

## 2.5 CLIMATE CHANGE

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the earth's climate system. An ever-increasing body of scientific research attributes these climatological changes to greenhouse gas (GHG) emissions, particularly those generated from the production and use of fossil fuels.

While climate change has been a concern for several decades, the establishment of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations and World Meteorological Organization in 1988 has led to increased efforts devoted to GHG emissions reduction and climate change research and policy. These efforts are primarily concerned with the emissions of GHGs generated by human activity including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), tetrafluoromethane, hexafluoroethane, sulfur hexafluoride (SF<sub>6</sub>), HFC-23 (fluoroform), HFC-134a (s, s, s, 2-tetrafluoroethane), and HFC-152a (difluoroethane).

In the U.S., the main source of GHG emissions is electricity generation, followed by transportation. In California, however, transportation sources (including passenger cars, light-duty trucks, other trucks, buses, and motorcycles make up the largest source of GHG-emitting sources. The dominant GHG emitted is CO<sub>2</sub>, mostly from fossil fuel combustion.

There are typically two terms used when discussing the impacts of climate change: "Greenhouse Gas Mitigation" and "Adaptation." "Greenhouse Gas Mitigation" is a term for reducing GHG emissions to reduce or "mitigate" the impacts of climate change. "Adaptation" refers to the effort of planning for and adapting to impacts resulting from climate change (such as adjusting transportation design standards to withstand more intense storms and higher sea levels).<sup>1</sup>

There are four primary strategies for reducing GHG emissions from transportation sources: 1) improving the transportation system and operational efficiencies, 2) reducing travel activity, 3) transitioning to lower GHG-emitting fuels, and 4) improving vehicle technologies/efficiency. To be most effective, all four strategies should be pursued cooperatively.<sup>2</sup>

### 2.5.1 REGULATORY SETTING

#### STATE

With the passage of several pieces of legislation including State Senate and Assembly bills and Executive Orders, California launched an innovative and proactive approach to dealing with GHG emissions and climate change.

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<sup>1</sup> [http://climatechange.transportation.org/ghg\\_mitigation/](http://climatechange.transportation.org/ghg_mitigation/)

<sup>2</sup> [http://www.fhwa.dot.gov/environment/climate\\_change/mitigation/](http://www.fhwa.dot.gov/environment/climate_change/mitigation/)

Assembly Bill 1493 (AB 1493), Pavley, Vehicular Emissions: Greenhouse Gases, 2002: This bill requires the California Air Resources Board (ARB) to develop and implement regulations to reduce automobile and light truck GHG emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with the 2009-model year.

Executive Order (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 the year 1990 levels by 2050. In 2006, this goal was further reinforced with the passage of Assembly Bill 32.

Assembly Bill 32 (AB 32), Núñez and Pavley, The Global Warming Solutions Act of 2006: AB 32 sets the same overall GHG emissions reduction goals as outlined in EO S-3-05, while further mandating that ARB create a scoping plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases."

Executive Order S-20-06 (October 18, 2006): This order establishes the responsibilities and roles of the Secretary of the California Environmental Protection Agency (Cal/EPA) and state agencies with regard to climate change.

Executive Order S-01-07 (January 18, 2007): This order set forth the low carbon fuel standard for California. Under this EO, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by 2020.

Senate Bill 97 (SB 97) Chapter 185, 2007, Greenhouse Gas Emissions: This bill required the Governor's Office of Planning and Research (OPR) to develop recommended amendments to the California Environmental Quality Act (CEQA) Guidelines for addressing GHG emissions. The amendments became effective on March 18, 2010.

Senate Bill 375 (SB 375), Chapter 728, 2008, Sustainable Communities and Climate Protection: This bill requires the California Air Resources Board (ARB) to set regional emissions reduction targets from 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 for the achievement of the emissions target for their region.

Senate Bill 391 (SB 391) Chapter 585, 2009 California Transportation Plan: This bill requires the State's long-range transportation plan to meet California's climate change goals under AB 32.

## FEDERAL

Although climate change and GHG reduction are a concern at the federal level, currently no regulations or legislation have been enacted specifically addressing GHG emissions reductions and climate change at the project level. Neither the United States Environmental Protection Agency (U.S. EPA) nor the Federal Highway Administration (FHWA) has issued explicit guidance or methods to conduct project-level GHG analysis.<sup>3</sup> FHWA supports the approach that climate change

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<sup>3</sup> To date, no national standards have been established regarding mobile source GHGs, nor has U.S. EPA established any ambient standards, criteria or thresholds for GHGs resulting from mobile sources.

considerations should be integrated throughout the transportation decision-making process—from planning through project development and delivery. Addressing climate change mitigation and adaptation up front in the planning process will assist in decision-making and improve efficiency at the program level, and will inform the analysis and stewardship needs of project-level decision-making. Climate change considerations can be integrated into many planning factors, such as supporting economic vitality and global efficiency, increasing safety and mobility, enhancing the environment, promoting energy conservation, and improving the quality of life.

The four strategies outlined by FHWA to lessen climate change impacts correlate with efforts that the state is undertaking to deal with transportation and climate change; these strategies include improved transportation system efficiency, cleaner fuels, cleaner vehicles, and a reduction in travel activity.

Climate change and its associated effects are also being addressed through various efforts at the federal level to improve fuel economy and energy efficiency, such as the “National Clean Car Program” and EO 13514 - *Federal Leadership in Environmental, Energy and Economic Performance*.

Executive Order 13514 (October 5, 2009): This order is focused on reducing greenhouse gases internally in federal agency missions, programs and operations, but also directs federal agencies to participate in the Interagency Climate Change Adaptation Task Force, which is engaged in developing a national strategy for adaptation to climate change.

