

4.8 Greenhouse Gas Emissions/Climate Change

This section discusses potential impacts related to greenhouse gas emissions and climate change. Air quality impacts are discussed in Section 4.2, *Air Quality and Health Impacts/Risks*.

4.8.1 Setting

a. Climate Change and Greenhouse Gases

Gases that absorb and re-emit infrared radiation in the atmosphere are called greenhouse gases (GHGs). The GHGs that are widely seen as the principal contributors to human-induced climate change include carbon dioxide (CO₂), methane (CH₄), nitrous oxides (N₂O), fluorinated gases such as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆). Water vapor is excluded from the list of GHGs because it is short-lived in the atmosphere and its atmospheric concentrations are primarily determined by natural processes, such as oceanic evaporation.

GHGs are emitted by both natural processes and human activities. Of these gases, CO₂, CH₄ and N₂O are emitted in the greatest quantities from human activities. Emissions of CO₂ are largely by-products of fossil fuel combustion, whereas CH₄ results from off-gassing associated with agricultural practices and landfills. N₂O is produced by microbial processes in soil and water, including those reactions that occur in fertilizers that contain nitrogen, fossil fuel combustion and other chemical processes.

Man-made GHGs, many of which have greater heat-absorption potential than CO₂, include fluorinated gases and SF₆ (California Environmental Protection Agency [CalEPA] 2006). Different types of GHGs have varying global warming potentials (GWPs). The GWP of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified timescale (generally, 100 years). Because GHGs absorb different amounts of heat, a common reference gas (CO₂) is used to relate the amount of heat absorbed to the amount of the gas emissions, referred to as “carbon dioxide equivalent” (CO₂e) and is the amount of a GHG emitted multiplied by its GWP. Carbon dioxide has a 100-year GWP of one. By contrast, methane has a GWP of 25, meaning its global warming effect is 25 times greater than carbon dioxide on a molecule-per-molecule basis (Intergovernmental Panel on Climate Change [IPCC] 2007).

b. Greenhouse Gas Emissions Inventories

Federal Emissions Inventory

Total U.S. GHG emissions were 6,586.7 million metric tons (MMT or gigatonne) CO₂e in 2015 (U.S. EPA 2017). Total U.S. emissions have increased by 3.5 percent since 1990. However, emissions decreased by 2.3 percent from 2014 to 2015 (U.S. EPA 2017). The decrease from 2014 to 2015 was a result of multiple factors, including: (1) substitution from coal to natural gas consumption in the electric power sector, (2) warmer winter conditions in 2015 resulting in a decreased demand for heating fuel in the residential and commercial sectors and (3) a slight decrease in electricity demand (U.S. EPA 2017). Since 1990, U.S. emissions have increased at an average annual rate of 0.2 percent. In 2015, the industrial and transportation end-use sectors accounted for 29 percent and 27 percent of CO₂ emissions (with electricity-related emissions distributed), respectively. Meanwhile, the residential and commercial end-use sectors accounted for 16 percent and 17 percent of CO₂ emissions, respectively (U.S. EPA 2017).

California Emissions Inventory

Based on the California Air Resources Board (CARB) California Greenhouse Gas Inventory for 2000-2014, California produced 440.4 MMT CO₂e in 2015 (CARB 2017a). The largest single source of GHG in California is transportation, contributing 39 percent of the State's total GHG emissions. Industrial sources are the second-largest source of the state's GHG emissions, contributing 23 percent of the State's GHG emissions (CARB 2017a). California emissions are due in part to its large size and large population compared to other states. However, the state's mild climate reduces California's per capita fuel use and GHG emissions as compared to other states. CARB has projected statewide unregulated GHG emissions for the year 2020 will be 509.4 MMT CO₂e (CARB 2017b). These projections represent the emissions that would be expected to occur in the absence of any GHG reduction actions.

c. Potential Effects of Climate Change

Globally, climate change has the potential to affect numerous environmental resources through potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. Long-term trends have found that each of the past three decades has been warmer than all the previous decades in the instrumental record and the decade from 2000 through 2010 has been the warmest. The global combined land and ocean temperature data show an increase of about 0.89°C (0.69°C to 1.08°C) over the period 1901 to 2012, and about 0.72°C (0.49°C to 0.89°C) over the period 1951 to 2012 when described by a linear trend. Several independently analyzed data records of global and regional Land-Surface Air Temperature (LSAT) obtained from station observations are in agreement that LSAT as well as sea surface temperatures have increased. In addition to these findings, there are identifiable signs that global warming is currently taking place, including substantial ice loss in the Arctic over the past two decades (IPCC 2014).

Potential impacts of climate change in California may include loss in snow pack, sea level rise, more extreme heat days per year, more high-ozone days, more large forest fires and more drought years (CalEPA 2010). Below is a summary of some of the potential effects that could be experienced in California as a result of climate change.

Air Quality

Higher temperatures, which are conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter rather than drier conditions, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thereby ameliorating the pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses and asthma attacks throughout the state (CEC 2009).

Water Supply

Analysis of paleoclimatic data, such as tree-ring reconstructions of stream flow and precipitation, indicates a history of naturally and widely varying hydrologic conditions in California and the west, including a pattern of recurring and extended droughts. Uncertainty remains with respect to the overall impact of climate change on future water supplies in California. However, the average early spring snowpack in the Sierra Nevada decreased by about 10 percent during the last century, a loss of 1.5 million acre-feet of snowpack storage. During the same period, sea level rose eight inches along California's coast. California's temperature has risen 1°F, mostly at night and during the winter, with higher elevations experiencing the highest increase. California's warmest year on record was in 2014 and the third warmest year on record was in 2016 (DWR 2017).

This uncertainty complicates the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood. The Sierra snowpack provides the majority of California's water supply by accumulating snow during the state's wet winters and releasing it slowly during the state's dry springs and summers. Based on historical data and modeling, the DWR projects that the Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050. Climate change is also anticipated to bring warmer storms that result in less snowfall at lower elevations, reducing the total snowpack (DWR 2013). As described in Section 4.10, *Hydrology and Water Quality*, the primary source of water for most users in the AMBAG region is groundwater. Climate change may reduce groundwater recharge, putting further strain on an already limited water supply in the region.

Hydrology and Sea Level Rise

Climate change could potentially affect the amount of snowfall, rainfall and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for saltwater intrusion. According to *Rising Seas in California: An Update on Sea-Level Rise Science* (Griggs, et al. 2017), climate change has the potential to induce substantial sea level rise in the coming century. The rising sea level increases the likelihood and risk of flooding. The rate of increase of global mean sea levels over the 2001 to 2010 decade, as observed by satellites, ocean buoys and land gauges, was approximately 3.2 mm per year, which is double the observed 20th century trend of 1.6 mm per year (World Meteorological Organization [WMO] 2013). As a result, sea levels averaged over the last decade were about eight inches higher than those of 1880 (WMO 2013). Sea levels are rising faster now than in the previous two millennia, and the rise is expected to accelerate, even with robust GHG emission control measures. The most recent IPCC report (2013) predicts a mean sea level rise of 11 to 38 inches by 2100. This prediction is more than 50 percent higher than earlier projections of 7 to 23 inches when comparing the same emissions scenarios and time periods. A rise in sea levels could result in coastal flooding and erosion, and could jeopardize California's water supply due to saltwater intrusion. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events. Over the past century (1900-2005), sea level rose approximately seven inches along most of the California coast. In particular, the Monterey Bay has experienced sea level rise of approximately two to three millimeters per year. Sea level is projected to rise approximately 14 inches by 2050 and 55 inches by 2100 (Center for Ocean Solutions 2011). There is a 50 percent probability that sea level rise in San Francisco between 2030 and 2050 would be at least 3.8 mm per year (Griggs, et al. 2017).

