4.3 GLOBAL CLIMATE CHANGE

This section provides a discussion of global climate change (GCC), existing regulations pertaining to GCC, and an analysis of greenhouse gas (GHG) emissions impacts associated with the construction and operation of potential development that would be allowed under the proposed City of Long Beach (City) General Plan Land Use Element and Urban Design Element (LUE/UDE) (proposed project). This analysis examines the short-term construction and long-term operational impacts within the planning area and evaluates the effectiveness of measures incorporated as part of the design of the proposed project. This section is based on information provided in the *Air Quality Impact Analysis* (LSA, April 2016) (Appendix B).

4.3.1 Methodology

Climate change is a global issue and is described in the context of the cumulative environment because individual projects are unlikely to measurably affect GCC. Therefore, the project is considered in the context of multiple sectors and the combined efforts of many industries, including development.

Greenhouse gas emissions associated with implementation of the proposed project would occur over the short term from construction activities, consisting primarily of emissions from equipment exhaust. There would also be long-term GHG emissions associated with project-related vehicular trips. Recognizing that the field of GCC analysis is rapidly evolving, the most recently advocated approaches indicate that lead agencies should calculate, or estimate, emissions from vehicular traffic, energy consumption, water conveyance and treatment, waste generation, construction activities, and any other significant source of emissions within the planning area. GHG emissions expected to be released from sources within the City primarily consist of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) and are described in greater detail below. In order to develop 2012 GHG emission levels, the sectors in which GHG emissions would be emitted have been characterized below to establish the basis upon which the analysis builds on to determine the levels of carbon dioxide, methane, and nitrous oxide emissions. The GHG emissions inventory includes the following sectors:

- **Transportation:** Transportation emissions forecasts were modeled for vehicle trips beginning and ending within the City and from external/internal vehicle trips (i.e., trips that either begin or end within the City) using the California Air Resources Board (ARB) EMFAC2014-EI. As previously described, the EMFAC2014 model runs were based on vehicle miles traveled (VMT) data and emission factors for 2012 (existing) and forecasted 2040 emission rates. The GHG emission assumption is consistent with the ARB's methodology within the Climate Change Scoping Plan Measure Documentation Supplement. Modeling was conducted for an adjusted business-as-usual (BAU) scenario, which includes the GHG emissions reduction from the Pavley Fuel Efficiency Standard and the ARB Low Carbon Fuel Standard (LCFS).
- **Energy:** Natural gas and electricity use for land uses in the City were modeled using data provided by the Southern California Gas Company (SoCal Gas) 2014 Gas Report and the Long Beach Water Department, respectively. Natural gas supply is discussed in Section 4.2, Air Quality. Electricity use is based on the California Emissions Estimator Model (CalEEMod) energy consumption rates for each land use type for year 2012 to account existing annual usage. Electricity use for residential and nonresidential land uses in the City was modeled using the

estimated annual electricity consumption rate of 3.8 million megawatt hours per year (MWh/yr) for the City. Based on the service population ratio between the City and the proposed project Major Areas of Change, an estimated annual electricity consumption rate of 640,177 MWh/yr is used for the existing year 2012 analysis. Forecast year 2040 data are adjusted for increases in service population in the Major Areas of Change. The intensity factor of the purchased electricity is based on the 2012 carbon dioxide equivalent (CO_2e) intensity factor provided by Southern California Edison. Intensity factors for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) provided in ARB's Local Government Operations Protocol (LGOP), Version 1.1, were used for natural gas. Future GHG emissions reductions for residential electricity use include a reduction in carbon intensity of the energy supply required under the 50 percent Renewable Portfolio Standard (RPS) (California Energy Commission 2015), a 46 percent increase in 2008 Title 24 building energy efficiency as a result of changes to the Building and Energy Efficiency Standards (i.e., the proposed California Green Building Standards Code [CALGreen Code] effective January 2017), and energy conservation measures.

- **Waste:** Modeling of landfilled waste disposed of by residents and employees in the City is based on the waste commitment method using the ARB's Landfill Emissions Tool model, Version 1.3, based on waste disposal data (municipal solid waste and alternative daily cover) and waste characterization data for existing year 2012 from the California Department of Resources Recycling and Recovery (CalRecycle) Disposal Reporting System (CalRecycle 2016). Landfills in California have gas capture systems, but because the landfill gas captured is not under the jurisdiction of the City, the emissions from the capture system are not included in the City's inventory. Only fugitive sources of GHG emissions from landfills are included. Modeling assumes a 75 percent reduction in fugitive GHG emissions from the landfill's gas capture system. The landfill gas capture efficiency is based on the ARB's LGOP, Version 1.1. Biogenic CO_2 emissions are not included. Forecasts are adjusted for increases in population and employment (service population) in the City-proposed LUE/UDE Major Areas of Change.
- **Water/Wastewater:** GHG emissions from water and wastewater include indirect GHG emissions from the embodied energy (i.e., energy required for treatment and distribution) of water and wastewater. Existing year 2012 total water use in the City is based on the water-demand average data provided by the Long Beach Water Department and also the existing year 2012 wastewater generation data) provided in the City's Urban Water Management Plan (UWMP). Forecasts are adjusted for increases in service population and are based on the target per capita Senate Bill (SB)x7-7.[1] Energy use from water use and wastewater treatment is estimated using energy rates identified by the California Energy Commission (2006) and carbon intensity of energy as provided and identified by Southern California Edison data. In addition to the indirect emissions associated with the embodied energy of water use and wastewater treatment, wastewater treatment also results in fugitive GHG emissions. Fugitive emissions from wastewater treatment associated with the Plan Area were calculated using the emissions factors in the ARB's LGOP, Version 1.1. Forecasts are adjusted for increases in service population in the Plan Major Areas of Change.

[1] Senate Bill (SB)x7-7 (2009) requires all water suppliers to reduce per capita urban water use by 20 percent by 2020, with incremental progress toward this goal (10 percent by 2015). The 2010 UWMPs contain water-use targets to meet this requirement. Effective 2016, urban retail water suppliers who do not meet the water conservation requirements established by SBx7-7 are not eligible for State water grants or loans.

- **Other Sources:** NONROAD and OFFROAD 2011 were used to estimate GHG emissions from landscaping equipment and light commercial equipment in the City. NONROAD and OFFROAD contain a database of equipment use and associated emissions for each county, compiled by the ARB. Annual emissions were compiled using NONROAD and OFFROAD for the County of Los Angeles for the year 2012. The amount of landscaping and light commercial equipment is estimated based on population (Landscaping) and employment (Light Commercial Equipment) for the City as a percentage of Los Angeles County. Daily emissions from off-road equipment are multiplied by 347 days per year to account for reduced/limited construction activity on weekends and holidays. Forecasts are adjusted for increases in service population in the City. It is assumed that construction emissions for the forecast year would be similar to historical levels.

  Industrial sources of emissions that require a permit from the SCAQMD are not included in the City's emissions inventory. However, due to the 15/15 Rule, natural gas use data for industrial land uses may also be aggregated with the nonindustrial land uses in the data provided by the Long Beach Gas & Oil Department.[1] Life-cycle emissions are also not included in this analysis because not enough information is available for the proposed project and, therefore, they would be speculative.

Evaluation of GHG emissions impacts associated with the proposed project includes the following:

- Determination of GHG emission levels from project-related mobile and stationary sources using applicable emission factors, inventory data information, and references from CalEEMod as well as their consistency with SCAQMD's screening thresholds.

The City has no adopted thresholds for determining significance of GHG emissions. The SCAQMD has adopted a significance threshold of 10,000 metric tons (MT) of carbon dioxide equivalent (CO_2e) per year for permitted (stationary) sources of GHG emissions for which SCAQMD is the designated lead agency. To provide guidance to local lead agencies on determining significance for GHG emissions in their California Environmental Quality Act (CEQA) documents, the SCAQMD convened a GHG CEQA Significance Threshold Working Group (Working Group). Based on the last Working Group meeting (Meeting No. 15) in September 2010, the SCAQMD identified a tiered approach for evaluating GHG emissions for development projects where it does not act as the lead agency:

- **Tier 1.** If a project is exempt from CEQA, project-level and cumulative GHG emissions are less than significant.

[1] The 15/15 Rule was adopted by the California Public Utilities Commission (CPUC) in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. The 15/15 rule requires that any aggregated information provided by a utility must be made up of at least 15 customers, and a single customer's load must be less than 15 percent of an assigned category. If the number of customers in the compiled data is below 15, or if a single customer's load is more than 15 percent of the total data, categories must be combined before the information is released. The Rule further requires that, if the 15/15 Rule is triggered for a second time after the data have been screened once already using the 15/15 Rule, the customer be dropped from the information provided.

- **Tier 2.** If the project complies with a GHG emissions reduction plan or mitigation program that avoids or substantially reduces GHG emissions in the project's geographic area (i.e., city or county), project-level and cumulative GHG emissions are less than significant.

  For projects that are not exempt or where no qualifying GHG reduction plans are directly applicable, the SCAQMD requires an assessment of GHG emissions. The SCAQMD is proposing a "bright-line" screening-level threshold of 3,000 MT of CO_2e annually for all land-use types or the following land-use-specific thresholds: 1,400 MT of CO_2e for commercial projects, 3,500 MT of CO_2e for residential projects, or 3,000 MT of CO_2e for mixed-use projects. This bright-line threshold is based on a review of the Governor's Office of Planning and Research database of CEQA projects. Based on its review of 711 CEQA projects, 90 percent of CEQA projects would exceed the bright-line thresholds identified above. Therefore, projects that do not exceed the bright-line threshold would have a nominal, and therefore, less than cumulatively considerable impact on GHG emissions.

- **Tier 3.** If GHG emissions are less than the screening-level threshold, project-level and cumulative GHG emissions are less than significant.
- **Tier 4.** If emissions exceed the screening threshold, a more detailed review of the project's GHG emissions is warranted.

  The SCAQMD has identified an efficiency target for projects that exceed the screening threshold. The current recommended approach is per capita efficiency targets. The SCAQMD is not recommending use of a percentage emissions-reduction target; instead, the SCAQMD identified a 2020 efficiency target of 4.8 MT of CO_2e per year per service population (MT of CO_2e/yr/SP) for project-level analyses and 6.6 MT of CO_2e/yr/SP for plan-level projects (e.g., general plans). Service population (SP) is defined as the sum of the residential and employment populations provided by a project.