U.S. EPA’s authority to regulate GHG emissions stems from the U.S. Supreme Court decision in *Massachusetts v. EPA* (2007). The Supreme Court ruled that GHGs meet the definition of air pollutants under the existing Clean Air Act and must be regulated if these gases could be reasonably anticipated to endanger public health or welfare. Responding to the Court’s ruling, U.S. EPA finalized an endangerment finding in December 2009. Based on scientific evidence it found that six greenhouse gases constitute a threat to public health and welfare. Thus, it is the Supreme Court’s interpretation of the existing Act and EPA’s assessment of the scientific evidence that form the basis for EPA’s regulatory actions. U.S. EPA in conjunction with NHTSA issued the first of a series of GHG emission standards for new cars and light-duty vehicles in April 2010.<sup>4</sup>

The U.S. EPA and the National Highway Traffic Safety Administration (NHTSA) are taking coordinated steps to enable the production of a new generation of clean vehicles with reduced GHG emissions and improved fuel efficiency from on-road vehicles and engines. These next steps include developing the first-ever GHG regulations for heavy-duty engines and vehicles, as well as additional light-duty vehicle GHG regulations.

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<sup>4</sup> <http://www.c2es.org/federal/executive/epa/greenhouse-gas-regulation-faq>

The final combined standards that made up the first phase of this national program apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. The standards implemented by this program are expected to reduce GHG emissions by an estimated 960 million metric tons and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program (model years 2012-2016).

On August 28, 2012, U.S. EPA and NHTSA issued a joint Final Rulemaking to extend the National Program for fuel economy standards to model year 2017 through 2025 passenger vehicles. Over the lifetime of the model year 2017-2025 standards this program is projected to save approximately four billion barrels of oil and two billion metric tons of GHG emissions.

The complementary U.S. EPA and NHTSA standards that make up the Heavy-Duty National Program apply to combination tractors (semi-trucks), heavy-duty pickup trucks and vans, and vocational vehicles (including buses and refuse or utility trucks). Together, these standards will cut greenhouse gas emissions and domestic oil use significantly. This program responds to President Barack Obama's 2010 request to jointly establish greenhouse gas emissions and fuel efficiency standards for the medium- and heavy-duty highway vehicle sector. The agencies estimate that the combined standards will reduce CO<sub>2</sub> emissions by about 270 million metric tons and save about 530 million barrels of oil over the life of model year 2014 to 2018 heavy duty vehicles.

## 2.5.2 PROJECT ANALYSIS

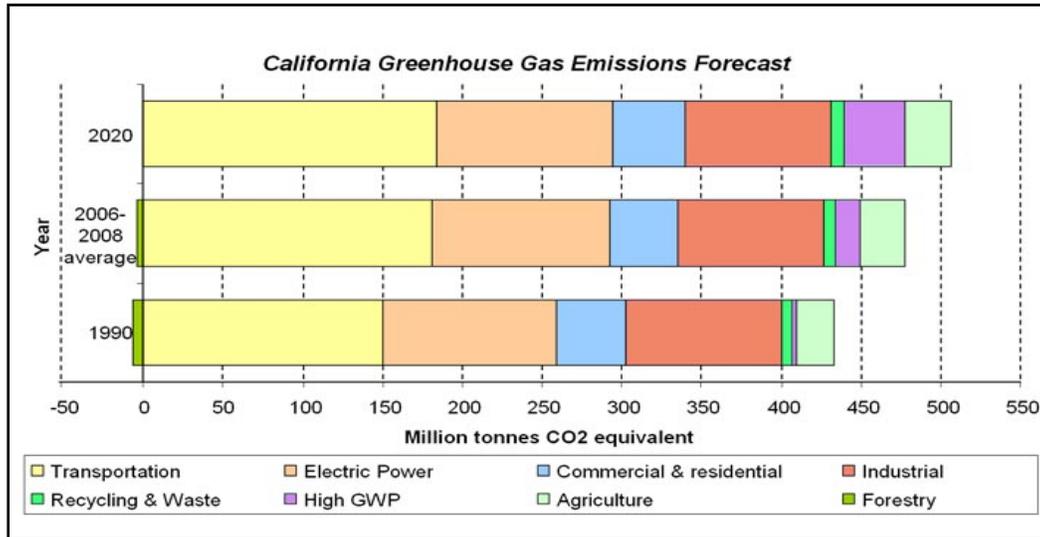
An individual project does not generate enough GHG emissions to significantly influence global climate change. Rather, global climate change is a cumulative impact. This means that a project may contribute to a potential impact through its *incremental* change in emissions when combined with the contributions of all other sources of GHG.<sup>5</sup> 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. To gather sufficient information on a global scale of all past, current, and future projects to make this determination is a difficult, if not impossible, task.

The AB 32 Scoping Plan mandated by AB 32 includes the main strategies California will use to reduce GHG emissions. As part of its supporting documentation for the Draft Scoping Plan, the ARB released the GHG inventory for California (forecast last updated: October 28, 2010). The forecast is an estimate of the emissions expected to occur in 2020 if none of the foreseeable measures included in the Scoping Plan were implemented. The base year used for forecasting emissions is the average of statewide emissions in the GHG inventory for 2006, 2007, and 2008.

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<sup>5</sup> This approach is supported by the AEP: Recommendations by the Association of Environmental Professionals on How to Analyze GHG Emissions and Global Climate Change in CEQA Documents (March 5, 2007), as well as the South Coast Air Quality Management District (Chapter 6: The CEQA Guide, April 2011) and the U.S. Forest Service (Climate Change Considerations in Project Level NEPA Analysis, July 13, 2009).

Figure 2.5-1 California Greenhouse Gas Forecast



Source: <http://www.arb.ca.gov/cc/inventory/data/forecast.htm>

The Department and its parent agency, the Transportation Agency, have taken an active role in addressing GHG emission reduction and climate change. Recognizing that 98 percent of California's GHG emissions are from the burning of fossil fuels and 40 percent of all human made GHG emissions are from transportation, the Department has created and is implementing the Climate Action Program at Caltrans that was published in December 2006.<sup>6</sup>

Projections of future conditions for travel within the project limits are anticipated to increase substantially by the year 2040, largely as a result of local and regional residential and employment growth projected over that period. As indicated in the **Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**, the new express lanes would accommodate approximately 35 percent more vehicles, providing better distribution of vehicles over all the lanes, which would relieve congestion and queuing along the entirety of the I-80 study corridor. No bottlenecks are expected with implementation of the Build Alternative in opening year 2020.