Ocean Acidification

The ocean covers over 70 percent of the earth's surface and acts as a major carbon sink in the global carbon cycle. As the concentration of CO₂ in the atmosphere increases, so does the concentration of carbon in the ocean. The reaction of dissolved CO₂ with seawater results in the creation of carbonic acid (H₂CO₃), carbonate, bicarbonate and hydrogen ions, which lowers pH causing higher seawater acidity. Higher acidity in seawater affects many aquatic animals' ability to fix calcium for body structure, which could have significant negative effects across the entire food chain. The effects of ocean acidification may impact the success of California's \$318 million per year fishing industry and \$17 billion per year tourism/recreation industry (National Ocean Economics Program [NOEP], Center for the Blue Economy, Market database. www.oceaneconomics.org, 2014). Ocean acidification in the Monterey Bay National Marine Sanctuary would impact key species such as kelp, which provide important structural features and ecosystem function (NOAA 2017).

Agriculture

California has a \$30 billion annual agricultural industry that produces approximately half of the country's fruits and vegetables. Higher CO₂ levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase, crop-yield could be threatened by a less reliable water supply and greater air pollution could render plants more susceptible to pest and disease outbreaks. In addition, temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen and thereby affect their quality (CCCC 2006). As described in Section 4.2, *Agriculture and Forestry*, AMBAG's planning area includes expansive agricultural lands. Agriculture may face challenges due to extreme heat and water stress associated with climate change.

Ecosystems and Wildlife

Climate change and the potential resulting changes in weather patterns could have ecological effects on a global, regional and local scale. Increasing concentrations of GHGs are likely to accelerate the rate of climate change. Scientists project that the average global surface temperature could rise by 1.0 to 4.5°F (0.6 to 2.5°C) in the next 50 years, and 2.2 to 10°F (1.4 to 5.8°C) in the next century, with substantial regional variation. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Rising temperatures could have four major impacts on plants and animals:

- Timing of ecological events;
- Geographic range;
- Species' composition within communities; and
- Ecosystem processes, such as carbon cycling and storage (Parmesan 2006).

d. Regulatory Setting

Federal

The U.S. Supreme Court in *Massachusetts et al. v. Environmental Protection Agency et al.* ([2007] 549 U.S. 05-1120) held that the U.S. EPA has the authority to regulate motor-vehicle GHG emissions under the federal Clean Air Act. U.S. EPA began regulating GHGs under the Clean Air Act in 2011 following its endangerment finding. U.S. EPA's GHG regulations include regulations governing transportation and mobile sources, renewable fuels, carbon pollution standards for existing power

plants, the GHG tailoring rule governing new and existing industrial facilities, and GHG reporting requirements. Standards for mobile sources have been established pursuant to Section 202 of the CAA, and GHGs from stationary sources are currently controlled under the authority of Part C of Title I of the Act.

The U.S. EPA issued a Final Rule for mandatory reporting of GHG emissions in October 2009. This Final Rule applies to fossil fuel suppliers, industrial gas suppliers, direct GHG emitters and manufacturers of heavy-duty and off-road vehicles and vehicle engines and requires annual reporting of emissions. In 2012, the U.S. EPA issued a Final Rule that establishes the GHG permitting thresholds that determine when Clean Air Act permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities.

In 2014, the U.S. Supreme Court in *Utility Air Regulatory Group v. EPA* (134 S. Ct. 2427 [2014]) held that U.S. EPA may not treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit. The Court also held that PSD permits that are otherwise required (based on emissions of other pollutants) may continue to require limitations on GHG emissions based on the application of Best Available Control Technology (BACT).

State

CARB is responsible for the coordination and oversight of State and local air pollution control programs in California. California has a numerous regulations aimed at reducing the state's GHG emissions. These initiatives are summarized below.

Executive Order S-3-05

Executive Order S-3-05, among other things, established the following GHG emission reduction goals for California: reduction to 2000 levels by 2010; to 1990 levels by 2020; and to 80 percent below 1990 levels by 2050.

Assembly Bill 1493: Reduction of Greenhouse Gas Emissions

Assembly Bill (AB) 1493 (Chapter 200, Statutes of 2002), known as the "Pavley bill," amended Health and Safety Code sections 42823 and 43018.5 requiring CARB to develop and adopt regulations that achieve maximum feasible and cost-effective reduction of GHG emissions from passenger vehicles, light-duty trucks and other vehicles used for noncommercial personal transportation in California.

Implementation of new regulations prescribed by AB 1493 required that the State of California apply for a waiver under the federal Clean Air Act. Although EPA initially denied the waiver in 2008, EPA approved a waiver in June 2009, and in September 2009, CARB approved amendments to its initially adopted regulations to apply the Pavley standards that reduce GHG emissions to new passenger vehicles in model years 2009 through 2016. According to CARB, implementation of the Pavley regulations is expected to reduce fuel consumption while also reducing GHG emissions (CARB 2017a).

Assembly Bill 32

California's major initiative for reducing GHG emissions is outlined in Assembly Bill 32, the "California Global Warming Solutions Act of 2006," signed into law in 2006 (Chapter 488, Statutes of 2006). AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020, and requires CARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHGs

to meet the 2020 deadline. In addition, AB 32 requires CARB to adopt regulations to require reporting and verification of statewide GHG emissions. Based on this guidance, CARB developed a Scoping Plan, which was adopted on December 11, 2009, approving a 1990 statewide GHG level and 2020 limit of 427 MMT CO₂e (CARB 2008). The Scoping Plan included measures to address GHG emission reduction strategies related to energy efficiency, water use and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

In May 2014, CARB approved the first update to the AB 32 Scoping Plan, which included an adjusted 2020 limit of 431 MMT CO₂e (CARB 2014). The 2013 Scoping Plan update defines CARB's climate change priorities for the next five years and sets the groundwork to reach post-2020 statewide goals. The update highlights California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan. It also evaluates how to align the State's longer-term GHG reduction strategies with other State policy priorities, such as for water, waste, natural resources, clean energy and transportation and land use (CARB 2014).

Executive Order B-16-12

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

- Infrastructure to support up to one million zero emission vehicles by 2020,
- Widespread use of zero emission vehicles for public transportation and freight transport by 2020,
- Over 1.5 million zero emission vehicles on California roads by 2025,
- Annual displacement of at least 1.5 billion gallons of petroleum fuels by 2025, and
- A reduction of GHG emissions from the transportation sector equaling 80 percent less than 1990 levels by 2050.

Executive Order B-30-15

Executive Order (EO) B-30-15 established a Statewide mid-term GHG reduction target of 40 percent below 1990 levels by 2030.

