

Climate Change Memorandum

State Route Highway 1 Auxiliary Lanes and Bus-on-Shoulder Improvements—Freedom Blvd. to State Park Dr.—and Coastal Rail Trail Segment 12 Project

Santa Cruz County, California

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Climate Change

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the Earth's climate system. The Intergovernmental Panel on Climate Change, established by the United Nations and World Meteorological Organization in 1988, is devoted to greenhouse gas (GHG) emissions reduction and climate change research and policy. Climate change in the past has generally occurred gradually over millennia, or more suddenly in response to cataclysmic natural disruptions. The research of the Intergovernmental Panel on Climate Change and other scientists over recent decades, however, has unequivocally attributed an accelerated rate of climatological changes over the past 150 years to GHG emissions generated from the production and use of fossil fuels.

Human activities generate GHGs consisting primarily of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), tetrafluoromethane, hexafluoroethane, sulfur hexafluoride (SF₆), and various hydrofluorocarbons (HFCs). CO₂ is the most abundant GHG; while it is a naturally occurring and necessary component of Earth's atmosphere, fossil-fuel combustion is the main source of additional, human-generated CO₂ that is the main driver of climate change. In the U.S. and in California, transportation is the largest source of GHG emissions, mostly CO₂.

The impacts of climate change are already being observed in the form of sea level rise, drought, more intense heat, extended and severe fire seasons, and historic flooding from changing storm patterns. Both mitigation and adaptation strategies are necessary to address these impacts. The most important mitigation strategy is to reduce GHG emissions. In the context of climate change (as distinct from CEQA and NEPA), "mitigation" involves actions to reduce GHG emissions or to enhance the "sinks" that store them (such as forests and soils) to lessen adverse impacts. "Adaptation" is planning for and responding to impacts to reduce vulnerability to harm, such as by adjusting transportation design standards to withstand more intense storms, heat, and

higher sea levels. This analysis will include a discussion of both in the context of this transportation project.

REGULATORY SETTING

This section outlines federal and state efforts to comprehensively reduce GHG emissions from transportation sources.

Federal

To date, no national standards have been established for nationwide mobile-source GHG reduction targets, nor have any regulations or legislation been enacted specifically to address climate change and GHG emissions reduction at the project level.

The National Environmental Policy Act (NEPA) (42 United States Code [USC] Part 4332) requires federal agencies to assess the environmental effects of their proposed actions prior to making a decision on the action or project.

The Federal Highway Administration (FHWA) recognizes the threats that extreme weather, sea level change, and other changes in environmental conditions pose to valuable transportation infrastructure and those who depend on it. FHWA therefore supports a sustainability approach that assesses vulnerability to climate risks and incorporates resilience into planning, asset management, project development and design, and operations and maintenance practices (FHWA 2019). This approach encourages planning for sustainable highways by addressing climate risks while balancing environmental, economic, and social values— “the triple bottom line of sustainability” (FHWA n.d.). Program and project elements that foster sustainability and resilience also support economic vitality and global efficiency, increase safety and mobility, enhance the environment, promote energy conservation, and improve the quality of life.

The federal government has taken steps to improve fuel economy and energy efficiency to address climate change and its associated effects. The most important of these was the Energy Policy and Conservation Act of 1975 (42 USC Section 6201) as amended by the Energy Independence and Security Act (EISA) of 2007; and Corporate Average Fuel Economy (CAFE) Standards. This act established fuel economy standards for on-road motor vehicles sold in the United States. The U.S. Department of Transportation’s National Highway Traffic and Safety Administration (NHTSA) sets and enforces the CAFE standards based on each manufacturer’s average fuel economy for the portion of its vehicles produced for sale in the United States. The Environmental Protection Agency (U.S. EPA) calculates average fuel economy levels for manufacturers, and also sets related GHG emissions standards under the Clean Air Act. Raising CAFE standards leads automakers to create a more fuel-efficient fleet, which improves our nation’s energy security, saves consumers money at the pump, and reduces GHG emissions (U.S. DOT 2014).

U.S. EPA published a final rulemaking on December 30, 2021, that raised federal GHG emissions standards for passenger cars and light trucks for model years 2023 through 2026, increasing in stringency each year. The updated GHG emissions standards will avoid more than 3 billion tons of GHG emissions through 2050. In April 2022, NHTSA announced corresponding new fuel economy standards for model years 2024 through 2026, which will reduce fuel use by more than 200 billion gallons through 2050 compared to the old standards and reduce fuel costs for drivers (U.S. EPA 2022a; NHTSA 2022).

State

California has been innovative and proactive in addressing GHG emissions and climate change by passing multiple Senate and Assembly bills and executive orders (EOs) including, but not limited to, the following:

EO S-3-05 (June 1, 2005): The goal of this EO is to reduce California's GHG emissions to: (1) year 2000 levels by 2010, (2) year 1990 levels by 2020, and (3) 80 percent below year 1990 levels by 2050. This goal was further reinforced with the passage of Assembly Bill (AB) 32 in 2006 and Senate Bill (SB) 32 in 2016.

Assembly Bill (AB) 32, Chapter 488, 2006, Núñez and Pavley, The Global Warming Solutions Act of 2006: AB 32 codified the 2020 GHG emissions reduction goals outlined in EO S-3-05, while further mandating that the California Air Resources Board (ARB) create a scoping plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." The Legislature also intended that the statewide GHG emissions limit continue in existence and be used to maintain and continue reductions in emissions of GHGs beyond 2020 (Health and Safety Code [H&SC] Section 38551(b)). The law requires ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions.

Executive Order S-01-07 (January 18, 2007): This order sets forth the low carbon fuel standard for California. Under this order, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by the year 2020. The California Air Resources Board readopted the low carbon fuel standard regulation in September 2015, and the changes went into effect on January 1, 2016. The program establishes a strong framework to promote the low-carbon fuel adoption necessary to achieve the governor's 2030 and 2050 greenhouse gas reduction goals.

Senate Bill (SB) 375, Chapter 728, 2008, Sustainable Communities and Climate Protection: This bill requires ARB to set regional emissions reduction targets for passenger vehicles. The Metropolitan Planning Organization (MPO) for each region must then develop a "Sustainable Communities Strategy" (SCS) that integrates transportation, land-use, and housing policies to plan how it will achieve the emissions target for its region.

Senate Bill 391, Chapter 585, 2009, California Transportation Plan: This bill requires the State's long-range transportation plan to identify strategies to address California's climate change goals under Assembly Bill 32.

EO B-16-12 (March 2012) orders State entities under the direction of the Governor, including ARB, the California Energy Commission, and the Public Utilities Commission, to support the rapid commercialization of zero-emission vehicles. It directs these entities to achieve various benchmarks related to zero-emission vehicles.