As indicated in the **Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**, under the No-Build Alternative, several segments of the I-80 corridor are expected to deteriorate to unacceptable LOS E conditions relative to existing conditions, with speeds as low as 47 miles per hour (mph) in some locations. These segments would experience increased congestion in the general purpose lanes, particularly between Beck Avenue and Travis Boulevard, and from Manuel Campos Parkway to Peabody Road during the PM peak period eastbound. Traffic would also worsen between West Texas Street and Suisun Valley Road during the AM peak period westbound.

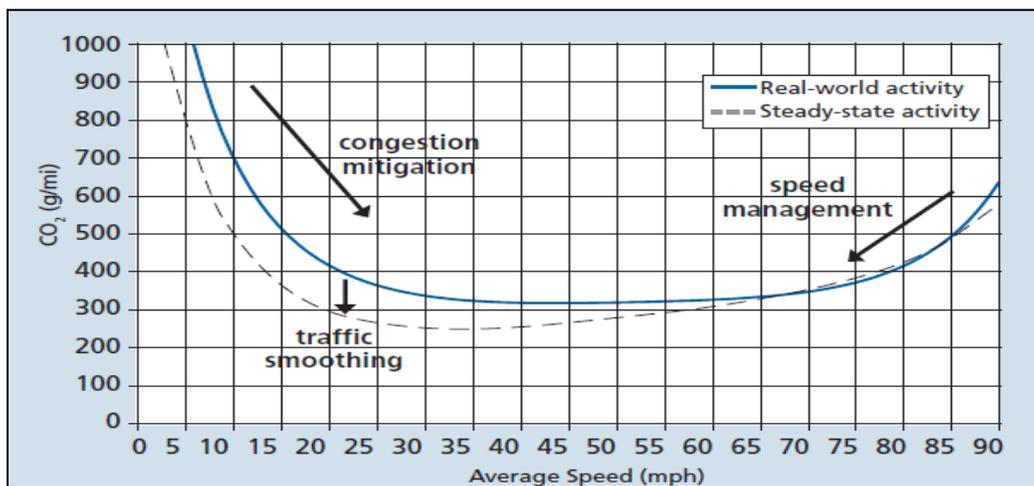
<sup>6</sup> Caltrans Climate Action Program is located at the following web address:  
[http://www.dot.ca.gov/hq/tpp/offices/ogm/key\\_reports\\_files/State\\_Wide\\_Strategy/Caltrans\\_Climate\\_Action\\_Program.pdf](http://www.dot.ca.gov/hq/tpp/offices/ogm/key_reports_files/State_Wide_Strategy/Caltrans_Climate_Action_Program.pdf)

Average travel times along the I-80 study corridor are anticipated to increase by over 0.5 minutes by 2040, as indicated in **Table 2.1-26 of Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities.**

One of the main strategies in Caltrans' Climate Action Program to reduce GHG emissions is to make California's transportation system more efficient. The highest levels of carbon dioxide (CO<sub>2</sub>), from mobile sources, such as automobiles occur at stop-and-go speeds (0-25 miles per hour) and speeds over 55 miles per hour; the most severe emissions occur from 0-25 miles per hour (see **Figure 2.5-2**). To the extent that a project relieves congestion by enhancing operations and improving travel times in high congestion travel corridors GHG emissions, particularly CO<sub>2</sub>, may be reduced.

The Build Alternative intends to relieve existing traffic congestion and improve traffic flow on the local roadway network for approved redevelopment and planned growth in the area. As discussed in **Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**, under 2040 conditions, the Build Alternative would distribute projected increases in traffic volumes within the project limits, reduce bottleneck conditions, and provide additional capacity for use by high occupancy vehicles and toll-paying single occupant vehicles. The effects of the Build Alternative would result in an increased throughput and more efficient operations of the I-80 corridor.

**Figure 2.5-2 Possible Effect of Traffic Operation Strategies in Reducing On-Road CO<sub>2</sub> Emission**



Source: *Traffic Congestion and Greenhouse Gases: Matthew Barth and Kanok Boriboonsomsin (TR News 268 May-June 2010)* <<http://onlinepubs.trb.org/onlinepubs/trnews/trnews268.pdf>>

Under 2020 Build Alternative conditions, I-80 traffic congestion would be less than the traffic congestion anticipated under the No-Build Alternative. The conversion of the HOV lane to an express lane from Red Top Road to Air Base Parkway would result in a 6 percent increase in vehicles using the express lane, which would decrease congestion in the general purpose lanes. As indicated in **Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**,

overall, implementation of the Build Alternative would accommodate approximately 35 percent more vehicles, providing better distribution of vehicles over all the lanes, which would relieve congestion and queuing within the entirety of the I-80 project limits.

Under 2020 Build Alternative conditions, overall travel times within the project limits would be less than travel times anticipated under the No-Build Alternative. Overall, travel times would be reduced by up to 30 seconds relative to the 2020 No-Build Alternative, as shown in **Table 2.1-23 of Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**. During the AM peak period, express lane travel times would decrease by 1.9 minutes in the westbound direction and 1.8 minutes in the eastbound direction. During the PM peak period, express lanes travel times would decrease by 1.6 minutes in the westbound and 1.7 minutes in the eastbound direction. Overall, travel times would be reduced by up to 27 seconds relative to the 2040 No-Build Alternative, as shown in **Table 2.1-26 of Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**. Relative to general purpose lanes, express lane travel times would be reduced by up to 1.5 minutes in the eastbound and westbound directions in the AM peak hour. During the PM peak hour, there would be a travel time savings of up to 1.3 minutes in the westbound direction and up to 1.9 minutes in the eastbound direction, relative to the general purpose lanes.

