PASADENA

CLIMATE ACTION PLAN

March 5, 2018

ACKNOWLEDGEMENTS

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CITY HALL

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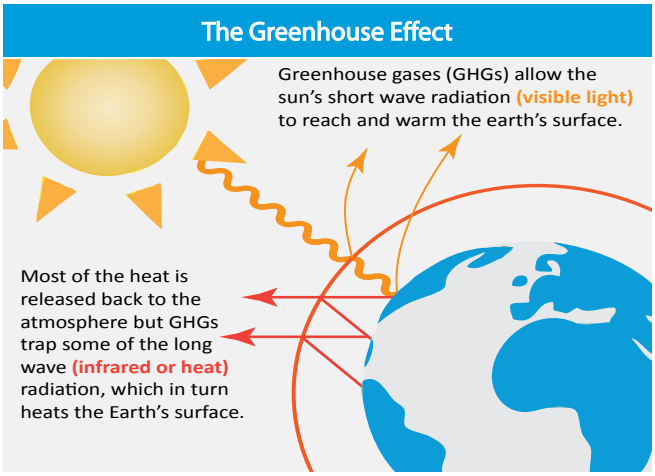
Built in 1927, Pasadena City Hall was retrofitted and achieved Leadership in Energy and Environmental Design (LEED) Gold Accreditation in 2008, a noteworthy achievement for a historic structure.

Chapter 1

PLANNING FOR A CHANGING ENVIRONMENT

The global climate is changing, due in part, to increases in concentrated emissions of greenhouse gases (GHG), such as carbon dioxide, over the last century. These gases play a critical role in the Earth's changing climate as they trap heat, resulting in a warming of the atmosphere. Heat trapped at the Earth's surface is known as the "greenhouse effect" because the gases act much like the windows in a greenhouse, retaining the refracted heat created when light enters the atmosphere.

Human activities, such as burning fossil fuel to generate electricity and industrial processes, have increased the amount of GHGs in the atmosphere, intensifying the greenhouse effect and changing the climate. It is projected that the Earth's temperature will continue to rise over the next hundred years.[1] These changes in temperature can translate to potentially hazardous shifts in climate and weather. Many places, including Pasadena, have seen changes in weather, with associated increases in droughts and intensified rainfall, as well as more frequent and severe heat waves. As the changes become more pronounced in the coming decades, they will most likely present local challenges to human health and welfare, the economy, and ecosystems.[2]



Source: February 2017 http://www.dec.ny.gov/energy/76533.html

Climate change presents Pasadena with both complex challenges and tremendous opportunities. The City of Pasadena is committed to creating a vision for a more sustainable community. By making choices to reduce its GHG emissions and preparing for the changes that are underway, Pasadena can reduce the risks from climate change.

[1] U.S. Environmental Protection Agency (EPA), Climate Change: Basic Information, January 19, 2017. Available at https://19january2017snapshot.epa.gov/climatechange/climate-change-basic-information_html

[2] California Emergency Management Agency and California Natural Resources Agency (CEMA/CNRA), Adaptation Planning Guide, 2012. Available at http://resources.ca.gov/climate/safeguarding/local-action/

PASADENA'S CLIMATE ACTION PLAN

Pasadena recognizes the important role cities play in addressing climate change and has prepared a climate action plan (CAP) to reduce its fair share of GHG emissions and to adapt to the potential consequences of a changing environment. In 2006, California passed the Global Warming Solutions Act, Assembly Bill (AB) 32, setting a state-wide target to reduce GHG emissions to 1990 levels by 2020. In 2016, the enactment of Senate Bill (SB) 32 extended this commitment by raising the emissions reduction target to 40 percent below 1990 levels by 2030. Overall, the state-wide target is to reduce emissions 80 percent below 1990 levels by 2050 (as established in Executive Order [EO] S-3-05). Figure 1.1 illustrates the state-wide GHG emissions reduction targets for the years 2020, 2030, and 2050.

The Pasadena CAP is the latest initiative in the City's ongoing commitment to confronting the issue of climate change. The purpose of the CAP is to analyze GHG emissions at a programmatic-level, outline a strategy to reduce and mitigate municipal and community-wide GHG emissions, demonstrate Pasadena's commitment to achieving the state-wide emissions reduction targets, and serve as a qualified GHG reduction plan consistent with the California Environmental Quality Act (CEQA) Guidelines Section 15183.5. The timeframe for the CAP extends from the date of adoption through the year 2035, consistent with the horizon year of Pasadena's 2015 General Plan Land Use Element.

A climate action plan is a tool that many cities throughout California are developing to help reduce their share of GHG emissions.

The CAP includes the following components:

- Summary of existing state and local initiatives addressing climate change;
- Community-wide GHG inventory and emissions forecasts;
- GHG reduction goals, measures, and actions;
- Implementation and monitoring of the plan; and
- Adaptation strategies and climate change preparedness.

Purpose of the Pasadena Climate Action Plan

1

Analyze GHG emissions at a programmatic level

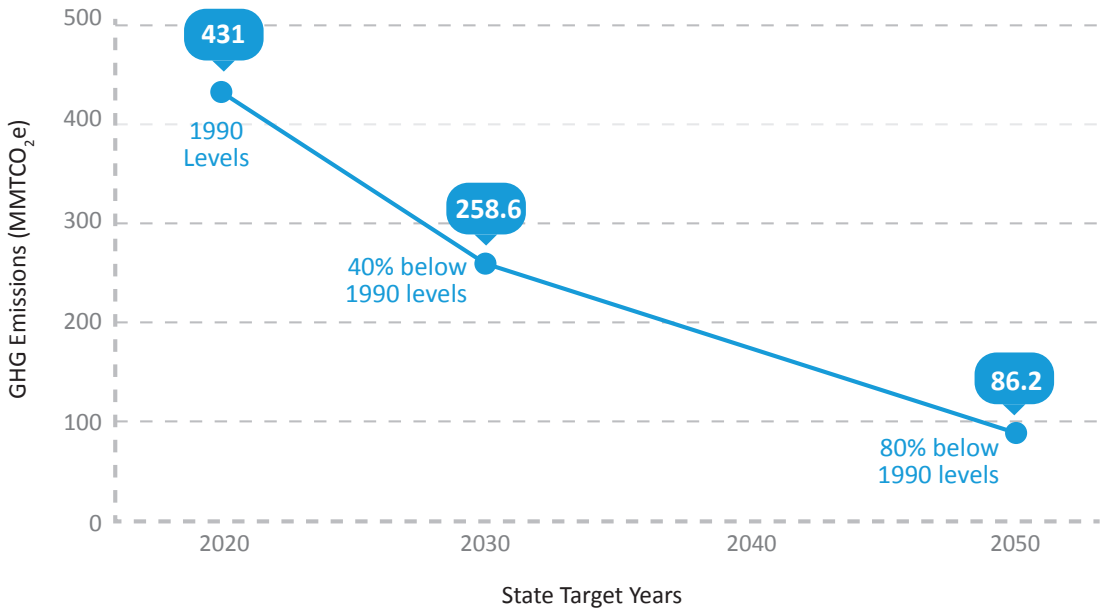
2

Provide a roadmap to reduce Pasadena's carbon footprint

3

Demonstrate Pasadena's commitment towards achieving statewide GHG emissions targets

Figure 1.1: State-wide GHG Emission Targets



Source: CARB, California 1990 GHG Emissions Level and 2020 Limit, March 2017. https://www.arb.ca.gov/cc/inventory/1990level/1990level.htm

REGULATORY CONTEXT

As the impacts of climate change are being recognized, many strategies that address climate change have emerged at the international, national, and state levels. This section provides an overview of the regulatory context at the state level relative to Pasadena's actions toward reducing GHG emissions.

State Regulatory Guidance on Climate Change

California remains a global leader in the effort to reduce GHG emissions and combat climate change through its mitigation and adaptation strategies.[3] With the passage of AB 32 in 2006, California became the first state in the United States (U.S.) to mandate GHG emission reductions across its entire economy. To support AB 32, California has enacted legislation, regulations, and executive orders that put it on course to achieve robust emission reductions and address the impacts of a changing climate. The following is a summary of executive and legislative actions most relevant to the CAP. Figure 1.2 on page 17 offers a timeline for implementation and fulfillment of the state legislation and local plans and policies.

Senate Bill 1078

In 2002, SB 1078, established the California Renewables Portfolio Standards (RPS) Program and was accelerated in 2006 by SB 107, requiring that 20 percent of electricity retail sales be served by renewable energy sources by 2010.

Assembly Bill 1493

In 2002, AB 1493, also known as the Pavley Law, directed the California Air Resources Board (CARB) to establish regulations to reduce GHG emissions from passenger vehicles. CARB approved the first set of regulations to reduce GHG emissions from passenger vehicles in 2004, with the regulations to take effect in 2009.

[3] California Energy Commission, California Climate Change: Climate Change Strategy, April 4, 2017. www.climatechange.gov.

Executive Order S-3-05

In 2005, EO S-3-05 was signed, establishing state-wide GHG emissions reduction targets for the years 2020 and 2050. The executive order calls for the reduction of GHG emissions in California to 1990 levels by 2020 and 80 percent below 1990 levels by 2050.

Assembly Bill 32

In 2006, with the passage of AB 32, the California Global Warming Solutions Act of 2006, California became the first state in the U.S. to mandate GHG emissions reductions across all industries. This landmark legislation requires the state to reduce GHG emissions to 1990 levels by 2020. It also directs CARB to develop and implement a scoping plan and regulations to meet the 2020 target. In 2008, CARB adopted the Climate Change Scoping Plan (Scoping Plan), which establishes a variety of programs, regulations, and incentives to reduce GHG emissions across the state. This initial Scoping Plan includes a recommendation for cities to establish a GHG emission reduction goal to coincide with the state-wide limit. It also includes a requirement for utility companies to provide 33 percent of their generated electricity from renewable sources, as established under EO S-14-08.

Executive Order S-1-07

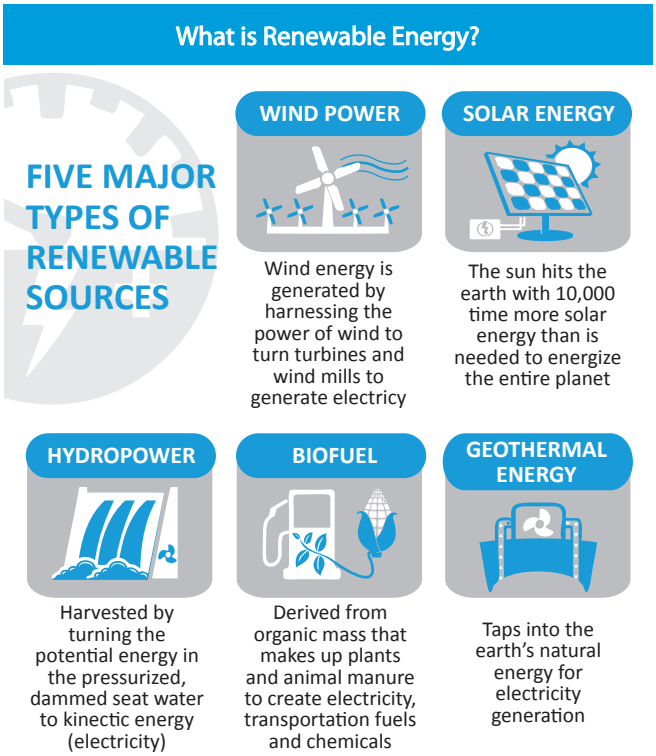
Also known as the Low Carbon Fuel Standard, EO S-1-07, issued in 2007, established a state-wide goal that requires fuel providers to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020.

Senate Bill 97

In 2007, SB 97 was signed, acknowledging that climate change is an environmental issue that requires analysis in CEQA documents. In 2010, CARB adopted amendments to California's 2009 CEQA Guidelines (Guidelines) for the feasible mitigation of GHG emissions. The adopted Guidelines give lead agencies (i.e., municipal governments) the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHG emissions and climate change impacts. It also allows lead agencies to streamline the analysis of GHG emissions on a project level using a programmatic GHG emissions reduction plan that meets certain criteria.

Senate Bill 375

SB 375, the Sustainable Communities and Climate Protection Act, was signed in 2008, establishing regional GHG emission reduction targets for passenger vehicle use. Under SB 375, CARB established targets for 2020 and



Renewable energy refers to resources that are replenished in a relatively short period of time. Unlike fossil fuels, which are the primary source of human-generated GHG emissions, renewable sources of energy do not directly emit GHGs.

Sources: Institute of Energy Research, US Energy of Information Administration, and US Environmental Protection Agency, Website: www.atoincom.biz/

2035 for each region covered by one of the metropolitan planning organizations. Each major metropolitan planning organization must prepare a sustainable communities strategy (SCS) as an integral part of its regional transportation plan. The City of Pasadena is within the Southern California Association of Governments (SCAG) region.

California Green Building Code

The California Green Building Standards Code (CALGreen) is Part 11 of the California Building Standards Code or Title 24 and is the first statewide "green" building code in the US. The purpose of CALGreen is to improve public health, safety, and general welfare by enhancing the design and construction of buildings through the use of building concepts having a reduced negative impact or positive environmental impact and encouraging sustainable construction practices. The first CALGreen Code was adopted in 2009 and has been updated in 2013 and 2016.

Senate Bill X7-7

In 2009, SB X7-7 was signed, also known as the Water Conservation Act, requires all water suppliers to increase water use efficiency. This legislation sets an overall goal of reducing per capita urban water use by 20 percent by 2020.

Senate Bill 2X

In 2011, SB 2X was signed, requiring California energy providers to buy (or generate) 33 percent of their electricity from renewable energy sources by 2020.

Assembly Bill 341

AB 341 directed the California Department of Resources Recycling and Recovery (CalRecycle) to develop and adopt regulations for mandatory commercial recycling. As of July 2012, businesses are required to recycle and jurisdictions must implement a program that includes education, outreach, and monitoring. AB 341 also set a state-wide goal of 75 percent waste diversion by the year 2020.

Assembly Bill 32 Scoping Plan Update

In 2014, CARB approved the first update to the Scoping Plan. This update defines CARB's climate change priorities and sets the groundwork to reach the post-2020 targets set forth in EO S-3-05. The update highlights California's progress toward meeting the near-term 2020 GHG emissions reduction target, defined in the original Scoping Plan. It also evaluates how to align California's longer-term GHG reduction strategies with other state-wide policy priorities, such as water, waste, natural resources, clean energy, transportation, and land use.

Senate Bill 350

SB 350, the Clean Energy and Pollution Reduction Act of 2015, was approved in 2015. SB 350 has two objectives: to increase the procurement of electricity from renewable sources from 33 percent to 50 percent by 2030, and to double the energy efficiency of electricity and natural gas end users through energy efficiency and conservation.

Executive Order B-30-15

In 2015, EO B-30-15 was signed, establishing an interim GHG emissions reduction target to reduce emissions to 40 percent below 1990 levels by 2030. The EO also calls for another update to the Scoping Plan.

Senate Bill 32

SB 32 was signed in 2016, requiring CARB to develop technologically feasible and cost-effective regulations to achieve the target of 40 percent below 1990 GHG emission levels by 2030. In December 2017, CARB updated the Scoping Plan. This plan calls for GHG emission reductions at the state level that meet or exceed the state-wide emission target. It also notes that additional effort will be needed to maintain emissions reductions to meet

the 2030 and 2050 targets. Furthermore, the proposed Scoping Plan recognizes the need to reach beyond statewide policy and engage local jurisdictions to develop plans to address local conditions and provide a "fair share" contribution towards the achievement of California's GHG reduction targets.

Local Plans on Climate Change

Pasadena's steps toward sustainable practices predate the adoption of AB 32. For example, the City's 2006 Green Building Ordinance using LEED as a standard was one of the first municipal ordinances in the nation to require green building standards for new commercial development. Since then, Pasadena has taken many steps to reduce GHG emissions and promote environmentally sustainable practices. From establishing goals and policies that promote sustainable growth and greener practices to including objectives for water and energy conservation, Pasadena remains committed to becoming a sustainable and green city. The following is a summary of local policy documents that address climate change.[4]

Green City Action Plan

The Green City Action Plan was adopted in 2006 and provides a list of environmental initiatives intended to guide Pasadena towards sustainability and accelerate its environmental commitment. The framework for and goals contained in this plan follow the United Nations Urban Environmental Accords (UNUEA), which include 21 actions that address energy, waste reduction, urban design, urban nature, transportation, environmental health, and water.

Comprehensive Water Conservation Plan

The Water Conservation Plan was completed in 2009 and outlines six conservation approaches that Pasadena will pursue simultaneously to meet water conservation targets. The applicable approaches include incentives for water efficient technologies and adopting or updating ordinances that deal with sustainable water supply.

Water Integrated Resources Plan (WIRP)

The WIRP, adopted in 2011, calls for a long-term water resource strategy through 2035 and contains information on Pasadena Water and Power's (PWP) water demands, water supply, and conservation options. The plan identifies for a preferred water resource portfolio that includes aggressive water conservation and increasing local water supplies. These actions will reduce GHG emissions by reducing demand for imported water which utilize significant energy to pump water from Northern California and the Colorado River.

Intelligent Transportation System (ITS) Master Plan

In 2012, the Department of Transportation (DOT) completed the ITS Master Plan Framework Update which contains a variety of programs to implement strategies that manage traffic in the City while protecting neighborhoods and encouraging non-auto travel.

Short Range Transit Plan (SRTP)

The SRTP is intended to guide programming of transit services. It outlines future operating programs and capital projects for local transit services in Pasadena. The SRTP is a management tool to guide ongoing improvements to the City-operated local transit system. DOT developed the SRTP for the Pasadena Area Rapid Transit System (ARTS), renamed Pasadena Transit, and Pasadena Dial-A-Ride service covering fiscal year 2012 through fiscal year 2017.

Zero Waste Strategic Plan

The Zero Waste Strategic Plan was adopted in 2014 and is the beginning of a long-term, systematic effort to reduce the total amount of disposed materials originating

[4] City of Pasadena, March 2017. http://ww5.cityofpasadena.net/main/.

and generated in Pasadena; increase the quantity of recyclable and compostable materials to divert these items from landfills; support state and federal efforts to build environmental and social costs into the price of products and packaging; and require manufacturers to take back products at the end of their useful life. Pasadena has increased its diversion rate from 37 percent in 1995 to 73 percent in 2010, and has a local goal of 75 percent by 2020.

Power Integrated Resource Plan (IRP)

The PWP Power IRP is a 20 year plan for meeting forecast energy demand plus reserve capacity through a combination of supply-side and demand-side resources while meeting the objectives of environmental responsibility, reliability, and affordable cost. The Power IRP accounts for future energy demand, advances in renewable energy resources and technology, energy efficiency, conservation, and forecast changes in regulatory requirements, among other considerations.

In June 2015, PWP's 2015 Power IRP goals were adopted, and include a commitment to eliminate the use of coal-based energy by 2027 and to achieve a 60 percent reduction in GHG emissions by 2030 (based on 1990 levels). The 2015 goals further support Pasadena's renewable energy target of 40 percent by 2020, a higher target than the state-wide goal of 33 percent. Additionally, Pasadena has set a goal to reduce its energy load by more than one percent annually, one of the most aggressive energy efficiency goals in California.

General Plan

Pasadena's General Plan, a blueprint for how the city should develop over time, consists of several mandated topics called "Elements". In 2015, the General Plan Land Use and Mobility Elements were updated. In general, these Elements include broad policies that identify the overall pattern of future development, determining when, where, and what type of new growth and investment may occur. They also contain policies that encourage sustainable development and aim to conserve and reduce the consumption of resources, such as energy and water, among others.

Bicycle Transportation Action Plan

Adopted in 2015, the Bicycle Transportation Action Plan outlines educational, engagement, enforcement, evaluation, and funding strategies designed to increase bicyclist safety and make Pasadena a more bike-friendly community. The plan provides details for a network of bikeways so that every neighborhood is within a quarter mile of an effective bicycle route. It also calls for the installation of buffered lanes, cycle tracks, and bike boulevards along 10 corridors.

Urban Water Management Plan (UWMP)

The UWMP was completed in 2015 by PWP and includes an analysis of management tools and other options to maximize resources and minimize the need to import water from Northern California and the Colorado River. It also includes an analysis of total projected water use compared to water supply sources over the next 20 years, demand management measures necessary to reduce water demands, information about potential climate change vulnerabilities related to water resources, and data about the energy intensity of PWP's water system.

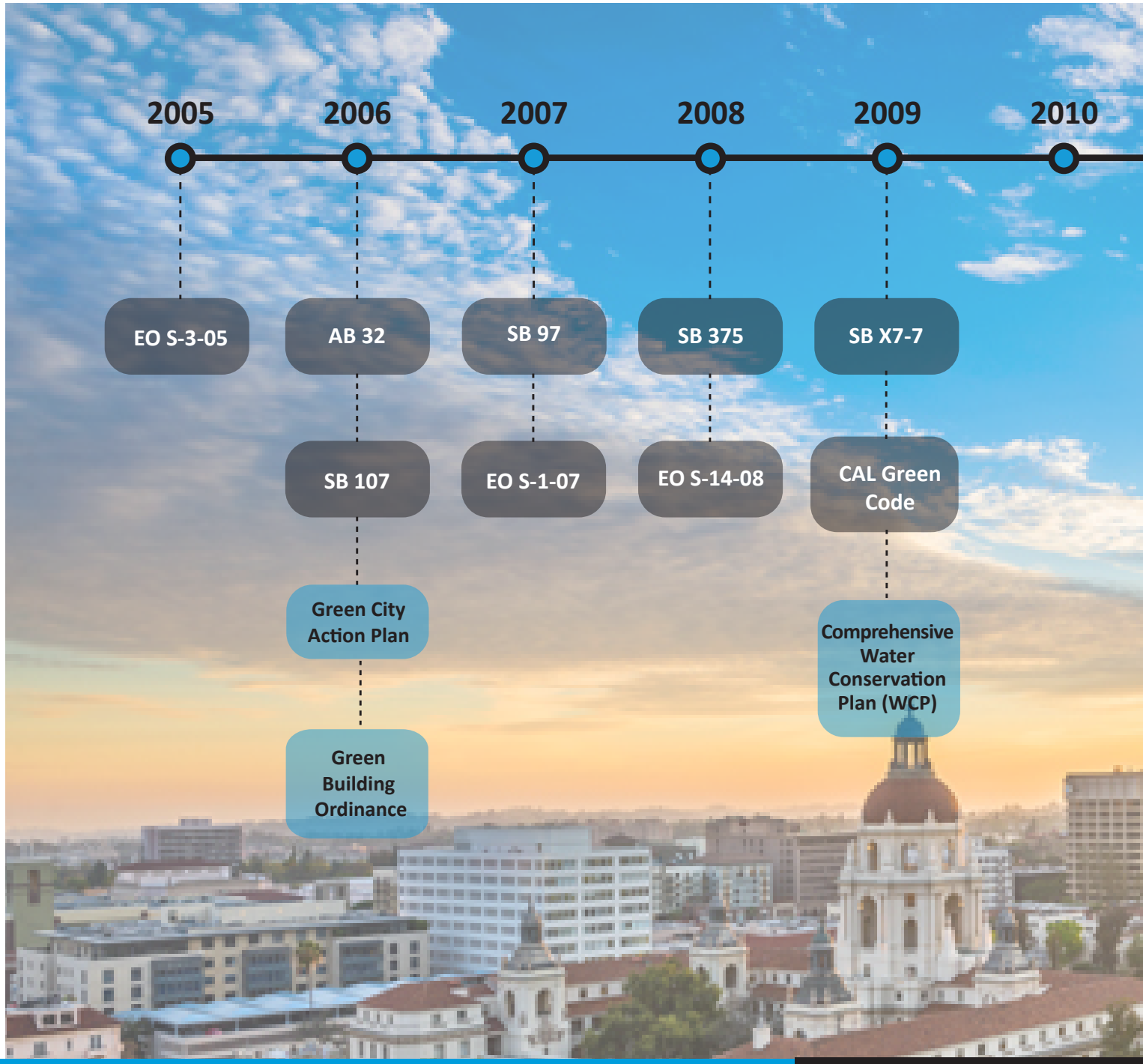
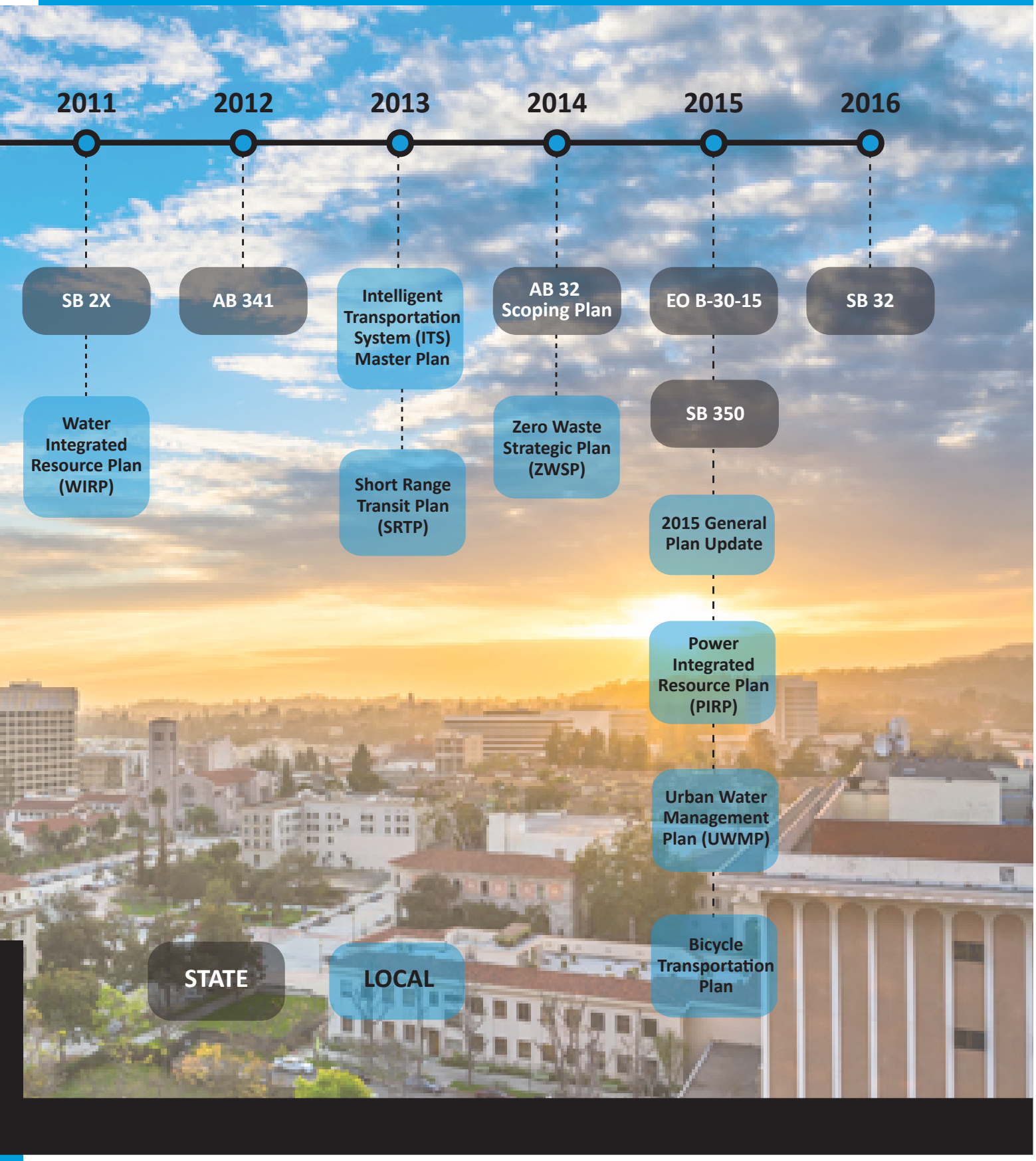


Figure 1.2:
Timeline of State Policies and Local Plans on Climate Change


2011
2012
2013
2014
2015
2016
SB 2X
AB 341
Intelligent Transportation System (ITS) Master Plan
AB 32 Scoping Plan
EO B-30-15
SB 32
Water Integrated Resource Plan (WIRP)
Short Range Transit Plan (SRTP)
Zero Waste Strategic Plan (ZWSP)
SB 350
2015 General Plan Update
Power Integrated Resource Plan (PIRP)
Urban Water Management Plan (UWMP)
Bicycle Transportation Plan
STATE
LOCAL

PLANNING AND DEVELOPMENT PROCESS

The CAP is the culmination of several years of work in Pasadena and represents past and future efforts to address climate change. In 2013, the City Council adopted the first community-wide GHG emissions inventory for the year 2009 (see Appendix A). This inventory was the initial step in understanding Pasadena's sources of emissions. Since 2013, the City has adopted several long-range plans, such as the Zero Waste Strategic Plan, the Power Integrated Resources Plan, and the Bicycle Transportation Action Plan, as discussed in the previous section. Pasadena strengthened its commitment to climate action planning with the adoption of the updated General Plan Land Use Element, requiring the City to prepare a climate action plan that would outline a strategy to reduce GHG emissions and adapt to climate change.[5]

In Fall 2015, Pasadena embarked on a process to develop a CAP and hired Rincon Consultants, Inc. to assist with the preparation of the plan. Support for development of this CAP was provided by the Strategic Growth Council Sustainable Communities Planning Grant and Incentives Program. The CAP development process included meeting with the community to provide an overview of the planned CAP, gather input on potential ways of reducing GHG emissions, and compile issues to consider in the process of developing the plan. The process also included meeting with the City of Pasadena Environmental Advisory Commission (EAC) to gather input on potential climate goals and actions the City should consider to reduce its emissions. In addition, City staff from multiple departments, including Pasadena Water and Power, Department of Transportation, Public Works, Public Health, and Planning and Community Development met periodically to discuss the CAP, focusing primarily on developing a list of recommended measures and actions for reducing emissions.

Second Public Open House at Throop Unitarian Universalist Church

COMMUNITY ENGAGEMENT OPPORTUNITIES

April 12, 2016
EAC Public Meeting

May 31, 2016
Public Open House

March 14, 2017
EAC Public Meeting

March 23, 2017
Public Open House

October 2017
Published Draft CAP and Initial Study/ Negative Declaration (30-Day Comment Period)

Anticipated Fall 2017
EAC Public Meeting
Planning Commission Public Hearing
City Council Public Hearing

[5] City of Pasadena Land Use and Mobility Elements of the General Plan, August 2015. Available at http://www.cityofpasadena.net/GeneralPlan/.

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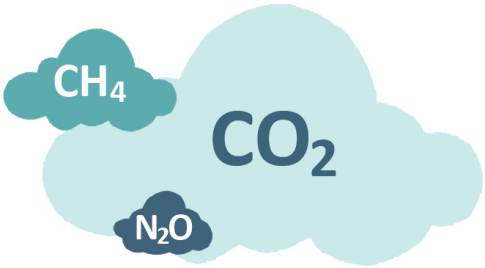
Intersection of Colorado Boulevard and Raymond Avenue in Old Pasadena

UNDERSTANDING PASADENA'S GHG EMISSIONS

GHG emissions in the atmosphere have played a critical role in the Earth's changing climate. In particular, human-activities, such as the burning of fossil fuels to generate electricity, have intensified these changes.[6] To better understand where these emissions originate and to inform the development of effective strategies and actions to reduce local emissions, the CAP includes a GHG inventory. This inventory identifies and quantifies emissions resulting from community-wide activities of residents, businesses, and municipal operations, and establishes an emissions baseline against which the City can set emissions reduction goals and measure future progress.

[6] Source: National Aeronautics and Space Administration (NASA). April 10, 2017. The consequences of climate change. https://climate.nasa.gov/effects/

What are GHG Emissions?



GHGs trap heat in the atmosphere which, in turn, heats the Earth's surface. These gases are emitted by both natural processes and human activities. The consumption of fossil fuels, such as coal, natural gas, and oil are the primary sources of those emissions. The three primary GHGs are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Source: EPA, Climate Change Indicators: GHGs, February 22, 2017. https://www.epa.gov/climate-indicators/greenhouse-gases

COMMUNITY-WIDE GHG INVENTORY

An inventory of Pasadena's community-wide GHG emissions was conducted for the year 2009 (see Appendix A). In developing the CAP, the community-wide inventory for the year 2009 was refined with updated transportation data. The refined inventory is referred to as the 2009 baseline inventory. The methods used to estimate GHG emissions for the 2009 baseline are consistent with the U.S. Community Protocol for Accounting and Reporting of GHG Emissions (see Appendix B).

The 2009 baseline inventory provides a reference point, or benchmark, from which future GHG emissions will be compared. The inventory accounts for GHG emissions in metric tons of carbon dioxide equivalent (MT CO_2e) resulting from community-wide activities from four sectors: energy, transportation, water, and solid waste. In 2009, community-wide emissions were approximately 2,044,921 MT CO_2e. This aggregate number accounts for direct emissions, such as on-site combustion of fuels and the combustion of fuel in vehicles, and indirect emissions associated with community electricity consumption, emissions from solid waste generated, and water consumed in Pasadena.

The combustion of fuel by the transportation sector contributed the largest share of emissions, accounting for approximately 1,054,901 MT CO_2e, or 52 percent of the community-wide total, as shown in Figure 2.1. Energy use from businesses and municipal operations was the second largest producer of emissions, contributing approximately 632,213 MT CO_2e, or 31 percent, while energy use from residents produced approximately 324,026 MT CO_2e, or 16 percent. The remainder of the emissions came from solid waste and water-related activities. Methane generation from the decomposition of solid waste sent to landfills resulted in approximately 15,019 MT CO_2e and electricity used to treat, transport, and pump water resulted in approximately 18,762 MT CO_2e, each representing less than one percent of the 2009 baseline total. Table 2.1 summarizes the results of the community-wide GHG inventory for the 2009 baseline.

What does it mean?

CO_2e
Carbon dioxide equivalent, is a standard unit for measuring carbon footprints.

$MTCO_2e$
Metric tons of carbon dioxide equivalent, is an international reporting standard for GHG. There are 2204.62 lbs of CO_2 in one metric ton

Carbon Footprint
The total amount of GHGs emitted into the atmosphere each year by a person, family, building, organization, or company.

Baseline Inventory
Provides a reference point to compare Pasadena's progress towards emission reduction.

Figure 2.1: Community-wide GHG Emissions by Sector (2009 Baseline)

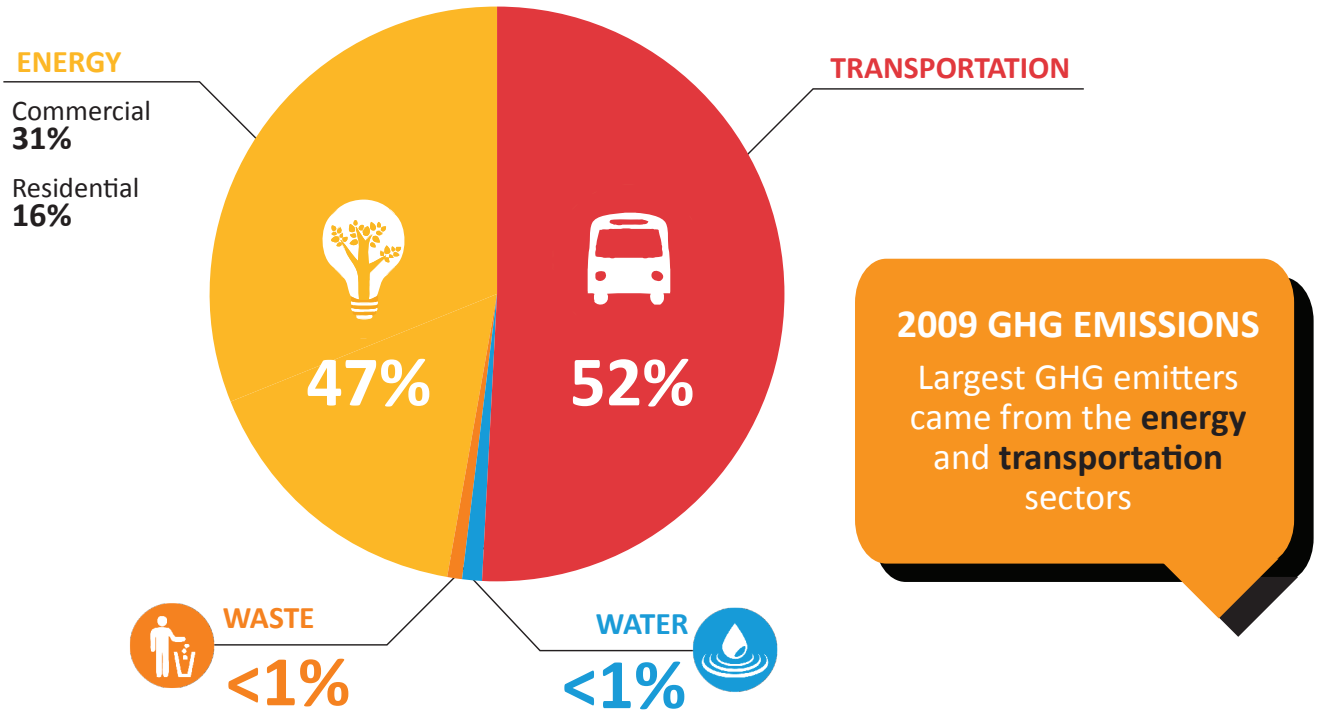
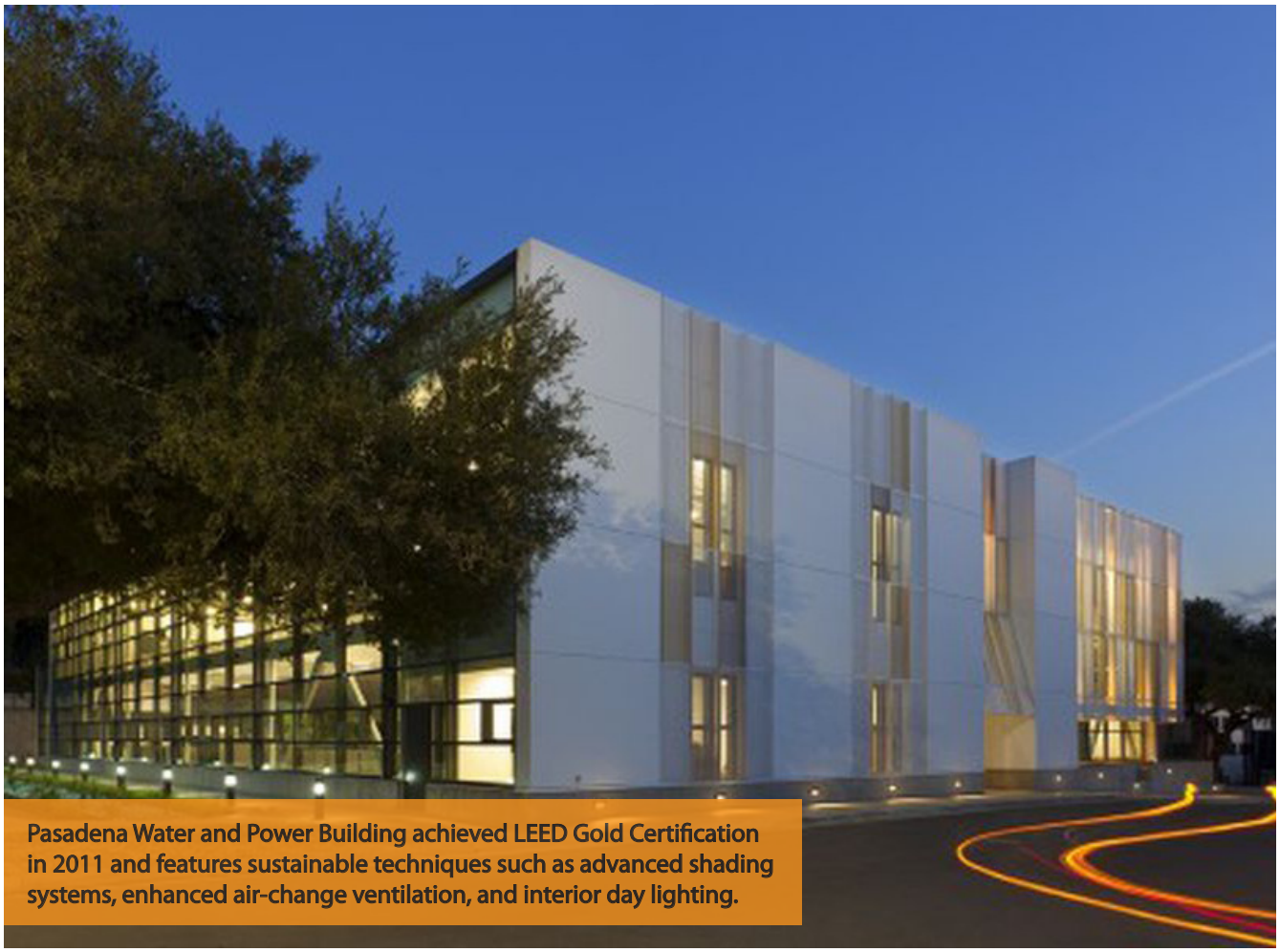


TABLE 2.1: Community-Wide GHG Inventory Results (2009 Baseline)

Sector	Primary Sources of Emissions	2009 MT CO_2e (Baseline)	% of Community-wide Total
Energy		956,239	47%
Residential Energy Use	Electricity and natural gas consumption	324,026	16%
Commercial Energy Use	Electricity and natural gas consumption	632,213	31%
Transportation	Vehicle fuel consumption	1,054,901	52%
Waste	Methane generation from the decomposition of solid waste sent to landfills	15,019	<1%
Water	Electricity used to treat, transport, and pump water consumed by residents and businesses	18,762	<1%
	Community-wide Total	2,044,921	100%



Pasadena Water and Power Building achieved LEED Gold Certification in 2011 and features sustainable techniques such as advanced shading systems, enhanced air-change ventilation, and interior day lighting.

Subset of the 2009 Baseline Inventory: Municipal Facilities and Operations

The 2009 baseline inventory also accounts for GHG emissions associated with municipal facilities and operations. These emissions are a subset of the 2009 baseline inventory. Completing a separate emissions inventory for municipal facilities and operations offers advantages for future priority setting and program implementation. Since the City has a higher degree of control over municipal activities and facilities that create GHG emissions than it does over those generated by the entire community, it can show leadership and commitment while monitoring progress against the municipal baseline inventory as emission reduction initiatives are implemented. However, since community-wide emissions make up more than 94 percent of all emissions in Pasadena, the larger community, including other public agencies, will need to play an active role in finding and implementing solutions.

Table 2.2 reflects data from the 2009 baseline inventory and shows GHG emissions resulting from municipal facilities and operations. In 2009, municipal facilities and operations resulted in approximately 121,811 MT CO_2e, or less than six percent of the community-wide total. Energy use by municipal buildings and facilities, electric power, and streetlights and traffic signals accounted for approximately 86 percent of the municipal-related emissions in Pasadena.

Figure 2.2: GHG Emissions from Municipal Facilities and Operations by Sector (2009 Baseline)

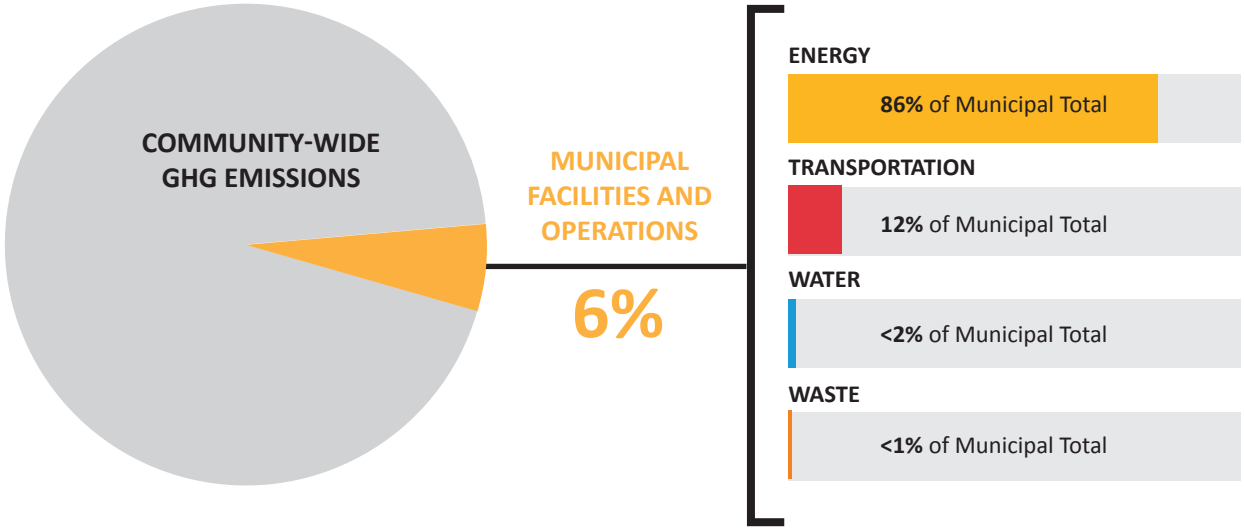


Table 2.2: GHG Emissions from Municipal Facilities and Operations by Sector (2009 Baseline)

Sector	Primary Sources of Emissions	2009 MT CO_2e (Baseline)
Energy		105,399
	Municipal Buildings and Facilities	24,027
	Electric Power	72,749
	Streetlights and Traffic Signals	8,623
Transportation		14,976
	Employee Commute	5,717
	Vehicle and Transit Fleet	5,303
	Tournament of Roses and Rose Bowl	3,956
Waste	Solid Waste	118
Water	Water Delivery	1,318
	Municipal Total	121,811

RECENT GHG EMISSIONS SNAPSHOT

As part of the 2015 General Plan Update process, the City prepared a GHG inventory for the year 2013. The 2013 inventory accounts for community-wide emissions in metric tons of carbon dioxide equivalent from four sectors: energy, transportation, solid waste, and water.[7] In developing the CAP, the 2013 inventory was refined to match the methodology of the 2009 baseline inventory to allow for a comparison of change in GHG emissions between 2009 and 2013 (see Appendix B and F).

During this period, community-wide GHG emissions decreased by approximately nine percent, as shown in Figure 2.3. The reductions in emissions came from the energy and transportation sectors. Emissions related to energy use by residents, businesses, and municipal operations decreased by approximately 151,397 MT CO_2e. Emissions related to vehicle fuel consumption also decreased by approximately 82,236 MT CO_2e.

However, emissions from the water and solid waste sectors increased during this period. Emissions related to electricity use to treat, transport, and pump water increased by approximately 36,395 MT CO_2e, despite the reductions in water consumption.[8] Changes to the emissions factors associated with the supply and delivery of water to Southern California account for the increase in water related emissions. Solid waste was the only sector that saw an increase in use, resulting in an increase in emissions by approximately 9,597 MT CO_2e.[9] Table 2.3 provides a comparison of emissions levels between the 2009 baseline and the 2013 refined inventory by sector.

Pasadena's first bike lane along Marengo Avenue

[7]The 2013 inventory provides a more accurate picture of current emissions levels and demonstrates Pasadena's progress over time. The 2013 inventory does not replace the 2009 baseline inventory, but provides additional data to inform understanding of changes in Pasadena's GHG emissions. Since the 2013 inventory is the most recent one, it is used as the basis to forecast Pasadena's future emissions levels. However, the 2009 inventory remains as the baseline for setting the city's GHG reduction goals since it can be directly tied to the state's GHG reduction goals outlined in AB32.

[8] In 2009, the City adopted a Level 1 water shortage which restricted watering. Although the water shortage was terminated in 2011, the water restriction stayed in place until 2014.

[9] During 2007 and 2009, the City was in an economic recession, which may account for the relatively lower solid waste generated emissions because during a recession, purchasing, building development, and all the activities which generate waste slow down. Therefore, the 2013 emissions related to solid waste might seem higher because it is being compared to recession influenced number for 2009.

Figure 2.3: Recent Trend of Community-wide GHG Emissions (2009-2013)

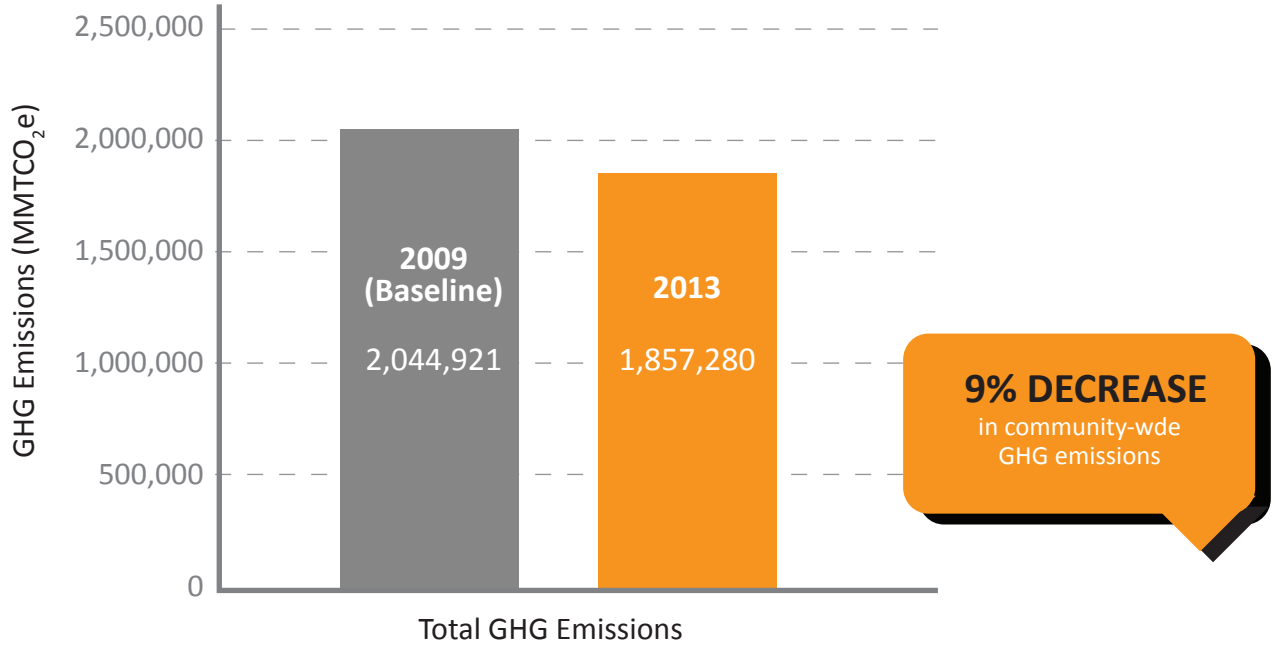


Table 2.3: Recent Trend of Community-Wide GHG Emissions by Sector (2009-2013)

Sector	2009 MT CO_2e (Baseline)	2013 MT CO_2e (Refined)	Change from 2009 to 2013	
			MT CO_2e Difference	% Difference Change
Energy	956,239	804,842	-151,397	-16%
Transportation	1,054,901	972,665	-82,236	- 8%
Waste	15,019	24,616	+9,597	+64%
Water	18,762	55,157	+36,395	+194%
Total	2,044,921	1,857,280	-187,641	-9%

GHG EMISSIONS FORECASTS

A GHG emissions forecast was prepared for Pasadena to better understand how projected trends in energy use, driving habits, population growth, and employment expansion will affect future GHG emissions in the community. The CAP prepared a business-as-usual and an adjusted forecast, as described below.

Business-as-Usual Forecast

The business-as-usual (BAU) forecast predicts how GHG emissions would change if population and consumption trends, along with energy efficiencies, remained unchanged and were not subject to any further regulatory or policy intervention to reduce emissions. The BAU forecast estimates emissions from four sectors: energy, transportation, solid waste, and water. The BAU forecasts for 2020, 2030, and 2035 are based on demographic growth projections developed for the 2015 General Plan update, including population, employment, and vehicle miles travelled (VMT). The BAU forecast for 2050 is based on a compilation of data sourced from the 2015 General Plan update, the Southern California Association of Governments (SCAG), the California Department of Finance, and CARB (see Appendix B).

Figure 2.4 shows how, under the BAU forecast, community-wide GHG emissions for Pasadena are expected to increase over time. It is anticipated that by 2050, GHG emissions will increase to 2,214,105 - 2,334,548 MT CO_2e (or up to 14 percent) from 2009 baseline conditions. Emissions forecasts for the 2050 are presented as a range since a forecast that extends that far into the future is uncertain.

Adjusted Forecast

A number of state-level programs have been enacted since the year 2013 that would reduce Pasadena's overall GHG emissions. The impact of these state-level programs was quantified and incorporated into an adjusted

Figure 2.4: Business-as-Usual and Adjusted GHG Emission Forecasts

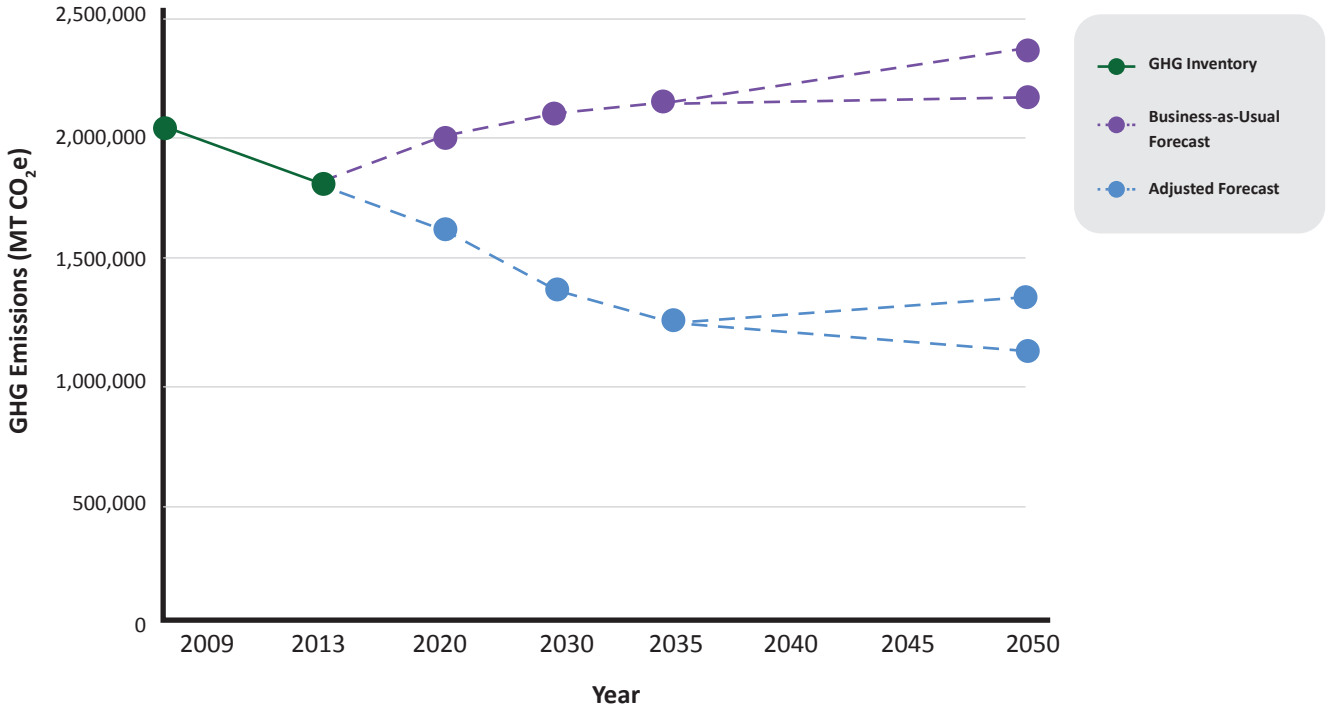


Table 2.4 Business-As-Usual and Adjusted GHG Emissions Forecasts				
	2020 (MT CO_2e)	2030 (MT CO_2e)	2035 (MT CO_2e)	2050 (MT CO_2e)
BAU Forecast	1,987,226	2,093,938	2,147,294	2,214,105 - 2,334,548
Anticipated Reductions from State Measures	315,292	685,875	871,166	951,532 - 1,029,760
Adjusted Forecast	1,671,934	1,408,063	1,276,128	1,262,573 - 1,304,788

forecast as shown in Table 2.4. Implementation of these state-level programs are expected to reduce community-wide emissions by approximately 16 percent from the BAU forecast by the year 2020 to 1,671,934 MT CO_2e (see Appendix B). It is projected that community-wide emissions will continue to decrease as a result of these state-level programs. By 2030, community-wide emissions are expected to decrease by approximately 41 percent from the BAU forecast (1,408,063 MT CO_2e) and by 2050 by approximately 43 to 44 percent (1,262,573 - 1,304,788 MT CO_2e).

The adjusted forecast accounts for the following state-level programs:[10]

- AB 1493, also known as the Pavley Law, and enacted in 2002, required CARB to implement regulations to control emissions of GHG from new passenger vehicles and light duty trucks in California. The regulations became effective in 2006. Advanced Clean Cars, adopted in 2012, formed a set of requirements that address smog control, soot causing pollutants and GHG emissions for vehicle model years 2015 through 2025, including the zero-emission vehicle regulations that require manufacturers to produce zero-emissions vehicles.
- Title 24, also known as the California Building Standards Code, consists of regulations that govern building construction and associated facilities and equipment, such as energy efficient standards, for residential and non-residential buildings.
- Renewables Portfolio Standard (RPS), established in 2002 under SB 1078, accelerated in 2006 under SB 107, and expanded in 2011 under SB 2X, is one of the most ambitious renewable energy standards in the country. The RPS program requires all electricity retailers, including publicly owned utilities, investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020.
- SB X7-7, also known as the Water Conservation Act, and enacted in 2009, requires all water suppliers to increase water use efficiency and reduce per capita urban water use by 20 percent by 2020.
- Construction and Demolition Waste Diversion Ordinance was established in 2012 under SB 1374, and requires jurisdictions to divert a minimum 50 percent of their nonhazardous construction and demolition waste from landfills.

[10] The adjusted forecast does not account for state-level regulations included in CARB's 2017 Climate Change Scoping Plan, as the Scoping Plan was in draft form and subject to change during the development of this CAP. Because of this, the adjusted forecast only accounts for state-level regulations currently programmed in order to maintain a conservative estimate of the portion of Pasadena's emissions that will be reduced by state measures.

Solar powered Metro Bike Share Station in front of Pasadena City Hall

CHAPTER 3

PASADENA'S GHG EMISSIONS REDUCTION STRATEGY

Pasadena has made significant progress in reducing climate changing GHG emissions with programs that range from promoting alternative modes of transportation to moving towards eliminating coal-based energy and increasing the city's renewable energy supply. Building on Pasadena's progress, the CAP outlines a strategy to reduce community-wide GHG emissions consistent with state-wide targets called for in EO S-3-05 and B-30-15, AB 32, and SB 32. Table 3.1 shows the state-wide GHG emissions reduction targets, relative to the 2009 level.[11]

Table 3.1 State-wide GHG Emissions Reduction Targets

2020 Target (AB 32)	15% below 2009 levels (equivalent to 1990 levels)
2030 Target (SB 32)	49% below 2009 levels (equivalent to 40% below 1990 levels)
2050 Target (EO S-3-05)	83% below 2009 levels (equivalent to 80% below 1990 levels)

[11] Statewide emissions reduction targets are presented relative to 2009 levels, as it is the City's baseline year from which GHG reduction progress will be measured. AB 32 sets a GHG emissions reduction target of 1990 levels by 2020 (equivalent to 15 percent below 2009 levels). SB 32 sets a GHG emissions reduction target of state-wide GHG emissions 40 percent below 1990 levels by 2030 (equivalent to 49 percent below 2009 levels). EO S-3-05 sets a GHG reduction target of reducing state-wide GHG emissions 80 percent below 1990 levels by 2050 (equivalent to 83 percent below 2009 levels).

GHG EMISSIONS REDUCTION GOALS

In accordance with AB 32, the CAP sets a goal to reduce community-wide GHG emissions 27 percent below 2009 levels by 2020, which is equivalent to 14 percent below 1990 levels. [12] The CAP also sets a goal to reduce emissions 49 percent below 2009 levels by 2030, 59 percent below 2009 levels by 2035, and 83 percent below 2009 levels by 2050. These goals are line with the state-wide targets established by AB 32, SB 32, and EO S-3-05. Table 3.2 compares Pasadena's GHG emissions reduction goals to the state-wide targets.

Achieving State-wide GHG Emissions Reduction Targets

It is forecasted that community-wide GHG emissions within Pasadena will continue to decline over the years, as shown in Figure 3.1. By 2020, emissions are calculated to be approximately 1,671,934 MT CO_2e, or four percent below the state-wide target. Despite Pasadena's recent efforts to combat climate change, if no additional actions are taken, Pasadena will likely fall short of meeting the state-wide targets for 2030 and 2050 by approximately 365,153 MT CO_2e and 914,936 - 957,151 MT CO_2e, respectively, as shown in Table 3.3 .

Table 3.2: CAP Goals and State-wide GHG Emissions Reduction Targets

Year	Pasadena CAP Goals	State-wide Targets
2020	27% below 2009 levels (equivalent to 14% below 1990 levels)	15% below 2009 levels per AB 32 (equivalent to 1990 levels)
2030	49% below 2009 levels (equivalent to 40% below 1990 levels)	49% below 2009 levels per SB 32 (equivalent to 40% below 1990 levels)
2035	59% below 2009 levels (equivalent to 52% below 1990 levels)	The state does not have a 2035 target
2050	83% below 2009 levels (equivalent to 80% below 1990 levels)	83% below 2009 levels per EO S-3-05 (equivalent to 80% below 1990 levels)

[12] Per AB 32, CARB adopted the Climate Change Scoping Plan in 2008 and included a recommendation for cities to establish a community-wide GHG emissions reduction goal of approximately 15 percent lower than current levels, to coincide with state-wide limit. In 2014, the Scoping Plan was updated and included a recommendation for cities to chart a reduction trajectory consistent with the state's overall target of reducing emissions 80 percent below 1990 levels by 2050, set by EO S-3-05. In December of 2017, CARB updated the Scoping Plan to provide a framework for achieving the state's 2030 target established under SB 32. For more information on CARB's Climate Change Scoping Plan go to https://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf.

Figure 3.1: Comparison of Pasadena's GHG Emissions Forecast, CAP Goals, and State-wide Targets

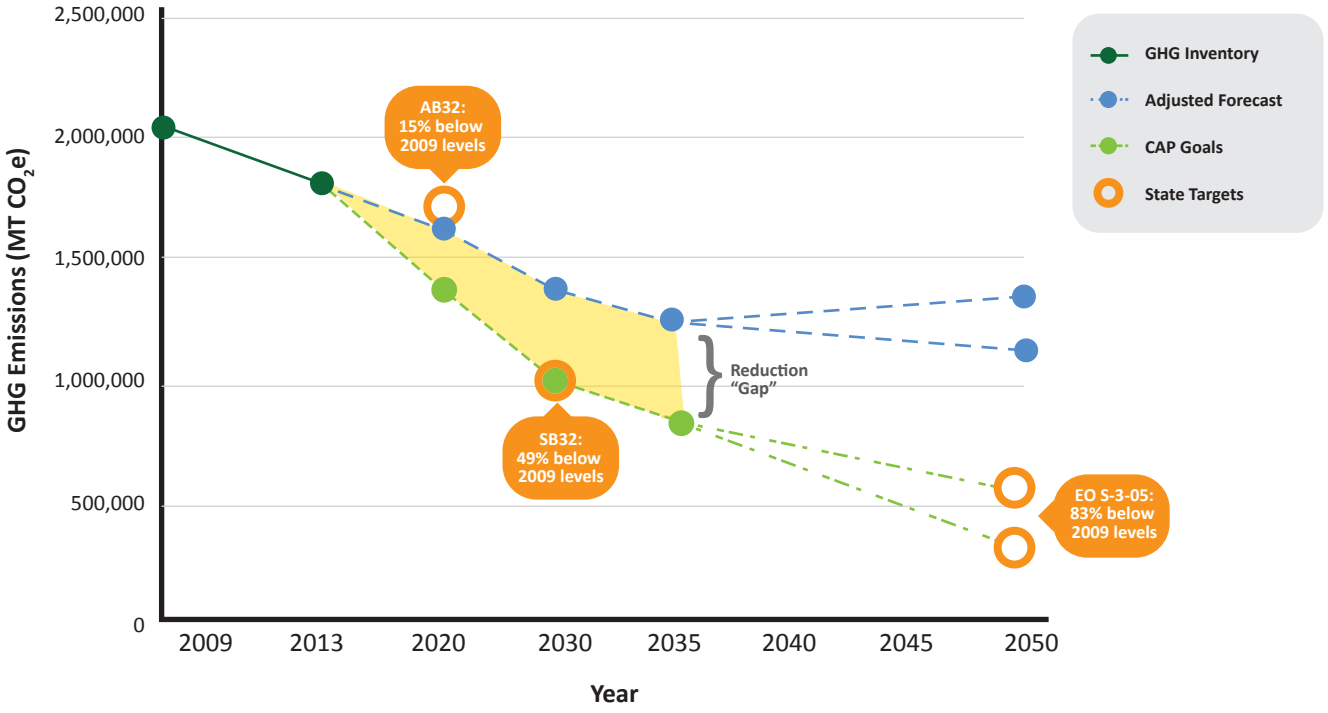
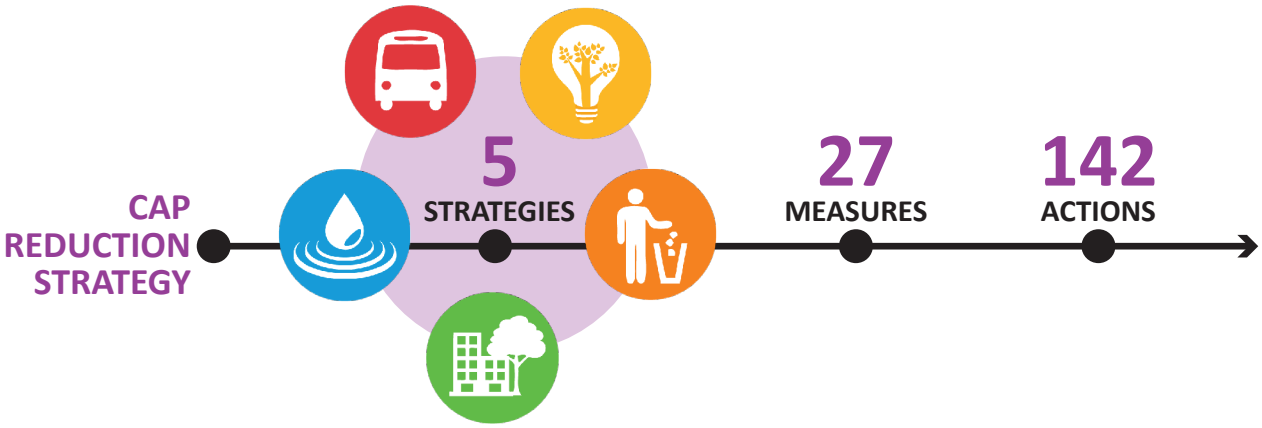


Table 3.3: Comparison of Pasadena's GHG Emissions Forecast, CAP Goals, and State-wide Targets

	2020 (MT CO_2e)	2030 (MT CO_2e)	2035 (MT CO_2e)	2050 (MT CO_2e)
Adjusted Emissions Forecast	1,671,934	1,408,063	1,276,128	1,262,573 - 1,304,788
State-wide Emissions Target	1,738,183 (15% below 2009 levels)	1,042,910 (49% below 2009 levels)	The State does not have a 2035 target	347,637 (83% below 2009 levels)
Reductions to Achieve State-wide Emissions Target	0[13]	365,153	The State does not have a 2035 target	914,936 - 957,151
CAP Emissions Goal	1,492,793 (27% below 2009 levels)	1,042,910 (49% below 2009 levels)	838,418 (59% below 2009 levels)	347,637 (83% below 2009 levels)
Reductions to Achieve CAP Emissions Goal	179,141	365,153	437,710	914,936 - 957,151

[13] Based on the state-wide GHG emissions target of 15 percent below 2009 levels, Pasadena should limit its emissions to approximately 1,738,183 MT CO_2e by 2020. According to Pasadena's adjusted forecast for the year 2020, it is anticipated that approximately 1,671,934 MT CO_2e will be emitted, roughly 66,249 MT CO_2e less than the state-wide limit. Therefore, no additional GHG emission reductions are necessary to meet the state-wide target for the year 2020.