EO B-30-15 (April 2015) establishes an interim statewide GHG emission reduction target of 40 percent below 1990 levels by 2030 to ensure California meets its target of reducing GHG emissions to 80 percent below 1990 levels by 2050. It further orders all state agencies with jurisdiction over sources of GHG emissions to implement measures, pursuant to statutory authority, to achieve reductions of GHG emissions to meet the 2030 and 2050 GHG emissions reductions targets. It also directs ARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent (MMTCO_{2e}). [GHGs differ in how much heat each traps in the atmosphere, called global warming potential, or GWP. CO₂ is the most important GHG, so amounts of other gases are expressed relative to CO₂, using a metric called "carbon dioxide equivalent", or CO_{2e}. The global warming potential of CO₂ is assigned a value of 1, and the GWP of other gases is assessed as multiples of CO₂.] Finally, it requires the Natural Resources Agency to update the state's climate adaptation strategy, Safeguarding California, every 3 years, and to ensure that its provisions are fully implemented.

SB 32, Chapter 249, 2016, codifies the GHG reduction targets established in EO B-30-15 to achieve a mid-range goal of 40 percent below 1990 levels by 2030.

SB 1386, Chapter 545, 2016, declared "it to be the policy of the state that the protection and management of natural and working lands ... is an important strategy in meeting the state's greenhouse gas reduction goals, and would require all state agencies, departments, boards, and commissions to consider this policy when revising, adopting, or establishing policies, regulations, expenditures, or grant criteria relating to the protection and management of natural and working lands."

SB 743, Chapter 386 (September 2013): This bill changes the metric of consideration for transportation impacts pursuant to CEQA from a focus on automobile delay to alternative methods focused on vehicle miles traveled (VMT), to promote the state's goals of reducing greenhouse gas emissions and traffic related air pollution and promoting multimodal transportation while balancing the needs of congestion management and safety.

SB 150, Chapter 150, 2017, Regional Transportation Plans: This bill requires ARB to prepare a report that assesses progress made by each metropolitan planning organization in meeting their established regional greenhouse gas emission reduction targets.

EO B-55-18 (September 2018) sets a new statewide goal to achieve and maintain carbon neutrality no later than 2045. This goal is in addition to existing statewide targets of reducing GHG emissions.

AB 1279, Chapter 337, 2022, The California Climate Crisis Act: This bill mandates carbon neutrality by 2045 and establishes an emissions reduction target of 85% below 1990 level as part of that goal. This bill solidifies a goal included in EO B-55-18. It requires ARB to work with relevant state agencies to ensure that updates to the scoping plan identify and recommend measures to achieve these policy goals and to identify and implement a variety of policies and strategies that enable carbon dioxide removal solutions and carbon capture, utilization, and storage technologies in California, as specified.

ENVIRONMENTAL SETTING

The proposed project is in an urban area of Santa Cruz County with a well-developed road and street network. The project area is mostly comprised of urban and built-up land with small portions of forested areas on the northern and southern edges of SR 1. These forested areas generally serve as vegetated buffers between SR 1 and adjacent land uses and none of these areas serve as active lumber production or other timberland use. The average minimum temperature is 45 degrees, and the average maximum temperature is 68.9 degrees. Average rainfall is 29.3 inches. At its closest point, the project is approximately 2,400 feet from the ocean. SR 1 is heavily used during peak hours. The 2040 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) guides transportation development in the project area. The Santa Cruz County General Plan Conservation and Open Space element addresses GHGs in the project area.

GHG Inventories

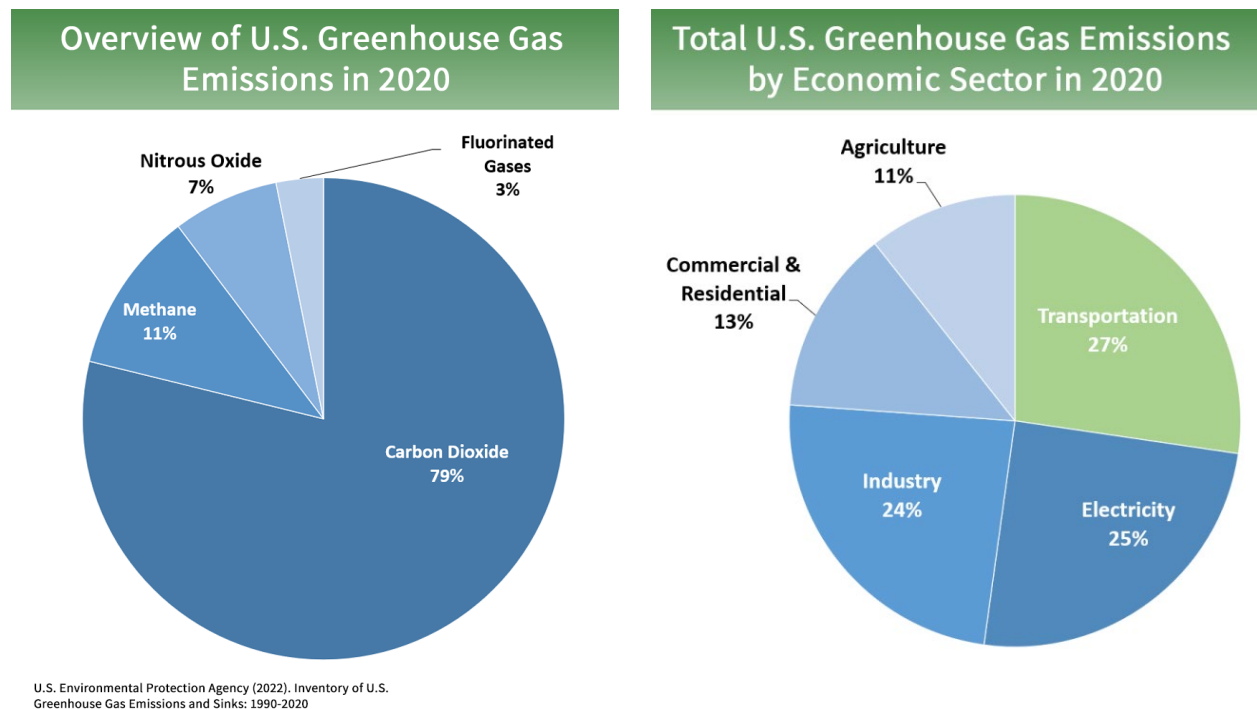
A GHG emissions inventory estimates the amount of GHGs discharged into the atmosphere by specific sources over a period of time. Tracking annual GHG emissions allows countries, states, and smaller jurisdictions to understand how emissions are changing and what actions may be needed to attain emission reduction goals. U.S. EPA is responsible for documenting GHG emissions nationwide, and the ARB does so for the state, as required by H&SC Section 39607.4. Cities and other local jurisdictions may also conduct local GHG inventories to inform their GHG reduction or climate action plans.

NATIONAL GHG INVENTORY

The annual GHG inventory submitted by the U.S. EPA to the United Nations provides a comprehensive accounting of all human-produced sources of GHGs in the United States. Total GHG emissions from all sectors in 2020 were 5,222 million metric tons (MMT), factoring in deductions for carbon sequestration in the land sector. Of these, 79 percent were CO₂, 11 percent were CH₄, and 7 percent were N₂O; the balance

consisted of fluorinated gases. Total GHGs in 2020 decreased by 21% from 2005 levels and 11% from 2019. The change from 2019 resulted primarily from less demand in the transportation sector during the COVID-19 pandemic. The transportation sector was responsible for 27 percent of total U.S. GHG emissions in 2020, more than any other sector (Figure 1), and for 36% of all CO₂ emissions from fossil fuel combustion. Transportation CO₂ emissions for 2020 decreased 13 percent from 2019 to 2020, but were 7 percent higher than transportation CO₂ emissions in 1990 (Figure 1) (U.S. EPA 2022b).