The current regional transportation plan (RTP) for the San Francisco Bay Area, known as Plan Bay Area, was adopted by Metropolitan Transportation Commission (MTC) on July 18, 2013 and was approved by Caltrans on August 12, 2013. Plan Bay Area grew out of “The California Sustainable Communities and Climate Protection Act of 2008” (SB 375), which requires each of the state’s 18 metropolitan areas, including the San Francisco Bay Area, to reduce greenhouse gas emissions from cars and light trucks. Key elements of SB 375 include the requirement that the San Francisco Bay Area and other California regions develop a SCS, a new element of the RTP, to strive to reach the GHG reduction target established for each region by the California Air Resources Board. The San Francisco Bay Area’s target is a 7 percent per capita reduction in GHG by 2020 and a 15 percent per capita reduction by 2035. Plan Bay Area is the region’s first RTP pursuant to SB 375. In the Plan Bay Area, the land use and housing assumptions for the SCS include demonstration of how the development pattern and the transportation network can work together to reduce GHG emissions. MTC’s Plan Bay Area is expected to achieve a 9 percent overall reduction in VMT between 2005 and 2040, which is short of their 10 percent VMT reduction target. This near-achievement of the per-capita VMT target reflects the carefully targeted locations of envisioned housing and commercial development in Priority Development Areas with excellent transit service.

The proposed project (RTP ID 240581 and 230660) is included in the regional emissions analysis conducted by MTC for the Plan Bay Area. Additionally, the project is included in the MTC’s 2013 Transportation Improvement Program (TIP) as project number SOL110001.<sup>7</sup> MTC approved the

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<sup>7</sup> The project was originally listed under the two TIP numbers SOL110001 and SOL110002 (relative to the East and West Segments). TIP Amendment No. 2013-16 combined the two segments under one TIP ID SOL110001, and reprogramed the funding sources and phases.

financially constrained TIP on July 18, 2013. The Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA) are expected to approve and incorporate the TIP in to the Federal Statewide Transportation Improvement Program (FSTIP) in 2014.

The STA's Comprehensive Transportation Plan (CTP 2030) for Solano County envisions, directs, and prioritizes the transportation needs of Solano County through the year 2030. The plan identifies HOV lane construction on the I-80 corridor within the county.<sup>8</sup> Additionally, express lanes on I-80 are identified as an operational strategy to implement the identified needs as outlined in the I-80/I-680/I-780 Major Investment & Corridor Study prepared for the STA.

**Table 2.5-1** shows project GHG emissions expressed in metric tons per day of CO<sub>2</sub>. CO<sub>2</sub> emissions were estimated using the Caltrans-Emfac model with EMFAC2011 emission factors and utilizing the average peak and off-peak period traffic volumes and speeds provided in the Traffic Operations Analysis Report prepared for the project (Caltrans 2014q). Average peak period and off-peak period emission calculations were combined to generate an average daily emission total. GHG emissions are presented with and without the Pavley and Low Carbon Fuel Standard (LCFS) requirements. As indicated in **Tables 2.1-23** and **2.1-26** of **Section 2.1.7, Traffic and Transportation/Pedestrian and Bicycle Facilities**, the Build Alternative will help relieve congestion in the traffic peak hour periods during the day. The net difference between the existing and build scenarios shows that even with the project, GHG emissions are predicted to decrease due mostly to the Pavley and LCFS requirements.

Assuming Pavley reductions apply to future emission rates, daily CO<sub>2</sub> GHG emissions were computed to decrease by approximately 205 metric tons per day under the 2020 Build Alternative conditions, as compared to existing conditions. Further in the future (i.e., year 2040), the reduction due to the project would be less at 37 metric tons per day, because traffic would increase substantially from planned growth. When compared to the No Build Alternative conditions, the project would have slightly higher emissions. This is because there would be higher traffic demand for the facility, as seen by the increased VMT associated with the Build Condition relative to the future No Build Alternative.

**Table 2.5-1 CO<sub>2</sub> Emissions in Metric Tons per Day**

CO <sub>2</sub> Emissions	Existing (2010)	2020 No Build	2020 Build	2040 No Build	2040 Build
CO <sub>2</sub> without Pavley	1,432	1,620	1,625	1,915	2,039
CO <sub>2</sub> with Pavley	1,427	1,222	1,225	1,306	1,390

Source: Caltrans, 2014a; Caltrans, 2014q

<sup>8</sup> Solano Transportation Authority Comprehensive Transportation Plan 2005, updates 2009; <  
<http://www.sta.ca.gov/Content/10054/ComprehensivePlans.html#ahf>> accessed on March 10, 2013.

## LIMITATIONS AND UNCERTAINTIES WITH MODELING

### EMFAC

Although EMFAC can calculate CO<sub>2</sub> emissions from mobile sources, the model does have limitations when it comes to accurately reflecting changes in CO<sub>2</sub> emissions due to impacts on traffic.

According to the National Cooperative Highway Research Program report, *Development of a Comprehensive Modal Emission Model* (April 2008) and a 2009 University of California study,<sup>9</sup> brief but rapid accelerations, such as those occurring during congestion, can contribute significantly to a vehicle's CO<sub>2</sub> emissions during a typical urban trip. Current emission-factor models are insensitive to the distribution of such modal events (i.e., cruise, acceleration, deceleration, and idling) in the operation of a vehicle and instead estimate emissions by average trip speed. This limitation creates an uncertainty in the model's results when compared to the estimated emissions of the various alternatives with baseline in an attempt to determine impacts. Although work by EPA and the CARB is underway on modal-emission models, neither agency has yet approved a modal emissions model that can be used to conduct this more accurate modeling.

CARB is currently not using EMFAC to create its inventory of greenhouse gas emissions. It is unclear why the CARB has made this decision. Their website only states:

REVISION: Both the EMFAC and OFFROAD Models develop CO<sub>2</sub> and CH<sub>4</sub> [methane] emission estimates; however, they are not currently used as the basis for [CARB's] official [greenhouse gas] inventory which is based on fuel usage information. . . However, ARB is working towards reconciling the emission estimates from the fuel usage approach and the models.<sup>10</sup>

### Other Variables

With the current science, project-level analysis of greenhouse gas emissions has limitations. Although a greenhouse gas analysis is included for this project, there are numerous key greenhouse gas variables that are likely to change dramatically during the design life of the proposed project and would thus dramatically change the projected CO<sub>2</sub> emissions.