Figure 3.2: GHG Emissions Reduction Strategy



GHG EMISSIONS REDUCTION STRATEGY

The CAP identifies five climate strategies to reduce Pasadena's GHG emissions, as shown in Figure 3.2. Together, they have the potential to decrease emissions within Pasadena, and contribute to state-wide efforts to combat climate change. The following summarizes Pasadena's climate strategy to reduce GHG emissions:

Energy Efficiency and Conservation

Minimize energy consumption, create high-performance buildings, and transition to carbon-neutral sources by enhancing energy performance requirements for new construction and energy efficiency retrofits for existing buildings, increasing use of carbon-neutral and renewable energy, and improving community energy management.

Sustainable Mobility and Land Use

Create an interconnected transportation system and land use pattern that shifts travel from personal automobile to walking, biking, and public transit by improving pedestrian and bicycle infrastructure, enhancing carpooling and public transit services, supporting pedestrian and transit-oriented development, expanding the use of electric vehicles and related infrastructure, and improving the City's vehicle fleet.

Solid Waste Reduction

Minimize waste by improving waste management and promoting reuse, recycling, and composting.

Water Conservation

Promote water conservation and efficiency in both indoor and outdoor uses by increasing access to and use of recycled water and improving storm water infiltration.

Urban Greening

Maintain a healthy urban forest by preserving greenspace and increasing the number of trees in Pasadena.

Figure 3.3: GHG Emissions Reduction Potential by Strategy (2020 and 2035)

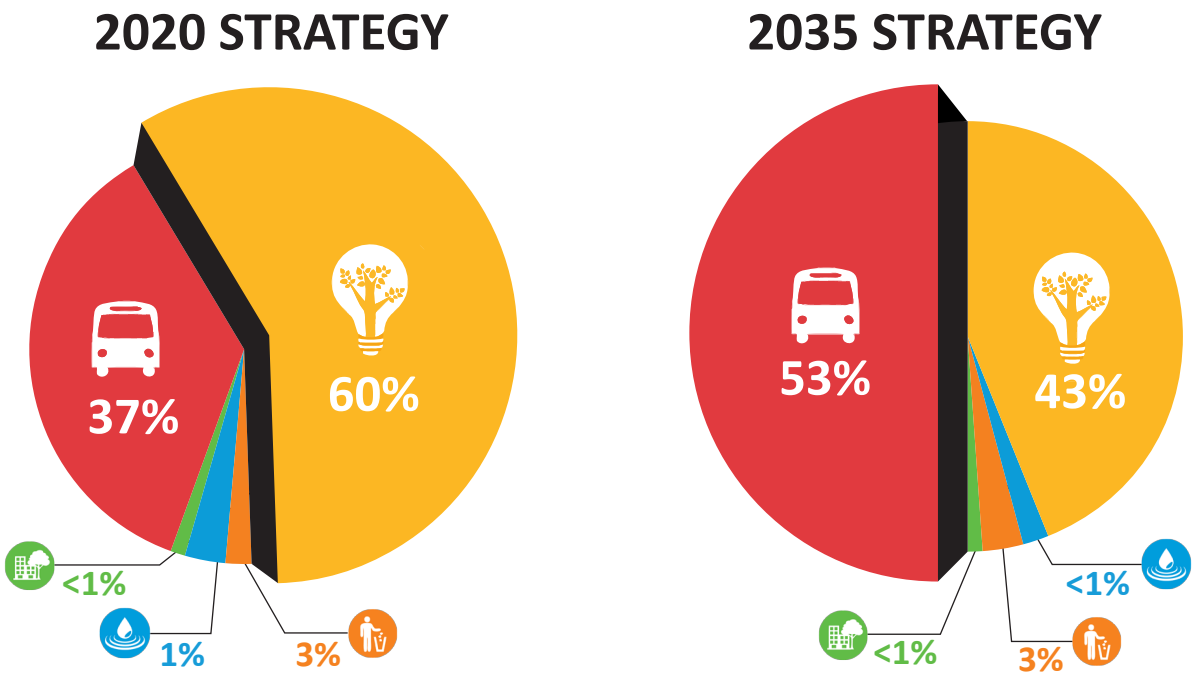


Table 3.4: GHG Emissions Reduction Potential by Strategy (2020 and 2035)

	2020 ($MT CO_2e$)	% of total Emission Reductions in 2020	2035 ($MT CO_2e$)	% of total Emission Reductions in 2035
Energy Efficiency and Conservation	108,299	60%	199,044	43%
Sustainable Mobility and Land Use	66,288	37%	242,680	53%
Water Conservation	1,867	1%	1,916	< 1%
Solid Waste Reduction	4,559	3%	14,197	3%
Urban Greening	184	< 1%	344	< 1%
Total Emisisons Reduction Potential [14]	181,197	100%	458,181	100%
Pasadena's Emissions Reduction Goal	179,141	-	437,710	-

[14] The Total Emissions Reduction Potential includes reductions that are anticipated to have occurred as a result of actions implemented by the City between 2009 and 2016 and emissions reductions that are expected to occur between 2016 and 2035 if the CAP is fully implemented. Refer to Appendix B for details regarding GHG emissions reduction potential calculations.

Improving energy efficiency and reducing energy demand and integrating transportation and land use patterns offer the most promising means to mitigate climate change, as shown in Figure 3.3. A significant number of Pasadena's residential buildings were built more than 30 years ago, prior to the adoption of California's energy efficiency standards. Considerable opportunities exist to reduce energy consumption, utilize energy more efficiently, and increase use of renewable energy for these older structures. There is also great opportunity to expand the availability and use of alternative fuel vehicles and fueling infrastructure, improve pedestrian and bicycle infrastructure, and enhance public transit services to further reduce emissions associated with fossil fuel consumption. In addition, improving waste management and minimizing solid waste, promoting water conservation efforts and efficiency, and maintaining a healthy urban forest will help mitigate climate change. Collectively, the five climate strategies have the potential to reduce emissions by approximately 181,197 MT CO_2e by 2020 and 458,181 MT CO_2e by 2035, as shown in Table 3.4.

CLIMATE ACTION MEASURES

Each of the climate strategies identified in the CAP contain a series of measures that define the direction that the community and the City will take to accomplish its emissions reduction goals for the years 2020, 2030, and 2035. [15] While the CAP does include a goal for the year 2050, the CAP does not include measures designed to achieve reductions pass the year 2035.[16]

Climate action measures define the direction Pasadena will take to accomplish its GHG emissions reduction goals.

The measures included in the CAP build on existing programs and provide new opportunities to address climate change. Overall, the CAP measures arose from a consideration of the reductions needed to achieve the state-wide targets and local goals, the sources and distribution of emissions revealed by the inventory, and the existing priorities and resources of Pasadena.

In total, the CAP contains 27 measures. Of these, 21 measures are quantifiable in terms of their GHG reduction potential. Four of the measures are considered supportive measures as their implementation may not result in direct emissions reductions. Nevertheless, they demonstrate Pasadena's commitment to sustainability.[17] The remaining two measures were quantified in the adjusted forecast. Table 3.5 shows the quantified and non-quantified (or supportive) measures with potential GHG emissions reductions for the years 2020 and 2035.

[15] This CAP does not account for state regulations included in CARB's 2017 Climate Change Scoping Plan as it was in draft form and subject to change during the development of this CAP. Because of this, Pasadena has chosen to demonstrate achievement of the state's 2030 target through the implementation of local measures, without additional support from the state. This is a conservative approach, as state measures included in the 2017 Scoping Plan will further reduce Pasadena's GHG emissions and help to achieve local GHG reduction goals. State measures included in the 2017 Scoping Plan will be taken into account during the next CAP update.

[16] While the CAP does include a GHG reduction goal in support of state efforts under EO-S-3-05 for 2050, the CAP does not include climate action measures designed to achieve the 2050 goal as EO-S-3-05 does not specify any plan or implementation measure to achieve its target.

[17] Refer to Appendix B for a details regarding supportive measures.

Table 3.5: CAP Measures and Potential GHG Emissions Reductions (MT CO_2e)			
CAP Measure	Measure Description	2020 GHG Reduction Potential	2035 GHG Reduction Potential
STRATEGY 1: SUSTAINABLE MOBILITY AND LAND USE Implementation actions are detailed on pages 44 to 56		**66, 288 (37% of total reductions)**	**242,680 (53% of total reductions)**
Measure T-1	Walking and Bicycling	1,275	1,602
T-1.1	Continue to expand Pasadena's bicycle and pedestrian network		
T-1.2	Continue to improve bicycle and pedestrian safety		
T-1.3	Continue to encourage bicycle and pedestrian travel		
Measure T-2	Public Transit	32,414	84,828
T-2.1	Continue to enhance safe, reliable, and seamless transit services		
Measure T-3	Transportation Demand Management	5,502	22,163
T-3.1	Decrease annual commuter miles traveled by single-occupancy vehicles		
T-3.2	Improve the existing transportation system to smooth traffic flow, reduce idling, minimize bottlenecks, and encourage efficient driving techniques	Supportive	Supportive
Measure T-4	Alternative Fuel Vehicles	27,097	134,087
T-4.1	Expand the availability and use of alternative fuel vehicles and fueling infrastructure		
Measure T-5	Transit-Oriented Development	Quantified in Adjusted Forecast	Quantified in Adjusted Forecast
T-5.1	Facilitate high-density, mixed-use, transit-oriented and infill development		
Measure T-6	Construction Vehicles	Supportive	Supportive
T-6.1	Reduce GHG emissions from heavy-duty construction equipment and vehicles		
Measure T-7	Lawn and Garden Equipment	Supportive	Supportive
T-7.1	Reduce GHG emissions from lawn and garden equipment		

Table 3.5: CAP Measures and Potential GHG Emissions Reductions (MT CO_2e)			
STRATEGY 2: ENERGY EFFICIENCY AND CONSERVATION Implementation actions are detailed on pages 58 to 66.		**108,299 (60% of total reductions)**	**199,044 (43% of total reductions)**
Measure E-1	Building Performance Standards for New Construction		
E-1.1	Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards	Implemented after 2020	6,784
E-1.2	Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency		
Measure E-2	Energy Retrofits of Existing Buildings		
E-2.1	Facilitate energy efficient upgrades in existing homes and businesses	103,629	162,720
Measure E-3	Municipal Operations		
E-3.1	Increase municipal energy conservation efforts	2,406	14,913
Measure E-4	Residential and Commercial Carbon-Neutral Energy		
E-4.1	Increase city-wide use of carbon-neutral energy by encouraging and/or supporting carbon-neutral technologies	2,264	15,347
Measure E-5	City's Energy Portfolio[18]		
E-5.1	Continue to expand the City's renewable and/or carbon-neutral energy portfolio	Quantified in Adjusted Forecast	Quantified in Adjusted Forecast
STRATEGY 3: WATER CONSERVATION Implementation actions are detailed on pages 68 to 73		**1,867 (1% of total reductions)**	**1,916 (< 1% of total reductions)**
Measure WC-1	Potable Water		
WC-1.1*	Reduce potable water usage throughout Pasadena	1,867	963
Measure WC-2	Non-Potable (Recycled) Water		
WC-2.1	Increase access to and use of non-potable water	0	953
Measure WC-3	Storm Water		
WC-3.1	Improve storm water systems to slow, sink, and treat run-off, recharge groundwater, and improve water quality	Supportive	Supportive

[18] Refer to Appendix B for details.

Table 3.5: CAP Measures and Potential GHG Emissions Reductions (MT CO_2e)			
STRATEGY 4: SOLID WASTE REDUCTION Implementation actions are detailed on pages 74 to 82		**4,559 (3% of total reductions)**	**14,197 (3% of total reductions)**
Measure WR-1	Solid Waste		
WR-1.1	Continue to reduce solid waste and landfill GHG emissions	0	7,359
Measure WR-2	Reuse and Recycling		
WR-2.1	Establish a "Preferred Procurement Plan" for sustainable, strategic sourcing for all City departments and facilities	Included as part of Measure WR-1.1	Included as part of Measure WR-1.1
WR-2.2	Create an internal program for all City departments to recirculate unwanted goods		
Measure WR-3	Composting and Food Recycling		
WR-3.1	Implement a city-wide composting program to limit the amount of organic material entering landfills	4,559	6,838
WR-3.2	Implement 3-bin compost systems, in addition to recycling and landfill bins, at public parks to compost all trimmings and waste on-site to divert organic materials from the landfill and increase locally available compost		
Measure WR-4	Waste Collection System	Included as part of Measure T-4.1	Included as part of Measure T-4.1
WR-4.1	Reduce the GHG impacts of the waste collection system		
STRATEGY 5: URBAN GREENING Implementation actions are detailed on pages 84 to 87		**184 (<1% of total reductions)**	**344 (<1% of total reductions)**
Measure UG-1	Greenspace		
UG-1.1	Continue to preserve, enhance, and acquire additional greenspace throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation	22	129
Measure UG-2	Urban Forest		
UG-2.1	Continue to protect existing trees and plant new ones to improve and ensure viability of Pasadena's urban forest	162	215
TOTAL GHG EMISSIONS REDUCTION POTENTIAL OF ALL FIVE STRATEGIES		**181, 197**	**458, 181**

Rain barrel used to capture rainwater

IMPLEMENTATION AND MONITORING

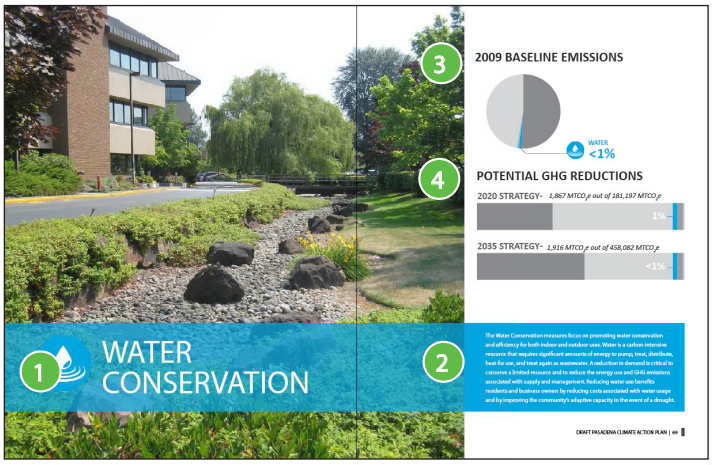
The CAP establishes a long-term strategy to reduce GHG emissions and address climate change at the local level. Achieving the emissions reduction goals outlined in the CAP will require considerable changes and participation from the entire community - residents, businesses, and the City. In addition to the measures described in Chapter 3, each of the climate strategies include a series of implementation actions. These actions define the specific steps that the City and the community will implement over time. They include a combination of ordinances, policies, programs, and incentives, as well as outreach and educational activities.

Overall implementation of the actions listed in the CAP have the potential to reduce emissions and contribute to the achievement of state-wide targets and local goals. The actions are organized by climate strategy and identify departments responsible for implementing the actions, general implementation timelines, performance indicators, and estimated GHG reductions for 2020 and 2035. The following charts are designed to guide the City in successfully implementing of the CAP. Figure 4.1 serves as guide on how to read the implementation charts.

Actions
are steps needed to support each measure in order to achieve GHG emissions reduction goals.

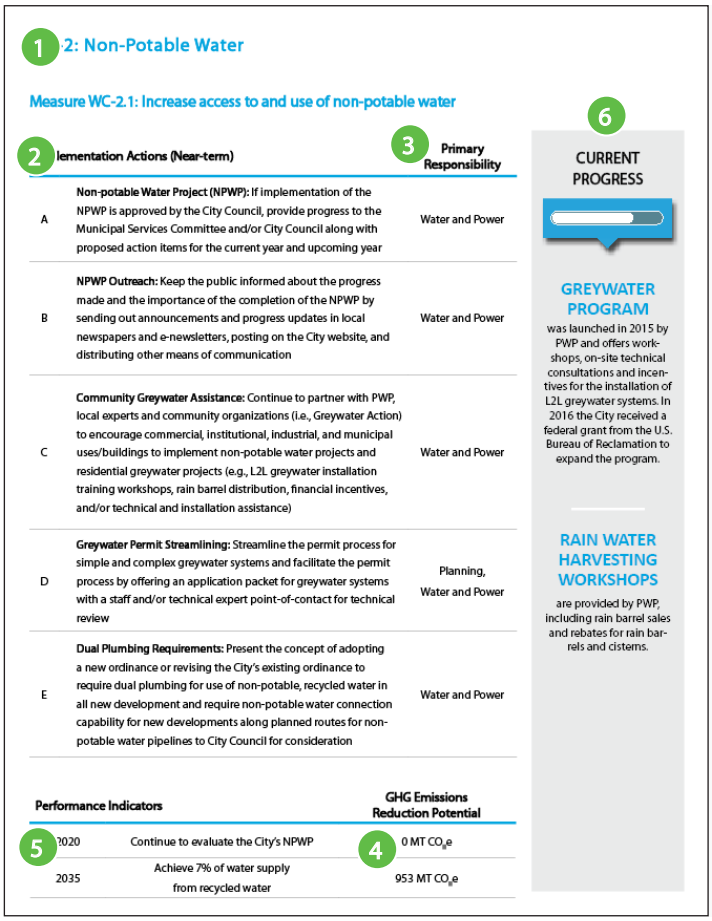
Figure 4.1 How to Read the Implementation Chart

STRATEGY SUMMARY REPORT



1. **ORGANIZATION**
   Implementation charts are organized by the CAP's five main strategies.
2. **STRATEGY SUMMARY REPORT**
   offers a brief description of the strategy and associated implementation actions.
3. **BASELINE EMISSIONS**
   from the specific sector provide a reference point.
4. **POTENTIAL GHG REDUCTIONS**
   associated with implementing the specific strategy.

IMPLEMENTATION CHART



1. **MEASURES**
   are included for each strategy and define the direction Pasadena will take to reduce its GHG emissions.
2. **IMPLEMENTATION ACTIONS**
   identify steps (e.g., regulation or policy) to be taken in support of each measure.
3. **PRIMARY RESPONSIBILITY**
   specifies the City department responsible for carrying out implementation.
4. **GHG REDUCTION POTENTIAL**
   was quantified based on industry data and research to determine associated, potential reductions.
5. **PERFORMANCE INDICATORS**
   are quantifiable targets that can yield approximate GHG emissions reductions. These also serve to evaluate the performance of each measure and monitor its success.
6. **CURRENT PROGRESS**
   provides a snapshot of the City's recent efforts to address climate change (i.e., programs) with respect to each measure.

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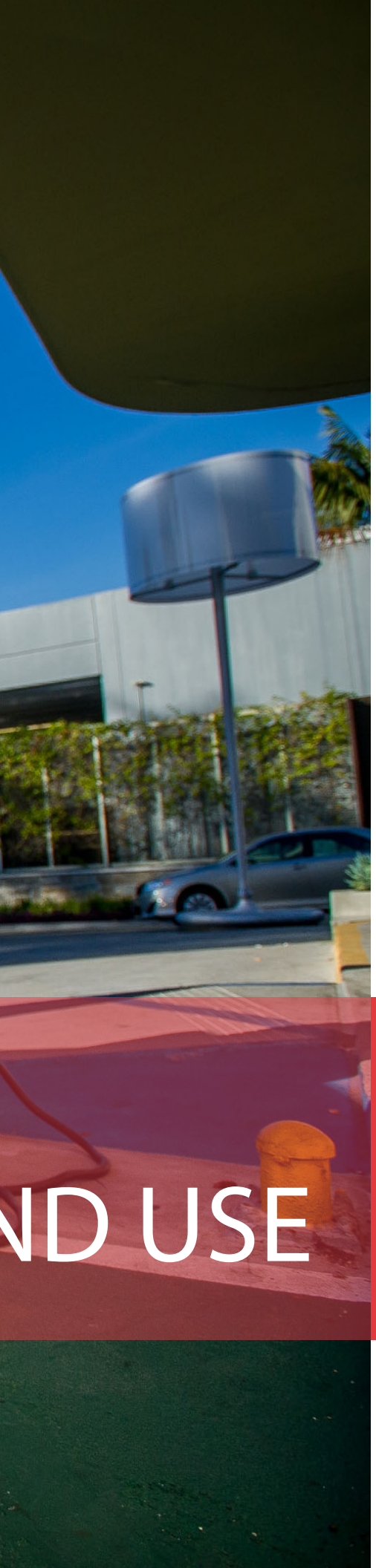
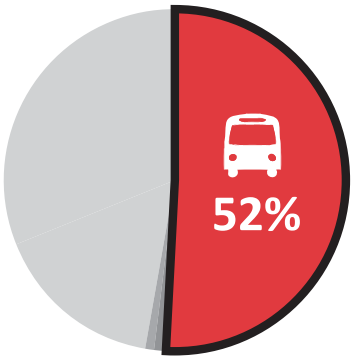
SUSTAINABLE MOBILITY AND LAN



ND USE

2009 BASELINE EMISSIONS



POTENTIAL GHG REDUCTIONS

2020 STRATEGY- *66,288 $MTCO_2e$ out of 181,197 $MTCO_2e$*

2035 STRATEGY- *242,680 $MTCO_2e$ out of 458,181 $MTCO_2e$*

This strategy focuses on lowering GHG emissions from transportation fuel consumption by reducing VMT and improving traffic flow. These involve reducing automobile dependence by facilitating smart growth development patterns; promoting walking, bicycling, and public transit as viable travel options; expanding the use of EV and related infrastructure; and managing transportation demand. This section also includes measures to reduce GHG emissions associated with off-road vehicles and equipment, such as construction, lawn, and garden equipment.

T-1: Walking and Bicycling

Measure T-1.1: Continue to expand Pasadena's bicycle and pedestrian network

	Implementation Actions (Near-term)	Primary Responsibility
A	**Bicycle Transportation Action Plan:** Establish a tiered priority list to implement the objectives and actions identified in the Bicycle Transportation Action Plan and present to City Council for approval	Transportation
B	**Track Progress:** Annually track and report progress toward implementation of the priority list and present to City Council for approval	Transportation
C	**Pedestrian Plan:** Complete an assessment of the progress made on strategies identified in the Pedestrian Plan and establish a prioritized list of strategies that require additional actions to present to City Council for approval	Transportation
D	**Bike Share Program:** Make bicycles more accessible to residents by coordinating with Metro to implement the Bike Share program	Transportation
E	**Network Improvement and Expansion:** Continue to apply for grants and research/pursue other funding opportunities to facilitate network improvements and expansions	Transportation
F	**Bike Friendly Development:** Incorporate bikeway projects into new development, road resurfacing, and restriping projects	Transportation
G	**End-of-Trip Facilities:** Present to City Council for consideration the concept of amending the Trip Reduction Ordinance requirements in the Zoning Code to require end-of-trip facilities for cyclists (e.g., showers, bike repair kiosks, and lockers) in new, non-residential building projects of a specified size	Transportation

T-1: Walking and Bicycling (Continued)

Measure T-1.1: Continue to expand Pasadena's bicycle and pedestrian network

	Performance Indicators	GHG Emissions Reduction Potential[19]
2020	• Install 3 miles of new bicycle lanes • Acquire approximately 400 bicycle share bicycles • Install 1 bike share station per square mile	196 MT CO_2e
2035	• Install 18 miles of new bicycle lanes • Acquire approximately 800 bicycle share bicycles • Install 3 bike share stations per square mile	523 MT CO_2e

CURRENT PROGRESS

42
MILES
of bicycle lanes were installed between 2013 to 2016.

30
BIKE SHARE STATIONS
were put into service, in 2017, in partnership with Metro.

THE FIRST BICYCLE BOULEVARD
was completed in 2013 along North Marengo Avenue.

[19] The City installed 42 miles of bicycle lanes between 2013 and 2016, resulting in an anticipated GHG reduction of 1,079 MT CO_2e in both 2020 and 2035. Completion of the 2020 and 2035 performance indicators is anticipated to result in an additional 196 MT CO2e by 2020 and 523 MT CO_2e by 2035, resulting in a total GHG reduction of 1,275 MT CO2e by 2020 and 1,602 MT CO_2e by 2035.

T-1: Walking and Bicycling

Measure T-1.2: Continue to improve bicycle and pedestrian safety

	Implementation Actions (Mid-term)	Primary Responsibility
A	**Safety Improvements:** Establish a priority list of safety improvements to implement consistent with the policies and recommendations identified in the Land Use Element, Mobility Element, and Bicycle Transportation Action Plan	Transportation
B	**Safe Routes to Schools:** Implement Safe Routes to Schools programs consistent with the Bicycle Transportation Action Plan	Transportation
C	**Bike Racks:** Identify locations to install additional bicycle racks	Transportation
D	**Traffic Calming:** Identify locations to implement traffic calming features to slow vehicle traffic and improve bicycle safety	Transportation
E	**Safety and Road Sharing Campaign:** Create a bicycle safety and road sharing campaign to promote safety for cyclists and motorists on the road	Transportation

Performance Indicators		GHG Emissions Reduction Potential
2020	Included as part of Measure T-1.1	Included as part of Measure T-1.1
2035	Included as part of Measure T-1.1	Included as part of Measure T-1.1

CURRENT PROGRESS

SAFETY CAMPAIGN

was launched in 2015. The City distributed 450 bike headlights, taillights, helmets, and upgraded the collision database system.

DIRECTIONAL SIGNAGE

was completed in 2013 for pedestrians and vehicles as part of Pasadena's wayfinding system.

T-1: Walking and Bicycling

Measure T-1.3: Continue to encourage bicycle and pedestrian travel

	Implementation Actions (Mid-term)	Primary Responsibility
A	**"Open Street" Events:** Incentivize walking and bicycling by encouraging "open street" types of events in which certain streets are temporarily closed to automobile traffic to promote cycling and walking	Transportation
B	**Traffic Training Courses:** Coordinate with nonprofit and educational facilities, or local bike shops to provide adult- and child-specific bicycle traffic training courses	Transportation
C	**Bicycle and Pedestrian Network Map:** Regularly update the City's bicycle and pedestrian network map and post throughout Pasadena	Transportation
D	**Publicize Bicycle and Pedestrian Improvements:** Publicize new bicycle and pedestrian facilities, network improvement projects, and new or updated policies and design guidelines through the City's website and appropriate mailings	Transportation

Performance Indicators		GHG Emissions Reduction Potential
2020	Included as part of Measure T-1.1	Included as part of Measure T-1.1
2035	Included as part of Measure T-1.1	Included as part of Measure T-1.1

CURRENT PROGRESS

FOLD-N-GO PASADENA

was launched in 2012, this folding bike demonstration program encourages bike use with bus or rail transit

BIKE MONTH & BIKE WEEK

is an annual, nation-wide event during the month May in which the City participates to increase cycling awareness

T-2: Public Transit

Measure T-2.1: Continue to enhance safe, reliable, and seamless transit services

	Implementation Actions (Near-term)	Primary Responsibility
A	**Seamless Transit:** Coordinate with other transit agencies to improve seamless transit and annually present upcoming initiatives to City Council	Transportation
B	**Short-Range Transit Plan:** Improve and expand the transit network consistent with the Short-Range Transit Plan	Transportation
C	**Update Plan:** Update the Short-Range Transit Plan to assess existing conditions and establish recommendations for the next five years (fiscal year 2018 to fiscal year 2022) and continue to update the Short-Range Transit Plan every five years	Transportation
D	**Outreach Activities:** Continue to conduct outreach activities to ensure availability of route information and provide easily accessible, real-time transit schedules for the Pasadena Transit and other local and regional transit systems	Transportation
E	**Transportation Surveys:** Conduct local transportation surveys to better understand the community's needs and motivation for travelling by car versus other alternatives such as bus or Metro Gold Line light rail and present results of surveys to City Council to inform transit expansion and improvement projects	Transportation
F	**Transit Subsidies:** Work with transit agencies, community organizations, colleges/universities, and local businesses to explore opportunities that could support transit subsidy programs	Transportation
G	**Transit Safety:** Implement appropriate measures, such as transit stop patrolling, to enhance the safety of the local transit system	Transportation, Police

	Performance Indicators	GHG Emissions Reduction Potential
2020	Achieve 10% transit mode share	32,414 MT CO_2e
2035	Achieve 20% transit mode share	84,828 MT CO_2e

CURRENT PROGRESS

ANNUAL TRANSPORTATION REPORT CARD

informs the public on the performance of the City's public road and transit system.

PASADENA TRANSIT RIDERSHIP REPORT CARD

conducted annually, measures the effectiveness of the bus routes, stop locations, and headways/route capacity.

T-3: Transportation Demand Management

Measure T-3.1: Decrease annual commuter miles traveled by single occupancy vehicles

	Implementation Actions (Near-term)	Primary Responsibility
A	**Trip Reduction Ordinance:** Present to City Council for consideration the concept of amending the Trip Reduction Ordinance Requirements of the Zoning Code so they apply to all non-residential and multi-family development projects	Transportation
B	**Trip Reduction Toolkit:** Continue to coordinate with Go Verdugo to develop a web-based trip reduction toolkit for people working in Pasadena, distributed by Pasadena employers (the website will be a clearinghouse for the transportation demand management programs for the cities of Burbank, Glendale, and Pasadena)	Transportation
C	**Car Sharing:** Continue to facilitate and incentivize car sharing through dedicated, on-street parking spaces	Transportation
D	**Incentivize Carpooling:** Incentivize carpooling by working with local employers to provide preferred parking spaces or free or discounted parking rates to employees who carpool	Transportation

Performance Indicators		GHG Emissions Reduction Potential
2020	Achieve 10% carpooling mode share	5,502 MT CO_2e
2035	Achieve 15% carpooling mode share	22,163 MT CO_2e

CURRENT PROGRESS

PRIDESHARE PROGRAM

is the City's employee rideshare program funded through fees paid by City employees who drive solo. It has received two Metro Blue Diamond Awards for 2012 and 2013.

ZIPCAR PILOT PROGRAM

began in 2013 and stationed 18 car-share, on-street vehicles throughout Pasadena.

T-3: Transportation Demand Management

Measure T-3.2: Improve the existing transportation system to smooth traffic flow, reduce idling, minimize bottlenecks, and encourage efficient driving techniques

	Implementation Actions (Long-term)	Primary Responsibility
A	**Transportation Protocol:** Implement recommendations developed as part of the City's intelligent transportation system (ITS) quantification protocol	Transportation
B	**Intelligent Transportation Systems (ITS):** Continue to utilize technology and ITS to improve traffic flow and reduce vehicle idling, including synchronizing signals, developing transit, and prioritizing emergency signals	Transportation
C	**Eco-driving Practices:** Conduct education campaigns to promote fuel-efficient and eco-driving practices, such as reduced idling, slower driving speeds, gentle acceleration, and proper tire inflation	Transportation
D	**Signal Synchronization:** Support SCAG and other regional efforts to develop potential revenue streams from various sources that would fund signal synchronization and similar projects that reduce GHG emissions	Transportation
E	**Integrated Corridor Management:** Participate in the Interstate 210 Freeway Pilot Integrated Corridor Management project to reduce congestion during incidents	Transportation
F	**Traffic Mitigation Improvements:** Enhance Metro Gold Line crossing operations by completing various traffic mitigation, such as the deployment of adaptive traffic control systems, installation of flashing yellow arrow protected/permissive operation, and prediction of long gate downs	Transportation

Performance Indicators		GHG Emissions Reduction Potential
2020	Reduce vehicle idling	Supportive
2035	Reduce vehicle idling	Supportive

CURRENT PROGRESS

INTELLIGENT TRANSPORTATION SYSTEM PILOT PROTOCOL

was developed to quantify GHG emission reductions associated with ITS operations such as 511 travel information, adaptive ramp metering, and signal timing projects.

T-4: Alternative Fuel Vehicles

Measure T-4.1: Expand the availability and use of alternative fuel vehicles and fueling infrastructure

	Implementation Actions (Near-term)	Primary Responsibility
A	**Charging Station Inventory:** Update the inventory of available charging infrastructure and identify priority locations for new charging stations	Water and Power
B	**Electrical Vehicle Chargers:** Pursue funding opportunities to install additional public, electric vehicle (EV) chargers at locations throughout Pasadena and present progress to City Council	Water and Power
C	**Alternative Vehicle Fueling Wiring:** Encourage that all new parking lots/structures provide wiring for at least one 240V Type II EV charger	Planning
D	**Update Zoning Code:** Present to City Council for consideration the concept of amending the Electric Recharge Stations portion of the Zoning Code to apply to a greater percentage of non-residential and multi-family development projects	Planning
E	**Advertise Stations:** Regularly advertise incentives for the installation and use of EV charging stations in local newspapers and on the City website	Water and Power
F	**EV Incentives:** Provide forward-leaning rebates, discounted rates, charging infrastructure, and vehicle-grid integration technologies to EV drivers	Water and Power
G	**EV and Transit Fleet:** Work with waste haulers and transit agencies to study the feasibility of transitioning to electric buses and fleet vehicles and present to City Council for consideration	Transportation Public Works
H	**Hydrogen Fueling Stations:** Investigate the interest in and feasibility of installing hydrogen fueling infrastructure and present to City Council for consideration	Public Works
I	**Alternative Fuel Vehicles Procurement:** Consider updating the City's vehicle procurement policy to include evaluation of operational feasibility, cost of life cycle, value of carbon reduction credit, and other benefits of alternative fuel vehicles compared to fossil fuel vehicles, and present to City Council for consideration	Water and Power

	Performance Indicators	GHG Emissions Reduction Potential
2020	Achieve 5% EV mode share	27,097 MT CO_2e
2035	Achieve 26% EV mode share	134,087 MT CO_2e

CURRENT PROGRESS

38
EV CHARGING STATIONS
were installed in public parking facilities between 2012 and 2015.

EV GRANT PROGRAM
provides stipends to private property owners who install publicly available EV chargers on private property.

All buses for Pasadena Transit were replaced with
100% COMPRESSED NATURAL GAS VEHICLES.

T-5: Transit-oriented Development

Measure T-5.1: Facilitate high density, mixed-use, transit-oriented, and infill development

	Implementation Actions (Mid-term)	Primary Responsibility
A	**Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)**: Continue to work with SCAG to implement the RTP/SCS, as it relates to Pasadena	Transportation, Planning
B	**Efficient Land Use**: Through the development review process, evaluate new development projects based on consistency with the General Plan's Land Use Element and encourage high-density, mixed-use, transit-oriented, and infill development	Planning
D	**Reduce Parking Requirements**: Consider amending the Zoning Code to reduce parking requirements in targeted areas as a means of minimizing single-occupancy vehicle travel, and present to City Council for consideration	Planning, Transportation

Performance Indicators		GHG Emissions Reduction Potential
2020	Implement General Plan Land Use Element	Quantified in Adjusted Forecast
2035	Implement General Plan Land Use Element	Quantified in Adjusted Forecast

CURRENT PROGRESS

2015 GENERAL PLAN UPDATE

includes policies that promote a sustainable environment, such as emphasizing a mix of uses, pedestrian activity, and transit services in targeted areas to reduce the need for auto use.

T-6: Construction Vehicles

Measure T-6.1: Reduce GHG emissions from heavy-duty construction equipment and vehicles

	Implementation Actions (Long-term)	Primary Responsibility
A	**Limit Equipment Idling:** Through the construction permitting process, limit construction vehicle and equipment idling time to three minutes and require that the project applicant provide an idling briefing to the contractor that involves posting clear signs for workers throughout the site	Planning
B	**Alternative Energy/Fuel Requirements:** Through the construction permitting process encourage the use of electrically powered or alternatively fueled construction vehicles and equipment by providing information regarding benefits of alternative equipment	Planning
C	**City Construction Requirements:** Consider a policy requiring all City construction projects to utilize equipment with Best Available Control Technology or alternative fuels	Public Works

Performance Indictors		GHG Emissions Reduction Potential
2020	Reduce emissions from construction vehicles	Supportive
2035	Reduce emissions from construction vehicles	Supportive

T-7: Lawn and Garden Equipment

Measure T-7.1: Reduce GHG emissions from lawn and garden equipment

	Implementation Actions (Long-term)	Primary Responsibility
A	**Efficient Equipment Incentives:** Provide incentive payments for residents and local gardeners who replace lawn and garden equipment (e.g., lawn mowers, leaf-blowers) with low-emissions alternatives, including but not limited to battery- or electric-operated	Public Works, Water and Power
B	**Replace City Equipment:** Explore funding to replace City-owned lawn and garden equipment with low-emissions alternatives	Public Works, Water and Power
C	**Native Landscape Education:** Provide educational workshops and training to promote the installation of low-maintenance, native landscaping in existing and newly developed lots, including turf removal to reduce lawn and garden equipment usage	Water and Power

Performance Indicators		GHG Emissions Reduction Potential
2020	Reduce emissions from lawn and garden equipment	Supportive
2035	Reduce emissions from lawn and garden equipment	Supportive

CURRENT PROGRESS

LEAF BLOWER ORDINANCE

was adopted in 2009 that requires leaf blowers in Pasadena to be certified annually by the City health department.

INCENTIVE PAYMENT FOR GARDENERS

was approved in 2009 for those who use low-emissions, low-noise leaf blowers.

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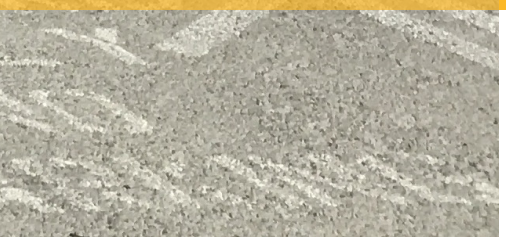
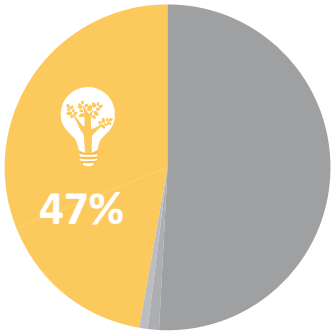
ENERGY EFFICIENC
AND CONSERVATIO



2009 BASELINE EMISSIONS



POTENTIAL GHG REDUCTIONS

2020 STRATEGY- *108,299 $MTCO_2e$ out of 181,197 $MTCO_2e$*

2035 STRATEGY- *199,044 $MTCO_2e$ out of 458,181 $MTCO_2e$*

The Energy Efficiency and Conservation measures focus on reducing GHG emissions from energy use by reducing the combustion of natural gas and other fossil fuels used to generate energy for heating, cooling, and providing power to residential and commercial buildings. GHG emissions reductions related to energy use can be achieved by changes to both energy demand (e.g., improved energy efficiency and reduced consumption) and energy supply (e.g., switching from grid electricity to solar or other carbon-neutral power). Reducing energy use and associated emissions benefits residents and business owners by lowering electricity costs, improving public health and air quality, and increasing energy independence.

E-1: Building Performance Standards for New Construction

Measure E-1.1: Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards[20]

	Implementation Actions (Mid-term)	Primary Responsibility
A	**Green Building Ordinance:** Explore a new Green Building Ordinance that establishes higher minimum energy performance targets for new construction and major renovations, and with local adaptations, adopts, the higher tiers of green building performance allowed by CalGreen, with the possibility of mandatory requirements and higher standards being phased in over time	Planning
B	**Energy Management Systems:** Encourage the use of energy management systems in all new development, including but not limited to Energy Star appliances, high-energy efficiency equipment, heat recovery equipment, and building energy management systems	Planning, Water and Power
C	**Renewable or Lower Carbon Energy:** Encourage the use of renewable or lower carbon energy for space heating, air conditioning, and appliances	Planning, Water and Power
D	**Encourage Energy Efficiency:** Encourage development projects that achieve energy efficiency higher than the 2016 Title 24 Standards	Planning
E	**Energy Outreach:** Conduct public workshops and trainings with contractors, architects, and other building professionals regarding state-of-the-art green building techniques	Planning

Performance Indicators		GHG Emissions Reduction Potential
2020	Measure will be implemented after 2020	Measure will be implemented after 2020
2035	100% of new residential units built between 2020 and 2035 are zero-net energy (ZNE) (as mandated by Title 24) and 25% of new commercial units built between 2020 and 2035 are ZNE (exceeds Title 24)	6,784 MT CO_2e

CURRENT PROGRESS

GREEN BUILDING ORDINANCE

was updated in 2010 to require new municipal buildings and commercial buildings to achieve LEED Silver Certification at a minimum.

[20] Emissions reductions associated with statewide implementation of 2016 Title 24 standards was accounted for in the adjusted forecast. 2016 Title 24 standards would reduce Pasadena's emissions by approximately 10,867 MT CO_2e in 2020, 29,436 MT CO_2e in 2035 (refer to Appendix B for details).

E-1: Building Performance Standards for New Construction

Measure E-1.2: Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency

	Implementation Actions (Long-term)	Primary Responsibility
A	**Solar Design:** Consider amending community design plans, guidelines, and other documents to maximize solar resources by promoting the following design techniques: a. Passive solar design, use of thermal mass and insulation to reduce space heating and cooling needs b. Shading on east, west, and south windows with overhangs, awnings, or native deciduous trees c. Sustainable site design and landscaping to create comfortable microclimates	Planning
B	**Natural Light:** Encourage new projects to provide ample daylight in the structure through the use of lighting shelves, exterior fins, skylights, atriums, courtyards, or other features to enhance natural light penetration	Planning
C	**Building Shade:** Distribute and/or post information specifically related to urban cooling that promotes the use of shade trees	Planning
D	**Cool Roofs:** Consider a policy requiring all new residential buildings to utilize cool roof technology, and present to City Council for consideration	Planning

Performance Indicators		GHG Emissions Reduction Potential
2020	Included as part of E-1.1	Included as part of E-1.1
2035	Included as part of E-1.1	Included as part of E-1.1

CURRENT PROGRESS

SHADE TREES PROGRAM

offers rebate per tree to incentivize planting shade trees near residences.

GUESTBOOK & SELECTION LIST

provided by the City to guide residents through the process of planning, choosing, planting, and caring for the trees.

COOL ROOF PROGRAM

offers rebates to residents who convert their existing roof into a coof roof. Rebates are offered per square feet for qualifying products.

E-2: Energy Retrofits of Existing Buildings

Measure E-2.1: Facilitate energy efficient upgrades in existing homes and businesses

	Implementation Actions (Near-term)	Primary Responsibility
A	**Energy Campaigns:** Develop effective energy conservation campaigns and provide targeted marketing for new and existing conservation programs	Water and Power
B	**Smart Appliances:** Provide educational information on and rebates for smart connected appliances through the City's website and explore offering cost-effective rebates	Water and Power
C	**Incentive Programs:** Market incentive programs to encourage retrofits and installation of efficient equipment that help save money, including City and SoCalGas rebates for ENERGY STAR light bulbs, appliances, air conditioners, heat pumps, insulation, pool pumps and solar thermal water heaters	Water and Power
D	**Provide Resources:** Update the City's website regularly with available rebates, incentives, and programs	Water and Power
E	**Benchmark Use:** Educate business owners through the City's website about the benefits of benchmarking their energy use (e.g., through ENERGY STAR portfolio manager)	Water and Power
F	**Provide Energy and Water Evaluations:** Promote programs that provide no-cost energy and water use evaluations and direct-install efficiency programs for businesses and residents	Water and Power
G	**Energy Efficiency Programs:** Educate customers on options available on energy efficiency improvements through the Pasadena Water and Power website	Water and Power
H	**Audits:** Consider offering free efficiency audits and direct Install program services to eligible customers	Water and Power
I	**Energy Efficient Giveaways:** Purchase light-emitting diodes (LED) and other energy efficient equipment for giveaways to motivate use of the energy-efficient technology and raise awareness of its value	Water and Power
J	**Highlight Success Stories:** Highlight success stories on the City's website where residents and businesses have implemented energy-efficient improvements on their properties	Planning, Water and Power

	Performance Indicators	GHG Emissions Reduction Potential
2020	16% decrease in energy use in existing buildings (below 2013 levels)[21]	103,629 MT CO_2e
2035	40% decrease in energy use in existing buildings (below 2013 levels)	162,720 MT CO_2e

CURRENT PROGRESS

HOME ENERGY REPORT PROGRAM

was expanded in 2015 to send reports to households about energy use and provide choices to use less energy.

[21] Performance indicators are calculated relative to 2013 levels to avoid double-counting with reductions that occurred between 2009 and 2013 as a result of state measures (i.e., Title 24) that were captured in the adjusted forecast.

E-3: Municipal Operations

Measure E-3.1: Increase municipal energy conservation efforts

	Implementation Actions (Near-term)	Primary Responsibility
A	**City Energy Audits:** Conduct energy audits at each municipal facility and utilize the information to establish a prioritized list of actions designed to reduce energy use along with feasible alternatives to replace natural gas with renewable or lower carbon energy	Public Works
B	**Municipal Upgrades:** Continue to replace existing lighting and other energy end-use equipment in municipal facilities with the most energy- and cost-effective equipment available	Public Works
C	**Energy-Saving Software:** Install energy-saving software and devices, such as those that automatically control the power settings of network computers at the server level	Public Works
D	**Plug-Load Management:** Install plug-load management devices, such as smart power strips to manage appliances and computing equipment based on time of day, immediate area occupancy, or power consumption of other equipment	Public Works
E	**City Renewable Power:** Purchase and supply renewable power to municipal facilities working toward the goal of 100% of municipal energy supplied by renewable sources.	Water and Power, Public Works

	Performance Indicators	GHG Emissions Reduction Potential
2020	10% decrease in municipal energy use (below 2013 levels) and/or 10% of municipal energy use should be from renewable sources	2,406 MT CO_2e
2035	50% decrease in municipal energy use (below 2013 levels) and/or 100% of municipal energy use should be from renewable sources	14,193 MT CO_2e

CURRENT PROGRESS

CITY BUILDINGS WITH LEED GOLD CERTIFICATION

include City Hall, and automatic temperature control systems were installed in all City-owned buildings.

E-4: Residential and Commercial Carbon-neutral Energy

Measure E-4.1: Increase City-wide use of carbon-neutral energy by encouraging and/or supporting carbon-neutral technologies

	Implementation Actions (Near-term)	Primary Responsibility
A	**Promote Solar:** Continue to promote solar installation by providing resources and technical support, accelerating permitting for rooftop solar, and minimizing administrative and procedural barriers for customers	Planning
B	**Solar-ready Buildings:** Consider requiring all new construction of a certain size or type/use to be solar-ready by specifying that roofs must be capable of carrying the future additional load of solar equipment and prewiring/pre-plumbing for solar-generated electricity and hot water	Planning
C	**On-site Carbon-neutral Requirement:** Consider establishing a minimum on-site, carbon-neutral energy generation requirement for all new municipal and commercial buildings, based on size	Planning
D	**100% Renewable Retail Rate Option:** Encourage use of renewable energy by providing customers a 100% renewable supply retail rate option and promoting through outreach. The 100% renewable retail rate option could be used as a substitute to on-site, carbon-neutral requirement	Water and Power
E	**Solar-power Shade Structures:** Recommend shade structures that support solar power for all new parking lots over a specified size and identify existing public and private parking structures where solar-power shade structures can be installed	Planning
F	**Rooftop Solar Study:** Identify private and public buildings, such as the Convention Center, with room for roof-top solar and work with building owners to facilitate solar installations	Planning

CURRENT PROGRESS

2,792 KILOWATTS OF PHOTOVOLTAIC (PV) SOLAR PANELS

were installed between 2013 and 2015 bringing the total customer-owned solar capacity to over 8,600 kilowatts (kW) as of 2015.

SCHOOL DEMONSTRATION PROJECT

was completed by PWP with the installation of four hybrid solar-powered heating, ventilation, and air conditioning pumps at local schools.

E-4: Residential and Commercial Carbon-neutral Energy (Continued)

Measure E-4.1: Increase City-wide use of carbon-neutral energy by encouraging and/or supporting carbon-neutral technologies

	Implementation Actions (Near-term)	Primary Responsibility
G	**Promote Solar Installation:** Review the City's existing permitting process for PV systems, consider streamlining the process, and reducing solar permit fee structure	Planning
H	**Solar Powered EV Charging:** Study the feasibility of purchasing and installing solar-powered EV chargers with battery storage, and as part of the EV charging permitting process, recommend installation of on-site solar to offset electricity use of vehicle chargers	Transportation, Water and Power
I	**Prohibit Non-renewable Customer Generation:** Prohibit future installations of non-renewable customer-owned electric generation resources that operate in parallel with PWP's grid. This would not apply to stand-by resources intended only to be used for emergency backup power	Water and Power

Performance Indicators		GHG Emissions Reduction Potential[22]
2020	950,000 kWh of electricity use replaced with carbon-free energy	344 MT CO_2e
2035	95,000,000 kWh of electricity use replaced with carbon-free energy	14,535 MT CO_2e

CURRENT PROGRESS

TOP TEN UTILITIES IN THE NATION

award was granted to PWP in 2017 by the Smart Electric Power Alliance for most solar watts per customer.

[22] 2,792 kW of solar were installed between 2013 and 2016, resulting in an anticipated GHG reduction of 1,920 MT CO_2e in 2020 and 812 MT CO_2e in 2035. Completion of the 2020 and 2035 performance indicators is anticipated to result in an additional 344 MT CO_2e by 2020 and 14,535 MT CO_2e by 2035, resulting in a total GHG reduction of 2,264 MT CO_2e by 2020 and 15,347 MT CO_2e by 2035.

E-5: City's Energy Portfolio

Measure E-5.1: Continue to expand the City's renewable and/or carbon-neutral energy portfolio

	Implementation Actions (Mid-term)	Primary Responsibility
A	**Eliminate Coal-Based Energy:** Eliminate the City's coal-based energy supply after its existing coal power contract expires in 2027	Water and Power
B	**Purchase Power Contract Review:** Through the City Council's routine contract authorization process, ensure all new power purchase contracts are consistent with the City's Power Supply IRP goals and that the contract's impact on the City's long-term, 100% carbon-neutral energy goal is considered prior to approval	Water and Power
C	**100% Carbon-neutral Portfolio Model:** Model a 100% carbon-neutral power portfolio as part of the City's IRP Update	Water and Power
D	**100% Renewable Retail Rate Option:** Provide a 100% renewable supply retail rate option to PWP's customers [23]	Water and Power

	Performance Indicators	GHG Emissions Reduction Potential
2020	40% Renewable Portfolio Standard	Quantified in Adjusted Forecast
2035	50% Renewable Portfolio Standard[24]	Quantified in Adjusted Forecast

CURRENT PROGRESS

30%
RENEWABLE SOURCES
supplied PWP's retail energy sales as of 2016, and the use of coal-based power has reduced by half.

2015 INTEGRATED RESOURCE PLAN
sets a goal to eliminate coal-based energy by 2027 and achieve a 60% reduction in GHG emissions by 2030.

GLENARM REPOWERING PROJECT
was completed in 2016 to replace old steam generating units with a high-efficiency, lowest emissions limit generator known as Gas Turbine 5.

[23] This implementation action is also included under Measure E-4.1 as it supports implementation of city-wide use of carbon-neutral energy. The implementation action is quantified as part of Measure E-4.1 and is not quantified as part of Measure E-5.1 in order to avoid counting GHG reductions twice.

[24] Instead of reaching this performance indicator by 2035, this indicator shall be met by 2030.

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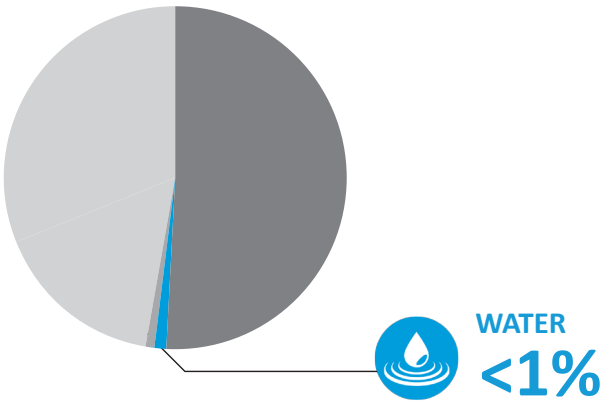
WATER CONSERVATION

2009 BASELINE EMISSIONS



POTENTIAL GHG REDUCTIONS

2020 STRATEGY- *1,867 $MTCO_2e$ out of 181,197 $MTCO_2e$*

2035 STRATEGY- *1,916 $MTCO_2e$ out of 458,181 $MTCO_2e$*

The Water Conservation measures focus on promoting water conservation and efficiency for both indoor and outdoor uses. Water is a carbon-intensive resource that requires significant amounts of energy to pump, treat, distribute, heat for use, and treat again as wastewater. A reduction in demand is critical to conserve a limited resource and to reduce energy use and GHG emissions associated with its supply and management. Reducing water use benefits residents and business owners by reducing costs associated with water use and by improving the community's adaptive capacity in the event of a drought.

WC-1: Potable Water

Measure WC-1.1: Reduce potable water use throughout Pasadena

	Implementation Actions (Near-term)	Primary Responsibility
A	**Urban Water Management Plan:** Complete an assessment of the progress made on conservation strategies identified in the Water Conservation Plan and Demand Management Measures in the UWMP and establish a prioritized list of strategies that require additional actions	Water and Power
B	**Retrofits and Rainwater Harvesting:** Develop new incentives for irrigation retrofits and rainwater harvesting and evaluate rainwater harvesting opportunities for residents and businesses	Water and Power
C	**Drought-Tolerant Landscaping:** Consider revising the City's landscape ordinance to mandate drought-tolerant landscaping and drip irrigation for all new residential, commercial, and municipal development	Planning
D	**Landscape Ordinance:** Consider revising the City's landscape ordinance to comply with or go beyond the requirements of the State Model Water Efficiency Landscape ordinance	Planning
E	**School Conservation:** Consider expanding existing water conservation programs in all schools and launch a competition among campuses to reward schools demonstrating leadership in water conservation efforts	Pasadena Unified School District
F	**Water Efficiency Planning and Outreach:** Provide water efficiency incentives and services for commercial and residential customers, including City facilities, develop partnerships to encourage and incentivize new water efficient technologies, and host public events and workshops to raise awareness about incentives and programs	Water and Power

CURRENT PROGRESS

WATER WASTE PROHIBITIONS & WATER SUPPLY SHORTAGE PLANS

Water Waste Prohibitions and Water Supply Shortage Plans Ordinance was amended in 2017 with enhanced permanent water conservation requirements which would be effective at all times.

WC-1: Potable Water (continued)

Measure WC-1.1: Reduce potable water use throughout Pasadena

	Implementation Actions (Near-term)	Primary Responsibility
G	**Water Efficiency Study:** Conduct a study of City facilities to determine water conservation potential from upgrades/retrofits and develop a water conservation implementation plan for City facilities	Water and Power
H	**Water Efficient Landscape:** Provide resources and incentives to residential and commercial customers to retrofit their landscapes to drought tolerant and native plants, and water efficient irrigation systems	Water and Power
I	**Water Quality Information:** Distribute information through the City's website regarding Pasadena's water quality to support use of local faucets in lieu of water bottles for drinking water	Water and Power

Performance Indicators		GHG Emissions Reduction Potential[25]
2020	0% reduction in water consumption per capita (comply with SB X7-7)	0 MT CO_2e
2035	6.4% decrease in water consumption per capita (below calendar year 2035 SB X7-7 levels)	130 MT CO_2e

CURRENT PROGRESS

WATER CONSERVATION EFFORTS

SB X7-7 requires that per capita water demand must be reduced 20% by 2020. Due to enhanced water conservation and efficiency programs, Pasadena's per capita water demand decreased by 30% in 2015.

[25] Community-wide water consumption dropped approximately 5-6% between 2013 and 2015, resulting in an anticipated reduction of 1,867 MT CO_2e in 2020 and 833 MT CO_2e in 2035. Completion of the 2020 and 2035 performance indicators is anticipated to result in an additional 130 MT CO_2e by by 2035, resulting in a total GHG reduction of 1,867 MT CO_2e by 2020 and 963 MT CO_2e by 2035.

WC-2: Non-Potable Water

Measure WC-2.1: Increase access to and use of non-potable water

	Implementation Actions (Near-term)	Primary Responsibility
A	**Non-potable Water Project (NPWP):** If implementation of the NPWP is approved by the City Council, provide progress to the Municipal Services Committee and/or City Council along with proposed action items for the current year and upcoming year	Water and Power
B	**NPWP Outreach:** Keep the public informed about the progress made and the importance of the completion of the NPWP by sending out announcements and progress updates in local newspapers and e-newsletters, posting on the City website, and distributing other means of communication	Water and Power
C	**Community Greywater Assistance:** Continue to partner with PWP, local experts and community organizations (i.e., Greywater Action) to encourage commercial, institutional, industrial, and municipal uses/buildings to implement non-potable water projects and residential greywater projects (e.g., L2L greywater installation training workshops, rain barrel distribution, financial incentives, and/or technical and installation assistance)	Water and Power
D	**Greywater Permit Streamlining:** Streamline the permit process for simple and complex greywater systems and facilitate the permit process by offering an application packet for greywater systems with a staff and/or technical expert point-of-contact for technical review	Planning, Water and Power
E	**Dual Plumbing Requirements:** Present the concept of adopting a new ordinance or revising the City's existing ordinance to require dual plumbing for use of non-potable, recycled water in all new development and require non-potable water connection capability for new developments along planned routes for non-potable water pipelines to City Council for consideration	Water and Power

Performance Indicators		GHG Emissions Reduction Potential
2020	Continue to evaluate the City's NPWP	0 MT CO_2e
2035	Achieve 7% of water supply from recycled water	953 MT CO_2e

CURRENT PROGRESS

GREYWATER PROGRAM

was launched in 2015 by PWP and offers workshops, on-site technical consultations and incentives for the installation of L2L greywater systems. In 2016 the City received a federal grant from the U.S. Bureau of Reclamation to expand the program.

RAIN WATER HARVESTING WORKSHOPS

are provided by PWP, including rain barrel sales and rebates for rain barrels and cisterns.

WC-3: Storm Water

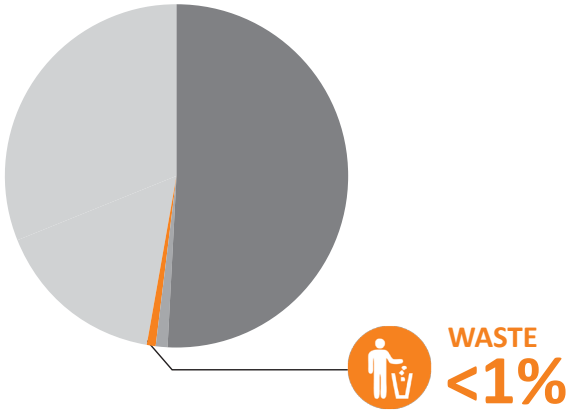
Measure WC-3.1: Improve storm water to slow, sink, and treat water run-off, recharge groundwater, and improve water quality

	Implementation Actions (Long-term)	Primary Responsibility
A	**Replace Impervious Surfaces:** Identify and map potential public locations to replace impervious surfaces with landscaped green spaces, permeable pavement, rain gardens, and/or bioswales	Public Works
B	**Increase Storm Water Capacity:** Continue to increase storm water capacity and reduce flooding by identifying locations to divert or redirect water run-off and improve culverts and other storm water infrastructure	Public Works
C	**Project Funding and Prioritization:** Develop a prioritized list of projects and identify funding for implementation	Public Works
D	**Restore Arroyo Seco:** Work with community organizations and volunteers to continue efforts to restore the Arroyo Seco region and other identified priority areas	Public Works
E	**Storm Water Management Development Standards:** Present the concept of amending development standards to require storm water management infrastructure in all new development, including but not limited to impervious pavement lot-coverage maximums, on-site water retention requirements, greywater storage requirements, and other Low Impact Development techniques to City Council for consideration	Public Works
F	**Cut Curbs and Bioswales:** Develop a policy requiring the use of cut curbs and bioswales in new development and redevelopment projects and present the policy to City Council for consideration	Transportation, Planning

Performance Indicators		GHG Emissions Reduction Potential
2020	Increase storm water capture	Supportive
2035	Increase storm water capture	Supportive

WASTE REDUCTION

2009 BASELINE EMISSIONS



POTENTIAL GHG REDUCTIONS

2020 STRATEGY- *4,559 $MTCO_2e$ out of 181,197 $MTCO_2e$*

2035 STRATEGY- *14,197 $MTCO_2e$ out of 458,181 $MTCO_2e$*

The Waste Reduction measures focus on decreasing GHG emissions from solid waste generation, specifically the GHG emissions associated with collection, transportation, and landfilling of waste, along with the methane generated by the decomposition of solid waste in landfill and combustion facilities. Waste management can be achieved by reducing the amount of trash and other waste discarded; reusing containers, products, and building materials; and recycling as many materials as possible, including green waste. Reducing solid waste and its associated GHG emissions benefits residents and business owners through improved air quality, reduced energy consumption, lower costs associated with disposal, and less congestion and noise associated with waste collection.

WR-1: Solid Waste

Measure WR-1.1: Continue to reduce solid waste and landfill GHG emissions

	Implementation Actions (Near-term)	Primary Responsibility
A	**Zero Waste Strategic Plan:** Complete an assessment of the progress made on strategies identified in the Zero Waste Strategic Plan, establish a prioritized list of strategies that require additional actions, and prioritize strategies that reduce waste over those that recycle	Public Works
B	**Annual Zero Waste Progress:** Annually evaluate and present progress towards implementation of the Zero Waste Strategic Plan to City Council along with proposed action items for the current year and upcoming year	Public Works
C	**Multi-use Food Containers:** Develop incentive programs to encourage multi-use food container programs throughout the city to address the importance of reducing the use of single-use plastics	Public Works
D	**Zero Waste Outreach:** Utilize the City's website to provide education and outreach related to zero waste, as well as details on comprehensive approaches to waste reduction, diversion, and recycling	Public Works
E	**Waste Diversion:** Continue to optimize waste diversion at City facilities and throughout public areas	Public Works
F	**Source Separated Recycling:** Encourage source separated recycling and composting for residential and commercial buildings through education and outreach including local workshops and appropriate mailings	Public Works

Performance Indicators		GHG Emissions Reduction Potential
2020	Achieve 75% diversion rate	0 MT CO_2e
2035	Achieve 87% diversion rate	7,359 MT CO_2e

CURRENT PROGRESS

73%
DIVERSION RATE
was achieved in 2010, an increase from 37% in 1995. Also, nearly 10% organic waste was diverted from landfill in 2015.

PLASTIC BAG BAN
was enacted in 2012 to prohibit large grocery stores and food marts from providing single-use plastic bags.

CONTAINER BAN ORDINANCE
was implemented in 2016 to prohibit the use of polystyrene food packaging in the City.

WR-2: Reuse and Recycling

Measure WR-2.1: Establish a "Preferred Procurement Plan" for sustainable, strategic sourcing of supplies for all City departments and facilities

	Implementation Actions (Mid-term)	Primary Responsibility
A	**Recycled or Refillable Supplies:** Select products made from post-consumer recycled content or use refillable options when possible	Public Works
B	**Bulk Ordering:** Order materials in bulk and utilize businesses with reusable delivery boxes, when possible	Public Works

Performance Indicators		GHG Emissions Reduction Potential
2020	Establish a Municipal Preferred Procurement Plan	Included as part of Measure WR-1.1
2035	Establish a Municipal Preferred Procurement Plan	Included as part of Measure WR-1.1

CURRENT PROGRESS

RECYCLED CONTENT PAPER

Current City policy requires departments to purchase recycled content printer paper and to encourage double sided copying.

WR-2: Reuse and Recycling

Measure WR-2.2: Create an internal program for all City departments to recirculate unwanted goods

	Implementation Actions (Mid-term)	Primary Responsibility
A	**"Free" Database:** Consider creating a link on the City website to a database of materials that are available for free (San Francisco's reuse program could be used as a model)	Public Works
B	**Office Clean Outs:** Designate regular office clean out days (e.g., semi-annual events) and redistribute materials to other departments or organizations as needed to better utilize existing supplies and equipment	Public Works

Performance Indicators		GHG Emissions Reduction Potential
2020	Create a Municipal Reuse Program	Included as part of Measure WR-1.1
2035	Create a Municipal Reuse Program	Included as part of Measure WR-1.1

WR-3: Composting and Food Recycling

Measure WR-3.1: Implement a city-wide composting program to limit the amount of organic material entering landfills

	Implementation Actions (Near-term)	Primary Responsibility
A	**Food Waste Recycling:** Continue to determine feasibility of a residential compost program and a business food waste redistribution and recycling programs	Public Works
B	**Community Outreach:** Conduct community outreach to encourage all residents to compost food scraps and organic waste at home in a backyard composter	Public Works
C	**Backyard Compost:** Create incentives or rebates for backyard compost bins/piles and host composting workshops to provide education and training for the community	Public Works
D	**Compost Education:** Clearly communicate to residents what materials are and are not compostable (make sure it aligns with the compost facility's material acceptance policies, [e.g., food-soiled paper products in the list of acceptable materials]) through local composting workshops, the City's website, and appropriate mailings	Public Works
E	**Composting Facilities:** Develop an ongoing partnership with composting facilities and local nurseries to consistently improve the composting program and create both low-grade and higher value compost commodities (e.g., Organic Materials Review Institute certification)	Public Works
F	**Compost Resources:** Expand the City's website to include more local resources related to various levels of composting, including images or infographics of exemplary kitchen pails, backyard bins, completed compost, and thriving gardens	Public Works

CURRENT PROGRESS

RESIDENTIAL COMPOST BINS

are offered for all Pasadena residents.