For purposes of this analysis, as the buildout year for the proposed LUE/UDE project is 2040, its per capita emissions rate is evaluated to an interim year 2040 efficiency target as discussed below.

The per capita efficiency targets are based on the Assembly Bill (AB) 32 GHG reduction target and 2020 GHG emissions inventory prepared for the ARB 2008 Scoping Plan.[1] Because the project is an LUE update to the existing General Plan, project emissions are compared to the SCAQMD's plan-level efficiency threshold. The following threshold is the applicable GHG threshold for the proposed project:

- 2040 GHG efficiency target of 3.4 MT of CO_2e per service population, per year.

Per SCAQMD guidance, plan level analyses (such as the proposed project) should be measured against the 6.6 MT of CO_2e/yr/SP efficiency target up to the year 2020. The use of post-2020 efficiency metrics poses a further challenge for general plans that have post-2020 build out or operational dates. The 2020 timeframe is important because it is tied to California's AB 32 goal

[1] The SCAQMD took the 2020 statewide GHG reduction target for land-use-only GHG emissions sectors and divided it by the 2020 statewide employment for the land-use sectors to derive a per capita GHG efficiency metric that coincides with the GHG reduction targets of AB 32 for year 2020.

(reduction of GHG emissions to 1990 levels by the year 2020). Executive Orders (EOs) B-30-15 and S-3-05 establish a more aggressive emissions reduction goal for target years 2030 (40 percent reduction in emission below 1990 levels) and 2050 (80 percent reduction in emissions below 1990 levels). The post-2020 GHG efficiency standard of 3.4 MT of CO_2e/yr/SP is derived by interpolating between years 2020 and 2050 targets for the year 2040. In other words, the efficiency target must meet or exceed (be below) the efficiency target of 3.4 MT of CO_2e/yr/SP to achieve the ambitious reductions goals established by the State of California for GHG emissions to the year 2050.If the community GHG emissions exceed this per capita efficiency target, GHG emissions would be considered potentially significant in the absence of mitigation measures.

- Determination of the required measures to reduce GHG emission levels.

4.3.2 Existing Environmental Setting

Existing Project Site. The proposed project includes the entire City as it is an update to the City's General Plan and is intended to guide growth and future development through the year 2040. Specifically, the project proposes to update the City's current 1989 LUE and adopt an entirely new UDE into its General Plan. Through implementation of the LUE, the City is looking to target future growth in a few specific transit-rich corridors and districts in order to increase job density in commercial and industrial areas, improve the corridors, and maintain and improve the existing established neighborhoods. The LUE will replace land use designations with "PlaceTypes" that are more flexible and comprehensive, and will lead to a subsequent comprehensive Zoning Code update. Major land use changes proposed as part of the LUE are identified as "Major Areas of Change," and are illustrated in previously referenced Figure 3.3.

The City is also proposing to adopt a new UDE as part of its General Plan to replace its existing Scenic Routes Element (SRE). The UDE would work towards shaping the continued evolution of the urban environment in Long Beach, while also allowing for a balance between the existing natural environment and new development. The UDE is interconnected with the LUE and will provide minimum design standards for the PlaceTypes and their respective component development types and patterns.

The project site is currently developed and consists of a mix of residential, commercial, medical, institutional, and open space and recreation uses. These uses currently generate emissions from natural gas use for energy, heating, and cooking; vehicle trips associated with each land use; and area sources such as landscaping equipment and consumer cleaning products.

Sensitive Land Uses in the Project Vicinity. Sensitive receptors in the City include residences, retirement facilities, hospitals, schools, recreational land uses, and similar uses that are sensitive to air pollutant emissions. Construction and operation of development allowed under the LUE could adversely affect nearby sensitive land uses.

Global Climate Change. Global climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans in recent decades. Climate change refers to any change in measures of weather (such as temperature, precipitation, or wind) lasting for an extended period

(decades or longer). Climate change may result from natural factors, such as changes in the sun's intensity; natural processes within the climate system, such as changes in ocean circulation; or human activities, such as the burning of fossil fuels, land clearing, or agriculture. The observed warming effect associated with the presence of GHGs in the atmosphere (from either natural or human sources) is often referred to as the greenhouse effect. The Earth's average near-surface atmospheric temperature rose 0.6 ±0.2 degrees Celsius (°C) or 1.1 ±0.4 degrees Fahrenheit (°F) in the 20th century. The prevailing scientific opinion on climate change is that most of the warming observed over the last 50 years is attributable to human activities.[1] Climate change modeling shows that further warming could occur, which would induce additional changes in the global climate system during the current century. Changes to the global climate system, ecosystems, and the environment of California could include higher sea levels, drier or wetter weather, changes in ocean salinity, changes in wind patterns or more energetic aspects of extreme weather, including droughts, heavy precipitation, heat waves, extreme cold, and increased intensity of tropical cyclones. Specific effects in California might include a decline in the Sierra Nevada snowpack, erosion of California's coastline, and seawater intrusion in the Sacramento-San Joaquin River Delta (Delta).

GHGs are present in the atmosphere naturally, are released by natural sources, or are formed from secondary reactions taking place in the atmosphere. The gases that are widely seen as the principal contributors to human-induced global climate change are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur Hexafluoride (SF_6)

Over the last 200 years, humans have caused substantial quantities of GHGs to be released into the atmosphere. These extra emissions are increasing GHG concentrations in the atmosphere, and enhancing the natural greenhouse effect, which is believed to be causing global warming. While manmade GHGs include naturally-occurring GHGs such as CO_2, CH_4, and N_2O, some gases, like HFCs, PFCs, and SF_6 are completely new to the atmosphere. Certain other gases, such as water vapor, are short-lived in the atmosphere as compared to these GHGs that remain in the atmosphere for significant periods of time, contributing to climate change in the long term. Water vapor is generally excluded from the list of GHGs because it is short-lived in the atmosphere and its atmospheric concentrations are largely determined by natural processes, such as oceanic evaporation. For the purposes of this analysis, the term "GHGs" will refer collectively to the six gases identified above.

These gases vary considerably in terms of Global Warming Potential (GWP), which is a concept developed to compare the ability of each GHG to trap heat in the atmosphere relative to another gas. The GWP is based on several factors, including the relative effectiveness of a gas to absorb infrared

[1] Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2007: The Physical Science Basis*. Website: http://www.ipcc.ch.

radiation and the length of time that the gas remains in the atmosphere ("atmospheric lifetime"). The GWP of each gas is measured relative to CO_2, the most abundant GHG. The definition of GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to the ratio of heat trapped by one unit mass of CO_2 over a specified time period. GHG emissions are typically measured in terms of pounds or MT of "CO_2 equivalents" (CO_2e). Table 4.3.A shows the GWPs for each type of GHG.

Table 4.3.A: Global Warming Potential of Greenhouse Gases

Gas	Atmospheric Lifetime (Years)	Global Warming Potential (100-year Time Horizon)
Carbon Dioxide (CO_2)	50–200	1
Methane (CH_4)	12	25
Nitrous Oxide (NO_x)	114	298
HFC-23	270	14,800
HFC-134a	14	1,430
HFC-152a	1.4	124
PFC: Tetrafluoromethane (CF_4)	50,000	7.390
PFC: Hexafluoromethane (C_2F_6)	10,000	12,200
Sulfur Hexafluoride (SF_6)	3,200	22,800

Source: IPCC, 2007. *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the IPCC.
HFC = Hydrofluorocarbons
PFC = Perfluorocarbons

The characteristics of these six GHGs and a discussion of black carbon are provided below.

Carbon Dioxide (CO_2). In the atmosphere, carbon generally exists in its oxidized form, as CO_2. Natural sources of CO_2 include the respiration (breathing) of humans, animals and plants, volcanic out gassing, decomposition of organic matter and evaporation from the oceans. Human-caused sources of CO_2 include the combustion of fossil fuels and wood, waste incineration, mineral production, and deforestation. Natural sources release approximately 150 billion tons of CO_2 each year, far outweighing the 7 billion tons of man-made emissions of CO_2 each year. Nevertheless, natural removal processes, such as photosynthesis by land- and ocean-dwelling plant species, cannot keep pace with this extra input of man-made CO_2, and consequently, the gas is building up in the atmosphere.

In 2002, CO_2 emissions from fossil fuel combustion accounted for approximately 98 percent of man-made CO_2 emissions and approximately 84 percent of California's overall GHG emissions (in CO_2e). The transportation sector accounted for California's largest portion of CO_2 emissions, with gasoline consumption making up the greatest portion of these emissions. Electricity generation was California's second largest category of GHG emissions.

Methane (CH_4). CH_4 is produced when organic matter decomposes in environments lacking sufficient oxygen. Natural sources include wetlands, termites, and oceans. Decomposition occurring in landfills accounts for the majority of human-generated CH_4 emissions in California and in the United States as a whole. Agricultural processes such as intestinal fermentation,

manure management, and rice cultivation are also significant sources of CH_4 in California. Methane accounted for approximately 6 percent of gross climate change emissions (in CO_2e) in California in 2002.

Total annual emissions of CH_4 are approximately 500 million tons, with manmade emissions accounting for the majority. As with CO_2, the major removal process of atmospheric methane—a chemical breakdown in the atmosphere—cannot keep pace with source emissions, and CH_4 concentrations in the atmosphere are increasing.

Nitrous Oxide (N_2O). N_2O is produced naturally by a wide variety of biological sources, particularly microbial action in soils and water. Tropical soils and oceans account for the majority of natural source emissions. N_2O is a product of the reaction that occurs between nitrogen and oxygen during fuel combustion. Both mobile and stationary combustion sources emit N_2O, and the quantity emitted varies according to the type of fuel, technology, and pollution control device used, as well as the maintenance and operating practices. Agricultural soil management and fossil fuel combustion are the primary sources of human-generated N_2O emissions in California. N_2O emissions accounted for nearly 7 percent of man-made GHG emissions (CO_2e) in California in 2002.

Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF_6). HFCs are primarily used as substitutes for ozone-depleting substances regulated under the Montreal Protocol.[1] PFCs and SF_6 are emitted from various industrial processes, including aluminum smelting, semiconductor manufacturing, electric power transmission and distribution, and magnesium casting. There is no aluminum or magnesium production in California; however, the rapid growth in the semiconductor industry leads to greater use of PFCs. HFCs, PFCs, and SF_6 accounted for about 3.5 percent of man-made GHG emissions in California in 2002.

