.00	1.42	1.45	1.48	0.3	0.5	0.7	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	118:	Cole	60	64	4.00	1.37	1.405	1.44	0.2	0.35	0.5	4.00	10.16	14.3	577682971	578	8.1	4.7	17.3
CA550	119:	Cole	0	8	8.00	1.26	1.36	1.46	2	3.5	5	8.00	20.32	27.6	1118361339	1118	15.2	8.8	32.3
CA550	119:	Cole	8	18	10.00	1.31	1.345	1.38	2	3	4	10.00	25.4	34.2	1382533090	1383	18.6	10.8	39.5
CA550	119:	Cole	18	32	14.00	1.27	1.32	1.37	1.5	2.25	3	14.00	35.56	46.9	1899569628	1900	25.1	14.5	53.3
CA550	119:	Cole	32	41	9.00	1.41	1.445	1.48	0.8	1	1.2	9.00	22.86	33.0	1336791289	1337	19.3	11.2	41.1
CA550	119:	Cole	41	48	7.00	1.42	1.445	1.47	0.5	0.65	0.8	7.00	17.78	25.7	1039726558	1040	15.0	8.7	32.0
CA550	119:	Cole	48	60	12.00	1.42	1.45	1.48	0.3	0.5	0.7	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	119:	Cole	60	64	4.00	1.37	1.405	1.44	0.2	0.35	0.5	4.00	10.16	14.3	577682971	578	8.1	4.7	17.3
CA550	120:	Contra Costa	0	5	5.00	1.45	1.5	1.55	0.5	0.75	1	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	120:	Contra Costa	5	22	17.00	1.3	1.375	1.45	0.5	0.75	1	17.00	43.18	59.4	2402729440	2403	33.0	19.2	70.3
CA550	120:	Contra Costa	22	34	12.00	1.3	1.375	1.45	0.5	0.75	1	12.00	30.48	41.9	1696044311	1696	23.3	13.5	49.6
CA550	121:	Contra Costa	0	5	5.00	1.45	1.5	1.55	0.5	0.75	1	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	121:	Contra Costa	5	34	29.00	1.3	1.375	1.45	0.5	0.75	1	29.00	73.66	101.3	4098773751	4099	56.4	32.7	119.9
CA550	122:	Coombs	0	14	14.00	1.45	1.5	1.55	0.5	0.75	1	14.00	35.56	53.3	2158601850	2159	32.4	18.8	68.9
CA550	122:	Coombs	14	54	40.00	1.4	1.45	1.5	0.5	0.75	1	40.00	101.6	147.3	5961852729	5962	86.4	50.1	183.8
CA550	122:	Coombs	54	60	6.00	1.55	1.6	1.65	0.1	0.3	0.5	6.00	15.24	24.4	986789417	987	15.8	9.2	33.6
CA550	123:	Coombs	0	14	14.00	1.45	1.5	1.55	0.5	0.75	1	14.00	35.56	53.3	2158601850	2159	32.4	18.8	68.9
CA550	123:	Coombs	14	54	40.00	1.4	1.45	1.5	0.5	0.75	1	40.00	101.6	147.3	5961852729	5962	86.4	50.1	183.8
CA550	123:	Coombs	54	60	6.00	1.55	1.6	1.65	0.1	0.3	0.5	6.00	15.24	24.4	986789417	987	15.8	9.2	33.6
CA550	124:	Cortina	0	11	11.00	1.46	1.505	1.55	0.8	1.4	2	11.00	27.94	42.0	1701697792	1702	25.6	14.9	54.5
CA550	124:	Cortina	11	21	10.00	1.54	1.56	1.58	0.5	0.65	0.8	10.00	25.4	39.6	1603532803	1604	25.0	14.5	53.2
CA550	124:	Cortina	21	32	11.00	1.59	1.595	1.6	0.2	0.35	0.5	11.00	27.94	44.6	1803460450	1803	28.8	16.7	61.2
CA550	124:	Cortina	32	60	28.00	1.6	1.635	1.67	0.1	0.2	0.3	28.00	71.12	116.3	4705752033	4706	76.9	44.6	163.6
CA550	125:	Cortina	0	21	21.00	1.45	1.5	1.55	0.5	0.75	1	21.00	53.34	80.0	3237902775	3238	48.6	28.2	103.3
CA550	125:	Cortina	21	60	39.00	1.45	1.5	1.55	0.5	0.75	1	39.00	99.06	148.6	6013248011	6013	90.2	52.3	191.8
CA550	126:	Diablo	0	5	5.00	1.18	1.28	1.38	1	2.5	4	5.00	12.7	16.3	657859611	658	8.4	4.9	17.9
CA550	126:	Diablo	5	18	13.00	1.18	1.28	1.38	1	2.5	4	13.00	33.02	42.3	1710434990	1710	21.9	12.7	46.6
CA550	126:	Diablo	18	30	12.00	1.24	1.345	1.45	0	0.5	1	12.00	30.48	41.0	1659039708	1659	22.3	12.9	47.5
CA550	126:	Diablo	30	39	9.00	1.24	1.345	1.45	0	0.5	1	9.00	22.86	30.7	1244279781	1244	16.7	9.7	35.6
CA550	126:	Diablo	39	53	14.00	1.31	1.365	1.42	0	0		14.00	35.56	48.5	1964327684	1964	26.8	15.6	57.0
CA550	127:	Diablo	0	5	5.00	1.18	1.28	1.38	1	2.5	4	5.00	12.7	16.3	657859611	658	8.4	4.9	17.9
CA550	127:	Diablo	5	18	13.00	1.18	1.28	1.38	1	2.5	4	13.00	33.02	42.3	1710434990	1710	21.9	12.7	46.6
CA550	127:	Diablo	18	30	12.00	1.24	1.345	1.45	0	0.5	1	12.00	30.48	41.0	1659039708	1659	22.3	12.9	47.5
CA550	127:	Diablo	30	39	9.00	1.24	1.345	1.45	0	0.5	1	9.00	22.86	30.7	1244279781	1244	16.7	9.7	35.6
CA550	127:	Diablo	39	53	14.00	1.31	1.365	1.42	0	0		14.00	35.56	48.5	1964327684	1964	26.8	15.6	57.0
CA550	128:	Diablo	0	60	60.00	1.25	1.3	1.35	1	2.5	4	60.00	152.4	198.1	8017664015	8018	104.2	60.5	221.7
CA550	129:	Diablo	0	5	5.00	1.18	1.28	1.38	1	2.5	4	5.00	12.7	16.3	657859611	658	8.4	4.9	17.9
CA550	129:	Diablo	5	18	13.00	1.18	1.28	1.38	1	2.5	4	13.00	33.02	42.3	1710434990	1710	21.9	12.7	46.6
CA550	129:	Diablo	18	30	12.00	1.24	1.345	1.45	0	0.5	1	12.00	30.48	41.0	1659039708	1659	22.3	12.9	47.5
CA550	129:	Diablo	30	39	9.00	1.24	1.345	1.45	0	0.5	1	9.00	22.86	30.7	1244279781	1244	16.7	9.7	35.6
CA550	129:	Diablo	39	53	14.00	1.31	1.365	1.42	0	0		14.00	35.56	48.5	1964327684	1964	26.8	15.6	57.0
CA550	129I:	Collayomi	0	15	15.00	1.45	1.5	1.55	0	1	2	15.00	38.1	57.2	2312787697	2313	34.7	20.1	73.8
CA550	129I:	Collayomi	15	60	45.00	1.4	1.475	1.55	0	0.25	0.5	45.00	114.3	168.6	6822723705	6823	100.6	58.4	214.0
CA550	129I:	Whispering	0	5	5.00	1.45	1.5	1.55	1	1.5	2	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	129I:	Whispering	5	15	10.00	1.45	1.5	1.55	1	1.5	2	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	129I:	Whispering	15	26	11.00	1.4	1.475	1.55	0.5	0.75	1	11.00	27.94	41.2	1667776906	1668	24.6	14.3	52.3
CA550	130:	Egbert	0	33	33.00	1.4	1.45	1.5	2	6	10	33.00	83.82	121.5	4918528501	4919	71.3	41.4	151.7
CA550	130:	Egbert	33	60	27.00	1.3	1.35	1.4	0.5	0.75	1	27.00	68.58	92.6	3746716068	3747	50.6	29.3	107.6
CA550	131:	Fagan	0	16	16.00	1.4	1.45	1.5	1	2	3	16.00	40.64	58.9	2384741092	2385	34.6	20.1	73.5
CA550	131:	Fagan	16	28	12.00	1.4	1.45	1.5	0.5	0.75	1	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	131:	Fagan	28	46	18.00	1.35	1.425	1.5	0.5	0.75	1	18.00	45.72	65.2	2636577974	2637	37.6	21.8	79.9
CA550	132:	Fagan	0	16	16.00	1.4	1.45	1.5	1	2	3	16.00	40.64	58.9	2384741092	2385	34.6	20.1	73.5
CA550	132:	Fagan	16	28	12.00	1.4	1.45	1.5	0.5	0.75	1	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	132:	Fagan	28	46	18.00	1.35	1.425	1.5	0.5	0.75	1	18.00	45.72	65.2	2636577974	2637	37.6	21.8	79.9
CA550	133:	Fagan	0	16	16.00	1.4	1.45	1.5	1	2	3	16.00	40.64	58.9	2384741092	2385	34.6	20.1	73.5
CA550	133:	Fagan	16	28	12.00	1.4	1.45	1.5	0.5	0.75	1	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	133:	Fagan	28	46	18.00	1.35	1.425	1.5	0.5	0.75	1	18.00	45.72	65.2	2636577974	2637	37.6	21.8	79.9
CA550	134:	Fagan	0	16	16.00	1.4	1.45	1.5	1	2	3	16.00	40.64	58.9	2384741092	2385	34.6	20.1	73.5
CA550	134:	Fagan	16	28	12.00	1.4	1.45	1.5	0.5	0.75	1	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	134:	Fagan	28	46	18.00	1.35	1.425	1.5	0	0		18.00	45.72	65.2	2636577974	2637	37.6	21.8	79.9
CA550	134I:	Forward variant	0	7	7.00	1.45	1.5	1.55	1	2	3	7.00	17.78	26.7	1079300925	1079	16.2	9.4	34.4
CA550	134I:	Forward variant	7	62	55.00	1.45	1.5	1.55	0.5	0.75	1	55.00	139.7	209.6	8480221554	8480	127.2	73.8	270.5
CA550	134I:	Kidd	0	4	4.00	1.45	1.5	1.55	1	2	3	4.00	10.16	15.2	616743386	617	9.3	5.4	19.7
CA550	134I:	Kidd	4	13	9.00	1.45	1.5	1.55	0.5	0.75	1	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	135:	Felton	0	10	10.00	1.4	1.45	1.5	5	7.5	10	10.00	25.4	36.8	1490463182	1490	21.6	12.5	46.0
CA550	135:	Felton	10	33	23.00	1.4	1.45	1.5	0.5	0.75	1	23.00	58.42	84.7	3428065319	3428	49.7	28.8	105.7
CA550	136:	Felton	0	10	10.00	1.4	1.45	1.5	5	7.5	10	10.00	25.4	36.8	1490463182	1490	21.6	12.5	46.0
CA550	136:	Felton	10	33	23.00	1.4	1.45	1.5	0.5	0.75	1	23.00	58.42	84.7	3428065319	3428	49.7	28.8	105.7
CA550	137:	Felton	0	10	10.00	1.4	1.45	1.5	5	7.5	10	10.00	25.4	36.8	1490463182	1490	21.6	12.5	46.0

CA550	137:	Felton	10	33	23.00	1.4	1.45	1.5	0.5	0.75	1	23.00	58.42	84.7	3428065319	3428	49.7	28.8	105.7
CA550	138:	Forward	0	2	2.00	0.18	0.215	0.25	55	67.5	80	2.00	5.08	1.1	44199943	44	0.1	0.1	0.2
CA550	138:	Forward	2	6	4.00	1.13	1.18	1.23	4	5	6	4.00	10.16	12.0	485171463	485	5.7	3.3	12.2
CA550	138:	Forward	6	12	6.00	1.37	1.405	1.44	1	1.75	2.5	6.00	15.24	21.4	866524457	867	12.2	7.1	25.9
CA550	138:	Forward	12	19	7.00	1.47	1.505	1.54	0.7	0.95	1.2	7.00	17.78	26.8	1082898595	1083	16.3	9.5	34.7
CA550	138:	Forward	19	28	9.00	1.37	1.46	1.55	0.3	0.55	0.8	9.00	22.86	33.4	1350668015	1351	19.7	11.4	41.9
CA550	138:	Forward	28	37	9.00	1.44	1.505	1.57	0.2	0.45	0.7	9.00	22.86	34.4	1392298193	1392	21.0	12.2	44.6
CA550	139:	Forward	0	2	2.00	0.18	0.215	0.25	55	67.5	80	2.00	5.08	1.1	44199943	44	0.1	0.1	0.2
CA550	139:	Forward	2	6	4.00	1.13	1.18	1.23	4	5	6	4.00	10.16	12.0	485171463	485	5.7	3.3	12.2
CA550	139:	Forward	6	12	6.00	1.37	1.405	1.44	1	1.75	2.5	6.00	15.24	21.4	866524457	867	12.2	7.1	25.9
CA550	139:	Forward	12	19	7.00	1.47	1.505	1.54	0.7	0.95	1.2	7.00	17.78	26.8	1082898595	1083	16.3	9.5	34.7
CA550	139:	Forward	19	28	9.00	1.37	1.46	1.55	0.3	0.55	0.8	9.00	22.86	33.4	1350668015	1351	19.7	11.4	41.9
CA550	139:	Forward	28	37	9.00	1.44	1.505	1.57	0.2	0.45	0.7	9.00	22.86	34.4	1392298193	1392	21.0	12.2	44.6
CA550	140:	Forward	0	2	2.00	0.18	0.215	0.25	55	67.5	80	2.00	5.08	1.1	44199943	44	0.1	0.1	0.2
CA550	140:	Forward	2	6	4.00	1.13	1.18	1.23	4	5	6	4.00	10.16	12.0	485171463	485	5.7	3.3	12.2
CA550	140:	Forward	6	12	6.00	1.37	1.405	1.44	1	1.75	2.5	6.00	15.24	21.4	866524457	867	12.2	7.1	25.9
CA550	140:	Forward	12	19	7.00	1.47	1.505	1.54	0.7	0.95	1.2	7.00	17.78	26.8	1082898595	1083	16.3	9.5	34.7
CA550	140:	Forward	19	28	9.00	1.37	1.46	1.55	0.3	0.55	0.8	9.00	22.86	33.4	1350668015	1351	19.7	11.4	41.9
CA550	140:	Forward	28	37	9.00	1.44	1.505	1.57	0.2	0.45	0.7	9.00	22.86	34.4	1392298193	1392	21.0	12.2	44.6
CA550	141:	Forward	0	2	2.00	0.18	0.215	0.25	55	67.5	80	2.00	5.08	1.1	44199943	44	0.1	0.1	0.2
CA550	141:	Forward	2	6	4.00	1.13	1.18	1.23	4	5	6	4.00	10.16	12.0	485171463	485	5.7	3.3	12.2
CA550	141:	Forward	6	12	6.00	1.37	1.405	1.44	1	1.75	2.5	6.00	15.24	21.4	866524457	867	12.2	7.1	25.9
CA550	141:	Forward	12	19	7.00	1.47	1.505	1.54	0.7	0.95	1.2	7.00	17.78	26.8	1082898595	1083	16.3	9.5	34.7
CA550	141:	Forward	19	28	9.00	1.37	1.46	1.55	0.3	0.55	0.8	9.00	22.86	33.4	1350668015	1351	19.7	11.4	41.9
CA550	141:	Forward	28	37	9.00	1.44	1.505	1.57	0.2	0.45	0.7	9.00	22.86	34.4	1392298193	1392	21.0	12.2	44.6
CA550	141:	Kidd	0	4	4.00	1.05	1.18	1.31	4	6.5	9	4.00	10.16	12.0	485171463	485	5.7	3.3	12.2
CA550	141:	Kidd	4	10	6.00	1.29	1.355	1.42	1	2.5	4	6.00	15.24	20.7	835687288	836	11.3	6.6	24.1
CA550	141:	Kidd	10	14	4.00	1.29	1.36	1.43	0.5	2.15	3.8	4.00	10.16	13.8	559180670	559	7.6	4.4	16.2
CA550	142:	Guenoc	0	3	3.00	1.22	1.31	1.4	3	4	5	3.00	7.62	10.0	403966918	404	5.3	3.1	11.3
CA550	142:	Guenoc	3	12	9.00	1.3	1.39	1.48	1	1.75	2.5	9.00	22.86	31.8	1285909959	1286	17.9	10.4	38.0
CA550	142:	Guenoc	12	22	10.00	1.35	1.415	1.48	0.8	1.15	1.5	10.00	25.4	35.9	1454486485	1454	20.6	11.9	43.8
CA550	142:	Guenoc	22	30	8.00	1.42	1.48	1.54	0.5	0.75	1	8.00	20.32	30.1	1217040281	1217	18.0	10.4	38.3
CA550	142l:	Henneke	0	3	3.00	1.15	1.27	1.39	2	3.5	5	3.00	7.62	9.7	391632050	392	5.0	2.9	10.6
CA550	142l:	Henneke	3	11	8.00	1.29	1.365	1.44	1	2	3	8.00	20.32	27.7	1122472962	1122	15.3	8.9	32.6
CA550	142l:	Henneke	11	16	5.00	1.38	1.455	1.53	0.7	1.1	1.5	5.00	12.7	18.5	747801355	748	10.9	6.3	23.1
CA550	142l:	Henneke	16	19	3.00	1.4	1.455	1.51	0.5	0.75	1	3.00	7.62	11.1	448680813	449	6.5	3.8	13.9
CA550	142l:	Montara	0	6	6.00	1.17	1.28	1.39	2	3.5	5	6.00	15.24	19.5	789431534	789	10.1	5.9	21.5
CA550	142l:	Montara	6	12	6.00	1.44	1.485	1.53	0.8	1.4	2	6.00	15.24	22.6	915863928	916	13.6	7.9	28.9
CA550	143:	Guenoc	0	12	12.00	1.4	1.45	1.5	0.5	1.25	2	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	143:	Guenoc	12	30	18.00	1.4	1.475	1.55	0.5	0.75	1	18.00	45.72	67.4	2729089482	2729	40.3	23.3	85.6
CA550	143l:	Henneke	0	3	3.00	1.15	1.27	1.39	2	3.5	5	3.00	7.62	9.7	391632050	392	5.0	2.9	10.6
CA550	143l:	Henneke	3	11	8.00	1.29	1.365	1.44	1	2	3	8.00	20.32	27.7	1122472962	1122	15.3	8.9	32.6
CA550	143l:	Henneke	11	16	5.00	1.38	1.455	1.53	0.7	1.1	1.5	5.00	12.7	18.5	747801355	748	10.9	6.3	23.1
CA550	143l:	Henneke	16	19	3.00	1.4	1.455	1.51	0.5	0.75	1	3.00	7.62	11.1	448680813	449	6.5	3.8	13.9
CA550	143l:	Okiota	0	1	1.00	1.21	1.3	1.39	3	4	5	1.00	2.54	3.3	133627734	134	1.7	1.0	3.7
CA550	143l:	Okiota	1	3	2.00	1.25	1.32	1.39	2	2.5	3	2.00	5.08	6.7	271367090	271	3.6	2.1	7.6
CA550	143l:	Okiota	3	5	2.00	1.36	1.42	1.48	0.8	1.05	1.3	2.00	5.08	7.2	291925203	292	4.1	2.4	8.8
CA550	143l:	Okiota	5	14	9.00	1.38	1.46	1.54	0.5	0.7	0.9	9.00	22.86	33.4	1350668015	1351	19.7	11.4	41.9
CA550	144:	Guenoc	0	12	12.00	1.4	1.45	1.5	0.5	1.25	2	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	144:	Guenoc	12	30	18.00	1.4	1.45	1.5	0.5	0.75	1	18.00	45.72	66.3	2682833728	2683	38.9	22.6	82.7
CA550	145:	Haire	0	22	22.00	1.4	1.45	1.5	1	2	3	22.00	55.88	81.0	3279019001	3279	47.5	27.6	101.1
CA550	145:	Haire	22	27	5.00	1.45	1.5	1.55	0.5	0.75	1	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	145:	Haire	27	45	18.00	1.25	1.325	1.4	0.5	0.75	1	18.00	45.72	60.6	2451554958	2452	32.5	18.8	69.1
CA550	145:	Haire	45	60	15.00	1.35	1.4	1.45	0.5	0.75	1	15.00	38.1	53.3	2158601850	2159	30.2	17.5	64.3
CA550	146:	Haire	0	22	22.00	1.4	1.45	1.5	1	2	3	22.00	55.88	81.0	3279019001	3279	47.5	27.6	101.1
CA550	146:	Haire	22	27	5.00	1.45	1.5	1.55	0.5	0.75	1	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	146:	Haire	27	45	18.00	1.25	1.325	1.4	0.5	0.75	1	18.00	45.72	60.6	2451554958	2452	32.5	18.8	69.1
CA550	146:	Haire	45	60	15.00	1.35	1.4	1.45	0.5	0.75	1	15.00	38.1	53.3	2158601850	2159	30.2	17.5	64.3
CA550	147:	Haire	0	22	22.00	1.35	1.4	1.45	0.5	0.75	1	22.00	55.88	78.2	3165949380	3166	44.3	25.7	94.3
CA550	147:	Haire	22	27	5.00	1.35	1.4	1.45	0.5	0.75	1	5.00	12.7	17.8	719533950	720	10.1	5.8	21.4
CA550	147:	Haire	27	45	18.00	1.35	1.4	1.45	0.5	0.75	1	18.00	45.72	64.0	2590322220	2590	36.3	21.0	77.1
CA550	147:	Haire	45	60	15.00	1.35	1.4	1.45	0.5	0.75	1	15.00	38.1	53.3	2158601850	2159	30.2	17.5	64.3
CA550	148:	Haire	0	22	22.00	1.45	1.5	1.55	0.5	0.75	1	22.00	55.88	83.8	3392088622	3392	50.9	29.5	108.2
CA550	148:	Haire	22	27	5.00	1.35	1.4	1.45	0.5	0.75	1	5.00	12.7	17.8	719533950	720	10.1	5.8	21.4
CA550	148:	Haire	27	45	18.00	1.35	1.4	1.45	0.5	0.75	1	18.00	45.72	64.0	2590322220	2590	36.3	21.0	77.1
CA550	148:	Haire	45	60	15.00	1.35	1.4	1.45	0.5	0.75	1	15.00	38.1	53.3	2158601850	2159	30.2	17.5	64.3
CA550	148l:	Kidd	0	9	9.00	1.45	1.5	1.55	1	2	3	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	148l:	Kidd	9	16	7.00	1.45	1.525	1.6	0.5	0.75	1	7.00	17.78	27.1	1097289274	1097	16.7	9.7	35.6
CA550	148l:	Forward	0	9	9.00	1.45	1.5	1.55	2	3	4	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	148l:	Forward	9	25	16.00	1.45	1.525	1.6	0	0.25	0.5	16.00	40.64	62.0	2508089769	2508	38.2	22.2	81.3
CA550	149:	Haire	0	22	22.00	1.35	1.4	1.45	0.5	0.75	1	22.00	55.88	78.2	3165949380	3166	44.3	25.7	94.3
CA550	149:	Haire	22	27	5.00	1.35	1.4	1.45	0.5	0.75	1	5.00	12.7	17.8	719533950	720	10.1	5.8	21.4
CA550	149:	Haire	27	45	18.00	1.35	1.4	1.45	0.5	0.75	1	18.00	45.72	64.0	2590322220	2590	36.3	21.0	77.1
CA550	149:	Haire	45	60	15.00	1.35	1.4	1.45	0.5	0.75	1	15.00	38.1	53.3	2158601850	2159	30.2	17.5	64.3
CA550	149l:	Kidd	0	9	9.00	1.45	1.5	1.55	1	2	3	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	149l:	Kidd	9	16	7.00	1.45	1.525	1.6	0.5	0.75	1	7.00	17.78	27.1	1097289274	1097	16.7	9.7	35.6
CA550	149l:	Forward	0	9	9.00	1.45	1.5	1.55	2	3	4	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3

CA550	149l:	Forward	9	25	16.00	1.45	1.525	1.6	0	0.25	0.5	16.00	40.64	62.0	2508089769	2508	38.2	22.2	81.3
CA550	150:	Haire	0	22	22.00	1.35	1.4	1.45	0.5	0.75	1	22.00	55.88	78.2	3165949380	3166	44.3	25.7	94.3
CA550	150:	Haire	22	27	5.00	1.45	1.5	1.55	0.5	0.75	1	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	150:	Haire	27	45	18.00	1.35	1.4	1.45	0.5	0.75	1	18.00	45.72	64.0	2590322220	2590	36.3	21.0	77.1
CA550	150:	Haire	45	60	15.00	1.35	1.4	1.45	0.5	0.75	1	15.00	38.1	53.3	2158601850	2159	30.2	17.5	64.3
CA550	151:	Hambright	0	12	12.00	1.4	1.45	1.5	2	5	8	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	152:	Hambright	0	12	12.00	1.4	1.45	1.5	2	5	8	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	153:	Henneke	0	5	5.00	1.29	1.38	1.47	2	3	4	5.00	12.7	17.5	709254894	709	9.8	5.7	20.8
CA550	153:	Henneke	5	16	11.00	1.35	1.43	1.51	0.8	1.4	2	11.00	27.94	40.0	1616895576	1617	23.1	13.4	49.2
CA550	154:	Henneke	0	7	7.00	1.4	1.45	1.5	2	4.5	7	7.00	17.78	25.8	1043324228	1043	15.1	8.8	32.2
CA550	154:	Henneke	7	15	8.00	1.35	1.4	1.45	0.5	1.25	2	8.00	20.32	28.4	1151254320	1151	16.1	9.3	34.3
CA550	155:	Kidd	0	14	14.00	0.85	0.9	0.95	1	2	3	14.00	35.56	32.0	1295161110	1295	11.7	6.8	24.8
CA550	156:	Kidd	0	14	14.00	0.85	0.9	0.95	1	2	3	14.00	35.56	32.0	1295161110	1295	11.7	6.8	24.8
CA550	157:	Lodo	0	7	7.00	1.4	1.475	1.55	1	3.5	6	7.00	17.78	26.2	1061312576	1061	15.7	9.1	33.3
CA550	157:	Maymen	0	12	12.00	1.45	1.5	1.55	0.5	0.75	1	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	157:	Felton	0	10	10.00	1.4	1.45	1.5	5	7.5	10	10.00	25.4	36.8	1490463182	1490	21.6	12.5	46.0
CA550	157:	Felton	10	33	23.00	1.4	1.45	1.5	0.5	0.75	1	23.00	58.42	84.7	3428065319	3428	49.7	28.8	105.7
CA550	158:	Los Gatos	0	25	25.00	1.4	1.45	1.5	1	2.5	4	25.00	63.5	92.1	3726157956	3726	54.0	31.3	114.9
CA550	158:	Los Gatos	25	36	11.00	1.4	1.45	1.5	0.5	0.75	1	11.00	27.94	40.5	1639509500	1640	23.8	13.8	50.6
CA550	159:	Los Gatos	0	25	25.00	1.4	1.45	1.5	1	2.5	4	25.00	63.5	92.1	3726157956	3726	54.0	31.3	114.9
CA550	159:	Los Gatos	25	36	11.00	1.4	1.45	1.5	0.5	0.75	1	11.00	27.94	40.5	1639509500	1640	23.8	13.8	50.6
CA550	160:	Los Gatos	0	25	25.00	1.4	1.45	1.5	1	2.5	4	25.00	63.5	92.1	3726157956	3726	54.0	31.3	114.9
CA550	160:	Los Gatos	25	36	11.00	1.4	1.45	1.5	0.5	0.75	1	11.00	27.94	40.5	1639509500	1640	23.8	13.8	50.6
CA550	161:	Maxwell	0	62	62.00	1.3	1.375	1.45	1	2	3	62.00	157.48	216.5	8762895606	8763	120.5	69.9	256.2
CA550	162:	Maymen	0	12	12.00	1.45	1.5	1.55	0.5	0.75	1	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	162:	Los Gatos	0	25	25.00	1.4	1.45	1.5	1	2.5	4	25.00	63.5	92.1	3726157956	3726	54.0	31.3	114.9
CA550	162:	Los Gatos	25	36	11.00	1.4	1.45	1.5	0.5	0.75	1	11.00	27.94	40.5	1639509500	1640	23.8	13.8	50.6
CA550	163:	Maymen	0	12	12.00	1.45	1.5	1.55	0.5	0.75	1	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	163:	Millsholm	0	12	12.00	1.4	1.45	1.5	1	2	3	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	163:	Lodo	0	7	7.00	1.4	1.475	1.55	1	3.5	6	7.00	17.78	26.2	1061312576	1061	15.7	9.1	33.3
CA550	164:	Millsholm	0	8	8.00	1.29	1.36	1.43	2	2.75	3.5	8.00	20.32	27.6	1118361339	1118	15.2	8.8	32.3
CA550	164:	Millsholm	8	17	9.00	1.38	1.47	1.56	0.5	0.75	1	9.00	22.86	33.6	1359919166	1360	20.0	11.6	42.5
CA550	165:	Millsholm	0	4	4.00	1.3	1.385	1.47	2	2.5	3	4.00	10.16	14.1	569459726	569	7.9	4.6	16.8
CA550	165:	Millsholm	4	12	8.00	1.38	1.425	1.47	0.5	0.75	1	8.00	20.32	29.0	1171812433	1172	16.7	9.7	35.5
CA550	166:	Montara	0	12	12.00	1.4	1.45	1.5	1	2	3	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	167:	Montara	0	12	12.00	1.4	1.45	1.5	1	2	3	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	168:	Perkins	0	7	7.00	1.39	1.435	1.48	1	1.5	2	7.00	17.78	25.5	1032531218	1033	14.8	8.6	31.5
CA550	168:	Perkins	7	19	12.00	1.36	1.475	1.59	0.5	0.75	1	12.00	30.48	45.0	1819392988	1819	26.8	15.6	57.1
CA550	168:	Perkins	19	29	10.00	1.41	1.485	1.56	0.4	0.6	0.8	10.00	25.4	37.7	1526439880	1526	22.7	13.1	48.2
CA550	168:	Perkins	29	44	15.00	1.48	1.495	1.51	0.3	0.5	0.7	15.00	38.1	57.0	2305078404	2305	34.5	20.0	73.3
CA550	168:	Perkins	44	57	13.00	1.58	1.59	1.6	0.1	0.15	0.2	13.00	33.02	52.5	2124680964	2125	33.8	19.6	71.8
CA550	168:	Perkins	57	60	3.00	1.54	1.585	1.63	0	0.05	0.1	3.00	7.62	12.1	488769133	489	7.7	4.5	16.5
CA550	169:	Perkins	0	29	29.00	1.45	1.5	1.55	1	2.5	4	29.00	73.66	110.5	4471389547	4471	67.1	38.9	142.6
CA550	169:	Perkins	29	60	31.00	1.4	1.45	1.5	0.5	0.75	1	31.00	78.74	114.2	4620435865	4620	67.0	38.9	142.5
CA550	170:	Pleasanton	0	5	5.00	1.45	1.49	1.53	0.5	0.75	1	5.00	12.7	18.9	765789704	766	11.4	6.6	24.3
CA550	170:	Pleasanton	5	18	13.00	1.39	1.455	1.52	0.5	0.75	1	13.00	33.02	48.0	1944283524	1944	28.3	16.4	60.2
CA550	170:	Pleasanton	18	23	5.00	1.44	1.475	1.51	0.3	0.55	0.8	5.00	12.7	18.7	758080412	758	11.2	6.5	23.8
CA550	170:	Pleasanton	23	44	21.00	1.44	1.52	1.6	0.3	0.55	0.8	21.00	53.34	81.1	3281074812	3281	49.9	28.9	106.1
CA550	170:	Pleasanton	44	66	22.00	1.52	1.585	1.65	0.2	0.5	0.8	22.00	55.88	88.6	3584306977	3584	56.8	33.0	120.8
CA550	171:	Pleasanton	0	21	21.00	1.41	1.46	1.51	1	1.5	2	21.00	53.34	77.9	3151558701	3152	46.0	26.7	97.9
CA550	171:	Pleasanton	21	33	12.00	1.37	1.42	1.47	1	1.5	2	12.00	30.48	43.3	1751551216	1752	24.9	14.4	52.9
CA550	171:	Pleasanton	33	45	12.00	1.37	1.42	1.47	1	1.5	2	12.00	30.48	43.3	1751551216	1752	24.9	14.4	52.9
CA550	171:	Pleasanton	45	55	10.00	1.44	1.475	1.51	0.5	0.75	1	10.00	25.4	37.5	1516160823	1516	22.4	13.0	47.6
CA550	171:	Pleasanton	55	79	24.00	1.4	1.47	1.54	0	0.25	0.5	24.00	60.96	89.6	3626451108	3626	53.3	30.9	113.4
CA550	172:	Reyes	0	14	14.00	1.18	1.275	1.37	2	6	10	14.00	35.56	45.3	1834811573	1835	23.4	13.6	49.8
CA550	172:	Reyes	14	60	46.00	1.35	1.36	1.37	0.5	1.25	2	46.00	116.84	158.9	6430577702	6431	87.5	50.7	186.0
CA550	173:	Reyes, salt ponds	0	14	14.00	1.18	1.275	1.37	2	6	10	14.00	35.56	45.3	1834811573	1835	23.4	13.6	49.8
CA550	173:	Reyes, salt ponds	14	60	46.00	1.35	1.36	1.37	0.5	1.25	2	46.00	116.84	158.9	6430577702	6431	87.5	50.7	186.0
CA550	175l:	Maymen	0	12	12.00	1.45	1.5	1.55	0	0.5	1	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	175l:	Millsholm	0	3	3.00	1.45	1.5	1.55	1	2	3	3.00	7.62	11.4	462557539	463	6.9	4.0	14.8
CA550	175l:	Millsholm	3	11	8.00	1.4	1.45	1.5	0.5	0.75	1	8.00	20.32	29.5	1192370546	1192	17.3	10.0	36.8
CA550	175l:	Bressa	0	12	12.00	1.45	1.5	1.55	0.5	1.75	3	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	175l:	Bressa	12	26	14.00	1.4	1.45	1.5	0.5	0.75	1	14.00	35.56	51.6	2086648455	2087	30.3	17.5	64.3
CA550	176:	Hambright	0	12	12.00	1.4	1.475	1.55	2	5	8	12.00	30.48	45.0	1819392988	1819	26.8	15.6	57.1
CA550	177:	Kidd	0	14	14.00	0.85	0.9	0.95	1	2	3	14.00	35.56	32.0	1295161110	1295	11.7	6.8	24.8
CA550	178:	Sobrante	0	6	6.00	1.4	1.45	1.5	1	2	3	6.00	15.24	22.1	894277909	894	13.0	7.5	27.6
CA550	178:	Sobrante	6	30	24.00	1.35	1.425	1.5	0.5	0.75	1	24.00	60.96	86.9	3515437299	3515	50.1	29.1	106.5
CA550	179:	Sobrante	0	6	6.00	1.4	1.45	1.5	1	2	3	6.00	15.24	22.1	894277909	894	13.0	7.5	27.6
CA550	179:	Sobrante	6	30	24.00	1.35	1.425	1.5	0.5	0.75	1	24.00	60.96	86.9	3515437299	3515	50.1	29.1	106.5
CA550	180:	Tehama	0	12	12.00	1.45	1.5	1.55	0.5	0.75	1	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	180:	Tehama	12	60	48.00	1.4	1.45	1.5	0.5	0.75	1	48.00	121.92	176.8	7154223275	7154	103.7	60.2	220.6
CA550	181:	Yolo, moist	0	6	6.00	1.37	1.405	1.44	2	2.5	3	6.00	15.24	21.4	866524457	867	12.2	7.1	25.9
CA550	181:	Yolo, moist	6	24	18.00	1.32	1.365	1.41	1	1.5	2	18.00	45.72	62.4	2525564165	2526	34.5	20.0	73.3
CA550	181:	Yolo, moist	24	45	21.00	1.38	1.42	1.46	0.8	1	1.2	21.00	53.34	75.7	3065214627	3065	43.5	25.2	92.6
CA550	181:	Yolo, moist	45	60	15.00	1.38	1.43	1.48	0.5	0.75	1	15.00	38.1	54.5	2204857604	2205	31.5	18.3	67.1
CA550	182:	Yolo, moist	0	6	6.00	1.37	1.405	1.44	2	2.5	3	6.00	15.24	21.4	866524457	867	12.2	7.1	25.9
CA550	182:	Yolo, moist	6	24	18.00	1.32	1.355	1.39	1	1.5	2	18.00	45.72	62.0	2507061863	2507	34.0	19.7	72.2

CA550	182:	Yolo, moist	24	45	21.00	1.38	1.42	1.46	0.8	1	1.2	21.00	53.34	75.7	3065214627	3065	43.5	25.2	92.6
CA550	182:	Yolo, moist	45	60	15.00	1.38	1.43	1.48	0.5	0.75	1	15.00	38.1	54.5	2204857604	2205	31.5	18.3	67.1
CA550	192I:	Okiota	0	1	1.00	1.4	1.45	1.5	2	3	4	1.00	2.54	3.7	149046318	149	2.2	1.3	4.6
CA550	192I:	Okiota	1	3	2.00	1.4	1.45	1.5	1	1.5	2	2.00	5.08	7.4	298092636	298	4.3	2.5	9.2
CA550	192I:	Okiota	3	14	11.00	1.35	1.4	1.45	1	1.5	2	11.00	27.94	39.1	1582974690	1583	22.2	12.9	47.1
CA550	192I:	Henneke	0	3	3.00	1.45	1.5	1.55	2	4.5	7	3.00	7.62	11.4	462557539	463	6.9	4.0	14.8
CA550	192I:	Henneke	3	11	8.00	1.4	1.45	1.5	1	1.5	2	8.00	20.32	29.5	1192370546	1192	17.3	10.0	36.8
CA550	192I:	Henneke	11	19	8.00	1.35	1.425	1.5	1	1.5	2	8.00	20.32	29.0	1171812433	1172	16.7	9.7	35.5
CA550	193I:	Okiota	0	1	1.00	1.4	1.45	1.5	2	3	4	1.00	2.54	3.7	149046318	149	2.2	1.3	4.6
CA550	193I:	Okiota	1	3	2.00	1.4	1.45	1.5	1	1.5	2	2.00	5.08	7.4	298092636	298	4.3	2.5	9.2
CA550	193I:	Okiota	3	14	11.00	1.35	1.425	1.5	1	1.5	2	11.00	27.94	39.8	1611242095	1611	23.0	13.3	48.8
CA550	193I:	Dubakella	0	7	7.00	1.45	1.5	1.55	4	7	10	7.00	17.78	26.7	1079300925	1079	16.2	9.4	34.4
CA550	193I:	Dubakella	7	30	23.00	1.35	1.425	1.5	1	1.5	2	23.00	58.42	83.2	3368960745	3369	48.0	27.8	102.1
CA550	193I:	Henneke	0	3	3.00	1.45	1.5	1.55	2	4.5	7	3.00	7.62	11.4	462557539	463	6.9	4.0	14.8
CA550	193I:	Henneke	3	11	8.00	1.4	1.45	1.5	1	1.5	2	8.00	20.32	29.5	1192370546	1192	17.3	10.0	36.8
CA550	193I:	Henneke	11	19	8.00	1.35	1.425	1.5	1	1.5	2	8.00	20.32	29.0	1171812433	1172	16.7	9.7	35.5
CA550	202I:	Sanhedrin	0	8	8.00	1.45	1.5	1.55	1	1.5	2	8.00	20.32	30.5	1233486771	1233	18.5	10.7	39.3
CA550	202I:	Sanhedrin	8	57	49.00	1.4	1.475	1.55	0.5	0.75	1	49.00	124.46	183.6	7429188034	7429	109.6	63.6	233.0
CA550	202I:	Kekawaka	0	9	9.00	1.45	1.5	1.55	1	1.5	2	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	202I:	Kekawaka	9	28	19.00	1.4	1.45	1.5	0.5	0.75	1	19.00	48.26	70.0	2831880046	2832	41.1	23.8	87.3
CA550	202I:	Kekawaka	28	42	14.00	1.35	1.5	1.65	0.5	0.75	1	14.00	35.56	53.3	2158601850	2159	32.4	18.8	68.9
CA550	202I:	Kekawaka	42	68	26.00	1.35	1.5	1.65	0	0.25	0.5	26.00	66.04	99.1	4008832007	4009	60.1	34.9	127.9
CA550	202I:	Speaker	0	8	8.00	1.45	1.5	1.55	2	3.5	5	8.00	20.32	30.5	1233486771	1233	18.5	10.7	39.3
CA550	202I:	Speaker	8	27	19.00	1.4	1.475	1.55	0.5	0.75	1	19.00	48.26	71.2	2880705564	2881	42.5	24.6	90.4
CA550	209I:	Skyhigh	0	2	2.00	1.45	1.5	1.55	2	3	4	2.00	5.08	7.6	308371693	308	4.6	2.7	9.8
CA550	209I:	Skyhigh	2	8	6.00	1.4	1.45	1.5	1	1.5	2	6.00	15.24	22.1	894277909	894	13.0	7.5	27.6
CA550	209I:	Skyhigh	8	38	30.00	1.35	1.425	1.5	0.5	0.75	1	30.00	76.2	108.6	4394296623	4394	62.6	36.3	133.2
CA550	209I:	Millsholm	0	6	6.00	1.45	1.5	1.55	1	2	3	6.00	15.24	22.9	925115079	925	13.9	8.0	29.5
CA550	209I:	Millsholm	6	16	10.00	1.4	1.45	1.5	0.5	0.75	1	10.00	25.4	36.8	1490463182	1490	21.6	12.5	46.0
CA550	219I:	Sobrante	0	10	10.00	1.45	1.5	1.55	1	2	3	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	219I:	Sobrante	10	38	28.00	1.35	1.425	1.5	1	1.5	2	28.00	71.12	101.3	4101343515	4101	58.4	33.9	124.3
CA550	219I:	Guenoc	0	11	11.00	1.4	1.45	1.5	0	1	2	11.00	27.94	40.5	1639509500	1640	23.8	13.8	50.6
CA550	219I:	Guenoc	11	36	25.00	1.35	1.45	1.55	0.5	0.75	1	25.00	63.5	92.1	3726157956	3726	54.0	31.3	114.9
CA550	219I:	Hambright	0	4	4.00	1.45	1.5	1.55	2	5	8	4.00	10.16	15.2	616743386	617	9.3	5.4	19.7
CA550	219I:	Hambright	4	16	12.00	1.45	1.5	1.55	1	1.5	2	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	220I:	Sobrante	0	10	10.00	1.4	1.45	1.5	1	2	3	10.00	25.4	36.8	1490463182	1490	21.6	12.5	46.0
CA550	220I:	Sobrante	10	38	28.00	1.35	1.425	1.5	1	1.5	2	28.00	71.12	101.3	4101343515	4101	58.4	33.9	124.3
CA550	220I:	Hambright	0	4	4.00	1.45	1.5	1.55	2	5	8	4.00	10.16	15.2	616743386	617	9.3	5.4	19.7
CA550	220I:	Hambright	4	16	12.00	1.45	1.5	1.55	1	1.5	2	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	220I:	Guenoc	11	36	25.00	1.35	1.45	1.55	0.5	0.75	1	25.00	63.5	92.1	3726157956	3726	54.0	31.3	114.9
CA550	AcF2so:	Altamont	0	22	22.00	1.25	1.35	1.45	1	2	3	22.00	55.88	75.4	3052879759	3053	41.2	23.9	87.6
CA550	AcF2so:	Altamont	22	34	12.00	1.2	1.275	1.35	0.5	0.75	1	12.00	30.48	38.9	1572695634	1573	20.1	11.6	42.6
CA550	AmE2so:	Altamont	0	28	28.00	1.25	1.35	1.45	1	2	3	28.00	71.12	96.0	3885483330	3885	52.5	30.4	111.6
CA550	AmE2so:	Altamont	28	38	10.00	1.2	1.275	1.35	0.5	0.75	1	10.00	25.4	32.4	1310579695	1311	16.7	9.7	35.5
CA550	AmE2so:	Diablo	0	30	30.00	1.2	1.275	1.35	1	2.5	4	30.00	76.2	97.2	3931739084	3932	50.1	29.1	106.6
CA550	AmE2so:	Diablo	30	40	10.00	1.2	1.275	1.35	0.5	0.75	1	10.00	25.4	32.4	1310579695	1311	16.7	9.7	35.5
CA550	CmEsn:	Cohasset	0	19	19.00	1.1	1.15	1.2	2	6	10	19.00	48.26	55.5	2245973830	2246	25.8	15.0	54.9
CA550	CmEsn:	Cohasset	19	53	34.00	1.1	1.2	1.3	0.5	0.75	1	34.00	86.36	103.6	4193855023	4194	50.3	29.2	107.0
CA550	CmFsn:	Cohasset	0	9	9.00	1.16	1.275	1.39	3	4.5	6	9.00	22.86	29.1	1179521725	1180	15.0	8.7	32.0
CA550	CmFsn:	Cohasset	9	19	10.00	1.35	1.41	1.47	1	1.5	2	10.00	25.4	35.8	1449346957	1449	20.4	11.9	43.5
CA550	CmFsn:	Cohasset	19	29	10.00	1.38	1.46	1.54	0.5	1	1.5	10.00	25.4	37.1	1500742239	1501	21.9	12.7	46.6
CA550	CmGsn:	Cohasset	0	15	15.00	1.25	1.3	1.35	2	4	6	15.00	38.1	49.5	2004416004	2004	26.1	15.1	55.4
CA550	CmGsn:	Cohasset	15	27	12.00	1.25	1.3	1.35	0.5	0.75	1	12.00	30.48	39.6	1603532803	1604	20.8	12.1	44.3
CA550	DaF2y:	Dibble	0	4	4.00	1.25	1.335	1.42	2	2.5	3	4.00	10.16	13.6	548901613	549	7.3	4.3	15.6
CA550	DaF2y:	Dibble	4	15	11.00	1.34	1.415	1.49	1	1.5	2	11.00	27.94	39.5	1599935133	1600	22.6	13.1	48.1
CA550	DaF2y:	Dibble	15	20	5.00	1.41	1.42	1.43	0.5	0.85	1.2	5.00	12.7	18.0	729813006	730	10.4	6.0	22.0
CA550	DaF2y:	Dibble	20	30	10.00	1.41	1.48	1.55	0.3	0.55	0.8	10.00	25.4	37.6	1521300352	1521	22.5	13.1	47.9
CA550	DaG2y:	Dibble	0	4	4.00	1.4	1.45	1.5	0.5	0.75	1	4.00	10.16	14.7	596185273	596	8.6	5.0	18.4
CA550	DaG2y:	Dibble	4	30	26.00	1.3	1.35	1.4	0	0.25	0.5	26.00	66.04	89.2	3607948807	3608	48.7	28.3	103.6
CA550	DbEso:	Dibble	0	13	13.00	1.45	1.5	1.55	0.5	0.75	1	13.00	33.02	49.5	2004416004	2004	30.1	17.4	63.9
CA550	DbEso:	Dibble	13	30	17.00	1.3	1.35	1.4	0	0.25	0.5	17.00	43.18	58.3	2359043450	2359	31.8	18.5	67.7
CA550	DbEso:	Los Osos	0	7	7.00	1.45	1.5	1.55	2	3	4	7.00	17.78	26.7	1079300925	1079	16.2	9.4	34.4
CA550	DbEso:	Los Osos	7	25	18.00	1.35	1.4	1.45	0	0.35	0.7	18.00	45.72	64.0	2590322220	2590	36.3	21.0	77.1
CA550	DbF2so:	Dibble	0	3	3.00	1.45	1.5	1.55	0.5	0.75	1	3.00	7.62	11.4	462557539	463	6.9	4.0	14.8
CA550	DbF2so:	Dibble	3	20	17.00	1.3	1.35	1.4	0	0.25	0.5	17.00	43.18	58.3	2359043450	2359	31.8	18.5	67.7
CA550	DbF2so:	Los Osos	0	1	1.00	1.45	1.5	1.55	2	3	4	1.00	2.54	3.8	154185846	154	2.3	1.3	4.9
CA550	DbF2so:	Los Osos	1	20	19.00	1.35	1.4	1.45	0	0.35	0.7	19.00	48.26	67.6	2734229010	2734	38.3	22.2	81.4
CA550	DlEso:	Dibble	0	13	13.00	1.4	1.45	1.5	0.5	0.75	1	13.00	33.02	47.9	1937602137	1938	28.1	16.3	59.7
CA550	DlEso:	Dibble	13	30	17.00	1.3	1.35	1.4	0	0.25	0.5	17.00	43.18	58.3	2359043450	2359	31.8	18.5	67.7
CA550	DlEso:	Los Osos	0	7	7.00	1.4	1.45	1.5	2	3	4	7.00	17.78	25.8	1043324228	1043	15.1	8.8	32.2
CA550	DlEso:	Los Osos	7	25	18.00	1.35	1.4	1.45	0	0.35	0.7	18.00	45.72	64.0	2590322220	2590	36.3	21.0	77.1
CA550	DlF2so:	Dibble	0	3	3.00	1.4	1.45	1.5	0.5	0.75	1	3.00	7.62	11.0	447138955	447	6.5	3.8	13.8
CA550	DlF2so:	Dibble	3	20	17.00	1.3	1.35	1.4	0	0.25	0.5	17.00	43.18	58.3	2359043450	2359	31.8	18.5	67.7
CA550	DlF2so:	Los Osos	0	1	1.00	1.4	1.45	1.5	2	3	4	1.00	2.54	3.7	149046318	149	2.2	1.3	4.6
CA550	DlF2so:	Los Osos	1	20	19.00	1.35	1.4	1.45	0	0.35	0.7	19.00	48.26	67.6	2734229010	2734	38.3	22.2	81.4
CA550	FaDsn:	Felta	0	5	5.00	1.4	1.45	1.5	1	2	3	5.00	12.7	18.4	745231591	745	10.8	6.3	23.0

CA550	FaDsn:	Felta	5	24	19.00	1.3	1.35	1.4	0.7	0.85	1	19.00	48.26	65.2	2636577974	2637	35.6	20.6	75.7
CA550	FaDsn:	Felta	24	60	36.00	1.35	1.425	1.5	0	0.25	0.5	36.00	91.44	130.3	5273155948	5273	75.1	43.6	159.8
CA550	FaEsn:	Felta	0	5	5.00	1.4	1.45	1.5	1	2	3	5.00	12.7	18.4	745231591	745	10.8	6.3	23.0
CA550	FaEsn:	Felta	5	24	19.00	1.3	1.35	1.4	0.7	0.85	1	19.00	48.26	65.2	2636577974	2637	35.6	20.6	75.7
CA550	FaEsn:	Felta	24	60	36.00	1.35	1.425	1.5	0	0.25	0.5	36.00	91.44	130.3	5273155948	5273	75.1	43.6	159.8
CA550	GgEsn:	Goulding	0	11	11.00	1.35	1.425	1.5	1	1.5	2	11.00	27.94	39.8	1611242095	1611	23.0	13.3	48.8
CA550	GgEsn:	Goulding	11	20	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GgFsn:	Goulding	0	9	9.00	1.35	1.425	1.5	1	1.5	2	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GgFsn:	Goulding	9	18	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GgGsn:	Goulding	0	9	9.00	1.35	1.425	1.5	1	1.5	2	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GgGsn:	Goulding	9	18	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GlDsn:	Goulding	0	11	11.00	1.35	1.425	1.5	1	1.5	2	11.00	27.94	39.8	1611242095	1611	23.0	13.3	48.8
CA550	GlDsn:	Goulding	11	20	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GlEsn:	Goulding	0	9	9.00	1.35	1.425	1.5	1	1.5	2	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GlEsn:	Goulding	9	18	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GlEso:	Gilroy	0	12	12.00	1.45	1.5	1.55	1	1.5	2	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	GlEso:	Gilroy	12	38	26.00	1.4	1.45	1.5	0	0.25	0.5	26.00	66.04	95.8	3875204274	3875	56.2	32.6	119.5
CA550	GlF2sn:	Goulding	0	6	6.00	1.35	1.425	1.5	1	1.5	2	6.00	15.24	21.7	878859325	879	12.5	7.3	26.6
CA550	GlF2sn:	Goulding	6	15	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GlFsn:	Goulding	0	9	9.00	1.35	1.425	1.5	1	1.5	2	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GlFsn:	Goulding	9	18	9.00	1.35	1.425	1.5	0	0.25	0.5	9.00	22.86	32.6	1318288987	1318	18.8	10.9	40.0
CA550	GrGsn:	Guenoc	0	12	12.00	1.4	1.45	1.5	0.5	1.25	2	12.00	30.48	44.2	1788555819	1789	25.9	15.0	55.2
CA550	GrGsn:	Guenoc	12	25	13.00	1.35	1.4	1.45	0.4	0.7	1	13.00	33.02	46.2	1870788270	1871	26.2	15.2	55.7
CA550	HaFso:	Hambright	0	5	5.00	1.45	1.5	1.55	1	1.5	2	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	HaFso:	Hambright	5	19	14.00	1.45	1.5	1.55	0	0.25	0.5	14.00	35.56	53.3	2158601850	2159	32.4	18.8	68.9
CA550	HbCsn:	Haire	0	24	24.00	1.35	1.4	1.45	1	2	3	24.00	60.96	85.3	3453762960	3454	48.4	28.0	102.8
CA550	HbCsn:	Haire	24	36	12.00	1.35	1.4	1.45	0	0.25	0.5	12.00	30.48	42.7	1726881480	1727	24.2	14.0	51.4
CA550	HbCsn:	Haire	36	60	24.00	1.4	1.45	1.5	0	0.25	0.5	24.00	60.96	88.4	3577111637	3577	51.9	30.1	110.3
CA550	HcCsn:	Haire	0	24	24.00	1.35	1.4	1.45	1	2	3	24.00	60.96	85.3	3453762960	3454	48.4	28.0	102.8
CA550	HcCsn:	Haire	24	36	12.00	1.35	1.4	1.45	0	0.25	0.5	12.00	30.48	42.7	1726881480	1727	24.2	14.0	51.4
CA550	HcCsn:	Haire	36	60	24.00	1.4	1.45	1.5	0	0.25	0.5	24.00	60.96	88.4	3577111637	3577	51.9	30.1	110.3
CA550	HcEsn:	Haire	0	14	14.00	1.35	1.4	1.45	1	2	3	14.00	35.56	49.8	2014695060	2015	28.2	16.4	60.0
CA550	HcEsn:	Haire	14	27	13.00	1.35	1.4	1.45	0	0.25	0.5	13.00	33.02	46.2	1870788270	1871	26.2	15.2	55.7
CA550	HcEsn:	Haire	27	60	33.00	1.4	1.45	1.5	0	0.25	0.5	33.00	83.82	121.5	4918528501	4919	71.3	41.4	151.7
CA550	HgG2sn:	Henneke	0	5	5.00	1.4	1.45	1.5	2	4.5	7	5.00	12.7	18.4	745231591	745	10.8	6.3	23.0
CA550	HgG2sn:	Henneke	5	16	11.00	1.35	1.4	1.45	0	0.25	0.5	11.00	27.94	39.1	1582974690	1583	22.2	12.9	47.1
CA550	HtEso:	Hambright	0	5	5.00	1.45	1.5	1.55	1	1.5	2	5.00	12.7	19.1	770929232	771	11.6	6.7	24.6
CA550	HtEso:	Hambright	5	19	14.00	1.45	1.5	1.55	0	0.25	0.5	14.00	35.56	53.3	2158601850	2159	32.4	18.8	68.9
CA550	HtEso:	Toomes	0	19	19.00	1.45	1.5	1.55	1	1.5	2	19.00	48.26	72.4	2929531082	2930	43.9	25.5	93.5
CA550	JoFsn:	Josephine	0	13	13.00	1.2	1.25	1.3	2	3.5	5	13.00	33.02	41.3	1670346670	1670	20.9	12.1	44.4
CA550	JoFsn:	Josephine	13	35	22.00	1.2	1.3	1.4	0.7	1.35	2	22.00	55.88	72.6	2939810139	2940	38.2	22.2	81.3
CA550	JoFsn:	Josephine	35	45	10.00	1.5	1.55	1.6	0.5	0.75	1	10.00	25.4	39.4	1593253747	1593	24.7	14.3	52.5
CA550	LaE2sn:	Laniger	0	10	10.00	0.85	0.875	0.9	1	3	5	10.00	25.4	22.2	899417438	899	7.9	4.6	16.7
CA550	LaE2sn:	Laniger	10	22	12.00	0.9	1	1.1	0.5	0.75	1	12.00	30.48	30.5	1233486771	1233	12.3	7.2	26.2
CA550	LaEsn:	Laniger	0	17	17.00	0.85	0.875	0.9	1	3	5	17.00	43.18	37.8	1529009644	1529	13.4	7.8	28.5
CA550	LaEsn:	Laniger	17	29	12.00	0.9	1	1.1	0.5	0.75	1	12.00	30.48	30.5	1233486771	1233	12.3	7.2	26.2
CA550	LaFsn:	Laniger	0	11	11.00	0.85	0.875	0.9	1	3	5	11.00	27.94	24.4	989359181	989	8.7	5.0	18.4
CA550	LaFsn:	Laniger	11	25	14.00	0.9	1	1.1	0.5	0.75	1	14.00	35.56	35.6	1439067900	1439	14.4	8.3	30.6
CA550	LgFsn:	Laughlin	0	4	4.00	1.45	1.5	1.55	2	3.5	5	4.00	10.16	15.2	616743386	617	9.3	5.4	19.7
CA550	LgFsn:	Laughlin	4	22	18.00	1.45	1.5	1.55	1	1.5	2	18.00	45.72	68.6	2775345236	2775	41.6	24.1	88.5
CA550	McFsn:	Maymen	0	12	12.00	1.45	1.5	1.55	1	1.5	2	12.00	30.48	45.7	1850230157	1850	27.8	16.1	59.0
CA550	McFsn:	Maymen	12	18	6.00	1.45	1.5	1.55	0.5	0.75	1	6.00	15.24	22.9	925115079	925	13.9	8.0	29.5
CA550	MlGsn:	Maymen	0	5	5.00	1.5	1.525	1.55	1	1.5	2	5.00	12.7	19.4	783778053	784	12.0	6.9	25.4
CA550	MlGsn:	Maymen	5	12	7.00	1.5	1.525	1.55	1	1.5	2	7.00	17.78	27.1	1097289274	1097	16.7	9.7	35.6
CA550	MlGsn:	Maymen	12	18	6.00	1.4	1.41	1.42	0.5	0.75	1	6.00	15.24	21.5	869608174	870	12.3	7.1	26.1
CA550	MlGsn:	Los Gatos	0	2	2.00	1.26	1.385	1.51	1	2.5	4	2.00	5.08	7.0	284729863	285	3.9	2.3	8.4
CA550	MlGsn:	Los Gatos	2	7	5.00	1.26	1.385	1.51	1	2.5	4	5.00	12.7	17.6	711824658	712	9.9	5.7	21.0
CA550	MlGsn:	Los Gatos	7	17	10.00	1.43	1.485	1.54	0.7	0.85	1	10.00	25.4	37.7	1526439880	1526	22.7	13.1	48.2
CA550	MlGsn:	Los Gatos	17	25	8.00	1.48	1.55	1.62	0.5	0.6	0.7	8.00	20.32	31.5	1274602997	1275	19.8	11.5	42.0
CA550	MmG2so:	Millsholm, eroded	0	6	6.00	1.39	1.435	1.48	1	1.75	2.5	6.00	15.24	21.9	885026759	885	12.7	7.4	27.0
CA550	MmG2so:	Millsholm, eroded	6	15	9.00	1.38	1.47	1.56	0.5	0.75	1	9.00	22.86	33.6	1359919166	1360	20.0	11.6	42.5
CA550	MoEsn:	Montara	0	10	10.00	1.35	1.4	1.45	1	2	3	10.00	25.4	35.6	1439067900	1439	20.1	11.7	42.8
CA550	MoGsn:	Montara	0	10	10.00	1.35	1.4	1.45	1	2	3	10.00	25.4	35.6	1439067900	1439	20.1	11.7	42.8
CA550	RaDsn:	Raynor	0	17	17.00	1.3	1.35	1.4	1	2.5	4	17.00	43.18	58.3	2359043450	2359	31.8	18.5	67.7
CA550	RaDsn:	Raynor	17	35	18.00	1.3	1.35	1.4	0.5	0.75	1	18.00	45.72	61.7	2497810712	2498	33.7	19.6	71.7
CA550	RaDsn:	Raynor	35	45	10.00	1.3	1.35	1.4	0.5	0.6	0.7	10.00	25.4	34.3	1387672618	1388	18.7	10.9	39.8
CA550	RhFsn:	Red Hill	0	16	16.00	1.3	1.35	1.4	1	2	3	16.00	40.64	54.9	2220276189	2220	30.0	17.4	63.7
CA550	RhFsn:	Red Hill	16	48	32.00	1.3	1.35	1.4	0.5	0.6	0.7	32.00	81.28	109.7	4440552377	4441	59.9	34.8	127.5
CA550	RhFsn:	Red Hill	48	80	32.00	1.25	1.3	1.35	0	0.25	0.5	32.00	81.28	105.7	4276087474	4276	55.6	32.2	118.2
CA550	RoAso:	Rincon	0	6	6.00	1.4	1.415	1.43	1	1.5	2	6.00	15.24	21.6	872691891	873	12.3	7.2	26.3
CA550	RoAso:	Rincon	6	12	6.00	1.4	1.435	1.47	1	1.5	2	6.00	15.24	21.9	885026759	885	12.7	7.4	27.0
CA550	RoAso:	Rincon	12	29	17.00	1.31	1.47	1.63	0.5	1.25	2	17.00	43.18	63.5	2568736202	2569	37.8	21.9	80.3
CA550	RoAso:	Rincon	29	38	9.00	1.39	1.445	1.5	0	0.25	0.5	9.00	22.86	33.0	1336791289	1337	19.3	11.2	41.1
CA550	RoAso:	Rincon	38	79	41.00	1.44	1.46	1.48	0	0.25	0.5	41.00	104.14	152.0	6153043178	6153	89.8	52.1	191.0
CA550	RoCso:	Rincon	0	6	6.00	1.39	1.415	1.44	1	1.5	2	6.00	15.24	21.6	872691891	873	12.3	7.2	26.3
CA550	RoCso:	Rincon	6	18	12.00	1.41	1.465	1.52	1	2	3	12.00	30.48	44.7	1807058120	1807	26.5	15.4	56.3
CA550	RoCso:	Rincon	18	52	34.00	1.32	1.415	1.51	0.5	1.25	2	34.00	86.36	122.2	4945254048	4945	70.0	40.6	148.8

CA550	RoCso:	Rincon	52	64	12.00	1.51	1.535	1.56	0	0.25	0.5	12.00	30.48	46.8	1893402194	1893	29.1	16.9	61.8
CA550	SkFsn:	Spreckels	0	9	9.00	1.45	1.5	1.55	0.5	1.25	2	9.00	22.86	34.3	1387672618	1388	20.8	12.1	44.3
CA550	SkFsn:	Spreckels	9	18	9.00	1.4	1.45	1.5	0.5	0.6	0.7	9.00	22.86	33.1	1341416864	1341	19.5	11.3	41.4
CA550	SkFsn:	Spreckels	18	37	19.00	1.35	1.4	1.45	0	0.25	0.5	19.00	48.26	67.6	2734229010	2734	38.3	22.2	81.4
CA550	StEsn:	Suther	0	3	3.00	1.4	1.475	1.55	1	1.5	2	3.00	7.62	11.2	454848247	455	6.7	3.9	14.3
CA550	StEsn:	Suther	3	14	11.00	1.4	1.45	1.5	0.7	0.85	1	11.00	27.94	40.5	1639509500	1640	23.8	13.8	50.6
CA550	StEsn:	Suther	14	36	22.00	1.35	1.4	1.45	0.5	0.6	0.7	22.00	55.88	78.2	3165949380	3166	44.3	25.7	94.3
CA550	ToG2so:	Toomes	0	10	10.00	1.45	1.5	1.55	1	1.5	2	10.00	25.4	38.1	1541858464	1542	23.1	13.4	49.2
CA550	ToGsn:	Toomes	0	4	4.00	1.4	1.45	1.5	1	1.5	2	4.00	10.16	14.7	596185273	596	8.6	5.0	18.4
CA550	ToGsn:	Toomes	4	13	9.00	1.4	1.45	1.5	1	1.5	2	9.00	22.86	33.1	1341416864	1341	19.5	11.3	41.4
CA550	Ysso:	Yolo	0	9	9.00	1.36	1.41	1.46	2	2.5	3	9.00	22.86	32.2	1304412261	1304	18.4	10.7	39.1
CA550	Ysso:	Yolo	9	18	9.00	1.26	1.325	1.39	1	1.5	2	9.00	22.86	30.3	1225777479	1226	16.2	9.4	34.5
CA550	Ysso:	Yolo	18	28	10.00	1.29	1.38	1.47	0.7	1.1	1.5	10.00	25.4	35.1	1418509787	1419	19.6	11.4	41.6
CA550	Ysso:	Yolo	28	36	8.00	1.42	1.445	1.47	0.5	0.85	1.2	8.00	20.32	29.4	1188258923	1188	17.2	10.0	36.5
CA550	Ysso:	Yolo	36	44	8.00	1.38	1.405	1.43	0.5	0.75	1	8.00	20.32	28.5	1155365943	1155	16.2	9.4	34.5
CA550	Ysso:	Yolo	44	60	16.00	1.4	1.415	1.43	0.3	0.5	0.7	16.00	40.64	57.5	2327178376	2327	32.9	19.1	70.0

Conversion Units

2.54	cm per inch
40,468,726	cm2 per acre
58%	Percent of Organic Matter that is Carbon
3.67	grams of CO2 per gram of C

Row Labels	Sum of mass of soil carbon per acre (metric ton CO2e/acre)
100:	**192.8828277**
Aiken	192.8828277
101:	**192.8828277**
Aiken	192.8828277
102:	**192.8828277**
Aiken	192.8828277
103:	**275.765498**
Bale	275.765498
104:	**264.6496236**
Bale	264.6496236
105:	**264.6496236**
Bale	264.6496236
106:	**540.4151215**
Bale	540.4151215
107:	**202.981933**
Boomer	202.981933
108:	**202.981933**
Boomer	202.981933
109:	**202.981933**
Boomer	202.981933
110:	**499.2210791**
Boomer	181.8489288
Felta	258.7938421
Forward	58.57830819
111:	**499.2210791**
Boomer	181.8489288
Felta	258.7938421
Forward	58.57830819
112:	**291.5976947**
Bressa	147.7307361
Dibble	143.8669587
113:	**291.5976947**
Bressa	147.7307361
Dibble	143.8669587
114:	**291.5976947**
Bressa	147.7307361
Dibble	143.8669587
115:	**291.5976947**
Bressa	147.7307361
Dibble	143.8669587
116:	**225.2781145**
Clear Lake, drained	225.2781145
117:	**290.2628607**
Clear Lake	290.2628607
118:	**270.6614863**
Cole	270.6614863
119:	**270.6614863**
Cole	270.6614863
120:	**144.4476183**
Contra Costa	144.4476183
121:	**144.4476183**
Contra Costa	144.4476183
122:	**286.2802189**
Coombs	286.2802189

123:	**286.2802189**
Coombs	286.2802189
124:	**332.4615946**
Cortina	332.4615946
125:	**295.1117101**
Cortina	295.1117101
126:	**204.536188**
Diablo	204.536188
127:	**204.536188**
Diablo	204.536188
128:	**221.6616845**
Diablo	221.6616845
129:	**204.536188**
Diablo	204.536188
129l:	**413.8887084**
Collayomi	287.7953989
Whispering	126.0933094
130:	**259.2392422**
Egbert	259.2392422
131:	**208.5920612**
Fagan	208.5920612
132:	**208.5920612**
Fagan	208.5920612
133:	**208.5920612**
Fagan	208.5920612
134:	**208.5920612**
Fagan	208.5920612
134l:	**368.8896376**
Forward variant	304.9487671
Kidd	63.94087052
135:	**151.6710239**
Felton	151.6710239
136:	**151.6710239**
Felton	151.6710239
137:	**151.6710239**
Felton	151.6710239
138:	**159.4280898**
Forward	159.4280898
139:	**159.4280898**
Forward	159.4280898
140:	**159.4280898**
Forward	159.4280898
141:	**211.8577455**
Forward	159.4280898
Kidd	52.42965571
142:	**131.341434**
Guenoc	131.341434
142l:	**130.5977525**
Henneke	80.18447484
Montara	50.41327763
143:	**140.7600882**
Guenoc	140.7600882
143l:	**142.2497465**
Henneke	80.18447484
Okiota	62.06527165

144:	**137.882749**
Guenoc	137.882749
145:	**259.0561636**
Haire	259.0561636
146:	**259.0561636**
Haire	259.0561636
147:	**257.0750897**
Haire	257.0750897
148:	**271.0218505**
Haire	271.0218505
148l:	**205.4619643**
Forward	125.6082879
Kidd	79.85367648
149:	**257.0750897**
Haire	257.0750897
149l:	**205.4619643**
Forward	125.6082879
Kidd	79.85367648
150:	**260.244808**
Haire	260.244808
151:	**55.15309959**
Hambright	55.15309959
152:	**55.15309959**
Hambright	55.15309959
153:	**69.98716295**
Henneke	69.98716295
154:	**66.44932005**
Henneke	66.44932005
155:	**24.78938365**
Kidd	24.78938365
156:	**24.78938365**
Kidd	24.78938365
157:	**243.9849726**
Felton	151.6710239
Lodo	33.29160666
Maymen	59.02234202
158:	**165.4592988**
Los Gatos	165.4592988
159:	**165.4592988**
Los Gatos	165.4592988
160:	**165.4592988**
Los Gatos	165.4592988
161:	**256.2416723**
Maxwell	256.2416723
162:	**224.4816408**
Los Gatos	165.4592988
Maymen	59.02234202
163:	**147.4670483**
Lodo	33.29160666
Maymen	59.02234202
Millsholm	55.15309959
164:	**74.85978519**
Millsholm	74.85978519
165:	**52.28483237**
Millsholm	52.28483237

166:	**55.15309959**
Montara	55.15309959
167:	**55.15309959**
Montara	55.15309959
168:	**298.3943907**
Perkins	298.3943907
169:	**285.1161672**
Perkins	285.1161672
170:	**335.0879795**
Pleasanton	335.0879795
171:	**364.5723719**
Pleasanton	364.5723719
172:	**235.7403711**
Reyes	235.7403711
173:	**235.7403711**
Reyes, salt ponds	235.7403711
175l:	**233.9142855**
Bressa	123.3676249
Maymen	59.02234202
Millsholm	51.52431857
176:	**57.07132571**
Hambright	57.07132571
177:	**24.78938365**
Kidd	24.78938365
178:	**134.1118771**
Sobrante	134.1118771
179:	**134.1118771**
Sobrante	134.1118771
180:	**279.6347404**
Tehama	279.6347404
181:	**258.8241184**
Yolo, moist	258.8241184
182:	**257.7538466**
Yolo, moist	257.7538466
192l:	**147.9548024**
Henneke	87.03609435
Okiota	60.918708
193l:	**286.1791158**
Dubakella	136.5260549
Henneke	87.03609435
Okiota	62.6169666
202l:	**730.4342726**
Kekawaka	328.3336376
Sanhedrin	272.3894747
Speaker	129.7111604
209l:	**246.0548533**
Millsholm	75.47208734
Skyhigh	170.582766
219l:	**417.632255**
Guenoc	165.4592988
Hambright	78.69645602
Sobrante	173.4765002
220l:	**414.4078864**
Guenoc	165.4592988
Hambright	78.69645602

Sobrante	170.2521316
AcF2so:	**130.29182**
Altamont	130.29182
AmE2so:	**289.2340685**
Altamont	147.0885948
Diablo	142.1454737
CmEsn:	**161.9562135**
Cohasset	161.9562135
CmFsn:	**122.0398954**
Cohasset	122.0398954
CmGsn:	**99.74775801**
Cohasset	99.74775801
DaF2y:	**133.6514482**
Dibble	133.6514482
DaG2y:	**121.9685768**
Dibble	121.9685768
DbEso:	**243.2212344**
Dibble	131.669008
Los Osos	111.5522264
DbF2so:	**168.8093632**
Dibble	82.48372297
Los Osos	86.32564023
DlEso:	**236.772497**
Dibble	127.4773287
Los Osos	109.2951683
DlF2so:	**167.5196157**
Dibble	81.51641236
Los Osos	86.00320336
FaDsn:	**258.4796028**
Felta	258.4796028
FaEsn:	**258.4796028**
Felta	258.4796028
GgEsn:	**88.77943945**
Goulding	88.77943945
GgFsn:	**79.9014955**
Goulding	79.9014955
GgGsn:	**79.9014955**
Goulding	79.9014955
GlDsn:	**88.77943945**
Goulding	88.77943945
GlEsn:	**79.9014955**
Goulding	79.9014955
GlEso:	**178.5207245**
Gilroy	178.5207245
GlF2sn:	**66.58457959**
Goulding	66.58457959
GlFsn:	**79.9014955**
Goulding	79.9014955
GrGsn:	**110.8527024**
Guenoc	110.8527024
HaFso:	**93.45204152**
Hambright	93.45204152
HbCsn:	**264.551253**
Haire	264.551253
HcCsn:	**264.551253**

Haire	264.551253
HcEsn:	**267.3548142**
Haire	267.3548142
HgG2sn:	**70.11089127**
Henneke	70.11089127
HtEso:	**186.904083**
Hambright	93.45204152
Toomes	93.45204152
JoFsn:	**178.1982876**
Josephine	178.1982876
LaE2sn:	**42.96881149**
Laniger	42.96881149
LaEsn:	**54.68447313**
Laniger	54.68447313
LaFsn:	**49.01450277**
Laniger	49.01450277
LgFsn:	**108.207627**
Laughlin	108.207627
McFsn:	**88.53351302**
Maymen	88.53351302
MlGsn:	**206.6567296**
Los Gatos	119.5745103
Maymen	87.08221921
MmG2so:	**69.52274456**
Millsholm, eroded	69.52274456
MoEsn:	**42.84584828**
Montara	42.84584828
MoGsn:	**42.84584828**
RaDsn:	**179.2803639**
RhFsn:	**309.4519532**
RoAso:	**365.7020486**
RoCso:	**293.1845213**
SkFsn:	**167.0386929**
StEsn:	**159.0857056**
ToG2so:	**49.18528501**
ToGsn:	**59.74919123**
Ysso:	**256.3526671**
Grand Total	**28152.47555**

	MT C stored by soil type
100	17.53480252
101	17.53480252
102	17.53480252
103	37.60438609
104	36.08858503
105	36.08858503
106	36.84648556
107	9.226451498
108	9.226451498
109	9.226451498
110	19.45017191
111	19.45017191
112	19.881661
113	19.881661
114	19.881661
115	19.881661
116	15.35987144
117	39.58129919
118	10.54525271
119	10.54525271
120	13.13160166
121	19.69740249
122	26.02547445
123	26.02547445
124	22.667836
125	40.24250592
126	11.15651934
127	11.15651934
128	60.45318667
129	11.15651934
129l	22.57574773
130	35.35080576
131	18.96291466
132	18.96291466
133	18.96291466
134	18.96291466
134l	25.1515662
135	20.68241235
136	20.68241235
137	20.68241235
138	7.246731356
139	7.246731356
140	7.246731356
141	6.419931683
142	8.955097772
142l	5.936261476
143	19.19455748
143l	4.849423176
144	18.80219304
145	17.66292025
146	17.66292025

147	17.52784702
148	18.47876253
148l	14.0087703
149	17.52784702
149l	14.0087703
150	17.74396418
151	15.04175443
152	15.04175443
153	9.543704039
154	9.061270916
155	6.760740995
156	6.760740995
157	16.63533904
158	22.56263165
159	22.56263165
160	22.56263165
161	69.88409246
162	20.40742189
163	13.4060953
164	10.20815253
165	7.129749869
166	15.04175443
167	15.04175443
168	13.56338139
169	38.87947734
170	18.27752616
171	19.88576574
172	32.14641425
173	32.14641425
175l	12.75896103
176	15.56490701
177	6.760740995
178	18.28798325
179	18.28798325
180	38.13201005
181	17.64709898
182	17.5741259
192l	6.725218289
193l	9.756106221
202l	24.90116839
209l	13.42117382
219l	18.98328432
220l	18.83672211
AcF2so	17.76706636
AmE2so	19.72050467
CmEsn	22.0849382
CmFsn	11.09453595
CmGsn	13.601967
DaF2y	9.112598742
DaG2y	16.63207865
DbEso	16.58326598
DbF2so	11.50972931
DlEso	16.14357934

DlF2so	11.42179198
FaDsn	23.49814571
FaEsn	23.49814571
GgEsn	12.1062872
GgFsn	10.89565848
GgGsn	10.89565848
GlDsn	12.1062872
GlEsn	10.89565848
GlEso	24.34373516
GlF2sn	9.079715398
GlFsn	10.89565848
GrGsn	15.11627759
HaFso	12.74346021
HbCsn	24.05011391
HcCsn	24.05011391
HcEsn	24.30498311
HgG2sn	9.560576082
HtEso	16.99128028
JoFsn	16.19984433
LaE2sn	5.859383385
LaEsn	7.456973609
LaFsn	6.683795833
LgFsn	14.7555855
McFsn	12.07275178
MlGsn	8.051560892
MmG2so	9.480374258
MoEsn	11.68523135
MoGsn	11.68523135
RaDsn	16.2982149
RhFsn	28.13199574
RoAso	19.94738447
RoCso	19.98985373
SkFsn	15.18533572
StEsn	14.46233687
ToG2so	13.41416864
ToGsn	8.147616986
Ysso	11.65239396

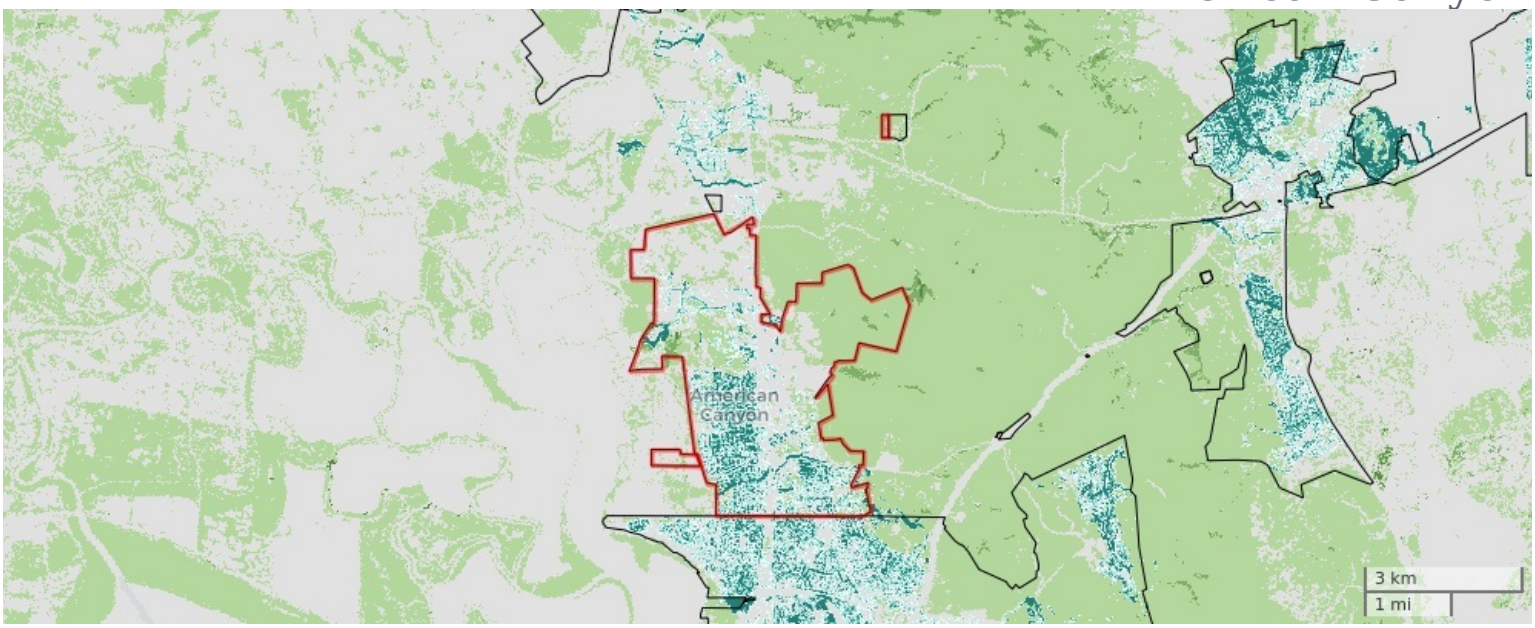
183	0	Note: Not relevant to carbon, so assigned val of 0
174	0	Note: Not relevant to carbon, so assigned val of 0
175	0	Note: Not relevant to carbon, so assigned val of 0
174	0	Note: Not relevant to carbon, so assigned val of 0
184	0	Note: Not relevant to carbon, so assigned val of 0
185	0	Note: Not relevant to carbon, so assigned val of 0

Attachment B

Carbon Stock Maps by Jurisdiction

BAY AREA GREENPRINT

American Canyon



City Limits

- Boundary

Aboveground Carbon Storage

- 0 Metric tons CO2/hectare
- 0-25 Metric tons CO2/hectare
- 26-50 Metric tons CO2/hectare
- 51-100 Metric tons CO2/hectare
- More than 100 Metric tons CO2/hectare

Urban Forest Carbon Storage

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BAY AREA GREENPRINT

American Canyon

City Limits

- Boundary

Soil Carbon Storage

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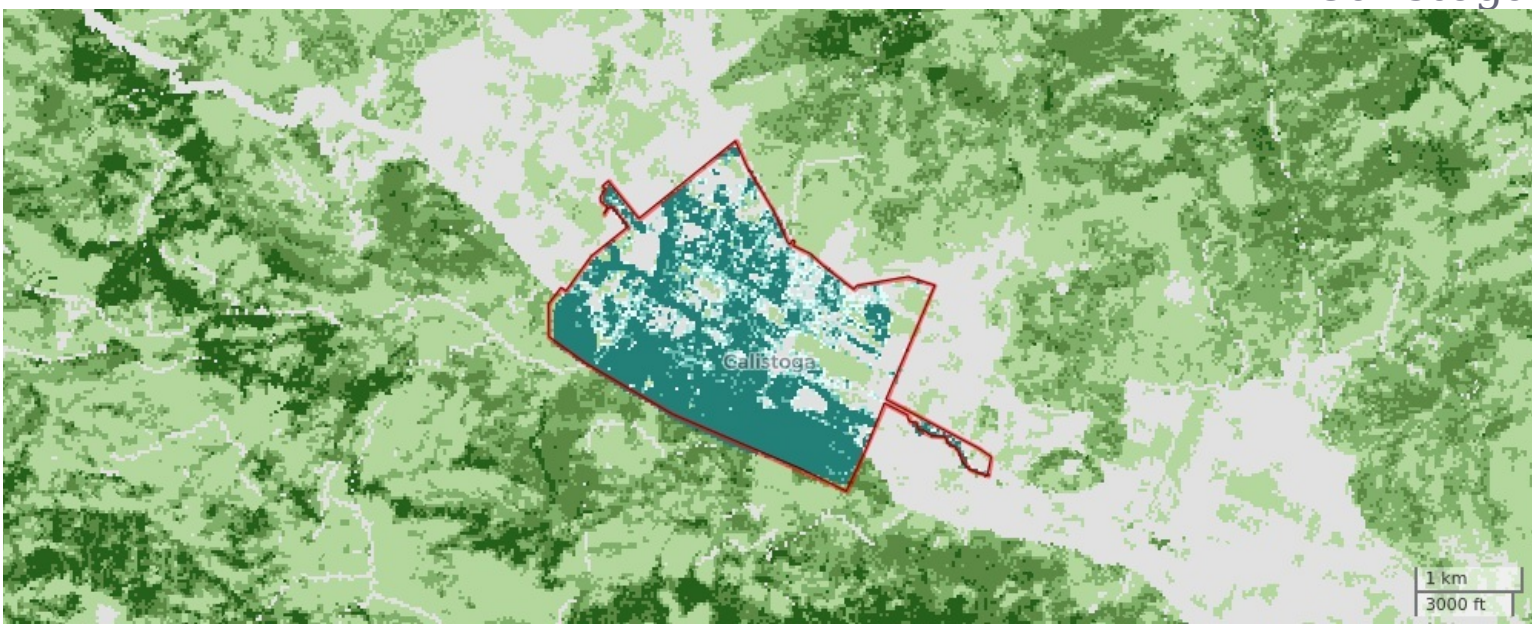
- More than 100 Metric tons CO2/hectare

BAY AREA GREENPRINT

Calistoga



City Limits

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Aboveground Carbon Storage

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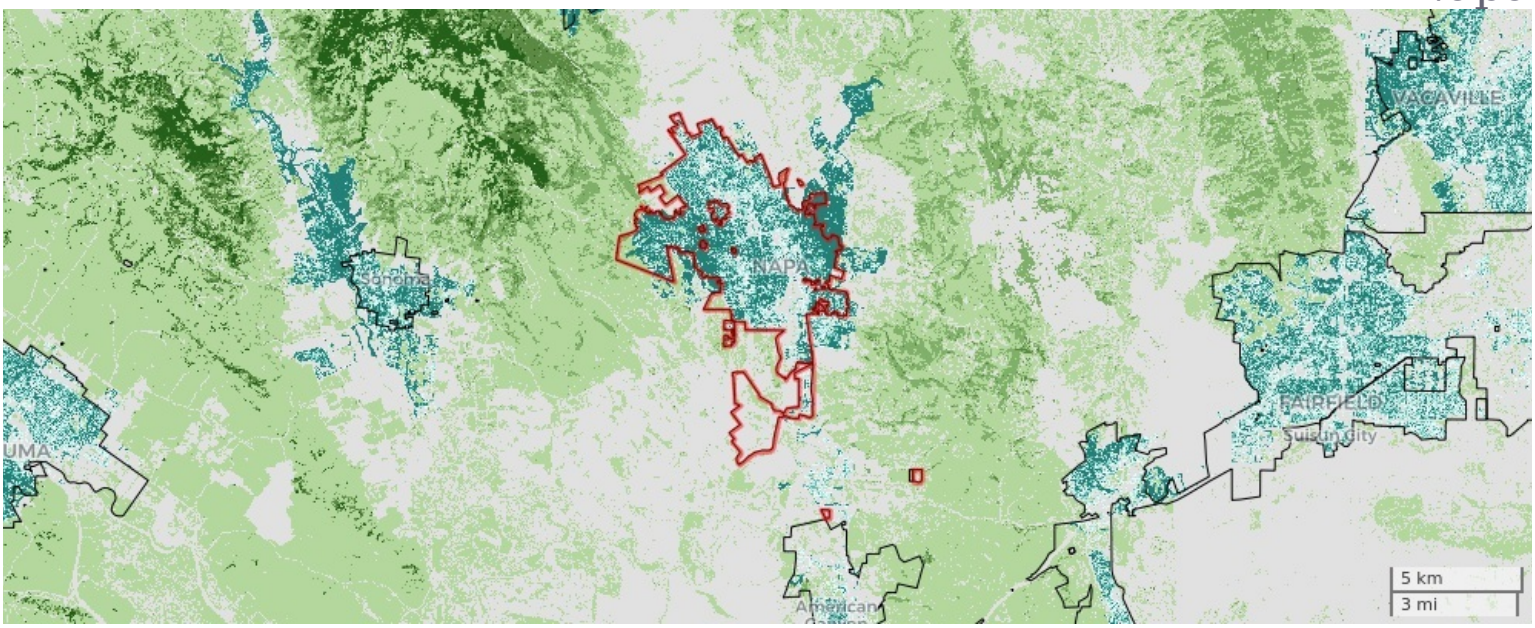
BAY AREA GREENPRINT

Napa



City Limits

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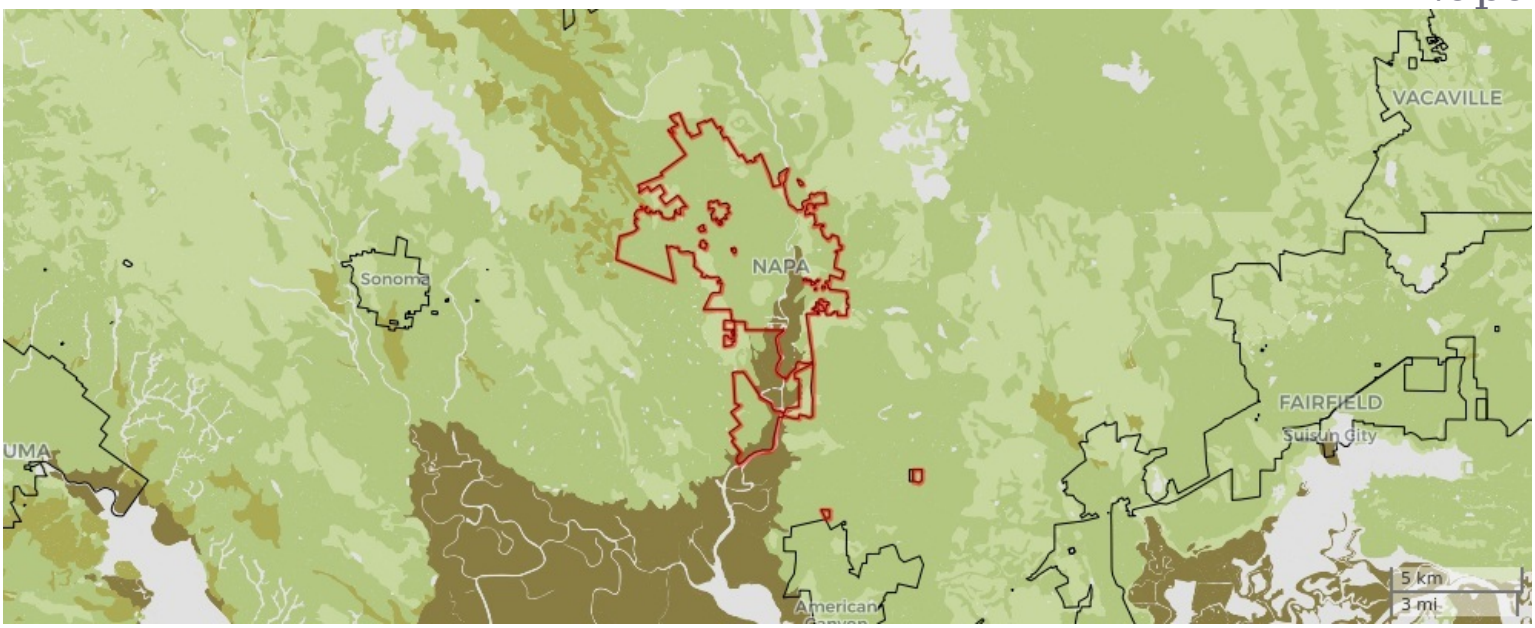

City Limits

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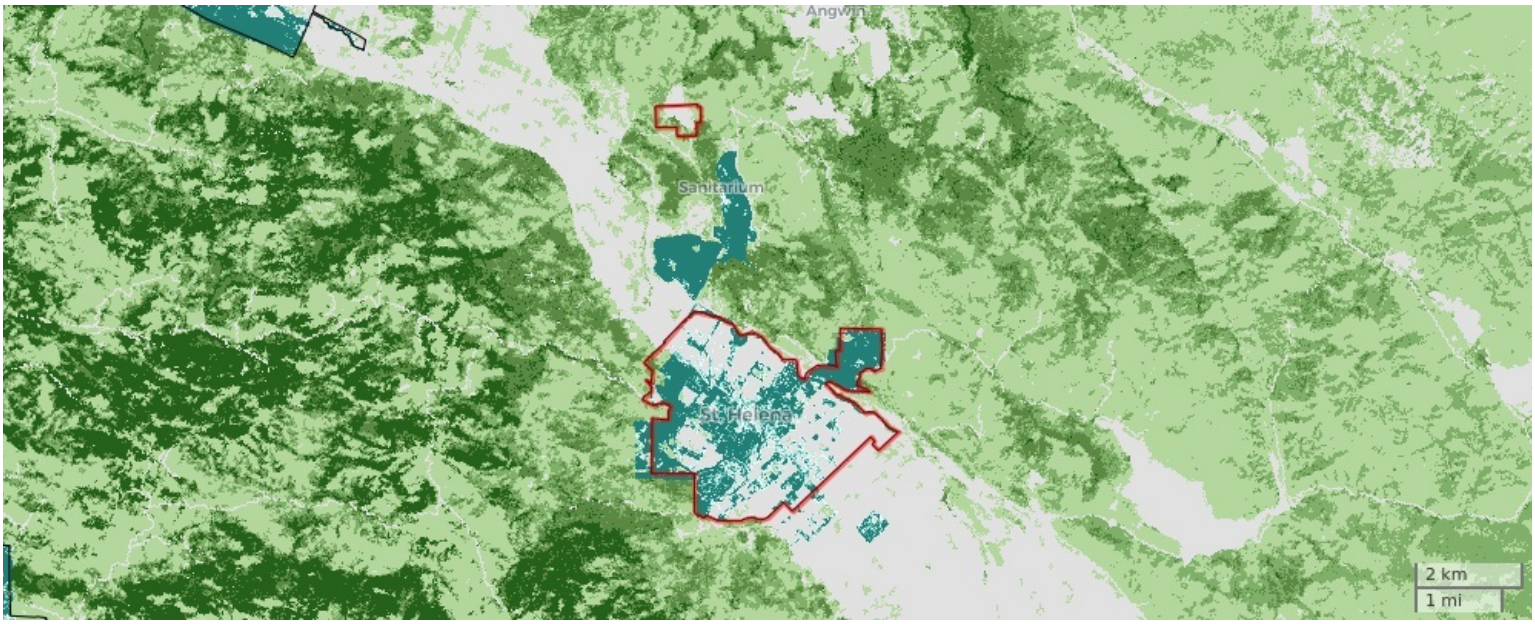
- 51-100 Metric tons CO2/hectare
- More than 100 Metric tons CO2/hectare

