CITY OF MERCED
Planning & Permitting Division

STAFF REPORT: #15-16 **AGENDA ITEM: 4.1**

FROM: Kim Espinosa, Planning Manager **PLANNING COMMISSION MEETING DATE: Aug. 19, 2015**

PREPARED BY: Bill King, Principal Planner

SUBJECT: **Draft Programmatic Climate Action Plan (PCAP) Overview.** Staff will inform the Planning Commission about City of Merced Staff efforts, objectives, and related implementation documents of the PCAP Project, including permit streamlining of the environmental review process for certain types of development projects.

ACTION: Review and Comment.

BACKGROUND

In 2012, the City of Merced adopted a Climate Action Plan (CAP). The 2012 CAP identified over 150 ways to achieve various community values (See table below), many already supported by the City's General Plan. In pursuing these values, the community will also reduce local greenhouse gas emissions and their influence on global climate change.

Community Values	Goals
Healthy Communities	- Enhance Mobility of all Transportation Modes - Sustainable Community Design
Quality Natural Resources	- Water Conservation and Technology - Protect Air Resources - Waste Reduction
Clean Energy Resources	- Increase the Use of Renewable Energy Resources - Building Energy Conservation
Leaders and Partners	- Public Outreach and Involvement

The City of Merced has secured a professional consultant to help City Staff and the community to create a tool to implement the City's Climate Action Plan; this tool is referred to as the Programmatic Climate Action Plan (PCAP). The PCAP will identify

government and community based projects and programs to implement between now and 2020.

In February 2012, City Staff was authorized by the City Council to seek grant funds from California's Strategic Growth Council to prepare a Programmatic CAP. The City was awarded funds. In January 2013, at a public meeting, the City Council accepted the state contract. In September 2013, the City Council authorized City Staff to hire PMC, Inc. as the project consultant and to begin work to create a Programmatic CAP, or PCAP.

At tonight's study session, the Planning Commission will get an overview of the PCAP process and will have an opportunity to review draft documents and provide preliminary comments. Future study sessions can be scheduled if needed.

PERMIT STREAMLINING

Through the PCAP, the City also seeks to streamline the City's permitting process, as it applies to CEQA-based greenhouse gas emission assessments. This will be accomplished by quantifying anticipated GHG reductions, and to identify, implement, and monitor community actions to reduce greenhouse gas emissions. The project also includes identifying code amendments that could help to implement CAP strategies, and to create a *Unified Design Manual* containing development prototypes, and making existing regulations easy to understand, thereby ensuring their effectiveness in achieving the goals of the CAP. The creation of these tools in a programmatic fashion is encouraged and supported by the California Environmental Quality Act (CEQA). The project does not circumvent CEQA, but rather front-loads the required environmental assessment in a manner that benefits the community, creating efficient government operations, early community member involvement, and an incentive for a variety of businesses, industry, homes, and retailers to locate in the City.

NOTE: Implementation of the PCAP and its recommended measures (Attachment A, pages 20-48), along with monitoring the achievements of those measures, is necessary for the City to utilize the permit streamlining component of the project. Implementation will affect City Department projects and programs.

KEY PCAP PROJECT ELEMENTS

The Project aims to create tools to be considered for adoption by the City Council at the end of the project, and include:

- **PCAP**: Selection of feasible and effective measures to achieve the City's adopted greenhouse gas reduction target (Attachment A, pages 20-48). A cost-benefit analysis has been performed to help with the process of selecting these measures.
- **Monitoring Tools:** Monitoring protocols and worksheets to track achievement of measures;

- **Unified Design Manual (UDM):** Listing of adopted policies, actions, mitigation measures, and recommended best practices organized in a highly graphic user-friendly Unified Design Manual (UDM) resulting in a more predictable development review process (Attachment B);
- **Project Option Checklists:** The PCAP will be crafted in such a manner to qualify it as a CEQA-streamlining tool, as provided for and encouraged by the State of California (Attachment A, Appendix A).
- **Emission Inventory:** The 2008 GHG Emission Inventory was updated and will be used in the PCAP project to identify GHG reduction goals.

PUBLIC OUTREACH AND INVOLVEMENT

The community has been involved in the preparation and review of the PCAP, including a Citizen-based Focus Group and outreach to the local development community.

PCAP Focus Group Members:

Sector	Member
Builders	Adam Cox
Engineers and Surveyors (Rep #1)	Dena Traina
Engineers and Surveyors (Rep #2)	Des Johnston
Local Chambers of Commerce	Jennifer Krumm
Real-Estate Brokers and/or agents	Robert Dylina
Transportation, Air quality, and Health Advocate	Michelle Xiong
Conservation	Erin Stacy
Local "green-jobs"	Dan Caris (Mr. Ink Pro)
Local "green-jobs"	Brent Jerner (APG Solar)
City Council Representative	Mayor Stan Thurston
City Planning Commissioner	Peter Padilla

Community Outreach Events:

- February 27, 2014, the City hosted a "**Resource Efficiency Fair"** at the Merced Senior Center. Approximately 70 community members and exhibitors attended to learn what conservation-related actions local government agencies, non-profit groups, schools and businesses are engaged in locally. Thirty-four local exhibitors shared efforts about water conservation, recycling, energy-efficiency, reduced utility bills, and expanded use in transit and bicycling. City Manager John Bramble also presented a summary of conservation-related actions by the City. As part of the City's Climate Action Planning efforts, it included general opportunities for citizens to guide local policy and to select future projects. In addition to games, activities, and booths, the fair was a great place to connect with local

leaders/organizations, share ideas, and learn how to stay involved in the project. Community input was gathered and results summarized.

- June 19, 2014: **Focus Group Meeting**

- August 29, 2014, a development community stakeholder meeting was held to gather input to craft the Unified Design Manual

- September 2, 2014, a status report of the PCAP project was provided to the City Council

- Sept. 10, 2014: **Focus Group Meeting**

- December 4, 2014, the City hosted the forum, "**Merced on the Move - Partnering for Prosperity"** at the Boys and Girls Club in Merced. Merced native Ben Duran, President of the Great Valley Center, and Valley Vision Chief Executive, Bill Mueller, provided speeches to fellow residents of Merced to: 1) hear how businesses, community, and neighborhood leaders throughout the Central Valley are partnering to help grow, diversity and strengthen the local economy in their communities; 2) discover how people in Merced are working to promote economic development, a cleaner environment and a better quality of life for all residents; and 3) learn what the can do to help build a more prosperous future for Merced.

- December 8, 2014: **Focus Group Meeting**

- March 12, 2015: **Focus Group Meeting**

- June 1, 2015, a status report of the PCAP project was provided to the City Council

- June 11, 2015: **Focus Group Meeting**

- June 18, 2015, a development community stakeholder meeting was held to gather input on the "Development Options Checklist" (Attachment A, Appendix A) and "Development Code Index" (Attachment C). The Development Options Checklist informs City Staff and development interests how a project can be found to be consistent with the PCAP to enable CEQA permit streamlining. The Development Code Index lists potential future PCAP-related code amendments; there are no code amendments proposed with the PCAP project.

- September 10, 2015: **Focus Group Meeting**

- Late Fall 2015: **Focus Group Meeting**

Attachments:

A) Draft Programmatic Climate Action Plan
B) Draft Unified Design Manual
C) Draft Development Code Index

Ref: N/shared/planning/grants/Programmatic CAP/Public Outreach/Other/Planning Commission/

City of Merced

PROGRAMMATIC CLIMATE ACTION PLAN

ATTACHMENT A

CITY OF MERCED

PROGRAMMATIC CLIMATE ACTION PLAN

ADMINISTRATIVE DRAFT

JULY 2015

Prepared for
the City of Merced

by
Michael Baker International

The work upon which this publication is based was funded in whole or in part through a grant awarded by the Strategic Growth Council.

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LIST OF ABBREVIATIONS

AB 32: Assembly Bill 32 (The California Global Warming Solutions Act)
ADC: alternative daily cover
C&D: construction and demolition
CALGreen: California Green Building Code
Caltrans: California Department of Transportation
CAP: Climate Action Plan
CARB: California Air Resources Board
CEC: California Energy Commission
CEQA: California Environmental Quality Act
CH_4: methane
CNG: compressed natural gas
CO_2: carbon dioxide
CPUC: California Public Utilities Commission
CSI: California Solar Initiative
EV: electric vehicle
FTE: full-time employee
GHG: greenhouse gas
GVC: Great Valley Center
HERO: Home Energy Renovation Opportunity
HVAC: heating, ventilation, and air conditioning
ISR: Indirect Source Rule
kW: kilowatt
kWh: kilowatt-hour
LCFS: Low Carbon Fuel Standard
LEED: Leadership in Energy and Environmental Design
MCAG: Merced County Association of Governments
MID: Merced Irrigation District
NEV: neighborhood electric vehicle
NOx: NO (nitric oxide) and NO_2 (nitrogen dioxide)
N_2O: nitrous oxide
PACE: Property Assessed Clean Energy
PCAP: Programmatic Climate Action Plan
PG&E: Pacific Gas and Electric Company
PM_{10}: particulate matter smaller than 10 microns in diameter
PV: photovoltaic
RPS: Renewables Portfolio Standard
SJVAPCD: San Joaquin Valley Air Pollution Control District
TDM: Transportation Demand Management
UDM: Unified Design Manual
VMT: vehicle miles traveled
ZNE: zero net energy

List of Abbreviations

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Introduction

This Programmatic Climate Action Plan (PCAP) serves as the City's tool to implement the Climate Action Plan (CAP) adopted by the Merced City Council in 2012. Specifically, this PCAP demonstrates consistency with California Environmental Quality (CEQA) Section 15183.5 to provide options for streamlining the review of new projects that are subject to CEQA. Building on the values and goals of the City's adopted CAP, the PCAP provides additional technical analysis and tools that maximize benefits to the City from the existing regulatory framework while achieving consistency with City Council directives.

In addition to meeting CEQA guidance, the PCAP supports the City's General Plan. Analysis in the PCAP is consistent with the General Plan's key assumptions. The PCAP also implements General Plan policies and mitigation measures that address greenhouse gas (GHG) emissions. Accordingly, the PCAP is an important step to support the City's ongoing progress in implementing and maintaining the General Plan.

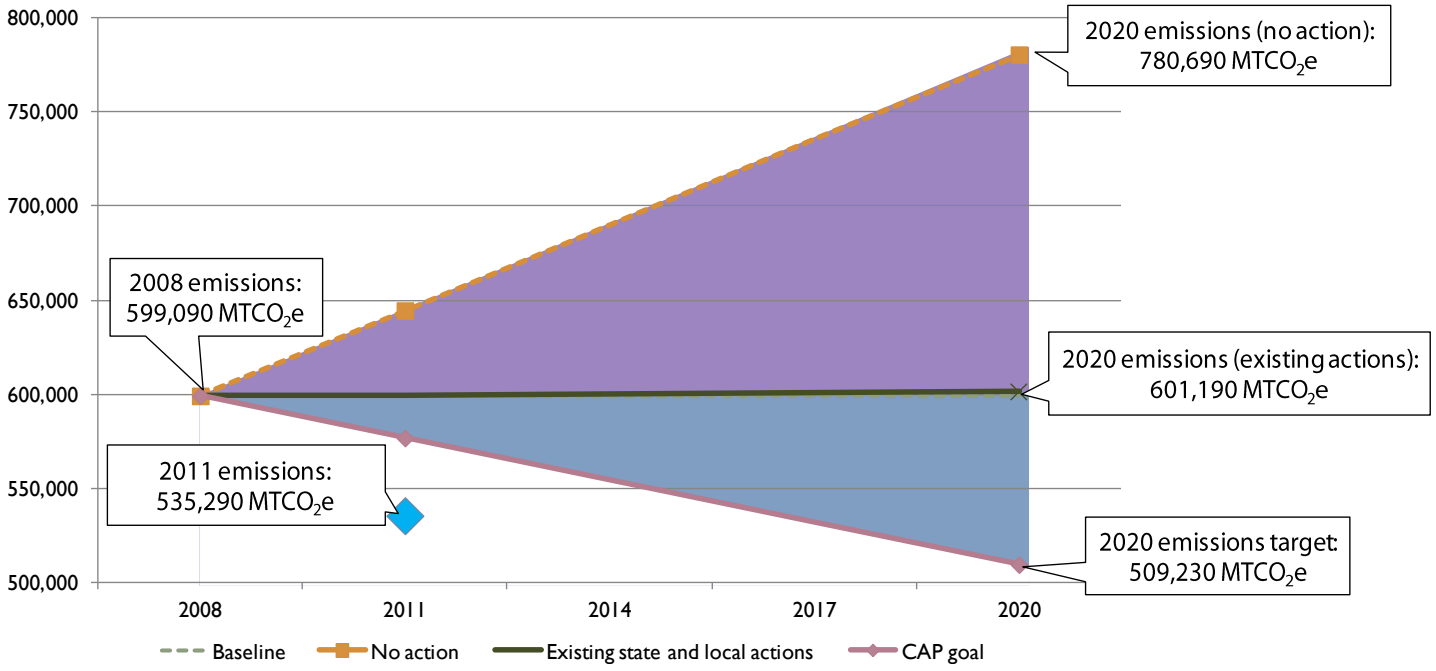
PCAP Outcomes

The PCAP serves as the City's comprehensive strategy to achieve 1990 GHG emissions levels by 2020, the GHG reduction target adopted by the City Council. This level of reduction is equivalent to a 15% reduction below community-wide 2008 GHG emissions by 2020. The PCAP consolidates existing state and local policies and programs that address greenhouse gas emissions. This approach includes an

evaluation of the community's progress to date, including the results of enacted state regulations and programs. By consolidating existing policy and program requirements, the PCAP shows credit for early efforts while also providing a simple summary of additional actions that are necessary to achieve the GHG reduction target.

Figure ES-1 summarizes the strategies that will allow the community to achieve the GHG reduction target of 509,230 metric tons of carbon dioxide equivalent ($MTCO_2e$). Existing state and local strategies play an important role to achieve the 2020 target.

Figure ES-1: City of Merced 2008–2020 Community GHG Emissions Forecast and Reduction Target



Ultimately, the PCAP serves as a clearinghouse for the community's climate action planning efforts. Measures in the PCAP identify the City's strategy to close the gap and achieve the 2020 target. In addition to providing technical information used in the analysis of these measures, the PCAP provides the City's plan for moving forward and achieving the 2020 GHG emissions reduction target. Strategies in the PCAP include concrete performance metrics and time frames for completion. Performance metrics in the PCAP consist of targets such as the number and size of solar photovoltaic panels in the community. With such information, City staff is equipped to work toward transparent objectives that both decision-makers and the public can easily evaluate and comprehend.

To achieve the 2020 target, the PCAP presents 31 measures that implement the adopted measures of the CAP. The measures provide a diverse array of City actions, programs, and incentives to achieve a 15% reduction in community-wide GHG emissions by 2020. In addition, the measures provide a path to sustain ongoing reductions toward 2030 in support of long-term state reduction targets. In addition to achieving GHG reductions, measures support other community values, such as clean energy resources and cost savings. The largest source of GHG reductions comes from a performance-based measure for new development that outlines options for new projects to achieve

a minimum level of GHG reductions in a manner consistent with regional guidance from the San Joaquin Valley Air Pollution Control District (SJVAPCD).

Plan Development

The City prepared this PCAP with extensive involvement from community members, City staff, and key stakeholders. In addition to hosting a public workshop and one-on-one meetings with the development community, the City facilitated an ad hoc advisory group for the effort, the PCAP Focus Group. This group reviewed key deliverables and vetted ideas and priorities for the project. Focus Group priorities for the PCAP included an emphasis on providing flexible, user-friendly tools to enable private initiative while reducing costs. The Focus Group also identified the importance of providing options for PCAP implementation while establishing an accurate system to track progress to PCAP targets.

Drawing on this input, City staff and the project team developed the PCAP as a comprehensive framework to achieve GHG reductions in a flexible manner that complements the local community. This approach led to a focus on consolidating existing policies and strategies, simplifying the process for new development, and equipping City staff with the tools to review new projects and account for accomplishments. The PCAP serves as a living document, outlining options for implementation and providing tools to prioritize and reconsider strategies that will achieve the CAP reduction target as resources and conditions change.

What is the PCAP?

A plan with tools to save money for Merced residents and businesses.

A plan to help conserve water, clean air, and other key resources.

A strategy to help ensure a healthy living and working environment.

An approach to take advantage of clean energy opportunities.

A means of streamlining permit approval and reducing regulatory barriers

PCAP Tools

Ultimately, the PCAP serves as a user-friendly guide to City staff, the development community, and the public. Rather than establishing a rigid plan for implementation, the PCAP offers tools and options that can accommodate changing funding and legislative considerations while equipping the City to attain the 2020 target. Tools that support this PCAP include the following:

- Project Options Checklists to identify discrete, project-level options for new development seeking consistency with the PCAP. The checklists are described throughout this PCAP and included as **Appendix A**.

Executive Summary

- A Unified Design Manual (UDM) to illustrate relevant visual aspects of project design that also support GHG reductions outlined in this PCAP. The UDM is described further throughout the PCAP and is also available on the City's website.
- A Work Program for City staff to achieve the GHG reduction target, provided in **Chapter 3**.
- A Monitoring and Implementation Tool for City staff. This Excel-based tool allows staff to track progress and prioritize measures for implementation based on key considerations in the PCAP. The tool also equips staff to conduct evaluation for regular updates to the City Council and other decision-makers, supporting ongoing input to guide implementation and prioritization of staff efforts.

Introduction and Purpose

In 2012, the City of Merced City Council adopted a Climate Action Plan (CAP). The CAP provides context for climate action, a greenhouse gas (GHG) emissions inventory and forecast, and strategies to reduce local GHG emissions. State and regional guidelines and programs provide incentives to cities with climate action plans. Key among these incentives is the ability to conduct a programmatic analysis of GHG emissions to simplify the review of new development.

The 2012 CAP was an important step toward the City providing streamlining benefits to new development. The CAP also identifies four values for the community: Healthy Communities, Quality Natural Resources, Clean Energy Resources, and Leaders and Partners. The purpose of this Programmatic Climate Action Plan (PCAP) is to support the CAP, help implement the four community values, and demonstrate the City's consistency with the California Environmental Quality Act (CEQA) Guidelines Section 15183.5 for programmatic GHG reduction plans. By meeting the guidance of the CEQA Guidelines, the City has conducted an upfront analysis of community-wide GHG emissions, providing the option for new projects subject to CEQA to streamline the GHG emissions analysis.

Relationship to the CAP

Merced's CAP was adopted in October 2012 following an extensive planning effort by City staff. The CAP provides a clear statement of community values as they relate to climate conditions. The key purpose of the CAP is to provide a plan to achieve 1990 GHG emissions levels by 2020. The CAP includes strategies to reduce GHG emissions and attain the 1990 GHG emissions levels, drawing on

and building on the policies included in Merced's General Plan. In addition to providing an approach to GHG reductions, the CAP also seeks to (1) save residents and businesses money by reducing energy bills, (2) provide opportunities for the City to apply for grant funding, and (3) allow streamlining of development projects.

Analysis in this PCAP shows that to attain 1990 GHG emissions levels, the community must achieve a reduction in community-wide GHG emissions by 91,960 metric tons of carbon dioxide equivalent ($MTCO_2e$) by 2020. While the CAP represents the targets and strategies that reflect and align with core community values, this PCAP is intended to achieve the reduction target with the following priorities and approach:

- Consistency with the intent of the 2012 CAP.
- Implementation of the City Council's adopted community-design goals and policies.
- Implementation of environmental commitments the City Council adopted in the environmental impact report for the Merced General Plan, including mitigations to improve air quality and protect environmental resources.
- Permit streamlining based on CEQA Guidelines Section 15183.5(b) that supports the type and quality of development envisioned by the Merced General Plan.
- Alignment of development codes with existing air pollution control district requirements.
- The PCAP demonstrates consistency with these objectives. Ultimately, the PCAP creates tools to achieve CAP targets, protect natural resources, encourage appropriate development, and streamline environmental review.

PCAP Objectives

This PCAP provides the option for CEQA streamlining while achieving the CAP reduction target by 2020 and establishing a plan for the City to achieve long-term, post-2020 targets consistent with state guidance. This section describes CEQA streamlining and target attainment considerations.

Allow CEQA Streamlining

Under CEQA Guidelines Section 15183.5(b), GHG reduction plans, such as a climate action plan, that can demonstrate consistency with the guidelines can be considered "qualified." A qualified GHG reduction plan is designed to streamline the GHG emissions component of the environmental review process of future projects.

In order for projects to use a CAP or other GHG reduction plan for the environmental review under state law for purposes of GHG emissions, a CAP or other GHG reduction plan must satisfy the six requirements contained in CEQA Guidelines Section 15183.5(b):

1) Quantify GHG emissions, both existing and forecast over a set time period, resulting from activities within a defined geographic area.

2) Based on substantive evidence, establish a level below which GHG emissions from activities covered by the plan are not cumulatively considerable.

3) Identify and analyze the GHG emissions as a result of specific actions or categories of actions anticipated within the defined geographic area.

4) Specify measures or a group of measures, including performance standards, which substantive evidence demonstrates would collectively achieve the specified emissions level if implemented on a project-by-project basis.

5) Establish a mechanism to monitor the plan's progress toward achieving the level and to require revisions to the plan if it is not achieving the specified levels.

6) Be adopted in a public process following environmental review.

Lead agencies may use adopted GHG reduction plans that are consistent with CEQA Guidelines Section 15183.5(b) in order to analyze and mitigate the significant effects of GHGs under CEQA at a programmatic level. Following adoption of the CAP, as individual projects are proposed in a jurisdiction with a qualified CAP, environmental documents for individual projects may tier from and/or incorporate by reference the existing programmatic GHG review into their cumulative impact analysis. Projects that are consistent with the general plan, GHG reduction plan, and other planning documents may rely on the programmatic analysis of GHGs in the reduction plan for their project-specific environmental analysis.

Achieve 2020 GHG Reduction Target

As noted above, the CEQA Guidelines require qualified plans to prepare a GHG inventory of existing emissions and a forecast of future emissions and to identify a target for reducing emissions to a point where they are not cumulatively considerable. The City prepared a 2008 inventory to establish existing GHG emissions levels, updated to be consistent with the most recent guidance and best practices. City staff used the 2008 inventory to forecast emissions for future years and to prepare a reduction target consistent with state guidance, enabling the CAP and this Work Plan to continue to be consistent with CEQA Guidelines Section 15183.5(b).

How to Use the PCAP

This PCAP serves to provide clear direction to City staff and members of the community for achievement of the 2020 CAP targets. General information about climate change and City priorities are available in the 2012 CAP. The PCAP also serves as a work plan to guide City staff with the implementation of the CAP. The remainder of this chapter provides basic context for the PCAP. Plan users that are interested in program implementation of development project CAP consistency should skip to the following chapters:

- Chapter 2: Reduction Measures, including performance targets and implementation actions for City staff, other agencies, residents, and businesses, to attain GHG reductions. This chapter provides a summary of all City strategies to achieve the 2020 reduction target, including actions for new and existing development.

- Chapter 3: Work Program, with guidance for City staff to implement the PCAP, understand costs and benefits, identify prioritization of measures implementation, and track progress.
- Appendix A: Project Options Checklists, which provides checklists that City staff will use to determine the consistency of new projects with the CAP and the PCAP. This appendix also includes:
  - Criteria, or "design elements" in the checklists, which show how reduction measures in Chapter 2 apply on a project level.
  - A menu of several options for projects seeking CAP consistency and provisions for CEQA streamlining, providing both flexibility and predictability to new projects subject to CEQA.
  - Additional resources for City staff and project applicants to further understand criteria for CAP consistency, including key terms, recommended guidance, and cross-references to indicate issues further addressed by the City's Unified Design Manual.
- Appendix B: Inventory and Forecast Update, including data, methods, and sources for the inventory and forecast, in addition to reduction measures.
- Appendix C: Technical Data, which explains the assumptions, data sources, and performance metrics used in the calculations for the reduction measures and the cost-benefit analysis.
- The City prepared five technical memos in support of this PCAP. In order to keep this document user friendly, the PCAP presents the findings of the technical memos. Some of the information from these memos has been incorporated into this PCAP and into the three appendices: **Appendix A** (Project Options Checklists), **Appendix B** (Inventory and Forecast Update), and **Appendix C** (Technical Data).

Regulatory Purpose of the PCAP

Although state laws and regulations do not require local agencies to prepare climate action plans, agencies are responsible for preparation of other types of planning documents that may deal with greenhouse gas emissions and climate change. State and/or federal law directs communities to prepare certain types of planning documents; for example, the California Government Code requires communities to have a general plan. Cities and counties are not required to have a CAP under state or federal law, although a local government may have a policy in its general plan or other guiding document directing the community to prepare a CAP.

Local and regional plans and programs address GHG emissions in new development. The City of Merced General Plan and its associated environmental impact report commit to strategies that reduce GHG emissions. The City is also responsible for analyzing GHG emissions of projects subject to CEQA prior to project approval. Following project approval, certain types of projects are further subject to the Indirect Source Review (ISR) Program administered by the San Joaquin Valley Air Pollution Control District (SJVAPCD). To meet ISR regulations, projects must pay a fee based on the volume of other types of air quality emissions such as criteria air pollutants or demonstrate reductions in project emissions using strategies that also reduce GHG emissions.

State regulations and guidance also require certain types of new projects to address greenhouse gas emissions and climate change. In March 2010, new amendments to the state CEQA Guidelines became effective, requiring projects subject to CEQA to analyze impacts on GHG emissions and climate change. Lead agencies have the option to analyze the significant effects of climate change at a programmatic level to simplify the subsequent review of projects for purposes of GHG emissions. One option to streamline the environmental review of GHG emissions for later project-level analysis is the development, adoption, and implementation of a community-wide climate action plan.

With adoption of this PCAP, the City of Merced provides simplified option for new projects to address the multiple requirements pertaining to GHG emissions. Projects subject to CEQA can now rely on the City's PCAP and CAP to assist in complying with the CEQA requirements for GHGs. Measures in the PCAP will also help new projects identify appropriate measures that meet the guidance of the ISR program, with the potential to reduce emissions and fees to the SJVAPCD.

Inventory and Forecast

The inventory and forecast serve as the foundation for the CAP and the PCAP by providing a summary of current and future GHG emissions in the city of Merced. The inventory and forecast allow elected officials, City staff, and community members to understand what activities contribute to their GHG emissions and how these emissions are expected to change in the future. This information gives decision-makers the ability to focus GHG reduction efforts on the largest sources of emissions and those that have the greatest potential to achieve reductions, maximizing the effective use of City resources.

Baseline 2008 GHG Inventory

The City of Merced prepared a GHG inventory for calendar year 2008, which City staff used to prepare the 2012 CAP. The Great Valley Center later prepared a second inventory for Merced for the calendar year 2011. The 2011 inventory uses updated methods that reflect the latest best practices and guidance. In response to the 2011 inventory, staff revised the 2008 inventory to ensure that it follows the most recent guidance in the US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, the first protocol developed for community-wide GHG inventories that provides the most widely accepted methods for preparing inventories. This update also helps to ensure that the inventory meets the standards allowing the 2012 CAP to be used to streamline environmental review under CEQA, allowable under CEQA Guidelines Section 15183.5(b), and is consistent with the inventory prepared by the Great Valley Center, allowing a more accurate comparison between the 2008 and 2011 inventories. **Appendix B** provides details about how the forecast was updated since the 2012 CAP.

In 2008, the community of Merced emitted approximately 599,090 $MTCO_2e$. Of these emissions, 95% resulted from only three sectors: vehicle travel on local roads and state highways within Merced (transportation), energy use in residential buildings, and energy use in nonresidential buildings. Transportation was the single largest sector, contributing approximately 39% of GHG emissions in 2008. Combined, energy use in both the nonresidential and residential sectors contributed 55% of emissions in 2008. Community-wide emissions in 2008 are shown in **Table 1**. **Appendix C** provides technical details on inventory calculations.

Table 1: City of Merced 2008 Community GHG Emissions

Sector	$MTCO_2e$	Percentage
Transportation	235,570	39%
Nonresidential energy	216,680	36%
Residential energy	115,110	19%
Solid waste	18,750	3%
Water and wastewater	6,670	1%
Off-road equipment	6,310	1%
Total	**599,090**	**100%**

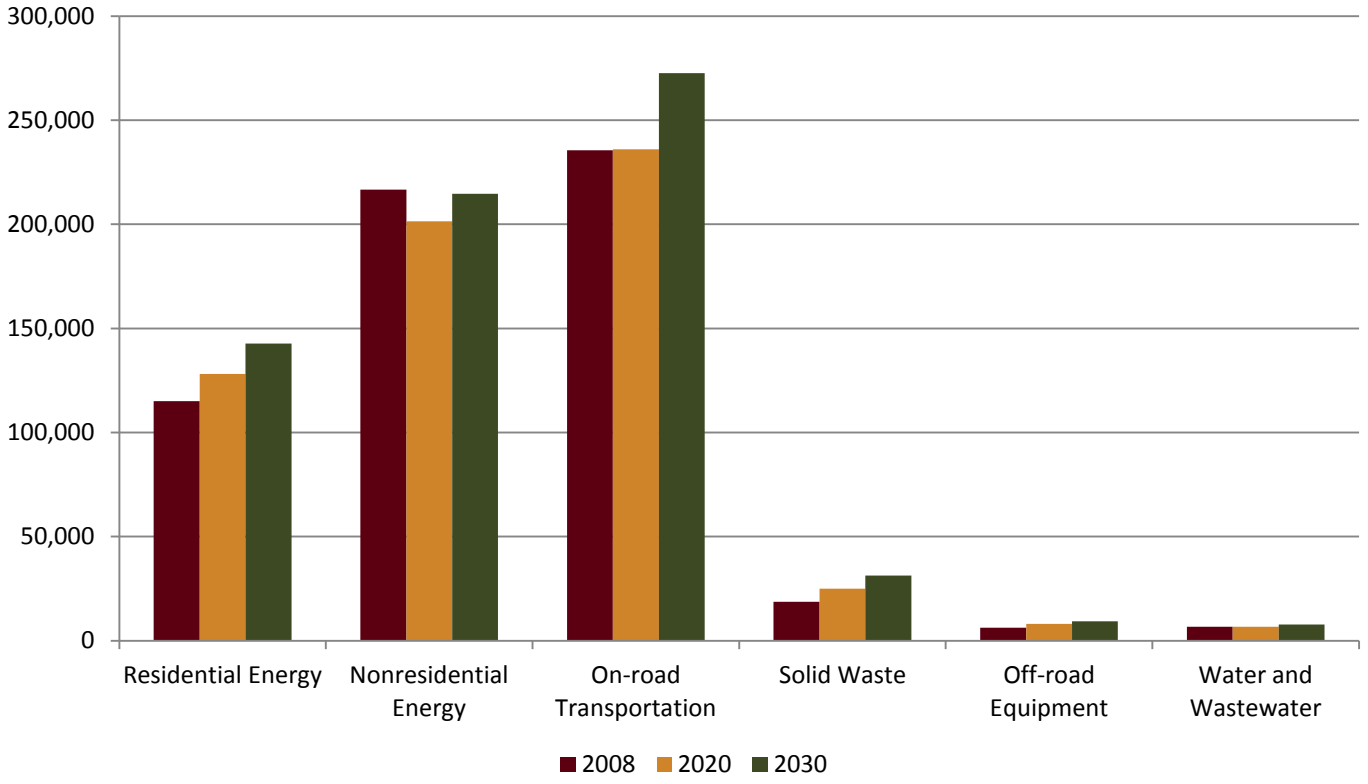
GHG Emissions Forecasts

The City forecast emissions for future years as a basis of calculating a reduction target. Like many other communities in the San Joaquin Valley, Merced's population and employment are expected to increase substantially over the next few decades. Without any action taken at the federal, state, or local level to reduce emissions, Merced's GHG emissions are expected to rise significantly as the city experiences growth in the number of new residential and nonresidential buildings, more residents, and more people working and conducting activities in the community. This growth scenario is a "worst-case" scenario, based on the growth assumptions of the City's General Plan.

California has already implemented a number of programs that reduce GHG emissions locally. The forecast is adjusted to account for GHG reductions from state actions.[1] In 2020, with state actions, the city's GHG emissions will reach 605,390 $MTCO_2e$, a 1% increase above baseline 2008 levels. By 2030, the emissions forecast will increase by 13% from 2008 levels, reaching 678,330 $MTCO_2e$. The transportation sector will remain the largest GHG emissions sector in 2020 and 2030, with total growth of 36,970 $MTCO_2e$ from 2008 to 2030, even after accounting for the impact of state actions. **Figure 1** presents GHG emissions for 2008, 2020, and 2030 by emissions sector. A technical summary of the City's updated GHG inventory and forecast is provided in **Appendix B**.

[1] The impact of state actions is sometimes referred to as the adjusted business-as-usual forecast, or ABAU approach. The ABAU forecast is adjusted for state actions that require little or no local action to reduce emissions. For this reason, state-mandated actions that give discretion to local governments on specific implementation actions, such as implementation of state recycling requirements or adopting complete street standards, are not included in the ABAU forecast. For more information, refer to Appendix A.

Figure 1: 2008–2030 Community Emissions in Merced by Sector with State Actions ($MTCO_2e$)

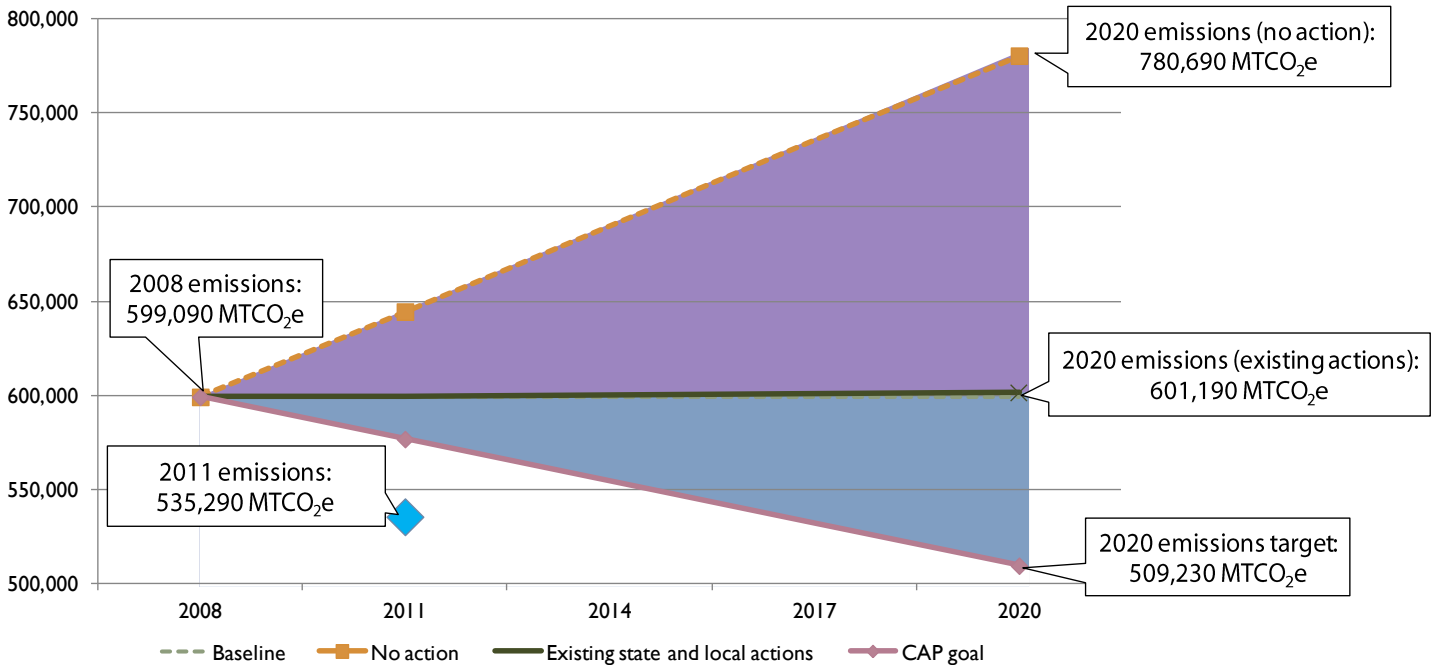


GHG Reduction Target

To establish a programmatic CAP that provides CEQA streamlining to new development, plans must identify a level of GHG emissions below which GHG emissions would not be cumulatively considerable. This level is typically referred to as a reduction target. With the Merced CAP, the Merced City Council adopted a community-wide GHG reduction target of 1990 levels by 2020. This target is equivalent to a 15% reduction below the baseline year of 2008 by 2020, consistent with the statewide target established by Assembly Bill (AB) 32. A key outcome of this PCAP is to provide a group of measures that are demonstrably capable of achieving the target adopted by the Merced City Council, consistent with the standards for a qualified GHG reduction strategy identified in state CEQA Guidelines Section 15183.5(b).

Figure 2 illustrates the adopted 2020 reduction target and 2020 GHG emissions forecast. With actions implemented by the State only, the City must close a gap of 96,160 $MTCO_2e$. Accounting for existing local accomplishments, the City must still close a gap of approximately 91,960 $MTCO_2e$. The shaded blue area in **Figure 2** represents the GHG emissions that the City must reduce with CAP measures to achieve the adopted CAP target. The City must address the outstanding 91,960 $MTCO_2e$ that remain after state efforts and existing accomplishments with actionable CAP tools and programs, which are presented in **Chapter 2**.