Black Carbon (BC). BC is the most strongly light-absorbing component of particulate matter (PM) formed by burning fossil fuels such as coal, diesel, and biomass. BC is emitted directly into the atmosphere in the form of $PM_{2.5}$ and is the most effective form of PM, by mass, at absorbing solar energy. Per unit of mass in the atmosphere, BC can absorb a million times more energy than CO_2.[2] BC contributes to climate change both directly, such as absorbing sunlight, and indirectly, such as affecting cloud formation. However, because BC is short-lived in the atmosphere, it can be difficult to quantify its effect on global-warming.

Most U.S. emissions of BC come from mobile sources (52 percent), especially diesel engines and vehicles. The other major source is open biomass burning, including wildfires, although residential heating and industry also contribute. The ARB estimates that the annual BC emissions

[1] The Montreal Protocol is an international treaty that was approved on January 1, 1989, and was designated to protect the ozone layer by phasing out the production of several groups of halogenated hydrocarbons believed to be responsible for ozone depletion.

[2] United States Environmental Protection Agency (EPA). 2015. *Black Carbon*. September. Website: http://www3.epa.gov/blackcarbon/basic.html (accessed September 17, 2015).

in California have decreased approximately 70 percent between 1990 and 2010 and are expected to continue to decline significantly due to controls on mobile diesel emissions.

Effects of Global Climate Change. Effects from GCC may arise from temperature increases, climate-sensitive diseases, extreme weather events, and air quality. There may be direct temperature effects through increases in average temperature leading to more extreme heat waves and less extreme cold spells. Those living in warmer climates are likely to experience more stress and heat-related problems. Heat-related problems include heat rash and heat stroke. In addition, climate-sensitive diseases may increase, such as those spread by mosquitoes and other disease-carrying insects. Such diseases include malaria, dengue fever, yellow fever, and encephalitis. Extreme events such as flooding and hurricanes can displace people and agriculture. GCC may also contribute to air quality problems from increased frequency of smog and particulate air pollution.[1]

Additionally, according to the 2006 California Climate Action Team (CAT) Report,[2] the following climate change effects, which are based on trends established by the United Nations Intergovernmental Panel on Climate Change (IPCC), can be expected in California over the course of the next century:

- The loss of sea ice and mountain snow pack, resulting in higher sea levels and higher sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures.[3]
- Rise in global average sea level, primarily due to thermal expansion and melting of glaciers and ice caps in the Greenland and Antarctic ice sheets.[4]
- Changes in weather that include widespread changes in precipitation, ocean salinity, wind patterns, and more energetic aspects of extreme weather, including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones.[5]
- Decline of the Sierra snowpack, which accounts for approximately one-half of the surface water storage in California by 70 percent to as much as 90 percent over the next 100 years.[6]
- Increase in the number of days conducive to O_3 formation by 25–85 percent (depending on the future temperature scenario) in high O_3 areas of Los Angeles and the San Joaquin Valley by the end of the 21st century.[7]

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1 EPA. 2016. *Climate Impacts on Human Health*. April. Website: https://www3.epa.gov/climatechange/impacts/health.html (accessed May 2016).

2 California Environmental Protection Agency (Cal-EPA). 2006. *Climate Action Team Report to Governor Schwarzenegger and the Legislature,* March.

3 Ibid.

4 Ibid.

5 IPCC. 2007. *Climate Change 2007: The Physical Science Basis, Summary for Policymakers*, February.

6 Cal-EPA. 2006. *Climate Action Team, Climate Action Team Report to Governor Schwarzenegger and the Legislature.* March.

7 Ibid.

- High potential for erosion of California's coastlines and seawater intrusion into the Delta and levee systems due to the rise in sea level.[1]

A summary of these potential effects are identified in Table 4.3.B.

Table 4.3.B: Potential Impacts of Global Warming and Expected Consequences for California

Potential Water Resource Impacts	Anticipated Consequences Statewide
Reduction of the State's average annual snowpack	• Specifically, the decline of the Sierra snowpack, would lead to a loss in half of the surface water storage in California by 70% to 90% over the next 100 years • Potential loss of 5 million acre-feet or more of average annual water storage in the State's snowpack • Increased challenges for reservoir management and balancing the competing concerns of flood protection and water supply • Higher surface evaporation rates with a corresponding increase in tropospheric water vapor
Rise in average sea level	• Potential economic impacts related to coastal tourism, commercial fisheries, coastal agriculture, and ports • Increased risk of flooding, coastal erosion along the State's coastline, seawater intrusion into the Delta and levee systems
Changes in weather	• Changes in precipitation, ocean salinity, and wind patterns • Increased likelihood for extreme weather events, including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones
Changes in the timing, intensity, location, amount, and variability of precipitation	• Potential increased storm intensity and increased potential for flooding • Possible increased potential for droughts • Long-term changes in vegetation and increased incidence of wildfires • Changes in the intensity and timing of runoff • Possible increased incidence of flooding and increased sedimentation • Sea level rise and inundation of coastal marshes and estuaries • Increased salinity intrusion into the Sacramento-San Joaquin River Delta (Delta) • Increased potential for Delta levee failure • Increased potential for salinity intrusion into coastal aquifers (groundwater) • Increased potential for flooding near the mouths of rivers due to backwater effects
Increased water temperatures	• Increased environmental water demand for temperature control • Possible increased problems with foreign invasive species in aquatic ecosystems • Potential adverse changes in water quality, including the reduction of dissolved oxygen levels • Possible critical effects on listed and endangered aquatic species

[1] Cal-EPA. 2006. *Climate Action Team, Climate Action Team Report to Governor Schwarzenegger and the Legislature.* March.

Table 4.3.B: Potential Impacts of Global Warming and Expected Consequences for California

Potential Water Resource Impacts	Anticipated Consequences Statewide
Changes in urban and agricultural water demand	• Changes in demand patterns and evapotranspiration
Increase in the number of days conducive to O_3 formation	• Increased temperatures • Potential health effects, including adverse impacts to respiratory systems

Source: U.S. Department of the Interior, Environmental Water Account Draft Supplemental EIS/EIR to the Environmental Water Account Final EIS/EIR, Bureau of Reclamation Mid-Pacific Region, Sacramento, California (October 2007).
EIR = Environmental Impact Report
EIS = Environmental Impact Statement
O_3 = ozone

Effects of Rising Ocean Levels in California. Rising ocean levels, more intense coastal storms, and warmer water temperatures may increasingly threaten the Long Beach coastal region. As previously described, global surface temperatures have increased by 1.5°F during the period from 1880 to 2012, with temperatures anticipated to rise in California by 3 to 10.5°F by the end of the century.

Rising sea levels may affect the natural environment in the coming decades by eroding beaches, converting wetlands to open water, exacerbating coastal flooding, and increasing the salinity of estuaries and freshwater aquifers. Coastal headlands and beaches are expected to erode at a faster pace in response to future sea level rise. The California Coastal Commission estimates that 450,000 acres of wetlands exist along the California coast,[1] but additional work is needed to evaluate the extent to which these wetlands would be degraded over time, or to what extent new wetland habitat would be created if those lands are protected from further development. Cumulatively, the effects of sea level rise may be combined with other potential long-term factors such as changes in sediment input and nutrient runoff. The cumulative impacts of physical and biological change due to sea level rise on the quality and quantity of coastal habitats are not well understood.[2]

Sea level along the west coast of the United States is affected by a number of factors, including climate patterns such as El Niño, effects from the melting of modern and ancient ice sheets, and geologic processes such as plate tectonics. Regional projections for California, Oregon, and Washington show a sharp distinction at Cape Mendocino in northern California. South of that point, sea-level rise is expected to be very close to global projections. Projections are lower north of Cape

1 California Coastal Commission (CCC), *Procedural Guidance for the Review of Wetland Projects in California's Coastal Zone*. Website: http://www.coastal.ca.gov/wetrev/wetch4.html (accessed February 2015).

2 Climate Change Science Program (CCSP) 4.1. January 15, 2009, 1 of 784 Final Report, United States CCSP, Synthesis and Assessment Product 4.1. *Coastal Sensitivity to Seal Level Rise: A Focus on the Mid-Atlantic Region*. Lead Agency: U.S. Environmental Protection Agency, Other Key Participating Agencies: U.S. Geological Survey, National Oceanic and Atmospheric Administration. Contributing Agencies: Department of Transportation.

Mendocino because the land is being pushed upward as the ocean plate moves under the continental plate along the Cascadia Subduction Zone.

According to the National Research Council's (NRC) June 2012 report on *Sea Level Rise for the Coasts of California, Oregon, and Washington*, sea level rise will cause many harmful economic, ecological, physical and social impacts but incorporating sea level rise impacts into agency decisions can help mitigate some of these potential impacts. According to the NRC's report, the State of California's *Sea-Level Guidance Document* recommends the ranges of sea level rise presented in the June 2012 NRC report as a starting place for analysis of potential impacts related to sea level rise. Accordingly, Table 4.3.C presents the seal level rise projections based on the NRC report.

Table 4.3.C: Sea-Level Rise Projections using 2000 as the Baseline - Areas South of Cape Mendocino

Time Period	Sea Level Rise
2000–2030	4 to 30 cm (0.13 to 0.98 ft)
2000–2050	12 to 61 cm (0.39 to 2.0 ft)
2000–2100	42 to 167 cm (1.38 to 5.48 ft)

Source: Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT), State of California Sea-Level Rise Guidance Document (March 2013).
cm = centimeters
ft = foot/feet

Rising sea levels may also affect the built environment, including coastal development such as buildings, roads, and infrastructure. Coastal areas within the City are relatively flat, low-lying, and developed and may be directly affected by the change in sea level resulting from GCC.

Areas that are essentially at sea level are potentially exposed to the rising of the ocean levels and could result in on-site flood conditions. A recent wave uprush study completed for a project along the coast in Long Beach indicated that sea levels along the Long Beach Coast could be expected to rise 0.5 to 2.6 feet (ft) by 2060 and 1.4 to 5.5 ft by 2100.[1] This is consistent with the seal level rise projections included in Table 4.3.C above.

Existing Greenhouse Gas Emissions. An emissions inventory that identifies and quantifies the primary human-generated sources and sinks (an artificial reservoir of emissions) of GHGs is a well-recognized and useful tool for addressing climate change. This section summarizes the latest information on global, national, California, and local GHG emission inventories. However, because GHGs persist for a long time in the atmosphere, accumulate over time, and are generally well-mixed, their impact on the atmosphere and climate cannot be tied to a specific point of emission.

[1] Moffat & Nichol. 2014. *Wave Uprush Study*, October.

