

Appendix B

Adaptation and Mitigation Actions

- Additional Context

ADAPTATION ACTIONS

This section provides additional context for each of the adaptation actions found in Chapter 4.

EXTREME HEAT ACTIONS

Action Number	Action Title	Additional Context
EH-1	Increase presence of cool roofs and cool walls	<p>Cool roofs are required under the California Green Building Code if the building is to achieve Tier 1 or Tier 2 compliance. However, under Part 6 of the Energy Code, any building will get compliance credits against the baseline building if it has a cool roof. Both the City and County of Los Angeles have made cool roofs mandatory for new and replaced residential roofs.</p> <p>Growing a vegetative layer (plants, shrubs, grasses, and/or trees) on a rooftop can also act as a cool roof, providing insulation to the building below. Due to seismic considerations, these green roofs, which can be heavy due to thick layers of substrate material, can only be sited on steel-reinforced buildings and are significantly more costly than cool roofs. As a result, cool roofs are generally accepted as a more cost-effective approach to reducing the heat island effect than green roofs, but both options should be allowed based on the local context. Despite this, green roofs can potentially offer important co-benefits, such as increased green space and local food production, which can be especially important in low-income communities that lack access to both. It is expected that candidate buildings in these communities may not be able to support green roofs; however, the City will conduct a study to assess the feasibility of green roofs in these areas.</p>
EH-2	Increase the presence of reflective streets, cool surfaces, and shade canopies	<p>One effort that is generally reflective of this approach is already underway. The City received a Southern California Association of Governments grant for the Washington Neighborhood to engage the community in the development of an urban greening and cool street plan that will include recommendations for cool street design standards and an implementation and funding framework. LBUSD is also installing solar shade structures over parking lots and playgrounds at school sites. Pilot cool street projects in the city of Los Angeles and elsewhere in the world have been well received.</p> <p>Since hotter temperatures result in more ozone and smog formation, installation of cool pavement is an effective way to improve local air quality. Children are particularly vulnerable to respiratory disease due to poor air quality, and so targeting playgrounds for cool pavement applications could deliver important public health benefits. Likewise, parking lots are a cost-effective location for cool pavement, since slow vehicle speeds mean that the reflective coating will have a longer durability on parking lots than it would on high-volume, high-speed streets that receive more wear-and-tear. As long as the reflectivity of the cool street does not exceed 50 percent, glare has not proven to be an issue of concern.</p>

EH-3	Enhance and expand urban forest cover and vegetation	<p>Long Beach’s 2016 Draft Urban Forest Management Planⁱ includes goals and policies to protect, preserve, and enhance Long Beach’s urban forest. The plan led to the development of the Urban Forestry Program, a collaboration between neighborhood associations, community groups, and the Neighborhood Services Bureau, which uses Federal Community Development Block Grant and State Funds to plant trees across the city. Since the 2016 plan was enacted, the Urban Forest Program has planted 10,000 trees across Long Beach.ⁱⁱ The City will continue to implement the Urban Forest Management Plan, which includes a goal to ensure the fair provision and distribution of urban forest services. This action also entails increasing the urban forest citywide by an additional 20,000 trees.</p> <p>A healthy urban forest and vegetation can reduce urban heat island conditions. They can also reduce the runoff augmenting existing stormwater management systems, and thereby increase system capacity during intense storm events and improve water quality. Particular emphasis should be placed in selecting drought-tolerant plants or California natives, whose benefits include reducing the urban heat island effect, increasing habitat due to the large canopy they offer fauna, providing drought-tolerant habitat, and establishing quickly and requiring little water once established.</p>
EH-4	Install additional water fountains and take other actions to increase public access to water	<p>As average temperatures and the number of extreme heat days and warm nights increase over the coming decades, an accessible public water supply will become increasingly important. At parks, schools, public buildings, and other facilities, water fountains are a valuable public resource for improved public health. This approach of installing public water fountains and engaging in public education surrounding plastic pollution has been adopted in other cities (e.g., the “Refill London” campaign in the United Kingdom).</p> <p>Plastic pollution remains in the environment and eventually finds its way into rivers, wetlands, and oceans, where it has long-term negative impacts on ecosystems and organisms. The negative impacts from plastic bottles are not just limited to pollution. Manufacturing and recycling plastic bottles also requires substantial energy and produces GHG emissions. In addition, despite sustained efforts to increase recycling rates, the vast majority of plastic bottles end up in landfills and the natural environment. In contrast, the Long Beach Water Department delivers high-quality water at the tap or water fountain at a fraction of the cost (and carbon footprint) of bottled water and safeguards water quality by continuously sampling and testing the city’s drinking water throughout the water distribution system.</p>