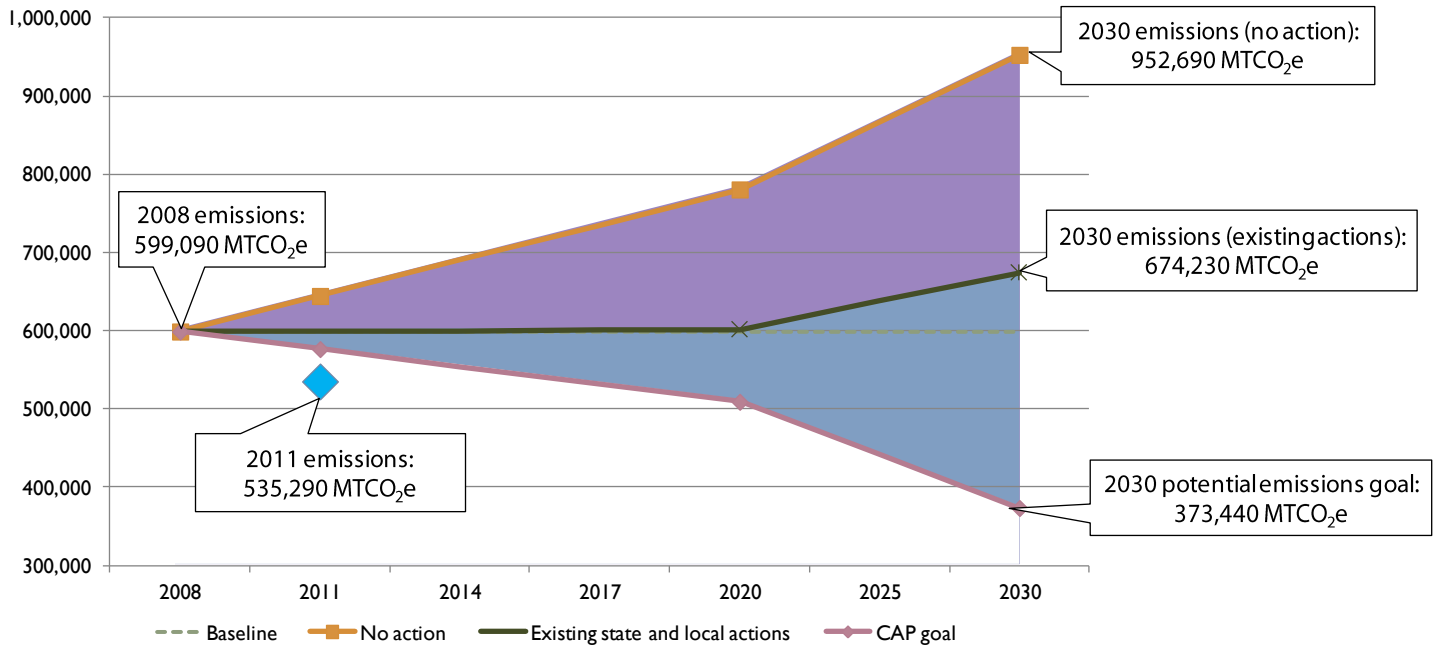
Figure 2: City of Merced 2008–2020 Community GHG Emissions Forecast and Reduction Target



The CAP does not provide a target beyond 2020. State guidance in the recently updated AB 32 Scoping Plan emphasizes the importance of establishing a post-2020 goal but does not recommend a specific target.[2] Executive Order (EO) S-3-05, signed in 2005, set a 2050 reduction goal of 80% below 1990 levels for the state, but this target has not been formally adopted. The trajectory toward the 2050 target is equivalent to a 2030 target of approximately 38% below baseline levels. The provisional 2030 target, a 38% reduction below baseline 2008 levels, is provided here to illustrate the commitment that would be needed to be on a trajectory to achieve the 2050 reduction target identified in EO S-3-05. A provisional 2030 target also shows emissions associated with the Merced General Plan horizon year. To achieve a reduction of approximately 38% below baseline 2008 levels, the City would need to increase the pace of reductions post-2020. **Figure 3** illustrates the provisional 2030 reduction target of 38% below baseline levels by 2008. The City would need to achieve an additional reduction of 300,790 $MTCO_2e$ beyond state and existing local actions by 2030 to achieve a reduction of approximately 38% below baseline levels to maintain a trajectory toward California's long-term 2050 GHG reduction goals. This is one potential 2030 target, and the City may wish to consider others, as discussed in greater detail in **Chapter 2**.

[2] California Air Resources Board. 2014. Scoping Plan Update.

Figure 3: City of Merced 2008–2030 Community GHG Emissions Forecast and Reduction Target



Summary of Early Progress Toward the Reduction Target

A number of actions undertaken by the State of California to reduce statewide GHG emissions are already under way, which helps to reduce emissions within the community of Merced. Four of these existing state actions collectively reduce 2020 emissions by 175,300 $MTCO_2e$ below the "no action" level:

- Assembly Bill 1493 and the Low Carbon Fuel Standard, which improve fuel efficiency in most passenger vehicles and reduce carbon intensity for transportation fuels
- Heavy Duty Vehicle GHG Reduction, which requires retrofits to large freight vehicles to improve fuel efficiency
- The Renewables Portfolio Standard, which requires electricity providers to obtain at least 33% of their electricity from eligible renewable sources by 2020
- Title 24 of the California Building Code, which establishes energy efficiency standards for new buildings

UC Merced Sustainability

UC Merced (UCM) has completed a number of actions to reduce GHG emissions to date, including:

- Building an 8.5-acre solar array that meets 20% of the campus's electricity needs.
- Receiving LEED green building certification on all buildings, the only campus in the US to achieve this distinction.
- Creating a composting program at the cafeteria, keeping 40,000 pounds of waste out of landfills annually.

Because UCM is not located within the Merced city limits, these actions do not result in direct GHG reduction credits for the CAP. Nonetheless, UC Merced is identified in this PCAP as an important partner to help the City implement transportation demand management programs for student housing in the city. Additional information is available in Chapter 2.

Source: https://sustainability.ucmerced.edu/area-stakeholders

The City of Merced has also initiated additional steps beyond the statewide actions that reduce GHG emissions locally with early action. These local actions reduce 2020 GHG emissions by an additional 4,200 $MTCO_2e$:

- Community solar panels: Merced has promoted the widespread use of rooftop and other smaller-scale solar energy systems, in large part due to incentives offered by the California Solar Initiative (CSI). Under this program, residents and businesses in Merced have installed approximately 200 solar energy systems since 2008.
- Green Facilities Project: The Green Facilities Project is an extensive retrofit of City-owned facilities to improve energy efficiency. The project was completed in July 2012 and saves approximately 3.6 million kilowatt-hours (kWh) of electricity each year.
- Commute Connections: Commute Connections is a vanpool program that provides an alternative for people driving to and from work in their personal vehicles. At the end of 2013, over 350 Merced residents participated in this program.
- Digester gas capture: Merced's wastewater treatment plant routinely produces digester gas as a by-product of the treatment process, which contributes to City GHG emissions. The digester gas capture program collects this gas and uses it for alternative purposes, preventing it from escaping into the atmosphere.

The list identifies only key actions with available data that provide certainty for early and ongoing GHG reductions. Other policies and regulations may contribute to GHG reductions, but the volume of reductions cannot be clearly identified at a community scale due to a lack of data or calculation methods. Where relevant, other state and local codes or policies that help new development achieve consistency with the CAP are addressed throughout this document. In these instances, complying with existing regulations may help a project implement the measures in **Chapter 2** and **Appendix A**. More information follows throughout this document.

To achieve the adopted 2020 target, the community of Merced must reduce emissions 271,460 $MTCO_2e$ below its "no action" emissions forecast. The state and local actions identified above collectively reduce emissions by 179,500 $MTCO_2e$ in 2020, equal to 66% of the necessary reductions. In order to achieve the 2020 reduction target, the City must accomplish the remaining 34% of necessary reductions and achieve a reduction of approximately 91,960 $MTCO_2e$ to reach the 2020 reduction target. The 91,960 $MTCO_2e$ is also referred to as the emissions "gap" that must be

Interim 2020 Targets – Annualized Progress Objectives

For illustrative purposes, if the 2020 emissions gap were averaged annually from 2008 to 2020, the annualized reduction equivalent would be approximately 7,660 $MTCO_2e$ in addition to the reductions achieved from the state actions and local reductions presented here. While this annualized reduction amount does not reflect the ramp-up time often needed for reductions or phasing of state programs, it serves to provide an early benchmark of progress. To achieve the informational 2030 target, the City would need to reduce GHGs by approximately 13,670 $MTCO_2e$ per year (from 2008 to 2030) above the reductions already counted by state actions and local accomplishments.

eliminated to achieve the target. This is equivalent to a 15% reduction below the adjusted emissions forecast (with local accomplishments) for 2020, as shown in **Table 2**. By 2020, state actions and local accomplishments are expected to achieve annual reductions equivalent to 179,500 $MTCO_2e$, or at a rate of 14,960 additional $MTCO_2e$ per year from 2008 to 2020.

Table 2: Future GHG Emissions and Reduction Targets, 2020 and 2030

	2020	2030
Baseline (2008) emissions ($MTCO_2e$)	599,090	599,090
Emissions forecast ($MTCO_2e$)	780,690	952,690
State actions ($MTCO_2e$)	-175,300	-274,360
Local accomplishments ($MTCO_2e$)	-4,200	-4,100
Emissions forecast with state actions and local accomplishments ($MTCO_2e$)	601,190	674,230
Emission target ($MTCO_2e$)	509,230*	373,440†
Local reduction needed to achieve target ($MTCO_2e$)	-91,960	-300,790
Local reduction needed to achieve target (percentage)	-15%	-45%

Notes:
**15% below baseline emissions*
†Approximately 38% below baseline emissions

Monitoring Progress and Plan Implementation

Monitoring plan progress toward reduction targets is one of the required criteria for qualified GHG reduction plans as outlined by CEQA Guidelines Section 15183.5. The City will conduct annual monitoring and reporting to track CAP measure progress on an annual basis through 2020. The City will use a monitoring and reporting tool to estimate changes in GHG emissions and track implementation of CAP measures. The tool will allow the City to prepare interim estimates of progress toward the 2020 goal, which can be presented to the Merced City Council, members of the public, and other key stakeholders. The tool also equips City staff to track the outcome of actual growth versus forecast growth on GHG emissions, allowing City staff to understand potential credits based on the community not collectively achieving its GHG reduction targets.

City staff will also support PCAP implementation by use of the Project Options Checklists in **Appendix A**. These checklists present several options for residential and nonresidential development to attain consistency with the PCAP. The checklists guide project applicants and City staff to additional resources to understand the key performance objectives and range of potential solutions to meet consistency with the checklists. A key resource is the City's Unified Design Manual (UDM). Available as a separate document, the UDM provides guidance for the visual aspects of project design that reduce GHG emissions and support the reduction measures in this plan. More information is available throughout this PCAP and in **Appendix A**.

Public Engagement

The City facilitated a collaborative process to prepare the PCAP. City staff, stakeholders, the public, and an appointed ad hoc advisory committee, the PCAP Focus Group, provided ongoing input on project development. Stakeholders in the community vetted and recommended appropriate strategies reflective of the community. The outreach process served to develop a plan that responds to community leadership and priorities. The strategies in this PCAP reflect those community priorities and recommendations. Engaging the community also allowed the City to build and nurture partnerships necessary to implement the CAP.

Resource Efficiency Fair

The City hosted the PCAP Resource Efficiency Fair for the PCAP on February 27, 2014, at the Senior Center. The fair served as the public kickoff event for the PCAP and as an educational event for Merced residents and business owners. The event was intended to inform members of the public about the PCAP project, including project purpose, components, and timeline. In addition, the City used the fair as an opportunity to invite individuals interested in joining the project's ad hoc advisory focus group. Attendees also participated in a number of activities to determine support for various resource efficiency actions and barriers that exist to implementing these items.

The Resource Efficiency Fair did not focus solely on the PCAP. In addition to staff from the Merced Planning Division and the project's consultants, representatives from 31 other organizations were in attendance to share information about resource efficiency with event attendees. These participants included other government agencies and departments (such as the City's Public Works Department), various community groups such as the Merced Bike Coalition and the Master Gardeners of Merced County, private companies and utilities that are key stakeholders in resource efficiency such as PG&E, and numerous representatives of community institutions, including multiple groups from UC Merced. Each organization hosted a table to display information, provide demonstrations, and conduct activities.

Including the representatives from the various organizations, approximately 120 people attended the fair. The City Manager and key project staff provided brief presentations. City staff and the project consultant presented a brief overview of the PCAP effort. Following these presentations, attendees were invited to visit the organization tables that were set up around the room. At

On February 27, 2014, over 100 individuals participated in the City's Resource Efficiency Fair to kick off the PCAP effort.

the PCAP Activity Table, participants provide input by voting on priorities using "issue buckets" and selecting recommended strategies on activity posters.

Key input from participants at the fair included the following:

- Water resource protection was identified as the most important priority issue for residents, visitors, and business participants.
- Participants identified costs and lack of information as key barriers to conducting home and building improvements that reduce energy use.
- The majority of responding participants already recycle, and use energy-efficient light bulbs and appliances.
- Respondents identified interest in installing renewable energy.
- Participants identified incentives as important tools to encourage additional actions .

City Staff Engagement

Interdepartmental engagement was essential in the development of the PCAP to ensure that strategies were attainable and appropriate for the community. The project team relied on input from key City staff to provide input and guide PCAP content development. The Technical Advisory Committee (TAC), including staff from Public Works and Planning and Building, reviewed deliverables and participated in working meetings to provide input. The TAC also was invited to attend and participate at Focus Group meetings.

Focus Group

The City established a Focus Group to review the PCAP and provide feedback as a vital means of ensuring that the PCAP reflects the values of the diverse interests and organizations in Merced. City staff invited Focus Group members from the Merced business community (including representatives from developers, real estate professionals, and local companies providing "green jobs"), advocacy groups, and City officials, including the mayor and a Planning Commission representative. The Focus Group reviewed PCAP policies and associated products, including the GHG reduction measures and their prioritization, the monitoring programs, the cost-benefit analyses, and the development code language and the UDM. The Focus Group met seven times between March 2014 and September 2015. All Focus Group meetings were open to members of the public, and all meeting materials were posted on the City's website. Community members who were unable to attend the meetings had the opportunity to submit comments electronically.

At each meeting, Focus Group members and other attendees received an update on the status of the PCAP and the work that had been done since the previous meeting. City staff then presented information on the next stage of PCAP development and brought up specific issues for the Focus Group to discuss and provide feedback on. The meetings also allowed additional discussion of other items, including issues submitted to the members by City officials, ensuring that the Focus Group could offer valuable input on all items rather than a limited set. Members of the public in attendance had the opportunity to offer comments on the PCAP at these meetings.

During the seven Focus Group meetings, members offered critical feedback on a wide range of items to guide PCAP development, including emphasis on the following issues:

- Focus on priorities to help Merced residents and businesses save money, conserve resources, and reduce GHG emissions.
- Identify measures that help Merced achieve its GHG reduction target in a cost-effective manner that encourages and does not hinder business.
- Provide options for implementation approaches to simplify the process for new development.
- Evaluate and disclose the cost-effectiveness and applicability of various proposed reduction measures, and show ways to reduce the cost of implementation.
- Support partnerships with the community and other agencies to educate the public and foster community achievement of PCAP objectives.

Additional Engagement

City staff conducted one-on-one meetings with other stakeholders in the community. These meetings provided the opportunity to share project updates and invite feedback. City staff invited developers and builders to attend open office hours for discussion of suggestions for PCAP measures related to new development. Additionally, the project team coordinated with staff from the San Joaquin Valley Air Pollution Control District. The intent of this additional outreach was to engage key stakeholders and identify opportunities to leverage efforts or share information.

Introduction

The GHG reduction measures are intended to reduce Merced's emission, closing the gap of 91,960 $MTCO_2e$ between community emissions after state and local existing accomplishments and the City's adopted GHG reduction goal of returning to 1990 levels by 2020. The reduction measures accomplish this goal by combining voluntary programs for existing residents and businesses with a flexible, performance-based approach that identifies existing regulations or new opportunities for new development. The combination of these two approaches and the way they are implemented allows residents, businesses, and developers a high degree of flexibility to implement the measures in the way that makes the most sense for their goals and values, while also demonstrating predictable GHG reductions to City staff to ensure that Merced can achieve its adopted GHG reduction target.

Relationship to Measures in Existing CAP

Merced's adopted CAP includes 8 goals and 24 strategies to reduce GHG emissions. These goals and strategies identify opportunities for GHG emission reductions, directing City staff and other stakeholders to focus GHG reduction efforts on these items. The measures in this chapter build on the strategies in the adopted CAP, providing additional implementation details to identify the volume of GHG reductions achieved by each measure and to allow the City to effectively track CAP implementation. The measures also included opportunities and available programs for GHG emission reductions that are applicable to Merced, but were not available at the time the adopted CAP was

prepared or were not included in the adopted document. This chapter lists 31 reduction measures, which correspond to the strategies in the existing CAP as shown in **Table 3**.

Table 3: Relationship Between Existing CAP Strategies and PCAP Measures

CAP Strategy	Applicable PCAP Measure(s)
EM 1.1: Site design planning	1, 31
EM 1.2: Transit planning	2, 3, 4, 6, 31
EM 1.3: Bicycle planning and projects	3, 6, 31
EM 1.4: Pedestrian planning and projects	1, 31
SC 2.1: Compact urban form and infill	1, 31
SC 2.2: Mixed use and transit-oriented development	1, 6, 31
SC 2.3: Growth management planning	1, 31
SC 2.4: Community appearance	1, 31
WC 3.1: Water conservation and technology	21, 22
WC 3.2: Reduce groundwater pumping	21, 22, 25, 31
WC 3.3: Water-efficient landscapes	24, 31
AR 4.1: Reduced vehicle trips	2, 3, 4, 6, 7, 31
AR 4.2: Clean trips – clean vehicles	8, 9, 31
AR 4.3: Reduce non-vehicular emissions	29, 30
WR 5.1: Reduce, reuse, and recycle	26, 27, 28
RE 6.1: Renewable energy systems	17, 18, 19, 20, 31
BE 7.1: Green City facilities and infrastructure	14, 15, 16
BE 7.2: Energy efficiency in new development	10, 11, 31
BE 7.3: Residential energy efficiency	12, 13, 15
BE 7.4: Commercial and industrial energy performance	14, 15, 16
BE 7.5: Urban forestry and heat island effect	15, 31
PO 8.1: Community resource	3, 6, 10, 11, 12, 13, 14, 15, 20, 26, 27, 28
PO 8.2: Support a green economy	2, 3, 4, 5, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 27, 28, 31
PO 8.3: Support sustainable neighborhoods	1, 2, 3, 4, 5, 6, 7, 8, 9, 31

Measure Structure

The measures presented in this chapter include the following information:

- The basic measure language, identifying the overarching intent of the measure.
- The 2020 GHG reduction from fully implementing the measure.
- The performance indicators, which specify the number of participants needed to fully implement the measure.
- The recommended actions, which are specific mechanisms to implement the measure.
- The types of developments to which the measure is applicable.
- The values and priorities that the measure supports.

GHG Reduction Calculations

All measures, including the performance-based approach, rely on the baseline GHG inventory and forecast. These calculations serve as the foundation for the quantification of the new reduction measures to identify GHG reduction potential. Quantification begins with activity data from the inventory, including community-wide vehicle miles traveled (VMT), kilowatt-hours (kWh) of electricity or therms of natural gas used, and tons of waste disposed, among others. Various data sources, including government agency tools and reports, case studies in similar jurisdictions, and scholarly research, were used to determine the amount of activity data that can reasonably be reduced per individual participant (e.g., a household, an employee) following the actions identified in the reduction measure. These data sources were also used to help determine a reasonable participation rate (the percentage of participants in the community who are expected to implement the measure), known as a performance target, which was adjusted to match local conditions based on community values and the presence of any mandates or incentives in the specific action items. The performance targets and reductions per participant were combined to identify the estimated total reduction in activity data from the implementation of a measure. Lastly, activity data reductions were converted to GHG reductions using emissions factors from the forecast. GHG emission reductions, performance targets, and reductions per participant for individual measures are given in **Appendix C.**[3]

Applicability

All measures can fall into one or more of four categories, depending on how they are applied:

- New development (performance-based approach): The measure is implemented through the development review process for new construction. The performance-based approach does not prescribe mandatory measures on new development, but instead provides options for

[3] These metrics do not include reductions or participation levels from implementation through the performance-based approach. New projects have multiple options to choose from when implementing the performance-based approach, and so it is impossible to specify the specific reductions or participation levels for any individual measure implemented through the performance-based approach.

projects to demonstrate CAP compliance and achieve GHG reductions using various design features or by participating in key programs. The performance-based approach is discussed in greater detail below.

- New development: The measure will be implemented during the construction and/or occupancy phase of a new development and is not a condition of the design and development review process. These types of actions are not included as performance-based options in the Project Options Checklists, but would eventually be implemented by new development in a voluntary capacity.
- Existing development: The measure is implemented by individual building owners and occupants of existing buildings that are already constructed and in operation.
- City government: The measure is implemented through budgets, workflow planning, capital improvements, coordination of educational or program efforts, and other planning and construction activities for City facilities and operations.

Performance-Based Approach

The performance-based approach allows new development projects to demonstrate compliance with the CAP by implementing a selection of specific reduction measures. Projects can choose to implement one of the options outlined in **Appendix A**, each of which contains design criteria based on reduction measures from the CAP and the PCAP. Projects can demonstrate compliance with the CAP by implementing all reduction measures in the selected option. Each option shows the criteria that would reduce the project's GHG emissions 29% below baseline levels consistent with the San Joaquin Valley Air Pollution Control District's recommended CEQA Assessment Guidance.

While new projects will implement these measures on a case-by-case basis, when the total impact of each new project's GHG reductions is aggregated, collectively new development would achieve a measurable reduction in GHG emissions that helps the City achieve its adopted GHG reduction target of returning to 1990 GHG emissions levels by 2020. Additionally, the measure options allow projects to achieve GHG reductions that also meet the requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) Indirect Source Review Program for new development. The SJVAPCD's Indirect Source Review rule requires that most projects reduce emissions of other air pollutants below specified levels or pay mitigation fees. The measures in the Project Options Checklists are intended to help facilitate compliance with the ISR rule and other regulations; however, projects that fully comply with the CAP are not necessarily fully compliant with SJVAPCD rules.

The performance-based approach already accounts for credit from regulatory actions that are under way. The following reductions from state-mandated actions are already attributed as credits toward the project for GHG reductions and cannot be claimed as additional credits to meet the performance-based options below:

- Compliance with California's Renewables Portfolio Standard (RPS), mandating that utilities procure 33% of their electricity from eligible renewable sources by the end of 2020.

- Vehicles with fuel efficiencies compliant with California's AB 1493 standards and using fuel that meets the requirements of the State's Low Carbon Fuel Standard.
- Compliance with the mandatory items of the California Building Standards Code, including all minimum energy efficiency requirements of the California Green Building Standards Code (CALGreen).

Projects cannot count these actions as additional credits for CAP consistency. Note that the performance-based approach also does not address reductions from reduced solid waste generation and off-road equipment use; reductions from these items are achieved on a citywide basis year by year through other CAP implementation measures, which apply to both existing and new developments. The City implements these measures through other methods, rather than as conditions of approval on new development or remodels.

Values and Priorities

In 2010, the City established a Climate Action Plan Ad-Hoc Advisory Committee to guide the development of the adopted CAP. As part of these efforts, the committee wanted to emphasize the overarching values of the adopted CAP to establish a broad guiding framework for GHG reduction strategies. The committee ultimately established four goals:

- Healthy communities
- Quality natural resources
- Clean energy resources
- Leaders and partners

The GHG reduction measures identified in this PCAP support the four values identified by the committee. This PCAP also adds a fifth value of cost savings, supporting long-term financial sustainability for both residents and businesses, and continuing the adopted CAP's established objective of being a business-friendly plan. The entry for each measure identifies which of these five values the measure supports, using the icons shown below.

Clean energy resources

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measures by Topic Area

The 31 measures fall into 11 categories, as shown in **Table 4**.

Table 4: Measures and Reductions by Topic Area

Topic Area	Included Measures	2020 $MTCO_2e$ Reduction
Land use and transportation – density and connections	1, 7	4,410
Land use and transportation – alternative transportation	2, 3, 4, 5, 6	2,570
Land use and transportation – alternative fuels	8, 9	5,550
Energy efficiency – new construction	10, 11	0*
Energy efficiency – existing buildings	12, 13, 14, 15, 16	21,530
Energy – renewable energy	17, 18, 19, 20	10,120
Water and wastewater – water conservation	21, 22, 23, 24	630
Water and wastewater – alternative water sources	25	70
Solid waste – increased diversion	26, 27, 28	17,190
Off-road equipment	29, 30	160
Performance-based approach†	31	31,320

** Because all energy efficiency measures from new construction are implemented through the performance-based approach, reductions from these measures are included as part of the reductions from the performance-based approach.*

† The performance-based approach is a means of applying the reduction measures to new development. As a result, it does not occupy a single category, since it implements reductions across all topic areas.

Land Use and Transportation Measures

Providing alternatives to vehicle use helps to save fuel and reduce GHG emissions. The City of Merced can establish programs that make it easier to use alternative forms of transportation such as public transit and bicycling, can encourage development patterns that make it easier for community members to have multiple transportation options to reach their destinations, and can promote the use of vehicles and transportation infrastructure that reduce fuel use. These items also help support cleaner air and make it easier for community members to use active transportation, promoting a healthy community.

Measure 1: Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.

2020 GHG Reduction: 2,730 $MTCO_2e$

2020 Performance Indicators:

- 3.1 housing units per acre
- 4.0 jobs per acre
- 4,260 new multifamily housing units
- 5,140 households in newly developed areas
- 2,540 jobs in newly developed areas

Recommended Actions:

1) Continue to conduct land use surveys to identify underutilized parcels for residential and nonresidential uses.
2) Evaluate the feasibility of a Transfer of Development Rights (TDR) program to concentrate development near existing and future centers while preserving agricultural land within the sphere of influence.
3) Coordinate future zoning with transit plans to enable mixed-use transit-oriented developments at rail stations and other key transportation nodes.
4) Work with regional transit providers to ensure that future transit routes connect to mixed-use neighborhoods.

California High-Speed Rail

Merced is set to be a stop on California's high-speed rail network, currently under construction. The City is preparing a plan for a 503-acre area located within half a mile of the proposed Merced station. Under this plan, this area is set to include higher-density mixed-use developments and business/research parks, focusing on providing easy access to both the high-speed rail station and local transportation. High-speed rail service to Merced is set to begin in 2022.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Healthy communities

Leaders and partners

Measure 2: Support a 30% increase in per-person intracity and intercity transit use by 2020.

2020 GHG Reduction: 180 $MTCO_2e$

2020 Performance Indicator:

- 1,164,170 Merced County Transit trips taken by Merced residents

Recommended Actions:

1) Coordinate with transit providers to identify and implement improvements to local and regional transit service, including expanded operating hours, new and adjusted routes, and increased frequency.
2) Coordinate with transit providers to allow riders to easily transfer from one provider to another, including synchronized schedules, free or reduced-cost transfers, and a unified fare schedule.
3) Subsidize low-cost/free transit passes to residents of new multifamily developments of at least 20 units.
4) Designate key streets as transit corridors and implement Complete Street guidelines to facilitate walking, biking, and transit use.
5) Work with UC Merced to improve transit ridership among the student population.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 3: Promote carpool and car-share systems.

2020 GHG Reduction: 510 $MTCO_2e$

2020 Performance Indicators:

- 20 shared cars
- 4,900 citywide employees eligible for car sharing

Recommended Actions:

1) Work with community employers to establish a unified carpool system for commute trips.
2) Work with car-share providers to enable car sharing in Merced.
3) Explore establishing designated car-share spots in City-owned or publicly accessible private parking lots and garages.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 4: Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.

2020 GHG Reduction: 230 $MTCO_2e$

2020 Performance Indicator:

- 540 bike commuters

Recommended Actions:

1) Fully implement the infrastructure improvements identified in the 2013 Bicycle Transportation Plan, including additional bike lanes, street treatments, traffic signal sensors, and appropriate signage.
2) Incentivize bicycle parking for all new multifamily developments of at least 10 units and all new nonresidential developments of at least 50,000 square feet.
3) Offer free bike safety and maintenance classes to Merced residents, including UC Merced students.
4) Encourage new and existing employers and multifamily developments to provide secure bicycle parking, showers, and lockers.
5) Coordinate with surrounding communities to link the Merced bicycle network with regional trails.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 5: Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.

2020 GHG Reduction: 160 $MTCO_2e$

2020 Performance Metrics:

- 730 employees telecommuting an average of 1.5 days per week

Recommended Actions:

1) Work with local and regional employers to allow telecommuting for employees, including offering incentives to telecommute-friendly local employers.
2) Establish one or more telecommuting centers in Merced with appropriate workspace and telecommunication infrastructure.
3) Promote telecommuting to Merced residents through education and outreach campaigns.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 6: Work with UC Merced to establish a Transportation Demand Management (TDM) program for new student housing located in the city.

2020 GHG Reduction: 1,490 $MTCO_2e$

2020 Performance Indicator:

- 5,420 students living off campus

Recommended Actions:

1) Educate developers working on projects for UC Merced about ways to reduce vehicle miles traveled and the resultant benefits.
2) Publicize developments and businesses with successful TDM programs.
3) Reduce permit fees and/or streamline review as feasible for new projects that commit to achieving a long-term trip reduction.
4) Work with regional partners to fund successful TDM strategies for existing developments that can be implemented with little or no cost to property owners (e.g., City- or University-subsidized transit passes).
5) Require new student housing located in the city to implement a suite of TDM strategies.

Applicability:

- New development

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 7: Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.

2020 GHG Reduction: 1,680 $MTCO_2e$

2020 Performance Indicators:

- 10 road miles with synchronization
- 25% of downtown streets with traffic calming

Recommended Actions:

1) Continue synchronization of traffic signals at key intersections.

2) Update the Capital Improvement Program to include funding for additional four-way stop signs, traffic signal synchronization equipment, and vehicle roundabouts.
3) Seek grant funding for additional infrastructure and traffic signal equipment to improve vehicular flow.

Applicability:

- New development
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Measure 8: Support the use of neighborhood electric vehicles (NEVs, such as lower-speed, street-safe golf carts) by 3% of households by 2020.

2020 GHG Reduction: 630 $MTCO_2e$

2020 Performance Indicator:

- 900 households with an NEV

Recommended Actions:

1) Adopt a NEV strategy for Merced, including identifying appropriate NEV corridors, use of NEV-specific signage and street treatments, and requiring designated NEV parking spaces, with charging stations in new multifamily and nonresidential developments along NEV corridors.
2) Provide education to Merced residents and businesses about purchasing an NEV.
3) Coordinate with NEV manufacturers to make NEVs available for test drives at public events.
4) Explore offering incentives to Merced residents and businesses that purchase an NEV.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Measure 9: Support the increased use of passenger plug-in electric vehicles (EVs) and other alternative fuels to 5% by 2020.

2020 GHG Reduction: 4,920 $MTCO_2e$

2020 Performance Indicators:

- 1,500 households with a full EV
- 15 publicly accessible EV chargers

Recommended Actions:

1) Provide education to Merced residents and businesses about purchasing an EV.
2) Coordinate with EV manufacturers to make EVs available for test drives at public events.
3) Explore offering incentives to Merced residents and businesses that purchase an EV.
4) Incentivize multifamily projects of at least four units or nonresidential projects of at least 10,000 square feet to pre-wire designated parking spaces in a desirable location for EV chargers at time of new construction or significant retrofits.
5) Encourage new multifamily projects of at least four units or nonresidential projects of at least 10,000 square feet to install designated parking spaces, with charging stations, for EVs.
6) Offer expedited and reduced- cost/free permits to applicants seeking to install an EV charging station.
7) Explore offering EV charging stations in public parking lots and garages. Work with charging station operators to offer subsidized electricity to EV owners.
8) Encourage the construction of alternative fuel stations in Merced to meet demand.

Electric Vehicle Charging

Although electric vehicles (EVs) are still relatively rare in Merced, lower costs and increased supply are expected to make them a more common sight throughout California. Cities can promote EV adoption by making it easier for community members to charge their vehicles. There are three types of EV charging stations:

- Level 1: This form of charging involves plugging an EV directly into a wall outlet. Full charging can take up to 17 hours.
- Level 2: This form of charging uses dedicated equipment and a special circuit. Full charging can take 6 to 8 hours.
- Level 3: Also called DC Fast Charging, Level 3 charging requires an advanced type of charging station and a high-capacity circuit. Full charging can take 30–45 minutes or less.

The Unified Design Manual provides additional detail on EV charging stations.

Source: http://driveclean.ca.gov/pev/Charging.php

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Energy Efficiency Measures

Virtually all buildings use electricity and natural gas for lighting, heating and cooling, cooking, and to power appliances and machinery. However, as the cost of energy continues to rise, inefficient use of energy can have a significant financial impact on community members as well as increasing GHG emissions. The City can promote energy-efficient design, infrastructure, and actions in both new and existing buildings through a variety of cost-effective measures, from small-scale changes to complete building retrofits. These measures help to save GHG emissions and reduce energy costs, which in turn promote a strong local economy by keeping more money in the pockets of Merced residents and businesses.

Measure 10: Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.

2020 GHG Reduction: This measure is implemented entirely through the performance-based approach in Measure 31.

2020 Performance Indicator: Because this measure is implemented through the performance-based approach in Measure 31 and there is no forecast community-wide participation rate, there are no community-wide performance indicators for this measure. Average performance indicators for individual participants are identified in **Appendix C**.

Recommended Actions:

1) Develop and adopt an incentive-based energy efficiency performance code which goes beyond minimum CALGreen standards and includes plug load.

CALGreen Energy Efficiency

California requires all new buildings to meet minimum standards for energy efficiency, which are updated every few years. The current standards, which went into effect in 2014, require increased insulation, cool roofs, high-efficiency lighting, and other energy efficiency items.

The State encourages new buildings to implement voluntary items to go beyond these minimum standards, resulting in increased cost savings and other benefits. Tier 1 buildings exceed minimum standards by 10%–15%, while Tier 2 buildings exceed minimum standards by 20%–30%.

California's minimum standards are set to be updated again in 2017. The State plans to require new buildings to meet zero net energy efficiency standards beginning in 2020.

2) Educate property owners, developers, and contractors about exceeding the minimum CALGreen energy efficiency standards, including discussion of potential cost savings and increases in building value.
3) Provide training to all City plan check and code enforcement staff to ensure that the minimum CALGreen energy efficiency standards are being implemented.
4) Encourage building owners to seek green building certification through systems such as GreenPoint Rated, Leadership in Energy and Environmental Design (LEED), Green Globes, and others.

Applicability:

- New development (performance-based approach)

Clean energy resources

Cost savings

Leaders and partners

Measure 11: Site new buildings to take advantage of natural solar resources for heating and cooling.

2020 GHG Reduction: This measure is implemented entirely through the performance-based approach in Measure 31.

2020 Performance Indicator: Because this measure is implemented through the performance-based approach in Measure 31 and there is no forecast community-wide participation rate, there are no community-wide performance indicators for this measure. Average performance indicators for individual participants are identified in **Appendix C**.

Recommended Actions:

1) Offer incentives to new single-family homes to include passive solar design features, including proper building orientation, appropriately sized and positioned fenestration, appropriate shading, and use of thermal mass and insulating materials to minimize active heating and cooling. Encourage new multifamily and nonresidential buildings to use passive solar design features.
2) Offer reduced-cost and/or expedited permitting to applicants who integrate passive solar design features into significantly retrofitted buildings.
3) Educate Merced residents about the cost savings associated with passive solar design features.

Applicability:

- New development (performance-based approach)

Clean energy resources

Cost savings

Leaders and partners

Measure 12: Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.

2020 GHG Reduction: 1,890 $MTCO_2e$

2020 Performance Indicators:

- 810 existing low-income or renter-occupied single-family homes undergoing basic energy retrofits
- 160 existing low-income or renter-occupied single-family homes undergoing advanced energy retrofits
- 400 existing multifamily homes participating in retrofits
- 3,240 existing multifamily, low-income, or renter-occupied single-family homes upgrading appliances

Recommended Actions:

1) Collaborate with utility providers and energy contractors to provide free home energy audits to low-income households and reduced-cost energy audits to moderate- and above moderate-income multifamily and rental units.
2) Offer free or reduced-cost home weatherization to low-income households and mobile homes.
3) Work with property owners of multifamily and rental units to establish a financing mechanism for energy efficiency retrofits, including appliance upgrades, HVAC efficiencies, and increased insulation.
4) Establish an education and incentive program to promote behavioral energy efficiency and low-cost energy-efficient infrastructure (e.g., energy-efficient lights and smart power strips) in multifamily and rental units.
5) Encourage property owners to disclose home energy performance to potential buyers/tenants prior to time of sale or rent.
6) Require landlords to replace appliances older than 10 years with newer models that meet or exceed current energy efficiency standards prior to occupation by new tenants.

Applicability:

- Existing development

Clean energy resources

Cost savings

Leaders and partners

Measure 13: Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.

2020 GHG Reduction: 1,990 $MTCO_2e$

2020 Performance Indicators:

- 120 owner-occupied existing single-family homes with variable frequency drive pool pumps
- 900 owner-occupied existing single-family homes undergoing basic energy retrofits
- 450 owner-occupied existing single-family homes undergoing advanced energy retrofits
- 2,260 owner-occupied existing single-family homes upgrading appliances

Recommended Actions:

1) Improve financing opportunities for energy retrofits, including participation in a Property Assessed Clean Energy (PACE) program and other efforts such as bulk buying programs and low- and no-interest loans for retrofits.

HERO Program

Merced participates in an innovative type of financing effort called Property Assessed Clean Energy (PACE), which helps property owners afford energy efficiency retrofits, water efficiency retrofits, and renewable energy systems. Instead of paying an upfront cost for the item, participants pay through a temporary increase on their property taxes until the item is paid off. PACE programs allow property owners to make upgrades without staying in the building until the payments are finished, as the new owner assumes responsibility for any remaining payments.

In September 2014, Merced joined HERO, one of the largest PACE programs. As of July 2015, over 320 communities throughout California are part of the HERO program.

2) Educate homeowners about the benefits of residential retrofits and how to participate, including availability of any PACE programs. Host outreach events and workshops, and distribute information online and at public buildings.
3) Offer incentives beyond PACE or other financing opportunities for single-family homeowners to include energy efficiency retrofits in a renovation or expansion of an existing house, including reduced-cost building permits.

4) Offer low-cost retrofits to homeowners to identify opportunities for residential retrofits.
5) Promote energy efficiency improvements to swimming pools and other outdoor residential energy uses.
6) Provide homeowners with education and materials necessary to reduce energy use through free and low-cost actions.
7) Establish neighborhood competitions to incentivize homeowners to track and reduce their residential energy use.
8) Encourage single-family homeowners to disclose home energy performance to potential buyers prior to time of sale.

Applicability:

- Existing development

Clean energy resources

Cost savings

Leaders and partners

Measure 14: Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.

2020 GHG Reduction: 16,790 $MTCO_2e$

2020 Performance Indicators:

- 1,790,270 retrocommissioned existing nonresidential square feet
- 1,193,510 nonresidential existing square feet with basic energy retrofits
- 716,110 nonresidential existing square feet with deep energy retrofits
- 1,790,270 nonresidential existing square feet with energy-efficient appliances

Recommended Actions:

1) Incentivize energy retrofits for commercial and industrial facilities at time of significant expansion or renovation.
2) Develop or join a financing mechanism for commercial and industrial energy efficiency retrofit projects such as the HERO revolving loan fund and a Property Assessed Clean Energy (PACE) program.
3) Provide reduced-cost or free energy audits to nonresidential property owners and occupants to identify energy efficiency opportunities.

4) Work with commercial and industrial landlords to offer green leases, allowing lessees to partially or entirely finance energy efficiency retrofits.
5) Encourage nonresidential building owners to disclose building energy performance to potential buyers/lessees prior to time of sale or lease.
6) Educate commercial and industrial property owners and tenants about ways to reduce energy use through free and low-cost actions.
7) Educate nonresidential property owners about available rebates for energy efficiency.