BAY AREA GREENPRINT

St. Helena



City Limits

- Boundary

Aboveground Carbon Storage

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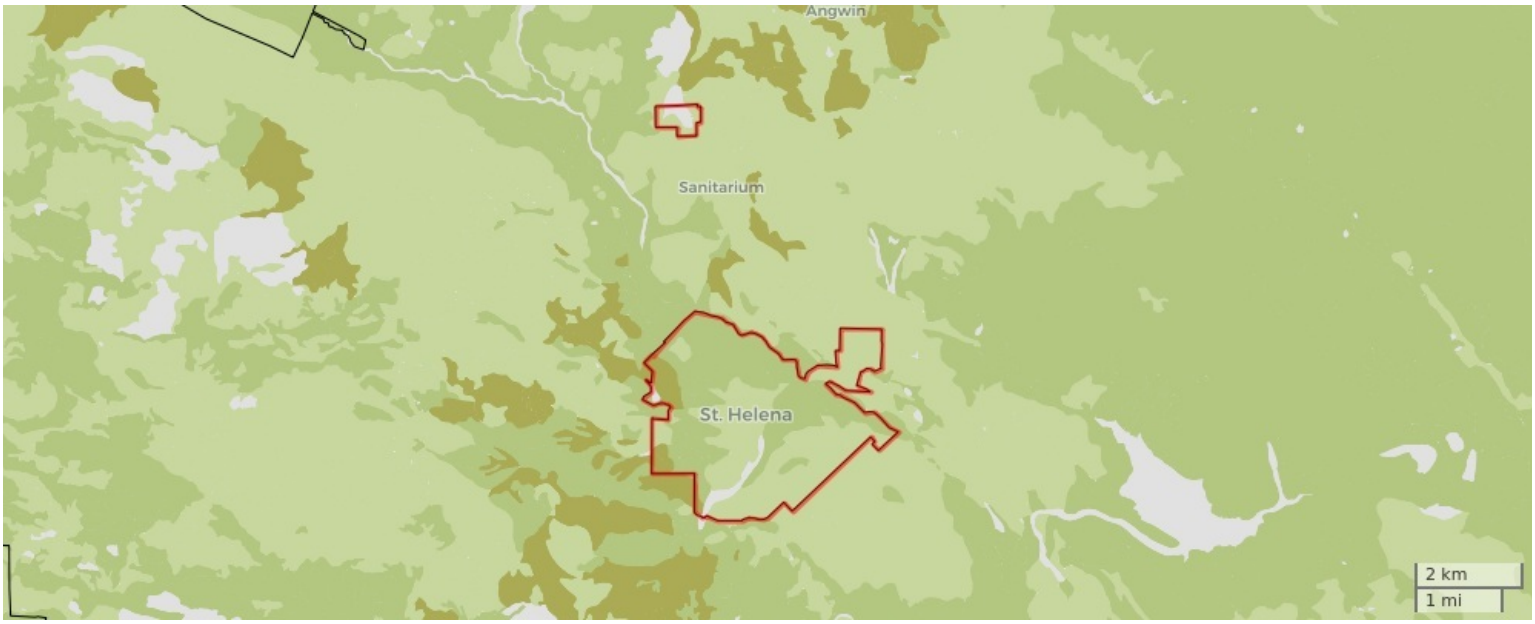
St. Helena



City Limits

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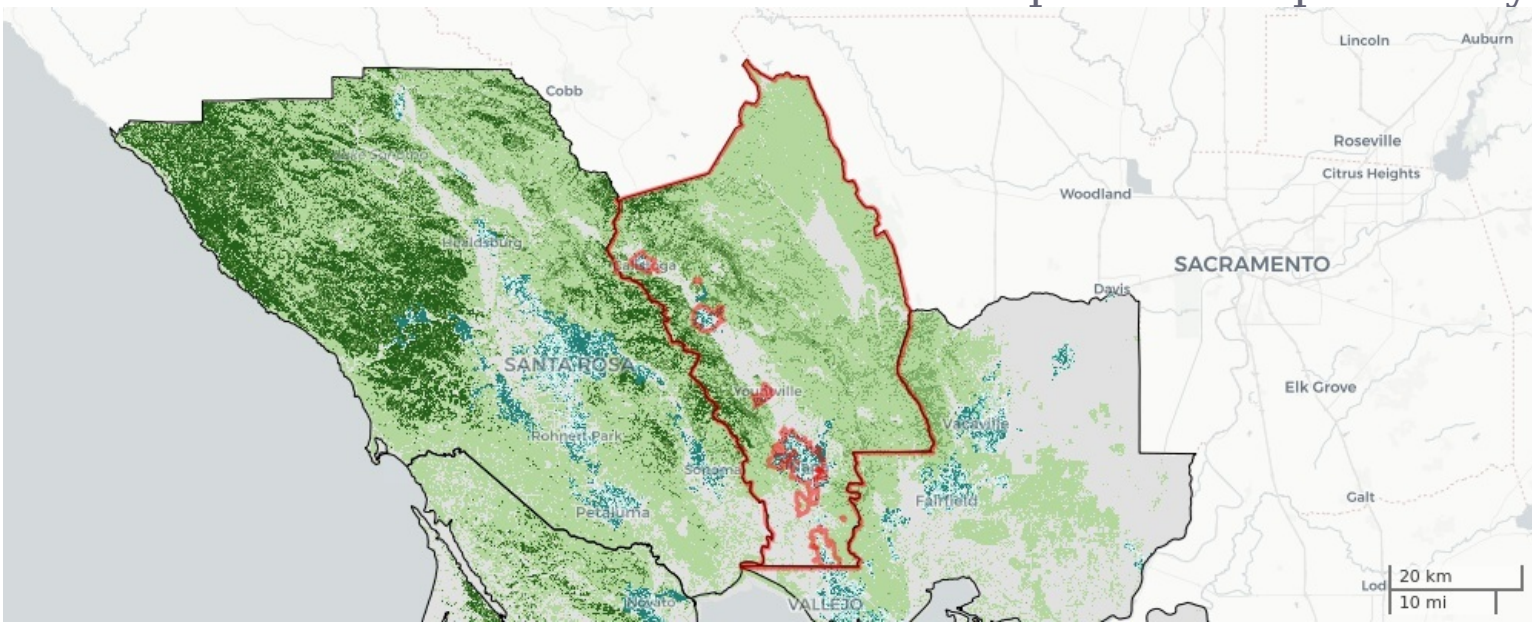
- More than 100 Metric tons CO2/hectare

BAY AREA GREENPRINT

Unincorporated Napa County



County Boundaries

- Boundary

Aboveground Carbon Storage

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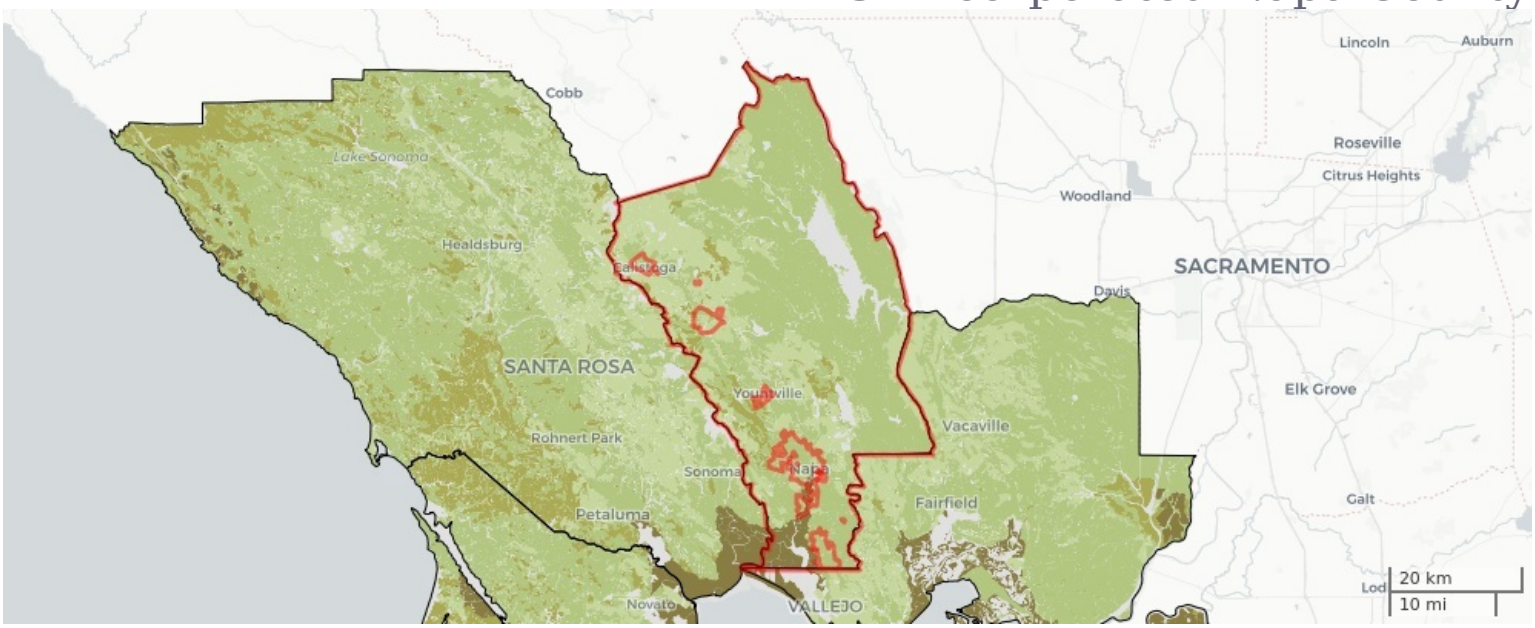
BAY AREA GREENPRINT

Unincorporated Napa County



County Boundaries

- Boundary

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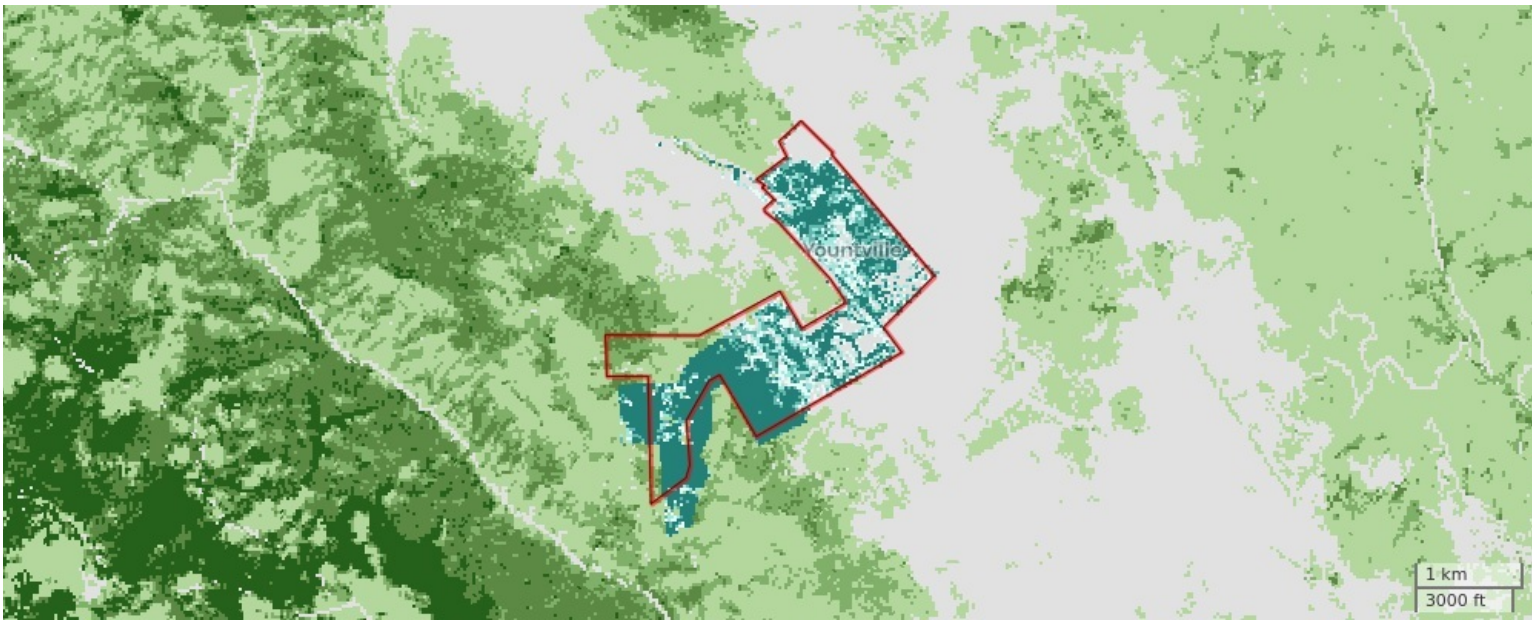
BAY AREA GREENPRINT

Yountville



City Limits

- Boundary

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BAY AREA GREENPRINT

Yountville

City Limits

- Boundary

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Appendix D

Short-Lived Climate Pollutant Inventory Memorandum

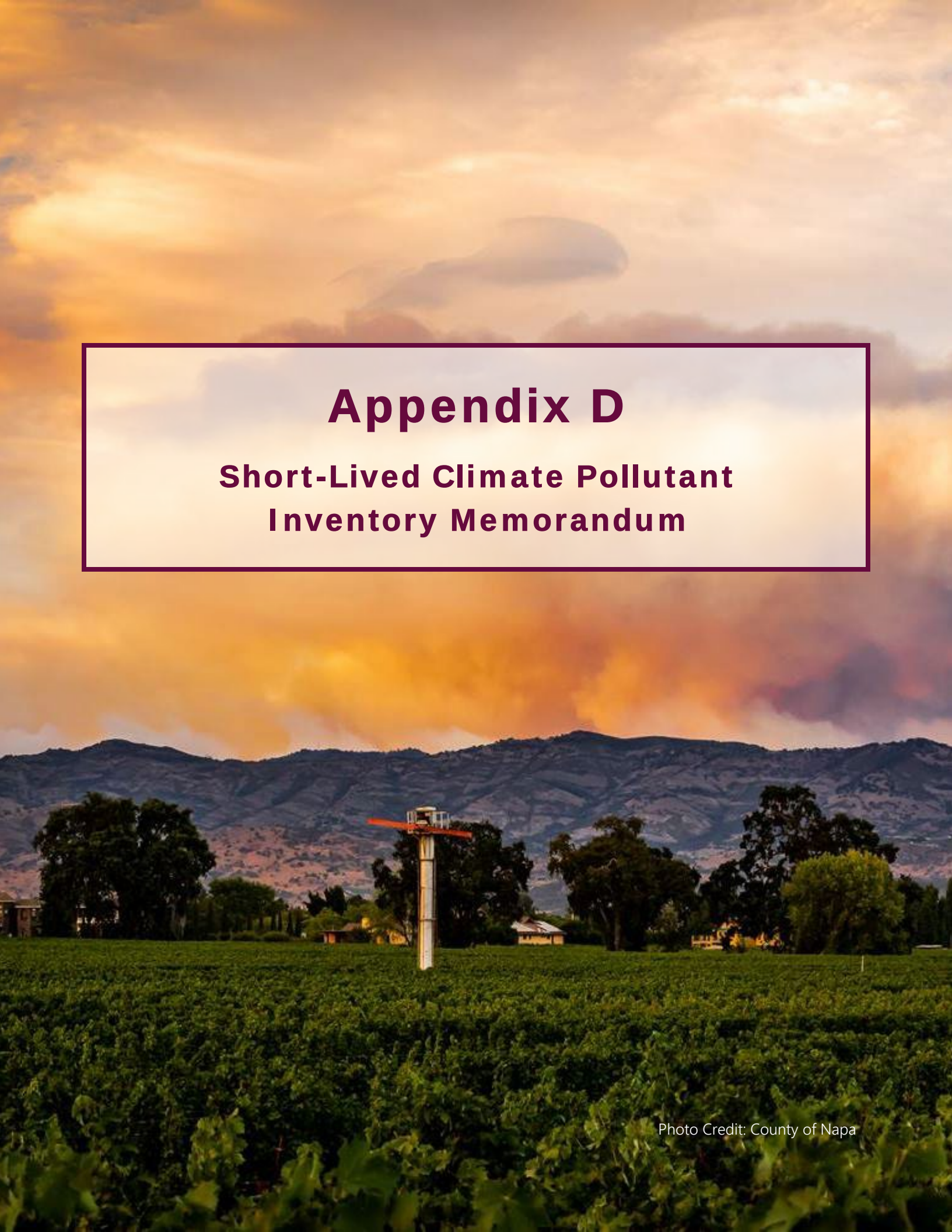

Photo Credit: County of Napa

Memo

455 Capitol Mall, Suite 300
Sacramento, CA 95814
916.444.7301

Date: August 27, 2024

To: David Morrison (County of Napa)

From: Brenda Hom and Honey Walters (Ascent Inc.)

Subject: Updated Final Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant Inventory Memorandum

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This version of the Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant (SLCP) Inventory Memorandum updates the final version released to the public on August 17, 2023. This update addresses comments received in Fall 2023 and additional revisions. These revisions are summarized as follows:

- Updated global warming potential (GWP) factors to use factors from the Intergovernmental Panel on Climate Change's Sixth Assessment Report (AR6), rather than the Fourth Assessment Report factors.
- Removed Oil and Gas sector emissions (e.g., refineries/drilling) from the fugitive methane sector because these activities do not occur within Napa County.
- Removed wildfire emissions from the short-lived climate pollutants inventory to be consistent with the California Air Resources Board's (CARB) approach in the *2022 Scoping Plan for Achieving Carbon Neutrality*. CARB excludes non-anthropogenic sources of black carbon from the state's GHG inventory (CARB 2022a:229). Wildfire emissions are addressed for informational purposes only.
- Updated wildfire emissions because the previous modeling was based on a 2017 base year. Wildfire emissions were updated to be based on 2019 wildfire activity levels. Wildfire emissions were revised by scaling the original modeled emissions by the difference in 2017 and 2019 wildfire acreages in Napa County.

1 INTRODUCTION

As part of the Napa County region's (region) 2019 Greenhouse Gas (GHG) Inventory update, this document presents a separate 2019 SLCP inventory for the region. SLCPs include GHGs with a strong temporary presence in the atmosphere contributing to short-term climate effects. Many of these GHGs have high GWP values, especially in the short term (within 20 years), that can be up to thousands of times more potent than carbon dioxide (CO_2). SLCPs include methane (CH_4), black carbon (BC), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfuryl hexafluoride (SF_6), described below.

The State acknowledges the contribution of SLCPs to climate change and has adopted the SLCP Reduction Strategy under Senate Bill (SB) 1383. SB 1383 requires the California Air Resources Board (CARB) to develop and implement a strategy to reduce statewide SLCP emissions (CalRecycle 2016). Additionally, as part of Assembly Bill (AB) 32, CARB enacted the Refrigerant Management Program for reducing hydrofluorocarbon refrigerants with high GWPs (CARB

2009). The SLCP Reduction Strategy established targets to reduce specific SLCP sources (e.g., landfill methane). Under the 2022 Scoping Plan, CARB outlines the pollutant-specific strategies for achieving those targets. However, it specifically excludes black carbon from the state's main GHG inventory as it was not included in the State's original 1990 inventory on which the State's GHG reduction targets are based (CARB 2022a).

The focus on SLCPs is crucial because reducing these emissions can have a rapid and significant impact on combating climate change in California, especially given the high GWP levels of SLCPs. The SLCP inventory presented in this memorandum is intended to inform the region of the magnitude and distribution of SLCP emissions and possible opportunities for and challenges with reducing these emissions. This document addresses the following five pollutants of concern, as categorized in CARB's SLCP Reduction Strategy, presented in order of increasing GWP:

- Fugitive Methane – Fugitive methane is natural gas that escapes into the atmosphere from drilling sites, processing plants, storage facilities, and pipelines that transfer natural gas from areas of supply to areas of demand. Aging pipelines and distribution infrastructure are common sources of leaks in urban environments (Union of Concerned Scientists 2014). Given that no oil and gas production occurs in Napa County, fugitive methane in the region is primarily from natural gas pipeline leakage from the import of natural gas into the region. Methane (CH_4) is 28 times more potent than carbon dioxide (CO_2) over a 100-year timeframe (World Resources Institute [WRI] 2013). Though CH_4 represents only about nine percent of state GHG emissions, it is a significant driver of short-term warming, and reducing methane emissions can help slow the rise in global temperatures (CARB 2022b). These emissions were not originally in the regional GHG inventory because the regional jurisdictions do not have control over these emissions.
- Other Methane – Other methane emissions are methane emissions generated from energy consumption, transportation (on-road vehicles and off-road equipment), landfills, wastewater processes, and agriculture (livestock and farming practices) in the region. These methane emissions are quantified in the regional 2019 GHG inventory. As explained above in the description of fugitive methane, the high GWP and shorter atmospheric presence of methane compared to carbon dioxide categorize it as an SLCP.
- Black Carbon – BC or soot is part of fine particulate matter emissions with a diameter of 2.5 microns or less ($PM_{2.5}$). It is formed by the incomplete combustion of fossil fuels, wood, and other fuels in transportation, agriculture, or cooking processes including wildfire events. Black carbon is a short-lived climate pollutant with a lifetime of only days to weeks after release in the atmosphere. During this short time, black carbon can have significant direct and indirect impacts on the climate (Climate and Clean Air Coalition [CCA Coalition] n.d.[a]). IPCC's AR6 report does not give estimates for BC GWP factors due to the variability of effects depending on the type of surface on which BC is deposited (e.g., ice vs. land). However, the IPCC's Fifth Assessment Report estimates that BC is the third most important individual contributor to warming after CO_2 and methane. This warming effect results from BC's high GWP of 900 over a 100-year time frame, and 3,200 over a 20-year time frame (IPCC 2013). The 2022 Scoping Plan distinguishes between the anthropogenic and non-anthropogenic sources of BC emissions, including only the BC emissions from anthropogenic sources in the State's black carbon inventory. Wildfire emissions are considered non-anthropogenic. (CARB 2022a).
- Hydrofluorocarbon – HFCs are a group of industrial chemicals primarily used for cooling and refrigeration. HFCs were developed to replace stratospheric ozone-depleting substances (ODS) which are currently being phased out under the Montreal Protocol and the Clean Air Act Amendments of 1990. Many HFCs are powerful GHGs and can persist in the atmosphere for up to 30 years. Though HFCs represent a small proportion of total GHGs, their impact on global warming can be hundreds to thousands of times greater than that of CO_2 per unit of mass (CCA Coalition n.d.[b]). Because HFCs and PFCs are the primary replacement for ODS, these are collectively known as "ODS substitutes."
- Perfluorinated compounds – PFCs differ from HFCs based on their fluorine content. Otherwise, like HFCs, the emissions of PFCs have been increasing as they are phased in as ODS substitutes. Emissions of ODS substitutes occur when they are intentionally released into the atmosphere during product use (e.g., from fire extinguishers

or aerosol cans), when they leak out of equipment such as refrigerators and air conditioning units, or upon disposal and destruction of equipment at end-of-life. Estimating these emissions is difficult because the sources are scattered, and the emissions occur over an equipment's lifetime (CARB 2016a). PFCs have GWP levels that are several thousand times higher than CO_2.

- **Sulfur hexafluoride (SF_6)** – SF_6 is a synthetic fluorinated compound with an extremely stable molecular structure. Because of its unique dielectric properties, electric utilities rely heavily on SF_6 in electric power systems for voltage electrical insulation, current interruption, and arc quenching in the transmission and distribution of electricity. It is also the most potent GHG known to date. SF_6 has a 20-year and 100-year GWP factor of 18,300 and 22,800, respectively, making it tens of thousands of times more effective at trapping infrared radiation than an equivalent amount of CO_2. Thus, a small amount of SF_6 can significantly impact global climate change. SF_6 is used in several different industries including electrical transmission and distribution equipment, the manufacture of electronics/semiconductors, and the production of magnesium (EPA 2022b).

The regional SLCP inventory relies on the best available and most up-to-date data and calculation methodologies to provide a foundation for the County of Napa (County), the incorporated areas (i.e., American Canyon, Calistoga, the City of Napa, St. Helena, and Yountville), and other relevant stakeholders to coordinate on reducing regional GHG emissions, specifically SLCPs. Quantification of the 2019 regional SLCP inventory is based on the methodologies used in CARB's GHG SLCP Inventory in the 2000-2020 GHG Inventory - 2022 Edition (CARB 2022b). Based on the modeling conducted, it was estimated that the region's SLCP emissions contributed 1,113,680 metric tons of carbon dioxide equivalent ($MTCO_2e$), using 20-year GWP factors, and 395,691 $MTCO_2e$, using 100-year GWP factors, in 2019.

Additionally, BC from wildfires accounted for 81,771 $MTCO_2e$, using the 20-year GWP factor, and 22,998 $MTCO_2e$, using the 100-year GWP factor. CARB considers wildfires as a non-anthropogenic source of emissions and excludes them from the state's GHG inventory (CARB 2022a:229). As such, BC emissions from wildfires are not included in the region's SLCP inventory. Wildfire emissions are shown in this inventory only for informational purposes due to the scale of these emissions relative to all BC emissions in the region.

2 ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of three parts:

- Section 1: **Sources of SLCP Emissions in the Napa County Region** summarizes the overall sources of SLCP Emissions and their applicability in the region.
- Section 2: **Summary of Inventory Results by Pollutant** summarizes the 2019 regional SLCP emissions inventory.
- Section 3: **Data, Methods, and Assumptions** presents the methods and data used to develop the 2019 inventory. This includes details on what sources the inventory includes and excludes.

3 SUMMARY OF INVENTORY RESULTS BY POLLUTANTS

Based on the modeling conducted, the region generated approximately 1,113,680 $MTCO_2e$ SLCPs in 2019. To reflect the short-lived nature of these SLCPs, this analysis presents emissions in $MTCO_2e$ using 20-year GWP factors (see section 4.1 Global Warming Potentials for details). As shown in Figure 1, most SLCPs in 2019 were from non-fugitive methane (70 percent) (e.g., energy consumption, on- and off-road transportation, landfills, wastewater processes, and agriculture). Other pollutants include HFCs (17 percent), black carbon (12 percent), fugitive methane (one percent), sulfur hexafluoride (<1 percent), and PFCs (<1 percent). Table 1 details the emissions results from the 2019 SLCP inventory update for the region. A detailed explanation of the 34 different sources and processes (e.g., industrial processes) that contribute to the emissions addressed in this memorandum is given in Attachment A.

Table 1 also compares the State's per-capita SLCP emissions to the region. The comparison shows that the region's SLCP emissions per capita are 50 percent higher than the State's, likely due to the large share of landfill-related methane emissions. At the state level, methane accounts for nearly 25 percent of SLCP emissions and HFCs account for nearly 75 percent, with the remaining SLCPs accounting for a small percentage (CARB 2022b). The region houses two landfills, the Clover Flat Landfill (active) and the American Canyon Landfill (closed), which are known sources of methane emissions. As discussed in the Regional 2019 GHG inventory and shown in Table 4, 75 percent of methane emissions in the region are from the solid waste sector, both emissions generated from decomposing waste accumulated in landfills over time and from the decomposition of waste generated in 2019.

Table 1 2019 Napa County Regional GHG SLCP Inventory by Pollutant ($MTCO_2e$/year) [1] and comparison with State SLCP emissions ($MTCO_2e$/year)

Pollutant	Emissions using 20-year GWP factors (Percent Share)	Emissions using 100-year GWP factors ($MTCO_2e$/year)
Other Methane[2]	774,410 (70%)	266,084 (67%)
Hydrofluorocarbon	189,896 (17%)	85,927 (22%)
Black Carbon	132,804 (12%)	37,351 (9%)
Fugitive Methane	15,953 (1%)	5,481 (1%)
Sulfur Hexafluoride	615 (<1%)	847 (<1%)
Perfluorinated compounds	2 (<1%)	0.78 (<1%)
Total	**1,113,680 (100%)**	**395,691 (100%)**
SLCP Emissions per capita – **Napa County Region**	7.98	2.83
SLCP Emissions per capita – **State**	5.15	1.86
Black Carbon Emissions from Wildfire[3] – **Napa County Region**	81,771	22,998

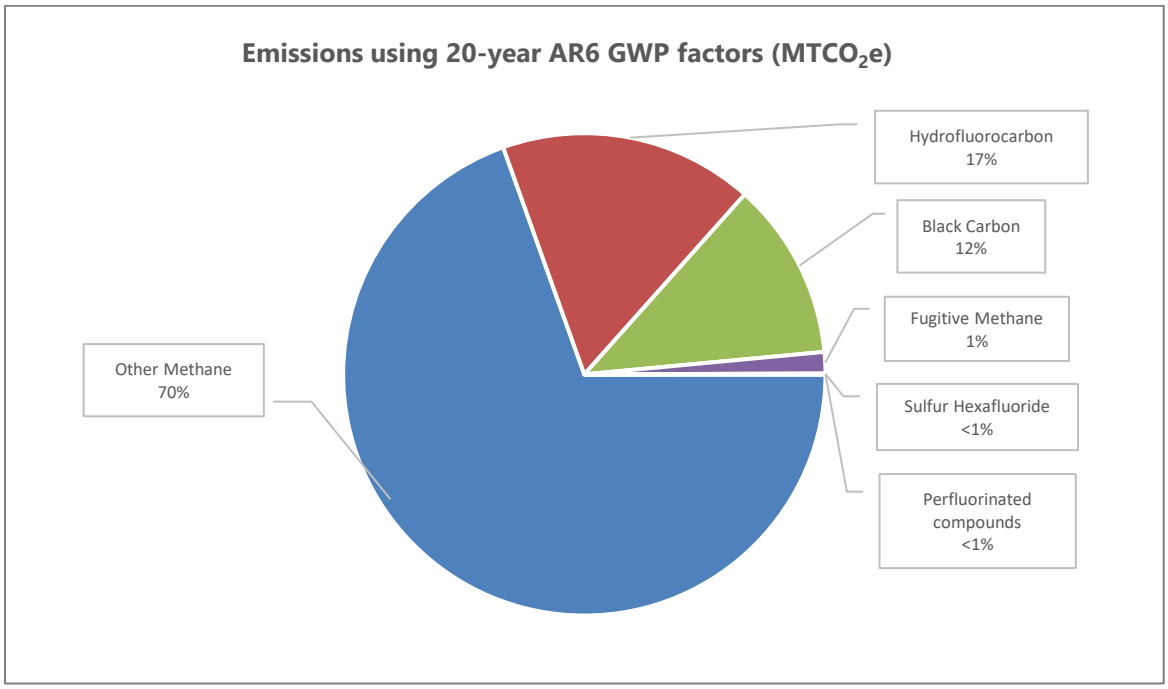
Notes: GWP = global warming potential; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year; NA= Not applicable; SLCP= short-lived climate pollutant.

[1] Totals may not add up due to rounding.

[2] Other methane emissions generated from energy consumption, transportation (on-road vehicles and off-road equipment), landfills, wastewater processes, and agriculture (livestock and farming practices). These are estimated in the Napa County Regional 2019 Community Greenhouse Gas Inventory.

[3] Black carbon emissions from wildfires are not included in the total SLCP emissions estimates. These are added here for informational purposes only because wildfires are a big contributor to non-anthropogenic black carbon emissions in the region.

Source: Prepared by Ascent in 2024.



Source: Prepared by Ascent in 2024.

Figure 1 2019 Napa County Regional SLCP Emissions Inventory by Pollutant

4 DATA, METHODS, AND ASSUMPTIONS

The SLCP inventory is subject to the limitations of the certainty of the data and the availability of accurate methods. Research on more accurate methods of estimating SLCPs is ongoing. The more sophisticated methods used for the national and State inventories do not apply at the county level. The methods used in this inventory are based on the best available data and the most applicable methods at the time of writing. This inventory uses a variety of methodologies and assumptions for each SLCP, many of which rely on the GHG inventory already performed for the region or based on top-down approaches. The following section describes the process of estimating SLCP emissions in the region.

An overview of calculation input for each emissions source, along with the description, assumptions (if any), and data sources, is shown in Table 2. Detailed methods are described in the sections following Table 2.

Table 2 2019 Napa County Regional GHG SLCP Quantification Methods by Pollutant

Pollutant/ Source	Input	Description	Assumptions	Data Sources
Other Methane				
Energy Consumption Transportation (on-road and off-road), Solid Waste, Wastewater processes, Agriculture	Refer to the Napa County Regional 2019 Community Greenhouse Gas Inventory memorandum			
HFCs				
Residential HFCs	California residential HFC estimations by equipment type	Emissions originating from the use of ODS substitutes are divided into residential and commercial emissions	-	California's High GWP Gases Emission Inventory -Emission Inventory Methodology and Technical Support Document (CARB 2016a)
	Number of households in California and the region		-	Demographic Profiles from California Department of Finance (Department of Finance 2012)
Commercial HFCs	California *commercial* HFC Estimations by equipment type		-	California's High GWP Gases Emission Inventory -Emission Inventory Methodology and Technical Support Document (CARB 2016a)
	Commercial square footage in California and the region		-	-
Black Carbon				
Combustion processes	Particulate Matter (PM) emissions from combustion	BC is the carbonaceous fraction of PM[2]	-	Napa County Regional emissions from CEPAM[1] 2019v1.03 Emission Projection Data (CARB 2017)
	Fraction of Elemental Carbon (EC) in PM in the state	EC measurements are commonly used as a proxy for BC for inventory purposes[2]	Fraction of EC for the region is equal to the fraction EC for the state	California's Black Carbon Emission Inventory (CARB 2016b)
Wildfires[3]	Particulate Matter (PM) emissions from combustion	BC is the carbonaceous fraction of PM[2]	-	Napa County Regional emissions from CEPAM[1] 2019v1.03 Emission Projection Data (CARB 2017)
	Fraction of Elemental Carbon (EC) in PM in the state	EC measurements are commonly used as a proxy for BC for inventory purposes[2]	Fraction of EC for the region is equal to the fraction EC for the state	California's Black Carbon Emission Inventory (CARB 2016b)
	Acres burned	Based on acres burned in different years due to wildfire events, the emissions are updated for the baseline year	Emissions generated per burned acre are the same every year	2019 Incident Archive (CAL FIRE 2019); Exploring The Devastating 2017 Napa, California Fires (Kirk, L. 2022)

Pollutant/ Source	Input	Description	Assumptions	Data Sources
Fugitive Methane				
Pipeline	Transmission Pipeline Leaks - Fugitive	Emissions are calculated based on emission factor and miles of transmission pipeline.	-	Fugitive emission data from PG&E
	Transmission Pipeline Blowdown - Vented	Venting natural gas to the atmosphere results in methane emissions[4]	-	Fugitive emission data from PG&E
	Distribution Main & Service Pipeline Leaks - Fugitive	Emissions generated from distribution main & service pipeline leaks are compiled in PG&E's Methane Emission Map[5]	-	Fugitive emission data from PG&E (Melendez, pers. comm., 2023).
Sulfur Hexafluoride				
Electricity Transmission	The region's total electricity consumption	-	-	Napa County Regional inventory prepared by Ascent
	Sulfur hexafluoride emission factor	-	-	Parameters and Constants in California 2000-2020 GHG Inventory query tool (CARB 2022b)
PFCs				
Use of electrical equipment	Total SLCP emissions in the region (excluding PFC emissions); Share of PFCs in total SLCP emissions in California	-	Share of PFCs to total SLCP emissions in the region is equal to the share of PFCs compared to total SLCP emissions in California	Calculated
Fire suppressant				

Notes: BC= black carbon; CARB = California Air Resources Board; EC= elemental carbon; GHG= greenhouse gas; HFCs = hydrofluorocarbons; ODS= ozone-depleting substances; PFC= perfluorinated compound; PG&E = Pacific Gas and Electric Company; PM = particulate matter; SLCP= short-lived climate pollutant; GWP = global warming potential

[1] CEPAM: California Emissions Projection Analysis Model

[2] Source: CARB 2016b.

[3] Emissions from wildfires are added for informational purposes only and are not included in the total BC emissions estimates.

[4] Pipeline blowdowns are routine operations on natural gas transmission and distribution systems to allow operators to safely perform maintenance, inspections, construction, and emergency response. This practice involves isolating and depressurizing a section of the pipeline and typically venting the natural gas into the atmosphere, which can result in methane emissions.

[5] PG&E maintained Methane Emission Map

Source: Compiled by Ascent in 2023.

4.1 GLOBAL WARMING POTENTIALS

Consistent with the Napa County Regional 2019 Community Greenhouse Gas Inventory, the 2019 GHG SLCP Inventory uses GWP factors published in the Sixth Assessment Report from IPCC for a 20-year time horizon and a 100-year time horizon. Table 3 shows the GWP factors used in the SLCP inventory.

Table 3 Global Warming Potentials used in the 2019 Napa County Regional GHG SLCP Inventory

Pollutant	GWP for 20-year timeframe	GWP for 100-year timeframe	Source
Fugitive Methane	81	28	IPCC AR6 GWP factors
Methane (non-fugitive)	81	28	IPCC AR6 GWP factors
Black Carbon	3,200	900	CARB 2016b
Hydrofluorocarbon	3,978	1,800	Estimated using IPCC AR6 GWP factors
Perfluorinated compounds	5,868	8,248	Estimated using IPCC AR6 GWP factors
Sulfur Hexafluoride	18,300	25,200	IPCC AR6 GWP factors

Notes: AR = assessment report; CARB = California Air Resources Board; GHG = greenhouse gas; GWP = global warming potential; IPCC = Intergovernmental Panel on Climate Change; SLCP= short-lived climate pollutant.

Source: IPCC 2021, Compiled by Ascent in 2024.

Consistent with the state's SLCP inventory, this section discusses emissions estimations using the 20-year GWP factors. Unless otherwise stated, the data and figures presented in this memorandum are estimations using the 20-year GWP factors.

5 OTHER METHANE

Methane emissions generated from energy consumption, transportation (on-road vehicles and off-road equipment), landfills, wastewater processes, and agriculture (livestock and farming practices) accounted for 9,537 MT CH_4 or 774,410 $MTCO_2e$, which is 70 percent of the total SLCP emissions. These are estimated in the regional 2019 Community Greenhouse Gas Inventory memo. The 20-year GWP factor used for fugitive methane is 81. GWP factors are presented in Table 3. Table 4 presents other methane emissions in the region.

Table 4 2019 Napa County Regional Methane Emissions

Emission Sources	Methane emissions from other sources (MT)	Methane emissions from other sources ($MTCO_2e$)	Share of Methane (Non-Fugitive) Emissions by Emission Sources (%)
Landfills from waste in place	4,108	333,557	43%
Landfills from waste generation	3,019	245,181	32%
Wastewater processes	1,639	133,099	17%
Agriculture (livestock)	650	52,759	7%
Off-road sector	71	5,741	1%
On-road sector	26	2,071	0.27%
Energy consumption	21	1,685	0.22%
Agriculture (farming practices)	3.47	282	0.04%
Imported Water	0.43	35	0.0045%
Total (MT)	**9,537**	**774,410**	**100%**

Notes: CO_2e= carbon dioxide equivalent; MT = metric tons

Source: Modelling by Ascent in 2023.

6 HYDROFLUOROCARBONS

Based on modeling conducted, approximately 48 MT of HFCs were emitted in 2019. This is equivalent to 189,896 $MTCO_2e$ or 17 percent of total SLCP emissions. The HFC compounds estimated in CARB's GHG SLCP Inventory in the 2000-2020 GHG Inventory – 2022 Edition (CARB 2022b) are detailed in Table A-3 alongside their sources in Attachment A. Through the California's High Global Warming Potential Gases Emission Inventory, CARB provides HFC emissions estimates by equipment type (e.g., "Residential A/C," "Refrigeration Large Centralized System ≥ 907.2 kg (2,000 lbs.)").

For residential emissions, CARB presented HFC emissions by equipment type for all residential uses across the state. These emissions are scaled to the region level by applying a ratio of the countywide households to the statewide households, using household data for 2019.

Non-residential emissions are estimated based on CARB's estimate of HFC emissions by user type. For example, 77 percent of HFC emissions from Refrigeration Large Centralized Systems over 2,000 lb are estimated to be emitted by the commercial sector and 23 percent by industrial (CARB 2016a). Based on the CARB HFC inventory, regional commercial and industrial emissions are estimated by using an average statewide factor of 0.000131 lb of HCFs per kWh. This factor is estimated by dividing statewide commercial and industrial HCF emissions by statewide commercial and industrial energy consumption (Energy Information Administration [EIA] 2021). This factor is then applied to total non-residential electricity consumption in the region to estimate regionwide non-residential HFC emissions. Table 5 presents residential and non-residential (commercial and industrial) emissions in the region.

A weighted GWP value for HFCs is estimated based on the distribution of HFC compounds in the state's inventory to account for the various GWP values across HFCs. The resulting estimated 20-year GWP factor used for HFCs is 3,978, as presented in Table 3. HFC-23 emissions are excluded from the region's SLCP inventory and weighted GWP calculation as they are typically used in semiconductor manufacturing, which is not present in the region.

Table 5 2019 Napa County Regional HFC Emissions

Emission Category	HFC emissions (MT)	HFC emissions ($MTCO_2e$)	Share of HFC Emissions by Emission Category (%)
Residential	12	48,876	26%
Non-residential (Commercial and Industrial)	35	141,021	74%
Total	**48**	**189,896**	**100%**

Notes: CO_2e= carbon dioxide equivalent; HFC = hydrofluorocarbon; MT = metric tons.

Source: Modelling by Ascent in 2024.

7 BLACK CARBON

Based on modeling conducted, BC emissions in 2019 resulted in 42 MT or 132,804 $MTCO_2e$. This is 12 percent of total SLCP emissions. These emissions account for anthropogenic BC emissions from incomplete burning of organic materials in sectors, such as transportation, agriculture, cooking, etc. Non-anthropogenic, or natural, sources of BC are excluded from this inventory. These include emissions from wildfire, which resulted in the emissions of 26 MT BC or 81,771 $MTCO_2e$ BC in 2019. This is consistent with CARB's approach in the 2022 Scoping Plan, where wildfire and other non-anthropogenic emissions are excluded from the state's SLCP inventory (CARB 2022a:229). However, non-anthropogenic BC is presented in this memorandum as an informational item.

For this SLCP inventory, BC emissions are based on scaling of the state's estimate of the existing $PM_{2.5}$ emissions in Napa County combined with speciation profiles that define the BC fraction of $PM_{2.5}$ (CARB 2016b). According to the state's inventory, Elemental Carbon (EC) measurements are commonly used as a proxy for BC. EC portions of $PM_{2.5}$ can vary between 0 percent (for dust) and 61 percent (for diesel exhaust), because $PM_{2.5}$ is a category of size rather than chemical compound. For the regional level inventory, the California Emissions Projection Analysis Model (CEPAM) is used to estimate $PM_{2.5}$ emissions for the region for 2017, the most recent year for which $PM_{2.5}$ emissions data is available (CARB 2017). CEPAM includes over 50 different combustion processes, and the individual estimated contributions of those processes queried for Napa County are shown in Attachment A. The proportion of BC in these combustion processes is derived from CARB's BC inventory modeled in CEPAM.

Based on the CEPAM outputs, agricultural activities generated 33 percent of regional BC emissions, off-road transportation generated 16 percent, on-road transportation 17 percent, and residential fuel combustion 15 percent. All other sources generated less than 12 percent of BC emissions. The 20-year GWP factor used for BC is 3,200. GWP factors are presented in Table 3. Table 6 summarizes BC emissions estimated for the region by sector for 2019.

Table 6 2019 Napa County Regional Black Carbon Emissions

Emissions Sector	Black Carbon Emissions (MT per year)	Black Carbon Emissions ($MTCO_2e$ per year)	Share of Black Carbon Emissions by Combustion Processes Categories (%)
Agricultural	13.82	44,224	33%
Off-Road Transportation	9.53	30,496	23%
On-Road Transportation	7.04	22,528	17%
Residential Fuel Combustion	6.28	20,096	15%
Prescribed Fires	2.97	9,504	7%
Industrial	0.97	3,104	2%
Dust	0.45	1,440	1%
Fires	0.27	864	1%
Other	0.11	352	<1%
Energy/utilities	0.04	128	<1%
Total (MT per year)	**42**	**134,400**	**100%**
Wildfires[1]	26[2]	83,200	NA

Note: CEPAM: California Emissions Projection Analysis Model; CO_2e= carbon dioxide equivalent; MT = metric tons; NA = not applicable.

[1] Emissions from wildfires are added for informational purposes only and are not included in the total BC emissions estimates.

[2] Wildfire emissions estimates for 2017 available from CEPAM were adjusted to reflect emissions in 2019. This was done because 2017 was an anomaly year in terms of wildfires in Napa and a vast discrepancy was identified in acres burned due to wildfires between 2017 and 2019 in the region.

Source: Data compiled by Ascent in 2023.

According to CEPAM's 2017 estimates, wildfires generated 2,396 $MTCO_2e$ in BC emissions. However, 2017 was an anomalous year in terms of wildfires in Napa. In 2017, 60,000 acres were reported burned (Kirk 2022). While in 2019, a total of 640 acres were reported burned (CAL FIRE 2019). Therefore, 2017 wildfire emissions estimates were scaled by the burned acreage to reflect 2019 conditions. As a result, it is estimated that wildfires generated 26 $MTCO_2e$ in BC emissions, which are more than half of the region's anthropogenic BC emissions.

8 FUGITIVE METHANE

Based on modeling conducted, fugitive methane emissions in 2019 were 13,424 MT CH_4 or 1,090,020 $MTCO_2e$. This only accounts for one percent of total SLCP emissions in the region. Primary sources of fugitive methane emissions are oil and gas refineries and natural gas pipelines. The methodology for estimating fugitive methane for the state inventory is provided in the California 2000-2020 GHG Inventory (CARB 2022b). For this inventory, fugitive methane from oil and gas sources is excluded because according to the State's annual Oil and Gas reports, this industry is not known to operate in the region (Department of Conservation 2024). Fugitive emissions from pipelines are generated from transmission pipeline leaks, distribution main & service pipeline leaks, and transmission pipeline blowdowns. Pipeline blowdowns are routine natural gas transmission and distribution systems operations to allow operators to safely perform maintenance, inspections, construction, and emergency response. This practice involves isolating and depressurizing a section of the pipeline and typically venting the natural gas into the atmosphere, which can result in methane emissions. Pacific Gas and Electric (PG&E) provided data for fugitive methane emissions from pipelines (Melendez, pers. comm., 2023). Fugitive methane has a 20-year GWP factor of 81. GWP factors are presented in Table 3. Table 7 presents fugitive methane emissions from the region's pipeline sources.

Table 7 2019 Napa County Regional Fugitive Methane Emissions

Emission Sources	Fugitive Methane Emissions (MT)	Fugitive Methane Emissions ($MTCO_2e$)	Share of Fugitive Methane Emissions by Emission Sources (%)
Pipeline	196	15,953	100%

Notes: CO_2e= carbon dioxide equivalent; MT = metric tons.

Source: Modelling by Ascent in 2024.

9 SULFUR HEXAFLUORIDE

Based on modeling conducted, SF_6 in the region accounted for 0.034 MT SF_6 or 615 $MTCO_2e$ in 2019 which is less than one percent of total SLCP emissions in the region. SF_6 is a gas used in electrical insulation with applications in both semiconductor manufacturing and transmission of electricity. SF_6 from semiconductor manufacturing are excluded because this industry is not known to operate in the region. For SF_6 emissions from electrical transmission, CARB's inventory methodology uses a 0.00003625 gram-per-kWh emissions factor to calculate SF_6 emissions from the total electricity generation in the state (CARB 2022b). The regional inventory uses the same emissions factor and applies it to the estimated 926,660,844 kWh of electricity used in Napa County in 2019. The 20-year GWP factor used for SF_6 is 18,300. GWP factors are presented in Table 3. Table 8 presents SF_6 emissions in the region.

Table 8 2019 Napa County Regional Sulfur Hexafluoride Emissions

Emission Sources	Sulfur Hexafluoride Emissions (MT)	Sulfur Hexafluoride Emissions ($MTCO_2e$)	Share of Sulfur Hexafluoride Emissions by Emission Sources (%)
Electrical Transmission	0.03	615	100%

Notes: CO_2e= carbon dioxide equivalent; MT = metric tons; SF_6 = sulfur hexafluoride

Source: Modelling by Ascent in 2024.

10 PERFLUORINATED COMPOUNDS

Based on modeling conducted, PFCs in the region accounted for 0.0004 MT PFCs or 2 $MTCO_2e$ in 2019 which is less than one percent of the total SLCP emissions. In the region, semiconductor manufacturing-related PFC emissions are not assumed to be present given the absence of semiconductor manufacturing industry. PFC emissions from other

sources (e.g., solvents, and fire protection) emit minimal emissions. Estimations using data from California's 2000-2020 GHG Inventory show that these emissions account for only 0.015 percent of statewide SLCP emissions (CARB 2022b). To calculate PFC emissions in the region, this percentage was applied to the total SLCP emissions originating from the region. The 20-year GWP factor used for PFCs is 5,868. GWP factors are presented in Table 3. Table 9 presents PFC compounds and their sources listed in the California 2000-2020 GHG Inventory applicable to the region and Table 10 presents PFC emissions in the region (CARB 2022b).

Table 9 PFC compounds and their sources listed in the California 2000-2020 GHG Inventory that apply to Napa County Region

Sources	Compounds
Solvents	Other PFC and PFE
Commercial Fire Protection	CF_4
Industrial Fire Protection	CF_4
Solvents	CF_4

Notes: CF_4= perfluorocarbon; PFC= perfluorinated compounds; PFE= perfluoropolyethers.

Source: Modelling by Ascent in 2024.

Table 10 2019 Napa County Regional PFC Emissions

Emission Sources	PFC emissions (MT)	PFC Emissions ($MTCO_2e$)	Share of PFC Emissions by Emission Sources (%)
Ozone-depleting substitutes and fire suppressants	0.0032	2	100%

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons; PFC= perfluorinated compounds.

Source: Modelling by Ascent in 2024.

11 SUMMARY

Although not included in the region's GHG inventory, SLCPs still contribute to increased concentrations of GHGs in the atmosphere and, thereby, climate change. In 2019, SLCPs accounted for 1.1 million $MTCO_2e$, based on a 20-year GWP factor, and over 396,000 $MTCO_2e$ if using a 100-year GWP factor. Accounting for the methane already included in the regional GHG inventory and using the same 100-year GWP factors, this could increase the region's emissions by 32 percent. However, reducing SLCPs in the near term can have immediate effects on the contribution of these gases to climate change.

The strategy for reducing SLCPs begins with identifying the largest sources. Actions to reduce these emissions are already underway, but there are opportunities to support these and further reductions. With nearly 70 percent of SLCPs coming from other methane sources, the region is already committed to reducing these emissions through the forthcoming Regional Climate Action and Adaptation Plan (RCAAP). Following other methane sources, HFCs and black carbon sources account for nearly 30 percent of emissions. In terms of reducing HFC emissions, the state is currently implementing a maximum GWP limit for refrigerants, the main source of HFCs. According to the Refrigerant Management Program, CARB began prohibiting refrigerants with GWPs greater than 750 in most new applications starting in January 2023 (CARB 2020). This GWP limit is almost 80 percent lower than the current GWP level assumed for HFCs, meaning that, once fully implemented, HFC emissions could be reduced by 80 percent in the future from 2019 levels.

Anthropogenic black carbon emissions come from a variety of sources, but most are from fuel combustion in buildings, transportation, and off-road equipment. Energy efficiency measures, building electrification, vehicle electrification, and strategies to reduce VMT are all existing and planned measures to reduce emissions from fuel

combustion in buildings and mobile sources. The reduction in PM emissions from these measures will also have a proportional reduction in black carbon emissions.

With the existing legislative reductions and planned measures under the RCAAP addressing most of the SLCP emissions sources, further reductions in the impact of SLCPs could be gained through the immediate implementation of these measures. The sooner SLCP emissions are reduced, the greater the reductions can be on climate change impacts due to these pollutants' high GWP, especially in the short term. Similarly, gains in wildfire management and the prevention of significant BC emissions from wildfires can also reduce impacts associated with climate change.

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Attachment A

Sources of SLCP Emissions in the Napa County Region

SOURCES OF SLCP EMISSIONS IN THE NAPA COUNTY REGION

Table A-1 presents the SLCPs and their emission sources as included in the region's 2019 SLCP inventory. The list of emissions sources is analogous to the list used by the State in its SLCP inventory. Table A-1 also identifies whether a particular SLCP emissions source, included in the State's inventory, applies to the region and explains the rationale behind its applicability. Table A-2 shows the detailed emissions sources accounted for in the BC inventory. Table A-3 details the HFC emissions estimated for 2019 by HFC pollutant as listed in California's 2000-2020 GHG SLCP Inventory.

Table A-1 Summary of Sources for the 2019 Napa County Regional GHG SLCP Inventory

Pollutant/ Sources	Applicability in Napa County Region (Yes/No)	Rationale
Black Carbon		
Manufacturing and Industrial	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Service and Commercial	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Incinerators	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Soil Remediation[2]	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Chemical	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Mineral Processes	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Other (Industrial Processes)	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Residential Fuel Combustion	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Agriculture[3]	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Construction and Demolition	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Paved Road Dust	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Unpaved Road Dust	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Fugitive Windblown Dust	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Managed Burning and Disposal	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Cooking	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Other (Miscellaneous Processes)	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]

Pollutant/ Sources	Applicability in Napa County Region (Yes/No)	Rationale
Transportation [4]	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Wildfires	Yes	Listed as a source of BC in Napa County Region in CEPAM 2019v1.03 Emission Projection Data[1]
Fugitive Methane		
Pipeline Methane Fugitives	Yes	Emissions arising from intentional and unintentional leakage of natural gas in pipelines
Oil & Gas CH_4 Fugitives	No	No oil and gas refineries in Napa County
Methane (non-fugitive)		
Energy consumption	Yes	Emissions from electricity demand, natural gas, biomass (wood), diesel, propane, and gasoline in residential, commercial, and industrial developments
On-road sector	Yes	Emissions from fuel combustion from on-road vehicles
Off-road sector	Yes	Emissions from fuel combustion from off-road equipment
Landfills	Yes	Emissions from waste generation and waste in place
Wastewater	Yes	Emissions from wastewater treatment
Agriculture (livestock)	Yes	Emissions from enteric fermentation and manure management in livestock
Agriculture (farming practices)	Yes	Emissions from crop growing & harvesting and fuel use in equipment
Hydrofluorocarbon (HFCs)		
From semiconductors	No	No semiconductor manufacturing companies in the region
From ODS substitutes	Yes	Emissions occur when they are released into the atmosphere or when they leak out of equipment such as refrigerators and air conditioning units
Perfluorinated compounds (PFCs)		
From semiconductors	No	No semiconductor manufacturing companies in Napa County
From ODS substitutes	Yes	Emissions occur when they are released into the atmosphere or when they leak out of equipment such as refrigerators and air conditioning units
Fire suppressants	Yes	Emissions occur from fire suppressants
Sulfur hexafluoride (SF_6)		
From electricity transmission	Yes	Emissions occur by use of SF_6 by the electric power industry in gas-insulated substations, circuit breakers, and other switchgear
From semiconductors	No	No semiconductor manufacturing companies in Napa County

Notes: BC= black carbon; CARB = California Air Resources Board; CEPAM = California Emissions Projection Analysis Model; CH_4 = methane; GHG= greenhouse gas; HFCs = hydrofluorocarbons; ODS= ozone-depleting substances; PFC= perfluorinated compound; SLCP= short-lived climate pollutant; SF_6 = sulfur hexafluoride.

[1] Source: CARB 2017.
[2] Soil remediation is a term that refers to various processes designed to remove contaminants such as hydrocarbons (petroleum and fuel residues), heavy metals, pesticides, cyanides, volatiles, creosote, and semi-volatiles from soil.
[3] Agriculture includes emissions from farming operations and farm equipment
[4] Transportation includes emissions from off-road Equipment, recreational boats, aircraft, Medium Heavy Duty Diesel Trucks (MHDDT), Heavy Heavy Duty Diesel Trucks (HHDDT), Light Heavy Duty Diesel Trucks - 1 (LHDDT1), Medium Duty Trucks (MDV), Light Duty Trucks - 2 (LDT2)

Source: Compiled by Ascent in 2024. CARB 2017.

Table A-2 2019 Napa County Regional Black Carbon Emissions by Process

Emissions Sector	CEPAM 2019v1.03 Combustion Processes Categories	Black Carbon Emissions (MT per year)	Share of Black Carbon Emissions by Combustion Processes Categories (%)
Industrial	Coatings and related process solvents	0	0.00%
Transportation	Heavy-heavy duty gas trucks (HHDGT)	0.00018	0.0004%
Transportation	School buses - gas (SBG)	0.00387	0.01%
Transportation	Heavy duty gas urban buses (UBG)	0.00626	0.02%
Dust	Unpaved road dust	0.00649	0.02%
Offroad	Commercial harbor craft	0.00783	0.02%
Transportation	Motorcycles (MCY)	0.009	0.02%
Other	Other (fuel combustion)	0.0102	0.02%
Energy/Utilities	Electric utilities	0.01068	0.03%
Industrial	Wood and paper	0.01185	0.03%
Transportation	Heavy duty diesel urban buses (UBD)	0.01307	0.03%
Transportation	Other buses - gas (OBG)	0.01521	0.04%
Industrial	Manufacturing and industrial	0.0164	0.04%
Agricultural	Farming operations	0.01712	0.04%
Transportation	Light heavy duty gas trucks - 2 (LHDGT2)	0.01722	0.04%
Transportation	Motor homes (MH)	0.01886	0.05%
Transportation	Medium heavy duty gas trucks (MHDGT)	0.01971	0.05%
Agricultural	Soil remediation	0.02757	0.07%
Transportation	Other buses - motor coach - diesel (OBC)	0.03241	0.08%
Energy/Utilities	Cogeneration	0.03392	0.08%
Industrial	Other (industrial processes)	0.04578	0.11%
Agricultural	Food and agriculture	0.05034	0.12%
Dust	Fugitive windblown dust	0.05475	0.13%
Offroad	Trains	0.06333	0.15%
Agricultural	Food and agricultural processing	0.07058	0.17%
Offroad	Construction and demolition	0.09455	0.23%
Other	Other (miscellaneous processes)	0.10175	0.25%
Transportation	All other buses - diesel (OBD)	0.10432	0.25%

Emissions Sector	CEPAM 2019v1.03 Combustion Processes Categories	Black Carbon Emissions (MT per year)	Share of Black Carbon Emissions by Combustion Processes Categories (%)
Industrial	Service and commercial	0.11599	0.28%
Transportation	Light heavy-duty gas trucks - 1 (LHDGT1)	0.12346	0.30%
Transportation	Light heavy-duty diesel trucks - 2 (LHDDT2)	0.15517	0.37%
Transportation	School buses - diesel (SBD)	0.15963	0.38%
Transportation	Light duty trucks - 1 (LDT1)	0.19822	0.48%
Industrial	Mineral processes	0.20095	0.48%
Industrial	Chemical	0.20752	0.50%
Fires	Fires	0.26984	0.65%
Offroad	Off-road recreational vehicles	0.3688	0.89%
Industrial	Incinerators	0.37145	0.90%
Dust	Paved road dust	0.39001	0.94%
Offroad	Aircraft	0.43989	1.06%
Transportation	Medium-duty trucks (MDV)	0.48498	1.17%
Transportation	Light heavy-duty diesel trucks - 1 (LHDDT1)	0.48562	1.17%
Transportation	Light duty trucks - 2 (LDT2)	0.60726	1.46%
Residential Fuel Combustion	Cooking	0.89901	2.17%
Offroad	Recreational boats	0.93546	2.25%
Offroad	Off-road equipment (perp)	0.94874	2.29%
Transportation	Heavy heavy-duty diesel trucks (HHDDT)	1.35201	3.26%
Transportation	Medium heavy-duty diesel trucks (MHDDT)	1.60775	3.87%
Transportation	Light duty passenger (LDA)	1.62773	3.92%
Prescribed Fires	Managed burning and disposal	2.97384	7.17%
Residential Fuel Combustion	Residential fuel combustion	5.38202	12.97%
Offroad	Off-road equipment	6.67398	16.08%
Agricultural	Farm equipment	13.65876	33%
	Total (MT per year)	**42**	**100%**
	Wildfires[1]	26[2]	NA

Note: CEPAM = California Emissions Projection Analysis Model; HHDDT = heavy heavy-duty diesel trucks; HHDGT= heavy-heavy duty gas trucks; LDA= light duty passenger; LHDGT= light heavy-duty gas trucks; LDT= light duty trucks; LHDDT= light heavy-duty diesel trucks; LHDGT = light heavy-duty gas trucks; MHDDT= medium heavy duty diesel trucks; MHDGT= medium heavy duty gas trucks; MDV= medium duty trucks; OBC= other buses - motor coach; OBD= all other buses – diesel; OBG= other buses-gas; SBG= school buses – gas; MCY= motorcycles; NA = not applicable; MT = metric ton; UBD = diesel urban buses.

[1] Emissions from wildfires are added for informational purposes only and are not included in the total BC emissions estimates.

[2] Wildfire emissions estimates for 2017 available from CEPAM were adjusted to reflect emissions in 2019. This was done because 2017 was an anomaly year in terms of wildfires in Napa and a vast discrepancy was identified in acres burned due to wildfires between 2017 and 2019 in the region.

Source: Data compiled by Ascent in 2023.

Table A-3 HFC Compounds and Sources Listed in the California 2000-2020 GHG SLCP Inventory that apply to the Napa County Region

HFC Compound	HFC Source
HFC-125	ODS Substitutes
HFC-134a	ODS Substitutes
HFC-143a	ODS Substitutes
HFC-152a	ODS Substitutes
HFC-227ea	ODS Substitutes
HFC-236fa	ODS Substitutes
HFC-245fa	ODS Substitutes
HFC-32	ODS Substitutes
HFC-365mfc	ODS Substitutes
HFC-43-10mee	ODS Substitutes

Notes: HFC = hydrofluorocarbon, ODS = ozone depleting substance, GHG = greenhouse gas, SLCP = slow lived climate pollutant

Source: CARB 2022b. Modeling conducted by Ascent in 2024.

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California Air Resources Board. 2017. California Emissions Projection Analysis Model (CEPAM) 2019v1.03. Sacramento, CA. Available: https://ww2.arb.ca.gov/applications/emissions-user-defined-query. Accessed on July 11, 2024.

_____. 2022. 2000-2020 GHG Inventory. 2022 edition. Sacramento, CA. Available: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed on July 11, 2024.

Appendix E

Greenhouse Gas Emissions Forecast Update Memorandum

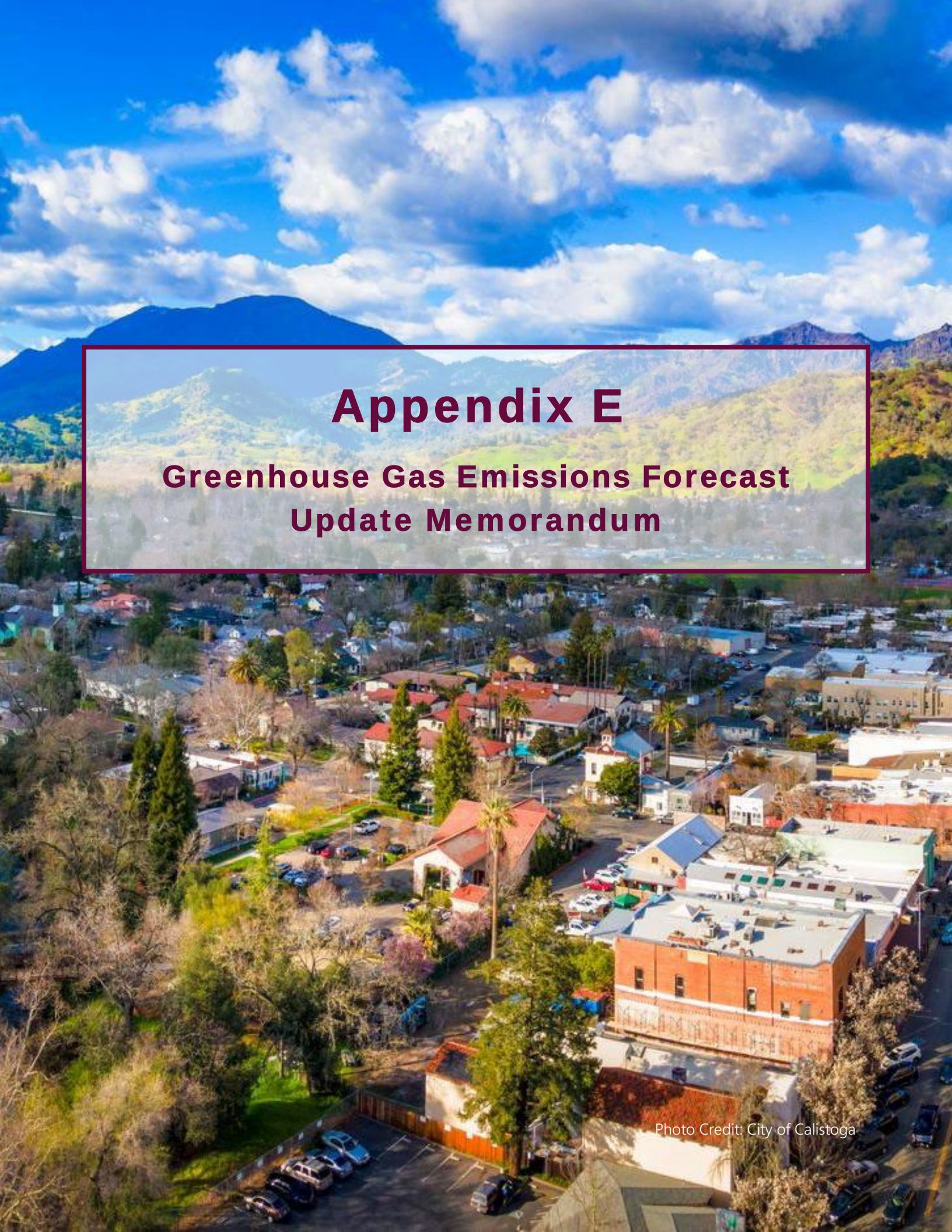


Photo Credit: City of Calistoga

Memo

455 Capitol Mall, Suite 300
Sacramento, CA 95814
916.444.7301

Date: December 9, 2024

To: David Morrison, 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: Revised Final Greenhouse Gas Emissions Forecast Update (2019 – 2045)

1 INTRODUCTION

In 2022, Ascent completed Napa County's regional greenhouse gas (GHG) emissions inventory for 2019 and a forecast for the year 2030. In December 2023, the six jurisdictions in the Napa County region (region) (i.e., City of American Canyon, City of Calistoga, City of Napa, City of St. Helena, Town of Yountville, and County of Napa [County]) hired Ascent to prepare the Napa County Regional Climate Action and Adaptation Plan (RCAAP), a comprehensive plan for all jurisdictions in the region to reduce GHG emissions and adapt to climate change. The RCAAP scope of work includes updates to the forecast through calendar year 2045.

This memorandum updates the Final Napa County Regional Greenhouse Gas Forecast (2019 – 2030) that was delivered to the County on November 29, 2022 (referred to herein as "2022 forecast memo").

1.1 ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of eight parts:

- Section 1: Introduction presents the background and purpose behind the GHG emissions forecast update.
- Section 2: BAU Greenhouse Gas Emissions Forecast Summary presents an overview of the region's "business-as-usual" (BAU) emissions projections for years 2030, 2035, and 2045.
- Section 3: Legislative-Adjusted Emissions Forecast Summary presents an overview of the region's legislative-adjusted emissions forecasts for years 2030, 2035, and 2045.
- Section 4: A CEQA Qualified RCAAP presents the requirements of a CEQA-qualified GHG reduction plan per CEQA Guidelines §15183.5.
- Section 5: Short-Lived Climate Pollutants and Carbon Stock Considerations
- Section 6: Forecast Methodology by Sector summarizes the forecast methodology used to estimate GHG emissions under BAU and legislative-adjusted scenarios for years 2030, 2035, and 2045.
- Section 7: Greenhouse Gas Emissions Forecast by Jurisdiction summarizes the regional GHG emissions forecasts by each jurisdiction. This section presents the results for each jurisdiction only without additional detail related to the data, methods, and assumptions, except those that are unique to the jurisdiction.

1.2 SUMMARY OF UPDATES FROM THE PREVIOUS 2030 GHG FORECAST

Updated forecasts of communitywide GHG emissions for the region as a whole are presented in this memorandum, along with a breakdown of forecasted emissions in each of the six jurisdictions in the region, under both "business-as-usual" (BAU) and legislative-adjusted BAU scenarios for the years 2030, 2035, and 2045.

Under the BAU scenario, forecasts provide an estimate of future GHG levels based on a continuation of current trends in activity and anticipated growth. Under the legislative-adjusted BAU scenario, the forecasts are adjusted to account for Federal, State, and regional legislative actions to reduce emissions in the future.

GHG forecasts are calculated based on emission sources addressed in the 2019 communitywide GHG emissions inventory, found in the Napa County Region 2019 Community Greenhouse Gas Inventory Update Summary memorandum that was delivered to the County on June 7, 2022. Any information, methodology, and background related to the 2019 GHG inventory and descriptions of the emissions sectors may be found in the 2022 inventory memorandum.

Many of the methods used to forecast the previous 2030 forecast remain unchanged, though there are significant differences in this update. The following is a summary of the primary methodological and data-related updates from the previous forecast completed in 2022.

- Updated Population, Employment, and Housing Growth through 2045
  - New demographic forecasts for the region through 2030 were available from the jurisdictions. These demographic forecasts (e.g., population, employment) impact overall growth forecasts in the building energy, off-road vehicle, water, wastewater, and waste emissions sectors. Overall, growth rates are generally lower than in the 2022 forecast memo, which had estimated that the countywide population would grow by 18 percent from 2019 to 2030. With the updated growth forecasts, the countywide population is estimated to grow by up to 12 percent by 2030.
  - For demographic forecasts beyond 2030, the cities of Napa, St. Helena, and Yountville provided estimates for population and employment forecasts through 2045. These cities account for 66 percent of the region's population. For other jurisdictions in the region, forecasts beyond 2030 were not available. Thus, for Calistoga, American Canyon, and the Unincorporated County, forecast data were derived from the Metropolitan Transportation Commission's (MTC) Plan Bay Area 2050 (PBA 2050) planning document. Based on this combination of sources, the region is expected to grow by 18 percent from 2019 to 2045. In contrast, the population trends from 2010 to 2024 have generally declined. Between 2010 and 2020, the population in the county rose by 1.1 percent, and between 2020 and 2024, the county's population fell by two percent from 2020 to 2024 (Department of Finance [DOF] 2021, DOF 2024). The forecasted increase in population is a product of MTC's anticipation of strong economic growth and lower housing prices due to increased housing supply in the future in the Bay Area (MTC 2023). While recently declining trends in the region's population may differ from forecasted population growth in adopted plans, relying on trends in adopted plans is still appropriate to ensure that GHG emissions associated with potential future growth identified in adopted regional and local plans are captured in the analysis, as discussed further under Section 4 (CEQA-Qualified RCAAP).
- Updated On-Road Vehicle Activity Forecasts
  - Forecasted on-road activity was updated to reflect the latest transportation modeling conducted in PBA 2050, which includes vehicle miles traveled (VMT) forecasts through 2050 for individual districts across the Bay Area. These differ from the previous forecasts which were based on MTC's Plan Bay Area 2040. Under Plan Bay Area 2040, countywide VMT was expected to decline by 33 percent from 2019 to 2030. With the updated modeling under PBA 2050, countywide VMT is expected to remain relatively unchanged from 2019, varying only by a few percent through 2030 and 2045 from 2019 levels. This applies to both BAU and legislative-adjusted BAU scenarios.

- Updated On-Road Emission Factors
  - New emission factors from 2030, 2035, and 2045 were taken from the California Air Resources Board's (CARB) EMissions FACtor model (EMFAC 2021) model and additionally adjusted to account for Zero Emission Vehicle mandates under the Advanced Clean Cars II (ACCII) and Advanced Clean Fleets (ACF) programs. While the 2022 forecast memo included the ACCII, the ACF program is new and additional years are now taken into account.
- Updated Off-Road Legislative-Adjusted Forecasts
  - Off-road vehicle and equipment legislative-adjusted BAU emissions forecasts were updated from CARB's OFFROAD2021 model version 1.0.1 to version 1.0.5. The primary updates reflect the effect of 2022 amendments to the Off-Road Regulation on construction, mining, industrial, and oil equipment emissions.
  - Regionwide off-road activity and emission forecasts are no longer scaled by demographic growth but are based on CARB's forecasts for the region through individual equipment trend analysis that is built into OFFROAD2021.
  - This forecast update accounts for new emission factors for small off-road engines for 2030, 2035, and 2045 as per the prohibition of emissions from new small off-road engines from 2024.
  - Additionally, OFFROAD2007 is no longer being used to quantify methane (CH_4) and nitrous oxide (N_2O) emissions or emissions from equipment that are not included in the OFFROAD2021 model. This was done to be consistent with State forecasts for the off-road sector, for which CARB has done extensive research in terms of the trends in off-road activity and applied legislative reductions.
  - Modeling now accounts for AB 1346, approved in late 2021, which requires new small off-road engines under 25 horsepower to be electric or zero emissions starting in 2024.
- New Electricity Legislative-Adjusted BAU Emission Factors and Energy Use
  - This forecast update accounts for new emission factor estimates for 2035 and 2045 that account for the net zero emission retail electricity requirements by 2045 under Senate Bill 1020.
  - The forecast update also accounts for the Bay Area Air Quality Management District's (BAAQMD's) zero nitrogen oxides (NOx) appliance rule.
  - Modeling of building energy use in new construction now accounts for the 2022 Title 24 Energy Efficiency standards, revising from the previous 2019 standard.
- Re-adjusted Agricultural Lands Forecast
  - The jurisdictions adjusted their forecasts of how agricultural (crop and rangeland) lands would change through 2045. Most notably, based on data received from the County for the unincorporated areas, which account for over 90 percent of agricultural land in the region, the County anticipates a four percent reduction in range/pastureland between 2019 and 2045. The previous forecast relied on forecasting from historical trends, which resulted in a 34 percent reduction in agricultural lands between 2019 and 2030.
  - This forecast update for the Agriculture sector also accounts for reduced emissions from agricultural offroad equipment as per the prohibition of emissions from new small off-road engines from 2024.

2 BAU GREENHOUSE GAS EMISSIONS FORECAST SUMMARY

Under the BAU forecast, regional GHG emissions are generally expected to remain constant due to a combination of increased growth and expected slight reductions in VMT. Table 1 shows the baseline emissions in 2019 and BAU emissions forecasts for 2030, 2035, and 2045. Under the BAU forecast, regional emissions are anticipated to increase

by four percent from 2019 to 2045. This is lower than the previous 12 percent forecast by 2030 primarily due to forecasted reductions in VMT under PBA 2050. Although most sectors would grow under the BAU scenario, MTC forecasts an overall reduction in VMT in the future.

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

Sector	2019	2030	2035	2045
Agriculture	103,381	105,244	106,690	109,538
Building Energy	279,592	326,969	324,880	327,387
Imported Water	5,943	6,793	6,845	7,174
Off-Road Equipment	115,548	118,539	118,318	119,557
On-Road Transportation	472,677	450,387	438,275	430,763
Solid Waste	198,862	217,407	215,942	216,139
Wastewater	45,858	52,621	52,772	54,585
Total	**1,221,861**	**1,277,959**	**1,263,720**	**1,265,143**
Percent Change from 2019				
Agriculture	NA	2%	3%	6%
Building Energy	NA	17%	16%	17%
Imported Water	NA	14%	15%	21%
Off-Road Equipment	NA	3%	2%	3%
On-Road Transportation	NA	-5%	-7%	-9%
Solid Waste	NA	9%	9%	9%
Wastewater	NA	15%	15%	19%
Total	NA	5%	3%	4%

Notes: VMT = vehicle miles traveled, NA = not applicable, $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

BAU emissions forecasts are generally estimated proportionally with activity growth. For building energy, on-road transportation, off-road transportation, water, and solid waste generation sectors, the emissions forecasts were scaled by demographic and VMT projections from 2019 to 2045. Population and employment projections were based on demographic forecasts provided by the cities of Napa, St. Helena, and Yountville along with growth estimates provided by MTC's PBA 2050 growth forecasts for the remaining jurisdictions (MTC 2021). Additionally, service population, which is the sum of population and employment, was used as a growth factor for specific sectors and sub-sectors (e.g., wastewater, construction off-road equipment) for which activities depend on growth in both population as well as employment. For the agricultural sector, emissions were scaled by forecasted changes in agricultural land cover in the region from 2019 through 2045, as provided by the Cities of St. Helena, Napa, Yountville, and the County for the unincorporated areas[1]. Future waste-in-place emissions were scaled by the decomposition of waste accumulated at each landfill within the region. All growth factors were applied based on the percent change from 2019 activity levels for each target year. The applied growth, or scaling, factors for each sector are described in Section 7. The demographic forecasts projected by each jurisdiction and MTC can be found in Attachment 1 and Attachment 2, respectively.

[1] Agricultural acreages and forecasts were unavailable from Calistoga and American Canyon. American Canyon reported no agricultural acres within city limits, despite some discrepancies with GIS data provided by the County from the previous inventory and forecast effort.

Throughout the region, population and employment are expected to increase by 18 and 13 percent, respectively, from 2019 to 2045. These growth factors were used to forecast emissions for all emission sectors. Annual VMT projections were developed using data from MTC's VMT Data Portal, which uses data from PBA 2050's VMT data (See Attachment 2) (MTC 2021) and developed based on the origin-destination method. Annual VMT in the region is projected to increase by two percent by 2030 and decrease by one percent by 2045 from 2019 levels. VMT projections were used to scale emissions from the on-road transportation sector. Table 2 shows growth in population, employment, and annual VMT from 2019 through 2045. Refer to Table 22 for demographic and VMT forecasts by jurisdiction.

Table 2 Napa County Regional Demographic and Vehicle Miles Traveled Forecasts

Forecast Factor	2019	2030	2035	2045
Population	139,608	156,842	157,066	164,054
Employment	97,452	114,219	112,868	110,335
Service Population[1]	237,060	271,061	269,934	274,389
Annual VMT	1,015,777,139	997,701,261	975,172,318	958,480,083
Percent change from 2019				
Population	NA	12%	13%	18%
Employment	NA	17%	16%	13%
Service Population[1]	NA	14%	14%	16%
Annual VMT	NA	-2%	-4%	-6%

Notes: VMT = vehicle miles traveled, NA = not applicable

[1] Service population is equal to the sum of population and employment.

Sources: Cooper, pers. comm., 2022.; DOF 2021; Mitchem, pers. comm., 2022.; City of Napa, 2022: 2-21.; City of St. Helena, 2022: 2-78.; Shelton, pers. comm., 2022; County of Napa 2008.; U.S. Census Bureau, 2019; MTC VMT Data Portal. See Attachment 1 for demographic forecasts from each jurisdiction.

For agricultural emissions under the BAU scenario, livestock and non-livestock emissions (i.e., fertilizer application and irrigation pumps) were scaled by the anticipated change in rangeland and cropland, respectively. Between 2019 and 2045, the County anticipates that rangeland acreage would decline by four percent (See Attachment 1). Over the same time, cropland acreage regionwide is anticipated to see a net increase of nine percent, with nearly all of that change occurring in the unincorporated region. BAU agricultural off-road emissions were anticipated to also change directly in proportion to cropland acreage in the region. See Attachment 1 for the agricultural land forecasts from each jurisdiction.

3 LEGISLATIVE-ADJUSTED EMISSIONS FORECAST SUMMARY

Legislative-adjusted BAU emissions forecasts only include emissions reductions associated with implementation of adopted federal, State, and local legislation and regulations and do not include goals established by executive orders. These adjusted forecasts provide the region with the information needed to focus efforts on emissions sectors and sources that have the greatest opportunities for GHG emissions reductions to meet GHG targets. A summary of the legislative reductions applied is provided in Table 3.

Table 3 Legislative Reductions Summary

Source	Legislative Reduction	Description	Sectors Applied
Regional	Marin Clean Energy Power Procurements	MCE aims to continue to procure 95 percent of energy from GHG-free sources (MCE 2021:7).	Building Energy
Regional	BAAQMD Zero NOx Appliance Rule	Prohibits the sale and installation of NOx-emitting water heaters by 2027, furnaces by 2029, and large commercial water heaters by 2031 in BAAQMD's jurisdiction. Currently, the only technology available to meet these rules are electric.	Building Energy
State	California's Building Energy Efficiency Standards (2019 Title 24, Part 6)[1]	Requires all new buildings in California to comply with energy efficiency standards established by CEC. Accounts for the energy efficiency gains associated with lighting, heating, cooling, ventilation, and water heating improvements, as well as onsite solar photovoltaic requirements for low-rise residential.	Building Energy
State	SB 100 (Renewables Portfolio Standard)	Requires California energy utilities to procure 60 percent of electricity from renewable sources by 2030 and 100 percent carbon-free electricity by 2045.	Building Energy
State	SB 1020 (Clean Energy, Jobs, and Affordability Act)	Requires that 90% of retail electricity is procured from zero-carbon sources by 2035 and 100% renewable electricity is procured to serve all State agencies by December 31, 2035 (this affects water imported from the Department of Water Resources).	Imported Water
State	AB 1346 (Small Off-road Engines)	Prohibits exhaust or evaporative emissions from new small off-road engines with less than 25 hp to By January 1, 2024. Bill requires CARB to provide funding for commercial rebates or similar incentives through local air districts.	Off-Road Vehicles and Equipment
State	Advanced Clean Car Standards	Establishes GHG emission reduction standards for model years 2017-2025 that are more stringent than federal CAFE standards.	On-Road Vehicles
State	Advanced Clean Cars II (ACCII)	Assumes that 100 percent of new light-duty vehicles would be either ZEV or PHEV by model year 2035. Requirements begin at a 35 percent ZEV or PHEV for the 2026 model year. (CARB 2022a)	On-Road Vehicles
State	Advanced Clean Fleet (ACF)	Establishes zero-emissions targets for heavy-duty vehicles (such as utility trucks with a gross vehicle weight of over 8,500 pounds, dump trucks, and haulers) in fleets operating in California.	On-Road Vehicles
State	Truck and Bus Regulation	Requires diesel trucks and buses that operate in California to be upgraded to reduce GHG emissions.	On-Road Vehicles
Federal	Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles	Establishes fuel efficiency standards for medium- and heavy-duty engines and vehicles.	On-Road Vehicles
Federal	EPA Off-Road Compression-Ignition Engine Standards	Establishes standards for phasing of EPA diesel engine tiers for off-road compression-ignition equipment.	Off-Road Vehicles and Equipment

Notes: BAAQMD = Bay Area Air Quality Management District; I = Corporate Average Fuel Economy; CEC = California Energy Commission; EPA = U.S. Environmental Protection Agency; GHG = greenhouse gas; MCE = Marin Clean Energy; SB = Senate Bill; ZEV = zero emission vehicle; PHEV = plug-in hybrid electric vehicle; hp = horsepower; ZEV = zero emission vehicle

[1] Although the 2022 standards have been in place since 2023, the methodology used in this memorandum depends on building energy assumptions in CalEEMod, which have not yet been updated to reflect the 2022 standards. See the discussion in Section 7.1.

Source: Ascent Inc. in 2024.

With the application of currently adopted legislation, future emissions in the region would decline by 55 percent from 2019 to 2045, as shown below in Table 4 and Figure 1. On-road transportation emissions are anticipated to have the

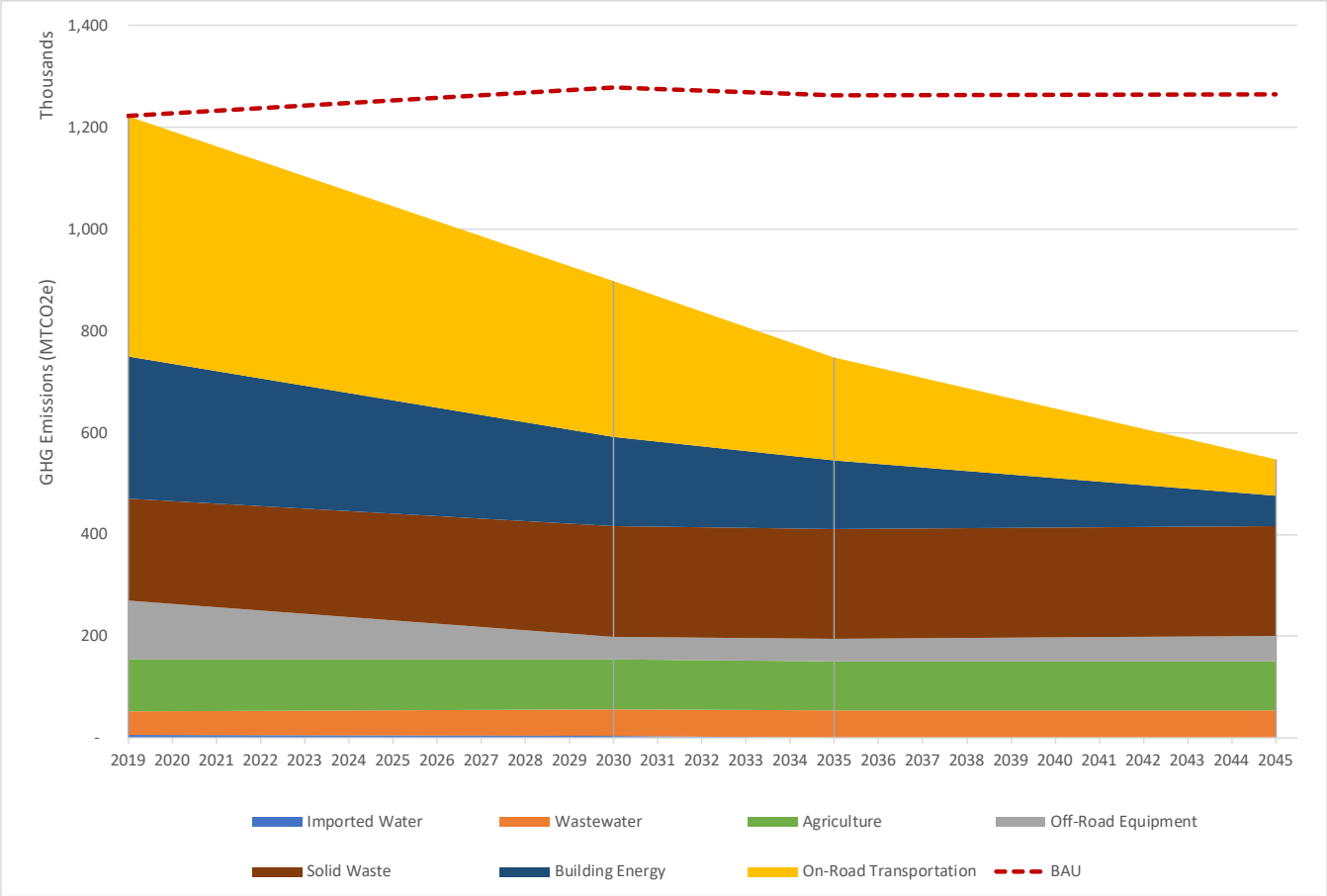
greatest reduction across all sectors with legislative reductions, with an 85 percent reduction in emissions from 2019 to 2045. With the reduction of on-road transportation emissions, other sectors naturally become a greater portion of the region's total emissions. By 2030, building energy, solid waste and agriculture would account for 55 percent of the region's emissions. These sectors are anticipated to account for 60 percent of regional emissions by 2045. With State and Federal efforts, emissions would decline by 55 percent from 2019 through 2045. Additional local actions would be needed to achieve further reductions. This highlights the importance of regional building decarbonization/electrification efforts, organic waste diversion and recycling, and efforts to reduce methane emissions from the solid waste sector, in addition to promoting regional transportation and land use efficiency and VMT-reducing actions that complement federal and State legislative reductions.

Table 4 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 of Total				
Agriculture	8%	11%	13%	18%
Building Energy	23%	19%	18%	11%
Imported Water	0%	0%	0%	0%
Off-Road Equipment	9%	5%	6%	9%
On-Road Transportation	39%	34%	27%	13%
Solid Waste	16%	24%	29%	39%
Wastewater	4%	6%	7%	10%
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-4%	-5%	-7%
Building Energy	NA	-38%	-52%	-79%
Imported Water	NA	-45%	-88%	-100%
Off-Road Equipment	NA	-62%	-62%	-57%
On-Road Transportation	NA	-35%	-57%	-85%
Solid Waste	NA	9%	9%	9%
Wastewater	NA	15%	15%	19%
Total	**NA**	**-26%**	**-39%**	**-55%**

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.



Source: Ascent Inc. in 2024.

Figure 1 Updated Napa County Regional GHG Emissions Forecasts (2019-2045)

In addition to the expected growth in the region's service population, there are three primary reasons for the emissions trends shown:

- Emissions from **on-road transportation**, currently the largest emissions sector, are expected to decrease by 85 percent from 2019 levels, primarily due to the State's efforts to transition vehicle technology to zero-emission vehicles under ACCII and ACF alongside modest declines in VMT as forecasted by MTC.
- **Building energy** is the second largest sector and would decline by 14 percent from 2019 to 2045. Although the State is aiming to have net zero emission retail electricity by 2045 under SB 100 and SB 1020, the majority of electricity use in the region is already zero emissions under Marin Clean Energy (MCE), and natural gas usage is anticipated to increase with population under current legislation.
- **Solid waste** is the third largest emissions sector and would increase with population. Even as emissions from American Canyon landfill continue to decline since its closure in 1995, Clover Flat Landfill serves the majority of the northern county and surrounding areas and would not close until 2056. Additionally, waste generated by the county would continue to increase with population and employment.

With the reductions anticipated from the on-road transportation sector and electricity use, natural gas use in buildings, solid waste, and agricultural emissions will become increasingly important to meet GHG reduction targets.

4 A CEQA-QUALIFIED RCAAP

The six jurisdictions in the region are considering the use of the RCAAP as a qualified climate action plan (CAP), from which future discretionary projects developed in the region could tier with respect to the assessment of their project impacts on GHGs and climate change. Under CEQA Guidelines §15183.5, the Napa jurisdictions can unlock CEQA tiering benefits that streamline environmental review of future projects under each jurisdiction's authority. Projects that demonstrate consistency with the RCAAP's emissions forecasts and incorporate all applicable GHG reduction measures may be able to conclude that they cause no additional significant environmental effects to GHG emissions and climate change in their CEQA review. According to §15183.5,

> a) *Lead agencies may analyze and mitigate the significant effects of greenhouse gas emissions at a programmatic level, such as in a general plan, a long-range development plan, or a separate plan to reduce greenhouse gas emissions. Later project-specific environmental documents may tier from and/or incorporate by reference that existing programmatic review.[…]*
>
> b) *Public agencies may choose to analyze and mitigate significant greenhouse gas emissions in a plan for the reduction of greenhouse gas emissions or similar document. A plan to reduce greenhouse gas emissions may be used in a cumulative impacts analysis as set forth below. Pursuant to sections 15064(h)(3) and 15130(d), a lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project complies with the requirements in a previously adopted plan or mitigation program under specified circumstances.*

Additionally, under §15183.5, a CEQA-qualified GHG reduction plan must consist of the following attributes:

- Quantifies GHG emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;
- Establishes a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable;
- Identifies and analyzes GHG emissions resulting from specific actions or categories of actions anticipated within the geographic area;
- Specifies measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified levels; and
- Is adopted in a public process following preparation and adoption of CEQA documentation.
- Projects that do not demonstrate consistency may, at each jurisdiction's discretion, include a more comprehensive project-specific analysis of GHG emissions consistent with CEQA requirements.

This memorandum addresses the first of these required attributes: the GHG forecast, which combined with the GHG inventory previously prepared, is essential for the RCAAP to address the first attribute identified under the first bullet above. As noted previously, projected emissions in this memo are based on activities associated with potential growth assumed in adopted local or regional plans. This approach represents a conservative, "worst case" scenario and accounts for potential new development projects and associated new GHG emissions.

5 STATE SHORT-LIVED CLIMATE POLLUTANTS AND CARBON STOCK CONSIDERATIONS

In 2024, Ascent drafted a memorandum addressing the short-lived climate pollutants (SLCP) emissions inventory (Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant Inventory) as well as a carbon stock report for the region (Regional Carbon Stock Inventory Report for Napa County) for 2019 (County of Napa 2024, 2023). Both sectors influence the region's impact on climate change. The following addresses how these sectors inform the region's forecast.

5.1 NAPA COUNTY REGIONAL 2019 GREENHOUSE GAS SHORT-LIVED CLIMATE POLLUTANT INVENTORY

The SLCP inventory addressed the region's emissions of fugitive methane, hydrofluorocarbons (HFCs), perfluorinated compounds (PFCs), sulfur hexafluoride (SF_6), and black carbon. HFCs, PFCs, and SF_6 are also considered high global warming potential (GWP) gases. Fugitive methane emissions are generated from leakage from industrial, oil and gas, and utility pipelines and landfills. Some emissions, such as methane from landfills and other methane resulting from the combustion of fossil fuels, are already included in the main regional GHG inventory and forecast. However, other SLCPs, such as high-GWP gases and black carbon are excluded from the inventory and forecast for the following reasons.

- High-GWP gases are highly regulated by CARB, such as through the State's Refrigerant Management Program, which aims to set maximum GWP levels for refrigerants in the future.
- Black carbon is not included in the State's GHG inventory and target setting to meet the statewide climate goals under SB 32 or AB 1279. Black carbon emissions are heavily tied to wood, fossil fuel combustion, and industrial processes. The 2022 Scoping Plan notes that the share of black carbon emissions from transportation is currently declining at a rapid pace due to CARB's air quality programs targeting exhaust emissions (e.g., Clean Truck Check, ACF, ACC) and is expected to continue to do so through 2030 (CARB 2022b: 60).
- Black carbon emissions are also highly variable and can be substantially skewed in a year with high levels of wildfire activity. In 2017, wildfires accounted for 98 percent of the total black carbon emissions in the region with over 60,000 acres burned (Kirk 2022). 2019 was a relatively mild year for wildfires in Napa County with about 640 acres burned (CAL FIRE 2019) accounting for 38 percent of the total black carbon emissions. However, in 2020, the region experienced one of its most severe wildfire years under the LNU Lightning Complex fire, which burned over 300,000 acres in the county (CAL FIRE 2020). CARB addresses these variabilities by presenting black carbon from forestry (i.e., wildfires and prescribed burning) in ten-year averages. Forecasting wildfire activity is highly speculative and depends on a variety of factors, many of which (e.g., climate events, arson) are not under the region's control.

As shown in Table 5 in 2019, SLCPs in the region accounted for 1.1 million $MTCO_2e$, based on a 20-year GWP factor, and approximately 396,000 $MTCO_2e$ based on a 100-year GWP factor. In comparison, the region's share of SLCP emissions and population indicates that the region has a 50 percent higher rate of SLCP emissions than the rest of the state on a per-capita basis. This is due to the large share of methane emissions, most of which are generated from solid waste. At the state level, methane accounts for nearly 25 percent of SLCP emissions (CARB 2022b). Conversely, methane accounts for nearly 70 percent of SLCP emissions in the region. According to the *Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant Inventory*, 75 percent of "Other Methane", shown in Table 5, comes from solid waste, including from decomposing accumulated waste at regional landfills and annual waste generated by the region (County of Napa 2024: Table 4). Methane is 81 times more potent than CO_2 as a GHG over 20 years and 28 times more potent over 100 years, significantly contributing to SLCP emissions. (See the *Napa County Regional 2019 Greenhouse Gas Short-Lived Climate Pollutant Inventory* for further information).

Table 5 2019 Napa County Regional GHG SLCP Inventory by Pollutant ($MTCO_2e$/year) [1] and comparison with State SLCP emissions

Pollutant	2019 Emissions using 20-year GWP factors ($MTCO_2e$/year)	2019 Emissions using 100-year GWP factors ($MTCO_2e$/year)	Percentage Share (20-year GWP factors)	Percentage Share (100-year GWP factors)
Other Methane[2]	774,410	266,084	-70%	-67%
Hydrofluorocarbon	189,896	85,927	-17%	-22%
Black Carbon	132,804	37,351	-12%	-9%
Fugitive Methane	15,953	5,481	-1%	-1%
Sulfur Hexafluoride	615	847	<1%	<1%
Perfluorinated compounds	2	0.78	<1%	<1%
Total	**1,113,680**	**395,691**	**100%**	**100%**
SLCP Emissions Per-capita – Napa County Region	7.98	2.83	NA	NA
SLCP Emissions Per-capita – State	5.15	1.86	NA	NA
Black Carbon Emissions from Wildfire[3] – **Napa County Region**	81,771	22,998	NA	NA

Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year; NA= Not applicable.

[1] Totals may not add up due to rounding.