Senate Bill 375

Senate Bill 375, signed in August 2008 (Chapter 728, Statutes of 2008), enhances the State's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles for 2020 and 2035. In addition, SB 375 directs each of the state's 18 major Metropolitan Planning Organizations (MPO) to prepare a "sustainable communities strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the Regional Transportation Plan (RTP). This EIR analyzes both the SCS and RTP for the AMBAG region. AMBAG prepared its first SB 365-compliant MTP/SCS in 2014 (AMBAG 2014). This EIR analyzes the proposed 2040 MTP/SCS, which updates the MTP/SCS adopted in 2014.

At the time of 2040 MTP/SCS preparation, the AMBAG region's GHG reduction targets from CARB, analyzed in this EIR, were a zero percent per capita change from 2005 levels by 2020 and a five

percent per capita reduction from 2005 levels by 2035. These targets apply to the entire AMBAG region for all on-road light duty trucks and passenger vehicles emissions, and not to individual cities or sub-regions. Therefore, AMBAG, through the 2040 MTP/SCS, must maintain a zero percent per capita change from 2005 levels by 2020 and reduce per capita emissions by five percent from 2005 levels by 2035.

Senate Bill 32

On September 8, 2016, the governor signed Senate Bill 32 into law (Chapter 429, Statutes of 2016), extending AB 32 by requiring the State to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). SB 32 became effective on January 1, 2017 and now codifies the 2030 goal set in EO B-30-15. This requires CARB to develop technologically feasible and cost-effective regulations to achieve the targeted 40 percent GHG emission reduction. CARB released a draft version of the updated Scoping Plan on October 27, 2017, but the updated Scoping Plan has not yet been adopted. Adoption of a final version of the updated Scoping Plan is expected by CARB in late 2017 (CARB 2017d). The draft version of the updated Scoping Plan (CARB 2017e) calls for emissions reductions at the State level that meet or exceed the Statewide GHG target, and notes that additional effort will be needed to maintain and continue GHG reductions to meet the mid- (2030) and long-term (2050) targets.

AB 197

AB 197 of 2016 (Chapter 250, Statutes of 2016) expands CARB membership to include two nonvoting members from the Legislature; creates a Joint Legislative Committee on Climate Change Policies to make recommendations to the Legislature concerning climate change policies; provides for annual reporting of GHG emissions from sectors covered by the AB 32 Scoping Plan as well as evaluations of regulatory requirements and other programs that may affect GHG emissions trends; and specifies that the adoption of GHG emissions reduction rules and regulations shall consider the social costs. In addition, Scoping Plan updates are required to identify the range of potential GHG emissions reductions and the cost-effectiveness for each emissions reduction measure, compliance mechanism and incentive.

SB 1383

SB 1383 of 2016 (Chapter 395, Statutes of 2016) sets forth specific legislative direction for control of short-lived climate pollutants (SLCPs). It requires CARB to approve and begin implementing its SLCP strategy to achieve the following reductions in emissions by 2030 compared to 2013 levels: methane by 40 percent, hydrofluorocarbons by 40 percent, and black carbon (non-forest) by 50 percent. The bill also specifies targets for reducing organic waste in landfills. SB 1383 also requires CARB to adopt regulations to be implemented on or after January 1, 2024 specific to the dairy and livestock industry, requiring a 40 percent reduction in methane emissions below 2013 levels by 2030, if certain conditions are met. Lastly, the bill requires CalRecycle to adopt regulations to take effect on or after January or after January 1, 2022 to achieve specified targets for reducing organic waste in landfills.

For more information on the Senate and Assembly Bills, Executive Orders, and reports discussed above, and to view reports and research referenced above, please refer to the following websites: www.climatechange.ca.gov and www.arb.ca.gov/cc/cc.htm.

Regional

AMBAG

AMBAG's Energy & Climate Action Planning Program includes the AMBAG Energy Watch, which supports local climate change efforts by completing GHG inventories for local government operations in 2005 as well as community-wide emissions in 2005 and 2009. In addition, the AMBAG Energy Watch standardizes GHG inventories for regional comparability, provides periodic updates to community-wide GHG inventories for all 21 AMBAG member jurisdictions, performs ongoing GHG inventory technical support and supports community engagement on climate change mitigation. Furthermore, the AMBAG Energy Watch program works closely with each member jurisdiction to develop Energy Action Strategies, which are standalone plans that quantify and reduce residential and non-residential energy consumption and related GHG emissions (AMBAG 2017b).

Monterey Bay Air Resources District

The Monterey Bay Air Resources District (MBARD) does not have an adopted GHG emissions threshold. MBARD is currently in the process of developing GHG emissions thresholds for evaluating projects under CEQA. According to an MBARD staff report to the District Board of Directors (MBARD 2014), MBARD is currently considering adoption of a threshold of 10,000 MT CO₂e per year. Since MBARD has no adopted thresholds, MBARD encourages lead agencies to consider a variety of metrics for evaluating GHG emissions and related mitigation measures as they best apply to the specific project (MBARD 2014). See Section 4.8.2a for a discussion of the significance criteria used to evaluate the MTP/SCS.

Local

Local Climate Action Plans

Seven of AMBAG's member jurisdictions have adopted climate action plans that set goals and outline policies to achieve GHG reduction targets. These cities are Capitola, Gonzales, Monterey, Santa Cruz and Watsonville, as well as Monterey County and Santa Cruz County. All of AMBAG's jurisdictions have conducted baseline emissions inventories, which establish a reference point for GHG emissions reduction. Baseline and projected 2020 GHG emissions from jurisdictions with Climate Action Plans are shown in Table 30.

Table 30 Existing and Projected Emissions Reported in Climate Action Plan in the AMBAG Region

Jurisdiction	Type	Annual Baseline Emissions (MT CO ₂ e)	2020 Target Annual Emissions (MT CO ₂ e)	Status
Monterey County ¹	Municipal Climate Action Plan	2005: 20,230	17,195	Completed June 2013
City of Monterey ²	Climate Action Plan	2005: 327,422	250,211	Completed March 2011; Updated March 2016
City of Capitola ³	Climate Action Plan	2010: 88,091	77,789	Completed October 2015
Santa Cruz County ⁴	Climate Action Strategy	2005: 1,907,037	827,076	Completed February 2013
City of Santa Cruz ⁵	Climate Action Plan	1990: 427,280	271,335	Completed October 2012
City of Gonzales ⁶	Climate Action Plan	2005: 26,847	15,920	Adopted February 2013
City of Watsonville ⁷	Climate Action Plan	2005: 219,773	45,622	Completed April 2015
City of Scotts Valley	Climate Action Plan	N/A	N/A	Currently under development

¹ Monterey County Municipal Climate Action Plan (April 2013), http://www.co.monterey.ca.us/planning/major/REF120044_DRAFT_MONTEREY_MCAP_APRIL_2013_COMPLETE.pdf

² City Monterey Climate Action Plan (March 2016), https://monterey.org/Portals/0/Reports/ForPublicReview/Draft_Climate_Action_Plan.pdf

³ City of Capitola Climate Action Plan (October 2015), http://www.cityofcapitola.org/sites/default/files/fileattachments/community_development/page/3953/capitola_climate_action_plan.pdf

⁴ Santa Cruz County Climate Action Strategy (January 2013), <http://www.sccoplanning.com/Portals/2/County/Planning/policy/Final%20Climate%20Action%20Strategy%20as%20of%201-10-13.pdf?ver=2013-01-15-133918-343>

⁵ City of Santa Cruz Climate Action Plan (June 2012), <http://www.cityofsantacruz.com/home/showdocument?id=27824>

⁶ City of Gonzales Climate Action Plan (February 2013), <http://www.ci.gonzales.ca.us/cms-assets/documents/160466-522662.adopted-gonzales-cap.pdf>

⁷ City of Watsonville Climate Action Plan (April 2015), <https://www.cityofwatsonville.org/DocumentCenter/View/194>

The completed climate action planning documents in the AMBAG region address similar issues related to emissions produced by transportation, energy usage and other operational emissions such as water supply and conveyance, wastewater treatment and solid waste disposal. The types and quantity of emissions produced in the AMBAG region vary among jurisdictions.