EH-5	Identify future vulnerability potential for power outages related to extreme heat and develop plans to prevent such outages	<p>Actions to enhance resiliency to be considered could include the creation of microgrids focused on vulnerable and/or critical areas to allow localized electricity service to continue in the event of an outage. The City could also work with SCE to expand their current efforts on expanding energy storage. SCE is planning to connect almost 750 megawatts of energy storage to the grid by 2024, which would provide reliable backup systems for power outages. This program also focuses on expanding renewable energy storage by providing incentives for low-income customers that are already a part of their multifamily solar programs. This would both reduce strain on the grid and provide reliable power to vulnerable communities.</p> <p>In July 2015, high temperatures may have been a factor in equipment failures that caused two power outages in downtown Long Beach. These outages left thousands of residents and businesses without power for days and stranded people without medical devices, refrigeration, air conditioning or elevator service during a period of high temperatures. This was particularly challenging for seniors living in high-rise apartments (KPCC 2015ⁱⁱⁱ). Since 2015, SCE has been involved in national efforts to accelerate the development of and investment in technologies, practices, and policies that will create a more resilient energy system. As a part of these efforts, SCE analyzed its system, using future climate models to better understand how to prepare for changes in its environment.</p>
EH-6	Enhance and expand accessibility of cooling centers	<p>There are 13 community centers and 12 libraries in Long Beach, with 15 cooling centers in the most disadvantaged areas (CalEnviroScreen). In the Long Beach CAAP survey, 58.5 percent said they remained indoors during heat advisories and 29 percent of respondents said they visited air-conditioned areas such as cooling centers or malls. Certain populations, such as the homeless, outdoor workers, older adults, young children and infants, pregnant women, and people with chronic illnesses, are more susceptible to warmer temperatures and heat-related illnesses. In order to protect these populations, a strong and expansive network of cooling centers is important to making Long Beach more adaptive and resilient to the threat of extreme heat.</p>
EH-7	Provide bus shelter amenities	<p>There are public and private funding options for these improvements. For example, Long Beach Transit has used some of its Low Carbon Transit Operations Program, which is funded by cap-and-trade revenues, to upgrade bus stops and shelters. Advertising companies will often install and maintain street furniture in exchange for the right to place advertisements on them at little or no cost to cities.</p> <p>Residents and businesses may request, through their City Council office, that bus stop amenities be installed.</p>

AIR QUALITY ACTIONS

Action Number	Action Title	Additional Context
AQ-1	Incentivize installation of photocatalytic tiles	<p>There are a growing number of photocatalytic tile products on the market. These are increasingly embedded into cool-roofing products, representing an opportunity to actively reduce air pollution and temperatures.</p> <p>The City will actively pursue grant funding options to incentivize installation of these tiles and will prioritize neighborhoods and communities near the Port and the I-710 corridor that are heavily impacted by air pollution. Several of California’s cap-and-trade programs prioritize funding projects in disadvantaged and low-income communities that reduce energy use and GHGs from building end uses. Integration of photocatalytic products into building energy efficiency projects, affordable housing developments, and similar projects could result in meaningful air quality co-benefits. In addition, in response to AB 617 (the Community Air Protection Program), air districts are tasked with working with identified impacted communities to identify projects to reduce exposure to air pollution. In 2018, West Long Beach (extending all the way to Cherry Avenue) was selected as one of the initial focus communities.</p> <p>The City will support the inclusion of photocatalytic tiles in projects located in areas of the city that are heavily impacted by pollution. This will include collaborating with SCAQMD, community partners, developers, and other stakeholders to identify projects that could become a component of projects that seek to more holistically address GHG and/or air quality emissions reductions with other amenities such as solar. In addition, the City will work with SCAQMD to quantify air pollutant reductions for any projects that implement photocatalytic tiles.</p>
AQ-2	Encourage urban agriculture practices that reduce air quality pollution	<p>Educational and training opportunities for drought-tolerant urban agriculture may be conducted in conjunction with the Lawn-to-Garden program and may include holding free urban gardening workshops at community gardens, such as the gardens at the Michelle Obama and Mark Twain libraries. Education and outreach could include demonstration plots, soil conservation practice trainings, drip tape irrigation trainings, and other materials on relevant urban agriculture water conservation practices. These trainings could also be expanded to other locations in the city, especially to low-income areas to allow for more equitable attendance.</p>

AQ-3	Support the development of the Long Beach Airport Sustainability Plan	<p>Long Beach Airport is working on a Sustainability Plan that will include an evaluation of areas where the airport can improve existing programs or introduce new programs.</p> <p>Longer term, as technologies evolve, there is likely to be an increasing number of opportunities to support the integration of electric airplanes into Long Beach Airport’s fleet. Regional flights are expected to be the strongest candidates for integration. For longer flights requiring jet fuel planes, the City will work with airlines to further promote their existing carbon offset programs</p>
AQ-4	Electrify small local emitters, such as lawn and garden equipment, outdoor power equipment, and others	<p>At least 50 cities across the state already have some sort of regulation on lawn and garden equipment. Small off-road engines are spark-ignition engines that produce less than 19 kilowatts gross power (and less than 25 horsepower). They are primarily used for lawn, garden, commercial utility, and other outdoor power equipment. Unfortunately, small off-road engines that use gasoline or diesel contribute greatly to local air pollution. According to CARB, in 1 hour, a traditional lawn mower can emit as much smog-forming pollution as the best-selling passenger car driven 300 miles – approximately the distance from Los Angeles to Las Vegas. A traditional leaf blower in 1 hour of operation emits smog-forming pollution comparable to driving about 1,100 miles, which is approximately the distance from Long Beach to Denver.</p> <p>Local governments, commercial landscapers, school districts, colleges, nonprofits, and residents are eligible to participate in the SCAQMD Electric Lawn and Garden Equipment Incentive and Exchange Program and Residential Lawn Mower Rebate Program. One equivalent operable gasoline- or diesel-powered piece of lawn and garden equipment must be scrapped to receive incentive funding to purchase an electric-powered equipment. Furthermore, SCAQMD is prioritizing funding in disadvantaged communities (CalEnviroScreen). The City can also apply for incentives to transition its own fleet of equipment. In addition, the City will identify strategies to accelerate the transition in disadvantaged communities and assist landscaping workers to transition with a reasonable cost. A voucher program would be one example of such a strategy.</p>
AQ-5	Work with LBUSD to support school bus electrification	<p>The negative effects of using diesel-powered school buses are well documented. Pollution levels inside school buses are greatly affected by the bus’s own exhaust and early childhood exposure to higher concentrations of particulate matter affects lung development and can cause respiratory health effects later in life. Transitioning diesel-powered buses to electric power will have positive, long-term public health impacts for children.</p>