[2] Other methane emissions generated from energy consumption, transportation (on-road vehicles and off-road equipment), landfills, wastewater processes, and agriculture (livestock and farming practices). These are estimated in the Napa County Regional 2019 Community Greenhouse Gas Inventory.

[3] Black carbon emissions from wildfires are not included in the total SLCP emissions estimates. These are added here for informational purposes only because wildfires are a big contributor to non-anthropogenic black carbon emissions in the region.

Source: County of Napa 2024.

Although most SLCPs are excluded from the region's forecast and not quantified, the information on SLCP sources and sectors can support the process of identifying opportunities for additional GHG reduction alongside the development of the RCAAP's measures. For example, the RCAAP plans to include climate adaptation measures that guide the region to improved wildfire resilience. Because wildfire could account for over half of SLCP emissions depending on the severity of wildfires in a given year, wildfire resilience measures that reduce the extent or severity of fire hazards could also have the co-benefit of reducing SLCPs associated with wildfire. Additionally, the RCAAP's measures would reduce some SLCPs such as methane emissions from fossil fuel combustion and landfills.

5.2 REGIONAL CARBON STOCK INVENTORY REPORT FOR NAPA COUNTY

Napa County's carbon stock report, the *Regional Carbon Stock Inventory Report For Napa County*, presented the carbon stock within the entire region as of 2019. While it neither forecasted carbon stock nor was it included as part of the region's GHG inventory, the carbon stock report can help identify opportunities for GHG reductions through carbon sequestration or limiting carbon stock losses in the future (e.g., habitat restoration, conservation, carbon farming practices, tree planting). The carbon stock report also includes a snapshot of the county's carbon storage inventory across land cover types, including agriculture and forests/woodland, which account for seven and 70 percent of the county's carbon stock in 2019, respectively. With forests and woodlands accounting for the majority of the county's carbon stock, the county's future carbon stock county would heavily depend on two main factors affecting

forests and woodlands: land use change (e.g., conversion of woodlands to agriculture) and wildfire. Additionally, changes to land use management (e.g., carbon farming) could also impact carbon storage on agricultural lands.

However, as noted in the carbon stock report, forecasting carbon stock in the region has many challenges. One of the challenges is the lack of forecasted land use data. Although the county's population is expected to grow by 18 percent from 2019 to 2045, growth is expected to be focused primarily on infill with minimal expansion on undeveloped lands. In addition, based on the projections from regional jurisdictions, as shown in Attachment 1, the region's total agricultural lands are expected to decline by less than one percent between 2019 and 2045. It is not clear from these projections whether the loss of agricultural lands is to conversion of these lands to urban areas or conversion to other uses. Another challenge is that climate-related impacts such as wildfire can be expected to impact existing carbon stock and future sequestration opportunities. Predicting future wildfire severity and locations would require extensive modeling and analysis that is outside the scope of this effort. Additional discussion of the forecast considerations can be found in Section 3.1.1 of the carbon stock report (County of Napa 2023).

6 FORECAST METHODOLOGY BY SECTOR

6.1 BUILDING ENERGY

Building Energy Assumptions

Building energy emissions in the region result directly from onsite combustion of natural gas and indirectly from electricity consumption. Although Pacific Gas & Electric (PG&E) is the main electricity and natural gas provider in Northern California, 85 percent of the region's electricity use in 2019 was supplied by MCE. MCE is a community choice aggregation (CCA) program that provides renewable electricity options to several northern Bay Area counties, including Napa County. MCE customers are automatically enrolled in a default energy service option, Light Green, or they may elect either the Deep Green or Local Sol service options for an extra fee to increase to 100 percent renewable energy or opt out of MCE altogether to maintain service with PG&E. Refer to the 2022 Inventory memorandum for detailed discussion of the assumptions used to estimate the 2019 building energy emissions.

2030-2045 ELECTRICITY EMISSIONS FACTORS

PG&E Emission Factors

PG&E's carbon dioxide (CO_2) emissions factors for 2030 and 2035 were calculated by first estimating the non-renewable portion of the 2022 emission factors (56 pounds [lb] of CO_2/megawatt-hour [MWh]) available from PG&E's 2022 Power Content Label (PCL) (PG&E 2023). PG&E's 2022 PCL also indicated that their energy mix was 95 percent GHG-free, or from zero-carbon sources (e.g., hydroelectric, nuclear, solar). For 2030 and 2035, it was assumed that PG&E would continue to have the same emissions factor as in 2022 because they are already meeting their requirements under SB 1020 to achieve a 90 percent zero-carbon electricity rate by 2035. For 2045, PG&E emission factors were assumed to have zero carbon emissions, per SB 100. Additionally, because PG&E's 2019 emission factors are provided in carbon dioxide equivalents, it is assumed that PG&E's emission factors include methane (CH_4) and nitrous oxide (N_2O) emission factors. PG&E's emission factors are summarized in Table 9.

MCE Emission Factors

Similar to the accelerated trends of the PG&E energy portfolio, MCE also achieved its SB 1020 requirements before 2035 with a 99.5 percent GHG-free mix for its Light Green Power Mix in 2022 (California Energy Commission [CEC] 2023). Thus, MCE's 2030 and 2035 Light Green emissions factors are assumed to be the same as in 2022 (44 lb of

CO2/MWh). Deep Green and Local Sol options are anticipated to continue to have a zero emissions factor through 2035. All power mix options were assumed to have zero carbon emission factors by 2045 under SB 100. Additionally, because MCE's 2022 emission factors are provided in carbon dioxide equivalents, it is also assumed that MCE's emission factors include CH4 and N2O. MCE's emission factors are summarized in Table 7.

To put the impact of PG&E and MCE emission factors into context, 85 percent of electricity use in the region is related to subscriptions to MCE's service options, as of 2019. For residential electricity usage, 88 percent of residential accounts are subscribed to MCE. Of the non-residential electricity usage, 83 percent of accounts are subscribed to MCE (Herrick, pers. comm., 2022). This makes the overall regional emission factors more heavily weighed and dependent on changes to MCE's energy profile.

2030-2045 NATURAL GAS EMISSIONS FACTORS

Future natural gas emission factors would remain unchanged from 2019. These are based on emissions factors obtained from The Climate Registry's (TCR's) 2020 Default Emission Factors, which are estimated to be 5.3 kilograms of carbon dioxide equivalents per therm (kg CO_2e/therm) (TCR 2020). Emissions factors associated with natural gas combustion are not anticipated to change over time, as there are no legislative actions that would reduce the carbon intensity of natural gas. Refer to Table 10 of the 2022 inventory memorandum for further details.

ENERGY EFFICIENCY

For existing buildings, energy intensity factors were adjusted to account for the turnover of natural gas appliances to electric under the Bay Area Air Quality Management District's (BAAQMD) NOx emission standards, which were amended in 2023, to require zero emission appliances starting in 2027. For new construction, energy intensity factors were adjusted to reflect increased stringency under California's Building Energy Efficiency Standards (California Code of Regulations Title 24 Part 6, hereafter referred to as "Title 24"). Title 24 standards apply to new construction. The efficiency gains under the 2022 Title 24 standards are assumed to apply to projects constructed after January 1, 2023. The 2025 Title 24 standards are currently being developed by the CEC and the details related to their impact on future building construction is not yet available.

Existing Buildings

The BAAQMD Zero NOx emission standards would effectively stop the installation and sale of natural gas water heaters, furnaces, and large commercial water heaters and replace them with electric equivalents by 2027, 2029, and 2031, respectively (BAAQMD 2023a). This rule applies to all BAAQMD jurisdictions, including Napa County, and would gradually result in the electrification of a majority of natural gas use in existing buildings as existing eligible appliances are replaced with electric counterparts over time. According to BAAQMD's emissions inventory, space and water heating account for 81 percent of natural gas use across residential and commercial buildings in the Bay Area (pers. comm., Henderson 2024).

To account for this new rule in the legislative-adjusted forecast, estimates of natural gas reduction and corresponding increases in electricity use compared to baseline levels, adjusted for Napa's 2019 inventory year, were used to approximate a scaling factor to adjust the electricity and natural gas use in existing buildings in future years. These estimates were derived from BAAQMD's staff report and supporting appendices that evaluate the impact of the Zero NOx standard on electricity demand and NOx emissions. Because NOx emissions from these appliances are primarily a result of natural gas combustion, it was assumed that changes in NOx under the rule would be proportional to changes in natural gas use. Consistent with the assumptions used in BAAQMD's modeling, these reductions were only assumed to apply to the existing building stock. (Energy and Environmental Economics 2022:12, BAAQMD 2023b:22-23).

Based on BAAQMD's documentation, the rule would reduce Bay Area's electricity use by approximately four percent by 2030 and up to 13 percent by 2045 and decrease natural gas use by approximately 45 percent by 2030 and up to 90 percent by 2045 compared to 2019 levels. These reductions could not be disaggregated between residential and non-residential land uses, thus final forecast results are aggregated across these land use types. Table 6 shows the estimated future adjustment factors for existing buildings in future years per BAAQMD's Zero NOx standard. Detailed calculations of these factors are available in Attachment 3 to this memorandum.

Table 6 Percent Change in Building Energy Use in Existing Buildings under BAAQMD's Zero NOx Appliance Standards by Fuel Type (Percent change from 2019)

Fuel Type	2030	2035	2045
Electricity	4%	8%	13%
Natural Gas	-45%	-64%	-90%

Source: Compiled by Ascent in 2024.

New Construction

Future energy use was adjusted to reflect increased emissions-intensity stringency under California's Building Energy Efficiency Standards (California Code of Regulations Title 24 Part 6, hereafter referred to as "Title 24"). Title 24 standards apply to new residential and nonresidential construction. The 2022 Title 24 standards apply to projects constructed after January 1, 2023, and the 2025 Title 24 standards would apply after January 1, 2026.

Adjustment factors were calculated using data available from the California Energy Commission (CEC) that were developed for the 2022 Title 24 standards. Two separate methodologies were for residential and non-residential land uses due to the difference in the availability of energy efficiency data between the two land use types. For residential land uses, to estimate adjusted future energy consumption resulting from Title 24 requirements in new construction, electricity- and natural gas-specific adjustment factors were calculated using the difference in the average energy use in residential buildings between existing buildings and those built to 2022 Title 24 standards. CEC's data included estimated annual energy use per housing unit by climate zone (Zone 2 for Napa County) and by residential land use type (i.e., multifamily and single-family) under the 2022 Title 24 standards.

For non-residential buildings, electricity- and natural gas-specific adjustment factors were calculated using the difference in the average energy use in nonresidential buildings between those built to 2019 Title 24 standards and those built to 2022 Title 24 standards. Unlike the detailed approach for residential buildings, CEC only provided total statewide energy use under the 2019 and 2022 standards. Additionally, climate zone-specific data for non-residential buildings were unavailable; therefore, nonresidential adjustment factors relied on statewide averages. The lack of comparison to existing factors for non-residential buildings is expected to result in a slightly conservative forecast because existing non-residential buildings are likely less efficient than those built to 2019 standards.

The resulting adjustment factors (specific to both land use type and energy type) were applied to the BAU growth in energy use to estimate the energy consumption and associated GHG emissions of future development with legislative adjustments. The adjustment factors are shown in Table 7. They are presented either in terms of the percent change in energy use for buildings compliant with the 2022 Title 24 standards compared to existing buildings for residential land uses or compared to those built to meet the 2019 Title 24 standards, for non-residential land uses. Positive values indicate an anticipated increase in energy use, while negative values indicate an anticipated decrease in energy use. It is important to note that although average electricity use in new residential buildings is anticipated to rise (due to an increase in electrical demand associated with electric appliances installed instead of natural gas appliances), emissions from new residential buildings are expected to be lower than they would be under existing or 2019 Title 24 as a result of overall lower building emissions intensities (due to lower emissions factors associated with electricity compared to natural gas). Detailed calculations of these factors are available in Attachment 3 to this memorandum.

Table 7 Title 24 Building Energy Adjustment Factors for 2022 Standards

Building Type	Electricity	Natural Gas	Percent Change Relative to
Residential Buildings	0%	-40%	Energy Use per Dwelling Unit in 2019
Nonresidential Buildings	-9.5%	-11%	2019 Building Energy Efficiency Standards

Source: Ascent Inc. in 2024.

Based on this analysis, it was estimated that, across the county, new residential buildings would use about the same electricity and 40 percent less natural gas than existing residential buildings and new non-residential buildings would use 9.5 percent less electricity and 11 percent less natural gas than existing non-residential buildings.

BUILDING ENERGY RESULTS

Emissions from future electricity and natural gas use were estimated by multiplying anticipated energy use by forecasted emissions factors. Future energy use was forecasted in two parts. First, energy use was scaled by population and employment growth factors detailed above. Second, legislative reductions from Title 24 energy efficiency standards were applied to the net future growth. Finally, energy emissions factors, adjusted to reflect current regulations and adopted targets as discussed above, were applied to the forecasted energy use. Table 8 summarizes the scaling factors and legislative reductions used to forecast building use by energy type.

Table 8 Building Energy Emissions Forecast Methods by Energy Type

Energy Type	Forecast Methods	
	Growth Factor	Applied Legislative Reductions
Electricity	Scaled by population growth for residential building energy by jurisdiction; scaled by employment growth for nonresidential building energy by jurisdiction.	BAAQMD Zero NOx emissions standards on space and water heating applied to existing building energy use. 2022 Title 24 energy efficiency gains in new construction based on the best available data for average building energy efficiency. SB100 scheduled targets (i.e., 100 percent renewable by 2045) applied to PG&E and MCE 2045 electricity emissions factors. PG&E and MCE's Light Green 2022 emission factors applied to 2030 and 2035 because they already meet SB 1020 requirements. MCE's Deep Green/Local Sol factors remain at 100% GHG-free.
Natural Gas		

Notes: MCE = Marin Clean Energy; RPS = Renewables Portfolio Standard; PG&E = Pacific Gas & Electric.

Source: Ascent Inc. in 2024.

Building Energy Forecasts

Between 2019 and 2045, electricity and natural gas emissions from buildings would decrease by approximately 79 percent from 279,592 to 59,733 $MTCO_2e$ with legislative adjustments. By 2045, all emissions would be from natural gas use as electricity-related emissions go to zero. Table 9 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the residential building energy sector by fuel type for 2030, 2035, and 2045. Note that PG&E's emission factors were especially low in 2019 due to greater than normal contributions from hydroelectric and nuclear sources that year (CEC 2020).

Table 9 Projected GHG Emissions from Building Energy Through 2045

Calendar Year	Fuel Type	Utility Provider	Energy Use	Fuel Unit	Emissions Factor	GHG Emissions (MT CO_2e)
2019	Electricity	PG&E	138,054	MWh	21 lb CO_2e/MWh	1,295
2019	Electricity	Light Green MCE	746,172	MWh	197 lb CO_2e/MWh	66,676
2019	Electricity	Deep Green/Local Sol MCE	42,435	MWh	0 lb CO_2e/MWh	0
2030	Electricity	PG&E	187,377	MWh	56 lb CO_2e/MWh	4,760
2030	Electricity	Light Green MCE	1,003,408	MWh	44 lb CO_2e/MWh	20,026
2030	Electricity	Deep Green/Local Sol MCE	54,547	MWh	0 lb CO_2e/MWh	0
2035	Electricity	PG&E	192,722	MWh	56 lb CO_2e/MWh	4,895
2035	Electricity	Light Green MCE	1,022,562	MWh	44 lb CO_2e/MWh	20,408
2035	Electricity	Deep Green MCE	56,763	MWh	0 lb CO_2e/MWh	0
2045	Electricity	PG&E	200,041	MWh	0 lb CO_2e/MWh	0
2045	Electricity	Light Green MCE	1,045,575	MWh	0 lb CO_2e/MWh	0
2045	Electricity	Deep Green MCE	60,308	MWh	0 lb CO_2e/MWh	0
2019	Natural Gas	PG&E	39,764,729	therms	5.3 kg CO_2e/therm	211,622
2030	Natural Gas	PG&E	28,157,884	therms	5.3 kg CO_2e/therm	149,852
2035	Natural Gas	PG&E	20,580,190	therms	5.3 kg CO_2e/therm	109,525
2045	Natural Gas	PG&E	11,224,162	therms	5.3 kg CO_2e/therm	59,733

Notes: PG&E = Pacific Gas & Electric, MCE = Marin Clean Energy, MWh = mega watt-hours, kg = kilograms, CO_2e = carbon dioxide equivalent, MT = metric tons.

Source: Ascent Inc. in 2024

6.2 TRANSPORTATION

ON-ROAD TRANSPORTATION

Between 2019 and 2045, GHG emissions from on-road vehicles would decrease by approximately 85 percent from 472,677 to 71,157 $MTCO_2e$, accounting for a slight decrease in VMT of approximately six percent, future vehicle emissions factors, and adjusted for the latest vehicle regulations. VMT projections were developed using the origin-destination method and data from MTC's PBA 2050 VMT Data Portal for 2030 and 2045 and interpolated for 2035 (MTC 2022). MTC's data were provided for non-commercial VMT only. To estimate commercial VMT, EMFAC 2021 was used to estimate the ratio of non-commercial (e.g., light duty vehicles) to commercial (e.g., heavy-duty vehicles) for each forecast year. This ratio was then applied to the non-commercial VMT forecasts to calculate VMT from commercial sources.

Vehicle emission factors were forecasted through a combination of using EMFAC2021 model (Version 1.0.2) and additional off-model calculations to account for Advanced Clean Cars II and Advanced Clean Fleets State programs. While the current version of EMFAC2021 does not yet account for these latter two legislative actions, it does account for other State and federal laws and regulations such as the Pavley Clean Car Standards, the pre-existing Advanced Clean Car (ACC) Standards, and fuel efficiency standards for medium- and heavy-duty vehicles. These policies, especially ACCII and ACF, are expected to increase the number of zero-emission vehicles in the county into the future and lower fleet-wide emission factors. The Low Carbon Fuel Standard was excluded in EMFAC2021 forecasts because the emissions benefits originate from upstream fuel production and do not directly reduce vehicle tailpipe emissions that affect the region's GHG emissions forecasts. Table 10 summarizes the scaling factors and legislative reductions used to forecast on-road transportation emissions.

Table 10 On-Road Transportation Emissions Forecast Methods

Source	Forecast Methods	
	Growth Factor	Applied Legislative Reductions
On-Road Transportation	Scaled by VMT estimates provided by MTC.	EMFAC2021 forecasts vehicle fleet distributions by vehicle type and the emissions factors anticipated for each vehicle category based on both vehicle emissions testing and approved legislative reductions. EMFAC2021's forecasts incorporate the effects of the pre-existing ACC Standards (ACC I), federal CAFE standards, and fuel efficiency standards for medium- and heavy-duty vehicles, as well as truck and bus regulations. Legislative actions that are anticipated to impact the number of electric vehicles in the future are incorporated into the emissions factors obtained from EMFAC2021. Emission factors were further adjusted to account for the phasing in of ZEV/PHEV requirements under ACCII and ACF.

Notes: ACC = Advanced Clean Cars; ACF = Advanced Cleanlet; CAFE = Corporate Average Fuel Economy; EMFAC2021 = California Air Resources Board's EMisson FACtor 2021 model; MTC = Metropolitan Transportation Commission; ZEV = zero emission vehicle; PHEV = plug-in hybrid electric vehicle.

Source: Ascent Inc. in 2024.

Table 11 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from on-road transportation for 2030 through 2045.

Table 11 Regional On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts

Year	Annual Commercial VMT	Annual Non-Commercial VMT	Total Annual VMT	Average Vehicle Emission Factor (g CO_2e/mile)	GHG Emissions ($MTCO_2e$)
2019	220,231,676	795,545,463	1,015,777,139	465.34	472,677
2030	182,832,099	814,869,162	997,701,261	308.53	307,817
2035	174,020,478	801,151,840	975,172,318	207.06	201,923
2045	171,016,644	787,463,439	958,480,083	74.24	71,157
Percent Change from 2019					
2030	-17%	2%	-2%	-34%	-35%
2035	-21%	1%	-4%	-56%	-57%
2045	-22%	-1%	-6%	-84%	-85%

Notes: BAU = business-as-usual; VMT = vehicle miles traveled; GHG = greenhouse gas; g = grams; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: MTC 2024. Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Between 2019 and 2045, emissions associated with off-road vehicles and equipment used in the region would decrease by 57 percent from 115,548 to 49,694 $MTCO_2e$, with legislative adjustments applied and the state's expected growth in off-road activity in the county. Emissions were obtained from CARB's latest off-road emissions model, OFFROAD2021 (Version 1.0.5). For the legislative adjustments in the off-road vehicle sector, modeling incorporated regulatory actions such as reformulated fuels and more stringent emissions standards and reduced emissions from small off-road engines as per AB 1346, which prohibits emissions from new fossil-fueled small off-road equipment starting in 2024. This effectively phases out fossil-fuel -powered off-road equipment in favor of zero-emission alternatives, such as electric or battery-operated equipment. The county-level emissions forecasts from off-road vehicles and equipment were scaled to each jurisdiction using changes in jurisdiction-specific demographic factors. Table 12 summarizes the scaling factors and legislative reductions used to forecast off-road vehicle and equipment emissions.

Table 12 Off-Road Vehicles and Equipment Forecast Methods by Source

Source	Forecast Methods		
	Jurisdictional Scaling Factors	Activity Growth	Applied Legislative Reductions
Airport Ground Support	Population	Based on OFFROAD2021 forecasts for the Napa County region	OFFROAD2021 emissions factor considerations include Off-Road Diesel Regulations and the implementation schedule of the EPA off-road compression-ignition engine standards. Additional off-model adjustments were made to account for AB1346.
Commercial Harbor Craft	Employment		
Construction and Mining	Service Population		
Industrial	Employment		
Lawn and Garden Equipment	Population		
Light Commercial Equipment	Employment		
Pleasure Craft	All assumed to occur in the unincorporated county		
Portable Equipment	Employment		
Railyard Operations	Employment		
Recreational Equipment	Population		
Transport Refrigeration Units	Service Population		

Notes: EPA = U.S. Environmental Protection Agency; OFFROAD2021 = California Air Resources Board's OFFROAD2021 model.

Source: Ascent Inc. in 2024.

Table 13 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the off-road vehicles and equipment sector through 2045. As modeled in OFFROAD2021, emissions from railyard operations are expected to decline to zero. This transition is due to the amendment to CARB's existing Cargo Handling Equipment regulation to transition diesel cargo handling equipment at rail yards to zero-emissions (CARB 2024). Following railyard operations, lawn and garden equipment and light commercial equipment are expected to have the most reductions, with nearly 100 and 95 percent emissions reduction respectively from 2019 through 2045. This reduction is due to the adoption of AB 1346. The significant decline in emissions from the three off-road emissions sources reflects an increasing trend toward the decarbonization of the off-road sector (CARB 2020:1). Following these three sources, the next biggest decline in emissions is from pleasure craft (65 percent), reflecting the anticipated reduction in overall pleasure craft activity in the region through 2045 (CARB 2014:9).

Table 13 Regional Off-Road Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Commercial Harbor Craft	140	135	135	135
Construction and Mining	12,294	11,166	11,184	11,009
Industrial	5,490	6,501	5,199	7,018
Lawn and Garden Equipment	28,726	290	149	12
Light Commercial Equipment	24,282	2,367	1,553	1,208
Pleasure Craft	28,896	8,174	8,793	10,116
Portable Equipment	10,088	12,056	13,311	16,226
Railyard Operations	383	0	0	0
Recreational Equipment	2,687	712	749	788
Transport Refrigeration Units	2,561	2,486	2,694	3,182
Total	**115,548**	**43,886**	**43,767**	**49,694**
Percent Change from 2019				
Commercial Harbor Craft	NA	-4%	-4%	-4%
Construction and Mining	NA	-9%	-9%	-10%
Industrial	NA	18%	-5%	28%
Lawn and Garden Equipment	NA	-99%	-99%	-100%
Light Commercial Equipment	NA	-90%	-94%	-95%
Pleasure Craft	NA	-72%	-70%	-65%
Portable Equipment	NA	20%	32%	61%
Railyard Operations	NA	-100%	-100%	-100%
Recreational Equipment	NA	-74%	-72%	-71%
Transport Refrigeration Units	NA	-3%	5%	24%
Total	**NA**	**-62%**	**-62%**	**-57%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

6.3 AGRICULTURE

Between 2019 and 2045, emissions generated from agricultural activities in the region would decrease by approximately seven percent from 103,381 to 96,070 $MTCO_2e$, accounting for the change in future agricultural land cover as reported by each jurisdiction and in changes in agricultural off-road emissions.

Livestock and non-livestock emissions (i.e., fertilizer application, and irrigation pumps) were scaled by the anticipated change in rangeland and cropland, respectively. Between 2019 and 2045, the County anticipates that rangeland acreage would decline by four percent. Over the same time, cropland acreage regionwide is anticipated to set a net increase of nine percent, with nearly all of that change occurring in the unincorporated region. Agricultural off-road emissions forecasts follow the same methodology as the off-road sector, relying on forecasts from the OFFROAD

model for the region that are then scaled to each jurisdiction by cropland acreage. See Attachment 1 for the agricultural land forecasts from each jurisdiction.

The only legislative adjustment made in this sector is for the agricultural off-road equipment, which is subject to the same legislative adjustments as discussed in Section 6.2 (off-road equipment). The agricultural off-road emissions modeling incorporated regulatory actions such as reformulated fuels and more stringent emissions standards and reduced emissions from small off-road engines as per AB 1346, which prohibits emissions from new fossil-fueled small off-road equipment starting in 2024. With these regulations, emissions from agricultural offroad equipment are expected to decline by 20 percent from 2019 through 2045. Table 14 summarizes the forecast methodologies, and Table 15 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the agriculture sector through 2045.

Table 14 Agricultural Emissions Forecast Methods by Source

Source	Forecast Methods	
	Growth Factor	Applied Legislative Reductions
Agricultural Offroad	Based on OFFROAD2021 forecasts for the Napa County region	OFFROAD2021 emissions factor considerations include Off-Road Diesel Regulations and EPA off-road compression-ignition engine standards implementation schedule. Additional adjustments were made to account for AB1346.
Fertilizer Application	Scaled by Change in Cropland by jurisdiction	None applied
Irrigation Pumps	Scaled by Change in Cropland by jurisdiction	None applied
Livestock	Scaled by Change in Rangeland by jurisdiction	None applied

Table 15 Regional Agriculture GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	2035	2045
Agricultural Offroad	47,682	42,981	41,211	38,194
Fertilizer Application	21,948	22,661	23,076	23,899
Irrigation Pumps	15,417	15,616	15,852	16,303
Livestock	18,334	17,982	17,879	17,674
Total	**103,381**	**99,240**	**98,018**	**96,070**
Percent Change from 2019				
Agricultural Offroad	NA	-10%	-14%	-20%
Fertilizer Application	NA	3%	5%	9%
Irrigation Pumps	NA	1%	3%	6%
Livestock	NA	-2%	-2%	-4%
Weighted Total	**NA**	**-4%**	**-5%**	**-7%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

6.4 SOLID WASTE

Waste Generation and Waste-in-Place

The ICLEI Community Protocol recommends that community GHG inventories include emissions from both waste generated by the community and solid waste facilities located in the community (i.e., "waste-in-place") (ICLEI 2019). Waste generated by the region is expected to increase nearly in proportion to population (17 percent from 2019 to 2045). Waste-in-place CH_4 emissions from landfill gas (LFG) generated at solid waste facilities located within the region accounted for approximately 58 percent of emissions from the solid waste sector in 2019.

Between 2019 and 2045, solid waste emissions generated from community activities in the region would increase by approximately 17 percent from 84,243 to 98,263 $MTCO_2e$ per year, accounting for overall population growth of approximately 18 percent over the same time. Solid waste generation emissions include CH_4 emissions from the decay of waste generated annually, which were scaled by population growth within the region between 2019 and 2030.

Waste-in-place emissions forecasts were calculated based on the existing and future anticipated waste disposal tonnages at two landfills located within the region: Clover Flat Landfill and American Canyon Landfill. Both landfills are located in the unincorporated area of the county. Open from 1966 to 1995, the American Canyon Landfill's methane emissions likely peaked around 1996, after its closure. The landfill's emissions would continue to decline into the future through 2045 based on the decay model available in CARB's Landfill Gas Tool and annual disposal tonnage reports from the U.S. Environmental Protection Agency (EPA) (CARB 2021, EPA 2022). Clover Flat Landfill, on the other hand, is an active landfill that has been open since 1963 and plans to close in 2056. Assuming average annual disposal rates between 2010 and 2019 continue through 2056, waste-in-place emissions from Clover Flat would continue to rise through 2045 and likely peak around 2057, as modeled in the Landfill Gas Tool. Although emissions from the American Canyon Landfill are expected to decline by 31 percent by 2045, emissions from Clover Flat Landfill would increase by 23 percent and also be nearly three times higher than American Canyon Landfill given its greater capacity and longevity.

Total solid waste emissions, including both community-generated waste and waste-in-place emissions, would increase by nine percent from 198,862 to 216,139 $MTCO_2e$ per year. Although SB 1383 is anticipated to reduce emissions of methane from the solid waste sector, it starts by requiring local jurisdictions to separately collect organic waste statewide by 2022. However, waste collection services in the region have already begun to collect organics separately. Because of the bill's reliance on local participation, the impact of SB 1383 is excluded from the legislative-adjusted BAU forecasts for the region.

Table 16 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the solid waste sector for 2030.

Table 16 Regional Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	2035	2045
Community-Generated Solid Waste	84,243	97,027	96,511	98,263
Waste-in-Place Emissions	114,619	120,380	119,431	117,876
American Canyon Landfill	*42,800*	40,085	36,270	29,695
Clover Flat Landfill	*71,819*	80,295	83,161	88,181
Total	**198,862**	**217,407**	**215,942**	**216,139**
Percent from 2019				
Community-Generated Solid Waste	NA	15%	15%	17%

Waste-in-Place Emissions	NA	5%	4%	3%
American Canyon Landfill	*NA*	*-6%*	*-15%*	*-31%*
Clover Flat Landfill	*NA*	*12%*	*16%*	*23%*
Weighted Total	NA	9%	9%	9%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

6.5 IMPORTED WATER

Imported water refers to water imported from outside the region into the region (e.g., water from the State Water Project). Between 2019 and 2045, imported water emissions generated from community activities in the region would decrease by 100 percent from 5,943 to 0 $MTCO_2e$. Imported water use is expected to increase in proportion to each jurisdiction's service population. These emissions include upstream emissions from electricity generation used to extract, convey, treat, and distribute imported water to the region. For local water supply sources within the region, the electricity usage associated with extracting, conveying, treating, and distributing local water is assumed to be captured in the building energy sector because these activities take place within the community. For 2030, electricity emission factors were interpolated between the average 2022 emission factors for the State and the 95 percent zero-carbon targets for 2035 under SB1020. The State average electricity emissions factors for 2022 were obtained for the State using EPA's eGRID2022 database for the CAMX region, which reported an average emission factor of 497.4 MT CO_2 per MWh which reflects a 46 percent zero-carbon energy mix (EPA 2024). In 2045, all electricity generation is assumed to be zero-carbon under SB100. Based on these assumptions and the 2022 eGRID emission factors, the average GHG emissions factor is anticipated to decline by 52 percent from 2019 to 2030, 90 percent by 2035, and 100 percent by 2045.

Table 17 summarizes the scaling factor and legislative reduction used to forecast water supply emissions.

Table 17 Imported Water Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Growth Factor	Applied Legislative Reductions
Imported Water	Scaled by service population growth by jurisdiction	Assumes electricity use for extraction, conveyance, distribution, and treatment aligns with the trajectory toward the 2045 carbon-free electricity requirements under SB100 and SB1020.

Source: Ascent Environmental in 2024.

Table 18 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the water supply sector for 2030, 2035, and 2045.

Table 18 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/year)

Sector	2019	2030	2035	2045
Imported Water	5,943	3,296	707	0
Percent Change from 2019				
Total	NA	-45%	-88%	-100%

Notes: BAU = business-as-usual; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year; NA = not applicable

Source: Ascent Environmental in 2024.

6.6 WASTEWATER TREATMENT

Between 2019 and 2045, community wastewater emissions would increase by 19 percent from 45,858 to 54,585 $MTCO_2e$. This change reflects an increase in wastewater generation resulting from population growth within the region of approximately 18 percent over the same time. Wastewater-related emissions are generated from centralized wastewater treatment plants (WWTPs) and septic systems for the region. Table 19 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from wastewater treatment sources for 2045.

Table 19 Regional Wastewater Treatment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	2035	2045
Septic Systems	2,961	3,423	3,278	2,987
Centralized WWTPs	42,897	49,198	49,494	51,598
Total	**45,858**	**52,621**	**52,772**	**54,585**
Percent Change from 2019				
Septic Systems	NA	16%	11%	1%
Centralized WWTPs	NA	15%	15%	20%
Total	**NA**	**15%**	**15%**	**19%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; WWTP = wastewater treatment plant.; NA = not applicable

Source: Ascent Inc. in 2024.

6.7 DISCUSSION

The community BAU emissions would increase by approximately four percent between 2019 and 2045, while legislative-adjusted BAU emissions would decrease by 55 percent between 2019 and 2045. The overall reduction under the legislative-adjusted BAU forecast scenario, despite growth, is associated with reductions that would be achieved from several legislative actions, including:

- a greater renewable mix in MCE's, PG&E's, and State's average electricity supply under SB 100 and SB 1020;
- carbon-free electricity supplied by MCE and PG&E;
- improved building energy efficiency through compliance with Title 24 standards;
- reduction in emissions due to the electrification of natural gas building appliances under BAAQMD's Zero NOx appliance rule;
- reductions in small off-road engine emissions due to AB 1346;
- reductions in on-road vehicle emissions factors from State vehicle standards as forecasted in EMFAC2021 and anticipated under ACCII and ACF; and
- reductions in off-road vehicle and equipment emissions factors forecasted in OFFROAD2021.

With these reductions, the building energy and transportation sectors are anticipated to go from making up 62 percent to 24 percent of the region's emissions. The legislative adjustments from AB 1346 would balance the growth in population and employment that affect offroad emissions, which are anticipated to remain at nine percent of the region's emissions by 2045. Other sectors also grow in importance as building energy and transportation emissions decline and even as some of their own emissions decline. Agricultural emissions are anticipated to decline by seven

percent by 2045, but with the reduction in other sectors, it is anticipated to account for 18 percent of the region's emissions by the same year. For solid waste, these emissions are anticipated to increase with population in the county by 18 percent, resulting in this sector accounting for the majority of emissions by 2045 (39 percent). Wastewater emissions, like solid waste, would grow with population and are anticipated to account for 10 percent of total emissions by 2045. Imported water emissions would be reduced to zero with the carbon-free electricity expected by 2045 under SB 100 and SB 1020.

Without future legislative actions and with future growth, emissions would increase from 2019 through 2045. Going forward, new legislative actions that would affect emissions may be adopted by State, federal, and regional agencies; however, because information regarding these regulatory changes is currently unavailable or not final, emissions reductions from future potential legislative actions are not quantified in this memorandum. Where new State regulations or programs are imminent and reasonably foreseeable, they can be incorporated as complementary actions to locally based GHG reduction measures or through an update to the RCAAP.

7 GREENHOUSE GAS EMISSIONS FORECAST BY JURISDICTION

This section provides a summary of the activity data used to prepare the GHG emissions forecasts for the region, as well as snapshots of baseline and forecasted emissions in each jurisdiction.

7.1 ACTIVITY DATA SUMMARY

Various demographic factors (i.e., population, employment, and service population), VMT, and agricultural acreages were used to estimate future activity levels for most emissions sectors and are shown in Table 20. These factors were developed based on data received from individual jurisdictions in the region, as well as from sources such as the California Department of Finance (DOF) and MTC. See Attachment 1 for detailed responses to data requests received from individual jurisdictions.

Table 20 Activity Forecast Factors by Jurisdiction

Jurisdiction/Factor	2019	2030	2035	2045
American Canyon				
Population[1]	20,996	26,829	26,021	24,405
Employment	6,200	8,642	8,636	8,624
Service Population[2]	27,196	35,471	34,657	33,029
Annual VMT[3]	154,556,520	195,038,276	199,833,553	204,605,943
Agricultural Acres (Cropland)	95	99	99	99
Agricultural Acres (Rangeland)	0	0	0	0
Calistoga				
Population	5,348	5,508	5,457	5,355
Employment	2,811	3,333	3,104	2,646
Service Population	8,159	8,841	8,561	8,002
Annual VMT	28,922,407	25,846,983	25,888,713	25,935,126
Agricultural Acres (Cropland)	168	175	175	175
Agricultural Acres (Rangeland)	0	0	0	0
Napa				

Jurisdiction/Factor	2019	2030	2035	2045
Population	79,301	88,677	89,311	97,201
Employment	51,200	56,857	58,805	62,700
Service Population	130,500	145,533	148,116	159,900
Annual VMT	472,155,386	452,494,878	436,120,895	419,780,510
Agricultural Acres (Cropland)	625	620	610	560
Agricultural Acres (Rangeland)	0	0	0	0
St. Helena				
Population	6,094	6,655	6,715	6,800
Employment	5,762	5,820	5,820	5,980
Service Population	11,856	12,475	12,535	12,780
Annual VMT	51,605,089	52,874,585	52,910,225	52,954,357
Agricultural Acres (Cropland)	1,100	1,000	1,000	1,000
Agricultural Acres (Rangeland)	0	0	0	0
Yountville				
Population	2,793	3,385	3,450	3,535
Employment	1,100	1,245	1,230	1,210
Service Population	3,893	4,630	4,680	4,745
Annual VMT	20,876,900	17,423,793	17,423,793	17,424,457
Agricultural Acres (Cropland)	92	76	76	76
Agricultural Acres (Rangeland)	0	0	0	0
Unincorporated County				
Population	25,077	25,789	26,112	26,759
Employment	30,379	38,322	35,273	29,175
Service Population	55,456	64,111	61,385	55,933
Annual VMT	67,429,161	71,190,648	68,974,660	66,763,045
Agricultural Acres (Cropland)	56,119	58,124	59,229	61,440
Agricultural Acres (Rangeland)	179,000	175,441	174,404	172,331
Total				
Population	139,609	156,842	157,066	164,055
Employment	97,452	114,219	112,868	110,335
Service Population	237,060	271,061	269,934	274,389
Annual VMT	795,545,462	814,869,162	801,151,840	787,463,439
Agricultural Acres (Cropland)	58,199	60,094	61,189	63,350
Agricultural Acres (Rangeland)	179,000	175,441	174,404	172,331

Notes: VMT = vehicle miles traveled. See the 2019 Inventory report for a description of the sources of the 2019 metrics. See Attachment 1 for demographic data provided by each jurisdiction.

[1] For existing population data that were not available from the jurisdictions, 2019 data from Table E-4 from the California Department of Finance was used in its place (DOF 2021). For future population forecasts that were not available from the jurisdictions, MTC PBA 2050

household forecasts were used and interpolated between 2015 and 2050 estimates (See Attachment 2) (MTC 2022). Household growth is assumed to be proportional to population growth.

[2] Service Population is the sum of population and employment.

[3] Forecasted annual VMT was obtained interpolated from MTC's Plan Bay Area 2050 Data Portal (MTC 2022). No changes were made to the 2019 VMT from the previous inventory.

Source: Compiled by Ascent Inc. in 2024.

7.2 AMERICAN CANYON

Emissions Summary

Table 21 shows a summary of American Canyon's share of the regional emissions inventory and legislative-adjusted forecast. American Canyon's emissions are anticipated to decrease by 57 percent between 2019 and 2045. Much of this reduction is due to reductions in the on-road transportation sector. As shown in Table 21, on-road transportation emissions would rapidly decline from 49 percent of the city's emissions to only 23 percent of the city's emissions. With decline in on-road transportation emissions, building energy and solid waste would make up nearly 60 percent of the city's emissions by 2045. Building energy use emissions reflect continued natural gas use in buildings under the legislative-adjusted BAU scenario. Solid waste emissions are scaled directly with population growth in the city, which is estimated to increase by 28 percent by 2030 and decline to 12 percent over 2019 levels by 2045. Off-road and wastewater emissions are expected to account for 5 percent and 12 percent of American Canyon emissions in 2045, respectively. As an urban area, there are minimal emissions from agriculture in American Canyon. No imported water-related emissions would be generated by 2045 due to the zero-carbon electricity requirements under SB100.

Table 21 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: American Canyon ($MTCO_2e$/year)

Sector	2019	2030	2030	2045
Agriculture	157	147	144	139
Building Energy	53,431	43,740	34,584	18,070
Imported Water	983	622	129	-
Off-Road Equipment	8,301	3,774	3,672	3,922
On-Road Transportation	91,830	73,676	50,366	18,489
Solid Waste	25,938	33,145	32,146	30,150
Wastewater	7,822	10,202	9,968	9,499
Total	**188,462**	**165,305**	**131,009**	**80,269**
Percent of Total				
Agriculture	0%	0%	0%	0%
Building Energy	28%	26%	26%	23%
Imported Water	1%	0%	0%	0%
Off-Road Equipment	4%	2%	3%	5%
On-Road Transportation	49%	45%	38%	23%
Solid Waste	14%	20%	25%	38%
Wastewater	4%	6%	8%	12%

Sector	2019	2030	2030	2045
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-7%	-8%	-11%
Building Energy	NA	-18%	-35%	-66%
Imported Water	NA	-37%	-87%	-100%
Off-Road Equipment	NA	-55%	-56%	-53%
On-Road Transportation	NA	-20%	-45%	-80%
Solid Waste	NA	28%	24%	16%
Wastewater	NA	30%	27%	21%
Total	**NA**	**-12%**	**-30%**	**-57%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

BUILDING ENERGY

Accounting for population and employment growth, trends toward zero-carbon electricity, BAAQMD's Zero NOx appliance rule, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, American Canyon's building energy-related emissions are anticipated to decrease to four percent below 2019 levels by 2045. With the implementation of SB100, by 2045, all building energy emissions would be generated from the combustion of natural gas.

Proportional to forecasted job growth in American Canyon, the jurisdiction is projected to see an increase in non-residential energy use. According to the City of American Canyon, the city is forecasted to have a 39 percent growth in employment between 2019 and 2030 (See Attachment 1). It is assumed this growth would be met by 2030 and plateau through 2045. American Canyon has the highest forecasted job growth rate in the region. However, due to the State and regional emission legislative reductions, emissions from building energy are expected to decline from 2019 through 2045. American Canyon has the third highest building energy emissions in the region.

Table 22 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: American Canyon ($MTCO_2e$/ year)

Energy Type	2019	2030	2035	2045
Electricity	6,929	3,281	3,348	-
Natural Gas	46,502	40,460	31,236	18,070
Total	**53,431**	**43,740**	**34,584**	**18,070**
Percent Change from 2019				
Electricity	NA	51%	54%	57%
Natural Gas	NA	-13%	-33%	-61%
Total	**NA**	**38%**	**22%**	**-4%**

Notes: Totals may not sum due to rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

ON-ROAD TRANSPORTATION

American Canyon's on-road transportation emissions are anticipated to decrease by 80 percent between 2019 and 2045, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, ACCII, ACF, and other adopted regulations as discussed in Section 3, which increase the percentage of zero-emission vehicles on the road and improve fuel economy, reducing average fleetwide GHG emissions per mile.

Table 23 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Trip Type	2019	2030	2035	2045
Commercial Trips	33,801	26,167	18,970	9,073
Non-Commercial Trips	58,030	47,509	31,396	9,415
Total	91,830	73,676	50,366	18,489
Percent Change from 2019				
Commercial Trips	NA	-23%	-44%	-73%
Non-Commercial Trips	NA	-18%	-46%	-84%
Total	**NA**	**-20%**	**-45%**	**-80%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Based on the scaling factors used to scale countywide off-road emissions to each jurisdiction (e.g., population, employment) that best match each off-road equipment category (refer to Table 12), and with emissions reduction due to State regulations, American Canyon's off-road equipment emissions are anticipated to decrease by 59 percent between 2019 and 2035, and then slightly increase by 3 percent compared to 2019 levels by 2045, resulting in an overall decline by 56 percent from 2019 through 2045. In particular, the greatest reductions would occur from the lawn and garden and light commercial equipment sectors which are anticipated to see emissions decline by approximately 5,000 $MTCO_2e$ by 2030 and through 2045 compared to 2019 levels. This accounts for more than 60 percent of American Canyon's off-road emission in 2019 and nearly all of the reductions through 2045. Additionally, emissions from the railyard operations sector are expected to decline to zero.

CARB anticipates a statewide trend toward increased electric adoption in lawn and garden and light commercial equipment due to State regulations and advances in battery technology supported with lawn and garden equipment exchange programs (CARB 2020; BAAQMD 2024). While the BAAQMD exchange programs are currently closed, the lasting effect of these programs and current marketplace offerings are expected to influence future overall consumer choices in purchasing electric equipment for these two equipment categories.

Table 24 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts, American Canyon ($MTCO_2e$/year)

Equipment Category	2019	2030	2035	2045
Commercial Harbor Craft	9	10	10	11
Construction and Mining	1,410	1,461	1,436	1,325
Industrial	349	492	398	549
Lawn and Garden Equipment	4,320	114	57	4
Light Commercial Equipment	1,545	179	119	94

Equipment Category	2019	2030	2035	2045
Portable Equipment	642	912	1,018	1,268
Railyard Operations	24	-	-	-
Recreational Equipment	404	280	288	288
Transport Refrigeration Units	294	325	346	383
Total	**8,998**	**3,774**	**3,672**	**3,922**
Percent Change from 2019				
Commercial Harbor Craft	NA	14%	16%	18%
Construction and Mining	NA	4%	2%	-6%
Industrial	NA	41%	14%	57%
Lawn and Garden Equipment	NA	-97%	-99%	-100%
Light Commercial Equipment	NA	-88%	-92%	-94%
Portable Equipment	NA	42%	59%	98%
Railyard Operations	NA	-100%	-100%	-100%
Recreational Equipment	NA	-31%	-29%	-29%
Transport Refrigeration Units	NA	11%	18%	30%
Total	**NA**	**-58%**	**-59%**	**-56%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

AGRICULTURE

As an incorporated city, American Canyon does not have a substantial presence of agricultural activity within its jurisdiction. Agriculture accounts for less than one percent of the jurisdiction's emissions. Agricultural acreage forecasts were not available from the City; thus it was assumed that any agricultural lands within the city would remain unchanged through 2045. Table 25 shows that the limited agricultural activities in the city (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline between 2019 and 2045 by 10 percent. CARB's OFFROAD2021 model forecasts a reduction across agricultural offroad emissions countywide due to an anticipated decline in the amount of equipment operating and State regulations to prohibit emissions from small engines. The majority of these reductions are from agricultural off-road equipment. Fertilizer and livestock-related emissions, in proportion to agricultural acreage, would remain the same through 2045.

Table 25 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Agricultural Offroad Equipment	84	76	73	69
Fertilizer Application	38	38	38	38
Livestock	32	32	32	32
Total	**154**	**147**	**144**	**139**
Percent Change from 2019				
Agricultural Offroad Equipment	NA	-9%	-12%	-18%

Fertilizer Application	NA	0	0	0
Livestock	NA	0	0	0
Total	**NA**	-5%	-7%	-10%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

SOLID WASTE

Waste Generation

American Canyon generated approximately 68,259 tons of solid waste in 2019 which generated 25,938 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both American Canyon's waste disposal and related emissions are anticipated to increase by 16 percent from 2019 to 2045, commensurate with population growth.

Table 26 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Annual waste tonnage delivered from jurisdiction (tons)	**68,529**	**87,567**	**84,930**	**79,655**
Solid Waste Generation Emissions ($MTCO_2e$/year)	25,938	33,145	32,146	30,150
Percent Change from 2019				
Annual waste tonnage delivered from jurisdiction	NA	28%	24%	16%
Solid Waste Generation Emissions	NA	28%	24%	16%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

Waste-in-Place

American Canyon does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

American Canyon is anticipated to increase its usage of imported water by 21 percent by 2045 from 2019 levels, commensurate with population growth trends. However, emissions from imported water are expected to be reduced completely by 2045 with the statewide implementation zero-carbon electricity under SB100 which would also apply to imported water conveyance and delivery. Emissions associated with locally sourced water, including groundwater pumping, are captured in the building energy sector.

Table 27 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Imported Water Usage (MG/year)	661	862	842	803
Imported Water Emissions ($MTCO_2e$/year)	983	622	129	0
Percent Change from 2019				
Imported Water Usage	NA	30%	27%	21%

Imported Water Emissions	NA	-37%	-87%	-100%

Notes: MG = million gallons; BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

WASTEWATER

American Canyon's emissions from wastewater are anticipated to increase by proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within American Canyon.

Table 28 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	2035	2045
WWTP Process Emissions	7,822	10,202	9,968	9,499
Percent Change from 2019	NA	30%	27%	21%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

7.3 CALISTOGA

Emissions Summary

Table 29 shows a summary of Calistoga's share of the regional emissions inventory and legislative-adjusted forecast. Calistoga's emissions are anticipated to decline by 72 percent between 2019 and 2045. Much of this reduction is due to reductions in the on-road transportation sector. As shown in Table 29, based on the modeling conducted, on-road transportation emissions would rapidly decline from 41 percent of the city's emissions to only 20 percent of the city's emissions. With decline in on-road transportation emissions, building energy and solid waste would make up 52 percent of the city's emissions by 2045. Building energy use emissions reflect continued natural gas use in buildings under the legislative-adjusted BAU scenario. Solid waste emissions are scaled directly with population growth in the city, which is estimated to increase by 22 percent over 2019 levels by 2045. Off-road and wastewater emissions are expected to account for 9 percent and 17 percent of Calistoga's emissions in 2045, respectively. As an urban area, there are minimal emissions from agriculture in Calistoga. No imported water-related emissions would be generated by 2045 due to the zero-carbon electricity requirements under SB100.

Table 29 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Calistoga ($MTCO_2e$/year)

Sector	2019	2030	2030	2045
Agriculture	278	260	256	247
Building Energy	14,450	8,775	5,911	1,178
Imported Water	229	120	25	-
Off-Road Equipment	2,702	1,141	1,068	1,068
On-Road Transportation	17,184	9,764	6,525	2,344
Solid Waste	4,981	5,130	5,083	4,988
Wastewater	1,992	2,159	2,091	1,954

Sector	2019	2030	2030	2045
Total	**41,818**	**27,349**	**20,958**	**11,778**
Percent of Total				
Agriculture	1%	1%	1%	2%
Building Energy	35%	32%	28%	10%
Imported Water	1%	0%	0%	0%
Off-Road Equipment	6%	4%	5%	9%
On-Road Transportation	41%	36%	31%	20%
Solid Waste	12%	19%	24%	42%
Wastewater	5%	8%	10%	17%
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-7%	-8%	-11%
Building Energy	NA	-39%	-59%	-92%
Imported Water	NA	-48%	-89%	-100%
Off-Road Equipment	NA	-58%	-60%	-60%
On-Road Transportation	NA	-43%	-62%	-86%
Solid Waste	NA	3%	2%	0%
Wastewater	NA	8%	5%	-2%
Total	**NA**	**-35%**	**-50%**	**-72%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, BAAQMD's Zero NOx appliance rule, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, Calistoga's building energy-related emissions are anticipated to decrease by four percent from 2019 to 2030, and further by 66 percent below 2019 levels by 2045. With the implementation of SB100, by 2045, all building energy emissions would be generated from the combustion of natural gas.

Table 30 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Calistoga ($MTCO_2e$/ year)

Energy Type	2019	2030	2035	2045
Electricity	2,340	738	737	-
Natural Gas	12,110	8,037	5,175	1,178
Total	**14,450**	**8,775**	**5,911**	**1,178**
Percent Change from 2019				
Electricity	NA	30%	30%	25%
Natural Gas	NA	-34%	-57%	-90%
Total	**NA**	**-4%**	**-27%**	**-66%**

Notes: Totals may not sum due to rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

ON-ROAD TRANSPORTATION

Calistoga's on-road transportation emissions are anticipated to decrease by 86 percent between 2019 and 2045, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, ACCII, ACF, and other adopted regulations as discussed in Section 3, which increase the percentage of zero-emission vehicles on the road and improve fuel economy, reducing average fleetwide GHG emissions per mile.

Table 31 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Trip Type	2019	2030	2035	2045
Commercial Trips	6,325	3,468	2,458	1,150
Non-Commercial Trips	10,859	6,296	4,067	1,193
Total	**17,184**	**9,764**	**6,525**	**2,344**
Percent Change from 2019				
Commercial Trips	NA	-45%	-61%	-82%
Non-Commercial Trips	NA	-42%	-63%	-89%
Total	**NA**	**-43%**	**-62%**	**-86%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Based on the scaling factors used to scale countywide off-road emissions to each jurisdiction (e.g., population, employment) that best match each off-road equipment category (refer to Table 12), and with emissions reduction due to State regulations, Calistoga's off-road equipment emissions are anticipated to decrease by 63 percent between 2019 and 2045. In particular, the greatest reductions would occur from the lawn and garden and light commercial equipment sectors which are anticipated to see emissions decline by over 1,700 $MTCO_2e$ by 2030 and through 2045 compared to 2019 levels. This accounts for more than half of Calistoga's off-road emissions in 2019 and nearly all of the reductions through 2045. Additionally, emissions from the railyard operations sector are expected to decline to zero.

CARB anticipates a statewide trend toward increased electric adoption in lawn and garden and light commercial equipment due to State regulations and advances in battery technology supported with lawn and garden equipment exchange programs (CARB 2020; BAAQMD 2024). While the BAAQMD exchange programs are currently closed, the lasting effect of these programs and current marketplace offerings are expected to influence future overall consumer choices in purchasing electric equipment for these two equipment categories.

Table 32 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Equipment Category	2019	2030	2035	2045
Commercial Harbor Craft	4	4	4	3
Construction and Mining	423	364	355	321
Industrial	158	190	143	168

Equipment Category	2019	2030	2035	2045
Lawn and Garden Equipment	1,100	23	12	1
Light Commercial Equipment	700	69	43	29
Portable Equipment	291	352	366	389
Railyard Operations	11	-	-	-
Recreational Equipment	103	58	60	63
Transport Refrigeration Units	88	81	85	93
Total	2,880	**1,141**	**1,068**	**1,068**
Percent Change from 2019				
Commercial Harbor Craft	NA	-3%	-8%	-20%
Construction and Mining	NA	-14%	-16%	-24%
Industrial	NA	20%	-10%	6%
Lawn and Garden Equipment	NA	-98%	-99%	-100%
Light Commercial Equipment	NA	-90%	-94%	-96%
Portable Equipment	NA	21%	26%	34%
Railyard Operations	NA	-100%	-100%	-100%
Recreational Equipment	NA	-44%	-41%	-39%
Transport Refrigeration Units	NA	-8%	-3%	5%
Total	**NA**	**-60%**	**-63%**	**-63%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

AGRICULTURE

As an incorporated city, Calistoga does not have a substantial presence of agricultural activity within its jurisdiction. Agriculture accounts for less than one percent of the jurisdiction's emissions. Agricultural acreage forecasts were not available from the City; thus it was assumed that any agricultural lands within the city would remain unchanged through 2045. Table 33 shows that emissions due to agricultural activities in the city (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline between 2019 and 2045 by 10 percent. CARB's OFFROAD2021 model forecasts a reduction across agricultural offroad emissions countywide due to an anticipated decline in the amount of equipment operating and State regulations to prohibit emissions from small engines. The majority of these reductions are from agricultural off-road equipment. Fertilizer and livestock-related emissions, in proportion to agricultural acreage, would remain the same through 2045.

Table 33 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Agricultural Offroad Equipment	148	135	130	122
Fertilizer Application	68	68	68	68
Livestock	57	57	57	57
Total	**274**	**260**	**256**	**247**

Source	2019	2030	2035	2045
Percent Change from 2019				
Agricultural Offroad Equipment	NA	-9%	-12%	-18%
Fertilizer Application	NA	0	0	0
Livestock	NA	0	0	0
Total	**NA**	**-5%**	**-7%**	**-10%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

SOLID WASTE

Waste Generation

Calistoga generated approximately 12,513 tons of solid waste in 2019 which generated 4,981 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both Calistoga's waste disposal and related emissions are anticipated to increase by three percent from 2019 to 2030 and return to 2019 levels by 2045, commensurate with anticipated population growth trends.

Table 34 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga

Source	2019	2030	2035	2045
Annual waste tonnage delivered from jurisdiction (tons)	12,513	12,887	12,768	12,530
Solid Waste Generation Emissions ($MTCO_2e$/year)	4,981	5,130	5,083	4,988
Percent Change from 2019				
Annual waste tonnage delivered from jurisdiction	NA	3%	2%	0%
Solid Waste Generation Emissions	NA	3%	2%	0%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

Waste-in-Place

Calistoga does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

Calistoga is anticipated to increase its usage of imported water by 21 percent by 2045 from 2019 levels, commensurate with population growth trends. However, emissions from imported water are expected to be reduced completely by 2045 with the statewide implementation zero-carbon electricity under SB100 which would also apply to imported water conveyance and delivery. Emissions associated with locally sourced water, including groundwater pumping, are captured in the building energy sector.

Table 35 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Imported Water Usage (MG/year)	154	167	162	151
Imported Water Emissions ($MTCO_2e$/year)	229	120	25	0
Percent Change from 2019				
Imported Water Usage	NA	8%	5%	-2%
Imported Water Emissions	NA	-48%	-89%	-100%

Notes: MG = million gallons; BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

WASTEWATER

Calistoga's emissions from wastewater are anticipated to increase proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within Calistoga.

Table 36 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	2035	2045
WWTP Process Emissions	1,992	2,159	2,091	1,954
Percent Change from 2019	NA	8%	5%	-2%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

7.4 CITY OF NAPA

Emissions Summary

Table 37 shows a summary of the City of Napa's share of the regional emissions inventory and legislative-adjusted forecast. City of Napa's emissions are anticipated to decline by 67 percent between 2019 and 2045. Much of this reduction is due to reductions in the on-road transportation sector. As shown in Table 37, based on the modeling conducted, on-road transportation emissions would rapidly decline from 48 percent of the city's emissions to only 22 percent of the city's emissions. With decline in on-road transportation emissions, building energy and solid waste would make up 39 percent of the city's emissions by 2045. Building energy use emissions reflect continued natural gas use in buildings under the legislative-adjusted BAU scenario. Solid waste emissions are scaled directly with population growth in the city, which is estimated to increase by 16 percent over 2019 levels by 2045. Off-road and wastewater emissions are expected to account for 10 percent and 11 percent of the City of Napa's emissions in 2045, respectively. As an urban area, there are minimal emissions from agriculture in the City of Napa. No imported water-related emissions would be generated by 2045 due to the zero-carbon electricity requirements under SB100.

Table 37 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Napa ($MTCO_2e$/year)

Sector	2019	2030	2030	2045
Agriculture	1,097	1,047	1,020	923

Sector	2019	2030	2030	2045
Building Energy	125,346	75,559	59,238	32,444
Imported Water	4,383	2,372	514	-
Off-Road Equipment	44,614	17,813	18,138	22,242
On-Road Transportation	280,533	170,930	109,920	37,932
Solid Waste	34,236	38,283	38,557	41,963
Wastewater	29,542	32,945	33,530	36,197
Total	**519,750**	**338,949**	**260,917**	**171,703**
Percent of Total				
Agriculture	0%	0%	0%	1%
Building Energy	24%	22%	23%	19%
Imported Water	1%	1%	0%	0%
Off-Road Equipment	9%	5%	7%	13%
On-Road Transportation	54%	50%	42%	22%
Solid Waste	7%	11%	15%	24%
Wastewater	6%	10%	13%	21%
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-5%	-7%	-16%
Building Energy	NA	-40%	-53%	-74%
Imported Water	NA	-46%	-88%	-100%
Off-Road Equipment	NA	-60%	-59%	-50%
On-Road Transportation	NA	-39%	-61%	-86%
Solid Waste	NA	12%	13%	23%
Wastewater	NA	12%	13%	23%
Total	**NA**	**-35%**	**-50%**	**-67%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, BAAQMD's Zero NOx appliance rule, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, the City of Napa's building energy-related emissions are anticipated to decrease by three percent from 2019 to 2030 and by 16 percent below 2019 levels by 2045. With the implementation of SB100, by 2045, all building energy emissions would be generated from the combustion of natural gas.

Table 38 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Napa ($MTCO_2e$/ year)

Energy Type	2019	2030	2035	2045
Electricity	26,583	9,708	10,203	-
Natural Gas	98,763	65,851	49,035	32,444

Energy Type	2019	2030	2035	2045
Total	**125,346**	**75,559**	**59,238**	**32,444**
Percent Change from 2019				
Electricity	NA	30%	37.12%	50.94%
Natural Gas	NA	-33%	-50%	-67%
Total	**NA**	**-3%**	**-13%**	**-16%**

Notes: Totals may not sum due to rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

ON-ROAD TRANSPORTATION

The City of Napa's on-road transportation emissions are anticipated to decrease by 86 percent between 2019 and 2045, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, ACCII, ACF, and other adopted regulations as discussed in Section 3, which increase the percentage of zero-emission vehicles on the road and improve fuel economy, reducing average fleetwide GHG emissions per mile.

Table 39 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Trip Type	2019	2030	2035	2045
Commercial Trips	103,259	60,708	41,401	18,615
Non-Commercial Trips	177,275	110,222	68,519	19,317
Total	**280,533**	**170,930**	**109,920**	**37,932**
Percent Change from 2019				
Commercial Trips	NA	-41%	-60%	-82%
Non-Commercial Trips	NA	-38%	-61%	-89%
Total	**NA**	**-39%**	**-61%**	**-86%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Based on the scaling factors used to scale countywide off-road emissions to each jurisdiction (e.g., population, employment) that best match each off-road equipment category (refer to Table 12), and with emissions reduction due to State regulations, the City of Napa's off-road equipment emissions are anticipated to decrease by 62 percent between 2019 and 2035, and then slightly increase by 9 percent through 2045 compared to 2019 levels, resulting in an overall decline by 53 percent between 2019 and 2045. In particular, the greatest reductions would occur from the lawn and garden and light commercial equipment sectors which are anticipated to see emissions decline by over 25,000 $MTCO_2e$ by 2030 and through 2045 compared to 2019 levels. This accounts for more than half of the City of Napa's off-road emissions in 2019 and nearly all of the reductions through 2045. Additionally, emissions from the railyard operations sector are expected to decline to zero.

CARB anticipates a statewide trend toward increased electric adoption in lawn and garden and light commercial equipment due to State regulations and advances in battery technology supported with lawn and garden equipment exchange programs (CARB 2020; BAAQMD 2024). While the BAAQMD exchange programs are currently closed, the

lasting effect of these programs and current marketplace offerings are expected to influence future overall consumer choices in purchasing electric equipment for these two equipment categories.

Table 40 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Equipment Category	2019	2030	2035	2045
Commercial Harbor Craft	74	67	70	77
Construction and Mining	6,768	5,995	6,137	6,416
Industrial	2,884	3,236	2,709	3,988
Lawn and Garden Equipment	16,317	-	-	-
Light Commercial Equipment	12,758	1,178	809	687
Portable Equipment	5,300	6,002	6,935	9,221
Railyard Operations	201	-	-	-
Recreational Equipment	1,526	-	-	-
Transport Refrigeration Units	1,410	1,335	1,478	1,855
Total	**47,238**	**17,813**	**18,138**	**22,242**
Percent Change from 2019				
Commercial Harbor Craft	NA	-9%	-5%	4%
Construction and Mining	NA	-11%	-9%	-5%
Industrial	NA	12%	-6%	38%
Lawn and Garden Equipment	NA	-100%	-100%	-100%
Light Commercial Equipment	NA	-91%	-94%	-95%
Portable Equipment	NA	13%	31%	74%
Railyard Operations	NA	-100%	-100%	-100%
Recreational Equipment	NA	-100%	-100%	-100%
Transport Refrigeration Units	NA	-5%	5%	32%
Total	**NA**	**-62%**	**-62%**	**-53%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

AGRICULTURE

As an incorporated city, Napa does not have a substantial presence of agricultural activity within its jurisdiction. Agriculture accounts for less than one percent of the jurisdiction's emissions. Table 41 shows that emissions due to the limited agricultural activities in the city (e.g., agricultural offroad equipment, irrigation pumps, use of fertilizers, and limited livestock presence) would decline between 2019 and 2045 by 15 percent. The city forecasts a 10 percent reduction in cropland acreage between 2019 and 2045. Forecasts of fertilizer and irrigation pump use are directly proportional to cropland forecasts. (Napa is one of few cities in the region where irrigation pumps operate.) CARB's OFFROAD2021 model forecasts a reduction across agricultural offroad emissions countywide due to an anticipated decline in the amount of equipment operating and State regulations to prohibit emissions from small engines. Additionally, although some livestock emissions were allocated to the city in the 2019 inventory, the city did not report any rangeland acres. Thus, it was assumed that livestock emissions would remain unchanged through 2045.

Table 41 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Agricultural Offroad	346	312	294	246
Fertilizer Application	159	158	155	143
Irrigation Pumps	448	444	437	401
Livestock	133	133	133	133
Total	1,086	**1,047**	**1,020**	**923**
Percent Change from 2019				
Agricultural Offroad	NA	-10%	-15%	-29%
Fertilizer Application	NA	-1%	-2%	-10%
Irrigation Pumps	NA	-1%	-2%	-10%
Livestock	NA	0%	0%	0%
Total	**NA**	**-4%**	**-6%**	**-15%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

SOLID WASTE

Waste Generation

The City of Napa generated approximately 50,755 tons of solid waste in 2019 which generated 34,236 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both Napa's waste disposal and related emissions are anticipated to increase by 23 percent from 2019 to 2045, commensurate with population growth.

Table 42 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Annual waste tonnage delivered from jurisdiction (tons)	50,755	56,756	57,162	62,212
Solid Waste Generation Emissions ($MTCO_2e$/year)	34,236	38,283	38,557	41,963
Percent Change from 2019				
Annual waste tonnage delivered from jurisdiction	NA	12%	13%	23%
Solid Waste Generation Emissions	NA	12%	13%	23%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

Waste-in-Place

Napa does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

The City of Napa is anticipated to increase its usage of imported water by 23 percent by 2045 from 2019 levels, commensurate with population growth trends. However, emissions from imported water are expected to be reduced completely by 2045 with the statewide implementation zero-carbon electricity under SB100 which would also apply to imported water conveyance and delivery. Emissions associated with locally sourced water, including groundwater pumping, are captured in the building energy sector.

Table 43 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Imported Water Usage (MG/year)	2,948	3,288	3,346	3,612
Imported Water Emissions ($MTCO_2e$/year)	4,383	2,372	514	0
Percent Change from 2019				
Imported Water Usage	NA	12%	13%	23%
Imported Water Emissions	NA	-46%	-88%	-100%

Notes: MG = million gallons; BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

WASTEWATER

Napa's emissions from wastewater are anticipated to increase proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within Napa.

Table 44 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	2035	2045
WWTP Process Emissions	29,542	32,945	33,530	36,197
Percent Change from 2019	NA	12%	13%	23%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

7.5 ST. HELENA

Emissions Summary

Table 45 shows a summary of the City of St. Helena's share of the regional emissions inventory and legislative-adjusted forecast. St. Helena's emissions are anticipated to decline by 68 percent between 2019 and 2045. Much of this reduction is due to reductions in the on-road transportation sector. As shown in Table 45, based on the modeling conducted, on-road transportation emissions would rapidly decline from 48 percent of the city's emissions to 19 percent of the city's emissions. With decline in on-road transportation emissions, building energy and solid waste would make up 58 percent of the city's emissions by 2045. Building energy use emissions reflect continued natural gas use in buildings under the legislative-adjusted BAU scenario. Solid waste emissions are scaled directly with population growth in the city, which is estimated to increase by 12 percent over 2019 levels by 2045. Off-road and

wastewater emissions are expected to account for 7 percent and 15 percent of the St. Helena's emissions in 2045, respectively. As an urban area, there are minimal emissions from agriculture in the St. Helena. No imported water-related emissions would be generated by 2045 due to the zero-carbon electricity requirements under SB100.

Table 45 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: St. Helena ($MTCO_2e$/year)

Sector	2019	2030	2030	2045
Agriculture	4,446	3,967	3,870	3,763
Building Energy	16,766	8,985	6,606	2,192
Imported Water	285	145	31	-
Off-Road Equipment	4,301	1,799	1,775	2,075
On-Road Transportation	30,661	19,973	13,336	4,785
Solid Waste	5,676	6,199	6,255	6,334
Wastewater	2,270	2,389	2,400	2,447
Total	**64,405**	**43,457**	**34,272**	**21,596**
Percent of Total				
Agriculture	7%	9%	11%	17%
Building Energy	26%	21%	19%	10%
Imported Water	0%	0%	0%	0%
Off-Road Equipment	7%	4%	5%	10%
On-Road Transportation	48%	46%	39%	22%
Solid Waste	9%	14%	18%	29%
Wastewater	4%	5%	7%	11%
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-11%	-13%	-15%
Building Energy	NA	-46%	-61%	-87%
Imported Water	NA	-49%	-89%	-100%
Off-Road Equipment	NA	-58%	-59%	-52%
On-Road Transportation	NA	-35%	-57%	-84%
Solid Waste	NA	9%	10%	12%
Wastewater	NA	5%	6%	8%
Total	**NA**	**-33%**	**-47%**	**-66%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, BAAQMD's Zero NOx appliance rule, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, St. Helena's building energy-related emissions are anticipated to decrease by 18 percent from 2019 to 2030, and further by 49 percent below 2019 levels by 2045. With the implementation of SB100, by 2045, all building energy emissions

would be generated from the combustion of natural gas. Notably, St. Helena also has the highest participation rate in the county in MCE's Deep Green option at 24 percent, which translates to low existing electricity emissions.

Table 46 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: St. Helena ($MTCO_2e$/ year)

Energy Type	2019	2030	2035	2045
Electricity	3,556	1,160	1,204	-
Natural Gas	13,209	7,825	5,401	2,192
Total	**16,766**	**8,985**	**6,606**	**2,192**
Percent Change from 2019				
Electricity	NA	22%	26.97%	34.37%
Natural Gas	NA	-41%	-59%	-83%
Total	**NA**	**-18%**	**-32%**	**-49%**

Notes: Totals may not sum due to rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

ON-ROAD TRANSPORTATION

St. Helena's on-road transportation emissions are anticipated to decrease by 86 percent between 2019 and 2045, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, ACCII, ACF, and other adopted regulations as discussed in Section 3, which increase the percentage of zero-emission vehicles on the road and improve fuel economy, reducing average fleetwide GHG emissions per mile.

Table 47 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Trip Type	2019	2030	2035	2045
Commercial Trips	11,286	7,094	5,023	2,348
Non-Commercial Trips	19,376	12,880	8,313	2,437
Total	**30,661**	**19,973**	**13,336**	**4,785**
Percent Change from 2019				
Commercial Trips	NA	-37%	-55%	-79%
Non-Commercial Trips	NA	-34%	-57%	-87%
Total	**NA**	**-35%**	**-57%**	**-84%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Based on the scaling factors used to scale countywide off-road emissions to each jurisdiction (e.g., population, employment) that best match each off-road equipment category (refer to Table 12), and with emissions reduction due to State regulations, St. Helena's off-road equipment emissions are anticipated to decrease by 61 percent between 2019 and 2035, and then slightly increase by 6 percent in 2045 compared to 2019 levels resulting in an overall decline by 54 percent from 2019 through 2045. In particular, the greatest reductions would occur from the

lawn and garden and light commercial equipment sectors which are anticipated to see emissions decline by over 2,500 $MTCO_2e$ by 2030 and through 2045 compared to 2019 levels. This accounts for more than half of St. Helena's off-road emissions in 2019 and over 90 percent of the reductions through 2045. Additionally, emissions from the railyard operations sector are expected to decline to zero.

CARB anticipates a statewide trend toward increased electric adoption in lawn and garden and light commercial equipment due to State regulations and advances in battery technology supported with lawn and garden equipment exchange programs (CARB 2020; BAAQMD 2024). While the BAAQMD exchange programs are currently closed, the lasting effect of these programs and current marketplace offerings are expected to influence future overall consumer choices in purchasing electric equipment for these two equipment categories.

Table 48 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Equipment Category	2019	2030	2035	2045
Commercial Harbor Craft	8	7	7	7
Construction and Mining	615	514	519	513
Industrial	325	331	268	380
Lawn and Garden Equipment	1,254	28	15	1
Light Commercial Equipment	1,436	121	80	65
Portable Equipment	596	614	686	879
Railyard Operations	23	-	-	-
Recreational Equipment	117	70	74	80
Transport Refrigeration Units	128	114	125	148
Total	**4,502**	**1,799**	**1,775**	**2,075**
Percent Change from 2019				
Commercial Harbor Craft	NA	-17%	-16%	-12%
Construction and Mining	NA	-16%	-16%	-17%
Industrial	NA	2%	-17%	17%
Lawn and Garden Equipment	NA	-98%	-99%	-100%
Light Commercial Equipment	NA	-92%	-94%	-95%
Portable Equipment	NA	3%	15%	47%
Railyard Operations	NA	-100%	-100%	-100%
Recreational Equipment	NA	-41%	-37%	-32%
Transport Refrigeration Units	NA	-11%	-2%	16%
Total	**NA**	**-60%**	**-61%**	**-54%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

AGRICULTURE

Although it is an incorporated city, 46 percent of St. Helena's General Plan area is made up by agricultural land. As such, it has the most agricultural emissions out of all the incorporated jurisdictions, with agriculture accounting for seven percent of its emissions in 2019. Through 2045, with the reductions in other sectors, the proportion of the city's emission that is from agriculture would increase to account for up to 17 percent of the city's emissions.

Table 49 shows that emissions due to agricultural activities in the city (e.g., agricultural offroad equipment, irrigation pumps, use of fertilizers, and limited livestock presence) would decline between 2019 and 2045 by 15 percent. The city forecasts a nine percent reduction in cropland acreage between 2019 and 2045. Forecasts of fertilizer and irrigation pump use are directly proportional to cropland forecasts. St. Helena is one of few cities in the region where irrigation pumps operate and irrigation pump account for the majority of the city's agricultural emissions, nearly 60 percent in 2019.

With respect to other sources, CARB's OFFROAD2021 model forecasts a reduction across agricultural offroad emissions countywide due to anticipated decline in the amount of equipment operating and State regulations to prohibit emissions from small engines. Additionally, although some livestock emissions were allocated to the city in the 2019 inventory, the city did not report any rangeland acres. Thus, it was assumed that livestock emissions would remain unchanged through 2045.

Table 49 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Agricultural Offroad	971	803	705	599
Fertilizer Application	447	406	406	406
Irrigation Pumps	2,623	2,384	2,384	2,384
Livestock	373	373	373	373
Total	4,415	**3,967**	**3,870**	**3,763**
Percent Change from 2019				
Agricultural Offroad	NA	-17%	-27%	-38%
Fertilizer Application	NA	-9%	-9%	-9%
Irrigation Pumps	NA	-9%	-9%	-9%
Livestock	NA	0%	0%	0%
Total	**NA**	**-10%**	**-12%**	**-15%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

SOLID WASTE

Waste Generation

St. Helena generated approximately 14,258 tons of solid waste in 2019 which generated 5,676 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both St. Helena's waste disposal and related emissions are anticipated to increase by 12 percent from 2019 to 2045, commensurate with population growth.

Table 50 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Annual waste tonnage delivered from jurisdiction (tons)	14,258	15,571	15,711	15,910
Solid Waste Generation Emissions ($MTCO_2e$/year)	5,676	6,199	6,255	6,334
Percent Change from 2019				
Annual waste tonnage delivered from jurisdiction	NA	9%	10%	12%
Solid Waste Generation Emissions	NA	9%	10%	12%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

Waste-in-Place

St. Helena does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

St. Helena is anticipated to increase its usage of imported water by eight percent by 2045 from 2019 levels, commensurate with population growth trends. However, emissions from imported water are expected to be reduced completely by 2045 with the statewide implementation zero-carbon electricity under SB100 which would also apply to imported water conveyance and delivery. Emissions associated with locally sourced water, including groundwater pumping, are captured in the building energy sector.

Table 51 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Imported Water Usage (MG/year)	191	201	202	206
Imported Water Emissions ($MTCO_2e$/year)	285	145	31	0
Percent Change from 2019				
Imported Water Usage	NA	5%	6%	8%
Imported Water Emissions	NA	-49%	-89%	-100%

Notes: MG = million gallons; BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

WASTEWATER

St. Helena's emissions from wastewater are anticipated to increase by proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within St. Helena.

Table 52 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	2035	2045
WWTP Process Emissions	2,270	2,389	2,400	2,447
Percent Change from 2019	NA	5%	6%	8%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

7.6 YOUNTVILLE

Emissions Summary

Table 53 shows a summary of the Town of Yountville's emissions inventory and legislative-adjusted forecast. Yountville's emissions are anticipated to decline by 68 percent between 2019 and 2045. Much of this reduction is due to reductions in the on-road transportation sector. As shown in Table 53, based on the modeling conducted, on-road transportation emissions would rapidly decline from 48 percent of the town's emissions to 19 percent of the town's emissions. With decline in on-road transportation emissions, building energy and solid waste would make up 58 percent of the city's emissions by 2045. Building energy use emissions reflect continued natural gas use in buildings under the legislative-adjusted BAU scenario. Solid waste emissions are scaled directly with population growth in the town, which is estimated to increase by 27 percent over 2019 levels by 2045. Off-road and wastewater emissions are expected to account for 7 percent and 15 percent of Yountville's emissions in 2045, respectively. As an urbanized area, there are minimal emissions from agriculture in Yountville. No imported water-related emissions would be generated by 2045 due to the zero-carbon electricity requirements under SB100.

Table 53 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Yountville ($MTCO_2e$/year)

Sector	2019	2030	2030	2045
Agriculture	77	62	56	50
Building Energy	8,532	4,887	3,836	1,461
Imported Water	65	37	8	-
Off-Road Equipment	1,236	512	506	557
On-Road Transportation	12,404	6,582	4,392	1,575
Solid Waste	2,601	3,153	3,213	3,293
Wastewater	1,040	1,237	1,251	1,268
Total	**25,955**	**16,470**	**13,262**	**8,204**
Percent of Total				
Agriculture	0%	0%	0%	1%
Building Energy	33%	30%	29%	18%
Imported Water	0%	0%	0%	0%
Off-Road Equipment	5%	3%	4%	7%
On-Road Transportation	48%	40%	33%	19%
Solid Waste	10%	19%	24%	40%

Sector	2019	2030	2030	2045
Wastewater	4%	8%	9%	15%
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-19%	-27%	-35%
Building Energy	NA	-43%	-55%	-83%
Imported Water	NA	-43%	-88%	-100%
Off-Road Equipment	NA	-59%	-59%	-55%
On-Road Transportation	NA	-47%	-65%	-87%
Solid Waste	NA	21%	24%	27%
Wastewater	NA	19%	20%	22%
Total	**NA**	**-37%**	**-49%**	**-68%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, BAAQMD's Zero NOx appliance rule, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, Yountville building energy-related emissions are anticipated to decrease by two percent from 2019 to 2030, and further by 34 percent below 2019 levels by 2045. With the implementation of SB100, by 2045, all building energy emissions would be generated from the combustion of natural gas. Notably, Yountville has the second highest participation rate in the county in MCE's Deep Green option at 23 percent, which translates to low existing electricity emissions. The next highest participating jurisdiction in Deep Green is the City of Napa at four percent.

Table 54 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Yountville ($MTCO_2e$/ year)

Energy Type	2019	2030	2035	2045
Electricity	2,749	850	874	-
Natural Gas	5,783	4,037	2,962	1,461
Total	**8,532**	**4,887**	**3,836**	**1,461**
Percent Change from 2019				
Electricity	NA	32%	40%	40%
Natural Gas	NA	-30%	-49%	-75%
Total	**NA**	**2%**	**-13%**	**-34%**

Notes: Totals may not sum due to rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

ON-ROAD TRANSPORTATION

Yountville's on-road transportation emissions are anticipated to decrease by 87 percent between 2019 and 2045, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, ACCII, ACF, and other adopted regulations as discussed in Section 3, which increase the percentage of zero-emission vehicles on the road and improve fuel economy, reducing average fleetwide GHG emissions per mile.

Table 55 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Trip Type	2019	2030	2035	2045
Commercial Trips	4,566	2,338	1,654	773
Non-Commercial Trips	7,838	4,244	2,737	802
Total	12,404	6,582	4,392	1,575
Percent Change from 2019				
Commercial Trips	NA	-49%	-64%	-83%
Non-Commercial Trips	NA	-46%	-65%	-90%
Total	**NA**	**-47%**	**-65%**	**-87%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Based on the scaling factors used to scale countywide off-road emissions to each jurisdiction (e.g., population, employment) that best match each off-road equipment category (refer to Table 12), and with emissions reduction due to State regulations, Yountville off-road equipment emissions are anticipated to decrease by 62 percent between 2019 and 2035, with a minor 4 percent increase in 2045 compared to 2019 levels, resulting in an overall decline by 58 percent from 2019 through 2045. In particular, the greatest reductions would occur from the lawn and garden and light commercial equipment sectors which are anticipated to see emissions decline by over 800 $MTCO_2e$ by 2030 and through 2045 compared to 2019 levels. This accounts for more than half of St. Helena's off-road emissions in 2019 and nearly all of the reductions through 2045. Additionally, emissions from the railyard operations sector are expected to decline to zero.

CARB anticipates a statewide trend toward increased electric adoption in lawn and garden and light commercial equipment due to State regulations and advances in battery technology supported with lawn and garden equipment exchange programs (CARB 2020; BAAQMD 2024). While the BAAQMD exchange programs are currently closed, the lasting effect of these programs and current marketplace offerings are expected to influence future overall consumer choices in purchasing electric equipment for these two equipment categories.

Table 56 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Equipment Category	2019	2030	2035	2045
Commercial Harbor Craft	2	1	1	1
Construction and Mining	202	191	194	190
Industrial	62	71	57	77
Lawn and Garden Equipment	575	14	8	1
Light Commercial Equipment	274	26	17	13

Equipment Category	2019	2030	2035	2045
Portable Equipment	114	131	145	178
Railyard Operations	4	-	-	-
Recreational Equipment	54	35	38	42
Transport Refrigeration Units	42	42	47	55
Total	**1,328**	**512**	**506**	**557**
Percent Change from 2019				
Commercial Harbor Craft	NA	-7%	-7%	-7%
Construction and Mining	NA	-6%	-4%	-6%
Industrial	NA	14%	-9%	24%
Lawn and Garden Equipment	NA	-97%	-99%	-100%
Light Commercial Equipment	NA	-91%	-94%	-95%
Portable Equipment	NA	15%	27%	56%
Railyard Operations	NA	-100%	-100%	-100%
Recreational Equipment	NA	-34%	-29%	-23%
Transport Refrigeration Units	NA	1%	11%	31%
Total	**NA**	**-61%**	**-62%**	**-58%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

AGRICULTURE

As an incorporated town, Yountville does not have a substantial presence of agricultural activity within its jurisdiction. Agriculture accounts for less than one percent of the jurisdiction's emissions. Based on data provided by the town, agricultural acres in Yountville are anticipated to decline by 17 percent from 2019 levels by 2030 and through 2045.

With this change, Table 57 shows that emissions due to the agricultural activities in the town (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline between 2019 and 2045 by 33 percent. CARB's OFFROAD2021 model forecasts a reduction across agricultural offroad emissions countywide due to an anticipated decline in the amount of equipment operating. The majority of these reductions are from agricultural off-road equipment and State regulations prohibiting emissions from small engines. Fertilizer emissions would decline in proportion to agricultural acres. Additionally, although some livestock emissions were allocated to the town in the 2019 inventory, the Town did not report any rangeland acres.

Thus, it was assumed that livestock emissions would remain unchanged through 2045.

Table 57 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Agricultural Offroad Equipment	41	31	24	19
Fertilizer Application	19	16	16	16
Livestock	16	16	16	16
Total	**75**	**62**	**56**	**50**

Source	2019	2030	2035	2045
Percent Change from 2019				
Agricultural Offroad Equipment	NA	-25%	-40%	-54%
Fertilizer Application	NA	-17%	-17%	-17%
Livestock	NA	0%	0%	0%
Total	**NA**	**-18%**	**-26%**	**-33%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

SOLID WASTE

Waste Generation

Yountville generated approximately 6,535 tons of solid waste in 2019 which generated 2,601 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both Yountville's waste disposal and related emissions are anticipated to increase by 27 percent from 2019 to 2045, commensurate with population growth.

Table 58 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Annual waste tonnage delivered from jurisdiction (tons)	6,535	7,920	8,072	8,271
Solid Waste Generation Emissions ($MTCO_2e$/year)	2,601	3,153	3,213	3,293
Percent Change from 2019				
Annual waste tonnage delivered from jurisdiction	NA	21%	24%	27%
Solid Waste Generation Emissions	NA	21%	24%	27%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

Waste-in-Place

The Town of Yountville does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

Yountville is anticipated to increase its usage of imported water by 22 percent by 2045 from 2019 levels, commensurate with population growth trends. However, emissions from imported water are expected to be reduced completely by 2045 with the statewide implementation zero-carbon electricity under SB100 which would also apply to imported water conveyance and delivery. Emissions associated with locally sourced water, including groundwater pumping, are captured in the building energy sector.

Table 59 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Imported Water Usage (MG/year)	43	52	52	53
Imported Water Emissions ($MTCO_2e$/year)	65	37	8	0
Percent Change from 2019				
Imported Water Usage	NA	19%	20%	22%
Imported Water Emissions	NA	-43%	-88%	-100%

Notes: MG = million gallons; BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

WASTEWATER

Yountville's emissions from wastewater are anticipated to increase proportionally with the service population. These emissions would primarily come from central wastewater treatment plants. No known septic systems are currently operating within Yountville.

Table 60 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	2035	2045
WWTP Process Emissions	1,040	1,237	1,251	1,268
Percent Change from 2019	NA	19%	20%	22%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2024.

7.7 UNINCORPORATED NAPA COUNTY

Emissions Summary

Table 61 shows a summary of the unincorporated county's share of the regional 2019 emissions inventory and legislative-adjusted forecasts in the unincorporated areas. Overall, the unincorporated county's emissions are anticipated to decline by 33 percent between 2019 and 2045. Currently, agriculture and solid waste make up 59 percent of the jurisdiction's emissions, followed by building energy, off-road transportation, and on-road transportation which together account for 40 percent of emissions. With the anticipated legislative reductions, building energy, off-road equipment, and on-road transportation are expected to decline by 93, 59, and 85 percent, respectively, from 2019 to 2045.

With the large-scale anticipated reductions in building energy, on-road transportation, and off-road equipment, the proportion of agricultural and solid waste emissions could increase to 36 and 51 percent of the area's total emissions by 2045. While agriculture is a major economic sector in the unincorporated area, solid waste emissions from the Clover Flat Landfill and American Canyon Landfill would continue to be the majority of the unincorporated county's emissions through 2045 – more than 15 percent higher than agricultural emissions in 2045. These emissions are primarily from methane generated from accumulated waste-in-place at the two county landfills.

Table 61 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Unincorporated County ($MTCO_2e$/year)

Sector	2019	2030	2030	2045
Agriculture	98,879	93,757	92,673	90,947
Building Energy	61,068	32,691	24,653	4,388
Off-Road Equipment	48,683	18,847	18,607	19,830
On-Road Transportation	40,063	26,892	17,384	6,033
Solid Waste	125,429	131,497	130,687	129,411
Wastewater	3,191	3,689	3,533	3,219
Total	**377,314**	**307,374**	**287,538**	**253,829**
Percent of Total				
Agriculture	26%	31%	32%	36%
Building Energy	16%	11%	9%	2%
Off-Road Equipment	13%	6%	6%	8%
On-Road Transportation	11%	9%	6%	2%
Solid Waste	33%	43%	45%	51%
Wastewater	1%	1%	1%	1%
Total	**100%**	**100%**	**100%**	**100%**
Percent Change from 2019				
Agriculture	NA	-5%	-6%	-8%
Building Energy	NA	-46%	-60%	-93%
Off-Road Equipment	NA	-61%	-62%	-59%
On-Road Transportation	NA	-33%	-57%	-85%
Solid Waste	NA	5%	4%	3%
Wastewater	NA	16%	11%	1%
Total	**NA**	**-19%**	**-24%**	**-33%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable

Source: Ascent Inc. in 2024.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, BAAQMD's Zero NOx appliance rule, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, the unincorporated county's building energy-related emissions are anticipated to decrease by three percent from 2019 to 2030, and further by 61 percent below 2019 levels by 2045. With the implementation of SB100, by 2045, all building energy emissions would be generated from the combustion of natural gas.

The unincorporated county has the highest rate of reductions in building energy emissions across the region. This is likely because the unincorporated county uses much more electricity than natural gas per BTU compared to other jurisdictions. In 2019, electricity use in the unincorporated county accounted for 62 percent of total energy use. This profile is assumed to continue. In contrast, the incorporated cities' energy use is almost exactly the inverse, with 62 percent of energy consumption from electricity and 38 percent from natural gas. This could be due to the greater

presence of wineries and agriculture processing in the unincorporated county that use a higher percentage of electricity for their operations as compared to natural gas.

Table 62 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Unincorporated County ($MTCO_2e$/ year)

Energy Type	2019	2030	2035	2045
Electricity	25,814	9,049	8,938	-
Natural Gas	35,254	23,642	15,715	4,388
Total	**61,068**	**32,691**	**24,653**	**4,388**
Percent Change from 2019				
Electricity	NA	36%	35%	27%
Natural Gas	NA	-33%	-55%	-88%
Total	**NA**	**3%**	**-21%**	**-61%**

Notes: Totals may not sum due to rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

ON-ROAD TRANSPORTATION

The unincorporated county's on-road transportation emissions are anticipated to decrease by 85 percent between 2019 and 2045, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, ACCII, ACF, and other adopted regulations as discussed in Section 3, which increase the percentage of zero-emission vehicles on the road and improve fuel economy, reducing average fleetwide GHG emissions per mile.

Table 63 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County $MTCO_2e$/year)

Trip Type	2019	2030	2035	2045
Commercial Trips	14,746	9,551	6,548	2,961
Non-Commercial Trips	25,317	17,341	10,837	3,072
Total	**40,063**	**26,892**	**17,384**	**6,033**
Percent Change from 2019				
Commercial Trips	NA	-35%	-56%	-80%
Non-Commercial Trips	NA	-32%	-57%	-88%
Total	**NA**	**-33%**	**-57%**	**-85%**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Ascent Inc. in 2024.

OFF-ROAD EQUIPMENT

Table 64 displays inventory and legislative-adjusted forecasts for off-road equipment for the unincorporated county. Based on the scaling factors used to scale countywide off-road emissions to each jurisdiction (e.g., population, employment) that best match each off-road equipment category (refer to Table 12), and with emissions reduction due to State regulations, the unincorporated county's off-road equipment emissions are anticipated to decrease by

63 percent between 2019 and 2035, and increase slightly by 2 percent by 2045, resulting in an overall decline by 61 percent from 2019 through 2045.

Like other jurisdictions, the greatest reductions would occur from the lawn and garden and light commercial equipment sectors which are anticipated to see emissions decline by over 11,500 $MTCO_2e$ by 2030 and through 2045 compared to 2019 levels. The pleasure craft which are anticipated to see emissions decline by over 70 percent or around 20,000 $MTCO_2e$ by 2030 and 65 percent or around 18,500 $MTCO_2e$ by 2045 compared to 2019 levels. Additionally, emissions from the railyard operations sector are expected to decline to zero. Together, these four sectors account for more than 82 percent of the unincorporated county's off-road emissions in 2019 and more than half of the reductions through 2045. CARB anticipates a gradual population decline of the outboard fleet through 2045 based on long-term forecasts of survival rates and forecasted annual sales (CARB 2014:9).

CARB anticipates a statewide trend toward increased electric adoption in lawn and garden and light commercial equipment due to State regulations and advances in battery technology with the support from lawn and garden equipment exchange programs (CARB 2020; BAAQMD 2024). While the BAAQMD exchange programs are currently closed, the lasting effect of these programs and current marketplace offerings are expected to influence future overall consumer choices in purchasing electric equipment for these two equipment categories.

Agricultural off-road forecasts are discussed in the next subsection.

Table 64 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Equipment Category	2019	2030	2035	2045
Airport Ground Support	<1	-	-	-
Commercial Harbor Craft	44	45	42	36
Construction and Mining	2,876	2,641	2,543	2,244
Industrial	1,711	2,181	1,625	1,856
Lawn and Garden Equipment	5,160	110	57	5
Light Commercial Equipment	7,569	794	485	320
Pleasure Craft	28,896	8,174	8,793	10,116
Portable Equipment	3,145	4,045	4,160	4,291
Railyard Operations	120	-	-	-
Recreational Equipment	483	269	289	315
Transport Refrigeration Units	599	588	613	649
Total	**50,602**	**18,847**	**18,607**	**19,830**
Percent Change from 2019				
Airport Ground Support	NA	-100%	-100%	-100%
Commercial Harbor Craft	NA	4%	-4%	-18%
Construction and Mining	NA	-8%	-12%	-22%
Industrial	NA	27%	-5%	8%
Lawn and Garden Equipment	NA	-98%	-99%	-100%
Light Commercial Equipment	NA	-90%	-94%	-96%
Pleasure Craft	NA	-72%	-70%	-65%
Portable Equipment	NA	29%	32%	36%
Railyard Operations	NA	-100%	-100%	-100%

Equipment Category	2019	2030	2035	2045
Recreational Equipment	NA	-44%	-40%	-35%
Transport Refrigeration Units	NA	-2%	2%	8%
Total	**NA**	**-63%**	**-63%**	**-61%**

AGRICULTURE

Most agricultural activity within the region takes place in the unincorporated county, accounting for approximately 30 percent of the jurisdiction's emissions. Table 65 shows that emissions due to the agricultural activities in the county (e.g., agricultural offroad equipment, use of fertilizers, and livestock) would decline between 2019 and 2045 by seven percent, scaled according to the forecasted change in both rangeland and cropland acres and anticipated changes in off-road activity. CARB's OFFROAD2021 model forecasts a reduction across agricultural offroad emissions countywide due to the anticipated decline in the amount of equipment operating and State regulations to prohibit emissions from small engines.

The greatest decline is anticipated in the off-road category (22 percent reduction by 2045), which also accounts for nearly all the reductions in this sector for the unincorporated area. Fertilizer and irrigation pump emissions are scaled by the forecasted change in cropland. Livestock emissions are scaled by the reduction in rangeland of four percent between 2019 and 2045, based on data provided by the County of Napa (See Attachment 1).

Table 65 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Agricultural Offroad	46,092	41,625	39,983	37,140
Fertilizer Application	21,216	21,974	22,392	23,228
Irrigation Pumps	12,347	12,788	13,031	13,517
Livestock	17,723	17,370	17,268	17,062
Total	**97,378**	**93,757**	**92,673**	**90,947**
Percent Change from 2019				
Agricultural Offroad	NA	-10%	-13%	-19%
Fertilizer Application	NA	4%	6%	9%
Irrigation Pumps	NA	4%	6%	9%
Livestock	NA	-2%	-3%	-4%
Total	**NA**	**-4%**	**-5%**	**-7%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2022.

SOLID WASTE

Solid waste emissions in the unincorporated county are anticipated to increase by three percent from 2019 to 2045 from 125,428 to 129,411 $MTCO_2e$/year, largely due to the expected increases in waste-in-place emissions at the two landfills located within the area.

Waste Generation

The unincorporated county generated approximately 28,105 tons of solid waste in 2019 which generated 10,810 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that

waste generation emissions are proportional to the amount of waste generated, both the unincorporated county's waste disposal and related emissions are anticipated to increase by seven percent from 2019 to 2045, commensurate with population growth.