Applicability:

- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 15: Use cool roofs and shade trees to reduce the urban heat island effect in Merced.

2020 GHG Reduction: 140 $MTCO_2e$

2020 Performance Indicators:

- 750 existing houses with cool roofs
- 61,230 existing nonresidential square feet with cool roofs
- 500 new mature shade trees

Recommended Actions:

1) Incentivize existing buildings to integrate light-colored roofs and surfaces into significant retrofits and expansions.
2) Work with local businesses and volunteer organizations to expand and maintain the Merced urban forest.
3) Encourage private property owners to maintain trees which provide a shade benefit to buildings and to replace shade trees that need to be removed.
4) Encourage private property owners to plant shade trees at time of new construction or significant retrofits.
5) Plant at least two new trees for every tree on public property that is removed.

Applicability:

- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 16: Support retrofits to outdoor public lighting in Merced to reduce energy use.

2020 GHG Reduction: 540 $MTCO_2e$

2020 Performance Indicator:

- 3,580,540 existing nonresidential square feet with energy-efficient outdoor lighting

Recommended Actions:

1) Pursue funding to replace streetlights and traffic signals with LED models, and carry out replacements as soon as funding becomes available.
2) Encourage property owners to use energy-efficient bulbs in existing outdoor signs and other outdoor publicly visible lighting.
3) Explore powering streetlights and traffic signals with renewable electricity generated by pole-mounted solar panels.

Applicability:

- New development (performance-based approach)
- Existing development

Clean energy resources

Cost savings

Leaders and partners

Renewable Energy Measures

Renewable energy is becoming increasingly widespread and affordable due to technological advances, a variety of financing options, and economic incentives. Community members can install renewable energy systems on their own property or they can participate in options that allow them to buy renewable energy from off-site facilities. By increasing the amount of energy supplied by renewable sources in Merced, community members not only reduce GHG emissions but reduce their own utility bills and gain more local control over where their energy comes from.

Measure 17: Increase the amount of renewable electricity generation for on-site residential use.

2020 GHG Reduction: 5,090 $MTCO_2e$

2020 Performance Indicator:

- 1,250 existing households with on-site solar photovoltaic (PV) systems

Recommended Actions:

1) Educate property owners about benefits associated with on-site renewable energy, available rebates and financing options, and ways to participate.
2) Offer incentives to new residential buildings to include rooftop solar panels.
3) Incentivize multifamily residential units with covered carports to include solar panels on carports at time of new construction or significant renovation.
4) Identify and implement financing opportunities for residential on-site renewable energy systems, including participation in a Property Assessed Clean Energy (PACE) program and a municipal finance district.
5) Offer incentives for new houses to work toward or meet zero net energy (ZNE) standards, generating as much energy as the home uses.

Applicability:

- New development (performance-based approach)
- Existing development

Clean energy resources

Cost savings

Lancaster Residential Solar Programs

The City of Lancaster, located in the high desert of Los Angeles County, has a goal of being the first zero net energy city for electricity in the world. To meet this ambitious goal, Lancaster plans to reduce electricity demand through extensive energy efficiency measures and then to offset the remaining electricity needs through renewable energy systems.

One program to achieve this objective is Solar Lancaster, an effort to make solar photovoltaic systems on existing buildings more affordable through reduced costs and increased financing options. Solar Lancaster was launched in 2010 as a partnership with solar panel manufacturer and installer SolarCity. As part of their role, SolarCity designs the installation to meet the participant's needs, provides free installation of the renewable energy system, and helps process the permitting and rebate paperwork. Property owners lease the solar panels for a monthly rate and purchase the electricity produced by the installation at a fixed cost, often for less than the local utility charges.

Lancaster also developed a program to install solar energy systems on new homes, called Solar Community. This program was a partnership between the City, homebuilder KB Home, and the solar manufacturer Build Your Dream. The program began in 2010 at KB Home's Alamosa development, which included new homes with pre-installed solar energy systems. A second development with pre-installed solar energy systems followed in 2011, and by early 2013 over 200 homes in Lancaster had solar panels installed at time of construction. Through the Solar Community partnership, home developers demonstrated the economic feasibility of pre-installing solar panels on new homes.

The Solar Community program showed that developers were able to install solar panels on new homes and that such efforts made economic sense. This program led to the development of Lancaster's residential solar mandate, also called Ordinance 994, which requires that all new homes permitted after January 1, 2014, install a solar photovoltaic system. Depending on the type of home, the array must be at least 0.5 kW to 1.5 kW per unit. New subdivisions have increased flexibility when installing these energy systems, as long the overall number of solar energy systems work out to an average of at least 0.5 kW to 1.5 kW per home. While a typical array costs $12,000 to $15,000 to install, or an additional $75 to $100 per month on mortgage payments, the added cost is more than offset by ongoing savings in household electricity bills. Preliminary data suggests that in the first year, over 100 new homes received solar photovoltaic energy systems as a result of this program.

Another Lancaster program that encourages new renewable energy installations is the Better Built Home Program, which launched at the beginning of 2015. New homes can reduce their impact fees by up to 25% (as much as $3,000 per home) by including features that reduce GHG emissions and demonstrate a commitment to preserving natural resources. Solar energy systems and home energy storage systems are among the most effective ways for new homes to meet the requirements of the program.

Measure 18: Facilitate renewable energy for on-site commercial and industrial uses.

2020 GHG Reduction: 2,630 $MTCO_2e$

2020 Performance Indicator:

- 245,420 existing nonresidential square feet with solar PV arrays

Recommended Actions:

1) Incentivize nonresidential buildings to install rooftop solar energy panels, especially at time of significant renovation.
2) Identify and implement financing opportunities for on-site renewable energy systems in collaboration with local lenders, including participation in the HERO Property Assessed Clean Energy (PACE) program.
3) Pursue funding to install renewable energy systems on municipal facilities.
4) Offer incentives for nonresidential building owners with parking lots to use solar panels as shading at time of new construction or significant renovation.
5) Incentivize new commercial and industrial buildings to approach or meet zero net energy (ZNE) standards, producing as much energy on-site as the building uses.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 19: Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.

2020 GHG Reduction: 510 $MTCO_2e$

2020 Performance Indicators:

- 500 existing homes with domestic solar water heaters
- 122 existing nonresidential square feet with solar water heaters

Recommended Actions:

1) Incentivize existing homes and nonresidential buildings to install rooftop solar water heaters.
2) Seek funding to install solar water heaters at municipal buildings.
3) Offer incentives for homes and nonresidential buildings to install solar water heaters at time of significant renovation or new construction.
4) Ensure that solar water heating is included in any other financing opportunities established in the community, including financing districts, a Property Assessed Clean Energy (PACE) program, revolving loan funds, or other mechanisms.
5) Provide education about solar water heating to residents and businesses through outreach events, workshops, online and in electronic media, and at public facilities.

PG&E Green Tariff

PG&E's Green Tariff Shared Renewables program will allow customers to receive an increased amount of electricity from renewable sources without having to install their own renewable energy system. The program will offer customers the chance to buy either 50% or 100% of their electricity from renewable sources for an increased fee, compared to the 27% renewable electricity PG&E offers by default. PG&E's program will also include an option called Enhanced Community Renewables, which will allow customers to purchase renewable electricity directly from a third-party developer. PG&E's Green Tariff program is expected to launch in late 2015 or early 2016.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 20: Create a community shared solar program to produce renewable energy for off-site use in Merced.

2020 GHG Reduction: 1,890 $MTCO_2e$

2020 Performance Indicators:

- 2,500 kW of community shared solar
- 1,230 kW from PG&E Green Tariff program

Recommended Actions:

1) Work with solar developers, property owners, and local financing institutions to establish a member-owned community shared solar system allowing Merced residents and businesses to own a share in local solar energy arrays and receive credit on their electricity bills.
2) Encourage new developments to fund improvements to the community shared solar system.
3) Promote community shared solar programs that allow residents and businesses to buy into medium-scale solar energy facilities.
4) Actively promote developer participation in the existing California Homebuyer Solar Program to provide on-site community solar for new subdivisions.
5) Support and promote Green Tariff programs and community solar programs operated by the Pacific Gas and Electric Company (PG&E) with distribution of information through digital media and at in-person events.

Applicability:

- New development
- New development (performance-based approach)
- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Water and Wastewater Measures

In addition to being vital for life and basic hygiene, water resources are also critical for the agricultural activities that support a large portion of the economy of Merced and the wider Central Valley. By reducing water use, Merced residents and businesses can help conserve critical sources of water for future needs. Because water requires significant amounts of energy to transport and process, water conservation also reduces energy use and decreases GHG emissions.

Measure 21: Install water meters on remaining unmetered housing units to promote awareness and conservation.

2020 GHG Reduction: 530 $MTCO_2e$

2020 Performance Indicator:

- 10,800 unmetered homes converted to metered homes

Recommended Actions:

1) Develop and implement a tiered water rate structure for all Merced water customers.
2) Require all City of Merced water customers to be connected to a water meter.

Applicability:

- Existing development

Water-Energy Grant Program

In June 2015, the City of Merced received a $2.5 million grant from the California Department of Water Resources Water-Energy Grant Program, a statewide effort to conserve water and reduce energy use, decreasing GHG emissions in the process. Much of the funding will be used to install water meters at approximately 10,800 homes in the city that are still unmetered, increasing awareness of residential water use and leading to water conservation efforts. Some funding will also be used to upgrade software on 10,100 existing water meters in Merced, eliminating the need for City staff to drive through the community to read the meters and further reducing GHG emissions.

Quality natural resources

Measure 22: Promote indoor water conservation through retrofits to existing buildings.

2020 GHG Reductions: 80 $MTCO_2e$

2020 Performance Indicator:

- 10,090 existing houses with water efficiency retrofits

Recommended Actions:

1) Provide Merced residents and business owners with information about water-efficient sinks, dishwashers, showerheads, and other fixtures and appliances. Continue to provide free retrofit kits to City residents.
2) Offer incentives for residents and businesses to replace old fixtures and appliances with water-efficient models.
3) Encourage building owners to replace old fixtures and appliances with water-efficient models at time of sale and/or significant renovation.

4) Continue to coordinate with the Merced Irrigation District to promote water conservation.
5) Offer low-cost or free water audits to commercial and industrial customers to identify key opportunities for water conservation.
6) Establish neighborhood competitions to incentivize homeowners to track and reduce their water use.

Applicability:

- Existing development
- City government

Cost savings

Leaders and partners

Quality natural resources

Measure 23: Improve indoor water efficiency in new buildings

2020 GHG Reductions: This measure is implemented entirely through the performance-based approach in Measure 31.

2020 Performance Indicator: Because this measure is implemented through the performance-based approach in Measure 31 and there is no forecast community-wide participation rate, there are no community-wide performance indicators for this measure. Average performance indicators for individual participants are identified in **Appendix C**.

Recommended Actions:

1) Provide information about fixtures and appliances that exceed the minimum state water efficiency standards to building owners and developers.
2) Promote voluntary participation in CALGreen Tier 1 for purposes of water efficiency.

Applicability:

- New development (performance-based approach)

Cost savings

Measure 24: Reduce the amount of water used for landscaping.

2020 GHG Reduction: 20 $MTCO_2e$

2020 Performance Indicators:

- 16,230 residents in existing homes with landscapes watered by smart irrigation systems
- 5,020 people in existing nonresidential buildings with landscapes watered by smart irrigation systems

Recommended Actions:

1) Develop incentives to reduce water use in residential and nonresidential landscaping, including rebates for turf replacement and subsidies for high-efficiency irrigation systems.
2) Limit the amount of turf used in new landscapes.
3) Offer reduced-cost landscape audits to customers with large landscaped areas.
4) Design new and replacement City-owned landscaping to use drought-tolerant plants, minimal or no turf, and high-efficiency irrigation.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Measure 25: Promote individual graywater and rainwater catchment systems to reduce potable water demand.

2020 GHG Reduction: 70 $MTCO_2e$

2020 Performance Indicator:

- 4,060 residents in existing homes with graywater systems

Recommended Actions:

1) Educate building owners about graywater and rainwater catchment systems, and develop incentives to reduce the installation costs.
2) Encourage/incentivize multifamily and nonresidential buildings to include graywater piping at time of construction or significant renovation.
3) Explore using permeable paving and other features to allow infiltration on City streets.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Solid Waste Measures

Waste measures are intended to help keep material out of landfills, either by providing alternative options for processing trash (such as recycling and composting) or by reducing the amount of waste generated to begin with. While these items may not lead to direct cost savings, they reduce significant quantities of GHG emissions and help prevent natural resources from being wasted. Waste reduction programs also provide Merced residents and businesses with a low-cost and highly effective way to focus on comprehensive sustainability efforts and increase awareness of their individual impacts on the environment.

Measure 26: Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.

2020 GHG Reduction: 4,290 $MTCO_2e$

2020 Performance Indicator:

- 15,960 tons of material reduced

Recommended Actions:

1) Collaborate with the Merced County Regional Waste Management Authority to investigate and implement cost-effective composting programs.
2) Promote backyard composting in homes and schools through free workshops and subsidies for composting equipment.
3) Explore developing a voluntary curbside composting program, with incentives as deemed necessary, to be integrated into existing waste service, particularly for households, restaurants, and other activities that generate large volumes of organic waste.
4) Explore ways to use compost generated from locally produced organic waste in the community, including selling discounted compost to local residents, using the compost in City-owned parks and other landscapes, or donating it to local gardens and farms.

5) Coordinate with UC Merced to explore creating a unified composting system for the community and surrounding areas.

Applicability:

- New development
- Existing development

Leaders and partners

Quality natural resources

Measure 27: Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.

2020 GHG Reduction: 8,400 $MTCO_2e$

2020 Performance Indicator:

- 9,990 tons of waste recycled

Recommended Actions:

1) Conduct education and outreach efforts to ensure recycling bins are being used properly.
2) Replace any stand-alone trash bins on City property with combination trash and recycling units.
3) Implement recycling at all residential and nonresidential buildings in the community.
4) Strive to minimize waste at all City-sponsored or City-hosted events, including events held at public parks.
5) Reduce the amount of waste generated by city residents through friendly neighborhood competitions, incentivizing households to minimize waste production and the volume of landfilled waste.
6) Provide ways for residents and businesses to easily recycle items not currently accepted in blue curbside bins, including polystyrene, plastic bags, and electronic waste.
7) Collaborate with the Merced County Regional Waste Management Authority to require solid waste haulers to achieve a diversion rate of 75% as a condition of future solid waste hauling franchise agreements.

Applicability:

- New development
- Existing development

Leaders and partners

Quality natural resources

Measure 28: Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.

2020 GHG Reduction: 4,500 $MTCO_2e$

2020 Performance Indicator:

- 14,060 tons of C&D waste recycled

Recommended Actions:

1) Establish a recycling target for all C&D waste from projects involving the construction of any new structure or addition, or renovations to existing structures with a cost of at least $10,000.
2) Work with contractors and buildings to identify C&D material recovery facilities, opportunities for material exchange, and reuse and recycling opportunities for C&D materials.
3) Support efforts to increase recycling rates and expand markets for C&D materials.

Applicability:

- New development
- Existing development

Leaders and partners

Quality natural resources

Off-Road Equipment Measures

Off-road equipment, such as construction and landscaping equipment, presents a prime opportunity for communities to reduce GHG emissions and promote healthier air. A wide variety of alternative-fuel options are available to replace conventional gasoline- and diesel-powered equipment. Reducing emissions from off-road equipment not only encourages sustainable thinking and can help reduce costs but can also reduce concentrations of air pollution, which is especially important for sensitive populations such as children, the elderly, and individuals with chronic respiratory disease

Measure 29: Reduce emissions from lawn mowers and leaf blowers by 10%.

2020 GHG Reduction: 10 $MTCO_2e$

2020 Performance Indicators:

- 1,090 lawn mowers replaced
- 280 leaf blowers replaced

Recommended Actions:

1) Purchase hybrid and alternative-fuel landscaping equipment for City use.
2) Conduct an outreach campaign to city residents promoting the use of hybrid and alternative-fuel landscaping equipment.
3) Develop incentives for individuals who replace conventional landscaping equipment with hybrid and alternative-fuel models.
4) Work with landscaping companies and contractors to promote the use of hybrid and alternative-fuel landscaping equipment.

Applicability:

- New development
- Existing development

Cost savings

Quality natural resources

Measure 30: Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.

2020 GHG Reduction: 150 $MTCO_2e$

2020 Performance Indicators:

- 25% of development projects using 25% alternative-fuel or hybrid construction equipment

- 4-minute maximum of idling time for construction equipment

Recommended Actions:

1) Promote the availability of alternative-fuel (electric, compressed natural gas (CNG), biofuels, etc.) and fuel-efficient (including hybrid) construction equipment to local contractors.
2) Replace City-owned construction equipment with fuel-efficient and alternative-fuel models as available.
3) Establish a citywide idling time restriction of 3 minutes for construction equipment after 2020.

Applicability:

- New development

Quality natural resources

Performance-Based Approach

As discussed earlier, the performance-based approach allows new development projects to demonstrate consistency with the CAP by choosing from one of several options. This avoids creating a mandatory set of actions that all new projects must meet for CAP consistency, and instead allows projects seeking CAP consistency to choose measures that best meet the project's needs. It also assists new developments in complying with the SJVAPCD's Indirect Source Rule (ISR).[4]

The performance-based approach does not create any new reduction strategies or implementation actions; rather, it applies the reduction strategies from many of the other measures to new development. It is built upon the same assumptions and calculations presented for other measures in **Appendix B**, but whereas the other measures present performance

Indirect Source Rule

The SJVAPCD's ISR is a program implemented at the project level to reduce air pollution. It requires projects to identify and implement appropriate mitigation standards or to pay fees to the SJVAPCD that the air district uses to fund emission reduction projects. While the ISR rules are intended to reduce air pollution levels by focusing on nitrogen oxides (NOx) and particulate matter (PM_{10}), GHG emissions from on-road transportation are likely to be reduced by this effort. The current ISR fees are $9,350 per ton of NOx and $9,011 per ton of PM_{10}.

The ISR does not specifically regulate GHG emissions, but some of the suggested mitigation efforts reduce GHG emissions as a co-benefit. Many of the example strategies to comply with the ISR also support implementation of the performance-based approach.

[4] The measures implemented through the different options of the performance-based approach are consistent with the measures recommended by the SJVAPCD to comply with the ISR. As a result, the performance-based approach helps to implement the ISR. However, projects that implement an option of the performance-based approach do not necessarily meet the standards of the ISR.

indicators, activity reductions, and GHG reductions for all participants in an aggregated way, the performance-based approach calculates indicators and reductions for individual participants.

Measure 31: Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.

2020 GHG Reduction: 31,320 $MTCO_2e$

2020 Performance Indicators: The performance-based approach does not have community-wide performance indicators as most of the other measures do. New projects have multiple options to choose from when implementing the performance-based approach. It is impossible to specify the specific reductions or participation levels for any individual measure implemented through the performance-based approach.

Recommended Actions: There are no specific actions associated with the performance-based approach.

Applicability:

- New development (performance-based approach)

Implementation Resources:

New projects can selection from 12 options to demonstrate compliance with the performance-based approach: six for residential projects and six for nonresidential projects.[5] These options are shown in **Table 5** and **Table 6** below. **Appendix A** includes additional details about implementing the performance-based approach and identifies the relationship between the various options and the UDM.

Table 5: Residential Options for the Performance-Based Approach

Issue	Residential Option					
	1	2	3	4	5	6
Renewable Energy	✓	✓			✓	
Energy Efficiency			✓	✓	✓	✓
Transportation		✓	✓	✓	✓	✓
Land Use			✓			✓
Water						✓

[5] Mixed-use projects should apply a residential option to the residential portion of the project and a nonresidential option to the nonresidential portion.

Table 6: Residential Options for the Performance-Based Approach

Issue	Nonresidential Option					
	1	2	3	4	5	6
Renewable Energy		✓	✓	✓		
Energy Efficiency	✓	✓	✓		✓	✓
Transportation	✓	✓	✓		✓	✓
Land Use	✓					✓
Water						✓

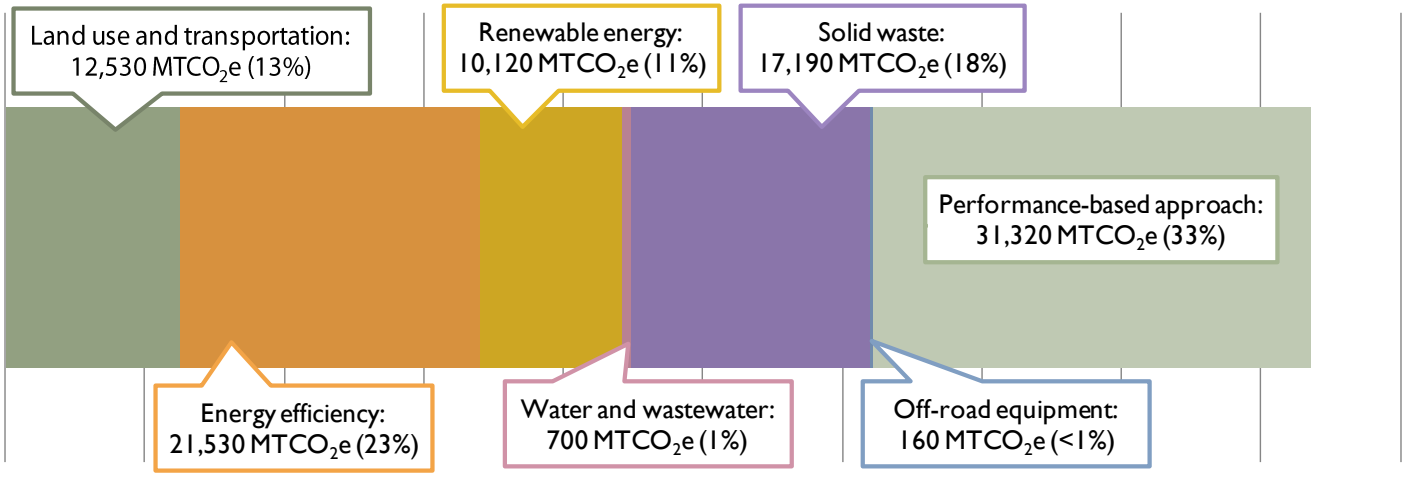
Plan Outcomes

When fully implemented, the above measures will be able to reduce GHG emissions to the City's adopted 2020 reduction target without requiring too great a reduction from community members or any specific activity. **Table 7** shows the 2020 reductions achieved by these measures in relation to the emissions forecast and the adopted 2020 reduction target, while **Figure 4** shows the volume and percentage of reductions from each measure category.

Table 7: 2020 GHG Reductions with PCAP

	2020
Baseline emissions ($MTCO_2e$)	599,093
2020 forecast with existing state and local accomplishments ($MTCO_2e$)	601,190
Adopted target ($MTCO_2e$)	509,229
Gap to adopted target without PCAP ($MTCO_2e$)	91,960
2020 Forecast with PCAP ($MTCO_2e$)	507,640
Target met?	Yes
Reductions beyond adopted target ($MTCO_2e$)	1,590
Percentage reduction beyond baseline with PCAP ($MTCO_2e$)	-15.27%

Figure 4: 2020 GHG Reductions by Measure Category



These measures also set a trajectory for future and continued GHG emission reductions beyond 2020. Although it is not the intent of this PCAP to reduce emissions to a specified level in any year beyond 2020, the PCAP does provide the City with a scope describing what needs to be accomplished. **Table 8** identifies forecast GHG emissions, potential targets, and the necessary degree of reductions for 2030. This table is provided for informational purposes. Merced has not yet adopted a GHG reduction target for 2030, and there is no state or regional guidance recommending or specifying a target for local communities for 2030 or any other post-2020 year.

Table 8: 2030 GHG Emissions and Targets

	Potential Target 1*	Potential Target 2†
Baseline emissions ($MTCO_2e$)	599,090	599,090
2030 forecast with no action ($MTCO_2e$)	952,690	952,690
2030 forecast with state and local accomplishments ($MTCO_2e$)	674,230	674,230
2030 target ($MTCO_2e$)	373,440	305,540
2030 percentage reduction from 1990 levels	-27%	-40%
2030 gap ($MTCO_2e$)	300,790	368,690

** Executive Order (EO) S-03-05 identified a statewide 2050 target of 80% below 1990 levels. This target is a linear interpolation between the adopted 2020 target and the 2050 target in EO S-03-05.*

† EO B-30-15 identified a statewide 2030 target of 40% below 1990 levels.

Note: As of July 2015, California does not have any adopted target for a post-2020 year. However, a bill is currently pending in the State Legislature that would establish a target of 40% below 1990 levels for 2030 and 80% below 1990 levels for 2050.

Introduction

To ensure the success of the adopted CAP and this PCAP, the City of Merced will integrate the goals and strategies of this PCAP into the CAP and other local plans, and implement the programs and activities identified herein. As the City moves forward with updating other planning documents such as the General Plan, the Merced Municipal Code, or specific plans, staff will ensure that these documents support and are consistent with the CAP.

Implementing the PCAP

Implementing the CAP and PCAP will require City leadership to execute these measures and report progress. This plan identifies a Work Plan that includes responsible departments, time frames, and relative costs associated with each measure. Staff will monitor progress using an implementation and monitoring tool on an annual basis and will provide an annual update to City decision-makers. The measures in this CAP are accompanied by a list of recommended actions, selected by City staff, members of the Technical Advisory Committee, and members of the public. Not all of the listed actions may be necessary for the City to achieve its target. As part of the implementation of this PCAP, the City may elect to alter or remove individual measures and actions so as to allow Merced to meet its GHG reduction goal in a manner that matches community needs and values. Designated City staff will serve as ongoing advisors for CAP implementation. As part of annual progress reports, City staff will evaluate the effectiveness of each measure to ensure that anticipated emissions

reductions are occurring. In the event reductions do not occur as expected, the City can modify and add additional measures to the CAP to ensure the reduction target is achieved.

The following programs are designed to guide the City of Merced in successfully implementing the CAP.

Implementation Program 1: The City will integrate CAP measures and actions into existing policies and programs, including revising other local and regional plans, developing new programs, and initiating new activities together with local leaders.

Recommended Actions:

1) Adhere to the CAP Implementation Matrix, including integration of CAP measures and action items into departmental work to guide CAP implementation.
2) As part of the annual monitoring process, update action priorities.
3) Encourage and incentivize voluntary participation in programs to reduce GHG emissions with implementation of CAP measures.
4) Use the Project Options Checklists to guide the design of new development projects for consistency with the CAP through the permitting process, including use of the visual guidance in the Unified Design Manual (UDM), which further illustrates key CAP concepts for new development.

Implementation Program 2: Seek and develop collaborative partnerships with agencies and community groups that support CAP implementation.

Recommended Actions:

1) Continue formal membership and participate in local and regional organizations that provide tools and support for energy efficiency, energy conservation, GHG emissions reductions, adaptation, public information, and implementation of this plan.
2) Partner with community leaders and partners to track program successes, such as the San Joaquin Valley Air Pollution Control District, the Merced Unified Public School District, UC Merced, PG&E, and the Merced Irrigation District (MID).
3) Ongoing collaboration may also yield new funding or staff resources that can be leveraged to provide regional benefit.

Implementation Program 3: Secure necessary funding to implement the CAP.

Recommended Actions:

1) Identify grant funding sources for priority CAP measures as part of annual reporting, as well as key staff responsible for identifying these funding sources.
2) Include information on CAP program successes in department work planning and in other plans as appropriate.

3) Identify and strategize regional, state, and federal programs that provide staff resources or funding for issues addressed by CAP measures.

Implementation Program 4: Monitor and report progress toward target achievement.

Recommended Actions:

1) Identify key staff responsible for annual reporting and monitoring.
2) Use the monitoring and reporting tool to assist with annual reports.
3) Monitor annual demographic changes in comparison to General Plan buildout expectations as included in the CAP, allowing staff to gauge actual growth in GHG emissions versus anticipated growth progress toward 2020 emission targets.
4) Prepare a progress report for review and consideration by the City Manager.

Implementation Program 5: Update the baseline emissions inventory and CAP.

Recommended Actions:

1) Prepare an emissions inventory for 2014 or another recent year no later than 2016.
2) Review and monitor evolving state guidance for post-2020 targets for 2030, 2050, or other horizon years identified by the State, as new legislation and guidance is available.
3) By 2018, review and consider adoption of post-2020 reduction targets consistent with long-term state GHG reduction goals.
4) Update the CAP no later than 2018 to incorporate new technologies and measures to reduce emissions, and present strategies to achieve any adopted post-2020 reduction target.
5) Update and amend the CAP, as necessary.

Cost-Benefit Analysis

Project staff have prepared a cost-benefit analysis to assess priority CAP measures on five variables. The analysis informs the feasibility assessment for measure implementation and uses costs and benefits along with other variables that indicate the viability of a measure. Factors include other partners and programs that would lead implementation or consistency with community values.

For purposes of this cost-benefit analysis, five variables categorize the financial impacts to the City of Merced and community members or other entities that will be involved in measure implementation. For many of the measures, financial impacts to the City and the community were estimated based on case studies and professional experience, using the scale shown in **Table 9.**

Table 9: Financial Impact Rubric for Feasibility Analysis

Score	Description
1	Net costs
2	Limited investment
3	Cost neutral
4	Limited return on investment
5	Significant return on investment

All measures were analyzed for cost-benefit criteria that include estimates of savings to community members and estimates of City staff time and costs. Twelve reduction measures received a more thorough cost-benefit analysis with estimated costs to community members, payback periods, and other methods associated with implementing the measure. Together, the information in the cost-benefit analysis informed the cost-related scores for the feasibility rankings. Measures with a full cost-benefit analysis represent plan-level cost estimates where reliable case studies, research, and literature are available. A full list of references is provided in **Appendix C**.

The 12 measures selected for the detailed cost-benefit analysis represent a diverse range of the measures. This list includes measures whether expected to be high or low in terms of financial impact, which apply to various sources of greenhouse gas emissions and are implemented through various programs and collaboration with external agencies. The team selected measures for the detailed cost-benefit analysis based on anticipated importance in terms of contribution to the CAP target, potentially high or low financial impact that represent outliers for implementation, or availability of other resources to leverage against anticipated costs. These measures are expected to have among the greatest financial impacts.

A summary of the results of the basic cost-benefit analysis is presented in **Table 10.** Additional cost-benefit information, including details on the methods and results of the analysis, is included in **Appendix C**.[6] Metrics in **Table 10** are provided for illustrative purposes to compare the likely scale of community savings to potential City staff time for implementation. Overall, **Table 10** provides a basis to compare benefits and costs of priority measures. Due to the high-level nature of these estimates, the full-time employee (FTE) values in **Table 10** show City staff time as total annual FTE values for the five-year period through the 2020 target year. For example, the anticipated five-year FTE for Measure 1 is one FTE, which means an anticipated FTE of 0.2 each year for five years. These anticipated FTEs may not require additional staff, as some measures may be implemented as part of current staffs' regular work plans or in conjunction with other measures. Each FTE estimate is based on the average anticipated level of effort for measure implementation. Actual staff efforts and ramp-up time will vary due to various factors such as departmental priorities, availability of external funding, and support of regional agencies.

[6] Cost-benefit information is also available in PCAP Technical Memorandum 3 on the City's website: https://www.cityofmerced.org/depts/cd/planning/programmatic_climate_action_plan.asp.

Table 10: Results of Basic Cost-Benefit Analysis

Measure	City Staff Five-Year FTE	Annual Total Community Savings
1: High density and mixed use	1	$1,416,900
2: Increased transit use	2.25	$94,900
3: Carpool and car share*	0.5	$293,800
4: Increased bicycle use	1.5	$121,700
5: Telecommuting*	0.5	$80,780
6: TDM program for UC Merced*	1	$770,150
7: Synchronization and traffic flow*	1.5	$783,860
8: Neighborhood electric vehicles	1	$334,800
9: Electric vehicles	2.25	$2,640,100
10: CALGreen*	0.75	$2,520/participant*
11: Passive solar design	1.25	$180,700
12: Multifamily unit, rental unit, and affordable housing energy retrofits	2.5	$724,300
13: Residential energy retrofits*	2.5	$755,250
14: Nonresidential energy retrofits*	0.75	$6,304,480
15: Cool roofs and shade trees*	1	$60,090
16: Commercial outdoor lighting retrofits	0.5	$229,300
17: Residential renewable energy*	1.75	$2,337,900
18: Nonresidential renewable energy*	2.25	$1,122,820
19: Solar water heating	0.75	$116,900
20: Community shared solar*	1	$349,190
21: Water metering	0.75	$223,430
22: Indoor water conservation retrofits	1.5	$31,100
23: Water efficiency in new buildings	0.25	$12,900
24: Landscaping water efficiency	0.75	$7,000
25: Graywater and rainwater catchment	0.75	$25,900

Measure	City Staff Five-Year FTE	Annual Total Community Savings
26: Waste reduction	0.75	$0
27: Improved recycling*	1.5	$0
28: Construction and demolition waste recycling	0.5	$0
29: Lawn and garden equipment efficiency	1	$29,100
30: Construction equipment efficiency	0.5	$68,200
31: Performance-based approach	0.5	N/A

** These measures received a more extensive cost-benefit analysis, presented in **Appendix C**.*

Note that the information in **Table 10** depicts the relative level of effort and potential savings for measures. Data in this table serves as a basis for staff to prioritize efforts for implementation. Although FTE is shown for each measure, it is likely that staff time can be leveraged across multiple measures for greater efficiencies. Rather than present staff time in a cumulative manner, this table informs the evaluation of relative staff time and resources. In many instances, the five-year FTE shown in **Table 10** can be offset through regional or state programs, or the efforts of other agencies. Further information on prioritization of measures for implementation follows.

Prioritization

Prioritization is the process of ranking each measure based on implementation considerations. This results in a simple, user-friendly summary of the multiple variables that determine the feasibility of any particular GHG emissions reduction measure from the CAP, such as capital cost, effectiveness, and co-benefit for other community values. Prioritization helps to guide the work efforts of City staff and can be updated based on City Council direction or other considerations at a future time. Five variables are used to prioritize the CAP measures:

1) Annual GHG reduction ($MTCO_2e$) in 2020
2) Partners and programs available to support measure implementation
3) Consistency with CAP values (as identified in the adopted CAP)
4) Financial impact to community (negative impact, neutral, positive return on investment)
5) Financial impact to City (negative impact, neutral, positive return on investment)

The scores for each criterion are weighted into an average score. The average score is shown in the table as the weighted average score for each measure. Those measures with the highest score indicate the highest priority for implementation. The prioritization calculations take place in the City's monitoring tool (discussed in a later section), where prioritization can be updated as needed. The results of the prioritization scoring are shown in **Table 11**.

Table 11: Measure Priority Scoring Results

Priority	Weighted Average Score	Measure Number and Measure Language
1	3.8	Measure 31: Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.
2	3.4	Measure 14: Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.
3	3.0	Measure 17: Increase the amount of renewable electricity generation for on-site residential use.
3	3.0	Measure 18: Facilitate renewable energy for on-site commercial and industrial uses.
5	3.0	Measure 16: Support retrofits to outdoor commercial lighting in Merced to reduce energy use.
6	2.8	Measure 3: Promote carpool and car-share systems.
6	2.8	Measure 13: Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.
6	2.8	Measure 19: Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.
9	2.6	Measure 2: Support a 30% increase in per-person intracity and intercity transit use by 2020.
9	2.6	Measure 12: Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.
11	2.6	Measure 1: Develop higher-density and mixed-use developments to support alternative travel in downtown Merced and appropriate neighborhood centers.
11	2.6	Measure 4: Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.
11	2.6	Measure 6: Work with UC Merced to establish a Transportation Demand Management (TDM) program for new student housing located in the city.
11	2.6	Measure 9: Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.
11	2.6	Measure 22: Promote indoor water conservation through retrofits to existing buildings.
11	2.6	Measure 27: Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.
17	2.4	Measure 7: Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.
17	2.4	Measure 20: Create a community shared solar program to produce renewable energy for off-site use in Merced.
17	2.4	Measure 24: Reduce the amount of water used for landscaping.
20	2.4	Measure 8: Support the increased use of neighborhood electric vehicles (NEVs, such as lower-speed street-safe golf carts) to 3% of households by 2020.

Priority	Weighted Average Score	Measure Number and Measure Language
20	2.4	Measure 15: Use cool roofs and shade trees to reduce the urban heat island effect in Merced.
22	2.2	Measure 21: Install water meters on remaining unmetered housing units to promote awareness and conservation.
22	2.2	Measure 25: Promote individual graywater and rainwater catchment systems to reduce potable water demand.
22	2.2	Measure 28: Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.
25	2.2	Measure 26: Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.
26	2.0	Measure 5: Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.
26	2.0	Measure 29: Reduce emissions from lawn mowers and leaf blowers by 10%.
28	1.2	Measure 30: Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.

Note: Measures 10, 11, and 23 are implemented with Measure 31 and are not included in this table. Measures associated with new development are presented in the table for completeness, but these measures will be implemented on a project-by-project basis using a performance-based approach. This approach provides flexibility for new development. Rather than analyze each measure for new development separately, the City's overall approach to implementing performance-based options for new development is ranked comprehensively for feasibility as Measure 31.