Figure 1. U.S. 2020 Greenhouse Gas Emissions (Source: U.S. EPA 2022b)

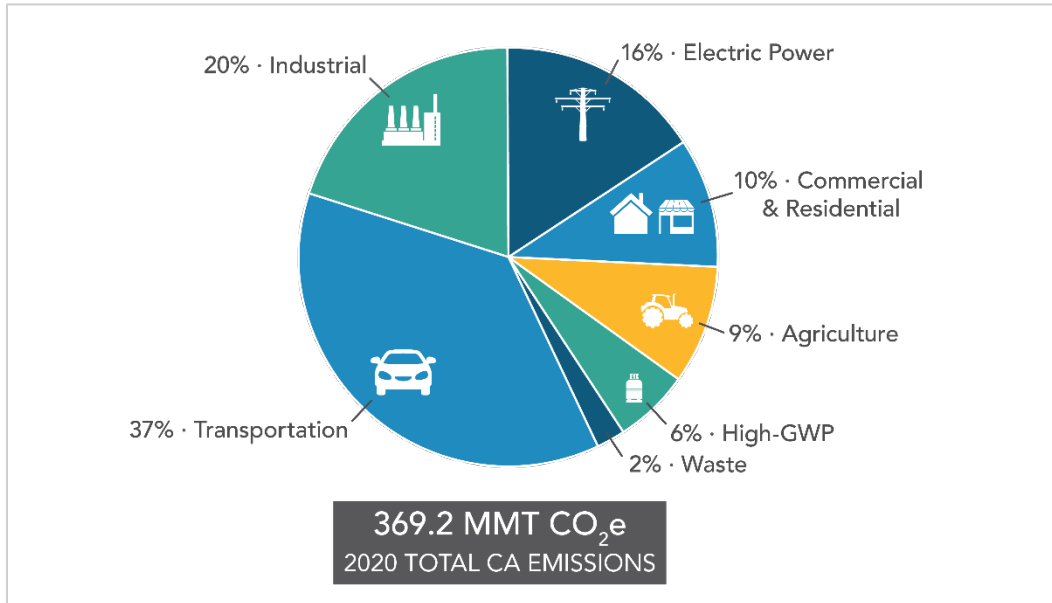


STATE GHG INVENTORY

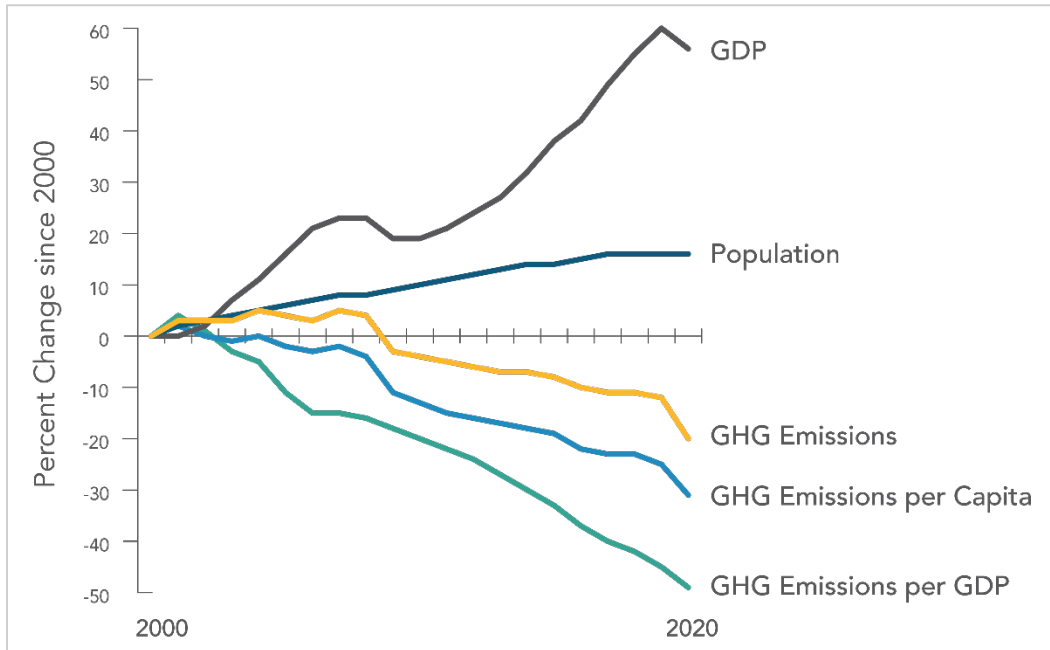
ARB collects GHG emissions data for transportation, electricity, commercial/residential, industrial, agricultural, and waste management sectors each year. It then summarizes and highlights major annual changes and trends to demonstrate the state’s progress in meeting its GHG reduction goals. The 2022 edition of the GHG emissions inventory reported emissions trends from 2000 to 2020. Total California GHG emissions in 2020 were 369.2 MMTCO₂e, a reduction of 35.3 MMTCO₂e from 2019 and 61.8 MMTCO₂e below the 2020 statewide limit of 431 MMTCO₂e. Much of the decrease from 2019 to 2020, however, is likely due to the effects of the COVID-19 pandemic on the transportation sector, during which VMT declined under stay-at-home orders and reductions in goods movement. Nevertheless, transportation remained the largest source of GHG emissions, accounting for 37 percent of statewide emissions (Figure 2). (Including upstream emissions from oil extraction, petroleum refining, and oil pipelines in California, transportation was responsible for about 47 percent of statewide emissions

in 2020; however, those emissions are accounted for in the industrial sector.) California's gross domestic product (GDP) and GHG intensity (GHG emissions per unit of GDP) both declined from 2019 to 2020 (Figure 2). It is expected that total GHG emissions will increase as the economy recovers over the next few years (ARB 2022a).

Figure 2. California 2020 Greenhouse Gas Emissions by Scoping Plan Category
(Source: ARB 2022a)



**Figure 3. Change in California GDP, Population, and GHG Emissions since 2000
(Source: ARB 2022a)**



AB 32 required ARB to develop a Scoping Plan that describes the approach California will take to achieve the goal of reducing GHG emissions to 1990 levels by 2020, and to update it every 5 years. ARB adopted the first scoping plan in 2008. The second updated plan, California’s 2017 Climate Change Scoping Plan, adopted on December 14, 2017, reflects the 2030 target established in EO B-30-15 and SB 32. The draft 2022 Scoping Plan Update additionally lays out a path to achieving carbon neutrality by 2045 (ARB 2022b).