Table 66 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Annual waste tonnage delivered from jurisdiction (tons)	28,105	28,902	29,264	29,989
Solid Waste Generation Emissions ($MTCO_2e$/year)	10,810	11,117	11,256	11,535
Percent Change from 2019				
Annual waste tonnage delivered from jurisdiction	NA	3%	4%	7%
Solid Waste Generation Emissions	NA	3%	4%	7%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

Waste-in-Place

Two major landfills are located within the unincorporated county: Clover Flat Landfill and American Canyon Landfill. Table 67 shows that emissions from waste-in-place from both landfills are anticipated to increase by three percent from 2019 to 2045. Section 7.4 describes the methodology used to quantify these forecasts.

Table 67 Waste in Place GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	2035	2045
American Canyon Landfill	42,800	40,085	36,270	29,695
Clover Flat Landfill	71,819	80,295	83,161	88,181
Total	**114,619**	**120,380**	**119,431**	**117,876**
Percent Change from 2019				
American Canyon Landfill	NA	-6%	-15%	-31%
Clover Flat Landfill	NA	12%	16%	23%
Total	**NA**	**5%**	**4%**	**3%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent, NA = not applicable

Source: Ascent Inc. in 2024.

IMPORTED WATER

The unincorporated county did not utilize imported water in 2019, thus this sector was not further evaluated for forecasts trough 2045.

WASTEWATER

Emissions from wastewater are anticipated to increase proportionally with service population in the unincorporated county. These emissions would primarily come from septic systems as the majority of the population in the unincorporated county resides in rural areas. A smaller proportion of the population are located near the incorporated cities and have access to central wastewater treatment plants.

Table 68 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	2035	2045
Service population served by septic systems	24,459	28,276	27,074	24,669
Service population served by WWTP	618	715	684	624
Percent change in service population from 2019 (applies to both sources)	NA	16%	11%	1%
Septic Process Emissions	2,961	3,423	3,278	2,987
WWTP Process Emissions	230	266	255	232
Total Emissions	3,191	3,689	3,533	3,219
Percent Change in WWTP Emissions from 2019				
Septic Process Emissions	NA	16%	11%	1%
WWTP Process Emissions	NA	16%	11%	1%
Total Emissions	NA	16%	11%	1%

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Inc. in 2022.

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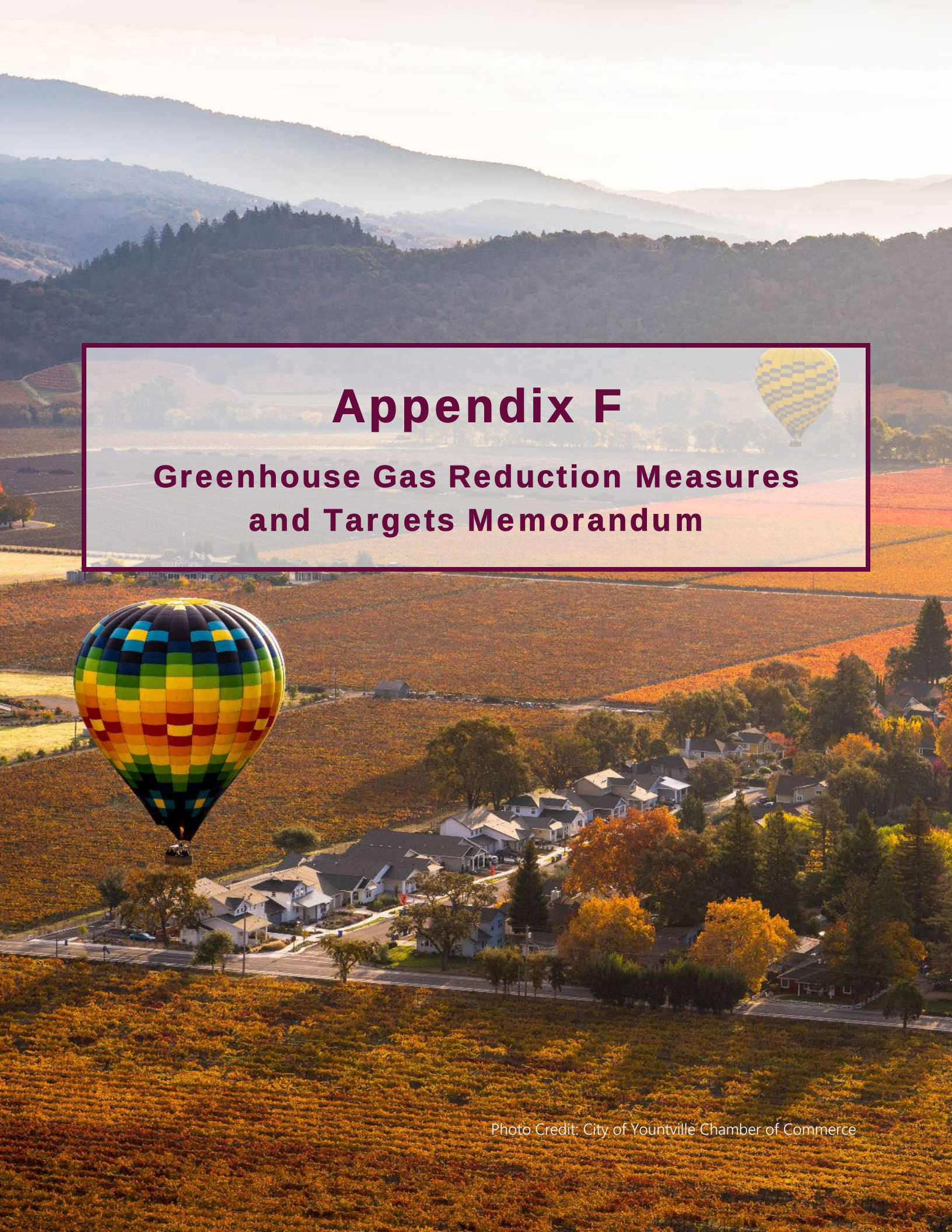
Appendix F

Greenhouse Gas Reduction Measures and Targets Memorandum



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Memo

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Date: April 3, 2025

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 - Revised

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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 17 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 17 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 that local governments should both demonstrate a reduction of 40 percent below 1990 levels by 2030and "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. In 2019, the state reduced its emissions by about 5 percent compared to 1990 across all emissions sectors. Given that the targets under SB 32 and AB 1279 are relative to 1990, the targets were readjusted to be relative to 2019, the baseline year for the region. These targets were also adjusted to account for emissions sources that are relevant to both state's emissions inventory and the

region's emissions inventory (See Table 6). 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] (22%)	164,403[b] (23%)
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] (23%)
Reduce GHGs from Agricultural Equipment	AG-1	Reduce fossil fuel consumption in field equipment.	25,316 (7%)	49,020 (9%)	52,862 (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 (24%)	98,772 (18%)	104,985 (15%)
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	**140,390**	**155,746**	**173,057**
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**	**58,375**
Wastewater/Water					
Wastewater Treatment	WW-1	Reduce fugitive CH_4 emissions from Wastewater Treatment Plants (WWTPs)	32,739 (8%)	43,227 (8%)	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.	17,830 (5%)	36,228 (6%)	43,785 (6%)
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			**23,868**	**40,702**	**45,421**
Total GHG Reductions			**386,084**	**562,553**	**718,500**
Total GHG Reductions without Carbon Sequestration Measures[c]			**283,105**	**375,696**	**386,653**
Legislative-Adjusted Forecasted Emissions with Measure Reductions			**512,820**	**185,403**	**-171,122**
Legislative-Adjusted Forecasted Emissions with Measure Reductions (excluding carbon sequestration measures)			**615,799**	**372,260**	**160,725**
Total Reductions from Carbon Sequestration Measures[c] Only			***102,979***	***186,857***	***331,847***

Source: Modeled by Ascent in 2025.

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.

[d] Negative values indicate that the region would sequester more emissions than it produces.

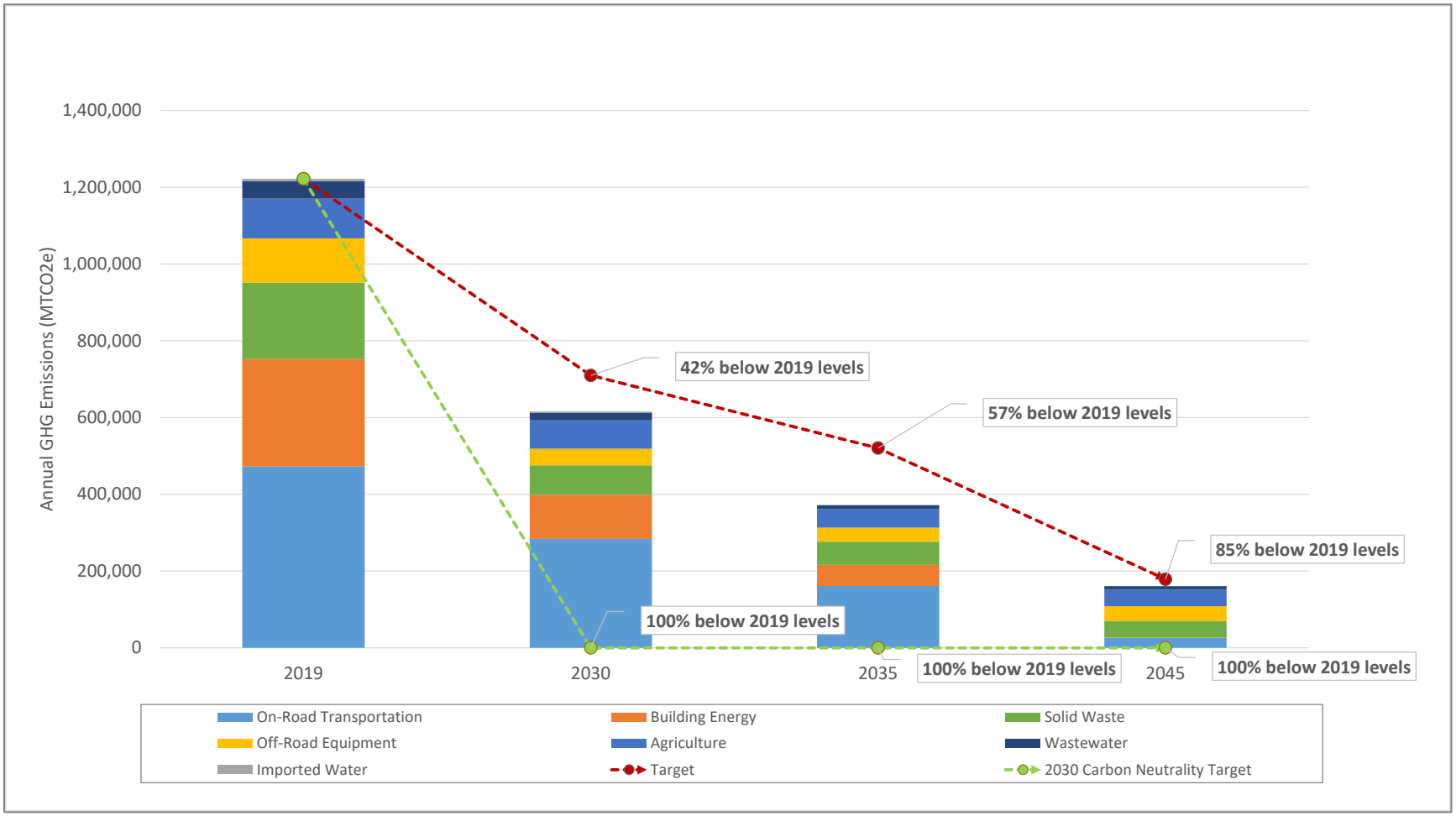
Table 8 Napa RCAAP Gap Analysis of GHG Reductions by Target Pathway ($MTCO_2e$/year)

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)	283,105	375,696	386,653
	Remaining Gap to Meet Target	0	0	0
	Targeted percent below 2019 levels	42%	57%	85%
	Achieved percent below 2019 levels with Measures	50%	70%	87%
	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	386,084	562,553	718,500
	Remaining Gap to Meet Target	512,820	185,403	0
	Targeted percent below 2019 levels	100%	100%	100%
	Achieved percent below 2019 levels with Measures	58%	85%	114%
	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	386,084	562,553	718,500
	Remaining Gap to Meet Target	0	0	0
	Targeted percent below 2019 levels	42%	57%	100%
	Achieved percent below 2019 levels with Measures	58%	85%	114%
	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.

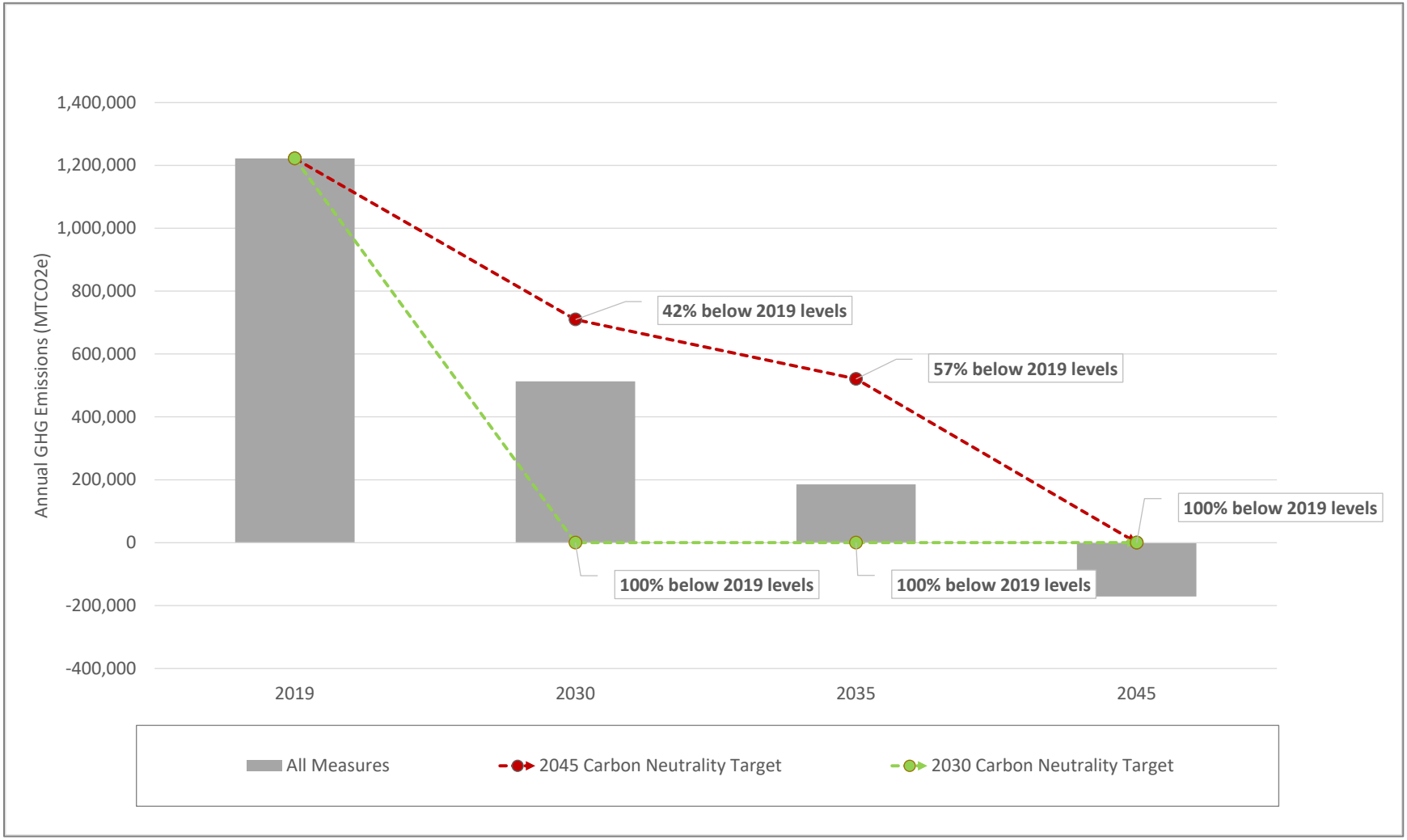
Source: Modeled by Ascent in 2025.



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 17 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 50 percent below 2019 levels by 2030, 70 percent below 2019 levels by 2035, and 87 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 160,725 $MTCO_2e$ 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 approximately 90 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 40 to 50 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 remaining half 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.	14%	15%	9%
TR-9	Increase availability of renewable diesel.	6%	10%	11%
AG-1	Reduce fossil fuel consumption in field equipment.	9%	13%	14%
SW-1	Increase diversion of solid waste to achieve diversion of at least 80 percent of waste from landfills by 2035.	17%	15%	18%
SW-4	Increase CH_4 capture capacity to 85 percent by 2035 at local landfills.	33%	26%	27%
WW-1	Reduce fugitive CH_4 emissions from Wastewater Treatment Plants (WWTPs)	12%	12%	12%
All other measures		10%	9%	9%
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 17 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 CAL FIRE 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 CAL FIRE. 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.	CAL FIRE 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 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.	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 up based on increased staffing, limited by the total number of vineyard acreage in the county.	Pers. comm., Ben Mackie 2024 Napa Green 2024

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
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 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.	Napa RCAAP Forecasts CARB 2020

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
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. ▶ 100% of the remainder of the fleet that is not electrified would use renewable diesel starting in 2030.	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
TR-9	Increase the availability of renewable diesel.	▶ 5 fueling stations in the county to sell renewable diesel by 2030, 10 by 2035, and 12 by 2045 ▶ 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

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
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 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.	CARB 2021b Napa RCAAP Forecasts

Measure Number	Measure Name	Assumptions/Measure Targets	Methods	Data Sources
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, CAL FIRE = 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.

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Attachment A

GHG Quantification Spreadsheets

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

Last Updated: 3/20/2025

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.	17,830	36,228	43,785
	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				**386,084**	**562,553**	**718,500**
			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	512,820	185,403	-171,122
			Emissions Gap	-196,865	-335,144	-171,122
			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	283,105	375,696	386,653
			Emissions with measures	615,799	372,260	160,725
			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.

Last Updated: 3/20/2025

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
		-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%			
		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_lPhIARfMUQoxvSFP4?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

Last Updated: 3/20/2025

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
				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-lqtDKYdKg8EfljaFbpGzcO1Vho0Jl6D18-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.

Last Updated: 3/20/2025

	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.

Last Updated: 3/20/2025

		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%			
Number stations selling RD in the county beginning in 2026 [2]		5	10	12
RD gallons sold per station per month (Sonoma wine country example) [3]	30,000			
	10,160			
Transportation Emissions Forecast (MTCO2e) [5]		307,817	201,923	71,157
Percent of emissions from diesel forecasted under EMFAC+ ACCII/ACF (MTCO2e)[5]		57%	52%	64%
Forecasted Emissions from Diesel (MTCO2e)		176,609	104,458	45,786
Total gallons of diesel use forecasted (reductions cannot exceed this)		17,382,732	10,281,312	4,506,484
Target Gallons of Renewable Diesel sold per Year under measure (gal)		1,800,000	3,600,000	4,320,000
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)		1,754,954	3,565,738	4,309,581
GHG Reductions (MTCO2e)		**17,830**	**36,228**	**43,785**

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). Emissions are associated with the reduction of diesel CO2 emissions only and are based on conventional diesel emission factors from EPA.

TR-10

Implement NVTA's Active Transportation Plan.

Last Updated: 3/20/2025

	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
	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.

Last Updated: 3/20/2025

	2019	2030	2035	
Emissions from on-road transportation (passenger vehicles) (MTCO2e)		198,492	125,869	
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	1
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)	
	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.
Last Updated: 3/20/2025

		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.**					
Last Updated: 3/20/2025					
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.
Last Updated: 3/20/2025

		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.
Last Updated: 3/20/2025

		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%				
		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. Last Updated: 3/20/2025				
	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		2030	2035	2045
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.

Last Updated: 3/20/2025

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
	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.

Last Updated: 3/20/2025

		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%			
		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

Last Updated: 3/20/2025

	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	

Existing Napa Waste Diversion Rate	51%			
Napa Waste Diversion Targets [4]		75%	80%	85%
Increased waste diversion		24%	29%	34%
Theoretical Emissions with 0% waste diversion (Assuming existing diversion rate) (MTCO2e)		198,739	197,683	201,271
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 methane capture capacity to 85 percent by 2035 at local landfills.
Last Updated: 3/20/2025

		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).**				
Last Updated: 3/20/2025				
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.				

Appendix G

Climate Vulnerability Assessment

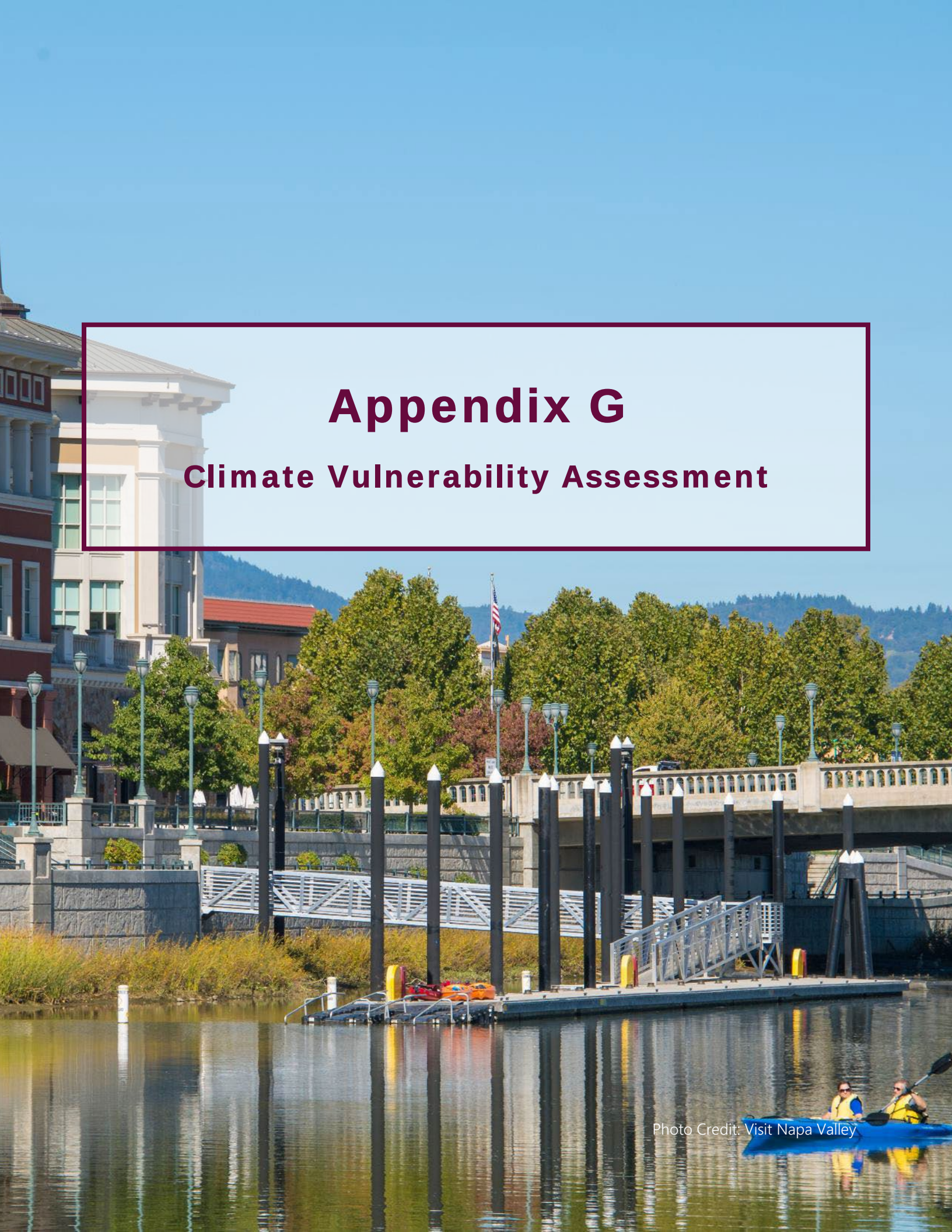

Photo Credit: Visit Napa Valley

Final Climate Vulnerability Assessment

for the

Napa County

Regional Climate Action and Adaptation Plan

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
APG	*California Adaptation Planning Guide*
ART Bay Area Report	*Adapting to Rising Tides, Bay Area: Regional Sea Level Rise Vulnerability and Adaptation Report*
BAAQMD	Bay Area Air Quality Management District
C2ES	Center of Climate and Energy Solutions
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Governor's Office of Emergency Services
Caltrans	California Department of Transportation
CCHPR	Climate Change and Health Profile Report: Napa County
CDPH	California Department of Public Health
CEC	California Energy Commission
Clean Air Plan	*2017 Clean Air Plan: Spare the Air, Cool the Climate*
Climate Assessment	*California's Fourth Climate Change Assessment*
CNRA	California Natural Resources Agency
CPUC	California Public Utilities Commission
CRS	Community Rating System
CWPP	Community Wildfire Protection Plan
District 4 Report	*Caltrans Climate Change Vulnerability Assessments: District 4 Technical Report*
DPA	Direct Protection Area
FEMA	Federal Emergency Management Agency
FHSZ	Fire Hazard Severity Zone
FRA	Federal Responsibility Area
FSC	Fire Safe Council
GHG	greenhouse gas
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HHSA	Napa County Health and Human Services Agency
HVAC	heating, ventilation, air conditioning
IPCC	Intergovernmental Panel on Climate Change
IRWMP	*San Francisco Bay Area Integrated Regional Water Management Plan*
KBDI	Keetch-Byram Drought Index
LHMP	*2021 City of Napa Local Hazard Mitigation Plan*

LNU	Sonoma-Lake-Napa Unit
LRA	Local Responsibility Area
MCE	Marin Clean Energy
MJHMP	*2020 Napa County Multi-Jurisdictional Hazard Mitigation Plan*
NCFF	Napa Communities Firewise Foundation
NDMC	National Drought Mitigation Center
NFIP	National Flood Insurance Program
OEHHA	California Office of Environmental Health Hazard Assessment
OLU	Operational Landscape Units
OPR	Governor's Office of Planning and Research
PG&E	Pacific Gas and Electric Company
$PM_{2.5}$	fine particulate matter measuring 2.5 micrometers or smaller
PSPS	Public Safety Power Shutoff
RCAAP	Napa County Regional Climate Action and Adaptation Plan
RCP	Representative Concentration Pathway
RISE	Resilience, Innovation, Sustainability, Empowerment program
Safeguarding California	*Safeguarding California Plan: 2018 Update*
SB	Senate Bill
SFBA Report	*California's Fourth Climate Change Assessment: San Francisco Bay Area Region Report*
SFEI	San Francisco Estuary Institute
SPUR	San Francisco Bay Area Planning and Urban Research Association
SRA	State Responsibility Area
Strategy	*California Climate Adaptation Strategy*
SVI	Social Vulnerability Index
UWMP	City of Napa 2020 Urban Water Management Plan
VA	Vulnerability Assessment
WSCP	Water Shortage Contingency Plan
WUI	wildland-urban interface

1 INTRODUCTION

This Vulnerability Assessment (VA) identifies and analyzes climate change effects that will impact Napa County. The VA is the first step in the adaptation planning process as part of the Napa County Regional Climate Action and Adaptation Plan (RCAAP), in which the County of Napa is collaborating with the five incorporated cities in the county to prepare a regionally-focused climate action and adaptation plan. The goal of the adaptation planning process included in the RCAAP effort is to improve community resilience countywide in the face of a changing climate. A resilient community is better prepared for current and future hazardous conditions and experiences less societal disruption when disaster strikes as the climate continues to change. Note that in this VA, "County" refers to the County of Napa as a local government agency, while "county" refers to the entire geographic area known as Napa County.

The purpose of the VA is to analyze countywide exposure to existing hazards, identify potential climate-related impacts from these hazards and sensitivities to these hazards and impacts, and determine the existing capacity of the County's local jurisdictions and communities to prepare for and adapt to these impacts, known as adaptive capacity. The VA will inform the next steps in the RCAAP's adaptation planning process, which include the development of climate adaptation and resilience strategies.

The primary effects of climate change include increased temperatures, changes in precipitation patterns, and sea level rise. These effects are expected to heighten and exacerbate risks posed by secondary climate change effects, including wildfires, extreme heat events, extreme precipitation and flooding, drought, and energy grid reliability issues. Climate-related hazards are wide-ranging, and while many of these hazards have historically posed a risk to the county, the frequency, intensity, and duration of them will shift because of climate change. The level of impact from these climate change effects will vary across the county due to physical, social, and economic variations.

1.1 CLIMATE CHANGE BACKGROUND

Since the beginning of the Industrial Revolution in the late 18th century, human activities—primarily the combustion of fossil fuels for electricity, heat, and transportation—have released an excessive amount of greenhouse gases (GHGs) into Earth's atmosphere. Significantly elevated levels of GHG emissions have intensified the greenhouse effect and have led to an unprecedented trend of human-caused (i.e., anthropogenic) warming of Earth's climate, among other climatic disruptions, known as climate change. There are many effects and associated impacts stemming from climate change that intersect with multiple facets of human society. Though it is a global issue, it is an issue that will be, and already is, experienced differently around the world. Over time, it has become an increasing priority to address climate change at multiple scales as weather patterns become more extreme, temperatures continue to rise, and polar ice caps continue to reduce in size over time.

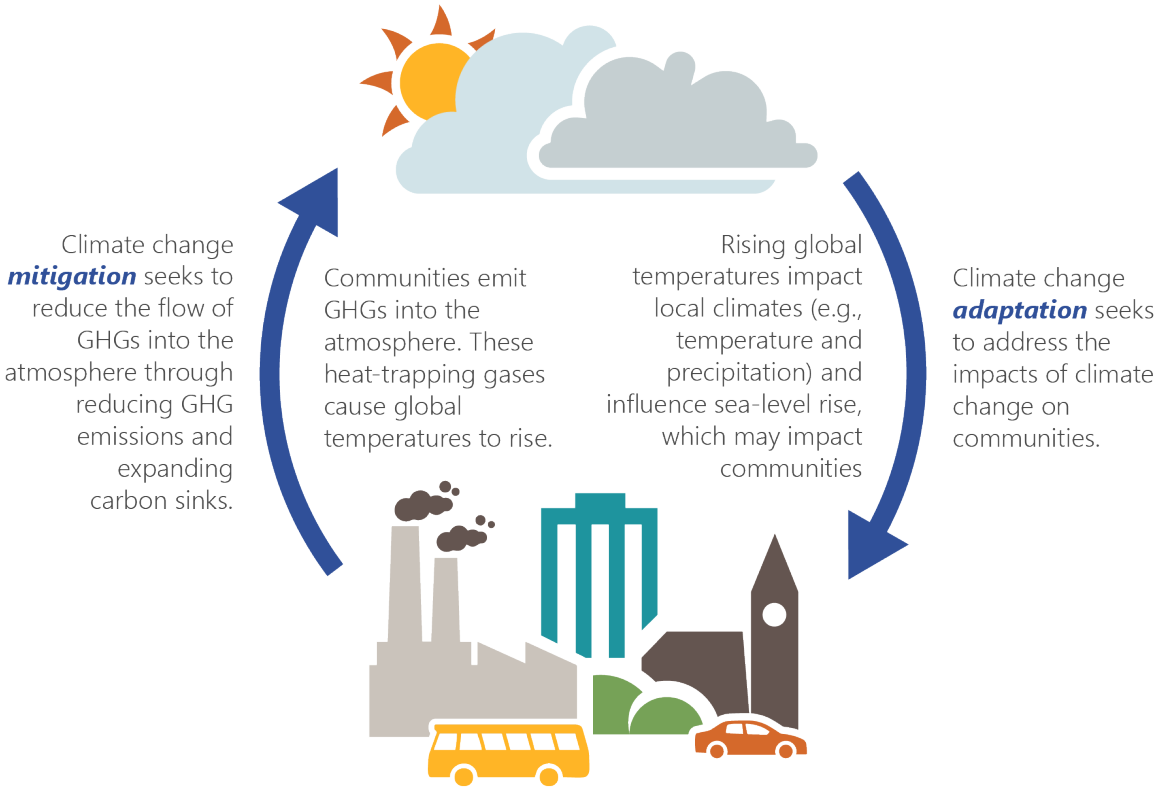
The average global surface temperature is expected to increase approximately 8 degrees Fahrenheit (°F) by the end of the century unless additional efforts are made to reduce GHG emissions (IPCC 2021). Depending on future GHG emissions scenarios, annual average maximum daily temperatures in California are projected to increase between 4.4 °F and 5.8 °F by 2050 and by 5.6 °F to 8.8 °F by 2100 (Pierce et al. 2018, cited in OPR, CEC, and CNRA 2018a). Temperature changes in the San Francisco Bay Area are expected to be consistent with California as a whole, with projected increases between roughly 5 °F and 8 °F by the end of the century (OPR, CEC, and CNRA 2018b). The state and the county have already begun to experience extreme weather effects, the frequency and intensity of which have been worsened by climate change (OPR, CEC, and CNRA 2018a). Extreme weather effects such as precipitation volatility (i.e., dramatic changes over a short period of time), increased average temperatures, and increased frequency of extreme heat events have led to increases in the frequency and intensity of human health and safety hazards such as wildfires, droughts, changes to water supply, and energy grid resiliency issues.

While it remains imperative to drastically reduce global GHG emissions, it is equally important for communities to engage in adaptation planning to prepare for and strengthen resilience to the adverse impacts of climate change. Local

efforts are critical in building climate resilience—the capacity of a community to prepare for and withstand disruptions, recover from shocks and stressors, and adapt and grow from turbulent experiences related to climate change—and can lead to a greater understanding of climate risks and strategies to reduce their impacts. There are plans, policies, and programs in place at the local and regional levels that address existing climate-related hazards. In some cases, these may be sufficient to address the potential for climate change to worsen existing hazards. In other cases, significant gaps exist, and new policies are needed. This VA intends to identify and address those gaps.

1.2 CLIMATE CHANGE MITIGATION AND ADAPTATION

Addressing climate change requires an integrated approach that targets both the sources of climate change and its effects. Targeting the sources of climate change is known as climate change mitigation and primarily involves reducing the flow of GHGs into the atmosphere. This can happen through the direct reduction of anthropogenic GHG emissions, or by enhancing carbon sinks (e.g., carbon sequestration), which capture and remove GHGs from the atmosphere, most notably carbon dioxide. The goal of climate change mitigation is to minimize significant human interference with the global climate. The extent to which climate change mitigation efforts are implemented today will likely determine the severity of climate change and its effects in the future. However, even in a scenario where anthropogenic GHG emissions were drastically and instantaneously reduced today, society will continue to endure a reduced degree of climate change and its associated effects. Adjusting to the effects of climate change that are already occurring and preparing for those that are anticipated to occur in the future is known as climate change adaptation. Climate change adaptation planning aims to enhance the resilience of communities to climate change impacts by analyzing jurisdiction-specific, climate-related vulnerabilities and developing strategies to respond to and prepare for current and future impacts. Figure 1 illustrates the relationship between climate change mitigation and climate change adaptation.



Source: Cal OES 2020; adapted by Ascent in 2024.

Figure 1 Relationship between Climate Change Mitigation and Adaptation

Climate change mitigation and adaptation are both crucial components of comprehensive climate change planning. While mitigation and adaptation are often separate planning efforts, it is important to consider both components as

part of the Napa County RCAAP. Many initiatives that focus on climate mitigation and reducing GHG emissions support climate adaptation objectives, and vice versa. These are referred to as 'co-benefits.' For example, renewable energy installations combined with battery storage systems will reduce reliance on fossil fuel-generated grid electricity, but they will also improve energy independence and resilience in the face of hazards exacerbated by climate change that threaten energy infrastructure, yielding both adaptation benefits as well as GHG emissions reductions. Similarly, building energy efficiency improvements, such as improving insulation in a home or structure, will help combat extreme heat events and decrease risks to humans of heat-related illnesses, but will also reduce cooling demands and thus save energy, reducing (i.e., mitigating) GHG emissions associated with energy consumption. Identifying co-benefits in climate mitigation and adaptation strategies in the climate action planning process is becoming an increasingly common approach taken by jurisdictions to address climate change.

1.3 REGULATORY SETTING

State law requires communities to address climate change adaptation through several planning processes, such as the development of general plans (Cal OES 2020). Specifically, Senate Bill (SB) 379 requires all cities and counties to update the general plan safety element to include climate adaptation and resiliency strategies beginning January 1, 2017. The requirements, which are codified in Government Code Section 65302(g)(4), generally include:

- A vulnerability assessment that identifies the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts;
- A set of adaptation and resilience goals, policies, and objectives based on the information specified in the climate vulnerability assessment for the protection of the community; and
- A set of feasible implementation measures designed to carry out the goals, policies, and objectives identified pursuant to the adaptation objectives.

1.4 GUIDANCE DOCUMENTS

Several key State guidance documents and resources were used to help develop the VA and are outlined in the following sections.

1.4.1 California Adaptation Planning Guide

The most recent version of the *California Adaptation Planning Guide* (APG) was released in June 2020 and was prepared by the California Governor's Office of Emergency Services (Cal OES). This version builds upon the first iteration of the APG that was released in 2012, and reflects the latest best practices, integrates recent updates to State plans, policies, programs, and regulations, and ensures that communities have guidance on using the best available science and information. The purpose of the APG is to guide local governments in climate change adaptation and resiliency planning, primarily through a step-by-step process that communities can use to plan for the impacts of climate change. The APG is designed to be flexible and guide communities through an adaptation planning process that is best suited to their needs (Cal OES 2020).

1.4.2 California's Fourth Climate Change Assessment

The Governor's Office of Planning and Research (OPR), the California Energy Commission (CEC), and the California Natural Resources Agency (CNRA) prepared *California's Fourth Climate Change Assessment* (Climate Assessment) in 2018. (The Fifth Climate Change Assessment is not expected to be released until 2026). The Climate Assessment was designed to address critical information gaps that decision-makers at the State, regional, and local levels need to close to protect and build the resilience of people, infrastructure, natural systems, working lands, and waterways to the impacts of climate change. The Climate Assessment also includes regional reports, which analyze and discuss the impacts on specific regions in the state, including *California's Fourth Climate Change Assessment: San Francisco Bay Area Region Report* (SFBA Report), which

encompasses the entirety of Napa County. The Climate Assessment and SFBA Report are referenced throughout this VA to provide information regarding regional climate change impacts.

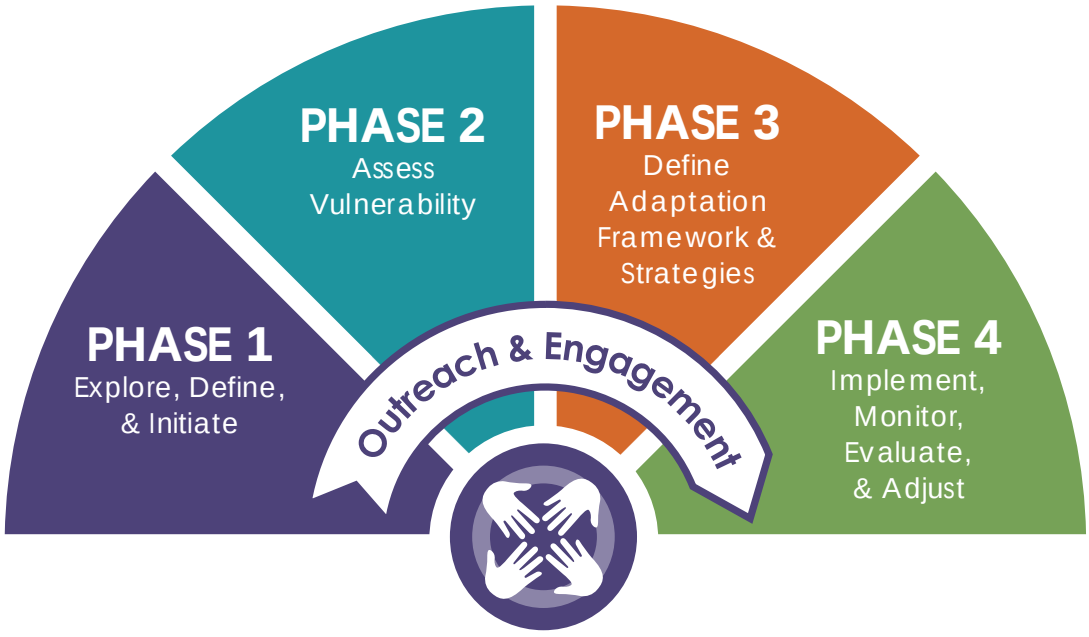
1.4.3 California Climate Adaptation Strategy

Every three years, the State of California is required to issue an updated statewide climate adaptation strategy. Alongside the update to the Climate Assessment, CNRA released the *Safeguarding California Plan: 2018 Update* (Safeguarding California), which served as the statewide climate adaptation strategy. Safeguarding California provided a holistic overview of the State's current and planned efforts to address the ongoing and forthcoming impacts of climate change and identified actions the State will take to protect communities, infrastructure, services, and the natural environment from climate change.

In April 2022, CNRA, in partnership with OPR's Integrated Climate Adaptation and Resiliency Program, released the *California Climate Adaptation Strategy* (Strategy), which serves as an update to Safeguarding California. The Strategy is organized around six outcome-based priorities and integrates key elements from numerous state plans and strategies, including statewide climate action plans, sector-based strategies, regionally focused strategies, and State stewardship plans. Each outcome-based priority consists of several unique goals, and each goal is comprised of specific climate actions that can be taken toward achieving that goal. The Strategy also identifies success metrics and an implementation timeline for each action within the strategy. The Strategy reflects the State's commitment to integrating climate resilience into the work of all state agencies, and this collective, statewide effort will ultimately support local communities.

1.5 ADAPTATION PLANNING PROCESS

The APG guides communities throughout the state in planning for and adapting to the impacts of climate change. The APG includes a four-phase process, illustrated in Figure 2, which allows communities to assess locally specific climate vulnerabilities and develop strategies to reduce climate change-related risks.



Source: Cal OES 2020; adapted by Ascent in 2024.

Figure 2 Adaptation Planning Process

- **Phase 1, "Explore, Define, and Initiate,"** includes scoping and defining the adaptation planning effort. Phase 1 also involves identifying key roles and interested parties in the local government and throughout the community to

contribute to the planning process. Potential climate change effects and important physical, social, and natural assets in the community are identified for further analysis.

- **Phase 2, "Assess Vulnerability,"** includes an analysis of potential climate change impacts and adaptive capacity to determine the vulnerability of populations, built environment, and community functions. The vulnerability assessment is composed of four steps: exposure, sensitivities and potential impacts, adaptive capacity, and vulnerability scoring. Phase 2 also integrates public input to provide a comprehensive assessment of the community's sensitivity to climate change and its ability to adapt.
- **Phase 3, "Define Adaptation Framework and Strategies,"** focuses on creating an adaptation framework and developing adaptation strategies based on the results of the vulnerability assessment. Adaptation strategies identify how the community will address the potential for harm based on the community's resources, goals, values, needs, and regional context. Community input is needed to prioritize adaptation strategies, identify co-benefits of strategies, and determine implementation steps.
- In **Phase 4, "Implement, Monitor, Evaluate, and Adjust,"** the adaptation framework is implemented, consistently monitored and evaluated, and adjusted based on continual learning, feedback, and/or triggers.

This VA encompasses Phase 2 "Assess Vulnerability" in the adaptation planning process recommended by the APG. Adaptation strategies will be developed based on the findings of this VA, under Phase 3 "Define Adaptation Framework and Strategies."

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2 VULNERABILITY ASSESSMENT

This section provides a comprehensive assessment of the county's vulnerabilities to climate change. It identifies and characterizes how climate change effects will exacerbate climate-related hazards and associated impacts in the county. The VA follows the process outlined in Phase 2 of the APG and is composed of the following four steps:

Exposure: The purpose of this step is to understand existing climate-related hazards within the county and how changes in climate variables (e.g., average temperature, precipitation) are projected to influence these hazards. Existing hazards that are likely to be exacerbated by the effects of climate change are identified and described based on historical data from sources such as the *2020 Napa County Multi-Jurisdictional Hazard Mitigation Plan* (MJHMP) and the 2021 City of Napa Local Hazard Mitigation Plan Update (LHMP). Climate projection data are used to develop forecasts for how existing hazards are expected to change within various timescales, including the near-term (current-2050), mid-term (2040-2069), and long-term (2070-2099).

Sensitivity and Potential Impacts: This step identifies the population groups and community assets in the county that are sensitive to localized climate impacts. Hazards influenced by climate change (e.g., extreme precipitation, flooding, wildfire) are generally projected to increase in severity, and additionally, climate change may generate new impacts that communities have not experienced historically. Using historical data, research from regional and State reports on climate impacts, and public input, this step seeks to assess the degree of sensitivity of people and assets based on the potential impacts of each exposure. Key populations and assets identified in the county are organized into three overarching categories: populations, built environment, and community functions. Each hazard included in the VA is analyzed and assigned a potential impact score using the criteria in Table 1.

Table 1 Potential Impacts Scoring

Score	Potential Impact Scoring Description
Low	Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern.
Medium	Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern.
High	Impact is highly likely based on projected exposure; would result in substantial consequences to public health, safety, and/or other metrics of concern.

Source: Cal OES 2020.

Adaptive Capacity: The purpose of this step is to identify the County and local jurisdictions' current capacity to address future climate impacts, referred to as adaptive capacity. The County, local jurisdictions, partner agencies, and regional organizations have already taken steps to build resilience and protect sensitive populations and assets from existing hazards. The ability of the County and local agencies to adapt to each of the identified climate impacts is determined through a review of existing plans, policies, and programs, and public engagement. Adaptive capacity scoring is described in Table 2. A summary of partner agencies and regional organizations and their climate adaptation-related work is included in Section 2.3, "Adaptive Capacity."

Table 2 Adaptive Capacity Scoring

Score	Adaptive Capacity Scoring Description
Low	The County lacks capacity to manage climate change effect; major changes would be required.
Medium	The County has some capacity to manage climate change effect; some changes would be required.
High	The County has high capacity to manage climate change effect; minimal to no changes are required.

Source: Cal OES 2020.

Vulnerability Scoring: This step characterizes the county's vulnerability to each climate change effect. Vulnerability scores are based on several factors including the severity of projected climate impacts, how sensitive certain

populations and assets are to anticipated climate impacts, and whether sufficient adaptive capacity exists to manage future climate impacts. Higher vulnerability scores (5 being the highest) indicate that a climate change effect should be prioritized earlier than those with lower scores (1 being the lowest). This scoring provides an understanding of which climate vulnerabilities are most urgent and should be prioritized during the adaptation strategy development process. Table 3 presents the methodology used to determine the overall vulnerability scores, which is based on ratings for potential impacts and adaptive capacity.

Table 3 Vulnerability Scoring

		Vulnerability Score		
Potential Impacts	High	3	4	5
	Medium	2	3	4
	Low	1	2	3
		High	Medium	Low
		Adaptive Capacity		

Source: Cal OES 2020.

2.1 EXPOSURE

This section includes the exposure analysis, which relies on existing planning documents and resources to understand the county's historical natural hazards, and climate modeling to identify how these climate-related hazards are projected to change in the future. To better contextualize the county's exposure to these hazards, an overview of the county is presented first.

2.1.1 County Overview

Napa County is situated in the North Bay region of the San Francisco Bay Area. It is bordered by Sonoma County to the west, Solano County to the south and southeast, Lake County to the northwest, and Yolo County to the east. The County seat is the City of Napa. Napa Valley, located within Napa County, is internationally renowned for its wine production. The region is currently home to numerous vineyards and wineries, making it a popular destination for wine enthusiasts.

Indigenous people have lived in the county for over 10,000 years. The Indigenous people who originally inhabited the region were members of various Native American tribes, each with its own distinct language, culture, and traditions. These tribes have a rich history and connection to the land that predates the European settlement of the area. Tribes in the county include Patwin/Wintun, Wappo, Miwok, and Pomo. Indigenous traditional ecological knowledge has the potential to play a vital role in climate change assessment and adaptation efforts.

Napa County includes four incorporated cities, one town, and other unincorporated communities and rural areas. The county encompasses approximately 789 square miles of diverse landscapes, including hills and mountains that provide a scenic backdrop to vineyards and agricultural areas. Some notable features of the county include the Napa River, which flows from north to south through the county and plays a crucial role in the region's irrigation and agricultural practices, as well as Lake Berryessa, which is in the eastern part of the county. The wetlands located in the southern part of the county are also important for climate adaptation. The county experiences a Mediterranean climate, characterized by warm, dry summers and cool, wet winters. This climate is conducive to all kinds of agriculture, especially grape growing. The county's climate is one of the reasons for the success of the wine industry in the region (Napa County 2020).

2.1.2 Existing Hazards

The County's MJHMP, City of Napa's LHMP, and an array of additional plans and sources provide a comprehensive understanding of natural and anthropogenic hazards that have historically threatened the county. Acknowledging the existence of this wide array of hazards, for this VA, the focus will be on hazards in the county that are exacerbated by climate change including drought, flooding, and wildfire. The effects of climate change, including how climate change is exacerbating existing hazards, are addressed under Section 2.1.3 (Climate Change Effects). The following subsections discuss existing hazards as evaluated by the County, drawing from other sources as needed.

DROUGHT

The USGS defines drought as a period of drier-than-normal conditions that result in water-related problems. When rainfall is less than normal for several weeks, months, or years, the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth of water in wells increases. If dry weather persists and water-supply problems develop, the dry period can become a drought (USGS n.d.).

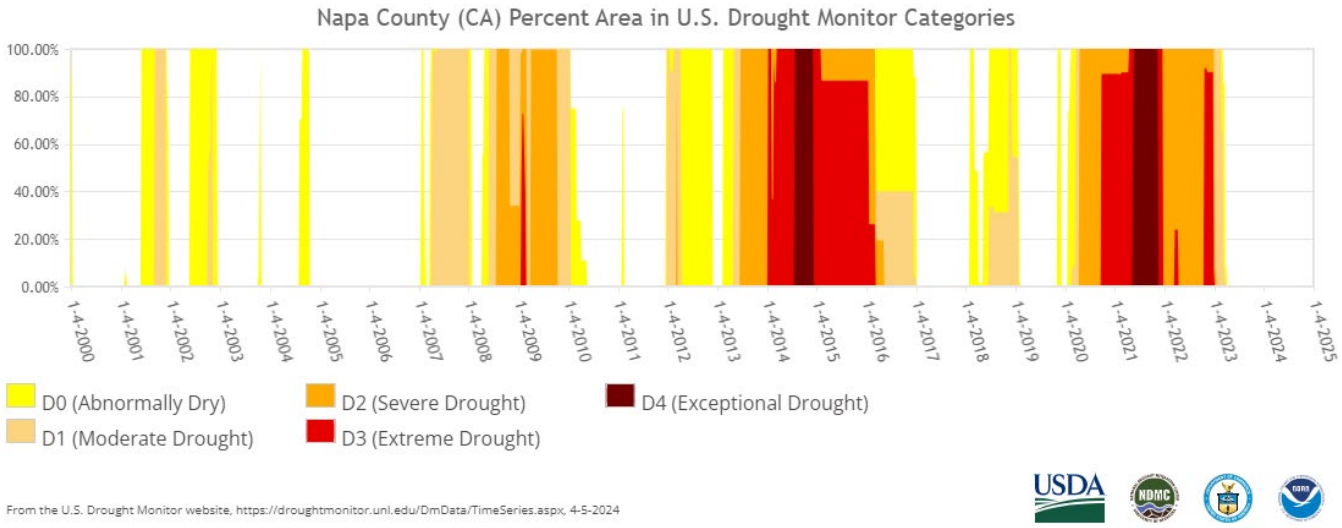
The term "drought" can have different meanings to different people, depending on how a water deficiency affects them. Droughts have been classified into different types such as:

- Meteorological drought – lack of precipitation;
- Agricultural drought – lack of soil moisture, or;
- Hydrologic drought -reduced streamflow or groundwater levels;

During times of drought, vegetation is visibly dry, stream and river flows decline, water levels in lakes and reservoirs fall, and the depth of water in wells increases. As drought persists, longer-term impacts can emerge, such as land subsidence, seawater intrusion, and damage to ecosystems. Unlike the immediate impacts of drought, however, long-term impacts can be harder to see, but more costly to manage in the future.

As addressed in the County's MJHMP, California's water resources have been stressed by periodic drought cycles and, in some places, overuse, creating the need for unprecedented restrictions in water diversions from the Sacramento-San Joaquin Delta in recent years. Climate change is expected to increase drought and extreme weather. While the duration of drought is variable, California and Napa County will certainly continue to be impacted by drought (Napa County 2020).

Overall, the frequency and severity of droughts can vary. According to historical data prepared by the National Drought Mitigation Center (NDMC), Napa County has experienced some level of drought in most years of the 21st century thus far (as of 2024). Figure 3 displays a time series of the percent area of Napa County classified within the five US Drought Monitor categories (i.e., D0 – Abnormally Dry, D1 – Moderate Drought, D2 – Severe Drought, D3 – Extreme Drought, and D4 – Exceptional Drought) since 2000. As displayed in the figure, the period from roughly 2011 to 2016 was a period of intense and prolonged drought, with much of the county experiencing multiple years of extreme and exceptional drought (i.e., D3 & D4). The drought during this period was one of the most severe droughts on record and it affected the entire state to the point where Governor Brown declared a statewide drought emergency in 2014, which was not lifted until 2017. The county also experienced extreme and exceptional drought from late 2020 to early 2023. As noted in the County's MJHMP, the severity and extent of a drought depends on the degree of soil moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Droughts can have significant impacts on water supply, which can then impact agriculture, people, and property functions,



Source: NDMC 2024.

Figure 3 Napa County Percent Area in US Drought Monitor Categories Since 2000

Unlike most disasters, droughts normally occur slowly but last a long time. On average, the nationwide annual impacts of drought are greater than the impacts of any other natural hazard. They are estimated to cost between $6 billion and $8 billion annually in the US and occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Moreover, a drought can result in farmers not being able to plant crops or the failure of planted crops, which results in loss of work for farm workers and those in food processing and winemaking jobs.

FLOODING

The County's MJHMP notes that in Napa County, a flood occurs when the existing channel of a stream, river, canyon, or other water course cannot contain runoff from rainfall or snowmelt, resulting in overflow onto adjacent lands. Flooding may also occur due to high tides and wind. The main factors affecting flood damage are water depth and velocity. Deeper and faster flood flows can cause more damage. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. Flood reduction, prevention, and mitigation are a major challenge to county residents and floodplain managers alike. The county is located within three watersheds: Napa River Watershed, Putah Creek Watershed and Suisun Creek Watershed. Many areas of the county are at risk of flooding, especially low-lying properties near the Napa River and its feeder streams, as this section explores in further depth. Flooding in Napa County routinely develops from north to south. The location of flood hazard zones in Napa County is mainly focused around the Napa River and the San Francisco Bay, but also exist along the tributaries of Suisun and Putah Creeks. Although the Napa River is the main drainage for the surrounding watershed, and the Napa River/Napa Creek Flood Protection Project will prevent catastrophic flooding along the river's banks, there remains a significant threat of flooding along the Napa River and many feeder streams in the watershed (Napa County 2020). Regardless of the Napa River/Napa Creek Flood Protection Project, Napa River and its adjoining areas are still designated as 100-year flood hazard zones.

Both 100-year floodplains and 500-year floodplains exist in the county. A 100-year floodplain is one that has a 1 percent chance (i.e., a 1-in-100 chance) of experiencing a flood in any given year, whereas a 500-year floodplain has a

0.2 percent chance (i.e., a 1-in-500 chance) of experiencing a flood in any given year. The County's *2023 General Plan Safety Element* also profiles flood hazards. Figure SAF-3 of the Safety Element shows the locations of 100-year floodplains and 500-year floodplains in the county. As discussed above, the majority of the floodplains are along Napa River, while 100-year floodplains are also elsewhere within the county (Napa County 2023).

Based on Federal Emergency Management Agency (FEMA) data, from May 1953 to January 2024, Napa County experienced a total of 39 hazard events resulting in Major Disaster Declarations, of which eight were flooding events and 10 were severe storm-related events (FEMA 2024). For context, a Major Disaster Declaration is any major disaster resulting from a natural event that the President of the United States determines has caused damage of such severity that it is beyond the combined capabilities of State and local governments to respond to. Major Disaster Declarations provide a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. Figure 4 displays the types of each of these 39 Major Disaster Declarations that Napa County has endured. Recently, and notably, together with other California Counties, Napa County experienced a series of heavy rain and flooding events from January to April 2023, caused by atmospheric rivers.

Furthermore, the County's MJHMP notes that Napa County will experience flooding in the future, with the probability of flooding in Napa County between 10 and 100 percent annually.

WILDFIRE

The County's MJHMP notes that a wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as energy supply infrastructure, smoking, campfires, equipment use, and arson. The 2018 California State Hazard Mitigation Plan also provides the following definition of wildfires: any free-burning vegetative fire that initiates from an unplanned ignition, whether natural (e.g., lightning) or human-caused (e.g., powerlines, mechanical equipment, escaped prescribed fires), where the management objective is full suppression.

Napa County is mainly characterized by a narrow valley floor surrounded by and intermingled with steep, hilly, wooded terrain—areas highly susceptible to wildfires. Such fires expose residential and other development within the county to an increased risk of conflagration, or extensive fire which destroys a great deal of land or property. The hilly/mountainous terrain on the east and west sides of Napa Valley strongly influences both wildfire behavior and fire suppression capabilities. Moreover, the wildland-urban interface (WUI) is defined by the U.S. Fire Administration as the zone of transition between unoccupied land and human development. It is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The County's MJHMP identifies the potential for significant damage from wildfire hazards to life and property increases in WUI areas. A few county communities, including Angwin and Calistoga, are located in WUI areas.

Wind is also a significant factor in the spread of fire. As fires spread faster, burning embers are carried with the wind to adjacent exposed areas. The Napa Valley has a characteristic southerly wind that originates from the San Francisco Bay and San Pablo Bay and, during the dry season, an occasional northerly wind of significant velocity. Both are significant factors in the spread of wildfires.

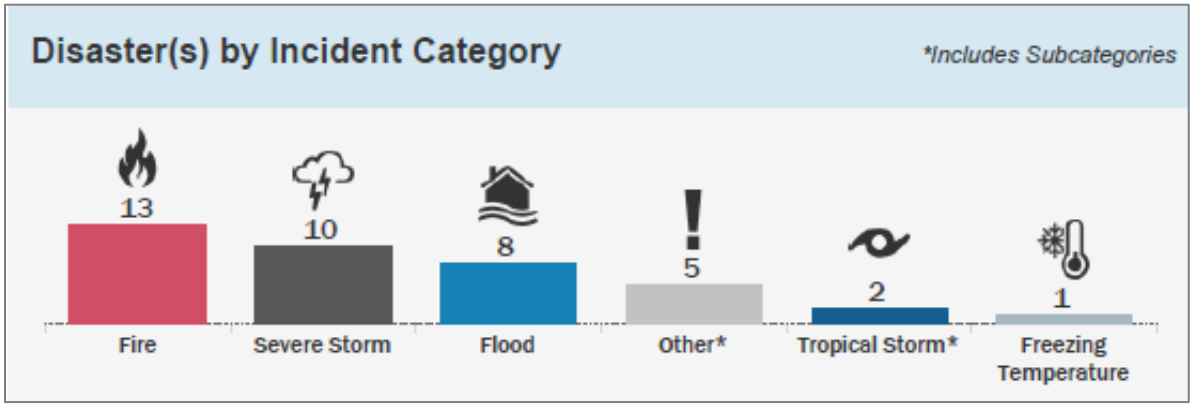
To help better refine areas of wildfire concern, the California Department of Forestry and Fire Protection (CAL FIRE) establishes and maps Fire Hazard Severity Zones (FHSZs), or areas of significant fire hazards based on factors such as fuel, weather, terrain, and the number of days of moderate, high, and extreme fire hazard potential. FHSZs range from "Moderate," "High," and "Very High."

Several agencies have responsibility for wildfire protection within any jurisdiction, ranging from local and tribal organizations to federal organizations. To address wildfire jurisdictional responsibilities, the State Legislature has designated Local Responsibility Areas (LRA), State Responsibility Areas (SRA), and Federal Responsibility Areas (FRA). FRAs encompass fire-prone wildland areas owned or managed by a federal agency responsible for wildfire response and safety on federal lands. SRAs include land under various ownership types in the state where CAL FIRE has legal and financial responsibility for wildfire protection, which include forested or other undeveloped lands, but does not include incorporated cities or federal lands. LRAs typically include lands in incorporated towns and cities, cultivated

agricultural lands, and other lands that otherwise do not meet the criteria for SRA or FRA, inclusive of some land in unincorporated counties. Figure SAF-9 of the County's General Plan Safety Plan shows the locations of these areas, together with FHSZs in the county. As shown in Figure SAF-9, a significant portion of the county is SRA and is also designated in the very high FHSZ (Napa County 2023).

Wildfires have proven to be costly and have put many elements of the county at risk, including human lives, property, rivers and watersheds, agriculture, open space, timber, recreation, wildlife habitats, historic and cultural assets, scenic assets, and local economies, among others. Of the 39 hazard events resulting in Major Disaster Declarations that Napa County experienced from May 1953 to January 2024, 13 of them were wildfire events, which are displayed in Figure 4 alongside the other types of Major Disaster Declarations the county has experienced (FEMA 2024). Note that the county experienced four Major Disaster Declarations due to fire hazards in 2020 (two in August, one in September, and one in October). The county also experienced four Major Disaster Declarations due to fire hazards in 2017 (three in September, and one in October). Ten out of the 13 fire-related Major Disaster Declarations occurred since 2000.

The County's MJHMP notes that the county faces a wildfire fire threat every year. The majority of past wildfire events in the county were in the summer months (typically June through August). The frequency of wildfire events may increase because of increasingly drier conditions caused by climate change. The county is already considered to be an area that is at high risk for wildfires. Climate change is projected to increase this current risk by anywhere from 10 to 20 percent, and the County will need to continue to adapt to this projected increase. This increase could cause additional threats to the county and has the potential to affect emergency services, roads, water supplies, housing access, public health, and quality of life. Moreover, fire risk will also continue to grow as more people build in WUI areas, which increases the exposure of people, buildings, infrastructure, and other assets and values to wildfire hazards. However, according to input received from the County and local agencies in the region, in recent years, the implementation of more stringent building and road standards, the requirement for fire insurance, and other related factors have markedly diminished new construction in WUI areas. Of the 1,350 homes that were destroyed in 2017, 2018, and 2020, less than half of them were rebuilt.



Source: FEMA 2024.

Figure 4 Napa County Major Disaster Declarations (Federal) from 1953-2023

2.1.3 Climate Change Effects

Climate change effects are categorized as primary (direct) and secondary (indirect). Primary effects are those that are caused by the direct effects of increased GHG emissions on the global climate, from which secondary effects result. The primary climate change effects analyzed for the county include increased temperatures, changes in precipitation patterns, and sea level rise. The secondary climate change effects, which can occur because of individual changes or a combination of changes in the primary climate change effects, include increased wildfire risk or severity, increased frequency of extreme heat events, increased frequency or severity of extreme precipitation and flooding events, increased risk of drought and associated water supply impacts, and energy grid resiliency issues.

Though the precise extent of future climate change effects is uncertain, historical climate data and forecasted GHG emissions can be used to project climate change effects through near-term (current-2050), mid-term (2040-2069), and long-term (2070-2099) timescales, unless noted otherwise for individual climate change effects. The time periods are established as 30-year time intervals to gather accurate data on average changes in the climate, which is typically measured over 30-year periods or longer. This results in overlap among some periods. Due to annual fluctuations in climate variables, climate data on shorter periods may be less accurate and not reflect long-term averages (NOAA 2020). To assess the potential effects of climate change, the APG recommends using Cal-Adapt, a tool developed by the CEC and the University of California, Berkeley Geospatial Innovation Facility that uses global climate simulation model data to identify how climate change might affect various geographies in California. Cal-Adapt addresses the uncertainty in future GHG emissions by using Representative Concentration Pathways (RCPs) developed by the Intergovernmental Panel on Climate Change (IPCC). These RCPs depict two future emissions scenarios. RCP 4.5 represents a lower emissions scenario in which GHG emissions continue to rise through 2040 and then decrease to below 1990 levels by the end of the century. RCP 8.5 represents a high emissions scenario, or business-as-usual scenario, where GHG emissions continue to increase through the end of the century. As recommended by the APG, this VA evaluates near-term and mid-term climate change effects and their associated impacts under the high emissions scenario (RCP 8.5), as this takes a conservative approach and assumes a worst-case scenario. Additionally, near-term and mid-term changes in climate variables are similar under both the low and high emissions scenarios. On the other hand, because long-term global GHG emissions trends are less certain and climate impacts vary more considerably between scenarios, a discussion of both the low and high emissions scenarios is included for this timescale (OPR, CEC, and CNRA 2018a).

Cal-Adapt downscales global climate models to local and regional resolutions using the Localized Constructed Analogs statistical technique. Four of the models included have been selected by California's Climate Action Team Research Working Group as priority models for research contributing to the Climate Assessment. The first model, CanESM2, represents an "average" simulation. The second model, CNRM-CM5, represents a "cooler/wetter" simulation. The third model, HadGEM2-ES, represents a "warmer/drier" simulation. The fourth model, MIROC5, represents a "dissimilar" simulation that is most unlike the other three to produce maximal coverage of possible future climate conditions. To analyze climate projections for the county, the average of the downscaled data provided by these four models was used. The boundaries of the study area for this analysis are the geographic boundaries of Napa County as a whole, unless otherwise noted.

PRIMARY CLIMATE CHANGE EFFECTS

Increased Temperatures

Though average annual temperature varies depending on location within Napa County, this analysis focuses on the county as a whole. According to Cal-Adapt, the historic (1961-1990) average annual maximum temperature for the county is 71.1 °F, and the historic average annual minimum temperature is 43.6 °F. As shown in Table 4, both are projected to increase throughout the century (CEC 2024a). The average annual maximum temperature in the county is projected to increase to 74.7 °F in the near-term and 76.0 °F in the mid-term under RCP 8.5. The average annual maximum temperature is projected to increase to 76.4 °F and 79.2 °F in the long-term under RCPs 4.5 and 8.5, respectively. Figure 5 graphically displays the increase in average annual maximum temperature within the county through the end of the century (CEC 2024b). The average annual minimum temperature in the county is projected to increase to 47.2 °F in the near-term and 48.3 °F in the mid-term under RCP 8.5. The average annual minimum temperature is projected to increase to 48.7 °F and 51.9 °F in the long-term under RCPs 4.5 and 8.5, respectively.

Historic average annual temperatures, along with future projected temperatures across each timescale, could vary slightly depending on location within the county. To show potential temperature differences due to geographic locations, temperature data was extracted for the cities of St. Helena and American Canyon. St. Helena is an inland incorporated city in the northwestern portion of the county, whereas American Canyon is a coastal city adjacent to the San Francisco Bay in the southernmost portion of the county. According to the data, the historic average annual maximum temperature in St. Helena is 71.6 °F, and the historic average annual maximum temperature in American Canyon is 71.4 °F. This data shows that there is not a significant difference in annual average maximum temperature

in these different geographic locations selected for the county. Meanwhile, the change in temperature across each timescale from the historic average is also similar in jurisdictions across the county. For example, in the long term under RCP 8.5, St. Helena is projected to have an average annual maximum temperature of 79.9 °F or an increase of 8.3 °F from its historic average. Similarly, American Canyon is projected to have an average annual maximum temperature of 79.1 °F in the long term under RCP 8.5, or an increase of 7.7°F from its historic average. These respective increases in temperature of 8.3 °F and 7.7 °F are also similar to the projected 8.1 °F increase across the county as a whole, which is shown in Table 4 (CEC 2024a). Increased temperatures in the county will likely influence secondary climate change effects, including increased wildfire risk, increased frequency of extreme heat events, and drought and water supply.

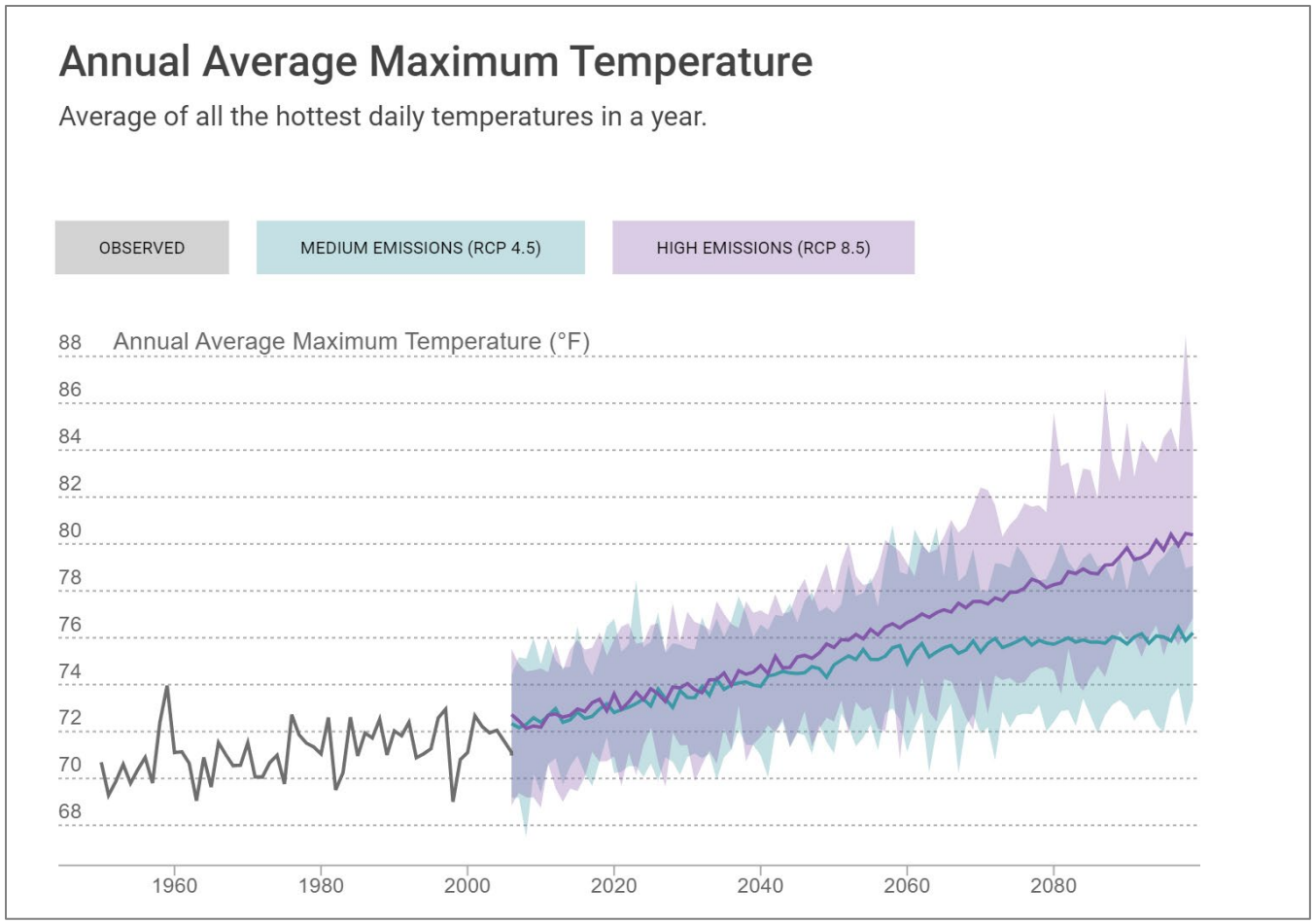
Table 4 Changes in Average Annual Temperature in Napa County

Average Annual Temperature	Historic (1961-1990)	Near-Term[1] (current-2050)	Mid-Term[1] (2035-2064)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Maximum Temperature (ºF)	71.1	74.7	76.0	76.4	79.2
Maximum Temperature Difference from Historic (ºF)	N/A	+3.6	+4.9	+5.3	+8.1
Minimum Temperature (ºF)	43.6	47.2	48.3	48.7	51.9
Minimum Temperature Difference from Historic (ºF)	N/A	+3.6	+4.7	+5.1	+8.3

Notes: ºF = degrees Fahrenheit; N/A = not applicable; RCP = Representative Concentration Pathway.

[1] Projections for the near-term and mid-term timescales are based on RCP 8.5.

Source: CEC 2024a.



Source: CEC 2024b.

Figure 5 Napa County Projected Increase in Average Annual Maximum Temperature through 2099

Changes in Precipitation Patterns

According to Cal-Adapt, the historic average annual precipitation in the county is 31.3 inches. As shown in Table 5, the average annual precipitation in the county is projected to increase to 36.2 inches in the near-term and 36.9 inches in the mid-term under RCP 8.5. In the long-term, average annual precipitation is projected to increase to 34 inches under RCP 4.5, and 41 inches under RCP 8.5 (CEC 2024a).

Historic average annual precipitation, along with future projected average annual precipitation across each timescale, can vary slightly depending on location within the county. Using the same examples as before (i.e., average annual maximum temperature), the historic average annual precipitation in St. Helena is 37.3 inches, whereas the historic average annual precipitation in American Canyon is 20.9 inches, which shows that there is a significant difference in average annual precipitation in these different geographic locations selected for the county. Moreover, in the long-term under RCP 8.5, St. Helena is projected to have an average annual precipitation of 48.9 inches, or an increase of 11.6 inches from its historic average. On the other hand, American Canyon is projected to have an average annual precipitation of 27.1 inches in the long-term under RCP 8.5, or an increase of 6.2 inches from its historic average. Based on the data, the predicted future changes in precipitation also differ slightly by different geographic locations in the county. The inland areas are projected to get more increasing annual precipitation than the coastal areas. The county's overall increase in precipitation will likely be between inland and coastal levels: 11.6 inches (inland) > 9.7 inches (county) > 6.2 inches (coastal) (CEC 2024a).

While average annual precipitation in the county is projected to trend upward in future years, overall precipitation patterns are also projected to change, with precipitation variability expected to continue, and potentially increase, over time across the San

Francisco Bay Area, inclusive of the county. Historically, precipitation in the San Francisco Bay Area exhibits "booms and busts," which refers to the existence of both very wet years and very dry years (OPR, CEC, and CNRA 2018b). The amount of precipitation that falls in any particular year is largely influenced by occurrences of large, discrete winter storms, which often provide a substantial fraction of the region's annual precipitation. As these storms happen in the coming decades, they will likely become more intense, and potentially more damaging. In general, periods of precipitation are projected to be wetter, but on an annual basis, there will likely be fewer total days with precipitation. Furthermore, climate projections show a likely increase in extreme dry events, which may result in severe and prolonged drought (OPR, CEC, and CNRA 2018b). Overall, the projected increase in average annual precipitation and changes in precipitation patterns through the end of the century will likely influence secondary climate change effects, including increased wildfire risk, extreme precipitation and flooding, drought and water supply shortages.

Table 5 Changes in Average Annual Precipitation in Napa County

Average Annual Precipitation	Historic (1961-1990)	Near-Term[1] (current-2050)	Mid-Term[1] (2035-2064)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Average Annual Precipitation (inches)	31.3	36.2	36.9	34.0	41.0
Average Annual Precipitation Difference from Historic (inches)	N/A	+4.9	+5.6	+2.7	+9.7

Notes: N/A = not applicable; RCP = Representative Concentration Pathway.

[1] Projections for the near-term and mid-term timescales are based on RCP 8.5.

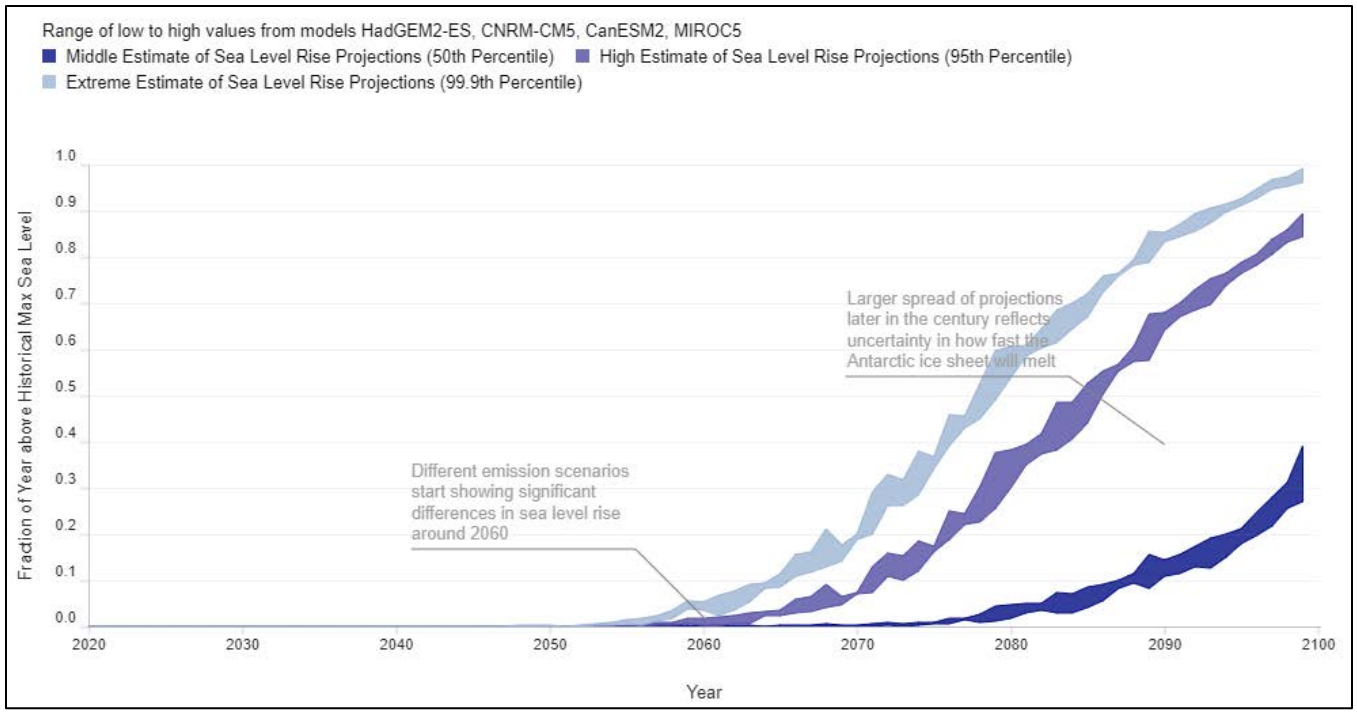
Source: CEC 2024a.

Sea Level Rise

Cal-Adapt provides probabilistic sea level rise projections for both RCPs 4.5 and 8.5, which incorporate estimates of components that contribute to global and regional sea level rise (e.g., thermal expansion of seawater, glacier ice melt, glacial isostatic adjustments, etc.). The sea level rise projections for RCP 8.5 also incorporate relatively recent scientific findings on the potential for rapid demise of the West Antarctic Ice Sheet, which could dramatically accelerate sea level rise in the latter decades of this century. The probabilistic framework is helpful because, despite substantial advances in the science of sea level rise, significant uncertainty remains in mid- and late-century projections of sea levels. Probabilistic sea level rise projections provide a range of possible outcomes in a framework that enables decision-makers to choose a number that is appropriate for their level of risk tolerance. Sea level rise scenarios presented in Cal-Adapt include the 50th percentile (middle estimate), 95th percentile (high estimate), and 99.9th percentile (extreme estimate) (CEC 2024c).

According to Cal-Adapt, the historic maximum sea level at the San Francisco tide gauge station is 67 inches. The San Francisco tide gauge station was chosen for this analysis as it is the closest of the 11 gauge stations across the state in proximity to the county as a whole and thus would provide the most relevant projections. Figure 6 displays the projected fraction of the year that sea level would be over the historic maximum sea level at the San Francisco (67 inches) tide gauge station under RCP 8.5 and each of the above-noted sea level rise scenarios (middle, high, and extreme estimates). As shown, it takes until roughly mid-century for each sea level rise scenario to start showing significant differences.

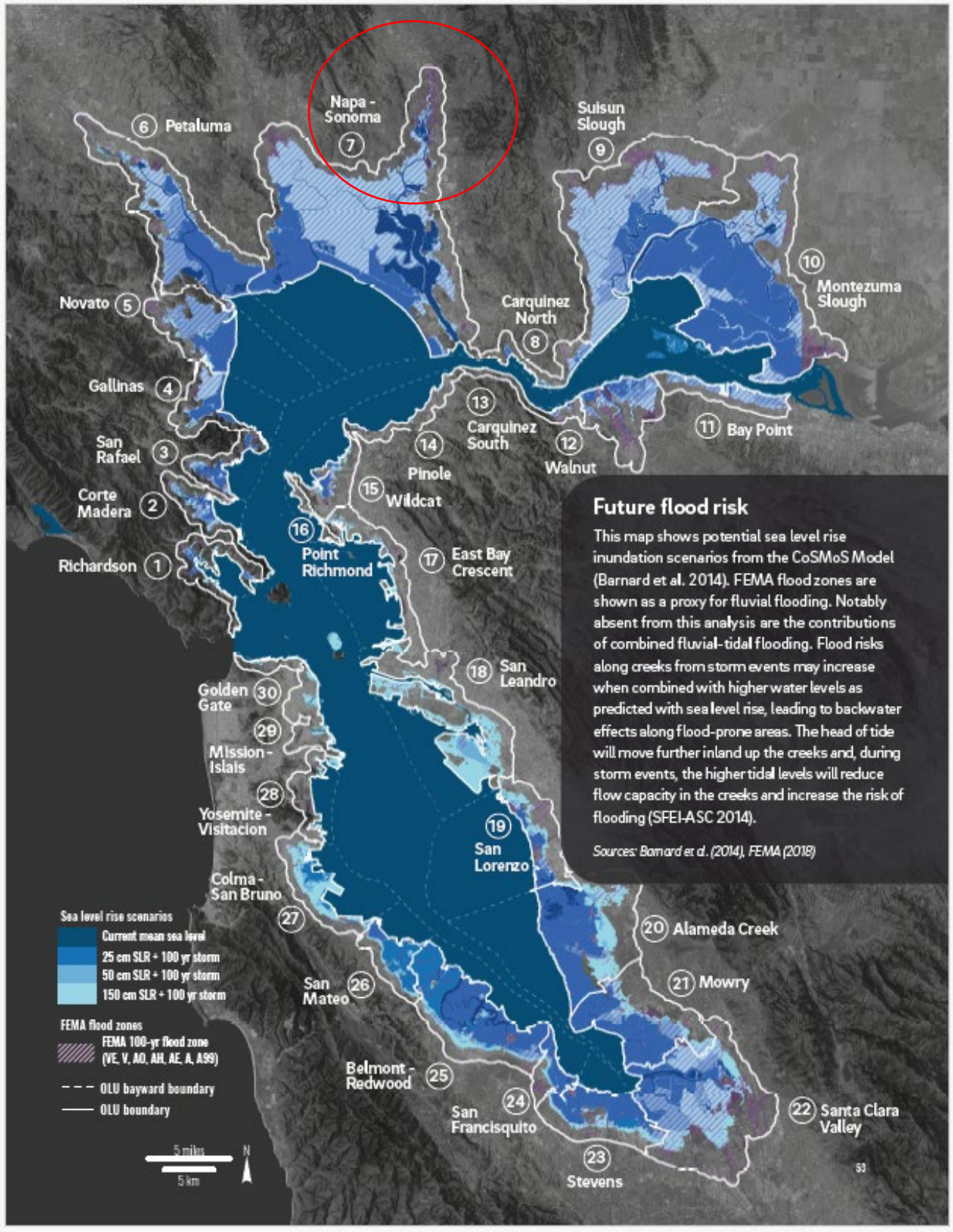
The County's MJHMP's Climate Change Hazard Profile included extensive discussion on sea level rise. As shown in the MJHMP's Figure 4-43: Sea Level Rise Potential of the MJHMP, the southern portion of the county, which includes the City of Napa, is projected to have moderate to high sea level rise potential. Moreover, although sea level rise will not impact most of the county directly and significantly, it can indirectly impact more inland communities. For example, landward intrusions of seawater due to sea level rise can make groundwater levels rise, which could result in subsurface flooding of underground utilities, basements, and other infrastructure, affecting the future suitability of land for commercial and residential use. Additionally, sea level rise will increase the severity of coastal flooding, one of the secondary climate change effects identified in this VA (Napa County 2020).



Source: CEC 2024c.

Figure 6 Projected Fraction of Year with Sea Level Above Historic Maximum at the San Francisco Tide Gauge Station Under RCP 8.5

Furthermore, the San Francisco Estuary Institute (SFEI) and the San Francisco Bay Area Planning and Urban Research Association (SPUR) released the *San Francisco Bay Shoreline Adaptation Atlas – Working with Nature to Plan for Sea Level Rise Using Operational Landscape Units (OLU)* report in April 2019. OLUs are a practical way to manage the physical and jurisdictional complexity of the Bay shoreline regarding adapting to sea level rise. A key purpose of the OLU framework is to identify where nature-based approaches, such as beaches, marshes, and subtidal reefs, can help create a resilient shoreline with multiple benefits against sea level rise. Napa County, grouped with Sonoma County, serves as the Napa-Sonoma OLU. According to the report's simulated sea level rise scenario analyses, an estimated 27 percent, 29 percent and 68 percent of the Napa-Sonoma OLU would be inundated if the OLU experiences a 100-year storm surge with 25 cm (0.8 feet), 50 cm (1.6 feet) and 150 cm (4.9 feet) sea level rise scenarios. Figure 7 below also shows the inundation areas under these different sea level rise scenarios (Napa-Sonoma OLU is circled in red) (SFEI and SPUR 2019).



Source: SFEI and SPUR 2019.

Figure 7 Estimated Bay Area Sea Level Rise Inundation under Different Future Scenarios

SECONDARY CLIMATE CHANGE EFFECTS

Increased Wildfire Risk

Historically, attention to wildfire in the state has mostly focused on the Sierra Nevada region and Southern California, but recent large and destructive wildfires in the San Francisco Bay Area have rapidly shifted attention to the ongoing risks in this region, inclusive of Napa County (OPR, CEC, and CNRA 2018b). Fire danger is complex. It is impacted by human activity, vegetation, wind, temperature, relative humidity, atmospheric stability, etc. Cal-Adapt provides projections for the future annual number of days when Keetch-Byram Drought Index (KBDI) is higher than 600. KBDI provides an estimate for how dry the soil and vegetative detritus is and represents a simplified proxy for the favorability of occurrence and spread of wildfire. However, Cal-Adapt clarifies that KBDI is not itself a predictor of fire. Table 6 displays the projected change in the annual number of days where KBDI > 600 within the county under RCP 8.5 for the near-term and mid-term timescales, and under both emissions scenarios, RCPs 4.5 and 8.5, for the long-term timescale.

The historic average annual number of days where KBDI > 600 in the county is 102.1. The average annual number of days where KBDI > 600 in the county is projected to increase to 113 in the near-term and 120.1 in the mid-term under RCP 8.5. The average annual number of days where KBDI > 600 is projected to increase to 121.8 in the long-term under RCP 4.5, and 140.3 in the long-term under RCP 8.5. Although it is difficult to pinpoint the exact timing, location, duration, and severity of future wildfires, the area's most susceptible to wildfire are the hilly/mountainous terrain on the east and west sides of Napa Valley, also described in Section 2.1.2. Also, a significant portion of the county is located in very high FHSZ.

Table 6 Changes in Annual Number of Days where KBDI > 600 in Napa County

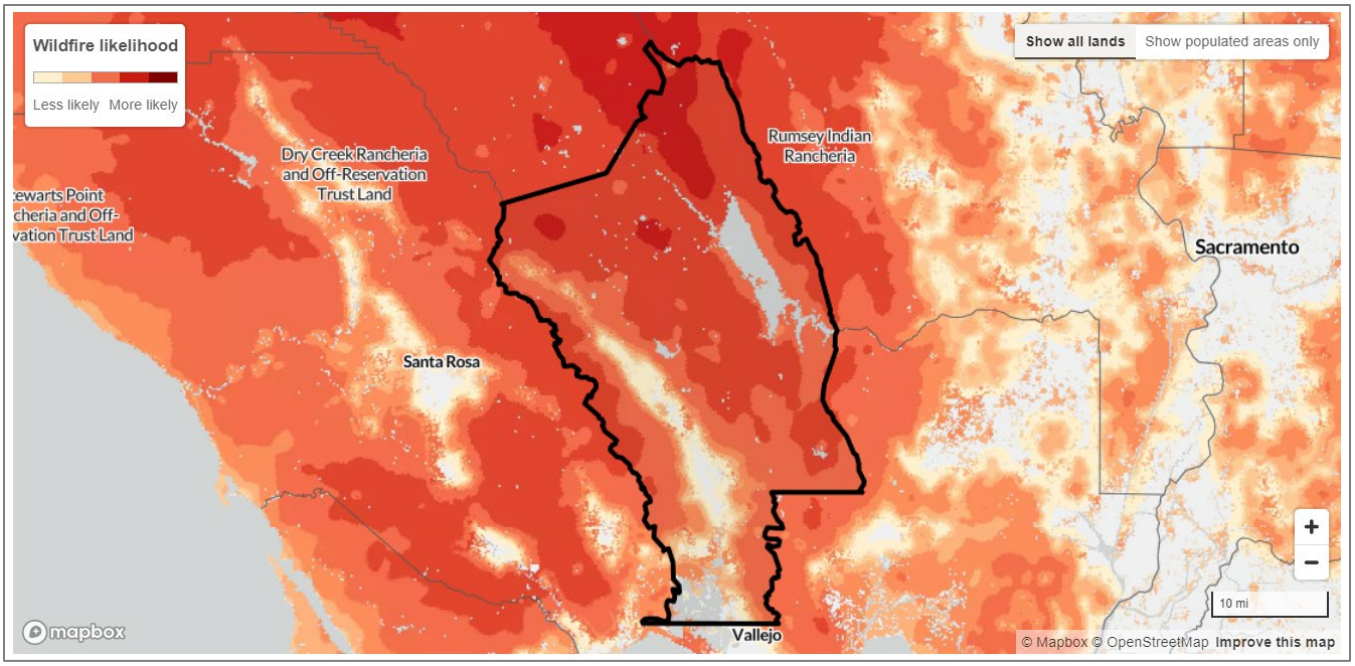
Average Annual Area Burned	Historic (1961-1990)	Near-Term[1] (current-2050)	Mid-Term[1] (2035-2064)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Annual Number of Days where KBDI >600 (days)	102.1	113.0	120.1	121.8	140.3
Annual Number of Days where KBDI >600 Difference from Historic (days)	N/A	+10.9	+18	+19.7	+38.2

Notes: N/A = not applicable; RCP = Representative Concentration Pathway.

1. Projections for the near-term and mid-term timescales are based on RCP 8.5.

Source: CEC 2024b.

Furthermore, Wildfire Risk to Communities is a tool created by USDA Forest Service that contains interactive maps, charts, and resources to help communities understand, explore, and reduce wildfire risk. This tool provides data on wildfire likelihood. As shown in Figure 8 below, the majority of Napa County has a "more likely" wildfire likelihood, which is greater than 74 percent of the other counties in the US.



Source: Wildfire Risk to Communities 2020.

Figure 8 Napa County Wildfire Likelihood

Increased Frequency of Extreme Heat Events

The Cal-Adapt tool provides estimates of future instances of extreme heat events. Extreme heat events include extreme heat days and heatwaves. Cal-Adapt defines an extreme heat day as a day when the daily maximum temperature exceeds the 98th historical percentile of daily maximum temperatures based on observed data from

1961–1990 between April and October. Heatwave events are characterized as periods of sustained extreme heat and are defined by Cal-Adapt as four or more consecutive extreme heat days.

Extreme heat day thresholds vary significantly for different portions of the county due to various geographic, topographic, and climatological factors. However, to be consistent with exposure analyses of other climate change effects, the study area in Cal-Adapt was kept as the geographic boundaries of the entire county. Table 7 below displays the data for extreme heat events in the county through the end of the century. The default extreme heat threshold for the county is 98.6°F, meaning 98 percent of all recorded temperatures between April and October from 1961 to 1990 were below 98.6 °F. Historically, the county experienced an average of 4.3 extreme heat days and 0.2 heatwaves per year from 1961-1990. As a result of rising temperatures from climate change, the county is projected to experience 15.9 extreme heat days and 1.5 heatwaves annually in the near-term, and 22.1 extreme heat days and 2.5 heatwaves annually in the mid-term under RCP 8.5. In the long-term, the county is projected to experience 24 extreme heat days and 2.6 heatwaves annually under RCP 4.5, and 40 extreme heat days and 5.4 heatwaves annually under RCP 8.5. In addition to the increasing number of extreme heat days and heatwaves on an annual basis, the length of consecutive extreme heat days is also projected to increase through the end of the century, as shown in Table 7. Moreover, the County's MJHMP mentions that high heat events can occur throughout Napa County and are projected to worsen with climate change.

Figure 9 provides a visual representation of the projected increase in the annual number of extreme heat days in the county through the end of the century using the four priority models previously described (i.e., CanESM2, CNRM-CM5, HadGEM2-ES, and MIROC5). Noting that the presented data is for Napa County as a whole and acknowledging that extreme heat is experienced differently across the county due to a range of factors (e.g., limited air conditioning in certain areas), a more in-depth discussion of heat-related sensitivities and potential impacts is presented in Section 2.2.5.

Table 7 Changes in Extreme Heat Events in Napa County

Annual Averages	Historic (1961-1990)	Near-Term[1] (current-2050)	Mid-Term[1] (2035-2064)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Number of Extreme Heat Days[2]	4.3	15.9	22.1	24.0	40.0
Number of Heatwaves[3]	0.2	1.5	2.5	2.6	5.4
Number of Days in Longest Stretch of Consecutive Extreme Heat Days	2.1	5.0	6.2	6.2	10.1

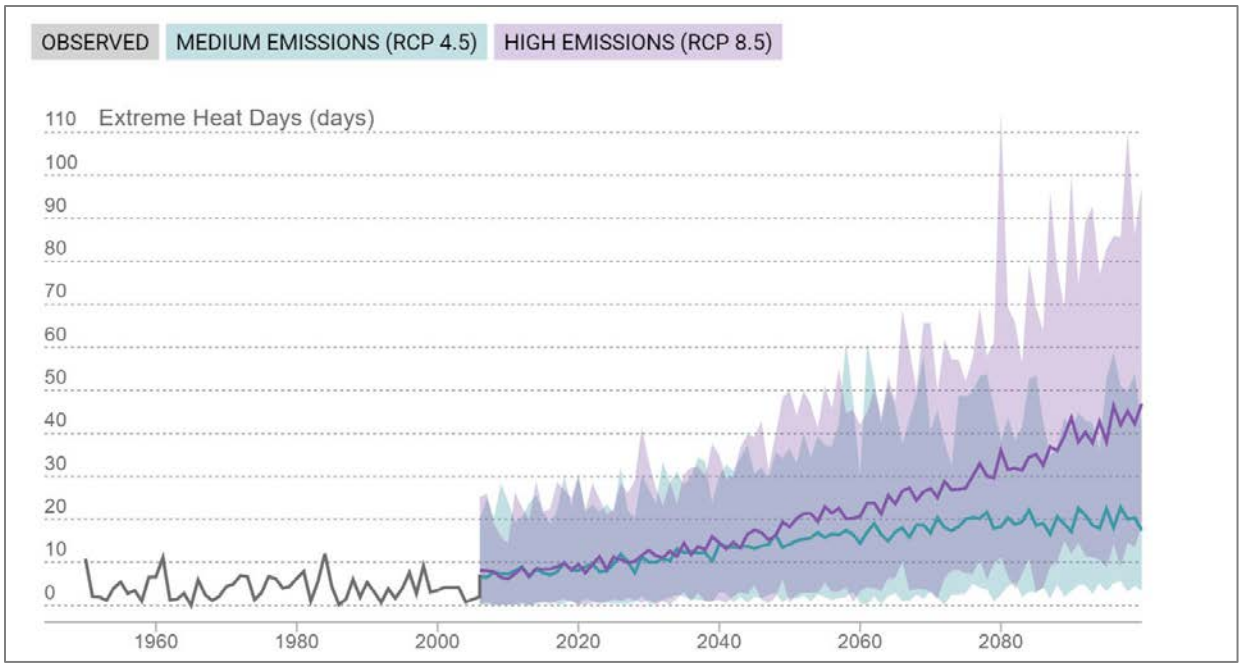
Notes: RCP = Representative Concentration Pathway.