Implementation Responsibility

Various City departments and related agencies are responsible for implementing different measures. These responsible departments are identified in **Table 12.**

Table 12: City Departments Responsible for Measure Implementation

Measure Language		Key Department or Agency	Supporting Departments and Agencies
1	Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.	Planning	Housing
2	Support a 30% increase in per-person intracity and intercity transit use by 2020.	MCAG	Planning, Engineering
3	Promote carpool and car-share systems.	Commute Connection	Planning, Economic Development
4	Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.	Planning	Engineering, Police
5	Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.	Economic Development	Planning, Engineering

	Measure Language	Key Department or Agency	Supporting Departments and Agencies
6	Work with UC Merced to establish a Transportation Demand Management (TDM) program for new student housing located in the city.	Planning	Housing
7	Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.	Engineering	Planning
8	Support the use of neighborhood electric vehicles (NEVs, such as lower-speed, street-safe golf carts) by 3% of households by 2020.	Planning	Engineering
9	Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.	Planning	Economic Development, Engineering
10	Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.	Building	Planning, Housing, Engineering
11	Site new buildings to take advantage of natural solar resources for heating and cooling.	Building	Planning, Housing, Engineering
12	Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.	Housing	Building
13	Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.	Housing	Building
14	Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.	Economic Development	Building
15	Use cool roofs and shade trees to reduce the urban heat island effect in Merced.	Public Works	Planning, Building, Housing, Engineering, Economic Development
16	Support retrofits to outdoor public lighting in Merced to reduce energy use.	Economic Development	Building, Housing, Public Works
17	Increase the amount of renewable electricity generation for on-site residential use.	Building	Planning, Housing
18	Facilitate renewable energy for on-site commercial and industrial uses.	Building	Planning, Economic Development
19	Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.	Building	Planning, Housing, Economic Development
20	Create a community shared solar program to produce renewable energy for off-site use in Merced.	Planning	Building, Economic Development

	Measure Language	Key Department or Agency	Supporting Departments and Agencies
21	Install water meters on remaining unmetered housing units to promote awareness and conservation.	Public Works	
22	Promote indoor water conservation through retrofits to existing buildings.	Public Works	Building, Housing
23	Improve indoor water efficiency in new buildings.	Building	Planning, Housing
24	Reduce the amount of water used for landscaping.	Public Works	Building, Planning
25	Promote individual graywater and rainwater catchment systems to reduce potable water demand.	Public Works	Building, Planning
26	Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.	Public Works	
27	Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.	Public Works	
28	Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.	Building	Public Works
29	Reduce emissions from lawn mowers and leaf blowers by 10%.	Public Works	
30	Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.	Building	Planning, Public Works
31	Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.	Planning	

Monitoring Tool

Monitoring plan progress toward reduction targets is one of the required criteria for qualified GHG reduction plans as outlined by CEQA Guidelines Section 15183.5. The City will conduct monitoring and reporting to track CAP measure progress on an annual basis through 2020. The tool will automatically calculate progress toward community-level GHG targets based on aggregate-level data and reductions from individual measures. Using the same technical data that informed development of the CAP, the tool will allow City staff to evaluate CAP progress using quantitative data and qualitative progress information. The City will use this tool to track its progress reducing emissions, vehicle miles traveled (VMT), waste generation, and energy use over time with readily available data. The monitoring tool will provide examples and instructions on how to gather relevant inventory activity data for GHG tracking. The monitoring and reporting tool uses this data to estimate emissions changes in the city year by year using publicly available activity data, and tracks progress for each measure including initiation dates and key metrics. The tool will enable the City to sort measures based on timing, responsible department, and level of success, progress, or completion.

Annual updates created by the monitoring and reporting tool are not intended to be a replacement for a full re-inventory. Annual monitoring allows interim estimates of progress.

As part of annual progress reports, staff will evaluate the effectiveness of each measure to ensure that anticipated emissions reductions are occurring. For example, certain measures may exceed expectations and provide more cost-effective options to reduce emissions. Other measures may not meet anticipated reductions. City staff will use the monitoring and reporting tool to provide updates to decision-makers in order to reassess funding decisions and allocation of staff time. In the event that reductions do not occur as expected, the City can modify and add additional measures to the CAP to ensure the reduction target is achieved.

By using the tool to track GHG emissions, City staff will also monitor Merced's demographic growth. The City and the Merced County Association of Governments (MCAG) anticipate a high rate of growth in the community between 2008 and 2020, which is used in the Merced General Plan. This rapid growth rate informed the development of Merced's 2020 GHG forecast (higher population levels generally result in higher emissions). Merced's demographic projections anticipate an average population growth of approximately 2.8% from 2008 to 2020. However, as of 2014, Merced's population growth since 2008 has been approximately 0.6% annually. If Merced continues along this slower growth trajectory, 2020 emissions may be less than forecast. The monitoring tool will allow Merced to track community demographics and how GHG emissions are changing as a result and to adjust implementation of CAP measures accordingly to achieve the 2020 goal. The CAP uses the higher growth rate for all calculations for consistency with the Merced General Plan.

Chapter 3

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APPENDIX A: PROJECT OPTIONS CHECKLIST

This appendix discusses in greater detail the new performance-based development approach and its role in implementing the measures in the CAP that apply to new development projects. The Residential and Nonresidential Project Options Checklists in this appendix summarize the criteria for a project to claim consistency with the CAP and thereby access CEQA permit streamlining for purposes of analyzing GHG emissions. Projects that demonstrate consistency with the CAP by meeting "design element" criteria on these checklists are eligible to rely on the City's analysis of GHG emissions for purposes of CEQA. Rather than prescribe a mandatory set of actions that all new projects must meet for CAP consistency, projects can choose from one of several options in the applicable checklist, also referred to as design elements. Where certain CAP performance measures also have a visual component, the City provides further guidance in the UDM. Together, the Project Options Checklists and the UDM use a performance-based approach to identify measures and performance requirements for new projects seeking consistency with the CAP. The minimum options a project must meet for CAP consistency are summarized in the Project Options Checklists. Additional information and suggestions are provided in the UDM to help the City further communicate desired outcomes to project applicants.

If new projects are subject to CEQA but do not wish to comply with the CAP or the UDM, they may elect to conduct an analysis of GHG emissions and climate change as required by CEQA. Such projects are expected to meet all CEQA requirements.

The performance-based approach allows projects seeking CAP consistency to choose measures that best meet the project's needs. These measures have already been analyzed by the City and would result in new development as a whole achieving reductions that would contribute toward the City's

GHG reduction target. The Project Options Checklists summarize the options for new projects to comply with CAP measures. The checklists also identify where the UDM provides additional guidance to support projects as they seek to meet the criteria in the Project Options Checklists. City staff will use the Project Options Checklists and the UDM as a basis for identifying conditions of approval for new projects seeking to demonstrate CAP consistency.

Method and Applicability

New development projects can demonstrate compliance with the CAP by choosing to implement one of the options outlined in the tables below, each of which contains design criteria based on reduction measures from the CAP and the PCAP. Projects can demonstrate compliance with the CAP by implementing all design element measures in the selected option. Each option shows the criteria that would reduce the project's GHG emissions 29% below baseline levels consistent with the San Joaquin Valley Air Pollution Control District's recommended CEQA Assessment Guidance. While new projects will implement these measures on a case-by-case basis, when the total impact of each new project's GHG reductions is aggregated, as a whole new development would achieve a measurable reduction in GHG emissions that helps the City achieve its adopted GHG reduction target of returning to 1990 GHG emissions levels by 2020. Additionally, the measure options allow projects to achieve GHG reductions that also meet the requirements of the SJVAPCD's Indirect Source Review Program for new development. The SJVAPCD's Indirect Source Review rule requires that most projects reduce emissions of other air pollutants below specified levels or pay mitigation fees. The design element measures in the Project Options Checklists are intended to help facilitate compliance with the ISR rule and other regulations; however, projects that fully comply with the CAP are not necessarily fully compliant with SJVAPCD rules.

As stated above, to demonstrate consistency with the CAP, each project must fully implement all design element measures in one of the applicable options. However, projects are not prohibited from implementing individual measures that enable the project to potentially achieve reductions beyond those required in the CAP.

The design element measures in the options are not a complete list of City requirements applicable to new development that reduce GHG emissions. For example, if a project chooses to demonstrate consistency by selecting Option 1, which only requires a renewable energy system of the specified size, the project may still be required to comply with existing City requirements that also help to reduce emissions. Reductions from City requirements have already been accounted for in the PCAP.

Residential and Nonresidential Project Options Checklists

The applicant will be asked to indicate the option the proposed project will include. Note that in addition to the options for CAP consistency shown below, the City assumes credit for projects based on numerous regulations already under way. The following reductions from State-mandated actions are already attributed as credits toward the project for GHG reductions and cannot be claimed as additional credits to meet the performance-based options below.

- Compliance with California's RPS, mandating that utilities procure 33% of their electricity from eligible renewable sources by the end of 2020.
- Vehicles with fuel efficiencies compliant with California's AB 1493 standards and using fuel that meets the requirements of the State's Low Carbon Fuel Standard.
- Compliance with the mandatory items of the California Building Standards Code, including all minimum energy efficiency requirements of CALGreen.

Projects cannot count these actions as additional credits for CAP consistency. Note that the performance-based approach also does not address reductions from reduced solid waste generation and off-road equipment use; reductions from these items are achieved on a citywide basis year by year through other CAP implementation measures, which apply to both existing and new developments. The City implements these measures through other methods, rather than as conditions of approval on new development or remodels.

The options for performance-based compliance with the CAP are provided below in the Project Options Checklists. The design element criteria for each option vary based on project type or the assumed level of participation. Each option provides a level playing field for new projects to select the types of GHG reduction measures that are most cost-effective or applicable to the project. While each option presents different design element criteria, each option would achieve a similar relative reduction of GHG emissions. Based on analysis in the CAP, the City has determined that projects consistent with the criteria below are meeting the level of GHG reductions for new development identified in the CAP and contribute to the City's achievement of GHG reduction targets. Accordingly, the City will provide the opportunity for streamlining to projects that are consistent with one of the following options. **Table A-1** and **Table A-2** show residential options, while **Table A-3** and **Table A-4** show nonresidential options.

Table A-1: Residential Project Options Checklist

Residential Project Options and Design Elements								
#	Design Elements for Residential Projects	CAP Measure #	Option Set					
			1	2	3	4	5	6
1	Install a solar water heating system for indoor use for all units and for any swimming pools included in the project.	19		✓	✓			
2	Construct all new buildings to CALGreen Tier 1 energy efficiency standards.	10				✓		✓
3a	Establish an on-site renewable energy system: The system should be capable of producing at least 7,000 kWh annually for every residential unit (for a solar photovoltaic system, this is a 5 kW system per home).	17, 20	✓					
3b	Establish an on-site renewable energy system: The system should be capable of producing at least 4,300 kWh annually per unit (for a solar photovoltaic system, this is a 3 kW system per home).	17, 20		✓				
3c	Establish an on-site renewable energy system: The system should be capable of producing at least 2,900 kWh annually per unit (for a solar photovoltaic system, this is a 2 kW system per home).	17, 20					✓	

Appendix A

Residential Project Options and Design Elements								
#	Design Elements for Residential Projects	CAP Measure #	Option Set					
			1	2	3	4	5	6
4a	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 15% reduction below average for project occupants should be 2,910 vehicle miles traveled (VMT) per person annually.*	2, 3, 4		✓				
4b	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 20% reduction below average for project occupants should be 2,730 vehicle miles traveled (VMT) per person annually.*	2, 3, 4			✓			
4c	Reduce through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 25% reduction below average for project occupants should be 2,550 vehicle miles traveled (VMT) per person annually.*	2, 3, 4					✓	
4d	Reduce vehicle trips (VMT) through measures that support alternative transportation options such as carpooling, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 28% reduction below average for project occupants should be 2,460 vehicle miles traveled (VMT) per person annually.*	2, 3, 4						✓
5	Utilize passive solar design techniques.	11			✓		✓	
6	Be located in an area of moderate road connectivity with small block sizes, using concepts illustrated in the City's Unified Design Manual.†	1			✓			
7	Provide one EV charging station (Level 2 or Level 3) per unit.	9				✓		
8	Plant trees to provide shade to the building.	15				✓	✓	
9	Be located in a mixed-use residential/commercial building, with no less than 25% of floor space devoted to either type of use.	1						✓
10	Use an NEV for trips when feasible, and provide design elements that support NEV use.	8						✓
11	Install a graywater system to reduce water consumption.	25						✓

** The per-person average VMT for project occupants is based on the average VMT for residents and employees in Merced. Depending on the specific size and land use of the development projects, actual per person VMT for individual project occupants may be higher or lower than the target average presented here. This data would typically be available in the common types of project analysis that applicants must submit to the San Joaquin Valley Air Pollution Control District for compliance with the Indirect Source Rule.*

† "Moderate road connectivity," as identified by the California Air Pollution Control Officers Association, is at least 45 intersections per square mile.

Table A-2: Residential Project Option Selection

Residential Project: Applicant Selection of Option with Measures		
Option	**Design Elements**	**Selection: The applicant signs here to denote which option and design elements will be used for the project.**
1	3a	
2	1, 3b, 4a	
3	1, 4b, 5, 6	
4	2, 7, 8	
5	3c, 4c, 5, 8	
6	2, 4d, 9, 10, 11	

Table A-3: Nonresidential Project Options Checklist

Nonresidential Project Options and Design Elements								
#	**Design Elements for Nonresidential Projects**	**CAP Measure #**	**Option Set**					
			1	**2**	**3**	**4**	**5**	**6**
1	Install a solar water heating system for indoor use for all buildings.	19			✓			
2	Construct all new buildings to CALGreen Tier 1 energy efficiency standards.	10	✓	✓			✓	
3a	Establish an on-site renewable energy system: The system should be capable of producing at least 5.9 kWh annually for every square foot of building space (for a solar photovoltaic system, this is 1 kW for every 245 square feet of building space).	18, 20				✓		
3b	Establish an on-site renewable energy system: The system should be capable of producing at least 2.9 kWh annually for every square foot of building space (for a solar photovoltaic system, this is 1 kW for every 500 square feet of building space).	18, 20		✓				
4a	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 15% reduction below average for project occupants should be 2,910 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5		✓				

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Nonresidential Project Options and Design Elements								
#	Design Elements for Nonresidential Projects	CAP Measure #	Option Set					
			1	2	3	4	5	6
4b	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 25% reduction below average for project occupants should be 2,550 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5	✓					
4c	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 20% reduction below average for project occupants should be 2,700 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5					✓	
4d	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 12% reduction below average for project occupants should be 3,030 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5						✓
5	Utilize passive solar design techniques.	11			✓			✓
6	Provide an EV charging station.	9			✓		✓	
7	Be located in a mixed-use residential/commercial building, with no less than 25% of floor space devoted to either type of use.	1	✓					✓
8	Plant trees to provide shade to the building.	15					✓	
9	Be located in an area of moderate road connectivity with small block sizes, using concepts illustrated in the City's Unified Design Manual.†	1						✓
10	Use smart irrigation systems and controllers for all irrigated landscape areas.‡	24						✓
11	Install showers, toilets, and sinks that use less water than required under state standards.	23						✓

** The per-person average VMT for project occupants is based on the average VMT for residents and employees in Merced. Depending on the specific size and land use of the development projects, actual per person VMT for individual project occupants may be higher or lower than the target average presented here. This data would typically be available in the common types of project analysis that applicants must submit to the San Joaquin Valley Air Pollution Control District for compliance with the Indirect Source Rule.*

† "Moderate road connectivity," as identified by the California Air Pollution Control Officers Association, is at least 45 intersections per square mile.

‡ Compliance with this item may potentially be achieved with the 2015 State Model Water Efficient Landscape Ordinance.

Table A-4: Nonresidential Project Option Selection

Nonresidential Project: Applicant Selection of Option with Measures		
Option	**Design Elements**	**Selection: The applicant signs here to denote which option and design elements will be used with the project.**
1	2, 4b, 7	
2	2, 3b, 4a	
3	1, 5, 6	
4	3a	
5	2, 4c, 6, 8	
6	4d, 5, 7, 9, 10, 11	

Project Option Resources

This section presents possible resources that applicants can use to help implement the various options identified in the different Project Options and for City staff to learn more about the items in the performance-based approach in order to better ensure compliance with the Project Options. This is not intended to be a comprehensive list of all potential resources, nor is it meant to serve as a list of required resources for applicants to use. **Table A-5** shows resources for the various issues in the performance-based approach for both residential and nonresidential developments.

Table A-5: Project Option Resources

Issue	Potential Resources
Renewable Energy	• California Solar Permitting Guidebook: http://www.opr.ca.gov/docs/California_Solar_Permitting_Guidebook_2014.pdf • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • New Solar Homes Partnership: http://www.gosolarcalifornia.org/about/nshp.php • UDM Chapter 5
Energy Efficiency	• Home Energy Rating System (HERS): http://www.energy.ca.gov/HERS/index.html • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • New Building Energy Efficiency Standards: http://energy.ca.gov/title24/ • UDM Chapter 4 • UDM Chapter 5

Issue	Potential Resources
Transportation	• California Plug-In Electric Vehicle Collaborative: http://www.pevcollaborative.org/ • Commute Connection: http://www.commuteconnection.com/ • US Department of Transportation List of Transportation Strategies: http://www.fhwa.dot.gov/environment/air_quality/conformity/research/mpe_benefits/mpe09.cfm • DriveClean Buying Guide: http://www.driveclean.ca.gov/ • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • UDM Chapter 2 • UDM Chapter 3
Land Use	• Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • UDM Chapter 2 • UDM Chapter 3
Water	• California State Model Water Efficient Landscape Ordinance: http://www.water.ca.gov/wateruseefficiency/landscapeordinance/ • EPA WaterSense Program: http://www.epa.gov/WaterSense/index.html • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • State Water Resources Control Board Water Conservation Portal: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/ • UDM Chapter 4

Definitions

The performance-based approach uses the following terms. Additional details about these items are included in the Unified Design Manual.

- **CALGreen:** A set of mandatory and voluntary standards for all new buildings in California to conserve resources and ensure public safety.
- **Graywater:** Wastewater from comparatively clean sources (e.g., sinks, clothes washing machines, and dishwashers) that can be filtered and reused for landscape irrigation, toilets, and other uses not intended for human consumption.
- **NEV:** Neighborhood electric vehicle, a small and inexpensive street-legal electric vehicle with a limited top speed, suitable for short local trips.
- **On-site energy use**: Energy generated on a property that is primarily used on the property or on an adjacent parcel under the same ownership.
- **Passive solar:** Design features of a building that use the heat from the sun to maintain a comfortable interior temperature without any mechanical or electricity systems.
- **Smart irrigation:** Irrigation systems that monitor soil moisture and only irrigate plants when the ground is dry, avoiding irrigation during or shortly after rainfall events.

APPENDIX B: INVENTORY AND FORECAST UPDATE

Summary of 2008 Inventory and Forecast Updates

The City of Merced prepared the 2008 inventory, which analyzed GHG emissions for electricity and natural gas use in residential and nonresidential buildings, on-road transportation, and solid waste deposited in a landfill (not including alternative daily cover, or ADC). Inventory revisions reflect methods in a new inventory prepared by the Great Valley Center (GVC) for the baseline year of 2011.[7] Updates also ensure that the inventory follows the most recent guidance in the US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, the first protocol developed for community-wide GHG inventories that provides the most widely accepted methods for preparing inventories.[8]

Updates also sought to ensure that the inventory was a reasonably complete summary of the sources of GHG emissions attributable to the City of Merced consistent with state guidance. The California Environmental Quality Act Guidelines also indicate the scope of activities to be included in the inventory for purposes of streamlining. Under CEQA Guidelines Section 15183.5(b), a CAP should quantify GHG emissions, both existing and forecast for activities within a defined geographic area.

[7] Great Valley Center. 2014. City of Merced 2011 Inventory of Community and Government Operations Greenhouse Gas Emissions.

[8] ICLEI-Local Governments for Sustainability USA. 2013. US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.

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GHG emissions from the residential and nonresidential energy sectors were recalculated using more recent emission factors. Activity data and GHG emissions from the on-road transportation, solid waste, and water and wastewater sectors were recalculated, following the methods used in the 2011 GVC inventory and the US Community Protocol. The off-road equipment sector was not included in the 2011 GVC inventory and so was added for consistency with the US Community Protocol. Data sources for activity data and emission factors varied by sector, but generally included utility companies, state agencies, local and regional governments, and the US Community Protocol. **Table B-1** identifies the sectors in the 2008 inventory and their relation to the sectors in the US Community Protocol, data sources, and a description of the updates. **Table B-2** summarizes activity data and GHG emissions for each sector and subsector for the updated 2008 inventory. Emission factors for the updated 2008 inventory and their sources are given in **Table B-3.**

Table B-1: 2008 Inventory Scope and Updates

Sector	Data Source	Notes	US Community Protocol Corresponding Sector
Residential energy	PG&E, MID, Community Protocol	Emissions were recalculated, using updated emission factors from PG&E and the Community Protocol, as well as the US Environmental Protection Agency and discussions with MID, for consistency with the Protocol and the 2011 GVC inventory	Built environment
Nonresidential energy	PG&E, MID, Community Protocol	Emissions were recalculated, using updated emission factors from PG&E and the Community Protocol, as well as the US Environmental Protection Agency and discussions with MID, for consistency with the Protocol and the 2011 GVC inventory	Built environment
On-road transportation	CARB, Caltrans	Activity data and emissions were recalculated using CARB and Caltrans data, for consistency with the 2011 GVC inventory	Transportation and other mobile sources
Solid waste	MCRWMA, CalRecycle	Activity data and emissions were recalculated with MCRWMA and CalRecycle data, for consistency with the Protocol and the 2011 GVC inventory	Solid waste

Sector	Data Source	Notes	US Community Protocol Corresponding Sector
Off-road equipment	CARB	This sector was added, using CARB data, for consistency with the Protocol	Transportation and other mobile sources
Water and wastewater	City of Merced, PG&E, MID, Community Protocol	Activity data and emissions were recalculated for consistency with the Protocol and the 2011 GVC inventory	Wastewater and water

CARB: California Air Resources Board

MCRWMA: Merced County Regional Waste Management Authority

MID: Merced Irrigation District

PG&E: Pacific Gas and Electric Company

CalRecycle: California Department of Resources Recycling and Recovery

Table B-2: 2008 Activity Data and GHG Emissions

Sector	Subsector	Activity Data		$MTCO_2e$
Residential energy	Residential electricity use	185,883,530	kWh	65,000
	Residential natural gas	9,418,610	therms	50,100
Nonresidential energy	Nonresidential electricity use	326,357,620	kWh	179,260
	Nonresidential natural gas	7,034,990	therms	37,420
On-road transportation	On-road passenger vehicles	349,593,380	VMT	235,570
Solid waste	Solid waste disposal	50,570	tons of waste	18,750
Off-road equipment	Lawn & garden	140,270	gallons of fuel	1,190
	Construction	425,999	gallons of fuel	5,120
Water and wastewater	Indirect water emissions	5,880,300	kWh	3,010
	Direct emissions	—	—	320
	Indirect wastewater electricity	4,699,340	kWh	3,340
Total*		**—**	**—**	**599,090**

**Due to rounding, the total may not equal the sum of component parts.*

Appendix B

Table B-3: 2008 GHG Emission Factors

Sector	Subsector	2008 Emission Factor		Source
Residential energy	Residential electricity use	0.000350	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Residential natural gas	0.005320	$MTCO_2e$/therm	PG&E
Nonresidential energy	Nonresidential electricity use	0.000549	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Nonresidential natural gas	0.005320	$MTCO_2e$/therm	PG&E
On-road transportation	On-road passenger vehicles	0.000674	$MTCO_2e$/VMT	CARB (EMFAC 2011 model)
Solid waste	Solid waste disposal	0.370689	$MTCO_2e$/ton	CARB (landfill model)
Off-road equipment	Lawn & garden	0.008462	$MTCO_2e$/gallon	CARB (OFFROAD 2007)
	Construction	0.012024	$MTCO_2e$/gallon	CARB (OFFROAD 2007)
Water and wastewater	Indirect water emissions	0.000513	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Direct emissions	—	—	N/A
	Indirect wastewater electricity	0.000711	$MTCO_2e$/kWh	MID, US Community Protocol, USEPA

Emissions are forecast to 2020 and 2030. 2020 is the year for achieving GHG reduction targets established by the Merced City Council; a 2020 forecast will indicate the size of the GHG reduction Merced must achieve to meet this goal. 2030 is the completion (buildout) year for the Merced General Plan; a 2030 forecast allows an estimate of emissions upon full implementation of the General Plan. Forecasts are made using indicators, demographic data that suggests how emissions in a particular sector will change. For example, the projected increase in the number of households in Merced is used as an indicator for residential energy and off-road equipment. Indicators are provided by the City of Merced, supplemented with data from MCAG or state agencies as needed. Forecast indicators and their sources are given in **Table B-4**.

Table B-4: Forecast Indicators, 2008–2030

Indicator	Applicable Sectors	2008	2020	2030	Source	Percentage Change, 2008–2030
Number of households	Residential energy, off-road equipment (lawn & garden)	25,230	35,870	45,800	CA Department of Finance, MCAG	82%
Number of new households	Off-road equipment (construction)	250	890	990	CA Department of Finance, MCAG	296%
Number of jobs	Nonresidential energy	24,420	29,340	33,680	City of Merced	38%
Service population	On-road transportation, solid waste, water and wastewater (all subsectors)	102,520	136,939	171,081	CA Department of Finance, MCAG, US Census	67%

Emissions are forecast under a business-as-usual (BAU) scenario that assumes no GHG reductions from federal, state, or local/regional activities. Forecast emissions are shown in **Table B-5**.

Table B-5: GHG Emissions, 2008–2030 (BAU Scenario)

Sector	2008 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	Percentage Change, 2008–2030
Residential energy	115,110	163,640	208,950	82%
Nonresidential energy	216,680	260,380	298,920	38%
On-road transportation	235,570	314,660	393,110	67%
Solid waste	18,750	25,040	31,280	67%
Off-road equipment	6,310	8,060	9,290	47%
Water and wastewater	6,670	8,910	11,140	67%
Total*	**599,090**	**780,690**	**952,690**	**59%**
Percentage change from baseline		30%	59%	—

**Due to rounding, the total may not equal the sum of component parts.*

The BAU scenario is useful for illustrating a high-emissions forecast, but it fails to account for actions to reduce GHG emissions that are planned or already under way. A number of actions taken by the State of California reduce statewide GHG emissions, which helps to reduce emissions from the City of Merced. The state efforts are described below.

Assembly Bill 1493 and the Local Carbon Fuel Standard

Assembly Bill 1493 (the Pavley Standards) establishes GHG emission standards for passenger cars, light-duty trucks (up to 5,750 pounds), and medium-duty trucks (up to 8,500 pounds) from 2009 to 2016. The LCFS calls for a 10% reduction in carbon intensity in California's transportation fuels by 2020 and is expected to reduce GHG emissions for all vehicles, including those not covered by the Pavley Standards.

GHG reductions from the Pavley Standards and the LCFS were calculated using the publicly available EMFAC model provided by CARB for Merced County, which estimates VMT and GHG emissions for various classes of cars. The EMFAC model estimates that these standards are expected to reduce Merced's on-road transportation GHG emissions by 25% in 2020 and by 30% in 2030. In addition, the fuel efficiency benefits of the Pavley Standards may reduce fuel costs for drivers.

Heavy Duty Vehicle GHG Reduction

The Heavy Duty Vehicle GHG Reduction is a regulation approved by CARB in 2008 to reduce emissions from long-haul tractors and box-trailers at least 53 feet long. Owners of vehicles covered by the regulation must retrofit their vehicles to be more aerodynamic and to use low-resistance tires, or must replace vehicles with models that incorporate these features.

GHG reductions from the Heavy Duty Vehicle GHG Reduction were calculated using CARB's forecast for statewide reductions from this action. CARB estimates that this measure will reduce emissions from these vehicles by approximately 1.45%. Using estimates of VMT and GHG emissions for Merced, as provided by the EMFAC model, the proportion of emissions from vehicles covered by this regulation was estimated. The reduction of 1.45% was applied to heavy vehicle emissions to identify the savings from this measure. This measure is expected to reduce Merced's on-road transportation emissions by less than 1% in both 2020 and 2030.

Renewables Portfolio Standard

California's RPS mandates that utility providers obtain 33% of their electricity from qualified renewable sources by 2020. Both PG&E and the Merced Irrigation District must meet this requirement. In 2008, approximately 11.9% of PG&E's electricity came from qualified renewable sources; this percentage is not definitively known for the Merced Irrigation District but is estimated to be 6% based on data supplied to the CEC and discussions with the MID's power suppliers. While utility companies have made significant strides to achieve the 2020 goal, the CPUC has indicated that electricity provides may not meet the 33% target due to transmission and permitting issues that have proven significant barriers to the development of renewable energy.

In recent reports on the Renewables Portfolio Standard, the CPUC observes that utility companies are on track to receive 33% of their electricity from renewable sources in 2020. Currently, there is no requirement to procure additional supplies of electricity from renewable sources beyond 2020. As a result, the forecast assumes that utility companies receive 33% of their electricity from renewable sources in both 2020 and 2030. The RPS is expected to reduce GHG emissions from electricity use by 25% in 2020 and by 29% in 2030.

California Building Code, Title 24

Title 24 of the California Code of Regulations provides standards for new buildings and (in the 2013 update) substantial renovations/additions to existing buildings. It includes requirements for structural, plumbing, electrical, and mechanical systems, as well as for fire and life safety, energy conservation and sustainable design, and accessibility. The 2013 update to Title 24 is the current version and applies to all new structures that applied for a building permit on or after July 1, 2014. The 2016 update to Title 24 is set to go into effect on January 1, 2017. This forecast focuses on two sections of Title 24: Part 6 (California Energy Code) and Part 11 (California Green Building Standards Code, also known as CALGreen). These sections require reductions in energy use for all applicable structures. Title 24 is a statewide standard implemented by local agencies through project review.

This forecast incorporated the net energy benefits of each new Title 24 update that did not exist in the baseline year (2008), based on CEC studies that compare each new update of Title 24 to its former version. Past updates to Title 24 have resulted in efficiency increases equal to or higher to those forecast in the CEC studies, but such studies have been used in this forecast as a more cautious approach. Future standards are assumed to result in reductions equal to 70% of the reductions achieved in the 2013 update. Reductions from renovations and additions have not been modeled due to uncertainty. Title 24 is expected to reduce GHG emissions from total building energy use by 4% in 2020 and by 9% in 2030.

Table B-6 shows forecast GHG emissions when reductions from state actions are taken into account. **Table B-7** shows specific reductions from statewide activities. Emission factors with the statewide actions are given in **Table B-8**.

Table B-6: GHG Emissions, 2008–2030 (State Actions)

Sector	2008 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	Percentage Change, 2008–2030
Residential energy	115,110	128,130	142,750	24%
Nonresidential energy	216,680	201,490	214,650	-1%
On-road transportation	235,570	236,000	272,540	16%
Solid waste	18,750	25,040	31,280	67%
Off-road equipment	6,310	8,060	9,290	47%
Water and wastewater	6,670	6,690	7,800	17%
Total*	**599,090**	**605,390**	**678,330**	**13%**
Percentage change from baseline		1%	13%	—

**Due to rounding, the total may not equal the sum of component parts.*

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Table B-7: GHG Reductions from State Actions, 2020–2030

	2008 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$
BAU Emissions	599,090	780,690	952,690
Pavley and LCFS	—	-77,470	-118,770
Heavy Duty Vehicles	—	-1,190	-1,800
Renewables Portfolio Standard	—	-78,790	-107,520
Title 24	—	-17,850	-46,280
Total State Reductions*	**—**	**-175,300**	**-274,370**
Emissions with State Reductions*	599,090	605,390	678,330
Percentage Change from 2008	—	1%	13%

**Due to rounding, the total may not equal the sum of component parts.*

Table B-8: GHG Emission Factors, 2008–2030

Sector	Subsector	2008 and BAU	State Actions (2020)	State Actions (2030)	Unit	Source
Residential energy	Residential electricity use	0.000350	0.000271	0.000265	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Residential natural gas	0.005320	0.005320	0.005320	$MTCO_2e$/therm	PG&E
Nonresidential energy	Nonresidential electricity use	0.000549	0.000404	0.000379	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Nonresidential natural gas	0.005320	0.005320	0.005320	$MTCO_2e$/therm	PG&E
On-road transportation	On-road passenger vehicles	0.000674	0.000505	0.000467	$MTCO_2e$/VMT	CARB (EMFAC 2011 model)
Solid waste	Solid waste disposal	0.370689	0.370689	0.370653	$MTCO_2e$/ton	CARB (landfill model)
Off-road equipment	Lawn & garden	—	—	—	N/A	CARB (OFFROAD 2007)
	Construction	—	—	—	N/A	CARB (OFFROAD 2007)
Water and wastewater	Indirect water emissions	0.000513	0.000382	0.000360	$MTCO_2e$/kWh	PG&E, US Community Protocol
	Direct emissions	—	—	—	N/A	GVC
	Indirect wastewater electricity	0.000711	0.000519	0.000477	$MTCO_2e$/kWh	MID, US Community Protocol, USEPA

APPENDIX C: TECHNICAL DATA

This appendix summarizes data sources, assumptions, and performance metrics used to calculate greenhouse gas emissions reductions for the City of Merced Programmatic Climate Action Plan. The sources and metrics are organized by measure and rely on four primary types of data and research: (1) Merced's GHG emissions inventory and forecast, (2) government agency tools and reports, (3) case studies in similar jurisdictions, and (4) scholarly research.

Further, the quantification approaches are consistent with guidance provided by CEQA Guidelines Section 15183.5(b) for development of a qualified GHG reduction strategy. The baseline GHG inventory and forecast serve as the foundation for the quantification of the City's GHG reduction measures. Activity data from the inventory form the basis of measure quantification, including vehicle miles traveled (VMT), kilowatt-hours (kWh) of electricity or therms of natural gas consumed, and tons of waste disposed. Activity data was combined with the performance targets and indicators identified by the City and consultants. The activity data and performance targets and indicators were used throughout the quantification process to calculate the emissions reduction benefit of each measure. This approach ensures that Merced's GHG emissions reductions are tied to the baseline and to future activities occurring within the city.

Constants

The emissions factors used to calculate reductions by each measure and the sources for each factor are given in **Table C-1.** The constants used in the cost-benefit analysis are given in **Table C-2**.

Appendix C

Table C-1: Emission Factors for Work Plan Measures

	2008	2011	2020	2030
$MTCO_2e$ per mile driven (with Pavley)	0.000674	0.000559	0.000505	0.000467
$MTCO_2e$ per kWh (with RPS)	0.000479	0.000378	0.000355	0.000334
$MTCO_2e$ per therm	0.005319	0.006122	0.005319	0.005319
$MTCO_2e$ per ton of waste	0.370773	0.382215	0.370688	0.370660

Table C-2: Constants for Cost-Benefit Analysis

Metric and Unit	2020 Estimated Value
Miles per gallon (mpg) for personal vehicles	17
Cost per kilowatt-hour (kWh) for residential electricity	$0.16
Cost per kWh for nonresidential electricity	$0.15
Cost per therm for natural gas	$1.08
Cost per gallon of gasoline	$4.54
Cost per hour of City staff time	$78.00
Work hours per year (for a full-time employee)	2,080
Years of measure implementation	5

Methods and Assumptions for GHG Quantification of Reduction Measures

Measure 1

Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.

Assumptions

	2020	2030
Percentage increase in people per acre	15%	20%
Percentage increase in jobs per acre	10%	15%
Percentage of future housing that is multifamily	40%	40%

Activity and GHG Reductions

	2020	2030
VMT Savings	5,410,110	8,562,650
Emissions Reduction ($MTCO_2e$)	2,730	4,000

Performance Indicators

	2020	2030
Number of housing units per acre	3.1	3.5
Number of jobs per acre	4.0	4.2
Number of new multifamily housing units	4,260	8,230
Number of households in newly developed areas	5,140	11,480
Number of jobs in newly developed areas	2,540	5,080

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

City of Merced. 2012. City of Merced General Plan: Land Use Element. https://www.cityofmerced.org/depts/cd/planning/merced_vision_2030_general_plan.asp.

Pacific Gas and Electric Company. 2014. "City of Merced Residential Energy Overview."

Measure 2

Support a 30% increase in per-person intracity and intercity transit use by 2020.

Assumptions

	2020	2030
Percentage increase in transit ridership per person	30%	50%
Percentage of developments within 1/4 mile of transit	25%	25%

Activity and GHG Reductions

	2020	2030
VMT Savings	362,410	604,000
Emissions Reduction ($MTCO_2e$)	180	280

Performance Indicators

	2020	2030
Number of Merced County Transit trips taken by Merced residents	1,164,170	1,343,260

GHG Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Federal Transit Administration. 2009. National Transit Database 2008 Profile: Merced County Transit. http://www.ntdprogram.gov/ntdprogram/pubs/profiles/2008/agency_profiles/9173.pdf.

Merced County Transit. 2012. Final Short Range Transit Plan, 2012–2017 - Volume 3: Market Research. http://www.mercedthebus.com/DocumentCenter/Home/View/28.

Measure 3

Promote carpool and car-share systems.

Assumptions

	2020	2030
Number of shared cars	20	40
Percentage of Merced employees eligible for carpooling	20%	35%

Cost-Benefit Assumptions

- Annual car-share membership: $55
- Annual cost of vehicle maintenance and gas: $1,330

Activity and GHG Reductions

	2020	2030
VMT Savings	1,003,380	1,657,430
Emissions Reduction ($MTCO_2e$)	510	770

Performance Indicators

	2020	2030
Number of shared cars	20 (reduction of 1,610 VMT per car-share member)	40 (reduction of 1,570 VMT per car-share member)
Number of citywide employees eligible for car sharing	4,900 (reduction of 100 VMT per eligible employee)	7,870 (reduction of 100 VMT per eligible employee)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Measure 4

Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.

Assumptions

	2020	2030
New bike miles (post-2013)	35	68

Activity and GHG Reduction

	2020	2030
VMT Savings	464,580	715,220
Emissions Reduction ($MTCO_2e$)	230	330

Performance Indicators

	2020	2030
Number of bike commuters	540 (reduction of 860 VMT per bike commuter)	630 (reduction of 1,130 VMT per bike commuter)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

City of Merced. 2012. City of Merced General Plan: Land Use Element. https://www.cityofmerced.org/depts/cd/planning/merced_vision_2030_general_plan.asp.

———. 2013. City of Merced Bicycle Transportation Plan. https://www.cityofmerced.org/civicax/filebank/blobdload.aspx?BlobID=13321.

Measure 5

Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.

Assumptions

	2020	2030
Percentage of employed residents telecommuting	3%	5%

Cost-Benefit Assumptions:

- Telecommute centers are privately built and operated, with City support as needed.
- No membership fees for use of telecommute centers.
- No increased utility costs for individuals telecommuting from home.

Activity and GHG Reductions

	2020	2030
VMT Savings	308,560	514,260
Emissions Reduction ($MTCO_2e$)	160	240

Performance Indicators

	2020	2030
Number of employees telecommuting an average of 1.5 days per week	730 (reduction of 420 VMT per telecommuting employee)	1,120 (reduction of 460 VMT per telecommuting employee)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Measure 6

Work with UC Merced to establish a Transit Demand Management (TDM) program for new student housing located in the city.

Assumptions

	2020	2030
Percentage of UC Merced students living off campus	65%	65%
Trip reduction from off-campus students	25%	25%

Cost-Benefit Assumptions:

- No capital or program-level costs to City or community members.
- Measure is primarily implemented by UC Merced, with City support as needed.

Activity and GHG Reductions

	2020	2030
VMT Savings	2,940,520	7,805,870
Emissions Reduction ($MTCO_2e$)	1,490	3,650

Performance Indicators

	2020	2030
Number of students living off campus	5,420 (reduction of 540 VMT per student)	14,710 (reduction of 530 VMT per student)

Sources

Sustainable Endowments Institute. 2011. Report Card 2010: University of California - Merced. http://www.greenreportcard.org/report-card-2010/schools/university-of-california-merced/surveys/campus-survey.html.

University of California, Merced. 2009. *Long Range Development Plan: University of California, Merced*. http://lrdp.ucmerced.edu/lrdp/Final_UCM_LRDP_2009.pdf.

Measure 7

Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.