However, for most jurisdictions, transportation and energy usage produce a majority of GHG emissions. Climate action planning policies in the region establish a framework for improved circulation networks and energy conservation. Transportation policies aim to reduce vehicle miles traveled (VMT) by offering more opportunities for alternative transportation modes, including bicycling, walking and transit use. In addition, many of the documents include policies to promote transit oriented development (TOD) and land use policies that encourage a greater diversity of land use in closer proximity to one another. In order to reduce emissions caused by energy usage, jurisdictions have established policies that will facilitate and encourage energy efficiency for both residential and commercial land uses. Cities and counties include programs to improve energy efficiencies in old and new buildings and decrease the use of fossil fuels by providing incentives for use of renewable energy.

4.8.2 Impact Analysis

a. Methodology and Significance Thresholds

Significance Thresholds

The significance of GHG emissions may be evaluated based on locally adopted quantitative thresholds, or consistency with a regional or state GHG reduction plan (such as a Climate Action Plan). To date, Monterey County, San Benito County and Santa Cruz County have not developed or adopted official GHG significance thresholds. MBARD is in the process of developing GHG emissions thresholds; however, none have been adopted to date. In the absence of MBARD-adopted thresholds, this section uses the project-specific thresholds of significance for each GHG impact criterion in Appendix G.

Appendix G of the State CEQA Guidelines identifies the following criteria for determining whether a project's impacts would have a significant impact related to GHG emissions:

1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. An increase that exceeds the following threshold would be considered a significant impact:
 - a. A net increase in transportation-related GHG emissions by 2040 compared to existing 2015 conditions.
2. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. Any conflict with the following thresholds would be considered a significant impact:
 - a. Conflict with regional SB 375 per capita passenger vehicle CO₂ emission reduction targets of zero percent by 2020 and five percent by 2035 from 2005 levels;
 - b. Conflict with State's ability to achieve AB 32 and SB 32 GHG reduction targets, which respectively aim to reduce statewide emissions to 1990 levels by 2020 and 40 percent below 1990 levels by 2030;
 - c. Conflict with applicable local GHG reduction plans; and/or
3. Result in a net increase in transportation or land use projects within areas likely to be affected by sea level rise midcentury.

For GHG emissions resulting from the 2040 MTP/SCS, this analysis compares forecasted 2040 emissions with existing 2015 baseline conditions. Land use and mobile emissions were quantified to determine whether region-wide GHG emissions exceed the 2015 baseline. Although construction activity is addressed in this analysis, construction-related emissions are speculative at the 2040 MTP-SCS level because such emissions are dependent on the characteristics of individual projects as well as the types of construction equipment that will be operating. A qualitative, program-level analysis is provided along with best management practices.

For operational emissions, CARB's EMFAC 2014 model was used to calculate mobile source emissions. In the absence of region-wide data, land use emissions were estimated based on available emissions inventory data from the city and county CAPs listed in Table 30. For the purpose of this analysis, for those jurisdictions without CAPs, per capita land use emissions from nearby cities and counties are representative of land use emissions in the AMBAG region because these counties have generally similar climate and demographic conditions that affect electricity and

natural gas consumption, which are the primary drivers of land use GHG emissions. If total region-wide GHG emissions associated with the 2040 MTP-SCS do not exceed the 2015 baseline, impacts related to GHG emissions would not be considered significant.

The SB 375-based threshold is also included as it demonstrates AMBAG’s achievement of CARB-specified targets and consistency toward achieving the goals of AB 32. As discussed in the Regulatory Setting, the targets from CARB are identified as a zero percent per capita change from 2005 levels by 2020 and a five percent per capita reduction from 2005 levels by 2035. In 2005, GHG emissions from passenger vehicles in the AMBAG region were approximately 15.4 pounds of CO₂ per capita. Therefore, AMBAG must reduce these levels in order to meet the 2035 target. If region-wide GHG emissions associated with the 2040 MTP-SCS from passenger vehicles do not exceed 15.4 pounds of CO₂ per capita in 2020 and 14.6 pounds of CO₂ per capita in 2035, the MTP/SCS would meet the mandate of SB 375.

However, meeting the goals of SB 375 does not guarantee consistency with AB 32, which is based on regional emissions in 2020. Furthermore, any conflict with AB 32 would likely result in a conflict with SB 32, which extends AB 32 by setting a target of reducing statewide GHG emissions by 40 percent below 1990 levels by 2030. On October 27, 2017, CARB released a draft version of an updated AB 32 Scoping Plan with a framework for achieving the 2030 target set forth by SB 32 (CARB 2017e). However, the updated Scoping Plan is currently in draft form and has yet to be adopted by CARB. To determine that a project would not conflict with the State’s ability to achieve the SB 32 target, the 2040 MTP/SCS would need to achieve substantial progress toward the long-term reduction target. Mobile source emissions were calculated to determine region-wide GHG emissions with implementation of the 2040 MTP/SCS. If implementation of the 2040 MTP/SCS would achieve substantial progress toward the state achieving the emissions reduction targets established by SB 32, then impacts related to SB 32 would not be considered significant.

Executive Order S-3-05, which sets a goal of reducing GHG emissions to 80 percent below 1990 levels by 2050, is not adopted state policy. Although 2050 is beyond the horizon year of the plan, this analysis addresses whether the 2040 MTP/SCS GHG emission would conflict with the state’s ability to achieving the 2040 GHG reduction goal set forth by Executive Order S-3-05. Table 31 summarizes the scenarios analyzed along with the applicable regulations and, for mobile source emissions, vehicle types.

Table 31 Summary of GHG Scenarios

Scenario	Vehicle Type	Applicable Laws
1990 Baseline	All Vehicles	AB 32, SB 32
2005 Baseline	Passenger Vehicles Only	SB 375, AB 32
2015 AMBAG Baseline	All Vehicles	AB 32, SB 32
2020 MTP/SCS	All Vehicles Passenger Vehicles Only	AB 32, SB 32 SB 375, AB 32
2030 MTP/SCS	All Vehicles	SB 32
2035 MTP/SCS	Passenger Vehicles Only	SB 375, AB 32
2040 No Project	All Vehicles	AB 32, SB 32
2040 MTP/SCS	All Vehicles	AB 32, SB 32

For sea level rise impacts, potential midcentury (e.g., 2050) conditions were selected for this analysis, rather than 2040 conditions. This is because most sea level rise projections are associated with midcentury and end-of-century conditions.