[1] Projections for the near-term and mid-term timescales are based on RCP 8.5.

[2] The threshold for an extreme heat day in Napa County is 98.6 °F.

[3] A heatwave is characterized as a period of sustained extreme heat and is defined by Cal-Adapt as four or more consecutive extreme heat days.

Source: CEC 2024d.



Source: CEC 2024b.

Figure 9 Napa County Projected Increase in Extreme Heat Days through 2099

Extreme Precipitation and Flooding

In the Cal-Adapt tool, extreme precipitation events are defined as events where 2-day rainfall totals are above an extreme threshold (i.e., days having precipitation at or exceeding the 95th percentile). For the county as a whole, this threshold is approximately 1.47 inches over a 2-day period. Similar to extreme heat thresholds, extreme precipitation thresholds vary significantly for different portions of the county due to various geographic, topographic, and climatological factors. However, to be consistent with exposure analyses of other climate change effects, the study area in Cal-Adapt was kept as the geographic boundaries of the entire county. According to Cal-Adapt, the county has historically experienced an average of 3.3 extreme precipitation events per year from 1961-1990. Under RCP 8.5, the county is expected to experience 3.9 extreme precipitation events per year in the near-term and 4.3 extreme precipitation events per year in the mid-term. In the long-term, the county is projected to experience 4.2 extreme precipitation events per year under RCP 4.5, and 5.4 extreme precipitation events per year under RCP 8.5 (CEC 2024e). Changes in extreme precipitation events in the county are shown in Table 8. Though the table displays an increase in the average annual number of extreme precipitation events through the end of the century, it is important to note that the quantity of extreme precipitation events in the county may vary considerably year-to-year due to California's highly variable climate setting. However, as the climate continues to warm, atmospheric rivers, responsible for many of the extreme precipitation events across the state, will carry more moisture and may make extreme precipitation events more severe (Polade et al. 2017).

Table 8 Changes in Extreme Precipitation Events in Napa County

Average Annual Number of Extreme Precipitation Events[1]	Historic (1961-1990)	Near-Term[2] (current-2050)	Mid-Term[2] (2040-2069)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Average Annual Number of Extreme Precipitation Events	3.3	3.9	4.3	4.2	5.4
Average Annual Number of Extreme Precipitation Events Difference from Historic	N/A	+0.6	+1.0	+0.9	+2.1

Notes: The annual year for extreme precipitation events refers to the water year, which is a 12-month period from October 1, for any given year through September 30, of the following year; N/A = not applicable; RCP = Representative Concentration Pathway.

[1] The threshold for an extreme precipitation event in Napa County is 1.47 inches of precipitation over a 2-day period.

[2] Projections for the near-term and mid-term timescales are based on RCP 8.5.

Source: CEC 2022e.

As the potential increases for more extreme precipitation events to occur on an annual basis through the end of the century, the county may also experience an increase in the frequency and intensity of flood events. Though the occurrence of extreme precipitation events is a major source of flooding in the county, and will increasingly be so in the future, it is not the only source. As discussed previously, sea level rise is another major source of flooding across the entire county as rising seas will put new areas at risk of coastal flooding, and also increase the likelihood and intensity of floods in areas already at risk. Figure 10 displays projected flooding inundation across the entire county under four distinct sea level rise scenarios associated with a 100-year storm: 1.6 feet of sea level rise, 3.3 feet of sea level rise, 5.0 feet of sea level rise, and 6.6 feet of sea level rise. As noted previously, although most of the county will not experience direct impacts associated with sea level rise and associated flooding, the southern portion of the county, including parts of American Canyon and City of Napa, is exposed to potential inundation caused by sea level rise and the aggregated storm events. Also, according to the County's MJHMP, when combined with a 4.92-feet rise in sea level rise, climate change is projected to expose 13,000 additional acres to 100-year flood risk. While most of these areas are undeveloped, some developed areas are at risk and should be accounted for in future plans.

Drought and Water Supply

As shown in Table 5 above and discussed in the Changes in Precipitation Patterns as a primary climate change effect, under both emissions scenarios, RCPs 4.5 and 8.5, the county is expected to experience slight overall increases in average annual precipitation in the long-term. However, in addition to these slight increases in average annual precipitation, overall precipitation patterns are projected to change, with precipitation variability expected to increase substantially. The county and state have a highly variable climate that is susceptible to prolonged periods of drought, and recent research suggests that extended drought occurrences could become more pervasive in future decades. While the state does not see the average annual precipitation changing significantly in the next 50-75 years, precipitation will likely be delivered in more intense storms and within a shorter wet season. Research suggests that for much of the state, wet years will become wetter, and the dry years will become drier. Dry years are also likely to be followed by additional dry years, increasing the risk of drought (CEC 2024f).

Cal-Adapt provides predictions on the county's future annual maximum length of dry spell. The annual maximum length of dry spell is the maximum number of consecutive days with precipitation < 1mm for each year. Table 9 displays the projected change in the county's annual maximum length of dry spell under RCP 8.5 for the near-term and mid-term timescales, and under both emissions scenarios, RCPs 4.5 and 8.5, for the long-term timescale. The historic annual maximum length of dry spell for the county is 110.8 days. The county's annual maximum length of dry spell is projected to increase to 111.2 days for both near-term and mid-term under RCP 8.5. The county's annual maximum length of dry spell is projected to slightly decrease to 110.3 days in the long-term under RCP 4.5, while increase to 116.4 days in the long-term under RCP 8.5 (CEC 2024b).

Furthermore, according to input received from the County and local agencies in the region, it is important to acknowledge that water supply in the region is not solely reliant on local trends, but also on broader state trends, as Napa communities depend on the State Water Project. While municipal reservoirs contribute only a fraction to the overall supply, the majority of cities' water originates from Oroville Dam via the North Bay Aqueduct. On the other hand, rural areas directly depend on wells and/or Lake Berryessa for their water sources.

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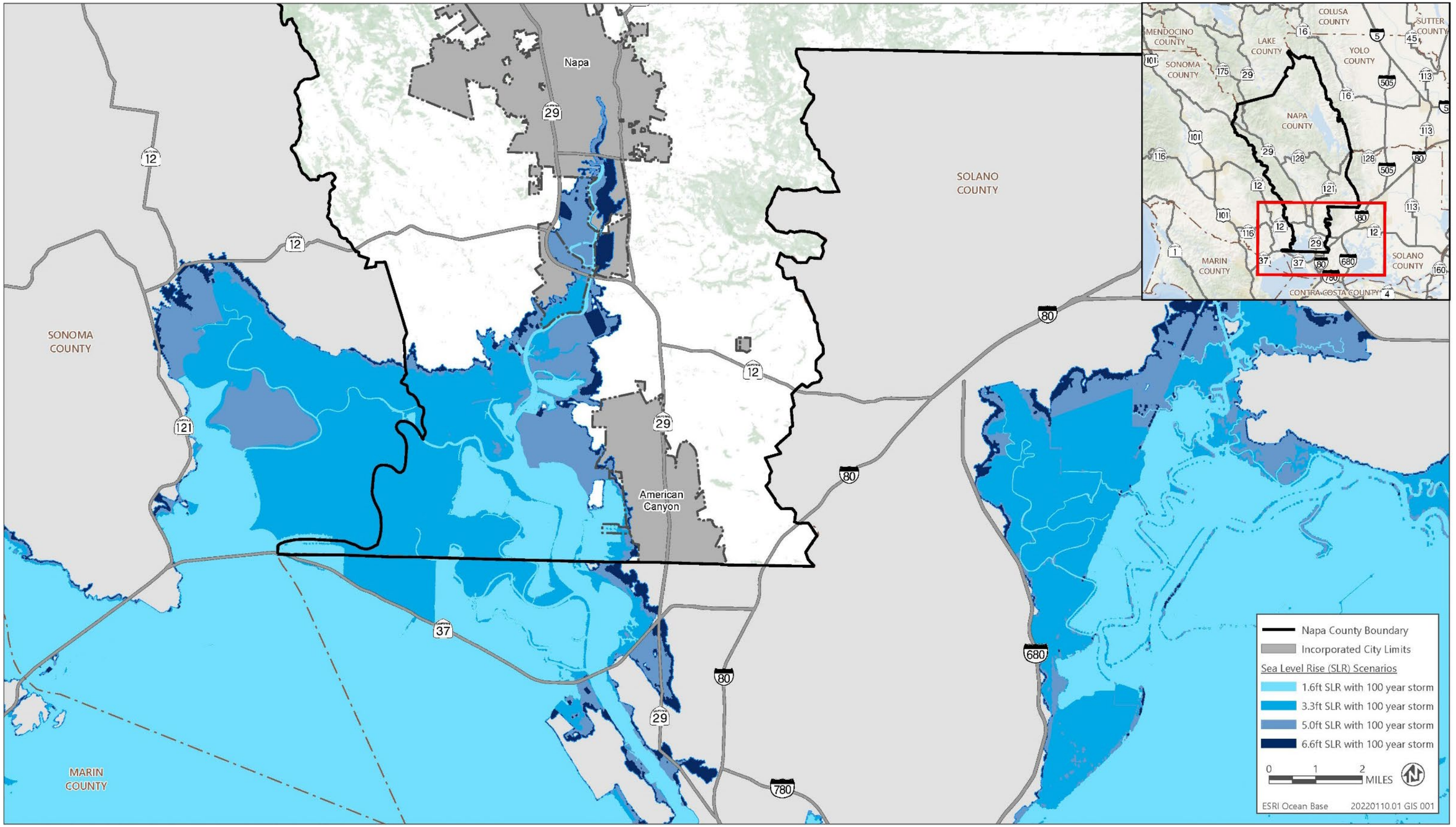


Source: USGS Coastal Storm Modeling System - Projected sea level rise and flood exposure data (CoSMoS v3.1; Barnard et al. 2018); accessed via the Our Coast Our Future web platform (Point Blue Conservation Science and USGS 2019); adapted by Ascent in 2024.

Figure 10 Napa County Sea Level Rise Scenarios

Table 9 Changes in Annual Maximum Length of Dry Spell for Napa County

Annual Maximum Length of Dry Spell	Historic (1961-1990)	Near-Term[1] (current-2050)	Mid-Term[1] (2035-2064)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Annual Maximum Length of Dry Spell (days)	110.8	111.2	111.2	110.3	116.4
Annual Maximum Length of Dry Spell Difference from Historic (days)	N/A	+0.4	+0.4	-0.5	+5.6

Notes: N/A = not applicable; RCP = Representative Concentration Pathway.

1. Projections for the near-term and mid-term timescales are based on RCP 8.5.

Source: CEC 2024b.

The county will experience extended drought periods like this as a result of climate change, and without effective adaptations, future droughts will challenge the management of the San Francisco Bay Area's water supplies, inclusive of the county (OPR, CEC, and CNRA 2018b).

Energy Grid Impacts

The impact of increased temperatures on the energy grid is a significant concern, especially considering the potential for more frequent and intense heatwaves due to climate change. Higher temperatures can strain energy infrastructure and present various challenges to the reliable operation of the power grid. Rising temperatures can lead to increased demand for cooling, especially in regions prone to heatwaves. This surge in demand can strain the electrical grid as more people use air conditioning and cooling systems. Extreme heat can also cause stress on power generation and distribution equipment, leading to failures and outages. Transformers, power lines, and other components may experience reduced efficiency and reliability in higher temperatures. Moreover, solar energy and hydropower are also subject to climate disruptions. For example, inconsistent precipitation can lead to a lack of consistency in hydropower production.

Electrical power disruptions can be grouped into two categories: intentional and unintentional. Intentional disruptions include planned disruptions, unscheduled, demand-side management, and load shedding. It is necessary to intentionally disrupt the service to prevent larger system failures when needed. A new intentional power disruption type has occurred in California related to wildfires that were ignited by downed power lines or malfunctioned electrical equipment that caused the Camp Fire in 2018. Because of the severity of that catastrophic wildfire event, the California Public Utilities Commission (CPUC) directed the three largest energy utilities in California to prepare their customers for wildfire threats and related power outages during severe weather events. This emergency preparedness resulted in safety procedures now referred to as public safety power shutoffs (PSPS) designed to protect customers and communities during severe weather events when power is proactively shut off for public safety reasons to prevent a wildfire. In comparison, unintentional disruptions are outages that come with no advance notice. Unintentional disruptions can be the most problematic and can include system failures or malfunction, equipment overload, fallen trees, vandalism, severe weather (lightning, high winds, flooding), and wildfires that damage transmission lines.

The relationship between wildfires and energy grid resiliency is a critical aspect of modern infrastructure planning, particularly in regions prone to wildfires. Wildfires can have severe and far-reaching impacts on the reliability and safety of the energy grid. For example, wildfires can result in power line damage and eventually result in grid disruption and outages. The occurrences of wildfires may also hinder emergency response efforts, making it challenging for utility crews to access affected areas and repair damaged infrastructure promptly. Moreover, as mentioned previously, utilities may implement PSPS to proactively reduce the risk of wildfire ignition caused by power lines. However, while PSPS can help prevent wildfires, they also lead to power disruptions for residents and businesses.

Furthermore, flooding events can also pose significant challenges to energy grids. Floodwater can damage critical components of the energy infrastructure, including power plants, substations, transformers, and power lines. Substations, where electricity is transformed and distributed, are particularly vulnerable to flooding. Damage to substation equipment can disrupt the flow of electricity through the grid and affect large areas. In addition, flooding poses electrical safety risks, which can create hazardous conditions for both the public and utility workers trying to repair and restore the grid.

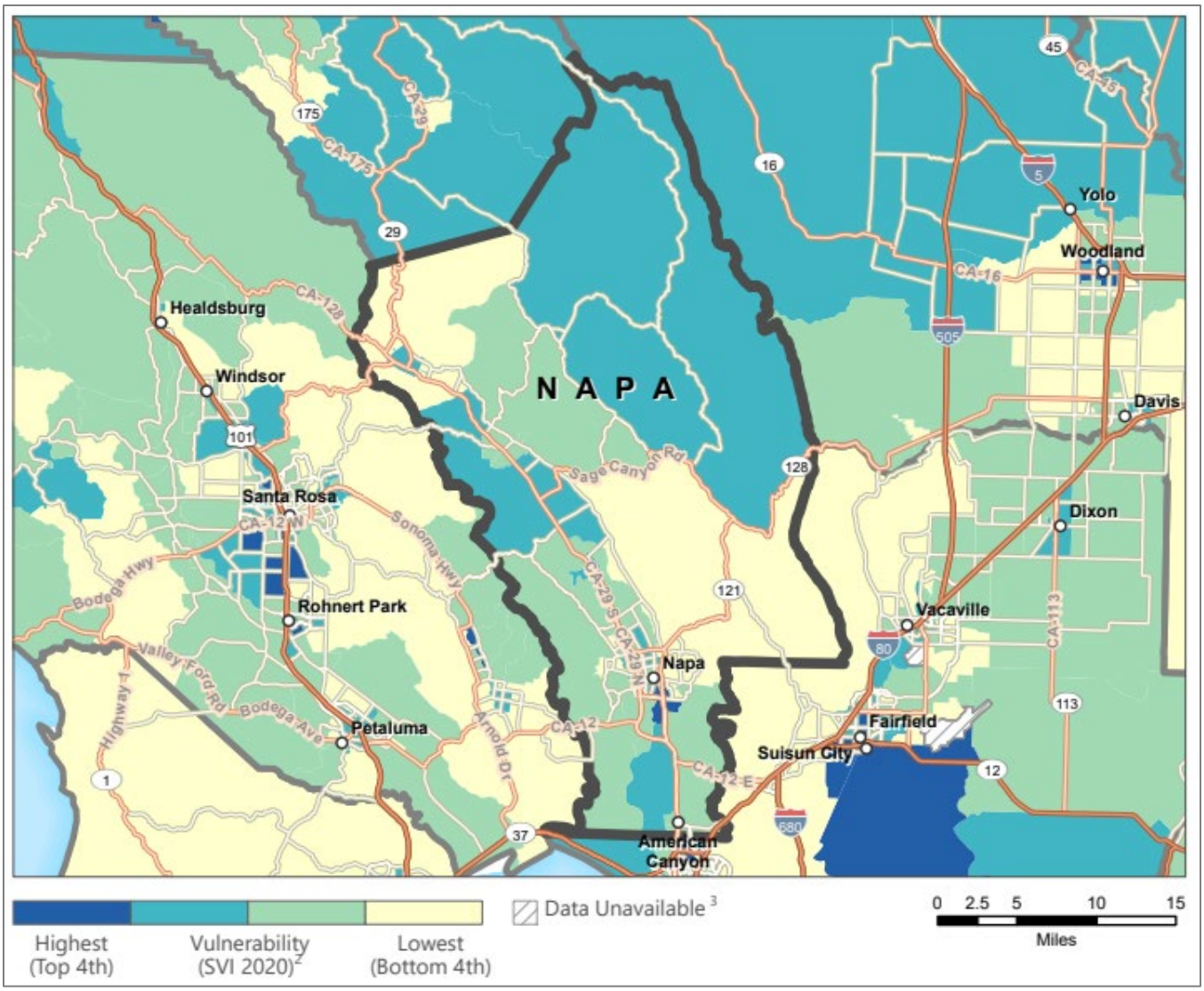
2.2 SENSITIVITY AND POTENTIAL IMPACTS

The second step of the VA process is conducting a sensitivity analysis and the analysis of potential impacts. The first objective of this step is to identify which populations and assets may be sensitive to climate change effects. The second objective is to determine the specific potential impacts that those populations and assets may face as a result of climate change effects. Key populations and assets identified in the county are organized into the following overarching categories: populations, built environment, and community functions. These categories are described in more detail below under Sections 2.2.1 through 2.2.3. Climate change effects and related impacts on each of these categories are then discussed in Sections 2.2.4 through 2.2.8, including increased wildfire risk, increased temperatures and extreme heat, extreme precipitation and flooding (including sea level rise), drought and water supply, and impacts to the energy grid.

2.2.1 Populations

While all persons in the county will experience impacts from climate change, some populations are more vulnerable to climate impacts due to a variety of factors. Vulnerable populations are those that "experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts" (OPR 2018). These disproportionate effects are caused by physical, social, political, and economic factors, which are exacerbated by climate impacts. Some of these factors include race, class, sexual orientation and identification, national origin, and income inequality, among others (OPR 2018).

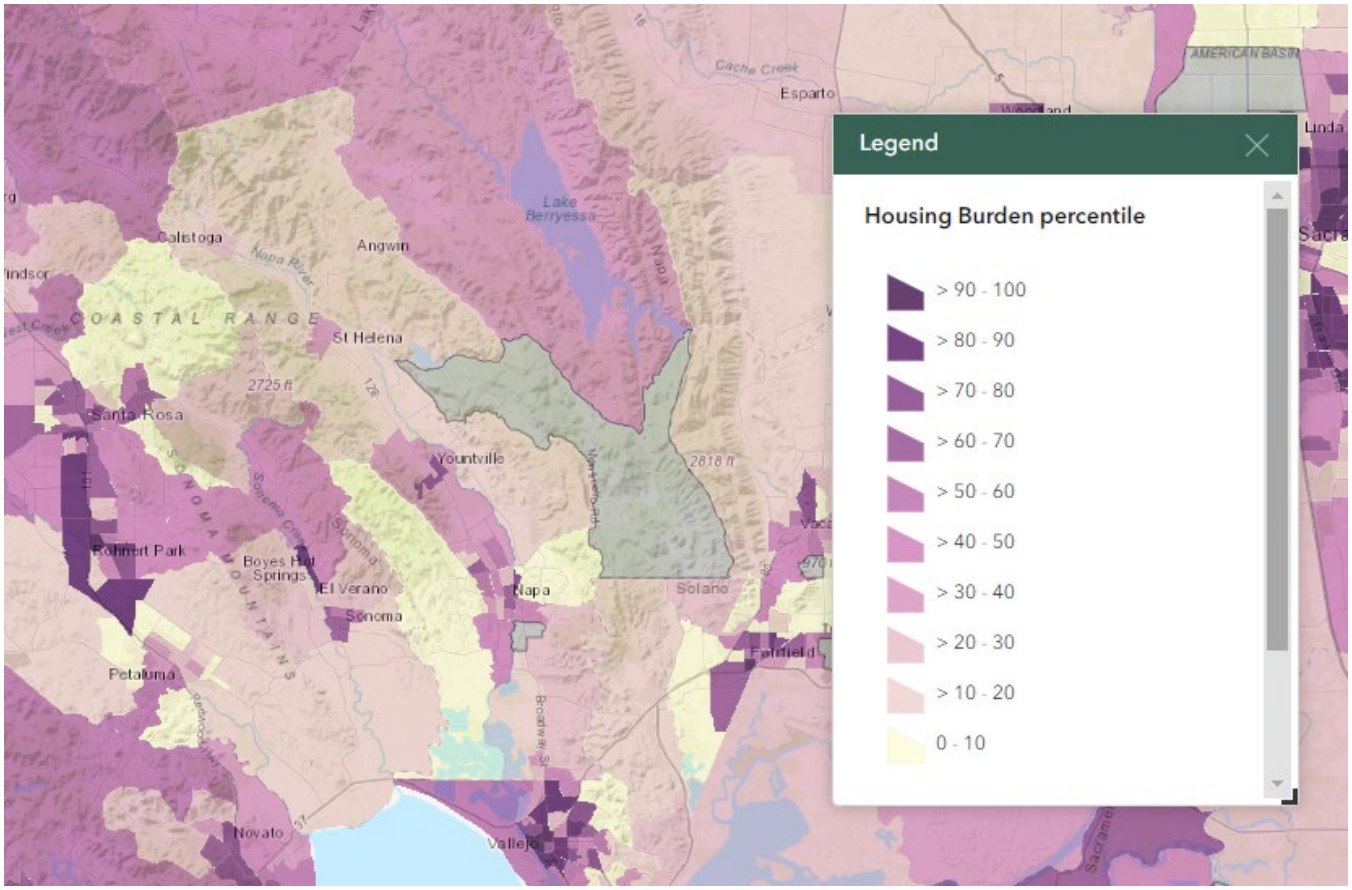
Within the county, an array of populations is vulnerable to the effects of climate change. The Social Vulnerability Index (SVI), developed by the Centers for Disease Control and Prevention, is a tool intended to assist local planners in better preparing for and responding to hazards by identifying and mapping areas where populations are most likely to need support before, during, and after a hazardous event, including those linked to or exacerbated by climate change. The SVI groups 16 distinct census-derived factors (e.g., poverty, lack of vehicle access, housing challenges) into four themes (i.e., socioeconomic status, household characteristics, racial and ethnic minority status, housing type/transportation) that summarize the extent to which an area is socially vulnerable to hazards. Figure 11 displays variations in social vulnerability in the county according to SVI. As shown in Figure 11, the most vulnerable populations are primarily in the northern, northeastern, western and southern portions of the county (CDC 2020). Specific vulnerable populations in the county include but are not limited to, children, pregnant people, the elderly, communities of color, linguistically isolated communities, individuals experiencing homelessness, low-income individuals, individuals with access and functional needs, workers in vulnerable occupations, and those with preexisting health issues. It is important to plan for all groups that, for one reason or another, lack available resources or capacity to react or adapt to the impacts of climate change. However, note that the SVI shows social vulnerability from a census tract level and may not capture broad disparities in the degree of vulnerability. For example, census tracts identified to be vulnerable may still contain people or households that are not socially vulnerable, and vice versa.



Source: CDC 2020.

Figure 11 Napa County Social Vulnerability Index

Moreover, the CalEnviroScreen 4.0 tool developed by the California Office of Environmental Health Hazard Assessment (OEHHA) also offers insights on potentially vulnerable communities. California has extremely high housing costs relative to much of the country, which can make it hard for many to afford housing. Also, households with lower incomes may spend a larger proportion of their income on housing and may suffer from housing-induced poverty. The CalEnviroScreen tool includes an indicator map that shows areas in the county where there are higher percentages of housing-burdened low-income households (see Figure 12). These are households that are both low-income and highly burdened by housing costs. As shown in Figure 12, a few communities near the City of Napa and Town of Yountville have relatively higher housing burdens while also are relatively low-income.



Source: OEHHA 2023.

Figure 12 Napa County Housing-Burdened Low-Income Households

2.2.2 Built Environment

The built environment in the county includes assets that are essential to the health and welfare of residents and visitors and are especially important during and following hazard events linked to or exacerbated by climate change. This ranges from residential and commercial buildings to an array of critical infrastructure, including essential facilities (e.g., fire stations, medical facilities, schools), transportation infrastructure (e.g., roadways, bridges, railroads), and utility infrastructure (i.e., energy, communications, and water and wastewater). Critical infrastructure, in general, refers to any structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to disrupt vital socioeconomic activities if it is destroyed, damaged, or functionally impaired.

2.2.3 Community Functions

Community functions are the resources, assets, operations, economic sectors, and services that are created or influenced by the interaction between populations and the built environment and allow day-to-day activities to continue in the county. Some of the county's community functions include, but are not limited to, agriculture (including wine industry), tourism and recreation, transportation and mobility, housing, essential and emergency services, energy delivery, and other utility operations (e.g., communications). Increases in the frequency and/or severity of hazards linked to climate change will cause environmental, economic, and/or social impacts across these community functions, which are crucial to the integrity and resilience of the county.

2.2.4 Increased Wildfire Risk

POPULATIONS

According to the County's MJHMP, in the unincorporated county, 7,123, 5,118, and 8,618 residents reside in very high, high, and moderate FHSZs respectively (Napa County 2020).

According to input received from the County and local agencies in the region, 11 people died due to wildfire events in Napa County since 2017. As noted in the County's MJHMP, smoke and air pollution from wildfires can also be a severe health hazard and cause breathing difficulties or exacerbate existing illnesses, especially in sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire contains visible and invisible emissions that contain particulate matter, gases such as carbon monoxide and nitrogen oxides, and toxics such as formaldehyde and benzene. Long term impacts include but are not limited to respiratory health effects such as bronchitis and asthma, as well as cardiovascular health effects such as an increased risk of heart attacks and strokes. Mental health impacts including anxiety, depression and post-traumatic stress disorder can also result from wildfire events. Furthermore, individuals with access and functional needs and those with certain medical issues residing in healthcare facilities are also inherently vulnerable during wildfires resulting in evacuations. Additionally, first responders are exposed to the dangers of wildfire from direct incident response and after-effects from smoke inhalation and heat stroke.

Wildfires can also create hazardous conditions even after they are suppressed. Most notably, destructive debris flows triggered by intense precipitation are one of the most dangerous post-fire hazards, and the risk of debris flows is directly correlated with the degree of vegetation loss and soil exposure after a wildfire (USGS 2018). Post-wildfire debris flows can adversely impact the county in different ways, but the deadly impact it can have on human lives is notable. Moreover, wildfires can lead to water supply and soil contamination. 2021 research shows that when combined with extreme precipitation, a series of watershed effects from headwaters to areas downstream can be triggered post-fire. These post-fire watershed hazards via source water contamination, flash floods, and mudslides can represent substantial, systemic long-term risks to drinking water production, aquatic life, and socio-economic activity (Robinne et al. 2021). However, based on input received from the County and local agencies in the region, over the past seven years, the County and such agencies have been dedicated to removing post-fire contaminated soil and debris to remediate impacts.

Moreover, the County's MJHMP mentions that wildfire can negatively impact farmworkers because of the potential degradation of transportation infrastructure and the need to work outside at key times such as grape harvesting. Because many agricultural workers cannot afford to live in the county due to high housing costs and the lack of affordable housing, their access and mobility could be impaired and result in evacuation challenges. Additionally, outdoor agriculture workers may be exposed to wildfire smoke during the grape harvest, which also coincides with peak wildfire season in the fall months

Overall, the entire population of the county is vulnerable to the impacts of wildfire, both directly and indirectly, which may be exacerbated because of climate change. However, wildfires disproportionately impact vulnerable populations due to an array of factors, including health disparities, lower mobility (reduced access to vehicles or ability to pay for temporary housing) lower access to resources, which is exacerbated by language barriers, lower levels of internet access, and hesitancy to contact authorities for help from undocumented individuals because of fears regarding immigration status. Due to structural inequities, renters and lower-income homeowners are often limited in their ability to build or upgrade to fire-safe building codes and maintain defensible space and therefore, have higher rates of uninsured or underinsured homes and belongings lost in fires (OPR, CEC, and CNRA 2018b).

BUILT ENVIRONMENT

Increased wildfire risk in the county poses significant threats to the county's built environment, especially within WUI areas and the county's FHSZs. Based on the analysis carried out in the County's MJHMP, 64 percent of the residential parcels in the unincorporated county are in at least moderate or higher FHSZs. These parcels possess a total value of

almost $10 billion which makes up 53.8 percent of the total value of the residential parcels in the unincorporated county. According to input received from the County and local agencies in the region, over 1,350 homes and over 30 wineries with a property value loss of over $1.5 billion have been destroyed since 2017. In addition, many of the county's critical facilities are in high and very high FHSZs. For example, eight dams, 13 bridges, four residential elder care facilities, and four schools are in very high FHSZs. Moreover, nearly 180 miles of roadways and over 10 miles of transmission lines are in very high FHSZs. As mentioned in the Cal Fire Sonoma-Lake-Napa Unit 2023 Strategic Fire Plan, assets at risk of wildfire include homes, infrastructure including water and power supply, rivers and watersheds, air quality, soil, wildlife and associated habitats, recreation areas including tourist attractions, scenic beauty, historical buildings, cultural unique areas, and timber holdings (CAL FIRE 2023).

Wildfires may also impact transportation infrastructure in the county. For example, the California Department of Transportation (Caltrans) has identified portions of State Route (SR)29 within the county that will be exposed to increased risk of wildfire in future years (Caltrans 2018). Moreover, according to input received from the County and local agencies in the region, all of SR29 and SR128 north of Calistoga, all of SR121 and SR128 east of the City of Napa, and most of SR12 are in fire hazard severity zones as of April 2024. During the 2017 and 2020 wildfire events, fires burned all around SR29, SR128, and SR121. Wildfires crossed SR12 in 2017 and even crossed SR29 on the valley floor in 2020. While roadways and bridges typically sustain minimal to moderate damage during wildfire events, except in extreme scenarios, wildfires can create conditions that obstruct these assets through fallen trees, downed power lines, and other debris. This is particularly concerning for residents who are isolated in more rural areas that may not have many egress options during a wildfire-related evacuation. In addition to the obstruction of these assets, the cracking and degradation of pavement is another risk related to wildfires.

COMMUNITY FUNCTIONS

The increased risk and severity of wildfire through the end of the century has the potential to impact or disrupt the county's community functions. As mentioned previously, electric utilities can carry out PSPS events during severe weather events to prevent wildfire. When PSPS events happen, power will remain out for as long as extreme and dangerous conditions pose a potential fire risk and until utilities can inspect and repair power lines and equipment. Once utilities deem it safe to do so, power will be systematically restored. While PSPS events are meant to prevent the ignition of potentially widespread, devastating wildfires, vulnerable populations without alternate power options (e.g., low-income individuals, individuals requiring electric-powered medical devices) may be adversely impacted by the PSPS event itself (e.g., loss of air conditioning during extreme heat conditions). Similarly, wildfire-induced loss of power affecting fire stations, police stations, and emergency dispatch and medical services, but not necessarily a purposive PSPS event, could diminish emergency dispatching, communications, and response capabilities, especially when coupled with evacuation-related traffic congestion.

Wildfires can also have severe economic impacts and other impacts on community functions within the county. At a basic level, wildfires include the cost of fire suppression and disruptions to the consumption and production of local goods and services. These costs are expected to increase in the future parallel to increased wildfire risk. One of the county's pillar industries – the wine industry, tourism, and thousands of acres of vineyards, can be affected by wildfire, as noted in the County's MJHMP. In addition to the direct impacts such as loss of vineyards and property, indirect impacts can also occur. a temporary downturn in tourism is expected during wildfire events. For vineyards that are near fire-prone areas, smoke from wildfire can cause damage, particularly for red grapes, where the grape skin is still used in the winemaking process. Studies have shown that wildfire smoke can potentially infuse grape skin. Furthermore, wildfires can directly threaten vineyards, particularly at the start of harvest season. When wildfires occur, evacuation orders may leave certain vineyards inaccessible for a period. Without access, grapes may remain on the vine too long, exposing them to smoke and rendering them unsuitable for winemaking. Moreover, considering the feedback provided by the County and local agencies in the region, it is evident that the county's current housing supply is already under strain. Should wildfires occur with increased frequency and severity, this strain may intensify, leading to a further shortage of housing supply.

2.2.5 Increased Temperatures and Extreme Heat

POPULATIONS

Increased temperatures and extreme heat exacerbated by climate change are one of the primary health concerns in the county, and the entire population of the county will be exposed to this climate change effect. Across the state, including the San Francisco Bay Area and Napa County, extreme heat ranks amongst the deadliest of all hazards (CNRA 2022). Temperature-related mortality (including from extreme heat) is projected to be among the most deadly and costly impacts of climate change in certain locations around the globe. Higher temperatures and extreme heat can lead to heat stroke and increase the risk of or exacerbate cardiovascular disease, respiratory disease, kidney failure, and preterm births (LAO 2022). Non-fatal heat stroke, specifically, can result in severe mental status changes, seizures, loss of consciousness, and abnormal cardiac rhythm (Cal EPA and CDPH 2013). Additionally, extreme heat can exacerbate other pre-existing conditions in certain vulnerable populations, such as the medically fragile and chronically ill. Moreover, as noted by the Center of Climate and Energy Solutions (C2ES), in extreme temperatures, air quality is also affected. Hot and sunny days can increase the production of ground-level ozone, a harmful pollutant that is the main component of smog, which can damage the respiratory system and is particularly harmful for those with asthma (C2ES n.d.). This correlation between extreme heat and heightened levels of pollutants is locally substantiated by data from the Bay Area Air Quality Management District (BAAQMD) (BAAQMD 2017).

In more densely populated areas of the county such as incorporated cities, increased temperatures, and extreme heat can contribute to the urban heat island effect, which makes these areas comparatively hotter than surrounding areas due to the higher density of heat-absorbing structures and lack of green space. In addition to the heightened temperatures in these areas, the urban heat island effect creates conditions more conducive to the production of smog, ground-level ozone, and Particulate Matter ($PM_{2.5}$). Heatwaves in cities are projected to cause two to three times more heat-related deaths by mid-century (CNRA 2022). Air conditioning can alleviate some of the discomfort felt during periods of extreme heat and lower the risk of mortality, but many coastal areas across the San Francisco Bay Area, inclusive of areas within the county, lack air conditioning due to historically lower temperatures.

Overall, when it comes to increased temperatures and extreme heat, vulnerable populations will likely experience the worst impacts, as heat-related risk is associated with physical, social, political, and economic factors. Children, the elderly, pregnant people, and people with chronic illnesses can be especially sensitive to heat exposure. Combining these characteristics and existing health inequities with additional factors, such as poverty, linguistic isolation, and housing insecurity, can put individuals at disproportionately high risk of heat-related illness and death (CNRA 2022). Additionally, people who work long hours outdoors, such as those working in agriculture and transportation maintenance, among others, are at heightened exposure and risk to increased temperatures and extreme heat (Caltrans 2018).

BUILT ENVIRONMENT

Increasing temperatures and increased frequency of extreme heat events are likely to affect the county's built environment primarily through changes in energy use, as well as disproportionate impacts on individuals residing in units that do not have air conditioning. Cal-Adapt provides data on the shifts in Cooling Degree Days and Heating Degree Days, which are measurements used to assess the energy demand needed for cooling and heating buildings in different climate zones throughout California. A "degree day" does not equate to a single day of the year, but rather compares the average outdoor temperatures recorded for a location to a standard temperature (i.e., 65 °F). For example, if the average temperature for a day is 80 °F, the day has 15 Cooling Degree Days (80 – 65 = 15). Degree days are used in the State's Title 24 Building Energy Efficiency Standards to help design the energy demand needed for heating and cooling in the various climate zones throughout the state. To illustrate how climate change is likely to affect energy demand for heating and cooling in the future, Table 10 includes the relative shift in Cooling Degree Days and Heating Degree Days in the county through 2099. As displayed, the county is projected to have decreases in Heating Degree Days and relatively significant increases in Cooling Degree Days through the end of the century, most notably with a 243.4 percent increase in Cooling Degree Days in the long-term under RCP 8.5 (CEC 2024h). These projections

for the county correlate to an overall significant increase in cooling costs through the end of the century, with a slight decrease in heating costs, which can potentially be due to warmer winters. Additionally, apart from projected changes in building energy use, increased temperatures can add to the heat load of buildings in more densely populated areas and can therefore worsen existing urban heat island effects, adding to the risk of extreme heat.

Table 10 Changes in Heating and Cooling Degree Days in Napa County

Annual Averages	Historic (1961-1990)	Near-Term[1] (current-2050)	Mid-Term[1] (2040-2069)	Long-Term (2070-2099)	
				RCP 4.5	RCP 8.5
Number of Heating Degree Days	3,379	2,580	2,278	2,274	1,761
Percent Change in Heating Degree Days from Historic	N/A	-23.6%	-32.6%	-32.7%	-47.9%
Number of Cooling Degree Days	572	1,115	1,395	1,375	1,964
Percent Change in Cooling Degree Days from Historic	N/A	+94.9%	+143.9%	+140.4%	+243.4%

Notes: RCP = Representative Concentration Pathway.

[1] Projections for the near-term and mid-term timescales are based on RCP 8.5.

Source: CEC 2024h.

In addition to the impacts of increased temperatures and extreme heat on buildings and energy use, transportation systems will also be affected. Transportation infrastructure is designed and constructed to withstand certain variabilities in weather and temperature based on observations of historical weather trends for specific climate regions. The performance of transportation infrastructure may begin to decline when the severity of extreme heat periods exceeds historical ranges. For example, extreme heat may cause pavement discontinuities and deformation, an increase in the risk of buckling of highways and railroad tracks, and may cause premature deterioration of transportation infrastructure, decreasing transportation safety and creating higher maintenance costs (Caltrans 2018). Air conditioning units in buses are placed under increased stress and risk of failure when maximum daily temperatures reach 100 °F, which is a temperature threshold that certain areas of the county may exceed more frequently over time according to Cal-Adapt (Cambridge Systematics 2015). Further, while bridges are designed to expand during periods of extreme heat, projected increases in extreme heat events could go beyond design criteria, resulting in cracking and crushing of the roadway deck, as well as increased maintenance costs (Transportation Research Board 2008).

COMMUNITY FUNCTIONS

Increased temperatures and extreme heat may increase the risks to the county's community functions. Similar to and connected with increased wildfire risk, increased temperatures and extreme heat can trigger a PSPS event, which can adversely affect vulnerable populations without alternate power options (e.g., greater risk of the development of heat-related illnesses due to inaccessible air conditioning) and could potentially disrupt emergency dispatching, communications, and response capabilities. Agriculture in the county could be significantly impacted by extreme heat, especially when coupled with drought. The county's overall labor availability can be restricted due to extreme heat. Moreover, higher temperatures can lead to increased evaporation rates of surface water and increased evapotranspiration in plants, resulting in decreased soil moisture content and increased demand for irrigation. For the county's wine industry, in particular, recent research in 2023 shows that the growing season start and duration, along with other temperature-related measures of importance to premium wine grapes in Napa Valley have changed as the climate over the western United States has warmed. Vintners and farmers will need to carefully monitor the climate, especially during certain times of the year, like the harvest, when temperatures are vital (Cayan et al. 2023). Furthermore, increased temperatures and extreme heat could result in many residences, schools, and businesses needing to add air conditioning systems and remodel any outdoor facilities (e.g., playgrounds) with more heat-resistant materials, despite financial barriers that may exist (LAO 2022).

2.2.6 Extreme Precipitation, Sea Level Rise, and Flooding,

POPULATIONS

The populations that will likely be most directly affected by extreme precipitation and flooding in the county are those that reside in the county's 100- and 500-year floodplains. According to the County's MJHMP, in the unincorporated county, 3,785 and 284 residents reside in 100- and 500-year floodplains respectively. This represents approximately 11.1 percent and 1 percent of the unincorporated county population, respectively (Napa County 2020). Additionally, related but separate from the county's populations that reside in floodplains are the populations that are at direct risk of coastal flooding and inundation resulting from sea level rise. As noted in the County's MJHMP, less than one percent of the County's population is considered at risk and vulnerable to sea level rise. However, as sea levels rise, the area and the number of people at risk because of flooding will rise. Depending on the severity of a flooding event, populations may be displaced or lose their homes and livelihoods, in addition to the risk of injuries and even death. Moreover, flooding can result in the overflow of sewage systems or hazardous waste site infiltration, which may create conditions that release contaminants and promote water- and food-borne diseases. (OPR, CEC, and CNRA 2018b).

All residents and visitors of the county may be sensitive to extreme precipitation and flooding. Vulnerable population groups will likely face disproportionate negative impacts to extreme precipitation and flooding, especially in the context of climate change. In addition to lacking adequate shelter and protection from these events, individuals experiencing homelessness, along with some broader county communities, may have limited access to warning messages and other pertinent information from the County and other public health and safety agencies. The elderly and individuals with access and functional needs may also face these challenges and are likely to have limited mobility and ability to react to and prepare for these events. For low-income individuals, risks of isolation and lost resources are elevated during flooding events. Because these residents have a lower rate of car ownership than the general population, they are heavily reliant on public transportation and frequently have limited mobility during extreme weather events and emergencies (OPR, CEC, and CNRA 2018b). Other vulnerable populations to extreme precipitation and flooding in the county include communities of color, linguistically isolated communities, children, and the elderly.

BUILT ENVIRONMENT

When it comes to flooding- and extreme precipitation-related impacts on the county's built environment, residential property is notably at risk, especially homes that lie within the county's floodplains or are at risk of sea level rise. As discussed in the County's MJHMP, within the unincorporated county, 7.5 percent of the total parcels are located in 100-year or 500-year floodplains. These parcels possess a total value of almost $1.7 billion, which makes up 9.2 percent of the unincorporated county's total parcel value. In addition, much of the county's critical infrastructure is at direct risk from flooding. A total of 100 facilities are located in 100-year or 500-year floodplains, including but not limited to two fire stations and 56 bridges. Over 180 miles of linear utilities are also exposed to 100-year or 500-year flood events, including over 60 miles of streets. Regarding sea level rise, the southwestern portion of the county includes the mouth of the Napa River, which forms a tidal estuary that drains into San Pablo Bay. Because several physical structures (i.e., levees) are currently in place to protect against a 100-year flood event, approximately 36 acres in the county are currently at risk for flooding. Taking a 1.5 m (4.9 feet) rise in sea level into account however, along with other storm factors, it is projected that an additional 13,000 acres could be inundated by a 100-year flood event (Napa County 2020).

Extreme precipitation events are often followed by flash floods, landslides, mudslides, and debris flows. These hazards can impact roadways within the county. In general, bridges and certain roadways often provide the only ingress and egress to some neighborhoods, while these facilities can be exposed to flooding events. Moreover, flooding-related disruption of the transportation network may reduce the capacity of individuals to evacuate or access hospitals and other health-related infrastructure in the event of an emergency and can prevent emergency services providers from reaching vulnerable populations or making necessary repairs (OPR, CEC, and CNRA 2018b). Meanwhile, local bus routes and bus stops can be directly affected.

Critical facilities such as electric distribution lines, pipelines, and public buildings are also at direct risk of flooding-induced scouring, which is the removal of sediment, such as sand and gravel, caused by swiftly moving water and compromising the integrity of a structure. The projected increases in annual precipitation will increase the vulnerability of these structures in the future. Flooding-related disruptions can also occur within power and fuel distribution networks, as well as water delivery or wastewater treatment systems, which can create substantial risks to public health depending on the length of the disruption (OPR, CEC, and CNRA 2018b). Flooding can cause underground utilities, along with water and sewer systems, to be damaged, or otherwise adversely affected via high inflow and infiltration. If drainage systems or culverts are backed up by floodwaters, pronounced localized flooding can occur. Furthermore, floodwater may infiltrate drinking water supplies, causing contamination. Facilities that are known to manufacture, process, store, or use hazardous materials, such as fuel stations, could also be damaged during flooding events. If damaged, these facilities, or containers holding these materials, can release chemicals that are carcinogenic, or otherwise detrimental to human health and the environment. Furthermore, seawater backflow resulting from coastal flooding can impair coastal sanitation drainage systems during flood events, requiring costly upgrades and alterations.

COMMUNITY FUNCTIONS

Heightened extreme precipitation and flooding can result in impacts on an array of community functions. Flooding may have adverse impacts on businesses (e.g., revenue loss due to closures) and public agency budgets. Increased direct and indirect costs associated with flood mitigation services, clean-up operations, and maintenance and replacement of damaged structures and infrastructure could put considerable strain on local and regional government budgets. If floods cause sustained closures of major roadways, in addition to limited transportation and mobility, there is an array of community functions that may result in limited access, including access to essential services (e.g., grocery stores) and emergency services (e.g., emergency response inhibited by damaged roads). These impacts can also persist, especially if funding for maintenance and repair is limited. The County's MJHMP also notes that while the Napa County Airport itself is not at immediate risk for inundation from coastal flooding due to 1.5 m (4.9 feet) sea level rise, adjacent areas to the west including communities along Milton Road are at increased risk of flooding due to sea level rise. Based on input received from the County and local agencies in the region, high wind events can also worsen the situation of such coastal flooding events.

Flooding events resulting in disruption of communications, utilities (e.g., energy, water, sewage), and related delivery of services, excessive expenditures for emergency response, and general disruption of the normal functions across the county can result in severe economic losses. Additionally, tourism opportunities can be adversely affected by major flood events, as some popular destinations (e.g., wine-tasting spots) tend to overlap with the county's floodplains and areas that are prone to sea level rise and coastal inundation. The ramifications of these effects can be enduring. Once an area gains notoriety in the media for having endured a disaster such as a disastrous flooding event, it can require years of effort to assure people that recovery has occurred and that it is safe and inviting to return. The agricultural sector is also at increased risk of flooding induced by extreme precipitation events, especially as these events become more common because of climate change. The increased likelihood of extreme floods could lead to the destruction of crops, erosion of topsoil, and deposits of debris and sediment on croplands.

2.2.7 Drought and Water Supply

POPULATIONS

As discussed in the County's MJHMP, drought is one of the few hazards with the potential to impact the entire population of Napa County directly or indirectly, be it from water restrictions, higher water and food prices, reduced air or water quality, or restricted access to recreational areas. No portion of the county is immune from drought conditions. The residents of the county rely on healthy watersheds to provide water for domestic and agricultural purposes as well as to support the existence, use, and enjoyment of natural resources. Water shortages during periods of drought can affect access to safe and relatively affordable water, with notably substantial impacts on low-income individuals and communities otherwise burdened with environmental pollution.

BUILT ENVIRONMENT

The built environment in the county will not experience substantial direct impacts associated with drought. However, when combined with other climate stressors, prolonged drought conditions in the future have the potential to cause secondary impacts. For example, heavy precipitation following periods of drought can cause intense flooding, debris flows, landslides, and mudslides. Also, wildfire events are more likely to happen following years of drought. Moreover, according to input received from the County and local agencies in the region, if the severity and geographical extent of subsidence hazard increases in the county in the future, it can also be exacerbated by prolonged drought conditions.

As noted in the County's MJHMP, drought eventually affects groundwater sources but generally not as quickly as surface water supplies, although groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate, which can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater also affects streams because much of the flow in streams comes from groundwater, especially during the summer when there is less. Reduced groundwater levels mean that even less water will enter streams when steam flows are lowest.

COMMUNITY FUNCTIONS

Drought will significantly impact community functions across the county. For one, the county's agricultural sector and wine industry are especially vulnerable to drought conditions, with the most notable consequences directly related to water availability for crop irrigation. A decrease in water availability could greatly reduce crop yields and overall levels of production in the county and across the San Francisco Bay Area, especially when coupled with extreme heat. Higher soil erosion exacerbated by drought can also decrease agricultural production. Particularly dry soil conditions resulting from low stream flow and groundwater levels can increase the risk of wildfires, another threat to agricultural production. The above factors can lead to higher consumer costs for agricultural products, loss of income for the supply chain, and can reduce regional food security . As noted in the County's MJHMP, the local wine industry and related businesses provide an annual economic impact of more than $9.4 billion locally and nearly $34 billion in the United States. The industry also creates 44,000 jobs in Napa County and nearly 190,000 nationwide. The direct and indirect impacts of drought on the wine industry can be significant.

In addition to agriculture, drought may affect other local businesses and economic sectors. The most significant economic impacts will likely be on industries that use or depend on water for their business or sector. Any water-use restrictions during times of drought can directly impact smaller-scale businesses that provide water-related services (e.g., power-washing). Essential product costs that increase because of drought (e.g., agricultural and energy products) can potentially discourage and reduce discretionary consumer spending in other industries, such as entertainment, dining, and retail. Recreational activities in the county can be diminished as a loss of aquatic species, lower stream flows, increased evapotranspiration, and reduced reservoir and lake level flows lead to less fishing, kayaking, and hiking, among other activities. Overall shifts in the county's economic sectors because of drought can lead to unemployment, increased risk for financial institutions, capital shortfalls, and loss of tax revenue.

Drought can also result in adverse environmental effects. Some effects are short-term, where conditions quickly return to normal following a drought, but others can be long-term, lingering for long periods of time or even becoming permanent. For example, wildlife habitat may be degraded because of drought through the loss of wetlands, lakes, and vegetation, but many species will eventually recover. However, the drought-induced degradation of landscape quality, including decreased soil moisture and high levels of soil erosion, may lead to a more permanent loss of biological productivity. Additionally, drought can influence tree mortality and result in the loss of tree canopy, which in more densely populated areas of the county, can heighten the urban heat island effect. The loss of urban tree canopy can have impacts on the county's overall public health, property values, as well as ecosystem functioning. Furthermore, low streamflow, higher temperatures, and degraded water quality during times of drought can affect aquatic ecosystems, as well as terrestrial wildlife that rely on surface water, floodplains, wetlands, marshes, and surrounding soil and vegetation.

2.2.8 Energy Grid

POPULATIONS

The impacts of climate change on the energy grid can have significant impacts on the population, affecting various aspects of daily life, public safety, and economic stability. Power outages and disruptions can disrupt daily activities, affecting homes, businesses, and essential services that rely on a consistent power supply. Extended power outages can also pose health and safety risks, especially for vulnerable populations such as the elderly, individuals with medical conditions, and those dependent on medical equipment. Lack of power can impact healthcare facilities, hindering medical services and emergency response capabilities. These vulnerabilities were also discussed in detail under other climate change effects such as increased temperature and extreme heat. Moreover, modern communication relies heavily on electricity. Power outages can disrupt communication systems, hindering emergency alerts, public announcements, and the ability of individuals to contact emergency services or critical contacts.

BUILT ENVIRONMENT

As discussed previously under other climate change effects, critical infrastructure such as power plants, substations, and transmission lines are vulnerable to damage from wildfire, flooding, and extreme weather events. Impacts on the energy grid can result in physical damage, leading to costly repairs, and disruptions in essential services. Critical services in the built environment, such as hospitals, emergency services, water treatment plants, and communication networks, rely on a reliable resilient energy grid. Grid failures can disrupt these services, compromising public safety and well-being. Meanwhile, many buildings utilize advanced energy management systems for heating, ventilation, air conditioning (HVAC), and lighting. Impacts on the energy grid can affect these systems, leading to discomfort for occupants and potential damage to sensitive equipment. Furthermore, grid reliability concerns may necessitate retrofits and upgrades to existing infrastructure to improve grid resilience, as well as investments in alternative power, such as battery storage and generators for solar power. This can be a costly process and may require careful planning to minimize disruptions during construction.

COMMUNITY FUNCTIONS

The failure of the energy grid can be disastrous to the local economy. Commercial and industrial buildings depend on a reliable power supply for operations. Energy grid impacts can lead to business interruptions, affecting manufacturing, production, and other economic activities. This can result in financial losses and impact the overall economic health of a region. Also, modern urban environments increasingly rely on smart technologies for energy management, transportation, and communication. Grid impacts can disrupt these systems, affecting the efficiency and functionality of smart technologies. Moreover, urban planning efforts, including the design of energy-efficient buildings and sustainable neighborhoods, can be hindered by energy grid impacts. Unreliable power sources may limit the feasibility of certain sustainable technologies and strategies. Furthermore, energy grid impacts can challenge the ability of communities to adapt and recover from disruptions, impacting the long-term sustainability and livability of the community.

2.2.9 Summary of Sensitivity and Potential Impacts

Based on guidance from the APG, potential impacts from each climate change effect are rated on a qualitative scale of Low, Medium, or High. A description of each qualitative rating for potential impacts is provided in Table 1 at the beginning of Section 2.

The potential impacts rating for each climate change effect that is anticipated to impact the county is shown in Table 11. This evaluation is based on the exposure analysis and analysis of sensitivities and impacts discussed in the previous sections.

Table 11 Potential Impacts Summary

Climate Change Effect	Potential Impacts Rating
Increased Wildfire Risk	High
Increased Temperatures and Extreme Heat	High
Extreme Precipitation, Sea Level Rise and Flooding	Medium
Drought and Water Supply	High
Energy Grid Resiliency	Medium

Source: Ascent 2024.

2.3 ADAPTIVE CAPACITY

The third step in the VA process is to evaluate the adaptive capacity of the populations, built environment, and community functions to adjust to climate change effects and their associated potential impacts. Adaptive capacity refers to a community's current and future ability to address climate-related impacts. A review of the County, County jurisdictions, and local agencies' existing policies, plans, programs, and resources, as well as those from relevant regional and State agencies and organizations, informed this assessment of the County, County jurisdictions, and local agencies' current ability to minimize vulnerability to hazards and adapt to climate change over the long-term. While there is some level of existing adaptive capacity, these efforts do not comprehensively identify all strategies and actions that will need to be implemented by the County and other local agencies to adequately address the full scope and magnitude of potential impacts from climate change. Climate change will increase the frequency and severity of some hazards in the future, requiring updates to emergency response and land use planning, new policies and programs, and new strategic partnerships.

2.3.1 Existing State, Regional, and Local Planning Efforts

This section summarizes current State, regional, and local planning efforts that address climate-related hazards. It should be noted that though this section is comprehensive, it is not exhaustive, as additional policies, plans, programs, and resources may be available that address climate-related hazards within the county.

2017 CLEAN AIR PLAN: SPARE THE AIR, COOL THE CLIMATE

Prepared by BAAQMD, the *2017 Clean Air Plan: Spare the Air, Cool the Climate* (Clean Air Plan) encompasses the entire San Francisco Bay Area, inclusive of Napa County, and focuses on two closely related goals, which include protecting public health and protecting the climate. The Clean Air Plan describes a multi-pollutant strategy to simultaneously reduce emissions and ambient concentrations of ozone, $PM_{2.5}$, toxic air contaminants, as well as GHGs that contribute to climate change. Additionally, it describes a vision for a thriving region with clean air, a stable climate, a robust natural environment, and a prosperous and sustainable economy (BAAQMD 2017).

ADAPTING TO RISING TIDES, BAY AREA: REGIONAL SEA LEVEL RISE VULNERABILITY AND ADAPTATION STUDY

Prepared in March 2020, *Adapting to Rising Tides, Bay Area: Regional Sea Level Rise Vulnerability and Adaptation Study* (ART Bay Area Report) presents a story of what consequences the San Francisco Bay Area may face as sea levels rise in the absence of coordinated, prioritized adaptation efforts. The ART Bay Area Report represents a commitment by many agencies to proactively manage the functionality and sustainability of critical regional assets in an uncertain future, and it speaks directly to the San Francisco Bay Area's most critical regional transportation and land use plan, *Plan Bay Area 2050* (ART 2020).

CAL FIRE SONOMA-LAKE-NAPA UNIT: 2023 STRATEGIC FIRE PLAN

This Strategic Fire Plan strives for the highest level of fire protection in Colusa, Lake, Napa, Solano, Sonoma, and Yolo counties through constant evaluation of fire problems. The Strategic Fire Plan aims to educate and participate with communities to evaluate fire prevention concerns and exposure, as well as collect data for proper record keeping, to analyze historical values, to benefit from trends associated with weather patterns, fuel contents, and project responsibility within the Strategic Fire Plan. The Strategic Fire Plan will also monitor the effectiveness of Unit programs, projects, and initial fire suppression successes, as well as identify and improve areas of WUI (CAL FIRE 2023).

CALIFORNIA'S FOURTH CLIMATE CHANGE ASSESSMENT: SAN FRANCISCO BAY AREA REGION REPORT

As described in Section 1.4.2, "California's Fourth Climate Change Assessment," the SFBA Report, published in January 2019, is one of a series of nine regional climate vulnerability assessments in California that provides an overview of region-specific climate science and anticipated climate-related changes, specific strategies to adapt to climate impacts, and key research gaps needed to safeguard the region from climate change. The SFBA Report breaks down regional vulnerability by ecosystems and biodiversity, water resources, and communities and provides adaptation strategies applicable to the county (OPR, CEC, and CNRA 2018b).

CALTRANS CLIMATE CHANGE VULNERABILITY ASSESSMENTS: DISTRICT 4 TECHNICAL REPORT

The *Caltrans Climate Change Vulnerability Assessments: District 4 Technical Report* (District 4 Report) was developed in 2018 for Caltrans and summarizes the climate change-specific vulnerabilities of the portion of the State Highway System located in Caltrans District 4, which encompasses the county. The report is divided into sections by climate stressor (e.g., wildfire, temperature, precipitation) and each section presents how that climate stressor is changing, the data used to assess State Highway System vulnerabilities from that stressor, and the methodology for how that data was developed. Additionally, the District 4 Report outlines a recommended framework for prioritizing projects that might be considered by Caltrans in the future (Caltrans 2018).

CITY OF NAPA 2020 URBAN WATER MANAGEMENT PLAN

The City of Napa *2020 Urban Water Management Plan* (UWMP) assesses the availability and reliability of City of Napa's water supplies and current and projected water use to help ensure reliable water service under different conditions, which is critical in the context of climate change and further development and growth. The UWMP is required to be updated every five years under the Urban Water Management Planning Act. The City of Napa sells and distributes treated water to individual water users such as residences and businesses. The City provides water to more than 25,000 customer accounts and a population of more than 85,000. The City serves drinking water to an area encompassing much of the lower Napa Valley and extending up to the foothills on the east and west sides of the valley. In addition, the City exports water to the City of American Canyon, the City of St. Helena, the City of Calistoga, the Town of Yountville, and the California Veterans Home (City of Napa 2022a).

CITY OF NAPA 2022 WATER SHORTAGE CONTINGENCY PLAN

This *2022 Water Shortage Contingency Plan* (WSCP) describes the City of Napa's strategic plan for preparing for and responding to water shortages, including defining water shortage stages and associated shortage response actions. This WSCP provides a guide for the City to proactively prevent catastrophic service disruptions and has been updated to be consistent with the 2018 Water Conservation Legislation requirements. The WSCP includes a water supply reliability analysis and specifies demand reduction actions that correspond to six standard water shortage levels. The WSCP also includes information on communication protocols that the City uses to inform its customers and other interested parties in the event of a water shortage (City of Napa 2022b).

CITY OF NAPA HAZARD MITIGATION PLAN (2021)

The City of Napa Local Hazard Mitigation Plan (LHMP) encompasses approximately 18.2 square miles and covers 11,650 acres. Similar to the County's MJHMP, the goal of the City's LHMP is to identify and profile the broad array of hazards (including those examined in this VA) that face the LHMP planning area (Napa city limits), assess risks posed by those hazards, and develop prioritized strategies to reduce those risks. The City's LHMP also meets the requirements of the Disaster Management Act of 2000 (City of Napa 2022c).

CLIMATE CHANGE AND HEALTH PROFILE REPORT: NAPA COUNTY

Primarily produced by the California Department of Public Health (CDPH), the *Climate Change and Health Profile Report: Napa County* (CCHPR) seeks to provide a county-level summary of information on current and projected risks from climate change and potential health impacts. The CCHPR represents a synthesis of information on climate change and health for communities based on published reports of State agencies and other public data. It is part of a suite of tools developed by CDPH to support local, regional, and statewide efforts of the public health sector to address the challenges of climate change (CDPH 2017).

NAPA COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

The Napa Communities Firewise Foundation (NCFF) completed a new county-wide Community Wildfire Protection Plan (CWPP) in 2021 that serves as a roadmap for fire hazard mitigation and preparedness at both county-wide and neighborhood levels. The CWPP aligns with the County, CAL FIRE, and federal cohesive pre-fire strategies, which include educating homeowners and building an understanding of wildfire, ensuring defensible space clearing and structure ignition resistance, safeguarding communities through fuel treatment, and protecting evacuation corridors. The CWPP also identifies and prioritizes areas for hazardous fuel-reduction treatment, recommends the types and methods of treatment that will reduce damages from wildfire, and recommends measures to reduce the ignitability of structures throughout unincorporated areas of Napa County (NCFF 2021).

NAPA COUNTY DROUGHT RESILIENCE PLAN

CURRENTLY UNDER DEVELOPMENT, THE NAPA COUNTY DROUGHT RESILIENCE PLAN (DRP) IS BEING DEVELOPED IN RESPONSE TO SENATE BILL (SB) 552 TO PROVIDE RESOURCES FOR COUNTY STATE SMALL WATER SYSTEMS (SSWS) AND DOMESTIC WELLS USERS THAT EXPERIENCE WATER SHORTAGE CAUSED BY DRY WELLS OR CONCERNS ABOUT WATER SUPPLY OR WATER QUALITY DURING TIMES OF PROLONGED DROUGHT. SB 552 WAS SIGNED INTO LAW IN SEPTEMBER 2021 BY GOVERNOR GAVIN NEWSOM AS *DROUGHT PLANNING FOR SMALL WATER SUPPLIERS, STATE SMALL WATER SYSTEMS, AND DOMESTIC WELL COMMUNITIES.* TO MEET AND COMPLY WITH SB 552, THE COUNTY FORMED A DROUGHT AND WATER SHORTAGE TASK FORCE (TASK FORCE), WHICH IS COMPRISED OF LOCAL COUNTY REPRESENTATIVES, OWNERS OF INDIVIDUAL DOMESTIC WELLS AND INTERESTED PARTIES. THE DRP WILL DESCRIBE ACTIONS WHICH CAN BE TAKEN TO ASSIST OWNERS OF INDIVIDUAL DOMESTIC WELLS THAT GO DRY AS A RESULT OF DROUGHT. A FINAL DRP IS EXPECTED IN 2025.

NAPA COUNTY EXTREME TEMPERATURE EMERGENCY RESPONSE PLAN (2019)

Prepared by the Napa County Health and Human Services Agency (HHSA), this Plan intends to establish a system for identifying potential extreme temperature events, establish a mechanism for coordinating response to such an event, and provide decision-makers with options that can be used to prepare and respond to extreme temperature events. The Plan

uses a three-phase approach to extreme temperature emergencies consistent with the State of California's contingency plans for extreme cold and excessive heat emergencies. The three phases are seasonal readiness, warning and preparation, and emergency response. Moreover, the Plan delineates detailed response actions, including both activities and the responsible entities, that are designed to respond to extreme heat events during all three different phases (HHSA 2019).

GENERAL PLAN SAFETY ELEMENTS

The purpose of a general plan safety element is to reduce the risk of death, injury, property damage, environmental damage, and economic and social dislocation associated with natural and human-caused hazards. Safety elements are included in the general plans of all jurisdictions in the county. These safety elements address existing hazards, including drought, flooding, severe weather, and wildfire, which are also addressed in this VA, and provide goals and policies to address these hazards. As noted in Section 1.3 (Regulatory Setting), some of the local safety elements have been updated to address SB 379 climate adaptation requirements.

NAPA COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN (2020)

The development of the MJHMP was a collaborative effort by the County, City of American Canyon, City of Calistoga, City of St. Helena, Town of Yountville, Napa County Flood and Water Conservation District, Napa County Office of Education, Napa Valley College, and Howell Mountain Mutual Water Co. The planning area for the MJHMP is the entire area within Napa County. Note that the City of Napa was not a participating jurisdiction of the MJHMP. The goal of the MJHMP is to identify and profile the broad array of hazards (including those examined in this VA) that face the MJHMP planning area, assess risks posed by those hazards, and develop prioritized strategies to reduce those risks. The MJHMP meets the requirements of the Disaster Management Act of 2000 (Napa County 2020).

SAN FRANCISCO BAY AREA INTEGRATED REGIONAL WATER MANAGEMENT PLAN

The *San Francisco Bay Area Integrated Regional Water Management Plan* (IRWMP), most recently updated in October 2019, aims to improve water supply reliability, protect water quality, manage flood protection, and protect habitat and watershed resources across the nine-county region, inclusive of Napa County. The Bay Area IRWMP provides a valuable venue for regional collaboration across agencies to improve responsiveness to regional needs and priorities, helps to effectively integrate water resources management activities, and serves as a platform to secure state and federal funding (IRWMP 2019).

SAN FRANCISCO BAY SHORELINE ADAPTATION ATLAS – WORKING WITH NATURE TO PLAN FOR SEA LEVEL RISE USING OPERATIONAL LANDSCAPE UNITS

As the climate continues to change, San Francisco Bay shoreline communities will need to build social and ecological resilience to rising sea levels. Given the complex and varied nature of the Bay shore, a science-based framework is essential to identify effective adaptation strategies that are appropriate for their particular settings and that take advantage of natural processes. This report proposes such a framework—Operational Landscape Units (OLU) for San Francisco Bay. The framework provided in this report divides the Bay shoreline into 30 OLUs—connected geographic areas that share common physical characteristics and that would accordingly benefit from being managed as individual units. A key purpose of the OLU framework is to identify where nature-based approaches, such as beaches, marshes, and subtidal reefs, can help create a resilient shoreline with multiple benefits. Napa County belongs to the Napa-Sonoma OLU (SFEI and SPUR 2019).

SUMMARY OF EXISTING PLANS AND REPORTS

Table 12 identifies the specific climate change effects covered under each of the plans and reports presented above. As shown in the table, multiple planning efforts address the climate-related impacts that are expected to affect the county. Most of the policies provided in existing plans are broad-based strategies to reduce risk from climate change.

Thus, it is important to note that an emphasis on specific and targeted policies should continue to be developed to improve the resilience of the most vulnerable populations and assets in the county.

Table 12 Summary of Existing Plans and Reports

Plan or Report	Prepared By	Climate Change Effects				
		Increased Wildfire Risk	Increased Temperatures and Extreme Heat	Extreme Precipitation, Sea Level Rise and Flooding	Drought and Water Supply	Energy Grid Resiliency
2017 Clean Air Plan: Spare the Air, Cool the Climate	BAAQMD	✓	✓		✓	
Adapting to Rising Tides, Bay Area: Regional Sea Level Rise Vulnerability and Adaptation Study	BCDC			✓		
CAL FIRE Sonoma-Lake-Napa Unit: 2023 Strategic Fire Plan	CAL FIRE	✓			✓	
California's Fourth Climate Change Assessment: San Francisco Bay Area Region Report	OPR, CEC, and CNRA	✓	✓	✓	✓	
Caltrans Climate Change Vulnerability Assessments: District 4 Technical Report	Caltrans	✓	✓	✓		
City of Napa 2020 Urban Water Management Plan	City of Napa			✓	✓	
City of Napa 2022 Water Shortage Contingency Plan	City of Napa				✓	
City of Napa Hazard Mitigation Plan (2021)	City of Napa	✓	✓	✓	✓	
Climate Change and Health Profile Report: Napa County	CDPH	✓	✓	✓	✓	✓
Napa County Community Wildfire Protection Plan	NCFF	✓				
Napa County General Plan Safety Element	County	✓	✓	✓	✓	✓
Napa County Multi-Jurisdictional Hazard Mitigation Plan (2020)	County	✓	✓	✓	✓	
Napa County Extreme Temperature Emergency Response Plan	HHSA		✓			
Napa Valley Drought Contingency Plan	County				✓	
San Francisco Bay Area Integrated Regional Water Management Plan	Collaborative Effort; No Distinct Author			✓	✓	
San Francisco Bay Shoreline Adaptation Atlas – Working with Nature to Plan for Sea Level Rise Using Operational Landscape Units	SFEI & SPUR			✓		
Napa County Emergency Operations Plan	County	✓	✓	✓	✓	

Notes: BAAQMD = Bay Area Air Quality Management District; BCDC = Bay Conservation and Development Commission; CAL FIRE = California Department of Forestry and Fire Protection; Caltrans = California Department of Transportation; County = Napa County government; CDPH = California Department of Public Health; HHSA: Napa County Health and Human Services Agency; NCFF: Napa Communities Firewise Foundation; OPR, CEC, and CNRA = California Governor's Office of Planning and Research, California Energy Commission, and California Natural Resources Agency; SFEI & SPUR: San Francisco Estuary Institute & San Francisco Bay Area Planning and Urban Research Association.

Source: Ascent 2024.

The following sections, organized by climate change effect, provide a snapshot of current adaptive efforts in place to address the impacts of climate change, and thus, may not represent the entirety of adaptive efforts. These evaluations serve to analyze and ultimately score adaptive capacity related to each climate change effect. Based on a combination of the adaptation initiatives outlined in the documents described above and additional adaptive efforts that have been pursued, the County, County jurisdictions, and local agencies' adaptive capacity for each climate change effect can be rated "Low," "Medium," or "High." High adaptive capacity indicates that sufficient measures are already in place to address the points of sensitivity and impacts associated with climate change, while a Low score indicates a community is unprepared and requires major changes to address hazards. Adaptive capacity ratings are defined in Table 2.

2.3.2 Adaptive Efforts Related to Increased Wildfire Risk

The three primary documents/resources that highlight wildfire adaptive efforts carried out by the County and local agencies in the region are the CAL FIRE Sonoma-Lake-Napa Unit: 2023 Strategic Fire Plan, the Napa County CWPP, and the Napa CWPP Hub Site, which are discussed further below.

CAL FIRE SONOMA-LAKE-NAPA UNIT: 2023 STRATEGIC FIRE PLAN

The Sonoma-Lake-Napa Unit (LNU) has primary responsibility for more than 2 million acres of CAL FIRE Direct Protection Area (DPA) lands. LNU has the third largest population living within CAL FIRE DPA, and also has had the largest number of reported total acres burned. LNU also has the largest SRA in the state. Regarding pre-fire management priorities and tactics, it is noted in the Strategic Plan that LNU prioritizes projects that enhance life safety, reduce ignition and fire spread, and improve structure resilience over any projects that address tactical containment and control of wildfires. LNU project priorities include the following six categories: (1) public arterial and collector road fuel reduction projects; (2) supporting defensible space and home hardening efforts; (3) WUI community fuel breaks; (4) landscape-level fuel reductions; (5) emergency responder incident response planning and ingress progress; (6) tactical ridgetop fuel breaks. Moreover, the Strategic Plan mentions that each year LNU updates programs, trainings, curriculums, and tech services to accommodate their personnel and improve resources and suppression efforts, which are discussed in the Strategic Plan in detail. Furthermore, the Plan notes that the need for accurate and thorough investigations on ignitions and initial attack successes is a priority for LNU (CAL FIRE 2023).

NAPA COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

The CWPP intends to serve as a companion to the Napa Firewise Hub Site compiled by the NCFF (see the next heading below). The CWPP aggregates projects from individual community-level Fire Safe Councils (FSCs) and other interested parties county-wide that address community engagement and education, fuel management, installation of address signs, and more. The priorities for this Napa County CWPP are evacuation corridors and containment, community perimeter fuel break and forest health projects, projects that protect drinking water, critical infrastructure and landscape-scale projects, and all other projects that are focused on life safety, property damage reduction, and natural resources preservation. Furthermore, these projects are organized into an Action Plan that sets the stage for implementation. There are five major categories of projects in the Action Plan: 1. Fuel management, 2. Wildfire response support, 3. Community education and outreach; 4. Critical infrastructure; and 5. Planning. The CWPP and Action Plan contain tables that show the project types of these five categories, respectively. Project details are also further included in the CWPP.

The City of Napa is currently developing a CWPP in 2024 that is specific to the City of Napa.

NAPA COUNTY COMMUNITY WILDFIRE PROTECTION PLAN HUB SITE

This website presents information as part of the Napa County CWPP spearheaded by the NCFF. In addition to the CWPP report itself, the related priority projects and Action Plan, which are mentioned above, this hub site also contains various GIS-based products (ArcGIS StoryMaps, interactive mapping platform, etc.) where users can dive into the details of the proposed CWPP projects, as well as the wildfire hazard and risk assessment that NCFF carries out for the county. Users can also download the geodatabase of all the projects identified in the CWPP, as well as other data layers shown in the hub site from the site, for further exploration on their own. This hub site can be accessed via this link: https://cwpp-napafirewise.hub.arcgis.com/.

OTHER EFFORTS

In addition to the CAL FIRE Strategic Fire Plan and the County's CWPP as foundational wildfire planning documents, the County's MJHMP also identifies numerous existing wildfire mitigation-related planning mechanisms, including the County's adoption of the 2019 California Fire Code and California Building Standards Code (Napa County 2020). The County's 2023 General Plan Safety Element goal for wildfire hazard mitigation is to "effectively manage forests and watersheds to protect homes and businesses from fire and wildfire and minimize potential losses of life and property." The Safety Element includes a total of 27 wildfire mitigation policies, which include working with other agencies and organizations to implement the CWPP and the MJHMP, as well as coordinating with fire agencies such as CAL FIRE to plan for fire prevention and suppression needs (Napa County 2023). Moreover, as outlined on the NCFF's website, the County's fire department provides a free chipping service to all Napa County residents who live in a designated fire hazard zone, meaning most all of rural Napa. The program intends to encourage residents to comply with the defensible space requirements of both the State and County. Furthermore, the County's MJHMP proposes 26 mitigation actions for wildfire mitigation. These actions include but are not limited to ignition control providing technical and financial assistance to private property owners and developing and conducting defensible space community education programs. Also, as noted in the County's MJHMP, the County has a NIXLE alert system in place that provides trustworthy and important neighborhood-level public safety and community event notifications (Napa County 2020). Moreover, ALERT Napa County is a system that enables the agencies within Napa County to provide residents with critical and non-critical information in a variety of situations. This includes situations such as severe weather, planned and unexpected road closures, missing persons, evacuations, natural disasters, and public health concerns. Many agencies across Napa County, including Emergency Services and local jurisdictions use ALERT Napa County to communicate with the public.

ADAPTIVE CAPACITY RATING: HIGH

The County and local agencies in the region have a wide range of robust plans, programs, and tools established that are intended to reduce the risk of wildfires in the county from a variety of standpoints, including prevention, preparedness, response, and recovery. Additionally, The County and local agencies acknowledge that climate change may increase the risk of wildfires in the future and have developed plans and intend to implement additional mitigation actions in accordance with this. Though the potential impacts associated with wildfire in the context of climate change are severe, and certain limitations are prevalent in existing plans, the County and partner agencies and organizations have demonstrated a high level of commitment to making the county more resilient to wildfires and know that implementation of related plans and programs must be consistently evaluated and revised, as needed. The high levels of community engagement that have been conducted, and are still ongoing, for current wildfire plans and programs display the County and local agencies' devotion and sense of responsibility towards protecting its citizens and visitors. The County and local agencies should continue expanding this engagement and emphasizing equity to ensure that all populations can provide input to inform future iterations of plans and programs, including those who are most vulnerable and who have not yet been reached by routine communication efforts. Because of the reasons described, the adaptive capacity rating for increased wildfire risk is high.

2.3.3 Adaptive Efforts Related to Increased Temperatures and Extreme Heat

NAPA COUNTY GENERAL PLAN SAFETY ELEMENT

In addition to the County's Extreme Temperature Emergency Response Plan prepared by HHSA in 2019, the County's General Plan Safety Element also addresses extreme heat together with extreme weather. One relevant policy is to provide resources to protect farm workers (e.g., facilities, education) in the event of an emergency situation such as a wildfire, extreme heat, extreme weather, flooding, or an earthquake (Napa County 2023). Besides, the County's MJHMP proposes a few mitigation actions towards extreme heat events, such as developing an air conditioning replacement/reimbursement program for low-income and elderly residents, as well as supporting risk assessments about warmer climate and related effects on the agriculture and wine industries (Napa County 2020). The County's MJHMP and the City of Napa's HMP also mention that few formal regulations pertain directly to severe weather events, including extreme heat events.

In addition to the above adaptive efforts to increased temperatures and extreme heat, the County provides an array of resources across its various websites that serve as reliable extreme heat-related information sources for residents and visitors, including information on how to prevent heat-related injury, immediate medical attention symptoms and greater risk group. Additionally, while PSPS events were identified as a potential impact for increased temperature and extreme heat, especially to vulnerable populations, they may be necessary during periods of sustained extreme heat and increased wildfire risk to reduce the risk of accidental wildfire ignition. Utilities usually provide updates in anticipation of and during a PSPS event regarding when power will be turned off and when power will be restored so affected individuals can plan accordingly. Moreover, similar to wildfire alerts, extreme heat alerts are issued through ALERT Napa County, which county residents and visitors can opt into.

ADAPTIVE CAPACITY RATING: MEDIUM

Through several planning mechanisms, the County and local jurisdictions acknowledge and demonstrate their understanding of the risk of increased temperatures and extreme heat presents, especially to the county's populations. These plans can help build resilience among populations that are particularly vulnerable to the impacts of extreme heat. However, extreme heat is a problem that will likely grow exponentially over time, and this is especially concerning for residents who may not have access to air conditioning (e.g., lack of air conditioning system, financial barriers) or awareness of nearby cooling centers, along with vulnerable buildings and infrastructure that are not constructed for higher temperatures and community functions that are particularly susceptible to the impacts of extreme heat (e.g., agriculture). Acknowledging the County and local agencies' current efforts to address extreme heat, further efforts will be needed in the context of climate change, as current adaptive efforts may not be enough to address extreme heat in the future, not only to protect vulnerable populations but also the county's built environment and community functions. For these reasons, the adaptive capacity rating for increased temperatures and extreme heat is medium.

2.3.4 Adaptive Efforts Related to Extreme Precipitation, Sea Level Rise and Flooding

As noted on the Napa County official website, the Napa County Flood Control and Water Conservation District (District) is the local sponsor for the award-winning Napa River Flood Management Plan and administers water supply contracts, watershed management, and stormwater management programs throughout Napa County. The District's mission is the conservation and management of flood and storm waters to protect life and property; the maintenance of the county's watersheds using the highest level of environmentally sound practices; and to provide coordinated planning for water supply needs for the community. As discussed previously in Section 2 Vulnerability Assessment, a significant portion of the floodplains in the county are along the Napa River. The District's Napa River

and Creek Flood River Project is returning the Napa River to its natural floodplain, which requires a creative blend of ecology and engineering. Once an integral part of the river, floodplains are being re-established at two levels to aid the passage of flood waters. A dry bypass allows raging flood waters to safely shortcut the oxbow, returning only when the river subsides. Yet, to ensure 100-year flood protection, the project also includes new levees, dikes, culverts, bridge replacements, and floodwalls in the most vulnerable areas (Napa County n.d.).

SAN FRANCISCO BAY AREA INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Zooming out, as mentioned above, the San Francisco Bay Area IRWMP contains discussions on regional floodplains and flood zones, flood protection infrastructure, and flood protection challenges. The IRWMP also discusses strategies to improve flood management, including the use of integrated flood risk management. Some of the existing Bay Area flood mitigation efforts noted in the IRWMP include but are not limited to the employment of collaborative approaches and innovative multi-benefit projects.

ADAPTING TO RISING TIDES, BAY AREA: REGIONAL SEA LEVEL RISE VULNERABILITY AND ADAPTATION STUDY

The ART Bay Area Report serves as one of the foundational plans for the region, particularly related to the risks posed by sea level rise, including coastal flooding. It provides an array of adaptation responses that require coordination with local and regional interests, should be initiated by regional interests or through a regional process, or consist of best practices for local jurisdictions to help address the common, regionally significant vulnerabilities identified within the report (ART 2020). The San Francisco Bay Shoreline Adaptation Atlas – Working with Nature to Plan for Sea Level Rise Using Operational Landscape Units report also offers insights on how Napa County as part of the Napa-Sonoma OLU can leverage nature-based approaches to mitigate coastal flooding and sea level rise.

NATIONAL FLOOD INSURANCE PROGRAM

The County joined the National Flood Insurance Program (NFIP) on February 1, 1980. The NFIP aims to reduce the impact of flooding on residential and nonresidential buildings by providing insurance to property owners and encouraging communities to adopt and enforce floodplain management regulations. All five incorporated cities in Napa County participate in the NFIP. The County and cities are currently in good standing with all provisions of the NFIP. In addition, both Napa County and the City of Napa are participants of the Community Rating System (CRS), which is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote awareness of flood insurance. For participating communities, flood insurance premium rates are discounted in increments of 5 percent according to the community's classification (Napa County 2020). As of the preparation of this VA (February 2024), according to FEMA's Community Status Book Report, both Napa County and the City of Napa are currently Class 7 and receive a 15 percent premium discount.

The County's MJHMP identifies an array of recommended mitigation actions related to county flooding and sea level rise issues. For flooding, the County proposes 13 actions for the unincorporated county and four actions for Napa County Flood Control and Water Conservation District. Such actions include but are not limited to constructing/improving stormwater basins countywide to accomplish 100-year protection and maintaining a countywide Storm Watch system. For sea level rise, the County proposes to support ongoing analysis of sea level rise data and create a comprehensive outreach strategy that informs residents in potentially affected areas of the county to protect and increase community resiliency to sea level rise (Napa County 2020).

Moreover, the County's municipal code has a specific chapter that is designated to floodplain management. The County's General Plan Safety Element also addresses flooding hazards and proposes 17 policies for flooding mitigation, such as evaluating new construction in floodplains and maintaining areas subject to flooding in agricultural or open

spaces (Napa County 2023). Also, similar to wildfire and extreme heat alerts, flood alerts are issued through ALERT Napa County, which county residents and visitors can opt into.

ADAPTIVE CAPACITY RATING: HIGH/MEDIUM

The County and local agencies in the region have adequately assessed the risks of extreme precipitation and flood events. The County and/or regional partners also have developed, adopted, and enforced a variety of robust plans, policies, and programs that will serve to mitigate impacts associated with increased intensity and frequency of floods in the future, and substantial flood mitigation operations are currently in place. Though the potential impacts associated with extreme precipitation, flooding and sea level rise in the context of climate change can get more severe in the future, and certain limitations are prevalent in existing plans, the County and partner agencies and organizations have demonstrated a high level of commitment in making the county more resilient to such hazards and know that the implementation of related plans and programs must be consistently evaluated and revised, as needed. The high levels of public engagement that have been conducted, and are still ongoing, for current flood control plans and programs display the County and local agencies' devotion and sense of responsibility towards protecting its citizens and visitors. The County and local agencies should continue expanding this engagement and emphasizing equity to ensure that all populations can provide input to inform future iterations of plans and programs, including those who are most vulnerable. Because of the reasons described, the adaptive capacity rating for extreme precipitation, sea level rise, and flooding is high/medium.

2.3.5 Adaptive Efforts Related to Drought and Water Supply

Water suppliers/wholesalers of the County, such as the Cities of Napa and American Canyon, have developed urban water management plans and water shortage contingency plans to ensure that customers have sustainable and reliable water supplies, even in the context of climate change and the existence of prolonged regional droughts.

SAN FRANCISCO BAY AREA INTEGRATED REGIONAL WATER MANAGEMENT PLAN

The San Francisco Bay Area IRWMP also aims to improve water supply reliability and quality, as well as protect and improve watershed health and function and Bay water quality. The IRWMP gives an overview of the regional water supplies in the Bay Area and discusses water demand and conservation by water suppliers, including the City of Napa. The IRWMP mentions that while the City of Napa is the largest water agency in Napa County, more than 6,000 AFY in additional municipal demands are met by the cities of American Canyon, St. Helena, and Calistoga and the Town of Yountville. Each has its own water supply portfolio including local reservoirs, groundwater, retail purchases, or State Water Project entitlements. The IRWMP then discusses regional issues, needs, and challenges, including but not limited to regulatory compliance challenges and dependence on the Sacramento-San Joaquin Delta. Furthermore, the IRWMP offers resource management strategies covering various aspects, including but not limited to strategies to reduce water demand and increase water supply (IRWMP 2019).

NAPA COUNTY WATER CONSERVATION WEBSITE HUB

Moreover, based on input received from the County and local agencies in the region, the County, its municipalities, and the agriculture and winery industry also have been spearheading various water conservation efforts. For example, the County's official website has a webpage that is dedicated to water conservation: https://www.countyofnapa.org/1295/Water-Conservation. This website notes that the County encourages all residents in Napa County to embrace wise water use as a daily habit, whether or not the county is experiencing a year of heavy or meager rain. The website also contains an exhaustive list of links to other state resources on drought and water supply, reservoir and precipitation levels, water-wise landscaping, as well as municipal water conservation links for the County's five incorporated cities. These municipal water conservation links demonstrate the cities' dedication to water conservation and drought preparedness.

NAPA COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

The County's MJHMP provides additional resources on the County's existing capability in drought mitigation and water supply support. The County enforces drought-tolerant landscaping requirements. Executive Order B-37-16 is also mentioned. Directive #10 specified that "For areas not covered by a Water Shortage Contingency Plan, California Department of Water Resources shall work with counties to facilitate improved drought planning for small water suppliers and rural communities." As noted in the MJHMP that was finished in 2020, all of the Napa Valley governments, including Napa County, were working towards completing a new regional study. In 2022, the County, its municipalities, and the Napa Sanitation District worked on and published the Napa Valley Drought Contingency Plan, which aims to help the region understand hydrologic risks and uncertainties that exacerbate and/or affect drought as well as how will drought affect the region and how communities can prepare for the next drought. Moreover, the MJHMP proposes five mitigation actions that target drought mitigation, including but not limited to installing water monitoring devices on government-owned facilities and drought tolerant landscaping at government-owned facilities, as well as adopting a new water conservation ordinance for commercial and residential land uses limiting outdoor watering (Napa County 2020).

NAPA COUNTY GENERAL PLAN SAFETY ELEMENT

Moreover, the County's General Plan Safety Element profiles drought hazards and mentions that the Napa County Groundwater Sustainability Agency (GSA) developed a Groundwater Sustainability Plan (GSP) for the Napa Valley Subbasin, which was adopted on January 11, 2022. The GSP identifies programs and projects that get the basin to sustainability and defines how the GSP will be implemented and how the GSA will measure progress over time. The five municipalities offer rebates for water-saving appliances and practices, including the popular "Cash For Grass" lawn removal incentive. In addition, the Safety Element proposes seven policies for drought mitigation, including but not limited to developing a public water conservation campaign and investing in water use efficiency and conservation (Napa County 2023).

ADAPTIVE CAPACITY RATING: MEDIUM

The County and local agencies in the region understand the implications of drought on water supplies and other associated impacts. The undertaking of urban water management plans, water shortage contingency plans, and other plans and programs will assist the County and local agencies in building resilience to future drought conditions. These plans and programs have taken necessary steps to mitigate the risk of inadequate water supplies, although it will be important for the County and local agencies to continue and increasingly plan for drought, as drought is likely going to be exacerbated by climate change in the future. The potential impacts of drought, especially on community functions, can be severe and long-lasting. However, because of the County and local agencies' plans and programs already in place, along with their demonstrated understanding of measures they can or should take in the future related to drought, the adaptive capacity rating for drought and water supply is medium.

2.3.6 Adaptive Efforts Related to Energy Grid

As discussed in Section 2 Vulnerability Assessment, both wildfire and flooding events can have severe impacts on the reliability and safety of the energy grid. Because adaptive capacity for wildfire and flooding events is discussed above, this section focuses on capacities that are directly related to the County and local agencies' existing planning mechanisms and programs regarding energy grid reliability.

NAPA GREEN & RISE PROGRAM

Napa Green, a winery and vineyard certification program, launched the NAPA Resilience, Innovation, Sustainability, Empowerment program (RISE) program in 2022, which is intended to enable the Napa County wine industry to leverage its powerful platform and set a standard for sustainability and climate action that galvanizes the global wine

industry. This program includes a three-week series of events that is designed to accelerate meaningful sustainability and climate action transformation across the entire industry and culture of wine. The most recent events happened in 2023 and were organized around the six pillars of sustainable winegrowing leadership, one of which is regarding energy efficiency & savings. During the energy efficiency & savings workshop, speakers talked about EV charger installation and available rebates and incentives, as well as carbon capture off fermentation tanks and market resale (NAPA RISE 2022). Moreover, according to the input received from the County and local agencies in the area, the RISE program is also a mentorship program that helps wineries and vineyards set pathways to reduce impacts and become more climate resilient. The Napa Green program is also a tool and serves as an incentive to help the local wine industry improve its energy efficiency and resilience.

Marin Clean Energy (MCE) is the largest electricity supplier in Napa County, followed by PG&E. MCE is a not-for-profit public agency that has set the standard for clean energy since 2010. MCE offers more renewable power at stable rates, significantly reducing energy-related greenhouse emissions and reinvesting millions of dollars in local energy programs. MCE provides electricity service and cutting-edge energy programs to more than 1.5 million residents and businesses in 37 member communities across four Bay Area counties: Contra Costa, Marin, Napa, and Solano. MCE buys and builds cleaner energy and PG&E still delivers energy and maintains lines. Therefore, the potential impacts from hazards on PG&E's energy grid still pose a threat to the county's overall energy resiliency. As noted in the County's MJHMP, the County proposes quite a few mitigation actions that are related to energy resiliency, including but not limited to: construct/install back up power generators for fire stations, pump houses, emergency shelters and cooling centers; develop microgrids to provide emergency power during natural disasters; procure backup generators in the event that public meeting spaces such as community centers or town halls will be used as emergency command centers; and perform regular maintenance on generators at water treatment plants (Napa County 2020). Moreover, according to input received from the County and local agencies in the region, the City of Calistoga also has been looking at developing a microgrid to increase energy resilience.

Furthermore, regarding PSPS events, PG&E has a comprehensive list of relevant support resources on its website, including but not limited to what to expect during PSPS events, a fact sheet about PSPS events, and seven-day PSPS forecast. The website also contains translation resources. There are also resources for businesses, such as large and small business emergency preparedness checklists (PG&E n.d.).

ADAPTIVE CAPACITY RATING: MEDIUM

The County and local agencies understand the energy resiliency issues that can be caused by wildfire and flooding events, and the County and local agencies have abundant capacities to mitigate such hazards, as well as a few planning mechanisms that directly target energy grid resiliency, such as the mitigation actions proposed in the County's MJHMP. The county's major utility also has capacities in place to mitigate PSPS events. These existing plans and programs will assist the County and local agencies in building resilience against future energy grid challenges, although it will be important for the County and local agencies to continue and increasingly improve energy grid resiliency, as wildfire and flooding hazards are likely going to be exacerbated by climate change in the future. The potential impacts of energy grid failure can be unexpected and severe. However, because of the County and local agencies' existing capacities regarding not only energy resiliency but also wildfire and flooding hazard mitigation, along with their demonstrated understanding of measures it can or should take in the future to improve energy grid resiliency, the adaptive capacity rating for energy grid resiliency is medium.

2.3.7 Summary of Adaptive Capacity

Table 13 summarizes the County, County jurisdictions, and local agencies' adaptive capacity regarding each climate change effect. Like the potential impacts rating evaluation, the scoring of adaptive capacity allows the County, County jurisdictions, and local agencies to better understand priority areas where there are gaps in preparing for and adapting to climate change. Adaptive capacity scoring is described in Table 2 at the beginning of Section 2.

Table 13 Adaptive Capacity Summary

Climate Change Effect	Adaptive Capacity Rating
Increased Wildfire Risk	High
Increased Temperatures and Extreme Heat	Medium
Extreme Precipitation, Sea Level Rise, and Flooding	High/Medium
Drought and Water Supply	Medium
Energy Grid Resiliency	Medium

Source: Ascent 2024

2.4 VULNERABILITY SCORING

The final step in the VA process is to characterize the county's vulnerability to each climate change effect, which is based on the magnitude of risk to and potential impacts on populations, the built environment, and community functions, while considering the current adaptive capacity in place to mitigate these impacts. Based on the ratings of potential impacts and adaptive capacity, an overall vulnerability score on a scale of 1 to 5 can be determined for each climate change effect. As noted at the beginning of Section 2, higher vulnerability scores (5 being the highest) indicate that a climate change effect should be prioritized sooner than those with lower scores (1 being the lowest). This scoring can be used to inform the development and prioritization of adaptation strategies included in the RCAAP, and it can also help the County, County jurisdictions, and local agencies understand which effects pose the greatest threats and should be emphasized in future planning efforts. Table 3 in Section 2 summarizes the overall vulnerability scores based on the ratings for potential impacts and adaptive capacity.

Vulnerability scoring for each climate change effect identified and evaluated in Sections 2.1 through 2.3 is included in Table 14 below. Table 14 shows that increased temperatures and extreme heat, as well as drought and water supply, are assigned a vulnerability score of 4, which means these two climate effects should be a high priority for the county. Increased wildfire risk and energy grid resiliency are both assigned a vulnerability score of 3, which means they should be prioritized next in the County, County jurisdictions, and local agencies' adaptation- and planning-related efforts. These climate change effects could potentially have significant impacts on the county's populations, built environment, and community functions in the near-term to mid-term, and although a variety of adaptive efforts related to both climate change effects are already in place, the magnitude or risks posed by these hazards contributes to higher vulnerability in the county. Extreme precipitation, sea level rise, and flooding is characterized as having a vulnerability rating of 2-3. This climate change effect is currently being addressed adequately based on existing conditions, but as extreme precipitation events potentially become more frequent and sea level rise becomes more severe in future years, additional adaptation and resilience planning will be required in the future to mitigate potential impacts and protect the county.

Table 14 Vulnerability Scoring Summary

Climate Change Effect	Vulnerability Score		
	Adaptive Capacity	Potential Impact	Vulnerability
Increased Wildfire Risk	High	High	3
Increased Temperatures and Extreme Heat	Medium	High	4
Extreme Precipitation, Sea Level Rise, and Flooding	High/Medium	Medium	2-3
Drought and Water Supply	Medium	High	4
Energy Grid Resiliency	Medium	Medium	3

Source: Ascent 2024.

2.5 CONCLUSION

The County, County jurisdictions, local agencies and other interest groups have already implemented a variety of initiatives to address climate change in the county through existing plans, policies, programs, and actions. As climate change continues to exacerbate risks and impacts from various hazards, the County, County jurisdictions, and local agencies must continue to develop and implement adaptation strategies to mitigate these risks. The RCAAP will include adaptation and resilience strategies based on the findings of this report, and the County, County jurisdictions, and local agencies should work together to prioritize strategies that will be effective, feasible, cost-appropriate, and include additional social, environmental, economic, and technological benefits.