Assumptions

	2020	2030
Road miles with traffic synchronization	10	15
Percentage of VMT occurring downtown	25%	25%

Cost-Benefit Assumptions:

- To be completed with actual capital costs from City staff, based on completed and planned capital projects.
- Although cost savings for community participants are zero, drivers are expected to experience a small cost savings for reduced fuel use resulting from reduced car idling time.

Activity and GHG Reductions

	2020	2030
VMT Savings	291,850	364,610
Fuel Savings (Gallons)	155,820	286,730
Emissions Reduction ($MTCO_2e$)	1,680	2,980

Performance Indicators

	2020	2030
Road miles with traffic synchronization:	10 (reduction of 155,820 gallons of fuel	15 (reduction of 286,730 gallons of fuel
Downtown streets with traffic calming	25%	25%

Sources

Argonne National Laboratory. n.d. *Which is Greener: Idle, or Stop and Restart? Comparing Fuel Use and Emissions for Short Passenger-Car Stops*. http://www.afdc.energy.gov/uploads/publication/which_is_greener.pdf.

California Air Resources Board. 2013. "EMFAC Emissions Database." http://www.arb.ca.gov/emfac/.

California Department of Transportation. 2009. *2008 California Public Road Data*. http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2008PRD.pdf.

Halkias, J., and M. Schauer. 2004. "Traffic Signal Retiming Programs Across the Country." Public Roads Journal. http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ID/8D5E4B72F890856C8525733A006D547C?OpenDocument&Query=Bapp.

ICLEI-Local Governments for Sustainability USA. 2012. *US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*. http://www.icleiusa.org/tools/ghg-protocol/community-protocol.

Measure 8

Support the increased use of neighborhood electric vehicles (NEVs, such as lower-speed street-safe golf carts) by 3% of households by 2020.

Assumptions

	2020	2030
Percentage of households with a NEV	3%	5%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	331,010	551,680
Effective VMT Savings	1,484,340	2,473,900
Emissions Reduction ($MTCO_2e$)	630	970

Performance Indicators

	2020	2030
Number of households with a NEV	900 (1,650 VMT per NEV, each using 370 kWh)	1,530 (1,620 VMT per NEV, each using 360 kWh)

Sources

California Energy Commission. 2002. *Demonstration of Neighborhood Electric Vehicles (NEVs)*. http://www.energy.ca.gov/reports/2002-08-28_600-02-020F.PDF.

Measure 9

Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.

Assumptions

	2020	2030
Percentage of households with an EV	5%	8%
Number of publicly accessible EV chargers	15	40

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	4,347,080	6,069,410
Effective VMT Savings	12,785,520	17,851,200
Emissions Reduction ($MTCO_2e$)	4,920	6,310

Performance Indicators

	2020	2030
Number of households with a full EV	1,500 (8,510 VMT per EV, each using 2,890 kWh)	2,450 (7,240 VMT per EV, each using 2,460 kWh)
Number of publicly accessible EV chargers	15 (4,700 VMT and 1,600 kWh per charging station)	40 (4,700 VMT and 1,600 kWh per charging station)

Sources

California Air Resources Board. 2013. "EMFAC Emissions Database." http://www.arb.ca.gov/emfac/.

Davies, J. 2014. "How Assumptions About Consumers Influence Estimates of Electric Vehicle Miles Traveled of Plug-in Hybrid Electric Vehicles." UC Davis Institute of Transportation Studies. http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=2036.

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

Merced County Association of Governments. 2012. San Joaquin Valley Demographic Forecasts 2010 to 2050. http://www.mcagov.org/DocumentCenter/View/262.

US Environmental Protection Agency. 2012. "Fuel Economy and Environment Labels – Electric Vehicles." http://www.epa.gov/carlabel/electriclabelreadmore.htm.

Measure 10

Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.

Assumptions

Because this measure only applies to new development and is implemented at a project level, participation is dependent upon the number of projects that elect to implement this measure. Therefore, no participation assumptions are anticipated for this measure.

Cost-Benefit Assumptions

- Cost premium to build a 2,500-square-foot single-family house to Tier 1: $1,300
- Cost premium to build a 960-square-foot multifamily unit to Tier 1: $550 per unit
- Cost premium to build a 50,000-square-foot office/warehouse space, capable of supporting approximately 3 businesses, to Tier 1: $11,200 ($3,700 per business)
- Cost premium to build a 25,000-square-foot retail space, capable of supporting 1–2 businesses, to Tier 1: $6,700 ($4,400 per business)
- Cost premium to build a 52,000-square-foot high-rise office, capable of supporting approximately 16 businesses, to Tier 1: $27,600 ($1,700 per business)

Activity and GHG Reductions

Because this measure only applies to new development and is implemented at a project level, all activity and GHG reductions from Measure 10 are included in the performance-based approach and are dependent upon the number of projects that elect to implement this measure. Therefore, no specific activity and GHG reductions are anticipated from this measure.

Performance Indicators

	2020	2030
Energy savings from houses exceeding state standards	Reduction of 130 kWh and 20 therms per house	Reduction of 80 kWh and 20 therms per house
Energy savings from nonresidential buildings exceeding state standards	Reduction of 630 kWh and 20 therms per job	Reduction of 390 kWh and 10 therms per job

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Measure 11

Site new buildings to take advantage of natural solar resources for heating and cooling.

Assumptions

Because this measure only applies to new development and is implemented at a project level, participation is dependent upon the number of projects that elect to implement this measure. Therefore, no participation assumptions are anticipated for this measure.

Activity and GHG Reductions

Because this measure only applies to new development and is implemented at a project level, all activity and GHG reductions from Measure 11 are included in the performance-based approach and are dependent upon the number of projects that elect to implement this measure. Therefore, no specific activity and GHG reductions are anticipated from this measure.

Performance Indicators

	2020	2030
Energy savings from new houses built with passive solar design features	Reductions of 180 kWh per house	Reductions of 120 kWh per house
Energy savings from new nonresidential buildings built with passive solar design features	Reductions of 1.9 kWh per square foot	Reductions of 1.2 kWh per square foot

Sources

Fosdick, J. 2012. Passive Solar Heating. http://www.wbdg.org/resources/psheating.php.

Measure 12

Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.

Assumptions

	2020	2030
Low-income/renter-occupied single-family homes participating in basic retrofits and operational changes	10%	20%
Low-income/renter-occupied single-family homes participating in advanced retrofits	2%	5%
Multifamily homes participating in retrofits	5%	10%
Home appliance infiltration rate	50%	50%
Units participating in appliance upgrades	20%	35%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	3,751,230	7,280,700
Natural Gas Savings (Therms)	104,480	221,200
Emissions Reduction ($MTCO_2e$)	1,890	3,610

Performance Indicators

	2020	2030
Number of existing low-income/renter-occupied single-family homes undergoing basic energy retrofits	810 (reduction of 1,120 kWh and 60 therms per house)	1,620 (reduction of 1,120 kWh and 60 therms per house)
Number of existing low-income/renter-occupied single-family homes undergoing advanced energy retrofits	160 (reduction of 2,980 kWh and 150 therms per house)	410 (reduction of 2,980 kWh and 150 therms per house)
Number of existing multifamily homes participating in retrofits	400 (reduction of 1,250 kWh and 80 therms per house)	810 (reduction of 1,250 kWh and 80 therms per house)
Number of existing multifamily and low-income/renter-occupied single-family homes upgrading appliances	3,240 (reduction of 570 kWh per house)	5,670 (reduction of 570 kWh per house)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. *U.S. Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

California Energy Commission. 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.

Energy Upgrade California. 2012. *Best Practices Case Study, Energy Upgrade California's Multifamily Initiative: Best Practices for Multifamily Energy Retrofit Program Design*. http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/MultifamilyCaseStudy_California.pdf.

———. 2014a. "Merced County – Home Upgrade." http://tools.energyupgradeca.org/county/merced/about_basic.

———. 2014b. "PG&E Home Upgrade - Advanced Program." http://www.energyupgradeca.org/en/find-programs-and-assistance/find-a-program/programs/advance-pge.

Measure 13

Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.

Assumptions

	2020	2030
Homes participating in variable frequency drive (VFD) pool pump upgrades	8%	20%
Homes participating in basic retrofits	10%	20%
Homes participating in advanced retrofits	5%	10%
Home appliance infiltration rate	50%	50%
Units participating in appliance upgrades	25%	40%

Cost-Benefit Assumptions:

- Net cost for a basic home retrofit, including improved air conditioner, air sealing, leak-free duct work, and $1,500 PG&E rebate: $3,700
- Net cost for an advanced home retrofit, including $4,500 PG&E rebate: $15,700
- Cost for a variable frequency drive pool pump, including $100 PG&E rebate: $1,500
- Cost per home to upgrade half of basic appliances: $2,300
- Home audits are paid for by the utility company.

Appendix C

Activity and GHG Reduction

	2020	2030
Electricity Savings (kWh)	3,849,450	7,273,290
Natural Gas Savings (Therms)	118,330	236,500
Emissions Reduction ($MTCO_2e$)	1,990	3,690

Performance Indicators

	2020	2030
Owner-occupied existing single-family homes with VFD pool pumps	120 (reduction of 1,630 kWh per home)	300 (reduction of 1,630 kWh per home)
Owner-occupied existing single-family homes undergoing basic energy retrofits	900 (reduction of 1,120 kWh and 60 therms per home)	1,810 (reduction of 1,120 kWh and 60 therms per home)
Owner-occupied existing single-family homes undergoing advanced energy retrofits	450 (reduction of 2,980 kWh and 150 therms per home)	900 (reduction of 2,980 kWh and 150 therms per home)
Number of owner-occupied existing single-family homes upgrading appliances	2,260 (reduction of 580 kWh per home)	3,610 (reduction of 580 kWh per home)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. U.S. *Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

California Energy Commission. 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.

Energy Upgrade California. 2012. "Best Practices Case Study, Energy Upgrade California's Multifamily Initiative: Best Practices for Multifamily Energy Retrofit Program Design." http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/MultifamilyCaseStudy_California.pdf.

———. 2014a. "Home Upgrade." http://www.energyupgradeca.org/en/save-energy/home/take-control-for-savings-and-comfort/get-a-home-upgrade-and-increase-comfort.

———. 2014b. "PG&E Home Upgrade - Advanced Program." http://www.energyupgradeca.org/en/find-programs-and-assistance/find-a-program/programs/advance-pge.

Pacific Gas and Electric Company and Southern California Gas Company. 2006. *Codes and Standards Enhancement Initiative: Draft Report – Residential Swimming Pools*. http://www.energy.ca.gov/title24/2008standards/prerulemaking/documents/2007-02-26-27_workshop/supporting/PGE-DRAFT_REPORT_RESIDENTIAL_SWIMMING_POOL.PDF.

Measure 14

Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.

Assumptions

	2020	2030
Businesses participating in retrocommissioning	15%	20%
Standard retrofit participation rate	10%	15%
Deep retrofit participation rate	6%	10%
Commercial appliance infiltration rate	40%	40%
Appliance upgrade participation rate	15%	20%

Cost-Benefit Assumptions:

- Businesses pay the cost of audits.
- Cost for a Level I audit, comprising 40% of all audits: $0.002 per square foot ($30 per businesses)
- Cost for a Level II audit, comprising 50% of all audits: $0.15 per square foot ($2,500 per business)
- Cost for a Level III audit, comprising 10% of all audits: $0.31 per square foot ($5,100 per business)
- Cost for retrocommissioning: $0.41 per square foot ($6,700 per business)
- Cost for a standard business retrofit: $2 per square foot ($32,900 per business)
- Cost for a deep business retrofit: $25 per square foot ($410,400 per business)[9]
- Cost per business to upgrade 40% of commercial-grade appliances, including rebates for water heater, oven, and refrigerator from PG&E: $8,000
- Retrofit and retrocommissioning costs do not include any tax rebates or rebates from utility companies.

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	36,124,200	53,735,430
Natural Gas Savings (Therms)	783,440	1,164,650
Emissions Reduction ($MTCO_2e$)	16,970	24,140

[9] Costs for deep retrofits are generally amortized across multiple years. Deep retrofits are also often conducted as part of more extensive building-wide retrofits that include non-energy-related improvements, and so the costs presented here may include additional work that does not result in improved energy efficiency.

Performance Indicators

	2020	2030
Number of retrocommissioned existing nonresidential square feet	1,790,270 (reductions of 6 kWh and 0.1 therms per square foot)	2,387,030 (reductions of 6 kWh and 0.1 therms per square foot)
Number of nonresidential existing square feet with basic energy retrofits	1,193,510 (reductions of 10.9 kWh and 0.2 therms per square foot)	1,790,270 (reductions of 10.9 kWh and 0.2 therms per square foot)
Number of nonresidential existing square feet with deep energy retrofits	716,110 (reductions of 14.2 kWh and 0.3 therms per square foot)	1,193,510 (reductions of 14.2 kWh and 0.3 therms per square foot)
Number of nonresidential existing square feet with energy-efficient appliances	1,790,270 (reductions of 1.2 kWh and 0.03 therms per square foot)	2,387,030 (reductions of 1.2 kWh and 0.03 therms per square foot)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. *U.S. Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

California Energy Commission. 2006. *California Commercial End-Use Survey*. http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF.

Pacific Gas and Electric Company. 2014. "City of Merced Nonresidential Energy Overview."

Pacific Northwest National Laboratory. 2011. *Advanced Energy Retrofit Guides – Office Buildings*. http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20761.pdf.

Measure 15

Use cool roofs and shade trees to reduce the urban heat island effect in Merced.

Assumptions

	2020	2030
Percentage of existing houses with a cool roof	3%	5%
Percentage of existing nonresidential buildings with a cool roof	0.5%	2%
Number of new shade trees planted	500	1500

Cost-Benefit Assumptions:

- Cost premium of a residential cool roof: $1,900 per house
- Cost premium of a commercial cool roof: $8,400 per business
- Cost to plant and maintain a tree: $140 annually
- Private individuals plant half of shade trees, City plants the other half.
- Capital costs to City are City's share of tree planting and maintenance.

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	386,070	896,880
Emissions Reduction ($MTCO_2e$)	140	300

Performance Indicators

	2020	2030
Number of existing houses with cool roofs	750 (reduction of 310 kWh per household)	1,250 (reduction of 310 kWh per household)
Number of existing nonresidential square feet with cool roofs	61,350 (reduction of 0.8 kWh per square foot)	245,420 (reduction of 0.8 kWh per square foot)
Number of new mature shade trees	500 (reduction of 200 kWh per tree)	1,500 (reduction of 200 kWh per tree)

Sources

California Energy Commission. 2012. *California Cool Roofs*. http://www.energy.ca.gov/2012publications/CEC-400-2012-003/CEC-400-2012-003-BR.pdf.

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

Sacramento Municipal Utility District. 2014. Cool Roofs. https://www.smud.org/en/residential/save-energy/rebates-incentives-financing/cool-roofs.htm.

Measure 16

Support retrofits to outdoor commercial lighting in Merced to reduce energy use.

Assumptions

	2020	2030
Percentage of existing nonresidential buildings with energy-efficient outdoor lighting	30%	50%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	1,517,560	2,529,270
Emissions Reduction ($MTCO_2e$)	540	840

Performance Indicators

	2020	2030
Number of existing nonresidential square feet with energy-efficient outdoor lighting	3,580,540 (reduction of 0.4 kWh per square foot)	5,967,570 (reduction of 0.4 kWh per square foot)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. *U.S. Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

Measure 17

Increase the amount of renewable electricity generation for on-site residential use.

Assumptions

	2020	2030
Percentage of existing (2014 and earlier) households with on-site solar panels	5%	5%

Cost-Benefit Assumptions:

- Cost per kW for a residential solar array: $5,000
- Size of residential solar array: 8 kW
- Average rebate size: $4,500

GHG Reduction

	2020	2030
Effective Electricity Savings (kWh)	14,343,670	14,343,670
Emissions Reduction ($MTCO_2e$)	5,090	4,790

Performance Indicators

	2020	2030
Number of households with on-site solar PV systems	1,250 existing households (8 kW PV array per house, with an average production of 11,470 kWh)	1250 existing households (8 kW PV array per house, with an average production of 11,470 kWh)

Sources

Go Solar California. 2014. "Current Working Dataset – California Solar Initiative." http://www.californiasolarstatistics.ca.gov/current_data_files/.

National Renewable Energy Laboratory. 2014. PVWatts Calculator. http://pvwatts.nrel.gov/.

Measure 18

Facilitate renewable energy for on-site commercial and industrial uses.

Assumptions

	2020	2030
Percentage of existing (2014 and earlier) commercial buildings with solar PV arrays	2%	3%

Cost-Benefit Assumptions:

- Cost per kW for a commercial solar array: $4,600
- Size of commercial solar array: 52 kW
- Average rebate size: $28,000

Activity and GHG Reductions

	2020	2030
Effective Electricity Savings (kWh)	7,431,080	11,146,620
Emissions Reduction ($MTCO_2e$)	2,630	3,720

Performance Indicators

	2020	2030
Number of existing nonresidential square feet with solar PV arrays	245,420 square feet (average PV array size of 52 kW, with an average production of 74,090 kWh)	368,120 square feet (average PV array size of 52 kW, with an average production of 74,090 kWh)

Sources

Go Solar California. 2014. "Current Working Dataset – California Solar Initiative." http://www.californiasolarstatistics.ca.gov/current_data_files/.

National Renewable Energy Laboratory. 2014. PVWatts Calculator. http://pvwatts.nrel.gov/.

Measure 19

Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.

Assumptions

	2020	2030
Existing houses with domestic solar water heaters	2%	5%
Existing nonresidential buildings with solar water heaters	1%	3%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	157,710	398,480
Natural Gas Savings (Therms)	85,370	219,440
Emissions Reduction ($MTCO_2e$)	510	1,300

Performance Indicators

	2020	2030
Number of homes with domestic solar water heaters	500 existing homes (average reduction of 300 kWh and 150 therms per existing house)	1,250 existing homes (average reduction of 300 kWh and 150 therms per existing house)
Number of existing nonresidential square feet with solar water heaters	122,710 square feet (average reduction of 0.1 kWh and 0.1 therms per square foot)	368,120 square feet (average reduction of 0.1 kWh and 0.1 therms per square foot)

Sources

California Energy Commission. 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

US Department of Energy. 2003. *Heat Your Water With the Sun: A Consumer Guide*. http://www.nrel.gov/docs/fy04osti/34279.pdf.

Measure 20

Create a community shared solar program to produce renewable energy for off-site use in Merced.

Assumptions

	2020	2030
kW of community shared solar	2,500	3500
Participation multiplier for green tariff	1.5	1.5

Cost-Benefit Assumptions:

- City does not establish solar arrays, but works with utilities, nonprofits, or other third parties to do so.
- Annual cost per participant exceeds annual savings.
- Costs for participation in the PG&E Green Tariff program are not calculated due to uncertainty about these costs at the time of analysis.

Activity and GHG Reductions

	2020	2030
Effective Electricity Savings (kWh)	5,344,240	6,777,240
Emissions Reduction ($MTCO_2e$)	1,890	2,260

Performance Indicators

	2020	2030
kW of community-shared solar	2,500 (average production of 3,582,500 kWh, equivalent to the annual electricity use of 440 homes)	3,500 (average production of 5,015,500 kWh, equivalent to the annual electricity use of 900 homes)
kW from PG&E Green Tariff program	1,230 (average production of 1,761,740 kWh, equivalent to the annual electricity use of 270 homes)	1,230 (average production of 1,761,740 kWh, equivalent to the annual electricity use of 270 homes)

Sources

California Energy Commission. 2015. Electricity Consumption by Entity. http://www.ecdms.energy.ca.gov/elecbyutil.aspx.

California Public Utilities Commission. 2015. *Decision Approving Green Tariff Shared Renewables Program for San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southern California Edison Company Pursuant to Senate Bill 43*. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M146/K250/146250314.PDF.

National Renewable Energy Laboratory. 2014. PVWatts Calculator. http://pvwatts.nrel.gov/.

Measure 21

Install water meters on remaining unmetered housing units to promote awareness and conservation.

Assumptions

	2020	2030
Percentage of residential units remaining unmetered	0%	0%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	1,370,730	1,370,730
Direct Emissions Savings ($MTCO_2e$)	40	40
Emissions Reduction ($MTCO_2e$)	530	500

Performance Indicators

	2020	2030
Number of unmetered homes converted to metered homes	10,800 (reduction of 94,270 gallons per unit)	10,800 (reduction of 94,270 gallons per unit)

GHG Sources

Baptista, Johnnie. 2014. Water Division Manager, Public Works Department. Personal correspondence to Eli Krispi, PMC assistant planner.

Measure 22

Promote indoor water conservation through retrofits to existing buildings.

Assumptions

	2020	2030
Percentage of existing houses conducting water efficiency retrofits	40%	75%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	190,640	451,140
Direct Wastewater Emission Savings	10	20
Emissions Reduction ($MTCO_2e$)	80	170

Performance Indicators

	2020	2030
Number of existing houses with water efficiency retrofits	10,090 (reduction of 8,420 gallons per house)	18,920 (reduction of 8,420 gallons per house)

Sources

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

Measure 23

Improve indoor water efficiency in new buildings.

Assumptions

Because this measure only applies to new development and is implemented at a project level, participation is dependent upon the number of projects that elect to implement this measure. Therefore, no participation assumptions are anticipated for this measure.

Activity and GHG Reductions

Because this measure only applies to new development and is implemented at a project level, all activity and GHG reductions from Measure 23 are included in the performance-based approach and are dependent upon the number of projects that elect to implement this measure. Therefore, no specific activity and GHG reductions are anticipated from this measure.

Performance Indicators

	2020	2030
Water reduction per person in new buildings with beyond-code water fixtures	Average reduction of 1,320 gallons per person	Average reduction of 1,320 gallons per person

Sources

California Building Standards Commission. 2013. *California Green Building Standards Code, Appendix A4: Residential Voluntary Measures*. http://www.ecodes.biz/ecodes_support/free_resources/2013California/13Green/PDFs/Appendix%20A4%20-%20Residential%20Voluntary%20Measures.pdf.

California Department of Housing and Community Development. 2013. *2013 CALGreen Residential Mandatory Measures*. http://www.documents.dgs.ca.gov/bsc/documents/2013/2013-Green-Residential-Mandatory.pdf.

US Environmental Protection Agency. n.d. *USEPA Water Conservation Plan Guidelines, Appendix B: Benchmarks Used in Conservation Planning*. http://www.epa.gov/WaterSense/docs/app_b508.pdf.

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Measure 24

Reduce the amount of water used for landscaping.

Assumptions

	2020	2030
Percentage of existing (2014 and earlier) landscapes with smart irrigation systems	20%	25%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	44,600	55,750
Emissions Reduction ($MTCO_2e$)	20	20

Performance Indicators

	2020	2030
Number of people in buildings with landscapes watered by smart irrigation systems	16,230 residents in existing homes and 5,020 people in existing nonresidential buildings (average reduction of 2,810 gallons per person)	20,280 residents in existing homes and 6,280 people in existing nonresidential buildings (average reduction of 2,810 gallons per person)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Heaney, J. P., W. DeOreo, P. Mayer, P. Lander, J Harpring, L. Stadjuhar, B. Courtney, and L. Buhlig. n.d. Nature of Residential Water Use and Effectiveness of Conservation Programs. http://bcn.boulder.co.us/basin/local/heaney.html.

Measure 25

Promote individual graywater and rainwater catchment systems to reduce potable water demand.

Assumptions

	2020	2030
Percentage of houses with graywater systems	5%	10%
Amount of graywater used	90%	90%

Activity and GHG Reduction

	2020	2030
Electricity Savings (kWh)	158,700	405,300
Direct Wastewater Emission Savings	10	20
Emissions Reduction ($MTCO_2e$)	70	160

Performance Indicators

	2020	2030
Number of residents in existing homes with graywater systems	4,060 (average reduction of 13,150 gallons of potable water per year)	8,110 (average reduction of 13,150 gallons of potable water per year)

Sources

California Department of Housing and Community Development. 2009. *2007 California Plumbing Code, Chapter 16A: Nonpotable Water Reuse Systems*. http://www.hcd.ca.gov/codes/shl/2007CPC_Graywater_Complete_2-2-10.pdf.

Measure 26

Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.

Assumptions

	2020	2030
Reduction in waste generation	33%	33%

Activity and GHG Reduction

	2020	2030
Reduced Waste Generation Savings (Tons)	15,960	19,940
Emissions Reduction ($MTCO_2e$)	4,290	5,360

Performance Indicators

	2020	2030
Amount of materials reduced	15,960 tons (31,917,800 pounds) of material reduced (reduction of 230 pounds per person)	19,940 tons (39,874,900 pounds) of material reduced (reduction of 230 pounds per person)

Sources

California Air Resources Board. 2014. Landfill Emissions Tool Version 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm.

California Department of Resources Recycling and Recovery. 2014. 2008 Jurisdiction Diversion/Disposal Rate Detail: Merced County Solid Waste Regional Authority. http://www.calrecycle.ca.gov/LGCentral/reports/diversionprogram/JurisdictionDiversionDetail.aspx?JurisdictionID=301&Year=2008.

California Integrated Waste Management Board. 2009. *California 2008 Statewide Waste Characterization Study*. http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf.

Measure 27

Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.

Assumptions

	2020	2030
Target pounds of recyclable waste per person per day (excluding construction and demolition (C&D), non-divertable waste, and organics)	0.4	0.1

Cost-Benefit Assumptions:

- Potential for any costs to be passed on to waste customers through increased rates.

Activity and GHG Reductions

	2020	2030
Recyclable Waste to Landfill Savings (Tons)	9,990	21,840
Emissions Reduction ($MTCO_2e$)	8,400	18,370

Performance Indicators

	2020	2030
Amount of waste reduced	9,990 tons (19,974,530 pounds) of waste recycled (reduction of 150 pounds per person)	21,840 tons (43,687,560 pounds) of waste recycled (reduction of 260 pounds per person)

Sources

California Department of Resources Recycling and Recovery. 2014. 2008 Jurisdiction Diversion/Disposal Rate Detail: Merced County Solid Waste Regional Authority.

http://www.calrecycle.ca.gov/LGCentral/reports/diversionprogram/JurisdictionDiversionDetail.aspx?JurisdictionID=301&Year=2008.

California Integrated Waste Management Board. 2009. *California 2008 Statewide Waste Characterization Study*. http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf.

ICLEI-Local Governments for Sustainability. 2013. Recycling and Composting Emissions Protocol, v 1.0. http://www.icleiusa.org/tools/ghg-protocol/recycling-and-composting-emissions-protocol.

Measure 28

Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.

Assumptions

	2020	2030
C&D recycling rate	50%	65%

Activity and GHG Reductions

	2020	2030
C&D Waste to Landfill Savings (Tons)	14,060	22,830
Emissions Reduction ($MTCO_2e$)	4,500	7,310

Performance Indicator

	2020	2030
Amount of waste reduced	14,060 tons (28,114,380 pounds) of C&D waste recycled (reduction of 210 pounds of C&D waste per person)	22,830 tons (45,660,510 pounds) of C&D waste recycled (reduction of 270 pounds of C&D waste per person)

Sources

California Department of Resources Recycling and Recovery. 2014. 2008 Jurisdiction Diversion/Disposal Rate Detail: Merced County Solid Waste Regional Authority. http://www.calrecycle.ca.gov/LGCentral/reports/diversionprogram/JurisdictionDiversionDetail.aspx?JurisdictionID=301&Year=2008.

California Integrated Waste Management Board. 2009. *California 2008 Statewide Waste Characterization Study*. http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf.

ICLEI-Local Governments for Sustainability. 2013. Recycling and Composting Emissions Protocol, v 1.0. http://www.icleiusa.org/tools/ghg-protocol/recycling-and-composting-emissions-protocol.

Measure 29

Reduce emissions from lawn mowers and leaf blowers by 10%.

Assumptions

	2020	2030
Percentage of lawn mowers replaced	10%	15%
Percentage of leaf blowers replaced	10%	15%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	87,250	130,880
Emissions Reduction ($MTCO_2e$)	10	20

Performance Indicators

	2020	2030
Number of lawn mowers replaced	1,090 (reducing 100 pounds of direct GHG emissions and using 60 kWh per lawnmower)	2,080 (reducing 100 pounds of direct GHG emissions and using 60 kWh per lawnmower)
Number of leaf blowers replaced	280 (reducing 50 pounds of direct GHG emissions and using 220 kWh per leaf blower)	540 (reducing 50 pounds of direct GHG emissions and using 220 kWh per leaf blower)

Sources

California Air Resources Board. 2011. OFFROAD model. http://www.arb.ca.gov/msei/categories.htm

Salem Electric. n.d. *Home Energy Use Guide*. http://www.salemelectric.com/residential/pdfs/energy_saving_tips/home_energy/HomeEnergyUseGuide.pdf

Measure 30

Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.

Assumptions

	2020	2030
Percentage of development projects using 25% alternative-fuel or hybrid construction equipment	25%	25%
Maximum minutes of idling time for construction equipment	4	3

Activity and GHG Reductions

	2020	2030
Emissions Reduction ($MTCO_2e$)	150	260

Performance Indicators

	2020	2030
Percentage of development projects using 25% alternative-fuel or hybrid construction equipment	25%	25%
Maximum minutes of idling time for construction equipment	4	3

Sources

California Energy Commission. 2007. "Full Fuel Cycle Assessment: Wells-to-wheels Energy Inputs, Emissions, and Water Impacts." http://cafcp.org/sites/files/sites/default/files/shared/CEC%20Appendices.pdf.

Nealon, S. 2013. "Hybrid Not Always Greener." University of California, Riverside. http://ucrtoday.ucr.edu/18506.

US Environmental Protection Agency. 2009. Potential for Reducing Greenhouse Gas Emissions in the Construction Sector. http://www.epa.gov/sectors/pdf/construction-sector-report.pdf.

Measure 31

Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.

Method and Background

Reductions for Measure 31 are calculated differently than the other methods, owing to Measure 31's unique structure and scope. Measure 31 allows new development projects to demonstrate consistency with the CAP by choosing from one of several options. This avoids creating a mandatory set of actions that all new projects must meet for CAP consistency, and instead allows projects seeking CAP consistency to choose measures that best meet the project's needs.

Appendix C

Measure 31 does not create any new reduction strategies; rather, it applies the reduction strategies from many of the other measures to new development. It is built upon the same assumptions and calculations presented for other measures in this appendix, but whereas the other measures present performance indicators, activity reductions, and GHG reductions for all participants in an aggregated way, Measure 31 calculates indicators and reductions for individual participants.

For example, Measure 19 (solar water heaters) identifies a reduction of 300 kWh and 150 therms for an average existing house in Merced that installs a solar water heater. These values are calculated using data from the California Energy Commission, ICLEI-Local Governments for Sustainability, and the US Department of Energy, as discussed in Measure 19's entry in this appendix. Using the same sources, Measure 31 identifies a reduction of 130 kWh and 60 therms for an average new house in Merced that installs a solar water heater; the values are lower because new houses are more energy-efficient. While Measure 19 presents GHG reductions from the sum of all participating existing houses that install a solar water heater, Measure 31 relies on GHG reductions from each individual participant.

Options

Measure 31 offers new development projects 12 different options to achieve CAP consistency, six for residential projects and six for nonresidential projects. Each option uses different combinations of CAP measures to achieve the desired reductions.

Issue	Residential Option					
	1	2	3	4	5	6
Renewable Energy	✓	✓			✓	
Energy Efficiency			✓	✓	✓	✓
Transportation		✓	✓	✓	✓	✓
Land Use			✓			✓
Water						✓

Issue	Nonresidential Option					
	1	2	3	4	5	6
Renewable Energy		✓	✓	✓		
Energy Efficiency	✓	✓	✓		✓	✓
Transportation	✓	✓	✓		✓	✓
Land Use	✓					✓
Water						✓

Assumptions and GHG Reductions

Measure 31 is designed to reduce the GHG emissions from new projects by 29% below baseline levels. This level of reduction is consistent with the San Joaquin Valley Air Pollution Control District's guidance, as identified in Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA. [10] Note that, unlike for other measures, there are no 2030 assumptions and GHG reductions for Measure 31.

	2020
Percentage of emissions for new development to reduce	29%
GHG emissions from new development ($MTCO_2e$)	108,010
Service population of new development	30,700
GHG emissions to reduce per new person ($MTCO_2e$)	1.02
Total reductions from Measure 31 ($MTCO_2e$)	31,320

Performance Indicators

Due to the nature of Measure 31, performance indicators will vary depending on which option the developer selects. All projects must indicate that they will meet the 29% reduction of approximately 1.02 $MTCO_2e$ per person relative to baseline levels.

Sources

Measure 31 is built on the same calculations and sources for the other measures. The sources for these other measures, identified elsewhere in this appendix, are the sources for Measure 31.

[10] http://www.valleyair.org/Programs/CCAP/12-17-09/3%20CCAP%20-%20FINAL%20LU%20Guidance%20-%20Dec%2017%202009.pdf.

Appendix C

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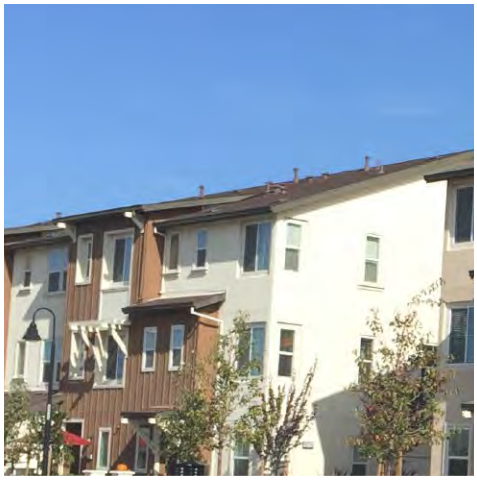
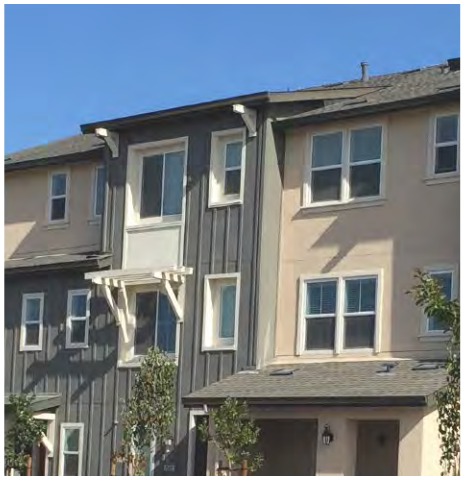
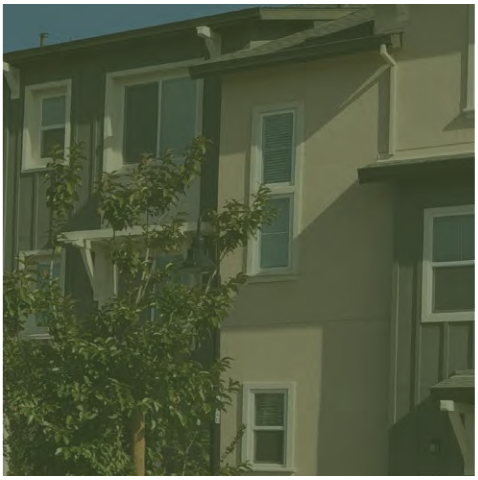
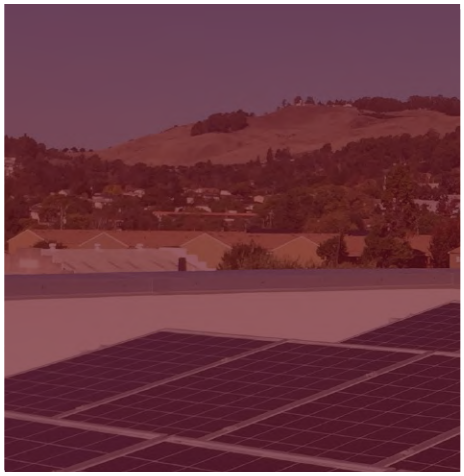




UNIFIED DESIGN MANUAL


CITY OF MERCED

Public Draft

August 13, 2015


ATTACHMENT B

TABLE OF CONTENTS

The work upon which this publication is based was funded in whole or in part through a grant awarded by the Strategic Growth Council.

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CHAPTER 1 INTRODUCTION

1.1 Context and Approach

A. Context

In October 2012, the City of Merced adopted a Climate Action Plan (CAP). The goals, strategies, and actions in the CAP support livable communities and sustainability principles. The Unified Design Manual (UDM) provides design-related guidance to projects seeking to demonstrate consistency with the City's adopted CAP and Programmatic Climate Action Plan (PCAP). The UDM shows project design options to meet the intent of the CAP.

B. Programmatic Approach

The California Environmental Quality Act (CEQA) requires each project applicant to analyze a project's greenhouse gas (GHG) emissions and impacts and to mitigate those impacts where necessary. This adds cost, time, and uncertainty to the development review process. The PCAP is designed to streamline environmental review of future development projects in Merced consistent with CEQA Guidelines Section15183.5(b). Projects that comply with the PCAP and applicable UDM measures rely on the PCAP's

Chapter TOC

programmatic analysis and methods to reduce greenhouse gases, which enables faster reviews, avoids additional costs for project analysis, and establishes predictable standards and outcomes.

With the UDM, the City seeks to provide visual guidance for key aspects of project design and siting related to reducing greenhouse gas emissions. As a result, the UDM is one of the key implementation tools of the PCAP. Together with the PCAP, the UDM provides transparency by communicating options for applicants to address existing guidance, standards, and best practices pertaining to the physical design of key components of their projects. Through a programmatic approach, the UDM and the PCAP ultimately provide development project applicants with a streamlined alternative to the current practice of assessing impacts on a project-by-project basis.

1.2 Purpose

The purpose of the UDM is to provide user-friendly design guidance to project applicants and City staff pertaining to compliance with the State's direction to analyze the impacts of projects on climate change and greenhouse gas emissions. The UDM provides an integrated and visual representation of an assortment of existing regulations that achieve greenhouse gas reductions, among other community goals. Prior to the application of the UDM, the City already locally applies several types of policies and regulations to site designs that reduce global warming impacts, including:

a. current General Plan policy;
b. existing Zoning Code;
c. mitigation measures from the City's certified General Plan Environmental Impact Report;
d. mandatory requirements of California's Building Energy Efficiency Standards and Green Building Standards Code (CALGreen); and
e. other municipal codes and standards, including the building code and street designs standards.

Design best practices in the UDM supplement existing policies and regulations to encourage the local development community to build high-quality projects. Strategies in the UDM also support projects seeking to meet the San Joaquin Valley Air Pollution Control District's (SJVAPCD) Rule 9410 (Indirect Source Review). Many types of residential and nonresidential projects are subject to fees from the SJVAPCD unless they implement on-site design measures or other improvements to improve air quality. In many instances, guidance in the UDM also provides locally appropriate examples of options for projects seeking to exceed minimum state requirements in CALGreen.