Regional Plans

ARB sets regional GHG reduction targets for California’s 18 metropolitan planning organizations (MPOs) to achieve through planning future projects that will cumulatively achieve those goals and reporting how they will be met in the MTP/SCS. Targets are set at a percent reduction of passenger vehicle GHG emissions per person from 2005 levels. The proposed project is included in the Association of Monterey Bay Area Governments’ (AMBAG) 2045 MTP/SCS. The regional reduction target for AMBAG is -6 percent by 2035 (ARB 2021).

The project is within the jurisdiction of the Santa Cruz County Regional Transportation Commission and is included in the 2040 Regional Transportation Plan for Santa Cruz County. The 2040 Regional Transportation Plan identifies goals to work toward a sustainable transportation system that addresses the current and future transportation challenges in the county, including congestion, safety, and maintenance. Additional

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relevant plans and proposed GHG reduction policies or strategies are shown below in Table 1.

Table 1. Regional and Local Greenhouse Gas Reduction Plans

Title	GHG Reduction Policies or Strategies
Association of Monterey Bay Area Governments (AMBAG) 2040 Metropolitan Transportation Plan/Sustainable Communities Strategy and Regional Transportation Plans for Monterey, San Benito, and Santa Cruz Counties (adopted June 2018)	Integrated multi-modal network; Expand the public transit network; Strategic capacity and technology enhancements to existing highways; Identify a list of projects that will add and enhance walking and biking facilities; Transportation Systems Management measures; Transportation Demand Management
Santa Cruz County 2040 Regional Transportation Plan (SCCRTP 2018, adopted June 2018)	Implement transportation system management programs and projects on major roadways to increase efficiency; decrease VMT; improve multi-modal access; ensure network connectivity and reduce conflict by improving bicycle, pedestrian, and transit networks; locate new facilities close to existing services
County of Santa Cruz Climate Action Strategy (Adopted February 2013)	Public education about climate change and the impacts of individual actions; reduce VMT through Santa Cruz County and regional long range planning efforts; increase bicycle ridership and walking through incentive programs and investment in bicycle and pedestrian infrastructure and safety programs; increase employee use of alternative commute modes.

PROJECT ANALYSIS

GHG emissions from transportation projects can be divided into those produced during operation and use of the State Highway System (SHS) (operational emissions) and those produced during construction. The primary GHGs produced by the transportation sector are CO₂, CH₄, N₂O, and HFCs. CO₂ emissions are a product of burning gasoline or diesel fuel in internal combustion engines, along with relatively small amounts of CH₄ and N₂O. A small amount of HFC emissions related to refrigeration is also included in the transportation sector.

The CEQA Guidelines generally address GHG emissions as a cumulative impact due to the global nature of climate change (Pub. Resources Code, § 21083(b)(2)). As the California Supreme Court explained, “because of the global scale of climate change, any one project’s contribution is unlikely to be significant by itself.” (Cleveland National Forest Foundation v. San Diego Assn. of Governments (2017) 3 Cal.5th 497, 512.) In assessing cumulative impacts, it must be determined if a project’s incremental effect is “cumulatively considerable” (CEQA Guidelines Sections 15064(h)(1) and 15130).

To make this determination, the incremental impacts of the project must be compared with the effects of past, current, and probable future projects. Although climate change is ultimately a cumulative impact, not every individual project that emits greenhouse gases must necessarily be found to contribute to a significant cumulative impact on the environment.

Operational Emissions

The purpose of the proposed project is to reduce delay and improve system reliability and safety, to improve traffic operational movements with auxiliary lanes, to enhance bicycle and pedestrian connectivity and safety, and to promote alternative transportation modes. The project will not increase the vehicle capacity of the roadway. This type of project generally causes minimal or no increase in operational greenhouse gas emissions. Because the project would not increase the number of travel lanes on State Route 1, no increase in vehicle miles traveled would occur. While some greenhouse gas emissions during the construction period would be unavoidable, no increase in operational greenhouse gas emissions is expected.

Construction Emissions

Construction GHG emissions would result from material processing and transportation, on-site construction equipment, and traffic delays due to construction. These emissions will be produced at different levels throughout the construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during construction phases.

Use of long-life pavement, improved traffic management plans, and changes in materials can also help offset GHG emissions produced during construction by allowing longer intervals between maintenance and rehabilitation activities.

Peak daily GHG construction emissions for each of the project phases were calculated in the Air Quality Study Report prepared for the project (Terry A. Hayes Associates, Inc. 2022). Emissions were estimated using the latest Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model. The total amount of GHG emissions during construction is predicted to be 4,437 tons of CO₂ over the 36-month construction period.

All construction contracts include Caltrans Standard Specifications related to air quality. Section 7-1.02A and 7 1.02C, Emissions Reduction, requires contractors to comply with all laws applicable to the project and to certify they are aware of and will comply with all ARB emission reduction regulations. Section 14-9.02, Air Pollution Control, requires contractors to comply with all air pollution control rules, regulations, ordinances, and statutes. Certain common regulations, such as equipment idling restrictions, that reduce construction vehicle emissions also help reduce GHG emissions.

The project would also implement standard measures AQ-4, AQ-5, AQ-8, and AQ-12 to reduce construction equipment emissions; and TR-1, Transportation Management Plan, to minimize emissions from delays and idling traffic, as described in Chapter 1 of this Environmental Impact Report/Environmental Assessment.

Conclusion

While the proposed project will result in greenhouse gas emissions during construction, it is expected that the project will not result in any increase in operational greenhouse gas emissions. The project does not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. With the implementation of construction greenhouse gas-reduction measures, the impact would be less than significant.

Caltrans is firmly committed to implementing measures to help reduce greenhouse gas emissions. These measures are outlined in the following section.

With the implementation of greenhouse gas- reduction measures during construction, the impact would be less than significant for construction emissions. The long-term operation of the Build Alternative is expected to decrease greenhouse gas emissions slightly relative to existing conditions. Impacts on operational emissions would be less than significant. Caltrans is firmly committed to implementing measures to help reduce greenhouse gas emissions. These measures are outlined in the following section.

GREENHOUSE GAS REDUCTION STRATEGIES

Statewide Efforts

In response to AB 32, California is implementing measures to achieve emission reductions of GHGs that cause climate change. Climate change programs in California are effectively reducing GHG emissions from all sectors of the economy. These programs include regulations, market programs, and incentives that will transform transportation, industry, fuels, and other sectors, to take California into a sustainable, low-carbon and cleaner future, while maintaining a robust economy (ARB 2022c).

Major sectors of the California economy, including transportation, will need to reduce emissions to meet 2030 and 2050 GHG emissions targets. The Governor's Office of Planning and Research identified five sustainability pillars in a 2015 report: (1) increasing the share of renewable energy in the State's energy mix to at least 50 percent by 2030; (2) reducing petroleum use by up to 50 percent by 2030; (3) increasing the energy efficiency of existing buildings by 50 percent by 2030; (4) reducing emissions of short-lived climate pollutants; and (5) stewarding natural resources, including forests, working lands, and wetlands, to ensure that they store carbon, are resilient, and enhance other environmental benefits (OPR 2015). OPR later added strategies related to achieving statewide carbon neutrality by 2045 in accordance with EO B-55-18 and AB 1279 (OPR 2022).