		<p>There is a significant amount of funding available from state sources such as the Hybrid Voucher Incentive Program and the Volkswagen Mitigation Environmental Trust (administered through CARB), Prop 39: School Bus Replacement Program (administered through the California Energy Commission) and the Carl Moyer Program and AB 617 Community Air Protection Funds (administered through SCAQMD). The eligible costs for these funds include lower emission or zero-emission school buses, electric charging infrastructure, and workforce training and development. Most of the programs prioritize disadvantaged communities (CalEnviroScreen).</p>
<p>AQ-6</p>	<p>Implement the San Pedro Bay Ports Clean Air Action Plan</p>	<p>The Port of Long Beach is a major hub for global, national, and regional trade. Port emission sources include ocean-going ships, harbor craft, cargo equipment, trains, and trucks. While these sources have historically relied on diesel fuel, there is an increasing number of options that are available and being deployed to reduce both GHG and air quality emissions. These include plugging ships into shore power while they are docked, reducing ship speeds, encouraging clean and alternative-fuel trucks, using more efficient locomotives, furthering the use of hybrid and electric cargo equipment and harbor craft, increasing energy efficiency and renewable power generation, investing in infrastructure to increase efficient movement of cargo, and continuing implementation of a Clean Trucks Program.</p> <p>The Ports of Los Angeles and Long Beach originally adopted the San Pedro Bay Ports Clean Air Action Plan in November 2006 and updated the plan in 2010. Since its adoption, the plan has guided aggressive strategies that have been effective in reducing air pollution from port-related sources. In June 2017, Mayor Eric Garcetti of the City of Los Angeles and Mayor Robert Garcia of the City of Long Beach announced a joint declaration for creating a zero-emissions goods movement future – with ultimate goals of zero emissions for cargo handling equipment by 2030 and zero emissions for on-road drayage trucks serving the ports by 2035.</p>

DROUGHT ACTIONS

Action Number	Action Title	Additional Context
DRT-1	Continue development and implementation of water use efficiency programs and implement additional water conservation programs	<p>Long Beach is located in the semi-arid region of Southern California, which relies on imported water, delivered via a process that uses 20 percent of the state's electricity. Conserving water and increasing water use efficiency is imperative to reducing costs and resource usage now, while increasing water supply sustainability and resiliency for the future. In an effort to increase water use efficiency, the State of California enacted AB 1668 and SB 606 in 2018, bills that emphasize the efficiency of water use and efforts to maximize existing water supplies. The legislation sets an initial limit for indoor water use of 55 gallons per person per day in 2022 and gradually drops to 50 gallons per person by 2030. This legislation is not imposed upon individual citizens, but instead upon urban water suppliers.</p> <p>The Water Resources Plan helps Long Beach move forward with water use efficiency programs that will ensure the 2030 target is met. Existing water use efficiency programs will change to help increase</p>
DRT-2	Enhance outreach and education related to water conservation	<p>The City has made significant strides through the initiation of a number of programs to respond to drought and meet and exceed state water use efficiency targets. This includes successful public outreach and education efforts to residents and businesses to conserve water. It also includes programs such as the L2G program, which provides incentives to transform lawns to drought-resistant gardens. In addition, the Long Beach Water Department has a user friendly, interactive website that features a variety of water conservation educational materials and programming that can be further built upon to enhance the use of various water conservation opportunities.</p> <p>Long Beach has water restrictions and seasonal watering day rules in effect. As noted in DRT-1, AB 1668 and SB 606 set limits on per capita daily water use that are gradually reduced over time. Although these limits are imposed on the water suppliers' end users, such as households and businesses that have a role to play in reducing water consumption. Education about choices and behaviors can go a long way to meeting citywide water conservation goals. Water conservation also has meaningful cost savings potential that will continue to be a core part of the Long Beach Water Department's ongoing efficiency outreach and education.</p>

DRT-4	Expand usage of recycled water and greywater for non-potable use	<p>The City's Water Reclamation Plant recycles up to 25 million gallons of wastewater per day for reuse. The water is used at more than 60 sites for uses such as irrigation, replenishment of groundwater supply and protection from saltwater intrusion, and repressurization of oil-bearing strata off the coast. Water that is not used is discharged to Coyote Creek. To establish a more diverse and sustainable water supply, the City will identify ways to increase the supply and use of recycled water.</p> <p>The City could expand upon the "Laundry to Landscape" pilot program that took place in 2012-2013 for greywater irrigation from washing machines. Proposition 68, Measure W, and Proposition 3 include funding that is potentially available for water infrastructure. Rebates and incentives are available through MWD.</p>
DRT-5	Incorporate increased rainfall capture and other actions to maximize local water supplies and to offset imported	<p>Some California cities have or are modifying construction codes to require new commercial developments to use recycled water from rainwater harvesting for irrigation and toilets. In addition, several California municipalities are harvesting rooftop rainwater for direct on-site indoor uses in city facilities, such as toilet and urinal flushing. California municipalities are also diverting water from the storm drain pipes and storing and treating the water for irrigation of adjacent park landscaping and for toilet flushing.</p> <p>Currently, residential rebates for rain barrels are available to Long Beach residents through the MWD. In addition, the City of Long Beach Office of Sustainability offers free classes on rainwater harvesting.</p>