Methodology for Estimating GHG Emissions

GHG emissions from mobile sources were calculated using emission factors from CARB's EMFAC 2014 model and regional VMT from AMBAG's Regional Travel Demand Model (RTDM) (refer to the "Modeling Methodology" section in Appendix F to the 2040 MTP/SCS). EMFAC emission factors are established by CARB and accommodate mobility assumptions (e.g., vehicle miles traveled, fleet, speed, time of day) provided by AMBAG's RTDM, which include socioeconomic growth projections based on AMBAG's Draft 2018 Regional Growth Forecast. EMFAC also reflects the emissions benefits of recent CARB rules, including on-road diesel fleet rules, Advanced Clean Car Standards and the Smartway/Phase I Heavy Duty Vehicle Greenhouse Gas Regulation (CARB 2014).

EMFAC models CO₂ emissions, which were used as the overall indicator of mobile source GHG emissions. Per capita CO₂ emissions were calculated by multiplying the emission factors from EMFAC by the VMT from all vehicle classes and dividing by the region's population. To assess whether the 2040 MTP/SCS would result in a significant increase in mobile source GHG emissions, total CO₂ emissions for the 2040 MTP/SCS were calculated and compared to 2015 baseline conditions.

In the absence of region-wide data, land use emissions were estimated based on available emissions inventory data from the city and county CAPs listed in Table 30. If county-wide emissions were available (i.e., Santa Cruz County), the per capita land use emissions were applied to cities without CAPs. In the absence of county-wide CAP emissions but some city CAP data (i.e., Monterey County), average available city per capita emissions were used for the remainder of the county. In the absence of any CAPs (i.e., San Benito County), average per capita emissions from available cities and counties in the AMBAG region were used. For the purpose of this analysis, per capita land use emissions from nearby cities and counties are representative of land use emissions in the AMBAG region because these counties have generally similar climate and demographic conditions that affect electricity and natural gas consumption, which are the primary drivers of land use GHG emissions. Therefore, using the per capita emissions and AMBAG planning region population, projected land use emissions for the AMBAG region were estimated.

If total GHG emissions (mobile and land use emissions) in 2040 do not exceed the 2015 baseline, the project's impacts would not be considered significant. In addition, total GHG emissions were compared to a future 'no project' scenario for informational purposes.

To assess whether the 2040 MTP/SCS would conflict with the State's ability to achieve AB 32 or SB 32 GHG reduction targets, total CO₂ emissions for 2020 and 2030 were compared to 1990 levels. AB 32 aims to reduce statewide emissions to 1990 levels by 2020, while SB 32 aims to reduce statewide emissions to 40 percent below 1990 levels by 2030. The 2040 MTP/SCS would not conflict with the state's ability to achieve AB 32 or SB 32 targets if total emissions are reduced on trajectories similar to the statewide trajectories. Similarly, the 2040 MTP/SCS would not conflict with the state's ability to achieve EO-S-3-05 targets if total emissions are reduced on a trajectory similar to the statewide trajectories.

To determine whether the 2040 MTP/SCS would allow AMBAG to meet its SB 375 reduction targets, per capita CO₂ emissions were calculated by multiplying the emission factors by the VMT from passenger vehicles, and dividing by the region's population. For this analysis, emission factors were

generated using the SB 375 template in EMFAC, which deactivates Advanced Clean Cars (Pavley) and Low Carbon Fuel Standards. In addition, the following three off-model adjustments were made to adjust the VMT from passenger vehicles based on the projects included in the 2040 MTP/SCS:

- Removal of through travel and half of Internal-External and External-Internal travel.
- Adjustments for “off-model” projects and programs included in AMBAG’s 2040 MTP/SCS (i.e., Transportation Demand Management [TDM] and Transportation System Management [TSM] Strategies, increase in work at home employees, additional efforts for zero emission vehicle (ZEV) infrastructure and active transportation).
- Accounting for transit service enhancements.

The above off-model techniques were based on academic literature reviews, collaboration with other MPOs, and consultation with CARB’s Policies and Practices Guidelines. Off-model adjustments were computed for 2020 and 2035 since these factors are cannot be modeled and have significant effects on VMT reduction and used to assess whether the 2040 MTP/SCS would allow the region to meet AMBAG’s SB 375 reduction targets. Refer to the “Methodology to Estimate Performance Measures” section in Appendix G to the 2040 MTP/SCS, which describes the methodology used to calculate the regional performance measures.

b. Project Impacts and Mitigation Measures

This section describes generalized GHG and climate change impacts associated with the 2040 MTP/SCS. Section 4.8.2(b) describes the transportation projects that could generate GHG emissions that could result in GHG and climate change impacts discussed in this section. Due to the programmatic nature of the 2040 MTP/SCS, a precise, project-level analysis of the specific impacts associated with individual transportation and land use projects is not possible. In general, however, implementation of proposed transportation improvements and future projects under the land use scenario envisioned by the 2040 MTP/SCS could result in greenhouse gas and climate change impacts as described in the following sections.

Threshold 1: Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. An increase that exceeds the following threshold would be considered a significant impact:

- a. A net increase in GHG emissions by 2040 compared to existing 2015 conditions

Impact GHG-1 CONSTRUCTION OF THE TRANSPORTATION IMPROVEMENT PROJECTS AND DEVELOPMENT WITHIN FUTURE LAND USE PROJECTS ENVISIONED BY THE 2040 MTP/SCS WOULD GENERATE TEMPORARY SHORT-TERM GHG EMISSIONS THAT MAY HAVE A SIGNIFICANT EFFECT. IMPACTS WOULD BE SIGNIFICANT BUT MITIGABLE.

Construction activities associated with transportation improvement projects and future land use projects envisioned by the 2040 MTP/SCS would generate temporary short-term GHG emissions primarily due to the operation of construction equipment and truck trips. Construction-related GHG emissions are generally associated with construction equipment. GHG emissions from operation of construction equipment can vary depending on the level of activity, the specific operations taking place, the equipment being operated and other factors. However, because such emissions are dependent on the characteristics of individual development projects, this analysis includes a qualitative analysis of potential GHG emissions from construction activity associated with projected land use development and proposed transportation projects. At the program level of analysis, it is

not possible to quantify the amount of emissions expected from implementation of the 2040 MTP/SCS because of variability in the extent of construction based on site conditions throughout the AMBAG region, and that the lack of project details needed to conduct such an analysis are.

Construction activity tends to be temporary in nature and would be expected to occur throughout the buildout period of the 2040 MTP/SCS. During construction activities, GHG emissions would be emitted from travel to and from the worksite and the operation of construction equipment such as graders, backhoes and generators. Site preparation and grading typically generate the greatest amount of emissions due to the use of grading equipment and soil hauling. The level of GHG emissions from the construction of any one project or all projects combined would be primarily dependent on the particular type, quantity, age and fuel type of the equipment and the duration of their operation at the construction site or in the region. Construction activities generally result in annual GHGs that represent a small proportion of total annual GHGs from operational sources such as transportation and land use emissions. For example, the Southern California Association of Governments (SCAG) found in their 2012 RTP/SCS PEIR, that total construction-related emissions account for less than 0.3 percent of total GHG emissions for the entire SCAG region.

Nonetheless, construction activities would result in GHG emissions, and this impact would be significant. Therefore, this analysis identifies the measures, or best management practices (BMPs), that should be implemented for an individual construction project to have less than significant impacts. Thus, should implementing agencies adopt feasible mitigation measures for each construction project resulting from the 2040 MTP/SCS, impacts associated with construction activity on GHG emissions would be less than significant.