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Appendix H

Implementation Matrices

Photo Credit: County of Napa

Greenhouse Gas Reduction Actions Implementation Matrix

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-1-A	Secure funding to support the implementation of energy efficiency and electrification actions.	▶ All	▶ Bay Area Air District ▶ BayREN	Securing Funding	2026	2027
BE-1-B	Create a pre-electrification program that provides affordable financing, rebates, or other incentives for electric panel upgrades.	▶ All	▶ Bay Area Air District ▶ BayREN ▶ MCE ▶ MTC/ABAG ▶ PG&E	New Program	2026	2028
BE-1-C	Work with the CECSP to develop reach codes and associated cost effectiveness studies.	▶ All	▶ BayREN Codes & Standards ▶ CECSP	Reach Code / Ordinance	2026	2045
BE-1-D	Determine reach code compliance triggers for retrofits.	▶ All	▶ N/A	Reach Code / Ordinance	2026	2027
BE-1-E	Conduct stakeholder outreach with building industry members, contractors, residents, business, and others to present reach code options and solicit feedback.	▶ All	▶ Napa Chamber of Commerce	Education / Outreach	2026	2027
BE-1-F	Adopt ordinance(s) to implement and enforce new reach code(s) for existing buildings. Pursuant to new statewide residential building code update limitations in Assembly Bill (AB) 130 (signed into law on June 30, 2025), a residential reach code may not be adopted and enforced until in 2031; however, nonresidential reach code adoption and enforcement may proceed starting in 2026.	▶ All	▶ N/A	Reach Code / Ordinance	2026	2031

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-1-G	Conduct training for permitting staff to understand reach code requirements for existing buildings and how compliance will be demonstrated.	▶ All	▶ BayREN Codes & Standards	Education / Outreach	2026	2027
BE-1-H	Develop a tracking system for measures related to energy efficiency upgrades, decarbonization, or pre-wiring completed by applicants pursuant to reach code requirements.	▶ All	▶ N/A	New Program	2026	2028
BE-1-I	Review existing permitting processes for building owners seeking to replace fossil fuel-powered equipment with electric equipment and modify as needed.	▶ All	▶ N/A	Municipal Operations	2026	2027
BE-1-J	Waive or reduce permitting fees for building retrofit projects that convert mixed-fuel buildings to all-electric and cap natural gas lines	▶ All	▶ N/A	Municipal Operations	2026	2045
BE-1-K	Develop a community outreach program to enable and encourage energy conservation and gas-to-electric conversions in residential and commercial buildings for space and water heating.	▶ All	▶ BayREN ▶ MCE ▶ PG&E	Education / Outreach	2026	2028
BE-1-L	Develop a revolving loan fund to provide low-interest loans to cover time-of-replacement/emergency replacement of natural gas water heaters and/or HVAC units with electric options.	▶ All	▶ Bay Area Air District ▶ BayREN	Securing Funding	2026	2045
BE-1-M	Work with MCE to improve participation in various programs.	▶ All	▶ MCE	Partnership	2026	2028

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-1-N	Partner with regional energy agencies, workforce development organizations, and community colleges to support contractor training for electrification, HVAC, and building energy efficiency projects.	▶ All	▶ BayREN ▶ CBOs	Partnership	TBD	Ongoing
BE-1-O	Secure long-term funding to continue offering energy efficiency, electrification, and other net-zero carbon rebates.	▶ All	▶ Bay Area Air District ▶ BayREN	Securing Funding	TBD	Ongoing
BE-1-P	Provide a sliding scale of rebates that offers more rebates in the short-term and less in the long-term.	▶ All	▶ Bay Area Air District ▶ BayREN ▶ MCE ▶ MTC/ABAG ▶ PG&E	New Program	TBD	Ongoing
BE-1-Q	Review existing building reach codes at the release of each triennial building code cycle to ensure they do not conflict with updates.	▶ All	▶ BayREN Codes & Standards ▶ CECSP	Reach Code	TBD	Ongoing
BE-1-R	Continue to streamline permitting and electrification program outreach.	▶ All	▶ N/A	Municipal Operations	TBD	Ongoing
BE-1-S	Research opportunities to work with local financial institutions to offer zero or low percent financing for a limited time or on a sliding scale based on income.	▶ All	▶ Bay Area Air District	Securing Funding	TBD	Ongoing
BE-1-T	Collaborate with regional and State agencies to expand long-term workforce development programs and permitting support for electrification and energy efficiency upgrades.	▶ All	▶ BayREN ▶ CBOs	Partnership	TBD	Ongoing
BE-2-A	Require that at least 90 percent of municipal buildings undergo energy audits that meet industry-accepted reporting standards.	▶ All	▶ N/A	Reach Code / Ordinance	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-2-B	Work with partners to develop a regional countywide energy audit program that provides free or subsidized energy audits of existing buildings.	▶ All	▶ BayREN ▶ MCE ▶ PG&E	New Program	TBD	Ongoing
BE-2-C	Partner with local workforce agencies to train and certify energy auditors and retrofit contractors.	▶ All	▶ Workforce development agencies.	Partnership	TBD	Ongoing
BE-2-D	Require energy audits for municipal buildings every five years.	▶ All	▶ N/A	Reach Code / Ordinance	TBD	Ongoing
BE-2-E	Secure long-term funding to continue offering energy audits until all existing buildings built before 2019 have been retrofitted.	▶ All	▶ N/A	Securing Funding	TBD	Ongoing
BE-3-A	Collaborate with utilities and other partners to offer rebates and incentives for renewable energy and storage.	▶ All	▶ Bay Area Air District ▶ MCE ▶ PG&E	Partnership	2028	2030
BE-3-B	Prioritize outreach to non-residential and residential property owners based on their electricity use by jurisdiction.	▶ All	▶ MCE ▶ PG&E	Education / Outreach	2028	Ongoing
BE-3-C	Continue to seek funding to sustain local programs in tandem with retrofit efforts under BE-1.	▶ All	▶ Bay Area Air District ▶ MCE ▶ PG&E	Securing Funding	TBD	Ongoing
BE-4-A	Support sustainability certification of wineries to reach a target of 75 percent of wineries certified by 2030.	▶ All	▶ Napa Green ▶ CA Sustainable Winegrowing Alliance ▶ Sustainability in Practice (SIP) Certified	Partnership	2026	2030

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-4-B	Require new wineries, winery retrofits, and additions greater than 10 percent of existing square footage to attain sustainability certification.	▶ All	▶ Napa Green ▶ CA Sustainable Winegrowing Alliance ▶ Sustainability in Practice (SIP) Certified	Ordinance	2026	2045
BE-4-C	Work with sustainability certification entities to quantify GHG reductions.	▶ All	▶ Napa Green ▶ CA Sustainable Winegrowing Alliance ▶ Sustainability in Practice (SIP) Certified	Partnership	2026	2028
BE-4-D	Work with sustainability certification programs to determine funding needs for increased certification targets.	▶ All	▶ Napa Green ▶ CA Sustainable Winegrowing Alliance ▶ Sustainability in Practice (SIP) Certified	Partnership	2026	2028
BE-4-E	Certify all new wineries by 2030. Target 90 percent of wineries in the County to become certified in sustainability by 2045.	▶ All	▶ Napa Green ▶ CA Sustainable Winegrowing Alliance ▶ Sustainability in Practice (SIP) Certified	Partnership	2030	2045
BE-5-A	Adopt a regionally consistent energy efficiency and renewable energy building reach code for new construction of residential and non-residential buildings, including major additions. Pursuant to new statewide residential building code update limitations in AB 130 (signed into law on June 30, 2025), a residential reach code may not be adopted and enforced until 2031; however, nonresidential reach code adoption and enforcement may proceed starting in 2026.	▶ All	▶ Bay Area Air District ▶ BayREN ▶ MCE	Ordinance	2026	2031

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-5-B	Track progress of state codes and bills related to climate and energy to inform the region's reach code.	▶ All	▶ N/A	Research	2027	Ongoing
BE-5-C	Develop reach codes requiring low carbon concrete and materials with low embodied carbon. Pursuant to new statewide residential building code update limitations in AB 130 (signed into law on June 30, 2025), a residential reach code may not be adopted and enforced until 2031; however, nonresidential reach code adoption and enforcement may proceed starting in 2026.	▶ All	▶ N/A	Ordinance	2027	2028
BE-5-D	Regularly update the reach code in accordance with the State's building energy code cycles and legislation.	▶ All	▶ Bay Area Air District ▶ BayREN ▶ MCE	Monitoring and Updating	TBD	Ongoing
BE-6-A	Increase education, awareness, and access to available rebates and incentives for energy efficiency.	▶ All	▶ BayREN ▶ MCE ▶ PG&E ▶ Switch is On	Education / Outreach	2029	Ongoing
BE-6-B	Develop a dedicated website for electrification and renewable energy resources for residents and businesses.	▶ All	▶ N/A	Education / Outreach	2029	2031
BE-6-C	Partner with contractors to promote the website at time-of-replacement or remodels.	▶ All	▶ Local contractors and news outlets	Partnership	2029	2031
BE-6-D	Use partnerships to promote appliance upgrades to energy efficient technologies and products.	▶ All	▶ BayREN ▶ CBOs ▶ MCE ▶ PG&E	Partnership	2029	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
BE-6-E	Promote alternatives to natural gas in all commercial sectors.	▶ All	▶ BayREN ▶ MCE ▶ PG&E	Education / Outreach	2029	Ongoing
BE-6-F	Promote use of electric cooking appliances in commercial kitchens.	▶ All	▶ BayREN ▶ MCE ▶ PG&E	Education / Outreach	2029	Ongoing
BE-6-G	Create a pilot of a series of exhibitions for local restaurants to demonstrate the effectiveness and benefits of induction cooktops.	▶ All	▶ BayREN ▶ CBOs	New Program	2029	2031
BE-6-H	Evaluate the effectiveness of short-term outreach and adjust as needed.	▶ All	▶ BayREN ▶ CBOs ▶ Local contractors and news outlets ▶ MCE ▶ PG&E ▶ Switch Is On	Monitoring and Updating	TBD	Ongoing
BE-6-I	Evaluate countywide transition away from natural gas use and adjust outreach, as needed.	▶ All	▶ BayREN ▶ CBOs ▶ MCE ▶ PG&E	Monitoring and Updating	TBD	Ongoing
TR-1-A	Support NVTA in developing a set of "transit first" policies for all jurisdictions.	▶ All	▶ NVTA	Partnership	2030	2032
TR-1-B	Support expanded analysis of VMT for passenger and commercial vehicle trips.	▶ All	▶ NVTA	Partnership	2030	2032
TR-1-C	Work with NVTA to implement VMT reduction strategies as part of the development review process.	▶ All	▶ NVTA	Partnership	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-1-D	Work with NVTA to develop travel behavior studies regularly.	▶ All	▶ NVTA	Partnership	TBD	Ongoing
TR-2-A	Identify funding to conduct a study on winery wastewater treatment demands.	▶ All	▶ Bay Area Air District	Securing Funding	2029	2030
TR-2-B	Partner with Napa Green, California Sustainable Winegrowing Alliance, SIP Certified, or other comparable programs to help gather data.	▶ All	▶ California Sustainable Winegrowing Alliance ▶ Napa Green ▶ SIP Certified	Partnership	2029	2030
TR-2-C	Coordinate across jurisdictions to consider implementation options and/or seek funding for the solution(s) recommended by the study.	▶ All	▶ Bay Area Air District ▶ California Sustainable Winegrowing Alliance ▶ Napa Green ▶ SIP Certified	Evaluate Options / Secure Funding	TBD	Ongoing
TR-2-D	Continue to monitor winery wastewater treatment trends to identify opportunities to reduce hauling VMT.	▶ All	▶ N/A	Research	TBD	Ongoing
TR-3-A	Work with partners and local EV charging programs to identify areas and opportunities to install and maintain chargers for medium- and heavy-duty fleets.	▶ All	▶ MTC ▶ Bay Area Air District	Partnership	2026	2028
TR-3-B	Analyze existing private parking lots and educate/incentivize owners to take advantage of funding opportunities such that at least 10 percent of their spaces have EVSE and at least an additional 10 percent are EV-ready.	▶ All	▶ NVTA	Research	2026	2027
TR-3-C	Identify opportunities to expand public electric vehicle charging infrastructure.	▶ All	▶ NVTA	Evaluate Options / Secure Funding	TBD	Ongoing
TR-3-D	Review requirements every 5 years and update the requirements to increase the percentage of parking lots with EV chargers.	▶ All	▶ NVTA	Research	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-4-A	Work with partners to evaluate the need for stations based on the State's forecasted growth of hydrogen vehicles.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	New Program	2031	2035
TR-4-B	Identify locations where hydrogen fueling stations could be built.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	Research	2031	2032
TR-4-C	Install at least one hydrogen fueling station in the county by 2030.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	Partnership	2031	2035
TR-4-D	Adopt an ordinance that expedites scaled permitting of fuel stations that offer renewable fuels.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	Ordinance	2029	2030
TR-4-E	Require expedited EV charging permitting in all jurisdictions.	▶ All	▶ BayREN	Ordinance	2026	2027
TR-4-F	Require 50 percent of parking spaces in new development to be EV-capable by 2030.	▶ All	▶ BayREN	Ordinance	2026	2030
TR-4-G	Adopt an EV charging station reach code that establishes minimum EV charging standards for all new residential and non-residential development.	▶ All	▶ BayREN	Ordinance	2026	2027
TR-4-H	Provide incentives for new hydrogen fueling installations in the identified locations noted in the short-term actions.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	Incentives	TBD	Ongoing
TR-4-I	Evaluate the feasibility of the ordinance at least once every five years and update, as necessary.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	Monitoring and Updating	TBD	Ongoing
TR-4-J	Review the requirements at least once every five years and make requirements more stringent, as feasible, in accordance with CALGreen voluntary recommendations.	▶ All	▶ Hydrogen Fuel Cell Partnership ▶ NVTA	Monitoring and Updating	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-5-A	Adopt a policy to support the requirements of Advanced Clean Fleet regulations as they relate to municipal fleets.	▶ All	▶ N/A	Ordinance	2028	2032
TR-5-B	Work with municipal fleet operators across the region to identify and mitigate any barriers that hinder ZEV adoption.	▶ All	▶ N/A	Municipal Operations	2028	2029
TR-5-C	Work with partners to pursue funding for EV deployment projects in municipalities.	▶ All	▶ Bay Area Air District	Securing Funding	2027	2045
TR-5-D	Identify locations where infrastructure may be needed and develop strategies to meet the existing and projected needs of public medium- and heavy-duty ZEV fleet operations.	▶ All	▶ N/A	Evaluate Options	TBD	Ongoing
TR-5-E	Review and address any barriers to achieving the 2030 targets and adjust the targets, as needed.	▶ All	▶ Bay Area Air District	Monitoring and Updating	TBD	Ongoing
TR-6-A	Conduct outreach to local commercial fleet operators to provide information on existing incentives, support the retirement of older vehicles, and establish requirements to replace fossil fuel-powered vehicles or engines with ZEV or carbon neutral fuel alternatives.	▶ All	▶ Local commercial fleet operators ▶ Napa Chamber of Commerce ▶ Napa County Farm Bureau	Education / Outreach	2027	2031
TR-6-B	Educate and provide resources to commercial fleet operators, vehicle manufacturers, or leasing companies regarding available funding for EV rebates from all available sources for both new and used EVs.	▶ All	▶ Bay Area Air District ▶ Local commercial fleet operators	Securing Funding	2028	2030

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-6-C	Review and address any barriers to achieving the short-term actions and adjust, as needed.	▶ All	▶ Bay Area Air District ▶ Local commercial fleet operators ▶ Napa Chamber of Commerce ▶ Napa County Farm Bureau	Monitoring and Updating	TBD	Ongoing
TR-7-A	Partner with Bay Area Air District and others to pursue EV funding/rebates for residents.	▶ All	▶ Bay Area Air District	Securing Funding	2028	2030
TR-7-B	Evaluate income limits and consider providing additional incentives for residents	▶ All	▶ Bay Area Air District	Incentives	2028	2029
TR-7-C	Increase awareness of and access to available rebates and incentives.	▶ All	▶ Bay Area Air District	Incentives	TBD	Ongoing
TR-7-D	Continue short-term actions, and evaluate and adjust incentive programs as needed.	▶ All	▶ Bay Area Air District	Monitoring and Updating	TBD	Ongoing
TR-8-A	Adopt an ordinance in all jurisdictions that permanently bans or phases out the development of new and existing fossil fuel pumps.	▶ All	▶ N/A	Ordinance	2034	2035
TR-8-B	Evaluate the feasibility of the ordinance at least once every five years and update, as needed.	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing
TR-9-A	Incentivize the sale of renewable diesel countywide, targeting a minimum of five stations offering R99 or R100 by 2030.	▶ All	▶ N/A	Incentives	2028	2032
TR-10-A	Support NVTA's adoption and implementation of the forthcoming NVTA Countywide Active Transportation Plan.	▶ All	▶ NVTA	Partnership	2025	2025

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-10-B	Support NVTA's efforts to secure funding for and consider opportunities to implement projects, programs, and policies of the Countywide Vision Zero Plan, Local Roadway Safety Plans, and other documents that address multimodal safety improvements.	▶ All	▶ NVTA	Securing Funding	2028	2029
TR-10-C	Support NVTA's efforts to report biennial jurisdiction-level progress toward targets for active transportation infrastructure and policies to advance mode shift.	▶ All	▶ NVTA	Partnership	2028	Ongoing
TR-10-D	Update municipal codes to incorporate comprehensive bicycle, e-bike, and micromobility parking and charging standards.	▶ All	▶ NVTA ▶ Napa County Bicycle Coalition	Ordinance	2027	Ongoing
TR-10-E	Support NVTA's efforts to evaluate opportunities and deploy secure bicycle parking in downtowns and key retail and employment destinations.	▶ All	▶ NVTA	Research	2027	2028
TR-10-F	Establish (and/or update) and implement policies addressing active transportation facility maintenance and access.	▶ All	▶ NVTA	Ordinance	2027	2028
TR-10-G	Support and coordinate with NVTA efforts to develop the Active Transportation Plan, ensure consistency with the Active Transportation Plan in local planning efforts, and avoid unnecessary or duplicative work.	▶ All	▶ NVTA	Partnership	2025	2025
TR-10-H	Encourage cross-agency collaboration between State and regional entities, NVTA, and local jurisdictions in the county to identify, prioritize, and secure funding for active transportation projects consistent with local and regional plans	▶ All	▶ Caltrans ▶ MTC/ABAG ▶ NVTA	Partnership	Ongoing	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-10-I	Continue updating the plans and evaluating the effectiveness of previous strategies and measures in reducing VMT and increasing the shift to active transportation modes.	▸ All	▸ NVTA	Monitoring and Updating	TBD	Ongoing
TR-10-J	Evaluate progress and effectiveness of requirements and modify as necessary to meet policy goals and priorities.	▸ All	▸ NVTA	Monitoring and Updating	TBD	Ongoing
TR-11-A	Support local and regional partners' efforts to expand and secure additional funding to provide active transportation mobility incentives and rebate programs.	▸ All	▸ Bay Area Air District ▸ NVTA	Securing Funding	2028	2029
TR-11-B	Support local and regional partners' efforts to expand and secure additional funding to expand current TDM programs.	▸ All	▸ Bay Area Air District ▸ NVTA	Securing Funding	2028	Ongoing
TR-11-C	Develop and adopt local TDM ordinances in all jurisdictions by 2028.	▸ All	▸ Bay Area Air District ▸ NVTA	Ordinance	2028	2030
TR-11-D	Support feasibility analysis for MAAS, particularly in urban areas.	▸ American Canyon ▸ Napa	▸ NVTA	Partnership	2028	2030
TR-11-E	Evaluate the progress and effectiveness of the ordinance and TDM program and modify, as needed.	▸ All	▸ NVTA	Monitoring and Updating	TBD	Ongoing
TR-12-A	Support NVTA in developing a visitor TDM program that targets recreational trips.	▸ All	▸ NVTA ▸ Visit Napa Valley	Partnership	2027	2028
TR-13-A	Consider the feasibility of reducing minimum parking standards or establishing maximum parking standards, along with complementary strategies. If feasible and appropriate, develop and adopt ordinances amending parking standards in local zoning codes.	▸ All	▸ NVTA	Ordinance	2033	2035

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
TR-13-B	Consider modifying zoning codes to unbundle parking from rent for all new multi-family residential developments with 16 or more units located within ¼ mile of arterials or collectors with fixed route service.	▶ All	▶ NVTA	Ordinance	TBD	Ongoing
TR-13-C	Implement parking supply-related measures.	▶ All	▶ NVTA	Ordinance	TBD	Ongoing
TR-14-A	Market existing transit/transportation options to support mode shift.	▶ All	▶ Napa County Bike Coalition ▶ NVTA ▶ Visit Napa Valley	Education / Outreach	2028	Ongoing
TR-14-B	Consider bike delivery pilot programs to demonstrate the effectiveness of zero-emission local deliveries.	▶ All	▶ NVTA	New Program	2028	2030
TR-14-C	Continue supporting local and regional partners to pursue Safe Routes to School funding and support bicycle and pedestrian safety education programs for K-12 students.	▶ All	▶ NVTA ▶ School Districts	Education / Outreach	TBD	Ongoing
TR-14-D	Support local and regional organizations to provide free bicycle safety education and skills training for youth and adults.	▶ All	▶ Napa County Bicycle Coalition ▶ NVTA	Education / Outreach	TBD	Ongoing
TR-14-E	Continue to expand awareness, education, and community action.	▶ All	▶ Napa County Bike Coalition ▶ NVTA ▶ Visit Napa Valley	Education / Outreach	TBD	Ongoing
TR-14-F	Explore opportunities to support ongoing Safe Routes to Schools Funding and work toward establishing a countywide bicycle and pedestrian safety education program.	▶ All	▶ NVTA ▶ School Districts	Education / Outreach	TBD	Ongoing
OF-1-A	Promote incentive programs to encourage converting or replacing fossil fuel-powered gardening equipment with electric alternatives.	▶ All	▶ N/A	Incentives	2029	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
OF-1-B	Implement a countywide ban on fossil fuel-powered landscape equipment under 25 horsepower by 2030.	▶ All	▶ N/A	Ordinance	2029	2033
OF-1-C	Develop a "lawn and garden equipment trade-in program" to provide vouchers or rebates for purchasing electric landscape equipment to residents and businesses.	▶ All	▶ Bay Area Air District	New Program	2029	2031
OF-1-D	Explore opportunities to provide more funding through extending Bay Area Air District incentives or developing new incentives for electric off-road equipment.	▶ All	▶ Bay Area Air District	Securing Funding	2029	2030
OF-1-E	Continue short-term actions until all gardening equipment has been electrified (or uses zero-carbon alternatives).	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing
OF-1-F	Evaluate program progress and track implementation with CARB's OFFROAD model.	▶ All	▶ Bay Area Air District	Monitoring and Updating	TBD	Ongoing
OF-2-A	Electrify 33 percent of existing commercial loading docks to include electric charging ports for trucks and TRUs by 2030.	▶ All	▶ Napa Green ▶ NVTA	Ordinance	2029	Ongoing
OF-2-B	Coordinate with Napa Green or other similar programs to include electrification of loading docks as a criterion for certification.	▶ All	▶ Napa Green	Partnership	2029	2031
OF-2-C	Electrify 100 percent of existing commercial loading docks to include electric charging ports for trucks and TRUs.	▶ All	▶ Napa Green ▶ NVTA	Ordinance	TBD	Ongoing
OF-2-D	Evaluate progress and effectiveness of requirements and modify as necessary to meet policy goals and priorities.	▶ All	▶ Napa Green	Partnership	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
OF-3-A	Provide information about available incentives for electric construction and portable equipment to contractors at the building permit counter.	▶ All	▶ N/A	Education / Outreach	2030	Ongoing
OF-4-A	Consider incorporating the use of electric construction and portable equipment in evaluation processes for capital improvement projects.	▶ All	▶ N/A	Capital Improvement Program	2029	Ongoing
OF-4-B	Evaluate progress and effectiveness of requirements and modify as necessary to meet policy goals and priorities.	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing
SW-1-A	Expand the Residential Backyard Composting Program for single-family residences.	▶ All	▶ Napa County School Districts ▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Modified Program	2025	Ongoing
SW-1-B	Adopt and implement the draft Reusable Food Ware and Waste Reduction Ordinance.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Ordinance	2025	2026

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
SW-1-C	Pursuant to SB 1383, implement an Edible Food Recovery Program.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Partnership	2025	Ongoing
SW-1-D	Implement a Mandatory Commercial Food Waste Diversion Program.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Ordinance	2025	2026
SW-1-E	Conduct random annual waste bin audits with local waste collection operators to check compliance.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	New Program	2025	2026
SW-1-F	Continue to implement the program and support backyard composting.	▶ All	▶ Napa County School Districts ▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Modified Program	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
SW-1-G	Monitor progress of ordinance implementation and enforcement.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Monitoring and Updating	TBD	Ongoing
SW-1-H	Evaluate progress and effectiveness of requirements and modify, as needed.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Monitoring and Updating	TBD	Ongoing
SW-2-A	Develop a unified Construction Waste Management Plan to require and achieve recycling or reuse of at least 70 percent of C&D waste from every project by 2035.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Research	2033	2042
SW-2-B	Review the plan every 10 years to incorporate updated construction waste management practices.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Monitoring and Updating	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
SW-3-A	Require jurisdictions to inform residents and businesses about available local programs and information of type of waste accepted as recyclable, solid waste, or compostable.	▶ All	▶ Napa County School Districts ▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Education / Outreach	2026	2027
SW-3-B	Update the Napa Countywide Waste Reduction and Recycling Curriculum.	▶ All	▶ Napa County School Districts ▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Education / Outreach	2030	2031
SW-3-C	Partner with school districts to ensure that schools use the Napa Countywide Waste Reduction and Recycling Curriculum.	▶ All	▶ Napa County School Districts ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Partnership	2030	2032
SW-3-D	Evaluate progress and effectiveness of requirements and modify, as needed.	▶ All	▶ Napa County School Districts ▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency ▶ Upper Valley Disposal Services ▶ Berryessa Garbage Service	Monitoring and Updating	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
SW-3-E	Review the Napa Countywide Waste Reduction and Recycling Curriculum for its applicability to the whole community.	▶ All	▶ Napa County School Districts ▶ Napa County Recycling and Waste Services ▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Monitoring and Updating	TBD	Ongoing
SW-4-A	Work with American Canyon Landfill and Clover Flat Landfill to confirm current landfill gas collection efficiency.	▶ Unincorporated County	▶ American Canyon Landfill ▶ Clover Flat Landfill ▶ Upper Valley Disposal Services	Partnership	2026	2027
SW-4-B	Conduct a feasibility study to determine solutions to restart CH_4 capture and either flare, collect, or generate electricity from CH_4 to reduce intensity of emitted GHGs.	▶ Unincorporated County	▶ Recology American Canyon ▶ Upper Valley Disposal Services	New Program	2026	2045
SW-4-C	Establish requirements that both landfills provide evidence to substantiate their collection efficiency improvements are being achieved.	▶ Unincorporated County	▶ Recology American Canyon ▶ Upper Valley Disposal Services ▶	Ordinance	2026	2028
SW-4-D	Require that both landfills provide evidence to substantiate their collection efficiency in a report by the end of 2046.	▶ Unincorporated County	▶ American Canyon Landfill ▶ Clover Flat Landfill ▶ Recology American Canyon ▶ Upper Valley Disposal Services	Monitoring and Updating	TBD	Ongoing
SW-5-A	Partner with landfills outside Napa County that receive waste from the county to increase CH_4 capture.	▶ All	▶ Napa County Recycling and Waste Services ▶ Recology American Canyon	Partnership	2033	2045
SW-6-A	Support waste management providers and jurisdictions in installing waste-to-energy systems.	▶ Unincorporated County	▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Partnership	2034	2043

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
SW-6-B	Review waste-to-energy systems every 5 years for feasibility.	▶ Unincorporated County	▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Monitoring and Updating	TBD	Ongoing
SW-6-C	Coordinate with other local agencies and jurisdictions to develop and implement decentralized waste-to-energy systems.	▶ Unincorporated County	▶ Recology American Canyon ▶ Upper Valley Waste Management Agency	Partnership	TBD	Ongoing
WW-1-A	Require public and private wastewater treatment plants to conduct a full evaluation and report on proposed solutions to reduce CH_4 emissions not captured by existing waste-to-energy systems.	▶ All	▶ Local wastewater agencies	Ordinance	2032	Ongoing
WW-1-B	Evaluate progress and effectiveness of requirements and modify, as needed.	▶ All	▶ Local wastewater agencies	Monitoring and Updating	TBD	Ongoing
WW-2-A	Encourage wastewater agencies to conduct a feasibility study to expand the supply of recycled water and infrastructure.	▶ All	▶ Local wastewater agencies	Partnership	2030	2032
WW-2-B	Plan the expansion of recycled water pipelines to meet demand.	▶ All	▶ Local wastewater agencies	Plan	TBD	Ongoing
WW-2-C	Reevaluate the feasibility of Purified Water based on updated cost estimates.	▶ All	▶ Local wastewater agencies	Monitoring and Updating	TBD	Ongoing
WW-3-A	Target average indoor residential water use of 47 gallons per capita per day or less for 2025-2029.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	Incentives	2029	Ongoing
WW-3-B	Offer a selection of rebate incentives for residential customers.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	Incentives	2029	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
WW-3-C	Consider increasing "Cash for Grass" rebate amounts to accelerate the conversion of residential lawns to water-efficient landscaping.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	Incentive	2029	2033
WW-3-D	Consider special direct installation programs to provide water efficiency upgrades for underserved community members.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	New Program	2029	2033
WW-3-E	Implement advanced metering infrastructure or offer smart home water monitor rebates.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	New Program	2029	2033
WW-3-F	Target average indoor residential water use of 42 gallons per capita per day or less for 2030 and beyond.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	Monitoring and Updating	TBD	Ongoing
WW-3-G	Reduce or eliminate rebates in the long-term based on available funding, changes in cost-effectiveness, or market saturation; and add new rebates as innovative, proven water-saving products arise.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	Monitoring and Updating	TBD	Ongoing
WW-3-H	Continue to seek grant funding for residential water conservation rebates.	▶ All	▶ Napa RCD ▶ California Water Efficiency Partnership	Secure Funding	TBD	Ongoing
WW-4-A	Offer rebate incentives for non-residential customers.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Incentives	2034	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
WW-4-B	Increase "Cash for Grass" rebate amounts to accelerate the conversion of non-functional, non-residential turf areas to water efficient landscaping.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Incentive	2034	2035
WW-4-C	Identify priority municipal landscaping areas for replacement with native, drought-tolerant alternatives.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Research	2034	2035
WW-4-D	Consider certification of at least one public works staff member from each jurisdiction to implement sustainable and climate-smart landscapes.	▶ All	▶ N/A	New Program	2034	2035
WW-4-E	Adopt regionally consistent ordinances to implement and enforce AB 1572.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Ordinance	2034	2037
WW-4-F	Study the feasibility of applying tiered water rates to non-residential customers for agencies that currently apply uniform volumetric rates for non-residential water consumption.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Research	2034	2035
WW-4-G	Rank non-residential customers by annual water use and require top users to undergo periodic water audits to identify areas for improvement.	▶ All	▶ N/A	New Program	2033	2034

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
WW-4-H	Enforce WELO for covered projects, ensuring the installation of climate-appropriate plants and efficient irrigation systems.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Ordinance	2034	Ongoing
WW-4-I	Adopt regionally consistent local amendments that include more stringent water efficiency and conservation measures. Pursuant to new statewide residential building code update limitations in AB 130 (signed into law on June 30, 2025), a residential reach code may not be adopted and enforced until 2031; however, nonresidential reach code adoption and enforcement may proceed starting in 2026.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners ▶ Napa County Green Business ▶ California Water Efficiency Partnership	Ordinance	2034	Ongoing
WW-4-J	Encourage growers to take advantage of Napa RCD water distribution uniformity testing.	▶ All	▶ Napa RCD	Education / Outreach	2034	Ongoing
WW-4-K	Reduce or eliminate rebates in the long term based on available funding, changes in cost-effectiveness, or market saturation.	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing
WW-4-L	Add new customized rebates as innovative, proven water-saving products arise.	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing
WW-4-M	Continue to seek funding for non-residential water conservation rebates.	▶ All	▶ N/A	Secure Funding	TBD	Ongoing
WW-4-N	Maintain sustainable landscape training regimen for municipal staff.	▶ All	▶ N/A	Municipal Operations	TBD	Ongoing
WW-4-O	Continue local enforcement of AB 1572 non-functional turf irrigation ban and encourage affected non-residential entities to certify their compliance with the State Water Board every three years.	▶ All	▶ N/A	Local Enforcement	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
WW-4-P	Adopt tiered water rates for non-residential customers, if feasible.	▶ All	▶ N/A	Ordinance	TBD	Ongoing
WW-4-Q	Offer free water audits to all non-residential customers.	▶ All	▶ N/A	New Program	TBD	Ongoing
WW-4-R	Implement a formal water conservation program for the top 20 percent of non-residential water users.	▶ All	▶ N/A	New Program	TBD	Ongoing
WW-4-S	Work with sustainability programs to include the highest level of water efficiency measures as technology evolves.	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing
WW-4-T	Consider establishing a Water Building Performance Standard.	▶ All	▶ N/A	Ordinance	TBD	Ongoing
WW-5-A	Establish and enforce local regulations that prohibit certain wasteful uses of potable water permanently.	▶ All	▶ N/A	Ordinance	2030	2031
WW-5-B	Adopt at minimum a core set of permanent water waste prohibitions with an aim to reduce the use of potable water for outdoor activities.	▶ All	▶ N/A	Ordinance	2030	2031
WW-5-C	Expand core set of permanent water waste prohibitions, as needed.	▶ All	▶ N/A	Ordinance	TBD	Ongoing
WW-6-A	Ensure Napa and American Canyon's compliance with SB 555 Maximum Real Loss Standards of 26.8 and 16.4 gallons per service connection per day, respectively, by January 1, 2028.	▶ American Canyon ▶ Napa	▶ American Water Works Association (CA-NV Section)	Ordinance	2031	2033
WW-6-B	Use a prioritization approach to asset management.	▶ All	▶ American Water Works Association (CA-NV Section)	Modified Program	2031	2032
WW-6-C	Evaluate progress and effectiveness of requirements and modify, as needed.	▶ All	▶ American Water Works Association (CA-NV Section)	Monitoring and Updating	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
WW-7-A	Increase both awareness of and access to available rebates and techniques for water use efficiency by taking a regional approach to public outreach.	▶ All	▶ NCGSA ▶ Napa County School Districts	Education / Outreach	2027	Ongoing
WW-7-B	Develop a regional water conservation web page that links all residents and business owners to their water provider's conservation web page and rebate offerings.	▶ All	▶ NCGSA	Education / Outreach	2027	2028
WW-7-C	Partner with Napa RCD and UCCE Master Gardeners to expand free Water-Wise Landscaping Workshops countywide via webinar offerings and/or additional in-person sessions up valley and in American Canyon.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners	Partnership	2027	2029
WW-7-D	Partner with Napa RCD and UCCE Master Gardeners to expand the Climate-Friendly Garden Tour to multiple days and jurisdictions.	▶ All	▶ Napa RCD ▶ UCCE Master Gardeners	Partnership	2027	2029
WW-7-E	Train and certify 100 local QWEL professionals by 2030.	▶ All	▶ N/A	New Program	2027	2031
WW-7-F	Train 60 local K-12 teachers in Project WET by 2030.	▶ All	▶ Project WET Foundation	New Program	2027	2031
WW-7-G	Partner with ZunZun program to expand Musical Water Education Assemblies.	▶ All	▶ ZunZun	Partnership	2027	2029
WW-7-H	Leverage an annual video contest winner as a countywide public service announcement for water conservation.	▶ All	▶ NCGSA ▶ Napa County School Districts	Education / Outreach	2027	Ongoing
WW-7-I	Evaluate the effectiveness of short-term actions, and adjust and continue as warranted.	▶ All	▶ N/A	Monitoring and Updating	TBD	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
AG-1-A	Explore opportunities to provide more funding or develop a new incentive program for buying electric agricultural equipment.	▶ Unincorporated County	▶ Bay Area Air District ▶ NRCS	Securing Funding	2027	2030
AG-1-B	Encourage the retirement of fossil fuel-powered equipment and the use of fossil fuels.	▶ Unincorporated County	▶ Napa RCD	Education / Outreach	2027	Ongoing
AG-1-C	Include a list of available incentives to support purchase of electric agricultural equipment on various websites.	▶ Unincorporated County	▶ Napa County Farm Bureau ▶ Napa Farmers Market Association ▶ Napa RCD	Education / Outreach	2027	2028
AG-1-D	Develop an irrigation pump replacement program.	▶ Unincorporated County	▶ Napa RCD	New Program	2027	2029
AG-1-E	Provide vouchers or rebates for the installation of solar electric irrigation pumps or the purchase of carbon-neutral fuels.	▶ Unincorporated County	▶ Napa RCD	Incentives	2027	2028
AG-1-F	Continue the funding program to achieve 100 percent transition of eligible equipment to electric or solar.	▶ Unincorporated County	▶ Bay Area Air District ▶ Napa County Farm Bureau ▶ Napa Farmers Market Association ▶ Napa RCD ▶ NRCS	Ongoing Program Implementation	TBD	Ongoing
AG-1-G	Continue the replacement program to achieve 100 percent of irrigation pumps transitioned to electric or renewable fuels.	▶ Unincorporated County	▶ Napa RCD	Ongoing Program Implementation	TBD	Ongoing
AG-2-A	Support the agricultural community in converting to alternatively fueled offroad equipment or renewable diesel.	▶ Unincorporated County	▶ Napa County Farm Bureau ▶ Napa Green ▶ Napa RCD ▶ USDA Natural Resources Conservation Service	Partnership	2026	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
AG-2-B	Encourage maintenance and operations of field equipment.	▶ Unincorporated County	▶ Napa County Farm Bureau ▶ Napa Green ▶ Napa RCD ▶ USDA Natural Resources Conservation Service	Education / Outreach	2026	Ongoing
AG-2-C	Work with Napa Green to provide education on and incentives for sustainable livestock grazing to reduce equipment usage.	▶ Unincorporated County	▶ Napa Green	Education / Outreach	TBD	Ongoing
AG-2-D	Evaluate the effectiveness of short-term actions and adjusted, as needed.	▶ Unincorporated County	▶ Napa County Farm Bureau ▶ Napa Green ▶ Napa RCD ▶ USDA Natural Resources Conservation Service	Monitoring and Updating	TBD	Ongoing
AG-3-A	Establish partnerships with entities that assist growers in implementing carbon farming practices.	▶ Unincorporated County	▶ Napa RCD ▶ UC ANR	Partnership	2026	2027
AG-3-B	Work with community organizations to develop and distribute educational resources on increasing carbon sequestration.	▶ Unincorporated County	▶ Napa RCD ▶ UC ANR	Education / Outreach	2026	Ongoing
AG-3-C	Support local partners as they deliver or develop carbon farming plans.	▶ Unincorporated County	▶ Napa County Farm Bureau ▶ Napa RCD	Partnership	2026	2027
AG-3-D	Support local supply chain solutions that support carbon farming efforts.	▶ Unincorporated County	▶ Napa RCD	Partnership	2026	2027
AG-3-E	Develop and offer multilingual training and educational materials for farmworkers who support the implementation of carbon farming practices.	▶ Unincorporated County	▶ Napa RCD	Education / Outreach	2026	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
AG-3-F	On the RCAAP website, develop a webpage dedicated to carbon farming and list the farmers, wineries, ranchers, and land managers who are currently practicing carbon farming.	▶ Unincorporated County	▶ Napa County Farm Bureau ▶ Napa RCD ▶ UC ANR	Monitoring and Updating	TBD	Ongoing
AG-3-G	Evaluate effectiveness of short-term actions, and adjust and continue actions as warranted	▶ Unincorporated County	▶ N/A	Monitoring and Updating	TBD	Ongoing
AG-4-A	Update the annual crop report to include carbon farming practices.	▶ Unincorporated County	▶ Napa RCD ▶ Napa Green	Municipal Operations	2027	2028
AG-4-B	Work with Napa Green to provide education on and incentives for sustainable livestock grazing.	▶ Unincorporated County	▶ Napa Green	Education / Outreach	TBD	Ongoing
AG-4-C	Review the crop reporting format after the Carbon Farming Program study is complete for any gaps.	▶ Unincorporated County	▶ Napa RCD ▶ Napa Green	Monitoring and Updating	TBD	Ongoing
AG-5-A	Create, adopt, and implement urban forest management plans in all jurisdictions by 2030.	▶ American Canyon ▶ Calistoga ▶ Napa ▶ St. Helena ▶ Yountville	▶ Napa RCD	Research	2030	2033
AG-5-B	Target a 20 percent expansion of the urban forest by 2035 from 2019 levels.	▶ American Canyon ▶ Calistoga ▶ Napa ▶ St. Helena ▶ Yountville	▶ Napa RCD	Monitoring and Updating	2030	2039

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
AG-5-C	Consider having consistent replacement requirements for tree removals across all jurisdictions.	▶ American Canyon ▶ Calistoga ▶ Napa ▶ St. Helena ▶ Yountville	▶ Napa RCD	Ordinance	2030	2032
AG-5-D	Encourage Napa Valley schools to increase tree planting for shade and carbon sequestration.	▶ American Canyon ▶ Calistoga ▶ Napa ▶ St. Helena ▶ Yountville	▶ Napa RCD ▶ School Districts	Education / Outreach	TBD	Ongoing
AG-5-E	Evaluate the effectiveness of short-term actions and adjust, as needed.	▶ American Canyon ▶ Calistoga ▶ Napa ▶ St. Helena ▶ Yountville	▶ Napa RCD	Monitoring and Updating	TBD	Ongoing
AG-6-A	Develop a dedicated countywide watershed management and habitat restoration program that coordinates with relevant stakeholders and departments to accelerate habitat restoration.	▶ Unincorporated County	▶ Napa RCD	New Program	2025	2027
AG-6-B	Evaluate the effectiveness of short-term actions and adjust, as needed..	▶ Unincorporated County	▶ Napa RCD	Monitoring and Updating	TBD	Ongoing
AG-7-A	Encourage and incentivize all vineyards to apply for and achieve sustainable vineyard certification.	▶ All	▶ Napa Green ▶ Wine Institute	Incentives	2025	Ongoing
AG-7-B	Support sustainability certification of vineyards to reach a target of 75 percent of vineyards certified by 2030.	▶ All	▶ Napa Green	Partnership	2026	2030

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
AG-7-C	Collaborate and incentivize sustainability certification programs to expand their reach and quantify the metrics they track for all participants.	▶ All	▶ Napa Green	Incentives	2026	2028
AG-7-D	Work with sustainability certification program administrators to determine additional funding needs for increased certification targets.	▶ All	▶ Napa Green	Partnership	2026	2027
AG-7-E	Review the short-term actions every five years to include more community groups in target audience list.	▶ All	▶ Napa Green ▶ Wine Institute	Monitoring and Updating	TBD	Ongoing
AG-7-F	Certify all new vineyards by 2030. Target 90 percent of vineyards, countywide, to become certified in sustainability by 2045.	▶ All	▶ Napa Green ▶ Wine Institute	Partnership	TBD	Ongoing
AG-8-A	Encourage livestock owners to include feed additives that reduce CH_4 emissions from cattle.	▶ Unincorporated County	▶ Napa RCD ▶ Local chapter of California Cattleman's Association ▶ UC ANR	Education / Outreach	2029	Ongoing
AG-8-B	Adopt ordinances that discourage or prohibit anaerobic manure management in favor of pasture-managed or composted manure.	▶ Unincorporated County	▶ Napa RCD	Ordinance	2029	2030
AG-8-C	Review and update ordinances every five years to apply more stringent regulations.	▶ Unincorporated County	▶ Napa RCD ▶ Local chapter of California Cattleman's Association ▶ UC ANR	Monitoring and Updating	TBD	Ongoing
AG-9-A	The County will explore the potential benefits of establishing a mitigation program and update the Conservation Regulations in Chapter 18 of the County Code, if needed.	▶ Unincorporated County	▶ Developers ▶ Land owners/managers	Ordinance	2026	2026

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Start	End
AG-9-B	The County will apply the mitigation program to proposed land development projects subject to County review and approval.	▶ Unincorporated County	▶ Developers ▶ Land owners/managers	Development Review	2026	Ongoing
AG-9-C	Coordinate with NCGSA to support the development of an incentive program that encourages landowners to delay vineyard replanting.	▶ Unincorporated County	▶ NCGSA	New Program	TBD	Ongoing
AG-9-D	The County will monitor replanting projects required as mitigation for proposed projects on an ongoing basis to ensure that carbon sequestration and storage benefits under this program are achieved over the long-term.	▶ Unincorporated County	▶ Developers ▶ Land owners/managers	Monitoring and Reporting	2026	Ongoing

Notes: AB = Assembly Bill; ABAG = Association of Bay Area Governments; BayREN = Bay Area Regional Energy Network; C&D = construction and demolition; CAC = Napa County Climate Action Committee; CARB = California Air Resources Board; CBO = community-based organization; CECSP = Certified Electric Safety Compliance Professional; CH_4 = methane; EV = electric vehicle; EVSE = electric vehicle supply equipment; MAAS = mobility as a service; MTC = Metropolitan Transportation Commission; N/A = not applicable; Napa RCD = Napa County Resource Conservation District; NRCS = Natural Resource Conservation Service; NVTA = Napa Valley Transportation Authority; PG&E = Pacific Gas & Electric Company; SB = Senate Bill; SIP = Sustainability in Practice; TBD = to be determined; TDM = transportation demand management; TRU = transport refrigeration unit; UC ANR = University of California Department of Agriculture and Natural Resources; UCCE = University of California Cooperative Extension; VMT = vehicle miles traveled; WELO = water efficient landscape ordinance; ZEV = zero-emission vehicle.

[1] The measure associated with each Action ID in this table can be found in Chapter 3 of the RCAAP.

[2] For sake of brevity, each Action Description included in this table may be a shortened or abbreviated version of the full action language found in Chapter 3 of the RCAAP.

Source: **Compiled by Ascent in 2025**.

Adaptation Actions Implementation Matrix

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
ALL-1.1	Collaborate among departments and jurisdictions to ensure progress on existing actions and measures in other plans	▸ All	▸ N/A	Monitoring and Updating	Ongoing
ALL-1.2	Monitor and evaluate local hazard mitigation actions and update, as needed.	▸ All	▸ N/A	Monitoring and Updating	1-5 Years (Near-Term)
ALL-2.1	Advocate for and implement countywide climate change adaptation-related initiatives.	▸ All	▸ N/A	Partnership	Ongoing
ALL-3.1	Require owners/developers to waterproof structures and foundations in 100- and 500-year floodplains.	▸ All	▸ N/A	Capital Improvement / Infrastructure Project	Ongoing
ALL-3.2	Establish wildfire risk reduction requirements for new and existing residential and commercial developments.	▸ All	▸ CAL FIRE ▸ NCFF	Capital Improvement / Infrastructure Project	Ongoing
ALL-3.3	Encourage and incentivize the use of pervious and reflective paving surfaces and climate-smart landscaped surfaces in new and existing developments.	▸ All	▸ N/A	Incentives	Ongoing
ALL-4.1	Adopt a "Health in All Policies" framework that integrates health considerations into regional policies and practices.	▸ All	▸ CDPH	Policy / Ordinance Adoption	1-5 years (Near-Term)
ALL-4.2	Ensure that public health initiatives serving vulnerable communities address the disproportionate impacts of climate stressors on these communities.	▸ All	▸ CDPH ▸ Live Healthy Napa County	Modified Program	Ongoing
ALL-4.3	Work with local medical providers and hospitals to ensure that medical facilities are prepared to meet increased demand because of more frequent hazardous events.	▸ All	▸ CDPH	New Program	Ongoing
ALL-5.1	Revise maintenance protocols for transportation systems to integrate climate vulnerability considerations.	▸ All	▸ Caltrans	Modified Program	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
ALL-5.2	Coordinate with community members, transportation agencies, and others to identify climate vulnerable populations served by transportation, transit, and active transportation corridors.	▸ All	▸ Caltrans ▸ NVTA	New Program	1-5 Years (Near-Term)
ALL-5.3	Collaborate with transportation agencies to identify alternative routes and stops to mitigate potential climate-related disruptions.	▸ All	▸ NVTA	New Program	1-5 Years (Near-Term)
ALL-5.4	Support NVTA in developing an emergency traffic operations center, ensuring all-electric transit fleet can meet community needs during evacuations and other emergency scenarios.	▸ All	▸ NVTA	New Program	1-5 Years (Near-Term)
ALL-6.1	Develop locally tailored agricultural heat resilience guidelines and other safety standards that consider enhancements beyond Cal/OSHA requirements.	▸ All	▸ N/A	Policy / Ordinance Adoption	1-5 Years (Near-Term) & Ongoing
ALL-6.2	Expand access to bilingual training programs for the agricultural workforce on heat and smoke exposure risks, first aid and emergency responses, and other related items.	▸ All	▸ N/A	Education / Outreach	1-5 Years (Near-Term) & Ongoing
ALL-6.3	Encourage the installations or retrofits of shade structures, cooling misters, and ventilated barns to reduce heat stress on livestock.	▸ All	▸ N/A	Education / Outreach	1-5 Years (Near-Term) & Ongoing
ALL-6.4	Create and maintain livestock evacuation plans, including shelter locations and rapid deployment logistics during wildfires and other climate hazard events.	▸ All	▸ N/A	Plan	1-5 Years (Near-Term) & Ongoing
ALL-6.5	Promote and support regenerative agricultural practices.	▸ All	▸ N/A	Education / Outreach	1-4 Years (Near-Term) & Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
ALL-7.1	Implement nature-based solutions, green infrastructure, and best management practices.	▸ All	▸ CDFW ▸ DOC ▸ NCGSA ▸ Napa Green ▸ Napa RCD ▸ Local Tribes	Capital Improvement / Infrastructure Project	Ongoing
ALL-7.2	Coordinate with NCGSA to fully implement the ISW/GDE Workplan.	▸ All	▸ NCGSA	Partnership	1-5 Years (Near-Term)
ALL-7.3	Consider expanding the scope of the ISW/GDE Workplan to areas outside the Napa Valley Subbasin.	▸ All	▸ NCGSA	Partnership	1-5 Years (Near-Term)
ALL-7.4	Encourage carbon farming and other sustainable land management activities.	▸ All	▸ CDFW ▸ DOC	Incentives	Ongoing
ALL-7.5	Partner with Napa RCD to expand youth education and workforce development programs focused on climate resilience, etc.	▸ All	▸ Napa RCD	Partnership	Ongoing
ALL-8.1	Incorporate Vulnerability Assessment findings into all stages of emergency management planning.	▸ All	▸ FEMA	Planning	Ongoing
ALL-8.2	Prioritize the safety of vulnerable communities in emergency management activities.	▸ All	▸ FEMA ▸ OEHHA	Planning	Ongoing
ALL-8.3	Identify potential locations to site new community resilience centers or "resilience hubs."	▸ All	▸ FEMA ▸ OEHHA	New Program	5-10 Years (Mid-Term)
FIRE-1.1	Map and identify locations that are newly at risk, or at higher risk, for wildfires hazards and implement wildfire mitigation best practices.	▸ All	▸ CAL FIRE ▸ Napa RCD ▸ NCFF	Planning	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
FIRE-2.1	Establish post-fire ecological recovery programs to support ecological restoration efforts.	▸ All	▸ CAL FIRE ▸ CDFW ▸ NCFF ▸ USDA Natural Resources Conservation Service ▸ USFWS ▸ Napa RCD	New Program	Ongoing
FIRE-3.1	Ensure wildfire mitigation best practices are planned and implemented regularly across the county.	▸ All	▸ CAL FIRE ▸ Napa RCD ▸ NCFF	Planning	Ongoing
FIRE-4.1	Plan and design new development strategically to avoid or minimize risk in High or Very High FHSZs.	▸ All	▸ CAL FIRE ▸ NCFF	Project Reviews & Development Planning	Ongoing
FIRE-4.2	Consider projections of future climate change when planning future land uses.	▸ All	▸ CAL FIRE ▸ NCFF	Project Reviews & Development Planning	Ongoing
FIRE-5.1	Develop a countywide forest health and wildfire resilience vision that assesses current conditions and helps to inform project prioritization and management decisions.	▸ All	▸ USFS ▸ BLM ▸ CAL FIRE ▸ Napa RCD ▸ Napa Firewise Foundation	Partnership	1-5 Years (Near-Term) & Ongoing
FIRE-5.2	Identify key metrics of forest health and wildfire resilience to track over time.	▸ All	▸ USFS ▸ BLM ▸ CAL FIRE ▸ Napa RCD ▸ Napa Firewise Foundation	Monitoring and Updating	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
FIRE-5.3	Plan and implement forest management projects following best practices, considering future climate conditions, and aligning with natural fire regimes.	▸ All	▸ USFS ▸ BLM ▸ CAL FIRE ▸ Napa RCD ▸ Napa Firewise Foundation	New Program	Ongoing
FIRE-6.1	Promote educational campaigns on the health effects of wildfire smoke and preventative measures.	▸ All	▸ Cal/OSHA ▸ Bay Area Air District	Education / Outreach	Ongoing
FIRE-6.2	Enhance and promote early warning systems that alert the public to smoke events.	▸ All	▸ Cal/OSHA ▸ Bay Area Air District	New Program	1-5 Years (Near-Term)
FIRE-6.3	Protect outdoor workers from wildfire smoke by establishing policies that limit outdoor work during periods of poor air quality.	▸ All	▸ Businesses that employ outdoor workers	New Program	Ongoing
TEMP-1.1	Share resources, update protocols, and coordinate efforts to regulate outdoor workers' activities during extreme heat events.	▸ All	▸ Cal/OSHA	Policy / Ordinance Adoption	1-5 Years (Near-Term)
TEMP-1.2	Provide extreme heat-related training to outdoor workers and ensure adequate shade, water, and protection from poor air quality.	▸ All	▸ Businesses that employ outdoor workers	Education / Outreach	Ongoing
TEMP-2.1	Develop policies and strategies to grow and preserve urban forests.	▸ All	▸ CaUFC	New Program	1-5 Years (Near-Term)
TEMP-2.2	Identify communities lacking access to parks and establish new and accessible urban parks and trail systems.	▸ All	▸ N/A	New Program	1-5 Years (Near-Term)
TEMP-2.3	Ensure newly established urban parks and trail systems are connected to high-density residential areas and workplaces.	▸ All	▸ N/A	New Program	Ongoing
TEMP-2.4	Revise parking lot shade standards to provide larger minimum sizes.	▸ All	▸ CaUFC	Policy / Ordinance Adoption	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
TEMP-2.5	Enhance shading and heat mitigation initiatives for active commuters.	▸ All	▸ N/A	New Program	1-5 Years (Near-Term)
TEMP-3.1	Provide site-appropriate heat-mitigated materials, shade trees, and/or structures on pedestrian walkways and at transit stops.	▸ All	▸ Caltrans ▸ NVTA	Partnership	1-5 Years (Near-Term)
TEMP-3.2	Evaluate and identify cool pavement technologies best suited for different applications across the county.	▸ All	▸ Caltrans ▸ NVTA	Partnership	1-5 Years (Near-Term) & Ongoing
TEMP-3.3	Install water fountains at transit stops, where feasible.	▸ All	▸ NVTA	Partnership	1-5 Years (Near-Term)
TEMP-3.4	Improve shading in high pedestrian traffic areas such as downtown Napa.	▸ All	▸ N/A	Partnership	1-5 Years (Near-Term)
TEMP-4.1	Upgrade communication, energy, public service, and transportation infrastructure to bolster extreme heat resilience.	▸ All	▸ N/A	Capital Improvement / Infrastructure Project	1-5 Years
TEMP-5.1	Consider adopting a mandatory green building code that requires installation of cool roof technologies for new development.	▸ All	▸ N/A	Policy / Ordinance Adoption	1-5 Years (Near-Term)
TEMP-5.2	Consider developing incentive programs to apply passive solar home design to future residential buildings.	▸ All	▸ N/A	Incentives	Ongoing
TEMP-5.3	Consider developing incentives programs to encourage the use of rooftop gardens and green roofs in residential and commercial buildings.	▸ All	▸ N/A	Incentives	Ongoing
FLOOD-1.1	Continue to implement the Phase II Small MS4 Permit.	▸ All	▸ N/A	Local Enforcement	Ongoing
FLOOD-1.2	Consider implementing a low-impact development reach code for all new and redevelopment projects.	▸ All	▸ N/A	Modified Program	5-10 Years (Mid-Term)

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
FLOOD-2.1	Invest in green stormwater infrastructure.	▸ All	▸ N/A	Capital Improvement / Infrastructure Project	1-5 Years (Near-Term)
FLOOD-2.2	Maintain flood control infrastructure, such as gutters, drainage ditches, and culverts to maximize drainage capacity.	▸ All	▸ N/A	Capital Improvement / Infrastructure Project	Ongoing
FLOOD-2.3	Enhance the capacity of stormwater infrastructure to manage high-intensity rainfall events.	▸ All	▸ N/A	Capital Improvement / Infrastructure Project	1-5 Years (Near-Term) & Ongoing
FLOOD-3.1	Coordinate to improve sewage and solid waste management infrastructure.	▸ All	▸ NapaSan	Capital Improvement / Infrastructure Project	Ongoing
FLOOD-4.1	Identify locations suitable for multi-benefit flood control projects.	▸ All	▸ Napa County Flood Control and Water Conservation District ▸ Napa Green ▸ Napa RCD ▸ NCGSA ▸ Other agricultural and environmental organizations	Capital Improvement / Infrastructure Project	Ongoing
FLOOD-4.2	Advance wetland restoration projects that provide multiple resilience benefits	▸ All	▸ Napa County Flood Control and Water Conservation District ▸ Napa Green ▸ Napa RCD ▸ NCGSA ▸ Other agricultural and environmental organizations ▸ Local Tribes	Capital Improvement / Infrastructure Project	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
FLOOD-5.1	Upgrade and/or relocate infrastructure and critical facilities exposed to flooding hazards.	▸ All	▸ Napa County Flood Control and Water Conservation District	Capital Improvement / Infrastructure Project	5-10 Years (Mid-Term)
FLOOD-6.1	Assess and map areas with bare soil or significant disturbance from natural hazards to prioritize restoration efforts.	▸ All	▸ CAL FIRE ▸ CDFW ▸ Napa RCD ▸ US Army Corps of Engineers ▸ USDA Farm Service Agency	New Program	Ongoing
FLOOD-7.1	Support investments in new and/or upgraded infrastructure to protect water supplies.	▸ All	▸ Napa County Flood Control and Water Conservation District	Capital Improvement / Infrastructure Project	Ongoing
FLOOD-8.1	Deliver robust, multi-lingual education and outreach materials for flood risk through multiple modes.	▸ All	▸ Napa County OES ▸ Napa County Flood Control and Water Conservation District ▸ Napa RCD ▸ NWS	Education / Outreach	Ongoing
FLOOD-8.2	Regularly update the Ready Napa County webpage.	▸ All	▸ N/A	Education / Outreach	Ongoing
FLOOD-9.1	Prepare an asset-level sea level rise vulnerability assessment.	▸ American Canyon ▸ Napa ▸ Unincorporated County	▸ California Coastal Commission ▸ California Ocean Protection Council	Planning	1-5 Years (Near-Term) & Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
FLOOD-9.2	Develop a regional sea level rise adaptive management plan.	▶ American Canyon ▶ Napa ▶ Unincorporated County	▶ BCDC ▶ California Coastal Commission ▶ California Ocean Protection Council ▶ MTC ▶ Local Tribes	Planning	>10 Years (long-term)
FLOOD-10.1	Continue supporting sea level rise analyses and guide future development out of exposed areas.	▶ American Canyon ▶ Napa ▶ Unincorporated County	▶ California Coastal Commission ▶ California Ocean Protection Council	Planning	Ongoing
FLOOD-10.2	Coordinate with NCGSA to install additional monitoring wells.	▶ American Canyon ▶ Napa ▶ Unincorporated County	▶ NCGSA	Partnership	5-10 Years (Mid-Term)
FLOOD-11.1	Update capital improvement plans to address sea level rise and other related hazards in vulnerable areas.	▶ American Canyon ▶ Napa ▶ Unincorporated County	▶ California Coastal Commission ▶ California Ocean Protection Council	Planning	5-10 Years (Mid-Term)
FLOOD-11.2	Design and locate critical infrastructure projects away from potential inundation areas.	▶ American Canyon ▶ Napa ▶ Unincorporated County	▶ California Coastal Commission ▶ California Ocean Protection Council ▶ Local Tribes	Capital Improvement / Infrastructure Project	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
FLOOD-11.3	Require all new development applications to consider sea level rise and implement sufficient protective measures.	▸ American Canyon ▸ Napa ▸ Unincorporated County	▸ California Coastal Commission ▸ California Ocean Protection Council	Policy / Ordinance Adoption	Ongoing
FLOOD-12.1	Conserve undeveloped land to facilitate ecosystem adaptation in areas prone to sea level rise.	▸ American Canyon ▸ Napa ▸ Unincorporated County	▸ California Coastal Commission ▸ California Ocean Protection Council ▸ DOC	Secure Funding / Land Conservation/Acquisition	Ongoing
DROUGHT-1.1	Raise awareness for water conservation and expand incentives for water-saving devices and "Cash for Grass" landscape conversion.	▸ All	▸ Napa County Flood Control and Water Conservation District	Incentives	Ongoing
DROUGHT-1.2	Implement regional and local water conservation opportunities.	▸ All	▸ N/A	Policy / Ordinance Adoption	Ongoing
DROUGHT-1.3	Increase on-site greywater use, rainwater reuse, stormwater reuse, managed aquifer recharge, and recycled water use.	▸ All	▸ N/A	Policy / Ordinance Adoption	1-5 Years (Near-Term)
DROUGHT-1.4	Determine feasibility of incentive programs that promote rainwater catchment systems.	▸ All	▸ N/A	Incentives	1-5 Years (Near-Term)
DROUGHT-1.5	Consider County-wide implementation of the American Canyon Zero Water Footprint program	▸ All	▸ N/A	Expand Program	1-5 Years (Near-Term)
DROUGHT-2.1	Promote and incentivize industry adoption of water conservation practices in the cultivation of wine grapes, other crops, and the breeding of livestock.	▸ All	▸ Napa Green ▸ Napa RCD	Incentives	Ongoing
DROUGHT-2.2	Incentivize groundwater recharge by promoting soil health best management practices.	▸ All	▸ Napa RCD	Incentives	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
DROUGHT-2.3	Collaborate with the agricultural community to develop incentives for grape growers, winemakers, and other users to adopt water conservation practices beyond drip irrigation.	▸ All	▸ NCGSA	Incentives	1-5 Years (Near-Term) & ongoing
DROUGHT-2.4	Consider expanding the geographic scope of the Napa County WC Workplan and GPR Workplan to areas outside the Napa Valley Subbasin.	▸ All	▸ NCGSA	Planning	5-10 Years (Mid-Term)
DROUGHT-3.1	Evaluate local water supply system vulnerability to climate impacts and develop strategies to bolster resilience.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District	Capital Improvement / Infrastructure Project	Ongoing
DROUGHT-3.2	Adopt and enforce water infrastructure resilience standards for all future development.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District	Policy / Ordinance Adoption	1-5 Years (Near-Term)
DROUGHT-3.3	Support efforts for ongoing maintenance of existing water infrastructure and identify potential deterioration.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District	Capital Improvement / Infrastructure Project	Ongoing
DROUGHT-3.4	Implement feasible drought mitigation measures proposed in the 2022 Napa Valley Drought Contingency Plan and the Drought Resilience Plan currently under development in response to SB 552.	▸ All	▸ NapaSan	Adopt and Implement Plans	1-5 Years (Near-Term)
DROUGHT-4.1	Increase awareness of indoor and outdoor water conservation methods.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District ▸ Napa RCD	Education / Outreach	Ongoing

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
DROUGHT-4.2	Expand water conservation educational materials and strategies.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District ▸ Napa RCD	Education / Outreach	Ongoing
DROUGHT-4.3	Invest in water conservation demonstration projects.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District ▸ Napa RCD	Education / Outreach	Ongoing
DROUGHT-4.4	Provide Spanish-language training for agricultural workers on sustainable water management.	▸ All	▸ Cities and towns ▸ Napa County Flood Control and Water Conservation District ▸ Napa RCD	Education / Outreach	Ongoing
DROUGHT-5.1	Pursue grant funding opportunities for recycled water projects.	▸ All	▸ DWR ▸ Napa County Flood Control and Water Conservation District ▸ Water Board ▸ USACE ▸ USBR	Secure Funding	Ongoing
DROUGHT-5.2	Explore future water supply options and collaborate on water conservation strategies to improve regional capacity.	▸ All	▸ Abuelitos Foundation ▸ DWR ▸ Napa County Flood Control and Water Conservation District ▸ Water Board ▸ USACE ▸ USBR	Partnership	5-10 Years (Mid-Term)

Action ID[1]	Action Description[2]	Applicable Jurisdiction(s)	Potential Partner(s)	Implementation Mechanism	Timeframe
ENERGY-1.1	Evaluate opportunities to transition to decentralized renewable energy sources, reducing reliance on centralized generation sources and long-range transmission (e.g., see MCE's Virtual Power Plant Pilot Program).	▶ All	▶ MCE ▶ PG&E	Partnership	5-10 Years (Mid-Term)
ENERGY-2.1	Harden energy infrastructure against various climate stressors.	▶ All	▶ MCE ▶ PG&E	Capital Improvement / Infrastructure Project	>10 Years (long-term)
ENERGY-3.1	Reduce stress on the electrical grid by educating the public on behavior changes they can make.	▶ All	▶ MCE ▶ PG&E	Education / Outreach	Ongoing
ENERGY-3.2	Expand the use of home batteries, vehicle-to-grid integration technology, and other energy storage technologies in residential and non-residential buildings to improve backup power supply availability.	▶ All	▶ N/A	Policy / Ordinance Adoption	5-10 Years (Mid-Term)
ENERGY-4.1	Identify existing facilities that can serve as emergency shelters and ensure they have sufficient backup power using batteries or generators.	▶ All	▶ N/A	Capital Improvement / Infrastructure Project	1-5 Years (Near-Term)
ENERGY-4.2	Partner with MCE and PG&E to explore the feasibility of microgrid installations and/or virtual power plant opportunities at local government facilities, schools, or other facilities.	▶ All	▶ MCE ▶ PG&E ▶ BayREN	Partnership	1-5 Years (Near-Term)

Notes: BCDC = San Francisco Bay Conservation and Development Commission; CAL FIRE = California Department of Forestry and Fire Protection; Cal/OSHA = California Division of Occupational Safety and Health; Caltrans = California Department of Transportation; CaUFC = California Urban Forests Council; CDFA = California Department of Food and Agriculture; CDFW = California Department of Fish and Wildlife; CDPH = California Department of Public Health; DOC = California Department of Conservation; DWR = California Department of Water Resources; FEMA = Federal Emergency Management Agency; N/A = not applicable; Napa RCD = Napa County Resource Conservation District; NapaSan = Napa Sanitation District; NCFF = Napa Communities Firewise Foundation; NCGSA = Napa County Groundwater Sustainability Agency; NVTA = Napa Valley Transportation Authority; NWS = National Weather Service; OEHHA = California Office of Environmental Health Hazard Assessment; PG&E = Pacific Gas and Electric Company; USACE = United States Army Corps of Engineers; USBR = United States Bureau of Reclamation; USFS = United States Forest Service; USFWS = United States Fish and Wildlife Service; Water Board = California State Water Resources Control Board;

[1] The measure associated with each Action ID in this table can be found in Chapter 5 of the RCAAP.

[2] For sake of brevity, each Action Description included in this table may be a shortened or abbreviated version of the full action language found in Chapter 5 of the RCAAP.

Source: **Compiled by Ascent in 2025**.

Appendix I

Cost and Funding Analyses

Photo Credit: County of Napa

1 INTRODUCTION

This appendix summarizes the findings of the **preliminary cost assessment** prepared by Jacobs for the RCAAP as well as the **funding and financing assessment** prepared by Economic & Planning Systems (EPS). The original works are included as **Attachments I-1 and I-2**, respectively, to this appendix.

- The **preliminary cost assessment** estimates and classifies Napa County Jurisdictions' implementation costs for a priority subset of proposed measures included in the RCAAP, including nine GHG reduction measures and 10 climate adaptation actions. Importantly, the scope of analysis did not include cost estimates for all measures in the RCAAP and does not represent a complete cost assessment for the entirety of the plan. The Napa County Jurisdictions collectively have a responsibility to successfully implement the RCAAP and as such, the Cost Assessment includes total costs for implementation of the selected measures as presented in the RCAAP, and costs are not estimated individually for any one jurisdiction. No cost-sharing analysis was included in the scope of the Cost Assessment. The Cost Assessment is intended to estimate Napa County Jurisdictions' municipal expenses necessary to implement the selected nine GHG reduction measures and 10 adaptation actions over a 20-year horizon (i.e., 2025-2045). Some of the measures involve one-time activities such as developing a program or plan, or adoption of an ordinance. Others are ongoing activities, such as structure hardening or certain infrastructure projects that have a longer timeframe. However, the scope of the analysis did not include quantifying potential cost savings to the Napa County Jurisdictions (e.g., through reduced municipal utility bills associated with more efficient buildings and vehicles), nor does it include potential costs or savings to the community (e.g., reduced utility bills through home electrification or fuel costs through vehicle electrification).
- The **funding and financing options assessment** offers insights into potential funding and financing options to support implementation of the priority subset of GHG reduction and climate adaptation measures in the RCAAP, based on the estimated costs identified in the Cost Assessment. It also provides a review of potential funding sources that could be used by the Napa County Jurisdictions for financing the implementation of these actions, along with recommended steps for developing a more detailed implementation and funding strategy.

2 PRELIMINARY COST ASSESSMENT

Jacobs prepared a preliminary cost assessment to estimate the incremental up-front costs that would be incurred by Napa County Jurisdictions in implementing the 19 selected GHG reduction measures and climate adaptation actions. The preliminary cost assessment provides transparency in the potential implementation costs of specific RCAAP policy decisions and may help prioritize implementing actions, based on the availability of funding and financing options. The 19 GHG reduction and climate adaptation measures and implementing actions selected for cost assessment and presented in the proposed RCAAP are currently in draft form, and as such, the cost analysis presented here is preliminary. Once the GHG reduction and climate adaptation

measures and actions in the RCAAP are finalized and adopted, implementation cost assumptions can be further refined to provide more detail and a more accurate assessment.

2.1 NAPA COUNTY JURISDICTION COST ANALYSIS FRAMEWORK AND METHODOLOGY

- The inputs of the cost assessment in **Table I.1 and Table I.2** fall within three categories described below: labor costs, capital costs, and other costs (e.g., consultants, rebates, or incentives).
  - Labor costs: correspond to Napa County Jurisdictions' staff. These are expressed in terms of a fraction of one average full-time equivalent (FTE) staff position per year over the 20 years from the FY 2025-2026 to the FY 2044-2045 (inclusive of both). For example, a value of 1 FTE per year could mean one dedicated staff member working full-time on a measure over the twenty-year period, or it could mean two staff members working half-time over the same period. For this analysis, it was assumed that 1 FTE would cost the Napa County Jurisdictions $280,000 per year (including wages, salary, and benefits). This value was derived using publicly available salary data and represents an average across project management, environmental specialist and engineering positions. This represents an approximation; the exact positions and salaries that would need to be created to implement the RCAAP measures are beyond the scope of this analysis.
  - Capital costs: correspond to physical assets and equipment with a such as electric vehicles and chargers; and
  - Other costs: correspond to non-capital expenses (e.g., rebates, assessments, consultants, and outreach materials).
- The estimated costs presented in the preliminary cost assessment are considered Class 4 order-of-magnitude with an accuracy range of -30% to +50% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries (AACE International 2021). The cost assessment was prepared to provide guidance in project evaluation and implementation from the information available at the time the assessment was prepared. The final costs of the proposed measures will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.
- Programmatic costs (e.g., unit cost, rebate values, full-time equivalent staff) are estimated based on inputs derived from coordination with County of Napa and City of Napa staff, and assumptions are included as noted in each measure.
- The selected GHG measures were each estimated individually as standalone programs, and all relevant implementing actions under each measure were assumed, or at least considered, in the analysis.

- The selected climate adaptation measures were estimated individually as standalone programs, based on a specific implementing action included underneath the selected measure that would have the most impact and potential for cost estimation. Not all implementing actions were assumed in the cost assessment for adaptation measures, due to the broad range of implementing actions defined under each measure.
- While there may be potential for efficiency in "bundling" measures or implementing actions that are similar across measures together, no such bundling was assumed in the analysis.
- Periodic costs, such as program updates occurring every 3 or 5 years, are annualized for cost estimation purposes. These costs can be allocated to specific years and discounted accordingly as more details of timing and precise implementation are defined.
- Estimates include new projected implementation costs expected to be realized by Napa County Jurisdictions. Funding from other sources required for successful program implementation is not included unless otherwise noted.
- An annual discount rate of 2.2% is used for all estimates unless otherwise noted. This is the 20-year real interest rate on US treasury notes and bonds for the 2025 calendar year per OMB Circular No. A-94.
- The estimated costs are for a select number of measures and actions and are considered preliminary and do not represent the full scope of costs to be considered in the RCAAP in its draft form.

The cost analysis considers only the incremental up-front costs and annual costs through FY 2045 to the Napa County Jurisdictions for RCAAP implementation. This analysis does not consider discount rates. The cost analysis does not include costs or cost savings for the community (such as for residents and businesses). Many measures are likely to result in net cost savings to the community or Napa County Jurisdictions, such as energy efficiency retrofits per measure BE-1 which would result in utility bill savings or fueling vehicles with electricity instead of gasoline per measure TR-3 which would reduce fuel costs.

In many cases, GHG reduction and climate adaptation measures and associated implementing actions call for the continuation or expansion of programs or policies that already exist, and as such action AG-6 to accelerate woodland and forest habitat restoration and stewardship in rural areas. Existing and expanded programs often incur less upfront costs to the Napa County Jurisdictions because they are supported by existing resources. Additionally, some of the implementation actions of the RCAAP can be completed within the current staff capacity. Cost savings, grant opportunities, and other funding and financing mechanisms that can lower upfront costs were not considered in the cost assessment.

2.2 PRELIMINARY COST ASSESSMENT RESULTS

The detailed results of the preliminary cost assessment, included in **Attachment I-1** to this appendix can be summarized as follows:

- **If all 19 measures selected for analysis were fully implemented, total implementation costs would be approximately $1.1 billion over 20 years**, or approximately $57 million per year.
  - Of this total, approximately 85 percent would be for rebates, incentives or other program costs excluding labor or capital costs incurred by local, regional, or other agencies; eight percent for capital costs; and seven percent would be for labor or administrative costs incurred by local agencies.
- **For the nine selected GHG reduction measures only, full implementation would cost approximately $772 million over 20 years.**
  - Over 90 percent of these estimated costs are associated with rebates, incentives, or other program costs.
  - Measure BE-1 has the highest estimated cost of the 19 measures included in the cost assessment. It is also the highest in the Building Energy sector, at $448 million. Measure BE-1 requires Napa County Jurisdictions to develop and implement a comprehensive energy retrofit program to transition existing residential and non-residential buildings to net zero carbon with a target of 25% of existing buildings by 2030 and 100% by 2045. This action is spread out over 20 years with 75% of costs in the mid- to long-term (i.e., 2030-2045). The estimated cost of residential and commercial rebates or other incentives under this measure could cost over $400 million over 20 years.
  - Measure AG-1 has the highest estimated cost in the Agriculture and Open Space sector in the GHG reduction, at $205 million. Measure AG-1 focuses on reducing fossil fuel consumption in field equipment. The program assumptions included the cost of incentives to replace equipment with solar and bio-fueled equipment and are spread out over the 20 years of the cost analysis.
  - Measure SW-1 has the highest estimated cost in the Solid Waste sector, at $18 million, to increase diversion of solid waste to achieve at least 80% diversion from landfills by 2035. This action has more upfront costs in the near- to mid-term because the action goal is 2035; however, in later years, there are costs associated with labor to manage and enforce the Reusable Food Ware and Waste Reduction Ordinance as well as evaluate the effectiveness of the commercial food waste diversion program, for example.

- **For the 10 selected climate adaptation measures only, full implementation would cost approximately $359 million over 20 years.**
  - Approximately 66 percent of these estimated costs are associated with rebates, incentives, or other program costs, while 28 percent would be for capital costs.
  - Action Flood-2.3 has the highest estimated cost of the Flood strategies quantified, at $123 million to invest in and enhance the capacity of stormwater infrastructure to manage high-intensity rainfall events as well as continue implementing the Phase II Small Municipal Separate Storm Sewer System (MS4) Permit. This is an action that has costs over the entire 20 years of the cost analysis; however, the first five years of this action's implementation are 70% of its total cost due to required capital improvement projects such as sewer capacity upgrades.
  - Action Fire-5.2 has the highest estimated cost of the Fire strategies quantified, at $117 million to implement selective thinning and pruning to reduce tree density and remove infested or weakened trees, making forests less susceptible to beetle outbreaks. This is an ongoing action that has fairly even costs over the entire 20 years of the cost analysis.
  - Action Temp-2.5, in the Temperature strategy, has estimated costs of $24 million over six years to enhance shading and reduce heat island effects for active commuters by increasing greenery along bike paths, sidewalks, pathways and streets and then has ongoing maintenance costs over the following 14-year period.

Table I.2, below, presents a summary of the incremental costs that would be incurred by the Napa County Jurisdictions or others in implementing the nine selected GHG reduction measures and **Table I.1** summarizes the incremental cost that would be incurred by the Napa County Jurisdictions in implementing the 10 selected climate adaptation actions. These estimated costs are based on the preliminary cost assessment prepared by Jacobs and are subject to change based on potential revisions to RCAAP measures, market conditions, specific details further defined for implementation programs following RCAAP adoption by Napa County Jurisdictions, the availability and cost of zero-emissions technology, and other factors. Detailed outputs from the preliminary cost assessment prepared by Jacobs are included in **Attachment I-1**.

Table I.1 Implementation Costs (FY 2025/26-2044/45) for Selected Climate Adaptation Actions

Measure & RCAAP Action No.	Strategy	RCAAP Action	Assumed Implementation Duration (Yrs)	Net Present Value	Total Cost (Not Discounted)
All-3.2	**Improve the County and its jurisdictions' overall climate resilience.**	Reduce wildfire risk in existing and new residential and commercial developments by requiring owners/developers to create and maintain defensible space and fire breaks; harden structures with fire-resistant materials; or other appropriate wildfire risk reduction measures.	20	$69,340,000	$86,370,000
All-5.1	**Improve the County and its jurisdictions' overall climate resilience.**	Revise maintenance protocols for transportation systems to integrate considerations of climate vulnerabilities, such as reducing fuel load regularly for wildfire events and inspecting stormwater collection systems regularly for flooding events. Ensure sufficient funding and capacity to routinely conduct maintenance measures.	3	$930,000	$960,000
All-7.2	**Improve the County and its jurisdictions' overall climate resilience.**	Coordinate with the Napa County Groundwater Sustainability Agency (NCGSA) to fully implement the Interconnected Surface Water and Groundwater Dependent Ecosystems Workplan: Napa Valley Subbasin (ISW/GDE Workplan).	12	$2,540,000	$2,800,000
All-8.3	**Improve the County and its jurisdictions' overall climate resilience.**	Identify potential locations throughout the county for siting new community resilience centers or "resilience hubs," either through new construction or repurposing of existing facilities.	2	$1,000,000	$1,030,000
Fire-5.1	**Prepare for and adapt to increased wildfire risk.**	Set up a network of monitoring stations to detect beetle infestations early. Utilize satellite imagery and drone technology to monitor large forest areas for signs of beetle activity and tree health.	20	$1,920,000	$2,360,000
Fire-5.2	**Prepare for and adapt to increased wildfire risk.**	Implement selective thinning and pruning to reduce tree density and remove infested or weakened trees, making forests less susceptible to beetle outbreaks.	20	$94,180,000	$117,420,000
Temp-2.5	**Prepare for increased temperatures and more frequent extreme heat events.**	Enhance shading and reduce heat island effects for active commuters by increasing greenery along bike paths, sidewalks, pathways and streets.	6	$21,500,000	$24,210,000

Measure & RCAAP Action No.	Strategy	RCAAP Action	Assumed Implementation Duration (Yrs)	Net Present Value	Total Cost (Not Discounted)
Flood-2.3	**Prepare for more frequent extreme precipitation and flooding events, combined with sea level rise threat.**	Invest in and enhance the capacity of stormwater infrastructure to manage high-intensity rainfall events. Continue implementing the Phase II Small MS4 Permit.	20	$108,290,000	$122,520,000
Drought-3.2	**Prepare for more frequent drought events and enhance the region's overall water supply resilience.**	Work with local water providers to adopt municipal codes to enforce resiliency standards for water-related infrastructure for all future development. Municipal codes may include but are not limited to standards related to the elevation of electrical generators and/or tanks and containers of hazardous materials, increased capacity of water storage tanks, and improved deployment of backflow preventers to impede contamination of drinking water following an extreme storms or related weather events.	20	$1,120,000	$1,360,000
Energy-4.2	**Improve the region's energy grid resilience.**	Partner with MCE and explore the feasibility of microgrid installations and/or virtual power plant opportunities at local government agency-owned facilities, school or college campuses, hospital campuses, or other types of facilities where the use of microgrids or similar systems would be cost-effective and appropriate for supporting both energy grid and community resilience.	1	$380,000	$390,000

Notes: Cost estimates shown in this table are for selected subset of proposed climate adaptation measures in the RCAAP and do not represent a complete cost estimate for all proposed climate adaptation measures. Measures are each estimated individually as standalone programs, with the exception of Fire-5.1 and Fire-5.2. There is potential for efficiency in bundling the Measures together.

Costs vary by measure because some measures are estimated as a multi-year program with up to 20 years of implementation, while other measures are assumed to only include a study or assessment. See Results Considerations in each tab of the quantification spreadsheets for further details.

Estimates include new projected costs expected to be realized by Napa County. Funding from other sources or required for successful program implementation is not included unless otherwise noted. The costs provided are for implementation by Napa County unless otherwise noted.

The costs included here are not an offer for construction and/or project execution. The costs presented in this estimate are considered Class 5 with an accuracy range of -50% to +100% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System. As Applied in Engineering,

Procurement and Construction for the Environmental Remediation Industries (AACE International 2021). The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

Source: **Compiled by Jacobs in 2025**.

Table I.2 Implementation Costs (FY 2025/26-2044/45) for Selected GHG Reduction Measures

Measure	Emissions Sector	Strategy	Measure	Net Present Value	Total Cost (Not Discounted)
BE-1	**Building Energy**	**Energy Efficiency and Electrification**	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.	$359,870,000	$448,380,000
BE-5	**Building Energy**	**Zero Carbon Development**	Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction.	$1,060,000	$1,330,000
TR-3	**On-Road Transportation**	**Low and Zero Emissions Vehicles**	Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure.	$350,000	$380,000
TR-11	**On-Road Transportation**	**Transportation Demand Management (TDM)**	Expand Individual Trip TDM Programs.	$2,750,000	$3,340,000
OF-3	**Off-Road Transportation**	**Electrification and Clean Alternatives**	Zero Carbon Construction Equipment – Community.	$150,000	$180,000
SW-1	**Solid Waste**	**Zero Waste**	Increase diversion of solid waste to achieve >80% diversion from landfills by 2035.	$14,890,000	$18,250,000
WW-1	**Water/ Wastewater**	**Waste Water Treatment**	Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs).	$1,890,000	$2,390,000
AG-1	**Agriculture and Open Space**	**Reduce GHGs from Agricultural Equipment**	Reduce fossil fuel consumption in field equipment.	$155,180,000	$204,750,000
AG-3	**Agriculture and Open Space**	**Increase Carbon Storage**	Enhance carbon farming practices in the region.	$82,210,000	$92,690,000

Notes: Cost estimates shown in this table are for selected subset of proposed GHG reduction measures in the RCAAP and do not represent a complete cost estimate for all proposed GHG reduction measures. Measures are each estimated individually as standalone programs. There is potential for efficiency in bundling the Measures together, however no bundling was assumed in the preliminary cost assessment.

Estimates include new projected costs expected to be realized by Napa County. Funding from other sources required for successful program implementation is not included unless otherwise noted. See the Funding and Financing section for more information on potential funding and financing sources.

The estimated costs included here are not an offer for construction and/or project execution. The costs presented in the preliminary costs assessment are considered Class 4 with an accuracy range of -30% to +50% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries (AACE International 2021). The cost estimates have been prepared for guidance in RCAAP project evaluation and implementation from the information available at the time of preparation of the estimate. The final costs of GHG reduction measures and climate adaptation actions will depend on actual labor, material costs, further program details not yet known at the time the cost assessment was prepared, and other factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

Source: **Compiled by Ascent in 2025, based on Preliminary Cost Assessment prepared by Jacobs**.

3 FUNDING AND FINANCING ASSESSMENT

This section summarizes the results of the funding and financing assessment completed for the RCAAP by EPS (see **Attachment I-2**). EPS's analysis focused on the 19 priority measures included in the cost assessment prepared by Jacobs. The four main cost categories defined in the cost assessment (i.e., program costs, capital costs, administrative/labor costs, and contracts and/or material costs), along with identification of the agency or agencies responsible for implementation (i.e., County of Napa, incorporated jurisdiction, or shared implementation by all jurisdictions) were used to help establish a framework of funding mechanisms available for implementation. EPS identified five categories of potential funding sources or financing mechanisms, including:

- **Local funding sources** (e.g., general fund revenues, new taxes or assessments, new fees);
- **Grants** (e.g., federal, state, regional, or local grant programs);
- **Loans** (e.g., California Infrastructure and Economic Development Bank [IBank] products, on-bill financing available through utilities);
- **Debt financing mechanisms** (e.g., general obligation bonds, revenue bonds, certificates of participation, Mello-Roos community facilities districts [CFDs], enhanced infrastructure financing districts [EIFDs], climate resilience districts [CRDs]); and
- **Other sources** (e.g., carbon credits, public-private partnerships, development or operating agreements; and regional programs such as MCE Flex Market Programs, BayREN incentives, Transportation Fund for Clean Air).

EPS' assessment determined that funding and financing options are available for all of the 19 prioritized measures included in the cost assessment. These options could also likely fund most or all implementation cost categories associated with the prioritized measures, with the exception of loans, which typically only fund capital facilities and contracts and materials.

EPS recommended that Napa County Jurisdictions take specific steps to develop a more detailed and specific **funding strategy**, including:

- **Develop a phased funding roadmap** that sequences implementation based on funding availability, project readiness, and potential for maximizing GHG reduction and community co-benefits
- **Prioritize actions that can be implemented relatively easily** by identifying projects that have the following characteristics:
  - Lower cost-barriers,
  - Existing staffing capacity to redirect toward implementation,
  - Capital improvements that can be included into respective jurisdictional CIPs.
- **Determine if any General Fund revenues can be made available** to fund any short- or long-term actions.

- **Evaluate the feasibility of establishing new or dedicated local funding sources**, including new taxes, assessments, fees, or utility surcharges earmarked for GHG reduction or climate adaptation efforts.
- **Pursue state and federal grants by actively monitoring funding opportunities from existing or new programs.** This will require jurisdictions to **build internal capacity or hire grant specialists** and collaborate across public agencies to increase competitiveness.
- **Utilize public financing tools,** such as products offered by IBank, CRDs, CFDs, climate-focused bonds, etc.
- Attract private investment by pursuing public-private partnerships (P3s) for targeted actions.
- Coordinate regionally through the Climate Action Committee (CAC) and corresponding joint powers agreement to align local priorities, pool match funding, and develop joint applications for regional-scale investments.

ATTACHMENT I-1

Ascent Cost Estimation

Programmatic Summary of GHG Measures

Napa County RCAAP

Prepared by: A. White, O. Guretta
Prepared for: Erik de Kok
April 11, 2025
Revision 3

The cost include here are not an offer for construction and/or project execution. The costs presented in this estimate are considered Class 4 with an accuracy range of -30% to +50% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries (AACE International 2021). The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

Programmatic costs are estimated based on inputs provided by the County of Napa and assumptions are included as noted in each measure.

401 B Street

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Summary of the GHG Mitigation Measures Estimated Costs.

Results are contingent on the accuracy of the input data provided by the County and specific assumptions for each measures should be reviewed for consistency as the measures are further developed.

Summary of Estimated Costs

Measure	Emissions Sector	Strategy	Measure	Net Present Value	Total Cost (Not Discounted)
BE-1 (M1)	Building Energy	Energy Efficiency and Electrification	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.	$359,870,000	$448,380,000
BE-5 (M2)	Building Energy	Zero Carbon Development	Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction	$1,060,000	$1,330,000
TR-3 (M3)	On-Road Transportation	Low and Zero Emissions Vehicles	Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure	$350,000	$380,000
TR-11 (M4)	On-Road Transportation	Transportation Demand Management (TDM)	Expand Individual Trip TDM Programs	$2,750,000	$3,340,000
OF-3 (M5)	Off-Road Transportation	Electrification and Clean Alternatives	Zero Carbon Construction Equipment - Community	$150,000	$180,000
SW-1 (M6)	Solid Waste	Zero Waste	Increase diversion of solid waste to achieve >80% diversion from landfills by 2035	$14,890,000	$18,250,000
WW-1 (M7)	Water/Waste Water	Waste Water Treatment	Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)	$1,890,000	$2,390,000
AG-1 (M8)	Agriculture and Open Space	Reduce GHGs from Agricultural Equipment	Reduce fossil fuel consumption in field equipment	$155,180,000	$204,750,000
AG-3 (M9)	Agriculture and Open Space	Increase Carbon Storage	Enhance carbon farming practices in the region	$82,210,000	$92,690,000

General Notes

- Measures are each estimated individually as standalone programs. There is potential for efficiency in bundling the Measures together.

- Estimates include new projected costs expected to be realized by Napa County. Funding from other sources required for successful program implementation is not included unless otherwise noted.

-The cost include here are not an offer for construction and/or project execution. The costs presented in this estimate are considered Class 4 with an accuracy range of -30% to +50% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries (AACE International 2021). The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

To refine each of the cost estimates, the following could be done:

- Review and confirm the assumptions on labor costs, both the assumed rate and FTE.
- Periodic costs, such as a program updates occurring every 3 or 5 years, are annualized for estimate purposes. These costs can be allocated to specific years and discounted accordingly as more details of timing and precise implementation are defined.

For each of the cost estimates, the following assumptions are made:

- Labor costs include internal staff, not consultants unless otherwise noted.
- An annual discount rate of 2.2% is used for all estimates unless otherwise noted. This is the 20-year real interest rate on US treasury notes and bonds for the 2025 calendar year per OMB Circular No. A-94.

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Estimate #: 1
Emissions Sector: Building Energy
Strategy: Energy Efficiency and Electrification
Measure: 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.

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Duration, yr.	Timeline
Pre-electrification program development	*3*	*2026 - 2028*
Reach code development	*3*	*2026 - 2028*
Streamline permitting program	*1*	*2026*
Community outreach and education	*3*	*2026 - 2028*
Residential income limit study	*3*	*2026 - 2028*
Non-residential participation study	*3*	*2026 - 2028*

Ongoing Program Management Tasks	Duration, yr.	Timeline
Implementation management	*16*	*2029 - 2045*
Reach code updates (every 3 years)	*16*	*2029 - 2045*
Permitting and outreach updates (annually)	*16*	*2029 - 2045*
Income limit reviews (annually)	*16*	*2029 - 2045*
Income limit program major review and update (one time)	*1*	*2035*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal	Target	Deadline
Transition all existing residential buildings to all-electric with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	*Avg two rebate projects per home*	2045
Transition all existing nonresidential buildings to all-electric with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	*Avg two rebate projects per building*	2045

Data Request Tab Instructions:

Input required	No input needed
Input optional (to override **preliminary** assumption)	Red text indicated change based on review in 9-2025.

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Measure				Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
1	Building Energy	Energy Efficiency and Electrification	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.	*Building types included*	*residential and non-residential*	*text*	Client input	High	
				Number of residential homes in program area	*56,049*	*quant*	Census data	High	Not all homes/buildings will require participation in rebate program. This is accounted for by "Residential target" value below. This number has been updated based on Ascent 9-19-25
				Number of non-residential buildings in program area	*34,890*	*quant*	Census data	High	Not all buildings will require participation in rebate program. This is accounted for by "Non-residential target" value below. Value confirmed on 2-27-25.
				Residential target	*2.0*	*avg projects per building*	Client input	Moderate	Ground truth research: 2.7 natural gas appliances per home. See References tab for additional info
				Non-residential target	*2.0*	*avg projects per building*	Client input	Low	Preliminary research did not return a value for number of natural gas appliances per non-res building. Recommend confirming this value, as non-res. rebate costs are largest driver of total program
				Residential adoption	*25%*	*of all homes at year 5*	Client input	High	
					50%	*at year 10*	Client input	High	
					75%	*at year 15*	Client input	High	
					100%	*at year 20*	Client input	High	
				Non-Residential adoption	*25%*	*of all buildings at year 5*	Client input	High	
					50%	*at year 10*	Client input	High	
					75%	*at year 15*	Client input	High	
					100%	*at year 20*	Client input	High	
				Average residential rebate	*$2,000*	*USD*	Client Input	Moderate	Based on similar rebate programs initial rebate was defined at $1,500. Rebate values vary widely across all similar programs. Key driver in total cost estimate. Per comment from Ryan Melendez value revised to be higher (maybe closer to $2000-$3000).
				Average non-residential rebate	*$3,500*	*USD*	Client Input	Low	Based on similar rebate programs original cost $3,000. Rebate values vary widely across all similar programs. Key driver in total cost estimate. Should be reviewed. Per comment from Ryan Melendez value revised to be higher.
				Average residential permitting fee	*$290*	*USD*	Jacobs research	Moderate	Assumes permitting fee for "new or alteration to electrical" according to Napa County Example Fees for Common BES Projects
				Residential permitting fee reduction	*20%*	*of total fee*	Client input	Moderate	
				Average non-residential permitting fee	*$740*	*USD*	Jacobs research	Moderate	Assumes permitting fee for "new or alteration to electrical" according to Napa County Example Fees for Common BES Projects
				Non-Residential permitting fee reduction	*20%*	*of total fee*	Client input	Moderate	
				Pre-electrification program development labor	*1.0*	*FTEs over task duration*	Jacobs assumption	Low	
				Reach code development labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
				Streamlined permitting program labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
				Community outreach and education labor	*1.0*	*FTEs over task duration*	Jacobs assumption	Low	
				Residential income limit study labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
				Non-residential participation study labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
				Implementation management labor	*1.2*	*FTEs over task duration*	Jacobs assumption	Low	
				Reach code updates labor	*0.1*	*FTEs over task duration*	Jacobs assumption	Low	
				Permitting and outreach updates labor	*0.1*	*FTEs over task duration*	Jacobs assumption	Low	
				Income limit reviews labor	*0.3*	*FTEs over task duration*	Jacobs assumption	Low	
				Income limit program major review and update labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor

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Estimate #: 1
Emissions Sector: Building Energy
Strategy: Energy Efficiency and Electrification
Measure: Develop a comprehensive energy retrofit program to transition existing residences and businesses to net zero carbon by 2045

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Home types included:	residential and non-residential
Number of residential homes in program area	56,049
Number of non-residential buildings in program area	34,890
Avg number of natural gas appliances per residential home	2.00
Avg number of natural gas appliances per non-residential building	2.00

Adoption

Year 5		
Residential adoption	25%	of all homes in implementation area
Commercial adoption	25%	of all commercial buildings in implementation area

Year 10		
Residential adoption	50%	of all homes in implementation area
Commercial adoption	50%	of all commercial buildings in implementation area

Year 15		
Residential adoption	75%	of all homes in implementation area
Commercial adoption	75%	of all commercial buildings in implementation area

Year 20		
Residential adoption	100%	of all homes in implementation area
Commercial adoption	100%	of all commercial buildings in implementation area

Rebates

Average rebate

Residential rebate per project	$2,000
Commercial rebate per project	$3,000

Reduced permitting fees

	Avg permitting fee	Fee reduction	Cost per permit to Jurisdictions
Residential	$290	20%	$58
Commercial	$740	20%	$148

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate, $/hı	Cost
Pre-electrification program development labor	1 to 3	1.00	3	$140	$840,000
Reach code development labor	1 to 3	0.50	3	$140	$420,000
Streamlined permitting program labor	1 to 3	0.50	3	$140	$420,000
Community outreach and education labor	1 to 3	1.00	3	$140	$840,000
Residential income limit study labor	1 to 3	0.50	3	$140	$420,000
Non-residential participation study labor	1 to 3	0.50	3	$140	$420,000
Implementation management labor	4 to 20	1.20	17	$140	$5,712,000
Reach code updates labor	4 to 20	0.13	17	$140	$595,000
Permitting and outreach updates labor	4 to 20	0.13	17	$140	$595,000
Income limit reviews labor	4 to 20	0.25	17	$140	$1,190,000
Income limit program major review and update labor	10	0.50	1	$140	$140,000

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total residential rebate cost	$56,049,000	$112,098,000	$168,147,000	$224,196,000	$224,196,000
Total commercial rebate cost	$52,335,000	$104,670,000	$157,005,000	$209,340,000	$209,340,000
Total permit fee reduction cost	$812,711	$1,625,421	$2,438,132	$3,250,842	$3,250,842
Total administrative labor costs	$4,312,000	$6,832,000	$9,212,000	$11,592,000	$11,592,000
Total cost (at today's value)	$113,508,711	$225,225,421	$336,802,132	$448,378,842	**$448,378,842**

Annual Spent																					
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total residential rebate cost	$0	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800
Total commercial rebate cost	$0	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000
Total permit fee reduction cost	$0	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542
Total administrative labor costs	$0	$862,400	$862,400	$862,400	$862,400	$862,400	$504,000	$504,000	$504,000	$504,000	$504,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000
Total spent	$0	$22,701,742	$22,701,742	$22,701,742	$22,701,742	$22,701,742	$22,343,342	$22,343,342	$22,343,342	$22,343,342	$22,343,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$22,213,055	$21,734,887	$21,267,013	$20,809,210	$20,361,263	$19,608,427	$19,186,328	$18,773,315	$18,369,193	$17,973,770	$17,564,820	$17,186,712	$16,816,744	$16,454,739	$16,100,528	$15,753,941	$15,414,815	$15,082,989	$14,758,307	$14,440,613
Total net present value	**$359,870,669**																				

Results Considerations
To refine this cost estimate the following could be done: Review and confirm the number of rebates to be issued and the cost per rebate for the commercial rebate program. This is the largest driver of cost. There is variability in the desired number of equipment between county provided data - review to determine if 2.0 or 2.7 rebate will be provided per building type.