SEA LEVEL RISE AND FLOODING ACTIONS

Action Number	Action Title	Additional Context
FLD-1	Update the floodplain ordinance	<p>As a participant in the FEMA National Flood Insurance Program, the City already enforces a minimum design standard for the base flood elevation for first floor building elevations (Chapter 18.73 [Flood-Resistant Design and Construction] of the City's Building Code). Many areas of the city adjacent to the coastline, inlets, or canals are currently located in FEMA-designated flood hazard areas. The Harbor District, neighborhoods surrounding Alamitos Bay, Belmont Shore, Lower Westside, and the Shoreline Marina are identified as vulnerable to a 100-year flood event based on existing conditions. Areas of the city identified as vulnerable to a 500-year flood event are significantly more expansive, and they include North Long Beach, Sunrise, Hamilton, Freeway Circle, Upper Westside, Arlington, Marina Pacifica, El Dorado South, South of Conant, Lakewood Village, and Los Altos neighborhoods. Although building codes can improve the chances that a structure will survive an extreme storm, additional regulation may be necessary to ensure adequate flood protection for the area. In updating the Floodplain Ordinance, addressing the city's flood risks will be emphasized, and regulations and programs to promote long-term flood resilience for buildings located in the floodplain will be introduced.</p> <p>The updated ordinance will include incentives for building owners to invest in resiliency improvements by either meeting or exceeding flood-resistant construction standards, even when they are not required by FEMA or the City's Building Code. Incentives will include City-led pursuits of FEMA grants to subsidize floodproofing and elevating properties as well as the removal of regulatory obstacles to incorporate resiliency standards in design. The City will consider recommending accommodation strategies, such as elevation, before construction of hard protective structures. This precautionary approach will help make buildings safer in the long term, and will thus decrease the risk of future property damage. By exceeding minimum FEMA floodplain requirements, the City may also reduce flood insurance premiums through FEMA's Community Rating System.</p>
FLD-2	Incorporate sea level rise language into citywide plans, policies, and regulations	<p>Mainstreaming sea level rise adaptation into planning and decision-making processes requires a coordinated, citywide effort. However, most decision-making responsibilities are allocated to specific functional areas or departments and follow relatively codified procedures, particularly where specialized knowledge is required. In general, city planning documents fall into two high-level categories: overarching planning documents and design guidelines. To help meet the City's goal of enhancing resilience to future climate conditions, language addressing sea level rise</p>

		<p>impacts will be added to both types of documents.</p> <p>Overarching documents, such as the General Plan, are high level and focus on the City's priorities. It is particularly important to influence overarching plans that aim to enhance the capacity and performance of operations and assets, often with a longer-term, strategic perspective. These documents provide an opportunity to introduce, coordinate, and generate knowledge, and to present a vision of long-term resilience.</p> <p>Design guidelines, such as design standards for capital projects, are detailed and provide guidance to technical practitioners. Existing building codes and minimum design standards are primarily based on historical weather data that do not account for changing climate conditions, such as the increasing frequency and magnitude of coastal flood events. Updating design criteria to consider future sea level rise conditions is a critical step toward integrating resilience as a core principle into the design of City infrastructure and facilities. Updating prevailing design guidelines, standards, and specifications allows the City to evaluate the risk tolerance of city assets and guides project design. Prioritizing the updating of design guidelines is particularly important to ensure opportunities to influence the construction or major renovation of assets with a long design life (e.g., bridges, stormwater infrastructure, seawalls, etc.).</p>
<p>FLD-3</p>	<p>Establish a flood impacts monitoring program</p>	<p>The flood impacts monitoring program can play an important role in monitoring the physical impacts of flooding over time, the associated costs, and the effectiveness of existing adaptation strategies, and in identifying the need for new adaptation strategies.</p> <p>In addition, the citizen monitoring component will connect residents with city officials and emergency managers, providing a firsthand look at flood risks throughout the city. This uploaded data collected by residents can be geolocated and added to a map interface that is viewable by the public. During the event, the real-time data are useful for emergency managers and may improve response times. Following the event, the City can review the information to address flooding hot spots and to monitor the effectiveness of implemented flood adaptation strategies.</p>
<p>FLD-4</p>	<p>Incorporate adaptation into City lease negotiations</p>	<p>The City will leverage its position as a lessor to incentivize and/or require adaptation actions for tenants who use City-owned buildings or land through lease agreements. Because some City-owned properties are located in areas vulnerable to flood exposure, adding flood adaptation requirements into lease negotiations will provide enhanced flood resilience for tenants and may avoid adverse environmental impacts. City leases also provide a vehicle</p>

		<p>to include adaptation strategies that will address extreme heat, air quality, and drought, and achieve GHG reduction co-benefits.</p> <p>A guidance document will be developed to assist City staff in understanding the key terms used to evaluate future climate impacts and in making informed decisions regarding lease permits. Project examples and an internal checklist for staff reviewing applications will also be included.</p>
FLD-5	Update the City's existing Stormwater Management Plan	<p>The Stormwater Management Plan includes an inventory of stormwater assets, field investigations, hydraulic modeling, and recommendations for capital improvements and expanded inventory data collection and maintenance programs. Its stated primary purpose is to protect water quality by preventing pollutant discharges to receiving waters.</p> <p>Updating the Stormwater Management Plan will include developing an up-to-date hydrological and hydraulic model of the City's major watersheds that includes new information regarding changes in climate and rising tides. This will help the City better understand how its infrastructure will perform under changing storm scenarios. The updated Stormwater Management Plan will also evaluate the invert elevations of stormwater outfalls located in tidally influenced areas and the existing capacity of the system to convey and drain excess stormwater.</p>
FLD-6	Conduct citywide beach stabilization study	<p>The goal of evaluating multiple scenarios for beach nourishment is to determine an effective adaptive management approach in dealing with spatial alongshore variation and high erosion or deposition that routinely occurs in nourished beaches.</p> <p>Ideally, a beach nourishment project will respond to seasonal changes in wave and current conditions, but is designed so the shoreline fluctuations remain relatively stable for the duration of the project design life. However, nourishment material is dynamic by nature, will be affected by large storm events and changing water levels, and will require periodic maintenance.</p>
FLD-7	Review and conduct studies of combined riverine/coastal flooding and increased severity of rainfall events on watershed flooding	<p>While existing 100-year floods occurring along the primary riverine waterways in Long Beach are contained within their channels by existing levees, overtopping risk could be exacerbated in the future by a combination of sea level rise and increased intensity of precipitation. With more intense precipitation events projected as a result of climate change, increased peak flows into major drainage channels (the Los Angeles River, Los Cerritos Channel, and the San Gabriel River) could cause overtopping of levees that were previously adequate. In addition, as sea levels increase, the zone of tidal influence will move further up the channels. If a major precipitation event coincides with a high tide, floodwaters will not be able to discharge the channels as quickly, which could result in overtopping at the riverine/coastal interface.</p>