Mitigation Measures

For all transportation projects under their jurisdiction, TAMC, SBtCOG and SCCRTC shall implement, and transportation project sponsor agencies can and should implement, the following mitigation measures developed for the 2040 MTP/SCS program where applicable for transportation projects generating construction GHG emissions. Cities and counties in the AMBAG region can and should implement these measures, where relevant to land use projects implementing the 2040 MTP/SCS. Project-specific environmental documents may adjust these mitigation measures as necessary to respond to site-specific conditions.

GHG-1 Construction GHG Reduction Measures

The implementing agency shall incorporate the most recent GHG reduction measures and/or technologies for reducing diesel particulate and NO_x emissions measures for off-road construction vehicles during construction. The measures shall be noted on all construction plans and the implementing agency shall perform periodic site inspections. Current GHG-reducing measures include the following:

- Use of diesel construction equipment meeting CARB's Tier 2 certified engines or cleaner off-road heavy-duty diesel engines, and comply with the State Off-Road Regulation;
- Use of on-road heavy-duty trucks that meet the CARB's 2007 or cleaner certification standard for on-road heavy-duty diesel engines, and comply with the State On-Road Regulation;
- All on and off-road diesel equipment shall not idle for more than 5 minutes. Signs shall be posted in the designated queuing areas and or job sites to remind drivers and operators of the five minute idling limit;
- Use of electric powered equipment in place of diesel powered equipment when feasible;

- Substitute gasoline-powered in place of diesel-powered equipment, where feasible; and
- Use of alternatively fueled construction equipment, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane or biodiesel, in place of diesel powered equipment for 15 percent of the fleet; and Use of materials sources from local suppliers; and
- Recycling of at least 50 percent of construction waste materials.

Implementing Agencies

Implementing agencies for AMBAG transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

Significance After Mitigation

With the implementation of the above mitigation, implementing agencies would reduce short-term GHG emissions from individual projects to the maximum extent feasible. Because construction activities generally result in annual GHGs that represent a small proportion of total annual GHGs, and implementation of the 2040 MTP/SCS would result in a net reduction in GHG emissions in 2040 when compared to as compared to the 2015 AMBAG baseline (refer to Impact GHG-2), impacts associated with construction activity on local and regional air quality would be less than significant.

Threshold 1: Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. An increase that exceeds the following threshold would be considered a significant impact:

- a. A net increase in GHG emissions by 2040 compared to existing 2015 conditions

Impact GHG-2 IMPLEMENTATION OF THE 2040 MTP/SCS WOULD NOT RESULT IN A SIGNIFICANT INCREASE IN TOTAL GHG EMISSIONS FROM MOBILE AND LAND USE SOURCES COMPARED TO 2015 BASELINE CONDITIONS. IMPACTS WOULD BE LESS THAN SIGNIFICANT.

GHG emissions associated with on-road motor vehicles for the proposed 2040 MTP/SCS were calculated using the CARB's EMFAC 2014 model based on the VMT that would be generated as a result of the proposed plan (refer to Section 4.14, *Transportation and Circulation*). As discussed in Section 1.2.2(a), land use emissions were estimated based on extrapolation of the emissions inventories from the cities and counties with CAPs. Table 32 compares the total transportation-related emissions from all vehicles classes for existing conditions as well as land use emissions in 2015 and 2040 conditions with implementation of the 2040 MTP/SCS. The conditions in 2040 without implementation of the 2040 MTP/SCS are also shown for informational purposes.

Table 32 Regional GHG Emissions

Scenario	Emissions (MT CO ₂ e/year)
2015 AMBAG Baseline	
On-Road Motor Vehicles	2,692,239
Land Use Emissions	2,150,457
Total Regional Emissions	4,842,695
2040 No Project	
On-Road Motor Vehicles	2,090,480
Land Use Emissions	2,509,717
Total Regional Emissions	4,600,197
2040 MTP/SCS	
On-Road Motor Vehicles	2,083,693
Land Use Emissions	2,509,717
Total Regional Emissions	4,593,410
Source: On-road motor vehicle GHG emissions were calculated by AMBAG using EMFAC. Land use emissions were based on the emissions inventories for available data in city and county CAPs listed in Table 30.	

As shown in Table 32, total future (2040) emissions with implementation of the 2040 MTP/SCS would result in fewer GHG emissions as compared to the 2015 AMBAG baseline. As previously discussed, the AB 32 Scoping Plan outlines the main State strategies for reducing GHGs to meet the 2020 target. Many of these strategies contribute to reductions from transportation-related emissions at the regional and local levels. In addition, EMFAC 2014 also reflects the emissions benefits of recent CARB rules, including on-road diesel fleet rules, Advanced Clean Car Standards, and the Smartway/Phase I Heavy Duty Vehicle Greenhouse Gas Regulation (CARB 2014). Since total regional emissions with implementation of the 2040 MTP/SCS would result in fewer GHG emissions than compared to 2015 conditions, this impact would be less than significant.

Mitigation Measures

None required.

Threshold 2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. Any conflict with the following thresholds would be considered a significant impact:

a. Conflict with regional SB 375 per capita passenger vehicle CO₂ emission reduction targets of zero percent by 2020 and five percent by 2035 from 2005 levels.

Impact GHG-3 IMPLEMENTATION OF THE 2040 MTP/SCS WOULD NOT CONFLICT WITH REGIONAL SB 375 PER CAPITA PASSENGER VEHICLE CO₂ EMISSION REDUCTION TARGETS. IMPACTS WOULD BE LESS THAN SIGNIFICANT.

One of the goals of SB 375 is to reach the GHG emissions reduction targets for passenger vehicles set by CARB through an integrated land use, transportation and housing plan. Achievement of this

goal is an objective of the proposed 2040 MTP/SCS. The targets from CARB, analyzed in this EIR, are identified as a zero percent per capita change from 2005 levels by 2020 and a five percent per capita reduction from 2005 levels by 2035. To assess whether the 2040 MTP/SCS would reach SB 375’s targets, EMFAC2014 was used to model CO₂ emissions for passenger vehicles. Emissions for 2020 and 2035 were compared to a 2005 baseline for assessing the compliance with SB 375, as shown in Table 31. Table 33 summarizes the per capita transportation-related emissions from passenger vehicles along with the off-model adjustments that were included to represent a reasonable level effect of the transportation programs included in the 2040 MTP/SCS.

Table 33 Per Capita Carbon Dioxide Emission Comparison: Passenger Vehicles

	2005 Baseline (per SB 375)	2020 MTP/SCS	2035 MTP/SCS
Modeled Per Capita CO ₂ Emissions ¹	15.39	14.30	14.29
Modeled Reduction from 2005		-7.06%	-7.14%
EMFACT 2011- EMFAC 2014 Adjustments		-3.0%	-5.5%
Adjusted per capita GHG reduction from 2005		-4.3%	-1.6%
Transportation System Management Strategies		N/A	-0.9%
Transportation Demand Management		N/A	-0.5%
Increase Work at Home Workers		N/A	-0.5%
Active Transportation		N/A	-1.6%
Transit System Enhancement Strategies		N/A	-0.5%
Zero Emission Vehicles and Electric Charging Infrastructure Development		N/A	-1.00%
Total % Reduction from 2005		-4.3%	-6.6%

¹ Emissions include external reductions, which remove through travel and half of Internal-External and External-Internal travel.

