

Recommendation

This is an informational report and requires no Council action.

Executive Summary

Since adoption of Climate Protection Plan (CPP) by the City Council in December 2007, and the adoption of updated goals in 2010, the City of Palo Alto's municipal operations (City) and the Palo Alto Community (Community) have made much progress in reducing their carbon footprint and adopt sustainable practices.

The 2012 greenhouse gas (GHG) emissions from City operations are estimated to be 53% below 2005 levels, exceeding the Council's goal to reduce these emissions by 20% by 2012. The activities that led to these reduced emission levels also resulted in reduction of the cost to the City for electricity and natural gas utility services and for vehicular fuel by approximately \$500,000 a year in 2012. GHG emissions in 2012 by the City and Community combined are estimated to be down 22% below 2005 levels, exceeding the Council goal of 15% reduction below 2005 levels by 2020.

Staff's preliminary estimate is that the Community's GHG emissions in 2012 were 28% lower than 1990 emission levels based on estimated community mobile fuel use and consumption of electricity and natural gas. If these estimates are confirmed, the Community has made a head start towards the state's goal of reducing 2050 emissions by 80% below 1990 levels.

The GHG reductions since 2005 were largely achieved by the greening of electricity supplies, aggressive electricity and natural gas efficiency programs, conservation efforts, utilization of landfill gas at the water quality control plant, and energy efficiency projects at the plant. An initial assessment of transportation-related emissions suggests that GHG emissions from this sector have also declined. The City's plan for carbon neutral electric supply in 2013 will eliminate the 75,000 Metric Tons (MT) of GHG emissions associated with this source in 2012, and will reduce the Community's 2013 emissions by 37% below 1990 levels.

In the coming year, with input from Council, staff expects to develop a new CPP in coordination with the planned update to the City's Comprehensive Plan. If the community chooses to further reduce emissions and allocate commensurate resources towards this effort, Palo Alto could become a model city as California embarks on the journey to meet the state's aspirational goal of 80% reduction (from 1990 levels) by 2050. Aspects of adaptation to climate change will also be considered in this assessment

Background

Climate change has become perhaps the most important threat facing the global environment and economy. In California, the effects of climate change are likely to reduce the availability of hydroelectric generation, impact the availability of our water supplies, increase the incidence of forest fires and extreme weather events, and lead to a rise in sea level, which would impact Palo Alto's shoreline and flood prone areas.

The City took a leadership role in 2007 as one of the first U.S. cities to develop a Climate Protection Plan (CPP), also referred to as the Climate Action Plan by other cities. The CPP describes measures that could be taken to reduce the City's GHG emissions and set GHG reduction goals. The City's CPP and GHG emissions reduction goals are described in detail in Attachment A. In brief, the GHG emission reduction goals are:

- By 2012, the City will reduce GHG emissions by 20% below 2005 levels.
- By 2012, the City and Community will reduce emissions by 5% below 2005 levels.
- By 2020, the City and Community will reduce emissions by 15% below 2005 levels.

Discussion

Greenhouse Gas Emission Measurement and Reporting Protocols

To quantify and report on GHG emissions related to City operations, the City has followed the Local Government Operations Protocol (LGOP), which is widely recognized by the industry and regulators. These reports were voluntarily filed with California Climate Action Registry (CCAR) since 2005 and with The Climate Registry (TCR) since 2010. In the beginning, the reports were verified by independent auditors. In recent years, due to the high cost of the audits, the City has filed the reports but has not commissioned independent verification audits. However, with the approval of the Carbon Neutral Plan for the electric portfolio, the City expects to reinstate the independent verification function to provide independent review of City's TCR filings. The City also separately voluntarily reports to the US EPA on the management of SF₆¹, a highly potent GHG used in electrical equipment by the electric utility. City emissions shown in this report were based on these filings.

In addition to 'corporate entity'² level GHG emissions reporting for City operations to TCR, 'ICLEI protocols'³ provide for total community level measurement and reporting of GHG emissions. The City and Community level emissions provided in this report conform to this protocol.