		<p>Reliable modeling on how riverine floodplains will be impacted by changes in extreme precipitation patterns and sea level rise does not exist for Long Beach. For this CAAP, asset exposure to riverine flooding was assessed based on location within FEMA's</p>
FLD-8	Enhance dunes	<p>Sand dunes are formed naturally when sand or sediment blown by wind accumulates against an obstacle, generally vegetation. Healthy dune systems rely on the root systems of dune grasses and other vegetation to maintain their shape. Currently, the City of Long Beach operates a beach grooming program along Belmont Shore Beach. While grooming helps maintain the pristine appearance of the beach, flattening the sand each day prevents dunes from forming naturally, and clearing the buildup of seaweed deprives beach vegetation of an important source of nutrients.</p> <p>Due to the lack of natural dunes, the City currently engineers sand berms each year to provide protection for adjacent communities from seasonal swells. However, because these berms do not have vegetation holding them together, they are eroded by tides and wave action each year and need to be replaced. By implementing a comprehensive active dune enhancement program as part of an adaptive management approach that includes actions such as beach nourishment, the City will enable the growth of sand dunes as natural coastal protection along beaches that do not have a bluff behind them. The City will pursue dune options that are best suited for the physical characteristics of the shoreline. For example, the southeastern tip of Alamitos Peninsula is characterized by a narrow beach that currently experiences significant seasonal erosion and may not be wide enough to support a natural dune. Alternative options (e.g., a hybrid dune/revetment feature and sand management strategies to keep sand in place) will be considered for this location.</p>
FLD-9	Inventory and flood-proof vulnerable sewer pump stations	<p>One of the City's priorities in the coming years will be enhancing the adaptive capacity of its wastewater infrastructure to increase the system's resilience to flood damage. Many of the City's pump stations are located in or near areas at risk of flood exposure and power outages, such as Belmont Shore and Naples, and areas around the Shoreline Marina in downtown. Pump stations rely on an uninterrupted power supply to maintain operation. A power failure may cause sewage overflows and backups may result. Because the likelihood of flooding will increase over time with sea level rise, the City will implement protective measures through capital projects to reduce flood damage for pump stations identified as vulnerable to future flood conditions.</p> <p>As an initial step, the City will perform a detailed inventory of all pump stations identified as vulnerable to future flooding. The inventory will include updated information for critical electrical</p>

		<p>and mechanical components (e.g., elevation, condition, age) and entryway elevations that could serve as a flood pathway. For pump stations identified as vulnerable to flooding, the City will implement protective measures (such as floodproofing techniques and adding emergency generators to ensure uninterrupted power) through capital projects to reduce flood damage for pump stations identified as vulnerable to future flood conditions.</p> <p>Flood adaptation strategies are likely to vary for each pump station, depending on local conditions (e.g., space constraints, cost-effectiveness, station criticality, projected flood depth). Potential floodproofing strategies may include the following: elevating pump housing entryways, sealing the building and entryways to projected flood depth, elevating electrical equipment, or replacing an existing pump with a submersible pump. All vulnerable pump stations should also be equipped with a flood-proof backup generator to maintain operability even during storm-induced power outages. If floodproofing techniques are not possible due to the configuration or location of components, the entire pump station may need to be relocated.</p>
<p>FLD-10</p>	<p>Relocate/ elevate critical infrastructure</p>	<p>To maintain essential assets and services for the economy, society, and health of the public, the City will identify critical assets vulnerable to sea level rise and either relocate them or incorporate protective adaptation measures to ensure assets can continue to maintain their functionality. The Ocean Protection Council’s March 2018 State of California Sea Level Rise Guidance recommended consideration of the H++ scenario, subsequent studies on urban/riverine flooding recommended by the CAAP, and other identified relevant emerging information will be used to assess each facility’s exposure to flooding, including the expected timing of flood risk. For example, facilities such as the fire stations in the Harbor District and in Belmont Shore and police stations in West Long Beach that need to remain in operation during or immediately following a flood event may be flood-proofed using a temporary barrier that is deployed prior to the storm event to provide protection of the facility during the storm. Other facilities such as Naples Bayside Academy and Charles F Kettering Elementary may also incorporate barriers, consider elevating or relocating the school, improve site stormwater drainage capacity, or raise electrical equipment in anticipation of future exposure. In cases where it is not feasible to relocate critical facilities outside of the flood vulnerability area, the City will prioritize regrading facility access roads so that they are above the projected flood elevation. As an added precaution, all critical facilities located in areas vulnerable to future flooding will be required to complete a continuity plan that describes appropriate design interventions necessary to maintain operation during or after flood events.</p>

<p>FLD-11</p>	<p>Elevate riverine levees</p>	<p>Based on the results of FLD-07 (a study of increased watershed flooding due to climate change), portions of existing levees adjacent to the City’s channels and rivers (Los Angeles River, Los Cerritos Channel, and San Gabriel River) may need to be elevated or modified to provide enhanced flood protection. Consequences assessed should include the number of residents and businesses, as well as critical facilities and transportation assets within each flood path.</p> <p>Multipurpose infrastructure can also improve the urban ecosystem and enhance living conditions for local communities. Complementary riverine modification projects may also include channel widening or watershed restoration, which would likely further enhance habitats and recreation co-benefits.</p>
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MITIGATION ACTIONS

This section provides additional context for each of the mitigation actions found in Chapter 6.