Source: AMBAG Technical Documentation for Off-Model Adjustments (2017)

As shown in the table, implementation of the 2040 MTP/SCS in the year 2020 would result in a decrease of per capita CO₂ emissions by 4.3 percent compared to 2005. In addition, implementation of the 2040 MTP/SCS in the year 2035 would result in a decrease of per capita CO₂ emissions by 6.6 percent compared to 2005. In both cases, implementation of the 2040 MTP/SCS would be consistent with the AMBAG’s SB 375 GHG reduction targets of zero percent in 2020 and five percent in 2035.

As discussed above, these projections do not account for any additional measures from the current Scoping Plan to further reduce passenger vehicle GHG emissions and are, therefore, conservative. As such, the 2040 MTP/SCS would contribute to an overall reduction in per capita passenger vehicle-related GHG emissions. Therefore, this impact would be less than significant.

Mitigation Measures

None required.

Threshold 2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. Any conflict with the following thresholds would be considered a significant impact:

- b. Conflict with State’s ability to achieve AB 32 and SB 32 GHG reduction targets, which respectively aim to reduce statewide emissions to 1990 levels by 2020 and 40 percent below 1990 levels by 2030; and/or
- c. Conflict with applicable local GHG reduction plans

Impact GHG-4 IMPLEMENTATION OF THE 2040 MTP/SCS WOULD NOT INTERFERE WITH CLIMATE ACTION PLANS FOR THE CITIES OF MONTEREY, CAPITOLA, SANTA CRUZ, GONZALES, AND WATSONVILLE, AS WELL AS MONTEREY COUNTY AND SANTA CRUZ COUNTY. HOWEVER, THE 2040 MTP/SCS WOULD CONFLICT WITH THE STATE’S ABILITY TO ACHIEVE THE AB 32, SB 32 AND EO-S-3-05 GHG REDUCTION GOALS. IMPACTS WOULD BE SIGNIFICANT AND UNAVOIDABLE.

The cities of Monterey, Capitola, Santa Cruz, Gonzales and Watsonville, as well as Monterey County and Santa Cruz County, have adopted climate action plans. These plans set goals and targets for the reduction of GHG emissions and outlines policies to help achieve those goals. These local climate action plans have been adopted in an effort to comply with the GHG emissions reduction goals recommended for local governments in the AB 32 Scoping Plan. The 2040 MTP/SCS would not conflict with these local climate action plans.

Although the projects, policies and land use scenarios identified in the 2040 MTP/SCS are designed to align transportation and land use planning to reduce transportation-related GHG emissions, the 2040 MTP/SCS would conflict with the State’s ability to achieve the AB 32 GHG emissions reduction goal. Implementation of the 2040 MTP/SCS would help the region achieve its SB 375 GHG emissions reduction target, thereby contributing to the State’s overall GHG emissions reduction goals identified in AB 32. However, as shown in Table 34, total regional GHG emissions in 2020 would increase by 14.1 percent above 1990 levels. Therefore, the 2040 MTP/SCS would conflict with the State’s ability to achieve the AB 32 GHG emissions reduction goal.

SB 32 has codified the 2030 GHG emissions reduction goals set forth in EO-30-15. CARB is currently working to update the Scoping Plan to provide a framework for achieving these 2030 targets, which would assign targets by sector to achieve the GHG emissions reduction goal of 40 percent below 1990 levels by 2030. CARB released a draft version of the updated Scoping Plan on October 27, 2017, but a final updated Scoping Plan has not yet been adopted by CARB (CARB 2017e). Adoption is expected in late 2017 (CARB 2017d), and the adopted final updated Scoping Plan will apply to SCSs adopted beginning in 2018. In the absence of an adopted Scoping Plan, this analysis assumes that the 2040 MTP/SCS would be required to achieve the same proportional GHG reductions as the state by the year 2030. Since data for 2030 was not available, the 2030 emissions trajectory was estimated using linear regression based on available data for the years 2015 and 2040. As shown in Table 34, implementation of the 2040 MTP/SCS would increase total regional GHG emissions to 13.9 percent above 1990 baseline levels by 2030. Thus, the 2040 MTP/SCS would conflict with the State’s ability to achieve the SB 32 GHG emissions reduction goal. Furthermore, the 2040 MTP/SCS would not be on track to be consistent with the state’s ability to achieve the Executive Order S-3-05 goal of 80 percent below 1990s levels by 2050. Therefore, since the 2040 MTP/SCS would conflict with the state’s ability to achieve AB, 32, SB 32 and EO S-3-05 GHG reduction goals, this impact would be significant.

Table 34 GHG Emissions Compared to 1990 Levels

Scenario	Regional Emissions (MT CO ₂ e/year)	% Reduction in Emissions Compared to 1990 Baseline
1990 Baseline ¹	4,442,218	–
2020 MTP/SCS	4,772,758	+7.4%
2030 MTP/SCS	4,652,012	+4.7%
2040 MTP/SCS	4,593,410	+3.4%

¹ Actual 1990 emissions are unknown but are generally assumed to be 15% below 2005 levels (CARB 2008). The population figure for 1990 is from AMBAG's 2014 Regional Growth Forecast (AMBAG 2014a).

Source: The emissions include both on-road motor vehicle and land use emissions. On-road motor vehicle GHG emissions were calculated by AMBAG using EMFAC. Land use emissions were based on the emissions inventories for available data in city and county CAPs listed in Table 30

Mitigation Measures

The 2040 MTP/SCS would facilitate TDM, TSM and other off model strategies discussed above, which would improve the transportation network in the AMBAG planning region and encourage the use of transportation modes other than passenger vehicles. However, the expected growth in the AMBAG region would still result in an increase in GHG emissions compared to 1990 baseline conditions, which would conflict with the state's ability to achieve AB, 32, SB 32 and EO S-3-05 GHG reduction goals. For land use projects under their jurisdiction, the cities and counties in the AMBAG region can and should implement measures to reduce energy consumption, water use, solid waste generation, and VMT, all of which contribute to GHG emissions. As shown in Table 30, several cities and counties in the AMBAG region have adopted Climate Action Plans to reduce land use related GHG emissions. Cities and counties in the AMBAG region can and should implement the following measures, where relevant to land use projects implementing the 2040 MTP/SCS. Project-specific environmental documents may adjust these mitigation measures as necessary to respond to site-specific conditions.

GHG-4 Project-Level Energy Consumption and Water Use Reduction

Implementing agencies shall evaluate energy consumption and water use as part of project-specific CEQA review and discretionary approval decisions for land use projects. Where project-level significant impacts are identified, implementing agencies shall identify and implement measures that reduce energy consumption and water use below local standards, or, in the absence of local standards, below MBARD-recommended standards. Examples of energy- and water-saving measures include:

- Require new residential and commercial construction to install solar energy systems or be solar-ready
- Require new residential and commercial development to install low-flow water fixtures
- Require new residential and commercial development to install water-efficient drought-tolerant landscaping, including the use of compost and mulch
- Require new development to exceed the applicable Title 24 energy-efficiency requirements

Implementing Agencies

Implementing agencies for land use projects include cities and counties.