First, vehicle fuel economy is increasing. The EPA's annual report, "Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2012,"<sup>11</sup> which provides data on the fuel economy and technology characteristics of new light-duty vehicles including cars, minivans, sport utility vehicles, and pickup trucks, confirms that average fuel economy has improved each year beginning in 2005, and is now at a record high. Corporate Average Fuel Economy (CAFE) standards

<sup>9</sup> Matthew Bartha, Kanok Boriboonsomsin. 2009. Energy and emissions impacts of a freeway-based dynamic eco-driving system. Transportation Research Part D: Transport and Environment

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<sup>10</sup> <http://www.arb.ca.gov/msei/offroad.htm>

<sup>11</sup> <http://www.epa.gov/oms/fetrends.htm>

remained the same between model years 1995 and 2003 and subsequently began setting increasingly higher fuel economy standards for future vehicle model years. The EPA estimates that light duty fuel economy rose by 16 percent from 2007 to 2012. **Table 2.5-2** shows the increases in required fuel economy standards for cars and trucks between Model Years 2012 and 2025 as available from the National Highway Traffic Safety Administration for the 2012-2016 and 2017-2025 CAFE Standards.

**Table 2.5-2 Average Required Fuel Economy (mpg)**

	2012	2013	2014	2015	2016	2018	2020	2025
Passenger Cars	33.3	34.2	34.9	36.2	37.8	41.1-41.6	44.2-44.8	55.3-56.2
Light Trucks	25.4	26	26.6	27.5	28.8	29.6-30.0	30.6-31.2	39.3-40.3
Combined	29.7	30.5	31.3	32.6	34.1	36.1-36.5	38.3-38.9	48.7-49.7

Source: EPA 2013, <http://www.epa.gov/fueleconomy/fetrends/1975-2012/420r13001.pdf>

Second, near zero carbon vehicles will come into the market during the design life of this project. According to the 2013 Annual Energy Outlook (AEO2013):

“LDVs that use diesel, other alternative fuels, hybrid-electric, or all-electric systems play a significant role in meeting more stringent GHG emissions and CAFE standards over the projection period. Sales of such vehicles increase from 20 percent of all new LDV sales in 2011 to 49 percent in 2040 in the AEO2013 Reference case.”<sup>12</sup>

The greater percentage of alternative fuel vehicles on the road in the future will reduce overall GHG emissions as compared to scenarios in which vehicle technologies and fuel efficiencies do not change.

Third, California has recently adopted a low-carbon transportation fuel standard in 2009 to reduce the carbon intensity of transportation fuels by 10 percent by 2020. The regulation became effective on January 12, 2010 (codified in title 17, California Code of Regulations, Sections 95480-95490). Beginning January 1, 2011, transportation fuel producers and importers must meet specified average carbon intensity requirements for fuel in each calendar year.

Lastly, driver behavior has been changing as the U.S. economy and oil prices have changed. In its January 2008 report, “Effects of Gasoline Prices on Driving Behavior and Vehicle Market,”<sup>13</sup> the Congressional Budget Office found the following results based on data collected from California: 1) freeway motorists adjust to higher gas prices by making fewer trips and driving more slowly; 2) the market share of sports utility vehicles is declining; and 3) the average prices for larger, less-fuel-efficient models declined from 2003 to 2008 as average prices for the most-fuel-efficient automobiles have risen, showing an increase in demand for the more fuel efficient vehicles. More

<sup>12</sup> [http://www.eia.gov/forecasts/aeo/pdf/0383\(2013\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf)

<sup>13</sup> <http://www.cbo.gov/ftpdocs/88xx/doc8893/01-14-GasolinePrices.pdf>

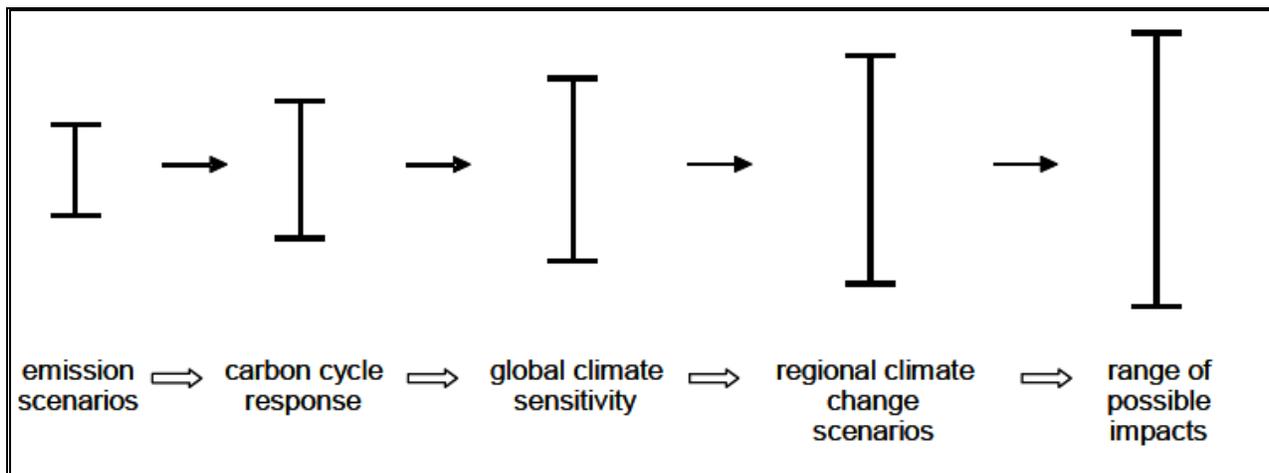
recent reports from the Energy Information Agency<sup>14</sup> and Bureau of Economic Analysis<sup>15</sup> also show slowing re-growth of vehicle sales in the years since its dramatic drop in 2009 due to the Great Recession as gasoline prices continue to climb to \$4 per gallon and beyond.