BUILDING AND ENERGY ACTIONS

Action Number	Action Title	Additional Context
BE-1	Provide access to renewably generated electricity	Reducing electricity-related emissions is a primary strategy for achievement of the State’s GHG targets, and is implemented through California’s Renewables Portfolio Strategy (RPS). An option available for reducing electricity-related emissions is joining the local CCA program’s CPA, which consists of Los Angeles and Ventura Counties and numerous other cities. Community Choice Aggregates purchase clean power for members, while traditional utilities, such as SCE, deliver it. Similar to SCE’s Green Rate, members have tiered rate options based on their desired share of renewable energy; however, data show that CCAs have much higher rates of participation in clean electricity usage, since clean electricity is set as the default. In addition to utility-scale options, Action BE-2 discusses building-scale solar energy development and Action BE-3 promotes community solar.
BE-2	Increase use of solar power	<p>Solar power is the conversion of energy from sunlight into electricity. It offers a renewable form of power that is plentiful, particularly in Southern California.</p> <p>Solar power technology has been a key aspect of the City’s transition toward cleaner energy. The Civic Center produces its own renewable energy with rooftop photovoltaic panels that can generate 930 kWh/yr. In 2008, the Long Beach Airport installed six solar trees that track sun movement to produce electricity, generating 15,000 kWh/yr. A citywide solar power purchase agreement will facilitate solar installation of 5 MW at 10 City-owned facilities.</p>
BE-3	Promote community solar and microgrids	<p>In addition to the utility-scale clean electricity options described in Action BE-1, the City can also facilitate development of local solar energy systems through community solar and microgrid projects. Customers contract directly with the developers for their desired solar energy subscription amount, and SCE applies a bill credit for its share of the project’s monthly output. In addition to partnering with SCE to increase participation in its community solar program, the City can also promote participation through information sharing and sign-up drives at City-sponsored events to collect the contact information of interested residents on behalf of the solar developers. The City can work directly with solar developers to identify local opportunity sites and remove permitting barriers within the City’s control.</p> <p>Based on the results of the Port microgrid project, the City will analyze opportunities for other microgrid systems in Long Beach. The analysis will consider the location of existing and planned</p>

		renewable energy systems and critical facilities that require power during emergencies, such as hospitals. The City will also explore development of community resilience hubs (community centers), where solar and battery storage can be installed to ensure neighborhood residents have a location where they can access electricity during power outages or other emergencies.
BE-4	Develop a residential and commercial energy assessment and benchmarking program	<p>Beginning in June of 2019, under AB 802 California began requiring all commercial and multifamily buildings over 50,000 square feet to perform energy benchmarking. Benchmarking will allow for the comparison of energy performance of a single building over time, relative to similar buildings or to a specific energy code. This can be used effectively to identify opportunities to improve energy efficiency. Some cities such as Berkeley have established energy assessment and benchmarking programs that go beyond AB 802, combining annual energy benchmarking with regular energy assessments for larger buildings and requiring regular energy assessments for smaller buildings and homes. Improving building energy efficiency can reduce utility costs for residents and businesses, and can minimize the size requirements for on-site renewable energy systems. Energy assessments can help homeowners, property managers, and business owners understand which upgrades will provide the greatest energy savings and what payback period to expect. If sufficient GHG reductions are not being achieved from combined CAAP actions, the City will develop a mandatory retrocommissioning ordinance designed to fill the emissions reduction gap.</p> <p>Opportunities to leverage existing resources and partnerships into the program will be evaluated and integrated into the program, such as the Office of Sustainability's Residential Direct Install Program for disadvantaged communities, which will include home energy assessments performed by City-approved HERS raters. The City will partner with the Pacific Gateway Workforce Innovation Network and other related parties to increase the number of certified HERS raters in the community and to expand local green job development opportunities.</p>
BE-5	Provide access to energy efficiency financing, rebates, and incentives for building owners	Residents and businesses in Long Beach have access to a variety of rebates and other funding sources to help offset upfront costs for building energy efficiency improvements. SCE and Energy Upgrade California provide rebates for energy-efficient appliances, insulation, smart thermostats, and more. When funding was available, the City's Energy Resources Department provided residential customers with information and assistance to access energy rebates when performing whole-house energy

		conservation projects. SoCalREN provides technical assistance and financing options to single-family, multifamily, and commercial buildings. PACE financing is also available for property owners to make permanent upgrades for building energy and water efficiency or to install renewable energy systems and repay improvement costs as an assessment on their property tax bill.
BE-5	Provide access to energy efficiency financing, rebates, and incentives for building owners	Residents and businesses in Long Beach have access to a variety of rebates and other funding sources to help offset upfront costs for building energy efficiency improvements. SCE and Energy Upgrade California provide rebates for energy-efficient appliances, insulation, smart thermostats, and more. When funding was available, the City's Energy Resources Department provided residential customers with information and assistance to access energy rebates when performing whole-house energy conservation projects. SoCalREN provides technical assistance and financing options to single-family, multifamily, and commercial buildings. PACE financing is also available for property owners to make permanent upgrades for building energy and water efficiency or to install renewable energy systems and repay improvement costs as an assessment on their property tax bill.
BE-6	Perform municipal energy and water audits	Local governments are not required to increase energy efficiency in municipal buildings, but efforts to do so will help California to achieve its emissions reduction goals and achieve cost savings. The City has partnered with SCE and SoCalREN, a service of the County of Los Angeles, to complete high-level energy audits and comparative energy analyses of City facilities. The City's overarching goal for these efforts is to identify and prioritize energy efficiency improvements.
BE-7	Update building codes to incentivize electric new residential and commercial buildings	<p>Moving away from natural gas is critical because it is primarily made up of methane, a super pollutant that is 84 times more effective at trapping heat in the atmosphere than CO2 over the short term. Cooking with natural gas has been shown to lead to severe indoor air quality degradation that has strong negative health impacts.</p> <p>Beginning in 2020, under the California Building Energy Efficiency Standards, new single-family and small multifamily buildings will be required to meet zero net energy standards. In 2030, this requirement will be extended to commercial buildings and mid- and high-rise residential buildings. The City will evaluate building codes to incentivize electric new residential and commercial buildings. If sufficient GHG reductions are not being achieved from combined CAAP actions, the City will develop a mandatory building reach code designed to fill the emissions reduction gap.</p>