GHG Emissions from City Operations

As illustrated in Figure 1 below, emissions from City operations in 2012 have been reduced by 53% since 2005, exceeding the 20% reduction goal. The reductions are primarily from improvements at the Water Quality Control Plant (WQCP), efficiency improvement undertaken

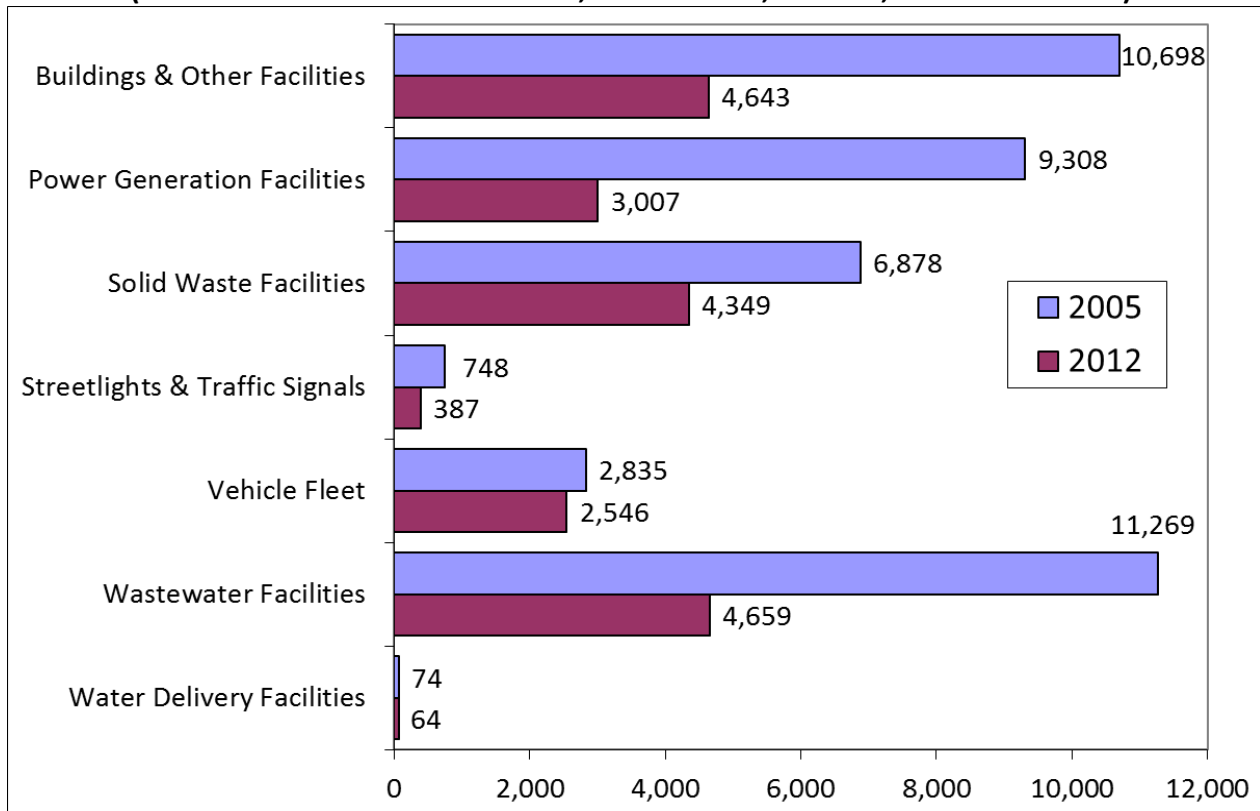
¹ SF₆ is a highly potent greenhouse gas used in electrical switchgear as an insulation medium in the past, but at present being gradually phased out. In addition to voluntary TCR reporting, the City also has a number of mandatory GHG reporting under California Air Resources Board (CARB) regulations to implement state law AB32 for the electric utility, gas utility and WQCP operations. Several of these reports also are subject to mandatory independent verification audits.

² TCR requires corporate level filing of the GHG emission inventory (in this case the City municipal corporation operations) to report all emissions that are within the control of that legal entity. For Palo Alto this excludes emissions such as those related to community transportation. As an electric and gas utility, the City does have some control over emissions related to these two energy sources, and, therefore, must count them in the inventory.