### LIMITATIONS AND UNCERTAINTIES WITH IMPACT ASSESSMENT

Taken from page 5-22 of the National Highway Traffic Safety Administration Final EIS for MY2017-2025 CAFE Standards (July 2012), **Figure 2.5-3** illustrates how the range of uncertainties in assessing greenhouse gas impacts grows with each step of the analysis:

“Moss and Schneider (2000) characterize the ‘cascade of uncertainty’ in climate change simulations **Figure 2.5-3**). As indicated in **Figure 2.5-3**, the emission estimates used in this EIS have narrower bands of uncertainty than the global climate effects, which are less uncertain than regional climate change effects. The effects on climate are, in turn, less uncertain than the impacts of climate change on affected resources (such as terrestrial and coastal ecosystems, human health, and other resources [...]) Although the uncertainty bands broaden with each successive step in the analytic chain, all values within the bands are not equally likely; the mid-range values have the highest likelihood.”<sup>16</sup>

**Figure 2.5-3 Cascade of Uncertainties**



Much of the uncertainty in assessing an individual project’s impact on climate change surrounds the global nature of the climate change. Even assuming that the target of meeting the 1990 levels of emissions is met, there is no regulatory or other framework in place that would allow for a ready assessment of what any modeled increase in CO<sub>2</sub> emissions would mean for climate change given the overall California greenhouse gas emissions inventory of approximately 430 million tons of CO<sub>2</sub> equivalent. This uncertainty only increases when viewed globally. The IPCC has created multiple

<sup>14</sup>[http://www.eia.gov/oiaf/aeo/tablebrowser/aeo\\_query\\_server/?event=ehExcel.getFile&study=AEO2013&region=0-0&cases=ref2013-d102312a&table=114-AEO2013&yearFilter=0](http://www.eia.gov/oiaf/aeo/tablebrowser/aeo_query_server/?event=ehExcel.getFile&study=AEO2013&region=0-0&cases=ref2013-d102312a&table=114-AEO2013&yearFilter=0)

<sup>15</sup> Historical Vehicle Sales: [www.bea.gov/national/xls/gap\\_hist.xls](http://www.bea.gov/national/xls/gap_hist.xls)

<sup>16</sup> [http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cale/FINAL\\_EIS.pdf](http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cale/FINAL_EIS.pdf), page 5-22

scenarios to project potential future global greenhouse gas emissions as well as to evaluate potential changes in global temperature, other climate changes, and their effect on human and natural systems. These scenarios vary in terms of the type of economic development, the amount of overall growth, and the steps taken to reduce greenhouse gas emissions. Non-mitigation IPCC scenarios project an increase in global greenhouse gas emissions by 9.7 up to 36.7 billion metric tons CO<sub>2</sub> from 2000 to 2030, which represents an increase of between 25 and 90 percent.<sup>17</sup>

The assessment is further complicated by the fact that changes in greenhouse gas emissions can be difficult to attribute to a particular project because the projects often cause shifts in the locale for some type of greenhouse gas emissions, rather than causing “new” greenhouse gas emissions. It is difficult to assess the extent to which any project level increase in CO<sub>2</sub> emissions represents a net global increase, reduction, or no change; there are no models approved by regulatory agencies that operate at the global or even statewide scale.

### 2.5.3 CONSTRUCTION EMISSIONS

Greenhouse gas emissions for transportation projects can be divided into those produced during construction and those produced during operations. Construction GHG emissions include emissions produced as a result of material processing, emissions produced by on-site construction equipment, and emissions arising from 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.

In addition, with innovations such as longer pavement lives, improved traffic management plans, and changes in materials, the GHG emissions produced during construction can be mitigated to some degree by longer intervals between maintenance and rehabilitation events. Currently Caltrans has not adopted GHG significance thresholds that apply to construction activities. For informational purposes, estimated GHG emissions from overall project construction were calculated.<sup>18</sup> Construction period GHG emissions were modeled using total expected duration of 24 months within the project limits. GHG emissions are estimated to be 1408 metric tons of CO<sub>2</sub> over the course of the entire construction project.

### 2.5.4 CEQA CONCLUSION

As discussed above, both the future with project and future no build show increases in CO<sub>2</sub> emissions over the existing levels; the future build CO<sub>2</sub> emissions are higher than the future no build emissions. In addition, as discussed above, there are also limitations with EMFAC and with assessing what a given CO<sub>2</sub> emissions increase means for climate change. Therefore, it is Caltrans determination that in the absence of further regulatory or scientific information related to greenhouse gas emissions and CEQA significance, it is too speculative to make a determination

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<sup>17</sup> Intergovernmental Panel on Climate Change (IPCC). February 2007. Climate Change 2007: The Physical Science Basis: Summary for Policy Makers. <http://www.ipcc.ch/SPM2feb07.pdf>.

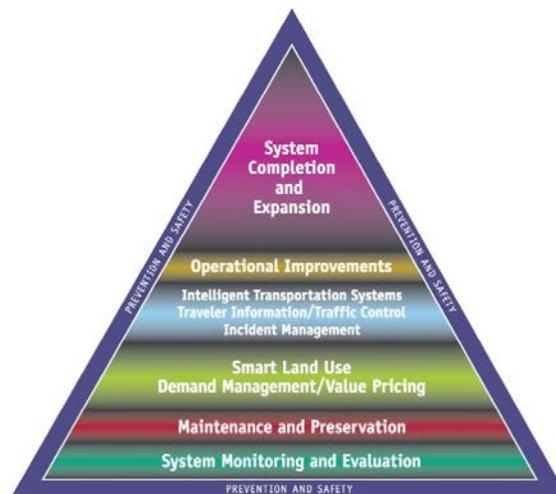
<sup>18</sup> RoadMod Version 6.3.2 was used for this analysis.

regarding significance of the project's direct impact and its contribution on the cumulative scale to climate change. However, Caltrans is firmly committed to implementing measures to help reduce the potential effects of the project. These measures are outlined in the following section.