The transportation sector is integral to the people and economy of California. To achieve GHG emission reduction goals, it is vital that the state build on past successes in reducing criteria and toxic air pollutants from transportation and goods movement. GHG emission reductions will come from cleaner vehicle technologies, lower-carbon fuels, and reduction of VMT. Reducing today's petroleum use in cars and trucks by 50% is a key state goal for reducing GHG emissions by 2030 (California Environmental Protection Agency 2015).

In addition, SB 1386 (Wolk 2016) established as state policy the protection and management of natural and working lands and requires state agencies to consider that policy in their own decision making. Trees and vegetation on forests, rangelands, farms, and wetlands remove carbon dioxide from the atmosphere through biological processes and sequester the carbon in above- and below-ground matter.

Subsequently, Governor Gavin Newsom issued Executive Order N-82-20 to combat the crises in climate change and biodiversity. It instructs state agencies to use existing authorities and resources to identify and implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience in our forests, wetlands, urban greenspaces, agricultural soils, and land conservation activities in ways that serve all communities and in particular low-income, disadvantaged, and vulnerable communities. To support this order, the California Natural Resources Agency (2022a) released *Natural and Working Lands Climate Smart Strategy* with a focus on nature-based solutions.

Caltrans Activities

Caltrans continues to be involved on the Governor's Climate Action Team as the ARB works to implement EOs S-3-05 and S-01-07 and help achieve the targets set forth in AB 32. EO B-30-15, issued in April 2015, and SB 32 (2016), set an interim target to cut GHG emissions to 40 percent below 1990 levels by 2030. The following major initiatives are underway at Caltrans to help meet these targets.

CLIMATE ACTION PLAN FOR TRANSPORTATION INFRASTRUCTURE

The California Action Plan for Transportation Infrastructure (CAPTI) builds on executive orders signed by Governor Newsom in 2019 and 2020 targeted at reducing GHG emissions in transportation, which account for more than 40 percent of all polluting emissions, to reach the state's climate goals. Under CAPTI, where feasible and within existing funding program structures, the state will invest discretionary transportation funds in sustainable infrastructure projects that align with its climate, health, and social equity goals (California State Transportation Agency 2021).

CALIFORNIA TRANSPORTATION PLAN

The California Transportation Plan (CTP) is a statewide, long-range transportation plan to meet our future mobility needs and reduce GHG emissions. It serves as an umbrella

document for all the other statewide transportation planning documents. The CTP 2050 presents a vision of a safe, resilient, and universally accessible transportation system that supports vibrant communities, advances racial and economic justice, and improves public and environmental health. The plan's climate goal is to achieve statewide GHG emissions reduction targets and increase resilience to climate change. It demonstrates how GHG emissions from the transportation sector can be reduced through advancements in clean fuel technologies; continued shifts toward active travel, transit, and shared mobility; more efficient land use and development practices; and continued shifts to telework (Caltrans 2021a).

CALTRANS STRATEGIC PLAN

The *Caltrans 2020–2024 Strategic Plan* includes goals of stewardship, climate action, and equity. Climate action strategies include developing and implementing a Caltrans Climate Action Plan; a robust program of climate action education, training, and outreach; partnership and collaboration; a VMT monitoring and reduction program; and engaging with the most vulnerable communities in developing and implementing Caltrans climate action activities (Caltrans 2021b).

CALTRANS POLICY DIRECTIVES AND OTHER INITIATIVES

Caltrans Director's Policy 30 (DP-30) Climate Change (June 22, 2012) established a Department policy to ensure coordinated efforts to incorporate climate change into Departmental decisions and activities. *Caltrans Greenhouse Gas Emissions and Mitigation Report* (Caltrans 2020) provides a comprehensive overview of Caltrans' emissions. The report documents and evaluates current Caltrans procedures and activities that track and reduce GHG emissions and identifies additional opportunities for further reducing GHG emissions from Department-controlled emission sources, in support of Departmental and State goals.

Project-Level GHG Reduction Strategies

The following measures will also be implemented in the project to reduce GHG emissions and potential climate change impacts from the project.

Project features include new and expanded bicycle and pedestrian facilities and improved bike lane connectivity, which would support non-motorized modes of transportation.

Bus-on-Shoulder facilities would enable buses to use the shoulder lane, avoiding traffic and congestion and shortening travel time.

The following measures will also be implemented in the project to reduce greenhouse gas emissions and potential climate change impacts from the project.

- **Standard Measure AQ-4:** The construction contractor shall properly tune and maintain construction equipment and vehicles. Factory emission related devices will be properly maintained on all construction equipment and vehicles.
- **Standard Measure AQ-5:** The construction contractor shall use low-sulfur fuel in all construction equipment as provided in California Code of Regulations Title 17, Section 93114.
- **Standard Measure AQ-8:** All on-road and off-road diesel equipment shall not idle for more than 5 minutes. The contractor shall post signs in the designated queuing areas and/or job sites to remind drivers and operators of the 5-minute idling limit. For non-diesel equipment, idling time for lane closure during construction shall be restricted to 10 minutes in each direction.
- **Standard Measure AQ-12:** The construction contractor shall route and schedule construction traffic to avoid peak travel times as much as possible to reduce congestion and related air quality impacts caused by idling vehicles along local roads.
- **AMM-VA-11 Landscaping and Revegetation.** During design and construction, landscape and revegetate disturbed areas to the greatest extent feasible (given Caltrans' setback and maintenance requirements). Vegetation absorbs carbon dioxide.

ADAPTATION

Reducing greenhouse gas emissions is only one part of an approach to addressing climate change. Caltrans must plan for the effects of climate change on the state's transportation infrastructure and strengthen or protect the facilities from damage. Climate change is expected to produce increased variability in precipitation, rising temperatures, rising sea levels, variability in storm surges and their intensity, and in the frequency and intensity of wildfires. Flooding and erosion can damage or wash out roads; longer periods of intense heat can buckle pavement and railroad tracks; storm surges combined with a rising sea level can inundate highways. Wildfire can directly burn facilities and indirectly cause damage when rain falls on denuded slopes that landslide after a fire. Effects will vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. Accordingly, Caltrans must consider these types of climate stressors in how highways are planned, designed, built, operated, and maintained.

Federal Efforts

Under NEPA Assignment, Caltrans is obligated to comply with all applicable federal environmental laws and FHWA NEPA regulations, policies, and guidance.

The *Fourth National Climate Assessment*, published in 2018, presents the foundational science and the “human welfare, societal, and environmental elements of climate change and variability for 10 regions and 18 national topics, with particular attention paid to observed and projected risks, impacts, consideration of risk reduction, and implications under different mitigation pathways.”