Global Emissions. Worldwide emissions of GHGs in 2010 were 30.6 billion MT[1] of CO_2e per year.[2] Global estimates are based on country inventories developed as part of the programs of the United Nations Framework Convention on Climate Change (UNFCCC).

United States Emissions. In 2010, the United States emitted approximately 6.8 billion MT of CO_2e. Of the six economic sectors nationwide—electric power, transportation, agriculture, commercial, and residential—the electric power industry and transportation sectors combined account for approximately 62 percent of the GHG emissions; the majority of the electrical power industry and all of the transportation emissions are generated from direct fossil fuel combustion. Overall, from 1990 to 2010, total emissions of CO_2 increased by 605.9 Tg[3] CO_2e (11.9 percent), while total emissions of CH_4 and N_2O decreased by 1.7 Tg CO_2e (0.3 percent), and 10.0 Tg CO_2e (3.2 percent), respectively. During the same period, aggregate weighted emissions of HFCs, PFCs, and SF_6 rose by 52.5 Tg CO_2e (58.2 percent). From 1990 to 2010, HFCs increased by 86.1 Tg CO_2e (233.1 percent), PFCs decreased by 15.0 Tg CO_2e (72.7 percent), and SF_6 decreased by 18.6 Tg CO_2e (57.0 percent).

City of Long Beach Emissions. An emissions inventory of the City was conducted based on the existing land uses and is shown in Table 4.3.D. Existing land uses include: residential, commercial, office, and industrial. GHG emissions generated in the City's LUE Major Areas of Change were estimated using EMFAC2014, OFFROAD, NONROAD, and data provided by the City Water Department and SoCal Gas for electricity and natural gas use, respectively.

Emissions for the City's LUE Major Areas of Change come from the following sources:[4]

- **Transportation:** Emissions from vehicle trips beginning and ending in the City and from external/internal vehicle trips (i.e., trips that either begin or end in the City).
- **Area Sources:** Emissions generated from lawn and garden, commercial, and construction equipment use in the City.
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1 A metric ton is equivalent to approximately 1.1 tons.

2 The International Energy Agency (IEA). World Energy Outlook. 2011. Released on November 9, 2011. Website: http://www.worldenergyoutlook.org/weo2011/.

3 Tg = teragram, equivalent to a million metric tons.

4 Governor's Office of Planning and Research (OPR). 2008. *Proposed Amendments to CEQA Guidelines, Appendix F – Energy Analysis*. Life-cycle emissions include indirect emissions associated with materials manufacture. However, these indirect emissions involve numerous parties, each of which is responsible for GHG emissions of their particular activity. The California Resources Agency, in adopting the CEQA Guidelines Amendments on GHG emissions, found that life-cycle analysis was not warranted for project-specific CEQA analysis in most situations, for a variety of reasons, including lack of control over some sources and the possibility of double-counting emissions (see Final Statement of Reasons for Regulatory Action, December 2009). Because the amount of materials consumed during the operation or construction of the proposed project is not known, the origin of the raw materials purchased is not known, and manufacturing information for those raw materials are also not known, calculation of life-cycle emissions would be speculative. A life-cycle analysis is not warranted.

Table 4.3.D: Existing City of Long Beach LUE Major Areas of Change Greenhouse Gas Emissions Inventory

Sector	Existing (CEQA Baseline) 2012 GHG Emissions	
	MT of CO_2e/yr	Percentage of Total
Transportation[1]	826,184	80.19
Energy – Residential[2]	54,054	5.94
Energy – Nonresidential[2]	130,111	12.63
Waste[3]	4,932	0.48
Water/Wastewater[4]	15,006	1.46
Existing LUE Major Areas of Change Emissions Total	1,030,893	100
Service Population[5]	107,893	N/A
MT of CO_2e/Year/Service Population	9.5	N/A

Source: Compiled by LSA Associates, Inc. (2016).
Note: Emissions may not total 100 percent due to rounding.

1 EMFAC2014. Model runs were based on daily per capita VMT data provided by LSA Associates, Inc.

2 Electricity and natural gas usage data provided by Southern California Edison and City of Long Beach Gas and Oil and 2014 California Gas Report, respectively. The carbon intensity of the purchased electricity is provided by the CEC for the Long Beach area. For natural gas, the intensity factors for CO_2, CH_4 and N_2O are from the LGOP, Version 1.1 (May 2010).

3 Landfill Emissions Tool Version 1.3 and CalRecycle. Waste generation based on 2012 waste commitment for the City of Long Beach obtained from CalRecycle. Assumes 75 percent of fugitive GHG emissions are captured within the landfill's Landfill Gas Capture System. The landfill gas capture efficiency is based on ARB's LGOP, Version 1.1. Significant CH_4 production typically begins 1 or 2 years after waste disposal in a landfill and continues for 10 to 60 years or longer. Therefore, the highest CH_4 emissions from waste disposal in a given year are reported.

4 LGOP, Version 1.1, based on the City's UWMP for water demand and City-provided wastewater generation rates.

5 Consists of approximately 59,598 residents and 48,295 employees for existing condition year 2012 within the LUE Major Areas of Change.

ARB = California Air Resources Board
CalRecycle = California Department of Resources Recycling and Recovery
CEC = California Energy Commission
CEQA = California Environmental Quality Act
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
LGOP = Local Government Operations Protocol
LUE = Land Use Element
MT of CO_2e/yr = metric tons of carbon dioxide equivalent per year
N/A = Not Applicable
N_2O = nitrous oxide
SP = Service Population
UWMP = Urban Water Management Plan
VMT = vehicle miles traveled

- **Energy:** Emissions generated from purchased electricity and natural gas consumption used for lighting, cooking, and heating in the City.
- **Solid Waste Disposal:** Indirect emissions from waste generated in the City.
- **Water/Wastewater:** Emissions from electricity used to supply, treat, and distribute water and wastewater based on the overall water demand and wastewater generation in the City.

4.3.3 Regulatory Setting

Federal Regulations.

Clean Air Act. The Clean Air Act (CAA) of 1970 and the CAA Amendments of 1971 required the United States Environmental Protection Agency (EPA) to establish national ambient air quality standards (NAAQS) with states retaining the option to adopt standards that are more stringent or to include other specific pollutants. The United States has historically had a voluntary approach to reducing GHG emissions. However, on April 2, 2007, the United States Supreme Court ruled that the EPA has the authority to regulate CO_2 emissions under the CAA. While there currently are no adopted federal regulations for the control or reduction of GHG emissions, the EPA commenced several actions in 2009 to implement a regulatory approach to global climate change, including the ones described below.

On September 22, 2009, the EPA issued a final rule for mandatory reporting of GHGs from large GHG emission sources in the United States. In general, this national reporting requirement will provide the EPA with accurate and timely GHG emissions data from facilities that emit 25,000 MT or more of CO_2 per year. This publicly available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost-effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial GHGs, along with vehicle and engine manufacturers, will report at the corporate level. An estimated 85 percent of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this rule.

On December 7, 2009, the EPA Administrator signed a final action under the CAA, finding that six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) constitute a threat to public health and welfare, and that the combined emissions from motor vehicles cause and contribute to global climate change. This EPA action does not impose any requirements on industry or other entities. However, the findings are a prerequisite to finalizing the GHG emission standards for light-duty vehicles mentioned below. The EPA received ten petitions challenging this determination. On July 29, 2010, the EPA denied these petitions.

On April 1, 2010, the EPA and the Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) announced a final joint rule to establish a national program consisting of new standards for model year 2012 through 2016 light-duty vehicles that will reduce GHG emissions and improve fuel economy. The EPA is finalizing the first-ever national GHG emissions standards under the CAA, and NHTSA is finalizing Corporate Average Fuel Economy (CAFE) standards under the Energy Policy and Conservation Act. The EPA GHG standards require light-duty vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile in model year 2016, equivalent to 35.5 miles per gallon.

In December 2010, the EPA issued its plan for establishing GHG pollution standards under the CAA in 2011. The agency looked at a number of sectors and is moving forward on GHG standards for fossil fuel power plants and petroleum refineries, two of the largest industrial sources, representing nearly 40 percent of the GHG pollution in the United States.[1]

[1] EPA, 2010. Press Release. December 23.

The EPA and the NHTSA also established standards to reduce GHG emissions and improve the fuel efficiency of heavy-duty trucks and buses.

State Regulations. The ARB is the lead agency for implementing climate change regulations in California. Since its formation, the ARB has worked with the public, the business sector, and local governments to find solutions to California's air pollution problems. Key efforts by the State are described below.

Executive Order S-3-05. Governor Schwarzenegger signed Executive Order (EO) S-3-05 on June 1, 2005, which proclaimed that California is vulnerable to the impacts of climate change. The executive order declared that increased temperatures could reduce snowpack in the Sierra Nevada Mountains, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established California's GHG emissions reduction targets, which established the following goals:

- GHG emissions should be reduced to 2000 levels by 2010;
- GHG emissions should be reduced to 1990 levels by 2020; and
- GHG emissions should be reduced to 80 percent below 1990 levels by 2050.

The Secretary of the California Environmental Protection Agency (Cal-EPA) is required to coordinate efforts of various State agencies in order to collectively and efficiently reduce GHGs. A biannual progress report must be submitted to the Governor and State Legislature disclosing the progress made toward GHG emission reduction targets. In addition, another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, the coastline, and forestry, and report possible mitigation and adaptation plans to address these impacts.

The Secretary of Cal-EPA leads this CAT made up of representatives from State agencies as well as numerous other boards and departments. The CAT members work to coordinate statewide efforts to implement global warming emission reduction programs and the State's Climate Adaptation Strategy. The CAT is also responsible for reporting on the progress made toward meeting the statewide GHG targets that were established in the executive order and further defined under Assembly Bill (AB) 32, the "Global Warming Solutions Act of 2006." The first CAT Report to the Governor and the Legislature was released in March 2006, which laid out 46 specific emission reduction strategies for reducing GHG emissions and reaching the targets established in the Executive Order. The CAT Report to the Governor and Legislature and will be updated and issued every 2 years thereafter; the most recent was released in 2013.

Assembly Bill 32 (2006), California Global Warming Solutions Act. California's major initiative for reducing GHG emissions is AB 32, passed by the State legislature on August 31, 2006. This effort aims at reducing GHG emissions to 1990 levels by 2020. The ARB has established the level of GHG emissions in 1990 at 427 million metric tons (MMT) CO_2e. The emissions target of 427 MMT requires the reduction of 169 MMT from the State's projected BAU 2020 emissions of 596 MMT. AB 32 requires the ARB to prepare a Scoping Plan that

outlines the main State strategies for meeting the 2020 deadline and to reduce GHGs that contribute to global climate change.