Design considerations in the UDM provide design professionals, property owners, residents, staff, and decision-makers with a clear and common understanding of the City's expectations for the planning, design, and review of development proposals to implement Merced's Programmatic Climate Action Plan.

1.3 Applicability and Process

A. Applicability

While the City encourages all project applicants to utilize the Unified Design Manual as a tool to design high-quality developments that support a variety of community goals, the UDM was crafted for projects that are subject to the California Environmental Quality Act. The CEQA Guidelines allow streamlining of the review of GHG emissions when new projects comply with a qualified GHG reduction plan that meets the CEQA criteria in Subsection 15183.5(b). With the PCAP, the City has demonstrated the PCAP's consistency with the CEQA Guidelines. Now, with this UDM, the City has developed another tool to help new development seeking to benefit from CEQA streamlining.

The UDM is designed to address the project-level impact of development projects, such as subdivisions and parcel maps, conditional use permits, site plan review, and design review. Planning-level projects, such as community plans, specific plans, annexations, General Plan amendments,

site utilization plan revisions, and zone changes, may not utilize the UDM for permit streamlining purposes, however. The potential greenhouse gas emissions impacts from these planning-level projects must be assessed through a separate environmental study consistent with the requirements of CEQA. Development that results in a compact urban form, supports infill development concepts, and/or conserves natural open space features may be deemed self-mitigating.

B. Process

The UDM was part of a comprehensive effort to establish a prequalified permitting program for purposes of GHG emissions through the identification of design and operation features that a project applicant elects to add to a project. As a means to address a project's impact to climate change, project applicants seeking streamlining with the PCAP may choose to use the UDM as a tool. The UDM provides visual guidance to further simplify the task of demonstrating PCAP consistency. Project applicants who elect to not use the UDM, or whose projects do not meet the guidance of the UDM, must demonstrate independent, project-level environmental review to meet CEQA requirements for greenhouse gas emissions.

To answer the question, "How can my project be consistent with the City's PCAP?," the City adopted a separate PCAP consistency checklist, the Project Options checklist, addressing topics both in and outside of the UDM. This comprehensive checklist includes specific references to items addressed in the UDM. In addition to UDM references, the Project Options checklist includes recommendations for other resources that can aid projects with consistency. For instance, existing state codes provide guidance for mechanical and lighting standards that are not visual elements but achieve reductions in energy use. The Project Options checklist is included in the appendices (A.1) and is organized by project type.

1.4 Organization and Use

A. Document Organization

This document is organized into different chapters based primarily on design topic. Specifically, design considerations are organized into the following chapters:

CHAPTER 1 Introduction. This chapter describes the purpose, intent, applicability, organization, and use of the Unified Design Manual.

CHAPTER 2 Community Design. This chapter includes design considerations for land use patterns and proximities, connectivity, and street design.

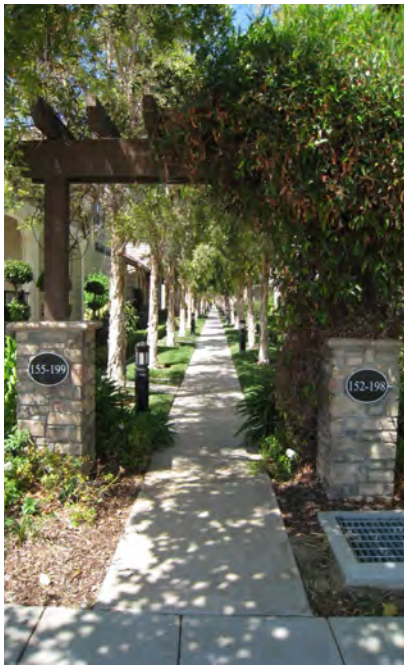
CHAPTER 3 Site Design for Mobility. This chapter identifies design considerations for special parking provisions (e.g., electric vehicles and bicycles) and on-site connections and facilities for pedestrians, cyclists, and transit users.

CHAPTER 4 Landscape Improvements. This chapter describes design considerations for water-efficient landscapes, tree canopies that provide shade on buildings and walkways, and stormwater features.

CHAPTER 5 Solar Energy Facilities and Resource Efficiency. This chapter includes design considerations for solar orientation and both building-mounted and ground- mounted solar design facilities, as well as cool pavements and roofs.

CHAPTER 6 Green Waste & Recycling Facilities. This chapter describes design considerations for food/green waste and the collection of recyclables.

APPENDICES. The appendices include a checklist to identify applicability of design provisions by land use and/or project type. They also include a list of referenced policies and regulations.



B. Chapter Organization

Each chapter is then organized into the following sections:

DESCRIPTION – Broadly explains the purpose of the design guidance presented in the chapter.

OBJECTIVES – Describes the specific aims that the design considerations are intended to achieve.

RELATIONSHIP TO THE PROGRAMMATIC CLIMATE ACTION PLAN – Identifies which of the four PCAP themes are addressed by each chapter. The following four icons are used to depict these themes:

SPECIFIC DESIGN TOPICS – Each design topic section is structured as follows:

a. Intent – Explains the purpose of the design considerations.
b. Design considerations – Identifies recommended design guidelines and a menu of design options for the physical design elements to be addressed. Design considerations include reiterations of General Plan policies and implementation measures, existing municipal codes, adopted city design standards, or suggested best design practices. The following icons are used to identify where a design consideration is a reiteration of Zoning Code standards, General Plan direction, state guidance, state requirements, and national guidance. CALGreen is a type of existing state requirement and provides additional measures and voluntary guidance highly relevant to strategies in this UDM. Accordingly, voluntary and required CALGreen references are identified throughout the plan, and

a list of each of the General Plan policy and Zoning Code references is included in the appendices (A.2)

c. Accompanying images or graphics – Illustrate each design concept.

GP Reiteration of General Plan policy or EIR mitigation measure

ZC Reiteration of Zoning Code Regulation

SR Reiteration of State Requirement

SG Reiteration of State Guidance

NG Reiteration of National Guidance

Design considerations may be in the form of recommended/ encouraged design guidelines, design targets, and/or a menu of design solutions from which to choose. This approach results in a greater measure of predictability in the development review process while maintaining flexibility and the option for creative design solutions.

1.5 Relationship to Other Plans and Policies

Development projects are subject to plans, codes, standards, and practices; for example, the City's General Plan, Municipal Code, and Standard Design Manual. As described in Section 1.2 above, the Unified Design Manual (UDM) displays design features from these documents that result in greenhouse gas emissions reductions, thereby informing applicants about design features that could be included in their development projects to be consistent with the City's Programmatic Climate Action Plan (PCAP). Projects that are consistent with the City's PCAP are determined to satisfy CEQA requirements for the purpose of assessing and mitigating GHG emissions and cumulative climate change impacts.

CHAPTER 2 COMMUNITY DESIGN

Description

This chapter provides community design considerations and strategies to encourage neighborhoods to provide an efficient street network for all modes of transportation, to design streets to be convenient and comfortable for pedestrians and cyclists, and to maintain a high quality community design aesthetic.

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Objectives

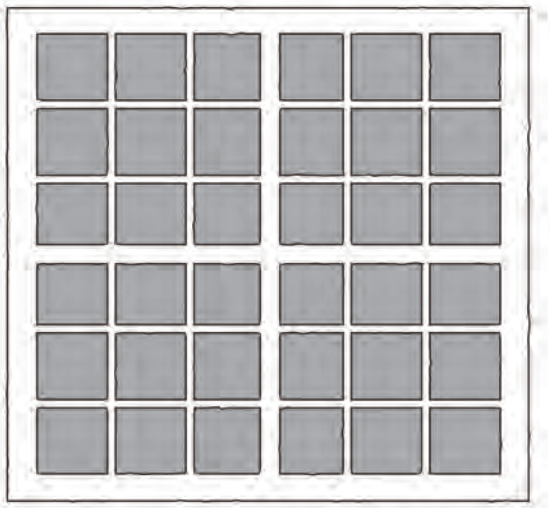
- Provide convenient and viable transportation choices for walking, biking, and transit.
- Provide orientation, safety, and comfort.
- Reduce air pollution, vehicle trips, and congestion.
- Maximize aesthetics and pedestrian comfort on all new streets.
- Ensure infill development is compatible with the surrounding context.

Relationship to CAP

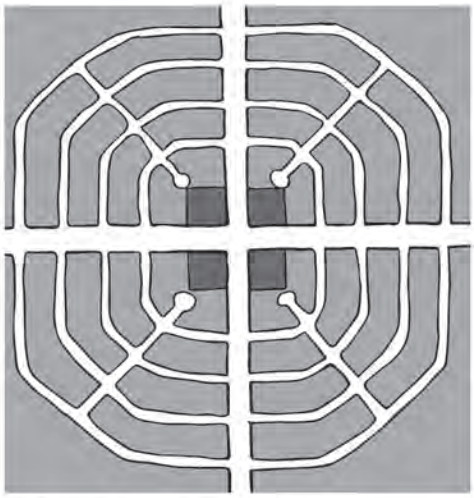
Land Use & Transportation

2.1 Connectivity
A. Circulation System

Encouraged Street Network Types



Traditional Grid Pattern



Modified Grid Pattern

Intent

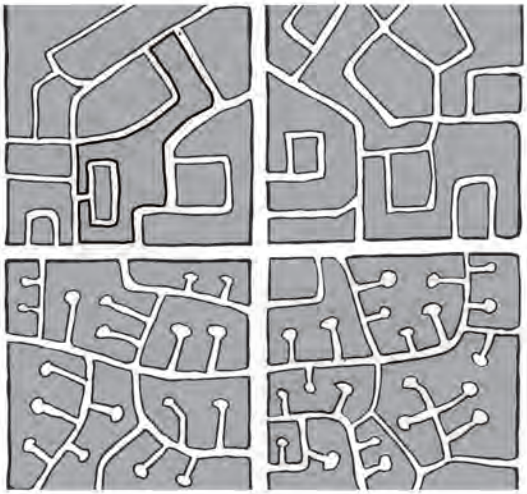
Connectivity design considerations are intended to ensure that circulation patterns are simple, efficient, legible, and memorable for all users. (GP)

Design Considerations

1. Development should be designed to accommodate the pedestrian by providing an efficient pedestrian network system of paths, sidewalks, and crossings that connect all parts of the community.
2. (GP) Street patterns should provide multiple routes to destinations to maximize flexibility, efficiency, and choice.
3. (GP) Streets should converge at common destinations to contribute to an area's unique identity.
4. New development should be designed with interconnected traditional grid or modified grid network street systems with short blocks (see Section 2.1C) to diffuse traffic and encourage pedestrian and bicycle circulation. A modified grid system is one where streets are curved slightly to produce the illusion of varied setbacks while maintaining the integrated grid pattern. This also narrows the line of sight for drivers and encourages them to slow down.
5. (GP) Curvilinear and winding roads, dead-end streets, and street patterns with cul-de-sacs (lollipop) and/or loops are discouraged for their poor connectivity of streets and land uses. Where cul-de-sacs are used,

Discouraged Street Network Types

Curvilinear Street Pattern



Loop & Cul-de-sac Pattern

they should:

a. Be limited to no more than 10 percent of the length of all streets in a subdivision map unless natural impediments such as hillside topography prevent vehicular connections.

b. Provide a walk-through path or "open end," if possible, to minimize walking distances to nearby destinations.

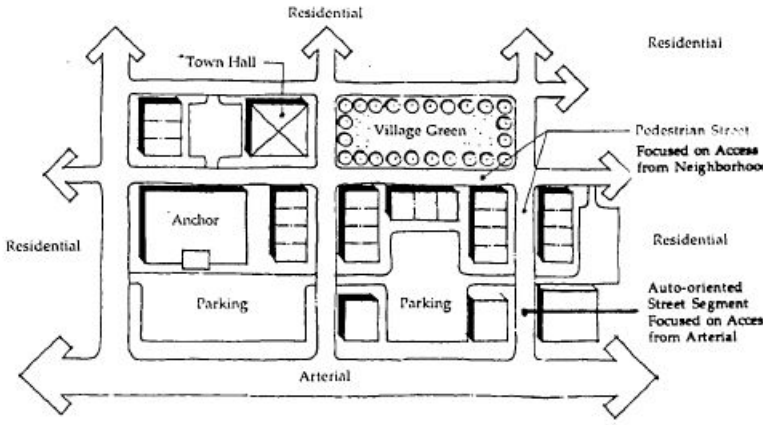
GP 6. Arterial streets should prioritize efficient conveyance of regional traffic, while collector and local streets should connect residential areas to local commercial areas, schools, and parks.

GP 7. Collectors and some local streets should be aligned along the edge of parks and open space to enhance the aesthetic character of the streets and sidewalks.

GP 8. Core commercial areas should be designed to create a pleasant and pedestrian-friendly "main street" environment, with shops and street parking oriented along the main street, and parking lots located behind shops.

GP 9. The circulation network should be designed to provide reasonably direct vehicular access to local destinations while discouraging outside traffic from

2.1 Connectivity (CAP M1)
A. Circulation System



"Main Street" circulation and site plan concept

Mid-block residential pathway

taking shortcuts through residential neighborhoods.

GP 10. Residents should be able to reach public transit routes, shopping centers, schools, and recreational areas as directly and easily as possible. The following barriers should be avoided:
   a. Residential subdivision designs that require pedestrians to duplicate walking distance (double-back)
   b. Long, unbroken walls
   c. Cul-de-sacs

11. New residential developments are encouraged to include the following:
   a. A linkage between all interior cul-de-sacs of a proposed subdivision that are in excess of 300 feet in length, except where terrain or other restrictions make such design impractical.
   b. Linkages to all open space areas, parks, activity centers, schools, and transit facilities from cul-de-sacs and interior or circulatory streets of the development, except where terrain or other restrictions make such design impractical.
   c. Linkages illuminated with streetlights at entries and along routes.

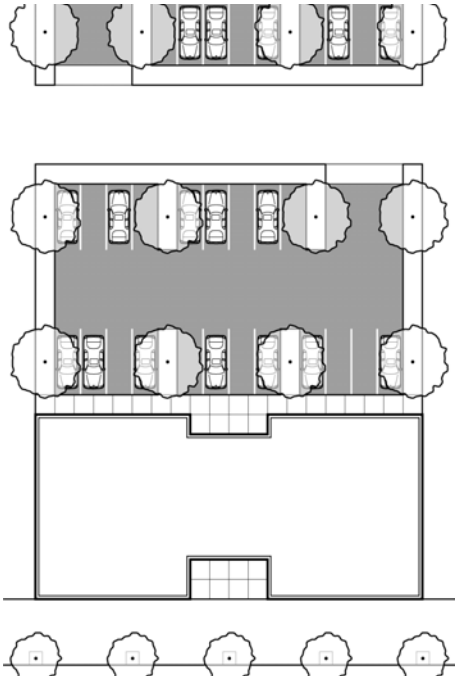
Internal circulation network connects to local street

Pedestrian linkage through cul-de-sac

12. For new subdivisions, master planned communities, and specific plan areas, bicycle routes should be incorporated into the overall design of the community through the use of both on- and off-street routes and trails. The project site should be connected to the citywide bikeway system.
13. Multi-family development with internal streets and driveways should be designed to be easy to navigate in a logical, commonsense manner so that residents or visitors can easily enter the site, park their car, and find a particular unit.

2.1 Connectivity
B. Site Access

Garages accessed from rear alley



Shared allley loaded access

Intent

Site access design considerations are intended to consolidate access points to improve safety by minimizing potential conflicts between automobiles, bicyclists, and pedestrians.

Design Considerations

GP 1. Shared access points should be created for adjoining sites, particularly for land uses fronting major streets, and driveways on opposite sides of the street should be aligned.

GP 2. Curb cuts should be minimized and limited to eighth- to quarter-mile intervals along public streets and near major intersections to reduce points of conflict and improve pedestrian safety.

GP 3. Access to parking from alleys or common driveways is encouraged.

ZC 4. For parcels served by a rear alley, new driveways that cross a sidewalk must be designed and placed to minimize impacts on pedestrians to the greatest extent possible.

5. Pedestrian pathways and sidewalks crossing a driveway should be made identifiable by the use of elevated crossings and/or alternative hardscape materials such as patterned, stamped, and/or colored concrete.

6. The majority of a street should not be dominated by driveways and curb cuts.

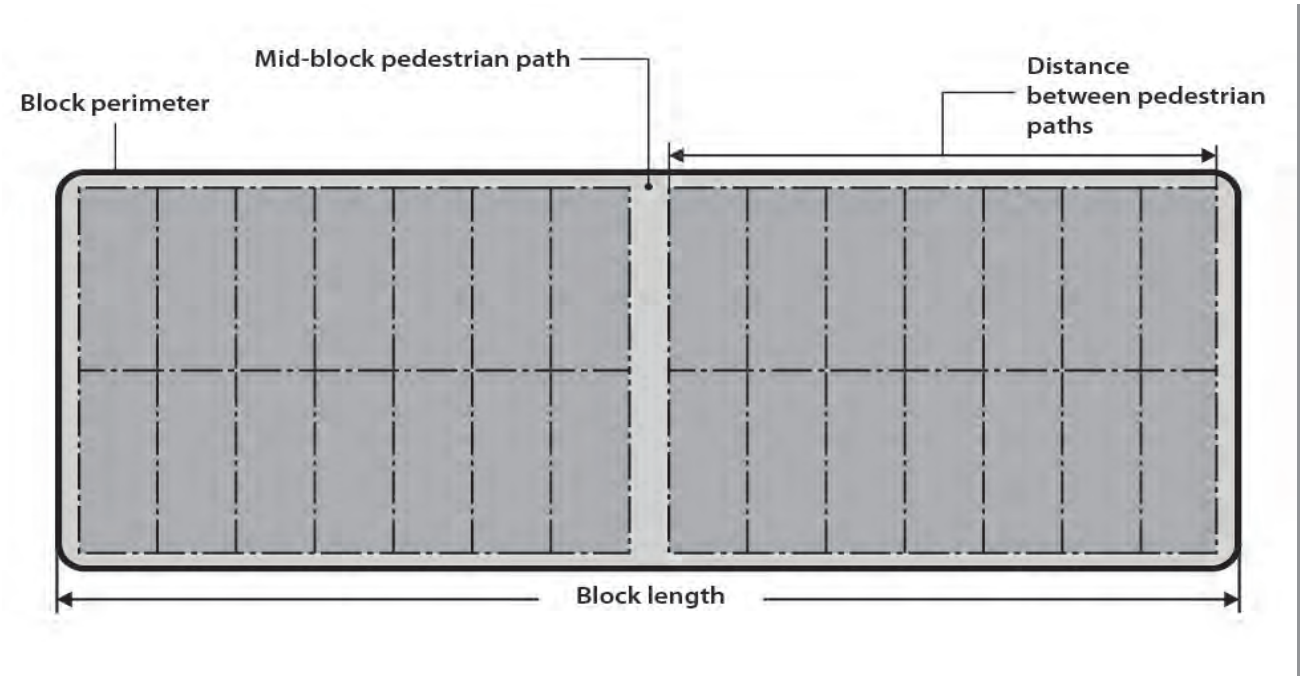
GP 7. Residential "fronting lots" should be avoided along

Driveways should not dominate the street

Shared driveway between adjoining sites

major collectors and arterials. Where residential lots front onto major roadways, alley-loaded access to homes and on-street parking should be considered to buffer residential uses from travel lanes.

2.1 Connectivity
C. Blocks and midblock connections



Block length and mid-block pathway concept

Intent

Block connection design considerations are intended to encourage walking by providing more efficient, flexible, and convenient circulation options for pedestrians.

Design Considerations

1. New developments are encouraged to use small blocks, as they promote walking by creating more flexibility and options for pedestrians.
2. Block lengths should be no longer than 600 feet and cul-de-sacs should be no longer than 300 feet, in accordance with the City Municipal Code.
3. Blocks with any block face length exceeding 600 feet should be developed with midblock pedestrian connections per the guidelines in Table 1.1.

Table 1.1 Block Length & Midblock Connection Standards

Block Length	Maximum Spacing Between Bike/Pedestrian Paths	Midblock Pedestrian Connection
Less than or equal to 600'	600'	Not required
More than 600'	600'	1 every 600'

4. Midblock pedestrian street crossings should be provided to connect midblock pedestrian/bike pathways.
5. Midblock connections should be well lit with pedestrian-scale lighting and provide a 5-foot minimum circulation path with 2 feet of landscaping

Bold painted striping delineates crosswalk

Mid-block crossing

along either side of the path.

6. To ensure safe and convenient pedestrian street crossings, two or more of the following design improvements should be incorporated at each designated intersection of a midblock crosswalk:
   a. Minimize crossing distance by utilizing curb extensions (bulb-outs) at intersections.
   b. Incorporate pedestrian islands.
   c. Use signage and/or lighting to delineate crossings.
   d. Use bold painted striping.
   e. Supplement crossings with advance crosswalk warning signs for vehicle traffic.
   f. Provide street lighting on both sides of midblock crossings.
   g. Use alternative hardscape materials such as pavers or patterned stamped and/or colored concrete.
   h. Raise the crosswalk section to visually and functionally call attention to the crossing and to slow traffic.

2.2 Pedestrian- and Bicycle-Friendly Street Designs

A. Pedestrian Design

"Complete Street" featuring vehicle, bike, and pedestrians facilities

Bulbout at intersection

Intent

Pedestrian street design considerations are intended to promote walking by improving the design and safety of streets for pedestrians.

Design Considerations

GP 1. All streets should be designed as "Complete Streets," which balance the needs of all modes of transportation, including vehicles, bicycles, transit, and pedestrians. (GP)

GP 2. Sidewalks and pedestrian ways should be provided in all new residential and commercial developments. Sidewalks are also encouraged in industrial areas to assist in employee access to public transit.

GP 3. Local streets should have travel and parking lanes that are narrow enough to slow traffic, while still providing adequate access for automobiles and for emergency and service vehicles.

GP 4. The use of traffic calming devices should be considered that reduce the length/distance of pedestrian street crossings such as:

   a. Bulbouts/curb extensions
   b. Bollards
   c. Median strips/pedestrian safety islands
   d. Narrow lanes

5. Traffic control devices and pedestrian/bike refuges are encouraged at midblock crossings.

GP 6. City and utility equipment such as streetlights,

Widened sidewalks and seating

Pedestrian refuge island

street signs, and fire hydrants should be located such that they do not obstruct sidewalks and other pedestrianways.

GP 7. Pedestrian links such as plazas, malls, arcades, and walk-throughs are encouraged in high-traffic areas.

GP 8. Rest areas with seating should be provided along major pedestrianways to create an inviting pedestrian environment.

GP 9. Street trees should be planted along roadways, trails, and bikeways to form a pleasing canopy over the street/pathway, buffer pedestrians from travel lanes, and provide relief from summer heat.

GP 10. On-street parking should be provided along collector and local streets to narrow the street and provide a buffer between pedestrians and vehicular travel.

11. City street standards dictate a 5- to 6-foot sidewalk and a 6- to 7-foot landscape buffer along most streets. Widened sidewalks are encouraged in areas of more intense pedestrian activity, as follows:
    a. 7 feet where the sidewalk is not separated from the roadway
    b. 8 feet in front of schools, universities, hospitals, and commercial and mixed-use development

2.2 Pedestrian- and Bicycle-Friendly Street Designs

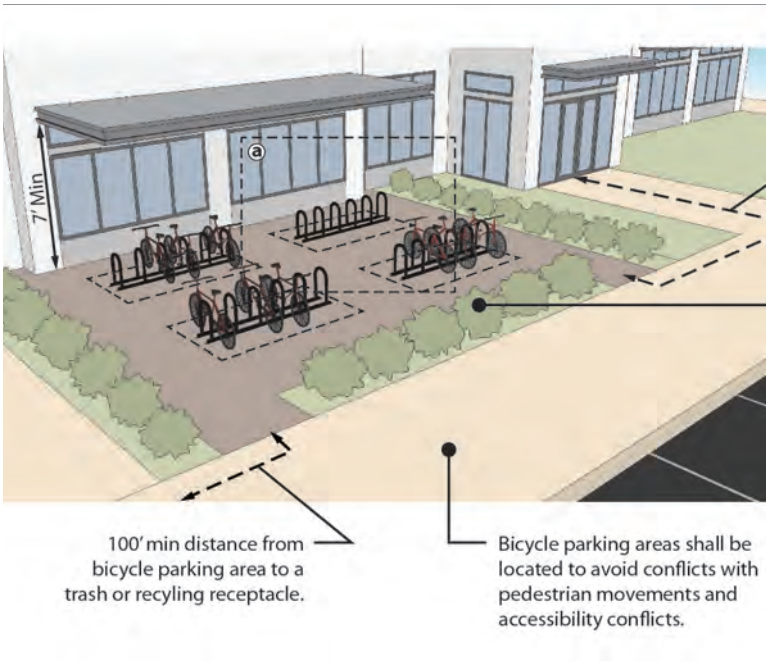
A. Pedestrian Design

Wide sidewalks accommodate outdoor dining

Sidewalk widened for outdoor seating

c. 10–12 feet along intensely used commercial and downtown areas
d. 15 feet adjacent to restaurant uses to provide seating along the sidewalk (can be accomplished with setbacks)

Bike lane positioned left of right-turn lane



Bicycle parking located next to building entrance

Design Considerations

GP 1. On-street bikeways should utilize existing or proposed major streets that provide the quickest, shortest, and safest route to take for bicyclists.
2. Bike lanes should be a minimum of 5 feet wide.
3. Bicycle lanes should extend up to the intersection stop bar or crosswalk. If right-of-way is a constraint, appropriate markings and signs should be used to end bicycle lanes prior to the intersection.
4. At intersections with exclusive right turn lanes, the bicycle lane should be transitioned to the left of the right turn lane. If right-of-way is a constraint, appropriate markings and signs should be used to end bicycle lanes prior to the intersection.
5. Bicycle racks should be located conveniently for the user in proximity to entrances and must not obstruct the pedestrian right-of-way.

Intent

Bicycle street design considerations are intended to promote bicycling by improving the design and safety of streets for cyclists.

2.2 Pedestrian and Bicycle Friendly Street Designs
C. Building Interface

Minimum 40% building transparency & blank wall guidelines

Corner entrance features special architectural details

Intent

Building interface design considerations are intended to enliven street edges and encourage interaction with pedestrians and other street users.

Design Considerations

1. Building entries should be set back or recessed to prevent conflicts with pedestrians.
2. ZC The ground-floor street-facing building walls of nonresidential uses shall provide transparent windows or doors with views into the building for a minimum of 40 percent of the building frontage located between 2.5 and 7 feet above the sidewalk. Fifty percent of the transparent windows or doors area shall remain clear to allow views into the building.
3. ZC The maximum length of an unarticulated/blank building wall shall be 10 feet in the D-COR zoning district and 25 feet for all other downtown zoning districts, unless otherwise approved with a Minor Use Permit. Architectural articulation shall have a similar pattern to other adjacent buildings to provide cohesive design in the neighborhood.
4. ZC Unarticulated/blank building walks should be avoided, particularly in commercial and downtown areas. Building and wall articulation may be provided through the use of:
   a. Doors, windows, and other building openings.
   b. Building projections or recesses, doorway and

Awnings provide shelter

Large commercial building designed to look like narrow storefronts

window trim, artwork displays, and other details that provide architectural articulation and design interest.

c. Varying wall planes, heights, or contrasting materials and colors.

d. Awnings, canopies, or arcades to reinforce the pedestrian scale and provide shade and cover from the elements.

5. Weather protection and a clear sense of entry should be provided along buildings and primary walkways to building entrances through the use of:
   a. Awnings, building overhangs, trellises, canopy trees, and recesses on building facades adjacent to walkways.
   b. Transparent surfaces (windows) that allow views into and out of buildings.
6. Large footprint retail stores should be lined with multiple narrow retail storefronts.
7. Special attention should be paid to the design of project and building corners as an opportunity to create visual interest and provide easy access to adjacent properties. This can be accomplished through building placement, entrances, public

C. Building Interface

Residential entrance highlighted by columns and archway

Porch entrance

plazas, or small parks that tie the building to the public street.

8. Residential entrances should be clearly identified with two or more of the following treatments:
   a. Oriented to face the street
   b. Porch or stoop
   c. Change in roof form
   d. Change in setbacks
   e. Special architectural articulation

Similar scale and character between residential and non-residential uses

Commercial building architecture matches adjacent residential neighborhood

Design Considerations

GP 1. Design of buildings in scale with adjacent development and harmonizing with the character of the area or neighborhood is encouraged.
2. To establish continuity between land uses, all new developments in the project area, regardless of size or use, should reflect a similar urban form that is human scale and pedestrian-oriented, with strong physical and visual connections to fronting streets.
3. Development on either side of streets (facing each other) should be designed with a compatible scale and massing to encourage a comfortable pedestrian environment and maintain a sense of visual cohesion along the street.
4. Positive transitions in scale, massing, height, setback, and character are encouraged at the interface between residential and nonresidential land uses, and between new and existing adjacent buildings.
5. Site planning should consider compatibility with surrounding neighborhoods by providing proper transition of density, increased setbacks, and architectural compatibility along common boundaries, particularly on infill sites adjacent to

Intent

Infill compatibility design considerations are intended to maximize compatibility with the neighboring context to the greatest extent possible. Compatibility is based on ensuring the massing and scale of structures are complementary from one project to another. Compatibility design considerations are also intended to buffer potentially incompatible uses.

2.3 Infill Compatibility Design

New development transitions in height and density

New development does not match scale of existing buildings

lower densities.

6. The mass of an infill structure should relate to the context of nearby structures. This may be accomplished by stepping back upper floors and by using vertical and horizontal articulation to divide larger building masses into forms that are similar in scale to structures seen in the immediate vicinity.

GP 7. Large buildings should not appear to dominate an entire street or block. Articulation and variety in floor levels, facades, and rooflines can be used to create the appearance of several smaller projects.

8. Infill development that is one or more stories taller than adjacent buildings should include upper-story stepbacks to provide visual relief and to minimize shading and loss of solar access to adjacent buildings.

9. Upper-story stepbacks or partial indentations should be used for upper-story features, such as balconies.

10. For multi-story buildings adjacent to single-family homes, the upper floors should be stepped back from adjacent property lines by 5 feet for every story.

11. Facades that front a street should be articulated to improve the quality of the building design and

Multi-family residential buildings designed to look like lower density townhomes

Articulation of roofline and facade

accentuate the ground floor. Appropriate methods of articulation include a combination of the following:

a. Varying the height or roofline.
b. Breaking up large smooth surfaces with projections, molding, or changes in texture and color.
c. Adding depth and detail to the cornice or roof parapet.
d. Providing front porches, entry porticos, window recesses, shutters, dormers, projections, or other unique design features at the front entrance and/or corners.

ZC 12. Infill of secondary dwelling units must fit within the same building envelope as the primary building and shall be compatible in height, materials, and colors.

13. Infill of secondary dwelling units is encouraged on corner lots to provide secondary site access to the structure.

CHAPTER 3 SITE DESIGN FOR MOBILITY

Description

This chapter provides site design considerations for mobility of pedestrians, cyclists, and transit users to and through developments. By following the requirements and suggestions outlined in this chapter, developments can be designed to direct users from sidewalks, transit stops, and parking areas to and between buildings in a safe, convenient, and efficient manner. Circulation to the site and between neighborhoods is addressed in Chapter 2. These design considerations are applicable to mixed-use, nonresidential, and multi-family residential project types.

Objectives

- Increase safety, comfort, and convenience for pedestrians, cyclists, and transit users.
- Minimize conflicts between pedestrian circulation and vehicular traffic.
- Ensure a safe, comfortable, convenient, and easy to navigate system of walkways.
- Provide convenient parking for fuel-efficient vehicles and bicycles.
- Minimize street frontages dominated by fields of surface parking.

Chapter TOC

Relationship to CAP

Land Use & Transportation

3.1 Site Planning for Transit, Bike, & Pedestrian Access
A. Building Orientation and Entries

Building fronts the sidewalk and provides

Intent

Design considerations for building orientation and entries are intended to provide a compatible relationship between buildings and the public sidewalk system. These considerations are applicable to primary building entries to mixed-use and nonresidential development or key entrances to residential neighborhoods or multi-family sites.

Design Considerations

1. Buildings should be encouraged to be located at the minimum setback assigned for the district to maximize the convenience of pedestrians and transit users. Deep front setbacks and driveways that separate the front door of buildings from the public sidewalk should be avoided.
2. Buildings should be arranged to define, connect, and activate sidewalks and public spaces. See Chapter 2 for design considerations to enliven building frontages through the use of defined entrances, display areas, changes in massing and facade setbacks, and outdoor seating.

GP 3. Primary ground-floor commercial building entrances should orient to plazas, parks, or pedestrian-oriented streets, not to interior blocks or parking lots.

GP 4. Anchor retail buildings may have their entries from off-street parking lots if pedestrian access to the entry is provided from the street and if pedestrians are not required to walk through the parking lot to enter the store.

GP 5. Buildings with multiple retail tenants should have numerous entries to the street.

3.1 Site Planning for Transit, Bike, & Pedestrian Access

A. Building Orientation and Entries

Buildings located at minimum setback

Building entries open on to the street with porches

GP 6. In residential areas, the front door and guest entry should orient to the street. Private back door entries can provide access from alleys, garages, and parking lots. Ancillary units and upper floor units in multi-family or apartment complexes may be accessed by rear or side entries.

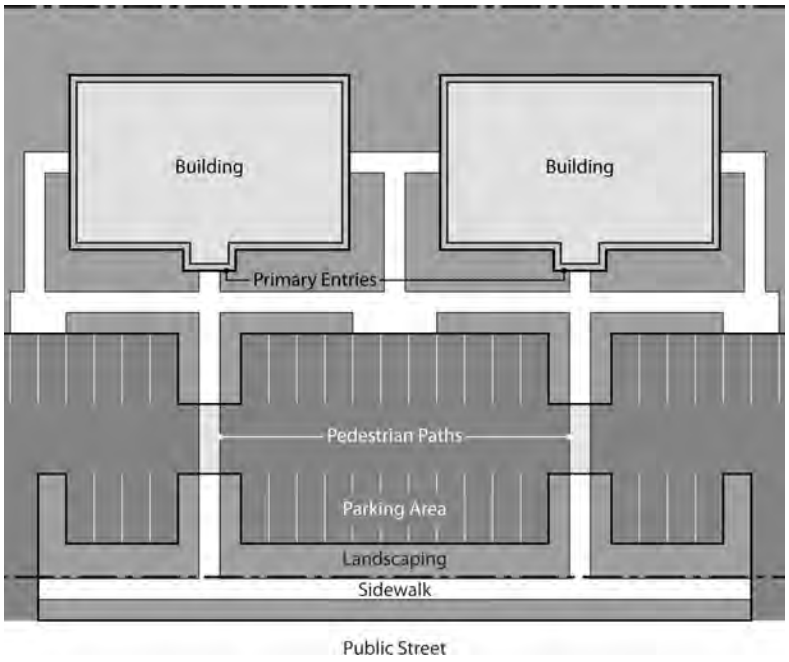
7. Main building entries should open on public streets and be clearly defined with signs or architectural treatment.

8. A number of the following features should be incorporated to accentuate primary building entries and to attract and protect pedestrians: canopies, porticoes, overhangs, recesses/projections, arcades, raised cornice parapets over the door, peaked roof forms, porches, arches, outdoor patios, display windows, and architectural details such as tile work and moldings.

9. Secondary commercial entrances should have minor detailing that adds architectural distinction to that portion of the facade.

10. Developments that are set back from the street should use the area between the right-of-way and the building to create a plaza court, planter area, benches, bicycle parking, or another amenity.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
B. Connections to the Sidewalk System



Direct pathways connect building entrances to sidewalk and parking

Direct pedestrian pathway from sidewalk to park

Intent

Design considerations for connections to the sidewalk system are intended to provide clear and designated paths of travel between buildings and the public sidewalk system.

Design Considerations

ZC 1. Convenient and direct pathways must be provided to accommodate pedestrian circulation from every primary building entrance to the public sidewalk system, adjacent trails, adjacent buildings, parks, plazas, open spaces, transit stops, bike lanes, bike and vehicle parking, and adjacent developments. This pedestrian network should enhance a campus-like appearance of the development site.

2. Multi-family residential projects should provide direct pedestrian connections from individual and common entries to the public sidewalk system.

GP 3. Where possible, the primary pedestrian path system should coincide with the street system along sidewalks or be visible from streets.

4. Internal pedestrian walkways should be a minimum of 6 feet in width and designed with special paving, landscaping, pedestrian-scale lighting, and street trees.

Building entrances face the paseo


Flags, landscaping and awnings along the paseo

5. Internal pedestrian walkways that are lined with retail shops, also referred to as paseos, are encouraged in commercial areas. They should be designed as follows:
   a. Have visibility from one end to the other.
   b. Be straight with minimal angles and turns to disrupt visibility.
   c. Buildings facing the paseo should have windows and/or side entrances to provide a higher level of visibility onto the paseo.
   d. Planting and site furnishings such as benches should be incorporated.
   e. Outdoor dining and outdoor retail displays are encouraged.
   f. Artwork such as banners, fountains, flags, and sculptures are encouraged.
   g. Paseo entrances should be designed to provide a sense of welcome at both ends of the paseo and to provide visual cues for pedestrians that these are unique spaces.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
C. Connections to the Transit System

Path leads from transit stop to shops

Enhanced crossing leading to transit stop

Intent

Design considerations for connections to the transit system are intended to provide a clear and designated path of travel between buildings and transit stops.

Design Considerations

1. The pedestrian network should serve transit by providing direct and convenient pedestrian paths from building entries to transit stops.
2. GP Paths to the transit stop should be lined with activities and be shaded. The configuration of parking, shopping, and pedestrian routes should reinforce access to transit.
3. Designated connections from transit stops to major destinations, such as shopping centers, should be highlighted with special paving, enhanced crossings, and pedestrian-scale lighting.
4. The convenience of transit use should be increased by incorporating the following site design techniques:
   a. Place transit facilities and supportive commercial uses (coffee house, news stand, etc.) in close proximity whenever possible.
   b. Where possible, incorporate transit stops into attractive public spaces and plazas that act as a node between the project and the stop.
   c. Provide easy access from transit stops to the front door of buildings.