WR-3: Composting and Food Recycling (Continued)

Measure WR-3.1: Implement a city-wide composting program to limit the amount of organic material entering landfills

	Implementation Actions (Near-term)	Primary Responsibility
G	**Redistribute Mulch/Compost:** Expand existing programs that redistribute mulch and compost to residents for free and advertise programs through the City's website and appropriate mailings	Public Works
H	**Compost/Mulch Program:** Partner with local nurseries to develop a program to collect and compost/mulch of all yard waste from residential black bins into mulch or compost for giveaways rather than sending this material to the Scholl Canyon Landfill, and advertise program through the City's website and appropriate mailings	Public Works

	Performance Indicators	GHG Emissions Reduction Potential
2020	Reduce organic waste by 50% below 2013 levels (as mandated by SB 1383)[26]	4,559 MT CO_2e
2035	Reduce organic waste by 75% below 2013 levels (as mandated by SB 1383)	6,838 MT CO_2e

[26] Performance indicators are calculated relative to 2013 levels to avoid double-counting with reductions that occurred between 2009 and 2013 as a result of state measures (i.e., Construction & Demolition Waste Diversion Ordinance) that were captured in the adjusted forecast.

WR-3: Composting and Food Recycling

Measure WR-3.2: Implement 3-bin compost systems, in addition to recycling and landfill bins, at public parks to compost all trimmings and waste on-site to divert organic materials from the landfill and increase locally available compost

	Implementation Actions (Mid-term)	Primary Responsibility
A	**Park Amenities Matrix:** Utilize the Park Amenities Matrix to identify a prioritized list of parks where compost systems can be implemented first, and create an action plan for that implementation	Public Works
B	**Compost Systems:** Update the Park Amenities Matrix to include composting systems	Public Works
C	**Compost Signs:** Create signs and other educational tools, such as a kiosk with information about composting and the benefits for local composting solutions	Public Works
D	**Compost Workshops:** Host community workshops and events in the park to promote the benefits of composting on-site and to increase environmental literacy	Public Works
E	**City to Home Compost:** Encourage community partnerships with the City to maintain the compost piles and encourage residents to harvest completed compost for use in their gardens	Public Works

Performance Indicators		GHG Emissions Reduction Potential
2020	Included as part of WR-3.1	Included as part of WR-3.1
2035	Included as part of WR-3.1	Included as part of WR-3.1

CURRENT PROGRESS

MULCH PRODUCTION & GIVE-AWAY PROGRAM

offers mulch generated from maintenance of City trees to the public nine months of the year.

FREE COMMERCIAL GRADE COMPOST

The City offers commercial grade compost, free of charge, to residents as a result of its partnership with a commercial compost generator.

COMPOST WORKSHOPS

The City partners with the Los Angeles County Department of Public Works to host compost workshops in Pasadena on a quarterly basis.

WR-4: Waste Collection System

Measure WR-4.1: Reduce the GHG impacts of the waste collection system

	Implementation Actions (Long-term)	Primary Responsibility
A	**Waste Collection Carbon Footprint Study:** Investigate ways to reduce the carbon intensity of hauling waste within Pasadena and present findings to City Council	Public Works
B	**Electrify Waste Haul Fleet:** Investigate switching to an electric waste hauling fleet and present finding to City Council	Public Works

	Performance Indicators	GHG Emissions Reduction Potential
2020	Reduce waste collection carbon footprint	Included as part of Measure T-4.1
2035	Reduce waste collection carbon footprint	Included as part of Measure T-4.1

CURRENT PROGRESS

40

BIG BELLY SOLAR TRASH COMPACTORS

were placed throughout the City in 2010. However, this did not result in a decrease in pickups due to several factors, including required maintenance and vandalism.

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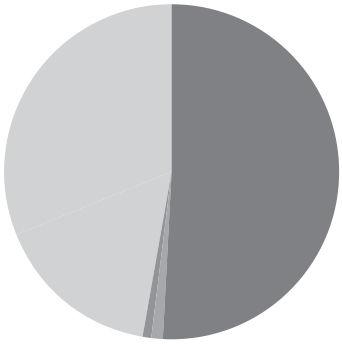
URBAN GREENING

2009 BASELINE EMISSIONS



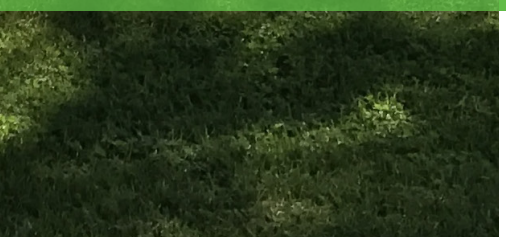
Emissions related to Urban Greening were not accounted for in the 2009 GHG Inventory.

POTENTIAL GHG REDUCTIONS

2020 STRATEGY- *184 $MTCO_2e$ out of 181,197 $MTCO_2e$*

2035 STRATEGY- *344 $MTCO_2e$ out of 458,181 $MTCO_2e$*

The Urban Greening measures focus on reducing GHG emissions by increasing the number of trees and other vegetation that absorb and capture carbon dioxide from the atmosphere, also known as carbon sequestration. By maintaining a healthy urban forest, prolonging the life of trees, and continually increasing the number of trees in the city, Pasadena can increase its net carbon storage over the long-term. Green infrastructure provides additional benefits to community members, such as improved air quality, water quality, and access to nature. Trees and other vegetation also help reduce local surface temperature by shading buildings, streets, and sidewalks, and enhancing the beauty of the community.



UG-1: Greenspace

Measure UG-1.1: Continue to preserve, enhance, and acquire additional green space throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation

	Implementation Actions (Near-term)	Primary Responsibility
A	**Accessible Open Space:** Complete an assessment of the progress made since 2009 of the Green City Action Plan that includes a goal to ensure that an accessible public park or recreational open space is situated within 0.5 kilometer of all residents, with particular focus on the seven gaps identified in the Green Space, Parks, and Recreation Master Plan	Planning
B	**Additional Green Space:** Map locations that do not meet the goals of the Green City Action Plan and establish priority areas to acquire/develop additional green space to meet the goals	Planning
C	**Convert to Green Space:** Identify and map public spaces that can be converted to green space, including public parking that can be converted to parklets, freeway airspace that can be made into green space, vertical walls that can be planted with vines, and rooftops of public buildings that can be developed into gardens	Planning
D	**Green Space Policies:** Through the development and permit review process, ensure new development and redevelopment projects include planting trees and providing green space where possible	Planning
E	**Native Green Space:** Through the development and permit review process, evaluate landscaping plans to ensure that native species are utilized where feasible	Planning

Performance Indicators		GHG Emissions Reduction Potential
2020	5 new acres of green space	22 MT CO_2e
2035	30 new acres of green space	129 MT CO_2e

CURRENT PROGRESS

DROUGHT-TOLERANT PLANT PALETTE

was developed in 2009 to be used in City planting projects.

1,000
NATIVE PLANTS

were planted in Washington Park in an effort to relandscape the area.

375
DROUGHT TOLERANT PLANTS

were added to the Jackie Robinson Center in collaboration with Pasadena Beautiful Foundation.

20.6
ACRES OF PARKS & OPEN SPACE

were added in the City in 2010.

UG-2: Urban Forest

Measure UG-2.1: Continue to protect existing trees and plant new ones to improve and ensure viability of Pasadena's urban forest

	Implementation Actions (Near-term)	Primary Responsibility
A	**Sidewalk Trees:** Continue to work with the Pasadena Beautiful Foundation to plant trees in all existing sidewalk sites that do not currently contain trees	Public Works
B	**Tree Health Assessment Program:** Continue to implement a Street Tree Health assessment program to periodically assess tree health and take corrective action to avoid tree death and removal where feasible	Public Works
C	**Encourage Private Tree Planting:** Encourage private property owners to plant trees on their property by working with community organizations to offer resources, technical assistance, and volunteer labor	Public Works
D	**Tree List:** Update the list of approved trees for planting in Pasadena with a focus on native and drought-tolerant species	Public Works

Performance Indicators		GHG Emissions Reduction Potential[27]
2020	Plant 500 new trees	18 MT CO_2e
2035	Plant 2,000 new trees	71 MT CO_2e

CURRENT PROGRESS

TREE CANOPY SURVEY
was completed in 2008 and counted 4,209 acres of canopy coverage, or 28.6% of the City's total land acreage.

4,064 TREES
were planted between 2013 and 2016. (anticipated GHG reduction potential of 144 MT CO_2e in both 2020 and 2035)

[27] The City planted 4,064 trees between 2013 and 2016, resulting in an anticipated GHG reduction of 144 MT CO_2e in both 2020 and 2035. Completion of the 2020 and 2035 performance indicators is anticipated to result in an additional 18 MT CO_2e by 2020 and 71 MT CO_2e by 2035, resulting in a total GHG reduction of 162 MT CO2e by 2020 and 215 MT CO_2e by 2035.

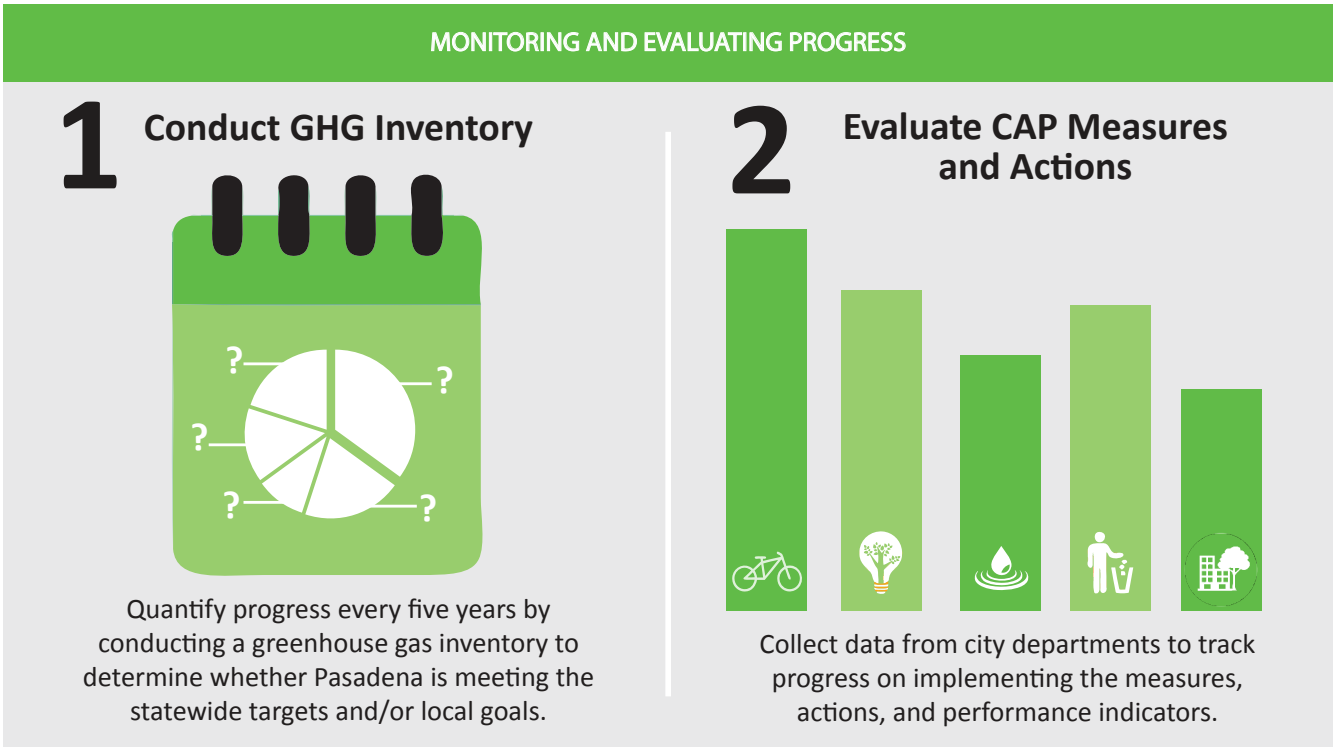
MONITORING PROGRESS, PLAN EVALUATION, AND UPDATING THE CLIMATE ACTION PLAN

The CAP outlines a strategy to reduce local GHG emissions consistent with state-wide targets. The following are the emissions reduction goals established under this CAP:

- **2020 Goal: Reduce emissions 27% below 2009 levels** (an emissions limit of approximately 1,492,793 MT CO_2e)
- **2030 Goal: Reduce emissions 49% below 2009 levels** (an emissions limit of approximately 1,402,910 MT CO_2e)
- **2035 Goal: Reduce emissions 59% below 2009 levels** (an emissions limit of approximately 838,418 MT CO_2e)
- **2050 Goal: Reduce emissions 83% below 2009 levels** (an emissions limit of approximately 347,637 MT CO_2e)

The City recognizes it may become necessary to modify/update the CAP to account for state and/or federal actions or improvements in technology and efficiency, and will do so through its monitoring of the overall progress of the CAP every five years. To evaluate the CAP's progress toward meeting the emissions reduction goals, a GHG inventory will be conducted approximately every five years. If the inventory reveals that the CAP is not making the expected or anticipated progress towards meeting the emissions reduction goals, the effectiveness of the measures and/or actions will be evaluated and may be modified as necessary. Following the inventory, a report will be prepared to update the City Council, residents, and other interested stakeholders on the overall progress of the CAP. If necessary, the report will provide recommendations for changes to the implementation strategy or the plan itself.

Overall, the CAP represents the City's best attempt to respond to the challenges of climate change at the time of preparation. The field of climate action planning is rapidly evolving - over the next decade, new information, GHG reduction methods, and legislation are likely to develop, as evidenced by CARB's current update to the Scoping Plan. In order to remain effective, the CAP must evolve over time.



PROJECTS AND ENVIRONMENTAL REVIEW

One of the benefits of adopting a local CAP is the ability to streamline the environmental review of projects. Under CEQA, lead agencies, such as local governments, may streamline the analysis of GHG emissions on a project by using a programmatic GHG reduction plan, such as this CAP.

The CAP and its accompanying environmental documentation are consistent with the criteria set forth in CEQA Guidelines Section 15183.5(b) as outlined below:

1. Quantify GHG emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area (see Chapter 2);

2. Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable (see Chapters 2 and 3);

3. Identify and analyze the GHG emissions resulting from specific actions or categories of actions anticipated within the geographic area (see Chapter 3);

4. Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level (see Chapters 3 and 4);

5. Establish a mechanism to monitor the plans' progress toward achieving the target and to require amendment if the plan is not achieving specified targets (see Chapter 4 and Appendix D); and

6. Adopt the GHG reduction strategy in a public process following environmental review (see Appendix E).

The Pasadena Towers achieved Platinum LEED Certification- the highest rating in office sustainability

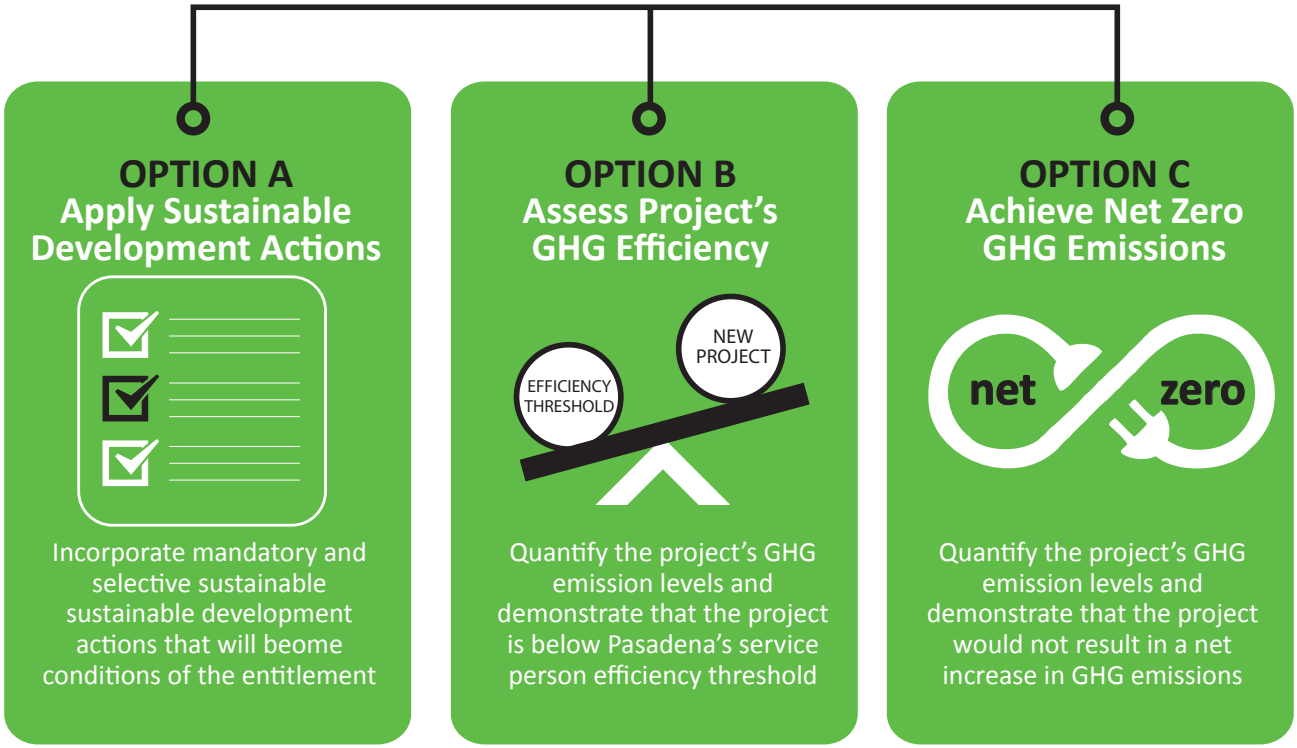
CEQA Implementation and CAP Consistency

The CAP establishes a framework for evaluating and mitigating GHG emissions by providing an emissions inventory, emissions reduction goals, and strategies for reducing emissions. Part of these emissions reductions will need to be achieved through better environmental and sustainable performance by new development projects.

To determine whether new development projects comply with the CAP, and to ensure that projects are contributing to GHG reductions, City staff will use the CAP Consistency Checklist (Checklist) for discretionary projects subject to CEQA (see Appendix D). The Checklist is intended to be a tool for new development projects to demonstrate consistency with the CAP, a qualified GHG reduction plan in accordance with CEQA Guidelines Section 15183.5. This Guideline allows lead agencies to analyze the impacts associated with GHG emissions at a programmatic level in plan level documents such as CAPs, so that project level environmental documents may tier from the programmatic review. New development projects that meet the requirements of the Checklist, including completion of one of the three options listed below, will be deemed to be consistent with the CAP and will be found to have a less than significant contribution to cumulative GHG emissions, pursuant to CEQA Guidelines Section 15064(h)(3), 15130(d), and 15183(b). Projects that do not meet the requirements in the Checklist will be deemed to be inconsistent with the CAP and must prepare a project specific analysis of GHG emissions.

NEW DEVELOPMENT PROJECTS AND CAP CONSISTENCY

Projects subject to CEQA review have three options to prove consistency with the CAP



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Pasadena Fire Department's Community Emergency Response Team (CERT) provides hands-on training for the community to gain basic disaster survival and rescue skills.

Chapter 5

ADAPTATION AND CLIMATE CHANGE READINESS

Impacts of climate change are already being seen, but the exact nature of the impacts are unknown.[28] By preparing for the changes that are underway, Pasadena can reduce the risks posed to the city by climate change. As part of the development of the CAP, a climate vulnerability assessment was conducted to help identify the potential impacts of climate change and to inform the development of effective strategies and actions that would increase community resilience (see Appendix D).

Climate Vulnerability Assessment

Pasadena, like many other cities across California, will be exposed to a variety of unavoidable climate change hazards. It is anticipated that Pasadena will experience more droughts and intense rains, as well as more frequent and severe heat waves. However, exposure to these hazards does not mean that all members of the community will be impacted or affected in the same way. A number of factors, including age and socioeconomic status, will determine the degree of impact each will experience. To better understand how climate-related hazards may impact the community, the climate vulnerability assessment included an evaluation of the following components:

- Exposure to climate change hazards
- Sensitivity to hazards
- Potential climate change impacts and risks

[28] California Natural Resources Agency, 2009. http://resources.ca.gov/.

Table 5.1 Vulnerability Assessment Components	
Exposure	The nature and degree to which the community experiences the stress of a hazard
Sensitivity	The aspects of the community (e.g., people, structures, and functions) most affected by the identified exposures
Potential Impacts	The nature and degree to which the community is affected by a given stressor, change, or disturbance
Adaptive Capacity	The ability to cope with extreme events, to make changes, or to transform to a greater extent, including the ability to moderate potential damages and to take advantage of opportunities
Risk and Onset	The likeliness and expected timing of impacts

As shown in Table 5.1, exposure to a hazard refers to the nature and degree to which a community experiences a stress or hazard, while the potential impacts refers to the nature and degree to which a community is affected by a given stressor, change, or disturbance. Risk refers to the likeliness and expected timing of the impacts, and sensitivity refers to the aspect of a community, such as the population or physical structures, most affected by the exposure. Adaptive capacity refers to the ability to cope or make changes to cope with extreme events.

Pasadena Fire Department in action

Vulnerability to climate change refers to the degree to which a system is susceptible to, or unable to cope with, adverse impacts of climate change.

Exposure to Climate Change Hazards

The major impacts of climate change that are expected to affect Pasadena include extreme and rising temperatures, changes in precipitation and droughts, storm frequency and intensity, and wildfire risk. The following is a summary of these impacts.

Extreme and Rising Temperatures
Pasadena can expect to experience warmer and more extreme temperatures. According to the California Energy Commission (CEC), Pasadena can expect to experience a rise in average annual temperature of about 3.5 to 6.0 degrees Fahrenheit above the historical average by the end of the 21st century. Pasadena can also expect to experience an increase in the annual number of extreme heat days (temperatures above 96 degrees Fahrenheit) and longer and more frequent heat waves (four or more extreme heat days).

Changes in Precipitation and Drought
Pasadena can expect to experience a decrease in annual rainfall, along with associated drier conditions. According to the CEC, Pasadena can expect a decrease in annual rainfall of about 6 inches by the end of the 21st century. As a result of decreased annual rainfall, droughts may become more frequent, longer, and more severe.

Storm Frequency and Intensity, and Windstorms
Pasadena is likely to experience altered seasons and intense rainstorms and windstorms. While average conditions may be drier, the expectation is that more intense rainstorms will occur during a shorter rainy season resulting in increased flooding and associated landslides.

Wildfire Risk
Although Pasadena is likely to see increases in the number and severity of rainstorms, the overall precipitation is likely to decrease over time. This decline in precipitation and rise in temperatures during the summer months may result in drier vegetation and greater threat from wildfire. Wildfire in turn makes the surrounding steep slopes of Pasadena increasingly susceptible to landslides in high precipitation events.

Local Climate Change Hazards

Increase in
Extreme Heat Days

Increased
Possibility of Fire

Increased
Frequency of
Destructive Storms

Decreased
Overall Precipitation

Sensitivity to Hazards

It is anticipated that Pasadena will be exposed to a variety of impacts from climate change. The degree to which individual members of the community will be affected will depend upon their sensitivity levels. When members of a community are likely to be affected by hazards, then they are considered to be sensitive to climate change. The climate vulnerability assessment evaluated three categories to determine sensitivity: population, physical structures, and community functions. The following is a summary of each category.

Sensitivity is the degree to which populations, physical structures, and community functions are directly or indirectly affected by changes in climate conditions.

Population

The sensitivity of a population depends upon factors such as age, preexisting health conditions, social and financial stability, and employment. Those most vulnerable to climate-related illnesses are the elderly, infants, individuals with chronic conditions such as heart disease, the socially or economically disadvantaged, and those who work outdoors. For instance, individuals who lack medical insurance may face unique obstacles if they become ill or are injured in an extreme weather event. Language is another hurdle that may impede individuals from obtaining resources for climate change preparation or emergency response. These socially vulnerable populations often face greater challenges preparing for, coping with, and recovering from climate-related hazards.[29]

Community Structures

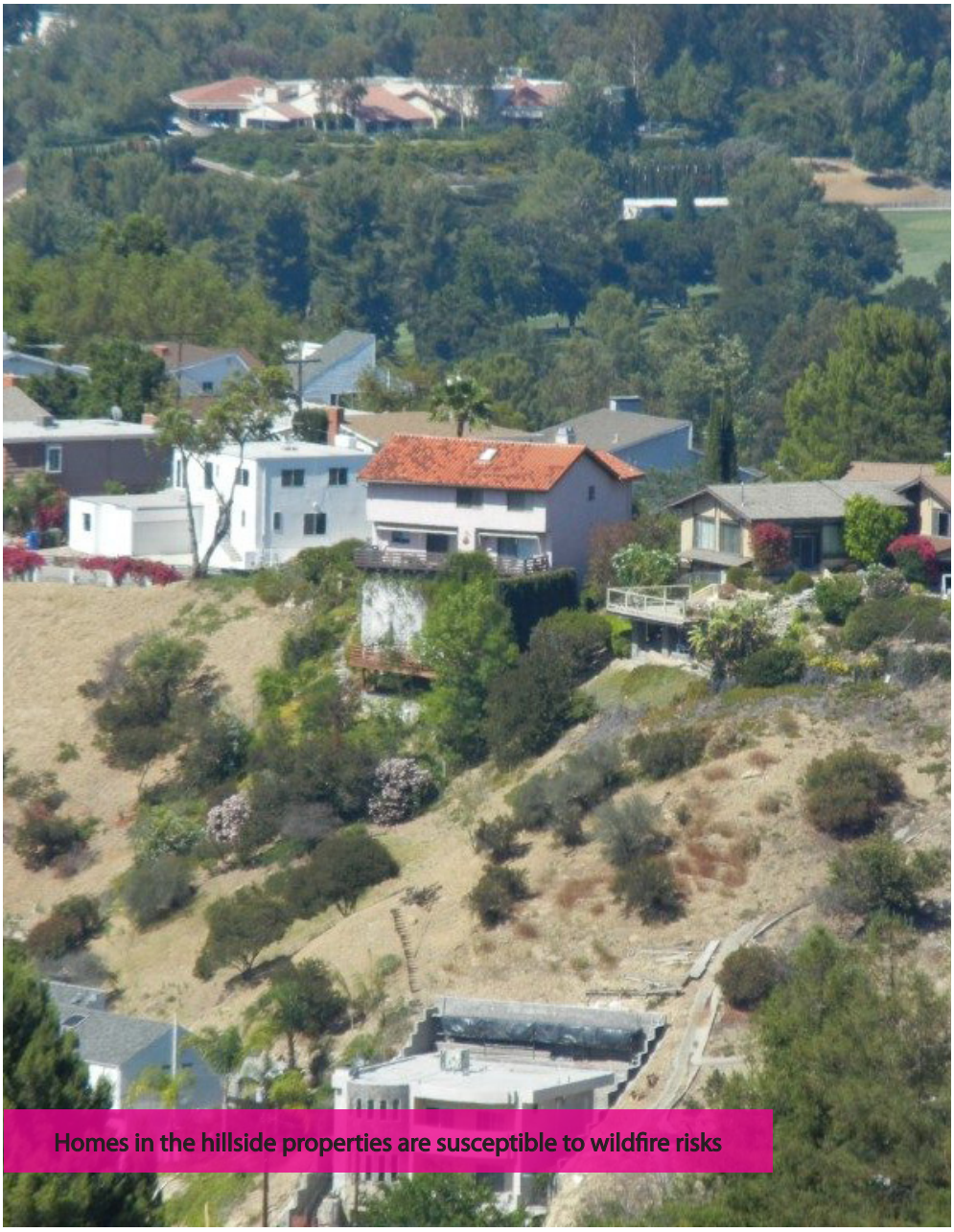
The built environment, including open space in the city, is especially sensitive to climate change hazards. Essential facilities such as hospitals, police and fire stations, emergency operation centers, evacuation shelters, schools, and parks are critical to the health and welfare of the population, perhaps more so following climate-influenced hazard events. Sensitive facilities where damage would have large environmental, economic, or public safety consequences, such as dams, reservoirs, water treatment plants, and hazardous waste facilities, are also particularly vulnerable to climate change.

Community Functions

Community functions refer to systems that enable a city to operate. They include transportation systems, lifeline utility systems, energy delivery, government continuity, and even tourism. Access to these systems, along with services provided by them, may be threatened by the impacts of climate change. For example, a climate-related disaster event can directly jeopardize transportation systems such as bridges, tunnels, overpasses, transfer centers, and the City's public transit system, while indirectly impacting residents who use those services.

[29] California Natural Resources Agency, 2009. http://resources.ca.gov/.

Climate-related risks are created by a range of hazards. Some are slow in their onset (such as changes in temperature and precipitation leading to droughts), while others happen more suddenly (such as floods).



Homes in the hillside properties are susceptible to wildfire risks

Potential Climate Related Impacts and Risks

As the effects of climate change continue to increase, ongoing stress to vulnerable populations and sectors of society are expected. Table 5.2 summarizes the impacts of climate change hazards identified earlier in this chapter and the potential impacts based on the three points of sensitivity.

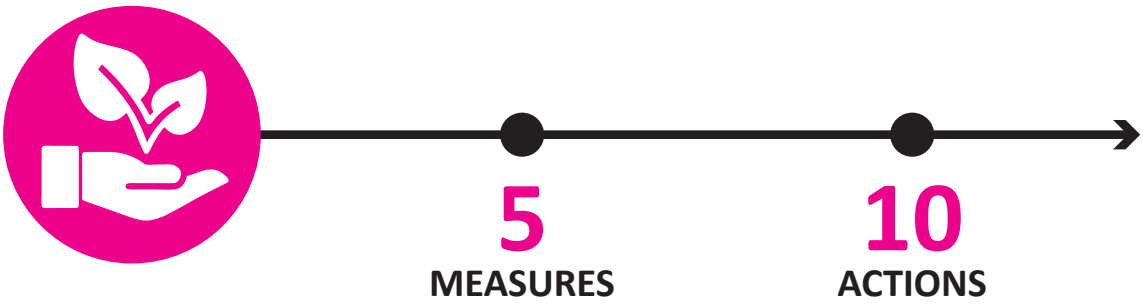
Table 5.2 Potential Climate-related Impacts			
Hazard	**Population Impact**	**Community Structure Impact**	**Community Function Impact**
Extreme and Rising Temperatures			
More extreme heat days and longer heat waves	• Rise in heat-related illnesses such as asthma and skin cancer • Increased dehydration, heat exhaustion, respiratory problems, heat stroke, and death • Rise in health care cost • Growing uncomfortable and unsafe conditions for visitors, reducing tourism • Increased risk for youth and elderly population	• Strain on health facilities (increase need for services) • Increased use of electricity for home cooling purposes leading to electricity restrictions and/or black-outs (strain on energy grid) • Decrease in walking and bicycling, increasing demand for public transit and use of city roadways by individual cars	• Impact to biological species and natural habitat • Increase in vector-borne diseases • Decrease in tourism due to uncomfortable and unsafe heat conditions • Reduced water supply
Precipitation and Drought			
More frequent and intense drought	• Higher prices for food and water • Food and water shortages, affecting nutrition • Water-related illnesses • Decrease in emergency response availability	• Decline in city roadways • Decreased water supply and quality • Reduced opportunities for community recreation • Reduced viability of natural landscape	• Diminished groundwater levels • Increasing slope instability due to the fractured, cracked, and dry soil • Impeded ability to fight against potential wildfires
Storm Frequency and Intensity and Windstorms			
Altered seasons and more intense rainstorms, flooding, landslides, and windstorms	• Decline in emergency response systems, increasing wait times for crucial services • Reduced access to emergency response and health centers	• Increased flooding and run-off • Strain on septic system and sewage treatment plants, impacting treatment of water • Potential inundation from local infrastructure failing, impacting residential and commercial areas • Communication of emergency response systems impacted if electricity transmission is interrupted • Increased peak storm runoff, adding to the risk of flooding due to the overtopped storm water channels, pipes, pumps, and creeks	• Increased erosion and sediment pollution in local watersheds • Impacted transportation network inhibiting movement of people and goods
Wildfire Risk			
Less vegetation and drier conditions, higher risk of wildfires	• Displacement • Impacted air quality	• Loss of homes • Loss of natural resources from erosion and landslides	• Loss of habitat • Loss of recreational space • Release of hazardous materials

Strategies for Increasing Resiliency to Climate Change

By preparing for the changes described on the previous page, Pasadena can reduce the risks from climate change. The measures in this section focus on the aspects of resilience that are not covered under the GHG emissions reduction measures. While the adaptation measures do not contribute to reductions in GHG emissions, they are recommended for their focus on bolstering the community's resilience to climate change.

Adaptive capacity
is the current ability to address the potential impacts of climate change and includes adjustment in behavior, resources, and technologies.

Figure 5.1 The CAP's Adaptation Strategy



Measure 1: Improve community preparedness and emergency response

	Implementation Actions	Primary Responsibility
A	**Refine Emergency Preparedness and Response to Address Climate Change Impacts:** Review the City's emergency preparedness plans, such as the Emergency Operations Plan and the Natural Hazard Mitigation Plan, and consider refining them to augment preparedness for events likely to increase with climate change, developing plans for anticipated impacts	Fire, Public Health
B	**Prepare an Extreme Heat Notification Process:** Coordinate efforts for alerting the community, especially those most vulnerable to extreme heat, when poor air quality days pose a health risk (early warning notifications may include locations of cooling centers, measures to prevent heat-related illness, and recommendations about limiting outdoor activities)	Public Health

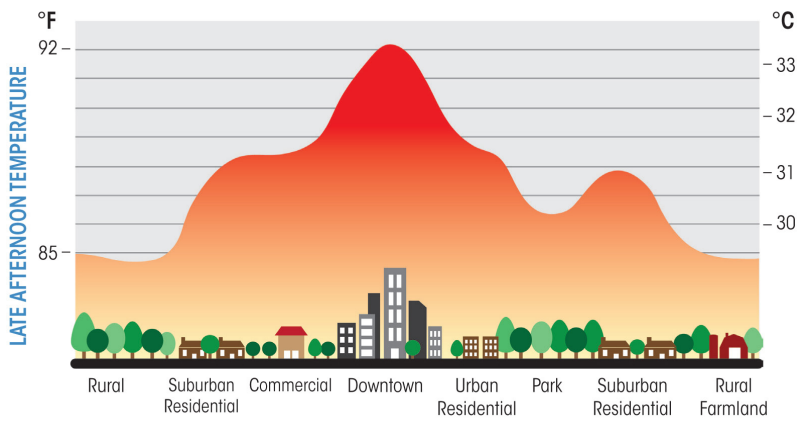
Measure 2 – Promote healthy, safe, and resilient communities

	Implementation Actions	Primary Responsibility
A	**Present the Community Health Needs Assessment:** Share available environmental health data when conducting community presentations	Public Health
B	**Promote Food Waste Prevention:** Continue to promote the "Be Better Pasadena" program where health educators provide free community nutrition classes that encourage food waste prevention by teaching topics such as proper food storage, repurposing leftovers, reading expiration date labels, participating in community garden projects, and composting	Public Health

Measure 3 – Support strategies to reduce the urban heat island effect.

	Implementation Actions	Primary Responsibility
A	**Analyze Cool Pavement Strategies:** Study the feasibility of implementing cool pavement strategies - materials and/or technologies that reflect more solar energy - in an effort to reduce the urban heat island effect	Planning
B	**Plant Shade Trees:** Continue to increase tree planting and urban green space by implementing the urban greening measures identified in the CAP, with emphasis on shading home, critical infrastructure, and bicycle and pedestrian routes	Public Works

What is the urban heat island effect?



An urban area creates a heat island when its temperatures are higher than those of the surrounding non-urban area. As urban areas develop, buildings, roads, and other infrastructure they replace open land and vegetation. Developed surfaces absorb more solar energy, and can create higher temperatures in urban areas.

Source: February 22, 2017. www.cleanairpartnership.org/

Measure 4 – Improve the resilience of systems that provide resources and services critical to community function

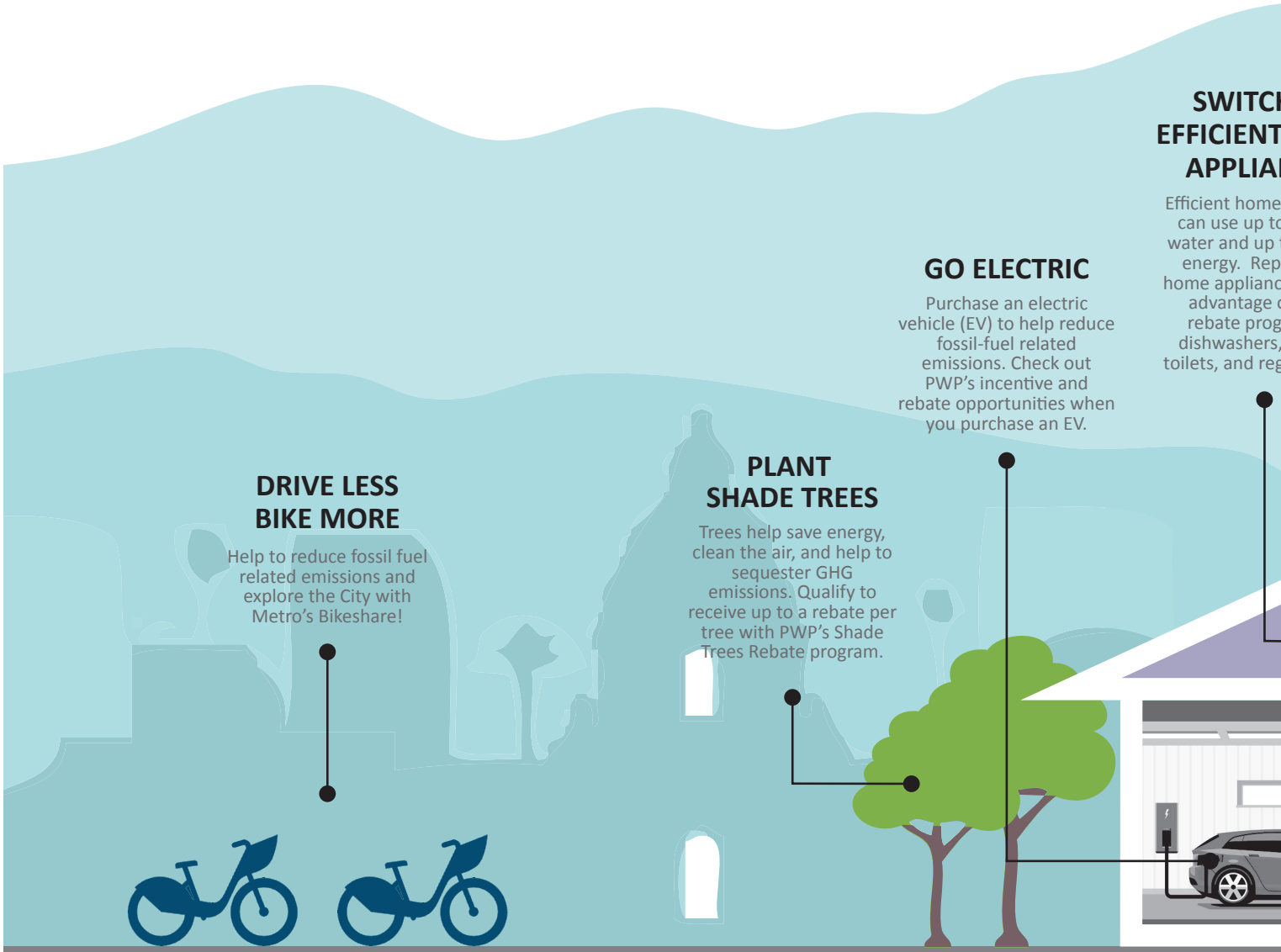
	Implementation Actions	Primary Responsibility
A	**Resilient Water and Energy Supply:** Continue to increase the resilience of the City's water and energy supply by implementing water and energy conservation measures identified in the CAP	Water and Power
B	**Transportation Safety:** Support efforts to ensure that all transportation modes remain safe and viable in the event of climate-related changes and that alternative and emergency routes are appropriately identified	Transportation

Measure 5 – Support educational campaigns and outreach efforts that increase public awareness of climate change and its anticipated effects on the community

	Implementation Actions	Primary Responsibility
A	**Distribute Informational Pamphlets:** Develop communication strategies and messages that enhance the understanding and response to human health vulnerability and equity dimensions of climate change by summarizing climate change vulnerabilities and responses and disseminate at public outreach events, at City facilities, and on the City's website	City Departments
B	**Publish Plans:** Publish emergency preparedness and response plans, as well as community health assessments on the City's website	Public Health, Fire Department

The "Be Better" Campaign offers free community classes and resources about good eating habits and healthy lifestyle choices.

10 Things You Can Do



* PWP rebate programs are subject to funding and can change over time. Visit PWP's website to view the most updated inform

HOME UPGRADES

PWP offers a variety of programs and rebates available for income-qualified customers to help lower bill payments and provide free or low-cost upgrades for water and energy home appliances.

LIGHTEN YOUR LOAD

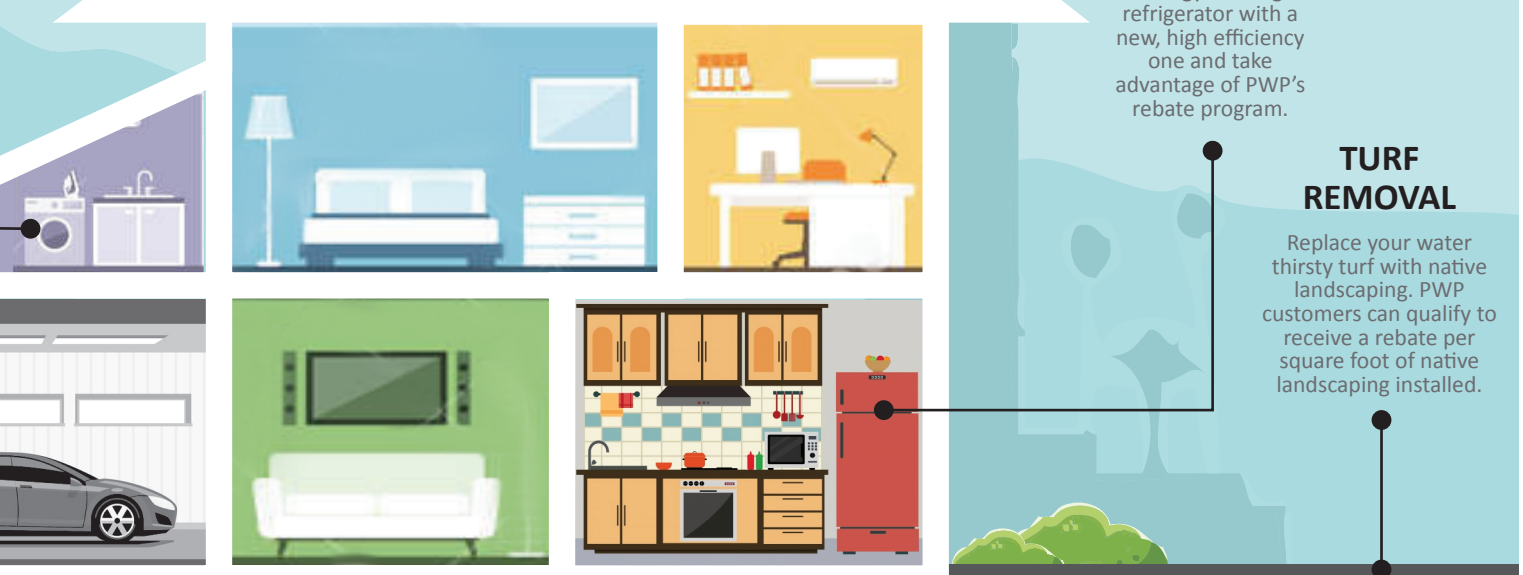
Switch out your old incandescent light builbs with LEDs and cut your energy use for lighting by up to 75%.

TRACK YOUR ENERGY AND WATER USE

Compare your energy and water use wih similarly sized homes to see how you can make your home more efficient.

H TO HOME NCES

appliances o 45% less to 25% less lace your es and take of PWP's rams for washers, frigerators.

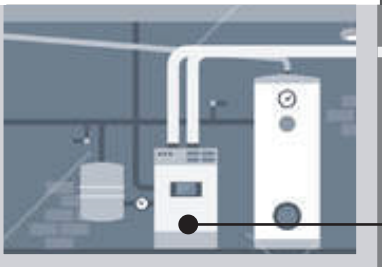


RECYCLE YOUR REFRIGERATOR

Recyle your old, energy wasting refrigerator with a new, high efficiency one and take advantage of PWP's rebate program.

TURF REMOVAL

Replace your water thirsty turf with native landscaping. PWP customers can qualify to receive a rebate per square foot of native landscaping installed.



LAUNDRY TO LANDSCAPE (L2L)

Increase water efficiency by reusing the water from your washing machine to water your plants. PWP's L2L Program offers rebates and installation workshops to help you get started.

nation.

ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ARTS	Pasadena Area Rapid Transit Service
BAU	Business-as-Usual
CARB	California Air Resources Board
CalEPA	California Environmental Protection Agency
CalGreen	California Green Building Code
CalRecycle	California Bureau of Reclamation, Reuse, and Recycling
CAP	Climate Action Plan
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DOT	Department of Transportation
EAC	Environmental Advisory Committee
EO	Executive Order
EOP	Emergency Operations Plan
EPA	United States Environmental Protection Agency
EV	Electric Vehicle
GHG	GHG
Guidelines	CEQA Guidelines
GWP	Global Warming Potential
IRP	Integrated Resource Plan
ITS	Intelligent Transportation System
kW	Kilowatt
kWh	Kilowatt Hours
L2L	Laundry-to-Landscape Program
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
MT	Metric Tons
MMT	Million Metric Ton
N_2O	Nitrous Oxide
NASA	National Aeronautic and Space Administration
NPWP	Non-potable Water Project
O_3	Ozone
PV	Photovoltaic
PWP	Pasadena Water and Power
RPS	Renewables Portfolio Standard
RTC/SCS	Regional Transportation Plan
SB	Senate Bill
SCAG	Southern California Association of Governments

Scoping Plan	CARB's Climate Change Scoping Plan
SCS	Sustainable Communities Strategies
SRTP	Short-range Transit Plan
TDM	Transportation Demand Management
UNUEA	United Nations Urban Environmental Accords
U.S.	United States
UWMP	Urban Water Management Plan
VMT	Vehicle Miles Traveled
WIRP	Water Integrated Resources Plan
ZNE	Zero Net Energy

GLOSSARY OF TERMS

Adaptation
Adjustment or preparation of natural or human systems to a new or changing environment that moderates harm or exploits beneficial opportunities.

Adaptive Capacity
The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Alternative Energy
Energy derived from nontraditional sources (e.g., compressed natural gas, solar, hydroelectric, wind).

Anthropogenic
Made by people or resulting from human activities, usually used in the context of emissions that are produced as a result of human activities.

Atmosphere
The gaseous envelope surrounding the Earth: the dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a number of trace gases, such as argon (0.93% volume mixing ratio), helium, GHGs such as carbon dioxide (0.035% volume mixing ratio), and ozone. In addition the atmosphere contains water vapor, the amount of which is highly variable but typically 1% volume mixing ratio. The atmosphere also contains clouds and aerosols.

Carbon Dioxide
A naturally occurring gas, and a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes; the principal human-caused GHG that affects the Earth's radiative balance. It is the reference gas against which other GHGs are measured and therefore has a Global Warming Potential (GWP) of 1.

Carbon Dioxide Equivalent
A metric measure used to compare the emissions from various GHGs based upon their GWP; carbon dioxide equivalents are commonly expressed as "million metric tons of carbon dioxide equivalents (MMT CO2e)" and the carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP

Carbon Footprint
The total amount of GHGs that are emitted into the atmosphere each year by a person, family, building, organization, or company; a person's carbon footprint includes GHG emissions from fuel that an individual burns directly, such as by heating a home or driving a car. It also includes GHGs that come from producing the goods or services that the individual uses, including emissions from power plants that make electricity, factories that make products, and landfills where trash is sent.

Carbon Sequestration
Terrestrial, or biologic, carbon sequestration is the process by which trees and plants absorb carbon dioxide, release the oxygen, and store the carbon. Geologic sequestration is one step in the process of carbon capture and sequestration, and involves injecting carbon dioxide deep underground where it stays permanently.

Climate
In a narrow sense, climate is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The normal period of measurement is three decades, as defined by the World Meteorological Organization. The quantities measured are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state of the climate system, including a statistical description.

Climate Change
Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

Emissions
The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere. Emissions Factor - A unique value for scaling emissions to activity data in terms of a standard rate of emissions per unit of activity (e.g., grams of carbon dioxide emitted per barrel of fossil fuel consumed, or per pound of product produced).

Fossil Fuel
A general term for organic materials formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years.

Global Warming
The recent and ongoing global average increase in temperature near the Earth's surface.

Greenhouse Effect
Trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. Some of the heat flowing back toward space from the Earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases in the atmosphere and then re-radiated toward the Earth's surface. If the atmospheric concentrations of these GHGs rise, the average temperature of the lower atmosphere will gradually increase.

Greenhouse Gas
Any gas that absorbs infrared radiation in the atmosphere. GHGs include: carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Heat Island
An urban area characterized by temperatures higher than those of the surrounding non-urban area. As urban areas develop, buildings, roads, and other infrastructure replace open land and vegetation. These surfaces absorb more solar energy, which can create higher temperatures in urban areas.

Indirect Emissions
Indirect emissions from a building, home, or business are those emissions of GHGs that occur as a result of the generation of electricity used in that building. These emissions are called "indirect" because the actual emissions occur at the power plant which generates the electricity, not at the building using the electricity.

Metric Ton
Common international measurement for the quantity of GHG emissions. A metric ton is equal to 2205 lbs. or 1.1 short tons.

Mitigation
A human intervention to reduce the human impact on the climate system; it includes strategies to reduce GHG sources and emissions and enhance GHG sinks.

Nitrous Oxide
A powerful GHG with a global warming potential of 265 times that of CO_2. Major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

Ozone
Ozone, the triatomic form of oxygen (O_3), is a gaseous atmospheric constituent. In the troposphere, it is created by photochemical reactions involving gases resulting from natural sources and from human activities (photochemical smog). In high concentrations, tropospheric ozone can be harmful to a wide range of living organisms. Tropospheric ozone acts as a GHG. In the stratosphere, ozone is created by the interaction between solar ultraviolet radiation and molecular oxygen. Stratospheric ozone plays a decisive role in the stratospheric radiative balance. Depletion of stratospheric ozone, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet-B radiation.

Renewable Energy
Energy resources that are naturally replenishing such as biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.
Resilience - A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.

Sensitivity
The degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise).

Ultraviolet Radiation
The energy range just beyond the violet end of the visible spectrum. Although ultraviolet radiation constitutes only about five percent of the total energy emitted from the sun, it is the major energy source for the stratosphere and mesosphere, playing a dominant role in both energy balance and chemical composition. Most ultraviolet radiation is blocked by Earth's atmosphere, but some solar ultraviolet penetrates, aids in plant photosynthesis, and helps produce vitamin D in humans. Too much ultraviolet radiation can burn the skin, cause skin cancer and cataracts, and damage vegetation.

Vulnerability
The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed; its sensitivity; and its adaptive capacity.

Water Vapor

The most abundant GHG, it is the water present in the atmosphere in gaseous form. Water vapor is an important part of the natural greenhouse effect. While humans are not significantly increasing its concentration through direct emissions, it contributes to the enhanced greenhouse effect because the warming influence of GHGs leads to a positive water vapor feedback. In addition to its role as a natural GHG, water vapor also affects the temperature of the planet because clouds form when excess water vapor in the atmosphere condenses to form ice and water droplets and precipitation.

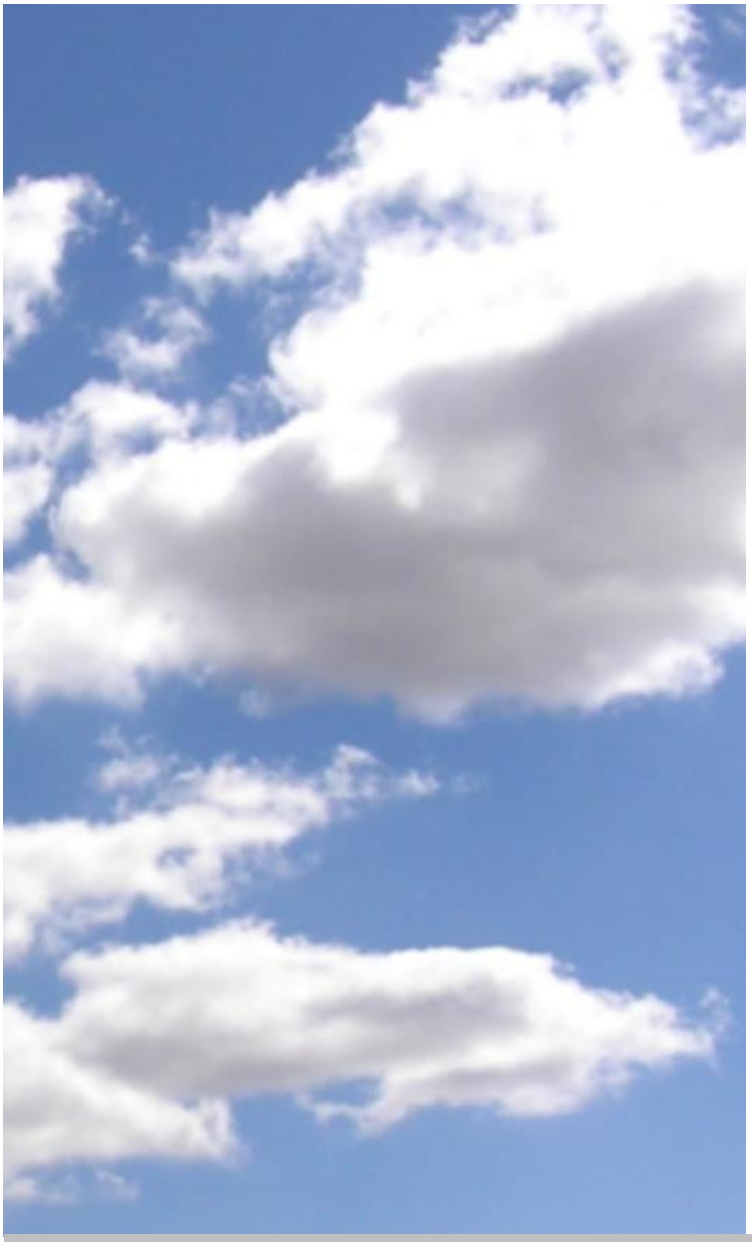
Weather

As the atmospheric conditions at any given time or place, weather is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour to hour, day to day, and season to season. A simple way of remembering the difference between weather and climate is that climate is what you expect (e.g., cold winters) and 'weather' is what you get (e.g., a blizzard).

CITY OF PASADENA

APPENDIX A

2009 GHG EMISSIONS INVENTORY



City of Pasadena
Greenhouse Gas Emissions Inventory

Adopted by City Council
November 18, 2013

rincon

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L. Right: http://www.placesonline.com/north_america/united_states/california/pasadena/photo_detail.asp?filename=22849_the_rose_bowl_stadium_pasadena

City of Pasadena
Greenhouse Gas Emissions Inventory

Adopted by City Council
November 18, 2013

Submitted to:

City of Pasadena, Permit Center
175 North Garfield Avenue
Pasadena, CA 91101-7205
Attn: Denver E. Miller, Principal Planner

Submitted by:

Rincon Consultants, Inc.
Environmental Scientists Planners Engineers

In association with:

Fehr & Peers

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EXECUTIVE SUMMARY

A greenhouse gas (GHG) emissions inventory identifies the major sources and quantities of GHG emissions produced by City government (municipal) operations and community-wide activities within a jurisdiction's boundaries for a given year. Estimating GHG emissions enables local governments to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdiction, and set targets for future reductions.

This document includes a 2009 baseline inventory of GHG emissions from municipal operations and community-wide activities within the City, and a 2020 and 2035 "business-as-usual" forecast of how emissions in Pasadena would change if consumption trends and behavior continue as they did in 2009, absent any new federal, state, regional or local policies or action that would reduce those emissions. It is important to note that the municipal operations inventory is a subset of the community inventory, meaning that the municipal emissions are included within the community-wide inventory.

The community-wide inventory is divided into five sectors, or sources of emissions: residential energy use, commercial and industrial energy use, transportation, solid waste, and water consumption. The municipal inventory provides a more detailed analysis of emissions resulting from City-owned or -operated buildings, lighting, and fleet/ transit vehicles; electric power generation; water delivery facilities; City-generated solid waste; employee commute travel; and the Tournament of Roses and Rose Bowl Stadium.

Like all GHG emissions inventories, this document must rely on the best available data and calculation methodologies. Emissions estimates are subject to change as better data and calculation methodologies become available in the future. Nevertheless, the findings of this analysis provide a solid basis upon which Pasadena can begin planning and taking action to reduce its GHG emissions.

Municipal Inventory Results

In 2009, the City of Pasadena's municipal GHG emissions totaled 121,811 metric tons of carbon dioxide equivalents (MT CO_2e). As shown in **Figure ES.1** and **Table ES.1** below, emissions from the City's electric power generation facilities were the largest (72,749 MT CO_2e, or 60%). The second largest source of emissions (24,027 MT CO_2e, or 20%) were from electricity and

natural gas consumed in the City's buildings and facilities. Cumulatively, the City spent approximately $13,543,767 on energy for municipal operations in 2009.

Figure ES.1 2009 Municipal Emissions by Sector

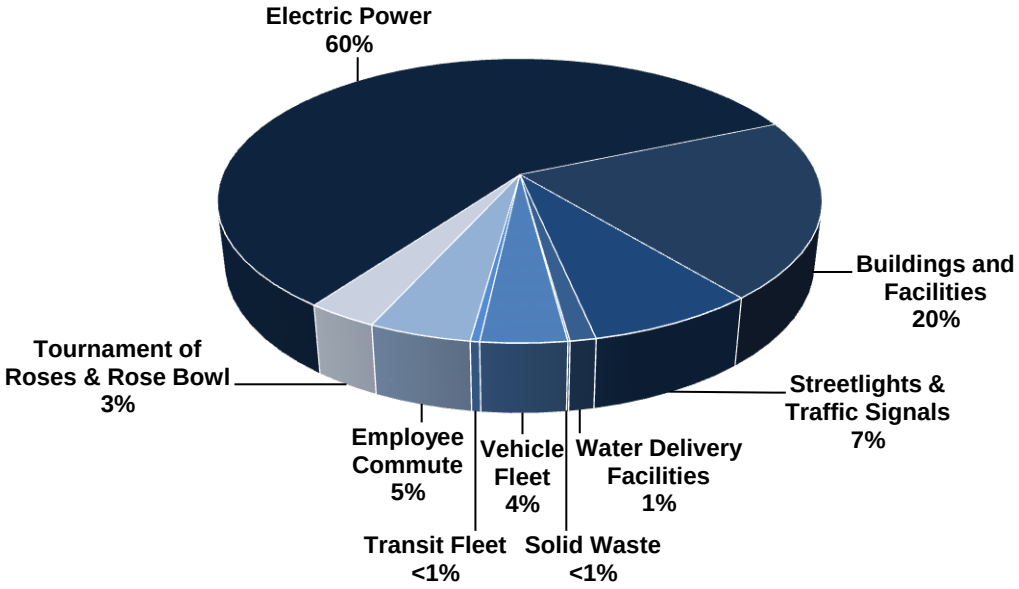


Table ES.1 2009 Municipal Emissions Summary by Sector

Sector	GHG Emissions (MT CO_2e)	Cost	Percentage of Total Emissions
Electric Power	72,749	$7,147,615	60%
Buildings and Facilities	24,027	$2,868,862	20%
Streetlights & Traffic Signals	8,623	$2,297,714	7%
Water Delivery Facilities	1,318	$262,725	1%
Solid Waste	118	--	<1%
Vehicle Fleet	4,784	$414,847	4%
Transit Fleet	519	$552,004	<1%
Employee Commute	5,717	--	5%
Tournament of Roses and Rose Bowl	3,956	--	3%
Total	**121,811**	**$13,543,767**	**100%**

Community-wide Inventory Results

In 2009, the Pasadena community emitted approximately 2,052,701 MT CO_2e. As shown in **Figure ES.2** and **Table ES.2** below, the transportation sector was the largest source of emissions, generating approximately 1,062,681 MT CO_2e, or 51% of total 2009 emissions. Electricity and natural gas consumption within the commercial/industrial sector was the second largest source of 2009 emissions, generating 632,213 MT CO_2e, or 31% of the total. Similarly, electricity and natural gas use in Pasadena's residential sector produced 324,026 MT CO_2e, or 16% of total community emissions. The remaining 2% of emissions are the result of electricity from water consumption and the methane that will result from the decomposition of waste that was generated by the Pasadena community during 2009.

Figure ES.2 2009 Community-wide Emissions by Sector

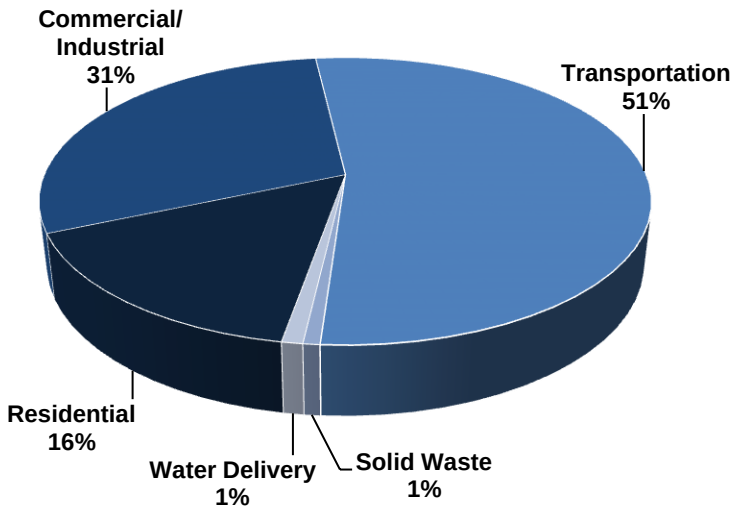


Table ES.2 2009 Community-wide Emissions Summary by Sector

Sector	GHG Emissions (MT CO_2e)	Percentage of Total Emissions
Residential	324,026	16%
Commercial/Industrial	632,213	31%
Transportation	1,062,681	51%
Solid Waste	15,019	1%
Water Consumption	18,762	1%
Total	**2,052,701**	**100%**

2020 and 2035 Emissions Forecast

The GHG emissions forecast provides a "business-as-usual" estimate of how emissions would change in the years 2020 and 2035 if consumption trends continue as they did in the 2009 baseline year, absent any new federal, state, regional, or local policies or actions that would reduce GHG emissions. As shown in **Figure ES.3**, if consumption trends continue the pattern observed in 2009 and accounting for projected growth in population, employment, and vehicle miles traveled (VMT), municipal emissions will reach 126,251 MT CO_2e by 2020 and 131,838 MT CO_2e by 2035. Forecast municipal emissions represent a 4% increase in 2020 and 8% increase in 2035 over 2009 baseline levels. Community-wide emissions are forecast to reach 2,186,122 MT CO_2e by 2020 and 2,367,191 MT CO_2e by 2035 (**Figure ES.4**). Forecast community-wide emissions represent a 6% increase in 2020 and a 15% increase in 2035 over 2009 baseline levels.