### 2.5.5 GREENHOUSE GAS REDUCTION STRATEGIES

The Department continues to be involved on the Governor's Climate Action Team as the ARB works to implement Executive Orders S-3-05 and S-01-07 and help achieve the targets set forth in AB 32. Many of the strategies the Department is using to help meet the targets in AB 32 come from then-Governor Arnold Schwarzenegger's Strategic Growth Plan for California. The Strategic Growth Plan targeted a significant decrease in traffic congestion below 2008 levels and a corresponding reduction in GHG emissions, while accommodating growth in population and the economy. The Strategic Growth Plan relies on a complete systems approach to attain CO<sub>2</sub> reduction goals: system monitoring and evaluation, maintenance and preservation, smart land use and demand management, and operational improvements as shown in **Figure 2.5-3**, The Mobility Pyramid.

**Figure 2.5-4 Mobility Pyramid**



The Department is supporting efforts to reduce vehicle miles traveled by planning and implementing smart land use strategies: job/housing proximity, developing transit-oriented communities, and high-density housing along transit corridors. The Department works closely with local jurisdictions on planning activities, but does not have local land use planning authority. The Department assists efforts to improve the energy efficiency of the transportation sector by increasing vehicle fuel economy in new cars, light and heavy-duty trucks; the Department is doing this by supporting ongoing research efforts at universities, by supporting legislative efforts to increase fuel economy, and by participating on the Climate Action Team. It is important to note, however, that control of fuel economy standards is held by the U.S. EPA and ARB.

The Department is also working towards enhancing the State's transportation planning process to respond to future challenges. Similar to requirements for regional transportation plans under Senate Bill (SB) 375 (Steinberg 2008), SB 391 (Liu 2009) requires the State's long-range transportation plan to meet California's climate change goals under Assembly Bill (AB) 32.

The California Transportation Plan (CTP) is a statewide, long-range transportation plan to meet our future mobility needs and reduce greenhouse gas (GHG) emissions. The CTP defines performance-based goals, policies, and strategies to achieve our collective vision for California's future, statewide, integrated, multimodal transportation system.

The purpose of the CTP is to provide a common policy framework that will guide transportation investments and decisions by all levels of government, the private sector, and other transportation stakeholders. Through this policy framework, the CTP 2040 will identify the statewide transportation system needed to achieve maximum feasible GHG emission reductions while meeting the State's transportation needs.

**Table 2.5-3** summarizes the Departmental and statewide efforts that the Department is implementing to reduce GHG emissions. More detailed information about each strategy is included in the Climate Action Program at Caltrans (December 2006).

Caltrans Director's Policy 30 (DP-30) Climate Change (June 22, 2012): is intended to establish a Department policy that will ensure coordinated efforts to incorporate climate change into Departmental decisions and activities.

Caltrans Activities to Address Climate Change (April 2013)<sup>19</sup> provides a comprehensive overview of activities undertaken by Caltrans statewide to reduce greenhouse gas emissions resulting from agency operations.

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

- Caltrans and the California Highway Patrol are working with regional agencies to implement Intelligent Transportation Systems (ITS) to help manage the efficiency of the existing highway system. ITS commonly consists of electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.
- In addition, STA provides ridesharing services, park-and-ride facilities, and commuter information assistance to help manage the growth in demand for highway capacity (<http://www.commuterinfo.net/>).

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<sup>19</sup> [http://www.dot.ca.gov/hq/tpp/offices/orip/climate\\_change/projects\\_and\\_studies.shtml](http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/projects_and_studies.shtml)

Table 2.5-3 Climate Change/CO2 Reduction Strategies

Strategy	Program	Partnership		Method/Process	Estimated CO2 Savings (MMT)	
		Lead	Agency		2010	2020
Smart Land Use	Intergovernmental Review (IGR)	Caltrans	Local Governments	Review and seek to mitigate development proposals	Not Estimated	Not Estimated
	Planning Grants	Caltrans	Local and regional agencies & other stakeholders	Competitive selection process	Not Estimated	Not Estimated
	Regional Plans and Blueprint Planning	Regional Agencies	Caltrans	Regional plans and application process	0.975	7.8
Operational Improvements & Intelligent Trans. System (ITS) Deployment	Strategic Growth Plan	Caltrans	Regions	State ITS; Congestion Management Plan	0.07	2.17
Mainstream Energy & GHG into Plans and Projects	Office of Policy Analysis & Research; Division of Environmental Analysis	Interdepartmental effort		Policy establishment, guidelines, technical assistance	Not Estimated	Not Estimated
Educational & Information Program	Office of Policy Analysis & Research	Interdepartmental, CalEPA, ARB, CEC		Analytical report, data collection, publication, workshops, outreach	Not Estimated	Not Estimated
Fleet Greening & Fuel Diversification	Division of Equipment	Department of General Services		Fleet Replacement B20 B100	0.0045	0.0065 0.045 0.0225
Non-vehicular Conservation Measures	Energy Conservation Program	Green Action Team		Energy Conservation Opportunities	0.117	0.34

Strategy	Program	Partnership		Method/Process	Estimated CO2 Savings (MMT)	
		Lead	Agency		2010	2020
Portland Cement	Office of Rigid Pavement	Cement and Construction Industries		2.5 % limestone cement mix	1.2	4.2
				25% fly ash cement mix	0.36	3.6
				> 50% fly ash/slag mix		
Goods Movement	Office of Goods Movement	Cal EPA, ARB, BT&H, MPOs		Goods Movement Action Plan	Not Estimated	Not Estimated
<b>Total</b>					2.72	18.18

Source: Caltrans, 2013

Note: CalEPA – California Environmental Protection Agency; ARB - Air Resources Board; CEC – California Energy Commission

- Landscaping reduces surface warming and, through photosynthesis, decreases CO<sub>2</sub>. The project proposes planting in the intersection slopes, drainage channels, and seeding in areas next to frontage roads as well as planting a variety of different-sized plant material and scattered skyline trees where appropriate but not to obstruct the view of the mountains. . An on-site Mitigation Monitoring Plan (MMP) for replacement of trees and shrubs will be developed by Caltrans. The MMP will specify that the mitigation plantings either will be composed of the same species and at the same ratios as those removed, or will reflect the composition and density of a reference site near the BSA. In addition, planting areas will be seeded with a native seed mixture that is similar in species and cover to what occurs in each of the oak woodland habitats. All woody plant materials will be replaced using a local native seed source. These replacement trees will help offset any potential CO<sub>2</sub> emissions increase.
- According to Caltrans' Standard Specifications, the contractor must comply with all local Air Pollution Control District's (APCD) rules, ordinances, and regulations for air quality restrictions. BAAQMD CEQA Guidelines provide feasible control measures for construction emissions. One of the measures that would be implemented under the Build Alternative includes minimizing idling times of construction equipment either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure, Title 13, Section 2485 of the California Code of Regulations (CCR)). Clear signage shall be provided for construction workers at all access points.