In addition to reducing GHG emissions to 1990 levels by 2020, AB 32 directed the ARB and the newly created CAT to identify a list of "discrete early action GHG reduction measures" that could be adopted and made enforceable by January 1, 2010. On January 18, 2007, Governor Schwarzenegger signed EO S-1-07, further solidifying California's dedication to reducing GHGs by setting a new Low Carbon Fuel Standard. The executive order sets a target to reduce the carbon intensity of California transportation fuels by at least 10 percent by 2020 and directs the ARB to consider the Low Carbon Fuel Standard as a discrete early action measure.

In June 2007, the ARB approved a list of 37 early action measures, including three discrete early action measures (Low Carbon Fuel Standard, Restrictions on GWP Refrigerants, and Landfill CH_4 Capture).[1] Discrete early action measures are measures that were required to be adopted as regulations and made effective no later than January 1, 2010, the date established by Health and Safety Code Section 38560.5. The ARB adopted additional early action measures in October 2007 that tripled the number of discrete early action measures. These measures relate to truck efficiency, port electrification, reduction of PFCs from the semiconductor industry, reduction of propellants in consumer products, proper tire inflation, and SF_6 reductions from the non-electricity sector. The combination of early action measures is estimated to reduce statewide GHG emissions by nearly 16 MMT.[2]

ARB Scoping Plan. In December 2008, the ARB adopted its Climate Change Scoping Plan, which contains the main strategies California will implement to achieve reduction of approximately 169 MMT of CO_2e, or approximately 30 percent from the State's projected 2020 emission level of 596 MMT of CO_2e under a BAU scenario (this is a reduction of 42 MMT of CO_2e, or almost 10 percent from 2002–2004 average emissions). The Scoping Plan also includes ARB-recommended GHG reductions for each emissions sector of the State's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- Improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT of CO_2e);
- The Low-Carbon Fuel Standard (15.0 MMT of CO_2e);
- Energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT of CO_2e); and
- A renewable portfolio standard for electricity production (21.3 MMT of CO_2e).

1 ARB. 2007a. *Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration*. October.

2 ARB. 2007b. "ARB approves tripling of early action measures required under AB 32" News Release 07-46. Website: www.arb.ca.gov/newsrel/nr102507.htm. October 25.

The Scoping Plan identifies 18 emissions reduction measures that address cap-and-trade programs, vehicle gas standards, energy efficiency, low carbon fuel standards, renewable energy, regional transportation-related GHG targets, vehicle efficiency measures, goods movement, solar roof programs, industrial emissions, high speed rail, green building strategies, recycling, sustainable forests, water, and air (refer to Table 4.3.E). The measures would result in a total reduction of 174 MMT of CO_2e by 2020.

On August 24, 2011, the ARB unanimously approved both the ARB's new supplemental assessment and re-approved its Scoping Plan, which provides the overall roadmap and rule measures to carry out AB 32. The ARB also approved a more robust CEQA equivalent document supporting the supplemental analysis of the cap-and-trade program. The ARB also announced that it would be delaying the date that entities would be required to comply with its cap-and-trade program until 2013.

The ARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the Scoping Plan does state that land use planning and urban growth decisions will play an important role in the State's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions (meanwhile, the ARB is also developing additional protocols for community emissions). The ARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The Scoping Plan states that the ultimate GHG reduction assignment to local government operations is to be determined. With regard to land use planning, the Scoping Plan expects approximately 5.0 MMT of CO_2e will be achieved associated with implementation of SB 375.

Senate Bill 97 (2007). SB 97, signed by the Governor in August 2007 (Chapter 185, Statutes of 2007; Public Resources Code, Sections 21083.05 and 21097), acknowledges climate change is a prominent environmental issue that requires analysis under CEQA. This bill directed the State of California, Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Natural Resources Agency guidelines for mitigating GHG emissions or the effects of GHG emissions, as required by CEQA. The California Natural Resources Agency adopted the amendments to the *CEQA Guidelines* in January 2010, which went into effect in March 2010. The amendments do not identify a threshold of significance for GHG emission, nor do they prescribe assessment methodologies or specific mitigation measures.

Executive Order B-30-15. EO B-30-15, signed April 29, 2015, sets a goal of reducing GHG emissions within the state to 40 percent of 1990 levels by year 2030. EO B-30-15 also directs ARB to update the Scoping Plan to quantify the 2030 GHG reduction goal for the State and requires State agencies to implement measures to meet the interim 2030 goal of EO B-30-15 as well as the long-term goal for 2050 in EO S-03-5. It also requires the Natural Resources Agency to conduct triennial updates to the California adaption strategy, Safeguarding California, in order to ensure climate change is accounted for in State planning and investment decisions.

Table 4.3.E: Recommended Actions from the ARB Climate Action Team Scoping Plan

ID #	Sector	Strategy Name
T-1	Transportation	Pavley I and II – Light-Duty Vehicle GHG Standards
T-2		LCFS (Discrete Early Action)
T-3		Regional Transportation-Related GHG Targets
T-4		Vehicle Efficiency Measures
T-5		Ship Electrification at Ports (Discrete Early Action)
T-6		Goods-movement Efficiency Measures
T-7		Heavy Duty Vehicle GHG Emission Reduction Measure – Aerodynamic Efficiency (Discrete Early Action)
T-8		Medium and Heavy-Duty Vehicle Hybridization
T-9		High Speed Rail
E-1	Electricity and Natural Gas – General Energy	Increased Utility Energy-Efficiency Programs. More Stringent Building and Appliance Standards
E-2		Increase Combined Heat and Power Use by 30,000 GWh
E-3		Renewables Portfolio Standard
E-4		Million Solar Roofs
CR-1	Electricity and Natural Gas – Commercial and Residential	Energy Efficiency
CR-2		Solar Water Heating
GB-1	Green Buildings	Green Buildings
W-1	Water	Water Use Efficiency
W-2		Water Recycling
W-3		Water System Energy Efficiency
W-4		Reuse Urban Runoff
W-5		Increase Renewable Energy Production
W-6		Public Goods Charge (Water)
I-1	Industry	Energy Efficiency and Co-benefit Audits for Large Industrial Sources
I-2		Oil and Gas Extraction GHG Emission Reduction
I-3		GHG Leak Reduction from Oil and Gas Transmission
I-4		Refinery Flare Recovery Process Improvements
I-5		Removal of CH_4 Exemption from Existing Refinery Regulations
RW-1	Recycling and Waste Management	Landfill CH_4 Control (Discrete Early Action)
RW-2		Additional Reductions in Landfill CH_4 – Capture Improvements
RW-3		High Recycling/Zero Waste
F-1	Forestry	Sustainable Forest Target
H-1	High GWP Gases	Motor Vehicle Air Conditioning Systems (Discrete Early Action)
H-2		SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)
H-3		Reduction in Perfluorocarbons in Semiconductor Manufacturing (Discrete Early Action)
H-4		Limit High GWP Use in Consumer Products (Discrete Early Action, Adopted June 2008)
H-5		High GWP Reductions from Mobile Sources
H-6		High GWP Reductions from Stationary Sources
H-7		Mitigation Fee on High GWP Gases
A-1	Agriculture	CH_4 Capture at Large Dairies

Source: California Air Resources Board. *Climate Change Proposed Scoping Plan* (2008).

ARB = California Air Resources Board
CH_4 = methane
GHG = greenhouse gas
GWh = gigawatt hour
LCFS = Low Carbon Fuel Standard
SF_6 = sulfur hexafluoride

Senate Bill 375. SB 375, the Sustainable Communities and Climate Protection Act, which establishes mechanisms for the development of regional targets for reducing passenger vehicle GHG emissions, was adopted by the State on September 30, 2008. On September 23, 2010, the ARB adopted the vehicular GHG emissions reduction targets that had been developed in consultation with the Metropolitan Planning Organization (MPOs); the targets require a 7 to 8 percent reduction by 2020 and between 13 to 16 percent reduction by 2035 for each MPO. SB 375 recognizes the importance of achieving significant GHG reductions by working with cities and counties to change land use patterns and improve transportation alternatives. Through the SB 375 process, MPOs such as the Southern California Association of Governments (SCAG) will work with local jurisdictions in the development of Sustainable Communities Strategy (SCS) designed to integrate development patterns and the transportation network in a way that reduces GHG emissions while meeting housing needs and other regional planning objectives. Pursuant to SB 375, the SCAG reduction targets for per capita vehicular emissions are 8 percent by 2020 and 13 percent by 2035 as shown in Table 4.3.F.[1]

Table 4.3.F: September 2010 ARB SB 375 Reduction Goals

	By 2020 (percent)	By 2035 (percent)
San Francisco Bay Area	7	15
San Diego	7	13
Sacramento	7	16
Central Valley/San Joaquin	5	10
Los Angeles/Southern California	8	13

Source: California Air Resources Board. *Final Regional GHG Emission Reduction Targets* (2011).
ARB = California Air Resources Board
SB = Senate Bill

Title 24, Building Standards Code and CALGreen Code. In November 2008, the California Building Standards Commission established the California Green Building Standards Code (CALGreen Code), which sets performance standards for residential and nonresidential development to reduce environmental impacts and encourage sustainable construction practices. The CALGreen Code addresses energy efficiency, water conservation, material conservation, planning and design, and overall environmental quality. The California Green Building Standards Code was most recently updated in 2016 to include new mandatory measures for residential as well as nonresidential uses; the new measures take effect on January 1, 2017.

Cap and Trade. The development of a cap-and-trade program was included as a key reduction measure of the ARB AB 32 Climate Change Scoping Plan. The cap-and-trade emissions trading program developed by ARB took effect on January 1, 2012, with enforceable compliance obligations beginning January 1, 2013. The cap-and-trade program aims to regulate GHG

[1] ARB. 2010. Resolution 10-31: Regional Greenhouse Gas Emissions Reduction Targets Pursuant to SB 375. September 23, 2010.

emissions from the largest producers in the State by setting a statewide firm limit, or cap, on allowable annual GHG emissions. The cap contains three compliance phases. In Compliance Phase One, large emitters from the electricity and industrial sector come under the cap. In Compliance Phase Two, which commences in 2015, fuels will be subject to the cap. Compliance Phase Three will include all three sectors (electricity, industry, and fuels) and will run until 2020. ARB administered the first auction on November 14, 2012, with many of the qualified bidders representing corporations or organizations that produce large amounts of GHG emissions, including energy companies, agriculture and food industries, steel mills, cement companies, and universities (ARB 2012). California is working closely with British Columbia, Ontario, Quebec, and Manitoba through the Western Climate Initiative to develop harmonized cap-and-trade programs that will deliver cost-effective emission reductions. Two lawsuits have been filed against cap-and-trade, but the cap-and-trade program will be implemented as is until further notice.[1]

Local and Regional Policies and Regulations.