Figure ES.3 Municipal Emissions Forecast for 2020 and 2035

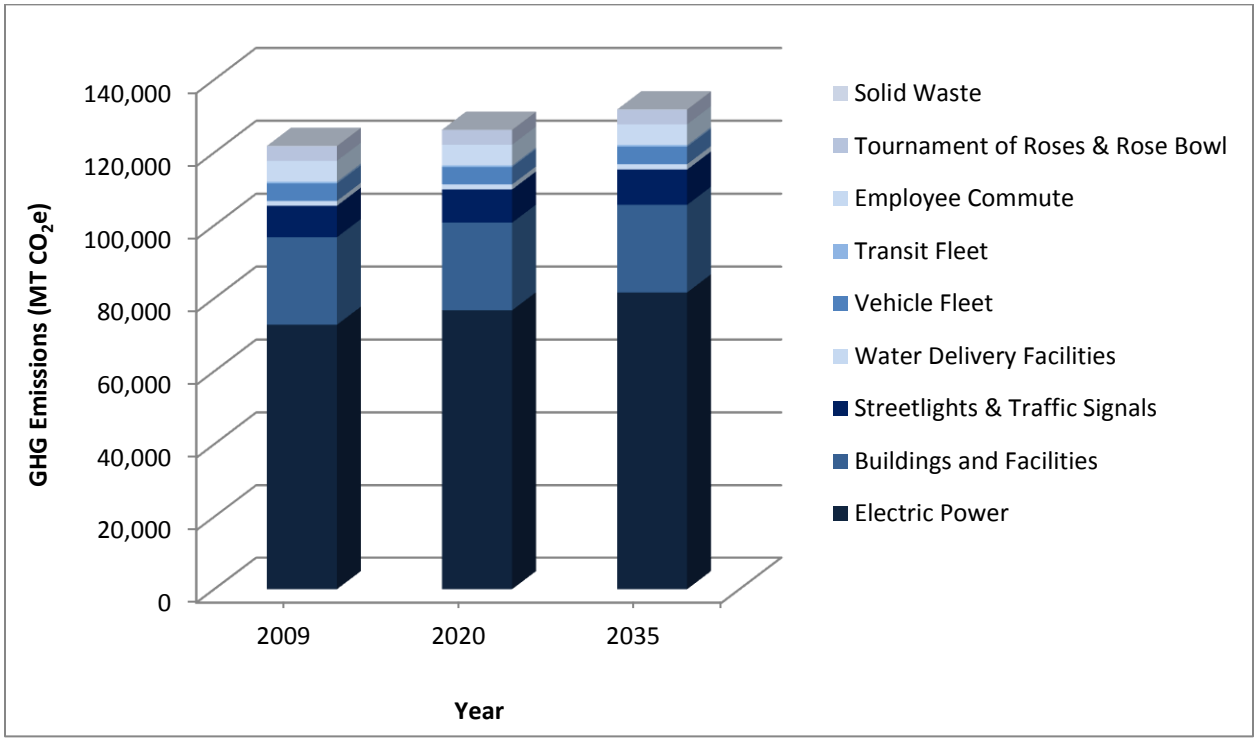
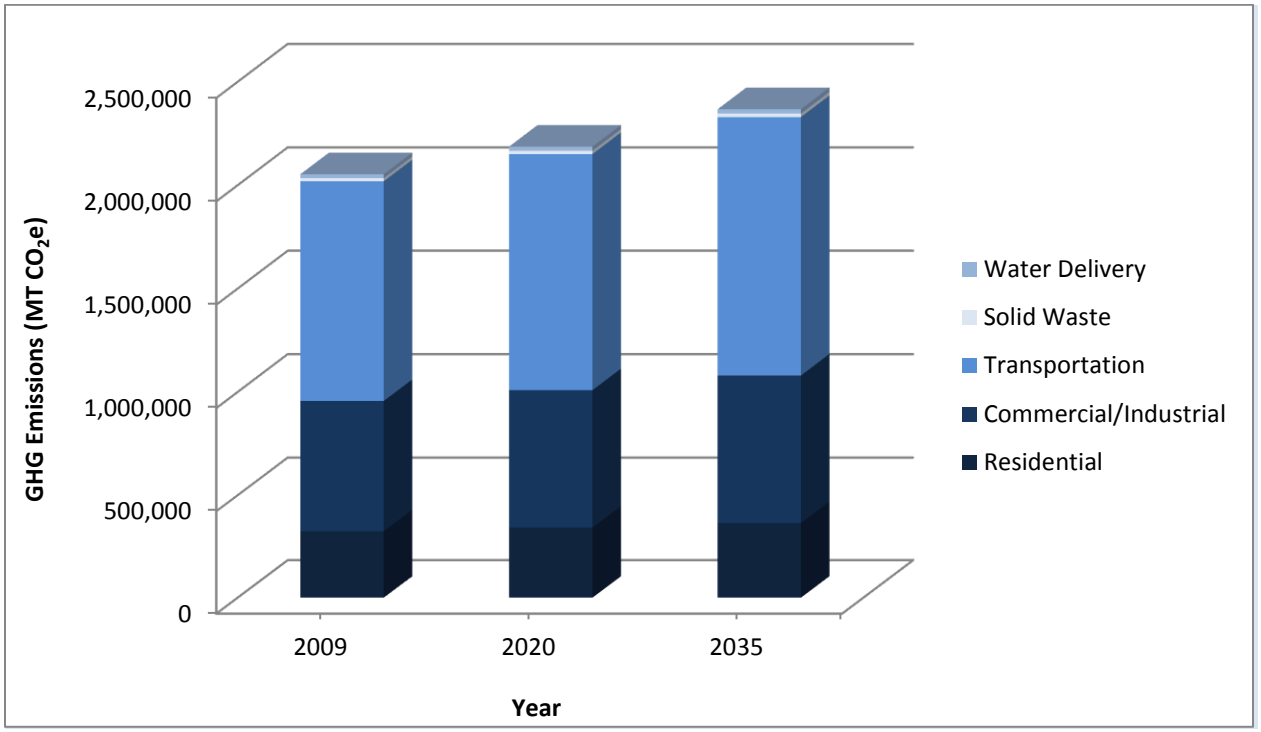


Figure ES.4 Community-wide Emissions Forecast for 2020 and 2035



1. INTRODUCTION

Local governments play a fundamental role in reducing greenhouse gas (GHG) emissions. Local government policies can effectively reduce GHG emissions and can prepare their communities for the potential impacts of climate change. Through such efforts, Pasadena can reduce GHG emissions at both the municipal (local government) and community level.

The City of Pasadena exercises direct control over its GHG emissions-generating activities. For example, it can reduce energy consumption in municipal buildings, reduce fuel consumption by municipal fleet vehicles, and increase the amount of energy that is obtained from renewable energy sources. The City can also influence community-wide activities that generate GHG emissions, for example, by improving building codes, incentivizing alternative transportation options, and educating community members about their choices as consumers. That influence may be exercised directly through the City's authority over local land use planning and building standards, and indirectly through programs that encourage GHG reducing activities.

By quantifying the GHG emissions from municipal facilities and operations and the community as whole, this report provides an understanding of where the highest percentages of emissions in Pasadena originate and where the greatest opportunities for emissions reductions exist. It also provides City decision-makers and the community with adequate information to inform policy decisions and provides a baseline against which future progress can be measured.

1.1 Purpose of GHG Inventory

The purpose of the City of Pasadena GHG Emissions Inventory (Inventory) is to identify the sources and quantities of GHG emissions within the City's jurisdictional boundaries. This Inventory is the first step in addressing GHG emissions. The Inventory was developed to serve the following purposes:

- Provide an understanding of Pasadena's major sources of GHG emissions and where the greatest opportunities for GHG emissions reductions exist;
- Create a GHG emissions baseline from which Pasadena can set GHG emissions reductions targets and measure future progress;
- Enable the City to understand the scale of emissions from various sources and develop GHG emissions accounting and reporting principles; and
- Provide best practices to aid in the development of a citywide Climate Action Plan.

2. METHODOLOGY

This Inventory was completed using methodologies recommended and supported by the California Air Resources Board (ARB). The local government operations (municipal) component of the GHG emissions inventory follows the Local Government Operations Protocol (LGOP), version 1.1, which was adopted in 2010 by the ARB and serves as the national standard for quantifying and reporting GHG emissions from local government operations. The community-wide inventory was developed using the Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) (2012). Emissions were calculated using the Clean Air Climate Protection (CACP) software, which is based on the principles and methods of these protocols.

2.1 Baseline and Forecast Years

The State of California uses 1990 as a reference year to remain consistent with Assembly Bill 32 (AB 32), which codified the State's 2020 GHG emissions target by directing the California ARB to reduce statewide emissions to 1990 levels by 2020. However, cities and counties throughout California typically elect to use years later than 1990 as baseline years because of the increased reliability of recordkeeping from those years and the large amount of growth that has occurred since 1990. The year 2009 was selected as the baseline year for Pasadena's Inventory due to the availability of reliable land use and transportation data, which was prepared for the City's General Plan. This Inventory uses a forecast year of 2020 to be consistent with the State of California GHG Inventory[1] forecast year and AB 32 target, both of which reference 2020. The Inventory also includes a forecast year of 2035 for consistency with the horizon year of the City's General Plan.

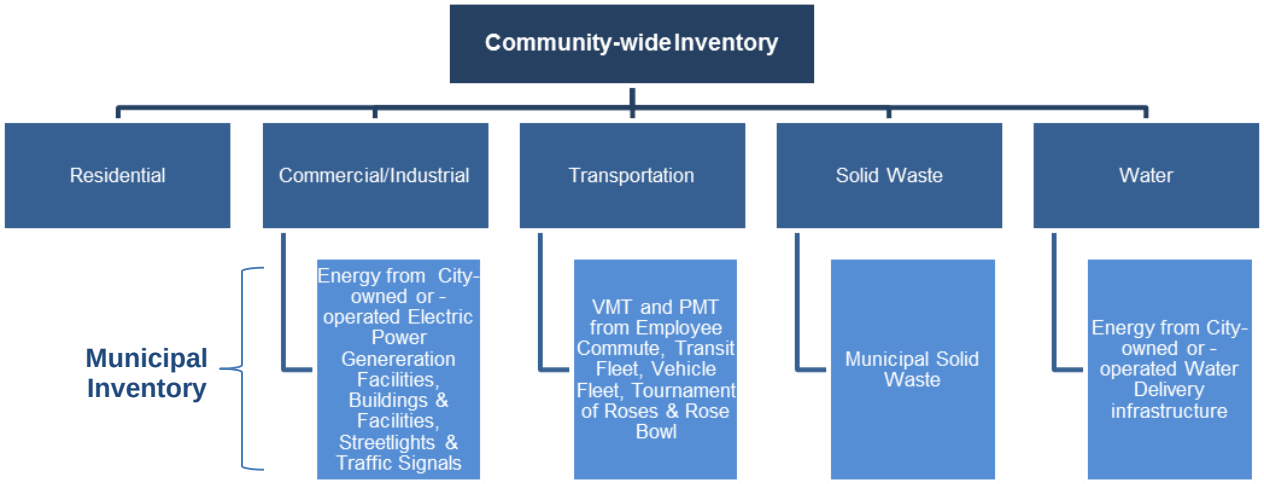
2.2 Municipal and Community-wide Inventories

This Inventory is separated into two sections: municipal and community-wide. The municipal inventory includes emissions resulting from facilities that the City owns and/or operates. The community-wide inventory includes all emissions occurring within Pasadena's geo-political control (i.e., sources of emissions within the City limits over which the City has significant influence or jurisdictional authority). The municipal inventory is a subset of the community inventory, meaning that all municipal operations are included in the commercial/industrial,

[1] California GHG Inventory, http://www.arb.ca.gov/cc/inventory/inventory.htm

transportation, solid waste, or water categories of the community-wide inventory. The municipal inventory should not be added to the community analysis; rather, it should be looked at as a portion of the total community emissions. Although municipal operations represent a small portion of the community's overall emissions, a municipal inventory allows the City to track its individual facilities and vehicles and to evaluate the effectiveness of its emissions reduction efforts at a more detailed level. **Figure 2.1** depicts the relationship between the community-wide and municipal inventories.

Figure 2.1 Relationship between Community-wide and Municipal Inventories



Once completed, these inventories provide the basis for policy development, the quantification of GHG emissions reductions associated with proposed measures, and the establishment of an informed emissions reduction target.

2.3 Calculating Emissions

2.3.1 Greenhouse Gases

According to both the LGOP and the Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, local governments should assess emissions of all six internationally recognized GHGs. These gases are outlined in **Table 2.1**, which includes their sources and global warming potential (GWP), which refers to their ability to trap heat in the atmosphere.[2] For example, one pound of methane has 21 times more heat capturing potential than one pound of carbon dioxide. This report focuses on the three GHGs most relevant to local government policymaking: CO_2, CH_4, and N_2O. These gases comprise a large majority of GHG emissions at the community level. The omitted gases, hydrofluorocarbons, perfluorocarbons, and SF_6 are emitted primarily in private sector manufacturing and electricity transmission,[3] and are the subject of regulation at the state level.

To simplify reporting and analysis of GHGs, GHG emissions are reported in metric tons of carbon dioxide equivalent (MT CO_2e) units, per standard practice. When dealing with an array of emissions, the gases are converted to their carbon dioxide equivalents for comparison purposes.

Table 2.1 Greenhouse Gases

Gas	Chemical Formula	Combustion	Global Warming Potential (CO_2e)
Carbon Dioxide	CO_2	Combustion	1
Methane	CH_4	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N_2O	Combustion, Wastewater Treatment	310
Hydrofluorocarbons	Various	Leaking Refrigerants, Fire Suppressants	12-11,700
Perfluorocarbons	Various	Aluminum Production, Semiconductor Manufacturing, HVAC Equipment Manufacturing	6,500-9,200
Sulfur Hexafluoride	SF_6	Transmission and Distribution of Power	23,900

[2] Global warming potential (GWP) is a measure of the amount of warming a GHG may cause, measured against the amount of warming caused by carbon dioxide.

[3] Data provided by Pasadena Water and Power (PWP) from the California ARB's 2009 GHG Report indicate that no emissions of SF_6 associated with storage, purchases, sales and/or change in total nameplate capacity of equipment occurred at City power generation facilities in 2009.

2.3.2 Activity Data and Emission Factors

GHG emissions are estimated using calculation-based methodologies to derive emissions using activity data and emissions factors. To estimate emissions, the basic equation below is used:

Activity Data x Emission Factor = Emissions

Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles travelled.

Emission factors are used to convert energy usage or other activity data into associated emissions quantities. They are usually expressed in terms of emissions per unit of activity data (e.g., lbs. CO_2/kWh).

2.4 Reporting Emissions

2.4.1 Emissions by Scope

For municipal and community-wide inventories, emissions sources can be categorized by "scope" according to the entity's degree of control over the emissions source and the location of the source. Emissions sources are categorized as direct (Scope 1) or indirect (Scope 2 or Scope 3), in accordance with the World Resources Institute and the World Business Council for Sustainable Development's *Greenhouse Gas Protocol Corporate Standard*. **Figure 2.2** illustrates the three emissions scopes.

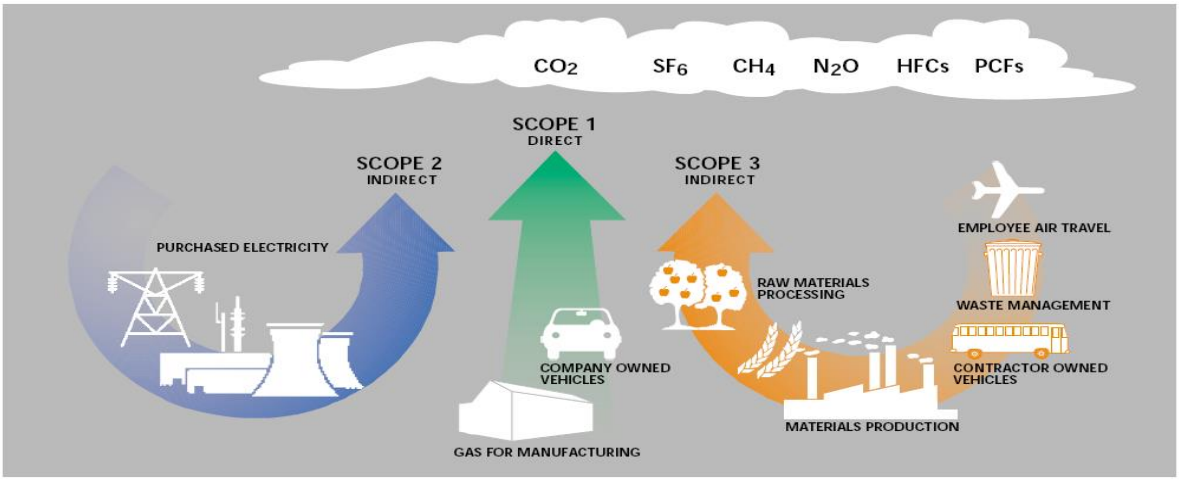
Municipal Scope Definitions

Scope 1: Direct GHG emissions from sources within a local government's operations that it owns and/or controls. This includes stationary combustion to produce electricity, steam, heat and power equipment; mobile combustion of fuels; process emissions from physical or chemical processing; fugitive emissions that result from production, processing, transmission, storage and use of fuels; and other sources.

Scope 2: Indirect GHG emissions associated with the consumption of electricity, steam, heating, or cooling that are purchased from a utility provider that also provides energy to other jurisdictions and/or is located outside City boundaries.

Scope 3: All other indirect GHG emissions not covered in Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the City (e.g., employee commuting and business travel, Tournament of Roses vehicles and travel, outsourced activities, waste disposal, etc.).

Figure 2.2 GHG Emissions Scopes



Sources of Scope 1, 2, and 3 GHG emissions
Source: Greenhouse Gas Protocol Corporate Standard

Community-wide Scope Definitions

Scope 1: Direct GHG emissions from sources located within the jurisdictional boundaries of the community, including emissions from fuel combustion vehicles[4] in the community and direct emissions from natural gas combustion in homes and businesses within the community.

Scope 2: Indirect GHG emissions associated with the consumption of electricity within the community.

Scope 3: All other indirect or embodied GHG emissions not covered in Scope 2, which occur as a result of activity within the jurisdictional boundaries (e.g., methane emitted at landfills outside the community resulting from solid waste generated within the community).

[4] Accounts for GHG emissions from running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak.

2.4.2 Emissions by Sector

In addition to categorizing emissions by scope, ICLEI recommends that local governments examine their emissions in the context of the sector that is responsible for those emissions. Many local governments will find a sector-based analysis more directly relevant to policy making and project management, as it assists in formulating sector-specific reduction measures and climate action plan components.

The municipal inventory reports emissions by the following sectors:

- Electric Power[5]
- Buildings and Facilities
- Streetlights and Traffic Signals
- Water Delivery Facilities
- Solid Waste
- Transit Fleet
- Vehicle Fleet
- Employee Commute
- Tournament of Roses and Rose Bowl Stadium

The community-wide inventory reports emissions by the following sectors:

- Residential
- Commercial/Industrial
- Transportation
- Solid Waste
- Water Consumption

Table 2.2 summarizes the scopes of each sector in the municipal and community-wide inventories.

[5] Electric power accounts for GHG emissions associated with City-owned power generation facilities.

Table 2.2 Emissions by Sector and Scope

Sector	Scope 1	Scope 2	Scope 3
Municipal Inventory			
Electric Power	Natural Gas	---	---
Buildings and Facilities	Natural Gas	Electricity	---
Streetlights and Traffic Signals	---	Electricity	---
Water Delivery Facilities	---	Electricity	---
Solid Waste	---	---	Methane from Decomposition
Vehicle Fleet[1]	Gasoline & Diesel	---	---
Transit Fleet	Gasoline, Diesel & Compressed Natural Gas	---	---
Employee Commute[1]	---	---	Transportation fuels from car, rail & air travel
Tournament of the Roses and Rose Bowl[2]	---	---	Transportation fuels from car, rail & air travel
Community-wide Inventory			
Residential	Natural Gas	Electricity	---
Commercial/Industrial	Natural Gas	Electricity	---
Transportation[1]	Gasoline & Diesel	---	---
Solid Waste	---	---	Methane from Decomposition
Water Consumption	---	Electricity (associated with water obtained from local sources)	Electricity (associated with water obtained from MWD)

[1] The Vehicle and Transit Fleet Sectors in the municipal inventory and Transportation Sector in the community-wide inventory estimate tailpipe emissions (including running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak) from vehicles, per the LGOP and Community Protocol. Battery electric, hydrogen, and some other alternative fuel vehicles do not produce tailpipe emissions. Emissions from electricity or natural gas (to produce hydrogen) used for these vehicles are aggregated in the Buildings and Facilities Sector for the municipal inventory and the Transportation Sector for the community-wide inventory. According to the Community Protocol, an inventory should "never compare a vehicle's direct tailpipe emissions with indirect electricity emissions" (Appendix D, page 19).

[2] GHG emissions resulting from electricity usage associated with the Tournament of the Roses and Rose Bowl are aggregated in Building and Facilities and Streetlight and Traffic Signal Sectors of the municipal inventory, consistent with the scoping of sectors outlined in the LGOP.

2.5 Data Sources

The data used to complete this Inventory came from multiple sources, as summarized in **Table 2.3**. These data sources are further explained in the sector-specific discussions of this document.

Table 2.3 Municipal and Community-wide Data Sources

Sector	Activity Data	Unit of Measurement	Data Source
Municipal Inventory			
Electric Power	Natural Gas Combusted	Cubic Feet	PWP
Buildings and Facilities	Electricity Consumption	kWh	PWP
	Natural Gas Consumption	Therms	SoCalGas
Streetlights and Traffic Signals	Electricity Consumption	kWh	City of Pasadena Public Works
Water Delivery Facilities	Electricity Consumption	kWh	PWP
Solid Waste	Solid Waste Tonnage	Tons	City of Pasadena Public Works
Vehicle Fleet	Gasoline and Diesel Consumption	Gallons	City of Pasadena Public Works
Transit Fleet	Gasoline, Diesel and Compressed Natural Gas Consumption	Gallons	City of Pasadena Transportation Department
Employee Commute	Sample of Employee Commuting Patterns	Annual VMT	City of Pasadena Transportation Department
Tournament of Roses and Rose Bowl	VMT	VMT	Fehr & Peers
Community-wide Inventory			
Residential	Electricity Consumption	kWh	PWP
	Natural Gas Consumption	Therms	SoCalGas
Commercial/Industrial	Electricity Consumption	kWh	PWP
	Natural Gas Consumption	Therms	SoCalGas
Transportation	VMT	VMT	Fehr & Peers
Solid Waste	Solid Waste Tonnage	Tons	City of Pasadena Public Works
Water Consumption	Water Consumption	Acre Feet	PWP, MWD

3. MUNICIPAL INVENTORY RESULTS

This chapter provides a detailed description of Pasadena's GHG emissions from municipal operations in 2009. It also provides details on emissions by scope and by operational sector. In 2009, Pasadena's municipal GHG emissions totaled 121,811 metric tons (MT) of CO_2e.

3.1 Municipal Emissions by Scope

As shown in **Figure 3.1** and **Table 3.1**, Scope 1 sources produced the largest percentage (65%) of municipal GHG emissions in 2009, totaling 78,642 MT CO_2e. Scope 2 emissions produced the second largest amount (27%, or 33,378 MT CO_2e), and Scope 3 emissions accounted for the remaining 8%, or 9,791 MT CO_2e.

Figure 3.1 2009 Municipal Emissions by Scope

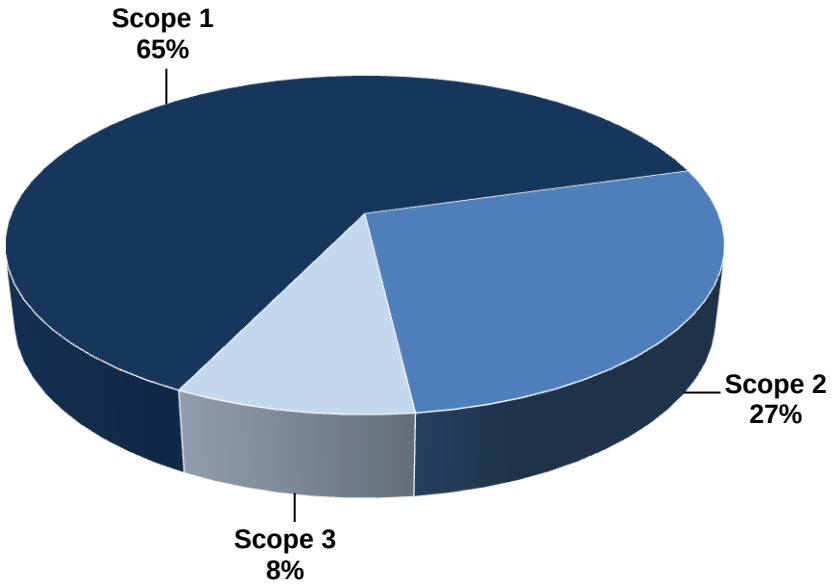


Table 3.1 2009 Municipal Emissions (MT CO_2e) Summary by Scope

Sector	Scope 1	Scope 2	Scope 3	Total
Electric Power	72,749	--	--	72,749
Buildings and Facilities[1]	590	23,437	--	24,027
Streetlights & Traffic Signals[1]	--	8,623	--	8,623
Water Delivery Facilities[1]	--	1,318	--	1,318
Solid Waste	--	--	118	118
Vehicle Fleet	4,784	--	--	4,784
Transit Fleet	519	--	--	519
Employee Commute	--	--	5,717	5,717
Tournament of Roses and Rose Bowl	--	--	3,956	3,956
Total	**78,642**	**33,378**	**9,791**	**121,811**
Percentage of Total	**65%**	**27%**	**8%**	**100%**

[1] 9% of the GHGs from PWP-supplied electricity come from City-owned generators and are therefore considered Scope 1 emissions. The remaining 91% of GHGs from PWP-supplied electricity come from imports generated outside the city and are considered Scope 2. To avoid double-counting, Scope 2 emissions from purchased electricity for municipal buildings and facilities, streetlights & traffic signals, and water delivery facilities were reduced by 9% as they are already accounted for in the Scope 1 category of the Electric Power sector.

The largest portion of Scope 1 emissions resulted from the electric power sector. These emissions qualify as Scope 1 because they involve the stationary combustion of fuels within the jurisdictional boundary of the City. The second largest source of Scope 1 emissions was the City's vehicle fleet. Electricity from City buildings and facilities generated the largest percentage of Scope 2 emissions. Emissions from employee commute and the Tournament of Roses and Rose Bowl Stadium account for the majority of Scope 3 emissions.

3.2 Municipal Emissions by Sector

Reporting emissions by sector provides a useful way to understand the sources of the City's emissions. By better understanding the relative scale of emissions from each sector, the City can more effectively focus strategies to achieve the greatest emissions reductions.

As shown in **Figure 3.2** and **Table 3.2**, the City's electric power generation facilities were the largest emitters (60%, or 72,749 MT CO_2e) in 2009. Emissions from buildings and facilities produced the second highest quantity of emissions, resulting in 24,027 MT CO_2e (20% of total municipal emissions). The City's streetlights and traffic signals produced 8,623 MT CO_2e (7% of total municipal emissions), with the remainder coming from employee commuting, the

Tournament of Roses and Rose Bowl, the vehicle fleet, water delivery facilities, the transit fleet, and solid waste.

Figure 3.2 2009 Municipal Emissions by Sector

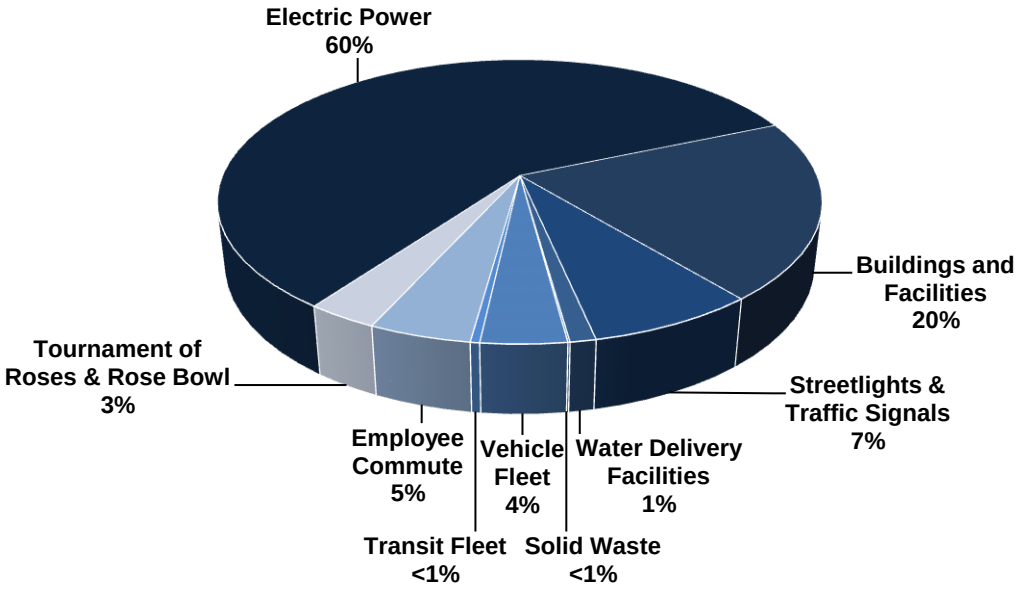


Table 3.2 2009 Municipal Inventory Summary by Sector

Sector	GHG Emissions (MT CO_2e)	Cost	Percentage of Total Emissions
Electric Power	72,749	$7,147,615	60%
Buildings and Facilities	24,027	$2,868,862	20%
Streetlights & Traffic Signals	8,623	$2,297,714	7%
Water Delivery Facilities	1,318	$262,725	1%
Solid Waste[1]	118	--	<1%
Vehicle Fleet	4,784	$414,847	4%
Transit Fleet	519	$552,004	<1%
Employee Commute[1]	5,717	--	5%
Tournament of Roses and Rose Bowl[1]	3,956	--	3%
Total	**121,811**	**$13,543,767**	**100%**

[1] No municipal costs are associated with these Scope 3 emissions. As with the GHG emissions, costs resulting from electricity usage associated with the Tournament of the Roses and Rose Bowl are aggregated in building and facilities and streetlight and traffic signal sectors of the municipal inventory, consistent with the scoping of sectors outlined in the LGOP (see footnote 2 in Table 2.2).

3.2.1 Electric Power

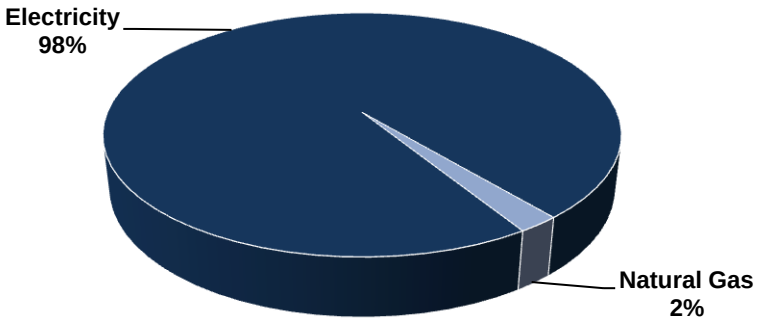
The City owns and operates two power generation facilities under the direction of PWP. Power generation facilities use a number of stationary combustion technologies to generate, transmit, and distribute electricity and produce heat and/or steam. PWP calculated a utility-specific coefficient set for its own operations for the baseline year, which was applied to the associated activity data in the CACP software. In 2009, PWP's electric power generation facilities generated 72,749 MT CO_2e (60% of total municipal emissions).

3.2.2 Buildings and Facilities

The City owns and/or operates several facilities, including City Hall, fire stations, libraries, and parks. Facility operations result in the consumption of electricity and fuels, such as natural gas and diesel, which result in GHG emissions. City-owned and -leased facilities were identified by cross-checking two lists, one from PWP and another from the City's Buildings Systems and Fleet Management Division (BSFMD). Energy use data for these facilities was provided by PWP and entered into the CACP Software.[6]

In 2009, the operation of City buildings and facilities generated approximately 24,027 MT CO_2e. As shown in **Figure 3.3**, the majority of emissions resulted from electricity use (98%). The City spent approximately $2,868,862 in 2009 on the electricity and natural gas that resulted in these emissions.

Figure 3.3 Emissions from City Buildings and Facilities by Source



[6] The City owns and operates two power generation facilities under the direction of PWP. Only 9% of the total PWP-supplied was generated by these PWP power generation facilities and is considered Scope 1. The remaining 91% was supplied through PWP but generated outside the City and is considered Scope 2. To avoid double-counting, Scope 2 emissions from purchased electricity for municipal buildings and facilities, streetlights and traffic signals, and water delivery facilities were decreased by 9%, as they are already accounted for in the Scope 1 category of the Electric Power sector.

3.2.3 Streetlights and Traffic Signals

Like most local governments, Pasadena operates a range of public lighting, from traffic signals and sidewalk lighting to outdoor and park lights. In 2009, public lighting in Pasadena consumed a total of 14,833,100 kilowatt hours (kWh) of electricity, producing approximately 8,623 MT CO_2e.[5] **Table 3.3** reports 2009 emissions by lighting type and annual electricity consumption associated with the activities that generated these emissions. The City spent approximately $2,297,714 in 2009 on the electricity that caused these emissions.

Table 3.3 Energy Use and Emissions from Public Lighting

Source	GHG Emissions (MT CO_2e)	Percentage of Total
Streetlights	7,520	87%
Traffic Signals	982	11%
Other Outdoor Lighting	121	2%
Total	**8,623**	**100%**

3.2.4 Water Delivery Facilities

This section addresses all City-owned or -operated stationary sources used for the distribution of water. Pasadena operates water transport equipment, including groundwater wells, booster pumps, interconnections, reservoirs, and water treatment plants, which use electricity resulting in GHG emissions. The majority of water delivery to the city is handled by PWP and the Metropolitan Water District (MWD).

In 2009, operation of the City's water delivery equipment produced approximately 1,318 MT CO_2e, representing 1% of total municipal emissions. [5] Pasadena spent approximately $262,725 in 2009 on the electricity that caused these emissions.

3.2.5 Solid Waste

Many local government facilities and operations generate solid waste, much of which is eventually sent to a landfill. Typical sources of solid waste from local government operations include paper and food waste from offices and facilities, construction waste from public works, and plant debris from parks departments. Organic materials in government-generated solid waste (including paper, food scraps, plant debris, textiles, wood waste, etc.) generate methane as they decay in the anaerobic environment of a landfill. An estimated 75% of this methane is

routinely captured via landfill gas collection systems; [7] however, a portion escapes and is emitted into the atmosphere. As such, estimating emissions from waste generated by government operations is an important component of a comprehensive emissions inventory.

In 2009, municipal facilities and operations generated 735 tons of solid waste. Identifying the different types of waste is necessary for a GHG inventory because certain types of waste generate methane at differing rates during decomposition within the anaerobic environment of landfills. The 2008 California Statewide Waste Characterization Study characterizes waste composition for the State of California and was used for this inventory.[8] Default emissions factors provided by CACP were used to calculate emissions by waste type. Municipal solid waste generated 118 MT CO_2e.

3.2.6 Vehicle and Transit Fleet

The majority of local governments use vehicles and other mobile equipment as an integral part of their daily operations – from maintenance trucks used for parks and recreation to police cruisers and fire trucks. These vehicles and equipment use gasoline, diesel, and compressed natural gas, which result in GHG emissions.

In 2009, City-owned and -operated vehicles emitted approximately 5,303 MT CO_2e. This sector includes gasoline, diesel, and compressed natural gas consumption from all departments in the City's operating vehicles (including off-road vehicles/equipment), as well as the transit fleet operated by the City. **Table 3.4** shows 2009 emissions from the combined vehicle fleet and transit fleet. The City's vehicle fleet accounts for 90% of total mobile emissions and the City's transit fleet accounts for the remaining 10% of total mobile emissions. Off-road vehicles and equipment resulted in 242 MT CO_2e, or 5% of the City's vehicle fleet emissions.

[7] Per the LGOP, landfill gas collection systems are not 100% efficient in collecting gas; therefore, a value of 75% collection efficiency should be used as a conservative default.

[8] CalRecycle's 2008 California Statewide Waste Characterization Study is available at http://www.calrecycle.ca.gov/publications/Detail.aspx?PublicationID=1346

Table 3.4 Mobile Emissions Summary by Source

Source	GHG Emissions (MT CO_2e)	Cost	Percentage of Total Mobile Emissions
Vehicle Fleet			**90%**
Gasoline	3,421	$1,182,794	65%
Diesel	1,363	$374,550	26%
Transit Fleet			**10%**
Gasoline	406	$154,572	8%
Diesel	113	$375,880	2%
Compressed Natural Gas	>1	$21,552	>1%
Total	**5,303**	**$2,109,348**	**100%**

Of all mobile emissions calculated, 72% resulted from the combustion of gasoline, 28% resulted from the combustion of diesel, and less than 1% resulted from the combustion of compressed natural gas. The City of Pasadena spent approximately $2,109,348 on the fuels that caused these emissions in 2009.

3.2.7 Employee Commute

Fuel combustion from employees commuting to work is another important emissions source from City operations. Similar to the City's vehicle fleet, the vehicles of personal employees use gasoline and other fuels, which when burned, generate GHG emissions. Emissions from employee commutes are considered optional to inventory by LGOP because the vehicles are owned and operated privately by the employees. However, LGOP encourages reporting these emissions because local governments can influence how their employees commute to work through incentives and commuting programs.

In 2009, emissions from employee commutes resulted in approximately 5,717 MT CO_2e (5% of total municipal emissions). Emissions were calculated from the results of the Pasadena Department of Transportation (DOT) Employee Commute Survey. These results included employee zip code, one-way trip mileage, and commute mode. Daily commute information was entered into CACP Software to determine annual VMT based on Pasadena's 4.5-day workweek. Since the travel mode was unknown, total drive-alone commute and carpool commute mileage were entered into CACP Software using a 65% passenger vehicle – 35% light truck ratio, per ICLEI's guidance. **Table 3.5** shows modes of employee commute based on 1,882 responses to the survey.

Table 3.5 Employee Travel by Commute Mode

Most Common Mode of Travel	Number of Employees	Percentage of Total
Drive Alone	976	51.9%
Carpool/Vanpool	693	36.8%
Transit	134	7.1%
Biking	34	1.8%
Walking	38	2.0%
Other/Telecommute	7	0.4%
Total	**1,882**	**100%**

Employee business travel was also included as a component of emissions from employee commute. Mileage reimbursement forms from the City's Finance Department were accessed to determine total annual mileage by travel mode. Total automobile VMT was entered into the CACP Software using the 65% - 35% breakdown described above. Passenger Miles Travelled (PMT) for train and airplane travel cannot be quantified by CACP Software and were calculated based on methodologies and formulas described by the U.S. Environmental Protection Agency (EPA).[9] **Table 3.6** depicts employee business travel by mode. Emissions from business travel account for 2% of total employee commute emissions.

Table 3.6 Business Travel by Mode

Mode of Travel	GHG Emissions (MT CO_2e)	Percentage of Total Business Commute
Car	26	21%
Train	<1	<1%
Airplane	98	79%
Total	**124**	**100%**

3.2.8 Tournament of Roses and Rose Bowl Stadium

The City owns the Rose Bowl Stadium and has jurisdictional[10] control over the annual Tournament of Roses festival comprised of several distinct events. GHG emissions resulting from energy usage associated with the Tournament of the Roses and Rose Bowl are aggregated in Building and Facilities, Streetlight and Traffic Signal, and Water Delivery Facilities

[9] U.S. EPA "Optional Emissions from Commuting, Business Travel and Product Transport" May 2008.

[10] Jurisdictional control refers to being within the City's land use and permitting authority.

sectors of the municipal inventory, consistent with the scoping of sectors outlined in the LGOP. This section identifies Scope 3 emissions that resulted from vehicle travel associated with Rose Bowl Stadium and Tournament of the Roses events held in 2009. These events are listed in **Table 3.7**.

Emissions were derived from VMT estimates (calculated in part using the Pasadena Citywide Travel Model and 2009 event attendance records; see **Appendix C** for detailed VMT calculations and methodology[11]) and regional emissions factors from the ARB's EMFAC 2007 model. EMFAC provides regionally-specific information on the mix of vehicle classes and model years, as well as ambient conditions and travel speeds that determine fuel efficiency.[12] As shown in **Table 3.7**, GHG emissions in 2009 from the Tournament of Roses and Rose Bowl Stadium events totaled 3,956 MT CO_2e. These emissions represent 3% of Pasadena's total municipal emissions.

Table 3.7 Tournament of Roses and Rose Bowl Stadium GHG Emissions

Event	VMT	GHG Emissions (MT CO_2e)	Percentage of Total
Tournament of Roses			**58%**
Rose Parade	1,542,423	813	21%
Rose Bowl Game	333,576	176	4%
Post Parade	233,770	123	3%
Float Decorating	2,266,134	1,194	30%
Rose Bowl			**42%**
Rose Bowl Flea Market	898,343	473	12%
UCLA Football Games	1,118,087	589	15%
International Soccer	615,701	324	8%
July 4th Americafest	65,181	34	1%
High School Football	27,606	15	<1%
US Marine Corps Silent Drill	15,923	8	<1%
U2 Concert	393,403	207	5%
Total	**7,510,147**	**3,956**	**100%**

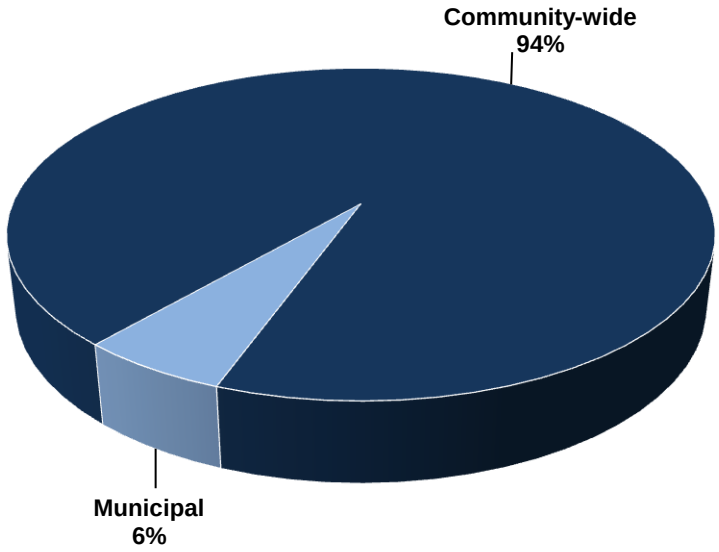
[11] Appendix C includes details regarding event attendance, travel mode, average vehicle occupancy, average trip length, and trip origin, which were used to calculate VMT.

[12] EMFAC accounts for the following types of emissions: running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak.

4. COMMUNITY-WIDE INVENTORY RESULTS

In 2009, activities and operations taking place within Pasadena's jurisdictional boundaries resulted in approximately 2,052,701 MT CO_2e. This number includes all Scope 1 emissions from on-site combustion of fuels in the residential and commercial/industrial sectors, and from the combustion of gasoline and diesel in vehicles traveling on local roads and state highways within Pasadena. This total also includes all Scope 2 emissions associated with electricity consumed within Pasadena, and all Scope 3 emissions from electricity consumption from water delivery to Pasadena from sources outside the city and waste generated by the Pasadena community. As shown in **Figure 4.1**, municipal operations represented 6% of total community-wide emissions in 2009.

Figure 4.1 Municipal Operations Portion of Community-wide Emissions



4.1 Community-wide Emissions by Scope

As shown in **Figure 4.2 and Table 4.1**, Scope 1 sources produced the largest percentage (61%) of community GHG emissions in 2009, totaling 1,256,695 MT CO_2e. Scope 2 emissions produced the second-largest amount (38%, or 769,610 MT CO_2e), and Scope 3 emissions accounted for the remaining 1%, or 26,396 MT CO_2e.

Figure 4.2 2009 Community-wide Emissions by Scope

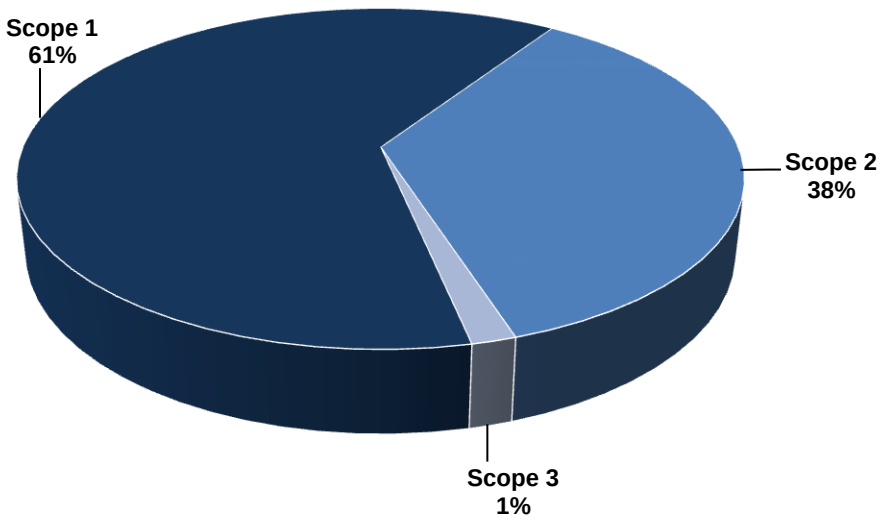


Table 4.1 2009 Community-wide Emissions (MT CO_2e) Summary by Scope

Sector	Scope 1	Scope 2	Scope 3	Total
Residential	116,939	207,087	--	324,026
Commercial/Industrial	77,075	555,138	--	632,213
Transportation	1,062,681	--	--	1,062,681
Solid Waste	--	--	15,019	15,019
Water Consumption	--	7,385	11,377	18,762
Total	**1,256,695**	**769,610**	**26,396**	**2,052,701**
Percentage of Total	**61%**	**38%**	**1%**	**100%**

The largest portion of Scope 1 emissions in 2009 came from the transportation sector. These emissions qualify as Scope 1 because they involve the direct combustion of fuel within the jurisdictional boundary of the City. The second-largest source of Scope 1 emissions was residential natural gas use. Commercial/Industrial electricity use resulted in the largest percentage of Scope 2 emissions. Emissions from solid waste account for the majority of Scope 3 emissions.

4.2 Community-wide Emissions by Sector

By understanding the relative scale of emissions from each primary sector, the City can more effectively focus emission reductions strategies to achieve the greatest emission reductions. As

noted above, the community emitted 2,052,701 MT CO_2e in 2009. **Figure 4.3** and **Table 4.2** show the total community emissions summarized by sector.

Figure 4.3 2009 Community-wide Emissions by Sector

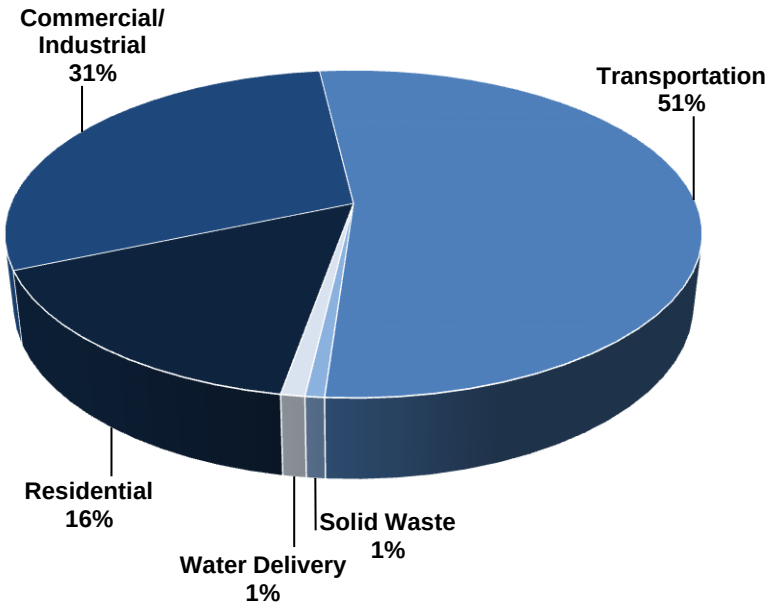


Table 4.2 2009 Community-wide Emissions Summary by Sector

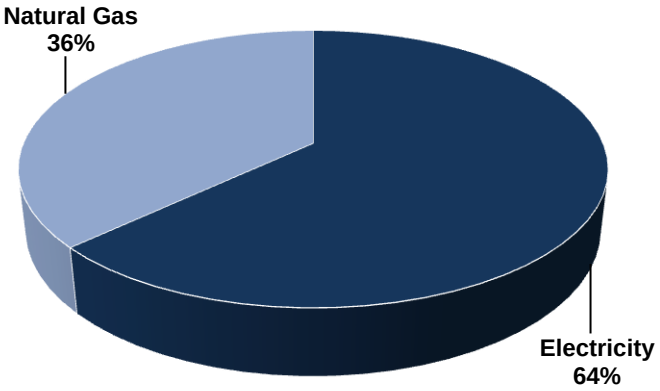
Sector	GHG Emissions (MT CO_2e)	Percentage of Total Emissions
Residential	324,026	16%
Commercial/Industrial	632,213	31%
Transportation	1,062,681	51%
Solid Waste	15,019	1%
Water Consumption	18,762	1%
Total	**2,052,701**	**100%**

4.2.1 Residential

The residential sector includes GHG emissions resulting from electricity and natural gas used in residences in Pasadena. In 2009, the residential sector produced 324,026 MT CO_2e. This represented 16% of total community-wide emissions.

In 2009, Pasadena's entire residential sector consumed 331,682,808 kWh of electricity and 21,999,120 therms of natural gas. As shown in **Figure 4.4**, 64% of total residential emissions (207,087 MT CO_2e) were the result of electricity consumption, and 36% (116,939 MT CO_2e) were the result of natural gas use.

Figure 4.4 Residential Emissions by Source



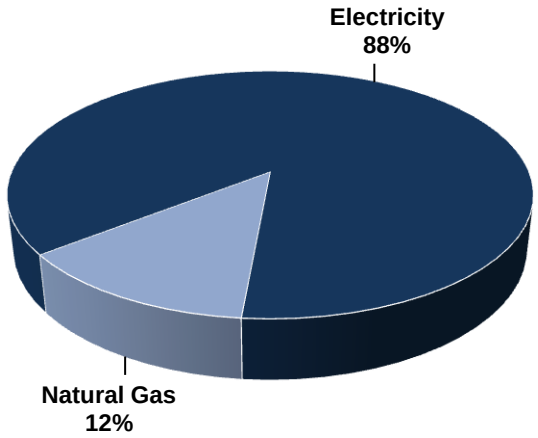
4.2.2 Commercial/Industrial

The commercial/industrial sector includes emissions resulting from electricity and natural gas used in non-residential buildings and facilities within Pasadena. In 2009, buildings and facilities within the commercial/industrial sector produced 632,213 MT CO_2e (31% of total community-wide emissions).[13]

[13] Please note the commercial/industrial sector does not include direct emissions from private stationary sources (fixed emitters of air pollutants, such as industrial plants, private cogeneration facilities, etc.) that are regulated by the South Coast Air Quality Management District or through Federal or State programs due to insufficient data. Also, this inventory is intended to guide future local policy decisions that relate to emissions within the City's jurisdictional control; therefore, these sources are excluded for the purpose of setting accurate emissions reduction targets. However, for disclosure purposes, according to the California Air Resources Board "Mandatory GHG Reporting Data - Emissions Reported for Calendar Year 2009" (March 12, 2012), the California Institute of Technology's (Caltech) cogeneration facility emitted 56,195 MT CO_2e in 2009.

In 2009, the City's commercial/industrial sector consumed 873,047,487 kWh electricity and 14,499,806 therms of natural gas. As shown in **Figure 4.5**, 88% of total commercial/industrial emissions (555,138 MT CO_2e) were the result of electricity consumption and 12% (77,075 MT CO_2e) were the result of natural gas use. Emissions resulting from electricity and natural gas use could not be disaggregated between commercial and industrial uses.

Figure 4.5 Commercial/Industrial Emissions by Source



4.2.3 Transportation

As with many other local governments, transportation on roads within Pasadena's geographic boundary constitutes the greatest percentage (51%) of community-wide emissions. Community-wide VMT for 2009 was calculated by Fehr & Peers, who performed a traffic study to quantify VMT for both vehicle trips internal to Pasadena and those that either originated or ended in Pasadena, but involved travel outside of the City's limits. Since travel mode was unknown, VMT data was input into CACP Software using the 65% passenger vehicle – 35% light trucks ratio described in Section 3.2.7 above. The transportation sector totaled 1,062,681 MT CO_2e in 2009.

4.2.4 Solid Waste

The solid waste sector comprised less than 1% of total community-wide emissions in 2009. Emissions from the waste sector are an estimate of the methane generation from the decomposition of solid waste sent to landfill in the base year (2009). In 2009, the community generated 93,632 tons of solid waste that was sent to landfills. These emissions are considered Scope 3 because they are not generated in the base year, but will result from the decomposition of 2009 waste over the full 100+ year cycle of its decomposition. The 2008 California Statewide Waste Characterization Study describes the standard waste composition for the State of

California.[14] Identifying the different types of waste in the general mix is necessary because during decomposition various materials generate methane within the anaerobic environment of landfills at differing rates. About 75% of landfill methane emissions are captured through landfill gas collection systems, but the remaining 25% escape into the atmosphere.[15] Default emissions factors provided by CACP were used to calculate emissions by waste type. Please see **Table 4.3** below for a summary of emissions per waste type.

Table 4.3 Solid Waste Emissions Sources

Source	GHG Emissions (MT CO_2e)	Percentage of Total
Paper Products	3,984	27%
Food Waste	7,855	52%
Plant Debris	1,034	7%
Wood/Textiles	2,146	14%
Total	**15,019**	**100%**

4.2.5 Water Consumption

The majority of water delivery to the City is handled by PWP and the MWD.[16] According to PWP, water usage totaled 32,800 AF in 2009. Based on percentages outlined in the Pasadena Water Integrated Resources Plan,[17] 65% of water usage resulted from the residential sector and 35% resulted from the commercial/industrial sector. As shown in **Table 4.4**, emissions from water delivery totaled approximately 18,762 MT CO_2e, representing less than 1% of total community-wide emissions.

Table 4.4 Water Consumption by Sector

Sector	Acre Feet	GHG Emissions (MT CO_2e)	Percentage of Total
Residential	21,320	12,195	65%
Commercial/Industrial	11,480	6,567	35%
Total	**32,800**	**18,762**	**100%**

[14] http://www.calrecycle.ca.gov/publications/Detail.aspx?PublicationID=1346

[15] US EPA AP 42.

[16] MWD provided the GHG emissions coefficient of 0.572 MT CO_2e per acre foot (AF) of water delivered to the City.

[17] http://ww2.cityofpasadena.net/waterandpower/WaterPlan/default.asp

5. 2020 AND 2035 EMISSIONS FORECAST

The emissions forecast for the City represents a "business-as-usual" projection, which is a representation of how municipal and community-wide GHG levels would change over time if consumption trends and behavior continue as they did in 2009, while taking into account projected growth in population, employment, and vehicle miles traveled. The forecast does not quantify emissions reductions from state or federal activities, including AB 32, the renewable portfolio standard, and SB 375. Additionally, it does not take into account reduction activities already under way or completed since 2009, the results of which likely put the City's emissions on a track below the business-as-usual linear projection.

5.1 Growth Rates

Several indicator growth rates were developed and applied to the various sectors in order to project emissions. The growth rates were applied to the 2009 baseline data to obtain projected activity data (i.e., energy use, gasoline consumption, VMT, etc.). This data was then entered into CACP Software for the future years in order to calculate the projected emissions. **Table 5.1** displays the growth rates (and their data sources) that were applied to each sector.

5.1.1 Population

Due to lack of accurate data, Pasadena population data from the 2010 Census was used as a proxy for 2009 population. Southern California Association of Governments (SCAG) population projections were used for 2020 and 2035. To account for the distortion caused by calculated growth rates between the Census and SCAG data, the numerical increment between SCAG's 2003 and 2020 and 2003 and 2035 figures were divided by the number of years in that increment (17 and 32, respectively). The resulting number was then multiplied by the number of years between 2010 and 2020 and 2010 and 2035 (10 and 25, respectively). The growth rate was calculated using the resultant figures and the 2010 Census figure.

5.1.2 Community Employment

SCAG community employment projections were used to calculate the employment growth rate. Due to lack of available data, 2010 community employment projections were used as a proxy for 2009.

5.1.3 VMT

VMT projections for 2035 were provided by Fehr & Peers. An interpolation calculation using the 2009 baseline and projected 2035 data points was performed in order to determine VMT data for 2020.

5.1.4 Municipal Employment

Data on the number of Pasadena's municipal employees were both historically limited (2002-2011) and covered a period of atypical growth (both positive and negative). Given these constraints, it was determined that municipal employment would be held constant at 2009 baseline levels for 2020 and 2035.

Table 5.1 Growth Rates by Sector

Sector	Applied Growth Rate	Source
Municipal Forecast		
Electric Power	Population	U.S. Census, SCAG
Buildings and Facilities	Municipal Employment	Pasadena Planning and Finance Departments
Streetlights and Traffic Signals	Population	U.S. Census, SCAG
Water Delivery Facilities	Population	U.S. Census, SCAG
Solid Waste	Municipal Employment	Pasadena Planning and Finance Departments
Transit Fleet	Population (adjusted to phase out diesel fleet)	U.S. Census, SCAG, and Phasing Out Diesel Powered Fleet
Vehicle Fleet	Municipal Employment	Pasadena Planning and Finance Departments
Employee Commute	Municipal Employment	Pasadena Planning and Finance Departments
Tournament of Roses and Rose Bowl[1]	---	Fehr & Peers, Pasadena Tournament of Roses Association
Community-wide Forecast		
Residential	Population	U.S. Census, SCAG
Commercial/Industrial	Community Employment	SCAG
Transportation	VMT	Fehr & Peers
Solid Waste	Population	U.S. Census, SCAG
Water Consumption	Population	U.S. Census, SCAG

1 No growth rates were applied to emissions from the Tournament of Roses or Rose Bowl Stadium. Baseline emissions for these sectors were calculated based on annual attendance and there are no plans for an expansion in facility capacity.

5.2 Municipal Emissions Forecast

Under a business-as-usual scenario, it is anticipated that Pasadena's municipal emissions will grow by approximately 4% by 2020 and 8% by 2035. **Figure 5.1** and **Table 5.2** show the results of the forecast.

Figure 5.1 Municipal Emissions Forecast for 2020 and 2035

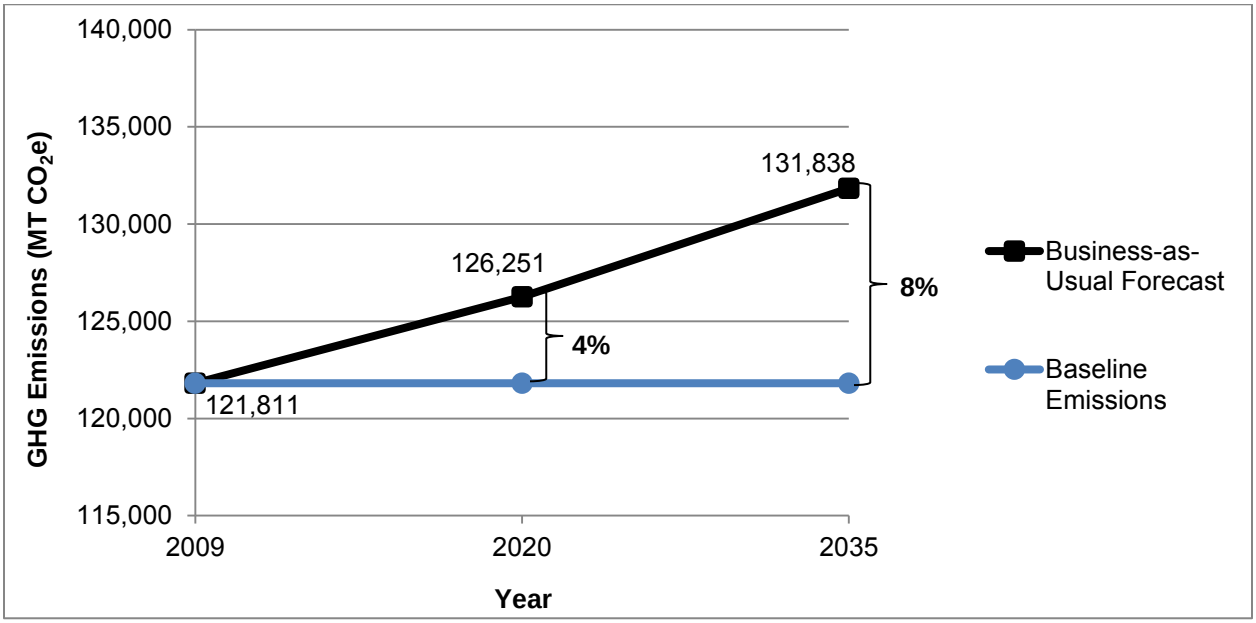


Table 5.2 Municipal Emissions Growth Forecast by Sector

Sector	2009 MT CO_2e	2020 MT CO_2e	2035 MT CO_2e	Percent Change from 2009 to 2020	Percent Change from 2009 to 2035
Electric Power	72,749	76,734	81,626	5%	12%
Buildings & Facilities	24,027	24,027	24,027	0%	0%
Streetlights & Traffic Signals	8,623	9,095	9,675	5%	12%
Water Delivery Facilities	1,318	1,390	1,479	5%	12%
Solid Waste	118	118	118	0%	0%
Vehicle Fleet	4,784	4,784	4,784	0%	0%
Transit Fleet[1]	519	429	456	-17%	-12%
Employee Commute	5,717	5,717	5,717	0%	0%
Rose Bowl	3,956	3,956	3,956	0%	0%
Total	**121,811**	**126,251**	**131,838**	**4%**	**8%**

1 Projected diesel usage for the City's fleet in 2020 and 2035 was converted into therms of compressed natural gas (CNG) and added to the existing CNG projections to reflect the phasing out of diesel vehicles by 2020.

5.3 Community-wide Emissions Forecast

Under a business-as-usual scenario, Pasadena's community-wide emissions will grow by approximately 6% by 2020 and 15% by 2035. **Figure 5.2** and **Table 5.3** show the results of the forecast.

Figure 5.2 Community-wide Emissions Forecast for 2020 and 2035

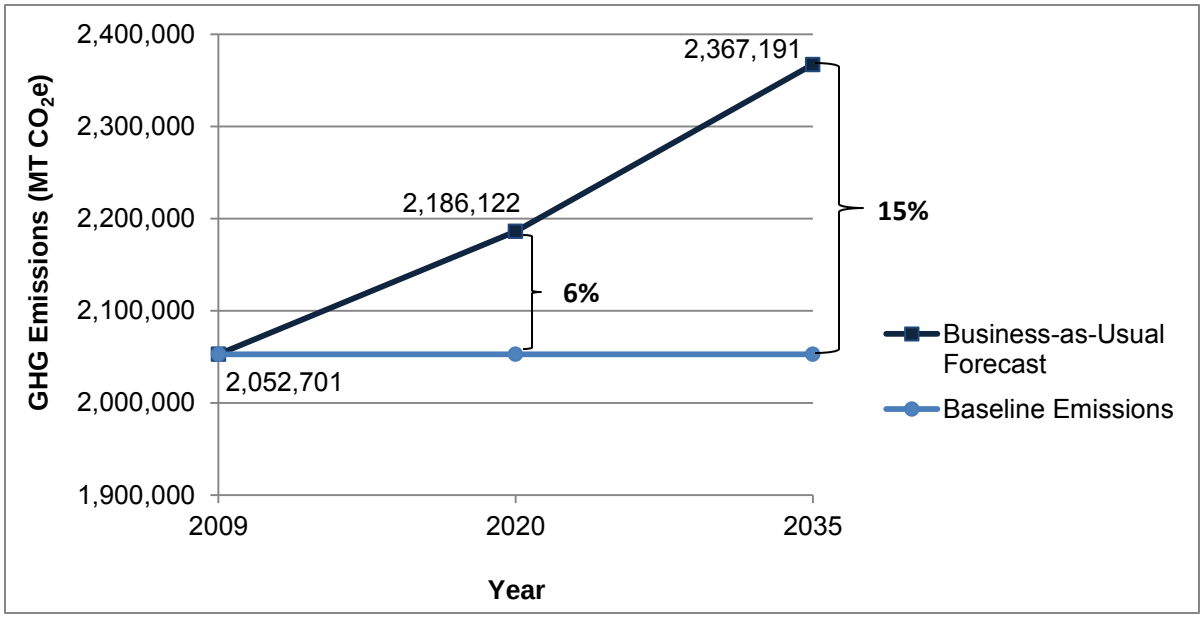


Table 5.3 Community-wide Emissions Growth Forecast by Sector

Sector	2009 MT CO_2e	2020 MT CO_2e	2035 MT CO_2e	Percent Change from 2009 to 2020	Percent Change from 2009 to 2035
Residential	324,026	341,775	363,563	5%	12%
Commercial/Industrial	632,213	666,788	715,735	5%	13%
Transportation	1,062,681	1,141,927	1,249,990	7%	18%
Solid Waste	15,019	15,842	16,852	5%	12%
Water Consumption	18,762	19,790	21,051	5%	12%
Total	**2,052,701**	**2,186,122**	**2,367,191**	**6%**	**15%**

6. CONCLUSION

This Inventory will assist decision makers and stakeholders in identifying opportunities to reduce GHG emissions throughout the City of Pasadena. It also provides an emissions baseline that the City can use to set future emissions reduction targets. As previously detailed, the City emitted approximately 2,052,701 MT CO_2e in 2009. Municipal GHG emissions totaled 121,811 MT CO_2e, or about 6% of that total.

Programs and policies are already underway to help Pasadena reduce its GHG emissions consistent with AB 32. Such programs include the City's energy efficiency programs, solar rebates, conservation programs, green business support and green building program, incentives and ordinances and Cool Trees programs. Refer to **Appendix D** for a complete list of GHG reduction programs that the City accomplished between 2007 and 2011. Accomplishments since the 2009 inventory baseline (i.e. the 2010-2011 accomplishments) could be quantified and included in a climate action plan.

6.1 Best Practices

This Inventory identifies Pasadena's major sources of emissions and, therefore, provides direction to decision makers as to where to target emissions reduction activities. Given the results of the inventory, it is recommended that the City focus on the following cost-effective "best practices" in order to significantly reduce emissions from its municipal operations:

Buildings

- Continued audits and retrofit of existing municipal buildings, parks, stadiums, swimming pools and other recreation facilities, e.g. lighting, insulation, HVAC systems
- Continued building-specific renewable energy applications, e.g. installing solar hot water heating for locker rooms of recreational facilities
- Continued lighting efficiency improvements
- Expanded use of light colors on existing rooftops and street paving to reduce "heat island" effect
- Expanded procurement policies that specify energy efficiency standards in all purchasing and bid specifications for office equipment, motors, lighting, appliances, etc.

Lighting

- Continued replacement of existing indoor and outdoor lighting with energy efficient and low-wattage lamps and ballast

- Reduction in energy use through reducing hours of operation and/or number of lights
- Solar photovoltaic powered street and emergency lighting

Vehicle Fleet

- Continued replacement of existing vehicles with zero and/or low emissions vehicles
- Reduction in fleet size, i.e. total number of vehicles
- Continued improvements in scheduling and route efficiency
- Improved maintenance regime for increased efficiency, e.g. check tire pressure

Water Conservation

- Continued energy efficient retrofit of facilities, especially pumping processes
- Continued energy efficient specs for new construction of sewage and waste water system
- Process changes to improve energy efficiency of treatment of drinking water, wastewater and sewage

Waste

- Increased office recycling, e.g. paper, cardboard, cans, toner cartridges
- Recovery of food waste in cafeterias and kitchens of local government buildings for composting or other use
- Expanded waste prevention in day-to-day operations—two-side copying, reduced paper requirements, etc.
- Continued purchasing preferences for recycled materials
- Continued composting of park, street, and other landscaping debris for re-use by Parks and Recreation
- Establishment of municipal composting program

Other

- Implementation of urban forestry projects
- Establishment of energy efficiency or climate protection information clearinghouse

In addition to the types of actions described above, which reduce emissions from government operations, ICLEI recommends developing policies and actions that will help to reduce emissions throughout the community. Examples include:

Residential and Commercial/Industrial Energy

- Building codes
  - Raising energy efficiency standards for new construction, significant renovations, remodeling, and additions
  - Requiring light colored, high albedo rooftops and pavement
- Ordinances for energy efficient retrofits of existing building stock at time of sale
- Continued solar hot water/pool heating and solar photovoltaic applications, ordinance, or incentives
- Continued financial incentives (e.g., existing tax incentives, rebates, loans) for:
  - Installation of solar photovoltaic systems, and other renewable energy applications
  - More efficient appliances, e.g. refrigerators, lighting, water heaters
  - Improving efficiency in existing and new buildings
- Home insulation or weatherization programs
- Expanded distribution of water saving devices, such as low-flow shower heads and faucet aerators
- Cooperative or aggregate purchase or buyer program for lighting, efficient equipment
- Reduced business fees or waiver of permits for energy efficiency improvements and use of solar energy
- Building energy tax credits
- Ordinances establishing energy efficiency requirements for new industrial permits
- Ordinances requiring industries to develop and implement energy conservation programs
- Ordinances lowering business fees or waiving permits for energy efficiency improvements and fuel switching (including use of solar energy), heat recovery/co-generation systems
- Provision of energy services to businesses, e.g. audits, assessments to recommend process changes, other energy efficiency improvements
- Establishment of financing program for efficiency improvements in the community (e.g., revolving loan funds through bonds, energy taxes, etc.)