Additional notes:

- Assumption: all new homes built after 2024 have electric equipment and will not need to utilize rebate program.

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Estimate #2
Emissions Sector: Building Energy
Strategy: Zero Carbon Development
Measure: BE-5: Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure -Action ID	Duration, yr.	Timeline
Develop and adopt regionally consistent energy efficiency and renewable energy reach building codes	BE-5a	2	2027 - 2028
Develop process to track climate and energy codes and bills	BE-5b	2	2027 - 2028
Develop a process for evaluating and updating low carbon building material requirements	BE-5c	2	2027 - 2028

Ongoing Program Management Tasks		Duration, yr.	Timeline
Implement and manage regional energy reach codes program	BE-5a	17	2029 - 2045
Reach code updates (every 3 years)	BE-5	17	2029 - 2045
Review progress of state codes and bills to inform regional reach code	BE-5b	17	2029 - 2045
Review regional standards for low carbon building material requirements	BE-5c	17	2029 - 2045

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
NONE			

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Data Request Tab Instructions:

Input required | No input needed

Input optional (to override **preliminary** assumption Client-provided value

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	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
			Decarbonize New Buildings						*Client comment: "At this point in time reach codes are not complicated to write, adopt, and implement because so many CA jurisdictions are early adopters and do the heavy lifting...assume FTEs for entire measure over duration would not exceed 0.25" Client input on 1/16/25*
2	Building Energy	Zero Carbon Development		*Reach code development labor*	*0.08*	*FTEs over task duration*	Client input	Moderate	
				Labor to track progress of state codes and bills related to climate to inform initial Reach code development	*0.08*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for initial development of low carbon building materials requirements for Reach code	*0.08*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for Reach code implementation and ongoing program management	*0.06*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for periodic Reach code updates	*0.06*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for state codes/bills review to inform reach code updates	*0.06*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for reviewing low carbon building materials requirements to inform Reach code updates	*0.06*	*FTEs over task duration*	Client input	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	

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Estimate #: 2
Emissions Sector: Building Energy
Strategy: Zero Carbon Development
Measure: Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (years	Avg Labor Rate	Cost
Reach code development labor	2 to 3	0.08	2	$140	$46,667
Labor to track progress of state codes and bills related to climate to inform initial Reach code development	2 to 3	0.08	2	$140	$46,667
Labor for initial development of low carbon buidling materials requirements for Reach code	2 to 3	0.08	2	$140	$46,667
Labor for Reach code implementation and ongoing program management	4 to 20	0.06	17	$140	$297,500
Labor for periodic Reach code updates	4 to 20	0.06	17	$140	$297,500
Labor for state codes/bills review to inform reach code updates	4 to 20	0.06	17	$140	$297,500
Labor for reviewing low carbon building materials requirements to inform Reach code updates	4 to 20	0.06	17	$140	$297,500

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$280,000	$630,000	$980,000	$1,330,000	$1,330,000
Total cost (at today's value)	$280,000	$630,000	$980,000	$1,330,000	**$1,330,000**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$56,000	$56,000	$56,000	$56,000	$56,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000
Total spent	$0	$56,000	$56,000	$56,000	$56,000	$56,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000
Real discount rate	##########	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$54,795	$53,615	$52,461	$51,332	$50,227	$61,432	$60,109	$58,815	$57,549	$56,310	$55,098	$53,912	$52,752	$51,616	$50,505	$49,418	$48,354	$47,313	$46,295	$45,298
Total net present value	**$1,057,206**																				

Results Considerations

- Cost to implement is not included due to varying nature of codes

Additional notes:

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Estimate #: 3
Emissions Sector: On-Road Transportation
Strategy: Low and Zero Emissions Vehicles
Measure: Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Study and stakeholder coordination (MTC) to identify location for med / heavy duty fleet	*TR-3-a*	*3*	*2026-2028*
Gap analysis of existing private parking infrastructure to achieve 10% EVSE and an additional 10% EV-ready	*TR-3-b*	*2*	*2026-2027*

Ongoing Program Management Tasks	Measure-Action ID	Duration, yr.	Timeline
Review and update targets and progress for EVSE in parking infrastructure	*TR-3*	*9, every 5 years*	*2027 - 2035*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal	Measure-Action ID	Target	Deadline
NONE			

Data Request Tab Instructions:

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Input required	No input needed	Client-provided value
Input optional (to override **preliminary** assumption)		Updated by Jacobs based on industry best practices

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Measure				Assumptions				
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
3	On-Road Transport	Low and Zero Emissions Vehicles	Increase access to Zero Emissions Vehicle (ZEV) fueling infrastructure	*Labor to identify opportunities and locations for chargers for medium and heavy duty fleet*	*0.25*	*FTEs over task duration*	Client input	Moderate	Program includes county-wide fleet mix, not just county-owned vehicles. Assumes ability to leverage existing GIS info/staff to understand scale of program. From Deborah Elliot: 0.25 because most jurisdictions are getting technical assistance on this from MTC for municipal fleets. Confirmed with Jacobs team. Client input on 1/16/25
				Labor for gap analysis of existing private parking infrastructure	*0.20*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Assume electrical infrastructure info. is available through public utility and that the County already has a relationship with private parking owners and has access to electricity records. Outreach component includes education component but not infrastructure info. gathering. No material costs are included for outreach activities.
				Labor for periodic review and update of requirements	*0.05*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Ongoing updates are about 20% of initial evaluation. Reviewed with Jacobs team and consistent with industry best practices.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumpti	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 3
Emissions Sector: On-Road Transportation
Strategy: Low and Zero Emissions Vehicles
Measure: Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (yea	Avg Labor Rat	Cost
Labor to identify opportunities and locations for chargers for mediu	1 to 3	0.25	2	$140	$140,000
Labor for gap analysis of existing private parking infrastructure	1 to 2	0.20	2	$140	$112,000
Labor for periodic review and update of requirements	2 to 10	0.05	9	$140	$126,000

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$308,000	$378,000	$378,000	$378,000	$378,000
Total cost (at today's value)	$308,000	$378,000	$378,000	$378,000	**$378,000**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$61,600	$61,600	$61,600	$61,600	$61,600	$14,000	$14,000	$14,000	$14,000	$14,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$61,600	$61,600	$61,600	$61,600	$61,600	$14,000	$14,000	$14,000	$14,000	$14,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Real discount rate	##########	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$60,274	$58,976	$57,707	$56,465	$55,249	$12,286	$12,022	$11,763	$11,510	$11,262	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total net present value	**$347,515**																				

Results Considerations

- There is no cost to customer or cost for increased utilization of existing incentive program factored in these results

Additional notes:

Assumes this is for a county wide fleet mix and that there is existing background information available. For example existing studies or mapping tools that have been used to identify the starting and ending point of trips.
Assumes that the County already has some basis for a network that can be used for medium and heavy duty charging.
Measures is for a study only and does not include developing infrastructure.
The cost for external studies done by a consultant are not included.

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Estimate #: 4
Emissions Sector: On-Road Transportation
Strategy: Transportation Demand Management (TDM)
Measure: Expand Individual Trip TDM Programs

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Support NVTA to secure additional funding for existing incentives	*TR-11-a1*	*2*	*2028-2029*
Consider expansion of current TDM programs through outreach	*TR-11-a2*	*3*	*2028-2030*
Develop and adopt TDM ordinances in all jurisdictions by 2028	*TR-11-b1*	*3*	*2028-2030*
Define and develop annual reporting metrics program (e.g. participation, VMT reduction, mode shift, funding)	*TR-11-b1*	*3*	*2028-2030*
Feasibility analysis for mobility as a service (MAAS)	*TR-11-c1*	*3*	*2028-2030*
Identify polices and programs that would spur adoption of services	*TR-11-c1*	*2*	*2028-2030*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Expand TDM program through ongoing outreach to employers and existing participants	*TR-11-a2*	*18*	*2028-2045*
Annual metrics reporting	*TR-11-b1*	*18*	*2028 - 2045*
Review, renew or amend agreements and partnerships	*TR-11-a2*	*18*	*2028 - 2045*
Ongoing evaluation and opportunity assessment ordinance and TDM program implementation	*TR-11-c1*	*18*	*2028 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
NONE			

Data Request Tab Instructions:

Input required	No input needed	Client-provided value
Input optional (to override **preliminary** assumption)		Updated by Jacobs based on industry best practices

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Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
4	On-Road Transportation	Transportation Demand Management (TDM)	Expand Individual Trip TDM Programs						Assumes support is limited to identification of relevant grant programs and support in preparation of applications along with existing NVTA staff. Assume that the primary grant application will either be through the state or other transportation agency and that the County staff is minimal / limited with primary to provide information to support Napa Valley Transit, i.e. they are not the primary grant application.
				Labor to support NVTA to secure additional funding	*0.1*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	
				Labor to expand current TDM programs through outreach	*0.2*	*FTEs over task dur.*	Jacobs assumption	Moderate	Develop turnkey outreach program to increase use of existing TDM programs and incentives.
				Labor to develop and adopt TDM ordinances	*0.3*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	Reviewed with Jacobs team and consistent with industry best practices.
				Labor to develop annual reporting metrics process	*0.1*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	Reviewed with Jacobs team and consistent with industry best practices.
				Labor to manage MAAS feasibility study	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	County staff requirement to review and approve consultant study
				Labor to identify policies and programs to spur adoption of services	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	County staff requirement to review and approve consultant recommendations
				Labor for TDM program outreach	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	
				Labor for annual metrics reporting	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	
				Labor to manage partnership relationships	*0.2*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	This is more about bringing all the components together in one place i.e. an app. Assumes mostly private partners – on the order of three partners.
				Labor for ongoing program evaluation	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.
				Material costs for outreach	*$ -*		Client input	Moderate	*Brenda Hom: Cost of labor only. The search for funding for rebates is intended to come from sources outside of the county, though it is not limited to being self-funded.*
				Consultant services for MAAS feasibility study and identification of relevant MAAS policies and programs to leverage	*$ 100,000*	*USD*	Jacobs Industry Best Practice	Moderate	Assumes outside consultant for a one time feasibility study and benchmarking of existing programs. This would include a policy audit of the current Napa County polices ex. Parking.

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Estimate #: 4
Emissions Sector: On-Road Transportation
Strategy: Transportation Demand Management (TDM)
Measure: Expand Individual Trip TDM Programs

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (years	Avg Labor Rate	Cost
Labor to support NVTA to secure additional funding	3 to 4	0.10	2	$140	$56,000
Labor to expand current TDM programs through outreach	3 to 5	0.15	3	$140	$126,000
Labor to develop and adopt TDM ordinances	3 to 5	0.25	3	$140	$210,000
Labor to develop annual reporting metrics process	3 to 5	0.10	3	$140	$84,000
Labor for MAAS feasibility study	3 to 5	0.10	3	$140	$84,000
Labor to identify policies and programs to spur adoption of services	3 to 4	0.10	2	$140	$56,000
Labor for TDM program outreach	3 to 20	0.10	18	$140	$504,000
Labor for annual metrics reporting	3 to 20	0.10	18	$140	$504,000
Labor to manage partnership relationships	3 to 20	0.20	18	$140	$1,008,000
Labor for ongoing program evaluation	3 to 20	0.10	18	$140	$504,000

Contract Fees & Material Costs

	Years	Cost
Consultant fee for MAAS feasibility study	3 to 5	$ 100,000
Material costs for outreach	3 to 20	$ -

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$1,136,000	$1,836,000	$2,536,000	$3,236,000	$3,236,000
Total contract fees & material costs	$100,000	$100,000	$100,000	$100,000	$100,000
Total cost (at today's value)	$1,236,000	$1,936,000	$2,636,000	$3,336,000	**$3,336,000**

Annual Spent

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$227,200	$227,200	$227,200	$227,200	$227,200	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000
Total contract fees & material costs	$0	$20,000	$20,000	$20,000	$20,000	$20,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$247,200	$247,200	$247,200	$247,200	$247,200	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000
Real discount rate	############	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$241,879	$236,672	$231,577	$226,592	$221,714	$122,863	$120,219	$117,631	$115,099	$112,621	$110,197	$107,824	$105,503	$103,232	$101,010	$98,836	$96,708	$94,626	$92,589	$90,596
Total net present value	**$2,747,989**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm administrative labor requirements. This is the largest driver of cost.

Additional notes:

Notes:
- Consultant fees included as a lump sum where relevant (MAAS study).
- Assumes the county already has a developed outreach program campaign that can be built upon and ready to launch. Assumes that analytics are run on the current outreach programs and will require some modifications to meet annual reporting requirements but will not be developed from scratch.

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Estimate #: 5
Emissions Sector: Off-Road Transportation
Strategy: Electrification and Clean Alternatives
Measure: Zero Carbon Construction Equipment - Community

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Act	Duration, yr.	Timeline
Develop brochure to advertise existing incentives	*OF-3a*	*1*	*2029*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Periodic updates of incentives brochure	*OF-3a*	*every 3 years*	*2030 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Distribute brochures to provide information about available incentives for electric construction equipment to contractors at the building permit counter		*All contractors seeking a building permit should have access to updated literature*	2045

Data Request Tab Instructions:

Input required	No input needed	client-provided value
Input optional (to override **preliminary** assumptio		Updated by Jacobs based on industry best practices

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Measure				Assumptions				
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
5	Off-Road Vehicles and Equipment	Electrification and Clean Alternatives	Zero Carbon Construction Equipment - Community	*FTE for developing electric construction equipment incentive brochure*	*0.1*	*FTEs over task duration*	Jacobs assumption	Low	
				FTE to periodically update brochures for currently available incentives	*0.03*	*FTEs over task duration*	Jacobs assumption	Low	0.1 FTE every 3 years
				Estimated cost/brochure	*0.71*	*USD/brochure*	Jacobs Industry Best Practice	Moderate	Fedex printing cost for color, trifold brochure, 500/order as of 2/19/25
				Target # brochures distributed / year	*500*	*quantity*	Jacobs Industry Best Practice	Moderate	331 single and multi-family building permits issued in Napa county in 2023 according to NAHB source: https://www.nahb.org/News%20and%20Economics/Housing%20Economics/State%20and%20Local%20Data/Building%20Permits%20by%20State%20and%20Metro%20Area
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 5
Emissions Sector: Off-Road Transportation
Strategy: Electrification and Clean Alternatives
Measure: Zero Carbon Construction Equipment - Community

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (ye:	Avg Labor Ra	Cost
Labor to develop incentive brochure	4	0.10	1	$140	$28,000
Labor to periodically update brochures for currently available incentives	5 to 20	0.03	16	$140	$149,333

Material Costs

Cost per brochure	$	0.71
Brochures printed per year		500

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$37,333	$84,000	$130,667	$177,333	$177,333
Total material costs	$355	$2,130	$3,905	$5,680	$5,680
Total cost (at today's value)	$37,688	$86,130	$134,572	$183,013	**$183,013**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$7,467	$7,467	$7,467	$7,467	$7,467	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333
Total material costs	$0	$71	$71	$71	$71	$71	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355
Total spent	$0	$7,538	$7,538	$7,538	$7,538	$7,538	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688
Real discount rate	##########	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$7,375	$7,217	$7,061	$6,909	$6,761	$8,502	$8,319	$8,140	$7,965	$7,794	$7,626	$7,462	$7,301	$7,144	$6,990	$6,840	$6,692	$6,548	$6,407	$6,269
Total net present value	**$145,324**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm administrative labor requirements. This is the largest driver of cost.
Review the size of the outreach program to make sure aligns with anticipated population.

Additional notes:

- No incentive funding is included in this estimate. Brenda Hom: "The purpose of this measure is to have the county/cities require the use of zero carbon equipment and identify outside incentive sources (E.g., BAAQMD or the state). Like M4, it is not intended to be funded by the municipalities, but they could if they wanted to."
- Cost to customer would vary widely

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Estimate #: 6
Emissions Sector: Solid Waste
Strategy: Zero Waste
Measure: Increase diversion of solid waste to achieve >80% diversion from landfills by 2035

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
~~*Setup to expand residential backyard composting program & advertise*~~ *(Although this is listed as a component, per County staff comments no expansion is included in the cost estimate. 4/2/2025)*	*SW-1-a1*	*1*	*2025*
Adopt and implement Reusable Food Ware and Waste Reduction Ordinance	*SW-1-a2*	*2*	*2025 - 2026*
Perform feasibility study to adopt similar ordinance in all regional cities	*SW-1-a3*	*2*	*2025 - 2026*
Implement mandatory commercial food waste diversion program for food facility health permit holders	*SW-1-c,d1/SW-1-a5*	*2*	*2025 - 2026*
Implement waste bin audit program	*SW-1-d2/SW-1-a6*	*2*	*2025-2026*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Ongoing management of residential composting program expansion	*SW-1-a1*	*20 yrs*	*2027 - 2045*
Implementation and enforcement of Reusable Food Ware and Waste Reduction Ordinance	*SW-1-a2*	*19 yrs*	*2027 - 2045*
Ongoing SB 1383/Edible Food Recovery Program Implementation & Management	*SW-1-a4*	*20 yrs*	*2027 - 2045*
Ongoing evaluation of Mandatory Commercial Food Waste Diversion Program	*SW-1-a5*	*20 yrs*	*2027 - 2045*
Ongoing evaluation of Waste Bin Audits	*SW-1-a6*	*20 yrs*	2027 - 2045

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Composting program outreach - start kit, info pamphlet, composting bins		*0% expansion of existing program*	2045

Data Request Tab Instructions:

Input required	No input needed	client-provided value
Input optional (to override **prelimi**		Updated by Jacobs based on industry best practices
		Updated per 3/12 staff comments and follow up discussion 4/2/25

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	Measure			Assumptions					
#	Emissions Secto	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
6	Solid Waste	Zero Waste	Increase diversion of solid waste to achieve diversion of at least 80% of waste from landfills by 2035	~~*Existing enrolled households in backyard compost program*~~	90	*# households*	Client input	High	# of households enrolled number from a 2018 source, scaled by the population change between 2018 and 2024 Source found governments spent an average of $12 per ton of organic materials composted at home; used an average of 646 pounds per year for each household. *Jesse: This number is County and City combined*. Client input on 1/30/25
				~~*Existing annual material costs for backyard compost program*~~	5100	*USD/year*	Client input	High	
				~~*Existing labor for management of backyard compost program*~~	0.011	*FTE/year*	Client input	High	Based on job titles found under County of Los Angeles Public Works directory; Napa County directories are not working. *Jesse: This number is County and City combined*. Client input on 1/30/25
				% expansion target for backyard composting program	0%	*%*	Client input	High	We assume that funding for the existing residential compost program is outside scope and are only considering expansions to the program. Per client feedback, setting the expansion target to 0. This brings costs for labor and materials to support the residential compost program expansion to 0 in the cost estimate. Target can be adjusted to include associated costs in the estimate as needed. *Jesse: Both the City of Napa and the County have reduced the number of backyard composting workshops due to a decrease in participation over the years. A noted reason could be the increase, accessibility, and convenience of curbside cart composting. Their Worm Composting Workshops have become more popular than the traditional compost bin.* Client input on 1/30/25
				~~*Progress toward expansion target at year 5*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.

Measure			Assumptions					
#	Emissions Secto	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				~~*Progress toward expansion target at year 10*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.
				~~*Progress toward expansion target at year 15*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.
				~~*Progress toward expansion target at year 20*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.
				~~*Labor to set up expansion of backyard compost program*~~	*0*	*FTEs over task duration*	Client input	High	Updated to zero since staff indicates no set up for compost program expansion is needed
				Labor for adopting Reusable Food Ware and Waste Reduction Ordinance	*0.5*	*FTEs over task duration*	Client Input	Moderate	Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. Comment from R. Melendez: from M2 (BE-5), the labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Ordinance is already adopted, and the labor for other jurisdictions to adopt a similar ordinance is assumed to be low, per County guidance. The labor for ongoing enforcement was approved by the County. After Discussion on 4/2, leaving this at 0.5 FTE to account for coordination with jurisdictions adopting their own ordinances per County guidance.
				Labor for ongoing enforcement of Reusable Food Ware and Waste Reduction Ordinance	*0.5*	*FTEs over task duration*	Jacobs Industry Best Practice	Low	FTE estimate does not include costs to private owners. Ordinance may require facility owners to organize their own compost pickup.
				Manage feasibility study to adopt Reusable Food Ware and Waste Reduction Ordinance in all cities	*0.25*	*FTEs over task duration*	Jacobs Industry Best Practice		
				Contracted feasibility study to adopt Reusable Food Ware and Waste Reduction Ordinance in all cities	*$ 50,000*	*USD*	Jacobs Industry Best Practice		One time fee. Reviewed with Jacobs team and consistent with industry best practices.

	Measure			Assumptions					
#	Emissions Secto	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Deborah: This is higher for the City of Napa. I can contact our solid waste team if needed, but we have multiple staff working on this issue. I think this can be increased to 1 FTE. Client input on 1/31/2025. Title changed to "Labor to expand commercial food waste diversion program"(It was noted that all jurisdictions should have a program in place already. Client Comment 4/2/2025. (D. Elliott))
				Labor to expand commercial food waste diversion program	*1.0*	*FTEs over task duration*	Client input	Moderate	
				Technician labor to implement waste bin audit program	*1.0*	*FTEs over task duration*	Jacobs assumption	Low	No material costs for audit program are included. Labor for technician to complete audits. All audits are completed manually by a field technician.
				Labor to manage and evaluate effectiveness of commercial food waste diversion program	*1.25*	*FTEs over task duration*	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices. Labor for project management, reviewing audit reports, aggregate findings, annually review program effectiveness, and adjust metrics as needed
				Labor for SB1383/Edible Food Recovery Program Implementation and Management	*1.25*	*FTEs over task duration*	Client input	Moderate	Deborah: This Probably should be higher for City of Napa, 1 FTE. Client input on 1/16/25. Per comments received 3/12 and discussion 4/2, increasing to 1.25 FTE to account for required coordination with individual jurisdictions.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 6
Emissions Sector: Solid Waste
Strategy: Zero Waste
Measure: Increase diversion of solid waste to achieve >80% diversion from landfills by 2035

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Existing enrolled households in backyard compost progra	90		
Existing annual material costs for backyard compost progr	$	5,100	
Existing labor for management of backyard compost progr	0.011		FTE
% expansion target for backyard composting program	0%		
new households enrolled in program based on expansion t	0		

Adoption

Year 5		
Residential compost program expansion	0%	of all homes in implementation area

Year 10		
Residential compost program expansion	0%	of all homes in implementation area

Year 15		
Residential compost program expansion	0%	of all homes in implementation area

Year 20		
Residential compost program expansion	0%	of all homes in implementation area

Material Costs

Material costs for compost program expansion	
Compost program costs/enrolled household/year	$56.67
Feasibility to adopt Reusable Food Ware and Waste Reduc	$50,000

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate,	Cost
Labor to set up expansion of backyard compost program	0	0	1	$ 140	$0
Labor for adopting Reusable Food Ware and Waste Reduction Ordinance	0 to 1	0.50	2	$ 140	$280,000
Labor for ongoing enforcement of Reusable Food Ware and Waste Reduction Ordinance	2 to 20	0.50	19	$ 140	$2,660,000
Labor for managing feasibility study to adopt Reusable Food Ware and Waste Reduction Ordinance in all cities	0 to 1	0.25	2	$ 140	$140,000
Labor to develop commercial food waste diversion program	0 to 1	1.00	2	$ 140	$560,000
Technician labor to implement waste bin audit program	0 to 1	1.00	2	$ 140	$560,000
Labor to manage and evaluate effectiveness of commercial food waste diversion program	1 to 20	1.25	20	$ 140	$7,000,000
Labor for SB1383/Edible Food Recovery Program Implementation and Management	1 to 20	1.25	20	$ 140	$7,000,000
Additional labor for backyard compost program expansion	1 to 20	0.00	20	$ 140	$0

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total material costs for residential compost program expa	$0	$0	$0	$0	$0
Total costs for contracted studies	$50,000	$50,000	$50,000	$50,000	$50,000
Total administrative labor costs	$5,600,000	$9,800,000	$14,000,000	$18,200,000	$18,200,000
Total cost (at today's value)	$5,650,000	$9,850,000	$14,050,000	$18,250,000	**$18,250,000**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total material costs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total costs for contracted studies	$50,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total administrative labor costs	$933,333	$933,333	$933,333	$933,333	$933,333	$933,333	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000
Total spent	$941,667	$941,667	$941,667	$941,667	$941,667	$941,667	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$941,667	$921,396	$901,562	$882,154	$863,165	$844,584	$737,181	$721,312	$705,785	$690,591	$675,726	$661,180	$646,947	$633,020	$619,394	$606,060	$593,014	$580,249	$567,758	$555,536	$543,577
Total net present value	**$14,891,855**																				

Results Considerations

To refine this cost estimate the following could be done:

Review and confirm the expansion target for residential compost program.

Review and confirm assumptions for administrative labor requirements. Ongoing labor requirements for the Commercial Food Waste Diversion Program and Edible Food Recovery Program are the largest drivers of cost.

Additional notes:

- 100% of contract study fees are all included in Year 0.
- Year 0-5 costs are spread evenly across Year 0-5 instead of 1-5 as with the other measures since this is the only measure with significant spending in Year 0
- Incentives to make organic waste pickup less expensive than standard landfill pickup are not included in program.
- Additional air space freed up in landfills may result in savings that offset some of the associated program costs. The changes in landfill infrastructure are not included in this measure or cost estimate.

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Estimate #: 7
Emissions Sector: Water/Waste Water
Strategy: Waste Water Treatment
Measure: Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Develop evaluation program for options to reduce fugitive emissions for WWTPs without waste-to-energy systems	*WW-1*	*1*	*2032*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Evaluate and periodically update program	*WW-1*	*14*	*2032 - 2045*
Program implementation/oversight/audit evaluations (Assumes audits are performed by existing onsite staff with analysis and follow up by the county/jurisdictions)	*WW-1*	*14*	*2032 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
NONE			

Data Request Tab Instructions:

Input required	No input needed
Input optional (to override **preliminary** assu	Updated by Jacobs based on industry best practices Updated per 3/12 staff comments and follow up discussion 4/2/25
client-provided value	

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
			Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)						Assumption: 2 Napa County facilities (NBRID and LBRID) plus 4 smaller jurisdictions/private WWTP included in program. 5 active NPDES permits per the state water resource control board. *Jesse: Napa County's 2 facilities (NBRID and LBRID) are not equipped with waste-to-energy. There are challenges in the engineering economics for methane gas recovery for a facility of this size according to District Engineer of Water Resources. It is likely that the smaller jurisdictions face similar challenges with bringing waste-to-energy to their wastewater treatment plants.* Client input on 1/30/25
7	Water/Wastewater	Waste Water Treatment		*Waste water treatment plants without waste-to-energy*	*6.00*	*quantity*	Client input	Low	
				Labor to evaluate audits and administer program	*0.25*	*FTEs over task duration*	Client input	Moderate	Labor to manage, evaluate, and administer audit program. Assumes contracted baseline assessment plus facility-administered updates every 3 years, with oversight and evaluation by the county/jurisdictions. If 6 plants are included in program, 2 audits would be completed per year. LOE reduced per County comment for assuming existing onsite staff will implement this program. 4-2-2025.
				Labor for program monitoring and updates	*0.10*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Project manager to oversee, report on, and update program as needed

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				Labor for program setup	*1.50*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Assumes a project manager and full time assistant. Program setup includes development of standard tools & templates (e.g. leak detection work practice forms) to implement industry best practices, especially for smaller facilities. Labor for program set-up was not reduced but labor to do ongoing evaluations were per client comment 4/2/2025. If existing audit programs are already established this set-up program may be reduced as appropriate based on current level of existing program.
				Target percent of applicable plants to audit per year	*33%*		Jacobs assumption	Moderate	Measure description specifies audits every 3 years. Assume audits are staggered so a fixed number are completed per year.
				Contract fee for initial baseline audits	*########*	*USD/audit*	Jacobs Industry Best Practice	Moderate	Assumes a contracted baseline evaluation for each plant is included as a lump sum fee. Internal resources are assumed to manage periodic (every 3 yr) updates to the baseline evaluations.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 7
Emissions Sector: Water/Waste Water
Strategy: Waste Water Treatment
Measure: Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Waste water treatment plants without	6.00
% plants audited per year	33%

Material Costs & Contract Fees

Average contract Fee for baseline ass	$100,000

Program Costs

	Years	FTEs	Duration (years	Avg Labor Rate,	Cost
Labor to evaluate audits and administ	7 to 20	0.25	14	$140	$980,000
Labor for program monitoring and upd	7 to 20	0.10	14	$140	$392,000
Labor for program setup	7	1.50	1	$140	$420,000

Total Cost Calculation

Cumulative Spent

	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$0	$812,000	$1,302,000	$1,792,000	$1,792,000
Total material costs & contract fees	$0	$600,000	$600,000	$600,000	$600,000
Total cost (at today's value)	$0	$1,412,000	$1,902,000	$2,392,000	**$2,392,000**

Annual Spent

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$0	$0	$0	$0	$0	$162,400	$162,400	$162,400	$162,400	$162,400	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000
Total material costs & contract fees	$0	$0	$0	$0	$0	$0	$120,000	$120,000	$120,000	$120,000	$120,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$0	$0	$0	$0	$0	$282,400	$282,400	$282,400	$282,400	$282,400	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$0	$0	$0	$0	$0	$247,833	$242,498	$237,278	$232,170	$227,172	$77,138	$75,477	$73,852	$72,263	$70,707	$69,185	$67,696	$66,238	$64,813	$63,417
Total net present value	**$1,887,738**																				

Results Considerations

To refine this cost estimate the following could be done:
- Review and confirm the number of plants without waste-to-energy and annual audits target.
- Review and confirm administrative labor requirements. These are the largest driver of cost. Current costs assume that audit will be done by facility staff and reviewed by County. The additional costs to the facility are not included per discussion on 4/2/2025. New program set up costs are included.

Additional notes:

- Program includes all public and private WWTP without waste-to-energy systems in County
- Assumes that initial baseline assessments are contracted studies (lump sum fee basis) but county personnel/WWTP personnel perform the periodic updates (FTE basis).
- Implementation of recommended actions from plant evaluations are not included in the estimate.
- Assumes that an optimization program, energy use / time of use would not be used to auto collect the data within the next 10 years.
- Assumes that smaller plants audits would be established as a base case to simplify the process. Rather than a full audit they would be set up as a standard work practices (example leak detection work practice forms) and compared year over year. Forms would be tied to a use of gas and standard inputs based on their configuration. The template could state performance metrics based on best practices to enable year over year comparisons
- Labor assumes this is a new program and staff to complete these efforts are not already included in County Plans.

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Estimate #: 8
Emissions Sector: Agriculture and Open Space
Strategy: Reduce GHGs from Agricultural Equipment
Measure: Reduce fossil fuel consumption in field equipment

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Evaluate existing BAAQMD incentive programs for electric agriculture equipment/retiring fossil fuel equipment	*AG-1-a1*	*4*	*2027-2030*
Website updates to advertise available incentives	*AG-1-a3*	*2*	*2027-2028*
Develop irrigation pump replacement program	*AG-1-b1*	*3*	*2027-2029*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Community outreach to encourage retirement of fossil fuel equipment	*AG-1-a2*	*16 yrs*	*2027 - 2045*
Periodic website updates for up-to-date incentive info	*AG-1-a3*	*0.1, annually*	*2028 - 2045*
Irrigation pump replacement program implementation and management	*AG-1-b1*	*16 yrs*	*2029 - 2045*
Program management of incentives for electric/solar equipment	*AG-1-b2*	*16 yrs*	*2030 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Electric equipment incentives for 100% transition of eligible agriculture equipment	*AG-1-a1*	*100% eligible equipment replaced*	2045
Community outreach for encouragement of fossil fuels (brochures, advertising)	*AG-1-a2*	*100% of agricultural community reached*	2045
Incentives for irrigation pump replacement up to 100% transition (electric pump replacement rebate/voucher)	*AG-1-b1*	*50% of fossil fuel pumps replaced*	2045
Incentives for biofuel irrigation pumps to 100% transition (biofuel purchase rebate/voucher)	AG-1-b2	*50% fossil fuel pumps replaced*	2045

Data Request Tab Instructions:

Input required	No input needed		Updated per 3/12 staff comments and follow up discussion 4/2/25
Input optional (to override **preliminary** as		Jacobs based on industry best	client-provided value

Measure				Assumptions				
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
8	Agriculture and Ope	Reduce GHGs from A	Reduce fossil fuel consumption in field equipment	Cost per incentive - agriculture equipment	$75,000	USD	Client input	High	Standard NRCS list or vineyard specific definition of equipment types. Assumption that this is per individual incentive and that this program includes the replacement of tractors and UTVs.
				~~Additional qualifying incentives - agriculture equipment~~	~~-~~	~~quantity~~	~~Client input~~		~~Undefined at this point. Not included in estimate. Client marked unknown on 1/31/25~~
				Cost support for tractor equipment	90%	% of eligible co	Jacobs Industry Best Practice		Assumes Tier 0, Tier 1, Tier 2 tractors must be scrapped; farms less than 100 acres will be considered "small farmers" and thus eligible for pre-owned equipment; Tier 0 and Tier 1 tractors may be replaced with certified pre-owned Tier 3 or cleaner equipment. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for UTV equipment	75%	% of eligible co	Jacobs Industry Best Practice		Diesel or gasoline UTVs can be replaced with electric models. The amount of incentive provided is variable and should be updated based on availability of funding sources.

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									This cost includes estimated costs per year for the pump and everything associated to make a solar pump function in the service: emitter package, solar package. This number has been updated to be based on the NAPA Irrigation System Overview, where irrigation accounts for 70% of farm electricity use. Variable frequency drives (VFDs) – most vineyards use well pumps, (vertical turbine or submersible pumps) to get water out of the ground, with booster pumps (for pressure) to irrigate from groundwater.
				Cost per incentive - electric/solar/biofuel irrigation pumps	$75,000	USD	Client input	High	
				~~Qualifying incentives - electric/solar irrigation pumps~~	~~unknown~~	~~quantity~~	~~Client input~~		~~Assume eligible incentives per grower per farm will be limited to $75,000 per rational above. Client marked unknown on 1/31/25. In terms of the mechanism that will be used to retire fossil fuel ag equipment: Brenda Hom on 10/23/24 "This hasn't been planned yet. It will depend on what funding the county can find/obtain. E.g., BAAQMD program may be a trade in one. Feel free to do additional research on this."~~
				~~Qualifying incentives - biofuel irrigation pumps~~	~~unknown~~	~~quantity~~	~~Client input~~		~~assume eligible incentives per grower per farm will be limited to $75,000. Client marked unknown on 1/31/25~~

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Assumes this covers the new pump; Tier 3 pumps are eligible to be replaced; replacement engines must be emission certified to a Tier 4 level, new, certified, off-road engine; projects will be funded based on a dollar per gross/brake horsepower basis, based on the horsepower of new replacement diesel engine not to exceed 90% eligible costs. The dollar per horsepower payment will be $120/HP less than 125 HP and $100/HP for 125HP or more. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for pump conversion from diesel/natural gas to electric/biofuel	90%	% of eligible co	Jacobs Industry Best Practice		

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									For irrigation conversion to solar, the incentive will cover the additional equipment, in addition to the pump, required to convert a system to solar. A solar irrigation system will include solar panels, inverter, pump, controller, batteries, sensors, piping, and emitters; Solar panels cost $3k-$15k, accessories (batteries, inverter, etc.) cost $1-5k, installation costs $1-10k. Because this is a new management technique, it is assumed that the incentive will take into account the use of additional management systems/planning; Cost of drilling a commercial well ($50-10/ft) is not included in this program. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for pump conversion from diesel/natural gas to solar	90%	% of eligible co	Jacobs Industry Best Practice	High	
				Number of county farms less than 180 acres	1,545	quantity	Jacobs research	High	Primary target of incentive programs are for farms less than 180 acres; 87% of total farms Assume all farms eligible for incentives if they meet individual program requirements
				Number of county farms	1,772	quantity	Jacobs research	High	

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). Response to R. Melendez comment: This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.
				Management of incentive program - agriculture equipment	0.50	FTEs over task	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Management of incentive pr	0.50	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Periodic website updates	0.10	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Community outreach mater	$ 5,000	USD	Client input	High	Client input on 1/31/25
				Community education and c	0.25	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Evaluate existing BAAQMD i	0.05	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Website setup to advertise available incentives	0.10	FTEs over task duration	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop irrigation pump replacement program	0.25	FTEs over task duration	Jacobs assumption	Low	Assumes program structure can be leveraged from existing lawn and garden trade-in program. Assumes a direct-to-farmer incentive - equipment dealers not involved.

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				incentive program adoption at year 5 for ag equipment	5%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 10 for ag equipment	33%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 15 for ag equipment	67%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 20 for ag equipment	99%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 5 for pumps	3%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 10 for pumps	10%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 15 for pumps	30%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 20 for pumps	50%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Average labor rate (all-in cost)	140	USD/hr	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

Estimate #: 8
Emissions Sector: Agriculture and Open Space
Strategy: Reduce GHGs from Agricultural Equipment
Measure: Reduce fossil fuel consumption in field equipment

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Total number of farms in the county	1772
Number of farms less than 180 acres	1545

Adoption

Year 5		
Land owner adoption of ag equipment	5%	of all landowners in implementation area
Land owner adoption of pumps conversion	3%	of all landowners in implementation area

Year 10		
Land owner adoption of ag equipment	33%	of all landowners in implementation area
Land owner adoption of pumps conversion	10%	of all landowners in implementation area

Year 15		
Land owner adoption of ag equipment	67%	of all landowners in implementation area
Land owner adoption of pumps conversion	30%	of all landowners in implementation area

Year 20		
Land owner adoption of ag equipment	99%	of all landowners in implementation area
Land owner adoption of pumps conversion	50%	of all landowners in implementation area

Incentives & Material Costs

Average Grant Award	
Cost per incentive - agriculture equipment	$75,000
Cost per incentive - electric/solar/biofuel irrigation pumps	$75,000

Material Costs	
Community outreach annual material costs	$5,000

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate, $/hr	Cost
Management of incentive program - agriculture equipment	5 to 20	0.50	16	$140	$2,240,000
Management of incentive program - irrigations pumps	5 to 20	0.50	16	$140	$2,240,000
Periodic website updates	3 to 20	0.10	18	$140	$504,000
Community education and outreach	2 to 20	0.25	19	$140	$1,330,000
Evaluate existing BAAQMD incentive programs	2 to 5	0.05	4	$140	$56,000
Website setup to advertise available incentives	2 to 3	0.10	2	$140	$56,000
Develop irrigation pump replacement program	2 to 4	0.25	3	$140	$210,000

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total Agricultural Equipment Incentive Costs	$6,645,000	$43,857,000	$89,043,000	$131,571,000	$131,571,000
Total Electric/Solar/Biofuel Irrigation Pumps Incentive Costs	$3,987,000	$13,290,000	$39,870,000	$66,450,000	$66,450,000
Total Community Outreach Materials Costs	$20,000	$45,000	$70,000	$95,000	$95,000
Total Administrative Labor Costs	$966,000	$2,856,000	$4,746,000	$6,636,000	$6,636,000
Total cost (at today's value)	$11,618,000	$60,048,000	$133,729,000	$204,752,000	**$204,752,000**

Annual Spent

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total Agricultural Equipment Incentive Costs	$0	$1,329,000	$1,329,000	$1,329,000	$1,329,000	$1,329,000	$7,442,400	$7,442,400	$7,442,400	$7,442,400	$7,442,400	$9,037,200	$9,037,200	$9,037,200	$9,037,200	$9,037,200	$8,505,600	$8,505,600	$8,505,600	$8,505,600	$8,505,600
Total Electric/Solar Irrigation Pumps Incentive Costs	$0	$797,400	$797,400	$797,400	$797,400	$797,400	$1,860,600	$1,860,600	$1,860,600	$1,860,600	$1,860,600	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000
Total Community Outreach Materials Costs	$0	$4,000	$4,000	$4,000	$4,000	$4,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Total Administrative Labor Costs	$0	$193,200	$193,200	$193,200	$193,200	$193,200	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000
Total spent	$0	$2,323,600	$2,323,600	$2,323,600	$2,323,600	$2,323,600	$9,686,000	$9,686,000	$9,686,000	$9,686,000	$9,686,000	$14,736,200	$14,736,200	$14,736,200	$14,736,200	$14,736,200	$14,204,600	$14,204,600	$14,204,600	$14,204,600	$14,204,600
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$2,273,581	$2,224,639	$2,176,751	$2,129,893	$2,084,044	$8,500,395	$8,317,412	$8,138,368	$7,963,178	$7,791,759	$11,599,136	$11,349,448	$11,105,135	$10,866,082	$10,632,174	$10,028,008	$9,812,141	$9,600,921	$9,394,247	$9,192,023

Total net present value	$155,179,334

Results Considerations

To refine this cost estimate the following could be done:

- Review and confirm assumptions related to agricultural equipment and irrigation pump incentives. These are the largest driver of cost and at the discretion of how much existing funding is available or additional funding can be provided by the County. This includes specifically the % per incentive the County is willing to provide under this program.
- Review and confirm administrative labor requirements.

Additional notes:

- The solar and biofuel irrigation pump replacement incentive is a single program; farmers that take advantage of the solar incentive cannot qualify for a separate biofuel incentive.
'- Labor and incentive costs realized by the county/jurisdictions will likely be only some fraction of the total if funding is primarily through the existing BAAQMD program or other external funding source.

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Estimate #: 9
Emissions Sector: Agriculture and Open Space
Strategy: Increase Carbon Storage
Measure: Enhance carbon farming practices in the region

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Establish university and community partnerships	*AG-3-a 1*	*2*	*2026 - 2027*
develop webpage on RCAAP website	*AG-3*	*1*	*2026*
develop other educational resources	*AG-3-a2*	*1*	*2026*
categorize carbon capture potential of conservation easements for natural areas associated with agricultural lands	*AG-3-a2*	*2*	*2026 - 2027*
develop grant program to support local CFP partners	*AG-3-a3*	*2*	*2026 - 2027*
develop annual workshop program	*AG-3-a2*	*3*	*2026-2028*
Develop technical assistance guidelines	*AG-3-a3*	*3*	*2026-2028*
Collaborate with Napa RCD to develop CFP for all agricultural land categories	*AG-3-a3*	*3*	2026-2028

Ongoing Program Management Tasks		Duration, yr.	Timeline
periodic webpage/resource update	*AG-3-a2*	*0.1 annually, 10*	*2026 - 2035*
implementation/management of grant program for local CFP partners	*AG-3-a3*	*8*	*2028 - 2035*
Provide grant application assistance to income-qualified farmers/ranchers	*AG-3-a3*	*8*	*2028 - 2035*
Provide grant application assistance for applicants that commit to annual reporting	*AG-3-a3*	*8*	*2028 - 2035*
implementation and management of workshop program	*AG-3-a2*	*8*	*2028 - 2035*
periodic review and update of incentives and grants, analyze and disseminate annual reporting data from CFP grant program partic	*AG-3-a3*	*8*	*2026-2035*
Support local supply chain for plant stock and composting	*AG-3-a4*	*8*	2026-2035

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Grants to support local CFP partners	*AG-3-a3*	*75% of farmers qualify*	2035
material costs for supply chain on-farm composting program	*AG-3-a4*	*50% of farmers qualify*	2035
material costs for supply chain plant stock composting program	*AG-3-a4*	*3% of farmers qualify*	2035

Data Request Tab Instructions:

Input required	No input needed		client-provided value
Input optional (to override **preliminary** assu		Updated by Jacobs based on industry best	client-provided value superseded with more specific information. Updated per 3/12 staff comments and follow up discussion 4/2/25

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Measure				Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
9	Agriculture and Open Space	Increase Carbon Storage	Enhance carbon farming practices in the region	*Average CFP grant award*	*$10,000*	*USD*	Client input	Moderate	Jesse: To deliver complete Carbon Farming Plan. Based on conversations with RCD. Client input on 1/31/25
				Qualifying CFP grants/year	*20*	*quantity*	Client input	Moderate	Client input on 1/31/25
				~~*Support for local supply chain develo*~~	~~*$1,000*~~	~~*USD/acre*~~	~~Client input~~	~~Moderate~~	Client input: $500-1000/acre. Using high end of range as a conservative estimate. Funding directly to farmer to implement CFD. Client input on 1/31/25. Number not used, due to more specific values provided after county input.
				Support for onsite compost local sup	*$270*	*USD/CY*	Jacobs Industry Best Practice	Moderate	NRCS conservation payments for CSP 336 Soild Carbon Amendment reimbursed CA farmers up to this amount for compost produced onsite
				Support for offsite compost local sup	*$1,698*	*USD/CY*	Jacobs Industry Best Practice	Moderate	NRCS conservation payments for CSP 336 Soil Carbon Amendment reimbursed CA farmers up to $270.21/CY up to this amount for compost procured from off-site
				Average compost application rate	*4.5*	*tons/acre*	Jacobs research	High	https://agroecology.berkeley.edu/resources/compost-bene https://www.peachcountrytractor.com/pages/mulch-calculator#:~:text=Length%20x%20Width%20=%20Square%20Feet,yd).
				Conversion of cubic yards per ton	*1.4*	*CY/ton*	Jacobs research	High	
				Assumed Average Onsite Compost U	*90%*	*%*	Jacobs assumption	Low	
				Assumed Average Offsite Compose U	*10%*	*%*	Jacobs assumption	Low	
				Compost local supply chains support	*5*	*years/farmer*	Jacobs Industry Best Practice	Moderate	Assume 100% of the farm acres owned by farmers adopting CSP 336 utilize the incentive
				Support for nursery stock local supply	*20%*	*% of start-up cost*	Jacobs Industry Best Practice	Moderate	

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Brenda Hom 10/23/24 "Probably some additional funding to ensure there are enough native plants to plant. But they will need to find that funding, which might be under Amy Lapin's scope to provide" and Erik de Kok 10/23/24 "Yes. The actual funding source is not known yet. But I think the question is whether program involves seeking financial support and staff time associated with that, which would be a correct assumption." Jacobs assumption: Number for vineyard nursery stock. Assumes Vines at $10,108/acre; custom plant, dig, place cartons, plant vines at $3,888/acre; one time cost of vineyard removal and clean field by hand at $4,500/acre; soil amendments at $870/acre; rip 3x at $975/acre; disc 3x at $270/acre; level at $300/acre.
				Start-up cost for establishing nursery	*$20,911*	*USD/acre*	Jacobs Industry Best Practice	Moderate	
				Average acres per farm	*137*	*acres/parcel*	Jacobs research	High	https://www.nass.usda.gov/Publications/AgCensus/2022/(
				Total crop land in Napa County	*68,190*	*acres*	Jacobs research	High	Just cropland acreage; total farm acreage is 242,403 acres
				Total vineyard land in Napa County	*28,890*	*acres*	Jacobs research	High	Just vineyard acreage
				Establish university and community p	*0.20*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				RCAAP webpage development	*0.10*	*FTEs over task dur*	Jacobs assumption	Low	Per 4/2/25 staff discussion, LOE reduced to only include adding a single webpage to an existing website.
				Periodic webpage updates	*0.10*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Other educational resource developr	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Categorize carbon capture potential	*0.50*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop grant program	*0.50*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Implement and manage grant progra	*1.50*	*FTEs over task dur*	Jacobs Industry Best Practice	Moderate	
				Grant application assistance	*0.50*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop annual workshop program	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Implement and manage workshop pr	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop technical assistance guideli	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Brenda Hom 10/23/24 "This will most likely be realized as additional funding for Napa RCD to provide the proposed assistance. Napa RCD is already doing the proposed action, they just need more staff. Probably another 2-4 staff over the next 10 years." Jacobs has dived the 2-4 staff requirement by individual function. Reviewed with Jacobs team and consistent with industry best practices.
				Collaborate with Napa RCD to develo	*1.00*	*FTEs over task dur*	Jacobs assumption	Low	
				Analyze data from program participar	*1.00*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Support local supply chain for plant s	*0.75*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Low	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.
				Number of farms (including vineyards) in program area	*1772*	# of applicable par	Jacobs research	High	https://www.nass.usda.gov/Publications/AgCensus/2022/(
				Land owner adoption of compost sup	*10%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of compost sup	*25%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices. Assume that 50% of all vineyard acres in the county will utilize the compost development incentive . Assume that this incentive will be a continual payment to each farmer for up to 5 years. Assume that the first three year's adoption rate will be 10%, the next three years will be an additional 15%, and the final four years will be 25%.
				Land owner adoption of compost sup	*50%*	%	Jacobs assumption	Low	
				Land owner adoption of compost sup	*50%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of native plant s	*1%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of native plant s	*2%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices. CDFA has offered a similar program. Assume the goal is to establish vineyard nursery stock. Assume 3% of all vineyard acres (2,889 acres) adopt and develop nursery stock for the local supply chain by year 10.
				Land owner adoption of native plant s	*3%*	%	Jacobs assumption	Low	
				Land owner adoption of native plant s	*3%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.

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Estimate #: 9
Emissions Sector: Agriculture and Open Space
Strategy: Increase Carbon Storage
Measure: Enhance carbon farming practices in the region

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Land types included:	only vineyard acres considered for local supply chain support	
Number of farms and vineyards in program a	1,772	# land parcels
Total crop land in farms	68,190	acres
Average crop land size per farm	38	acres
Total vineyard acres in county	28,890	acres

Adoption

Year 3		
Land owner adoption of compost local supp	10%	of all landowners in implementation area
Land owner adoption of native plant stock s	1%	of all landowners in implementation area

Year 6		
Land owner adoption of compost local supp	25%	of all landowners in implementation area
Land owner adoption of native plant stock s	2%	of all landowners in implementation area

Year 10		
Land owner adoption of compost local supp	50%	of all landowners in implementation area
Land owner adoption of native plant stock s	3%	of all landowners in implementation area

Year 20		
Land owner adoption of compost local supp	50%	of all landowners in implementation area
Land owner adoption of native plant stock s	3%	of all landowners in implementation area

Grants & Material Costs

Average Grant Award			
CFP Grant Award	$10,000		USD/grant
Qualifying CFP Grants/Year	20		
Compost Supply Chain Program Onsite Compost Support	$270		USD/CY
Compost Supply Chain Program Offsite Compost Support	$1,698		USD/CY
Assumed Average Onsite Compost Used	90%		
Assumed Average Offsite Compose Used	10%		
Average Compost Supply Chain Support in $/ton	$578		USD/ton
Average Compost Application Rate		4.50	ton/acre
Compost Supply Chain Program Average Support	$2,602		USD/acre
Compost Supply Chain Support Duration	5		years/farmer
Compost Supply Chain Annualized Support Costs	$1,301		$/acre/yr
Native Plant Supply Chain Program Startup Costs	$20,911		USD/acre
Maximum eligible support for native plant	20%		% of startup costs

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate, $/hr	Cost
Establish university and community partnerships	1 to 2	0.20	2	$140	$112,000
RCAAP webpage development	1	0.10	1	$140	$28,000
Periodic webpage updates	1 to 10	0.10	10	$140	$280,000
Other educational resource development	1	0.25	1	$140	$70,000
Categorize carbon capture potential of natural easements	1 to 2	0.50	2	$140	$280,000
Develop grant program	1 to 2	0.50	2	$140	$280,000
Implement and manage grant program	3 to 10	1.50	8	$140	$3,360,000
Grant application assistance	3 to 10	0.50	8	$140	$1,120,000
Develop annual workshop program	1 to 3	0.25	3	$140	$210,000
Implement and manage workshop program	1 to 3	0.25	3	$140	$210,000
Develop technical assistance guidelines	1 to 3	0.25	3	$140	$210,000
Collaborate with Napa RCD to develop CFP	1 to 3	1.00	3	$140	$840,000
Analyze data from program participants, review and update grant program	1 to 10	1.00	10	$140	$2,800,000
Support local supply chain for plant stock and composting	1 to 10	0.75	10	$140	$2,100,000

Total Cost Calculation

	Cumulative Spent				
	Year 3	Year 6	Year 10	Year 20	**Total**
Total CFP Grant Costs	$600,000	$1,200,000	$2,000,000	$2,000,000	$2,000,000
Total Compost Supply Chain Program Costs	$11,274,979	$28,187,447	$75,166,525	$75,166,525	$75,166,525
Total Native Plant Stock Supply Chain Progra	$1,208,238	$2,416,475	$3,624,713	$3,624,713	$3,624,713
Total administrative labor costs	$4,354,000	$7,588,000	$11,900,000	$11,900,000	$11,900,000
Total cost (at today's value)	$17,437,216	$39,391,922	$92,691,238	$92,691,238	**$92,691,238**

	Annual Spent																			
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total CFP Grant Costs	$0	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Compost Supply Chains Program Cost	$0	$3,758,326	$3,758,326	$3,758,326	$5,637,489	$5,637,489	$5,637,489	$11,744,770	$11,744,770	$11,744,770	$11,744,770	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Native Plant Stock Supply Chain Progra	$0	$402,746	$402,746	$402,746	$402,746	$402,746	$402,746	$302,059	$302,059	$302,059	$302,059	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total administrative labor costs	$0	$1,451,333	$1,451,333	$1,451,333	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$5,812,405	$5,812,405	$5,812,405	$7,318,235	$7,318,235	$7,318,235	$13,324,829	$13,324,829	$13,324,829	$13,324,829	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Real discount rate	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%
Discount Factor		0.98	0.96	0.95	0.93	0.91	0.89	0.88	0.86	0.84	0.83	0.81	0.80	0.78	0.77	0.75	0.74	0.73	0.71	0.70	0.69
Annual net present value (annual)	$0	$5,704,029	$5,597,673	$5,493,300	$6,787,497	$6,660,939	$6,536,741	$11,679,987	$11,462,205	$11,248,484	$11,038,748	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total net present value	**$82,209,602**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm assumptions for local compost supply chain support. This is the largest driver of cost.
Review and confirm the number and cost of CFP grants to be issued.
Review adoption rates to see what is expected specific to County. Generally it is understood that these types of programs historically have low adoption rates based on total acres available.

Additional notes:

Comments received from client:
- An annual discount rate of 1.9% is used for this estimate. This is the 10-year real interest rate on US treasury notes and bonds for the 2025 calendar year per OMB Circular No. A-94.

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ATTACHMENT I-2

Ascent Cost Estimation
Programmatic Summary of GHG Measures

Napa County RCAAP

Prepared by: A. White, O. Guretta
Prepared for: Erik de Kok
April 11, 2025
Revision 3

The cost include here are not an offer for construction and/or project execution. The costs presented in this estimate are considered Class 4 with an accuracy range of -30% to +50% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries (AACE International 2021). The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.

Programmatic costs are estimated based on inputs provided by the County of Napa and assum

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Summary of the GHG Mitigation Measures Estimated Costs.

Results are contingent on the accuracy of the input data provided by the County and specific assumptions for each measures should be reviewed for consistency as the measures are further developed.

Summary of Estimated Costs

Measure	Emissions Sector	Strategy	Measure	Net Present Value	Total Cost (Not Discounted)
BE-1 (M1)	Building Energy	Energy Efficiency and Electrification	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.	$359,870,000	$448,380,000
BE-5 (M2)	Building Energy	Zero Carbon Development	Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction	$1,060,000	$1,330,000
TR-3 (M3)	On-Road Transportation	Low and Zero Emissions Vehicles	Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure	$350,000	$380,000
TR-11 (M4)	On-Road Transportation	Transportation Demand Management (TDM)	Expand Individual Trip TDM Programs	$2,750,000	$3,340,000
OF-3 (M5)	Off-Road Transportation	Electrification and Clean Alternatives	Zero Carbon Construction Equipment - Community	$150,000	$180,000
SW-1 (M6)	Solid Waste	Zero Waste	Increase diversion of solid waste to achieve >80% diversion from landfills by 2035	$14,890,000	$18,250,000
WW-1 (M7)	Water/Waste Water	Waste Water Treatment	Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)	$1,890,000	$2,390,000
AG-1 (M8)	Agriculture and Open Space	Reduce GHGs from Agricultural Equipment	Reduce fossil fuel consumption in field equipment	$155,180,000	$204,750,000
AG-3 (M9)	Agriculture and Open Space	Increase Carbon Storage	Enhance carbon farming practices in the region	$82,210,000	$92,690,000

General Notes

- Measures are each estimated individually as standalone programs. There is potential for efficiency in bundling the Measures together.
- Estimates include new projected costs expected to be realized by Napa County. Funding from other sources required for successful program implementation is not included unless otherwise noted.

-The cost include here are not an offer for construction and/or project execution. The costs presented in this estimate are considered Class 4 with an accuracy range of -30% to +50% of the actual cost, according to the Recommended Practice No. 107R-19: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries (AACE International 2021). The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

To refine each of the cost estimates, the following could be done:

- Review and confirm the assumptions on labor costs, both the assumed rate and FTE.
- Periodic costs, such as a program updates occurring every 3 or 5 years, are annualized for estimate purposes. These costs can be allocated to specific years and discounted accordingly as more details of timing and precise implementation are defined.

For each of the cost estimates, the following assumptions are made:

- Labor costs include internal staff, not consultants unless otherwise noted.
- An annual discount rate of 2.2% is used for all estimates unless otherwise noted. This is the 20-year real interest rate on US treasury notes and bonds for the 2025 calendar year per OMB Circular No. A-94.

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Estimate #: 1
Emissions Sector: Building Energy
Strategy: Energy Efficiency and Electrification
Measure: 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.

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Duration, yr.	Timeline
Pre-electrification program development	*3*	*2026 - 2028*
Reach code development	*3*	*2026 - 2028*
Streamline permitting program	*1*	*2026*
Community outreach and education	*3*	*2026 - 2028*
Residential income limit study	*3*	*2026 - 2028*
Non-residential participation study	*3*	*2026 - 2028*

Ongoing Program Management Tasks	Duration, yr.	Timeline
Implementation management	*16*	*2029 - 2045*
Reach code updates (every 3 years)	*16*	*2029 - 2045*
Permitting and outreach updates (annually)	*16*	*2029 - 2045*
Income limit reviews (annually)	*16*	*2029 - 2045*
Income limit program major review and update (one time)	*1*	*2035*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal	Target	Deadline
Transition all existing residential buildings to all-electric with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	*Avg two rebate projects per home*	2045
Transition all existing nonresidential buildings to all-electric with a target of 25 percent of existing buildings by 2030 and 100 percent by 2045.	*Avg two rebate projects per building*	2045

Data Request Tab Instructions:

Input required	No input needed
Input optional (to override **preliminary** assumption)	Red text indicated change based on review in 9-2025.

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Measure				Assumptions				
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
1	Building Energy	Energy Efficiency and Electrification	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.	*Building types included*	*residential and non-residential*	*text*	Client input	High	
				Number of residential homes in program area	*56,049*	*quant*	Census data	High	Not all homes/buildings will require participation in rebate program. This is accounted for by "Residential target" value below. This number has been updated based on Ascent 9-19-25
				Number of non-residential buildings in program area	*34,890*	*quant*	Census data	High	Not all buildings will require participation in rebate program. This is accounted for by "Non-residential target" value below. Value confirmed on 2-27-25.
				Residential target	*2.0*	*avg projects per building*	Client input	Moderate	Ground truth research: 2.7 natural gas appliances per home. See References tab for additional info
				Non-residential target	*2.0*	*avg projects per building*	Client input	Low	Preliminary research did not return a value for number of natural gas appliances per non-res building. Recommend confirming this value, as non-res. rebate costs are largest driver of total program cost.
				Residential adoption	*25%*	*of all homes at year 5*	Client input	High	
					50%	*at year 10*	Client input	High	
					75%	*at year 15*	Client input	High	
					100%	*at year 20*	Client input	High	
				Non-Residential adoption	*25%*	*of all buildings at year 5*	Client input	High	
					50%				Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Ordinance is already adopted, and the labor for other jurisdictions to adopt a similar ordinance is assumed to be low, per County guidance. The labor for ongoing enforcement was approved by the County. After Discussion on 4/2, leaving this at 0.5 FTE to account for coordination with jurisdictions adopting their own ordinances per County guidance.
						at year 10	Client input	High	
					75%				Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.
						at year 15	Client input	High	
					100%	*at year 20*	Client input	High	
				Average residential rebate	*$2,000*	*USD*	Client Input	Moderate	Based on similar rebate programs initial rebate was defined at $1,500. Rebate values vary widely across all similar programs. Key driver in total cost estimate. Per comment from staff, value revised to be higher (maybe closer to $2000-$3000).
				Average non-residential rebate	*$3,500*	*USD*	Client Input	Low	Based on similar rebate programs original cost $3,000. Rebate values vary widely across all similar programs. Key driver in total cost estimate. Should be reviewed. Per comment from staff, value revised to be higher.
				Average residential permitting fee	*$290*	*USD*	Jacobs research	Moderate	Assumes permitting fee for "new or alteration to electrical" according to Napa County Example Fees for Common BES Projects
				Residential permitting fee reduction	*20%*	*of total fee*	Client input	Moderate	
				Average non-residential permitting fee	*$740*	*USD*	Jacobs research	Moderate	Assumes permitting fee for "new or alteration to electrical" according to Napa County Example Fees for Common BES Projects
				Non-Residential permitting fee reduction	*20%*	*of total fee*	Client input	Moderate	
				Pre-electrification program development labor	*1.0*	*FTEs over task duration*	Jacobs assumption	Low	
				Reach code development labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	

Streamlined permitting program labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
Community outreach and education labor	*1.0*	*FTEs over task duration*	Jacobs assumption	Low	
Residential income limit study labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
Non-residential participation study labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
Implementation management labor	*1.2*	*FTEs over task duration*	Jacobs assumption	Low	
Reach code updates labor	*0.1*	*FTEs over task duration*	Jacobs assumption	Low	
Permitting and outreach updates labor	*0.1*	*FTEs over task duration*	Jacobs assumption	Low	
Income limit reviews labor	*0.3*	*FTEs over task duration*	Jacobs assumption	Low	
Income limit program major review and update labor	*0.5*	*FTEs over task duration*	Jacobs assumption	Low	
Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 1
Emissions Sector: Building Energy
Strategy: Energy Efficiency and Electrification
Measure: Develop a comprehensive energy retrofit program to transition existing residences and businesses to net zero carbon by 2045

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Home types included:	residential and non-residential
Number of residential homes in program area	56,049
Number of non-residential buildings in program area	34,890
Avg number of natural gas appliances per residential home	2.00
Avg number of natural gas appliances per non-residential building	2.00

Adoption

Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction

Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.

Year 5		
Residential adoption	25%	of all homes in implementation area
Commercial adoption	25%	of all commercial buildings in implementation area
Year 10		
Residential adoption	50%	of all homes in implementation area
Commercial adoption	50%	of all commercial buildings in implementation area
Year 15		
Residential adoption	75%	of all homes in implementation area
Commercial adoption	75%	of all commercial buildings in implementation area
Year 20		
Residential adoption	100%	of all homes in implementation area
Commercial adoption	100%	of all commercial buildings in implementation area

Rebates

Average rebate	
Residential rebate per project	$2,000
Commercial rebate per project	$3,000

Reduced permitting fees

	Avg permitting fee	Fee reduction	Cost per permit to Jurisdictions
Residential	$290	20%	$58
Commercial	$740	20%	$148

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate, $/hr	Cost
Pre-electrification program development labor	1 to 3	1.00	3	$140	$840,000
Reach code development labor	1 to 3	0.50	3	$140	$420,000
Streamlined permitting program labor	1 to 3	0.50	3	$140	$420,000
Community outreach and education labor	1 to 3	1.00	3	$140	$840,000
Residential income limit study labor	1 to 3	0.50	3	$140	$420,000
Non-residential participation study labor	1 to 3	0.50	3	$140	$420,000
Implementation management labor	4 to 20	1.20	17	$140	$5,712,000
Reach code updates labor	4 to 20	0.13	17	$140	$595,000
Permitting and outreach updates labor	4 to 20	0.13	17	$140	$595,000
Income limit reviews labor	4 to 20	0.25	17	$140	$1,190,000
Income limit program major review and update labor	10	0.50	1	$140	$140,000

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total residential rebate cost	$56,049,000	$112,098,000	$168,147,000	$224,196,000	$224,196,000
Total commercial rebate cost	$52,335,000	$104,670,000	$157,005,000	$209,340,000	$209,340,000
Total permit fee reduction cost	$812,711	$1,625,421	$2,438,132	$3,250,842	$3,250,842
Total administrative labor costs	$4,312,000	$6,832,000	$9,212,000	$11,592,000	$11,592,000
Total cost (at today's value)	$113,508,711	$225,225,421	$336,802,132	$448,378,842	**$448,378,842**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total residential rebate cost	$0	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800	$11,209,800
Total commercial rebate cost	$0	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000	$10,467,000
Total permit fee reduction cost	$0	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542	$162,542
Total administrative labor costs	$0	$862,400	$862,400	$862,400	$862,400	$862,400	$504,000	$504,000	$504,000	$504,000	$504,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000	$476,000
Total spent	$0	$22,701,742	$22,701,742	$22,701,742	$22,701,742	$22,701,742	$22,343,342	$22,343,342	$22,343,342	$22,343,342	$22,343,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342	$22,315,342
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$22,213,055	$21,734,887	$21,267,013	$20,809,210	$20,361,263	$19,608,427	$19,186,328	$18,773,315	$18,369,193	$17,973,770	$17,564,820	$17,186,712	$16,816,744	$16,454,739	$16,100,528	$15,753,941	$15,414,815	$15,082,989	$14,758,307	$14,440,613
Total net present value	**$359,870,669**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm the number of rebates to be issued and the cost per rebate for the commercial rebate program. This is the largest driver of cost.
There is variability in the desired number of equipment between county provided data - review to determine if 2.0 or 2.7 rebate will be provided per building type.

Additional notes:

- Assumption: all new homes built after 2024 have electric equipment and will not need to utilize rebate program.

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Estimate #2
Emissions Sector: Building Energy
Strategy: Zero Carbon Development
Measure: BE-5: Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.
Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Setup Tasks	Measure -Action ID	Duration, yr.	Timeline
Develop and adopt regionally consistent energy efficiency and renewable energy reach building codes	BE-5a	2	2027 - 2028
Develop process to track climate and energy codes and bills	BE-5b	2	2027 - 2028
Develop a process for evaluating and updating low carbon building material requirements	BE-5c	2	2027 - 2028

minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated

Ongoing Program Management Tasks		Duration, yr.	Timeline
Implement and manage regional energy reach codes program	BE-5a	17	2029 - 2045
Reach code updates (every 3 years)	BE-5	17	2029 - 2045
Review progress of state codes and bills to inform regional reach code	BE-5b	17	2029 - 2045
Review regional standards for low carbon building material requirements	BE-5c	17	2029 - 2045

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.
Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
NONE			

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Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.

Data Request Tab Instructions:

Input required | No input needed

Input optional (to override **preliminary** assumption Client-provided value

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	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
			Decarbonize New Buildings						*Client comment: "At this point in time reach codes are not complicated to write, adopt, and implement because so many CA jurisdictions are early adopters and do the heavy lifting...assume FTEs for entire measure over duration would not exceed 0.25" Client input on 1/16/25*
2	Building Energy	Zero Carbon Development		*Reach code development labor*	*0.08*	*FTEs over task duration*	Client input	Moderate	
				Labor to track progress of state codes and bills related to climate to inform initial Reach code development	*0.08*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for initial development of low carbon building materials requirements for Reach code	*0.08*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for Reach code implementation and ongoing program management	*0.06*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for periodic Reach code updates	*0.06*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for state codes/bills review to inform reach code updates	*0.06*	*FTEs over task duration*	Client input	Moderate	Client input on 1/16/25
				Labor for reviewing low carbon building materials requirements to inform Reach code updates	*0.06*	*FTEs over task duration*	Client input	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	

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Estimate #: 2
Emissions Sector: Building Energy
Strategy: Zero Carbon Development
Measure: Develop and adopt a Zero-Carbon Buildings Reach Code for New Construction

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (years	Avg Labor Rate	Cost
Reach code development labor	2 to 3	0.08	2	$140	$46,667
Labor to track progress of state codes and bills related to climate to inform initial Reach code development	2 to 3	0.08	2	$140	$46,667
Labor for initial development of low carbon buidling materials requirements for Reach code	2 to 3	0.08	2	$140	$46,667
Labor for Reach code implementation and ongoing program management	4 to 20	0.06	17	$140	$297,500
Labor for periodic Reach code updates	4 to 20	0.06	17	$140	$297,500
Labor for state codes/bills review to inform reach code updates	4 to 20	0.06	17	$140	$297,500
Labor for reviewing low carbon building materials requirements to inform Reach code updates	4 to 20	0.06	17	$140	$297,500

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$280,000	$630,000	$980,000	$1,330,000	$1,330,000
Total cost (at today's value)	$280,000	$630,000	$980,000	$1,330,000	**$1,330,000**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$56,000	$56,000	$56,000	$56,000	$56,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000
Total spent	$0	$56,000	$56,000	$56,000	$56,000	$56,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000
Real discount rate	##########	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$54,795	$53,615	$52,461	$51,332	$50,227	$61,432	$60,109	$58,815	$57,549	$56,310	$55,098	$53,912	$52,752	$51,616	$50,505	$49,418	$48,354	$47,313	$46,295	$45,298
Total net present value	**$1,057,206**																				

Results Considerations

- Cost to implement is not included due to varying nature of codes

Additional notes:

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Estimate #: 3
Emissions Sector: On-Road Transportation
Strategy: Low and Zero Emissions Vehicles
Measure: Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Study and stakeholder coordination (MTC) to identify location for med / heavy duty fleet	*TR-3-a*	*3*	*2026-2028*
Gap analysis of existing private parking infrastructure to achieve 10% EVSE and an additional 10% EV-ready	*TR-3-b*	*2*	*2026-2027*

Ongoing Program Management Tasks	Measure-Action ID	Duration, yr.	Timeline
Review and update targets and progress for EVSE in parking infrastructure	*TR-3*	*9, every 5 years*	*2027 - 2035*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal	Measure-Action ID	Target	Deadline
NONE			

Data Request Tab Instructions:

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Input required	No input needed	Client-provided value
Input optional (to override **preliminary** assumption)		Updated by Jacobs based on industry best practices

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Measure				Assumptions				
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
3	On-Road Transport	Low and Zero Emissions Vehicles	Increase access to Zero Emissions Vehicle (ZEV) fueling infrastructure	*Labor to identify opportunities and locations for chargers for medium and heavy duty fleet*	*0.25*	*FTEs over task duration*	Client input	Moderate	Program includes county-wide fleet mix, not just county-owned vehicles. Assumes ability to leverage existing GIS info/staff to understand scale of program. From Deborah Elliot: 0.25 because most jurisdictions are getting technical assistance on this from MTC for municipal fleets. Confirmed with Jacobs team. Client input on 1/16/25
				Labor for gap analysis of existing private parking infrastructure	*0.20*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Assume electrical infrastructure info. is available through public utility and that the County already has a relationship with private parking owners and has access to electricity records. Outreach component includes education component but not infrastructure info. gathering. No material costs are included for outreach activities.
				Labor for periodic review and update of requirements	*0.05*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Ongoing updates are about 20% of initial evaluation. Reviewed with Jacobs team and consistent with industry best practices.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumpti	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 3
Emissions Sector: On-Road Transportation
Strategy: Low and Zero Emissions Vehicles
Measure: Increase access to Zero Emissions Vehicle (ZEV) Fueling Infrastructure

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (yea	Avg Labor Rat	Cost
Labor to identify opportunities and locations for chargers for mediu	1 to 3	0.25	2	$140	$140,000
Labor for gap analysis of existing private parking infrastructure	1 to 2	0.20	2	$140	$112,000
Labor for periodic review and update of requirements	2 to 10	0.05	9	$140	$126,000

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$308,000	$378,000	$378,000	$378,000	$378,000
Total cost (at today's value)	$308,000	$378,000	$378,000	$378,000	**$378,000**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$61,600	$61,600	$61,600	$61,600	$61,600	$14,000	$14,000	$14,000	$14,000	$14,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$61,600	$61,600	$61,600	$61,600	$61,600	$14,000	$14,000	$14,000	$14,000	$14,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Real discount rate	##########	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$60,274	$58,976	$57,707	$56,465	$55,249	$12,286	$12,022	$11,763	$11,510	$11,262	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total net present value	**$347,515**																				

Results Considerations

- There is no cost to customer or cost for increased utilization of existing incentive program factored in these results

Additional notes:

Assumes this is for a county wide fleet mix and that there is existing background information available. For example existing studies or mapping tools that have been used to identify the starting and ending point of trips.
Assumes that the County already has some basis for a network that can be used for medium and heavy duty charging.
Measures is for a study only and does not include developing infrastructure.
The cost for external studies done by a consultant are not included.

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Estimate #: 4
Emissions Sector: On-Road Transportation
Strategy: Transportation Demand Management (TDM)
Measure: Expand Individual Trip TDM Programs

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Support NVTA to secure additional funding for existing incentives	*TR-11-a1*	*2*	*2028-2029*
Consider expansion of current TDM programs through outreach	*TR-11-a2*	*3*	*2028-2030*
Develop and adopt TDM ordinances in all jurisdictions by 2028	*TR-11-b1*	*3*	*2028-2030*
Define and develop annual reporting metrics program (e.g. participation, VMT reduction, mode shift, funding)	*TR-11-b1*	*3*	*2028-2030*
Feasibility analysis for mobility as a service (MAAS)	*TR-11-c1*	*3*	*2028-2030*
Identify polices and programs that would spur adoption of services	*TR-11-c1*	*2*	*2028-2030*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Expand TDM program through ongoing outreach to employers and existing participants	*TR-11-a2*	*18*	*2028-2045*
Annual metrics reporting	*TR-11-b1*	*18*	*2028 - 2045*
Review, renew or amend agreements and partnerships	*TR-11-a2*	*18*	*2028 - 2045*
Ongoing evaluation and opportunity assessment ordinance and TDM program implementation	*TR-11-c1*	*18*	*2028 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
NONE			

Data Request Tab Instructions:

Input required	No input needed	Client-provided value
Input optional (to override **preliminary** assumption)		Updated by Jacobs based on industry best practices

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Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
			Expand Individual Trip TDM Programs						Assumes support is limited to identification of relevant grant programs and support in preparation of applications along with existing NVTA staff. Assume that the primary grant application will either be through the state or other transportation agency and that the County staff is minimal / limited with primary to provide information to support Napa Valley Transit, i.e. they are not the primary grant application.
4	On-Road Transportation	Transportation Demand Management (TDM)		*Labor to support NVTA to secure additional funding*	*0.1*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	
				Labor to expand current TDM programs through outreach	*0.2*	*FTEs over task dur.*	Jacobs assumption	Moderate	Develop turnkey outreach program to increase use of existing TDM programs and incentives.
				Labor to develop and adopt TDM ordinances	*0.3*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	Reviewed with Jacobs team and consistent with industry best practices.
				Labor to develop annual reporting metrics process	*0.1*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	Reviewed with Jacobs team and consistent with industry best practices.
				Labor to manage MAAS feasibility study	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	County staff requirement to review and approve consultant study
				Labor to identify policies and programs to spur adoption of services	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	County staff requirement to review and approve consultant recommendations
				Labor for TDM program outreach	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	
				Labor for annual metrics reporting	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	
				Labor to manage partnership relationships	*0.2*	*FTEs over task dur.*	Jacobs Industry Best Practice	Moderate	This is more about bringing all the components together in one place i.e. an app. Assumes mostly private partners – on the order of three partners.
				Labor for ongoing program evaluation	*0.1*	*FTEs over task dur.*	Jacobs assumption	Moderate	Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Ordinance is already adopted, and the labor for other jurisdictions to adopt a similar ordinance is assumed to be low, per County guidance. The labor for ongoing enforcement was approved by the County. After Discussion on 4/2, leaving this at 0.5 FTE to account for coordination with jurisdictions adopting their own ordinances per County guidance.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	
				Material costs for outreach	*$ -*		Client input	Moderate	Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is *assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.*
				Consultant services for MAAS feasibility study and identification of relevant MAAS policies and programs to leverage	*$ 100,000*	*USD*	Jacobs Industry Best Practice	Moderate	Assumes outside consultant for a one time feasibility study and benchmarking of existing programs. This would include a policy audit of the current Napa County polices ex. Parking.

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Estimate #: 4
Emissions Sector: On-Road Transportation
Strategy: Transportation Demand Management (TDM)
Measure: Expand Individual Trip TDM Programs

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (years	Avg Labor Rate	Cost
Labor to support NVTA to secure additional funding	3 to 4	0.10	2	$140	$56,000
Labor to expand current TDM programs through outreach	3 to 5	0.15	3	$140	$126,000
Labor to develop and adopt TDM ordinances	3 to 5	0.25	3	$140	$210,000
Labor to develop annual reporting metrics process	3 to 5	0.10	3	$140	$84,000
Labor for MAAS feasibility study	3 to 5	0.10	3	$140	$84,000
Labor to identify policies and programs to spur adoption of services	3 to 4	0.10	2	$140	$56,000
Labor for TDM program outreach	3 to 20	0.10	18	$140	$504,000
Labor for annual metrics reporting	3 to 20	0.10	18	$140	$504,000
Labor to manage partnership relationships	3 to 20	0.20	18	$140	$1,008,000
Labor for ongoing program evaluation	3 to 20	0.10	18	$140	$504,000

Contract Fees & Material Costs

	Years	Cost
Consultant fee for MAAS feasibility study	3 to 5	$ 100,000
Material costs for outreach	3 to 20	$ -

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$1,136,000	$1,836,000	$2,536,000	$3,236,000	$3,236,000
Total contract fees & material costs	$100,000	$100,000	$100,000	$100,000	$100,000
Total cost (at today's value)	$1,236,000	$1,936,000	$2,636,000	$3,336,000	**$3,336,000**

Annual Spent

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$227,200	$227,200	$227,200	$227,200	$227,200	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000
Total contract fees & material costs	$0	$20,000	$20,000	$20,000	$20,000	$20,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$247,200	$247,200	$247,200	$247,200	$247,200	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000
Real discount rate	############	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$241,879	$236,672	$231,577	$226,592	$221,714	$122,863	$120,219	$117,631	$115,099	$112,621	$110,197	$107,824	$105,503	$103,232	$101,010	$98,836	$96,708	$94,626	$92,589	$90,596
Total net present value	**$2,747,989**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm administrative labor requirements. This is the largest driver of cost.

Additional notes:

Notes:
- Consultant fees included as a lump sum where relevant (MAAS study).
- Assumes the county already has a developed outreach program campaign that can be built upon and ready to launch. Assumes that analytics are run on the current outreach programs and will require some modifications to meet annual reporting requirements but will not be developed from scratch.

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Estimate #: 5
Emissions Sector: Off-Road Transportation
Strategy: Electrification and Clean Alternatives
Measure: Zero Carbon Construction Equipment - Community

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.
Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Ac	Duration, yr.	Timeline
Develop brochure to advertise existing incentives	*OF-3a*	*1*	*2029*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Periodic updates of incentives brochure	*OF-3a*	*every 3 years*	*2030 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.
Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Distribute brochures to provide information about available incentives for electric construction equipment to contractors at the building permit counter		*All contractors seeking a building permit should have access to updated literature*	2045

Data Request Tab Instructions:

Input required	No input needed	client-provided value
Input optional (to override **preliminary** assumptio		Updated by Jacobs based on industry best practices

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	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
5	Off-Road Vehicles and Equipment	Electrification and Clean Alternatives	Zero Carbon Construction Equipment - Community	*FTE for developing electric construction equipment incentive brochure*	*0.1*	*FTEs over task duration*	Jacobs assumption	Low	
				FTE to periodically update brochures for currently available incentives	*0.03*	*FTEs over task duration*	Jacobs assumption	Low	0.1 FTE every 3 years
				Estimated cost/brochure	*0.71*	*USD/brochure*	Jacobs Industry Best Practice	Moderate	Fedex printing cost for color, trifold brochure, 500/order as of 2/19/25
				Target # brochures distributed / year	*500*	*quantity*	Jacobs Industry Best Practice	Moderate	331 single and multi-family building permits issued in Napa county in 2023 according to NAHB source: https://www.nahb.org/News%20and%20Economics/Housing%20Economics/State%20and%20Local%20Data/Building%20Permits%20by%20State%20and%20Metro%20Area
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 5
Emissions Sector: Off-Road Transportation
Strategy: Electrification and Clean Alternatives
Measure: Zero Carbon Construction Equipment - Community

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Program Costs

	Years	FTEs	Duration (ye:	Avg Labor Ra	Cost
Labor to develop incentive brochure	4	0.10	1	$140	$28,000
Labor to periodically update brochures for currently available incentives	5 to 20	0.03	16	$140	$149,333

Material Costs

Cost per brochure	$	0.71
Brochures printed per year		500

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total administrative labor costs	$37,333	$84,000	$130,667	$177,333	$177,333
Total material costs	$355	$2,130	$3,905	$5,680	$5,680
Total cost (at today's value)	$37,688	$86,130	$134,572	$183,013	**$183,013**

	Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	$0	$7,467	$7,467	$7,467	$7,467	$7,467	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333	$9,333
Total material costs	$0	$71	$71	$71	$71	$71	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355	$355
Total spent	$0	$7,538	$7,538	$7,538	$7,538	$7,538	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688	$9,688
Real discount rate	##########	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$7,375	$7,217	$7,061	$6,909	$6,761	$8,502	$8,319	$8,140	$7,965	$7,794	$7,626	$7,462	$7,301	$7,144	$6,990	$6,840	$6,692	$6,548	$6,407	$6,269
Total net present value	**$145,324**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm administrative labor requirements. This is the largest driver of cost.
Review the size of the outreach program to make sure aligns with anticipated population.

Additional notes:

- No incentive funding is included in this estimate. Brenda Hom: "The purpose of this measure is to have the county/cities require the use of zero carbon equipment and identify outside incentive sources (E.g., BAAQMD or the state). Like M4, it is not intended to be funded by the municipalities, but they could if they wanted to."
- Cost to customer would vary widely

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Estimate #: 6
Emissions Sector: Solid Waste
Strategy: Zero Waste
Measure: Increase diversion of solid waste to achieve >80% diversion from landfills by 2035

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.
Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
~~*Setup to expand residential backyard composting program & advertise*~~ *(Although this is listed as a component, per County staff comments no expansion is included in the cost estimate. 4/2/2025)*	*SW-1-a1*	*1*	*2025*
Adopt and implement Reusable Food Ware and Waste Reduction Ordinance	*SW-1-a2*	*2*	*2025 - 2026*
Perform feasibility study to adopt similar ordinance in all regional cities	*SW-1-a3*	*2*	*2025 - 2026*
Implement mandatory commercial food waste diversion program for food facility health permit holders	*SW-1-c,d1/SW-1-a5*	*2*	*2025 - 2026*
Implement waste bin audit program	*SW-1-d2/SW-1-a6*	*2*	*2025-2026*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Ongoing management of residential composting program expansion	*SW-1-a1*	*20 yrs*	*2027 - 2045*
Implementation and enforcement of Reusable Food Ware and Waste Reduction Ordinance	*SW-1-a2*	*19 yrs*	*2027 - 2045*
Ongoing SB 1383/Edible Food Recovery Program Implementation & Management	*SW-1-a4*	*20 yrs*	*2027 - 2045*
Ongoing evaluation of Mandatory Commercial Food Waste Diversion Program	*SW-1-a5*	*20 yrs*	*2027 - 2045*
Ongoing evaluation of Waste Bin Audits	*SW-1-a6*	*20 yrs*	2027 - 2045

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.
Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Composting program outreach - start kit, info pamphlet, composting bins		*0% expansion of existing program*	2045

Data Request Tab Instructions:

Input required	No input needed	client-provided value
Input optional (to override **prelimi**		Updated by Jacobs based on industry best practices
		Updated per 3/12 staff comments and follow up discussion 4/2/25

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	Measure			Assumptions					
#	Emissions Secto	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
6	Solid Waste	Zero Waste	Increase diversion of solid waste to achieve diversion of at least 80% of waste from landfills by 2035	~~*Existing enrolled households in backyard compost program*~~	90	*# households*	Client input	High	# of households enrolled number from a 2018 source, scaled by the population change between 2018 and 2024 Source found governments spent an average of $12 per ton of organic materials composted at home; used an average of 646 pounds per year for each household. *Jesse: This number is County and City combined*. Client input on 1/30/25
				~~*Existing annual material costs for backyard compost program*~~	5100	*USD/year*	Client input	High	
				~~*Existing labor for management of backyard compost program*~~	0.011	*FTE/year*	Client input	High	Based on job titles found under County of Los Angeles Public Works directory; Napa County directories are not working. *Jesse: This number is County and City combined*. Client input on 1/30/25
				% expansion target for backyard composting program	0%	*%*	Client input	High	We assume that funding for the existing residential compost program is outside scope and are only considering expansions to the program. Per client feedback, setting the expansion target to 0. This brings costs for labor and materials to support the residential compost program expansion to 0 in the cost estimate. Target can be adjusted to include associated costs in the estimate as needed. *Jesse: Both the City of Napa and the County have reduced the number of backyard composting workshops due to a decrease in participation over the years. A noted reason could be the increase, accessibility, and convenience of curbside cart composting. Their Worm Composting Workshops have become more popular than the traditional compost bin.* Client input on 1/30/25
				~~*Progress toward expansion target at year 5*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.

	Measure			Assumptions					
#	Emissions Secto	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				~~*Progress toward expansion target at year 10*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.
				~~*Progress toward expansion target at year 15*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.
				~~*Progress toward expansion target at year 20*~~	0%		Jacobs assumption	Low	The progress % are not applicable since there is no expected increase in program expansion.
				~~*Labor to set up expansion of backyard compost program*~~	*0*	*FTEs over task duration*	Client input	High	Updated to zero since staff indicates no set up for compost program expansion is needed
				Labor for adopting Reusable Food Ware and Waste Reduction Ordinance	*0.5*	*FTEs over task duration*	Client Input	Moderate	Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Ordinance is already adopted, and the labor for other jurisdictions to adopt a similar ordinance is assumed to be low, per County guidance. The labor for ongoing enforcement was approved by the County. After Discussion on 4/2, leaving this at 0.5 FTE to account for coordination with jurisdictions adopting their own ordinances per County guidance.
				Labor for ongoing enforcement of Reusable Food Ware and Waste Reduction Ordinance	*0.5*	*FTEs over task duration*	Jacobs Industry Best Practice	Low	Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.

Measure			Assumptions					
#	Emissions Secto	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				Manage feasibility study to adopt Reusable Food Ware and Waste Reduction Ordinance in all cities	*0.25*	*FTEs over task duration*	Jacobs Industry Best Practice		One time fee. Reviewed with Jacobs team and consistent with industry best practices.
				Contracted feasibility study to adopt Reusable Food Ware and Waste Reduction Ordinance in all cities	*$ 50,000*	*USD*	Jacobs Industry Best Practice		Deborah: This is higher for the City of Napa. I can contact our solid waste team if needed, but we have multiple staff working on this issue. I think this can be increased to 1 FTE. Client input on 1/31/2025. Title changed to "Labor to expand commercial food waste diversion program"(It was noted that all jurisdictions should have a program in place already. Client Comment 4/2/2025. (D. Elliott))
				Labor to expand commercial food waste diversion program	*1.0*	*FTEs over task duration*	Client input	Moderate	
				Technician labor to implement waste bin audit program	*1.0*	*FTEs over task duration*	Jacobs assumption	Low	No material costs for audit program are included. Labor for technician to complete audits. All audits are completed manually by a field technician.
				Labor to manage and evaluate effectiveness of commercial food waste diversion program	*1.25*	*FTEs over task duration*	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices. Labor for project management, reviewing audit reports, aggregate findings, annually review program effectiveness, and adjust metrics as needed
				Labor for SB1383/Edible Food Recovery Program Implementation and Management	*1.25*	*FTEs over task duration*	Client input	Moderate	Deborah: This Probably should be higher for City of Napa, 1 FTE. Client input on 1/16/25. Per comments received 3/12 and discussion 4/2, increasing to 1.25 FTE to account for required coordination with individual jurisdictions.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 6
Emissions Sector: Solid Waste
Strategy: Zero Waste
Measure: Increase diversion of solid waste to achieve >80% diversion from landfills by 2035

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Existing enrolled households in backyard compost progr	90		
Existing annual material costs for backyard compost pro	$	5,100	
Existing labor for management of backyard compost pro	0.011		FTE
% expansion target for backyard composting program	0%		
new households enrolled in program based on expansion	0		

Adoption

minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the co

Year 5		
Residential compost program expansion	0%	of all homes in implementation area
Year 10		
Residential compost program expansion	0%	of all homes in implementation area
Year 15		
Residential compost program expansion	0%	of all homes in implementation area
Year 20		
Residential compost program expansion	0%	of all homes in implementation area

Material Costs

Material costs for compost program expansion	
Compost program costs/enrolled household/year	$56.67
Feasibility to adopt Reusable Food Ware and Waste Red	$50,000

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate,	Cost
Labor to set up expansion of backyard compost program	0	0	1	$ 140	$0
Labor for adopting Reusable Food Ware and Waste Reduction Ordinance	0 to 1	0.50	2	$ 140	$280,000
Labor for ongoing enforcement of Reusable Food Ware and Waste Reduction Ordinance	2 to 20	0.50	19	$ 140	$2,660,000
Labor for managing feasibility study to adopt Reusable Food Ware and Waste Reduction Ordinance in all cities	0 to 1	0.25	2	$ 140	$140,000
Labor to develop commercial food waste diversion program	0 to 1	1.00	2	$ 140	$560,000
Technician labor to implement waste bin audit program	0 to 1	1.00	2	$ 140	$560,000
Labor to manage and evaluate effectiveness of commercial food waste diversion program	1 to 20	1.25	20	$ 140	$7,000,000
Labor for SB1383/Edible Food Recovery Program Implementation and Management	1 to 20	1.25	20	$ 140	$7,000,000
Additional labor for backyard compost program expansion	1 to 20	0.00	20	$ 140	$0

Total Cost Calculation

Cumulative Spent					
	Year 5	Year 10	Year 15	Year 20	Total
Total material costs for residential compost program exp	$0	$0	$0	$0	$0
Total costs for contracted studies	$50,000	$50,000	$50,000	$50,000	$50,000
Total administrative labor costs	$5,600,000	$9,800,000	$14,000,000	$18,200,000	$18,200,000
Total cost (at today's value)	$5,650,000	$9,850,000	$14,050,000	$18,250,000	**$18,250,000**

Annual Spent																						
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Total material costs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Total costs for contracted studies	$50,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Total administrative labor costs	$933,333	$933,333	$933,333	$933,333	$933,333	$933,333	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	
Total spent	$941,667	$941,667	$941,667	$941,667	$941,667	$941,667	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	$840,000	
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	
Discount Factor	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65	
Annual net present value (annual)	$941,667	$921,396	$901,562	$882,154	$863,165	$844,584	$737,181	$721,312	$705,785	$690,591	$675,726	$661,180	$646,947	$633,020	$619,394	$606,060	$593,014	$580,249	$567,758	$555,536	$543,577	

Total net present value	$14,891,855

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm the expansion target for residential compost program.
Review and confirm assumptions for administrative labor requirements. Ongoing labor requirements for the Commercial Food Waste Diversion Program and Edible Food Recovery Program are the largest drivers of cost.

Additional notes:

- 100% of contract study fees are all included in Year 0.
- Year 0-5 costs are spread evenly across Year 0-5 instead of 1-5 as with the other measures since this is the only measure with significant spending in Year 0
- Incentives to make organic waste pickup less expensive than standard landfill pickup are not included in program.
- Additional air space freed up in landfills may result in savings that offset some of the associated program costs. The changes in landfill infrastructure are not included in this measure or cost estimate.