Southern California Association of Governments 2012 Regional Transportation Plan/Sustainable Communities Strategy. SCAG's 2012 Regional Transportation Plan (RTP)/ SCS is a regional growth-management strategy that targets per capita GHG reduction from passenger vehicles and light-duty trucks in the southern California region. The 2012 RTP/SCS incorporates local land-use projections and circulation networks in city and county general plans. The projected regional development pattern, including locations of land uses and residential densities included in local general plans, when integrated with the proposed regional transportation network identified in the 2012 RTP/SCS, would reduce per capita vehicular travel-related GHG emissions and achieve the GHG reduction per capita targets for the SCAG region of 8 percent per capita from 2005 GHG emission levels by 2020 and 13 percent per capita from 2005 GHG emission levels by 2035.

City of Long Beach Sustainable City Action Plan. The City's Sustainable City Action Plan (SCAP) was adopted in February 2010.[2] The SCAP is intended to guide operational, policy, and financial decisions to create a more sustainable Long Beach. The SCAP includes initiatives, goals and actions that will move Long Beach toward becoming a sustainable city. These goals and actions included in the SCAP relate to the following:

- Buildings & Neighborhoods
- Energy
- Green Economy & Lifestyle
- Transportation
- Urban Nature
- Waste Reduction
- Water

[1] ARB. 2014. Cap and Trade Program. Website: http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm (accessed September 10, 2014).

[2] Long Beach, City of, 2010. *City of Long Beach Sustainable City Action Plan*. February.

Proposed Land Use Element and Urban Design Element Goals, Strategies, and Policies. The following proposed strategies and policies from the proposed LUE are applicable to the analysis of GHG emissions and GCC. There are no applicable goals, strategies, or policies from the UDE.

Land Use Element.

- **Strategy No. 1:** Support sustainable urban development patterns.
- **LU Policy 1-1:** Promote sustainable development patterns and development intensities that use land efficiently and accommodate and encourage walking.
- **LU Policy 1-2:** Support high-density residential, mixed-use and transit-oriented development within the downtown, along transit corridors, near transit stations and at neighborhood hubs.
- **LU Policy 1-3:** Require sustainable design strategies to be integrated into public and private development projects.
- **LU Policy 1-5:** Encourage resources and processes that support sustainable development for adaptive reuse projects, as well as appropriate infill projects.
- **Strategy No. 2:** Promote efficient management of energy resources to reduce greenhouse gas emissions and the impacts of climate change.
- **LU M-11:** Continue to implement the Sustainability Action Plan. Introduce new goals and action measures that promote sustainability, including items related to land use and mobility planning, increasing walking and biking, increasing energy efficiency, reducing greenhouse gases and promoting renewable energy.
- **LU M-60:** Continue to update the City's greenhouse gas (GHG) emissions inventory with the California Climate Action Registry, which will enable the City to better meet future environmental regulations and secure future grant funding for sustainability programs.
- **LU M-61:** Through the Port of Long Beach, provide Greenhouse Gas Emissions Reduction Grant Program and similar programs aimed at implementing strategies to reduce the impacts of greenhouse gases.
- **LU M-64:** Continue to participate in programs and organizations aimed at improving energy efficiency and reducing greenhouse gas emissions.
- **LU M-66:** Consult with utility companies in promoting and developing renewable energy and emerging greenhouse gas reduction technologies. Identify potential sites within the Regional-Serving Facilities PlaceType to locate such facilities.
- **Eastside Land Use Strategy 10:** Finish the City's urban forestry inventories then develop and implement tree planting, maintenance and greening plans, which are coordinated with citywide air quality improvement (greenhouse gas reduction) and local water-saving landscape plans and programs.

4.3.4 Thresholds of Significance

The following thresholds of significance are based on Appendix G of the *State California Environmental Quality Act Guidelines*. Based on these thresholds, implementation of the proposed project would have a significant adverse impact with respect to noise if it would:

Threshold 4.3.1: Generate greenhouse gas emission, either directly or indirectly, that may have a significant impact on the environment

EO B-30-15 and EO S-03-05 identified the long-term goals of reducing GHG emissions by 40 percent and 80 percent of 1990 levels by 2030 and 2050, respectively. The interim efficiency threshold of 3.4 $MTCO_2e/yr/SP$ measures progress in meeting the EO B-30-15 and EO S-03-05 reduction targets; or

Threshold 4.3.2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Standard Conditions and Project Design Features. No Standard Conditions or Project Design Features have been identified with respect to GCC and GHG emissions; however, the update to the LUE includes several policies to support sustainable urban development patterns previously identified above.

4.3.5 Project Impacts

Threshold 4.3.1: Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Significant Unavoidable Impact. As described in Chapter 3.0, Project Description, of this Draft EIR, major land use changes proposed as part of the LUE/UDE are identified as Major Areas of Change, and include eight primary change areas associated with the updated LUE.

- The first Major Area of Change involves the creation of more open space throughout the City. Areas targeted for the establishment of the Open Space PlaceType include small pockets of land along the Los Angeles River, two strips of land along State Route 103 and an abandoned railroad in the northern area of the City, a large portion of the Southeast Area Development and Improvement Plan (SEADIP) area, and pockets of land scattered throughout the City.
- The second Major Area of Change proposes to buffer industrial activities from existing neighborhoods by encouraging the conversion of some industrial uses to Neo Industrial uses. Areas targeted for the establishment of the Neo-Industrial PlaceType include existing industrial areas in the northern portion of the City and a larger industrial area along the Los Angeles River, just north of the City's Downtown.
- The third Major Area of Change aims to promote Regional-Serving Uses by maintaining existing regional-serving facilities throughout the City.
- The fourth Major Area of Change proposes to provide land use transitions from industrial to commercial uses in small areas in the northern portion of the City and in the area directly east of the Long Beach Airport.
- The fifth Major Area of Change aims to promote transit-oriented development along Long Beach Boulevard as part of a larger citywide effort to reduce automobile dependence in the City.
- The sixth Major Area of Change aims to continue development in the Downtown area.

- The seventh Major Area of Change aims to promote infill and redevelopment to support transit along Redondo and Cherry Avenues and near the Traffic Circle.
- The eighth Major Area of Change aims to redevelop sites within the City to their "highest and best use." The sites targeted for redevelopment are located within the SEADIP area, in the southeastern portion of the City.

In total, the LUE proposes changes to approximately 13 percent of the land area (or the equivalent of 4,180 acres) in the City. Construction associated with implementation of the LUE would occur over a period of approximately 15 to 24 years.

Impact Analysis. Implementation of the proposed LUE/UDE would contribute to GCC through direct and indirect emissions of GHGs from land uses within the City. The change in GHG emissions is based on the difference between the SP for the existing land uses and those associated with the proposed implementation of the LUE/UDE. Table 4.3.G compares the communitywide annual GHG emissions inventory (expressed in MT of CO_2e) for the City at build out in year 2040 to existing conditions (2012). The emissions shown in Table 4.3.G are expressed as the adjusted BAU (ABAU) buildout inventory, which includes reductions from federal and State measures identified in the ARB's Scoping Plan, including the Pavley fuel efficiency standards, the LCFS for fuel use (transportation and off-road), the 50% Renewable Portfolio Standards and 2017 CalGreen Code for Title 24 energy efficiency standards, and a reduction in carbon intensity from electricity use. The existing condition year 2012 does not account for GHG reductions in building energy use from Title 24 updates.

As noted above, the LUE includes strategies and policies that would result in further reductions in GHG emissions. In addition, EO B-30-15 and EO S-03-05 identified the long-term goals of reducing GHG emissions by 40 percent and 80 percent of 1990 levels by 2030 and 2050, respectively. The interim efficiency threshold of 3.4 MT of CO_2e/yr/SP measures progress in meeting the EO B-30-15 and EO S-03-05 reduction targets.

As shown in Table 4.3.G, on a per capita basis, buildout of the proposed LUE/UDE would reduce the GHG emissions from 9.5 MT of CO_2e/yr/SP under existing conditions down to 5.9 MT of CO_2e/yr/SP (with reduction measures incorporated). However, the LUE/UDE GHG emissions in the City for buildout year 2040 (5.9 MT of CO_2e/yr/SP) would still exceed the interim efficiency threshold of 3.4 MT of CO_2e/yr/SP. Consequently, although the implementation of the proposed LUE/UDE would result in lower GHG emissions within the City as compared to existing conditions, the GHG emissions would still exceed the interim efficiency threshold of 3.4 MT of CO_2e/yr/SP. Impacts are potentially significant, and mitigation is required.

While the proposed LUE/UDE includes various policies that would contribute to reduced GHG emissions, the City would require assistance from additional federal and State programs and regulations to achieve the long-term GHG emissions goal. Therefore, GHG impacts within the City from the overall growth under the proposed LUE/UDE project would need to develop a GHG reduction plan as recommended under CEQA Guidelines Section 15183.5 and a VMT reduction plan under CEQA Guidelines Section 21083 in order to achieve the long-term GHG reductions goals under EO B-30-15 and EO S-03-05.

Table 4.3.G: LUE/UDE Buildout 2040 GHG Emissions Inventory (MT of CO_2e/yr)

Sectors	Existing 2012 GHG Emissions	General Plan 2040	General Plan Change from 2012	LUE/UDE 2040 Buildout	LUE/UDE Change from 2012
Transportation[1]	826,184	544,830	-281,354	682,844	-143,341
Energy – Residential[2]	54,054	42,964	-11,090	52,588	-1,466
Energy – Nonresidential[2]	130,111	112,952	-17,159	136,968	6,857
Waste[3]	4,932	2,903	-2,030	3,638	-1,294
Water/Wastewater[4]	15,006	11,786	-3,220	14,392	-614
Emissions Total	1,030,287	715,434	-314,853	890,428	-139,859
Service Population[5]	107,893	119,684	N/A	150,002	N/A
Emissions per Service Population	9.5	6	N/A	5.9	N/A
SCAQMD Proposed Plan-Level Efficiency Standard	N/A	3.4	N/A	3.4	N/A

Source: Compiled by LSA Associates, Inc. (2016).