BE-8	Implement measures to reduce emissions related to oil and gas extraction	<p>Short-term measures for reducing emissions related to oil and gas extraction, as outlined in the CAAP Oil and Gas Technical Memorandum, are critical to reducing the City’s overall GHG emissions profile. In 2015, 13.3 million barrels of crude oil and 5.1 million MCF (thousand) of natural gas were extracted in Long Beach. This resulted in an estimated 8.3 million metric tons of CO₂e in life cycle emissions, which is effectively 2.7 times greater than the City’s 2015 production-based inventory. Approximately 91 percent of these emissions occur downstream and midstream as a result of refining and transporting to consumers and end users of fuel, while the remaining 9 percent consists of upstream emissions associated with extraction (5 percent) and natural gas life cycle emissions (4 percent). It is estimated that 99 percent of the natural gas produced in Long Beach is combusted, and 1 percent escapes as fugitive emissions through leakage.</p> <p>In addition, the CAAP Oil and Gas Technical Memorandum contains a number of the long-term actions that are addressed in part through the existing mitigation actions included in this CAAP. These are intended to put Long Beach on a path to reduce and eventually eliminate oil and gas consumption in the city. They include transportation electrification, building energy use reduction and increased energy efficiency, and City advocacy for policies and regulations that reduce oil and gas consumption beyond Long Beach.</p>
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TRANSPORTATION ACTIONS

Action Number	Action Title	Additional Context
T-1	Increase the frequency, speed, connectivity, and safety of transit options	<p>In addition to evaluating opportunities within its own service area, the City will work with Long Beach Transit to explore options to improve and expand regional connector routes to key destinations. Examples of regional connector routes from Long Beach to key destinations include: the temporary Metro 860 express shuttle from Downtown Long Beach to Downtown Los Angeles, the Long Beach Transit/UCLA Westwood Commuter Shuttle, the LAX Flyway, and FlixBus/Greyhound buses to Las Vegas, San Francisco, and San Diego. The City will also collaborate on STAR's Future Emerging Mobility Zones, where on-demand service using smaller vehicles serves the needs of customers and can prioritize the disabled and those who currently use the "Dial-A-Lift" access services. Mobility zones are planned to be located near the Del Amo and Artesia Blue Line Stations, around Bellflower and Lakewood, and in the vicinity of Long Beach Towne Center and California State University, Long Beach.</p> <p>Identification and implementation of customer safety enhancements, done alongside increasing frequency and connectivity of transit options, will be important, especially since many Long Beach survey respondents identified not feeling safe on transit as a barrier to their ridership. Safety improvements could include lighting at stops, bus video monitors, and signage that provides riders with emergency contact and "what to do" information. In addition, the presence of trained social workers on public transit lines is one way to support the homeless population and reduce minor crime violations.</p>
T-2	Expand and improve pedestrian infrastructure citywide	<p>The City has taken many steps to improve pedestrian infrastructure. In 2013, it approved the General Plan's Mobility Element; in 2016, it approved the Downtown and TOD Pedestrian Master Plan; and in 2017, it approved the CX3 Pedestrian Plan. The City also worked with Metro to produce the Blue Line First/Last Mile: A Community-Based Process and Plan, which was adopted in 2018. All of these plans are appendices to the Mobility Element. While three of these plans focus on specific areas of Long Beach, the City will take a more comprehensive approach and develop a citywide Pedestrian Master Plan that incorporates street design standards from each plan.</p> <p>In addition, pedestrian improvements within parks also play an important role in creating a complete pedestrian network and ensuring that all Long Beach residents have access to high-quality park space within a 10-minute walk.</p>

T-3	Increase bikeway infrastructure citywide	<p>The City of Long Beach has taken many steps to improve its bicycle and e-scooter infrastructure. In 2017, the City adopted its Bicycle Master Plan as an appendix to the General Plan Mobility Element. The plan outlines the City's efforts to expand its 141 miles of existing bikeways, establish and expand its bike share program, and increase bicycle parking across the city. The success of these efforts has been noticed, as Long Beach has been recognized in past years as one of the most bike-friendly cities in the U.S. With the rise of e-scooters since 2018, the City has worked extensively with e-scooter companies to increase mobility for short-distance travel.</p>
T-4	Implement the Port of Long Beach Clean Trucks Program	<p>As detailed in the San Pedro Bay Ports' 2017 Clean Air Action Plan Update, the Ports had never undertaken a program that was so transformational to a sector of the port industry; however, numerous challenges arose with implementing the Clean Trucks Program. There were many concerns with the ability of the trucking sector to take on the costs of upgrading its equipment and uncertainty as to the availability of enough clean trucks to meet the operational needs of the Ports.</p> <p>Drayage is a low-margin industry and many of the truck owners were not well positioned to invest in newer, more expensive trucks. The high cost of new technology is beyond what most drivers can afford. During the previous Clean Trucks Program, a widespread drayage industry practice was for licensed motor carriers to purchase the trucks and lease them to drivers, with lease deductions taken directly from the payments to the drivers. Some have argued that this practice was highly successful for achieving the rapid replacement of trucks. However, numerous drivers have complained, that these expenses and deductions left little remaining to cover living expenses.</p> <p>It is critical that the drivers, the motor carrier companies, the Ports, the goods movement industry, cargo owners, agencies, and legislators all work together on solutions to address this problem so that transitioning to a sustainable cleaner truck fleet and drayage system does not place an undue burden on any particular party. In March 2020, the commissioners of both of the San Pedro Bay Ports approved a \$20 fee per 40-foot loaded shipping container to be paid by cargo owners, including retailers and manufacturers, and agreed that the fees would go into a fund to help truckers switch to cleaner vehicles.</p>
T-5	Develop an Electric Vehicle Infrastructure Master Plan	<p>The City can facilitate development of EV charging infrastructure to further support broad adoption of this technology. As a first step, Long Beach Sustainability recently received a SCAG planning grant to develop an EV study. After an initial study of existing conditions,</p>