D. Connections to the Bicycle System

Intersection of bike path, pedestrian path, sidewalk and bicycle parking

Bicycle path connection from street to shopping center

Design Considerations

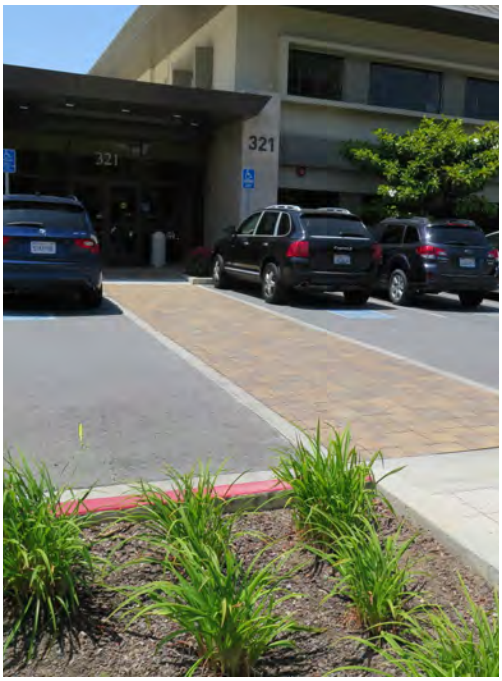
1. A linked system of bicycle paths should be provided throughout the project site by:
   a. Connecting to the regional bicycle system (streets with bike lanes, open spaces with bike paths, etc.).
   b. Continuing bicycle routes to the property boundary to connect to existing systems on adjacent development or to allow future connections when adjacent properties develop.
   c. Providing bicycle facilities as part of roadways/ driveways with painted lanes and signage or providing a separate bicycle path system.
   d. Connecting bicycle parking areas with bike paths and pedestrian paths that lead to building entrances

Intent

Design considerations for connections to the bicycle system are intended to provide a clear and designated path of travel between buildings and bicycle routes.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
E. Connections to Parking Areas

Designated path with archway and landscaping



Special paving and raised walkway

Intent

Design considerations for connections to parking areas are intended to provide a clear and designated path of travel between buildings and parking lots.

Design Considerations

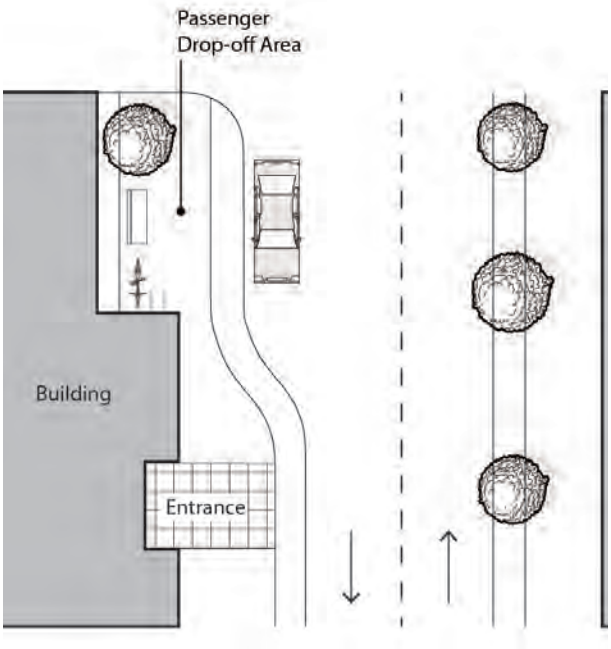
ZC 1. Parking areas should provide safe pedestrian passage by creating a continuous designated walking path that connects the primary entrances of the structure(s) on the site to the associated parking area.

2. Safe and comfortable pedestrian routes should be designed through parking areas with the use of landscaping, special pavers, raised walkways, bollards, arches, trellises, and other design elements to alert drivers to potential conflicts with pedestrians.

3. Where walls and/or landscaping are used to screen parking areas, breaks should be provided at least every 60 feet (minimum one per lot) to provide pedestrian access from the parking area to the public sidewalk.

3.1 Site Planning for Transit, Bike, & Pedestrian Access

F. Passenger Loading & Unloading Areas at Destinations



Designated passenger drop-off area

Passenger drop off area designated with special paving

Design Considerations

GP 1. The provision of designated off-street passenger drop-off and pick-up zones should be considered at major destinations, such as shopping centers and schools, for transit users, pedestrians, and cyclists.

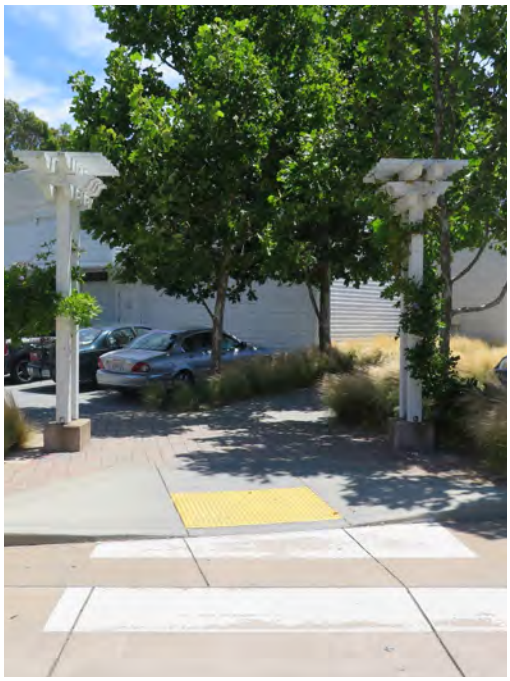
2. Amenities should be provided for passenger waiting areas such as shade trees, shelters, benches, newspaper vending machines, and lighting.
3. The placement of public transit/bus drop-off areas should be considered within project sites for convenient pick-up and drop-off.
4. Passenger loading and unloading areas are encouraged to be co-located with public open spaces such as plazas to allow use of their amenities.
5. Land uses with over 100 parking spaces are encouraged to provide a designated passenger loading turn-out area located at the main entrance, unless another entrance serves as the main point of access from the parking area to the building or use.
6. Loading areas should be designed with special paving and/or bollards to distinguish from the street or sidewalk.
7. Drop-off areas should not interfere with the circulation of other users within the parking area or at building entrances.

Intent

Design considerations for passenger loading and unloading areas are intended to create safe and comfortable zones for pedestrians to embark and disembark from public transit, private vehicles, and bicycles.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
G. Access Between Adjacent Developments

Opening in fence provides pedestrian access



Painted crossing, landscaping and arbors provide inviting access between sites

Intent

Design considerations for access between adjacent developments are intended to create clear and inviting designated access points and travel paths between adjoining developments.

Design Considerations

1. Adjacent land uses should be connected through trails, public sidewalks, or other designated pedestrian pathways.
2. (GP) Safe and inviting pedestrian connections should be provided between adjoining compatible uses, particularly at pedestrian destinations such as sports facilities, schools, parks, government facilities, and public open space areas.
3. (GP) Multiple pedestrian links are encouraged from pedestrian activity areas such as schools, parks, and government centers to the nearby street and/or trail system.
4. (GP) Development should minimize the use of walls, fences, hedges, or other barriers that limit the connections between uses. Where it is necessary to develop fences or perimeter walls as visual screens or sound barriers, openings for pedestrian and bicycle access in such walls are encouraged at regular intervals.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
G. Access Between Adjacent Developments

Separate pedestrian access

Arch gateway features highlights access between developments

5. Pedestrian access between compatible uses should be designed with the following features to be safe, visible, and inviting:
   a. Enhanced landscaping
   b. Lighting
   c. Direct designated path with special paving
   d. Gateway feature, such as an archway or arbor
6. Gates as entryways into subdivisions are strongly discouraged, as they tend to create an unwelcome feeling and discourage interaction among neighborhoods. However, when the City approves gated entrances, such entrances should include separate vehicular and pedestrian access gates.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
H. Transit Facilities

Benches, news racks shelter and signage at transit stop


Shelter design matches aesthetics of area

Intent

Design considerations for transit facilities are intended to create comfortable and inviting waiting areas for passengers taking public transit.

Design Considerations

1. The following amenities should be provided at each transit stop located adjacent to major destinations:
   a. Shelter
   b. Benches
   c. Lighting
   d. Shade trees
   e. Clear signage and schedules
   f. Marked crossings
   g. Wider sidewalks
   h. Trash and recycling receptacles
2. Transit stops are encouraged to be designed to contribute to project and area-wide identity. This can be achieved by:
   a. Using special paving materials.
   b. Integrating public artwork into the design.
   c. Ensuring that the shelter/shade structure and bench design match the aesthetics of the area or development.
   d. Installing special landscaping.

H. Transit Facilities

Shelter and signage at bus stop

Overhangs, benches and railings integrated into building architecture

3. Transit signage should provide clear information on bus route numbers, schedules, and fares to facilitate transit ridership. Where bus stops include a passenger shelter, additional information displays such as route maps should be provided. Transit stop signage should be well lit.
4. More opportunities for sitting and leaning should be provided at heavily used bus stops by integrating benches and leaning devices such as railings into the building architecture adjacent to bus stops. The portion of the building facade that integrates amenities for transit riders should be clearly differentiated and separate from the main entrance to prevent conflicts with pedestrians entering/exiting the building.
5. Developments at bus stop locations are encouraged to provide architectural features integrated into the building facade such as awnings, arcades, and galleries to provide overhead protection for passengers waiting for the bus.
6. Bus stops are encouraged to be located adjacent to but not directly in front of main building entrances to prevent conflicts with those entering and exiting the building.

H. Transit Facilities

Transit stop located within a shopping center

Bus stop co-located with a plaza

7. The placement of public transit/bus drop-off areas are encouraged within project sites at popular destinations, such as shopping centers, for convenient pick-up and drop-off.
8. Bus stops are encouraged to be co-located with plazas to allow use of the amenities for transit riders. At busy downtown bus stops, passengers can wait in the plaza area rather than crowd the sidewalks.
9. GP Public transit route transfer points should be located at one point, such as in conjunction with a major commercial area, so that passengers can go from one route to another with minimal inconvenience.

3.1 Site Planning for Transit, Bike, & Pedestrian Access
I. Wayfinding for Alternative Travel Modes

Directory sign

Gateway feature

Design Considerations

1. Pedestrian signs, maps, and kiosks should be placed in appropriate locations throughout large projects to direct visitors to local businesses, community amenities, major transit stations, and parking areas.
2. Pedestrian-oriented signs and maps should be located at key pedestrian activity nodes, such as transit stops, plazas, and shopping areas.
3. Gateway features should be used to provide a sense of arrival and transition to unique places in the city. Entrance features may consist of a combination of plant materials, archways, trellises, special paving, and/or signage. Gateways can provide an opportunity for architectural features, monuments, murals, banners, and lighting features that serve as identifiable community landmarks.
4. Wayfinding signage should be co-located with other streetscape furniture, such as light standards and transit shelters, where possible, to enhance visibility and reduce visual clutter in the public realm.

Intent

Design considerations are intended to direct pedestrians, bicyclists, and transit users around sites and to key destinations.

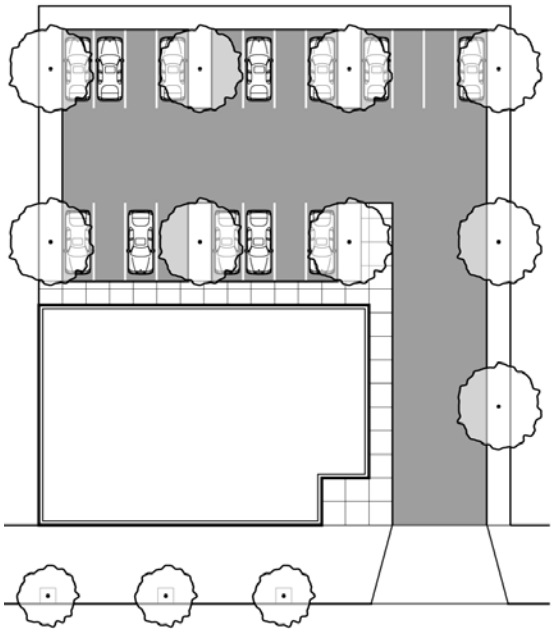
3.1 Site Planning for Transit, Bike, & Pedestrian Access
I. Wayfinding for Alternative Travel Modes

Directional sign to major transit station

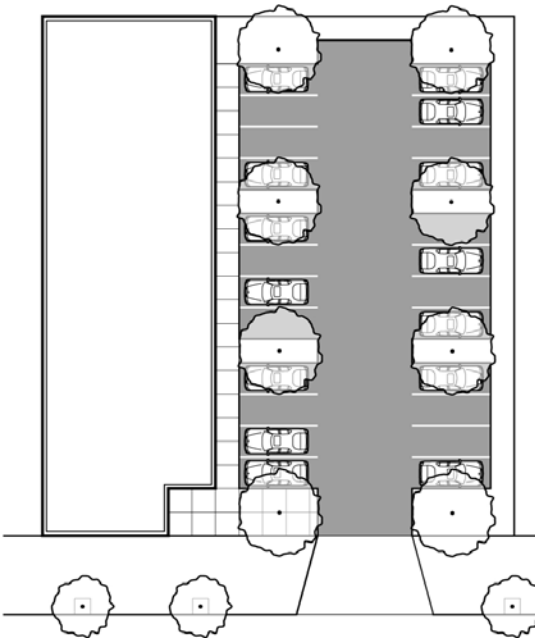
Directory sign at multi-family complex

5. Wayfinding should be used to help facilitate connections to and from major transit stations and other key destinations in the city. Directional and information signs that are attractive, clear, and consistent in theme, location, and design should be provided.
6. Large developments, such as multi-family complexes, should provide on-site directional or directory signs to help orient and direct the pedestrian around the site. Other effective wayfinding designs include color-coded buildings, pedestrian signage, and landscape accents.

3.2 Off-Street Parking
A. Location of Parking



Parking located behind the building



Parking located to the side of the building

Design Considerations

GP ZC 1. In order to reduce public views of parking areas, a significant amount of a development's parking area should be located beside or behind the building that it serves with short, pleasant passageways leading to the pedestrian-oriented street and primary entrances.

ZC 2. Surface parking areas should be divided into smaller units to decrease visual impacts associated with large expanses of pavement and vehicles.

3. Access to parking areas should be provided with driveways or through an alley if practicable. Also see Section 2.1.B.

Intent

Off-street parking design considerations are intended to reduce the visual impacts of parking on public streets and to provide convenient locations for the parking of bicycles and fuel-efficient vehicles.

3.2 Off-Street Parking
B. Designated Parking for Fuel-Efficient Vehicles

Electric vehicle parking and charging stations

Carpool parking

Intent

Design considerations for designated parking are intended to clearly identify parking for fuel-efficient vehicles and to locate these spaces in convenient locations to encourage their use.

Design Considerations

1. Designated parking for fuel-efficient vehicles is encouraged per CALGreen for 10 percent of the total designated off-street parking spaces. Fuel-efficient vehicles include any combination of low-emitting, fuel-efficient, and carpool/van pool vehicles (excluding neighborhood electric vehicles).

SR 2. Signage should be provided to clearly identify designated fuel-efficient parking stalls. In nonresidential areas, CALGreen requires painting the following characters such that the lower edge of the last word aligns with the end of the stall striping and is visible beneath a parked vehicle: "CLEAN AIR VEHICLE".

SG 3. For each electric vehicle parking space, one 120 volt AC 20 amp (level 1 charger) and one 240 volt 40 amp (level 2 charger) rounded AC outlets or panel capacity should be provided, along with the installation of conduit for future outlets. These are voluntary CALGreen guidelines.

4. Electric vehicle charging stations are encouraged at locations where visitors may park for long periods of time, such as movie theaters, shopping centers,

Designated parking for electric vehicles


Electric vehicle charging station

grocery stores, business parks, and multi-family developments.

5. Electric vehicle charging stations (EVCS) for public use should meet the following design considerations:
   a. Be located in a manner which will be easily seen by the public for informational and security purposes, and should be illuminated during evening business hours.
   b. Be located in desirable and convenient parking locations that will serve as an incentive for the use of electric vehicles.
   c. EVCS pedestals should be designed and protected as necessary to prevent damage by automobiles and vandalism.
   d. One standard sign may be posted for the purpose of identifying the location of each cluster of EVCS.
   e. One Level 2 charger should be provided for each space through a 240 volt AC plug and a dedicated 40 amp circuit. Level 2 charging equipment is compatible with all electric vehicles and plug-in electric hybrid vehicles. Level 2 chargers have a cord that plugs directly into the vehicle in the same connector location used for

3.2 Off-Street Parking
B. Designated Parking for Fuel-Efficient Vehicles

Neighborhood electric vehicle

Parking for neighborhood electric vehicle

Level 1 equipment. Level 2 charging generally takes 4 to 6 hours to completely charge a fully depleted battery.

6. Neighborhood electric vehicles (NEVs) or "low-speed vehicles" are encouraged for use in making short-distance trips along local streets with a maximum speed of 25 mph or on private streets in campus-like settings.
7. NEV parking spaces should be 15 feet long by 7 feet wide.

Covered parking provided near building entrance

Bicycle repair equipment and signage

Design Considerations

GP 1. On-site bicycle parking and/or storage facilities should be:
   a. Provided in well-lit, visible areas.
   b. Visible from streets or parking lots.
   c. In close proximity to building entries.

GP 2. Bicycle parking facilities should be provided at shopping, employment, transit, and recreational destinations.

3. Bicycle parking should be clearly marked and located close to building entrance areas where they are visible.

4. Bicycle parking is encouraged to be integrated into the design of the project.

5. Bicycle repair equipment, such as tire pumps, are encouraged to be co-located with bicycle parking.

GP 6. Bicycle parking should be protected and should be more convenient than that provided for cars.

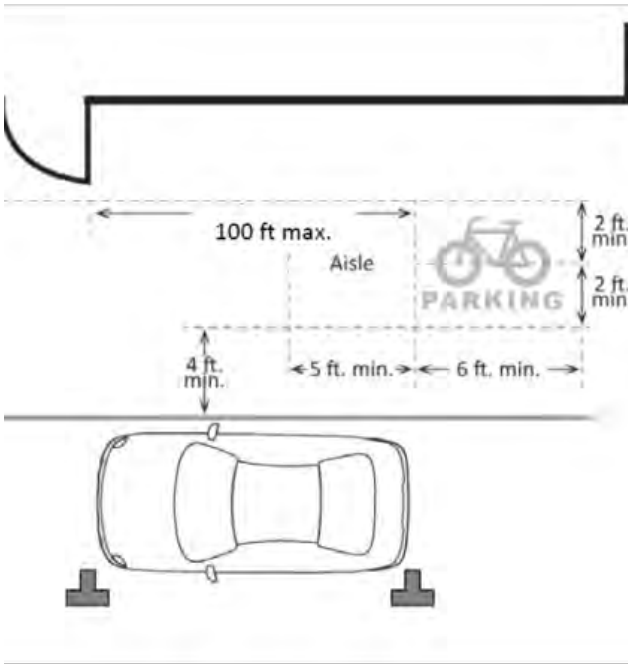
GP 7. Employers are encouraged to provide end-of-trip facilities, such as bike lockers, bike rooms, and shower facilities, to encourage bicycle commuting.

Intent

Bicycle parking design considerations are intended to clearly identify parking for bicycles and to locate these spaces in convenient and visible locations to encourage their use.

3.2 Off-Street Parking
C. Bicycle Parking

Bicycle parking located adjacent to the entrance



Bicycle parking requirements per the Zoning Code

8. Decorative bicycle racks should be used that allow the user to lock both the bicycle frame and the front tire to a permanent fixture.

ZC 9. Short-term Class II bicycle parking and long-term Class I bicycle parking must be provided in accordance with the Zoning Code parking ratio requirements. Short-term parking is intended to provide visitors who generally park for two hours or less a convenient and readily accessible place to park bicycles. Long-term Class I bicycle parking provides employees, residents, visitors, and others who generally stay at a site for several hours a secure and weather-protected place to park bicycles.

ZC 10. Short-term bicycle parking must be located within 100 feet of the primary entrance of the structure or use it is intended to serve and be readily visible to passers-by. At least 25 percent of required short-term bicycle parking spaces are required to be covered.

ZC 11. The following standards are recommended for long-term bicycle parking:

a. Location. Long-term bicycle parking must be located in highly visible, well-lighted areas that are convenient to the street and users.

Lockers provided for long-term bicycle parking

Inverted U-shaped bicycle rack

b. Cover. A minimum of 75 percent of required long-term bicycle parking spaces must be covered.

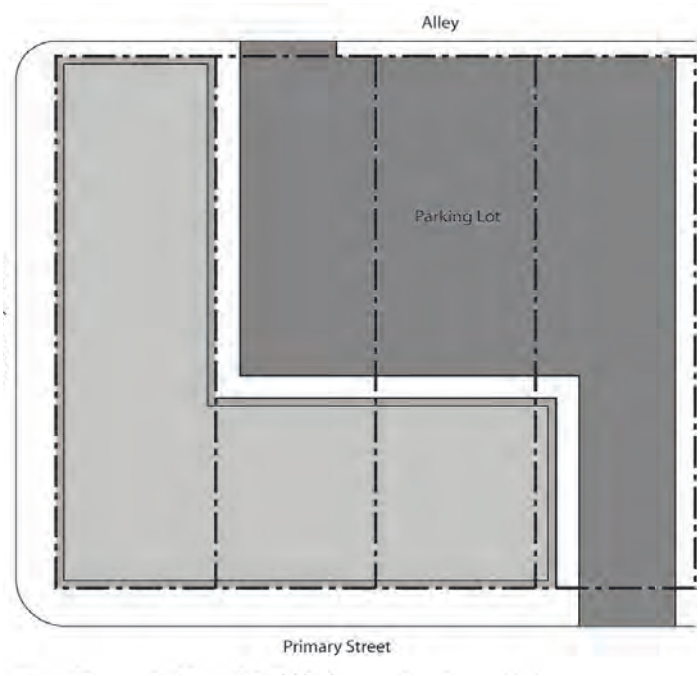
c. Parking Facilities. Long-term bicycle parking spaces must be secure and may include covered, lockable enclosures with permanently anchored racks for bicycles; or lockable bicycle rooms or areas with permanently anchored racks; or lockable, permanently anchored bicycle lockers.

ZC 12. Minimum dimensions for bicycle parking, aisles, and clearance must be provided in accordance with Zoning Code requirements.

ZC 13. Bicycle racks must be capable of locking both the wheels (one wheel with a U-type lock), providing at least two points of contact with the frame of the bicycle and supporting bicycles in an upright position. "Inverted U" bicycle racks are highly recommended.

14. Required cover for bicycle parking spaces must be permanent, designed to protect the bicycle from sun and rainfall, and be at least 7 feet above the floor or ground.

3.2 Off-Street Parking
D. Shared Parking



Parking shared amongst multiple properties

Directional signs at exits to surrounding streets

Intent

Shared parking design considerations are intended to provide convenient locations for parking and to minimize the amount of land devoted to parking lots.

Design Considerations

ZC 1. Multiple land uses on a single parcel or development site may use shared parking facilities when operations for the land uses are not normally conducted during the same hours, or when hours of peak use differ. Requests for the use of shared parking may be approved if:
   a. The total number of parking spaces required for the land uses does not exceed the number of parking spaces anticipated during periods of maximum use.
   b. The proposed shared parking facility is located no farther than 400 feet from the primary entrance of the land use(s) which it serves.

2. Multi-use developments with shared parking should have effective signage, including:
   a. Directional signs at entrances to the development from all public streets
   b. Signs at development exits giving direction to streets surrounding the site
   c. Information that directs parkers to and from their destination

Designated pedestrian links

Directional signage at entrance

3. Themed wayfinding systems and memorable graphics are encouraged in shared parking facilities to assist pedestrians in finding their vehicles upon returning to the facility.
4. Shared parking facilities should provide pedestrian links to destinations, particularly within a multi-use complex. Pedestrian links should be short and direct, safe, well-lit, and attractive. See also Section 3.1.E.
5. Parking spaces should be located close to building and stairwell/elevator cores to help orient visitors.

CHAPTER 4 LANDSCAPE IMPROVEMENTS

Description

This chapter provides landscape design considerations and strategies to maximize shade and water-efficient planting and manage stormwater. Trees and vegetation offer many benefits to the environment. By following the requirements and suggestions outlined in this chapter, developments can be designed to reduce temperatures while conserving water and maximizing aesthetics and comfort.

Chapter TOC

Objectives

- Plant trees along pedestrian paths and sidewalks that maximize shade, are easy to maintain, and do not conflict with pedestrian mobility.
- Design parking areas that maximize planted areas to reduce the heat island effect.
- Locate trees to minimize heat gain in hot months and maximize heat gain and light access in cool months.
- Maximize aesthetics and pedestrian comfort.
- Direct, detain, and minimize stormwater runoff.

Relationship to CAP

4.1 Shade Trees

A. Along streets in new subdivisions and large projects

Tree grates used in commercial areas

Curbed tree wells between parking spaces

Intent

Street tree design considerations are intended to maximize tree canopy along street medians and sidewalks to provide shade for pedestrians and reduce the heat island effect.

Design Considerations

When planting required street trees in new subdivisions and large multi-family, nonresidential, and mixed-use projects with internal streets, the following items should be incorporated into the project design as applicable:

GP 1. Trees should be spaced a maximum of 40 feet on center.

GP 2. Trees should be located in planter strips between curbs and sidewalks and also in median strips.

3. Tree species should be selected that are climate appropriate, easy to maintain, and with canopies which can maximize shade.

4. Two or more tree species should be planted along each street to increase biodiversity and minimize the potential spread of disease.

5. Ornamental trees should be used to draw attention to and enhance prominent intersections, gateways into the city, and/or driveway entrances into projects.

6. In commercial areas with heavy foot traffic, tree grates should be used to protect trees and reduce safety hazards.

4.1 Shade Trees

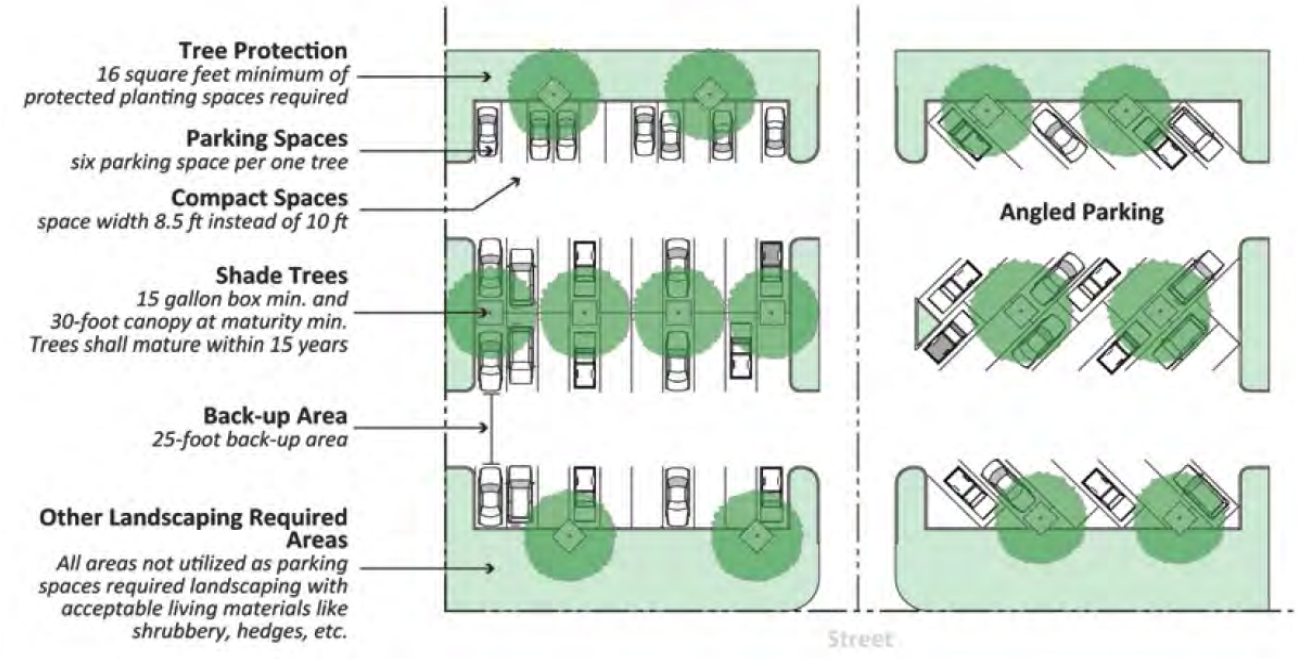
A. Along streets in new subdivisions and large projects

Narrow canopy trees along multi-story building

Broad canopy tree along residential street with larger setback

7. For areas that do not require planter strips, trees should be planted between on-street parking spaces in curbed tree wells.
8. Trees with a narrow form (canopy) should be favored in urban areas with multistory buildings and shallow setbacks. Conversely, broad-canopy trees could be favored along residential streets with deep setbacks.
9. Tree well size should be a minimum of 4 feet by 4 feet.
10. Street trees should be a minimum 15-gallon box size.

4.1 Shade Trees
B. Shade trees in parking lots



Intent

Design considerations for shade trees in parking lots are intended to maximize tree canopy to provide shade and reduce the heat island effect in parking areas. Tree canopies also create a more inviting environment.

Design Considerations

When designing parking lots, the following items should be incorporated into the project design as applicable:

ZC 1. A minimum of one shade tree should be provided for every six parking spaces in a parking lot.

ZC 2. Shade trees should be a minimum 15-gallon box in size and provide a minimum 30-foot canopy at maturity.

ZC 3. Shade trees should be of a type/variety that can reach maturity within 15 years of planting and be selected from a City-approved list of canopy tree species.

ZC 4. Shade trees should be arranged in a parking lot to provide maximum shade coverage (based on a 30-foot canopy) on August 21 to represent typical summer foliage. The arrangement should approximate nearly 50 percent shade coverage.

GP 5. Tree canopies in commercial parking lots should be trimmed to retain shade while allowing building visibility.

6. When parking areas face a public street, trees should be planted around the perimeter of parking areas.

C. Along buildings and paths

Shade trees along pedestrian paths

Shade trees adjacent to buildings

Design Considerations

When planting trees, the following items should be incorporated into the project design as applicable:

1. For pathways, trees with canopies that can provide maximum shade should be selected.
2. For pathways, tree species without fruit should be selected to avoid creation of a slippery surface.
3. Shade trees should be planted on the south and west sides of new or renovated buildings (per the General Plan Sustainability Element). A minimum of one tree should be placed approximately every 25 linear feet along the south and west sides of the building, with a minimum of two trees per side.
4. Evergreen trees should be selected where foliage is desired throughout the year, such as to provide shade, screening, and/or shelter from wind.
5. Deciduous trees should be selected for areas where shade is desired in the summer and sunlight is desired in the winter when they lose their leaves.
6. Deciduous trees should be planted on the southern side of a property to provide solar access to south-facing buildings.

Intent

Design considerations for shade trees alongside buildings and paths are intended to maximize shade for buildings and pedestrians and reduce heat gain in buildings as well as energy costs.

4.2 Water-Conserving Landscape

A. Drought-tolerant and/or native planting

Native plant species along pedestrian paths

Drought-tolerant landscaping

Intent

Design considerations for drought-tolerant and/or native plantings are intended to plant attractive landscapes with drought-tolerant and/or native California plants to conserve water, provide habitat, and reduce use of pesticides.

Design Considerations

When selecting drought-tolerant and native plantings, the following items should be incorporated into the project design as applicable:

ZC 1. Landscape designs should incorporate a minimum of 90 percent of plants and trees that are drought-tolerant, non-invasive species.
2. Landscape designs should support a diverse range of native/drought-tolerant plant species to bring interest and beauty to the landscape, support biodiversity, and reduce the need for pesticides.
3. The plant palette for each project should include a variety of colors, textures, and heights. Species that attract beneficial insects, such as bees that pollinate plants, are strongly encouraged.
4. All non-turf planting areas, except areas covered by groundcover, should be mulched on a regular basis to retain moisture, suppress weeds, and moderate soil temperature. A minimum of 2 inches of mulch should cover bare soil.

A. Drought-tolerant and/or native planting

Area around plants is mulched to retain moisture

Drought-tolerant landscaping

5. An Integrated Pest Management (IPM) approach should be set up and adopted. IPM is a process used to solve pest problems while minimizing risks to people and the environment. Chemicals, pesticides, and/or herbicides should not be used.

4.2 Water-Conserving Landscape
B. Minimize turf areas

Drought-resistant Mexican Feather Grass


Limited turf area combined with shrubbery

Intent

Design considerations for minimizing turf areas are intended to conserve water and reduce associated maintenance costs.

Design Considerations

When planting turf, the following items should be incorporated into the project design as applicable:

ZC 1. Turf areas should be limited to 50 percent of the landscaped area. The Planning Commission may approve larger areas as part of discretionary review if the lawn area provides functional open space (per Draft Zoning Code Section 20.36.060). OR turf areas should be limited to 30 percent of the total landscaped area. (Per the WELO)

ZC 2. Where turf is proposed, drought-resistant grass species are required.

ZC 3. Turf should not be used on berms, slopes, or median islands where runoff drains directly to paved surfaces used for circulation of any type.

4. Small, irregularly shaped turf areas that are difficult to maintain should be avoided. Such areas should be landscaped with drought-tolerant plants and mulch.

5. Turf should not be planted on slopes exceeding 20 percent or in areas narrower than 8 feet.

6. Turf areas should be located, sized, and shaped to minimize irrigation overspray into hardscaped areas.

Artificial turf sports field

Turf should be avoided in small, irregularly shaped areas

7. As an alternative to turf in high-use pedestrian zones, the use of permeable hardscape features, such as patios and walkways, should be considered. Permeable hardscape materials include interlocking permeable pavers and pervious concrete. (See also Section 4.3F, Permeable Paving.)
8. Artificial turf may be installed in high activity or foot-traffic areas, such as sports fields. Where artificial turf is installed, it should be designed and maintained as follows:
   a. Trees should be kept a minimum of 10 feet away from turf areas.
   b. Artificial turf should be maintained free of moss, mold, algae, and fungi growth.
   c. No chemical agents or contaminated water should be applied to artificial turf.
   d. A turf groomer should be used to maintain the distribution of the infill material in the turf and to raise the turf fibers. Brushing should be performed every couple weeks, raking of the turf should be performed once a month, and cleaning/sanitizing should be performed once a year.

4.3 Stormwater Considerations

A. Roof Downspout Planters

Roof downspout empties into planter

Downspout is directed under pavement into a rain garden

Intent

Roof downspout design considerations are intended to redirect roof rainwater from the sewer onto pervious surfaces such as planted areas, swales, or rain gardens to soak into the ground.

Design Considerations

1. Roof rainwater should be directed to a storage device or a permeable surface like a lawn, garden, or infiltration system.
2. Stormwater should not be directed onto an impermeable surface like a driveway, sidewalk, or paved path.
3. Flow should be directed away from the property foundation, approximately 5 feet away.
4. A splash pad should be provided below the downspout so that the strong current of water does not erode the soil.

B. Green Roofs

Vegetation on a sloped roof ensures proper drainage

Design Considerations

Green roofs come in two types, intensive and extensive, each with different access, area, and depth requirements. Extensive green roofs consist of a thin layer of planting medium (generally less than 8 inches) and vegetation and are generally not intended for people to access. Intensive green roofs include highly engineered structural components, irrigation and drainage, much thicker layers of growing medium (generally 8-24 inches), and are intended to support park-like landscapes accessed by people.

1. The type of green roof should be chosen based on project goals. Consideration should be given to:
   a. water-retention requirements
   b. structural requirements
   c. planting palette
   d. desired access
2. Green roofs should only be located on structures with roof slopes less than 25 percent to ensure proper drainage while still providing stormwater retention capacity. Intensive roofs are suitable for flat roofs or roofs with a mild slope of up to 3 percent.

Intent

Green roof design considerations are intended to offer multiple benefits including stormwater management, water filtration, habitat enhancement, recreational open space, and improved aesthetics.

4.3 Stormwater Considerations
B. Green Roofs

Extensive green roof

Green wall

3. Roof strength must be adequate to hold 10–25 pounds per square foot above the requirements for a basic roof.
4. The roof design should include overflow structures such as drains or downspouts.
5. If the roof includes grasses or other annual plants, dry vegetation should be occasionally cut and removed to ensure that combustible material does not accumulate.
6. Modular systems, or pre-grown self-contained units, are discouraged for their poor long-term vigor of plants and poor stormwater retention performance.
7. Green roofs are encouraged to be designed as habitat elements to support urban open space and provide habitat for birds and native pollinator species including bees, butterflies, and hummingbirds. Accessible green roofs are encouraged to support urban agriculture.

C. Stormwater Planters and Rain Gardens

Stormwater planter with grasses

Stormwater planter between curb and sidewalk

Design Considerations

1. Rain gardens and planters should consist of a splash pad to slow the velocity of runoff and a slightly depressed planting bed or container to allow shallow ponding (approximately 6 inches deep).
2. Planters and rain gardens should be planted with native and climate-appropriate grasses and shrubs to increase the effectiveness of the bioretention facility. A minimum of two species should be planted.
3. Wildflowers are encouraged to add color to rain gardens and planter boxes. The installation should be planned to place low-water flowers at higher elevations.
4. The type of bioretention facilities should be selected based on the context. Rain gardens are typically applied in more suburban settings, while planter boxes are a more urban treatment located between a sidewalk and planting strip to absorb runoff from sidewalks, parking lots, and streets.
5. Trees should be planted on raised surfaces adjacent to bioretention areas or on raised terraces within them. Trees' extensive root systems will allow them to reach water supplies from the rain garden and reduce requirements for irrigation.

Intent

Design considerations for stormwater planters and rain gardens (bioretention facilities) are intended to effectively mimic natural hydrological features to absorb rainwater into gardens, filter out pollutants, and slow water before it enters natural waterways.

4.3 Stormwater Considerations
C. Stormwater Planters and Rain Gardens

Raingarden with a variety of plant species

Trees planted on raised surface adjacent to garden

6. The size of the rain garden should be increased and amendments should be added to the soil in areas with clay or other low permeability soil types. Soil amendments may include compost, pumice, or perlite 0.5 to 2 feet below the ponding area. Mason or ball field sand may not be used, and compost should be mixed in to a depth of 3 inches on the surface.
7. For installations separated by a curb, curb cuts should be utilized to allow stormwater to drain into the garden, rather than into the storm sewer.
8. Rain gardens are encouraged to be located where vegetation will provide maximum desired benefit, such as shading hardscape for cars, calming traffic, or creating community gathering spaces.
9. Where possible, sites should be chosen where adequate runoff is available to reduce the need for long-term irrigation of vegetation.
10. When designing rain gardens, the mature size of plants should be considered. Planting too densely based on the size of young plants can create overgrown landscapes.

D. Vegetated Bioswales

Vegetated bioswale with plants and pebbles

This bioswale does not provide enough vegetation

Design Considerations

1. Bioswale channels should be landscaped with plants and materials such as crushed rock, pebbles, and stone to provide treatment and retention as they move stormwater from one place to another.
2. Vegetated swales are particularly suitable along streets and parking lots.
3. Filter strips should have a minimum slope of 1 percent and a minimum length of 20 feet to be most effective in slowing and filtrating stormwater.
4. Shrubs are best planted on the slope of a basin/ swale or on a raised platform just above the level of extended inundation, where they are low enough that their roots can easily reach moisture in the soil but not so low that they will be inundated for extended periods.
5. Grasses should be planted in the bottom of bioswales, as they survive both inundation and extended drought quite well and provide the best benefits in cleaning stormwater.