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Estimate #: 7
Emissions Sector: Water/Waste Water
Strategy: Waste Water Treatment
Measure: Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Develop evaluation program for options to reduce fugitive emissions for WWTPs without waste-to-energy systems	*WW-1*	*1*	*2032*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Evaluate and periodically update program	*WW-1*	*14*	*2032 - 2045*
Program implementation/oversight/audit evaluations (Assumes audits are performed by existing onsite staff with analysis and follow up by the county/jurisdictions)	*WW-1*	*14*	*2032 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal	Target	Deadline

NONE			

Data Request Tab Instructions:

Input required	No input needed
Input optional (to override **preliminary** assu	Updated by Jacobs based on industry best practices Updated per 3/12 staff comments and follow up discussion 4/2/25
client-provided value	

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
			Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)						Assumption: 2 Napa County facilities (NBRID and LBRID) plus 4 smaller jurisdictions/private WWTP included in program. 5 active NPDES permits per the state water resource control board. *Jesse: Napa County's 2 facilities (NBRID and LBRID) are not equipped with waste-to-energy. There are challenges in the engineering economics for methane gas recovery for a facility of this size according to District Engineer of Water Resources. It is likely that the smaller jurisdictions face similar challenges with bringing waste-to-energy to their wastewater treatment plants.* Client input on 1/30/25
7	Water/Wastewater	Waste Water Treatment		*Waste water treatment plants without waste-to-energy*	*6.00*	*quantity*	Client input	Low	
				Labor to evaluate audits and administer program	*0.25*	*FTEs over task duration*	Client input	Moderate	Labor to manage, evaluate, and administer audit program. Assumes contracted baseline assessment plus facility-administered updates every 3 years, with oversight and evaluation by the county/jurisdictions. If 6 plants are included in program, 2 audits would be completed per year. LOE reduced per County comment for assuming existing onsite staff will implement this program. 4-2-2025.
				Labor for program monitoring and updates	*0.10*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Project manager to oversee, report on, and update program as needed

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				Labor for program setup	*1.50*	*FTEs over task duration*	Jacobs Industry Best Practice	Moderate	Assumes a project manager and full time assistant. Program setup includes development of standard tools & templates (e.g. leak detection work practice forms) to implement industry best practices, especially for smaller facilities. Labor for program set-up was not reduced but labor to do ongoing evaluations were per client comment 4/2/2025. If existing audit programs are already established this set-up program may be reduced as appropriate based on current level of existing program.
				Target percent of applicable plants to audit per year	*33%*		Jacobs assumption	Moderate	Measure description specifies audits every 3 years. Assume audits are staggered so a fixed number are completed per year.
				Contract fee for initial baseline audits	*########*	*USD/audit*	Jacobs Industry Best Practice	Moderate	Assumes a contracted baseline evaluation for each plant is included as a lump sum fee. Internal resources are assumed to manage periodic (every 3 yr) updates to the baseline evaluations.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

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Estimate #: 7
Emissions Sector: Water/Waste Water
Strategy: Waste Water Treatment
Measure: Reduce fugitive methane emissions from Wastewater Treatment Plants (WWTPs)

**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Waste water treatment plants withou	6.00
% plants audited per year	33%

Material Costs & Contract Fees

Average contract Fee for baseline as	$100,000

minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure

Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the count

Program Costs

	Years	FTEs	Duration (year	Avg Labor Rate	Cost
Labor to evaluate audits and adminis	7 to 20	0.25	14	$140	$980,000
Labor for program monitoring and up	7 to 20	0.10	14	$140	$392,000
Labor for program setup	7	1.50	1	$140	$420,000

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	Total
Total administrative labor costs	$0	$812,000	$1,302,000	$1,792,000	$1,792,000
Total material costs & contract fees	$0	$600,000	$600,000	$600,000	$600,000
Total cost (at today's value)	$0	$1,412,000	$1,902,000	$2,392,000	**$2,392,000**

Annual Spent

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total administrative labor costs	############	$0	$0	$0	$0	$0	$162,400	$162,400	$162,400	$162,400	$162,400	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000
Total material costs & contract fees	############	$0	$0	$0	$0	$0	$120,000	$120,000	$120,000	$120,000	$120,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	############	$0	$0	$0	$0	$0	$282,400	$282,400	$282,400	$282,400	$282,400	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000	$98,000
Real discount rate	############	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	############	$0	$0	$0	$0	$0	$247,833	$242,498	$237,278	$232,170	$227,172	$77,138	$75,477	$73,852	$72,263	$70,707	$69,185	$67,696	$66,238	$64,813	$63,417
Total net present value	**$1,887,738**																				

Results Considerations

To refine this cost estimate the following could be done:
- Review and confirm the number of plants without waste-to-energy and annual audits target.
- Review and confirm administrative labor requirements. These are the largest driver of cost. Current costs assume that audit will be done by facility staff and reviewed by County. The additional costs to the facility are not included per discussion on 4/2/2025. New program set up costs are included.

Additional notes:

- Program includes all public and private WWTP without waste-to-energy systems in County
- Assumes that initial baseline assessments are contracted studies (lump sum fee basis) but county personnel/WWTP personnel perform the periodic updates (FTE basis).
- Implementation of recommended actions from plant evaluations are not included in the estimate.
- Assumes that an optimization program, energy use / time of use would not be used to auto collect the data within the next 10 years.
- Assumes that smaller plants audits would be established as a base case to simplify the process. Rather than a full audit they would be set up as a standard work practices (example leak detection work practice forms) and compared year over year. Forms would be tied to a use of gas and standard inputs based on their configuration. The template could state performance metrics based on best practices to enable year over year comparisons
- Labor assumes this is a new program and staff to complete these efforts are not already included in County Plans.

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Estimate #: 8
Emissions Sector: Agriculture and Open Space
Strategy: Reduce GHGs from Agricultural Equipment
Measure: Reduce fossil fuel consumption in field equipment

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Evaluate existing BAAQMD incentive programs for electric agriculture equipment/retiring fossil fuel equipment	*AG-1-a1*	*4*	*2027-2030*
Website updates to advertise available incentives	*AG-1-a3*	*2*	*2027-2028*
Develop irrigation pump replacement program	*AG-1-b1*	*3*	*2027-2029*

Ongoing Program Management Tasks		Duration, yr.	Timeline
Community outreach to encourage retirement of fossil fuel equipment	*AG-1-a2*	*16 yrs*	*2027 - 2045*
Periodic website updates for up-to-date incentive info	*AG-1-a3*	*0.1, annually*	*2028 - 2045*
Irrigation pump replacement program implementation and management	*AG-1-b1*	*16 yrs*	*2029 - 2045*
Program management of incentives for electric/solar equipment	*AG-1-b2*	*16 yrs*	*2030 - 2045*

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Electric equipment incentives for 100% transition of eligible agriculture equipment	*AG-1-a1*	*100% eligible equipment replaced*	2045
Community outreach for encouragement of fossil fuels (brochures, advertising)	*AG-1-a2*	*100% of agricultural community reached*	2045
Incentives for irrigation pump replacement up to 100% transition (electric pump replacement rebate/voucher)	*AG-1-b1*	*50% of fossil fuel pumps replaced*	2045
Incentives for biofuel irrigation pumps to 100% transition (biofuel purchase rebate/voucher)	AG-1-b2	*50% fossil fuel pumps replaced*	2045

Data Request Tab Instructions:

Input required	No input needed		Updated per 3/12 staff comments and follow up discussion 4/2/25
		Updated by Jacobs based on industry best practices	
Input optional (to override **preliminary** as			client-provided value

Measure				Assumptions				
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
			Reduce fossil fuel consumption in field equipment						Standard NRCS list or vineyard specific definition of equipment types. Assumption that this is per individual incentive and that this program includes the replacement of tractors and UTVs.
8	Agriculture and Ope	Reduce GHGs from A		Cost per incentive - agriculture equipment	$75,000	USD	Client input	High	
				~~Additional qualifying incentives - agriculture equipment~~	~~-~~	~~quantity~~	~~Client input~~		~~Undefined at this point. Not included in estimate. Client marked unknown on 1/31/25~~
									Assumes Tier 0, Tier 1, Tier 2 tractors must be scrapped; farms less than 100 acres will be considered "small farmers" and thus eligible for pre-owned equipment; Tier 0 and Tier 1 tractors may be replaced with certified pre-owned Tier 3 or cleaner equipment. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for tractor equipment	90%	% of eligible co	Jacobs Industry Best Practice		
									Diesel or gasoline UTVs can be replaced with electric models. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for UTV equipment	75%	% of eligible co	Jacobs Industry Best Practice		

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									This cost includes estimated costs per year for the pump and everything associated to make a solar pump function in the service: emitter package, solar package. This number has been updated to be based on the NAPA Irrigation System Overview, where irrigation accounts for 70% of farm electricity use. Variable frequency drives (VFDs) – most vineyards use well pumps, (vertical turbine or submersible pumps) to get water out of the ground, with booster pumps (for pressure) to irrigate from groundwater.
				Cost per incentive - electric/solar/biofuel irrigation pumps	$75,000	USD	Client input	High	
				~~Qualifying incentives - electric/solar irrigation pumps~~	~~unknown~~	~~quantity~~	~~Client input~~		~~Assume eligible incentives per grower per farm will be limited to $75,000 per rational above. Client marked unknown on 1/31/25. In terms of the mechanism that will be used to retire fossil fuel ag equipment: Brenda Hom on 10/23/24 "This hasn't been planned yet. It will depend on what funding the county can find/obtain. E.g., BAAQMD program may be a trade in one. Feel free to do additional research on this."~~
				~~Qualifying incentives - biofuel irrigation pumps~~	~~unknown~~	~~quantity~~	~~Client input~~		~~assume eligible incentives per grower per farm will be limited to $75,000. Client marked unknown on 1/31/25~~

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Assumes this covers the new pump; Tier 3 pumps are eligible to be replaced; replacement engines must be emission certified to a Tier 4 level, new, certified, off-road engine; projects will be funded based on a dollar per gross/brake horsepower basis, based on the horsepower of new replacement diesel engine not to exceed 90% eligible costs. The dollar per horsepower payment will be $120/HP less than 125 HP and $100/HP for 125HP or more. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for pump conversion from diesel/natural gas to electric/biofuel	90%	% of eligible co	Jacobs Industry Best Practice		

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									For irrigation conversion to solar, the incentive will cover the additional equipment, in addition to the pump, required to convert a system to solar. A solar irrigation system will include solar panels, inverter, pump, controller, batteries, sensors, piping, and emitters; Solar panels cost $3k-$15k, accessories (batteries, inverter, etc.) cost $1-5k, installation costs $1-10k. Because this is a new management technique, it is assumed that the incentive will take into account the use of additional management systems/planning; Cost of drilling a commercial well ($50-10/ft) is not included in this program. The amount of incentive provided is variable and should be updated based on availability of funding sources.
				Cost support for pump conversion from diesel/natural gas to solar	90%	% of eligible co	Jacobs Industry Best Practice	High	
				Number of county farms less than 180 acres	1,545	quantity	Jacobs research	High	Primary target of incentive programs are for farms less than 180 acres; 87% of total farms

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Ordinance is already adopted, and the labor for other jurisdictions to adopt a similar ordinance is assumed to be low, per County guidance. The labor for ongoing enforcement was approved by the County. After Discussion on 4/2, leaving this at 0.5 FTE to account for coordination with jurisdictions adopting their own ordinances per County guidance.
				Number of county farms	1,772	quantity	Jacobs research	High	
				Management of incentive program - agriculture equipment	0.50	FTEs over task	Jacobs assumption	Low	Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Reviewed with Jacobs team and consistent with industry best practices.
				Management of incentive pr	0.50	FTEs over task	Jacobs Industry Best Practice	Low	
				Periodic website updates	0.10	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Community outreach mater	$ 5,000	USD	Client input	High	Client input on 1/31/25
				Community education and c	0.25	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Evaluate existing BAAQMD i	0.05	FTEs over task	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Website setup to advertise available incentives	0.10	FTEs over task duration	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop irrigation pump replacement program incentive program	0.25	FTEs over task duration	Jacobs assumption	Low	Assumes program structure can be leveraged from existing lawn and garden trade-in program. Assumes a direct-to-farmer incentive - equipment dealers not involved.
				adoption at year 5 for ag equipment	5%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				adoption at year 10 for ag equipment	33%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				adoption at year 15 for ag equipment	67%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				adoption at year 20 for ag equipment	99%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.

	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				incentive program adoption at year 5 for pumps	3%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 10 for pumps	10%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 15 for pumps	30%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				incentive program adoption at year 20 for pumps	50%	%	Jacobs Industry Best Practice	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Average labor rate (all-in cost)	140	USD/hr	Jacobs assumption	Moderate	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.

Estimate #: 8
Emissions Sector: Agriculture and Open Space
Strategy: Reduce GHGs from Agricultural Equipment
Measure: Reduce fossil fuel consumption in field equipment

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Total number of farms in the county	1772
Number of farms less than 180 acres	1545

Adoption

Year 5		
Land owner adoption of ag equipment	5%	of all landowners in implementation area
Land owner adoption of pumps conversion	3%	of all landowners in implementation area
Year 10		
Land owner adoption of ag equipment	33%	of all landowners in implementation area
Land owner adoption of pumps conversion	10%	of all landowners in implementation area
Year 15		
Land owner adoption of ag equipment	67%	of all landowners in implementation area
Land owner adoption of pumps conversion	30%	of all landowners in implementation area
Year 20		
Land owner adoption of ag equipment	99%	of all landowners in implementation area
Land owner adoption of pumps conversion	50%	of all landowners in implementation area

Incentives & Material Costs

Average Grant Award	
Cost per incentive - agriculture equipment	$75,000
Cost per incentive - electric/solar/biofuel irrigation pumps	$75,000
Material Costs	
Community outreach annual material costs	$5,000

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate, $/hr	Cost
Management of incentive program - agriculture equipment	5 to 20	0.50	16	$140	$2,240,000
Management of incentive program - irrigations pumps	5 to 20	0.50	16	$140	$2,240,000
Periodic website updates	3 to 20	0.10	18	$140	$504,000
Community education and outreach	2 to 20	0.25	19	$140	$1,330,000
Evaluate existing BAAQMD incentive programs	2 to 5	0.05	4	$140	$56,000
Website setup to advertise available incentives	2 to 3	0.10	2	$140	$56,000
Develop irrigation pump replacement program	2 to 4	0.25	3	$140	$210,000

Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equ

Total Cost Calculation

	Cumulative Spent				
	Year 5	Year 10	Year 15	Year 20	**Total**
Total Agricultural Equipment Incentive Costs	$6,645,000	$43,857,000	$89,043,000	$131,571,000	$131,571,000
Total Electric/Solar/Biofuel Irrigation Pumps Incentive Costs	$3,987,000	$13,290,000	$39,870,000	$66,450,000	$66,450,000
Total Community Outreach Materials Costs	$20,000	$45,000	$70,000	$95,000	$95,000
Total Administrative Labor Costs	$966,000	$2,856,000	$4,746,000	$6,636,000	$6,636,000
Total cost (at today's value)	$11,618,000	$60,048,000	$133,729,000	$204,752,000	**$204,752,000**

Annual Spent																				
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total Agricultural Equipment Incentive Costs	$0	$1,329,000	$1,329,000	$1,329,000	$1,329,000	$1,329,000	$7,442,400	$7,442,400	$7,442,400	$7,442,400	$7,442,400	$9,037,200	$9,037,200	$9,037,200	$9,037,200	$9,037,200	$8,505,600	$8,505,600	$8,505,600	$8,505,600	$8,505,600
Total Electric/Solar Irrigation Pumps Incentive Costs	$0	$797,400	$797,400	$797,400	$797,400	$797,400	$1,860,600	$1,860,600	$1,860,600	$1,860,600	$1,860,600	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000	$5,316,000
Total Community Outreach Materials Costs	$0	$4,000	$4,000	$4,000	$4,000	$4,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Total Administrative Labor Costs	$0	$193,200	$193,200	$193,200	$193,200	$193,200	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000	$378,000
Total spent	$0	$2,323,600	$2,323,600	$2,323,600	$2,323,600	$2,323,600	$9,686,000	$9,686,000	$9,686,000	$9,686,000	$9,686,000	$14,736,200	$14,736,200	$14,736,200	$14,736,200	$14,736,200	$14,204,600	$14,204,600	$14,204,600	$14,204,600	$14,204,600
Real discount rate	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Discount Factor		0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65
Annual net present value (annual)	$0	$2,273,581	$2,224,639	$2,176,751	$2,129,893	$2,084,044	$8,500,395	$8,317,412	$8,138,368	$7,963,178	$7,791,759	$11,599,136	$11,349,448	$11,105,135	$10,866,082	$10,632,174	$10,028,008	$9,812,141	$9,600,921	$9,394,247	$9,192,023
Total net present value	**$155,179,334**																				

Results Considerations

To refine this cost estimate the following could be done:
- Review and confirm assumptions related to agricultural equipment and irrigation pump incentives. These are the largest driver of cost and at the discretion of how much existing funding is available or additional funding can be provided by the County. This includes specifically the % per incentive the County is willing to provide under this program.
- Review and confirm administrative labor requirements.

Additional notes:

- The solar and biofuel irrigation pump replacement incentive is a single program; farmers that take advantage of the solar incentive cannot qualify for a separate biofuel incentive.
'- Labor and incentive costs realized by the county/jurisdictions will likely be only some fraction of the total if funding is primarily through the existing BAAQMD program or other external funding source.

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Estimate #: 9
Emissions Sector: Agriculture and Open Space
Strategy: Increase Carbon Storage
Measure: Enhance carbon farming practices in the region

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Program Labor Cost Components

The inputs here will be the basis for the estimated cost of labor (administrative, engineering, planning, consultant, etc.) associated with setting up and running the program.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Set up Tasks	Measure-Action ID	Duration, yr.	Timeline
Establish university and community partnerships	*AG-3-a 1*	*2*	*2026 - 2027*
develop webpage on RCAAP website	*AG-3*	*1*	*2026*
develop other educational resources	*AG-3-a2*	*1*	*2026*
categorize carbon capture potential of conservation easements for natural areas associated with agricultural lands	*AG-3-a2*	*2*	*2026 - 2027*
develop grant program to support local CFP partners	*AG-3-a3*	*2*	*2026 - 2027*
develop annual workshop program	*AG-3-a2*	*3*	*2026-2028*
Develop technical assistance guidelines	*AG-3-a3*	*3*	*2026-2028*
Collaborate with Napa RCD to develop CFP for all agricultural land categories	*AG-3-a3*	*3*	2026-2028

Ongoing Program Management Tasks		Duration, yr.	Timeline
periodic webpage/resource update	*AG-3-a2*	*0.1 annually, 10*	*2026 - 2035*
implementation/management of grant program for local CFP partners	*AG-3-a3*	*8*	*2028 - 2035*
Provide grant application assistance to income-qualified farmers/ranchers	*AG-3-a3*	*8*	*2028 - 2035*
Provide grant application assistance for applicants that commit to annual reporting	*AG-3-a3*	*8*	*2028 - 2035*
implementation and management of workshop program	*AG-3-a2*	*8*	*2028 - 2035*
periodic review and update of incentives and grants, analyze and disseminate annual reporting data from CFP grant program partic.	*AG-3-a3*	*8*	*2026-2035*
Support local supply chain for plant stock and composting	*AG-3-a4*	*8*	2026-2035

Program Material Cost Components

The inputs here will inform the basis for the cost of variable components (program participation, construction projects, capital expenditures) dependent on program targets.

Instructions: List the program components and corresponding information to be included in this measures cost estimation. Preliminary items have been provided based on measure text, but need confirmation from Ascent.

Program Goal		Target	Deadline
Grants to support local CFP partners	*AG-3-a3*	*75% of farmers qualify*	2035
material costs for supply chain on-farm composting program	*AG-3-a4*	*50% of farmers qualify*	2035
material costs for supply chain plant stock composting program	*AG-3-a4*	*3% of farmers qualify*	2035

Data Request Tab Instructions:

Input required	No input needed		client-provided value
Input optional (to override **preliminary** assu		Updated by Jacobs based on industry best practices	client-provided value superseded with more specific information.
			Updated per 3/12 staff comments and follow up discussion 4/2/25

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	Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
9	Agriculture and Open Space	Increase Carbon Storage	Enhance carbon farming practices in the region	*Average CFP grant award*	*$10,000*	*USD*	Client input	Moderate	Jesse: To deliver complete Carbon Farming Plan. Based on conversations with RCD. Client input on 1/31/25
				Qualifying CFP grants/year	*20*	*quantity*	Client input	Moderate	Client input on 1/31/25
				~~*Support for local supply chain develo*~~	~~*$1,000*~~	~~*USD/acre*~~	~~Client input~~	~~Moderate~~	Client input: $500-1000/acre. Using high end of range as a conservative estimate. Funding directly to farmer to implement CFD. Client input on 1/31/25. Number not used, due to more specific values provided after county input.
				Support for onsite compost local sup	*$270*	*USD/CY*	Jacobs Industry Best Practice	Moderate	NRCS conservation payments for CSP 336 Soild Carbon Amendment reimbursed CA farmers up to this amount for compost produced onsite
				Support for offsite compost local sup	*$1,698*	*USD/CY*	Jacobs Industry Best Practice	Moderate	NRCS conservation payments for CSP 336 Soil Carbon Amendment reimbursed CA farmers up to $270.21/CY up to this amount for compost procured from off-site
				Average compost application rate	*4.5*	*tons/acre*	Jacobs research	High	https://agroecology.berkeley.edu/resources/compost-bene https://www.peachcountrytractor.com/pages/mulch-calculator#:~:text=Length%20x%20Width%20=%20Square%20Feet,yd).
				Conversion of cubic yards per ton	*1.4*	*CY/ton*	Jacobs research	High	
				Assumed Average Onsite Compost U	*90%*	*%*	Jacobs assumption	Low	
				Assumed Average Offsite Compose U	*10%*	*%*	Jacobs assumption	Low	

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction Ordinance is already adopted, and the labor for other jurisdictions to adopt a similar ordinance is assumed to be low, per County guidance. The labor for ongoing enforcement was approved by the County. After Discussion on 4/2, leaving this at 0.5 FTE to account for coordination with jurisdictions adopting their own ordinances per County guidance.
				Compost local supply chains support	*5*	*years/farmer*	Jacobs Industry Best Practice	Moderate	
				Support for nursery stock local supply	*20%*	*% of start-up cost*	Jacobs Industry Best Practice	Moderate	Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirement (up to 10 hrs. / month). This is for the management of incentives for electric/solar equipment, which is assumed to be an expansion of the BAAQMD program. The LOE may vary greatly based on the extent of the expansion / level of implementation by the county.
				Start-up cost for establishing nursery	*$20,911*	*USD/acre*	Jacobs Industry Best Practice	Moderate	Brenda Hom 10/23/24 "Probably some additional funding to ensure there are enough native plants to plant. But they will need to find that funding, which might be under Amy Lapin's scope to provide" and Erik de Kok 10/23/24 "Yes. The actual funding source is not known yet. But I think the question is whether program involves seeking financial support and staff time associated with that, which would be a correct assumption." Jacobs assumption: Number for vineyard nursery stock. Assumes Vines at $10,108/acre; custom plant, dig, place cartons, plant vines at $3,888/acre; one time cost of vineyard removal and clean field by hand at $4,500/acre; soil amendments at $870/acre; rip 3x at $975/acre; disc 3x at $270/acre; level at $300/acre.
				Average acres per farm	*137*	*acres/parcel*	Jacobs research	High	https://www.nass.usda.gov/Publications/AgCensus/2022/(
				Total crop land in Napa County	*68,190*	*acres*	Jacobs research	High	Just cropland acreage; total farm acreage is 242,403 acres
				Total vineyard land in Napa County	*28,890*	*acres*	Jacobs research	High	Just vineyard acreage

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
				Establish university and community p	*0.20*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				RCAAP webpage development	*0.10*	*FTEs over task dur*	Jacobs assumption	Low	Per 4/2/25 staff discussion, LOE reduced to only include adding a single webpage to an existing website.
				Periodic webpage updates	*0.10*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Other educational resource developr	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Categorize carbon capture potential	*0.50*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop grant program	*0.50*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Implement and manage grant prograı	*1.50*	*FTEs over task dur*	Jacobs Industry Best Practice	Moderate	
				Grant application assistance	*0.50*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop annual workshop program	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Implement and manage workshop pr	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Develop technical assistance guideli	*0.25*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Collaborate with Napa RCD to develo	*1.00*	*FTEs over task dur*	Jacobs assumption	Low	Brenda Hom 10/23/24 "This will most likely be realized as additional funding for Napa RCD to provide the proposed assistance. Napa RCD is already doing the proposed action, they just need more staff. Probably another 2-4 staff over the next 10 years." Jacobs has dived the 2-4 staff requirement by individual function. Reviewed with Jacobs team and consistent with industry best practices.
				Analyze data from program participar	*1.00*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Support local supply chain for plant s	*0.75*	*FTEs over task dur*	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Average labor rate (all-in cost)	*140*	*USD/hr*	Jacobs assumption	Low	Assumes internal labor for all program development and management labor costs. Assumes no consultant or contractor labor costs.
				Number of farms (including vineyards) in program area	*1772*	# of applicable par	Jacobs research	High	https://www.nass.usda.gov/Publications/AgCensus/2022/(
				Land owner adoption of compost sup	*10%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of compost sup	*25%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.

Measure			Assumptions					
#	Emissions Sector	Strategy	Measure	Parameter	Value	Unit/Type	Source	Confidence	Notes
									Assume that 50% of all vineyard acres in the county will utilize the compost development incentive . Assume that this incentive will be a continual payment to each farmer for up to 5 years. Assume that the first three year's adoption rate will be 10%, the next three years will be an additional 15%, and the final four years will be 25%.
				Land owner adoption of compost sup	*50%*	%	Jacobs assumption	Low	
				Land owner adoption of compost sup	*50%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of native plant s	*1%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of native plant s	*2%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.
				Land owner adoption of native plant s	*3%*	%	Jacobs assumption	Low	CDFA has offered a similar program. Assume the goal is to establish vineyard nursery stock. Assume 3% of all vineyard acres (2,889 acres) adopt and develop nursery stock for the local supply chain by year 10.
				Land owner adoption of native plant s	*3%*	%	Jacobs assumption	Low	Reviewed with Jacobs team and consistent with industry best practices.

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Estimate #: 9
Emissions Sector: Agriculture and Open Space
Strategy: Increase Carbon Storage
Measure: Enhance carbon farming practices in the region

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**red text denotes cells with formulas that must be reviewed and potentially manually updated with any updates to Program Outline or Inputs Matrix tab inputs

Parameters and Assumptions

Demographic

Land types included:	only vineyard acres considered for local supply chain support	
Number of farms and vineyards in program a	1,772	# land parcels
Total crop land in farms	68,190	acres
Average crop land size per farm	38	acres
Total vineyard acres in county	28,890	acres

Adoption

			includes minor revisions to county ordinance plus coordination with individual jurisdictions to adopt their own ordinances based on the county's. The labor for initial adoption of a Building Energy Reach Code Ordinance was only 0.08 FTE, and that measure needs updated ordinances every three years. The County's Reusable Foodware and Waste Reduction
Year 3			
Land owner adoption of compost local supp	10%	of all landowners in implementation area	
Land owner adoption of native plant stock si	1%	of all landowners in implementation area	
Year 6			
Land owner adoption of compost local supp	25%	of all landowners in implementation area	
Land owner adoption of native plant stock si	2%	of all landowners in implementation area	
Year 10			
Land owner adoption of compost local supp	50%	of all landowners in implementation area	
Land owner adoption of native plant stock si	3%	of all landowners in implementation area	
Year 20			
Land owner adoption of compost local supp	50%	of all landowners in implementation area	
Land owner adoption of native plant stock si	3%	of all landowners in implementation area	

Assume funding source has limited reporting requirements - FTE not impacted by funding source. FTE will increase with increased reporting requirer

Grants & Material Costs

Average Grant Award			
CFP Grant Award	$10,000		USD/grant
Qualifying CFP Grants/Year	20		
Compost Supply Chain Program Onsite Compost Support	$270		USD/CY
Compost Supply Chain Program Offsite Compost Support	$1,698		USD/CY
Assumed Average Onsite Compost Used	90%		
Assumed Average Offsite Compose Used	10%		
Average Compost Supply Chain Support in $/ton	$578		USD/ton
Average Compost Application Rate		4.50	ton/acre
Compost Supply Chain Program Average Support	$2,602		USD/acre
Compost Supply Chain Support Duration	5		years/farmer
Compost Supply Chain Annualized Support Costs	$1,301		$/acre/yr
Native Plant Supply Chain Program Startup Costs	$20,911		USD/acre
Maximum eligible support for native plant	20%		% of startup costs

Program Costs

	Years	FTEs	Duration (years)	Avg Labor Rate, $/hr	Cost
Establish university and community partnerships	1 to 2	0.20	2	$140	$112,000
RCAAP webpage development	1	0.10	1	$140	$28,000
Periodic webpage updates	1 to 10	0.10	10	$140	$280,000
Other educational resource development	1	0.25	1	$140	$70,000
Categorize carbon capture potential of natural easements	1 to 2	0.50	2	$140	$280,000
Develop grant program	1 to 2	0.50	2	$140	$280,000
Implement and manage grant program	3 to 10	1.50	8	$140	$3,360,000
Grant application assistance	3 to 10	0.50	8	$140	$1,120,000
Develop annual workshop program	1 to 3	0.25	3	$140	$210,000
Implement and manage workshop program	1 to 3	0.25	3	$140	$210,000
Develop technical assistance guidelines	1 to 3	0.25	3	$140	$210,000
Collaborate with Napa RCD to develop CFP	1 to 3	1.00	3	$140	$840,000
Analyze data from program participants, review and update grant program	1 to 10	1.00	10	$140	$2,800,000
Support local supply chain for plant stock and composting	1 to 10	0.75	10	$140	$2,100,000

Total Cost Calculation

	Cumulative Spent				
	Year 3	Year 6	Year 10	Year 20	**Total**
Total CFP Grant Costs	$600,000	$1,200,000	$2,000,000	$2,000,000	$2,000,000
Total Compost Supply Chain Program Costs	$11,274,979	$28,187,447	$75,166,525	$75,166,525	$75,166,525
Total Native Plant Stock Supply Chain Progr	$1,208,238	$2,416,475	$3,624,713	$3,624,713	$3,624,713
Total administrative labor costs	$4,354,000	$7,588,000	$11,900,000	$11,900,000	$11,900,000
Total cost (at today's value)	$17,437,216	$39,391,922	$92,691,238	$92,691,238	**$92,691,238**

Annual Spent																					
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total CFP Grant Costs	$0	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Compost Supply Chains Program Cost	$0	$3,758,326	$3,758,326	$3,758,326	$5,637,489	$5,637,489	$5,637,489	$11,744,770	$11,744,770	$11,744,770	$11,744,770	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Native Plant Stock Supply Chain Progra	$0	$402,746	$402,746	$402,746	$402,746	$402,746	$402,746	$302,059	$302,059	$302,059	$302,059	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total administrative labor costs	$0	$1,451,333	$1,451,333	$1,451,333	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$1,078,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total spent	$0	$5,812,405	$5,812,405	$5,812,405	$7,318,235	$7,318,235	$7,318,235	$13,324,829	$13,324,829	$13,324,829	$13,324,829	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Real discount rate	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%
Discount Factor		0.98	0.96	0.95	0.93	0.91	0.89	0.88	0.86	0.84	0.83	0.81	0.80	0.78	0.77	0.75	0.74	0.73	0.71	0.70	0.69
Annual net present value (annual)	$0	$5,704,029	$5,597,673	$5,493,300	$6,787,497	$6,660,939	$6,536,741	$11,679,987	$11,462,205	$11,248,484	$11,038,748	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total net present value	**$82,209,602**																				

Results Considerations

To refine this cost estimate the following could be done:
Review and confirm assumptions for local compost supply chain support. This is the largest driver of cost.
Review and confirm the number and cost of CFP grants to be issued.
Review adoption rates to see what is expected specific to County. Generally it is understood that these types of programs historically have low adoption rates based on total acres available.

Additional notes:

Comments received from client:
- An annual discount rate of 1.9% is used for this estimate. This is the 10-year real interest rate on US treasury notes and bonds for the 2025 calendar year per OMB Circular No. A-94.

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Appendix J

Sample Consistency Review Checklist

Photo Credit: County of Napa

SAMPLE CONSISTENCY REVIEW CHECKLIST

INTRODUCTION

The Napa County Regional Climate Action and Adaptation Plan (RCAAP) identifies strategies, measures, and actions to meet the regional targets to reduce greenhouse gas (GHG) emissions by 2030 and 2045, consistent with the State's 2022 Scoping Plan for Achieving Carbon Neutrality and legislative GHG reduction targets and demonstrates progress towards the State's 2045 net zero GHG emissions goal. The RCAAP's attainment of the regional GHG reduction targets is the result of (1) several initiatives to be directly implemented by the County of Napa and the five incorporated cities in the county (collectively referred to hereinafter as the "Napa County Jurisdictions"); and (2) incorporating GHG-reduction features into the construction and operation of development projects, including both privately initiated projects and public projects.

The RCAAP has been prepared in accordance with California Environmental Quality Act (CEQA) Guidelines Section 15183.5, which allows for public agencies to analyze and mitigate GHG emissions as part of a larger "plan for the reduction of greenhouse gases." The RCAAP, this Consistency Review Checklist (Checklist), and the CEQA document prepared for the RCAAP collectively include the required elements of "a plan for the reduction of greenhouse gas emissions" set forth in CEQA Guidelines Section 15183.5(b). Therefore, the RCAAP is a CEQA-qualified climate action and adaptation plan.

The purpose of this Checklist is to provide a tool for determining project-level consistency with the RCAAP, focusing on GHG reduction measures that would apply to new development projects that require discretionary review and approvals from Napa County Jurisdictions. New development projects undergoing discretionary development review that (1) demonstrate consistency with applicable GHG reduction measures and (2) are consistent with planned growth and land use assumptions in the RCAAP (i.e., consistent with local general plans and Plan Bay Area 2050) would not conflict with the Napa County Jurisdictions' ability to achieve the identified GHG reduction targets through implementation of applicable measures. Projects that are consistent with the RCAAP, as determined by this Checklist, may rely on the RCAAP and its associated CEQA document for the cumulative impact analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible. Projects that are unable to meet the requirements of this Checklist will be subject to alternative compliance approaches to GHG analysis using Bay Area Air District CEQA Guidelines. Cumulative GHG impacts would need to be analyzed further on a project-specific basis for any project that is not consistent with the RCAAP.

This checklist is a sample checklist that may be customized by individual jurisdictions covered under the RCAAP, based on applicable GHG reduction measures and implementation assumptions in their jurisdiction. Some of the GHG reductions measures included in the RCAAP may not apply in all jurisdictions, but most do. Once the RCAAP is adopted and the CEQA

document prepared for the RCAAP is certified, individual jurisdictions can begin using this sample checklist and customize it to their needs, based on the final adopted RCAAP.

CHECKLIST APPLICABILITY

The Checklist applies to discretionary projects that are subject to environmental review and not exempt from CEQA (referred to herein as projects). The Checklist is a critical implementation tool for identifying and incorporating applicable RCAAP GHG reduction measures and actions that are not otherwise binding and enforceable into development projects (including new development applications and major expansions or major renovations of existing development projects), in order to provide project-level GHG analysis and mitigation streamlining benefits for eligible projects per CEQA Guidelines Section 15183.5.

Implementation of GHG reduction measures that do not apply to projects will occur through the implementation mechanisms identified in **Chapter 3** of the RCAAP. Implementation of applicable RCAAP GHG reduction measures and actions by projects will help the Napa County Jurisdictions achieve incremental GHG reductions towards the RCAAP targets, with additional reductions occurring through local agency initiatives and measures related to existing development that are implemented outside of the Checklist process.

CHECKLIST OVERVIEW

The Checklist establishes a two-step process that project proponents and local agency staff shall follow to determine if projects are consistent with the RCAAP.

Step 1 of the Checklist assesses a project's consistency with the growth projections used in the RCAAP to estimate future GHG emissions from activities occurring in each community. Because the RCAAP uses growth projections based on implementation of the adopted General Plans and MTC growth forecasts under Plan Bay Area 2050, the first step in determining a project's consistency with the RCAAP is to demonstrate its consistency with the regional categories and land use and priority designations of the General Plan and Plan Bay Area. All projects must demonstrate consistency with the existing Plan Bay Area regional categories, applicable local General Plan land use designations, and the uses and development density and intensity allowed under the applicable local jurisdiction's the Zoning Ordinance.

If a project is consistent with the General Plan, then Step 2 of the Checklist should be completed. If a project is not consistent with the regional categories or land use designations of the General Plan, then it shall not use the RCAAP Consistency Review Checklist for CEQA streamlining.

Step 2 of the Checklist sets forth applicable GHG reduction measures and actions in the form of "consistency requirements" that project proponents are required to incorporate into their projects to demonstrate compliance with the RCAAP. Project proponents are required to demonstrate project consistency with the RCAAP consistency requirements or demonstrate why the requirements are not applicable to their project.

Projects that are consistent with the RCAAP, as determined using Steps 1 and 2 in this Checklist, may rely on the RCAAP for the cumulative impacts analysis of GHG emissions under CEQA. Projects that are not consistent with the RCAAP as determined by Steps 1 or 2 of the Checklist, shall not use the RCAAP Consistency Review Checklist for CEQA streamlining.

CHECKLIST COMPLETION AND REVIEW PROCEDURES

General procedures for Checklist completion and review are described below, with more specific directions provided in Steps 1 and 2 of the Checklist.

1. The applicable local jurisdiction reviews development applications and makes determinations regarding project environmental review requirements under CEQA. Procedures for CEQA can be found on the [insert jurisdiction name here, for example "County of Napa"] website [https://www.countyofnapa.org/1792/California-Environmental-Quality-Act].

2. The project proponent shall complete the Checklist and provide substantial evidence to demonstrate project consistency with the RCAAP. Completed Checklists will be reviewed by the applicable local agency to determine project eligibility for use of the Checklist under Step 1, and overall consistency with the applicable GHG reduction measures and RCAAP consistency requirements under Step 2.

3. When completing Step 2 of the Checklist, the project proponent must provide substantial evidence demonstrating how each applicable RCAAP consistency requirement will be implemented or incorporated into the project.

4. RCAAP consistency requirements determined to be applicable to the project in Step 2 of the Checklist shall be required as project-specific mitigation measures in the project's environmental document.

5. Projects that cannot demonstrate consistency with the RCAAP using this Checklist are required to prepare a separate GHG analysis as part of the CEQA document prepared for the project. Refer to the local agency or Bay Area Air District's guidance for analysis and thresholds of significance for analyzing a project's GHG emissions under CEQA.

CHECKLIST UPDATES

This Checklist may be updated periodically to incorporate new GHG reduction techniques or to comply with later amendments to the RCAAP or local, State, or federal law. Comprehensive updates to this Checklist will be coordinated with each subsequent RCAAP update. Administrative updates to the Checklist may occur regularly, as necessary for the purpose of keeping the Checklist up to date and implementable.

Application Information

Contact Information

Project No. and Name: _____

Property Address and APN: _____

Applicant Name and Co.: _____

Contact Phone: _____ Contact Email: _____

Was a consultant retained to complete this checklist? ☐ Yes ☐ No
If Yes, complete the following:

Consultant Name: _____ Contact Phone: _____

Company Name: _____ Contact Email: _____

Project Information

1. What is the size of the project site (acres [gross and net])? _____

2. Identify all applicable proposed land uses (indicate square footage [gross and net]):

   ☐ Residential (indicate # of single-family dwelling units): _____

   ☐ Residential (indicate # of multi-family dwelling units): _____

   ☐ Commercial (indicate total square footage [gross and net]): _____

   ☐ Industrial (indicate total square footage [gross and net]): _____

   ☐ Agricultural (indicate total acreage [gross and net]): _____

   ☐ Other (describe): _____

3. Provide a description of the project. This description should match the project description used for the CEQA document. The description may be attached to the Checklist if there are space constraints.

Step 1: Demonstrate Consistency with the General Plan

The RCAAP uses growth projections based on implementation of the adopted General Plan and Plan Bay Areas to estimate future GHG emissions from activities occurring in [insert jurisdiction name here]. Therefore, the first step in determining a project's consistency with the RCAAP is to demonstrate its consistency with the applicable General Plan and Zoning Ordinance, and Plan Bay Area.

All projects must demonstrate consistency with existing Plan Bay Area regional categories, applicable local General Plan land use designations, and applicable local zoning designations. If a project is consistent with all of these, then Step 2 of the Checklist should be completed. If a project is not consistent with these, then it shall not use the RCAAP Consistency Checklist for CEQA streamlining.

Step 1: Demonstrate Consistency with Plan Bay Area, General Plan, and Zoning Designations		
RCAAP Consistency Requirement	Yes	No
1. Is the proposed project consistent with the Plan Bay Area 2050 regional categories, respective General Plan land use designations, and respective land use designations and the uses and development density and intensity allowed under the local Zoning Ordinance?	☐	☐

Provide substantial evidence supporting the project's consistency determinations. Attach additional information as needed.

_____
_____
_____
_____
_____
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_____
_____
_____
_____
_____

If **"Yes,"** proceed to Step 2: Demonstrate Consistency with RCAAP GHG reduction Measures and Actions

If **"No,"** the project is not consistent with the RCAAP and shall not use the RCAAP Consistency Checklist for CEQA streamlining. Such projects are required to prepare preparation of a separate GHG analysis as part of the CEQA document prepared for the project Refer to the local agency or Bay Area Air District's guidance for analysis and thresholds of significance for analyzing a project's GHG emissions under CEQA.

Step 2: Demonstrate Consistency with RCAAP GHG Reduction Measures and Actions

The second step of the RCAAP consistency review is to demonstrate a project's consistency with applicable GHG reduction measures and actions. Projects are required to demonstrate consistency with the RCAAP consistency requirements or demonstrate why the requirements are not applicable. For ease of reference, two sets of RCAAP consistency requirements are provided in this section: one set of requirements that applies to privately initiated projects (Table 1), and a second set of requirements that applies to local agency-initiated projects (Table 2).

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects

RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
On-Road Transportation				
1. Low Vehicle Miles Traveled When the Napa County Jurisdictions have adopted the Transit First policy and it has gone into effect, the project must comply with the ordinance. **Note:** The Napa County Jurisdictions will adopt the Transit First policy by 2026, pursuant to RCAAP Action TR-1(a). This requirement does not apply to projects unless the Transit First policy has been adopted and has gone into effect. *Check "N/A" if the project is not a privately initiated project, is not subject to the applicable local codes and ordinances as amended, or if the amendments are not in effect.*	TR-1 (A, C)	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
2. Electric Vehicle Charging Capability/ Infrastructure The project must comply with applicable local codes and ordinances, as amended, to require (Tier 2) CALGreen or similar electric vehicle charging infrastructure installations and preferential parking for ZEVs for existing and new multifamily residential and nonresidential construction. If the applicable local codes and ordinances have not yet been amended at the time the project is undergoing discretionary review, the project shall achieve Tier 2 status as set forth in the 2022 California Green Building Standards Code, Title 24, Part 11 (CALGreen), Appendix A4 Residential Voluntary Measures, Division A4.6, Tier 1 and Tier 2, Section A4.601.5, Tier 2, and Appendix A5 Nonresidential Voluntary Measures, Division A5.6, Voluntary Tiers, Section A5.601.3 *CALGreen* Tier 2. **Note:** Napa County Jurisdictions will amend local codes and ordinances by 2026, pursuant to RCAAP Action TR-4 (F, G). *Check "N/A" if the project is not a privately initiated project or is not subject to CALGreen or local codes and ordinances as amended.*	TR-4 (F, G)	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

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Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
3. Active Transportation The project must comply with the applicable local codes and ordinances as amended to comply with sidewalk, bikeway, charging improvements, and access as required by the NVTA's Active Transportation Plan. **Note:** The Napa County Jurisdictions will amend the applicable local codes and ordinances by 2026, pursuant to RCAAP Action TR-10 (D, F). *Check "N/A" if the project is not a privately initiated project or is not subject to the applicable local codes and ordinances as amended.*	TR-10 (D, F)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____ _____ _____ _____ _____				
4. Transportation Demand Management When the Napa County Jurisdictions have adopted the Transportation Demand Management (TDM) ordinance and it has gone into effect, the project must comply with the ordinance. **Note:** The Napa County Jurisdictions will adopt the TDM ordinance by 2028, pursuant to RCAAP Action TR-11 (C). This requirement does not apply to projects unless the TDM Ordinance has been adopted and has gone into effect. *Check "N/A" if the project is not a privately initiated project, is not subject to the applicable local codes and ordinances as amended, or if the amendments are not in effect.*	TR-11 (C)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____ _____ _____ _____ _____				

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
5. Parking Requirements When the Napa County Jurisdictions have adopted parking requirements for all new development and redevelopment of residential and non-residential buildings within ½ mile of public transit and it has gone into effect, the project must comply with the ordinance. **Note:** The Napa County Jurisdictions will adopt parking requirements by 2026, pursuant to RCAAP Action TR-13 (A, B), AB 2097, and AB 1317. This requirement does not apply to projects unless the parking requirements ordinance has been adopted and has gone into effect. *Check "N/A" if the project is not a privately initiated project, is not subject to the applicable local codes and ordinances as amended, or if the amendments are not in effect.*	TR-13 (A, B)	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Building Energy				
6. Electrify Existing Buildings and Appliances The project must comply with applicable local codes and ordinances as amended to phase out natural gas appliances and equipment in existing residential, commercial, and industrial construction or incorporate (Tier 2) CALGreen or similar energy efficiency requirements for existing development projects. If the applicable local codes and ordinances have not yet been amended, the project shall achieve Tier 2 status as set forth in the 2022 California Green Building Standards Code, Title 24, Part 11 (CALGreen), Appendix A4 Residential Voluntary Measures, Division A4.6, Tier 1 and Tier 2, Section A4.601.5, Tier 2, and Appendix A5 Nonresidential Voluntary Measures, Division A5.6, Voluntary Tiers, Section A5.601.3 *CALGreen* Tier 2. **Note:** The Napa County Jurisdictions will amend applicable local codes and ordinances by 2026 to establish requirements for existing development projects, pursuant to RCAAP Actions BE-1 Ci, Cii, D, F, and BE-4 (B). *Check "N/A" if the project is not a privately initiated project or is not subject to CALGreen or the applicable local codes and ordinances as amended.*	BE-1 (Ci, Cii, D, F))	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

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Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
7. Winery Sustainability Certification The project must comply with applicable local codes and ordinances as amended to attain sustainability certification. **Note:** The Napa County Jurisdictions will amend applicable local codes and ordinances by 2026 to establish requirements for existing development projects, retrofits, and/or additions greater than 10% of existing square footage. *Check "N/A" if the project is not a privately initiated winery project or is not subject to the applicable local codes and ordinances as amended.*	BE-4 (B)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____ _____				
8. Zero Carbon Development The project must comply with applicable local codes and ordinances as amended to incorporate energy efficiency and renewable energy in new residential, commercial, and industrial construction or incorporate (Tier 2) CALGreen or similar energy efficiency requirements for new residential and nonresidential development projects. If the applicable local codes and ordinances have not yet been amended, the project shall achieve Tier 2 status as set forth in the 2022 California Green Building Standards Code, Title 24, Part 11 (CALGreen), Appendix A4 Residential Voluntary Measures, Division A4.6, Tier 1 and Tier 2, Section A4.601.5, Tier 2, and Appendix A5 Nonresidential Voluntary Measures, Division A5.6, Voluntary Tiers, Section A5.601.3 *CALGreen* Tier 2. **Note:** The Napa County Jurisdictions will amend the applicable local codes and ordinances by 2026, pursuant to RCAAP Action BE-5 (A, C). *Check "N/A" if the project is not a privately initiated project or is not subject to CALGreen or the applicable local codes and ordinances as amended.*	BE-5 (A, C)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____				

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Wastewater/Water				
9. Increase Water Efficiency The project must comply with the applicable local codes and ordinances as amended to require (Tier 2) CALGreen or similar water efficiency requirements and reduced outdoor water use for landscaping requirements on nonresidential properties. **Nonresidential projects:** If the applicable local codes and ordinances have not yet been amended, nonresidential projects must comply with the requirements of the 2022 California Green Building Standards Code, Title 24, Part 11 (CALGreen), Appendix A5 Voluntary Nonresidential Measures, Section A5.303.2.3.2 Tier 2 Water Efficiency and Conservation Requirements and three elective measures from Section A5.303, Section A5.304, and Section A5.305 Tier 2 Water Efficiency and Conservation Requirements. **Note:** The Napa County Jurisdictions will amend the applicable local codes and ordinances by 2026, pursuant to RCAAP Action WW-7 (E, I). *Check "N/A" if the project is not a privately initiated project, is not subject to CALGreen or the applicable local codes and ordinances as amended.*	WW-4 (E, I)	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Solid Waste				
10. Construction Waste If the Napa County Jurisdictions Construction Waste Management Plan is in effect, the project must comply. **Note**: The Napa County Jurisdictions will develop a unified Construction Management Plan by 2035, pursuant to RCAAP Action SW-2 (A). If the Construction Waste Management Plan is not in effect, non-residential projects must comply with the requirements of the 2022 California Green Building Standards Code Section 5.408 and residential projects must comply with Section 4.408. *Check "N/A" if the project is not a privately initiated project, is not subject to the Construction Waste Management Plan or CALGreen, or if the plan is not in effect.*	SW-2 (A)	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

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Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Off-Road Vehicles and Equipment				
11. Zero-Emission Loading Docks If the project includes cold storage or refrigerated warehouse facilities, it must comply with the applicable local codes and ordinances as amended to require electric truck loading docks must be equipped with adequate infrastructure to deliver electricity to electric-powered truck refrigeration units (e-TRUs). **Note:** The Napa County Jurisdictions will amend the applicable local codes and ordinances by 2026, pursuant to RCAAP Action OF-2. This requirement does not apply to projects unless the applicable local codes and ordinances has been amended and the amendments have gone into effect. *Check "N/A" if the project is not a privately initiated project, is not subject to the applicable local codes and ordinances as amended, or if the amendments are not in effect.*	OF-2 (A)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____				
12. Use Electric-Powered or Zero Emission Construction and Portable Equipment By 2030, the project must use electric-powered or other zero emissions construction and portable equipment (defined as 50 horsepower or more) during construction activities. *Check "N/A" if the project is not a privately initiated project.* *Check "N/A" if the project does not require the use of construction or portable equipment.* *Check "N/A" if electric-powered or zero emission equipment are not commercially available for the project's construction and portable equipment needs during construction. To support this "N/A" response, demonstrate that a minimum of three fleet owners/operators/fuel providers in Napa County or adjacent counties were contacted and responded that electric-powered or other zero emission equipment and/or fuel options are not commercially available for the project's equipment needs during construction.*	OF-3 (A)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____				

Table 1. RCAAP Consistency Requirements for Privately Initiated Projects				
RCAAP Consistency Requirement (Privately Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Agriculture and Open Space				
13. Tree and Vegetation Preservation or Replanting Proposed projects must avoid or minimize carbon sequestration losses attributable to land use development activities, including vineyard conversions. To accomplish this, projects shall demonstrate consistency with General Plan Policy CON-24 and the County's Conservation Regulations in Chapter 18 of the County Code. Preservation of existing on-site trees and vegetation on-site will be prioritized wherever feasible; and trees or vegetation that cannot be preserved shall be replaced at ratios specified in the Policy CON-24 and Chapter 18 of the County Code. For any tree or vegetation replacements, the County will require projects to prioritize replanting on the project site, followed by off-site plantings if on-site replanting is infeasible. *Check "N/A" if the project is not a local agency-initiated project, or if the plan is not in effect.*	AG-9 (B)	☐	☐	☐

Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.

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Table 2. RCAAP Consistency Requirements for Local Agency-Initiated Projects				
RCAAP Consistency Requirement (Local Agency-Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Agriculture and Open Space				
1. Expand the Urban Forest When the applicable jurisdictions have adopted an urban forest management plan, the project must comply with the plan. **Note:** The applicable jurisdictions will develop an urban forest management plan by 2030. This requirement does not apply to projects unless the urban forest management plan has been adopted and has gone into effect. *Check "N/A" if the project is not a local agency-initiated project, or if the plan is not in effect.*	AG-5 (C)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____ _____ _____				
2. Avoid or Minimize Carbon Sequestration Losses Proposed projects must avoid or minimize carbon sequestration losses attributable to land use development activities, including vineyard conversions. To accomplish this, projects shall comply with the mitigation program established by the County that prioritizes preservation of existing on-site trees and vegetation. Trees or vegetation that cannot be preserved will be required to be replaced at ratios consistent with General Plan Policy CON-24 and the County's Conservation Regulations in Chapter 18 of the County Code. For any tree or vegetation replacements, the County will require projects to prioritize replanting on the project site, followed by off-site plantings if on-site replanting is infeasible. *Check "N/A" if the project is not a local agency-initiated project, or if the plan is not in effect.*	AG-9 (B)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____ _____ _____				

Table 2. RCAAP Consistency Requirements for Local Agency-Initiated Projects				
RCAAP Consistency Requirement (Local Agency-Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Wastewater/Water				
2. Increase Water Efficiency The project must comply with the applicable local codes and ordinances as amended to implement and enforce AB 1572 to phase in bans on the use of potable water for irrigation of non-functional turf. **Note:** The Napa County Jurisdictions will amend the applicable local codes and ordinances by 2026, pursuant to RCAAP Action WW-4 (C). *Check "N/A" if the project is not a local agency-initiated project, is not subject to CALGreen or the applicable local codes and ordinances as amended.*	WW-4 (C)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed. _____ _____ _____ _____ _____ _____ _____ _____				
On-Road Transportation				
3. Use Electric-Powered or Zero Emission Vehicles By 2035, the project must use electric-powered or other zero emissions vehicles. This requirement applies to medium- and heavy-duty vehicles. *Check "N/A" if the project is not a local agency-initiated project.* *Check "N/A" if the project does not require the use of medium- or heavy-duty construction vehicles.* *Check "N/A" if electric-powered or zero emission vehicles are not commercially available for the project's medium- and heavy-duty vehicle needs during construction. To support this "N/A" response, demonstrate that a minimum of three fleet owners/operators/fuel providers in Napa County or adjacent counties were contacted and responded that electric-powered or other zero emission vehicles and/or fuel options are not commercially available for the project's vehicle needs during construction.*	TR-5 (A)	☐	☐	☐

Table 2. RCAAP Consistency Requirements for Local Agency-Initiated Projects				
RCAAP Consistency Requirement (Local Agency-Initiated Project)	Supporting RCAAP Measure (Action)	Project Consistency Determination		
		Consistent	Not Consistent	N/A
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.				
Off-Road Vehicles and Equipment				
4. Use Electric-Powered or Zero Emission Construction and Portable Equipment By 2030, the project must use electric-powered or other zero emissions construction and portable equipment (defined as 50 horsepower or more) during municipal construction activities. Check "N/A" if the project is not a local agency-initiated project. Check "N/A" if the project does not require the use of construction or portable equipment. Check "N/A" if electric-powered or zero emission equipment are not commercially available for the project's construction and portable equipment needs during construction. To support this "N/A" response, demonstrate that a minimum of three fleet owners/operators/fuel providers in Napa County or adjacent counties were contacted and responded that electric-powered or other zero emission equipment and/or fuel options are not commercially available for the project's equipment needs during construction.	OF-4 (A)	☐	☐	☐
Provide substantial evidence supporting the project's consistency determination. Attach additional information as needed.				

Appendix K

Existing Hazard Mitigation Actions

Photo Credit: City of American Canyon

This appendix compiles the existing hazard mitigation actions and general plan safety element policies of the Napa County Jurisdictions. These actions and policies are categorized by hazard topic in each of the tables below (along with a summary table). Each hazard mitigation action includes detailed information such as the responsible party, time frame, estimated capital cost, estimated maintenance cost, potential funding sources, and priority. In contrast, safety element policies typically do not contain such detailed information, so that information is not included for them. This comprehensive compilation of existing policies and actions laid the foundation to develop adaptation strategies, measures, and actions for the RCAAP. The documents reviewed in preparation for this appendix include:

- Napa County Operational Area Hazard Mitigation Plan (2020)
- City of Napa Hazard Mitigation Plan Update (2022)
- Napa County General Plan Safety Element (2023)
- City of American Canyon Flood Hazards Element (2019)
- City of Calistoga General Plan Public Safety Element (2014)
- City of Napa 2040 General Plan Safety and Noise Element (2022)
- St. Helena General Plan Update 2040 Public Health, Safety, and Noise Element (2019)
- Yountville General Plan Safety + Hazards Element (2019)

Summary – Number of Existing Hazard Mitigation Actions and Safety Element Policies

	Napa County	American Canyon	Calistoga	Napa	St. Helena	Yountville	Total
Wildfire	30	1	24	16	15	9	95
Extreme Heat	5	—	—	1	—	—	6
Sea Level Rise + Flooding	29	3	6	13	19	18	88
Drought + Water Supply	13	1	1	3	4	1	23
Energy Grid Impacts	3	—	3	2	2	—	10
Emergency Preparedness	39	—	5	17	5	10	76

Source: **Compiled by Ascent in 2025**.

Existing Hazard Mitigation Actions and Safety Element Policies Related to Wildfire

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
During drought conditions increase fuel reduction in parks and open space areas.	County	Annually	Unknown	Unknown	General Funds/Grants	High
Map and identify locations and implement fuel reduction projects in high-risk areas in the City such as the areas west of Highway 128.	Calistoga	Ongoing	Unknown	Unknown	Existing Department Budgets	High
Maintain and further develop the fuel reduction program to include provisions for Legacy High School fuel breaks.	American Canyon	Ongoing	Unknown	N/A	ACFPD General Fund, Fire Prevention Grant Programs, Cost Recovery Fees	Extreme
Retrofit critical public safety infrastructure.	Calistoga	5-10 Years	Unknown	Unknown	General Fund/Grants	Extreme
Revise the General Plan Safety Element with lessons learned from to include new information from HMP and fire-wise programs and analysis.	Calistoga	1-3 Years	50,000	Unknown	General Fund	Extreme
Focus on human causes of ignition and address the problem through education and enforcement actions. Develop "mitigation" resources for residents in high hazard areas including incentives for fuel reduction and building material retrofits.	Calistoga	Ongoing	Unknown	Unknown	General Fund	Extreme
Fund / augment chipper program equipment and resources.	County	1-3 Years	50,000	10,000 Annually	CAL FIRE Community Fire Prevention Grants/Fire Mitigation Grants/California Fire Safe Council	Medium
Continue technical and financial assistance to private property owners to implement fuel reduction projects.	County	Annually	50,000	10,000 Annually	CAL FIRE Community Fire Prevention Grants/Fire Mitigation Grants/California Fire Safe Council	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Develop & conduct a Defensible Space community education program.	County	Annually	25,000	5,000 Annually	Napa County Fire Department/Fire Mitigation Grants	High
Draft & promulgate Defensible Space Ordinance.	County	Annually	N/A	Staff work as necessary	N/A	High
Foster & form neighborhood based Firewise Councils through grant writing.	County	Annually	25,000	N/A	Grants	High
Retrofit critical public safety infrastructure with fire resistant materials and or create defensible space around structures.	County	5-10 Years	200,000	20,000	General Funds/Grants	High
Focus on human causes of ignition and address the problem through education and enforcement actions, to include vigorous investigation and prosecution of arson.	County	3-5 Years	50,000	10,000 Annually	General Fund	High
Conduct prescribed burns as part of wildfire mitigation strategy.	County	3-5 Years	100,000	20,000 Annually	Napa County Fire Department/Fire Mitigation Grants	Medium
Retrofit care facilities (adult care, childcare) with fire-resistant materials and or create defensible space around structures.	County	3-5 Years	50,000	10,000 Annually	Fire Mitigation Grants	High
Complete vegetation management projects as prescribed in CWPPs.	County	Annually	200,000	50,000 Annually	CAL FIRE Community Fire Prevention Grants/Fire Mitigation Grants/California Fire Safe Council/ Cal. Consv. Corps/ General Fund	High
Construct shaded fuel breaks and complete roadside treatment projects as prescribed in CWPPs.	County	Annually	750,000	50,000 Annually	CAL FIRE/ California Fire Safe Council/ California Conservation Corps/ Napa County General Fund	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Install proper addressing in rural areas to assist in wildfire emergencies.	County	1-3 Years	25,000	5,000 Annually	Existing County Funds/Grants	Medium
Work with utility providers to move above ground lines underground.	PG&E	5-10 Years	1,500,000	250,000 Annually	Fire Mitigation Grants	High
Construct or improve egress for wildfire emergencies in wildland urban interface (WUI) areas.	County	5-10 Years	50,000	10,000 Annually	CAL FIRE/Napa Firewise/California Fire Safe Council	High
Provide smoke/air quality mitigation measures for Critical Facility Air Intakes.	St. Helena	1-3 Years	Unknown	Unknown	Bonds, Grants, Fee Increases	Extreme
Implement fuel reduction projects to reduce impacts to homes and businesses.	St. Helena	Ongoing	Unknown	Unknown	Existing Budget, Grants	Extreme
Retrofit At-Risk Structures with Ignition-Resistant Materials or Require or Encourage Fire-Resistant Construction Techniques.	St. Helena	Ongoing	Unknown	Unknown	Existing Budget, Grants	Extreme
Develop and or share outreach material on air quality mitigation measures for residents before wildfire season.	St. Helena	Annually	10,000	2,500	Existing Budget, Grants	Extreme
Implement fuel reduction/building retrofit projects to limit combustibility to school facilities.	St. Helena	Ongoing	Unknown	Unknown	Bonds, Grants, Fee Increases	Extreme
Develop Public awareness information for wildfire season related to flame/sparking equipment.	St. Helena	Ongoing	10,000	2,500	Existing Budget, Grants	Extreme
Work with local agencies to develop evacuation plans and provide education and outreach to populations vulnerable to wildfire.	Yountville	Annually	25,000	25,000	Town General Fund And Grant Funding	High
Develop Structural Protection Plans for Wildland Urban Interface Areas.	City of Napa	1-3 Years	Medium	Unknown	HMGP/BRIC, AFG	High
Continue to support the Napa Communities Firewise Foundation in the development of Fire Safe Councils and implementation of the 2021 Community Wildfire Protection Plan.	City of Napa	Ongoing	High	Unknown	HMGP/BRIC, Internal Funding	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Continue to upgrade existing water utility infrastructure to increase redundancy in high fire hazard areas especially at the rural and urban interface to minimize the risk of losing access to infrastructure during an event.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC, AFG	Medium
Ensure the Fire Department reviews all building plans in WUI areas for defensible space, emergency vehicle access, fire flow and ignition resistant construction requirements.	City of Napa	Ongoing	Medium	Unknown	HMGP/BRIC, AFG	Low
Provide an ongoing vegetation management program such as the City's weed abatement ordinance to prohibit the spread of wildfire in ground and aerial fuels and to assist homeowners in developing defensible space.	City of Napa	1-3 Years	Medium	Unknown	HMGP/BRIC, AFG	Low
Coordinate watershed protection efforts within the Lake Hennessey and Lake Milliken watersheds to protect drinking water supplies from water quality impacts.	City of Napa	Ongoing	High	Unknown	HMGP/BRIC, Internal Funding	High
Implement Lake Hennessy Intake Pump Station Defensible Space /Construction Upgrade.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC, EMPG, Internal Funding	High
Conduct Lake Hennessy Pipeline Protection Project.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC, Internal Funding	High
Implement demonstration fuels treatment and emergency access project at Timberhill Park.	City of Napa	3-5 Years	High	Unknown	CAL FIRE, HMGP / BRIC	Extreme
Maintain Fire Access Roads and evacuation routes that have been identified throughout the City of Napa.	City of Napa	Ongoing	Medium	Unknown	Internal Funding, Cal FIRE	Extreme
Fund and implement the Milliken Raw Water Pipeline Hardening Project.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC	Extreme

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Implement fuel reduction in high fire hazard severity zones.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Collaborate with other agencies for the implementation of wildfire and hazard plans.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Maintain consistency with California codes.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Coordinate with fire agencies to plan for fire prevention and suppression needs.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Minimize hazards in very high fire hazard severity zones.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Meet or exceed fire safety standards for Napa County buildings and roads.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Support new technology in fire suppression and prevention.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Ensure new development complies with fire safety standards.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Preserve and maintain fire prevention techniques.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Maintain fire breaks.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Use guidance from the Community Wildfire Protection Plan.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Continue county chipper program.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Require proper addressing and signage.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Coordinate implementation of farmworker wildfire education.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Locate public facilities outside of high fire hazard severity zones.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Implement fire safety and evacuation recommendations.	County	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Implement best practices to address wildfire prevention on open space land within and around the City.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Facilitate communication and education to the community about fire safety, wildland fire protection measures, and evacuation/emergency response to wildland fires.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Continue to educate property owners and the public about local fire hazard prevention programs, vegetation management strategies, and other disaster preparation activities in areas threatened by wildfire.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Ensure that future development plans provide adequate evacuation routes, vegetation management policies, and fire-reduction design measures, as appropriate.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Support efforts to improve the provision of emergency fire services for areas north of Fire Station 5.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Limit development in areas of High and Very High wildfire hazard as defined and mapped by the California Department of Forestry and Fire Prevention (CAL FIRE) in order to prevent the loss of lives, injuries, and property damage due to wildfires.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Ensure that all streets and roads are adequate in terms of width, turning radius, and grade in order to facilitate access by City firefighting apparatus, and to provide alternative emergency routes of ingress and egress.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Designate areas in St. Helena that are prone to fire hazards and make this information available to the community.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Continue to require implementation of best practices in fire resistance for all new and remodeled structures in fire-prone areas, including fire fuel removal, creation of defensible space for firefighters, construction with fire-resistant building materials, and installation of automatic sprinkler systems. Study the need to designate a Wildland-Urban Interface Fire Area within St. Helena to provide protection in additional areas.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Require all structures in high wildfire hazard areas to maintain a clearance of flammable vegetation away from structures and to use fire-resistant ground covers. The minimum clearance distance should be 30 feet.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Require all new development to meet the minimum fire flow rates specified by the City's Fire Code.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Require all new development plans to be approved by the Fire Department prior to the issuance of building permits, grading permits, or final map approval.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Develop a program to inform and educate the community about potential risks, resources, and roles and responsibilities for addressing fire safety in St. Helena. Inform residents of homes adjacent to public lands of their responsibility to provide fire breaks adjacent to their homes.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Develop a program to inform and educate the community about potential risks, resources, and roles and responsibilities for addressing fire safety in St. Helena. Inform residents of homes adjacent to public lands of their responsibility to provide fire breaks adjacent to their homes.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Napa County Fire Department Agreement. Maintain agreement with Napa County Fire Department for fire protection and to maintain adequate level of service.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Risk and Response Time. Coordinate with Napa County Fire Department to meet accepted levels of risk and response time.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Inspections and Site Plan Review. Maintain programs with Napa County Fire Department for inspections and site plan review.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Weed Abatement and Defensible Space. Develop weed abatement and defensible space programs which reduce risk of fire while maintaining native vegetation and wildlife habitat.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Heather Street and Heritage Court Emergency Access. Maintain the existing one-lane emergency access connection at Heather Street and Heritage Court.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Fire Risk in New Development. - Review all development proposals for fire risk and require mitigation measures to reduce the probability of fire. Encourage attractive native and drought tolerant, low-maintenance landscaping responsive to fire hazards. - Require all new development to meet the adopted State and local fire codes. - Require adequate access for emergency vehicles, adequate street width and vertical clearance, driveway access and parking restrictions for new development. - Require sprinkler systems for new commercial and residential development and substantial remodels and additions.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Water Supply for Fire Fighting. Maintain an adequate water supply, fire hydrant system, and water pressure to effectively suppress fires.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Education and Code Enforcement. Increase fire prevention effectiveness through education and code enforcement, including requirements for defensible space around structures and removal of flammable vegetation near roadways.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Plans for development in the Very High Fire Hazard Area shall be reviewed for their incorporation of design measures to reduce wildland fire risk.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
New roadways and driveways in the Very High Fire Hazard Area shall be designed and constructed to be adequate in terms of width, radius, and grade to facilitate access by fire-fighting apparatus.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Enforce wildland fire control measures required by the Fire Code.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
The City shall be fully informed about potential wildfire risks and how wildfires are likely to behave.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Prepare a community wildfire risk assessment that identifies likely severe-case wildfire characteristics; identifies sub-standard conditions, such as existing structures that do not conform to contemporary fire standards, inadequate access, and insufficient water flow; and actions that could be taken to avoid wildfires and minimize wildfire damage.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Provide opportunities for residents within the Very High Fire Hazard Area to be informed about wildfire prevention and response.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Support efforts to organize residents within the Very High Fire Hazard Area to promote fire-wise practices.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
As resources are available, educate residents about defensible space planning and construction, fire-safe landscaping, fire-wise construction, emergency supplies and evacuation, wildfire behavior and "fire hardening" their homes to survive an advancing wildland fire through workshops and providing information.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
As resources are available, work to establish a Fire Safe Council and the preparation of a community action plan that prioritizes hazard mitigation actions and provides a sustained program of wildfire mitigation.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Support events that involve residents in vegetation clean-up.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Seek fire safety grants to fund wildfire mitigation activities such as vegetation management.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Maximize the use of outside resources in responding to wildfires.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Maintain effective communications during major mutual aid incidents.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Work with CAL FIRE to develop a coordinated plan that effectively addresses wildfires in the city and its environs.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Participate in countywide local hazard mitigation planning efforts and the implementation of fire hazard mitigation actions.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Continue to implement state and federal communication and interoperability guidelines and maintain sufficient communication equipment.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Be prepared to minimize damage after a wildfire from erosion, landslides, and mudflows.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Promote appropriate revegetation after a wildfire.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Seek funding for and prepare a burn area recovery plan that provides for revegetation; control of noxious weeds; restoration of native species and wildlife habitats; minimizes flooding, sediment flows and landslides; protects water quality and reduces other risks.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Plan for the disposal of debris and ash, building inspections, and building and grading permits post-wildfire.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified

Source: **Compiled by Ascent in 2025.**

Existing Hazard Mitigation Actions and Safety Element Policies Related to Extreme Heat

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Construct or identify existing locations for cooling centers near farm worker populations.	County	1-3 Years	25,000	10,000 per year	Mitigation Funds	Medium
Develop air conditioning replacement/reimbursement program for low income and elderly residents.	County	1-3 Years	250,000	10,000 annually	Grants/Bonds/Fee Increased	High
Support risk assessments in relation to warmer climate in the agriculture and wine industries.	County	1-3 Years	25,000	5,000 annually	Existing County Funding/Grants	Medium
Conduct public outreach regarding cooling center availability, especially targeting vulnerable populations; periodically review available cooling center usage, distribution, and availability throughout the City.	City of Napa	Ongoing	Low	N/A	HMGP/BRIC	Medium
Construct cooling centers near farmworker populations.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Assist vulnerable populations with acquisition of air conditioning systems.	County	Not identified	Not identified	Not identified	Not identified	Not identified

Source: **Compiled by Ascent in 2025**.

Existing Hazard Mitigation Actions and Safety Element Policies Related to Sea Level Rise + Flooding

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Plan for and construct sea level rise protection for American Canyon Critical Infrastructure such as Public Works Yard, Sewer Treatment Plant, and Pump Station.	American Canyon	Ongoing	Unknown	Unknown	FEMA	Medium
Support ongoing analysis of sea-level rise data.	County	1-3 Years	50,000	10,000 Annually	Existing County Funds	Medium
Create a comprehensive outreach strategy that informs residents in potentially affected areas of County efforts to protect and increase community resiliency to sea-level rise.	County	1-3 Years	25,000	5,000 Annually	Existing County Funds/Grants	Medium
Elevate 100 of the most flood prone residential structures along areas not receiving direct protection from Measure "A" Flood Project. Provide flood mitigation resource (e.g., ways to reduce flood risk) to residents within the American Canyon Mobile Home Park (68 parcels).	American Canyon	5-10 Years	5,000,000	Unknown	City Capital Budget Grants; Federal Grants	High
Inform American Canyon residents and in-home Adult Care providers of possible flooding during "major" flood events.	American Canyon	Ongoing	Unknown	Unknown	Existing budget or grants	High
Implement localized flood reduction projects or flood-proof 100 of the most flood-prone residential structures along with areas "not" receiving direct protection from Measure "A" Flood Project in the City of Calistoga.	Calistoga	3-5 Years	5,000,000	Unknown	City Capital Budget Grants; Federal Grants	High
Routinely inspect and maintain storm water inlets and outfalls for debris and obstructions, sand & gravel build-up, and structural damage or vandalism.	Calistoga	Annually	30,000	100,000	Local Jurisdictions Annual Budget, General Fund, Local Funding	High
Develop a localized remap of the floodplain, flood projects, or flood-proofing for Critical Facilities within the City; specifically, north of Lincoln Avenue.	Calistoga	3-5 Years	Unknown	Unknown	General Fund/Grants	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Mitigate flood risk for flood-prone residential structures along areas not receiving direct protection from Measure "A" Flood Project.	County	3-5 Years	5,000,000	Unknown	City Capital Budget Grants; Federal Grants	High
Develop a public outreach program that informs property owners located in the dam or levee inundation areas about voluntary flood insurance (preferred risk policies).	County	1-3 Years	40,000	Unknown	Existing budget or grants	High
Increase participation in the NFIP.	County	1-3 Years	25,000	Unknown	Existing budget or grants	High
Draft stream channel ordinance that would place responsibility for maintenance on the property owner and give Napa enforcement power.	County	5-10 Years	Unknown	Unknown	Bonds, grants, fee increases	Low
Construct, install and maintain warning gauges on local dams as the opportunity or need arises.	County	3-5 Years	1,500,000	Unknown	Bonds, grants, fee increases	Medium
Improve risk assessments for dams located within the county.	County	1-3 Years	20,000	5,000	Existing budget	Medium
Complete an inventory of all publicly owned stormwater facilities.	County	1-3 Years	Unknown	Unknown	Existing budget, grants, bonds, fee increases	Low
Create an inventory and establish a priority list for culvert replacement that takes into account fish passage, flood depth reduction, and future losses avoided.	County	3-5 Years	Unknown	Unknown	Existing budget, grants, bonds, fee increases	Low
Relocate farmwork centers from flood risk areas.	County	3-5 Years	Unknown	Unknown	Bonds, grants, fee increases	Medium
Elevate and/or retrofit bridges, culverts to allow proper stormwater / 100-YR flows.	County	5-10 Years	Unknown	Unknown	Bonds, grants, fee increases	Medium
Mitigate flood risk to NFIP repetitive loss properties.	County	Annually	Unknown	Unknown	Existing budget, grants, bonds, fee increases	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Construct / improve stormwater basins County-wide to accomplish 100-YR protection.	County	3-5 Years	Unknown	Unknown	Bonds, grants, fee increases	Medium
Adopt higher regulatory standards (including but not limited to freeboard, comp storage, lower substantial damage thresholds, setbacks, and fill restrictions) as a means to reduce future flood risk and support a no adverse-impact philosophy of floodplain management.	County	1-3 Years	Unknown	Unknown	Existing budget, grants, bonds, fee increases	Medium
Maintain Countywide Storm Watch System.	County	Annually	80,000	30,000	Napa County Watershed Assessment	High
Completion of the Measure "A" Flood Control Project.	County	5-10 Years	100,000,000	100,000	County sales tax/federal funding	High
Routinely inspect storm water channels for vegetation build up or encroachment, trash and debris, silt and gravel build up, and erosion or bank failure and maintain said channels permitted by California Department of Fish and Wildlife.	County	Annually	N/A	200,000	Local watershed assessment/federal funding needed	High
Secure grant funding to develop and implement a river restoration program that would reduce flood damage and increase environmental quality on the river, maintain fish habitat, decrease impediment to drainage by preventing silt build-up and loss of stream bed capacity.	County	5-10 Years	23,000,000	200,000	State and Federal grants	High
Provide flood protection resources to residents on the Napa River to reduce flood losses. Resources could include technical, education and grant application assistance for floodproofing properties.	St. Helena	Ongoing	Unknown	Unknown	Existing budget, grants	High
Provide flood mitigation resources (e.g., ways to reduce flood risk) to residents within the Vineyard Valley Mobile Home Park.	St. Helena	Ongoing	Unknown	Unknown	Existing budget, grants	High
Improve stormwater drainage system capacity and maintenance for Pratt and Pope Street bridges in St. Helena.	St. Helena	5-10 Years	Unknown	Unknown	Bonds, grants, fee increases	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Develop evacuation plans for communities and residents downstream from the Rector Creek Dam.	Yountville	Annually	25,000	25,000	General fund revenue and potential grant funding	High
Identify properties that are potential candidates for elevation, relocation or buyout based on an evaluation of flood risks, project feasibility, and planned flood risk reduction capital projects.	Yountville	Annually	12,000,000	25,000	General fund and grant funding	High
Secure grant funding to develop and implement river restoration program that would reduce flood damages and increase environmental quality on the river, maintain fish habitat, decrease impediment to drainage by preventing silt build up and loss of stream bed capacity.	Yountville	5-10 Years	Unknown	Unknown	General fund and potential grant funding	Medium
Invest in flood prediction and forecast modeling to support all facets of the Napa County floodplain management program, including, but not limited to, flood hazard identification, flood threat recognition in support of flood notification programs, climate change adaptation, and risk assessment.	Yountville	5-10 Years	Unknown	Unknown	General fund and grant funding	Low
Enhance the existing flood notification program to achieve real-time flood threat recognition capability.	Yountville	3-5 Years	Unknown	Unknown	General fund and grant funding	Medium
Complete approved Napa River Flood Protection Project by continuing to assist the U.S. Army Corps of Engineers, Napa County Flood Control and Water Conservation District, other responsible agencies, and the public to maintain funding for the development of the Flood Project.	City of Napa	Ongoing	High	Unknown	HMGP/BRIC, FMA	Extreme

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Pursue funding for the design and construction of storm drainage projects to protect properties that will not be fully protected by the Flood Protection Project, including home elevations, property acquisitions, upstream storage such as detention basins, and channel widening with the associated right-of-way acquisitions, relocations, and environmental mitigations.	City of Napa	Ongoing	High	Unknown	HMGP/BRIC, FMA	High
Coordinate with County to improve Countywide flood surveillance/early warning system.	City of Napa	Ongoing	Low	Unknown	Internal Funding	High
Continue to apply floodplain management regulations for development in the flood plain and floodway.	City of Napa	Ongoing	Medium	Unknown	HMGP/BRIC, FMA	High
Increase coverage of Storm Watch sensors to include small streams that, due to land use changes, have demonstrated an impact on existing streams and urban flooding.	City of Napa	1-3 Years	Medium	Unknown	HMGP/BRIC, FMA, Internal Funding	Medium
Distribute NOAA weather Radios to high risk, limited income families living in flood zones. Develop program of at cost NOAA radios for families in the various flood zones in Napa County. Provide weather radios to block captains.	City of Napa	1-3 Years	Medium	Unknown	N/A	Low
Periodically update the Flood Insurance Rate Maps to reflect the improvements that have been completed as part of the Flood Protection Project.	City of Napa	Ongoing	Low	Unknown	FMA	High
Implement various flood control projects after approved Flood Control Project. For example, additional pump stations are needed to increase the functionality and resilience of the flood wall along the west side of the Napa River.	City of Napa	5-10 Years	High	Unknown	HMGP/BRIC, FMA, Internal Funding	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Implement the Trower Avenue Storm Drain Improvements, Phase II project, which consists of improvements to alleviate flooding from heavy rain events along Valencia Street, Yosemite Street, Diablo Street and Glacier Drive.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC, FMA	High
Encourage public utility agencies to analyze and prepare for impacts of sea level rise on facilities.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Conduct sea level rise monitoring and public education.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Implement safety and preparation measures from the MJHMP.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Evaluate construction in new floodplains.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Maintain areas subject to flooding in agricultural or open spaces.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Review potential flood impacts for newly proposed projects in a floodway.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Ensure proper maintenance and repairs for dams and levees.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Improve stormwater basins.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Elevate new structures above the 100-year flood level.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Update National Flood Insurance Program floodplain maps.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Seek opportunities to invest in flood prevention infrastructure, including extension of integrated flooding/open space solutions, to reduce impacts from flooding to Downtown Napa and other areas located along the Napa River.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Update the Storm Drain Master Plan focusing the City's effort on condition assessment and needed repairs, storm drain capacity improvements to reduce neighborhood flooding, and assure it is complementary with the Napa River-Napa Creek Flood Protection Project (including both constructed and planned future improvements).	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Limit development in the 100-year floodplain to development which represents an acceptable use of the land in relation to the hazards involved and the costs of providing flood control facilities. Locate critical facilities, such as hospitals, fire stations, police stations, public administration buildings, and schools outside of flood hazard areas, to the extent feasible.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Require all projects in floodplains, to the extent feasible, adhere to strict design guidelines that ensure any proposed development will withstand a flooding event, and will not jeopardize the existing surrounding or downstream structures.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Minimize the risk to people, property and the environment caused by flooding hazards. Site new development to minimize potential damage from a 100-year flood. Continue to require that any new development is constructed FEMA standards. Prohibit the siting of uses within Flood Hazard Areas inconsistent with FEMA standards that could result in health and safety hazards, including those due to the release of chemicals or other substances as a result of inundation or erosion. Ensure that any new flood protection projects comply with federal and State standards.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Ensure that new development or existing lots of record within the 100-year floodplain are properly graded, sited, and constructed to mitigate flood effects and do not cause increases or expansion of the flood area that increase flood risk.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Within the 100-year floodplain, encourage open space uses, such as parks or natural areas.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Ensure that construction of flood barriers does not adversely affect natural floodplains, stream channels and natural barriers that help accommodate or channel flood waters.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Prohibit new development within areas designated as Floodway in the current FEMA Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM).	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Coordinate with the Napa County Flood Control and Water Conservation District and other responsible agencies to maintain protocols and funding for the regular inspection and maintenance of flood control facilities in the city, including levees, floodwalls, floodplain terracing, stormwater detention ponds, and pumping facilities.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Require that development within Special Flood Hazard Areas prepare and implement infrastructure and drainage plans compliant with State and federal requirements in order to minimize risk in these areas.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Locate new essential public facilities outside of Special Flood Hazard Areas, including hospitals and health care facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Coordinate with the Napa County Flood Control District to ensure that stream channels are routinely cleared of vegetation and debris which could impede stormwater flows, while protecting riparian habitat.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Require developers with land adjacent to the Napa River to construct or contribute a fair share toward the construction of necessary flood control improvements.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Strengthen and enforce regulations that prohibit the dumping of litter, fill, and waste materials into creeks and waterways. Educate the public about flooding and health hazards associated with these activities.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Require that sewer and water lines in areas subject to flooding are sited to avoid contamination and flooding when pipelines break.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Prohibit the introduction of urban development in FEMA-designated Floodway zones.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Review Municipal Code Chapter 15.52, Flood Damage Prevention, to ensure that regulations reflect best practices. Periodically update the City's flood hazard regulations in accordance with FEMA/NFIP regulations.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Implement the requirements of FEMA relating to construction in Special Flood Hazards Areas as illustrated on Flood Insurance Rate Maps.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Implement low impact development practices for new development and redevelopment projects to reduce stormwater peak flow rates and volumes from smaller, more frequently occurring storm events.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Mesa-Tallent Lane Storm Drainage Benefit District. Require all development within the Mesa-Tallent Lane Storm Drainage Benefit District to participate and fund improvements which address the drainage problems of the area.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Hopper Creek. Maintain Hopper Creek as a natural creek. Preserve and enhance the riparian habitat and flood control attributes of the creek by requiring development setbacks and regulating the planting and removal of creekside vegetation.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Flood Insurance Rate Maps. Use the most recent Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps to identify 100-Year Flood Events and calculate flow rates within identified stream channels. Monitor FEMA's efforts to map the 200-year flood plain and address new requirements as appropriate.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Development within the 100-Year Flood Zone. Require development within the 100-year flood zone to comply with the floodplain management regulations of the Yountville Municipal Code.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Maintain Flood Wall. Maintain the flood wall surrounding the mobile home parks to reduce damage from flooding.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Extension of Flood Wall. Evaluate whether to extend the flood wall to the church-owned property at the far southeast corner of town.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Storm Drainage System. Maintain unobstructed water flow in the storm drainage system to the maximum extent feasible. Continue to carry out inspections and maintenance of drainage systems.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Flood Protection Easements. Ensure the retention of flood protection easements held by public agencies on private property to prevent development in these areas.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Beard Ditch. Work with Napa County to support its efforts to perform annual maintenance of Beard Ditch for drainage purposes.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Rector Creek Dam. Work with Napa County, the State, and federal agencies to encourage measures to ensure the safety of Rector Creek Dam and to prepare for and respond to potential flooding events.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Coordination with Napa County. Work with Napa County officials in urging the State and federal governments to make flood control improvements to the Napa River which will reduce or eliminate the danger of flooding caused by overflow of the Napa River.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Napa County Stormwater Pollution Prevention Program. Work with the Napa County Flood Control District to implement the Stormwater Pollution Prevention Program to minimize negative impacts of storm runoff.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
Napa County Flood Control District. Participate in the Napa County Flood Control and Water Conservation District to manage flood and storm waters to protect life and property, and to maintain the Napa River, its tributaries, and watershed.	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
No construction shall be permitted in the floodway as mapped by FEMA and modified in subsequent site-specific studies without the approval of a variance by the City Council.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Continue to administer the City's floodplain management regulations.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified
Encourage property owners in Calistoga to purchase National Flood Insurance to reduce the financial risk from flooding and mudflows.	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified

Source: **Compiled by Ascent in 2025**.

Existing Hazard Mitigation Actions and Safety Element Policies Related to Drought

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Construct and develop alternative water supplies to augment single sources of water delivery.	County	3-5 Years	1,000,000	50,000	Grants/Bonds/Fee Increases	High
Construct rainwater catchment systems to recharge groundwater in government ROWs.	County	5-10 Years	1,000,000	50,000	Grants/Bonds/Fee Increases	Low
Require mandatory water conservation measures during drought emergencies.	American Canyon	Ongoing	Unknown	Unknown	Existing Budget, grants	High
Augment City water supply systems with supply contingency projects for Drought years, such as increasing water supply and treatment capacity of Kimball Reservoir. Contingency planning/projects will include provisions for agriculture sector.	Calistoga	5-10 Years	Unknown	Unknown	Water Enterprise/General Fund/Impact Fees/Grants	High
Develop a public education campaign to encourage water conservation during drought.	County	3-5 Years	25,000	5,000	Existing County Budget/Grants	Medium
Install water monitoring devices on government-owned facilities.	County	5-10 Years	1,000,000	50,000	Grants/Bonds/Fee Increases	High
Install drought tolerant landscaping at government-owned facilities.	County	3-5 Years	250,000	25,000	Grants/Bonds/Fee Increases	Low
Amend or revise water conservation regulations for landscape design.	County	1-3 Years	50,000	10,000 Annually	Existing County Budget/Grants	Medium
Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering.	County	1-3 Years	50,000	10,000 Annually	Existing County Funds/Grants	Medium
Retrofit water supply systems in order to improve water supply and delivery and conserve water.	County	5-10 Years	Unknown	Unknown	Bonds, grants, fee increases	High
Develop landscape planting procedures and planting plans for residents and business wishing to reduce water usage through landscape design.	St. Helena	Ongoing	Unknown	Unknown	Existing budget, grants	High
During drought conditions increase fuel reduction in parks and open space areas.	St. Helena	Ongoing	Unknown	Unknown	Existing budget, grants	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Increase engagement between the fire and drought communities.	Yountville	Ongoing	Unknown	Unknown	General Fund and grants if available	Medium
Secure internal and external water supply sources and maintain reservoir levels to withstand drought years.	City of Napa	Ongoing	Medium	Unknown	HMGP/BRIC	High
Develop a public education campaign to encourage water conservation during drought, in collaboration with the Napa Valley Drought Contingency Plan Task Force and Napa Sanitation District. The intent is to avoid or delay issuance of water restriction emergency declarations.	City of Napa	3-5 Years	Medium	Unknown	HMGP/BRIC, Internal Funding	Medium
Implement recommendations from the Napa Valley Drought Contingency Plan. Incorporate into the City's Urban Water Management Plan.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC, Internal Funding	High
Construct rainwater catchment systems.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Develop alternative water supplies.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Continue to invest in programs that promote water conservation in Napa County's agricultural industry.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Install water monitoring devices on government-owned facilities.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Invest in water use efficiency and conservation.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Strengthen water conservation measures that result in significant reductions in local water use and the protection of local water resources.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Adopt landscape ordinances that promote drought resistant plants, and limit or restrict lawns and other high-water-demand plants unless irrigated with reclaimed or grey water systems.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified

Source: **Compiled by Ascent in 2025**.

Existing Hazard Mitigation Actions and Safety Element Policies Related to Energy Grid Impacts

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Establish tree pruning / removal standards for above ground utilities lines within City limits.	Calistoga	1-3 Years	Unknown	Unknown	Existing department budgets	High
Identify schools that have been designated as emergency shelters by the Red Cross within City Limits and ensure they have sufficient back up power generators.	Calistoga	1-3 Years	Unknown	Unknown	Grants	High
Procure backup generators in the event that public meeting spaces such as community centers or town halls will be used as Emergency Command Centers. Perform regular maintenance on generators at water treatment plants.	County	3-5 Years	1,500,000	5,000 annually	Federal Grant Funds	High
Develop microgrids to provide emergency power during natural disasters.	Calistoga	3-5 Years	Unknown	Unknown	General Funds/Grants	High
Harden and build redundant (power and other) capabilities into Public Safety buildings.	County	5-10 Years	1,000,000	20,000 Annually	Federal Grant Funds	Medium
Construct/Install back up power generators for fire stations, pump houses, emergency shelters and cooling centers.	County	1-3 Years	1,500,000	5,000 Annually	Federal Grant Funds	High
Develop microgrids to provide emergency power during natural disasters.	St. Helena	3-5 Years	Unknown	Unknown	Bonds, grants, fee increases	Medium
Provide hazard mitigation information (e.g., ways to reduce risk) to first responders living within hazard-prone areas.	St. Helena	Ongoing	Unknown	Unknown	Existing budget, grants	Medium
Construct backup generators at critical facilities (fire stations, hospital) and sheltering locations to respond to hazard events in loss of power.	City of Napa	Ongoing	Medium	Unknown	HMGP/BRIC	High
Develop cost share program to help private landowners with tree maintenance to avoid power outages and damage during windstorms.	City of Napa	3-5 Years	High	Unknown	HMGP/BRIC	Medium

Source: **Compiled by Ascent in 2025**.

Existing Hazard Mitigation Actions and Safety Element Policies Related to Emergency Preparedness

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Organize outreach to vulnerable populations, including establishing and promoting accessible shelters in the community.	County	1-3 Years	40,000	5,000	Existing County Funds/Grants	High
Develop a public information campaign on 72-hour kits.	County	1-3 Years	20,000	5,000	General Fund	Medium
Develop a "Natural Hazard Awareness Week" campaign and conduct corresponding outreach to the community and all interested parties. Activities will focus on flooding and other natural hazards, including associated hazard functions, governing laws/regulations, mitigation strategies and precautions. Outreach will also be conducted throughout the year, wherever possible.	County	1-3 Years	80,000	10,000 Annually	Existing County Funds	High
Inform residents and tourists of shelter locations and evacuation routes and procedures for storing or taking valued items before large scale evacuations.	St. Helena	Ongoing	Unknown	Unknown	Unknown	High
Improve existing communication systems, especially developing redundant communication systems and wireless infrastructure.	City of Napa	3-5 Years	High	N/A	HMGP / BRIC, EMPG	High
Build an alternate EOC.	City of Napa	3-5 Years	High	N/A	EMPG, Internal Funding	High
Create a Remote Workers Infrastructure.	City of Napa	1-3 Years	High	N/A	HMGP / BRIC	Medium
Promote greater public awareness of disaster preparedness, hazard mitigation, and disaster recovery.	City of Napa	Ongoing	Low	N/A	Internal funding, N/A	High
Maintain and equip an Emergency Operation Center (EOC) for immediate availability in the event of a disaster.	City of Napa	Ongoing	Low	N/A	N/A	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Work with local businesses to prepare Emergency Preparedness Plans by working with other agencies and advocacy organizations to distribute to and assist businesses with the preparation of plans in the case of disaster.	City of Napa	Ongoing	Low	N/A	N/A	High
Develop short-term shelter options for residents and animals by working with the American Red Cross, Humane Society, animal shelters, pet stores, local veterinarians, and others. Identify locations, necessary facilities, responders, etc.	City of Napa	Ongoing	Low	N/A	N/A	High
Develop procedures for inspecting and tagging business for occupancy after a disaster (Post Disaster Restoration Ordinance).	City of Napa	Ongoing	Low	N/A	N/A	Medium
Establish the position of Disaster Coordinator for the City of Napa.	City of Napa	1-3 Years	Medium	N/A	N/A	Medium
Develop a program to identify evacuation routes and procedures for all sensitive facilities and implement programs to practice evacuation and safety maneuvers.	City of Napa	Ongoing	Medium	N/A	N/A	Low
Develop a Climate Action Plan applicable with state and federal law.	City of Napa	Ongoing	Medium	N/A	N/A	Low
Organize outreach to vulnerable populations, including establishing and promoting accessible shelters in the community.	County	1-3 Years	40,000	5,000	Existing County Funds/Grants	High

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Promote intergovernmental cooperation and training. The County supports and will promote intergovernmental cooperation among local, state, and federal public agencies to reduce known hazards; further define uncertain hazards; and provide interagency training to effectively respond and coordinate during hazardous events. In particular, the County will work to develop cooperative working relationships with agencies having responsibility for flood and fire protection. Action Item SAF-1.1a: Participate in education programs. Participate in local, regional, and state education programs regarding fire, flood, and geologic hazards. Action Item SAF-1.1b: Promote safety training. Work to ensure that all county fire departments and local law enforcement, as well as other emergency office staff, identify potentially hazardous and cascading hazardous events and perform regular training biannually.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Provide up-to-date information. Individuals and businesses should have access to up-to-date information that allows them to collaborate with regional agencies and community-based organizations to expand communications, improve hazard preparation and response, and be able to make informed decisions about potential safety hazards and the level of risk they are willing to accept.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Perform post-disaster evaluation. Following disasters, conduct an evaluation of redevelopment, particularly after large fires.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Develop intra-county evacuation routes. The County shall cooperate with other local jurisdictions to develop intra-county evacuation routes to be used in the event of a disaster within Napa County.	County	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Update evacuation routes.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Utilize diverse communication technologies.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Maximize Alert Napa County registrations.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Address mental health in emergency planning.	County	Not identified	Not identified	Not identified	Not identified	Not identified
Disseminate emergency planning information (to the ag industry)	County	Not identified	Not identified	Not identified	Not identified	Not identified
Update evacuation planning actions	County	Not identified	Not identified	Not identified	Not identified	Not identified
36 actions on emergency preparedness	County	Not identified	Not identified	Not identified	Not identified	Not identified
Regularly assess adequacy of emergency response and evacuation routes and identify any need for road extensions to serve neighborhoods that do not have sufficient evacuation routes or access for emergency services.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Work with Downtown businesses to establish plans and procedures guiding response to natural disasters.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Inform and educate community members about natural hazards and safety procedures.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Effectively coordinate disaster response and preparation strategies with County, regional, State, and federal agencies in the event of major seismic activity, flood, or wildland fire.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Coordinate with other local public agencies to facilitate resilient telecommunication networks and infrastructure during disasters.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified
Facilitate expansion of the telecommunication system to ensure widespread community access during a disaster.	City of Napa	Not identified	Not identified	Not identified	Not identified	Not identified

Description	Responsible Party	Timeframe	Estimated Capital Costs	Estimated Maintenance Cost	Potential Funding Sources	Priority
Ensure that City emergency procedures are adequate in the event of potential natural or man-made disasters.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Maintain and periodically update the City's Emergency Response Plan.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Conduct periodic emergency response exercises to test the effectiveness of City emergency response procedures.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
Continue to collaborate with regional agencies and neighboring jurisdictions to develop and implement a regional emergency coordination plan and agreement for police, fire, and emergency medical services.	St. Helena	Not identified	Not identified	Not identified	Not identified	Not identified
7 policies/actions + 3 policies/actions on emergency management + disaster planning	Yountville	Not identified	Not identified	Not identified	Not identified	Not identified
5 Policies/actions on emergency management + disaster planning	Calistoga	Not identified	Not identified	Not identified	Not identified	Not identified

Source: **Compiled by Ascent in 2025**.