The U.S. DOT Policy Statement on Climate Adaptation in June 2011 committed the federal Department of Transportation to “integrate consideration of climate change impacts and adaptation into the planning, operations, policies, and programs of DOT in order to ensure that taxpayer resources are invested wisely, and that transportation infrastructure, services and operations remain effective in current and future climate conditions” (U.S. DOT 2011). The U.S. DOT Climate Action Plan of August 2021 followed up with a statement of policy to “accelerate reductions in greenhouse gas emissions from the transportation sector and make our transportation infrastructure more climate change resilient now and in the future,” following this set of guiding principles (U.S. DOT 2021):

- Use best-available science
- Prioritize the most vulnerable
- Preserve ecosystems
- Build community relationships
- Engage globally

U.S. DOT developed its climate action plan pursuant to the federal EO 14008, *Tackling the Climate Crisis at Home and Abroad* (January 27, 2021). EO 14008 recognized the threats of climate change to national security and ordered federal government agencies to prioritize actions on climate adaptation and resilience in their programs and investments (White House 2021).

FHWA order 5520 (Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events, December 15, 2014) established FHWA policy to strive to identify the risks of climate change and extreme weather events to current and planned transportation systems. FHWA has developed guidance and tools for transportation planning that foster resilience to climate effects and sustainability at the federal, state, and local levels (FHWA 2019).

State Efforts

Climate change adaptation for transportation infrastructure involves long-term planning and risk management to address vulnerabilities in the transportation system. A number of state policies and tools have been developed to guide adaptation efforts.

California’s *Fourth Climate Change Assessment* (Fourth Assessment) (State of California 2018) is the state’s effort to “translate the state of climate science into useful information for action.” It provides information that will help decision makers across sectors and at state, regional, and local scales protect and build the resilience of the

state's people, infrastructure, natural systems, working lands, and waters. The State's approach recognizes that the consequences of climate change occur at the intersections of people, nature, and infrastructure. The Fourth Assessment reports that if no measures are taken to reduce GHG emissions by 2021 or sooner, the state is projected to experience a 2.7 to 8.8 degrees Fahrenheit increase in average annual maximum daily temperatures, with impacts on agriculture, energy demand, natural systems, and public health; a two-thirds decline in water supply from snowpack and water shortages that will impact agricultural production; a 77% increase in average area burned by wildfire, with consequences for forest health and communities; and large-scale erosion of up to 67% of Southern California beaches and inundation of billions of dollars' worth of residential and commercial buildings due to sea level rise (State of California 2018).

Sea level rise is a particular concern for transportation infrastructure in the coastal zone. Major urban airports will be at risk of flooding from sea level rise combined with storm surge as early as 2040; San Francisco airport is already at risk. Miles of coastal highways vulnerable to flooding in a 100-year storm event will triple to 370 by 2100, and 3,750 miles will be exposed to temporary flooding. The Fourth Assessment's findings highlight the need for proactive action to address these current and future impacts of climate change.

In 2008, then-governor Arnold Schwarzenegger recognized the need when he issued EO S-13-08, focused on sea level rise. Technical reports on the latest sea level rise science were first published in 2010 and updated in 2013 and 2017. The 2017 projections of sea level rise and new understanding of processes and potential impacts in California were incorporated into the *State of California Sea-Level Rise Guidance Update* in 2018. This EO also gave rise to the *California Climate Adaptation Strategy* (2009), updated in 2014 as *Safeguarding California: Reducing Climate Risk* (Safeguarding California Plan), which addressed the full range of climate change impacts and recommended adaptation strategies. The Safeguarding California Plan was updated in 2018 and again in 2021 as the *California Climate Adaptation Strategy*, incorporating key elements of the latest sector-specific plans such as the *Natural and Working Lands Climate Smart Strategy*, *Wildfire and Forest Resilience Action Plan*, *Water Resilience Portfolio*, and the CAPTI (described above). Priorities in the 2021 California Climate Adaptation Strategy include acting in partnership with California Native American Tribes, strengthening protections for climate-vulnerable communities that lack capacity and resources, nature-based climate solutions, use of best available climate science, and partnering and collaboration to best leverage resources (California Natural Resources Agency 2022b).

EO B-30-15, signed in April 2015, requires state agencies to factor climate change into all planning and investment decisions. This EO recognizes that effects of climate change in addition to sea level rise also threaten California's infrastructure. At the direction of EO B-30-15, the Office of Planning and Research published *Planning and Investing for a Resilient California: A Guidebook for State Agencies* in 2017, to encourage a uniform and systematic approach.

AB 2800 (Quirk 2016) created the multidisciplinary Climate-Safe Infrastructure Working Group to help actors throughout the state address the findings of California’s Fourth Climate Change Assessment. It released its report, *Paying it Forward: The Path Toward Climate-Safe Infrastructure in California*, in 2018. The report provides guidance to agencies on how to address the challenges of assessing risk in the face of inherent uncertainties still posed by the best available science on climate change. It also examines how state agencies can use infrastructure planning, design, and implementation processes to address the observed and anticipated climate change impacts (Climate Change Infrastructure Working Group 2018).

Caltrans Adaptation Efforts

CALTRANS VULNERABILITY ASSESSMENTS

Caltrans completed climate change vulnerability assessments to identify segments of the State Highway System vulnerable to climate change effects of precipitation, temperature, wildfire, storm surge, and sea level rise.

The climate change data in the assessments were developed in coordination with climate change scientists and experts at federal, state, and regional organizations at the forefront of climate science. The findings of the vulnerability assessments guide analysis of at-risk assets and development of Adaptation Priority Reports as a method to make capital programming decisions to address identified risks.

Project Adaptation Analysis

The Governor’s Office of Planning and Research prepared *Planning and Investing for a Resilient California*, a guidebook for state agencies performing climate risk analyses to determine how to integrate climate considerations into planning or investment decisions. The first step is to identify how climate change could affect a project or plan by identifying impacts of concern and assessing the scale, scope, and context of climate disruption. Next, a climate risk analysis can be conducted by selecting climate change scenarios for analysis and selecting an analytical approach. Following that, a climate-informed decision can be made by evaluating the alternatives and design and applying resilient decision principles. Finally, the agency can track and monitor progress by evaluating determined metrics, adjusting as needed. The adaptation analysis evaluates the first two steps to inform a decision for the project.

Assessing the scale, scope, and context of climate disruption for the project means considering the timeframe/lifetime, adaptive capacity, and risk tolerance of the project areas. The guidebook states, “If the expected lifetime of a project is less than 5 years, it may not be necessary to integrate longer- term climate change into the design and analysis.” The project (i.e., roadway improvements along SR 1) is expected to last far longer than 5 years, so the impacts of extreme events are considered to ensure that planning and investment decisions reflect the current and future climate conditions. In the following sections, the extreme impacts of climate change- based sea-level rise,

flooding, and wildfire are addressed. Other extreme weather impacts, such as drought and extreme heat, are also expected as changing climate conditions, but this analysis focuses on conditions that could potentially affect the project and its proposed structures.

SEA LEVEL RISE

Except for the improvements along Soquel Drive, the project is within the Coastal Zone. Therefore, a sea level rise analysis is required in accordance with the California Coastal Commission, California Ocean Protection Council, and Caltrans planning guidance. The California Ocean Protection Council published the State of California Sea-Level Rise Guidance 2018 Update to assist in the preparation of sea level rise analyses in planning documents. The analysis is informed by consultation of the 2019 Caltrans Climate Change Vulnerability Assessment Summary Report—District 5 and sea level rise visualizations from the National Oceanic and Atmospheric Administration Sea Level Rise Viewer tool, which provides a range of sea level rise scenarios and resulting coastal inundation. The discussion of potential sea level rise impacts also relies on the 2018 California Coastal Commission Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development permits, the 2011 Caltrans Guidance on Incorporating Sea Level Rise, and updated Caltrans guidance on analysis of sea level rise.