³The International Council for Local Environmental Initiatives (ICLEI) protocol is a premier GHG reporting standard for local governments and communities.

at many facilities including City Hall building, participation in recycling and other waste management programs, greater use of renewable electric supply, and reduced utilization of the back-up electrical generator at the Municipal Service Center. Descriptions of these improvements are provided in Attachment B. The annual operational cost saving from these improvements total approximately \$500,000 per year per year, with \$350,000 of savings attributable to improvements at the water quality control plant, \$50,000 related to lower utility bills for City facilities, and more than \$100,000 in reduced fuel consumption by the City fleet.

Figure 1: City Operations GHG Emissions: 2005 vs. 2012
(Total Emissions Reduced from 42,000 MT to 20,000 MT⁴, a 53% reduction⁵)



GHG Emissions from Community and City Municipal Operations

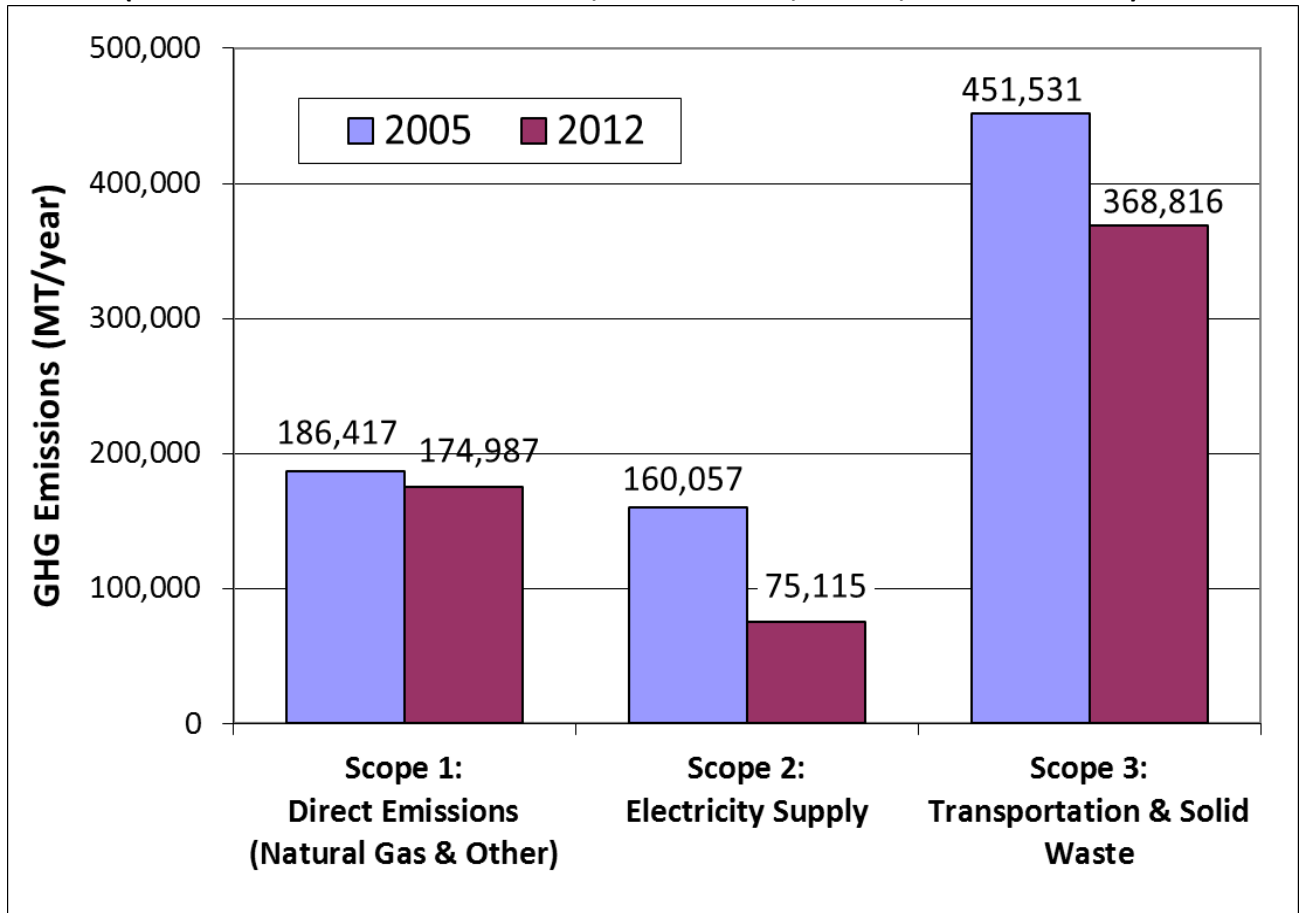
Figure 2 below summarizes the combined City and Community emissions in three categories⁶.