Intent

Vegetated bioswale (bio-filtration facilities) design considerations are intended to create attractive landscapes while conveying, slowing, and filtrating stormwater.

4.3 Stormwater Considerations
E. Retention of Existing Natural Vegetation

Preserve established trees in good health

Existing vegetation provides habitat for wildlife

Intent

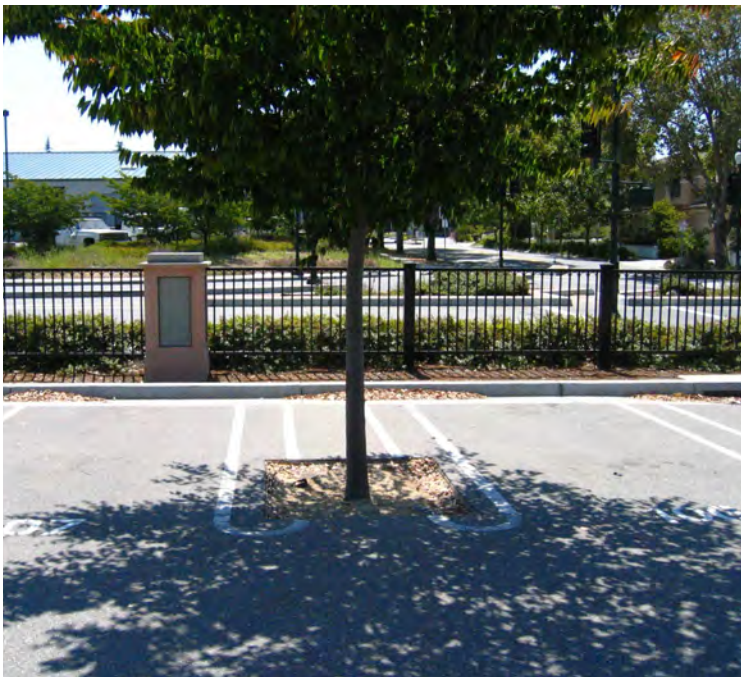
Design considerations for protecting trees and natural vegetation are intended to mitigate the water quality and flooding impacts of urban stormwater while providing natural beauty and recreational opportunities for city residents.

Design Considerations

1. Established trees in good health should be preserved for the visual, cultural, and ecological benefits that the trees provide.
2. Species should be preserved that are well suited to present and future site conditions and/or preferred by wildlife for food, cover, and nesting.
3. Tree removal should be considered as a last resort. If removal of trees is approved, the loss should be mitigated by planting comparable replacement trees at a ratio of 1 to 1.
4. Site design should preserve, to the greatest extent feasible, high-value existing vegetation and greenbelts.
5. Existing trees greater than 6 inches in diameter, measured 3 feet above grade, within a development should be preserved to the extent reasonably feasible.

E. Retention of Existing Natural Vegetation

Tree is not properly protected from construction



Existing tree has been preserved and incorporated into parking lot

6. Prior to removal, it is recommended that a certified arborist analyze the reasons for removal, the condition of the tree with respect to disease, general health, damage, and structural integrity, and the effect of tree removal on soil stability/erosion, particularly near watercourses or drainage ditches, or on steep slopes.
7. Highly visible and strong barricades and signs should be posted around the trees and areas to be protected.
8. The root zone extends horizontally from the tree for a distance at least equal to the tree's height. At least 50 percent of the root system should be preserved to maintain a healthy tree. Avoid trenching or excavating the soil within the root zone.
9. Construction traffic and material storage should be kept away from tree root areas. Wood chips should be applied to a depth of 4 to 6 inches around all protected trees to help reduce compaction from vehicles that inadvertently cross the barricades.

4.3 Stormwater Considerations
F. Permeable Pavement

Permeable paving used in parking areas

Residential driveway with permeable paving

Intent

Permeable pavement design considerations are intended to create context-appropriate, attractive pathways and hardscaping areas that absorb rainwater where it falls.

Design Considerations

1. Permeable pavements may be constructed from durable pervious concrete, porous asphalt, permeable interlocking pavers, grass pavers, and several other materials. Permeable pavement, asphalt, and pavers all mimic their conventional counterparts.
2. Permeable pavement has a lower load-bearing capacity than conventional pavement and should only be used in very low-speed, low-volume traffic areas, such as pedestrian pathways, plazas, patios, residential driveways, alleys, parking stalls, and overflow parking areas.
3. Grass pavers, which are open pavers planted with turf, are not suitable for everyday, all-day parking locations because the grass will get insufficient sunlight. This type of permeable paving is better for use as occasional overflow parking.

CHAPTER 5 SOLAR ENERGY FACILITIES AND RESOURCE EFFICIENCY

Description

This chapter provides design considerations for solar access and solar energy facilities. By following the applicable development and design provisions outlined in this chapter, projects can be designed to reduce reliance on non-renewable energy sources while maintaining an aesthetically pleasing environment.

Chapter TOC

Objectives

- Design projects to conserve energy and minimize impacts on natural resources.
- Site buildings to take advantage of natural heating and cooling.
- Site solar energy facilities to maximize solar access and minimize visual nuisance.
- Enhance aesthetics of solar energy facilities.

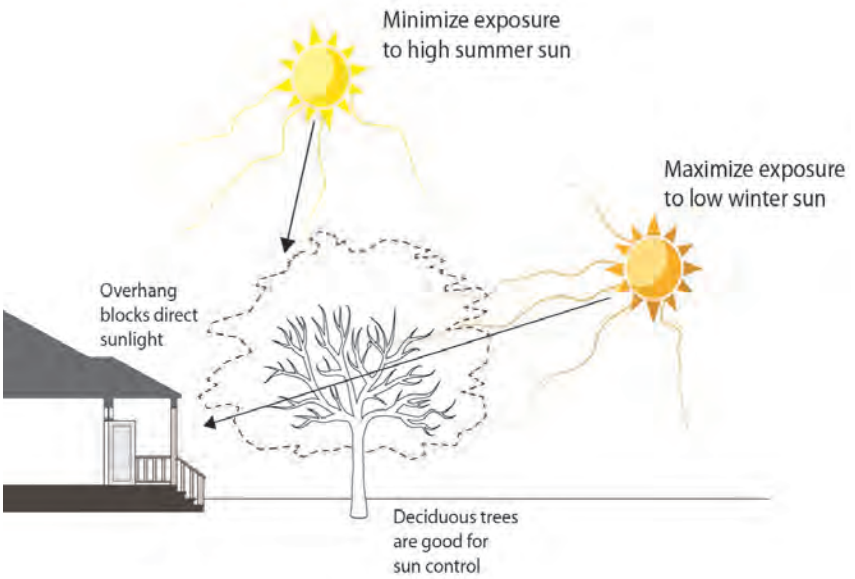
Relationship to CAP

Energy

5.1 Solar Orientation and Solar Energy

A. Solar Orientation and Passive Solar Design

Buildings elongated on east-west axis



Intent

Design considerations for solar orientation and passive solar heating and cooling are intended to control sun exposure to reduce energy consumption and to provide a comfortable environment.

Design Considerations

When orienting buildings and building features on a site, the following items should be incorporated into the project design as applicable:

GP 1. Buildings and windows should be oriented to the south, and buildings should be placed on the site to maximize winter sun exposure.
2. Buildings should be elongated along their east–west axis for increased winter sun exposure. The long face of each building should orient within 20 degrees of true south.
3. To minimize full direct sun exposure in summertime, exterior shading devices for south- and west-facing windows and for plazas and pedestrian hardscape areas should be utilized. These devices may include trees, overhangs, awnings, porches, and trellises to block direct light and heat.
4. Buildings and openings should be arranged to allow cool air to enter and hot air to leave the building during summertime.
5. Tall buildings should be sited to the north of shorter ones to maximize solar access.

5.1 Solar Orientation and Solar Energy
B. Roof-Mounted Solar Energy Design and Siting

Solar panels integrated into roof tiles

Solar panels integrated into glazing

Design Considerations

When designing roof-mounted solar energy facilities, the following items should be incorporated into the project design as applicable:

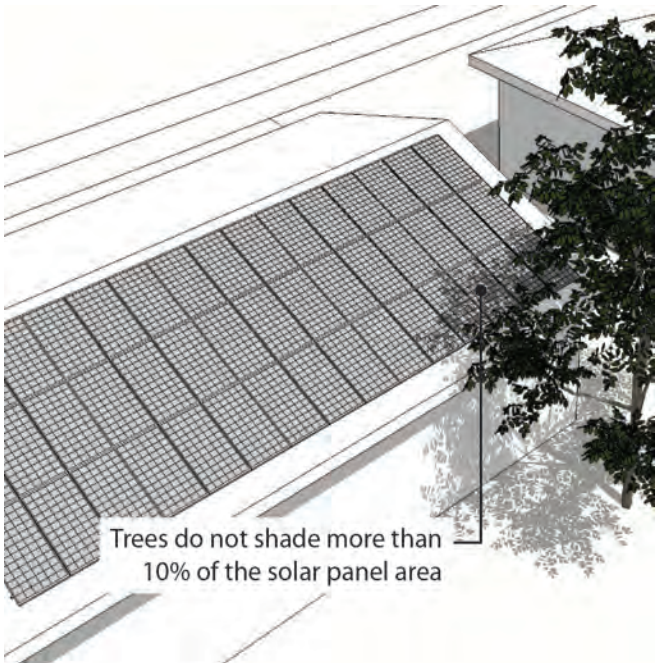
1. The City encourages the use of solar arrays or other types of solar-based energy generation on all new roofing structures.
2. Roof-mounted photovoltaic solar panels should meet the height requirement of the designated zoning district, but may be allowed to extend higher in accordance with the California Building Code. ZC
3. Whenever feasible, photovoltaic solar panels should be integrated into the structure design as one of its architectural elements. Building integrated photovoltaics are visually attractive and can be incorporated into roof tiles or glazing for awnings or glass roofs. ZC
4. The pitch of roofs and the orientation of the building should be considered when designing the project so as to maximize solar energy generation.
5. Solar panels and equipment on flat roofs can be elevated and rotated to maximize solar orientation.

Intent

Design considerations for energy design and siting are intended to encourage aesthetically designed solar energy facilities that protect and enhance the natural environment.

5.1 Solar Orientation and Solar Energy

B. Roof-Mounted Solar Energy Design and Siting (continued)

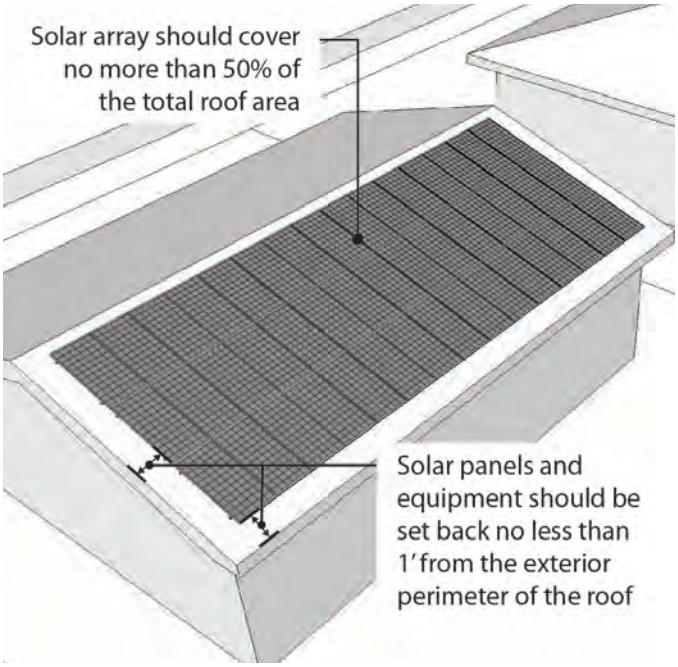


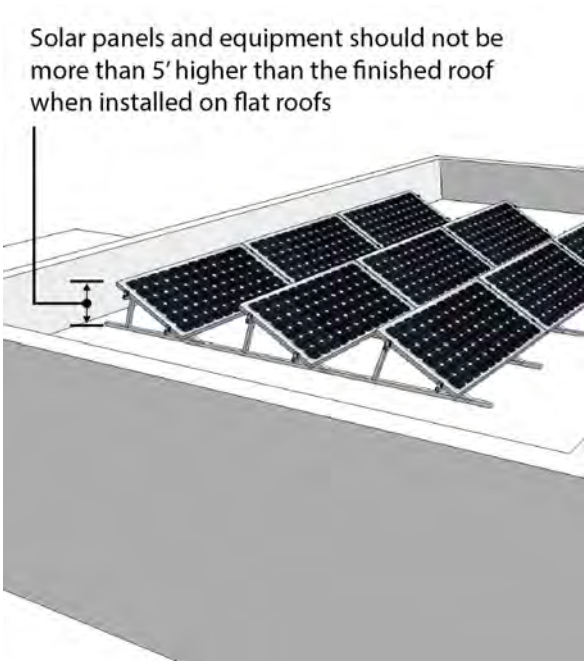
Brick tower element screens solar panels from the street

SG Elevated panels on flat roofs should not extend more than 5 feet above the finished roof surface when installed on flat roofs, measured perpendicular to the roof surface.

6. Solar panels on sloped roofs should either be integrated or flush-mounted parallel to the roof plane with a 2- to 10-inch gap between the underside of the module and the finished roof surface.
7. Solar panels should not extent beyond the edge of the roof. Solar panels and supporting equipment SG should be set back no less than 1 foot from the exterior perimeter of the roof.
8. The solar array should not cover more than half of the total roof area (all roof planes).
9. Tree species and planting locations should be selected to minimize shade on solar energy systems. Trees should be placed so as not to cast a shadow greater than 10 percent of the solar energy system's absorption area. Calculate shade coverage on the summer solstice at noon local standard time.
10. Structures should be designed and located on the property so that they will not shade the solar energy facility.

B. Roof-Mounted Solar Energy Design and Siting (continued)





11. For flat roofs, architectural styles and features should be incorporated to screen the solar energy facilities. A parapet or tower architectural feature can effectively and attractively screen solar energy system.
12. For sloped roofs, visual clutter should be reduced by avoiding breaking up the array into multiple irregular-shaped areas. Instead, match the shape and proportions of the array with the shape and proportions of the roof.
13. Solar panels should be designed with nonreflective coatings and nonreflective surfaces on exposed frames and components to minimize glare.
14. Solar panels should be angled and oriented to minimize glare on neighboring windows and, to the extent possible, away from public areas.
15. To allow the future installation of solar facilities, one section of the roof should be designed with at least 300 square feet of space for solar installations that is south-facing, and where all mechanical equipment and skylights are absent.

5.1 Solar Orientation and Solar Energy

C. Ground-Mounted Solar Energy Design and Siting

Building height panels serve as shade

Solar panels serve as shade structures in parking lots

Intent

Design considerations for ground-mounted solar energy design and siting are intended to encourage appropriate installations while minimizing the visual impacts of solar panel shade facilities on adjacent properties and the streetscape environment.

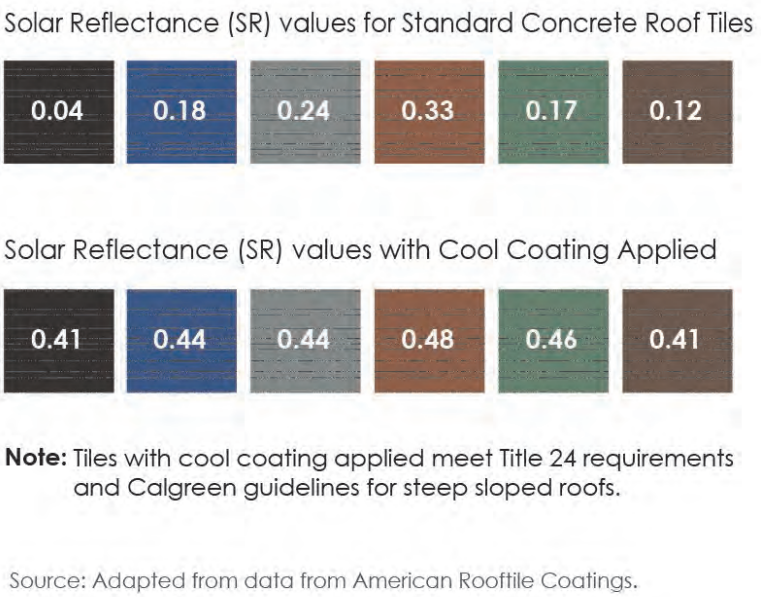
Design Considerations

When installing ground-mounted solar energy systems, the following items should be incorporated into the project design as applicable:

ZC 1. Ground-mounted photovoltaic solar panels should be screened from public view.
2. The ground-mounted solar energy system should not be located within a required front yard area.
3. The solar energy system is encouraged to serve as a shade structure in parking lots.
4. Ground-mounted solar energy structures should not exceed the height of the main structure on the parcel and must comply with all applicable height restrictions.
5. At maximum tilt, the ground-mounted solar energy structure should not exceed the maximum height allowed in that zoning district for accessory buildings.
6. Solar panels should be designed and located to prevent glare on the adjacent public right-of-way as well as on any adjacent inhabited structure.

5.2 Cool Materials
A. Cool Roofs

Applying liquid cool roof coating



Cool roofs come in a broad range of colors

Design Considerations

When selecting roof materials, the following items should be incorporated into the project design as applicable:

SR 1. Roofing materials for non-residential buildings and high-rise residential buildings and hotels/motels must comply with the Title 24 requirements for solar reflectance (SR value) and thermal emittance.

SG 2. The voluntary guidelines in the CALGreen code for high solar reflectance (indicated by the SR value) should be considered for residential rooftops.

3. The surrounding context and where the reflected sunlight will go should be considered. Limit bright, reflective roof coatings on low-rise buildings that could reflect light and heat into taller neighboring buildings.

4. Roof colors should be selected based on the roof slope, with darker colors on steep pitched roofs to minimize glare. State requirements are less stringent for steep sloped roofs and cool colors can be applied.

5. Roofing materials should be selected for their compatibility with the building architecture. A variety of materials and colors can be used to achieve Title 24 and CALGreen reflectance requirements.

Intent

Design considerations for light-colored reflective materials on rooftops, sometimes referred to as "cool roofs" are intended to minimize the heat island effect through use of materials that minimize heat gain while preventing glare.

Common Roofing Materials and Cool Options

Roof Type	Roof Slope	Cool Roof Options	Cool Roof Solar Reflectance
 Asphalt Shingle	Steep-Sloped	"white" (actually light gray) or cool color shingle	0.25
 Built-Up Roof	Low-Sloped	with white gravel	0.30 – 0.50
		white smooth coating	0.75 – 0.85
 Clay Tile	Steep-Sloped	terracotta (unglazed red tile)	0.40
		color with cool pigments	0.40 – 0.60
		white	0.70
 Concrete Tile	Steep-Sloped	color with cool pigments	0.30 – 0.50
		white	0.70
 Liquid Applied Coating	Low- or Steep-Sloped	smooth white	0.70 – 0.85
 Metal Roof	Low- or Steep-Sloped	white painted	0.55 – 0.70
		color with cool pigments	0.40 – 0.70
 Modified Bitumen	Low-Sloped	white coating over a mineral surface (SBS, APP)	0.60 – 0.75
 Single-Ply Membrane	Low-Sloped	white (PVC or EPDM)	0.70 – 0.80
		color with cool pigments	0.40 – 0.60
 Wood Shake	Steep-Sloped	bare	0.40 – 0.55

Cool paving and shading device

Cool paving materials and shaded hardscape areas

Design Considerations

When selecting hardscape and paving materials, the following items should be incorporated into the project design as applicable:

1. Light-colored reflective materials with a minimum solar reflectance value of 0.28 should be used for a minimum of 50 percent of all site hardscaped areas, such as sidewalks, pathways, plazas, driveways, and parking areas.
2. Cool pavements may include any of the following high-reflectance materials: asphalt pavements treated with a high reflectance material, concrete pavements, resin based pavements, white topping of concrete over existing asphalt, light-colored aggregates, slag/fly ash cement, and light-colored colored concrete.
3. Hardscape areas should be designed and located so that approximately 50 percent of the area is shaded by vegetation, buildings, trellises, umbrellas, or other features or shading devices. Calculate shade coverage on the summer solstice at noon.
4. Permeable paving should be used for sidewalks,

Intent

Design considerations for cool pavements are intended to minimize the heat gain in the urban environment through the use of aesthetically pleasing paving materials.

5.2 Cool Materials

B. Cool Paving (continued)

Turf block pavers used in parking area

Permeable paving in parking area

pathways, plazas, and parking areas to allow for air, water and water vapor into the voids of the pavement for cooling. Permeable paving includes porous concrete/asphalt, open-jointed pavers, and turf blocks.

CHAPTER 6 GREEN WASTE & RECYCLING FACILITIES

Description

This chapter provides design considerations for the collection areas of dry recyclable materials and green waste (garden and food waste). By following the applicable development and design provisions outlined in this chapter, mixed-use, multifamily, and nonresidential projects can be designed to encourage greater participation in the services provided and reduce waste generation while maintaining a development's aesthetic appeal.

Chapter TOC

Objectives

- Provide adequate space for and access to collection and storage areas for green waste and recycling.
- Site services to maximize ease of use.
- Enhance aesthetics and minimize negative impacts.

Relationship to CAP

Waste

6.1 Location & Access

Enclosure is located to the side of the primary building, with a clear path for mechanical pickup

Intent

Location and access design considerations are intended to balance the following objectives: convenience to residents and collectors, space, access, noise, security, and site integration.

Design Considerations

The following best practices should be considered when deciding where to locate communal recycling and green waste storage areas:

ZC 1. In commercial areas, enclosures should be located away from main entry drive ways, if feasible.
2. Location of rolling bins should be convenient to residents. Conveniently located bins are more likely to be used appropriately by residents.
3. Communal rolling bins should be in a high pedestrian traffic area to encourage good housekeeping, ease of access, and convenience, so that disposing of recyclables can occur as part of daily routine. Bins located in rarely frequented areas tend to attract dumped rubbish and encourage poor practices.
4. If collection of rolling bins is from the curbside, the waste storage areas should be as close to the curb as possible. The distance to move bins from storage areas to the collection point should be minimized to reduce potential safety risks and the time required to take bins out for collection and bring them back. However, bins stored too close to the street can be subject to vandalism.

Storage area is appropriately distanced from residential units

Clear pathway of access adjacent to enclosure

5. Storage areas should be located an appropriate distance from dwellings to reduce the impact of odor and noise during bin use and collection.
6. Commercial and multi-family residential trash and recycling bins stored outdoors should be in enclosures. Trash and recycling bins should be located in the same enclosure.
7. The location of, proximity to, and space allocated to the storage areas for garbage and recyclables should be considered.
8. The path of access should be considered for both users and collection vehicles:
   a. Clear pathways, free from steps, should be provided for movement of bins.
   b. The path of travel from building to rolling bin should be free of stairs, textured surfacing, and other impediments.
   c. An appropriate collection point that is free from obstacles and traffic hazards should be considered.
   d. Collection points should be provided that enable the mechanical pickup of rolling bins or dumpsters.

6.1 Location & Access

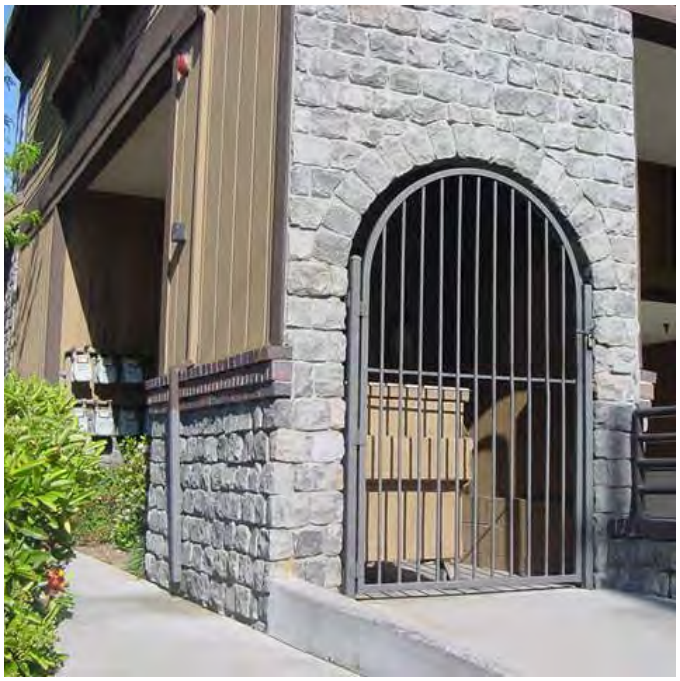
Recycling and garbage are located in the same enclosure, but separated from each other

Waste enclosure is within 150 feet of units

9. Recycling should be located adjacent to garbage facilities and should never stand alone. Although located near each other, garbage and recycling bins should be kept separated within the storage area and not intermingled.
10. Enclosures should not be:
    a. Located along any frontage streets or roadways.
    b. Visible from residential properties, except for those it serves, except those it serves.
    c. Adjacent to or along a property line shared with single-family and multi-family residential properties.
11. Commercial waste enclosures should be a maximum distance of 250 feet from the nearest point of the building served.
12. Residential waste enclosures should be within 150 feet of the building to be served/from all units served by the enclosure.
13. Containers should not be located within any street or be placed in required open space areas or in areas where they will block sidewalks, trails, required parking spaces, or loading spaces.

6.2 Design and Construction of Enclosures

Materials and landscaping blend in with surroundings



Walls constructed of masonry

Design Considerations

All enclosures should be designed and constructed consistent with the following:

ZC 1. Enclosures should be constructed of durable materials, with color, texture, and architectural detailing that is consistent with the overall site and building design.
2. Storage areas should blend in with the surrounding buildings and landscape.
3. Enclosure walls and doors should be a minimum of 6 feet high and fully screen all materials and containers from public view. Enclosures should be built of noncombustible materials (wood is not permitted).
4. Each enclosure should have four sides, one of which should include a service door.
5. A pedestrian access, separate from primary service access, is recommended.
6. Concrete surfacing is recommended in all access and service areas, and a reinforced concrete pad should be constructed in front of each enclosure to withstand the weight of the collection vehicle.
7. One of the following two protective measures should be used to protect enclosure walls from damage:

Intent

Enclosure design considerations are intended to ensure that trash, green waste, and recycling storage areas are of safe and durable construction and are designed to be compatible with the surrounding architecture.

6.2 Design and Construction of Enclosures

Concrete pad in front of enclosure

Curb and metal bollards to protect enclosure

a. Installation of a 6-inch-out and 8-inch-high curb around the perimeter of the inner enclosure wall.
b. Installation of wood or metal bumpers to interior enclosure walls. Bolts or screws should be inset on bumpers to avoid injury to the collector or user.

Green wall screens the enclosure from view

Trellis screens the enclosure from upper stories

Design Considerations

ZC 1. In residential areas, the perimeter of trash enclosures shall be planted with landscaping, such as shrubs or climbing evergreen vines, unless otherwise required by the City.

ZC 2. In commercial areas, bins should be located within a trash enclosure at all times and screened from public view. Gates are to remain closed and secured except during pickup.

3. Landscaping and screening in all areas should be included to help visually buffer the loading area and enclosures. Storage areas should be out of sight or well screened from the street and not affect the aesthetics of the development.

4. Containers should be located within an enclosed area consistent with the architecture of the project with a surrounding wall at least 6 feet high and not higher than 8 feet.

5. Roofs or trellises are recommended for all enclosures to screen the interior of enclosures from upper-floor view.

ZC 6. In residential complexes, enclosures should have a decorative pedestrian gate with walk-in access for tenants.

Intent

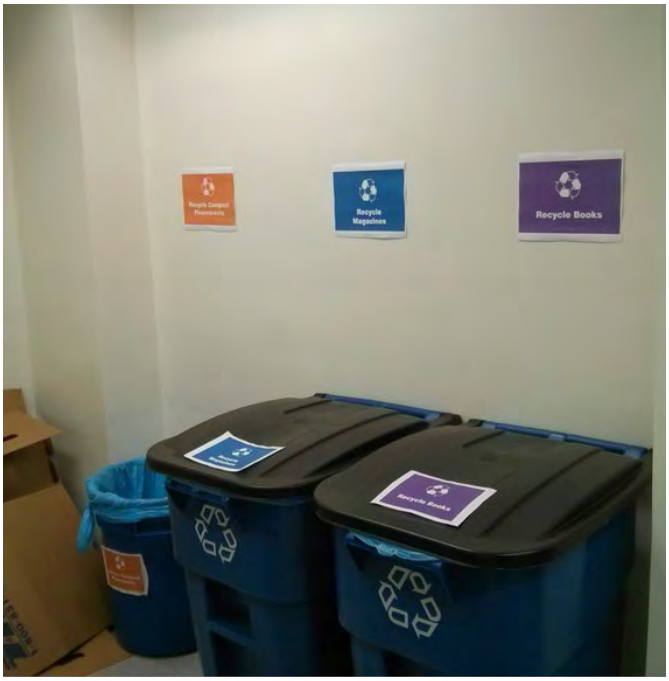
Screening design considerations are intended to minimize visual impacts and screen trash, green waste, and recycling enclosures from public view.

6.3 Screening

Screening is consistent with the surrounding architecture

Decorative iron pedestrian gate

7. Gates should be 2 inches off the ground and hung on the outside so that when open, gates are out of the bins' way. Gates should be able to open more than 90 degrees and should be equipped to prevent accidental swinging, which can result in injury to persons or equipment. Gates made of chain-link fencing with wooden/plastic slats are prohibited.
8. ZC Screening for waste is to be provided in accordance with the zoning ordinance.



Instructional signage minimizes intermingling of materials
Source: https://bpcnewsletter.files.wordpress.com

Signage on dumpsters

Design Considerations

1. Trash, green waste, and recycling services should be safe, convenient, simple to use, and as intuitive as possible to maximize recycling and minimize intermingling of trash and recycling.
2. Trash, green waste, and recycling services should be designed to:
   a. Ensure residents can use them with ease.
   b. Be equally convenient for all residents.
   c. Ensure collection crews can easily access and service them.
3. A well-designed enclosure system should have:
   a. Sufficient space to move among bins and carts.
   b. A lever-style door handle that can be operated with hands full.
   c. Wall space for instructional signage.
   d. A smooth floor that can be swept or mopped if necessary.
   e. Wheel stops near walls to prevent damage to walls.
   f. The area inside and around the enclosure must be adequately lit for visibility of signs and for safety reasons.

Intent

Trash, green waste, and recycling services should be as simple as possible to use in order to maximize source separation and recovery of recyclables.

6.5 Interior Enclosure Space

Trash, recycling, and green waste bins are organized and separated; Source: http://www.zoningplus.com/regs/valparaiso

Intent

Space design considerations are intended to ensure that trash, green waste, and recycling bins are accessible and provide sufficient space to accommodate storage of generated waste and recyclables and prevent intermingling.

Design Considerations

1. Storage areas should provide space for trash, recycling, and green waste.
2. At least two-thirds of the enclosure space should be designated for recycling and green waste. Actual dimensions may vary based on projected usage.
3. Adequate storage space should be provided for easy maneuvering of bins within the property and to and from the storage area. Enclosures should be approximately an area that is 150 percent of the sum of the bin and cart footprints.
4. The enclosure should be no less than 2 feet higher than the tallest bin to allow for opening the bin lids.
5. Enclosures should have appropriate overhead clearance. Enclosures with dumpsters serviced by vehicles need to allow enough clearance for collection service equipment.
6. Sufficient space should be provided to keep garbage, recyclables, and green waste bins separate within the storage area and to prevent intermingling. However, bin storage areas that are too large may encourage dumping of bulky items.

DEVELOPMENT CODE INDEX

The Development Code Index identifies specific code additions, changes or deletions recommended for consideration in future code amendments to implement CAP objectives. Below, this index is organized by thirteen (13) general CAP issue and topic areas. Within each topic area, the Development Index: 1) states the relevant CAP measures; 2) summarizes how the existing City Zoning Code and Draft Zoning Code address the topic; and 3) identifies new code opportunities and recommendations for each CAP measure. As a whole, the Development Code Index provides guidance specifying how city codes can be created, streamlined or updated to better support CAP objectives.

LAND USE AND TRANSPORTATION

DENSITY AND CONNECTIONS

1. **CAP Issue and Topic Area: Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.**

   Existing/Draft Zoning Code: Existing and draft zoning code include a mixed use district and mixed use allowances (D-COR, C-V), higher density housing, density bonuses, and limited requirements for pedestrian and bicycle connections and circulation.

   Additional Opportunities/Recommendations: The zoning code could expand pedestrian and bicycle connections and circulation standards and include infill compatibility standards. The zoning code could also establish new incentives (e.g., flexibility for certain development standards) and/or increase density bonuses for construction of non-vehicular trails (e.g., bicycle, pedestrian, multi-use).

2. **CAP Issue and Topic Area: Support a 30% increase in per-person intracity and intercity transit use by 2020.**

   Existing/Draft Zoning Code: New mixed use zoning districts in the draft zoning code support transit. Additionally, draft zoning code parking reductions offers incentives for new development near transit and requirements for proximity to bus service.

   Additional Opportunities/Recommendations: Existing zoning supports transit through parking reductions incentives and requirements for proximity to bus. Less stringent parking requirements may be allowed in areas where bicycle, pedestrian and transit use is high Additional standards could be provided for loading and unloading areas, waiting areas, and transition areas for pedestrians and cyclists using transit. Examples include dedicated passenger loading/unloading areas adjoining transit stops, enhanced/enlarged transit shelters, secure bicycle parking/lockers, and allowances for information and/or retail kiosks (e.g., newsstand, coffee).

3. **CAP Issue and Topic Area: Promote carpool and car share systems.**

   Existing/Draft Zoning Code: This topic is not addressed in the existing or draft zoning code.

   Additional Opportunities/Recommendations: The municipal code could include incentives for carpool and car share systems, such as allowing zip car parking spaces on street parking.

ALTERNATIVE FUELS

4. **CAP Issue and Topic Area: Support the use of neighborhood electric vehicles (NEVs, such as lower-speed, street-safe golf carts) by 3% of households by 2020.**

   Existing/Draft Zoning Code: Existing and draft zoning code include compact parking spaces are in the zoning code 20.38.070, but does not specify NEVs.

   Additional Opportunities/Recommendations: The zoning code could specify NEV parking spaces and/or allow a higher number of compact parking spaces to be utilized in new developments.

5. **CAP Issue and Topic Area: Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.**

   Existing/Draft Zoning Code: This topic is not addressed in the existing or draft zoning code.

   Additional Opportunities/Recommendations: The City's Standard Design Manual could provide design standards for location of EV charging stations and stalls, and the municipal code could identify locations and/or development types and sizes where such improvements may be encouraged through incentives or satisfy existing "public benefit" requirements.

ENERGY EFFICIENCY

NEW CONSTRUCTION

6. **CAP Issue and Topic Area: Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.**

   Existing/Draft Zoning Code: This topic is not addressed in the existing or draft zoning code.

   Additional Opportunities/Recommendations: The municipal code could offer incentives to exceed CALGreen standards for energy efficiency (e.g., flexibility in certain development standards, additional density bonus options).

7. **CAP Issue and Topic Area: Site new buildings to take advantage of natural solar resources for heating and cooling.**

   Existing/Draft Zoning Code: This topic is not addressed in the existing or draft zoning code.

Additional Opportunities/Recommendations: The municipal code could offer incentives to adopt voluntary CALGreen recommendations for new residential and/or non-residential development. Examples of incentives could include flexibility in certain development standards and/or additional density bonus options.

EXISTING BUILDINGS

8. **CAP Issue and Topic Area: Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.**

   Existing/Draft Zoning Code: This topic is not addressed in the existing or draft zoning code.

   Additional Opportunities/Recommendations: The municipal code could offer incentives for improved energy efficiency retrofits in existing multifamily units, rental units and/or affordable households. Examples of incentives could include flexibility in certain development standards (e.g., landscape or parking requirements).

9. **CAP Issue and Topic Area: Use cool roofs and shade trees to reduce the urban heat island effect in Merced.**

   Existing/Draft Zoning Code: The existing and draft zoning code require shade trees in parking lots.

   Additional Opportunities/Recommendations: The zoning code could include language or incentives for cool roofs consistent with CALGreen recommendations. Examples of incentives could include flexibility in certain development standards and/or additional density bonus options. The zoning code could also include shade tree requirements for areas near buildings where such feature can reduce its energy consumption, or in areas frequented by pedestrians, cyclists or transit riders..

RENEWABLE ENERGY

10. **CAP Issue and Topic Area: Increase the amount of renewable electricity generation for on-site residential use.**

    Existing/Draft Zoning Code: The draft zoning code addresses roof and ground-mounted solar energy facilities.

    Additional Opportunities/Recommendations: The zoning code could include language for other renewable energy facilities such as wind turbines. The zoning code could also include modifications to requirements for ground mounted Solar PVs when used as parking lot shade structures to be allowed when visible from public streets if they meet minimum aesthetic design standards. Finally, the zoning code could offer incentives in building code to pre-wire for solar consistent with CALGreen. Examples of incentives could include flexibility in certain development standards.

11. **CAP Issue and Topic Area: Facilitate renewable energy for on-site commercial and industrial uses.**

    Existing/Draft Zoning Code: The draft zoning code addresses roof and ground-mounted solar energy facilities.

    Additional Opportunities/Recommendations: The zoning code could include language for renewable energy facilities that are located and designed to be compatible with surrounding neighborhoods and uses. The zoning code could also include modifications to requirements for ground mounted Solar PVs when used as parking lot shade structures to be allowed when visible from public streets if they meet minimum aesthetic design standards.

WATER AND WASTEWATER

ALTERNATIVE WATER SOURCES

12. **CAP Issue and Topic Area: Reduce the amount of water used for landscaping, while continuing to allow lawn and turf installations.**

    Existing/Draft Zoning Code: The existing and draft zoning code include regulations for drought tolerant landscaping, amount of turf, and water efficient irrigation through the Water Efficient Landscape Ordinance. The City also adopted a "watering schedule" limiting the days and hours that people may irrigate.

    Additional Opportunities/Recommendations: The municipal code and/or City Standards Manual could modify requirements for continuous curbs to allow for stormwater curb cuts to allow rainwater to irrigate landscaped areas in parking lots and along streets. The municipal code could update maximum turf requirements and clarify locations to maximize efficiencies (e.g., slopes, medians).

SOLID WASTE

INCREASED DIVERSION

13. **CAP Issue and Topic Area: Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.**

    Existing/Draft Zoning Code: The draft zoning code addresses recycling collection facilities, but not smaller scale recycling within commercial or multi-family developments.

    Additional Opportunities/Recommendations: The zoning code could add standards for locating and operating small-scale recycling facilities (e.g., collection facilities).