Transportation and Land Use

- Policy shifting funding away from roads to alternative transit
- Increased use of alternative transit—public transit, van-, carpooling, cycling, walking through:
  - Funding for facility, system and/or infrastructure improvements
  - Adopt a complete streets plan
  - Implement the facility and network improvements included in the Bicycle Transportation Plan

    - Implement a bike share program serving the Central District
    - Enhance Pasadena ARTS service connecting neighborhoods to Gold Line Stations
- Establishment of service center selling transit passes, coordinating car/van pooling, ridesharing, etc.
- Establishment of solar photovoltaic or other electric vehicle charging stations
- Parking policies:
    - Zoning ordinance that reduces minimum parking space requirements for new construction
    - Parking fees to fund transit use, bicycle or pedestrian improvements
- Zoning change to reduce parking requirements and allowances
- Density bonuses and incentives for high-density, infill, mixed use, and transit-oriented development
- Implement a Parking Guidance and Wayfinding program

Waste Reduction

- Home composting education programs, distribute compost bins
- Improved or expanded residential curbside recycling collection (e.g., food waste recycling)
- Improved or expanded commercial recycling collection
- Financial incentives to reduce waste such as:
    - Special taxes and tipping fees
    - Advance disposal fees
- Establishment of a center for reusing salvageable goods
- Continued efforts to support the City's Zero Waste Strategic Plan

By identifying and implementing a set of these types of strategies, Pasadena would likely be able to reduce its GHG emissions consistent with AB 32. In the process, it may also be able to improve the quality of its services, reduce costs, and stimulate local economic development.

7. REFERENCES AND PREPARERS

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7.2 List of Preparers

This GHG Inventory was prepared by Rincon Consultants, Inc. and Fehr & Peers under contract to the City of Pasadena. Persons involved in research, analysis, report preparation, project management, and quality control include:

Joe Power, Principal, Rincon Consultants, Inc.
Shauna Callery, Senior Project Manager, Rincon Consultants, Inc.
Christina McAdams, Associate Planner, Rincon Consultants, Inc.

Chris Gray, Senior Associate, Fehr & Peers
Peter Carter, Transportation Planner, Fehr & Peers

APPENDIX A

CACP DETAILED REPORT FOR MUNICIPAL EMISSIONS, 2009

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Buildings and Facilities							
Pasadena, CA							
City Buildings & Facilities - Natural Gas							
Natural Gas	588	1	55	590	0	11,095	98,515
Subtotal City Buildings & Facilities	588	1	55	590	0	11,095	98,515

Natural Gas data may not be comprehensive, information was gathered from invoices for 28 facilities.

Data contact for Municipal Buildings Natural Gas Data: Sharon Killloran, Public Works, Management Analyst IV, 626-744-3920 skilloran@cityofpasadena.net

City Leased Facilities - Purchased Electricity							
Electricity	3,444	27	71	3,454	0	18,451	7,554
Subtotal City Leased Facilities - P	3,444	27	71	3,454	0	18,451	7,554

Total electricity used in City-leased facilities/buildings was 5,940,936 kWh in 2009.

PWP was unable to provide energy usage data for three leased facilities. Therefore, energy usage data for these facilities were calculated based on an average electricity usage statistic (27.26 kWh/sq ft) from The Department of Energy's, 2003 Commercial Building Energy Consumption Survey.

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Total emissions from electricity used in City-owned + City-leased buildings/facilities = 23,437 MT CO2e

Total does not include any electricity used for water transportation/delivery. Water-related energy use is captured in the water delivery facilities tab.

Data Sources: Cielo Martinez, Customer Service Supervisor, 626-744-4403, cmartinez@cityofpasadena.net; Badia Harrell, Management Analyst, PWP, bharrell@cityofpasadena.net.

City Owned Facilities - Purchased Electricity							
Electricity	19,926	156	411	19,983	0	106,761	2,762,793
Subtotal City Owned Facilities - P	19,926	156	411	19,983	0	106,761	2,762,793

Total electricity used in City-owned facilities/buildings was 34,374,559 kWh in 2009.

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Total emissions from electricity used in City-owned + City-leased buildings/facilities = 23,437 MT CO2e

Total does not include any electricity used for water transportation/delivery. Water-related energy use is captured in the water delivery facilities tab.

Data contact: Clarence Siruno, PW, csiruno@cityofpasadena.net Sharon Killoran, PW-BSFM, skilloran@cityofpasadena.net

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Propane Tanks							
Propane	0	0	0	0	0	7	0
Subtotal Propane Tanks	0	0	0	0	0	7	0
16 propane tanks hold 20 lbs each.							
Data source: George Aleman, BSFMD, galeman@cityofpasadena.net							
Subtotal Buildings and Facilities	23,958	184	538	24,027	0	136,314	2,868,862
Streetlights & Traffic Signals							
Pasadena, CA							
2800 Sierra Grande							
Electricity	25	0	1	25	0	133	744
Subtotal 2800 Sierra Grande	25	0	1	25	0	133	744
Total electricity usage was 42,904 kWh in 2009.							
9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.							
The meter at this address formerly belonged to AVON, but currently serves as safety lighting for the Sierra Madre Villa Gold Line station. It is metered separetely because an individual meter here when the building still belonged to AVON.							
Data Contact:Cheri Kuhlins, PW, ckuhlins@cityofpasadena.net							
Billboards							
Electricity	3	0	0	3	0	18	227
Subtotal Billboards	3	0	0	3	0	18	227
Total electricity usage was 5,652 kWh in 2009.							
9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.							
Data Contact:Cheri Kuhlins, PW, ckuhlins@cityofpasadena.net							
Flashing Beacon							
Electricity	1	0	0	1	0	5	861
Subtotal Flashing Beacon	1	0	0	1	0	5	861
Total electricity usage was 1,488 kWh in 2009.							

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Data Contacct:Cheri Kuhlins, PW, ckuhlins@cityofpasadena.net

Other Outdoor Lighting

Electricity	91	1	2	92	0	489	157,531
Subtotal Other Outdoor Lighting	91	1	2	92	0	489	157,531

Total electricity usage was 157,507 kWh in 2009.

Other outdoor lighting - e.g., park lighting, parking lot lighting, etc.

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Data Contacct:Cheri Kuhlins, PW, ckuhlins@cityofpasadena.net

Streetlights

Electricity	7,499	59	155	7,520	0	40,178	1,881,120
Subtotal Streetlights	7,499	59	155	7,520	0	40,178	1,881,120

Total electricity usage was 12,936,405 kWh in 2009.

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Data Contact:Cheri Kuhlins, PW, ckuhlins@cityofpasadena.net

Traffic Signals

Electricity	979	8	20	982	0	5,246	257,231
Subtotal Traffic Signals	979	8	20	982	0	5,246	257,231

Total electricity usage was 1,689,144 kWh in 2009.

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Data Contacct: Kuhlins, PW, ckuhlins@cityofpasadena.net

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Subtotal Streetlights & Traffic Signa	8,598	67	178	8,623	0	46,069	2,297,714
Water Delivery Facilities							
Pasadena, CA							
Municipal Water Delivery							
Electricity	1,315	10	27	1,318	0	7,044	262,725
Subtotal Municipal Water Delivery	1,315	10	27	1,318	0	7,044	262,725
Subtotal Water Delivery Facilities	1,315	10	27	1,318	0	7,044	262,725
Vehicle Fleet							
Pasadena, CA							
Hybrid Vehicles 2004							
Gasoline	13	0	0	13	0	184	4,012
Subtotal Hybrid Vehicles 2004	13	0	0	13	0	184	4,012
Hybrid Vehicles 2006-2008							
Gasoline	27	1	3	27	0	384	8,070
Subtotal Hybrid Vehicles 2006-20	27	1	3	27	0	384	8,070
Hybrid Vehicles 2009							
Gasoline	7	0	1	7	0	103	2,185
Subtotal Hybrid Vehicles 2009	7	0	1	7	0	103	2,185

Total electricity use was 2,268,002 kWh in 2009.

9% of GHGs from purchased electricity are from City-owned generators and are considered Scope 1 emissions (and are accounted for under Electric Power sector). Therefore, these GHGs (which are Scope 2) were reduced by 9% to avoid double counting with the emissions accounted for in the Electric Power sector.

Data source: Brad Boman, PWP, bboman@cityofpasadena.net

Data for MY 2006-2009 vehicles was entered using methodology described in ICLEI CACP 2009 v3.0 Data Entry document

Data source: Killoran, Sharon. Aleman, George, skilloran@cityofpasadena.net , galeman@cityofpasadena.net

Data source: Killoran, Sharon. Aleman, George, skilloran@cityofpasadena.net , galeman@cityofpasadena.net

Data source: Killoran, Sharon. Aleman, George, skilloran@cityofpasadena.net , galeman@cityofpasadena.net

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Vehicle Fleet 2006-2008							
Gasoline	1,080	37	106	1,094	0	15,379	0
Subtotal Vehicle Fleet 2006-2008	1,080	37	106	1,094	0	15,379	0

Data source: Killoran, Sharon. Aleman, George, skilloran@cityofpasadena.net, galeman@cityofpasadena.net

Note: Although fuel usage and cost data for 2009 was available by model year, this data was summed and entered under the alternative method for Heavy Duty, Light Truck and Passenger Vehicle categories. Due to time constraints, data was entered in this way for the years 2020 and 2035. When the reports where run, the emissions totals reflected inconsistencies between 2009 and the other years, so 2009 data was re-entered in the way that was consistent with how 2020 and 2035 data was entered.

Vehicle Fleet 2009							
Gasoline	56	2	5	56	0	793	17,508
Subtotal Vehicle Fleet 2009	56	2	5	56	0	793	17,508

Data source: Killoran, Sharon. Aleman, George, skilloran@cityofpasadena.net, galeman@cityofpasadena.net

Vehicle Fleet up to 2005							
Compressed Natural Gas	0	0	0	0	0	1	601
Diesel	1,144	3	3	1,145	0	15,469	321,388
Gasoline	2,151	142	120	2,198	0	30,626	0
OFF ROAD Diesel	216	5	12	218	0	2,916	53,162
OFF ROAD Gasoline	26	1	1	26	0	367	7,921
Subtotal Vehicle Fleet up to 2005	3,537	152	137	3,587	0	49,379	383,072

Data source: Killoran, Sharon. Aleman, George, skilloran@cityofpasadena.net, galeman@cityofpasadena.net

Note: Although fuel usage and cost data for 2009 was available by model year, this data was summed and entered under the alternative method for Heavy Duty, Light Truck and Passenger Vehicle categories. Due to time constraints, data was entered in this way for the years 2020 and 2035. When the reports where run, the emissions totals reflected inconsistencies between 2009 and the other years, so 2009 data was re-entered in the way that was consistent with how 2020 and 2035 data was entered.

Subtotal Vehicle Fleet	4,720	192	252	4,785	0	66,221	414,847

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Employee Commute							
Pasadena, CA							
Business Travel - Car - Scope 3							
Gasoline	25	2	1	26	0	360	0
Subtotal Business Travel - Car - S	25	2	1	26	0	360	0

Data source: Ozzie Aranda, Finance, oaranda@cityofpasadena.net

Using Alt method - VMT.
65% of total VMT attributed to passenger vehicles, 35% to light trucks

Total emissions from Car Business Travel using EPA Climate Leaders formula: 21,092.055 kg CO2e

EPA ClimateLeaders formula CO2e = VMT or PMT * (EFCO2 + EFCH4 * 0.021 + EFN20 * 0.310)

Emissions from Business Travel by Car: 26 MT CO2e

Business Travel - Plane - Scope 3							
OFF ROAD Jet Fuel	98	0	0	98	0	1,377	0
Subtotal Business Travel - Plane -	98	0	0	98	0	1,377	0
Employee Commute - Drive Alone (Scope 3)							
Gasoline	2,806	187	158	2,867	0	39,944	0
Subtotal Employee Commute - Dr	2,806	187	158	2,867	0	39,944	0

Using Alt method - VMT.
65% of total VMT attributed to passenger vehicles, 35% to light trucks

Data source: Rideshare survey, Jenny Cristales, DOT, jcristales@cityofpasadena.net

Employee Commute - Public Bus - Scope 3							
Compressed Natural Gas	6	1	13	7	0	120	0
Subtotal Employee Commute - Pu	6	1	13	7	0	120	0
Employee Commute Carpool Scope 3							
Gasoline	2,661	177	150	2,719	0	37,878	0
Subtotal Employee Commute Carp	2,661	177	150	2,719	0	37,878	0

Using Alt method - VMT.
65% of total VMT attributed to passenger vehicles, 35% to light trucks

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Data source: Rideshare survey, Jenny Cristales, DOT, jcristales@cityofpasadena.net							
Subtotal Employee Commute	5,596	369	326	5,717	0	79,679	0
Transit Fleet							
Pasadena, CA							
Transit Fleet CNG							
Compressed Natural Gas	0	0	0	0	0	3	21,552
Subtotal Transit Fleet CNG	0	0	0	0	0	3	21,552
Data source: Jenny Cristales, DOT, jcristales@cityofpasadena.net							
Transit Fleet Diesel							
Diesel	113	0	0	113	0	1,530	375,880
Subtotal Transit Fleet Diesel	113	0	0	113	0	1,530	375,880
Data source: Jenny Cristales, DOT, jcristales@cityofpasadena.net							
Transit Fleet Gasoline							
Gasoline	399	23	27	406	0	5,675	154,572
Subtotal Transit Fleet Gasoline	399	23	27	406	0	5,675	154,572
Data source: Jenny Cristales, DOT, jcristales@cityofpasadena.net							
Subtotal Transit Fleet	512	23	28	520	0	7,208	552,004
Electric Power							
Pasadena, CA							
PWP Electric Power - Glenarm and Broadway							
Carbon Dioxide	72,749	0	0	72,749	0	0	7,147,615
Subtotal PWP Electric Power - Gle	72,749	0	0	72,749	0	0	7,147,615
Note: Total energy consumption (MMBtu) is 1,370,762.60							
Data source: Badia Harrell, Management Analyst, PWP, bharrell@cityofpasadena.net; Jason Miller, Engineer, PWP, jpmiller@cityofpasadena.net, (Aug 2013)							
Subtotal Electric Power	72,749	0	0	72,749	0	0	7,147,615

Government Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Scope 3 Waste							
Pasadena, CA							
Municipal Solid Waste							*Disposal Method - Managed Landfill*
Paper Products	0	0	2,936	62	0		0
Food Waste	0	0	1,489	31	0		0
Plant Debris	0	0	387	8	0		0
Wood or Textiles	0	0	802	17	0		0
Subtotal Municipal Solid Waste	0	0	5,614	118	0		0
Data Source: Gabriel Silva, City of Pasadena Public Works							
Waste Share derived from CalRecycle's 2008 Waste Characterization Study							
Subtotal Scope 3 Waste	0	0	5,614	118	0		0
Total	117,448	843	6,960	117,856	0	1,713,296	13,543,767

APPENDIX B

CACP DETAILED REPORT FOR COMMUNITY-WIDE EMISSIONS, 2009

Community Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)
Residential						
Pasadena, CA						
Residential Electricity						
Electricity	206,496	1,617	4,264	207,087	0	1,106,379
Subtotal Residential Electricity	206,496	1,617	4,264	207,087	0	1,106,379

In 2009, 331,682,808 kWh of electricity was used in the residential sector. However, 7,513,804 kWh of this is attributed to water delivery and is therefore captured in the "Other" tab under water delivery. Therefore, 7,513,804 kWh was subtracted from the residential electricity total to avoid double counting.

The wholesale portfolio emissions rate factor was applied to retail electricity sales, which does not account for emissions associated with electric power transmission and distribution losses, as this information was not available at the time this inventory was prepared.

Data Sources: Charles Chang, PWP, "2009 Calendar Year Retail Revenue and Usage by Customer Class," John Lambeck, MWD, jlambeck@mwdh2o.com; Natalie Ouwersloot, PWP, nouwersloot@cityofpasadena.net

Residential Natural Gas						
Natural Gas	116,639	220	11,000	116,939	0	2,199,912
Subtotal Residential Natural Gas	116,639	220	11,000	116,939	0	2,199,912

2009 residential natural gas usage was 21,999,120 therms. Of this, 18,653,515 therms were used in single family residences, and 3,345,605 therms were used in multifamily residences.

Data Sources: Tony Tartaglia, Sempra Utilities, ttartaglia@semprautilities.com
and Angela Kimmey, PWP, Management Analyst IV; 626-744-7582, akimmey@cityofpasadena.net

In 2009, Pasadena had 54,771 occupied households and 136,502 residents (Data Source: California Department of Finance Report E-8).

Subtotal Residential	323,135	1,837	15,264	324,025	0	3,306,291
Commercial						
Pasadena, CA						
Commercial/Industrial Electricity						
Electricity	553,554	4,336	11,431	555,138	0	2,965,873
Subtotal Commercial/Industrial Ele	553,554	4,336	11,431	555,138	0	2,965,873

In 2009, total non-residential electricity usage reported by PWP was 873,047,487 kWh. However, 4,046503 kWh of this is attributed to water delivery and is therefore captured in the "Other" tab under water delivery. Therefore, 4,046503 kWh was subtracted from the residential electricity total to avoid double counting.

The wholesale portfolio emissions rate factor was applied to retail electricity sales, which does not account for emissions associated with electric power transmission and distribution losses, as this information was not available at the time this inventory was prepared.

Data Sources: Charles Chang, PWP, "2009 Calendar Year Retail Revenue and Usage by Customer Class," John Lambeck, MWD, jlambeck@mwdh2o.com; Natalie Ouwersloot, PWP, nouwersloot@cityofpasadena.net

Community Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)
Commercial/Industrial Natural Gas						
Natural Gas	76,878	145	7,250	77,075	0	1,449,981
Subtotal Commercial/Industrial Na	76,878	145	7,250	77,075	0	1,449,981

Data Sources: Tony Tartaglia, Sempra Utilities, ttartaglia@semprautilities.com
and Angela Kimmey, PWP, Management Analyst IV; 626-744-7582, akimmey@cityofpasadena.net

Subtotal Commercial	630,432	4,481	18,681	632,213	0	4,415,854

Transportation

Pasadena, CA

Community-wide VMT						
Gasoline	1,040,018	69,131	58,666	1,062,681	0	14,805,039
Subtotal Community-wide VMT	1,040,018	69,131	58,666	1,062,681	0	14,805,039

Vehicle miles traveled (VMT) data comes from consultant Fehr & Peers analysis for Pasadena's General Plan Update. Total VMT for 2009 base year was 2,017,319,960 (5,526,904 average daily VMT). Approximately 1,311,257,974 VMT (annual) was attributed to passenger vehicles and 706,061,986 VMT (annual) was attributed to light trucks.

Data Source: Brian Welch, Fehr & Peers (no longer at Fehr & Peers)

Subtotal Transportation	1,040,018	69,131	58,666	1,062,681	0	14,805,039

Waste

Pasadena, CA

Landfilled Solid Waste					*Disposal Method - Managed Landfill*
Paper Products	0	0	374,066	7,855	0
Food Waste	0	0	189,705	3,984	0
Plant Debris	0	0	49,242	1,034	0
Wood or Textiles	0	0	102,196	2,146	0
Subtotal Landfilled Solid Waste	0	0	715,208	15,019	0

Data Sources: Solid waste tonnage provided by Gabriel Silva, City of Pasadena Public Works.
Waste share from CalRecycle's 2008 Waste Characterization Study

In 2009, landfilled solid waste from Pasadena totaled 93,632 tons. Of this approximately 16,198 tons were paper products, 14,513 tons were food waste, 6,648 tons were plant debris, 15637 tons were wood or textiles, and the remainder was other waste.

Community Greenhouse Gas Emissions in 2009
Detailed Report

Scope 1 + Scope 2 + Scope 3

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Bio CO_2 (tonnes)	Energy (MMBtu)
Subtotal Waste	0	0	715,208	15,019	0	
Other						
Pasadena, CA						
Water Delivery						
Carbon Dioxide	18,762	0	0	18,762	0	
Subtotal Water Delivery	18,762	0	0	18,762	0	

Total water delivery to customers in Pasadena totaled 32,800 AF in 2009. Approximately 65% of the total is attributed to the residential sector (broken out as 48% single family, and 17% multi-family) and the remaining 35% of the total is attributed to the commercial/industrial sector.

Based on the total water delivery in 2009 (32,800 AF) in 2009 and an emissions factor (0.572 MT CO2e per AF) provided by Metropolitan Water District for 2009, total emissions associated with water delivery were 18,762 MT CO2e in 2009.

Data source: Natalie Z. Ouwersloot, PWP, nouwersloot@cityofpasadena.net; John Lambeck, MWD, jlambeck@mwdh2o.com

Subtotal Other	18,762	0	0	18,762	0	
Total	2,012,347	75,449	807,819	2,052,700	0	22,527,184

APPENDIX C

TOURNAMENT OF ROSES AND ROSE BOWL VMT INVENTORY

FEHR PEERS

Date: April 17, 2013

To: Shauna Callery, Rincon Consultants, Inc.

From: Chris Gray, Fehr & Peers

Subject: ***City of Pasadena Rose Bowl Event Vehicle Miles Traveled (VMT)-Updated***
SM12-2552

As part of the City of Pasadena Greenhouse Gas Emissions Inventory, Fehr & Peers has estimated vehicle miles traveled (VMT) associated with the Rose Bowl. This estimate was produced in consultation with the City and was informed by email correspondence from Rose Bowl event planning consultant John Blanchard and the Pasadena Convention and Visitors Bureau. In all, the Tournament of Roses and Rose Bowl stadium events produce an estimated annual VMT of 7,510,147. The methodology and assumptions used to produce this estimate are described below.

TOURNAMENT OF ROSES

The Tournament of Roses is an annual festival comprised of several distinct events. For purposes of this analysis, we followed the breakdown used in the *2008 Economic Output Impact and Demographics Study* produced by the USC Marshall Sports Business Institute and commissioned by the Pasadena Tournament of Roses Association. The study refers to four specific events in the following descending order: the Rose Parade, the Rose Bowl Game, the Post Parade, and Float Decoration.

The Waterfall Method was used to estimate attendance at each of these events to avoid double counting multi-event attendees. According to this method, attendance at "upstream" events is captured first, with tallies at lower levels capturing residual attendance. For example, if someone attends the Rose Parade and the Rose Bowl Game, they are only counted in the Rose Parade "bucket." While this method was used for purposes of estimating spending, it was assumed to be applicable for estimating corresponding vehicle trips.

Estimated Attendees

Table 1 shows the total number of "waterfall" attendees estimated by the study to have attended each event. In addition, a detailed survey of event participants describes their points of origin before traveling to the Tournament of Roses. For purposes of estimating VMT, attendees were assumed to have come from the City of Pasadena if they said that they lived in Pasadena, reported staying at a hotel in Pasadena or said that they were staying with friends. If they said they were staying with friends, a proportional share of this category was applied. Attendees were assumed to have come from outside Pasadena if they did not come from inside Pasadena. This group included people staying at hotels, people staying with friends, and people who chose "other," presumably referring to lodging in a Southern California city other than Pasadena or Los Angeles. Long distance trips, such as airline flights, were not included in this analysis.

Mode Choice and Average Vehicle Occupancy

Rose Bowl event planner John Blanchard suggested that there are typically 400 to 500 private transit coaches used to transport people to the Rose Parade in a typical year and up to 800 in a good year. Using a conservative estimate of 400 private transit coaches and Blanchard's estimate of 40 people per private transit vehicle, an estimated 16,000 people travel to the Rose Parade by private transit. Applying this number to the Rose Parade bucket suggests that 4% of people from this group arrive by private transit. Although the exact number of people arriving by public transit was unavailable, this analysis assumes that 1% of people arrive by public bus or rail. Based on these estimates, it was assumed that 95% of people attending the Rose Parade, the Rose Bowl, and the Post Parade arrived by private vehicle. Given the absence of organized private shuttles during Float Decoration, 99% of trips associated with this activity were assumed to be made by private vehicle.

John Blanchard estimated that average vehicle occupancy (AVO) during the Rose Parade was 3.5 and for employees and participants (corresponding to Float Decoration), it was 1.5. This analysis also assumed an AVO of 3.5 for the Rose Bowl Game and the Post Parade.

Average Trip Length

Average trip length was estimated based on outputs from the Pasadena Citywide Travel Model. According to the model, the average length of a car trip beginning and ending in Pasadena (internal-internal) is 4.15 miles, or 8.30 miles roundtrip. The average length of a car trip coming to or from Pasadena (internal-external or external-internal) is 14.85 miles, or 29.70 miles roundtrip. The weighted average for all Pasadena trips is 8.32 miles or 16.64 miles roundtrip. For automobile trips coming into or out of Pasadena, VMT was discounted by 50%, to avoid excessive attribution of miles traveled outside City limits. This approach follows the Regional Targets Advisory Committee (RTAC) recommendation to the California Transportation Commission on using VMT for purposes of estimating mobile source greenhouse gas emissions. This recommendation appears in the report *Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375* (RTAC 2009).

Annual Occurrences

The Rose Parade, Rose Bowl Game and Post Parade each occur once a year. Float Decorating occurs for an average of two weeks in advance of the Rose Parade and was assumed for this analysis to occur on 12 days each year.

UCLA FOOTBALL, THE ROSE BOWL FLEA MARKET AND OTHER EVENTS

In addition to the Tournament of Roses events, other events were analyzed including:

- Rose Bowl Flea Market (12 events in 2009)
- UCLA Football Games (6 events in 2009)
- International Soccer (3 events in 2009)
- July 4th Americafest (1 event in 2009)
- High School Football (1 event in 2009)
- USMC Color, Drum, Bugle, Silent Drill Corp (1 event in 2009)
- U2 Concert (1 event in 2009)

The Pasadena Citywide Travel Model was used to determine the average percent of trips originating from within Pasadena and the average percent of trips coming from outside the City for a majority of the events. According to the model, 16% of VMT on all roads in Pasadena (including both freeways and surface streets) comes from internal-external driving; 23% comes from external-internal driving; 26% comes from internal-internal driving; and 36% comes from external-external driving. When external-external trips are excluded from this total because they are not arriving or departing from Pasadena, it is estimated that 40% of event attendees [26/(16+23+26)=40%] come from inside Pasadena and 60% of event attendees [(16+23)/(16+23+26)=60%] come from outside Pasadena. This process was used to estimate the percent of persons traveling from inside Pasadena for the following events:

- Rose Bowl Flea Market (12 events in 2009)
- UCLA Football Games (6 events in 2009)
- July 4th Americafest (1 event in 2009)
- High School Football (1 event in 2009)
- US Marine Corps Color, Drum, Bugle, Silent Drill Corp (1 event in 2009)

For the International Soccer events and the U2 concert, it was assumed that only 5% of the attendees came from Pasadena given the size of the events and the likelihood these events would be regional draws unlike the more local events.

Rose Bowl Flea Market

The Rose Bowl Flea Market is held on the second Sunday of the month, twelve months a year. According to attendance records provided by the City of Pasadena, the average attendance each month is 12,366, including approximately 10,000 visitors and 2,500 vendors.

UCLA Football

UCLA typically holds five to seven football games at the Rose Bowl each year, depending on their schedule. In 2009, six UCLA football games were played at the Rose Bowl, with an average of 53,868 visitors to each game, based on 2009 attendance figures provided by the City of Pasadena.

International Soccer

Three international soccer games were held at the Rose Bowl in 2009. The total attendance at these events was 149,886 according to attendance data provided by the City of Pasadena.

July 4th Americafest

The Americafest is held every year at the Rose Bowl to commemorate the July 4th holiday. The number of attendees in 2009 was 18,842 according to the City of Pasadena.

High School Football

In 2009, one high school football game was held at the Rose Bowl. The attendance at this event was 7,980 according to attendance data provided by the City of Pasadena.

United States Marine Corp (USMC) Event

In 2009, the Rose Bowl hosted the USMC Color Detachment, Drum and Bugle Corp Silent Drill. There were 4,603 attendees at this event according to attendance data provided by the City of Pasadena.

U2 Concert

A U2 Concert was held at the Rose Bowl in 2009. The attendance at the event was 95,770 according to attendance data provided by the City of Pasadena.

CALCULATIONS

Rose Parade VMT

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length
= 402,300 * 12% * 95% / 3.5 * 8.3 = 108,759 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction
= 402,300 * 88% * 95% / 3.5 * 29.7 * 50% = 1,426,970 miles/year

Motor coach VMT = Total Attendees * Percent traveling by motor coach / AVO * Average trip length
= 402,300 * 4% / 40 * 16.64 = 6,694 miles/year

Rose Bowl VMT

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length
= 84,269 * 5% * 95% / 3.5 * 8.3 = 9,492 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction
= 84,269 * 95% * 95% / 3.5 * 29.7 * 50% = 322,681 miles/year

Motor coach VMT = Total Attendees * Percent traveling by motor coach / AVO * Average trip length
= 84,269 * 4% / 40 * 16.64 = 1,402 miles/year

Post Parade VMT

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length
= 59,591 * 7% * 95% / 3.5 * 8.3 = 9,398 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction
= 59,591 * 93% * 95% / 3.5 * 29.7 * 50% = 223,381 miles/year

Motor coach VMT = Total Attendees * Percent traveling by motor coach / AVO * Average trip length
= 59,591 * 4% / 40 * 16.64 = 992 miles/year

Float Decorating VMT

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 20,536 * 14% * 99% / 1.5 * 8.3 * 12 = 188,994 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 20,536 * 86% * 99% / 1.5 * 29.7 * 50% * 12 = 2,077,141 miles/year

Rose Bowl Flea Market VMT

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 12,366 * 40% * 99% / 2 * 8.3 * 12 = 243,867 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 12,366 * 60% * 99% / 2 * 29.7 * 50% * 12 = 654,475 miles/year

UCLA Football VMT

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 53,868 * 40% * 99% / 3.5 * 8.3 * 6 = 303,250 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 53,868 * 60% * 99% / 3.5 * 29.7 * 50% * 6 = 814,567 miles/year

International Soccer

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 49,962 * 5% * 99% / 3.5 * 8.3 * 3 = 17,594 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 49,962 * 95% * 99% / 3.5 * 29.7 * 50% * 3 = 598,106 miles/year

July 4th Americafest

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 18,842 * 40% * 99% / 3.5 * 8.3 * 1 = 17,694 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences

= 18,842 * 60% * 99% / 3.5 * 29.7 * 50% * 1 = 47,487 miles/year

High School Football

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 7,980 * 40% * 99% / 3.5 * 8.3 * 1 = 7,494 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 7,980 * 60% * 99% / 3.5 * 29.7 * 50% * 1 = 20,112 miles/year

USMC Color, Drum, Bugle, and Silent Drill

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 4,603 * 40% * 99% / 2 * 8.3 * 1 = 4,323 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 4,603 * 60% * 99% / 2 * 29.7 * 50% * 1 = 11,061 miles/year

U2 Concert

Internal origin VMT = Total Attendees * Percent with internal origin * Percent traveling by car / AVO * Average trip length * Annual occurrences
= 95,770 * 5% * 99% / 2 * 8.3 * 1 = 11,242 miles/year

External origin VMT = Total Attendees * Percent with external origin * Percent traveling by car / AVO * Average trip length * 50% RTAC reduction * Annual occurrences
= 95,770 * 95% * 99% / 2 * 29.7 * 50% * 1 = 382,161 miles/year

APPENDIX D

GHG ACCOMPLISMENTS (2007-2011)

Pasadena GHG Accomplishments (2007-2011)

Provided by the City of Pasadena

This appendix lists accomplishments from 2007-2011 that result in GHG emissions reductions. For the purposes of a climate action plan, the accomplishments that occurred after the GHG emissions inventory baseline year could be credited to meeting an established target.

ENERGY

2007

- Restored the City Hall building to be 20% more energy efficient than the California energy standards (Title 24) and use approximately half of the electricity it used prior to the retrofit.
    - City Hall is the first municipal facility to use 100% Green Power provided by Pasadena Water and Power.
    - City Hall features several high-efficiency plumbing fixtures such as zero-consumption urinals, dual-flush toilets, dual-valve flush-o-meters, lavatories, sinks, and showers which will reduce water use by more than 40 percent compared to a conventional building.
    - Drip irrigation was installed in the landscaped areas at the courtyard.
    - The City Hall building is expected to receive LEED (Leadership in Environmental Energy Design) certification in 2008.
- Provided incentive rebates for 15 residential solar installations.
- Completed a Municipal-Owned Facilities Solar Study identifying available roof space at City-owned facilities for solar installation.
- Signed approximately 200 green power customers.
- Provided $100,000 worth of incentives to the Northwest Innovation Center for incorporating a host of energy and water efficiency measures and obtaining LEED Gold rating.
- Partnered with the Mothers Club in the renovation of their new building. The building is expected to receive LEED Gold rating in 2008.
- Installed Thermal Energy Systems at Hill Library. These Freon–free systems are being used to reduce energy costs by allowing energy-intensive, electrically driven cooling equipment to be operated off peak hours when electricity rates are lower.
- Installed automatic temperature control systems in all City owned buildings. This system controls the temperature by monitoring climate conditions within the building and resets the system automatically when the temperature fluctuates.
- Implemented Green Building Energy Efficiency. Green Building projects are required to achieve 14% energy efficiency over Title 24.
- Replaced half of all traffic signal lamps with energy efficient Light-Emitting Diodes (LEDs).
- Provided home energy audits to assist customers in identifying energy saving measures
- Began purchasing and installing new eco-friendly, low-mercury fluorescent light bulbs to replace existing fluorescent bulbs. Lighting fixtures at Linda Vista library, the PW Building, and Fire Station #33 were retrofitted to accommodate green bulbs.

2008

- Achieved LEED Gold certification for the historic City Hall, which is now 20 percent more energy efficient than state standards.

- Created a new Commercial Energy Efficiency Partnering Program, with rebates for any permanently installed energy-saving technology. The 2008 installations alone are expected to save over 7 MW of energy each year.
- Sparked a wave of solar installations with the new Pasadena Solar Initiative Program, advancing Pasadena closer to its goal of 14 megawatts of solar power by 2017.
- Partnered with Caltech to secure the City's first large-scale solar power purchase agreement, providing the campus with 320,000 kilowatt-hours of clean power through a state-of-the-art rooftop solar system.
- Contracted a purchase of 30,000 MWh of power generated by methane gas emitted from the Skunk Creek Landfill. Online by 2010, the project will cut the City's annual greenhouse gas emissions by 16,500 tons per year and provide enough energy to power 5,000 homes.
- Invested $57,000 to illuminate all City libraries with 100 percent green power, joining City Hall, Kaiser Permanente, Caltech Housing, Huntington Hospital and more than 1,500 customers City-wide in purchasing renewable energy.
- Issued "The Power of 10 Challenge" with the delivery of free compact-fluorescent light bulbs (CFLs) City-wide. The program encourages 53,000 Pasadena households to switch to 10 CFLs, with the City-wide goal of eliminating 10,000 tons of greenhouse gas emissions annually.
- Partnered with Heritage Housing Partners in the design and construction of the Fair Oaks Court Affordable Housing Project, including energy and water efficiency measures from top to bottom and achieving Energy Star Certification.
- Launched a community effort to craft a new 20-year Integrated Resource Plan (IRP) to ensure reliable and environmentally responsible electric service, competitive rates and energy independence.

2009

- Adopted a new 20 year energy plan setting significantly higher targets for renewable energy (green power), greenhouse gas reductions, solar installations and energy efficiency.
- Increased state-qualifying renewable energy to 8%.
- Completed a contract to purchase six megawatts (MW) of wind power.
- Completed a contract to purchase 6.6 MW of energy generated from waste conversion at the Ameresco Chiquita Landfill.
- Saved a total of 22,060 MWh of energy use -13,766 MWh in the commercial sector, 338 MWh in municipal buildings and 7,956 MWh in the residential sector.
- Provided 16,000 residential households with 224,000 efficient compact fluorescent light bulbs.
- Reduced peak power demand by 5.42 MW annually through residential and business energy programs.
- Doubled the number of rebate assisted solar installations City-wide from 26 to 52.
- Built the first building-integrated photovoltaic (BIPV) solar system for a new bus shelter at the Lake Avenue Metro Gold Line station. The 20-kilowatt project is the first PWP-owned solar system. The canopy will generate about 30,000 kilowatt-hours of energy each year, enough to power six homes.
- Reduced energy and roof maintenance costs through the installation of "cool roof" coatings at City facilities. Cool roofs reflect damaging ultraviolet and infrared sunlight reducing environmental impact.

2010

- The City saved nearly 22,000 Megawatt-hours of energy with help from Water and Power customers and increased its renewable, clean sources of energy while reducing greenhouse gas emissions.
- Caltech completed six solar energy projects that boosted Pasadena's clean-energy cache by 1.1 Megawatts. The campus now generates enough to power 400 homes each year.
- Completed more than 100 new solar installations City-wide to reach a milestone: 2 Megawatts of solar power capacity installed under the Pasadena Solar Initiative. Rebates now extend to low-income and affordable-housing customers.
- Celebrated "Greening the Earth Day" community festival, powered with 100 percent solar energy.
- Reduced energy use of Pasadena Central Library. Thirty-two 800-watt light fixtures were replaced with 78-watt lights, saving 122,824 kilowatt-hours per year. New energy-efficient air conditioning saves 128,503 kilowatt hours per year.
- Upgraded to a more energy efficient air conditioning system at the Allendale Branch Library, saving 11,370 kilowatt-hours per year.
- Replaced four pendant 320-watt lights in the towering lobby at police headquarters with 56-watt lights, saving 4,625 kilowatt-hours per year.
- Installed a high-tech energy management system at the police department's indoor firing range cutting costs by 10 percent.
- Installed three new energy-efficient cool roofs at Robinson and Villa Parke community centers and the Lamanda Park Branch Library.
- Adopted energy efficiency goals of cutting energy use by 14,500 Megawatt-hours and demand by 3.3 Megawatts per year through 2013.
- Conducted a Small Business Lighting Use and Energy Survey in partnership with Outward Bound Adventures, Inc., a local nonprofit, for 200 small businesses.
- Partnered with California Energy Commission (CEC) staff to complete energy audits at four municipal facilities.
- Installed efficient variable frequency drives on the City Hall fountain pump motors, saving 12,149 kilowatt-hours per year.
- Replaced incandescent exit signs with LED exit signs at 11 municipal buildings.

2011

- Amended the Light and Power Rate Ordinance.
- La Paz Solar Tower Project.
- Purchased biogas fuel to generate renewable electricity
- 25,000 Pasadena W&P residential electric customers, selected at random, received personalized Home Energy Reports (pilot program) aimed at reducing home energy use.
- Purchased energy efficient retrofit street light luminaires.
- Westridge School's LEED@ Platinum certified Upper School science building has been awarded the 2011 Pasadena & Foothill Chapter American Institute of Architects (AIA) Merit Award. Westridge holds the distinction of having completed the first building the City to be LEED certified to the Platinum level *(Community Level)*.
- Robinson Laboratory for Astrophysics at Caltech awarded LEED Platinum for its energy savings.

WASTE REDUCTION

2007

- Over 40 million pounds of construction and demolition debris materials were recycled from construction projects in Pasadena.
- The Big Belly came to Pasadena in 2007 - The City piloted four Big Belly solar powered trash compacters, placed at various locations. These environmentally sound compactors run off of solar power and require less service pick-ups, reducing greenhouse gas emissions.
- The forestry program recycled 85 percent of all green waste accumulated by City crews, converting waste into mulch for ground cover in the City's natural areas, parkways and frontage roads.
- The City held quarterly electronic waste collection events, collecting over 182,000 pounds of electronic waste.
- The City implemented use of 100% recycled janitorial paper products in all City facilities.
- The City implemented a battery recycling program, identifying public sites (Central Library, Jackie Robinson Center and Villa Park Community Center) to host the "Big Green Box" - the box collects up to 44 pounds of household batteries. Over 2000 lbs. of batteries and cell phones were collected.
- The City expanded its recycling program at special events and at the Rose Bowl, purchasing 120 easily transportable recycling containers, placed at special events throughout the City to collect beverage containers. Over half a million beverage containers were collected in Fiscal Year 2007.
- The Planning & Development Department banned Styrofoam products from its offices. Employees were encouraged to use reusable wares.
- Pasadena Water and Power expanded its recycling program to its leased City office spaces, providing blue desk-side recycling containers to each employee to capture all paper, plastic, aluminum, glass, and cardboard products.
- In 2007 the City amended its code to place a limit on the amount of waste haulers which could operate in the City. The City has 32 licensed waste haulers operating in the City which represent 160 trash trucks operating within the City, which causes significant air pollution, road damage, noise pollution, and congestion.
- Pasadena's libraries are reducing paper waste. Hold and Overdue notifications are being sent via email, saving postcards and postage.
- The Department of Public Health implemented Electronic Death Registration which reduces use of paper by eliminating draft paper certificates; eliminates faxing of draft certificates and eliminates unnecessary trips by funeral home/mortuaries to the Vital Records Office.

2008

- Diverted 12,000 pounds of trash for recycling during the 2008 Rose Bowl Game and collected and recycled 480,000 beverage containers during the 2008 UCLA football season.
- Increased the diversion rate requirements of licensed waste haulers.
- Installed recycling stations adjacent to the athletic fields at Memorial Park, Victory Park, Allendale Park and Brookside Park.
- Collected 207,273 pounds of household hazardous waste and 74,089 pounds of electronic waste during free collection events.
- Introduced a new Battery and Compact Fluorescent Lamp recycling program, with 12 convenient collection points throughout the City for residents and business owners.

- Recycled 85% of all green waste collected by City crews; converting waste into mulch for ground cover in the City's natural areas, parkways and frontage roads.
- Launched a program to provide free one-quart "sharp waste" containers for the safe disposal of needles, and other medical supplies used at home by residents.
- Joined Green Cities California in pledging to only purchase 100% post-consumer recycled copy paper, saving 8.6 million pounds of greenhouse gas emissions, 19.6 million gallons of water, 11.5 million kilowatt hours of electricity and 67,000 trees.

2009

- Reached a 21% reduction in per capita solid waste disposal from the FY05 baseline year.
- Diverted 66% of the City's waste from landfills.
- Placed 40 Big Belly Solar Compacters throughout the City. The environmentally sound trash containers run off of solar power, compacting the waste, resulting in 80 percent less service pick-ups and reduced greenhouse gas emissions.
- Collected over 68,000 pounds of electronic equipment for recycling at two electronic waste collection events.
- Recycled over 31 million pounds of debris material from private and public construction projects in Pasadena.
- Recycled 1,100 gallons of motor oil from residents through the curbside oil collection program.
- Reduced municipal paper waste through the implementation of the PayMode direct deposit system to process vendor payments for Section 8 housing payments. Electronic payments are more secure, save money and conserve resources by eliminating printing and mailing checks.

2010

- Set up 13 temporary recycling stations at the Rose Bowl to improve recycling efforts.
- Increased efforts to promote cardboard recycling at the Rose Bowl, which resulted in collecting about 32,000 pounds of cardboard after eight home games. In addition, about 338,000 beverage containers, or about 45,000 pounds, were collected during the football season.
- Provided printing services for Pasadena Unified School District, using 30% recycled paper.
- Recycled about 18.7 million pounds of debris material from private and public construction projects.
- Cut the number of paper checks issued by the City with more electronic payments and invoicing, and a debit-card-based Cash Pay program.
- Approved funding to initiate the City's Zero Waste Strategic Plan, a study to achieve zero waste by 2040.
- Promoted community e-waste collections that recycled about over 120,000 pounds of electronic equipment.
- Recycled 860 gallons of motor oil from residents through a curbside oil collection program.
- Collected about 81,000 gallons of hazardous waste in partnership with the county.
- Partnered with a contingent of California cities, to study the effects of plastic and paper shopping bags.

2011

- Ocean Blue Environmental Services – provided waste management and emergency services for Broadway, Glenarm, and Azusa Power Plants.

- Resurfaced City streets at various locations – reuse of recycled rubber tires in paving material (reduction of tires from landfill and methane gas from environment).
- Prohibited the distribution of single-use plastic carryout bags for consumer use and established a charge on single-use paper carryout bags.
- Contracted service for development of a zero waste strategic plan

TRANSPORTATION

2007

- On May 17, 2007 the Department of Transportation (DOT) and the Fire Department organized the City's 17th Annual Celebration of "Bike to Work Day". Every year City of Pasadena employees join thousands of Californians riding their bicycles to work to promote healthy living and an environmentally friendly commute. DOT is actively encouraging the public to circulate within the City without the use of cars. Outreach events such as the annual "Bike to Work Day", distribution of the City Bicycle Map through local businesses, and the annual "Bicycle Rodeo" target kids of all ages and encourage the increased use of an alternate mode of transportation.
- DOT staff continues to provide a leadership role in the Pasadena TMA to support regulated developments and employers to cultivate, implement and market alternative transportation programs for their tenants and employees (through Metro Employer Programs) that reinforce compliance with the SCAQMD's Rule 2202 Employee Commute Reduction Program and the County's Congestion Management Program/City of Pasadena's Trip Reduction Ordinance, by facilitating the bi-monthly TMA meetings that are attended by approximately 40 local businesses and are hosted by participating businesses. In addition, the Department of Transportation continues to enforce compliance with the outlined carpool parking requirements by surveying approximately 30 regulated carpool sites annually.
- The City Council was presented with 12 traffic reduction strategies on City streets. On April 21, 2007, DOT staff facilitated a joint meeting of the City Council and Transportation Advisory Commission to review the proposed strategies and get community input on the strategies. The twelve strategies discussed involved the following: charge the right price for curb parking, return the meter revenue to the neighborhoods that generate it, invest a portion of parking revenues in transportation demand management programs, provide universal transit passes, require the unbundling of parking costs, require parking cash-out, strengthen transportation demand management requirements, improve transit, improve bicycle and pedestrian facilities and programs, remove minimum parking requirements for off-street parking, set maximum parking requirements, and establish congestion pricing.
- The Department of Public Works has converted six refuse collection trucks from diesel power to dual fuel utilizing Compressed Natural Gas and diesel in order to reduce diesel exhaust.
- In the Holly Street Garage, three public parking spaces will be designated for "Qualified Green Vehicles", which are approved by the California Air Resources Board Zero Emission Vehicles (ZEV), or have an American Council for an Energy Efficient Economy (ACEEE) green score of 40 or more. Although the spaces have not been assigned, these spaces would be closer to exits from the structure or the parking garage stairs.
- For City vehicle purchases, preference is given to environmentally friendly and fuel efficient vehicles. Vehicle standards include the preference for purchasing hybrids whenever feasible. In 2007 Building Systems and Fleet Maintenance purchased 5 hybrid vehicles, extending the City's fleet to 45 green vehicles.
- The City is building a compressed natural gas fueling station at the City yards, funded by the Mobile Source Reduction Committee (MSRC). The system will utilize natural gas to fuel the

City's compressed natural gas fleet. This project supports the Conservation Element of the General Plan though utilization of low-emissions vehicles to promote air quality which enhances the environment and protects health and welfare. It also supports the Land Use Element policy to improve air quality in Pasadena and the region through usage of low emissions vehicles.

- City's Area Rapid Transit System (ARTS) buses run on clean "green" fuel. Twelve buses use bio-diesel also known as vegetable oil; five buses are hybrid – running on electric and gas; and two of the buses run on compressed natural gas.
- DOT continues to promote the use of public transit through the "Try Transit" program through the Pasadena Transportation Management Association (TMA). Seven regulated sites have participated since September 2006 – Art Center College of Design, One Colorado, Huntington Hospital, Macy's, Fidelity, Avery Dennison, and EarthLink. This program promotes the sale of ARTS bus ticket books to employers to encourage employees to use transit to get to and from work.

2008

- Maintained 60 lane-miles of bikeways and on-street parking for 1,000 bikes.
- Added bike racks to each of the 24 Pasadena Area Rapid Transit Service (ARTS) buses.
- Transported over one million passengers on the ARTS bus system.
- Encouraged Metro to continue bus service on two lines - Line 177 and Line 256 - that were scheduled to be eliminated, and to create a Bus Rapid Transit service along Fair Oaks Avenue, Line 762, a well-traveled and popular commuter route.
- Installed four solar-powered traffic-calming awareness signs. The dynamic, electronic boards alert drivers to their speed.
- Improved Metro Gold Line train service with a new operating schedule that provides service every 7.5 minutes during peak hours.
- Built a safe and secure bike storage area adjacent to the Allen Avenue Gold Line Station.
- Exceeded ridesharing goals set by the South Coast Air Quality Management District. Average Vehicle Ridership (AVR) for this reporting period was 1.72 exceeding the 1.50 AVR goal by 15%.

2009

- Completed construction of a compressed natural gas fueling station which will serve the City's compresses natural gas (CNG) fleet of 21 Public Works vehicles and 2 public transportation buses.
- Increased the City's electric vehicle fleet from 13 to 20 vehicles.
- Continued to phase down sulfur levels in diesel and gasoline fuels, and use advanced emission controls on all public fleets to reduce particulate matter and smog-forming emissions from those fleets by 50% by 2012.
- Installed the first multi-family residential complex electric vehicle charging station at the Westgate Apartments - a green building project.

2010

- Completed the comprehensive Outreach and Metrics Reports for the update of the General Plan Mobility Element.
- Fine tuned the City's Bicycle Master Plan to champion biking for recreation and commuting, increased bicycle safety and parking, and a network of bikeways. This plan would qualify the City for Bicycle Transportation Account funds.

- Forged a steering committee and funded a study for the feasibility of a downtown streetcar, in partnership with the Pasadena Center Operating Company, the Old Pasadena Management District, the Playhouse District Association, the South Lake Avenue Business District and Paseo Colorado.
- Piloted a "road diet" project on Cordova Street from Mentor to Hill avenues, using markings to slow traffic and clear space for bicycles.
- Received a grant for $114,000 from the California Office of Traffic Safety for Pedestrian Safety at Signalized Intersections.
- Enhanced the Metro Gold Line Fillmore Station Plaza for better traffic circulation, pedestrian safety and water and energy conservation.
- Pursued two Caltrans grants worth $500,000 to create new street design guidelines and a web-based employee trip reduction toolkit for Pasadena employers.
- Initiated an evaluation of service provision by Foothill Transit for the Pasadena ARTS.
- Partnered with Google and Metro to make sure Pasadena ARTS bus information is accessible through popular phone and online trip planners.
- Received approval from the South Coast Air Quality Management District for the City's Rule 2202 Employee Commute Reduction Program annual report. The City continues to exceed its target of 1.5 commuters per car, with 1.63 per car at the Civic Center and 2.02 per car at the City Yard.
- Improved traffic mobility by extending Walnut and Kinneloa avenues to provide a smooth connection under the 210 Freeway. The rubberized street pavement used recycled car tires.

2011

- Purchased annual and monthly transit passes for City employees participating in the City's employee trip reduction program.
- Purchased CNG 25-foot bus for ARTS system.
- Received master agreement with the State of California for state-funded transit projects.

WATER

2007

- The City launched a drought tolerant landscape and irrigation upgrade program to evaluate irrigated landscape areas in parks, medians, City facilities, and public buildings to determine the potential for water conservation through replanting and/or replacement of irrigations systems.
- Hired a full-time Irrigation Coordinator. One of the responsibilities of this position is to investigate ways to reduce water usage in park and non-park areas maintained by park maintenance staff.
- Prepared a draft list of 600 water-wise plants. Staff is working with a consultant to amend this list and group plants by water consumption and compatibility variables.
- Delayed turf renovation projects at Viña Vieja and Villa Parke to reduce the amount of water necessary during the turf reestablishment period.
- Identified three projects where turf is to be eliminated: Turf area in front of the City Yards; 12,000 square feet of turf around the Victory Park Community Center and the elimination of 4500 square feet of turf at Washington Park.
- Began working with Water & Power to develop a GIS-based map of water meters to assist staff in highlighting water usage through park and landscaped areas.
- Began incorporating low-flow design and technology in irrigation projects.
- Continued to convert irrigation systems to operate from weather-based data rather than manually adjusted controls.

2008

- Implemented Water Shortage Plan I, urging Pasadena residents and businesses to follow specific, voluntary water-saving measures with the goal of conserving 10%, or about 1.1 billion gallons annually.
- Amended the Green Building Ordinance to require green building projects to achieve a minimum water use reduction of 20% under baseline.
- Secured a grant from the U.S. Department of the Interior's Bureau of Reclamation to merge water use data and satellite photos onto an electronic map of the City to more accurately predict water consumption.
- Offered an extensive list of City rebates on water-saving fixtures. Commercial projects alone in 2008, including more than 500 new high-efficiency toilets in multi-family complexes and commercial buildings, will save over 110 acre feet, or nearly 36 million gallons of water annually.
- Installed low flow water drip tubing that eliminates water runoff and overspray for landscaping design at street medians.
- Improved storm water runoff in the Central Arroyo through the creation of ten new vegetated islands and the installation of permeable pavers in 30 parking spaces at Rose Bowl Parking Lot I.

2009

- Reduced per capita water use to 175 gallons daily, reaching a 12% reduction in FY09 from the FY05 baseline year of 199 gallons daily per capita water use.
- Adopted a Comprehensive Water Conservation Plan which sets goals for reducing City-wide water use by 10%, 20% and 30% in years 2015 and 2020 respectively and details six major strategies for achieving water use reduction.
- Adopted a budget for the construction of the first phase of a recycled water distribution system for landscape irrigation, designed to conserve millions of gallons of drinking water every year.
- Incorporated new technology into municipal facilities to reduce water usage.
- Allocated $35,000 for affordable housing toilet retrofits.
- Increased distribution of high efficiency showerheads and shower timers.
- Provided a new water savings rebate for synthetic turf.
- Increased the rebate for qualifying weather-based irrigation controllers to $160 - about half the cost of most models.
- Established a City-wide irrigation crew to prioritize and address irrigation problems.
- Installed weather based automatic irrigation controllers at City parks and landscaped areas.
- Renovated City landscaped areas with water conserving drip irrigation systems.
- Reduced irrigation schedules at all City sports fields and other turf areas and eliminated irrigation during the winter months.

2010

- Engaged the community in crafting a new Water Integrated Resource Plan to ensure a reliable, cost-effective and environmentally responsible supply for the next 25 years. Calling for aggressive conservation and new local sources, the plan is expected to be adopted in early 2011.
- Took the first step in developing a City-wide recycled water system with a feasibility study funded by a state grant.
- Adopted the statewide Water Efficient Landscape Ordinance requiring a detailed water-saving plan before any major landscaping projects are approved.

- Reduced per capita water use to 157 gallons daily, a decrease of about 15 percent from fiscal year 2009.
- Cut overall water use in public areas, including parks and medians, by 20 percent in FY2010 compared to the wettest year in the past five years and by more than 30 percent compared to the driest year during the same time period, thanks to the Calsense Water Management System.
- Enhanced website, pasadenasaveswater.com, with do-it-yourself water conservation videos and a full-color water-smart landscaping guide.
- Installed solar-powered water-saving irrigation controllers at more than 40 sites, primarily along median islands.
- Replaced old inefficient spray heads at the Hastings Branch Library with waterwise nozzles.
- Supported John Muir High School students with training and supplies to build a drought-tolerant campus garden. Students also built a solar-powered concession stand on their own.

2011

- Implemented of the 2010 Urban Water Management Plan.
- Monk Hill Treatment System and Disinfection Facility - Protected the ecological integrity of the City's primary drinking water sources.
- Purchased gas chromatograph/mass spectrometer for Monk Hill Water Treatment system.
- Held free workshop for water-saving alternatives to grass lawns.
- Termination of Level 1 water supply shortage measures (water supply shortage no longer exists).
- Applied for grant with U.S. Department of Interior, Bureau Reclamation for preparation of recycled water project feasibility study.
- Adopted Water Integrated Resources Plan (WIRP).

APPENDIX B
TECHNICAL APPENDIX

Appendix B – Technical Appendix

This appendix provides the details, assumptions, and methodologies used in the technical and quantitative analysis performed to complete Pasadena's CAP.

B.1 2009 GHG Emissions Inventory

Data for the 2009 baseline was taken from the City of Pasadena GHG Inventory adopted by City Council November 18, 2013. The 2009 baseline GHG emissions levels for transportation were calculated using CACP, the predecessor to the EMFAC software. Therefore, to provide a consistent methodology across past and future GHG inventories and account for GHG reductions from transportation-related state regulations in 2020 and 2035, the 2009 transportation baseline was updated using EMFAC2014[1]. In addition, updated growth rates from the General Plan (2015) were used for estimating BAU forecasts in the CAP. Because of these updates, the 2009 baseline total as well as the 2020 and 2035 forecast totals presented herein do not match the total GHGs reported in the City of Pasadena GHG Emissions Inventory (November 2013). **Table B.1** below shows the values as presented in the City of Pasadena GHG Inventory verses the CAP.

TABLE B.1: DATA UPDATED FROM GHG INVENTORY

MT CO_2e	GHG Inventory (2013)	CAP (2017)
2009 Transportation Emissions	1,062,681	1,054,901
2009 Communitywide Emissions	2,052,701	2,044,921
2020 BAU Forecast	2,186,122	1,987,226
2035 BAU Forecast	2,367,191	2,147,294

B.2 2013 GHG Emissions Inventory

Pasadena's 2013 GHG Inventory was developed as part of the City of Pasadena General Plan EIR adopted by City Council on July 14, 2015. The 2013 inventory was modified to match the methodology of the 2009 baseline inventory to allow for a comparison of Pasadena's change in emissions between 2009 and 2013. Modifications to the 2013 community-wide emissions inventory presented in the General Plan EIR included removing the wastewater and off-road sectors as these sectors were not included in the 2009 baseline inventory, removing double-counting of electricity emissions associated with water delivery, and recalculating solid waste emissions following the methodology in the 2009 inventory. In addition, the forecasting methodology used in the General Plan EIR is not consistent with the standard practice forecasting methodology used for CAPs. Therefore, the 2013 GHG emissions total as well as the 2035 forecast total presented herein do not match those reported in the City of Pasadena General Plan EIR (July 2015). **Table B.2** below shows the values as presented in the City of Pasadena General Plan EIR verses the CAP.

[1] CARB, 2015b

TABLE B.2: DATA UPDATED FROM GENERAL PLAN EIR

MT CO_2e	General Plan EIR (2013)	CAP (2017)
2013 Residential Energy Emissions	290,660	286,759
2013 Commercial Energy Emissions	497,823	495,897
2013 Municipal Energy Emissions	22,278	22,186
2013 Solid Waste Emissions	3,880	24,616
2013 Communitywide Emissions	1,854,908	1,857,280
2035 BAU Forecast	2,411,872	2,147,294

B.3 Business-as-Usual Forecast

The City of Pasadena business-as-usual forecast provides an estimate of how GHG emissions would change in the years 2020, 2035, and 2050 if consumption trends and efficiencies continue as they did in 2013, absent any new regulations that would reduce local emissions. Several indicator growth rates were developed and applied to the various sectors to project future year emissions. **Table B.3** displays the demographic data which was used to calculate growth rates and forecast GHG emissions.

TABLE B.3: DEMOGRAPHIC DATA USED FOR GHG EMISSIONS FORECASTS

Demographics	2013[1]	2020[2]	2035[3]	2050[4]
Population	135,938	143,508	161,180	147,163-167,453
Households	59,641	63,004	70,864	64,449-72,061
Employment	111,348	121,411	146,141	161,074-176,107
VMT	5,591,328	5,951,831	6,804,532	7,042,498-7,069,866

1 Data for 2013 represents build-out capacities in the City of Pasadena General Plan[2]
2 Data for 2020 was interpolated between 2013 and 2035 build-out capacities in the City of Pasadena General Plan
3 Data for 2035 represents build-out capacities in the City of Pasadena General Plan
4 Data for 2050 is presented as a range, as forecasting out to the year 2050 is inherently uncertain at this time. The ranges presented herein are based on a compilation of data including the City of Pasadena General Plan, Southern California Association of Governments[3], California Department of Finance[4], and CARB EMFAC2014.

The growth rates were applied to the 2013 emissions inventory data to obtain projected emissions in 2020, 2035, and 2050. **Table B.4** displays the growth rates (and their data sources) that were applied to each sector.

[2] City of Pasadena, 2015a
[3] SCAG, 2012; SCAG 2015
[4] California Department of Finance, 2014

TABLE B.4: GROWTH RATES BY SECTOR

Sector	Growth Rate	Source
Residential Energy	Population	U.S. Census[1], SCAG[2]
Commercial/Industrial Energy	Employment	SCAG
Transportation	Vehicle Miles Travelled	Fehr & Peers[3]
Solid Waste	Population	U.S. Census, SCAG
Water Consumption	Population	U.S. Census, SCAG

1 City of Pasadena, 2015b
2 SCAG, 2012; SCAG, 2015
3 City of Pasadena, 2015b

B.4 Adjusted Forecast

Since 2013, a number of federal and State regulations have been enacted that would reduce Pasadena's GHG emissions in 2020, 2035, and 2050. The impact of these regulations was quantified and incorporated into an adjusted forecast to provide a more accurate picture of future emissions growth and the responsibility of the City and community once State regulations to reduce GHG emissions have been implemented. **Table B.5** summarizes the local reduction that will result from and be quantified for each State regulation that will reduce local emissions in 2020, 2035 and 2050, and is followed by a brief description of each regulation and the methodology used to calculate associated reductions. As shown in the table below, these State regulations will reduce Pasadena's business-as-usual GHG emissions by approximately 315,292 MT CO_2e in 2020, 871,166 MT CO_2e in 2035 and 951,532-1,029,760 MT CO_2e in 2050.

TABLE B.5: SUMMARY OF GHG EMISSIONS REDUCTIONS FROM STATE REGULATIONS IN 2020, 2035, AND 2050

State Measure	2020 Reduction (MT CO_2e)	2035 Reduction (MT CO_2e)	2050 Reduction (MT CO_2e)
Pavley I Clean Car Standards (AB 1493) & Advanced Clean Car Standards	-75,074	-303,683	-360,632 – -365,104
Title 24	-10,867	-29,436	-37,708 – -60,434
Renewables Portfolio Standard	-221,840	-533,139	-548,710 – -599,122
Water Conservation Act of 2009 (SB X7-7)	-6,211	-3,526	-3,220 – -3,664
Construction & Demolition Waste Diversion Ordinance	-1,299	-1,382	-1,262 – -1,436
Total Reduction from State Regulations	**-315,292**	**-871,166**	**-951,532 – -1,029,760**

Note: California's 2017 Climate Change Scoping Plan was adopted in December 2017, following completion of the GHG reduction calculations from State Measures detailed above. As such, reductions associated with State regulations presented in the 2017 Climate Change Scoping Plan have not been quantified. GHG reductions from State Regulations for the year 2030 were interpolated between the calculated 2020 and 2035 values in the table above.

Pavley I Clean Car Standards (AB 1493) and Advanced Clean Cars

Signed into law in 2002, AB 1493 (Pavley I standard) requires vehicle manufactures to reduce GHG emissions from new passenger vehicles and light trucks from 2009 through 2016. Regulations were adopted by the CARB in 2004 and took effect in 2009 when the U.S. Environmental Protection Agency (EPA) issued a waiver confirming California's right to implement the bill. CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016, while simultaneously improving fuel efficiency and reducing motorists' costs.[5]

In January 2012, CARB approved the Advanced Clean Cars program which coordinates the goals of the Low Emissions Vehicles, Zero Emissions Vehicles, and Clean Fuels Outlet programs combining the control of smog, soot causing pollutants and GHG emissions into a single coordinated package of requirements for model years 2017 to 2025. The new standards will reduce GHG emissions by 34% in 2025.[6]

Reductions in GHG emissions from the above referenced standards were calculated using CARB's EMFAC2014 model for Los Angeles County. The newly updated EMFAC2014 model integrates the estimated reductions into the mobile source emissions portion of the model.[7] As shown in **Table B.5**, the combined efficiency gains resulting from California's suite of mobile efficiency measures would reduce vehicle related emissions by 75,074 MT CO_2e in 2020, 303,683 MT CO_2e in 2035, and between 360,632-365,104 MT CO_2e in 2050.

Title 24

Although it was not originally intended specifically to reduce GHG emissions, California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated periodically to allow consideration and possible incorporation of new energy-efficient technologies and methods. The updates that have occurred since the 2013 inventory year and, therefore, were not included in the business-as-usual forecast, include the 2013 and 2016 Title 24 Energy Efficiency Standards. For projects implemented after January 1, 2014, the California Energy Commission estimates that the 2013 Title 24 energy efficiency standards will reduce consumption by 25 percent for residential buildings and 30 percent for commercial buildings, relative to the 2008 standards. For projects implemented after January 1, 2017, the California Energy Commission estimates that the 2016 standards will reduce consumption by 28 percent for residential buildings and 5 percent for commercial buildings, relative to the 2013 standards. These percentage savings relate to heating, cooling, lighting, and water heating only and do not include other appliances, outdoor lighting that is not

[5] CARB, 2013

[6] CARB, 2011

[7] Additional details are provided in CARB's EMFAC2014 Technical Documentation (CARB, 2015a)Note that the Low Carbon Fuel Standard (LCFS) regulation is excluded from EMFAC2014 because most of the emissions benefits due to the LCFS come from the production cycle (upstream emissions) of the fuel rather than the combustion cycle (tailpipe). As a result, LCFS is assumed to not have a significant impact on CO_2 emissions from EMFAC's tailpipe emission estimates.

attached to buildings, plug loads, or other energy uses. Therefore, these percentage savings were applied to the percentage of energy use covered by Title 24.[8]

The calculations and GHG emissions forecast assume that all growth in the residential and commercial/industrial sectors is from new construction. As shown in **Table B.5,** the 2013 and 2016 Title 24 requirements would reduce emissions by approximately 10,867 MT CO_2e in 2020, 29,436 MT CO_2e in 2035, and between 37,708-60,434 MT CO_2e in 2050.

The AB 32 Scoping Plan calls for the continuation of ongoing triennial updates to Title 24 that will yield regular increases in the mandatory energy and water savings for new construction. Future updates to Title 24 standards for residential and non-residential alterations are not taken into consideration due to lack of data and certainty about the magnitude of energy savings that will be realized with each subsequent update.