Per the 2016 Coastal Commission’s *California Coastal Commission Statewide Sea Level Rise Vulnerability Synthesis*, the Santa Cruz County Local Coastal Program (LCP) was in the process of updating their LCP to address SLR. Aptos is an unincorporated place under the jurisdiction of Santa Cruz County; therefore, the entire Coastal Zone area within the project is anticipated to be subject to the requirements of the Santa Cruz County LCP.

The next step is to answer the following questions:

- Is the project on the coast or in an area vulnerable to sea level rise?
- Will the project be impacted by the stated sea level rise?

After determining whether the project is in the Coastal Zone, the 2018 California Ocean Protection Council Sea Level Rise guidance states that the analysis should identify the appropriate sea level rise projections for the project area to address the second question. The decision framework used to determine the Sea Level Rise projections evaluates the consequences and risk tolerance of various planning decisions and is broken down into five steps:

- Step 1: Identify the nearest tide gauge.

The nearest tide gauge to the project area is in Monterey, about 25.5 miles south of the project corridor.

- Step 2: Evaluate project lifespan.

The project opening year is 2025 and the design/horizon year is 2045. As a comprehensive approach, sea level rise projections are considered in 2030, 2040, 2050 and 2100.

- Step 3: For the nearest tide gauge and project lifespan, identify range of sea-level rise projections.

Table 2 presents the range of sea level rise projections for the Monterey tide gauge in 2030, 2040, 2050 and 2100 for high emissions scenario (IPCC RPC 8.5) with low, medium/high, and extreme risk aversion approaches. Low-Risk Aversion corresponds to a 66 percent probability that sea level rise will reach the specified height by the associated year, Medium/High-Risk Aversion corresponds to a 0.5 percent probability that sea level rise meets or exceeds the specified height (i.e., 99.5 percent chance sea level rise will be at or below this height), and the Extreme Risk Aversion scenario is based on a maximally conservative estimate of sea level rise that could result from loss of the West Antarctic ice sheet by the associated year; this scenario is not assigned any probability of occurrence.

Table 2. Monterey Sea Level Rise Projections

Year	Emissions Scenario	Low-Risk Aversion Sea Level Rise Projection (Feet)	Medium/High-Risk Aversion Sea Level Rise Projection (Feet)	Extreme Risk Aversion Sea Level Rise Projection (Feet)
2030	High	0.5	0.8	1.0
2040	High	0.8	1.2	1.7
2050	High	1.1	1.9	2.7
2100	High	3.3	6.9	10.1

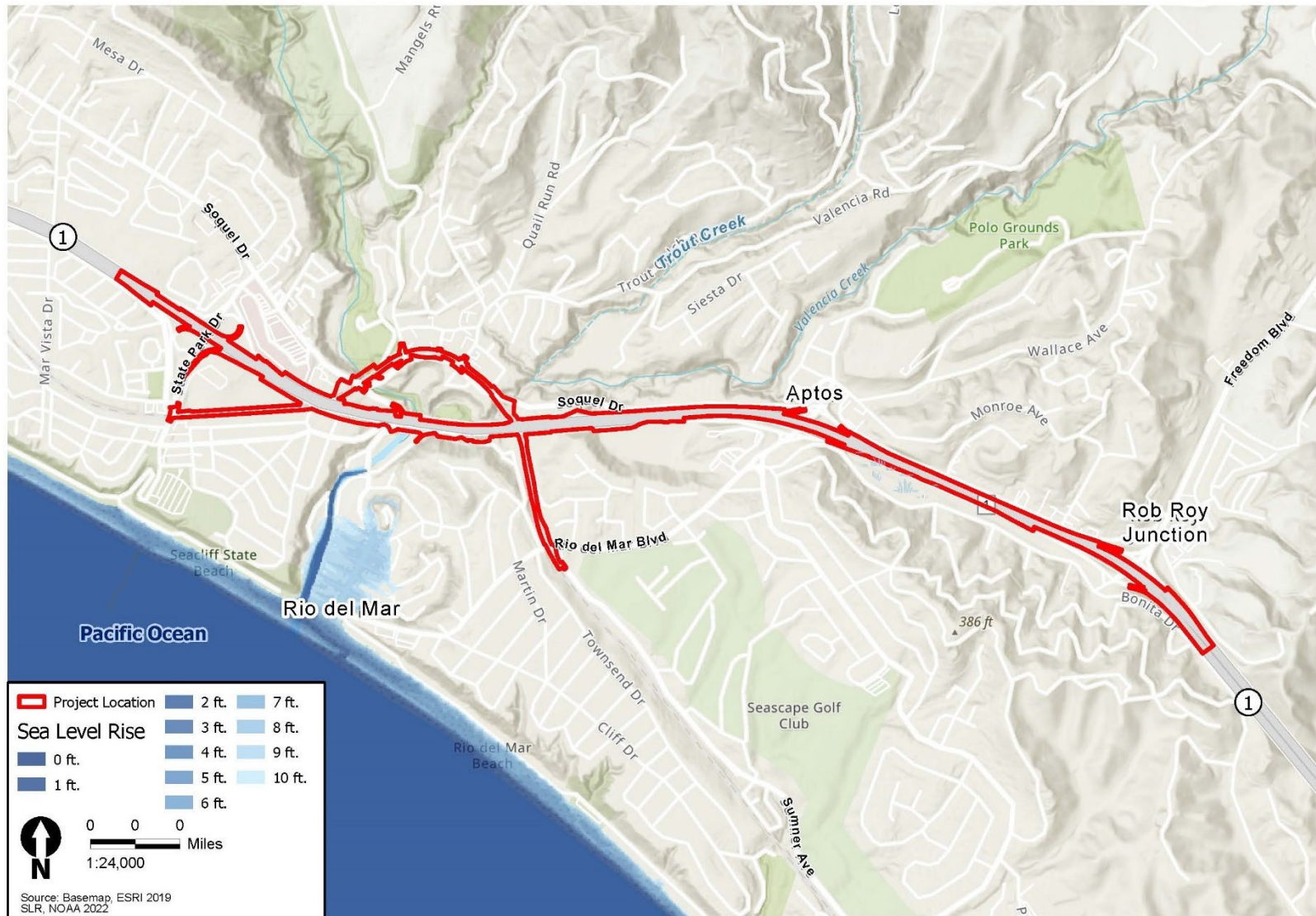
The data in Table 2 demonstrate that the range of sea level rise projections is from 0.5 feet to 1.0 feet in 2030, from 0.8 feet to 1.7 feet in 2040, from 1.1 feet to 2.7 feet in 2050, and from 3.3 feet to 10.1 feet in 2100. These years are of particular interest to this project because the opening year of 2025 would most closely model the 2030 predictions and the horizon/design year of 2045 would most closely model between the predictions of 2040 and 2050.