Notes: Emissions forecast based on changes in population (residential energy), employment (nonresidential energy), or service population (City energy, waste, water/wastewater, and transportation). Emissions may not total 100 percent due to rounding.

General Plan 2040 includes reductions identified in the Scoping Plan associated with transportation (Pavley+LCFS), energy (50% RPS), and Title 24 2017 CalGreen Building code (46% efficiency improvement over 2008 Title 24 code). The current inventory does not account for reductions in building energy use from Title 24 cycle updates.

1 EMFAC2014 based on daily per capita VMT data provided by LSA Associates, Inc. (2016). Modeling was conducted for both a General Plan 2040 scenario, and for the LUE/UDE 2040 scenario, which includes all statewide vehicle regulations.

2 Electricity and natural gas usage data provided by Southern California Edison and City of Long Beach Oil and Gas, respectively. The carbon intensity of the purchased electricity is estimated by CEC for Long Beach area. For natural gas, the intensity factors for CO_2, CH_4, and N_2O are provided by the EPA's e-GRID data for year 2012. The LUE/UDE 2040 scenario for residential electricity use includes a reduction in carbon intensity of Long Beach Water Department's energy supply required under the 50 percent RPS (CEC 2015).

3 Landfill Emissions Tool Version 1.3 and CalRecycle. Waste generation based on 2012 waste commitment for the City of Long Beach obtained from CalRecycle. Assumes 75 percent of fugitive GHG emissions are captured in the landfill's Landfill Gas Capture System. The landfill gas capture efficiency is based on the ARB's LGOP, Version 1.1. Significant CH_4 production typically begins 1 or 2 years after waste disposal in a landfill and continues for 10 to 60 years or longer. Therefore, the highest CH_4 emissions from waste disposal in a given year are reported.

4 LGOP, Version 1.1, based on the three-year water demand data as provided by Long Beach Water Department and City's 2010 UWMP. Forecasts are adjusted for increases in population and employment and are based on the target per capita of SBx7-7. The LUE/UDE 2040 scenario for residential electricity use includes a reduction in carbon intensity of Long Beach Water Department's energy supply required under the 50 percent RPS (CEC 2015).

5 Based on an existing service population of 107,893 people (59,598 residents and 48,295 employees), a projected LUE/UDE 2040 service population of 150,002 people (82,858 residents and 67,144 employees), and a projected General Plan 2040 service population of 119,684 people (63,707 residents and 55,977 employees).

ARB = California Air Resources Board
CALGreen = California Green Building Standards
CalRecycle = California Department of Resources Recycling and Recovery
CEC = California Energy Commission
CH_4 = methane
CO_2 = carbon dioxide
GHG = greenhouse gas
LCFS = Low Carbon Fuel Standard
LGOP = Local Government Operations Protocol
LUE/UDE = Land Use Element/Urban Design Element
MT COMT of CO_2e/yr = metric tons of carbon dioxide equivalent per year
N/A = Not Applicable
N_2O = nitrous oxide
RPS = Renewable Portfolio Standard
SB = Senate Bill
SCAQMD = South Coast Air Quality Management District
EPA = United States Environmental Protection Agency
UWMP = Urban Water Management Plan
VMT = vehicle miles traveled

Mitigation Measures GHG-1 through GHG-4 have been proposed to minimize and reduce potentially significant GHG impacts. These measures require the preparation of a GHG Reduction Plan or Climate Action Plan, the preparation of a VMT reduction plan, and adoption of mechanisms to ensure that specific GHG reduction features are incorporated into the design of future development projects to meet or exceed the statewide goals aimed at the reduction of GHG emissions.

In addition, the implementation of Mitigation Measures GHG-1 through GHG-4 would encourage and accommodate use of alternative-fueled vehicles and non-motorized transportation and would ensure that GHG emissions from the buildout of the proposed project would be minimized. However, in addition to the proposed mitigation measures, additional statewide measures would be necessary to reduce GHG emissions from development that may occur with adoption of the proposed project to meet the long-term GHG reduction goals under EO S-3-05 and EO B-30-15. The new EO B-30-15 requires ARB to prepare another update to the Scoping Plan to address the 2030 target for the State. At this time, there is no plan past 2020 that achieves the long-term GHG reduction goal established under EO S-3-05 or the new EO B-30-15. As identified by the California Council on Science and Technology (CCST), the State cannot meet the 2050 goal without major advancements in technology (CCST 2012). Since no additional statewide measures are currently available that can be implemented, GHG emission impacts for the project under the buildout scenario would remain significant and unavoidable.

Threshold 4.3.2: Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases

Less than Significant Impact. In addition to the City's SCAP, there are two applicable existing plans, the ARB Scoping Plan and SCAG's 2012 RTP/SCS, that identify strategies to reduce GHG emissions that are applicable to the proposed project. The following discusses the consistency of the proposed project to these plans.

The City is assisting the State with implementation of the AB 32 Scoping Plan measures by reviewing projects for compliance with Title 24 standards that help reduce GHG emissions through increasing energy efficiency of new residential and nonresidential buildings. Table 4.3.H presents the additional electricity and natural gas consumption rate reductions from the implementation of the proposed 2016 Title 24 standards that would be effective on and after January 1, 2017. The 2016 update to the

Table 4.3.H: Additional Energy Consumption Rate Reductions from 2016 Title 24 Standards and 50 Percent Renewable Portfolio Standards

	Residential	Nonresidential	Total
Electricity (MWh)	14,556	72,993	87,548
Natural Gas (therms)	996	1,620	2,616

Source: Compiled by LSA Associates, Inc. (2016)
MWh = megawatt hours

Building Energy Efficiency Standards would result in greater energy efficiencies when compared to the current 2008 Title 24 Standards and focuses on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. The most significant efficiency improvements to the residential Standards include improvements for attics, walls, water heating, and lighting. The most significant efficiency improvements to the nonresidential Standards include alignment with the ASHRAE 90.1 2013 national standards. New efficiency requirements for elevators and direct digital controls are included in the nonresidential Standards. All new residential and nonresidential structures constructed under the proposed LUE/UDE would be required to be in compliance with 2016 Title 24 standards and the 50 percent RPS, which has the

potential to save up to approximately 87,548 MWh of electricity and 2,616 therms of natural gas annually.

Table 4.3.I provides a summary of the statewide strategies and the associated GHG emissions reductions when integrated into the proposed LUE/UDE project. In addition to these statewide strategies, the LUE/UDE policies outlined above would also contribute to reducing GHG emissions. Therefore, the proposed LUE/UDE project would be consistent with the Scoping Plan.

Table 4.3.I: Statewide GHG Emissions Reduction Strategies

Policy/Action	Policy/Implementation Action Description
Circulation/Land Use	
Pavley I	A clean-car standard that reduces GHG emissions from new passenger vehicles (light- to medium-duty) from 2009 through 2016 and is anticipated to reduce GHG emissions from new passenger vehicles by 30 percent in 2016. California implements the Pavley I standards through a waiver granted to California by the U.S. Environmental Protection Agency.
Advanced Clean Car (Pavley II)	A multifaceted approach focused on controlling smog and soot and reducing GHG emissions from passenger vehicles for model years 2015–2025. It is designed to extend beyond Pavley I (i.e., 2016). The program is anticipated to reduce GHG emissions by 12% in year 2025.
Low Carbon Fuel Standard (LCFS)	Requires a reduction of 2.5% in the carbon intensity of California's transportation fuels by 2015 and of at least 10% by 2020. Applies to refiners, blenders, producers, and importers of transportation fuels and uses market-based mechanisms to allow providers to use the most economically feasible methods to reduce emissions during the fuel cycle.
Energy Efficiency and Use	
Title 24 Energy Standards	Energy conservation standards for new residential and nonresidential buildings were adopted by the California Energy Resources Conservation and Development Commission in June 1977 and are updated triennially to allow for consideration and possible incorporation of new energy-efficiency technologies and methods. The 2016 Building and Energy Efficiency Standards will be effective on January 1, 2017. Buildings that are constructed in accordance with the 2016 Building and Energy Efficiency Standards are 46 percent more energy efficient than the 2008 standards as a result of better windows, insulation, lighting, ventilation systems, and other features that reduce energy consumption in homes and businesses.
Title 24 CALGreen	Adopted in 2008 as part of the California Green Building Standards Code. Established planning and design standards for sustainable site development, energy efficiency, water conservation, material conservation, and internal air contaminants.
50% RPS	Senate Bill 350 was signed in October 2015 and expands the State's renewable energy standard to 50% renewable power by 2030. Renewable sources of electricity include wind, small hydropower, solar, geothermal, biomass, and biogas. The increase in renewable electricity production will decrease indirect GHG emissions from development projects, because electricity production from renewable sources is generally considered carbon neutral.
Title 25	The 2006 Appliance Efficiency Regulations were adopted by the California Energy Commission and approved by the California Office of Administrative Law in 2006. The regulations include standards for both federally and non-federally regulated appliances.

Source: Compiled by LSA Associates, Inc. (2016).
CALGreen = California Green Building Standards
GHG = greenhouse gas
RPS = Renewable Portfolio Standard

The proposed LUE/UDE project and its policies would be consistent with the applicable RTP/SCS goals. Implementation of General Plan Air Quality Element policies would create higher density mixed-use communities. These policies, in addition to Policies LU 4.6, 18.1, and 21.6, which also call for creation of more mixed-use and walkable communities, would contribute to reduced VMT per capita and overall GHG emissions from passenger vehicles. Therefore, the proposed LUE/UDE project is consistent with SCAG's 2012 RTP/SCS.

City of Long Beach Sustainable City Action Plan: The SCAP is a City-adopted plan to guide the City in becoming more sustainable. As described above, the SCAP identifies a wide range of goals and implementation actions to conserve energy and water, reduce solid waste, address global warming, tailor urban design, protect natural habitats, improve transportation options, and reduce risks to human health. Specific goals related to GHG include increasing the use of renewable energy in the City and reducing the City's overall electric load by 10 percent. Other goals include reducing single-occupancy vehicle trips by 10 percent and advancing higher density mixed-use neighborhoods that are bike and pedestrian friendly. The proposed LUE/UDE project includes various policies, identified above in Section 4.3.4, that are and would be consistent with these goals and initiatives of the City's SCAP.