Renewables Portfolio Standard

Established in 2002 under Senate Bill 1078, California's Renewables Portfolio Standard (RPS) was accelerated in 2006 under Senate Bill 107 by requiring that 20 percent of electricity retail sales be served by renewable energy resources by 2010. Subsequent recommendations in California energy policy reports advocated a goal of 33 percent by 2020, and on November 17, 2008, Governor Arnold Schwarzenegger signed Executive Order S-14-08 requiring that "...[a]ll retail sellers of electricity shall serve 33 percent of their load with renewable energy by 2020." Senate Bill X1-2 was signed by Governor Edmund G. Brown, Jr., in April 2011 setting the RPS target at 33% by 2020. This new RPS applied to all electricity retailers in the state including publicly owned utilities (POUs), investor-owned utilities, electricity service providers, and community choice aggregators. All of these entities had to adopt the new RPS goals of 20 percent of retails sales from renewables by the end of 2013, 25 percent by the end of 2016, and the 33 percent requirement being met by the end of 2020. Most recently, Governor Edmund G. Brown, Jr. signed into legislation Senate Bill 350 in October 2015, which requires retail sellers and publicly owned utilities to procure 50 percent of their electricity from eligible renewable energy resources by 2030.[9]

PWP is the electricity provider in Pasadena. In order to calculate future emissions that take into account the Renewables Portfolio Standard, PWP provided projected emissions factors for the years 2020 and 2035. In addition to Renewables Portfolio Standard, PWP's projected emissions factors for the years 2020 and 2035 also take into account local shifts in power sources including a large shift from coal to natural gas sources. As shown in **Table B.5**, the Renewables Portfolio Standard and PWP's commitment to reduce overall carbon intensity would reduce Pasadena's GHG emissions by approximately by 221,840 MT CO_2e in 2020, 533,139 MT CO_2e in 2035, and between 548,710-599,122 MT CO_2e in 2050.

[8] This calculation follows the methodology detailed in the Statewide Energy Efficiency Collaborative's report, Greenhouse Gas Forecasting Assistant (SEEC, 2011).

[9] California Energy Commission, 2016a

Water Conservation Act of 2009 – SB X7-7

California Senate Bill X7-7 (2009) requires all water suppliers to reduce urban per capita water consumption by 2020 – either through the "standard target", a 20 percent reduction from the average water demand between 1994 and 2004, or the "alternative minimum", a 5 percent reduction from the average water demand between 2003 and 2007. PWP is the primary water supplier for the City of Pasadena. PWP plans to reduce per-capita water use 20 percent by 2020 and maintain that per-capita water use through 2035.[10] PWP's per-capita water use target for the years 2020 and 2035 is 168 gallons per capita per day. Reductions in GHG emissions from SB X7-7 were calculated by subtracting the 2020 and 2035 per-capita water use target from the business-as-usual per-capita water usage in 2020 and 2035. As shown in **Table B.5**, SB X7-7 would reduce Pasadena' GHG emissions by approximately 6,211 MT CO_2e in 2020, 3,526 MT CO_2e in 2035, and between 3,220-3,664 MT CO_2e in 2050.

Construction and Demolition Waste Diversion Ordinance

Effective July 1, 2012, CalReycle, as directed by SB 1374, requires jurisdictions to divert a minimum of 50% of their nonhazardous construction and demolition waste from landfills.[11] Recycling construction and demolition materials reduces GHG emissions by removing material from landfills that would otherwise generate methane and may also reduce the need to harvest and transport new raw construction materials, as recycled materials can be locally repurposed and reused. According to the California Department of Resources and Recycling, Construction and Demolition debris made up 10 percent of the State's waste stream in 2014.[12] Reductions in GHG emissions from construction and demolition waste diversion were calculated by taking a 50 percent reduction in Pasadena's construction and demolition waste. As shown in **Table B.5**, the Construction and Demolition Waste Diversion Ordinance would reduce Pasadena' GHG emissions by approximately 1,299 MT CO_2e in 2020, 1,382 MT CO_2e in 2035, and between 1,262-1,436 MT CO_2e in 2050.

Sustainable Communities and Climate Protection Act – Senate Bill 375

Senate Bill (SB) 375, the Sustainable Communities and Climate Protection Action of 2008, enhances California's ability to reach its AB 32 target by aligning regional transportation planning efforts with land use and housing allocations to reduce transportation-related GHG emissions. SB 375 requires CARB to set regional GHG emissions targets for passenger vehicles and light trucks for the years 2020 and 2035 for each of California's 18 metropolitan planning organizations (MPOs). Each MPO is required to prepare a Sustainable Communities Strategy (SCS) as part of its next Regional Transportation Plan (RTP) that demonstrates how the region will meet its GHG reduction target.

SCAG's 2012 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

[10] PWP, 2016a
[11] Chapter 8.62 of the Pasadena Municipal Code requires a minimum 75% diversion of construction and demolition waste. GHG reductions associated with Pasadena's additional 25% diversion requirement will be quantified in the Climate Action Plan.
[12] California Department of Resources Recycling and Recovery, 2015

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 eight percent per capita from 2005 GHG emission levels by 2020 and 13 percent per capita from 2005 GHG emission levels by 2035.

In August 2015, the City adopted updated Land Use and Mobility Elements which are consistent with the applicable RTP/SCS goals. Projected vehicle miles travelled estimates provided by Fehr and Peers were taken from the updated Land use and Mobility Elements which account for GHG emissions reductions resulting from the RTP/SCS.

B.5 Methods for Estimating GHG Reductions from CAP Measures

The quantification of GHG reduction measures is based on full implementation of the 2020 and 2035 performance indicators identified for each measure. GHG reductions are based primarily on calculation methods detailed in the California Air Pollution Control Officers Association's (CAPCOA) report, Quantifying Greenhouse Gas Mitigation Measures (CAPCOA, 2010). There are five GHG reduction measure categories include in the CAP: Sustainable Mobility and Land Use, Energy Efficiency and Conservation, Water Conservation, Waste Reduction, and Urban Greening. The calculations utilize emissions factors and CO_2e totals from Pasadena's GHG emissions inventories and adjusted forecasts, and assumptions made about the degree of implementation in the years 2020 and 2035. A detailed list of assumptions and sources used to quantify GHG reductions for each CAP measure is provided below.

Existing Actions

Since Pasadena's most recent GHG emissions inventory for the year 2013, the City has continued to make progress toward GHG reduction. All reductions in GHGs that occurred between the 2009 baseline and 2013 refined inventory are accounted for in the Adjusted Forecast. Actions taken since 2013 have not been included in the Adjusted Forecast. To take credit for GHG reductions that occurred since 2013, the CAP quantifies GHG reductions associated with existing actions for the specific measures for which quantifiable data was available (T-1.1, E-4.1, WC-1.1, and UG-2.1). City actions that occurred since 2013 for which quantifiable data was not available were quantified for the CAP measures using the performance indicators and assumptions detailed below.

T-1.1 – Continue to expand Pasadena's bicycle & pedestrian network

Quantification:

	2020	2035
Performance Indicators	Install 3 new miles of bike lanes Acquire 400 bike share bikes Establish 1 bike share station per square mile	Install 18 new miles of bike lanes Acquire 800 bike share bikes Establish 3 bike share stations per square mile
GHG Reduction Potential	Existing: 1,079 MT CO_2e*	Existing: 1,079 MT CO_2e*

	New: 196 MT CO_2e TOTAL: 1,275 MT CO_2e	New: 523 MT CO_2e TOTAL: 1,602 MT CO_2e

Assumptions:

- *42 miles of bike lanes were installed between 2013 and 2016[13]
- 3.0% bicycle commute mode share in 2013[14]
- 4.0% transit mode share in 2035 under General Plan build out[15]
- 0.075% increase in bicycle commuting with each mile of bikeway per 100,000 residents[16]
- 0.000465 MT CO_2e/VMT in 2020, 0.000342 MT CO_2e/VMT in 2035[17]
- Ideal ratio of bikes per population is between 10 to 30 bikes per 1,000 residents; Ideal station density is between 10 and 16 stations per square kilometer[18]
- 0.5-2.5% increase in bike mode share from bike share program[19]
- Calculations conservatively assume 0.5% increase in mode share

T-1.2 – Continue to improve bicycle and pedestrian safety

This measure is considered supportive and was quantified as part of T-1.1.

T-1.3 – Continue to encourage bicycle and pedestrian travel

This measure is considered supportive and was quantified as part of T-1.1.

T-2.1 – Continue to enhance safe, reliable, and seamless transit service

Quantification:

	2020	2035
Performance Indicators	Achieve 10% transit mode share	Achieve 20% transit mode share
GHG Reduction Potential	32,414 MT CO_2e	84,828 MT CO_2e

Assumptions:

- 6.4% transit mode share in 2013[20]
- 8.4% transit mode share in 2035 under General Plan build out[21]
- 0.000465 MT CO_2e/VMT in 2020, 0.000342 MT CO_2e/VMT in 2035[22]
- 28%-84% increase in transit ridership resulting from provision of bus rapid transit system[23]
- 1.5%-2.3% increase in annual transit trips due to increased frequency of service[24]
- 4%-15% increase in annual transit trips due to increased operational speed[25]

[13] Pasadena Department of Transportation, 2016
[14] U.S. Census Bureau, 2014
[15] Fehr & Peers, 2017
[16] CAPCOA, 2010
[17] CARB, 2015b
[18] Institute for Transportation & Development Policy, 2013
[19] CAPCOA, 2010
[20] U.S. Census Bureau, 2014
[21] Fehr & Peers, 2017
[22] CARB, 2015b
[23] CAPCOA, 2010
[24] CAPCOA, 2010
[25] CAPCOA, 2010

- 0.3-20% reduction in commute VMT through implementing a subsidized or discounted transit program[26]
- Calculations conservatively assume 3.6% mode share increase by 2020 (from 6.4% to 10%) and 11.6% mode share increase by 2035 (from 8.4% to 20% resulting from a combination of providing bus rapid transit system, increasing frequency of service and increasing operational speed; equivalent to a 4% reduction in single-occupancy VMT by 2020 and 13% reduction in single-occupancy VMT by 2035

T-3.1 – Decrease annual commuter miles traveled by single occupancy vehicles

Quantification:

	2020	2035
Performance Indicators	Increase carpooling mode share to 10% by 2020	Increase carpooling mode share to 15% by 2035
GHG Reduction Potential	5,502 MT CO_2e	22,163 MT CO_2e

Assumptions:

- 8.6% carpooling mode share in 2013[27]
- 8.2% carpooling mode share in 2035 under General Plan build out[28]
- 0.000465 MT CO_2e/VMT in 2020, 0.000342 MT CO_2e/VMT in 2035[29]
- 5-15% reduction in commute VMT through ride-sharing programs[30]
- 0.07-5.5% reduction in commute VMT through encouraging telecommuting and alternative work schedules[31]
- 0.4-0.7% reduction in commute VMT through implementing a car-sharing program[32]
- 0.3-13.4% reduction in commute VMT through providing an employer-sponsored vanpool/shuttle[33]
- 0.1-19.7% reduction in commute VMT through pricing workplace parking[34]
- 0.6-77% reduction in commute VMT through implementing an employee parking "cash-out" program[35]
- Calculations conservatively assume 1.4% mode share shift from single occupancy vehicles to carpooling in 2020 (8.6% to 10%)and 6.8% mode share shift from single occupancy vehicles to carpooling in 2035 (8.2% to 15%) resulting from implementation of comprehensive trip reduction programs including providing ride-sharing programs, telecommuting, car-sharing programs, vanpool, and parking pricing/cash-out; equivalent to 0.7% reduction in single occupancy VMT in 2020 and 3.4% reduction in single occupancy VMT in 2035)

[26] CAPCOA, 2010
[27] U.S. Census Bureau, 2014
[28] Fehr & Peers, 2017
[29] CARB, 2015b
[30] CAPCOA, 2010
[31] CAPCOA, 2010
[32] CAPCOA, 2010
[33] CAPCOA, 2010
[34] CAPCOA, 2010
[35] CAPCOA, 2010

T-3.2 – Improve the existing transportation system to smooth traffic flow, reduce idling, eliminate bottlenecks, and encourage efficient driving techniques

This measure is considered supportive as the City's pilot protocol to quantify GHG emission reductions associated with Intelligent Transportation System operations indicated that Intelligent Transportation System operations do not result in significant GHG reductions.

T-4.1 – Expand the availability and use of alternative fuel vehicles and fueling infrastructure

Quantification:

	2020	2035
Performance Indicators	Achieve 5% EV mode share by 2020	Achieve 26% EV mode share by 2035
GHG Reduction Potential	27,097 MT CO_2e	134,087 MT CO_2e

Assumptions:

- 0.2% EV VMT in 2013, 1.6% EV VMT in 2020, 7.6% EV VMT in 2035[36]
- 0.000465 MT CO_2e/VMT in 2020, 0.000342 MT CO_2e/VMT in 2035[37]
- 0.4% to 20.3% reduction in GHG emissions by utilizing electric or hybrid vehicles[38]
- 0.5-12.7% VMT reduction from implementing a neighborhood electric vehicle (NEV) network[39]
- Executive Order B-16-2012 to encourage ZEVs in California and set a long-term goal of reaching 1.5 million ZEVs on California's roadways by 2025[40]
- ARB anticipates annual ZEV sales of 200,000-260,000 in the next 5-10 years, with a goal of 100% of sales are ZEV and PHEV by 2050[41]
- Light duty EV sales are expected to grow from 2.6 million in 2015 to over 6.0 million in 2024[42]
- Calculations assume 3.4% increase in EV mode share by 2020 (from 1.6% to 5%) and 17.4% increase in EV mode share by 2035 (from 7.6% to 25%) resulting from a combination of local initiatives to improve/expand the charging infrastructure as well as State initiatives to expand EV sales
- 2017 Chevy Bolt (representative example for EV vehicle): 4.1 to 4.8 miles/kWh (average of 4.45 miles/kWh was used in calculations[43]

T-5.1 – Facilitate high density, mixed-use, transit-oriented and infill development

GHG emissions reductions associated with General Plan land use were quantified within the adjusted forecast for 2020 and 2035.

[36] CARB, 2015b
[37] CARB, 2015b
[38] CAPCOA, 2010
[39] CAPCOA, 2010
[40] California Energy Commission, 2016b
[41] CARB, 2016
[42] Navigant Research, 2013
[43] Green Car Reports, 2016

T-6.1 – Reduce GHG emissions from heavy-duty construction equipment and vehicles

This measure is considered supportive as GHG emissions from construction equipment were not included in the baseline GHG emissions inventory.

T-7.1 – Reduce GHG emissions from lawn and garden equipment

This measure is considered supportive as GHG emissions from lawn and garden equipment were not included in the baseline GHG emissions inventory.

E-1.1 – Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards

Quantification:

	2020	2035
Performance Indicators	Measure will be implemented after 2020	Achieve 100% of new residential units built between 2020 and 2035 are ZNE (as mandated by Title 24) and 25% of new commercial development built between 2020 and 2035 is ZNE (as mandated by Title 24).
GHG Reduction Potential	Measure will be implemented after 2020	6,784 MT CO_2e

Assumptions:

- ZNE building have zero energy use
- Percent ZNE commercial square footage is equivalent to percent employees working at ZNE commercial buildings
- Electricity emission factor: 0.362 MT CO_2e/MWh in 2020, 0.153 MT CO_2e/MWh in 2035[44]
- Natural gas emission factor is 0.005324 MT CO_2e per therm[45]
- Household growth was used to estimate GHG emissions resulting from new residential construction (59,641 households in 2013; 63,004 households in 2020; 70,864 households in 2035)[46]
- Employment growth was used to estimate GHG emissions resulting from new commercial construction (111,348 employees in 2013; 121,411 employees in 2020; 146,141 employees in 2035)[47]
- A zero energy building is an energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy[48]

[44] PWP, 2017
[45] CARB, at al., 2010
[46] City of Pasadena, 2015b
[47] City of Pasadena, 2015b
[48] U.S. Department of Energy, 2015a

- The California Energy Commission has indicated that the 2019 Building Energy Efficiency Standards will require all new residential construction to be ZNE or equivalent by 2020 and new commercial construction to be ZNE or equivalent by 2030[49]
- Calculations take credit for reductions resulting from implementing the 2019 Building Energy Efficiency Standards for residential construction beginning in 2020 and also includes reductions associated with 25% of new commercial development as ZNE resulting from local incentives, development review and/or requirements if voluntary initiatives are not effective

E-1.2 – Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency

This measure is considered supportive and was quantified as part of E-1.1.

E-2.1 – Facilitate energy efficient upgrades in existing homes and businesses

Quantification:

	2020	2035
Performance Indicators	Decrease energy use in existing buildings by 16% below 2013 levels by 2020	Decrease energy use in existing buildings by 40% below 2013 levels by 2035
GHG Reduction Potential	103,629 MT CO_2e	162,720 MT CO_2e

Assumptions:

- Electricity emission factor: 0.362 MT CO_2e/MWh in 2020, 0.153 MT CO_2e/MWh in 2035[50]
- Natural gas emission factor is 0.005324 MT CO_2e per therm[51]
- 1% reduction in residential energy use and 5% reduction in commercial energy from 2013 to 2015[52]GHG reductions from Title 24 were quantified in the adjusted forecast. Therefore, to avoid double counting, energy reductions associated with this measure were applied to the energy use totals presented in the Adjusted Forecast to calculate GHG reductions.
- Household growth was used to estimate GHG emissions resulting from new versus existing residential buildings (59,641 households in 2013; 63,004 households in 2020; 70,864 households in 2035)[53]
- Employment growth was used to estimate GHG emissions resulting from new versus existing commercial buildings 111,348 employees in 2013; 121,411 employees in 2020; 146,141 employees in 2035[54]
- Energy efficiency upgrades to existing buildings can achieve up to 40% energy savings cost effectively[55]

[49] California Energy Commission, 2011
[50] PWP, 2017
[51] CARB, at al., 2010
[52] PWP, 2016b
[53] City of Pasadena, 2015b
[54] City of Pasadena, 2015b
[55] California Energy Commission, 2015

- Good control systems may be able to reduce ventilation-related energy use in residences by as much as 40%[56]
- The U.S. Department of Defense examined the performance of three advanced lighting systems and was able to achieve savings above 40% using only improved sensors, lighting design, and control systems[57]
- Energy reductions of 15%–40% have been demonstrated through model-predictive control uses energy modeling, as well as real-time weather forecasts and (price) signals from the grid to tailor short-term control strategies for energy reduction, peak demand reduction, or other objectives[58]
- 5-30% reduction on energy bill by making efficient upgrades identified in energy audit[59]
- 71% of auditors report that homeowners make at least one of the recommended improvements 'fairly often' or 'always[60]'
- New front load washing machines used about 37% less energy than traditional washing machines[61]
- ENERGY STAR refrigerators, clothes washers, dishwashers, and ceiling fans use 15%, 25%, 40%, and 50% less electricity than standard appliances, respectively[62]
- Refrigerators 15 years or older use twice as much energy as an Energy Star refrigerator[63]
- Sealing and insulating ducts can improve furnace efficiency by up to 20%[64]
- The DOE reports that residents can save approximately 10% on heating and cooling bills per year by lowering the thermostat by 10-15 degrees for eight hours[65]
- Energy-saving incandescent 43 Watt (W) light bulb – 25% reduction from traditional 60 W incandescent light bulb; 15 W compact fluorescent (CFL) – 75% reduction from traditional 60 W incandescent light bulb; and 12 W LED – 75-80% reduction from traditional 60 W incandescent light bulb[66]

E-3.1 – Increase municipal energy conservation efforts

Quantification:

	2020	2035
Performance Indicators	Reduce municipal energy use by 10% from 2013 levels	Reduce municipal energy use by 50% below 2013 levels
GHG Reduction Potential	2,406 MT CO_2e	14,193 MT CO_2e

Assumptions:

- Electricity emission factor: 0.362 MT CO_2e/MWh in 2020, 0.153 MT CO_2e/MWh in 2035[67]

[56] U.S. Department of Energy, 2015b
[57] U.S. Department of Energy, 2015b
[58] U.S. Department of Energy, 2015b
[59] U.S. Department of Energy, 2017a
[60] Palmer, Karen L., et al., 2011.
[61] LifeHacker, 2012
[62] CAPCOA, 2010
[63] Energy Star, 2017
[64] Energy Star, 2009
[65] CAPCOA, 2010
[66] U.S. Department of Energy, 2017b
[67] PWP, 2017

- Natural gas emission factor is 0.005324 MT CO_2e per therm[68]
- 6% reduction in municipal energy use from 2013 to 2015[69]
- 5-30% reduction on energy bill by making efficient upgrades identified in energy audit[70]
- Energy-saving incandescent 43 W light bulb – 25% reduction from traditional 60 W incandescent light bulb; 15 W CFL – 75% reduction from traditional 60 W incandescent light bulb; and 12 W LED – 75-80% reduction from traditional 60 W incandescent light bulb[71]
- Plug loads in commercial buildings account for almost 5% of U.S. primary energy consumption (NREL 2011). On average, plug loads account for approximately 30% of electricity in offices (Moorefield, L., et al. (2008). In minimally code-compliant office buildings, plug loads may account for 25% or less of total energy consumption; in high efficiency buildings, plug loads may account for more than 50% of the total energy consumption.[72]
- Computers and monitors accounted for 66% of all [plug load] devices; office electronics (printers, faxes, multifunction devices and computer speakers) accounted for 17% of all devices; miscellaneous devices (portable lighting, telephones, and coffee makers) accounted for the remaining 17% of all plug load devices[73].

E-4.1 – Increase citywide use of carbon-neutral energy by encouraging and/or supporting carbon-neutral technologies

Quantification:

	2020	2035
Performance Indicators	Replace 950,000 kWh of electricity with carbon-neutral energy	Replace 95,000,000 kWh of electricity with carbon-neutral energy
GHG Reduction Potential	Existing:1,920 MT CO_2e* New: 344 MT CO_2e TOTAL: 2,264 MT CO_2e	Existing: 812 MT CO_2e* New: 14,535 MT CO_2e TOTAL: 15,347 MT CO_2e

Assumptions:

- Solar is currently the most common, readily available, and validated carbon-neutral technology, and as such the GHG reduction calculations for this measure demonstrate that the measure could be implemented with 100% solar technology. However, the measure also provides flexibility to utilize other types of carbon neutral technologies in the future as availability increases and data regarding associated GHG reductions is developed
- *2,792 kW of solar were installed between 2013 and 2016[74]
- Electricity emission factor: 0.362 MT CO_2e/MWh in 2020, 0.153 MT CO_2e/MWh in 2035[75]

[68] CARB, at al., 2010
[69] PWP, 2016b
[70] U.S. Department of Energy, 2017a
[71] U.S. Department of Energy, 2017b
[72] United States General Services Administration, 2016
[73] United States General Services Administration, 2016
[74] PWP, 2016b
[75] PWP, 2017

- 1 kW = 1,900 kWh per year - conversion factor[76]
- Assuming 2013 to 2016 solar installation rate (1,396 kW installed per year) continues to 2020 and 2035 would result in an installation of 9,755 kW by 2020 and 30,712 kW by 2035; equivalent to 18,534,500 kWh in 2020 and 58,352,800 kWh in 2035; solar installation rate is expected to increase above 1,396 kW/year as a result of outreach, education and incentive programs implemented as part of the CAP
- PWP is currently looking for site for community solar (500kW – 1,000 kW; equivalent to 950,000 kWh – 1,900,000 kWh)
- Solar PV installations are expected to increase from 13 gigawatts in 2017 to 18 gigawatts in 2021 with over 100 gigawatts of solar installed in the U.S. by 2021[77]

E-5.1 – Continue to expand the City's renewable and/or carbon-neutral energy portfolio

GHG emissions reductions from PWP's energy portfolio were quantified under the adjusted forecast.

PWP's Energy Portfolio[78]:

Energy Source		2009	2013	2020 Forecast	2035 Forecast
Generated	Natural Gas	16%	8%	30%	33%
Purchased	Coal	56%	47%	24%	--
	Nuclear	6%	6%	6%	6%
	Renewable	9%	24%	33%	49%
	Hydroelectric	4%	4%	4%	4%
	Bonnevile Power	1%	1%	--	--
	Market Purchases	7%	10%	3%	8%

WC-1.1 – Reduce potable water usage throughout Pasadena

Quantification:

	2020	2035
Performance Indicators	0% reduction in water consumption per capita (comply with SB X7-7)	6.4% decrease in water consumption per capita (below calendar year 2035 SB X7-7 levels)
GHG Reduction Potential	Existing: 1,867 MT CO_2e* New: 0 MT CO_2e TOTAL: 1,867 MT CO_2e	Existing: 833 MT CO_2e* New: 130 MT CO_2e TOTAL: 963 MT CO_2e

Assumptions:

- *Communitywide water consumption dropped 5% between 2013 and 2016[79]
- 11,110 kWh/million gallons water (supply, conveyance, treatment & distribution)[80]

[76] Solar-Estimate, 2017
[77] Solar Energy Industries Association, 2017
[78] PWP, 2017
[79] PWP, 2016b
[80] City of Pasadena, 2015b

- 1.31 MT CO_2e/acre-feet in 2020, 0.55 MT CO_2e/acre-feet in 2035[81]
- 24% reduction in residential water use due to water efficient appliances[82]
- 10% reduction in commercial water use due to water efficient appliances[83]
- 20-45% reduction in water use due to water efficient landscaping[84]
- Field research studies indicate that traditionally used landscape trees, shrubs, and groundcovers have considerable drought resistance and perform acceptably with about 40% to 60% of the water required to maintain the average lawn in good condition[85]
- Replacing water-consuming, high-maintenance, traditional landscapes and lawn with California native plants can reduce the average homeowner's water consumption by 60%[86]
- Drip irrigations systems use 20 to 50 percent less water than conventional pop-up sprinkler systems and can save up to 30,000 gallons per year[87]

WC-2.1 – Increase access to and use of non-potable water

Quantification:

	2020	2035
Performance Indicators	Continue to evaluate the City's NPWP	Achieve 7% of water supply sourced from recycled water
GHG Reduction Potential	0 MT CO_2e	953 MT CO_2e

Assumptions:

- 81% GHG reduction resulting from use of 100% reclaimed water in Southern California[88]
- The Pasadena Non-Potable Water Project proposed to construct a pipeline to be placed underground that would bring more than 3,000 acre feet (10% of the city's overall water use) of water annually to serve the city's non-potable water needs, such as irrigation, dust control, and commercial and industrial cooling.[89]
- Greywater systems could result in 30% reduction in total household water use[90]
- Calculation assumes full implementation of Non-Potable Water Project by 2035

WC-3.1 – Improve storm water systems to slow, sink, and treat run-off, recharge groundwater, and improve water quality

This measure is considered supportive as improvements to stormwater capture and water quality do not directly result in GHG emissions reductions.

[81] Calculated from projected water usage and electricity emissions factors
[82] California Department of Water Resources, 2013
[83] California Department of Water Resources, 2013
[84] California Department of Water Resources, 2013
[85] University of California, Center for Landscape and Urban Horticulture, 2016
[86] Save Our Water, 2017
[87] US EPA, 2017a
[88] CAPCOA, 2010
[89] City of Pasadena, 2017a
[90] HouseLogic, 2017

WR-1.1 – Continue to reduce solid waste and landfill GHG emissions

Quantification:

	2020	2035
Performance Indicators	Achieve 75% diversion rate	Achieve 87% diversion rate
GHG Reduction Potential	0 MT CO_2e	7,359 MT CO_2e

Assumptions:

- 73% diversion rate in 2010[91]
- 152,967 tons of waste disposed by Pasadena in 2013[92]
- The Zero Waste Strategic Plan outlines a path to achieve 87% diversion by 2040 through programs including:[93]
    - Expanding the Mandatory Commercial Recycling Program: 4.6% reduction in diversion
    - School Recycling Programs: 0.1% reduction in diversion
    - Enhanced Educational Outreach: 4.6% reduction in diversion
    - Technical Assistance to Businesses: 0.6% reduction in diversion
    - Commercial Food Scraps & Organics Collection Pilot program:<0.1% reduction in diversion
    - Additional waste reduction, reuse, recycling, and composting policies at City Facilities: 0.1% reduction in diversion
    - Mandatory Organics Separation and Collection at Stadiums and Large Venues/Events: 0.3% reduction in diversion
    - Expand EPR Policies: <0.1% reduction in diversion
    - Product and Disposal Bans:0.3% reduction in diversion
    - Green Business Partnership Program: 0.3% reduction in diversion
    - Recycling in Public Areas: 0.2% reduction in diversion
    - C&D Diversion Requirements: 3.0% reduction in diversion
- Calculation assumes full implementation of the Zero Waste Strategic Plan by 2035
- Chapter 8.62 of the Pasadena Municipal Code requires a minimum 75% diversion of construction and demolition waste. GHG reductions associated with 50% diversion of construction and demolition waste were calculated under the adjusted forecast consistent with the State's Green Building Standards Code. Pasadena's additional 25% diversion requirement for construction and demolition waste is quantified herein under WR1.

WR-2.1 – Establish a "Preferred Procurement Plan" for sustainable, strategic sourcing for all City departments and facilities

This measure is considered supportive and was quantified as part of WR-1.1.

[91] Pasadena Public Works Department, 2016
[92] CalRecycle, 2017
[93] City of Pasadena, 2014

WR-2.2 – Create an internal reuse program for all City departments to recirculate unwanted goods

This measure is considered supportive as it was quantified as part of WR-1.1.

WR-3.1 – Implement a citywide composting program to limit the total amount of organic material entering landfills

Quantification:

	2020	2035
Performance Indicators	Reduce organic waste disposal by 50% below 2013 levels (as mandated by SB 1383)	Reduce organic waste disposal by 75% below 2013 levels (as mandated by SB 1383)
GHG Reduction Potential	4,559 MT CO_2e	6,838 MT CO_2e

Assumptions:

- 37.4% of California's waste disposal stream is comprised of organic waste[94]
- 152,967 tons of waste disposed by Pasadena in 2013[95]
- Food scraps and yard waste currently make up 20 to 30% of residential garbage[96]
- As a nation, we have made remarkable strides towards recycling these materials, primarily through the development of effective composting technologies. Whereas in 1990 recovery via composting only diverted 2% of the total solid waste stream, we now recover 20% through composting, including 62% of all yard trimmings[97]
- Analysis of the top prevention, recovery, and recycling solutions shows that 13.2 million tons — over 20% of annual food waste — can be reduced over the next decade in cost-effective and scalable ways[98]
- In September 2016, Governor Brown signed SB 1383, establishing targets to achieve a 50% reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020 and a 75% reduction by 2025. The law grants CalRecycle the regulatory authority required to achieve the organic waste disposal reduction targets and establishes an additional target that not less than 20% of currently disposed edible food is recovered for human consumption by 2025. In 2019, CalRecycle will be networking, providing technical assistance, and developing tools, model ordinances, contracts, and case studies to support efforts at the local level to meet the organic waste reduction targets and comply with the regulatory requirements. By January 2, 2024, the regulations may require local jurisdictions to impose penalties for noncompliance on generators within their jurisdiction[99]

WR-3.2 – Implement 3-bin compost systems, in addition to recycling bins and landfill bins, at public parks to compost all trimmings and waste onsite to divert organic materials from the landfill and increase locally available compost

[94] Cal Recycle, 2015
[95] CalRecycle, 2017
[96] U.S. EPA, 2017b
[97] US Composting Council, 2011
[98] ReFED, 2017
[99] CalRecycle, 2017

This measure is considered supportive as it was quantified as part of WR-3.1.

WR4.1 – Reduce the GHG impacts of the waste collection system

This measure is considered supportive as it was quantified as part of T-4.1.

UG-1.1 – Continue to preserve, enhance, and acquire additional greenspace throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation

Quantification:

	2020	2035
Performance Indicators	Increase green space by 5 net new acres	Increase green space by 30 net new acres
GHG Reduction Potential	22 MT CO_2e	129 MT CO_2e

Assumptions:

- 4.31 MT CO_2e/year average carbon sequestration rate for grassland[100]
- Pasadena has 23 dedicated city parks totaling 635 acres of parkland[101]

UG-2.1 – Continue to protect existing and plant new trees to improve and ensure viability of Pasadena's urban forest

Quantification:

	2020	2035
Performance Indicators	Plant 500 net new trees	Plant 2,000 net new trees
GHG Reduction Potential	Existing: 144 MT CO_2e* New: 18 MT CO_2e TOTAL: 162 MT CO_2e	Existing: 144 MT CO_2e* New: 71 MT CO_2e TOTAL: 215 MT CO_2e

Assumptions:

- *4,064 trees were planted between 2013 and 2016[102]
- 0.0354 MT CO_2e/year average carbon sequestration rate for trees[103]
- In the contiguous United States alone, urban trees store over 708 million tons of carbon (approximately 12.6% of annual carbon dioxide emissions in the United States) and capture an additional 28.2 million tons of carbon (approximately 0.05% of annual emissions) per year[104]

B.6 CAP Consistency Checklist Supporting Documentation

The CAP includes 27 measures, 16 of which were selected as Sustainable Development Actions and therefore, have been included in the CAP Consistency Checklist. The table below details which of the

[100] CAPCOA, 2010
[101] City of Pasadena, 2007
[102] Pasadena Public Works Department, 2016
[103] CAPCOA, 2010
[104] Safford, H. et al., 2013

CAP measures are applicable to new development and why. CAP measures that are not applicable to new development were not included in the CAP Consistency Checklist as the checklist only applies to new development projects.

Measure Number & Name		Applicable to New Development?	Reason
T-1.1	Continue to expand Pasadena's bicycle and pedestrian network	Yes	New developments and major renovations can include end of trip facilities and bike share programs. New developments usually do not have the ability to incorporate other types of infrastructure such as bike lanes.
T-1.2	Continue to improve bicycle and pedestrian safety	Yes	New developments and major renovations can install bike racks in their facilities. Other safety measures will be based on policy changes and City projects.
T-1.3	Continue to encourage bicycle and pedestrian travel	No	These measures are policy based and will be implemented at the community scale. If new policies are put in place, they may later effect new construction and major renovations.
T-2.1	Continue to enhance safe, reliable, and seamless transit services	No	These measures are policy based and will be implemented at the community scale. If new policies are put in place, they may later effect new construction and major renovations.
T-3.1	Decrease annual commuter miles traveled by single occupancy vehicles	Yes	New construction and major renovations can include car sharing, parking de-coupling, and TDM plans to aid the reduction of VMT throughout the community.
T-3.2	Improve the existing transportation system to smooth traffic flow, reduce idling, minimize bottlenecks, and encourage efficient driving techniques	No	These measures are policy based and will be implemented at the community scale. If new policies are put in place, they may later effect new construction and major renovations.
T-4.1	Expand the availability and use of alternative fuel vehicles for fueling infrastructure	Yes	New construction and major renovations can play a major role in developing an alternative fueling system by incorporating electric car chargers.
T-5.1	Facilitate high-density, mixed-use, transit-oriented and infill development	Yes	New development can select locations near transit stops to facilitate transit-oriented development to reduce single occupancy VMT.
T-6.1	Reduce GHG emissions from heavy-duty construction equipment and vehicles	Yes	New development projects can utilize alternative fuel construction vehicles and limit idling to three minutes while performing construction activities.
T-7.1	Reduce GHG emissions from lawn and garden equipment	No	This measure relates to operations rather than construction. A City ordinance could require or incentivize the use of alternative fuel law and garden equipment.
E-1.1	Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards	Yes	New buildings and major renovations can exceed Title 24 or become ZNE.
E-1.2	Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency	Yes	New buildings and major renovations can include passive design concepts.

E-2.1	Facilitate energy efficient upgrades in existing homes and businesses	No	This measure relates to existing buildings.
E-3.1	Increase municipal energy conservation efforts	No	This is a City-led initiative, pertaining to internal operations.
E-4.1	Increase citywide use of carbon-neutral energy by encouraging and or supporting carbon-neutral technologies	Yes	New construction and major renovations can include renewable energy.
E-5.1	Continue to expand the City's renewable and or carbon-neutral energy portfolio	No	This is a City-led initiative, pertaining to internal operations.
WC-1.1	Reduce potable water usage throughout Pasadena	Yes	New construction and major renovations can improve water efficiency indoor and outdoor through several strategies.
WC-2.1	Increase access to and use of non-potable water	Yes	New construction and major renovations can utilize non-potable water through greywater use and dual plumbing.
WC-3.1	Improve storm water systems to slow, sink, and treat water run-off, recharge groundwater, and improve water quality	Yes	New construction and major renovations can incorporate stormwater practices to keep stormwater on-site.
WR-1.1	Continue to reduce solid waste and landfill GHG emissions	Yes	Projects can facilitate recycling by supplying locations for trash and recycling bins and by providing handouts and/or signage to show residents how to recycle.
WR-2.1	Establish a "Preferred Procurement Plan" for sustainable, strategic sourcing for all City departments and facilities	No	This is a City-led initiative, pertaining to internal operations.
WR-2.2	Create an internal program for all City departments to recirculate unwanted goods	No	This is a City-led initiative, pertaining to internal operations.
WR-3.1	Implement a city-wide composting program to limit the amount of organic material entering landfills	Yes	New construction and major renovations can implement on-site composting.
WR-3.2	Implement 3-bin compost systems, in addition to recycling and landfill bins, at public parks to compost all trimmings and waste onsite to divert organic materials from the landfill and increase locally available compost	No	This is a City-led initiative, pertaining to internal operations.
WR-4.1	Reduce the GHG impact of the waste collection system	No	This is a City-led initiative, pertaining to internal operations.
UG-1.1	Continue to preserve, enhance, and acquire additional greenspace throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active reaction	Yes	New construction and major renovations can include public park space, rooftop gardens, parklets, and other strategies to increase the amount of park space in Pasadena.

UG-2.1	Continue to protect existing trees and plant new ones to improve and ensure viability of Pasadena's urban forest	Yes	New construction and major renovations can preserve existing trees and plant new ones.

B.7 CEQA GHG Thresholds Supporting Documentation

A service person efficiency threshold was chosen for this CAP because Pasadena has a higher ratio of jobs to residents then the State on average, and excluding emissions from employees would not provide a complete picture of emissions within the city. [105] Using the demographics projections developed for the CAP, Pasadena has developed four per person efficiency thresholds which are consistent with the CAP and the State targets it is designed to achieve (AB 32, SB 32, EO S-3-05). Because the 2017 Climate Change Scoping Plan (adopted December 14, 2017) was still in draft form and subject to change at the time Pasadena's local GHG thresholds were developed, a multi-threshold approach was developed to allow the City to achieve their long-term reduction goals in the absence of anticipated emission reductions from the 2017 Climate Change Scoping Plan. This is consistent with the current guidance provided by the AEP Final White Paper "Beyond 2020 and Newhall".

The following methodology was used to calculate the efficiency thresholds and to compare the values to the service person targets established by the 2017 Climate Change Scoping Plan. The City's 2030 efficiency threshold is lower than the emissions threshold suggested by the State in the 2017 Climate Change Scoping Plan, as Pasadena has set GHG reduction goals which exceed State targets. Pasadena's thresholds were calculated based on the GHG reduction goals and demographic projections included in the CAP. California data was taken from the Department of Transportation County Level Economic Forecast.[106]

California 2030 Efficiency Threshold *= 2030 GHG Emissions Goal / (2030 Residents + 2030 Employees)*

258,600,000 MT CO_2e / (44,740,000 Residents +19,091,000 Employees) = **4.05 MT CO_2e/service person**

Pasadena 2020 Efficiency Threshold *= 2020 GHG Emissions Goal / (2020 Residents + 2020 Employees)*

1,492,793MT CO_2e / (143,508 Residents +121,411 Employees) = **5.63 MT CO_2e/service person**

Pasadena 2025 Efficiency Threshold *= 2025 GHG Emissions Goal / (2025 Residents + 2025 Employees)*

1,268,560 MT CO_2e / (149,172 Residents +129,150 Employees) = **4.56 MT CO_2e/service person**

[105] A service person efficiency threshold is the amount of emissions per year for every resident and employee in a defined area. By including both residents as employees a service person threshold incorporates emissions from all sectors including transportation, commercial activities, and residential activities.
[106] California Economic Forecast, 2013

Pasadena 2030 Efficiency Threshold *= 2030 GHG Emissions Goal / (2030 Residents + 2030 Employees)*

1,042,910 MT CO_2e / (155,060 Residents +137,383 Employees) = **3.57 MT CO_2e/service person**

Pasadena 2035 Efficiency Threshold *= 2035 GHG Emissions Goal / (2035 Residents + 2035 Employees)*

838,418 MT CO_2e / (161,180 Residents +146,141 Employees) = **2.73 MT CO_2e/service person**

B.8 Zero Net Emissions Documentation

GHG Estimation

The methodology detailed in the CAP Consistency Checklist has been vetted by CARB and is used in the determination of Zero Net Carbon requirements for CEQA streamlining (under Assembly Bill 900). For an example of how to properly implement and document this methodology please see the CARB Determination for the 6220 West Yucca Street Project.[107]

GHG Reductions

Once total GHG emissions have been calculated, the project must then purchase the required offsets from Climate Action Registry's marketplace. Additional carbon credit suppliers may be added in the future as they are verified. The total emissions for the project must be offset by Climate Reserve Tonnes or CRT's through the Climate Action Reserve marketplace.

CRT's gain their GHG value through projects which are verified by Climate Action Reserve to reduce a quantity of GHG emissions through renewable energy generation, short lived climate pollution reduction, carbon sequestration, and others. For every MT of CO_2e the project sequesters or reduces from entering the atmosphere, one CRT is generated. Each CRT can be purchased to offset one MT of CO_2e generated by a project. In the above example, the proposed project would be required to purchase 90,500 CRT's through the Climate Action Reserve marketplace. Offsets cost between $12-$15 as of September 2017 but prices are subject to changes in the carbon market.

The marketplace can be found here: http://www.climateactionreserve.org/how/crt-marketplace/

Each project should reduce their overall GHG emissions through the following methodologies which have been prioritized in order of desirability.

1. Project Design Features/on-site reduction measures
2. Climate Action Reserve offsets from off-site projects within the neighborhood
3. Climate Action Reserve offsets from off-site projects within the South Coast Air Quality Management District Jurisdiction
4. Climate Action Reserve offsets from off-site projects within the State
5. Climate Action Reserve offsets from off-site projects outside the State

[107] http://opr.ca.gov/docs/FINAL_6220_Yucca_Street__CARB_Determination.pdf

This methodology has been followed and legally vetted by the Newhall Ranch Project, and was found to be consistent with all State legislation and climate action goals.[108]

Projects which show the required documentation including the full CalEEMod output (construction, existing, and 30 years of operational data) and verification of the CRT's purchased to reduce net GHG emissions to zero can be considered consistent with the Pasadena CAP.

[108] http://netzeronewhall.com/

APPENDIX C
CLIMATE CHANGE VULNERABILITY ASSESSMENT

Rincon Consultants, Inc.
Environmental Scientists Planners Engineers

MEMORANDUM

Date: March 17, 2016

Re: Climate Change Vulnerability Assessment for the City of Pasadena

INTRODUCTION

This memorandum provides a climate change vulnerability assessment for the City of Pasadena. The purpose of this assessment is to provide a preliminary evaluation of the potential impacts of climate change on community resources. This report categorizes community resources as people, structures, and functions. Understanding the vulnerabilities that Pasadena may face due to climate change hazards is a first step in identifying strategies aimed at improving Pasadena's resilience to climate change.

BACKGROUND

This vulnerability assessment is intended to help develop an understanding of the potential primary impacts of climate change on the community and was completed to begin to evaluate the degree to which physical, socioeconomic, and natural factors are susceptible to, or unable to accommodate, the anticipated effects of climate change. According to the Intergovernmental Panel on Climate Change (IPCC), in its Fifth Assessment Report, vulnerability is defined as "the propensity or predisposition to be adversely affected." It further adds that vulnerability "encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (IPCC, 2013). Consistent with the Climate Adaptation Planning Guide (California Emergency Management Agency (CEMA) and California Natural Resources Agency (CNRA), 2012), this assessment is comprised of five primary components:

- **Exposure** – the nature and degree to which the community experiences a stress or hazard;
- **Sensitivity** – the aspects of the community (i.e., people, structures, and functions) most affected by the identified exposures;
- **Potential Impacts** – the nature and degree to which the community is affected by a given stressor, change, or disturbance;

- **Adaptive Capacity** – the ability to cope with extreme events, to make changes, or to transform to a greater extent, including the ability to moderate potential damages and to take advantage of opportunities; and
- **Risk and Onset** – the likeliness and expected timing of impacts.

It is anticipated that Pasadena will be exposed to a variety of unavoidable climate change effects. However, exposure to climate change hazards does not necessarily mean that the community will be sensitive to the effect. Whether individuals, property, and the environment are affected and to what degree depends on a number of factors, such as the ones listed above. Typically, climate change hazards would impact those people, structures, and functions that have the greatest exposure and sensitivity to climate change impacts the most, as well as the lowest adaptive capacity. For each climate related hazard, the population and economic sector that would be most vulnerable depends on the unique combination of these three factors (people, structures, and functions). For this vulnerability assessment, the years 1990, 2015, 2035, 2050, and 2100 were examined. The years 1990 and 2015 provide historic and current recorded data, while the years 2035, 2050 and 2100 present projections of expected change in the future.

Exploring California's Climate Change Research

There are a number of resources available and scientific groups attempting to more accurately define the potential risks of climate change. One of these tools specific to California is Cal-Adapt (cal-adapt.org), a web-based climate adaptation planning tool that allows the user to identify potential climate change risks in specific geographic areas throughout the state. Cal-Adapt was designed by University of California Berkeley's Geospatial Innovation Facility (GIF) with funding and oversight provided by the California Energy Commission (CEC) to provide access to data and information produced by the State's scientific and research community which offers a view of how climate change might affect California at the local level. Users can either search by location or use an interactive map to explore what climate impacts are projected to occur in a specific area of interest. Cal-Adapt synthesizes volumes of existing climate change scenarios and climate impact research and presents it in an easily available, graphical layout that is intended to benefit local planning efforts. Much of the information found at Cal-Adapt is based on downscaled Intergovernmental Panel on Climate Change (IPCC) models to describe how the climate may evolve in California. The source data used within the tool are available for download, as well as further information including research organizations that have developed the data, and relevant scientific publications. It is important to note that Cal-Adapt does not provide forecasts; however it does provide potential scenarios based on the most currently available science which can be used to inform local adaptation planning such as the development of climate action plan.

EXPOSURE: WHAT CLIMATE CHANGE EFFECTS WILL THE COMMUNITY EXPERIENCE?

Climate change is a global phenomenon that has the potential to impact local health, natural resources, infrastructure, emergency response, tourism, and many other facets of society. The direct changes projected for California include sea level rise, changed temperature and/or precipitation patterns, increased temperature, and wildfires. Secondary impacts occur as a result of primary impacts as shown in Table 1.

Table 1: Primary and Secondary Climate Change Impacts

Primary Impact	Associated Secondary Impacts
Sea level rise	Inundation, waterline change, extreme high tide, coastal erosion, saltwater intrusion
Changed temperature and/or precipitation patterns	Changed seasonal patterns
Increased temperature	Heat wave
Increased temperature and/or changed precipitation	Intense rainstorms, floods
Wildfire and/or increased precipitation	Landslide
Increased temperature and/or reduced precipitation	Drought, wildfire, reduced snowpack, reduced air quality

Source: CEMA and CNRA, 2012

Exposure to climate change is primarily a function of geography as such projected changes to the climate vary based on location. For example, coastal communities will have a higher exposure to sea level rise, while communities in the dessert may be more exposed to drought. According to Cal-Adapt, Pasadena can expect to experience extreme temperatures, changes in precipitation patterns, and increased storm frequency and intensity. Pasadena can also expect to experience hazards related to wildfires and sea level rise.

Extreme Temperatures

Average temperatures in Pasadena are expected to become 3.5°F to 6.0°F warmer by the end of the century, depending on emission levels (CEC, 2015). Greater warming is expected to occur in the early spring and late fall months compared to summer and winter. Pasadena is also expected to experience more extreme heat conditions. The annual number of heat waves, defined as four or more days over 96° F, is projected to increase from four to five heat waves per

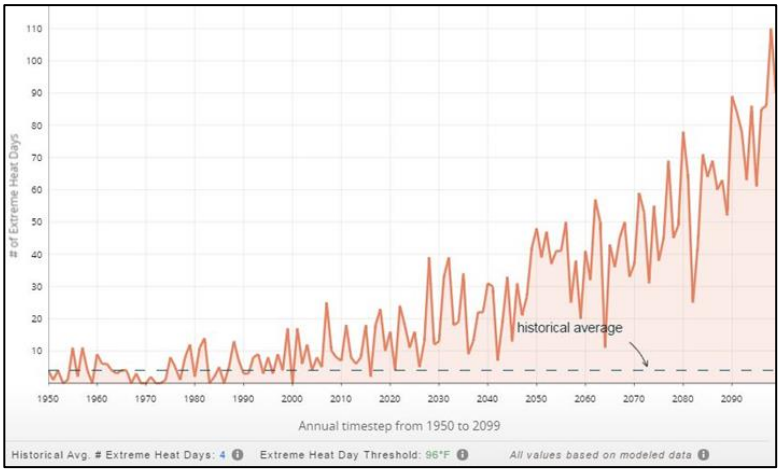

Figure 1: Number of Days with Extreme Heat (CEC, 2015)

year by 2050 and nearly 15 heat waves per year by 2100 (CEC, 2015). In addition, the annual number of extreme heat days, with temperatures greater than 96°F, is projected to increase from approximately 18 to 48 by 2050, and roughly 90 by the end of the century (refer to Figure 1). This combination could result in longer heat waves. It is predicted that the maximum duration of a heat wave would increase. In 2015, the maximum duration of a heat wave was approximately 5 days and by 2050 it is expected to increase to 8 days and by the end of the century to 26 days. The annual high temperature is also expected to increase. In 1990, the annual high temperature was 97°F, in 2015 it increased to approximately 103°F, by 2050 it is expected to increase to 105°F and further to 111°F by the end of the century.

Table 2: Temperature Extremes

Effect	1990	2015	2035	2050	2100[1]
# Days Extreme Heat per year	3	18	34	48	90
# Warm Nights per year	1	21	35	47	90
# Heat Waves per year	0	0	2	5	15
Max Duration of Heat Wave	0	4	5	8	26
Annual High Temperature °F	97	103	103	105	111
Period of Extreme Heat Days	July 27	July 10	Apr 24	June 16	May 28
	Sept 01	Sept 27	Sept 05	Oct 04	Oct 05

[1] *2099 data was used when 2100 data was unavailable.*
Source: CEC, 2015

In addition, the timing of extreme heat days is expected to change. In 1990, the earliest day of extreme heat was July 27th and the latest day was September 1st; by the end of the century, the earliest day of extreme heat is expected to occur on May 28th with the latest day of extreme heat occurring on October 5th (CEC, 2015). This change would extend the period of extreme heat days by nearly three months.

Changes in Precipitation

Precipitation, except during winter months, is anticipated to change little in the near future. However, climate models forecast drier conditions in Pasadena by 2050, and even drier conditions by 2100. Average annual rainfall in Pasadena is expected to decrease from approximately 21 inches to 18 inches in 2050, and approximately 15 inches by the end of the century (Figure 2).[1] Based on the climate models, it appears that the timing of the rainy season may change as well.

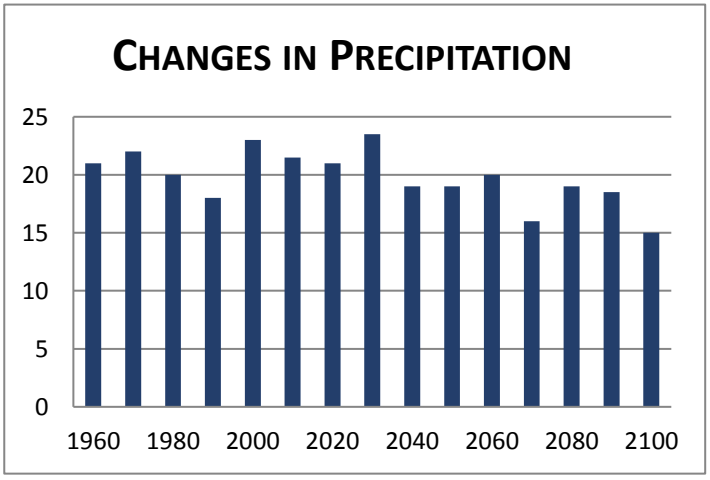

Figure 2: Precipitation: Decadal Averages Chart (CEC, 2015)

[1] Figure 2 is based on high emissions scenario.

The greatest amount of rainfall currently occurs between the months of December and March in Pasadena; the amount of rain during these months is expected to decrease by the end of the century. Likewise, in the future, the amount of rainfall may increase slightly over existing rates during the months of August and September. As a result of decreased rainfall, droughts may become more frequent, longer, and more severe. It is also projected that when rainfall does occur, it may be more likely to come in the form of intense downpours.

Increased Storm Frequency and Intensity

In combination with increased temperatures and changed precipitation, Pasadena is likely to experience altered seasons and intense rainstorms. Forecasts for these phenomena are currently unavailable in Cal-Adapt, but are acknowledged as possible outcomes. Intense rainstorms might result in increased flooding or trigger intense landslides that could impact infrastructure and human health and safety in Pasadena.

Fires

Although fire predictions in Cal-Adapt suggest a slight decrease in wildfire risk, with the implications of changes in temperature and precipitation, Pasadena would remain at risk. In particular, areas near the San Rafael Hills and the San Gabriel Mountains and other areas along the wildland-urban interface are subject to fire hazards. In addition, fires can also be generated by hazardous spills, earthquakes, and other natural disasters in areas that are not generally considered high-risk areas. These induced fires can pose additional risks to the developed and downtown areas of Pasadena that may be impacted by downed power lines, broken gas mains, and over turned appliances. Further, decreased water in the local reservoirs would exacerbate the problem and create challenges when fighting these urban and wildland fires.

Sea Level Rise

Pasadena is approximately 22 miles northeast of the Pacific Ocean and will not be directly affected by sea level rise. Overall, Los Angeles County has 3,951.7 acres that are currently vulnerable to a 100-year flood event and an additional 7,293.9 acres that would be vulnerable with 140 cm of sea-level-rise (CEC, 2015). Although sea level rise may not result in a direct physical impact to the city, Pasadena may be impacted by the indirect effects of sea level rise including population change, shift in jobs, and/or increased need for healthcare.

SENSITIVITY: WHAT ASPECTS OF THE COMMUNITY (STRUCTURES, FUNCTIONS, AND POPULATIONS) WILL BE AFFECTED?

Sensitivity is the degree to which a given community or ecosystem is affected by climatic stresses. For example, arid or semi-arid communities will be more sensitive than a tropical one to a decrease in rainfall, due to the subsequent impact on water flows.

Community Structures

Structures
☒ Residential
☒ Commercial
☒ Industrial
☒ Government
☒ Institutional (schools, churches, hospitals, prisons, etc.)
☒ Parks and open space
☒ Recreational facilities
☒ Transportation facilities and infrastructure
☐ Marine facilities
☒ Communication infrastructure
☐ Dikes and levees
☒ Water treatment plant and delivery infrastructure
☒ Wastewater treatment plant and collection infrastructure

Essential facilities such as hospitals and other medical facilities, police and fire stations, emergency operations centers, evacuation shelters, and schools are essential to the health and welfare of the population of Pasadena and are especially important following climate-influenced hazard events. The following community structures within Pasadena would be particularly sensitive to climate change:

- City Hall and all other municipal buildings, including 10 branch libraries throughout the City
- Huntington Memorial Hospital, Las Encinas Hospital, and various doctors' offices and medical entities
- Educational facilities, including Pasadena Unified School District's schools as well the Art Center College of Design, Caltech, and Pasadena Community College
- Rose Bowl Stadium, the 18th largest stadium in the world with a capacity for approximately 88,000 people
- Homeless shelters
- Pasadena's eight fire stations and five Police Department service areas.
- 2,400 acres of open space, including city parks, City-owned and privately owned golf courses, including Annandale and Brookside, and Arroyo Seco and Eaton Canyons, including utility owned lands in Eaton Canyon (City of Pasadena, 2012).

Sensitive facilities, such as dams, reservoirs, water treatment plants, and facilities that manage a large amount of hazardous waste, where damage would have large environmental, economic, or public safety consequences, are also considered particularly vulnerable to climate change including:

- Devil's Gate Dam, the first flood control dam in Los Angeles County built by the Los Angeles County Flood Control District in 1920, is used as a flood control dam between the communities of Pasadena, La Cañada Flintridge, and Altadena.

- City reservoirs (14) and wells (16), including: Sunset Treatment Plant and Reservoir, Jones Reservoir, and Eaton Reservoir
- Eaton Canyon stormwater detention/debris basin in the hills above Pasadena managed by Los Angeles County Department of Public Works (LACDPW) and U.S. Army Corps of Engineers (USACE). In addition, property owners in the hillside areas have constructed numerous small dikes to impound water.
- NASA's Jet Propulsion Laboratory (JPL) managed by California Institute of Technology (Caltech), located just outside the city boundaries, is a leading laboratory for construction and operation of planetary robotic spacecraft. This facility is leading the world in space exploration and is also considered a large-quantity hazardous waste generator. JPL is located within the recommended fault hazard management zone for Sierra Madre, and within a fire hazard area. According to the *Safety Element* of the General Plan, since JPL is also the largest user of hazardous materials in the area, there is a real potential for this site to negatively impact the surrounding area should an earthquake on the Sierra Madre fault, a wildfire, or alternative natural disaster cause hazardous materials to be released.
- Monk Hill Treatment Plant, a state-of-the-art water treatment plant established to remove perchlorate and volatile organic compounds (VOCs) from the groundwater near NASA-owned JPL, was funded by NASA and backed by the U.S. Environmental Protection Agency (EPA), California Department of Toxic Substances Control, and the Los Angeles Regional Water Quality Board.
- Pasadena Water and Power (PWP) facilities which provide water and power to the City of Pasadena and areas outside the city boundaries including unincorporated areas of southern Altadena, East Pasadena, Chapman Woods, and East San Gabriel. In 2014, PWP supplied over 30,000 acre-feet (approximately 10.50 billion gallons) of water, to serve more than 160,000 consumers and over 1 million megawatt hours (MWh) of electricity to serve more than 140,000 consumers (PWP, 2015).

Community Functions

Functions

☒ Government continuity
☒ Water/sewer/solid waste
☒ Energy delivery
☒ Emergency services
☒ Public safety
☒ Emotional and mental health
☒ Business continuity
☒ Housing access
☒ Employment and job access
☒ Food security
☒ Mobility, transportation, & access
☒ Quality of life
☒ Social services
☒ Ecological function
☒ Tourism
☒ Recreation
☒ Agriculture, forest, and fishery productivity
☒ Industrial Operations

Transportation Systems such as airways (airports, heliports, highways); bridges; tunnels; road beds; overpasses; transfer centers; and railways (tracks, tunnels, bridges, rail yards, depots) may be threatened by the impacts of climate change as well. Pasadena sits in the heart of Los Angeles County, located adjacent to State Route 134 (SR 134) and Interstates 210 and 710 (I-210 and I-710). State Route 110 (SR 110) also runs through Pasadena. In addition to vehicular transportation, Pasadena relies on a robust public transit system that may also be vulnerable to impacts of climate change. Pasadena is currently served by seven transportation agencies: Commuter Express, Foothill Transit, Glendale Bee Line, Metro, Montebello Bus Lines, Pasadena Area Rapid Transit System (ARTS), and South Pasadena Gold Link. As mentioned in the Mobility Element of the General Plan, Pasadena's local system connects with the larger regional system, and the operation of the two systems is interdependent. Impacts to the regional transportation system could therefore impact Pasadena. In 2004, Pasadena was recognized as the most bike-friendly city in Los Angeles County. Pasadena has 82 miles of bike routes that lead to jobs, shopping centers, schools, and Metro Gold Line Stations (City of Pasadena, 2015b). Pasadena has also prioritized pedestrian access by creating connectivity to neighborhoods through linking commercial areas to residential neighborhoods and other districts. Although highly popular among residents and tourists, use of the bike and pedestrian routes may decrease if temperatures increase to the point where active transportation is uncomfortable or unsafe in extreme heat conditions.

Lifeline utility systems such as potable water, wastewater, fuel, natural gas, electric power, and communication systems may also be particularly sensitive to a changing climate. Pasadena currently relies on PWP, a municipal utility which supplies power to a service population of 140,879 and water to a service population of 162,011 (PWP, 2015). Approximately 41 percent of PWP's water supply is groundwater from the Raymond Groundwater Basin, and is pumped from wells throughout the city; 58 percent of the water is imported from the Metropolitan Water District of Southern California (MWD), which acquires water from Northern California and the Colorado River; and the remaining 1 percent is purchased from neighboring water agencies, and is a combination of surface and groundwater (City of Pasadena, 2015g). The water distribution system consists of 520 miles of water mains, ranging from 2 to 36 inches in diameter; 17 booster stations; and 14 distribution reservoirs (PWP, 2015). Pasadena also has five service connections with MWD. Water from MWD is stored in reservoirs with a total capacity of 110 million gallons before it is put into the water distribution system. PWP owns and operates 16 wells that draw water from the Raymond Groundwater Basin and has developed 11

interconnections with neighboring water agencies to enhance the reliability of Pasadena's system and to use as emergency back-up (City of Pasadena, 2015c). The majority of Pasadena's wastewater is collected, treated, and disposed by the County Sanitation Districts of Los Angeles County No. 16, while a small portion of the southwest hillside area of Pasadena, comprised exclusively of single family homes, is tributary to the waste water collection, treatment, and disposal system owned and operated by the City of Los Angeles (City of Pasadena, 2015c); increased flooding could impact these wastewater management facilities.

Electricity provided by PWP increasingly comes from renewable sources of energy; however PWP also currently relies on traditional, non-renewable sources of energy as well. In 2013, PWP achieved a renewable portfolio standard of over 27 percent (PWP, 2015). Energy is moved from sources to substations over Pasadena's transmission system. At present, that system operates at 34 Kilovolts and is approximately 95% underground. Future transmission facilities, which may be of a higher voltage, will all be underground (City of Pasadena, 2015c). Energy is delivered to Pasadena at two locations: the Water and Power Department generating plants near the SR 110 Freeway, in the south-central portion of the city, and at the T. M. Goodrich Receiving Station in the eastern side of Pasadena, where energy is imported from sources outside the city.

Changes in climate could also have a substantial impact on Pasadena's economy, as tourism is a driving force, generating $475.4 million and supported 2,383 jobs in 2011 alone (City of Pasadena, 2015e). Pasadena's tourism is driven in part due to the temperate, Mediterranean climate and exciting annual events which draw millions each year, including the Tournament of Roses, Rose Parade, Rose Bowl, Doo Dah Parade, and Pasadena Chalk Festival (City of Pasadena, 2015e).

Populations

Some populations are more vulnerable than others to climate related exposures such as people who may require special response assistance or special medical care after a climate-influenced disaster. The 2009 California Climate Adaptation Strategy identifies those most at risk and vulnerable to climate-related illness as the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors (CNRA, 2009). Of the non-elderly adult population in Pasadena, nearly 25 percent does not have medical insurance (City of Pasadena PHD, 2012); these individuals may face unique climate change impacts if they become ill or are injured in an extreme weather event.

Populations

☒ Seniors
☒ Children
☒ Individuals with disabilities
☒ Individuals with compromised immune systems or who are chronically ill
☒ Individuals without access lifelines (e.g. car or transit, telephones)
☒ Non-white communities
☒ Low-income, unemployed, or underemployed communities
☒ Individuals with limited English skills
☒ Renters
☒ Students
☒ Seasonal residents
☒ Individuals uncertain about available resources

The current population of Pasadena is 141,510 (DOF, 2015). Based on the 2014 U.S. Census, 14 percent of the population is 65 years or older and 19 percent of the population is under the age of 18 (with 6 percent under the age of 5) (Figure 3). These individuals may face unique impacts related to climate change. According to the findings from a recent United Nations Children's Fund (UNICEF) study, children are "physiologically and metabolically less able than adults at adapting to heat. The study recognizes that geography plays a role on the impacts of climate change that may affect specific populations, and acknowledges the fact that those with fewer resources have a more difficult time adapting.

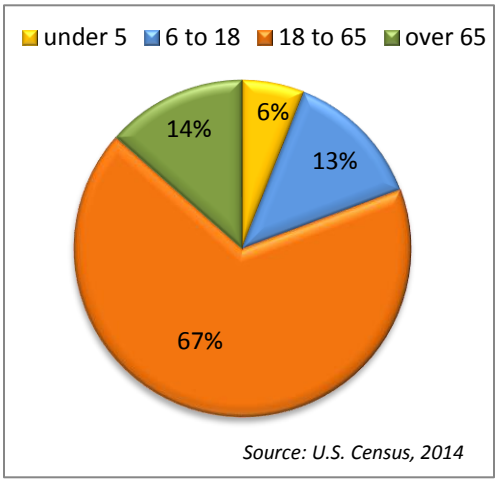

Figure 3: Pasadena Age Demographic

Financial wellbeing also impacts climate change sensitivity, as well as preparation, because those with a greater access to resources have a greater ability to prepare and adapt. While Pasadena has an average household income above the California average, over 10 percent of the population lives below the poverty line. According to the Pasadena Public Health Department, there is a broad geographic earning disparity within the city; on the northeast side of the city (91103 zip code), the 2012 median income was $44,358, compared to the southwest side of the city (91105 zip code), with a median income of $91,587 (City of Pasadena PHD, 2012).

In addition, many Pasadena residents speak a language other than English at home (44.6 percent vs. the California average of 43.7 percent) (U.S. Census, 2014), which may result in a language barriers in dissemination of information related to climate change preparation and emergency response.

POTENTIAL IMPACTS: HOW WILL CLIMATE CHANGE AFFECT THE POINTS OF SENSITIVITY?

As climate change continues to progress, increased stress to vulnerable populations and sectors of society are expected. In Pasadena, the most likely primary impacts of climate change include temperature extremes, changes in precipitation, and increased storm frequency and intensity. There is currently no recorded snowpack in Pasadena, and that is not expected to change over the next century. However, decreased snowpack in other areas of California will likely impact the water supply in the city due to a decrease in snowpack melt that supplies much of Southern California with potable water. Likewise, Pasadena is approximately 22 miles northeast of the Pacific Ocean and will not be directly affected by sea level rise; however, indirect effects (population change, shift in jobs, increased need for healthcare, etc.) of sea level rise may impact the city. The potential impacts of temperature extremes, changed precipitation, and increased storm frequency and intensity are discussed below.

Temperature Extremes

As describe above, Pasadena may experience a variety of impacts from climate change, which include an increase of 3.5°F to 6.0°F by the end of the century (CEC, 2015). This increase in temperature (which may result in changes in seasonal patterns, potential heat waves, drought, and increased storm frequency and intensity) has the potential to affect Pasadena through decreased public health, potential infrastructure damage, decreased economic viability, and decreased water supply.