- Step 4: Evaluate potential impacts and adaptive capacity across a range of sea-level rise projections and emissions scenarios.

The Caltrans Climate Change Vulnerability Assessment District 5 Technical Report (Caltrans 2019a) evaluated the roadways at risk of permanent inundation or exposure from higher sea levels within Caltrans District 5, which includes the County of Santa Cruz and the project area. The technical report used OPC projections in combination with National Oceanic and Atmospheric Administration data and identified no roadway segments in the County of Santa Cruz, including the project area, that would be impacted by up to 6 feet of sea level rise. Furthermore, the technical report did not identify any locations in the project area that would be affected by a combination of sea level rise and storm surge; this was confirmed using the National Oceanic and Atmospheric Administration Sea Level Rise Viewer tool.

The National Oceanic and Atmospheric Administration Sea Level Rise Viewer identifies the project area as at medium vulnerability to the effects of climate change. The visualization, as shown below in Figure 4, demonstrates that project facilities would remain unaffected by sea level rise with about 10 feet of Sea Level Rise (Extreme Risk Aversion in 2100).

Figure 4. National Oceanic and Atmospheric Administration Sea Level Rise Viewer displaying 10 feet of Sea Level Rise (Extreme Risk Aversion 2100)



State Route Highway 1 Auxiliary Lanes and Bus-on-Shoulder Improvements—Freedom Blvd. to State Park Dr.—and Coastal Rail Trail Segment 12 Project

- Step 5: Select Sea Level Rise projections based on risk tolerance and, if necessary, develop adaptation pathways that increase resiliency to Sea Level Rise; include contingency plans if projections are exceeded.

Taking a conservative approach, the analysis for the project considers the Extreme Risk Aversion Sea Level Rise in 2030 (1.0 feet), 2040 (1.7 feet), 2050 (2.7 feet), and the Medium/High-Risk Aversion—Low Emissions Sea Level Rise (6.9 feet) and the Extreme Risk Aversion (10.1 feet) Sea Level Rise projections for 2100. The Extreme Risk Aversion Sea Level Rise projection represents the worst-case scenario.

Based on the range of sea level rise projections and the analytical resources available (National Oceanic and Atmospheric Administration Sea Level Rise Viewer, 2019 Caltrans Vulnerability Assessment, and the OPC Sea Level Rise Guidance), maximum sea level rise projections in 2030 (1.0 feet), 2040 (1.7 feet), 2050 (2.7 feet), and 2100 (10.1 feet) would not have the potential to impact the project area. Project facilities would remain unaffected by sea level rise with about 10 feet of Sea Level Rise (Extreme Risk Aversion in 2100).

Based on the above 5 steps, the project would not be subject to risks from sea level rise at any location and no further consideration of adaptation strategies is warranted. The technical report did not identify any locations in the project area that would be affected by a combination of sea level rise and storm surge effects.

PRECIPITATION AND FLOODING

The floodplain evaluation report prepared for the project included hydrological and hydraulic assessments that considered potential climate change–related changes to project-area hydrology (WRECO 2022a). The project limits are within Aptos Creek, Soquel Creek, and San Andreas watersheds. Most of the project limits are within an unshaded FEMA Zone X, areas of minimal flood hazard and outside the FEMA base floodplain.

One of the bridges proposed for widening is the railroad bridge that crosses Aptos Creek, which flows to the Pacific Ocean (WRECO 2022a: 35). The Aptos Creek crossing is in a FEMA Special Flood Hazard Area Zone AE, subject to flooding by the 100-year flood event, and is also in a designated floodway (WRECO 2022a: 40). The project also intersects Valencia Creek, a tributary to Aptos Creek, at a culvert. The hydraulics assessment evaluated whether the project would affect 100-year water surface elevations (WSE) within the project vicinity at these locations (WRECO 2022a: 56). Model results showed an increase in WSE of less than one-quarter inch for Aptos and Valencia Creeks. The proposed pedestrian bridges along Coastal Rail Segment 12 would be designed with all grading, piers, and structures outside the base floodplain with projected sea level rise. The proposed grading and retaining wall on SR 1 to

accommodate widening the existing railroad bridge over Aptos Creek would likewise be above the 100-year WSE including sea level rise. The hydraulic model showed the proposed bridge at Aptos Creek would have adequate freeboard during the 100-year flood (approximately 22.8 feet during the 100-year flood, and 19 feet during the 100-year flood with SLR) (WRECO 2022a: vi).

The sea level rise analysis in this chapter and that conducted for the floodplain evaluation report both concluded that the project would not be vulnerable to inundation by sea level rise of 7 feet plus 100-year storm surge at the likely end of bridge service lives at about 2100 under the medium-high risk aversion scenario. No special mitigation measures are required, but sea level rise will be considered for project construction (WRECO 2022a: vi, 53).

The District 5 Climate Change Vulnerability Assessment technical report (Caltrans 2019a) reported projected changes in 100-year storm precipitation depth. Mapping shows the project area may experience an up to 10% increase in 100-year storm depth as early as 2025 and through 2085. Increased precipitation can affect flood flows in the project-area watersheds. Presence of impervious surfaces also affect flows; the project would add 3.61 acres in the Caltrans' right-of-way, 6.28 acres for the interim trail in the Santa Cruz County's right-of-way and 6.51 acres for the ultimate trail in the Santa Cruz's right-of-way. However, the project's water quality assessment found that minimal net impervious area would drain to the different receiving waters within project limits and would not change WSE upstream of SR 1 during a 100-year event with sea level rise (WRECO 2022a: 70–71). As noted for sea level rise, bridge freeboard was found to be more than adequate to pass any increased flows. Furthermore, new drainage systems would be designed to convey 100-year flow, existing undersized culverts would be replaced, and treatment best management practices and hydromodifications to enhance percolation would be conducted in accordance with requirements of Caltrans, Santa Cruz County, and the Central Coast Regional Water Quality Control Board (WRECO 2022a: 18; 2022b: 52). Accordingly, the project is not likely to be affected by the projected relatively small changes in 100-year storm precipitation.

WILDFIRE

According to the 2019 Caltrans Vulnerability Assessment, the project area is generally classified as having a high level of concern for wildfires, and the project corridor is identified as a roadway exposed to wildfire impacts. Through consulting the CalFire Fire Hazard Severity Zone web mapping tool, it was determined that the project area is within a Local Responsibility Area and Moderate Fire Hazard Severity Zone (California Department of Forestry and Fire Protection 2007). The Local Responsibility Area has not been designated as a Very High Fire Hazard Severity Zone at the local authority level. During construction, Caltrans' 2018 revised Standard Specification 7-1.02M(2) mandates fire prevention procedures, including a fire prevention plan, to avoid accidental fire starts. Furthermore, the project is in an urban area and is not expected to exacerbate the impacts of wildfires intensified by climate change.

TEMPERATURE

The District Climate Change Vulnerability Assessment does not indicate temperature changes during the project's design life that would require adaptive changes in pavement design or maintenance practices.

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