## 2.5.6 ADAPTATION STRATEGIES

“Adaptation strategies” refer to how the Department and others can 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 intensity, and the frequency and intensity of wildfires. These changes may affect the transportation infrastructure in various ways, such as damage to roadbeds from longer periods of intense heat; increasing storm damage from flooding and erosion; and inundation from rising sea levels. These effects will vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. There may also be economic and strategic ramifications as a result of these types of impacts to the transportation infrastructure.

At the federal level, the Climate Change Adaptation Task Force, co-chaired by the White House Council on Environmental Quality (CEQ), the Office of Science and Technology Policy (OSTP), and the National Oceanic and Atmospheric Administration (NOAA), released its interagency task force progress report on October 28, 2011<sup>20</sup>, outlining the federal government's progress in expanding and strengthening the Nation's capacity to better understand, prepare for, and respond to extreme

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<sup>20</sup> <http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation>

events and other climate change impacts. The report provides an update on actions in key areas of federal adaptation, including: building resilience in local communities, safeguarding critical natural resources such as freshwater, and providing accessible climate information and tools to help decision-makers manage climate risks .

Climate change adaptation must also involve the natural environment as well. Efforts are underway on a statewide-level to develop strategies to cope with impacts to habitat and biodiversity through planning and conservation. The results of these efforts will help California agencies plan and implement mitigation strategies for programs and projects.

On November 14, 2008, then-Governor Arnold Schwarzenegger signed EO S-13-08, which directed a number of state agencies to address California's vulnerability to sea level rise caused by climate change. This EO set in motion several agencies and actions to address the concern of sea level rise.

In addition to addressing projected sea level rise, the California Natural Resources Agency (Resources Agency) was directed to coordinate with local, regional, state and federal public and private entities to develop The California Climate Adaptation Strategy (Dec 2009)<sup>21</sup>, which summarizes the best-known science on climate change impacts to California, assesses California's vulnerability to the identified impacts, and then outlines solutions that can be implemented within and across state agencies to promote resiliency.

The strategy outline is in direct response to EO S-13-08 that specifically asked the Resources Agency to identify how state agencies can respond to rising temperatures, changing precipitation patterns, sea level rise, and extreme natural events. Numerous other state agencies were involved in the creation of the Adaptation Strategy document, including the California Environmental Protection Agency; Business, Transportation and Housing; Health and Human Services; and the Department of Agriculture. The document is broken down into strategies for different sectors that include: Public Health; Biodiversity and Habitat; Ocean and Coastal Resources; Water Management; Agriculture; Forestry; and Transportation and Energy Infrastructure. As data continues to be developed and collected, the state's adaptation strategy will be updated to reflect current findings.

The National Academy of Science was directed to prepare a Sea Level Rise Assessment Report<sup>22</sup> to recommend how California should plan for future sea level rise. The report was released in June 2012 and included:

- Relative sea level rise projections for California, Oregon and Washington taking into account coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge and land subsidence rates.
- The range of uncertainty in selected sea level rise projections.

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<sup>21</sup> <http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-F.PDF>

<sup>22</sup> *Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* (2012) is available at [http://www.nap.edu/catalog.php?record\\_id=13389](http://www.nap.edu/catalog.php?record_id=13389).

- A synthesis of existing information on projected sea level rise impacts to state infrastructure (such as roads, public facilities and beaches), natural areas, and coastal and marine ecosystems.
- A discussion of future research needs regarding sea level rise.

In 2010, interim guidance was released by The Coastal Ocean Climate Action Team (CO-CAT) as well as Caltrans as a method to initiate action and discussion of potential risks to the states infrastructure due to projected sea level rise. Subsequently, CO-CAT updated the Sea Level Rise guidance to include information presented in the National Academies Study.

All state agencies that are planning to construct projects in areas vulnerable to future sea level rise are directed to consider a range of sea level rise scenarios for the years 2050 and 2100 to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. Sea level rise estimates should also be used in conjunction with information on local uplift and subsidence, coastal erosion rates, predicted higher high water levels, storm surge and storm wave data.

All projects that have filed a Notice of Preparation as of the date of EO S-13-08, and/or are programmed for construction funding from 2008 through 2013, or are routine maintenance projects may, but are not required to, consider these planning guidelines. The proposed project is outside the coastal zone and direct impacts to transportation facilities due to projected sea level rise are not expected.

Executive Order S-13-08 also directed the Business, Transportation, and Housing Agency to prepare a report to assess vulnerability of transportation systems to sea level rise affecting safety, maintenance and operational improvements of the system, and economy of the state. The Department continues to work on assessing the transportation system vulnerability to climate change, including the effect of sea level rise.

Currently, the Department is working to assess which transportation facilities are at greatest risk from climate change effects. However, without statewide planning scenarios for relative sea level rise and other climate change effects, the Department has not been able to determine what change, if any, may be made to its design standards for its transportation facilities. Once statewide planning scenarios become available, the Department will be able review its current design standards to determine what changes, if any, may be needed to protect the transportation system from sea level rise.

Climate change adaptation for transportation infrastructure involves long-term planning and risk management to address vulnerabilities in the transportation system from increased precipitation and flooding; the increased frequency and intensity of storms and wildfires; rising temperatures; and rising sea levels. The Department is an active participant in the efforts being conducted in response to EO S-13-08 and is mobilizing to be able to respond to the National Academy of Science Sea Level Rise Assessment Report.

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