Decreased Public Health

Public health may be negatively impacted by a changing climate as a result of changing environmental conditions (e.g., extreme weather events; changes in temperature and rainfall that decrease water supply; worsening air quality; and increases in allergens and air pollutants). This could lead to hazardous conditions, such as heat stroke and respiratory ailments for athletes, children playing outdoors, tourists attending community events, and construction laborers or others working outdoors. Potential impacts to public health include cardiovascular disease; exacerbation of asthma, allergies, and chronic obstructive pulmonary disease (COPD); increased risk of skin cancer and cataracts; premature death; cardiovascular stress and failure; and heat-related illnesses such as heat stroke, heat exhaustion, and kidney stones (CEMA and CNRA, 2012). Those in the community without health insurance, which includes nearly 25 percent of the non-elderly adult population, are particularly vulnerable. As described above, more than 10 percent of all Pasadena residents live below the poverty line (U.S. Census, 2014). With anticipated increases in temperature, these economically disadvantaged residents may find it more difficult to afford the additional costs of cooling their homes. Likewise, those without access to public transit or who do not own vehicles may be at increased risk because they may be unable to go to cooler areas or community cooling centers (Shonkoff et al. 2009). Consequently, many low-income households, especially those of seniors and the disabled may become physically vulnerable to the effects of extreme heat events.

Changing temperatures may also impact vulnerable youth populations as nearly 20 percent of the population within Pasadena is under the age of 18 (U.S. Census, 2014). In particular, children are "especially susceptible to air and water quality, temperature, humidity and vector-borne infections due to their less-developed physiology and immune system." These health concerns are not just physical; children can be impacted psychologically as well, which could result in a loss of self-confidence, nervousness, and insomnia (UNICEF, 2011). This additional stress on children's systems could affect them into adulthood and result in lifelong ailments. Climate change impacts on the youth populations may extend past their personal development and into their family and social lives through the impacts of increased food prices, spread of disease and illness, and potential competition over natural resources (Jones, 2011).

Changes in temperature may also indirectly impact human health through impacts to biological species and natural habitat, such as increases in the incidence of vectorborne disease (World Health Organization, 2015). According to the World Health Organization (WHO), insects have no internal control over their body temperature, and as ambient temperatures rise, the

distribution of insects may expand through increased reproductive rate, biting behavior, and survival (2015). Additionally, they state that the incubation period for pathogens within vectors is also temperature-dependent, and the period often becomes shorter as conditions warm (WHO, 2015). This will result in pathogens developing and spreading more quickly; susceptibility to disease may increase.

As rising temperature impacts public health, community resources such as Huntington Memorial Hospital, Las Encinas Hospital, and various doctors' offices and medical entities may be impacted by an increased need for various health care services including heat and respiratory care. Although Pasadena currently has a strong healthcare sector, climate driven health concerns may necessitate additional growth and expansion.

Infrastructure Damage

Community infrastructure including PWP facilities and the Pasadena's transportation system may also be impacted by increased temperatures. Long periods of intense heat may result in an increase use of electricity for home cooling purposes that could tax the system and result in electricity restrictions or black-outs. In addition, cyclists and active-commuters could be impacted by increased temperatures and could suffer from heat related illnesses and be less inclined to ride their bikes for transportation if the temperatures continue to climb. This would increase demand on other aspects of the transportation system including public transit and city roadways, which may also exacerbate worsening air quality conditions.

Decreased Economic Viability

As mentioned above, increases in temperature could also have a substantial impact to Pasadena's economy, as tourism is a driving force, generating $475.4 million and supporting 2,383 jobs in 2011 alone (City of Pasadena, 2015e). Increased temperatures may result in uncomfortable and unsafe conditions for tourists, athletes, and event staff, thus reducing the attendance at and associated income generated by outdoor recreational activities and events within the city.

Decreased Water Supply

High temperatures may also contribute to a reduced water supply. For instance, higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher, in addition to the reduction in precipitation, which will result in less snowpack to supply water to California users (CNRA, 2009). Increased temperatures could therefore result in decreased potable water supply for the city which relies on local groundwater as well as imported water from water projects. Currently, many water supply wells and reservoirs in Pasadena are operating at seriously diminished capacities, including two wells which were taken out of service in 2014 due to low groundwater levels (PWP, 2015). As mentioned, there are a total of 14 reservoirs throughout Pasadena that range in capacity from the Jones Reservoir, which can hold approximately 50 million gallons of water to the Lida Reservoir, which has the smallest capacity of Pasadena's reservoirs and can hold approximately 0.43 million gallons of water (City of Pasadena, 2015d). Impacts of a decreased water supply are discussed in greater detail below.

Changes in Precipitation

Decreased precipitation will result in more frequent and persistent droughts, especially in combination with increased temperatures which would result in decreased water supply, decreased water quality, decreased public health, reduced viability of natural landscapes, and increased risk of wildfires.

Decreased Water Supply

Approximately 41 percent of PWP's water supply is groundwater from the Raymond Groundwater Basin, and is pumped from wells throughout the city; 58 percent of the water is imported from the Metropolitan Water District of Southern California (MWD), which acquires water from Northern California and the Colorado River; and the remaining 1 percent is purchased from neighboring water agencies, and is a combination of surface and groundwater (City of Pasadena, 2015g). Based on the current water supply, without intervention, Pasadena may expect a 17 percent shortfall in water supply by 2035 (City of Pasadena Public Health Department (PHD), 2012). Further decreases in precipitation and Sierra snow pack may directly impact the city's water supply and could cause water prices to increase. Increased water prices would impact potable water used in residential, retail, and commercial uses. Additionally, increased prices and decreased water supply would affect emergency response availability. The current drought has already impacted the Pasadena's water supply; groundwater levels have dropped 20 to 60 feet and two wells have been taken out of service due to low groundwater levels (City of Pasadena, 2015g).

Decreased Water Quality

In addition to the decrease in Pasadena's groundwater levels, some residents have noticed that their tap water has been unusually hard and/or cloudy (City of Pasadena, 2015g). Decreased water quality or supply during drought is more likely to affect Pasadena because a large portion of the community's water is supplied by groundwater or imported from other water projects. Drought may cause a decrease in water quality and increase the levels of chemical concentration, nutrients, or solid particulates, or decrease the dissolved oxygen level (Stanke, et. al., 2013). Water quality can decrease further when rainfall follows a prolonged period of low-precipitation because chemicals accumulate on the ground and roads and are washed into the rivers. If water quality decreases to a level where it is no longer potable, a shortage would ensure. Bottled drinking water could be purchased, however, as with all impacts, risk is not dispersed evenly. Poor water quality would likely impact the economically disadvantaged sector of the community to a greater extent than it would the affluent, because bottled water is sold at a much higher price per gallon than water provided by the municipal provider.

Decreased Public Health

Although not currently a health risk, a continued decrease in water supply and quality may result in community health impacts or a shortage of potable water. This decrease in water availability could cause health effects associated with drought that include impacts on nutrition, water-related disease, airborne and dust-related disease, vector-borne disease, and other health impacts. One of the greatest risks of prolonged drought are impacts on nutrition, however,

populations in developed countries do not usually experience drought-associated malnutrition because food is sourced from geographically diverse suppliers and can be purchased from different locations if drought-driven problems with agricultural production arise (Stanke, et. al., 2013). Nonetheless, reduced water availability may result in an increase in the price of produce, thus potentially affecting the nutritional availability for the community, particularly for the economically disadvantaged.

Reduced Viability of Natural Landscapes

Decreased precipitation and drought would also impact Pasadena's 2,400 acres of open space, including city parks, city-owned and privately owned golf courses, such as Annandale and Brookside, and Arroyo Seco and Eaton Canyons, including utility owned lands in Eaton Canyon. Without sufficient water the native environment may not be able to sustain itself, resulting in disease or death of natural landscapes as well reduced opportunities for community recreation. Decreased community recreation opportunities may drive residents and tourists to visit other communities for recreational outlets and reduce the amount of activity-driven tourism.

Increased Risk of Wildfires

Decreased precipitation and drought may indirectly result in increased risk of wildfires through drier natural landscapes in close proximity to the community. As mentioned above, Pasadena is bordered by Angeles National Forest and is vulnerable to wildfire hazards. Portions of the San Rafael Hills and the San Gabriel Mountains within city limits are mapped as having fire hazards due to the steep topography of the area and the presence of flammable vegetation. Decreased precipitation may result in increased dry, flammable vegetation and combined with increased temperatures, could result in increased wildfires. Additionally, wildfires often precede other events including landslides, which could further impact the city. According to the General Plan, JPL has the potential to negatively impact the surrounding area should an earthquake on the Sierra Madre fault or a wildfire cause hazardous materials to be released (City of Pasadena, 2002). Proper maintenance of dry vegetation and JPL facilities will be increasingly important into the future. Further, decreased water in the local reservoirs would exacerbate the problem and create challenges when fighting these urban and wildland fires. In addition to the direct impacts of fires, poor air quality due to smoke would further impact the community if fire frequency increased.

Increased Frequency and Severity of Storm Events

As mentioned above, the frequency and severity of storm events could increase, even if precipitation levels do not. This could result in impacts to community infrastructure and well as human health and safety particularly related to flooding and landslides.

Flooding and Landslides

The region may see more severe (but not necessarily more frequent) rainfall events, leading to quick pulses of runoff. Within developed cities such as Pasadena, large amounts of impervious pavement prevent much of the rain from infiltrating into the ground. More rain falling in a

shorter time frame, in combination with large amounts of impervious surfaces increases the risk of flooding. In addition, since Pasadena is located in the foothills, the frequency and intensity of landslides may also increase. Hillside areas within Pasadena may be vulnerable to slope instability due primarily to the fractured, crushed, and weathered condition of the bedrock and steep terrain (City of Pasadena, 2002). The Arroyo Seco, on the west, and Eaton Wash on the east, are the two major stream channels that transect the city. Landslides have occurred previously in many of the canyons near the Pasadena area, in the upper reaches of the watersheds; specifically, Zachau, Rubio, and Shields Canyons have flooded in the past, and are likely to occur again (City of Pasadena, 2002). As would be predicted, landslides are more likely to occur in wet years following wildland fires. According to the *Safety Element* of the General Plan, if Devil's Gate Reservoir fails catastrophically, most of the water will be confined to the Arroyo Seco channel, but it may impact the Rose Bowl and other developed areas both north and south of the I-210. If Eaton Wash Dam failed, the inundation may impact residential and commercial areas located downstream of the dam, north of the I-210.

Infrastructure

Increased flooding may result in septic systems and sewage treatment plants being unable to handle increases in intense rainfall events and associated runoff. This could impede the proper functioning of on-site septic systems or overwhelm sewers and centralized sewage treatment plants. As a result, untreated water, with a full load of toxics and organic waste, could enter streams and coastal waters.

Infrastructure located within or adjacent to floodplains could be more susceptible to damage or disruption by larger than average precipitation events. Devil's Gate Dam is located between the communities of Pasadena, La Cañada Flintridge, and Altadena. The flood basin located above the dam, which captures the water that flows from the mountain, was filled with debris after the 2009 Station Fire and subsequent rains. In 2014, a five-year project was approved to remove 2.4 million cubic yards of sediment from the basin to reduce flood risk for most major storms. Although the project is currently underway, prior to completion of the project, an intense flood may result in an increased risk of flooding.

Flooding and landsides may also impact Pasadena's transportation network inhibiting movement of people and goods throughout the city. Emergency response systems would similarly be affected by flooding and landslides through restricted access to and from emergency response systems, increasing wait times for these crucial services. Communication to these entities may also be impacted if electricity transmission is interrupted or water/other natural resources are unavailable.

Decreased Public Health and Safety

Public health and safety may be directly impacted by injury and or death of community members resulting from large floods and/or landslides. Public health may also be indirectly impacted by reduced access to emergency response and health centers resulting from infrastructure impacts discussed above.

ADAPTIVE CAPACITY: WHAT IS CURRENTLY BEING DONE TO ADDRESS THE IMPACTS?

Adaptive capacity is the current ability to address the potential impacts of climate change (CEMA and CNRA, 2012) and includes adjustments in behavior, resources, and technologies (IPCC, 2007). Pasadena recognizes its role of leadership and has actively taken steps to increase the city's adaptive capacity, which include promoting disaster preparedness. Adaptive capacity also includes recognizing opportunities to take advantage of impacts from climate change. Pasadena uses a set of guiding documents with underlying emphasis on adaptive capacity which include but are not limited to:

Table 3: Pasadena Guiding Planning Documents

Document	Year Established
General Plan[1]	2002, 2007, 2015
Water System Master Plan	2002
Hahamongna Watershed Park Master Plan	2003
Specific Plans: Central District, South Fair Oaks, West Gateway, East Pasadena, East Colorado Boulevard, North Lake, Fair Oaks/Orange Grove, and Lincoln Avenue	2004
Neighborhood Traffic Management Plan	2004
Arroyo Seco Master Plans	2003, 2005
Green City Action Plan/Report	2006 - 2010
Pasadena Pedestrian Plan	2006
Safe Routes to School Plan	2006
Cultural Nexus Implementation Report	2007 - 2008
Central Park Master Plan	2007
Green Space, Recreation and Parks Master Plan	2007
Master Sewer Plan	2007
Recreation and Parks Master Plan	2007
Pasadena Groundwater Storage Program	2008
Green City Indicator Report	2008 - 2010
PWP Annual Report	2008 – 2014
Intelligent Transportation System Master Plan	2009
Comprehensive Water Conservation Plan	2009
Urban Water Management Plan	2011
Plastic Bag Ordinance 7214	2011
PWP's 25-year Water Integrated Resource Plan (WIRP)	2011
Emergency Operations Plan	2011
Economic Development Strategic Plan	2012
Power Integrated Resource Plan	2012
City of Pasadena Greenhouse Gas Inventory	2013
Short Range Transit Plan	2013
Community Health Improvement Plan	2014
Bicycle Transportation Action Plan	2015

[1] The General Plan was originally approved in 2002. The Green Space, Recreation, and Parks Element was completed in 207 and the Land Use and Planning and Mobility Elements were updated in 2015.

Several examples of adaptive planning are outlined in detail in the Pasadena General Plan *Safety Element*. This section of the General Plan sets forth policies and programs to minimize fatalities and injuries, the burden on public and emergency response resources, public and private costs for clean-up, repair, and recovery, and long-term impacts caused by displaced households, business disruption, and reduced fiscal resources (City of Pasadena, 2002). Policy S-4 of the *Safety Element* states that, "*the City will ensure to the fullest extent possible that, in the event of a major disaster, essential structures and facilities remain safe and functional, as required by current law. Essential facilities include hospitals, police stations, fire stations, emergency operation centers, communication centers, generators and substations, and reservoirs.*" This policy would apply to impacts from climate change identified above including heat waves, drought, flooding, fire, and storm events. Further, the *Safety Element* specifically outlines policies and programs to reduce impacts from various hazards that may impact the community such as seismic hazards, geologic hazards, flood hazards, fire hazards, hazardous materials, and disaster response planning.

Long-term projects to improve adaptive capacity and promote water security in the city include the Non-Potable Water Project, Eastside Well Collector and Centralized Disinfection Facility Project, and the Arroyo Seco Canyon Project, which are all outlined in PWP's 25-year Water Integrated Resource Plan (WIRP), adopted by City Council in 2011. The non-potable water pipeline will supply treated, recycled water from the Los Angeles-Glendale Water Reclamation plant and/or tunnel water to the city for irrigating public landscaped areas. This project will save the city 700 acre-feet of potable water per year in the first phase, and could save the city over 3,000 acre-feet of water per year upon build-out (City of Pasadena, 2015g). PWP has installed over 23,000 linear feet of pipeline in conjunction with the Eastside Well Collector and Centralized Disinfection Facility Project, which increases the reliability of groundwater well production and provides a more consistent water supply. The Collector pipeline and connections to five wells are completed and will allow flow to the Jones Reservoir for centralized disinfection (City of Pasadena, 2015g). These measures will help ensure PWP is able to supply a sustainable water supply to the City of Pasadena into the future, despite a predicted decrease in precipitation. Pasadena is also working on the Arroyo Seco Canyon Project which is an integrated resource project that includes restoring a portion of the Arroyo Seco Stream and increasing diversion of the Pasadena's water rights during large storm events when stream water is more readily available. The goal is to increase the local recharge that could result in an increase of 600 acre-feet per year of additional groundwater.

Additional improvements are outlined in the WIRP that will enhance Pasadena's adaptive capacity, including replacing approximately 3.0 miles of aging water mains and 2,000 water meters with Automatic Meter Read devices per year, upgrades to multiple facilities, and completion of new disinfection facilities. These initiatives enable the city to reduce its dependency on the imported water, and provide a reliable long-term water supply for the city. PWP, in conjunction with MWD, offers a variety of incentives and rebates that help expand the community's adaptive capacity as well, and encourage residents to replace their ornamental turf lawns with drought tolerant gardens and take other active measures to reduce water

consumption. Programs include irrigation retrofits, turf removal, landscape surveys, greywater systems, and rain barrel programs which will become increasingly important in times of increased temperatures and decreased precipitation. On average, ornamental turf accounts for about 60% of the average residential customer's water bill (City of Pasadena, 2015g). Replacing this turf with drought tolerant landscaping, permeable groundcover, and mulch promotes groundwater recharge while avoiding excess water usage as the climate changes. The City of Pasadena's overall adaptive capacity would be considered medium to high. There is secure infrastructure in place to protect people and land as the climate changes which include a robust safety and protection services and health care sector. Pasadena may be most impacted by health and human safety concerns related to the increased temperature and decreased precipitation that may result in problems such as heat stroke, dehydration, and other health problems. In addition, the city has access to technology that may allow Pasadena to further adapt to the changes in climate. According to the IPCC, efficient cooling systems, improved seeds, desalination technologies, and other engineering solutions represent some of the options that can lead to improved outcomes and increased coping under conditions of climate change (IPCC, 2007). It's been noted that strong local and international support networks enable communities to recover from and prepare for storms (IPCC, 2007). Pasadena is founded on a strong network that will allow the city to prepare and encourage long-term solutions that improve adaptive capacity.

In addition to the measures currently being implemented by the city, additional measures should be adopted requiring unique actions going forward to maintain and improve upon the city's current adaptive capacity. Specifically, the areas related to climate change vulnerability that provide the greatest opportunity for growth in Pasadena include preparing for extreme heat events, changes in precipitation and wildfires, as well improving outreach to vulnerable populations such as the elderly, youth, and non-English speakers. In addition, the *Safety Element*'s discussion of disaster response planning could be updated to include a more robust discussion of the impacts of climate change and the preparation necessary to adapt to a changing climate.

RISK AND ONSET: HOW LIKELY ARE THE IMPACTS AND HOW QUICKLY WILL THEY OCCUR?

Risk is defined as the likelihood or probability that a certain magnitude/extent/scale of potential impact will occur (CEMA and CNRA, 2012). For each impact, a level of uncertainty, based on the probability of the primary or secondary exposures is assigned.

Table 4: Probability Based on Global Models

Driver	% Probability (IPCC)	Certainty Rating
Temperature Change	>90%	High
Precipitation Change	>66%	Medium

Source: IPCC 2007

For each secondary impact, a low, medium, or high uncertainty was estimated based on the most conservative driver from Table 4 above.

Table 5: Probability of Secondary Impacts Based on Global Models

Primary Impact	Associated Secondary Impacts	Certainty Rating	Timeline for Expected Impacts[1]
Changed temperature and/or precipitation patterns	Changed seasonal patterns	Medium	Near-term
Increased temperature	Heat wave	High	Mid-term
Increased temperature and/or changed precipitation	Intense rainstorms	Medium	Mid-term
Increased temperature and/or reduced precipitation	Drought, wildfire, reduced snowpack	Medium	Near-term

Source: CEMA and CNRA, 2012
1 Timeline: Current: impacts currently going on; Near-term: 2020-2040; Mid-term: 2040-2070; and Long-term: 2070-2100.

CONCLUSION

Climate change will affect populations throughout the state, nation, and the world differently based on their actual and perceived vulnerabilities. The major impacts of climate change that are expected to affect Pasadena include temperature extremes, changes in precipitation, increased frequency and severity of storm events, and increased fires. Identifying potential hazards and understanding Pasadena's potential vulnerabilities is a first step towards improving the community's resiliency.

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APPENDIX D
CLIMATE ACTION PLAN CONSISTENCY CHECKLIST

Climate Action Plan Consistency Checklist Introduction

The Climate Action Plan Consistency Checklist (Checklist) is intended to be a tool for new development projects to demonstrate consistency with Pasadena's Climate Action Plan (CAP), which is a qualified greenhouse gas (GHG) emissions reduction plan in accordance with California Environmental Quality Act (CEQA) Guidelines Section 15183.5. This Checklist has been developed as part of the CAP implementation and monitoring process and will support the achievement of individual CAP measures as well as Pasadena's overall GHG reduction goals. In addition, this Checklist will further Pasadena's sustainability goals and policies that encourage sustainable development and aim to conserve and reduce the consumption of resources, such as energy and water, among others.

CEQA Guidelines Section 15183.5 allows lead agencies to analyze the impacts associated with GHG emissions at a programmatic level in plan-level documents such as CAPs, so that project-level environmental documents may tier from the programmatic review. Projects that meet the requirements of this Checklist will be deemed to be consistent with Pasadena's CAP and will be found to have a less than significant contribution to cumulative GHG (i.e., the project's incremental contribution to cumulative GHG effects is not cumulatively considerable), pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b). Projects that do not meet the requirements in this Checklist will be deemed to be inconsistent with Pasadena's CAP and must prepare a project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible.

Applicability

This Checklist is only required for discretionary projects[1] that are subject to and not exempt from CEQA. Projects that are exempt from CEQA are deemed to be consistent with Pasadena's CAP, and no further review is necessary, with the exception of the Class 32 "In-Fill Development Projects" categorical exemption (CEQA Guidelines Section 15332), for which Projects are required to demonstrate consistency with the CAP through this Checklist.

[1] In this context a project is any action that meets the definition of a "Project" in Section 15378 of the State CEQA Guidelines.

Climate Action Plan Consistency Checklist Application Form

When required, the Checklist must be included in the project submittal package. The requirements in the Checklist will be included in the project's conditions of approval. The applicant is required to provide supporting documentation on how the proposed project will implement the measures identified in the Checklist to the satisfaction of the Planning & Community Development Department.

Step 1: Complete a Master Land Use Application Form (separate attachment)

Step 2: Demonstrate consistency with the Land Use Element of the General Plan

The growth projections outlined in the 2015 General Plan Land Use Element were used in Pasadena's CAP to estimate community-wide GHG emissions over time. Therefore, new development projects must be consistent with the Land Use Element to be consistent with Pasadena's CAP. In order for City staff to determine a project's consistency with the Land Use Element, please answer the following question and provide explanation with supporting documentation for each response.

Is the proposed project consistent with the existing land use designation of the Land Use Element?

☐ Yes ☐ No

If "Yes," proceed and complete Step 3 of the Checklist.

If "No," the proposed project may not tier from this document and must prepare a comprehensive project-specific analysis of GHG emissions and incorporate the measures in this Checklist to the extent feasible.

Step 3: Demonstrate consistency with Pasadena's CAP

Proposed projects which complete one of the following three options will be deemed to be consistent with Pasadena's CAP and will be found to have a less than significant contribution to cumulative GHG emissions (i.e., the project's incremental contribution to cumulative GHG effects is not cumulatively considerable), pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b).

Please select one of the following options:

☐ Option A: Sustainable Development Actions – Demonstrate that the proposed project is consistent with the Pasadena CAP by incorporating applicable actions intended to ensure that the project contributes its fair share to the City's cumulative GHG reduction goals

☐ Option B: GHG Efficiency - Demonstrate that the proposed project is consistent with Pasadena's per person GHG efficiency thresholds

☐ Option C: Net Zero GHG Emissions – Demonstrate that the proposed project would not result in a net increase in GHG emissions

Option A: Sustainable Development Actions

In order to complete this option, a proposed project must incorporate applicable Sustainable Development Actions to the satisfaction of the applicable City Departments. Incorporating these actions will ensure that the project is reducing its fair share of GHG emissions and support the achievement of Pasadena's overall GHG emissions reduction goals. For each action selected, please submit the requested documentation. If a mandatory action is not applicable to the project, please provide a description as to why that action cannot be implemented.

Mandatory Actions (all of the actions below are required)

GHG Reduction Strategy (Measure in Pasadena's CAP)	Sustainable Development Actions	Yes	N/A
		Check the appropriate box and provide explanation	
T-1.2: Continue to improve bicycle and pedestrian safety	**Bicycle Storage:** Does the project provide bicycle storage lockers, racks, or other bicycle storage facilities for residents/employees? Check "N/A" only if the project does not include residents or employees.		
T-3.1: Decrease annual commuter miles traveled by single occupancy vehicles	**Transportation Demand Management (TDM):** Does the project include a TDM plan? A TDM plan is required for the following projects: multifamily residential development that are 100 or more units; mixed-use developments with 50 or more residential units or 50,000 square feet or more of non-residential development; or non-residential projects which exceed 75,000 square feet. If applicable, please submit the TDM plan for review.		
T-4.1: Expand the availability and use of alternative fuel vehicles and fueling infrastructure	**Alternative Vehicle Fueling Wiring:** For projects with more than three parking spaces, does the project provide wiring for at least one 240V Type II electric car charger? Please include specifications on the project plans. Check "N/A" only if the project does not include more than three parking spaces.		
E-1.2: Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency	**Passive Design Features:** Does the project utilize passive design techniques such as awnings or overhangs on the east, west, and south facing windows which block the high summer sun but allow in lower winter sun? Please include specifications on the project plans.		
WC-1.1: Reduce potable water usage throughout Pasadena	**Irrigation Efficiency:** Will the project utilize drought tolerant landscaping and/or drip irrigation and/or weather controllers to reduce outdoor water use? Please include specifications on the project plans. Check "N/A" only if the project does not include any landscaping.		
WR-1.1: Continue to reduce solid waste and landfill GHG emissions	**Facilitate Recycling:** Does the project include a space for separate trash and recycling bins as well as provide informational signage/handouts for residents/employees outlining materials to be recycled? Please include specifications on the project plans.		

Selective Actions

In addition the mandatory actions, the proposed project must implement the following:

- One additional action in the Energy Efficiency and Conservation category
- One additional action in the Sustainable Mobility and Land Use category
- Three additional actions from any category

Energy Efficiency and Conservation (select a minimum of one action)

GHG Reduction Strategy (Measure in Pasadena's CAP)	Sustainable Development Actions	Yes	No
E-1.1: Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards	**Zero-Net Energy (ZNE):** Does the project generate 100% of electricity required on site? ZNE calculations must be provided.		
E-1.1: Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards	**Energy Efficiency (Exceed 2016 Title 24):** Does the project exceed the 2016 Title 24 Efficiency Standards by at least 5%? Please include Title 24 energy model.		
E-4.1: Increase city-wide use of carbon-neutral energy by encouraging and/or supporting carbon-neutral technologies	**Renewable Energy:** Does the project generate at least 60% of the building's projected electricity needs through renewable energy? Please include specifications on the project plans.		

Sustainable Mobility and Land Use (select a minimum of one action)

GHG Reduction Strategy (Measure in Pasadena's CAP)	Sustainable Development Action	Yes	No
T-1.1: Continue to expand Pasadena's bicycle and pedestrian network	**End-of-Trip Bicycle Facilities (Commercial Development):** Does the project provide at least one shower for every 50 employees? Please include these specifications on the project plans.		
T-1.1: Continue to expand Pasadena's bicycle and pedestrian network	**Bike Share:** Does the project include a bike share station? Please include these specifications on the project plans.		
T-3.1: Decrease annual commuter miles traveled by single occupancy vehicles	**Car Sharing:** Does the project provide/facilitate car sharing by providing a designated car share space on or within the immediate vicinity of the project site? Examples of car share options include ZipCar, PitCarz, and Getaround. Please include these specifications on the project plans.		
T-3.1: Decrease annual commuter miles traveled by single occupancy vehiclesT-3.1	**Parking De-Coupling:** Does the project separate the cost of parking from the cost of commercial space and/or residential housing by charging for each individually? Please include these specifications on the project plans.		
T-3.1: Decrease annual commuter miles traveled by single occupancy vehicles	**Transportation Demand Management (TDM):** Does the project include a TDM plan? Please submit the TDM plan for review (Note: this measure cannot be combined with the mandatory measure that requires a TDM plan for projects that meet certain size thresholds.)		
T-4.1: Expand the availability and use of alternative fuel vehicles and fueling infrastructure	**Alternative Vehicle Fueling Infrastructure:** Does the proposed project include functioning 240V Type II electric car chargers at 3% of parking spaces (at least one charger) AND conduit to allow for future charger installation to 25% of spaces?		
T-5.1: Facilitate high density, mixed-use, transit-oriented, and infill development	**Transit Oriented Development:** Is the project located within 0.25 mile of a major transit stop as defined in the Zoning Code. Please include a map outlining the nearest transit stop.		
T-6.1: Reduce GHG emissions from heavy-duty construction equipment and vehicles	**Reduce GHG emissions from heavy-construction equipment:** Will the project utilize at least 30% alternative fueled construction equipment (by pieces of equipment) and implement an equipment idling limit of 3 minutes? Please provide idling limit plan including implementation strategies along with the total pieces of equipment and those utilizing alternative fuels.		

Water Conservation

GHG Reduction Strategy (Measure in Pasadena's CAP)	Sustainable Development Action	Yes	No
WC-1.1: Reduce potable water use throughout Pasadena	**Indoor Water Efficiency:** Will the project achieve at least a 35% reduction in indoor water use per the LEED V4 Indoor Water Use Reduction Calculator? Please attach the calculator output.		
WC-2.1: Increase access to and use of non-potable water	**Rainwater Capture and Reuse:** Does the project utilize a rainwater capture and reuse system to reduce the amount of potable water consumed on site? Please include these specifications on the project plans.		
WC-2.1: Increase access to and use of non-potable water	**Indoor & Outdoor Recycled Water:** Will the project be plumbed to utilize recycled water for either indoor or outdoor water use? Please include these specifications on the project plans.		
WC-2.1: Increase access to and use of non-potable water	**Greywater:** Will the project be plumbed to take advantage of greywater produced on site such as a laundry to landscape system or another on-site water reuse system? Please include these specifications on the project plans.		
WC-3.1: Improve storm water to slow, sink, and treat water run-off, recharge groundwater, and improve water quality	**Permeable Surfaces:** Is at least 30% of the hardscape (e.g., surface parking lots, walkways, patios, etc.) permeable to allow infiltration? Please include these specifications on the project plans.		
WC-3.1: Improve storm water to slow, sink, and treat water run-off, recharge groundwater, and improve water quality	**Stormwater Capture:** Is the project designed to retain stormwater resulting from the 95th percentile, 24 hour rain event as defined by the Los Angeles County 95th percentile precipitation isohyetal map? Please provide the engineered stormwater retention plan with the project plans (http://dpw.lacounty.gov/wrd/hydrologygis/)		

Waste Reduction

GHG Reduction Strategy (Measure in Pasadena's CAP)	Sustainable Development Action	Yes	No
WR-1.1: Continue to reduce solid waste and landfill GHG emissions	**Recycled Materials**: Does the project utilize building materials and furnishings with at least 50% (pre- or post-consumer) recycled content or products which are designed for reuse? At a minimum, projects must show at least 10% of the material by cost meets the recycled content requirement? Please submit the plan for review.		
WR-3.1: Implement a city-wide composting program to limit the amount of organic material entering landfills	**On-Site Composting:** Does the project include an area specifically designated for on-site composting? Please include these specifications on the project plans.		

Urban Greening

GHG Reduction Strategy (Measure in Pasadena's CAP)	Sustainable Development Action	Yes	No
UG-1.1: Continue to preserve, enhance, and acquire additional green space throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation	**Greenspace:** Does the project include at least 500 sq. ft. of public use greenspace (landscaped yards, parklets, rooftop garden, etc.)? At a minimum, 50% of the required greenspace must include softscape landscaping (e.g., trees, plants, grass, etc.).		
UG-2.1: Continue to protect existing trees and plant new ones to improve and ensure viability of Pasadena's urban forest	**Trees:** Does the project result in a net gain of trees? Please include these specifications on the project plans.		

Total Actions Taken

Sector	Actions Selected (#)	Actions Required
Mandatory Actions		6
Energy Efficiency and Conservation		1
Sustainable Mobility and Land Use		1
Water Conservation		0
Waste Reduction		0
Urban Greening		0
Total # of Actions Selected		
Total Required	*11*	

Supporting Documentation

Use the section below to provide supporting information describing how each selected Sustainable Development Action will be implemented in the proposed project. Additional information such as model outputs, invoices, and project plans should be noted below and attached to this submittal as needed.

Sustainable Development Action	Description of Project Implementation

Sustainable Development Action	Description of Project Implementation

Option B: GHG Efficiency

The efficiency threshold assesses the GHG efficiency of a proposed project on a service person (residents + full time employees) basis. This method recognizes that highly efficient projects (e.g., compact and mixed-use development) with relatively high mass emissions may nevertheless meet the local and State GHG reduction goals/targets. Using the demographic projections developed for the CAP, Pasadena has developed service person efficiency thresholds for the years of 2020, 2025, 2030 and 2035 which are consistent with Pasadena's GHG emission goals included in the CAP and the State targets it is designed to achieve (AB 32, SB 32, and substantial progress towards EO S-3-05). Applicants may decide to assess their proposed project's GHG emissions relative to Pasadena's GHG efficiency thresholds in lieu of completing the Sustainable Development Actions. Applicants should utilize standard GHG modeling techniques (such as CalEEMod[2]) to estimate total GHG emissions associated with the proposed project. Models should include all construction emissions (amortized over 30 years) and operational emissions. Total annual emissions should be divided by the proposed project's service population (residents + full time employees) to determine the efficiency of the proposed project using the following equation:

Proposed Project's GHG Efficiency = Annual GHG Emissions / Service Population (Residents + Full Time Employees)

The proposed project must be able to demonstrate a GHG efficiency which is less than or equal to the threshold listed below for the projects first operational year to be considered consistent with the Pasadena CAP and State targets it is designed to achieve. Refer to Appendix B for a complete description of the methodology used to calculate the efficiency thresholds.

Project First Operational Year	Threshold
2017 – 2020	5.63 MT CO_2e/Service Person
2021 – 2025	4.56 MT CO_2e/Service Person
2026 – 2030	3.57 MT CO_2e/Service Person
2031 – 2035	2.73 MT CO_2e/Service Person

[2] The California Emissions Estimator Model® (***CalEEMod***) is a statewide land use emissions computer model designed to provide a uniform platform for assessing air quality and GHG impacts associated with construction projects. Available at: http://www.caleemod.com/

Option C: Net Zero GHG Emissions

In lieu of Option A or B, applicants can demonstrate consistency with this CAP by demonstrating their proposed project would result in no net increase of GHG emissions. A proposed project can reduce its GHG emissions through the purchasing of carbon offsets issued by Climate Action Reserve[3] or other validated carbon offset registry to a level which results in zero net GHG emissions. The following methodology must be followed to prove zero net GHG emissions.

1. The applicant must model the proposed project's annual emissions using the most recent version of CalEEMod or equivalent model accepted by SCAQMD and/or CARB for CEQA purposes. Each model must include all emissions associated with the project including land clearing, demolition, earth moving, construction activities and operational related emissions such as energy use, water use, waste generation, transportation, area sources, and vegetation change, if applicable. The total annual operational emissions over 30 years as projected by the model should then be summed and added to the construction emissions to estimate the total lifetime GHG emissions associated with the project. CalEEMod is able to estimate operation related emissions over time taking into account changes to grid mix and vehicle fleet mandated by state legislation such as Renewable Portfolio Standard (RPS) and Pavley. Applicants should use CalEEMod forecasting to show overall GHG emissions and existing conditions (if applicable) should be modeled separately using CalEEMod for operations only and then subtracted from the project total to show the net change in GHG emissions.

   Example:
   Construction Emissions (1,000 MT of CO_2e) + Sum of Annual Emissions over 30 years (90,000 MT of CO_2e) – Existing Conditions (500 MT CO_2e) = 90,500 MT of CO_2e

2. The total emissions for the project must then be offset by Climate Reserve Tonnes or CRT's through the Climate Action Reserve marketplace. In the above example, the proposed project would be required to purchase 90,500 CRT's through the carbon marketplace. Offsets cost between $12-$15 as of September 2017 but prices are subject to changes in the carbon market. The marketplace can be found here: http://www.climateactionreserve.org/how/crt-marketplace/

The full CalEEMod output and verification of the CRT's purchased must be provided to the City of Pasadena as part of the review process.

[3] The Climate Action Reserve can be considered a bank which holds credits that amount to 1 metric ton of CO_2e per Climate Reserve Tonne (CRT). These credits get their reduction value through projects which reduce GHG emissions such as renewable energy development or through carbon sequestration. Those projects can sell CRT's equal to the amount of GHG emissions reduced. Other projects, can then purchase those CRT's to offset their own emissions. For more information see the Technical Appendix B of the Climate Action Plan

APPENDIX E
DRAFT INITIAL STUDY/ NEGATIVE DECLARATION

Pasadena Climate Action Plan

Draft Initial Study/Negative Declaration

prepared by
City of Pasadena
175 North Garfield Avenue
Pasadena, California 91101

prepared with the assistance of
Rincon Consultants, Inc.
250 East 1st Street, Suite 301
Los Angeles, California 90014

Rincon Consultants, Inc.
Environmental Scientists Planners Engineers
www.rinconconsultants.com

December 28, 2017

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Initial Study

1. Project Title

Pasadena Climate Action Plan (CAP)

2. Lead Agency Name and Address

City of Pasadena
175 North Garfield Avenue
Pasadena, CA 91101

3. Contact Person and Phone Number

Anita Cerna, Senior Planner
(626) 744-6767

4. Project Location

The City of Pasadena Climate Action Plan (CAP) applies to all areas within the Pasadena City limits. Pasadena covers approximately 22.5 square miles in the western San Gabriel Valley in Los Angeles County, and is bordered by the San Gabriel Mountains to the north, and seven cities: La Canada Flintridge, South Pasadena, Arcadia, Sierra Madre, San Marino, Glendale, Los Angeles, and unincorporated Los Angeles County (including the Altadena community).

5. Project Sponsor's Name and Address

City of Pasadena
175 North Garfield Avenue
Pasadena, CA 91101

6. Regulatory Background

This section summarizes California's greenhouse gas (GHG) emissions reduction efforts. The State of California considers GHG emissions and the impacts of climate change to be a serious threat to the public health, environment, economic well-being, and natural resources of California, and has taken an aggressive stance to mitigate the State's impact on climate change through the adoption of policies and legislation. Assembly Bill (AB) 32, also known as the Global Warming Solutions Act of 2006 establishes a statewide target of reducing GHG emission to 1990 levels by 2020 and directs public agencies to support the targets through their local planning efforts. The following paragraphs summarize the State's GHG reduction efforts in chronological order.

Executive Order S-3-05

In 2005, the Governor issued Executive Order (EO) S-3-05, which identifies statewide GHG emission reduction targets to achieve long-term climate stabilization as follows:

- Reduce GHG emissions to 1990 levels by 2020; and
- Reduce GHG emissions to 80 percent below 1990 levels by 2050.

In response to EO S-3-05, California Environmental Protection Agency (CalEPA) created the Climate Action Team (CAT), which in March 2006 published the Climate Action Team Report (the "2006 CAT Report") (CalEPA, 2006). The 2006 CAT Report identified a recommended list of strategies that the State could pursue to reduce GHG emissions. These are strategies that could be implemented by various State agencies to ensure that the emission reduction targets in EO S-3-05 are met and can be met with existing authority of the State agencies. The strategies include the reduction of passenger and light duty truck emissions, the reduction of idling times for diesel trucks, an overhaul of shipping technology/infrastructure, increased use of alternative fuels, increased recycling, and landfill methane capture, etc.

Assembly Bill 32

California's major initiative for reducing GHG emissions is outlined in Assembly Bill 32 (AB 32), the "California Global Warming Solutions Act of 2006," signed into law in 2006. AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020 (the same requirement as under S-3-05), and requires the Air Resources Board (ARB) to prepare a Scoping Plan that outlines the main State strategies for reducing GHGs to meet the 2020 deadline. In addition, AB 32 requires ARB to adopt regulations to require reporting and verification of State's largest industrial emitters.

Senate Bill 97

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In March 2010, the California Resources Agency (Resources Agency) adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts. Specifically, Section 15183.5 was added to the State CEQA Guidelines, which specifies that a GHG Reduction Plan, or Climate Action Plan, may be used for tiering and streamlining the analysis of GHG emissions in CEQA documents provided that the CAP does the following:

- Quantifies GHG emissions both existing and projected over a specific period of time, resulting from activities within a defined geographical area.
- Establishes a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable.
- Identifies and analyzes the GHGs emissions resulting from specific actions or categories of actions anticipated within the geographic area.
- Specifies measures or a group of measures, including performance indicators, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.
- Establishes a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels.
- Be adopted in a public process following environmental review.

Senate Bill 375

SB 375, signed in August 2008, enhances the State's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles for 2020 and 2035. In addition, SB 375 directs each of the State's 18 major Metropolitan Planning Organizations (MPO) to prepare a "sustainable communities strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the Regional Transportation Plan (RTP). On September 23, 2010, CARB adopted final regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035.

AB 32 Scoping Plan

The Air Resources Board approved the initial AB 32 Scoping Plan on December 11, 2008 and a 2020 statewide GHG emission limit of 427 million metric tons (MMT) of carbon dioxide equivalents (CO_2e) was established. The Scoping Plan also included measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

Senate Bill 2X

In April 2011, the governor signed SB 2X requiring California to generate 33 percent of its electricity from renewable energy by 2020.

AB 32 Scoping Plan Update

In May 2014, CARB approved the first update to the AB 32 Scoping Plan. The first Scoping Plan update defines CARB's climate change priorities for the next five years and sets the groundwork to reach post-2020 targets set forth in EO S-3-05. The update highlights California's progress toward meeting the "near-term" 2020 GHG emission reduction targets defined in the original Scoping Plan. It also evaluates how to align the State's longer-term GHG reduction strategies with other State policy priorities, such as for water, waste, natural resources, clean energy and transportation, and land use (CARB 2017).

Executive Order B-30-15

EO B-30-15 established a statewide mid-term GHG reduction target of 40 percent below 1990 levels by 2030. Targets set beyond 2020 provide market certainty to foster investment and growth in industries like clean energy.

Senate Bill 350

Senate Bill (SB) 350, the Clean Energy and Pollution Reduction Act of 2015, was approved in October 2015. SB 350 has two objectives: to increase the procurement of electricity from renewable sources from 33 percent to 50 percent by 2030 and to double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation.

Senate Bill 32

Senate Bill 32 (SB 32) became effective on January 1, 2017 and requires the CARB to develop technologically feasible and cost effective regulations to achieve the targeted 40 percent GHG

emission reduction by 2030. On December 14, 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 target. As with the 2013 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends that local governments adopt policies and locally-appropriate quantitative thresholds consistent with a statewide per capita goal of six metric tons CO_2e by 2030 and two metric tons CO^2e by 2050.[1]

7. General Plan Designation

The CAP would be implemented throughout the City and would occur in all General Plan designations.

8. Zoning

The CAP would be implemented throughout the City in all zoning designations.

9. Description of Project

The CAP is a programmatic, long-range qualified GHG reduction plan that is intended to reduce GHG emissions from community activities and municipal operations in Pasadena to support the State's efforts under EO S-3-05, AB 32, and SB 32 and provide adaptation measures to minimize the impacts of climate change on Pasadena . The Pasadena CAP serves as a roadmap for the City to reduce GHG emissions and prepare for the impacts of climate change. The CAP builds on the goals and policies of the General Plan and complements the State's climate change objectives to address climate change. As part of the development of the Pasadena CAP, a GHG emissions inventory and forecast were conducted. The inventory provides the City with a baseline from which to track emission reductions – both citywide and within the City's municipal government. A Vulnerability Assessment was also conducted, which provides the City with an overview of anticipated impacts that could be caused by a changing climate and evaluates the potential impacts these hazards may have on people and community assets. The CAP sets GHG reduction goals and includes actions that will assist with accomplishing those goals. It also establishes strategies that will help strengthen community resilience to climate impacts. Specifically, the CAP does the following:[2]

- Summarizes the results of the City of Pasadena's GHG Emissions Inventories (2009 and 2013 data years), which identify the major sources and quantities of GHG emissions produced within Pasadena and forecasts how these emissions may change over time
- Establishes GHG emissions reduction goals consistent with the State targets as follows:
  - 27 percent below 2009 levels by the year 2020 (equivalent to 14 percent below 1990 levels), exceeding the AB 32 target
  - 49 percent below 2009 levels by 2030 (equivalent to 40 percent below 1990 levels) , consistent with the SB 32 target
  - 59 percent below 2009 levels by 2035 (equivalent to 52 percent below 1990 levels); and
  - 83 percent below 2009 levels by 2050 (equivalent to 80 percent below 1990 levels), consistent with Executive Order S-3-05[3]

[1] CARB 2017 Climate Change Scoping Plan (2017)
[2] Section 15183.5(b)(1)A-G of the State CEQA Guidelines
[3] This is an improvement from the 2009 baseline.

- Identifies climate action measures and implementation actions to reduce GHG emissions, including performance indicators that, if implemented, would collectively achieve the specified emissions reduction goals
- Identifies climate action measures to help Pasadena prepare for anticipated climate change impacts
- Sets forth procedures to implement, monitor, and verify the effectiveness of the climate action measures and adapt efforts moving forward

The CAP utilizes 2009 as the baseline year and 2020, 2030, 2035, and 2050 as the goal years for achieving reductions. The 2020 goal corresponds with the target year identified in AB 32 and the 2030 goal corresponds with the target year identified in SB 32. The 2035 goal corresponds with the horizon year of the Pasadena General Plan and is included on the trajectory from the 2030 goal to the City's long term 2050 goal as identified in Executive Order S-3-05.

GHG Emissions Inventory and Forecast

2009 and 2013 GHG Emissions Inventories

In preparation of a climate action plan, the City conducted a community-wide GHG emissions inventory for the year 2009. The 2009 inventory serves as the baseline from which Pasadena's progress towards GHG emissions reduction is measured. The 2009 inventory (also referred to as the 2009 baseline) establishes an emissions level which can be tied to the State's GHG reduction targets and from which Pasadena's reduction goals can be established. Pasadena's reduction goals for future years will all be relative to the 2009 baseline GHG emissions level (e.g., percentage reduction below the 2009 baseline). Subsequently, the City conducted a community-wide GHG emissions inventory for the year 2013, as part of the General Plan Update process. The 2013 inventory allows the City to start analyzing emissions trends over time. These inventories were refined in order to provide a consistent methodology across past and future GHG inventories to allow for a comparison of the City's change in emissions over time. The 2013 inventory was modified in order to remove the wastewater and off-road sectors, as these sectors were not included in the 2009 inventory. Additionally, to provide an accurate comparison between the 2009 and 2013 inventories, it was necessary to adjust the calculation methods used to estimate the emissions associated with the 2013 electricity use for water delivery to avoid double-counting and to recalculate 2013 solid waste emissions utilizing the same methodology used in 2009 inventory.

Between 2009 and 2013, community-wide GHG emissions fell from 2.04 MMT of CO_2e to 1.86 MMT of CO_2e despite continued growth in the Pasadena's service population (residents + employees). In 2009, the largest contributors of GHG emissions were transportation (52 percent), commercial/industrial energy use (31 percent), and residential energy use (16 percent). The remainder of emissions resulted from solid waste (less than 1 percent) and water (less than 1 percent). A similar breakdown of emissions occurred in 2013, with the largest contributors of GHG emissions being transportation (53 percent), commercial/industrial energy use (27 percent), and residential energy use (16 percent). The remainder of emissions resulted from solid waste (1 percent) and water (3 percent).

The GHG emissions inventory also analyzed GHG emissions from municipal operations and facilities. The municipal inventory is a subset of the community-wide inventory, meaning that the local government's GHG emissions are included within the community-wide inventory. In 2009, municipal operations generated approximately 121,811 MT CO_2e. This quantity represents approximately six percent of the community's total GHG emissions.

GHG Emissions Forecasts

Pasadena's community-wide GHG emissions were forecasted for the years 2020, 2030, 2035, and 2050. Under the business-as-usual scenario (a projection of how emissions will change in the future based on 2009 emissions levels and the projected growth that would be accommodated by the General Plan[4]), Pasadena's community-wide GHG emissions are projected to decrease by approximately 3 percent below 2009 GHG emissions levels by the year 2020 (from 2,044,921 MT of CO_2e to 1,987,226 MT of CO_2e), and increase by approximately 2 percent by the year 2030 (from 2,044,921 MT of CO_2e to 2,093,938 MT of CO_2e). By 2035, emissions are expected to increase to 2,147,294 MT of CO_2e (or 5 percent) from 2009 baseline conditions. Community-wide emissions for Pasadena are expected to increase to 2,214,105 – 2,334,548 MT of CO_2e (or up to 12 percent) by 2050. Emissions forecasts for the year 2050 are presented as a range since forecasting out to the year 2050 is inherently uncertain at this time.

In May 2014, pursuant to AB 32, CARB approved the first update to the AB 32 Climate Change Scoping Plan. This update identifies several State regulations that are approved, programmed, and/or adopted and would reduce future GHG emissions within Pasadena. The business-as-usual scenario was adjusted to account for these State regulations, such as Pavley, Advanced Clean Cars, and the California Building Standards Code (Title 24). This scenario is referred to as the adjusted scenario, which provides a more accurate picture of future emissions growth and the responsibility of the City once State regulations to reduce GHG emissions have been implemented[5].

Under the adjusted scenario, GHG emissions are projected to decrease approximately 16 percent below the business-as-usual scenario to 1,671,934 MT of CO_2e in 2020; 33 percent below the business-as-usual scenario to 1,408,063 MT of CO_2e in 2030; 41 percent below the business-as-usual scenario to 1,276,128 MT of CO_2e in 2035; and between 43 to 44 percent below the business as usual scenario to 1,262,573 – 1,304,788 MT of CO_2e in 2050. Table 1 summarizes the reduction in local GHG emissions that would result from State regulations compared to the business-as-usual forecast and the adjusted forecast.

Table 1 Summary of State Reductions and Adjusted Forecast

	City of Pasadena GHG Emissions (MT of CO_2e)			
	2020	2030	2035	2050
Business as Usual Forecast	1,987,226	2,093,938	2,147,294	2,214,105 – 2,334,548
Reduction from State Regulations	315,292	685,875	871,166	951,532 – 1,029,760
Adjusted Forecast	1,671,934	1,408,063	1,276,128	1,262,573 – 1,304,788

GHG Reduction Goals

Pasadena's GHG emissions reduction goals are:

- 1,492,793 MT of CO_2e in 2020 (equivalent to 27 percent below 2009 levels and 14 percent below 1990 levels)
- 1,042,910 MT of CO_2e in 2030 ((equivalent to 49 percent below 2009 levels and 40 percent below 1990 levels)

[4] The business-as-usual forecasts do not take the reductions from existing State and local measures into account.
[5] The adjusted forecast does not account for State regulations included in CARB's 2017 Climate Change Scoping Plan as the scoping plan was in draft form and subject to change when this document was prepared. As such, the adjusted forecast only accounts for State regulations that are currently programmed in order to maintain a conservative estimate of the portion of Pasadena's emissions that will be reduced by State measures.

- 838,418 MT of CO_2e in 2035 (equivalent to 59 percent below 2009 levels and 52 percent below 1990 levels)
- 347,637 MT of CO_2e in 2050 (equivalent to 83 percent below 2009 levels and 80 percent below 1990 levels)

Pasadena has established an ambitious GHG reduction goal for the year 2020. Pasadena's 2020 GHG reduction goal is 27 percent below 2009 levels, exceeding the State's 2020 target by 14 percent. To meet this 2020 goal, Pasadena will need to reduce its GHG emissions by 179,141 MT of CO_2e, approximately 11 percent below the 2020 adjusted forecast.

Pasadena's 2030 GHG reduction goal is 49 percent below 2009 levels by 2030, consistent with the State's target identified in SB 32 (40 percent below 1990 levels by 2030). To meet this 2030 goal, Pasadena would need to reduce its GHG emissions by 365,153 MT of CO_2e, approximately 26 percent below the 2030 adjusted forecast.

Pasadena's 2035 GHG reduction goal is 59 percent below 2009 levels by 2035, in-line with the State's GHG reduction trajectory identified in Executive Order S-3-05. To meet this 2035 goal, Pasadena would need to reduce its GHG emissions by 437,710 MT of CO_2e, approximately 34 percent below the 2035 adjusted forecast.

Pasadena's 2050 GHG reduction goal is 83 percent below 2009 levels by 2050, consistent with the State's reduction target identified in Executive Order S-3-05 (80 percent below 1990 levels by 2050). To meet this 2050 goal, Pasadena would need to reduce its GHG emissions by 914,936 - 957,151 MT of CO_2e, approximately 72-73 percent below the 2050 adjusted forecast.

These goals will be achieved by implementing a set of local GHG reduction measures established in the CAP.

Climate Action Measures and Adaptation Measures

The CAP identifies a set of climate action measures designed to achieve the GHG emissions reduction goals for 2020, 2030, and 2035. It also establishes measures to help prepare for the anticipated effects of climate change. Proposed climate action measures were developed to meet the goals established by the City and to achieve or exceed the statewide emission reduction targets. These CAP measures are organized into the following focus areas, or categories: Sustainable Mobility and Land Use, Energy Efficiency and Conservation, Water Conservation, Waste Reduction, and Urban Greening. The climate action measures were selected based on distribution of emissions sources revealed in the GHG emissions inventories, the emissions reductions needed to achieve the goals, the goals and policies identified in the General Plan, and existing and ongoing efforts and priorities. Collectively, the climate action measures identified in the CAP have the potential to reduce GHG emissions in Pasadena by 181,197 MT of CO_2e by 2020 and 458,181 MT of CO_2e by 2035. Therefore, the established set of measures would provide for GHG reductions sufficient to meet Pasadena's proposed GHG emission reduction goals and the State's established targets. While the CAP does include a GHG reduction goal in support the State's efforts under EO S-3-05 for 2050, the CAP does not include climate action measures designed to achieve the 2050 goal as presently EO S-3-05 does not specify any plan or implementation measure to achieve its goal. Additionally, although the emission forecasting for 2050 does predict a downward trend in emissions from 2020

to 2050, there is presently no reliable means of forecasting how future technological developments or state legislative actions to reduce GHG emissions may affect future emissions in Pasadena.

Table 2 shows a list of climate action measures and their associated GHG emissions reductions, and Table 3 shows the adaptation measures. While the adaptation measures do not contribute to reductions in greenhouse gas emissions, the recommended adaptation measures focus on bolstering the community's resilience to climate change.

Table 2 Summary of Climate Action Measures

CAP Measure		Potential 2020 GHG Reduction MT of CO_2e	Potential 2035 GHG Reduction MT of CO_2e
Sustainable Mobility and Land Use			
T-1.1:	Continue to expand Pasadena's bicycle and pedestrian network.	1,275	1,602
T-1.2:	Continue to improve bicycle and pedestrian safety.		
T-1.3:	Continue to encourage bicycle and pedestrian travel.		
T-2.1:	Continue to enhance safe, reliable, and seamless transit services.	32,414	84,828
T-3.1:	Decrease annual commuter miles traveled by single-occupancy vehicles.	5,502	22,163
T-3.2:	Improve the existing transportation system to smooth traffic flow, reduce idling, minimize bottlenecks, and encourage efficient driving techniques.	Supportive	Supportive
T-4.1:	Expand the availability and use of alternative fuel vehicles and fueling infrastructure.	27,097	134,087
T-5.1:	Facilitate high-density, mixed-use, transit-oriented and infill development.	Quantified in adjusted forecast	Quantified in adjusted forecast
T-6.1:	Reduce GHG emissions from heavy-duty construction equipment and vehicles.	Supportive	Supportive
T-7.1:	Reduce GHG emissions from lawn and garden equipment.	Supportive	Supportive
Sustainable Mobility and Land Use Subtotal		**66,288**	**242,680**
Energy Efficiency and Conservation			
E-1.1:	Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards.	Implemented after 2020	6,784
E-1.2:	Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency.	Quantified in E-1.1	Quantified in E-1.1
E-2.1:	Facilitate energy-efficient upgrades in existing homes and businesses.	103,629	162,720
E-3.1:	Increase municipal energy conservation efforts.	2,406	14,193
E-4.1:	Increase city-wide use of carbon-neutral energy by encouraging and/or supporting carbon-neutral technologies.	2,264	15,347
E-5.1:	Continue to expand the City's renewable and/or carbon-neutral energy portfolio.	Quantified in adjusted forecast	Quantified in adjusted forecast
Energy Efficiency and Conservation Subtotal		**108,299**	**199,044**
Water Conservation			

CAP Measure	Potential 2020 GHG Reduction MT of CO_2e	Potential 2035 GHG Reduction MT of CO_2e
WC-1.1: Reduce potable water usage throughout Pasadena.	1,867	963
WC-2.1: Increase access to and use of non-potable water.	0	953
WC-3.1: Improve storm water systems to slow, sink, and treat run-off, recharge groundwater, and improve water quality.	Supportive	Supportive
Water Conservation Subtotal	**1,867**	**1,916**
Waste Reduction		
WR-1.1: Continue to reduce solid waste and landfill GHG emissions.	0	7,359
WR-2.1: Establish a "Preferred Procurement Plan" for sustainable, strategic sourcing for all City departments and facilities.	Quantified in WR-1.1	Quantified in WR-1.1
WR-2.2: Create an internal recuse program for all City departments to recirculate unwanted goods.		
WR-3.1: Implement a city-wide composting program to limit the amount of organic material entering landfills.	4,559	6,838
WR-3.2: Implement 3-bin compost systems, in addition to recycling and landfill bins, at public parks to compost all trimmings and waste on-site to divert organic materials from the landfill and increase locally available compost.	Quantified in WR-3.1	Quantified in WR-3.1
WR-4.1: Reduce the GHG impacts of the waste collection system.	Quantified in T-4.1	Quantified in T-4.1
Waste Reduction Subtotal	**4,559**	**14,197**
Urban Greening		
UG-1.1: Continue to preserve, enhance, and acquire additional greenspace throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation	22	129
UG 2.1: Continue to protect existing and plant new trees to improve and ensure viability of Pasadena's urban forest	162	215
Urban Greening Subtotal	**184**	**344**
Total	**181,197**	**458,181**

Table 3 Summary of Climate Adaptation Measures

Adaptation Measures	
A 1:	Improve community preparedness and emergency response.
A 2:	Promote healthy, safe, and resilient communities.
A 3:	Support strategies to reduce the urban heat island effect.
A 4:	Improve the resilience of systems that provide resources and services critical to community function.
A 5:	Support educational campaigns and outreach efforts that increase public awareness of climate change and the anticipated effects on the community.

Implementation and Monitoring

Implementation and monitoring are essential processes to ensure that Pasadena reduces its GHG emissions and meets its goals. To facilitate this, each climate action measure is identified along with implementation actions, parties responsible for implementation and monitoring, the GHG reduction potential (as applicable), performance indicators to monitor progress, and an implementation time

frame (see Chapter 4, Implementation and Monitoring, of the CAP). Climate action measure implementation is separated into three phases: near-term (by 2020), mid-term (2021-2030), and long-term (2031-2035). The City's Planning & Community Development Department will monitor implementation of the CAP.

10. Required Approvals

The project requires the adoption of the CAP and the Initial Study and Negative Declaration. Although individual projects may be implemented under the CAP, each project would be subject to separate environmental review under CEQA.

11. Surrounding Land Uses and Setting

Pasadena encompasses approximately 14,803 acres (23 square miles) in the western San Gabriel Valley, bordered by the unincorporated Altadena community to the north; South Pasadena and San Marino to the south; Arcadia, Sierra Madre, and unincorporated Los Angeles County to the east; and Glendale, La Cañada Flintridge, and Los Angeles to the west. The City is located 10 miles northeast of downtown Los Angeles with an elevation of 864 feet above sea level (City of Pasadena 2015c).Pasadena is an urbanized city that is generally dominated by residential uses and supporting service uses such as the Rosebowl, Arroyo Seco, and the Gold Line. Pasadena has an average high temperature of 75°F and an average low temperature of 48°F. Figure 1 shows the regional location and Figure 2 shows the project site location.

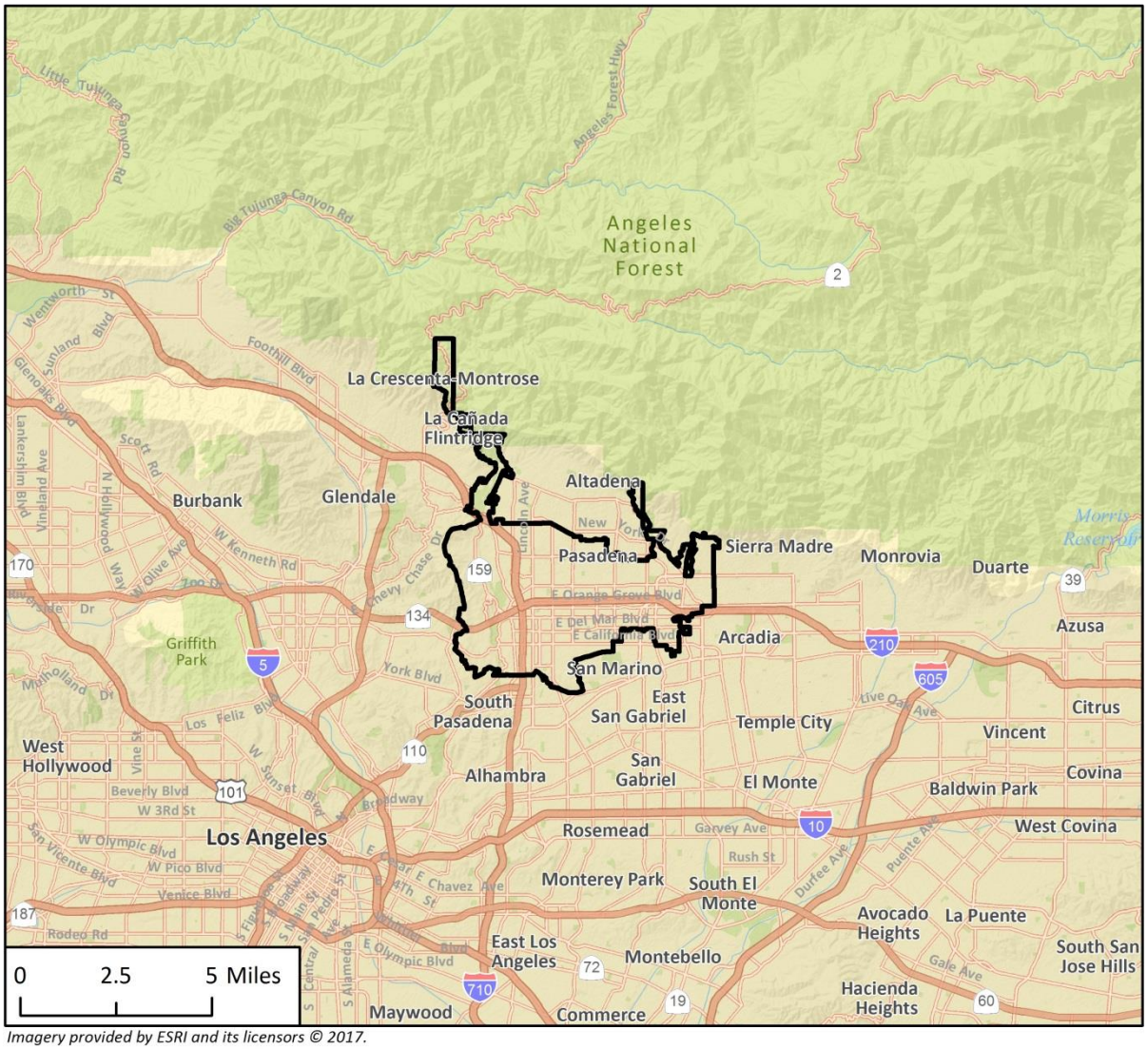
12. Other Public Agencies Whose Approval is Required

The City of Pasadena has sole approval authority over the CAP. There are no other public agencies whose approval is required.

13. Have California Native American Tribes Traditionally and Culturally Affiliated with the Project Area Requested Consultation Pursuant to Public Resources Code Section 21080.3.1? If so, Has Consultation Begun?

The City of Pasadena prepared and mailed notification letters under Assembly Bill 52 on March 23, 2017. The Gabrieleño Band of Mission Indians responded and requested consultation, which occurred on May 25, 2017. The tribal consultation concluded that the CAP would not have a significant adverse impact on Tribal Cultural Resources.