In addition, Mitigation Measure T-5, described in Section 4.14, *Transportation and Circulation*, requires implementing agencies to evaluate VMT as part of project-specific CEQA review and discretionary approval for land use projects, and to identify and implement measures that reduce VMT. Reducing VMT would further reduce GHG emissions. Mitigation Measures W-2(a) through W-2(b) described in Section 4.10, *Hydrology and Water Quality*, require implementing agencies to include water use reduction measures for transportation projects under their jurisdiction.

Significance After Mitigation

If implementing agencies adopt and require the mitigation described above, impacts would be reduced because GHG emissions from land use projects would be reduced. However, implementation of project-level GHG-reducing measures may not be feasible and cannot be guaranteed on a project-by-project basis. Additionally, it is unlikely that an increase in annual GHG emissions above existing conditions could be fully avoided in 2040, due to factors unrelated to discretionary approvals, such as population growth in the region. Therefore, this impact would remain significant and unavoidable. No additional feasible mitigation measures are available that would reduce emissions to trajectories consistent with AB, 32, SB 32 and EO S-3-05 GHG reduction goals.

Threshold 2: d. Result in a net increase in transportation or land use projects within areas likely to be affected by sea level rise by midcentury

Impact GHG-5 IMPLEMENTATION OF PROPOSED TRANSPORTATION IMPROVEMENTS AND FUTURE PROJECTS FACILITATED BY THE LAND USE SCENARIO ENVISIONED IN THE 2040 MTP/SCS COULD BE SUBJECT TO COASTAL FLOODING AND SEA LEVEL RISE. IMPACTS WOULD BE SIGNIFICANT AND UNAVOIDABLE.

Proposed transportation improvements and future land use projects located near the coastline in Monterey and Santa Cruz counties could be subject to increased risk of sea level rise. San Benito County is inland and would not be affected by sea level rise. As discussed in the Setting, substantial sea level rise is expected in the coming century, which would increase the likelihood and risk of coastal flooding and erosion. There is a 50 percent probability that sea level rise in San Francisco between 2030 and 2050 would be at least 3.8 mm per year (Griggs, et al. 2017). This rate would be expected to be similar in the AMBAG region. Any coastal transportation or infill project in Monterey or Santa Cruz counties would be potentially affected, especially projects within a sea level rise inundation zone, flood zone, or tsunami hazard area. As discussed in Section 4.10, *Hydrology and Water Quality*, the portions of Monterey County most susceptible to flooding are the coastal areas of Salinas Valley, the City of Seaside, the City of Monterey and the Elkhorn Slough area. The portions of Santa Cruz County most susceptible to flooding are the Pajaro and San Lorenzo River Valleys. Sea level rise leading to coastal flooding would pose a significant vulnerability to public transportation in the region, as it would exacerbate flooding in these and other coastal areas. The *2016 City of Monterey Final Sea Level Rise and Vulnerability Analyses, Existing Conditions and Issues Report* found that the Recreational Trail (Projects MON-PGV008-PG and MON-PGV017-PG) and Del Monte Avenue bus routes (Project MON-MRY005-MY) would be the most vulnerable to coastal flooding (City of Monterey 2016). Other projects within Monterey and Santa Cruz counties may also be vulnerable, depending on the final design and location of specific projects, as well as the extent of sea level rise in the future.

The City of Santa Cruz General Plan and Local Coastal Program (Santa Cruz County, 1994) includes policies to adapt to climate change. For example, Policy NRC 4.5 is to minimize impacts of future sea

level rise. However, any transportation or infill projects along the coast throughout Monterey and Santa Cruz counties that would be within the sea level rise inundation zone (i.e., in an area subject to flooding as a result of an estimated 14-inch rise in sea level by 2050) would be potentially affected by sea level rise. This is a significant impact.

Mitigation Measures

Mitigation Measures W-4(a) and W-4(b) from Section 4.10, *Hydrology and Water Quality*, would partially reduce impacts, as they would require structures to be elevated one foot above the 100-year flood zone and 10-feet above the ground elevation in areas subject to tsunamis. Because sea level rise inundation areas are geographically similar to coastal flood and tsunami hazard areas, these measures would serve to minimize impacts to some extent.

In addition, for all transportation projects under their jurisdiction, TAMC and SCCRTC shall implement, and transportation project sponsor agencies can and should implement, the following mitigation measures developed for the 2040 MTP/SCS program where applicable for transportation projects located within a potential sea level rise inundation area. Coastal cities and counties in the AMBAG region can and should implement these measures, where relevant to land use projects implementing the 2040 MTP/SCS. Project-specific environmental documents may adjust these mitigation measures as necessary to respond to site-specific conditions.

GHG-5 Sea Level Rise Adaptation

For projects located within a potential sea level rise inundation area, the implementing agency shall incorporate appropriate adaptation strategies to minimize hazards associated with sea level rise, such that project structures and other critical facilities would be located outside of an identified sea level rise inundation area. Appropriate adaptation strategies will depend on project- and site-specific considerations, including proximity to the coastline, elevation and type of structure or facility proposed. Adaptation strategies may include, but would not be limited to:

- Project redesign to place structures and critical facilities outside of the potential sea level rise inundation area;
- Structural measures including drainage improvements, raising road surfaces or first floor elevations above the expected sea level rise inundation level, or strengthening structures to improve resiliency;
- Designing facilities to withstand periodic inundation and continue to function (i.e., waterproofing);
- Building a new levee or raising the elevation of an existing levee to protect the proposed building or structure, or construct engineered shoreline protection structures such as revetment and bulkheads; and/or
- Replenishment of sand from off-site locations to preserve beaches that are subject to erosion and land loss from rising sea levels (beach nourishment).

Implementing Agencies

Implementing agencies for AMBAG transportation projects include TAMC, SCCRTC and transportation project sponsor agencies. Implementing agencies for land use projects include coastal cities and counties.

Significance After Mitigation

Although the above mitigation may reduce the impact associated with sea level rise, these measures may not be feasible for all projects. No additional feasible mitigation measures have been identified that would further reduce this impact without fundamentally altering the project. This impact would remain significant and unavoidable.

c. Specific MTP Projects That May Result in Impacts

The proposed projects listed in Appendix B and summarized in Section 2.0, *Project Description*, would have the potential to generate GHG emissions. However, the 2040 MTP/SCS as a whole is designed to reduce per capita transportation-related GHG emissions in accordance with SB 375, AB 32 and SB 32.

d. Cumulative Analysis

GHG emissions are, by definition, cumulative impacts, as they add to the global accumulation of greenhouse gases in the atmosphere. As discussed in Section 4.8.2, construction activities associated with transportation improvement projects and future land use projects envisioned by the 2040 MTP/SCS may generate temporary GHG emissions. However, compliance with GHG mitigation measures during construction would reduce this impact. Implementation of the 2040 MTP/SCS would reduce total region wide mobile and land use emissions compared to existing conditions as well as per capita CO₂ vehicle emissions beyond the SB 375 reduction targets of a zero percent per capita change from 2005 levels by 2020 and a five percent per capita reduction from 2005 levels by 2035. However, the 2040 MTP/SCS would conflict with the state's ability to achieve the AB 32, SB 32 and EO S-3-05 GHG reduction targets. Therefore, the project's contribution to cumulative GHG and climate change impacts, including sea level rise, would be cumulatively considerable, and thus significant and unavoidable.