As demonstrated in the foregoing analysis, implementation of the proposed project would not conflict with or impede implementation of reduction goals identified in AB 32, EO S-3-05, or other strategies to help reduce GHGs to the level proposed by the Governor. In addition, the project would also be subject to all applicable regulatory requirements, which would also reduce the GHG emissions of the project. Further, the proposed project would result in a net reduction of overall GHG emissions. Therefore, the proposed project would not conflict with any applicable plan, program, policy, or regulation related to the reduction of GHG emissions. Impacts are considered less than significant, and no mitigation is required.

4.3.6 Mitigation Measures

The following mitigation measures have been identified to reduce GHG emissions that would result from the proposed project.

GHG-1 The City of Long Beach (City) shall develop a greenhouse gas (GHG) Reduction Plan or Climate Action Plan (CAP) to ensure that the City continues on a trajectory that aligns with the short-term, interim, and long-term state GHG reduction goals of Assembly Bill (AB) 32 (2020 goal), Executive Order (EO) B-30-15 (2030 goal), and EO S-03-05 (2050 goal). Within approximately 36 months of adoption of the proposed General Plan Land Use Element (LUE)/Urban Design Element (UDE) project, the City of Long Beach shall prepare and present to the City Council for adoption a community climate action plan/greenhouse gas reduction plan (Plan). The Plan shall identify strategies to be implemented to reduce GHG emissions associated with the City, and shall include as one alternative a program that achieves the AB 32 targets. In addition, the City shall monitor GHG emissions by updating its community-wide GHG emissions inventory every 5 years upon adoption of the initial Plan. Upon the next update to the Plan, the inventory, GHG reduction measures, and GHG reductions shall be forecast to year 2040 to ensure progress toward achieving

the interim target that aligns with the long-term GHG reduction goals of EO S-03-04. The Plan update shall take into account the reductions achievable from federal and State actions and measures as well as ongoing work by the City and the private sector. The 2040 Plan update shall be completed by January 1, 2020, with a plan to achieve GHG reductions for 2030 (EO B-30-15 goal), provided the State has an actual plan to achieve reductions for 2030. New reduction programs in similar sectors as the proposed Plan (building energy, transportation, waste, water, wastewater, agriculture, and others) will likely be necessary. Future updates to the Plan shall account for the horizon beyond 2030 as the State adopts actual plans to meet post-2030 targets. The Plan will include details on how the reduction programs will be implemented and will designate responsible parties to monitor progress and ensure implementation of the reductions within the Plan. A monitoring and reporting program will be included to ensure the Plan achieves the reduction targets. The Plan will also include criteria that would trigger an update to the Plan. Examples of triggers requiring a Plan update include monitoring of progress that demonstrates that the Plan will not achieve the reduction targets, or economic and/or population growth that exceeds the scope of the Plan. In all instances, the Plan and any updates shall be consistent with State and federal law.

Long Beach GHG Reduction Plan or Climate Action Plan Measures:

- Establish a goal to encourage 15 percent of existing single-family homes to install solar installations before 2020.
- Establish a goal to encourage 15 percent of existing commercial/industrial buildings to install solar installations before 2020.
- Collaborate with Long Beach Transit to implement "Smart Bus" technology, global positioning system (GPS), and electronic displays at all transit stops by 2020 to provide customers with "real-time" arrival and departure time information.
- Explore the opportunity for expansion of electric-vehicle infrastructure, including requiring electric-vehicle charging stations in new qualified developments.
- Develop public education materials that support and encourage the use of recycled water.
- Consider a plan for installing recycled water infrastructures for all new parks, schools, and other public facilities to use 100 percent recycled water for non-potable outdoor uses.
- Adopt a municipal goal of 100 percent recycled water for non-potable sources, as feasible, depending on available recycled water infrastructure.
- Adopt a landscaping water conservation ordinance that exceeds the requirements in the Model Landscape Ordinance (AB 1881).

Post-2020 Measures:

- Prior to January 1, 2020, the City of Long Beach shall update the GHG Reduction Plan or CAP to address the GHG reduction goals of EO B-30-15 for GHG sectors for which the City has direct or indirect jurisdictional control. The City shall identify a GHG emissions reduction target for year 2030 that is consistent with the GHG reduction goals identified in EO S-03-05. The GHG Reduction Plan or CAP shall be updated to include measures to ensure that the City is on a trajectory that aligns with the State's 2030 GHG emissions reduction target.

GHG-2 Within approximately 18 months of adoption of the proposed General Plan LUE/UDE project, the City shall prepare and present to the City Council for adoption a vehicle miles traveled (VMT) reduction plan to ensure that GHG reduction can be achieved by reducing VMT and by increasing or encouraging the use of alternative fuels and transportation technologies.

- The City will ensure that new development incorporate both local and regional transit measures into the project design that promote the use of alternative modes of transportation.
- The City shall give priority to transportation projects that will contribute to a reduction in VMT per capita, while maintaining economic vitality and sustainability.
- The City will create an interconnected transportation system that allows a shift in travel from private passenger vehicle to alternative modes, including public transit, ride sharing, car sharing, bicycling, and walking.

GHG-3 Prior to issuance of building permits for residential development projects within the LUE/UDE Major Areas of Change, the property owner/developer shall indicate on the building plans that the following features have been incorporated into the design of the building(s). Proper installation of these features shall be verified by the City of Long Beach Building and Safety Bureau prior to issuance of a certificate of occupancy.

- For multifamily dwellings, electric vehicle charging shall be provided as specified in Section A4.106.8.2 (Residential Voluntary Measures) of the California Green Building Standards Code (CALGreen Code).
- Bicycle parking shall be provided as specified in Section A4.106.9 (Residential Voluntary Measures) of the CALGreen Code.

GHG-4 Prior to issuance of building permits for non-residential development projects within the LUE/UDE Major Areas of Change, the property owner/developer shall indicate on the building plans that the following features have been incorporated into the design of the building(s). Proper installation of these features shall be verified by the City of Long Beach Building and Safety Bureau prior to issuance of a certificate of occupancy.

- For buildings with more than ten tenant-occupants, changing/shower facilities shall be provided as specified in Section A5.106.4.3 (Nonresidential Voluntary Measures) of the CALGreen Code.
- Preferential parking for low-emitting, fuel-efficient, and carpool/van vehicles shall be provided as specified in Section A5.106.5.1 (Nonresidential Voluntary Measures) of the CALGreen Code.
- Facilities shall be installed to support future electric vehicle charging at each non-residential building with 30 or more parking spaces. Installation shall be consistent with Section A5.106.5.3 (Nonresidential Voluntary Measures) of the CALGreen Code.

4.3.7 Cumulative Impacts

As defined in Section 15130 of the *State CEQA Guidelines*, cumulative impacts are the incremental effects of an individual project when viewed in connection with the effects of past, current, and probable future projects within the cumulative impact area for GCC. However, unlike the cumulative analysis for many topics that address the combined impacts of a proposed project in addition to related projects in a project study area, GCC is affected by a larger range of development activity. Climate change is a global issue and is already addressed as a cumulative impact because individual projects are unlikely to measurably affect GCC. Although the State requires Metropolitan Planning Organizations and other planning agencies to consider how regionwide planning decisions can impact GCC, there is currently no established non-speculative methodology for assessing the cumulative impact of proposed independent private party development projects.

Although the proposed project is expected to emit GHGs, the emission of GHGs by any single project into the atmosphere is not itself necessarily an adverse environmental effect. Rather, it is the increased accumulation of GHGs from more than one project and many sources in the atmosphere that may result in GCC. The resultant consequences of that climate change, including sea level rise, could cause adverse environmental effects. A project's GHG emissions typically would be very small in comparison to State or global GHG emissions and, consequently, they would, in isolation, have no significant direct impact on climate change. Due to the complex physical, chemical, and atmospheric mechanisms involved in GCC, it is speculative to identify the specific impact, if any, to GCC from one project's incremental increase in global GHG emissions. As such, a project's GHG emissions and the resulting significance of potential impacts are more properly assessed on a cumulative basis. Thus, the analysis conducted above is essentially already a cumulative analysis because it takes into consideration statewide GHG reduction targets and demonstrates that the proposed project would be consistent with those targets.

The State has mandated a goal of reducing statewide emissions to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050, even though statewide population and commerce are predicted to continue to expand. In order to achieve these goals, the ARB is in the process of establishing and implementing regulations to reduce statewide GHG emissions. However, there are currently no applicable significance thresholds, specific reduction targets, and/or approved policy or guidance to assist in determining significance at the cumulative level. Additionally, there is currently no generally accepted methodology to determine whether GHG emissions associated with a specific project represent new emissions or existing, displaced emissions.

As previously stated, the proposed project would result in a GHG emission profile that is lower than existing GHG emissions within the City. Additionally, since climate change is a global issue, it is unlikely that the proposed project would generate enough GHG emissions to influence GCC on its own. Because the proposed project's impacts alone would not cause or significantly contribute to GCC, project-related CO_2e emissions and their contribution to GCC impacts in the State of California would not make a significant contribution to cumulatively considerable GHG emission impacts. Therefore, the proposed project would not result in a significant long-term cumulative impact on GCC (including sea level rise).

As shown previously in Table 4.3.C, projected sea level rise for southern California is anticipated to be 0.39 to 2.9 ft by 2050 (NRC, 2012). A recent wave uprush study completed for a project along the coast in Long Beach indicated that sea levels along the Long Beach coastal area could be expected to rise 0.5 to 2.6 ft by 2060, and 1.4 to 5.5 ft by 2100[1]. This is consistent with the sea level rise projections by the NRC. Rising sea levels may affect the built environment, including coastal development such as buildings, roads, and infrastructure. However, future projects facilitated under the proposed LUE/UDE project would be planned in consideration of the conditions at the time they are proposed and would be evaluated for their potential to be affected by the change in sea level resulting from GCC during environmental review. Sea level rise is a slow gradual condition and future projects would be implemented over the proposed project's planning horizon through the year 2040 and would undergo environmental review, as necessary. Due to the programmatic nature of the project, the uncertainty in the timing regarding when sea level rise could affect coastal areas within the City limits, and because the future development proposals within the City would be subject to environmental review under CEQA and would be required to analyze potential sea level rise impacts and include mitigation as appropriate, cumulative sea-level rise impacts would be less than significant.

4.3.8 Level of Significance after Mitigation

The proposed project would result in significant unavoidable adverse impacts related to GHG emissions.

[1] Moffat & Nichol. 2014. *Wave Uprush Study*, October.