Figure 1 Regional Location



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City of Pasadena

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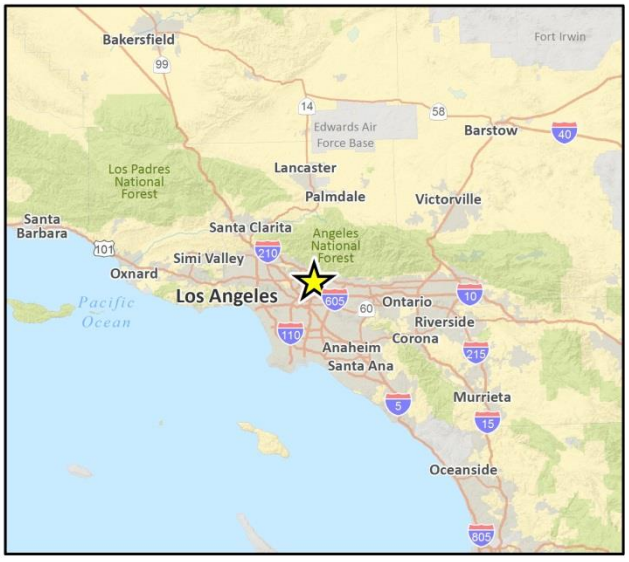
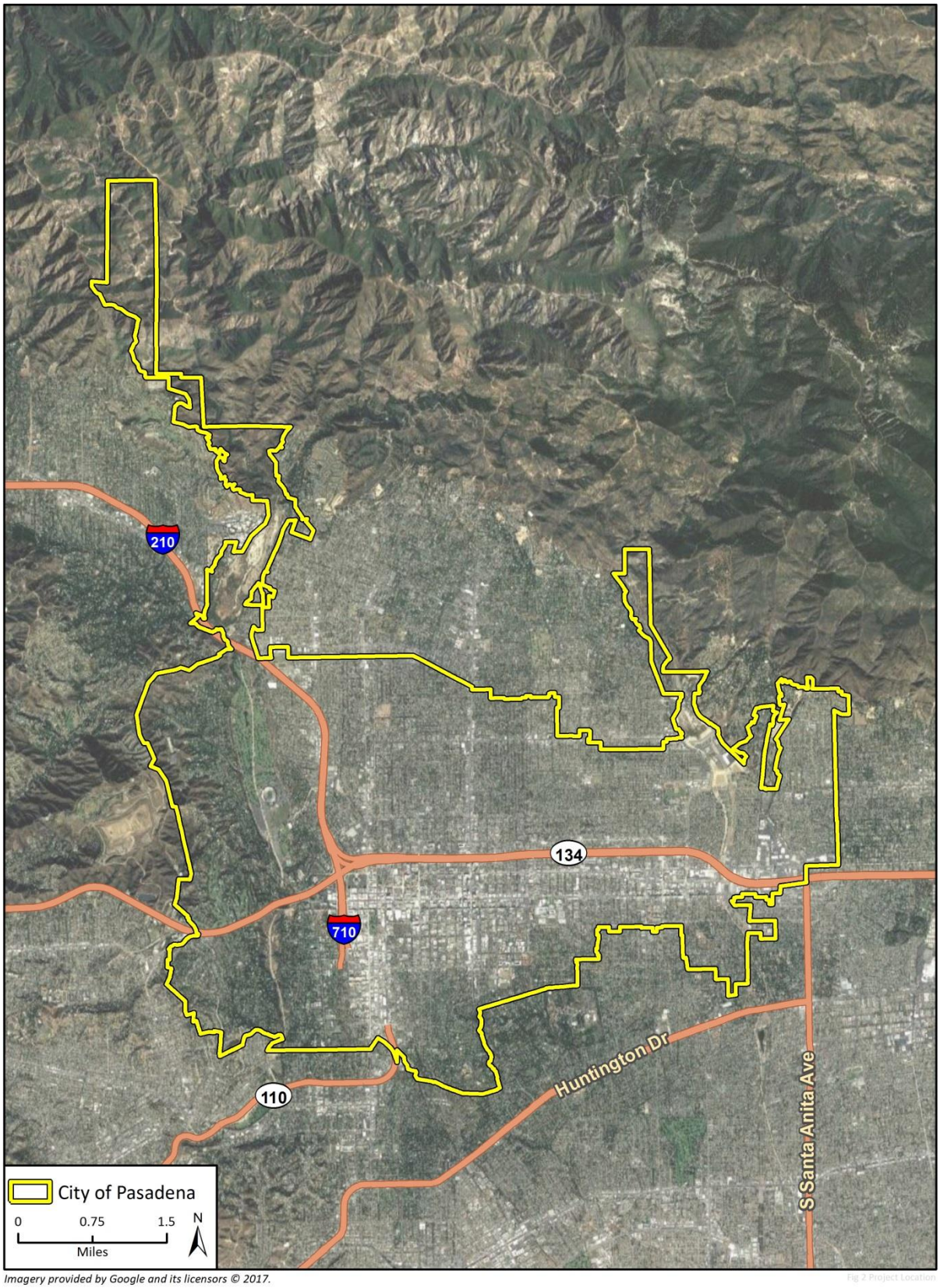


Figure 2 Project Site Location



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Environmental Factors Potentially Affected

This project would potentially affect the environmental factors checked, involving at least one impact that is "Potentially Significant" or "Potentially Significant Unless Mitigation Incorporated" as indicated by the checklist on the following pages.

☐	Aesthetics	☐	Agriculture and Forestry Resources	☐	Air Quality
☐	Biological Resources	☐	Cultural Resources	☐	Energy
☐	Geology and Soils	☐	Greenhouse Gas Emissions	☐	Hazards and Hazardous Materials
☐	Hydrology / Water Quality		Land Use/ Planning	☐	Mineral Resources
☐	Noise	☐	Population / Housing	☐	Public Services
☐	Recreation	☐	Transportation / Traffic	☐	Tribal Cultural Resources
☐	Utilities / Service Systems	☐	Mandatory Findings of Significance	☐	Utilities / Service Systems

Determination

Based on this initial evaluation:

■ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potential significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Printed Name	Title

Environmental Checklist

1 Aesthetics

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Have a substantial adverse effect on a scenic vista?	☐	☐	■	☐
b. Substantially damage to scenic resources, including but not limited to trees, rock outcroppings, and historic buildings along a State scenic highway?	☐	☐	■	☐
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	■	☐
d. Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	☐	☐	■	☐

a. Would the project have a substantial adverse effect on a scenic vista?

c. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

The Pasadena CAP serves as a roadmap for the City to reduce GHG emissions and prepare for the impacts of climate change. The Pasadena CAP builds on the goals and policies of the General Plan and complements the State's objectives to address climate change.

The Pasadena CAP is designed to reduce the City's GHG emissions and combat climate change. It establishes near and long-term goals for reducing emissions. In order to meet these GHG reduction goals, the Pasadena CAP identifies local measures. These measures focus on reducing emissions in the following sectors: Sustainable Mobility and Land Use, Energy Efficiency and Conservation, Water Conservation, Waste Reduction, and Urban Greening. Each measure is to be achieved through a set of specific actions. Most of these actions will have quantifiable reductions in GHG emissions, while others are difficult to measure. Many of these actions are intended to achieve broader sustainability objectives, such as improving air quality and public health, conserving water and other natural resources.

The CAP does not involve any land use or zoning changes. Rather, the CAP would promote development that could already occur under the General Plan. As a policy document, the CAP would not affect scenic vistas or the visual character or quality of the area. Implementation of the climate action measures and actions would generally encourage energy efficiency and conservation, as well

as the use of solar energy; incentivize smart growth as specified in the General Plan; encourage walking, bicycling, and use of existing public transit; and increase solid waste diversion.

The CAP includes a climate action measure (Measure E-4.1) to pursue small-scale onsite carbon-neutral energy systems at City buildings and facilities and to encourage their installation throughout the community. In 2011, the California Legislature signed Senate Bill 226 and created a statutory exemption (CEQA exemption 21080.35) for solar projects installed on rooftops or existing parking lots (and meeting specified conditions). In addition, Assembly Bill 2188 (AB 2188) took effect on January 1, 2015 and required local governments to adopt a streamlined and expedited permit approval process for small residential solar energy panels. Pasadena adopted an ordinance (Pasadena Municipal Code: 14.90.030) to comply with AB 2188 regulations. Solar photovoltaic array (PV) installations that are exempt from CEQA are the type of solar energy projects anticipated to result from implementation of the CAP measures. Large-scale substantial renewable energy facilities, such as a wind or solar farm or large solar panel installations that could have visual impacts are not included in the CAP measures.

The CAP also includes a climate action measure (Measure UG-2.1) that facilitates the continued protection of existing trees, in addition to planting new trees to improve and ensure the viability of the City's urban forest. Similarly, Measure E-1.2 encourages the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency and reduce housing costs such as maximize the cooling of buildings through tree planting and shading to reduce building electricity demands. Planting new street trees and private trees may change the visual character of the City. Pasadena's urban forest is managed by the Department of Public Works, which oversees the Urban Forestry Program. As part of the Urban Forestry Program, an Urban Forest Management Plan (UFMP) was drafted in 2016. The goal of the UFMP is to assemble public tree management practices, policies, and procedures into one user friendly document. The Department of Public Works has developed various management practices and is guided by policies and plans approved by the City Council. The practices and policies establish strict thresholds for tree removals, advocate for proper planting and maintenance practices, establish tree protections and include a plan to guide street tree plantings throughout the City (Dudek 2016).

Additionally, with respect to trees on private property the City recognizes that public education regarding the importance of proper private tree care is an essential component of urban forest management and the UFMP includes goals to raise the level of public understanding and appreciation for trees and urban forest systems, resulting in improved private tree selection, placement, care, and more sustainable urban forest benefits. Therefore, it is anticipated that the implementation of Measures UG-2.1 and E-1.2 would not result in a substantial adverse effect on a scenic vista or substantially degrade the existing visual character or quality of the City. Rather, trees would be planted in a way that promotes the existing character and quality of the City.

In addition, the CAP includes a measure (Measure WR-3.2) that encourages implementation of a three-bin compost system in addition to recycling bins and landfill bins at public parks to compost trimmings and waste onsite to divert organic materials from the landfill, increase locally available compost to fertilize the park landscape, and educate the public about composting. Installing onsite composting systems at public parks could alter the visual character of the site. However, onsite composting systems installed at public parks would compost the material that is generated onsite and would be relatively small in scale. Additionally, Measure WR-3.2 includes an action item that would promote signs and other educational tools such as a kiosk with information about composting and the benefits for local composting solutions. The composting system would also provide an opportunity to host community workshops and events in the park to promote the

benefits of composting onsite and environmental literacy, which aligns with the goals and objectives included in the Open Space and Conservation Element of the General Plan.

The CAP would also include Measure T-5.1 that facilitates high density, mixed-use, transit-oriented, and infill development. Implementation of this measure may provide incentives for private property owners and developers to improve vacant or underutilized parcels in the urban core, which could result in intensification that is consistent with build-out of the General Plan. For example, Goal 28, *Places to Live, Work, Shop, and Recreate*, included in the Land Use Element of the General Plan, aims to provide a diversity of well-designed corridors and villages containing an integrated mix of commercial uses and/or housing that enable residents to live close to businesses, services, and employment, and reduce automobile use, and actively engage and enhance pedestrian activity.

Furthermore, the CAP includes climate action measures to pursue energy efficiency and conservation at City buildings and facilities (CAP Measure E-3.1) and to encourage energy efficiency improvements in new and existing buildings throughout the City (CAP Measures E-1.1, E-1.2, and E-2.1). Making buildings more energy efficient does not involve any design features that would adversely affect scenic vistas or negatively affect the visual character or quality. Based on the analysis above, implementation of CAP measures and actions would not result in substantial effects on a scenic vista or substantially degrade the existing visual character or quality of the City. Further, any future site-specific discretionary projects would be subject to subsequent environmental review wherein any site-specific aesthetic impacts would be addressed accordingly. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings in a State scenic highway?

The portion of Interstate 110 (I-110) that is designated as a Historic Parkway runs from Los Angeles to Pasadena, where it connects to Historic Route 66. Additionally, Interstate 210 (I-210), an eligible State scenic highway, however not officially designated, runs from Pasadena to the terminus of I-210, at Interstate 5 (I-5) in Sylmar (Caltrans 2011).

The CAP is a policy document that does not include any specific development or other direct physical change to the environment, nor does it grant any entitlements for development that would potentially damage scenic resources such as trees, rock outcroppings, and historic buildings in a State scenic highway. Proposed climate action measures and actions would generally encourage energy efficiency and conservation, as well as the use of carbon-neutral energy; promote smart growth as specified in the General Plan; facilitate walking, bicycling, and use of existing public transit; and increase solid waste diversion. Because implementation of CAP measures would not potentially damage scenic resources, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?

Implementation of the CAP would not result in the development of new significant sources of light or glare. Distributed installation of small-scale solar photovoltaic systems is encouraged to reduce community-wide GHG emissions within Pasadena. Solar panels are designed to absorb light to generate energy, not reflect it. Thus, their placement and orientation on structures would not generate glare in a manner that would adversely affect day or nighttime views in the area.

Moreover, home and business owners may choose to install solar photovoltaic panels regardless of whether the CAP is implemented. The CAP also includes climate action measures (Measures E-1.1 – E-4.1) and actions to pursue energy efficiency and conservation at City buildings and facilities and to encourage energy efficiency improvements in new and existing buildings throughout the City. Implementation of these climate action measures and actions may include replacing lighting with energy efficient lighting, but would not create new sources of light and glare and, in some instances, may reduce lighting levels. Furthermore, Pasadena Zoning Code Section 17.40.080 requires new exterior lighting on private property to be energy-efficient and shielded. In particular, lights must be shielded or recessed so that direct glare and reflections are confined to the maximum extent feasible within the boundaries of the site by directing downward and away from adjoining properties and public rights-of-way.

Implementation of Measure T-3.2, which aims to implement improvements to smooth traffic flow, reduce idling, eliminate bottlenecks, and encourage efficient driving techniques, may include enhancing the Gold Line crossings. Enhancing the Gold Line crossings could include installation of flashing yellow arrows. These lights would only flash as the train approaches the train stop or intersection and would be temporary in nature to serve as a safety warning to stay off the tracks. Because the lights would be periodic in nature, they would not represent a new source of substantial light that would adversely affect daytime or nighttime views of the area.

Implementation of the CAP is not expected to create a new source of substantial light or glare that would adversely affect daytime or nighttime views. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

2 Agriculture and Forestry Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	■
b. Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	■
c. Conflict with existing zoning for or cause rezoning of forest land (as defined in Public Resources Code Section 12220(g)); timberland (as defined by Public Resources Code Section 4526); or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	☐	☐	☐	■
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	■
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	■

a. Would the project convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

c. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?

d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

e. Would the project involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?

Pasadena does not include land designated as farmland according to the California Department of Conservation Farmland Mapping and Monitoring Program (State of California 2014). Likewise, the City does not contain any forestry resources. The CAP is a policy document that does not involve any land use or zone changes, nor does it involve any specific development or other physical changes to the environment. As such, implementation of the CAP would not have the potential to substantially degrade agricultural resources or convert agricultural or forest land to non-agricultural or non-forest uses, nor would it conflict with existing zoning. Impacts to agricultural and forestry resources would not occur.

NO IMPACT

3 Air Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	■	☐
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	■	☐
c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	■	☐
d. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	■	☐
e. Create objectionable odors affecting a substantial number of people?	☐	☐	☐	■

Pasadena is in the South Coast Air Basin (the Basin), which is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). As the local air quality management agency, the SCAQMD is required to monitor air pollutant levels to ensure that State and federal air quality standards are met and, if they are not met, to develop strategies to meet the standards.

Depending on whether or not standards are met or exceeded, the Basin is classified as being in "attainment" or "non-attainment." The Basin is a non-attainment area for the federal standards for ozone, $PM_{2.5}$, and lead (Los Angeles County only), and the State standards for ozone, PM_{10}, and $PM_{2.5}$. Thus, the SCAQMD is required to implement strategies to reduce pollutant levels to recognized acceptable standards. The Basin's non-attainment status is a result of several factors, the primary ones being the naturally adverse meteorological conditions that limit the dispersion and diffusion of pollutants, the limited capacity of the local airshed to eliminate air pollutants, and the number, type, and density of emission sources within the Basin. The health effects associated with criteria pollutants are described in Table 4.

Table 4 Health Effects Associated with Criteria Pollutants

Pollutant	Adverse Effects
Ozone (O_3)	(1) Short-term exposures: (a) pulmonary function decrements and localized lung edema in humans and animals and (b) risk to public health implied by alterations in pulmonary morphology and host defense in animals; (2) long-term exposures: risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (3) vegetation damage; and (4) property damage.
Carbon monoxide (CO)	(1) Aggravation of angina pectoris and other aspects of coronary heart disease; (2) decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (3) impairment of central nervous system functions; and (4) possible increased risk to fetuses.
Nitrogen dioxide (NO_2)	(1) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (2) risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and (3) contribution to atmospheric discoloration.
Sulfur dioxide (SO_2)	(1) Bronchoconstriction accompanied by symptoms that may include wheezing, shortness of breath, and chest tightness during exercise or physical activity in persons with asthma.
Suspended particulate matter (PM_{10})	(1) Excess deaths from short-term and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease (including asthma).
Suspended particulate matter ($PM_{2.5}$)	(1) Excess deaths from short- and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes, including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children, such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease, including asthma.

Source: SCAQMD 2013

The SCAQMD has adopted an Air Quality Management Plan (AQMP) that provides a strategy for the attainment of State and federal air quality standards. For individual projects, the SCAQMD recommends the use of quantitative thresholds to determine the significance of temporary construction-related pollutant emissions and project operations. The SCAQMD has also developed Localized Significance Thresholds (LSTs). LSTs were devised in response to concern regarding exposure of individuals to criteria pollutants in local communities. LSTs represent the maximum emissions from a project that will not cause or contribute to an air quality exceedance of the most stringent applicable federal or State ambient air quality standard at the nearest sensitive receptor, taking into consideration ambient concentrations in each source receptor area (SRA), project size, distance to the sensitive receptor, etc. However, LSTs only apply to emissions within a fixed stationary location, including idling emissions during both project construction and operation. LSTs have been developed for NO_X, CO, PM_{10} and $PM_{2.5}$. LSTs do not apply to mobile sources such as cars on a roadway (SCAQMD 2003). Although SCAQMD has developed project-level quantitative thresholds, this analysis focuses on the consistency of the CAP with the AQMP because the CAP does not propose any specific development. The CAP's goal is to minimize emissions of GHGs, as mentioned in the *Description of Project (Page 4)*. Measures that would reduce GHG emissions would also generally reduce emissions of criteria air pollutants. These measures include Measures T-1.1 – T-5.1, which aim to reduce vehicle miles traveled (VMT) and improve traffic flow. This would reduce overall GHG emissions as well as emissions of criteria pollutants. Additionally, climate action measures related to energy, Measures E-1.1 – E-5.1, would also reduce emissions of criteria air

pollutants by reducing electricity use, facilitating energy upgrades in existing buildings, and pursuing and promoting renewable energy options.

a. *Would the project conflict with or obstruct implementation of the applicable air quality plan?*
b. *Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?*
c. *Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?*
d. *Would the project expose sensitive receptors to substantial pollutant concentrations?*

The Pasadena CAP is a policy document that does not propose specific development or other physical changes to the environment. Rather, the CAP would support development that could already occur under the General Plan. Thus, it is consistent with the AQMP. Furthermore, the purpose and intended effect of the CAP is to reduce GHG emissions generated in the City to help reduce the effects of climate change.

The proposed measures, when implemented, may require construction activities (e.g., bicycle facilities, energy retrofits, increased access to recycled water, etc.). Emissions from construction activities represent temporary impacts that are typically short in duration, depending on the size, phasing, and type of project. These impacts are generally associated with fugitive dust (PM_{10} and $PM_{2.5}$) and exhaust emissions from heavy construction vehicles and soil hauling trucks, in addition to ROG that would be released during the drying phase upon application of architectural coatings. Given the type and scale of improvements envisioned in the proposed CAP (e.g. residential solar panel installation, replacement of light fixtures, installation of bicycle racks, etc.), construction emissions are expected to be well below SCAQMD air quality emissions thresholds.

With respect to operational emissions, many programs to reduce GHG emissions would have the secondary benefit of reducing criteria pollutant emissions. For example, CAP measures and implementation actions identified in the CAP aim to increase energy efficiency and expand the city's renewable and/or carbon-neutral energy portfolio (CAP Measures E-4.1 – E-5.1); reduce vehicle miles traveled (CAP Measures T-1.1 – T-3.2, and T-5.1); reduce vehicle and equipment idling (CAP measures T-6.1); promote travel via low- and zero-emissions modes (i.e., walking, bicycling, transit, carpooling, electric vehicles, and other alternatively fueled vehicles (CAP Measures T-1.1 – T-3.1, T-4.1, and T-5.1)); reduce gasoline and diesel fuel use (CAP Measures T-1.1 – T-7.1); reduce potable water use (CAP Measures WC-1.1 and WC-2.1); increase renewable and carbon-neutral energy use (CAP Measures E-4.1 and E5.1); and improve waste management efficiency (CAP Measures WR-1.1 – WR-4.1). Implementation of these CAP measures would be beneficial by helping Pasadena meet applicable air quality plan goals and generally reduce sensitive receptor exposure to pollutant concentrations. In addition, as mentioned above, any development projects constructed in the City would undergo project-level CEQA review. Impacts related to air quality would be less than significant.

LESS THAN SIGNIFICANT IMPACT

e. Would the project create objectionable odors affecting a substantial number of people?

The CARB *Air Quality Land Use Handbook: A Community Health Perspective* (2005) identifies land uses associated with odor complaints which include: sewage treatment plants, landfills, recycling facilities, waste transfer stations, petroleum refineries, biomass operations, auto body shops, coating operations, fiberglass manufacturing, foundries, rendering plants, and livestock operations (CARB 2005).

Climate action Measure WR-3.1 would encourage backyard composting and Measure WR-3.2 would encourage compost systems in public parks. Backyard and park compost systems are not identified on the list of "Sources of Odor Complaints" (Table 1-4) as provided in the CARB *Air Quality Land Use Handbook*. Properly managed composting systems generate limited amounts of odor, if any. Composting at the scale encouraged by the proposed CAP (e.g., backyard composting) would not create objectionable odors affecting a substantial number of people. The CAP would not facilitate any specific development that would create odors. No impact would occur.

NO IMPACT

4 Biological Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	■	☐
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	■	☐
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	■	☐
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	■	☐
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	■	☐
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?	☐	☐	☐	■

a. *Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as candidate, sensitive, or special status in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?*

b. *Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?*

c. *Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?*

d. *Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?*

The Pasadena CAP is a policy document that does not facilitate new specific development. Rather, the CAP would generally encourage development in a manner consistent with the City's General Plan. The CAP does not include any site-specific development, designs, or proposals, nor does it grant any entitlements for development that would result in biological resource impacts. Pasadena is a primarily urbanized community. Nevertheless, the General Plan Land Use Element incorporates programs and policies to protect biological resources and preserve sensitive areas. Additionally, the Open Space Element of the General Plan provides a blueprint for natural open space and conservation, including specific goals and objectives that have been developed to protect and increase Pasadena's natural open space and support conservation efforts. Implementation of the CAP would not have a substantial adverse effect, either directly or indirectly through habitat modifications, on any species identified as a candidate, sensitive, special status species, or wildlife movement. In addition, the CAP itself would not have a substantial adverse effect on any riparian habitat or sensitive natural community. Furthermore, climate action Measures UG-1.1 and UG-2.1 support the protection of biodiversity and habitats by continuing to preserve, enhance, and acquire additional greenspace throughout the City and continuing to protect existing and plant new trees.

The measures included in the CAP would generally apply to the urbanized areas of the City, with little application to parks, open spaces area, or other locations where sensitive biological resources may be present. As discussed above, Measures UG-1.1 and UG-2.1 are specifically aimed at the preservation of trees and biological habitats. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

e. *Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?*

The CAP does not include any specific development nor would it add or enable any new development that would conflict with these local goals, policies, or ordinances protecting biological resources. Rather, the CAP would generally encourage development in a manner consistent with the City's General Plan. In addition, the CAP contains measures and actions that are consistent with the General Plan, which contains a Land Use Element with goals and policies to identify, protect, and enhance significant ecological and biological resources in Pasadena. Specifically, the General Plan Land Use Element includes policies 10.9 – 10.15 that relate to the natural environment. These policies intend to "protect natural open spaces, hillsides, watersheds, and critical habitats," as stated in Policy 10.9. Additionally, the City adopted the City Trees and Tree Protection Ordinance on

May 5, 2002. The City Trees and Tree Protection Ordinance was established to grow and preserve the urban forest. The ordinance includes four categories of protected trees, Public, Landmark, Specimen, and Native trees, and the specified locations where they are protected. Additionally, the CAP includes Measures UG-1.1 and UG-2.1, as mentioned above under impact a-d. Measures UG-1.1 and UG-2.1 aim to continue to preserve, enhance, and acquire additional greenspace throughout the City and continue to protect existing and plant new trees. The CAP would not affect the City's ability to attain goals and policies that protect biological resources, including the Trees and Tree Protection Ordinance. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

f. Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?

There are no adopted Habitat Conservation or Natural Community Conservation Plans in Pasadena. There are also no approved local, regional, or State habitat conservation plans. The CAP would not facilitate any specific development that would conflict with these plans. No impact would occur.

NO IMPACT

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5 Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	■	☐
b. Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	■	☐
c. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	■	☐
d. Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?	☐	☐	■	☐

a. *Would the project cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?*

b. *Would the project cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?*

c. *Would the project disturb any human remains, including those interred outside of formal cemeteries?*

d. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?*

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. The General Plan includes goals and policies in the Land Use Element that protect and preserve historic resources. For example, General Plan Goal 8, *Historic Preservation*, included in the Land Use Element, requires the preservation and enhancement of Pasadena's cultural and historic buildings, landscapes, streets, and districts as valued assets and important representations of its past and a source of community identity, as well as social, ecological, and economic vitality. Additionally, Policies 8.1 – 8.10 included under Goal 8, *Historic Preservation*, aim to: identify and protect historical resources; support historic designation; support preservation and restoration efforts; encourage sensitive adaptive reuse; promote architecturally sensitive approach to new construction in Landmark and Historic districts; encourage street design, public improvements, and utility infrastructure that preserves and is compatible with historic resources; preserve historic landscapes; encourage evolving preservation practices; support and encourage maintenance and upkeep of historical resources; and ensure that City enforcement procedures and activities comply with local, State, and federal historic preservation requirements.

Pasadena also has a Historic Preservation Ordinance that is part of the Historic Preservation Program managed by the City to promote the identification, evaluation, rehabilitation, adaptive reuse, and restoration of historic structures. The City's Historic Preservation Ordinance provides guidance for specifying significance criteria for the designation of historic resources, procedures for designation, and review procedures as outlined in Chapter 17.62 (Historic Preservation) of the PMC. Designation as a landmark under the Historic Preservation Ordinance necessitates design review of exterior alterations (and designated interiors). Pasadena has 11 historic districts listed on the National Register and 17 local landmark districts; there are also numerous individual historic resources in the City (City of Pasadena 2014). Examples of Pasadena's best-known historic resources include the Old Pasadena National Register Historic District, Pasadena City Hall, Pasadena Civic Auditorium, Castle Green/Green Hotel Apartments, Colorado Street Bridge spanning the Arroyo Seco, Pasadena Playhouse, and Gamble House.

The CAP includes measures that would encourage retrofit of older buildings to be more energy efficient and installation of solar PV systems on structures in the City. Physical alternation to historical buildings could adversely affect listing and/or eligibility. However, the City currently has policies and ordinances in place to protect historical resources (including City-owned buildings), such as the Historical Preservation Ordinance and goals/policies in the Land Use Element of the General Plan. Although the CAP does not propose any specific development, nor does it grant any entitlements for development that could cause a substantial adverse change in the significance of a historical, cultural, or archaeological resource, the CAP would be implemented in a manner consistent with the General Plan goals and policies, including those related to the protection and preservation of historic and cultural resources, in addition to the Historic Preservation Ordinance. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

6 Energy

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Conflict with adopted energy conservation plans?	☐	☐	■	☐
b. Use non-renewable resources in a wasteful and inefficient manner?	☐	☐	■	☐

a. Would the project conflict with adopted energy conservation plans?

b. Would the project use non-renewable resources in a wasteful and inefficient manner?

The Pasadena CAP is a policy document containing climate action measures and implementation actions to reduce GHG emissions. The CAP does not propose any specific development or other physical changes to the environment and would not facilitate growth beyond what the General Plan would allow. Furthermore, the purpose and intended effect of the CAP is to reduce GHG emissions generated in the City to help reduce the effects of climate change, including those emissions generated by energy demand and supply. For example, CAP Measures E-1.1 - E-2.1 support energy conservation by increasing energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards, encouraging the use of energy conservation devices and passive design concepts, and facilitating energy efficiency upgrades in existing homes and businesses. Measure E-4.1 encourages and promotes the use of residential and commercial carbon-neutral energy technology. Additionally, Measure E-3.1 encourages the City to lead by example through increased municipal energy conservation and Measure E-5.1 requires the City to continue to expand Pasadena Water and Power's renewable and carbon-neutral energy portfolio. Furthermore, in order to promote energy conservation, Pasadena has adopted an amended California Green Building Standards Code per Pasadena Municipal Code (PMC) Section 14.04.010. Therefore, any construction associated with projects included in the CAP would be required to be designed to comply with the performance levels of the California Green Building Standard Code. Likewise, all projects would be required to comply with the energy standards in the California Energy Code, Part 6 of the California Building Standards Code (Title 24). Therefore, the CAP would not conflict with any adopted energy conservation plans or result in the use of non-renewable resources in a wasteful or inefficient manner and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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7 Geology and Soils

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving:				
i Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?	☐	☐	■	☐
ii Strong seismic ground shaking?	☐	☐	■	☐
iii Seismic-related ground failure, including liquefaction?	☐	☐	■	☐
iv Landslides?	☐	☐	■	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	■	☐
c. Be located on a geologic unit or soil that is made unstable as a result of the project, and potentially result in on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	■	☐
d. Be located on expansive soil, as defined in Table 1-B of the Uniform Building Code, creating substantial risks to life or property?	☐	☐	■	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	■	☐

a.1 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent

Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?

a.2 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

a.3 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

a.4 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

b Would the project result in substantial soil erosion or the loss of topsoil?

c. Would the project be located on a geologic unit or soil that is unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

d. Would the project be located on expansive soil, as defined in Table 1-B of the Uniform Building Code, creating substantial risks to life or property?

The Pasadena CAP is a policy document containing climate action measures and implementation actions to reduce GHG emissions. The proposed CAP is consistent with Pasadena's General Plan and does not include any site-specific development, designs, or proposals, nor does it grant any entitlements for development that would impact geology and soils. Pasadena is located in a seismically active area and is susceptible to other various geological hazards such as the potential for liquefaction, landslides, subsidence, and expansive soils. However, all development projects are required to conform to applicable provisions of the current California Building Code (CBC). Additionally, the Safety Element of the General Plan includes policies to minimize injury, loss of life, property damage, and other impacts caused by seismic shaking, fault rupture, ground failure, earthquake induced landslides, and other earthquake-induced ground deformation. For example, Policies S-1, S-2, S-3, S-5, and S-7, included under Goal S-1, and Policy G-1, included under Goal G-1, fully cover the necessity to address seismic and geologic hazards:

- Goal S-1: Minimize injury and loss of life, property damage, and other impacts caused by seismic shaking, fault rupture, ground failure, earthquake-induced landslides, and other earthquake-induced ground deformation.
  - Policy S-1: The City will monitor development or re-development within the Fault Hazard Management Zones identified for both the Sierra Madre and Raymond faults.
  - Policy S-2: The City will ensure that current geologic knowledge and State-certified professional review are incorporated into the design, planning and construction stages of a project, and that site specific data are applied to each project.
  - Policy S-3: The City will strive to ensure that the design of new, and the performance of existing structures address the appropriate earthquake hazards.
  - Policy S-5: The City will continue earthquake strengthening and provisions for alternate or back-up essential services, such as water, sewer, electricity, and natural gas pipelines and connections throughout the City. First priority for this program should be for the essential services within the identified fault hazard management zones.

- Policy S-7: The City will educate the public on the hazards that can pose a risk to the City and its residents, and will describe loss reduction strategies that can be used to mitigate the specific hazards identified.

- Goal G-1: Minimize the risk to life or limb, and property damage resulting from soil and slope instability.
  - Policy G-1: Whenever possible, mitigation of geologic hazards will be conducted without violating the property owners' rights to modify or improve their investment, along with preserving the aesthetic or natural conditions of the area through minimal grading. When these goals are in conflict, protection of life and property will take precedence.

As mentioned above, the Pasadena CAP does not propose any site-specific development that would expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, or landslides. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

e. Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

With respect to septic tanks, most developments in the City of Pasadena are connected to Pasadena's sewer system and do not require the use of alternative wastewater disposal or septic tanks. Additionally, the recommended measures in the CAP would not require the use of septic tanks or alternative waste water disposal systems. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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8 Greenhouse Gas Emissions

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	■	☐
b. Conflict with any applicable plan, policy, or regulation adopted to reduce the emissions of greenhouse gases?	☐	☐	■	☐

Climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans along with other substantial changes in climate (such as wind patterns, precipitation, and storms) over an extended period. Climate change is the result of numerous, cumulative sources of greenhouse gases (GHG), which contribute to the "greenhouse effect," a natural occurrence that helps regulate the temperature of the planet. The majority of radiation from the sun hits the earth's surface and warms it. The surface in turn radiates heat back towards the atmosphere, known as infrared radiation. Gases and clouds in the atmosphere trap and prevent some of this heat from escaping into space and re-radiate it in all directions. This process is essential to support life on Earth because it warms the planet by approximately 60° Fahrenheit. Emissions from human activities since the beginning of the industrial revolution (approximately 250 years ago) are adding to the natural greenhouse effect by increasing the gases in the atmosphere that trap heat and contribute to an average increase in Earth's temperature.

GHGs occur naturally and from human activities. Human activities that produce GHGs are the burning of fossil fuels (coal, oil, and natural gas for heating and electricity, gasoline and diesel for transportation); methane generated by landfill wastes and raising livestock; deforestation activities; and some agricultural practices. GHGs produced by human activities include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). Since 1750, estimated concentrations of CO_2, CH_4, and N_2O in the atmosphere have increased by over 36 percent, 148 percent, and 18 percent respectively, primarily due to human activity. Emissions of GHGs affect the atmosphere directly by changing its chemical composition. Changes to the land surface indirectly affect the atmosphere by changing the way in the Earth absorbs gases from the atmosphere. Potential impacts in California due to climate change may include loss of snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (California Energy Commission [CEC] 2009).

a. Would the project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?

The Pasadena CAP is a policy document containing climate action measures and implementation actions to reduce GHG emissions. The proposed CAP creates a GHG emissions reduction strategy (consistent with Section 15183.5 of the CEQA Guidelines) for the City of Pasadena. The CAP contains a series of climate action measures and actions to reduce cumulative GHG emissions by

approximately 27 percent below 2009 levels by 2020, which is consistent with AB 32; 49 percent below 2009 levels by 2030 (equivalent to 40 percent below 1990 levels by 2030), which is consistent with SB 32; and 59 percent below 2009 levels by 2035with an 83 percent reduction below 2009 levels by 2050 (equivalent to 80 percent below 1990 levels), consistent with the trajectory of Executive Order S-3-05. The Pasadena CAP would result in the reduction of GHG emissions. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The CAP includes climate action measures and actions to reduce the City's GHG emissions by approximately 27 percent below 2009 levels by 2020 in accordance with AB 32; 49 percent below 2009 levels by 2030 (equivalent to 40 percent below 1990 levels), which is consistent with SB 32; and 59 percent below 2009 levels by 2035 with an 83 percent reduction below 1990 levels by 2050 (equivalent to 80 percent below 1990 levels), consistent with the trajectory of Executive Order S-3-05 (see Table 2 of this Initial Study). CARB updated the Scoping Plan in December 2017 to reflect the 2030 target set by Executive Order B-30-15 and codified by SB 32. As described in the project description, the purpose of the CAP is to reduce Pasadena's proportionate fair share of the statewide target set by AB 32 and SB 32 and work toward the State's longer term target identified in Executive Order S-3-05. Note, Executive Order S-03-05 is intended to guide State agencies' efforts to control and regulate GHG emissions, but has no direct binding effect on local government or private actions. The CAP would not conflict with any applicable GHG reduction plan, including the AB 32 Scoping Plan or the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The Southern California Association of Governments (SCAG) adopted the RTP/SCS in April 2016, which reflects the region's commitment to improve mobility, sustainability, and economy. Additionally, the Plan demonstrates how the region will reduce emissions from transportation sources to comply with SB 375. The CAP includes measures and reduction goals that align with the Scoping Plan and RTP/SCS. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

9 Hazards and Hazardous Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	■	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	■	☐
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?	☐	☐	■	☐
d. Be located on a site that is included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	■	☐
e. Result in a safety hazard for people residing or working in the project area for a project located in an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project?	☐	☐	■	☐
f. Result in a safety hazard for people residing or working in the project area for a project near a private airstrip?	☐	☐	■	☐
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	■	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
h. Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	■	☐

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

b. Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?

d. Would the project be located on a site included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

f. For a project near a private airstrip, would it result in a safety hazard for people residing or working in the project area?

h. Would the project expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

The Pasadena CAP is a policy document containing climate action measures and implementation actions to reduce GHG emissions. The proposed CAP does not involve any site-specific development nor would it facilitate new development. The Safety Element of the General Plan includes goals and policies to reduce the potential for hazardous contamination. For example, Policy H-1.3 states that new proposed facilities involved in production, use, storage, transport, or disposal of hazardous materials must be located a safe distance from land uses that may be adversely impacted by such activities. Implementation of the proposed CAP measures would not involve the routine transport, use, or disposal of hazardous materials, and would not create reasonably foreseeable upset and/or accidental conditions involving the release of hazardous materials into the environment. Construction activities (e.g., bicycle facilities, energy retrofits, increased access to recycled water, etc.) could involve the use of onsite fueling/servicing of construction equipment, and the transport of fuels, lubricating fluids, and solvents. These types of materials are not considered acutely hazardous, and all storage, handling, and disposal of these materials are regulated by the California Department of Toxic Substances Control (DTSC), United States Environmental Protection Agency, the Occupational Safety & Health Administration (OSHA), the Los Angeles County Fire Department

(LACoFD) Health and Hazardous Materials Division, and the County of Los Angeles Department of Environmental Health. The transport, use, and disposal of construction-related hazardous materials would be in conformance with applicable federal, State, and local regulations governing such activities.

The CAP would encourage the renovation of older structures to support energy retrofits (Measure E-2.1) and the installation of carbon neutral technologies (Measure E-4.1). Structures built prior to 1978 may contain asbestos-containing building materials and lead paint. If not properly handled and released into the environment in large enough quantities, these materials could pose a threat to construction workers and residents. However, these retrofits would primarily be small-scale and no single renovation would likely result in releases large enough to pose a health hazard to the general public. In addition, demolition and construction activities involving hazardous materials removal are regulated at the federal, State, and local levels, and construction workers must comply with applicable safety regulations.

Three private heliports are located in Pasadena: Huntington Memorial Hospital Heliport – CL 14, Mesa Heliport – 24CA, and Super Bowl Heliport 3CL4. The CAP is a policy document and implementation of CAP measures would not increase helicopter activity or otherwise increase potential exposure to aircraft-related hazards. Additionally, discretionary development projects associated with the CAP would undergo project-level CEQA review.

Therefore, no impact with regard to hazards to the public or environment, hazardous materials with ¼ mile of a school, development on a hazardous material site, or development near an airport or airstrip would occur. Further, the CAP would not expose people or structures to wildland fires, consistent with Policy R-1, R-2, and R-3, included under Goal R-1 of the General Plan Safety Element, which reduce threats to public and private property from wildland an urban fire hazards. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

g. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The CAP includes climate action measures to promote bicycle, pedestrian, and transit facilities (CAP Measures T-1.1, T-1.2, T-1.3, T-2.1, and T-3.1), but would not impair implementation of an adopted emergency response plan. The CAP contains a climate action measure(CAP Measure T-3.2) to continue to utilize technology and intelligent transportation systems to improve traffic flow and reduce vehicle idling, such as synchronized signals, transit and emergency signal priority, and other traffic flow management techniques, which would help to alleviate traffic congestion and benefit emergency evacuation procedures. Moreover, the CAP would be consistent with the General Plan Safety Element, which includes goals and programs to provide and enhance emergency response. For example, Goal H-1 aims to reduce the potential for hazardous contamination in the City, while Program H-1.2 aims to identify City roadways along which hazardous materials are routinely transported. If critical facilities, such as schools, hospitals, child care centers, or other facilities with special evacuation needs are located along these routes, the City would identify emergency response plans that these facilities can implement in the event of an unauthorized release of hazardous materials. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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10 Hydrology and Water Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☐	■
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering or the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	■	☐
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?	☐	☐	■	☐
d. Substantially alter the existing drainage pattern of the site or area, including the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or offsite?	☐	☐	■	☐
e. Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	■	☐
f. Otherwise substantially degrade water quality?	☐	☐	■	☐
g. Place housing in a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary, Flood Insurance Rate Map, or other flood hazard delineation map?	☐	☐	■	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
h. Place structures in a 100-year flood hazard area that would impede or redirect flood flows?	☐	☐	■	☐
i. Expose people or structures to a significant risk of loss, injury, or death involving flooding, including that occurring as a result of the failure of a levee or dam?	☐	☐	■	☐
j. Result in inundation by seiche, tsunami, or mudflow?	☐	☐	■	☐

a. Would the project violate any water quality standards or waste discharge requirements?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. Implementation of CAP measures would not violate water quality standards or waste discharge requirements. Furthermore, climate action Measure WC-3.1 is aimed at improving storm water capture to slow, sink, and treat water run-off, recharge groundwater, and improve water quality. Therefore, no impact would result.

NO IMPACT

b. Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering or the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?

c. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site??

d. Would the project substantially alter the existing drainage pattern of the site or area, including the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or offsite

e. Would the project create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

f. Would the project otherwise substantially degrade water quality?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan and does not include any site-specific development, designs, or proposals, nor does it grant any entitlements for development. As a result, no negative impacts related to groundwater or surface water quality, groundwater resources, runoff, or sensitive areas would occur. According to the City's General Plan EIR (City of Pasadena 2015), future water demand will be within the projected supply despite increased population and employment. Further, several of the CAP Measures (WC-1.1, WC-2.1, and WC-3.1) identify strategies to reduce potable water use and seek funding to enhance flood control and improve water quality. For example, climate action Measure

WC-1.1 relates to potable water reduction, WC-2.1 relates to increased community access to recycled water, and WC-3.1 relates to water quality and improved stormwater capture. Water conservation strategies may have a beneficial effect on water quality and may incrementally reduce communitywide surface runoff. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

g. Would the project place housing in a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary, Flood Insurance Rate Map, or other flood hazard delineation map?

h. Would the project place structures in a 100-year flood hazard area that would impede or redirect flood flows?

i. Would the project expose people or structures to a significant risk of loss, injury, or death involving flooding, including that occurring as a result of the failure of a levee or dam?

The CAP is a policy document containing programs that are consistent with Pasadena's General Plan and does not propose any land use or zoning changes, nor does it include any site-specific development. There are no areas in Pasadena that are susceptible to flooding during a 100-year event (City of Pasadena 2002b). Two major stream channels transect the City: Arroyo Seco on the west and Eaton Wash on the east. Both drainages have been modified by flood control dams near the base of the mountains, and both have been confined to man-made channels or storm drains along their lower reaches. Pasadena is currently not vulnerable to flooding associated with the Arroyo Seco and Eaton Canyon Creek and its tributaries. However, future development in the upstream areas could change this (City of Pasadena 2002b). Goal F-1 included in the Safety Element of the General Plan aims to minimize injury, loss of life, property damage, and economic and social disruption caused by flood and inundation hazards. For example, Policy F-1.1, included under Goal F-1, discourages development in flood hazard areas and strengthens the City's maintenance program for stormwater detention basins, culverts, and storm drains to minimize future flooding events. Implementation of the CAP would be consistent with the General Plan and would not expose people or structures to potential flood hazards or impede or redirect flood flows. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

j. Would the project result in inundation by seiche, tsunami, or mudflow?

The CAP is a policy document containing programs that are consistent with Pasadena's General Plan and does not propose any land use or zoning changes, nor does it include any site-specific development. The City of Pasadena is located inland and is not subject to inundation by seiche or tsunami. However, the City's hillsides are vulnerable to slope instability, which can result in small slides, slumps, soil slips, rock falls, and debris flows. Debris flows have occurred in the past in some of the canyons near the Pasadena area in the upper reaches of the watersheds. They are most likely to occur in years with heavy rainfall following wildland fires (City of Pasadena 2002b). However, the City of Pasadena requires new construction in hillside areas of the San Gabriel Mountains and San Rafael Hills to conduct hydrology studies to assess the impact of construction on downgradient developed areas. The assessment of possible impacts on LA County storm drains and privately owned debris basins is also required. If the analyses indicate a potential hazard, improvements are required and fees may be assessed to the developers, as appropriate to pay for the improvements that would allow for the storm drains and privately owned debris basins to avoid impacts associated with the new construction. Therefore, this impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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11 Land Use and Planning

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Physically divide an established community?	☐	☐	■	☐
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	■	☐
c. Conflict with an applicable habitat conservation plan or natural community conservation plan?	☐	☐	■	☐

a. Would the project physically divide an established community?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan and does not include any climate action measures or any specific development projects that would divide an established community. The CAP includes climate action measures (Measures T-1.1, T-1.2, T-1.3, T-2.1, T-3.1, and T-5.1) that would support pedestrian and bicycle circulation and improved transportation alternatives, as identified in the General Plan, which would improve connectivity throughout the City. For example, Measures T-1.1 – T-1.3 relate to bicycle and pedestrian travel, T-2.1 relates to transit travel, and T-5.1 relates to land use, with the goal of facilitating high-density, mixed-use, transit-oriented, and infill development. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

The CAP is consistent with and builds upon the objectives, goals, and policies of the Pasadena General Plan. The City's General Plan Policy 10.1 calls for the reduction of GHG emissions from the City and Implementation Program 3 calls for the development of a CAP:

> **Policy 10.1 - Environmental Quality and Conservation:** Establish Pasadena as a leader on environmental stewardship efforts, including air quality protection, energy and water

efficiency, renewable energy standards, natural resource conservation, and greenhouse gas emission standards in the areas of energy, water, air and land.

Implementation Program 3 - Climate Action Plan: Develop and adopt a Climate Action Plan that monitors climate change impacts, outlines a strategy for reducing greenhouse gas emissions, and includes measures to adapt to climate change.

The CAP is primarily intended to implement policies and programs of the General Plan and therefore does not conflict with the General Plan. Nonetheless, implementing the CAP could require some modification of existing City policies, including changes to the Municipal and Zoning Codes and the Design Guidelines. For example, Measures T-1.1 and T-3.1 suggest amending the Trip Reduction Ordinance requirements in the Zoning Code to require end-of-trip facilities (e.g., showers and lockers for bicyclists). In addition, Measure T-4.1 suggests amending the Electric Recharge Stations of the Zoning Code to apply to a greater portion of nonresidential projects. Measure E-1.2 also suggests amending community design plans, guidelines, and other documents to promote maximizing solar resources. In order to implement these measures the Municipal Code and other applicable documents would need to be amended to reflect new requirements. While the proposed measures could require changes to some existing policies, the CAP is designed to mitigate adverse environmental impacts associated with climate change. Where modifications of existing policies are needed, such as updates to the Land Use policies related to active transportation to include additional bicycle and pedestrian services, the CAP measures would generally result in greater avoidance or mitigation of environmental effects. For example, the CAP promotes end-of-trip facilities and access to bicycles through a bike-share program in Measure T-1.1. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. Would the project conflict with an applicable habitat conservation plan or natural community conservation plan?

There are no adopted Habitat Conservation or Natural Community Conservation Plans in Pasadena. There are also no approved local, regional, or State habitat conservation plans. The CAP would not facilitate any development projects nor would it add or enable any new development that would conflict with these plans. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

12 Mineral Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?	☐	☐	☐	■
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	■

a. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

b. Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. The General Plan does not identify any mineral resources in the City (City of Pasadena 2012). Additionally, the CAP would not facilitate any specific development projects and would not add or enable development that could result in the loss of mineral resources. No impact to mineral resources would occur.

NO IMPACT

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13 Noise

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in:				
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	■	☐
b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	■	☐
c. A substantial permanent increase in ambient noise levels above those existing prior to implementation of the project?	☐	☐	■	☐
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above those existing prior to implementation of the project?	☐	☐	■	☐
e. For a project located in an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	■
f. For a project near a private airstrip, would it expose people residing or working in the project area to excessive noise?	☐	☐	☐	■

Noise is unwanted sound that disturbs human activity. Environmental noise levels typically fluctuate over time, and different types of noise descriptors are used to account for this variability. Noise level measurements include intensity, frequency, and duration, as well as time of occurrence. Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). Because of the way the human ear works, a sound must be about 10 dBA greater than the reference sound to be judged as twice as loud. In general, a 3 dBA change in community noise levels is noticeable, while 1-2 dBA changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while arterial streets are in the 50-60+ dBA range. Normal conversational levels are in the 60-65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations.

Noise levels typically attenuate (or drop off) at a rate of 6 dBA per doubling of distance from point sources (such as construction equipment). Noise from lightly traveled roads typically attenuates at a rate of about 4.5 dBA per doubling of distance. Noise from heavily traveled roads typically attenuates at about 3 dBA per doubling of distance; while noise from a point source typically attenuates at about 6 dBA per doubling of distance. Noise levels may also be reduced by the introduction of intervening structures. For example, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm that breaks the line-of-sight reduces noise levels by 5 to 10 dBA. The construction style for dwelling units in California generally provides a reduction of exterior-to-interior noise levels of about 30 dBA with closed windows (Federal Highway Administration [FHWA] 2006).

Some land uses are more sensitive to ambient noise levels than other uses due to the amount of noise exposure and the types of activities involved. In Pasadena, schools, hospitals, and residential areas are considered sensitive receptor. .

Pasadena adopted the General Plan Noise Element in September 2002, which includes the following (City of Pasadena 2002):

- A description of existing noise levels and sources and incorporates comprehensive goals, policies, and implementing actions;
- Several policies on noise and acceptable noise levels, which address unnecessary, excessive, and annoying noise levels and sources such as vehicles, construction, special sources (e.g., radios, musical instrument, animals), and stationary sources (e.g., heating and cooling systems, mechanical rooms); and
- Established land use compatibility categories for community noise exposure, the maximum "normally acceptable" noise level for the exterior of residential areas is 70 dBA CNEL or Ldn and is 77.5 dBA CNEL or Ldn for commercial and professional uses.

To implement the City's noise policies, the City adopted a Noise Restrictions Ordinance. The Noise Ordinance is part of the PMC. The City's Noise Ordinance contains the following interior noise standards:

Table 5 Interior Noise Standard

Time Interval	Interior Noise Standards (dBA)
7:00 am – 10:00 pm	60
10:00 pm - 7:00 am	50

Source: Pasadena Municipal Code Chapter 9.36 2017, Table 1

The City has not adopted any thresholds or regulations addressing vibration. Vibration is a unique form of noise because its energy is carried through buildings, structures, and the ground, whereas noise is simply carried through the air. Thus, vibration is generally felt rather than heard. Some vibration effects can be caused by noise (e.g., the rattling of windows from passing trucks). This phenomenon is caused by the coupling of the acoustic energy at frequencies that are close to the resonant frequency of the material being vibrated. Typically, ground-borne vibration generated by manmade activities attenuates rapidly as distance from the source of the vibration increases. The ground motion caused by vibration is measured as particle velocity in inches per second and is referenced as vibration decibels (VdB) in the U.S.

The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Most perceptible indoor vibration is caused by sources inside buildings such as the operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

a. *Would the project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?*

b. *Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?*

c. *Would the project result in a substantial permanent increase in ambient noise levels above levels existing without the project?*

d. *Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?*

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. Construction activity associated with implementation of CAP measures could result in a temporary increase in noise levels. The City has jurisdiction over noise regulation, as stated in the Municipal Code, Title 9, Chapter 36 Noise Restrictions (Noise Ordinance) (City of Pasadena 2017). The noise ordinance generally limits intrusive noises from exceeding the ambient level at the property line by more than 5 dB. The ambient is the actual measured ambient noise level. Section 9.36.060 of the PMC sets the interior noise standard for multi-family residential uses to 60 dBA between 7:00 am and 10:00 pm, and 50 dBA between 10:00 pm and 7:00 am. Construction noise is regulated by Section 9.36.070 of the PMC, which restricts construction activities "within a residential district or within a radius of 500 feet at any time other than" between 7:00 am and 7:00 pm Monday through Friday, and between 8:00 am and 5:00 pm on Saturdays. Construction activities are prohibited on Sundays and holidays. Additionally, Section 9.36.080 of the PMC further restricts noise levels from construction equipment to 85 dBA L_{eq} measured at 100 feet from the equipment.

Some of the proposed measures would involve small scale construction projects, such as energy efficient retrofits. In addition, the CAP includes several transportation and land use measures that could lead to the development of expanded bicycle and pedestrian paths or transit upgrades consistent with the City's General Plan Mobility Element, Bicycle Transportation Action Plan, and Pedestrian Plan. Noise generated by construction activity would be variable depending on the project and intensity of equipment use. Roadway widening projects would likely require the operation of pieces of heavy-duty equipment that generate high noise levels. Alternatively, repainting/restriping would typically be less intense requiring minimal, if any, use of heavy equipment. As mentioned throughout the document, the CAP does not facilitate development projects beyond what could occur under the General Plan. Additionally, all construction activities would be required to comply with the City's noise ordinance.

The majority of the Sustainable Mobility and Land Use measures within the CAP focus on reducing the amount of vehicle miles traveled by providing enhanced access to alternative modes of transportation and encouraging the development of high density, mixed-use, transit-oriented, and infill development. As a result, no permanent increase in local traffic volumes or associated noise is

anticipated. Therefore, implementation of CAP measures would not result in exposure of persons to noise in excess of established standards or groundborne vibration or noise, nor would it result in a temporary, periodic, or permanent increase in ambient noise levels above existing levels. Noise impacts associated with future City buildout were analyzed and disclosed in the General Plan EIR. Further, any future site-specific discretionary projects would be subject to subsequent environmental review wherein any site-specific noise impacts would be addressed accordingly. Impacts would be less than significant.

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e. For a project located in an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise?

There are no airports or airstrips within Pasadena. However, as mentioned in Section 9, *Hazards and Hazardous Materials*, there are three heliports in the City. The CAP does not propose any land use or zoning changes related to airports, airstrips, or heliports, nor does it include any development that would increase exposure to excessive noise levels associated with airports, airstrips, or heliports. No impact would occur.

NO IMPACT

14 Population and Housing

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	☐	☐	☐	■
b. Displace substantial amounts of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■

a. Would the project induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

b. Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

c. Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan and would not result in increases in population and does not accommodate growth beyond that anticipated by the General Plan or induce additional population growth. While Pasadena is largely built out and there are not large amounts of vacant land, mixed-use, transit-oriented, and infill development is anticipated under the current General Plan. Such development would facilitate population growth consistent with SCAG forecasts. The CAP would not facilitate any population or housing growth beyond that allowed under the General Plan. New development could potentially displace existing housing in some instances, but the General Plan would generally facilitate an overall increase in housing in the City and CAP measures would not increase the potential for displacement. Therefore, no impacts related to population and housing would result.

NO IMPACT

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15 Public Services

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in:				
a. Substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i Fire protection?	☐	☐	☐	■
ii Police protection?	☐	☐	☐	■
iii Schools?	☐	☐	☐	■
iv Parks?	☐	☐	☐	■
v Other public facilities?	☐	☐	☐	■

a.1. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for fire protection?

a.2. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for police protection?

a.3. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for schools?

a.4. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental

impacts, in order to maintain acceptable service ratios, response times or other performance objectives for parks?

a.5. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for other public facilities?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. Build out of the City in accordance with the General Plan could increase public service needs in the City by adding population, housing, businesses, and employees. The General Plan EIR states that the increase in demand would require new or expanded facilities, specifically police and fire facilities (City of Pasadena 2015). However, the impacts to police services are anticipated to be adequately funded by an increase in tax revenues over an extended period of time, relative to the increase in development intensity and the impacts to fire facilities would be funded by revenue sources that contribute to the general fund, including property and sales taxes, which would be expected to grow in rough proportion to any increase in residential dwelling units and/or nonresidential space in Pasadena. Implementation of the CAP would not accommodate additional growth beyond that anticipated by the General Plan and, therefore, would not in itself increase demand for public services or facilities. As such, the CAP would not require the construction of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts. Furthermore, any future site-specific discretionary projects would be subject to subsequent environmental review wherein any site-specific public service impacts would be addressed accordingly. Therefore, no impact on public services causing the need for new governmental facilities would occur.

NO IMPACT

16 Recreation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	■	☐
b. Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	■	☐

a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

b. Would the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. The CAP would not result in population growth beyond that which would be accommodated by the General Plan. Therefore, implementation of the CAP would not result in a substantial physical deterioration of parks or other recreational facilities or result in the need to expand recreational facilities. Additionally, Measure T-1.1 promotes the expansion of the current network of bicycle and pedestrian paths and end-of-trip facilities, which would provide additional recreation facilities in the City and could potentially lessen wear on existing facilities. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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17 Transportation and Traffic

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Conflict with an applicable plan, ordinance or policy establishing a measure of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways, and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	■	☐
b. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	■	☐
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	■
d. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?	☐	☐	☐	■
e. Result in inadequate emergency access?	☐	☐	☐	■
f. Conflict with adopted policies, plans, or programs regarding public transit, bikeways, or pedestrian facilities, or otherwise substantially decrease the performance or safety of such facilities?	☐	☐	■	☐

a. Would the project conflict with an applicable plan, ordinance or policy establishing a measure of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways, and freeways, pedestrian and bicycle paths, and mass transit?

b. Would the project conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan, many of which are aimed at reducing motor vehicle trips and VMT. For example, Measure T-1.1 encourages continued expansion of the City's bicycle and pedestrian network, while Measure T-3.1 encourages reduction in annual commuter vehicle miles traveled by single occupancy vehicles. The specific action items under T-1.1 include:

- Bicycle Transportation Action Plan: Establish a tiered priority list to implement the objectives and actions identified in the Bicycle Transportation Action Plan and present to City Council for approval Track Progress: Annually track and report progress toward implementation of the priority list and present to City Council for approval
- Pedestrian Plan: Complete an assessment of the progress made on strategies identified in the Pedestrian Plan and establish a priority list of strategies that require additional actions and present to City Council for approval
- Bike Share Program: Make bicycles more accessible to residents by coordinating with Metro to implement the Bike Share program
- Network Improvement and Expansion: Continue to apply for grants and research/pursue other funding opportunities to facilitate network improvements and expansions
- Bike Friendly Development: Incorporate bikeway projects into new development, road resurfacing, and restriping projects
- End-of-Trip Facilities: Present the concept of amending the Trip Reduction Ordinance requirements in the Zoning Code to require end-of-trip facilities for cyclists, such as showers, bike repair kiosk, and lockers, in new nonresidential building projects of a specified size to City Council for consideration

The specific action items under T-3.1 include:

- Trip Reduction Ordinance: Present the concept of amending the Trip Reduction Ordinance Requirements of the Zoning Code to apply to all nonresidential and multi-family development projects to City Council for consideration Trip Reduction Toolkit: Continue to coordinate with Go Verdugo to develop a web-based trip reduction toolkit for employees, distributed by Pasadena employers (the website will be a clearinghouse for TDM programs for the cities of Burbank, Glendale, and Pasadena) Car Sharing: Continue to facilitate and incentivize car sharing through dedicated on-street parking spaces
- Incentive Carpooling: Incentivize carpooling by working with local employers to provide preferred parking spaces or free or discounted parking rates to employees who carpool

The CAP also includes climate action Measure T-3.2 which encourages the implementation of improvements to smooth traffic flow, reduce idling, minimize bottlenecks, and encourage efficient driving techniques, while Measure T-5.1 would facilitate high density, mixed-use, transit oriented, and infill development. Signal coordination and synchronization would reduce congestion and the amount of time vehicles spend idling while on City streets. Likewise, high density, mixed-use, transit oriented, and infill development would also reduce congestion and the amount of time vehicles

spend driving and idling on City streets. Additionally, CAP measures would promote the use of alternate transportation that could improve levels of service on City roads (CAP Measures T-1.1 – T-3.1). For example, Measure T-1.2 aims to maintain ongoing efforts to improve bicycle and pedestrian safety. One of the action items includes working with local schools to implement Safe Routes to Schools programs consistent with the Bicycle Transportation Action Plan and the Pedestrian Plan. The Safe Routes to School program focuses on both education and infrastructure development with the goal of increasing the number of students who walk and bike to school. According to the Bike Transportation Action Plan, Safe Routes to School programs can increase the number of students who walk and bike to their neighborhood schools, which would reduce VMT and vehicle trips (VT) within Pasadena (City of Pasadena 2015d).

These measures would align with the objectives and policies included in the General Plan Mobility Element, including:

- Objective 1: Enhance Livability
- Objective 2: Encourage walking, biking, transit, and other alternatives to motor vehicles
- Objective 3: Create a supportive climate for economic viability

The General Plan EIR states that under the General Plan Update, service population increases by 27 percent, while VMT and VT would increase by 25 percent and 19 percent, respectively. As discussed above, the CAP would implement a range of General Plan objectives and policies aimed at reducing VMT and encouraging the use of alternative transportation modes. In addition, it would not accommodate growth or development beyond that accommodated by the General Plan. Moreover, climate action measures would be consistent with the goals, policies, and strategies included in the Bicycle Transportation Action Plan and the Pedestrian Plan. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. Would the project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

There are no airports in Pasadena. Implementation of the CAP would not result in a change in air traffic patterns. No impact related to air traffic or safety would occur.

NO IMPACT

d. Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?

e. Would the project result in inadequate emergency access?

The CAP would not facilitate development beyond that allowed under the General Plan. As such, it would not create any traffic hazards or result in inadequate emergency access. The proposed measures included in the CAP are aimed at providing alternative modes of transportation and reducing the amount of vehicle miles traveled throughout Pasadena. Additionally, the CAP promotes design guidelines to enhance bicycle, pedestrian, and transit connectivity, which would provide greater safety. The CAP does not include measures that would substantially increase hazards due to a design feature or incompatible uses. Further, any future site-specific discretionary projects would be subject to subsequent environmental review wherein any site-specific impacts related to hazards or emergency access would be addressed accordingly. No impact would occur.

NO IMPACT

f. Conflict with adopted policies, plans, or programs regarding public transit, bikeways, or pedestrian facilities, or otherwise substantially decrease the performance or safety of such facilities?

Implementation of the CAP would encourage alternatives to single-occupancy vehicles, consistent with the General Plan, Bicycle Transportation Plan, and Pedestrian Plan, and would not result in negative effects on the safety or performance of transit, bicycle, or pedestrian facilities. Therefore, the CAP would not conflict with any policies or plans supporting alternative transportation. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

18 Tribal Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	■	☐
b. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Cod Section 2024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significant of the resource to a California Native American tribe?	☐	☐	■	☐

The City of Pasadena prepared and mailed notification letters under Assembly Bill 52 on March 23, 2017. Under AB 52, tribes have 30 days to respond and request consultation. As of the date of this document, the Gabrieleño Band of Mission Indians responded and requested consultation, which was completed on May 25, 2017.

a. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in a Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code § 5020.1 (k), or*

b. *A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code § 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code § 5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.*

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan and does not involve any specific development. Although the CAP does not include any specific development, nor does it grant any entitlements for development that could cause a substantial adverse

change in the significance of a tribal cultural resource, the CAP would be implemented in a manner consistent with the requirements of Assembly Bill 52. Additionally, the tribal consultation concluded that the CAP would not have a significant adverse impact on Tribal Cultural Resources. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

19 Utilities and Service Systems

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	■	☐
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	■	☐
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	■	☐
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	■	☐
e. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	■	☐
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	■	☐
g. Comply with federal, State, and local statutes and regulations related to solid waste?	☐	☐	■	☐

a. Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

b. Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

c. Would the project require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

d. Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

e. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

The City of Pasadena is its own water purveyor. The Pasadena Water and Power Department (PWP) is the designated provider of water supplies to residents, businesses, and other water users. Pasadena's water supply is drawn from a combination of groundwater, local surface water, imported water, and short-term water exchanges with neighboring jurisdictions and water agencies (City of Pasadena 2014).

The Pasadena CAP is a policy document containing programs that are consistent with Pasadena's General Plan. The CAP would not accommodate growth beyond that anticipated by the General Plan nor does it propose any specific development projects that would increase wastewater generation, water demand, or stormwater runoff. The CAP includes climate action Measures WC-1.1, WC-2.1, and WC-3.1 that aim to reduce potable water consumption, increase recycled water access and use, and improve storm water capture to slow, sink, and treat water run-off, recharge groundwater and improve water quality, compared to business-as-usual. For example, Measure WC-1.1 includes incentives for irrigation retrofits and rainwater harvesting; WC-2.1 includes implementing the City's Non-Potable Water Project; and WC-3.1 includes replacing impervious surfaces with landscape green spaces, permeable pavement, rain gardens, and/or bioswales. Because the CAP is a policy document that would not facilitate growth beyond that anticipated by the General Plan, the project would not exceed wastewater treatment requirements; require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities; require or result in the construction of new stormwater drainage facilities or expansion of existing facilities; have insufficient water supplies available to serve the project; or result in a determination by the wastewater treatment provider that there is inadequate capacity to serve the projected demand. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

f. Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

g. Would the project comply with federal, State, and local statutes and regulations related to solid waste?

The CAP includes three climate action measures that focus on waste reduction (WR-1.1, WR-2.1, and WR-3.1). Climate action Measure WR-1.1 has an objective of continuing to reduce solid waste and landfill emissions through implementation of the City's Zero Waste Strategic Plan, with the ultimate goal of achieving zero waste. Implementation of this climate action measure would reduce the amount of solid waste sent to the Scholl Canyon Landfill. Pasadena has already met and exceeded the State of California's 50 percent diversion goal and achieved 73 percent diversion in 2010 (City of Pasadena 2014). Although "zero waste" is not necessarily 100 percent recycling, it shifts the focus to waste reduction, product redesign, and elimination of wasteful practices. By implementing the proposed policies and programs, Pasadena will move towards Zero Waste, even

though some residual waste will be disposed (City of Pasadena 2014). Nonetheless, climate action Measure WR-1.1 would comply with AB 939, which calls for a 50 percent diversion rate and AB 341, which has a statewide solid waste diversion goal of 75 percent by 2020. Impacts would be less than significant.

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20 Earlier Analysis

Earlier analysis may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. See CEQA Guidelines Section 15063(c)(3)(D).

This IS/ND utilizes the Pasadena General Plan, adopted in August 2015 for background information and general guidance on City growth parameters. No program EIR, tiering, or other process was used as part of the analysis of the project's environmental impacts.

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21 Mandatory Findings of Significance

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Does the project:				
a. Have the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self- sustaining levels, eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	■	☐
b. Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	■	☐
c. Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	■	☐

a. Does the project have the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self- sustaining levels, eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

The intent of the CAP is to reduce GHG emissions from Pasadena operations and within the City through implementation of GHG reduction measures. CAP measures are consistent with the General Plan and encourage actions by residents, businesses, and the City to reduce energy, water, and fuel use and associated GHG emissions. The CAP would not facilitate any specific development and would not diminish wildlife habitats or eliminate important examples of the major periods of California history or prehistory. As discussed in Sections 4, Biological Resources, and 5, Cultural Resources, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Implementation of the CAP would result in a cumulatively considerable beneficial reduction of GHG emissions and would not facilitate any development that would make a considerable contribution to any significant adverse cumulative impacts. To the contrary, as discussed throughout this Initial Study, implementation of the CAP would be consistent with many General Plan policies aimed at reducing emissions of GHGs and air pollutants, reducing vehicle trips and vehicle miles traveled, reducing demands upon utilities and service systems, and preserving biological, cultural, and other resources. The CAP would not make a substantial contribution to any cumulative impacts related to growth in accordance with the General Plan.

LESS THAN SIGNIFICANT IMPACT

c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

The CAP does not have any effects that would cause a direct or indirect adverse effect on human beings. Rather, as discussed throughout this Initial Study, the CAP would serve as a pathway to reduce GHG emissions as well as have many other positive environmental effects. These include reduction in air pollution, reduction in transportation congestion, reduction in landfilled solid waste, energy efficiency, and water conservation. Therefore, CAP implementation would have less than significant impacts with respect to adverse effects on humans.

LESS THAN SIGNIFICANT IMPACT

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