		<p>the SCAG grant will deliver a plan that provides Long Beach-specific guidelines for EV infrastructure deployment after the implementation of an outreach and marketing strategy to engage the community in plan development. It will address multifamily dwellings, workplaces, fleets, commercial and public sites, and fast charging stations in strategic locations. The Plan will also identify policy recommendations for prioritized locations for and quantity of charging infrastructure, needed investment, and a timeline for deployment.</p> <p>Implementation of this action can also include the development of EV car shares at affordable housing sites or a broader EV car share pilot program with incentives for low-income participants. The Cities of Los Angeles and Sacramento implemented similar programs with cap-and-trade grant funding. This would allow all members of the community to share in the benefits of improved air quality from increased EV use.</p>
T-8	Increase density and the mixing of land uses	<p>According to the U.S. Census American Community Survey (2018), 75 percent of Long Beach residents drive alone, 9 percent carpool, 6 percent use public transit, and 2.5 percent walk to get to and from work. Seventy-five percent of the respondents to the CAAP survey also indicated that driving is their dominant transportation mode for all trips, but also indicated a strong preference for walkable, bikeable neighborhoods. Promoting sustainable neighborhoods encourages residents to access stores, healthy foods, and community services without a car. Inherently, sustainable neighborhoods mitigate GHG emissions by making residents less dependent on fossil-fueled vehicles and by lowering overall VMT. Moreover, state regulations such as SB 375 push regional and local jurisdictions to strategically implement regional allocation of housing needs and regional transportation planning coordinated together to further reduce GHG emissions.</p> <p>Reduced and shared parking offer a number of potentially important benefits, including a reduction in commercial and housing development costs, which can lead to more affordable housing options, increased walkability, and increased development near transit.</p>
T-9	Integrate SB 743 planning with the CAAP process	<p>Research studies funded by SCAG, Metro, and CARB have explored various VMT mitigation strategies to determine which strategies are most effective.</p>

WASTE ACTIONS

Action Number	Action Title	Additional Context
W-1	Ensure compliance with state law requirements for multifamily and commercial property recycling programs	The Public Works Department - Environmental Services Bureau provides recycling collection as part of the refuse services it provides to all single-family residential accounts in the city and to the multifamily and commercial accounts the bureau services. The City's private waste haulers provide recycling collection to customers that sign up for the service, and they communicate with impacted customers about the requirements of AB 341 and how they can achieve compliance. The City also provides information on the Long Beach Recycles website about AB 341 and tips for compliance. In accordance with state regulations, the City and private haulers will continue to conduct commercial recycling outreach to provide technical assistance on establishing recycling programs for properties that are out of compliance.
W-3	Partner with private waste haulers to expand organic waste collection community-wide	<p>As described in Action W-2, diverting organic waste from landfills is an important strategy in achieving California's GHG emissions reduction target. Senate Bill 1383 defines specific targets for organic diversion and outlines the State's implementation strategy. As part of this strategy, California enacted AB 1826 to require businesses that exceed solid waste disposal thresholds to recycle their organic waste. As of January 1, 2019, businesses producing 4 cubic yards or more of solid waste per week are required to arrange for organic waste recycling services for food waste, green waste, landscape and pruning waste, nonhazardous wood waste, and food-soiled paper. AB 1826 also set green waste disposal thresholds for multifamily properties (five or more units). As of April 1, 2016, multifamily properties that generate 8 or more cubic yards of green waste (e.g., landscaping, pruning, wood waste) must implement organic waste diversion strategies.</p> <p>Franchise waste haulers provide collection services to many of the city's multifamily and commercial properties, while the City provides waste collection services to the remaining properties. In accordance with AB 1826, the City will continue to provide information on the Long Beach Recycles website to assist businesses and multifamily property managers in complying with the law's requirements.</p>
W-4	Identify organic waste management options	Actions W-1 and W-2 will result in increased organic waste collection and management in the future. The City will collaborate with other agencies, such as Los Angeles County, to identify potential locations for organic waste treatment facilities to handle future waste volumes and avoid the use of landfills due to capacity issues. The City will then work to support and share this information with potential parties willing to go through the permitting process. If a

		<p>facility is identified and ultimately established in Long Beach, the City will work to update waste hauler contracts and ensure that organic waste is hauled to locally sited facilities, which will help reduce transportation emissions.</p> <p>Currently, the City identifies organic waste collection requirements for its franchise waste haulers to ensure a high-quality level of service community-wide. These requirements include providing information to the City on the collection of organic waste. To support implementation monitoring, the City will continue to work with its franchise waste haulers to measure and report the amount of organic waste collected and to track its treatment by method or facility.</p>
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ⁱ<https://ufmptoolkit.net/wp-content/uploads/2016/03/LongBeachUFMP.pdf>

ⁱⁱhttp://www.lbds.info/neighborhood_services/neighborhood_improvement/urban_forestry_program.asp

ⁱⁱⁱKPCC 2015. "SoCal Edison says mismanagement led to Long Beach outages."