⁴ MT refers to metric tons of carbon dioxide equivalent (CO₂e) emissions.

⁵ The emissions reduction excluding adjustments to account for variations in hydro-electricity production and PaloAltoGreen purchases is 31%. This is primarily because 2012 was a relatively dry year which resulted in hydro electric supply providing 42% of electric needs, instead of the 52% supply Palo Alto would have received in an average hydro year or about 62% of supply in a wet year.

Staff has revised its baseline calculations for City operations emissions to be in line with the current calculation methodology known as the Local Government Operations protocol (LGOP). The LGOP was developed by California Air Resources Board (CARB) staff in partnership with the Climate Action Reserve (CAR), The Climate Registry (TCR), and Local Governments for Sustainability.

Figure 2: Community and City Operations GHG Emissions: 2005 vs. 2012
 (Total Emissions⁷ reduced from 798,000 MT to 619,000 MT, a 22% reduction)



The use of natural gas has decreased slightly, primarily as a result of efficiency improvements and a large commercial natural gas customer leaving town. The electricity emissions reduction accounts for the majority of the reduction and is largely due to greater amount of renewable energy supply. The Community's purchase of PaloAltoGreen renewable energy certificates (RECs) was factored into the Community's total emissions⁸. Attachment C provides greater detail.

⁶ Scope 1 is defined to be direct emissions that the City can control and as a natural gas utility it primarily includes natural gas related communitywide GHG emissions. Scope 2 is communitywide emissions related to electricity usage. Scope 3 is emissions not in scope 1 or scope 2. (World Resource Institute protocol adopted by TCR).

⁷ The total emissions estimate is adjusted for hydroelectric production variations caused by weather and PaloAltoGreen energy purchases. Staff has revised its baseline calculations in line with the LGOP protocols.

⁸ A reduction of 879 lbs of CO₂e per REC purchased is used to estimate the GHG emission reductions for PaloAltoGreen program. This factor is the US EPA estimate for emissions from natural gas fired electric generation in 2005.

An assessment of transportation-related emissions was conducted by consultants earlier this year, and preliminary results suggest a 10% reduction vehicle related emissions despite an increase in 'service population' in Palo Alto. This decrease was driven by a reduction of per capita miles travelled and improved vehicular fuel efficiency. A detailed description of the study results and assumptions is provided in Attachment F. Table 1 below summarizes the results and shows that emissions were reduced by 13.6%, from 371,870 MT in 2005 to 321,200 MT in 2012. It also shows the corresponding emission estimates for year 1990, the base year utilized by the state for emission reduction goals under state law AB32.

Table 1: Estimates of Vehicle Emissions within Palo Alto City Limits

Measure	Units ¹	Service Population, VMT & Vehicle Emissions		
		Year 1990	Year 2005	Year 2012
Service Population (residents + employees)	persons	145,900	155,900	156,400
Daily Vehicle Miles Traveled	miles	2,471,300	2,293,180	2,206,800
Emissions Before Implementation of Fuel Economy (Pavley I) and Standards (LCFS)				
1. Daily CO ₂ e Emissions	tons	1,050	1,020	920
Daily CO ₂ e Emissions per service population ³	lbs	15.82	14.41	12.95
Annual CO ₂ e Emissions ³	tons	382,070	371,870	335,390
Emissions After Implementation of Fuel Economy (Pavley I) and Standards (LCFS)				
2. Daily CO ₂ e Emissions	tons	1,050	1,020	880
Daily CO ₂ e Emissions per service population ³	lbs	15.82	14.41	12.40
Annual CO ₂ e Emissions ³	tons	382,070	371,870	321,200
Notes:				
¹ tons = metric tons, lbs = pounds				
² Service population = residents + employees.				
³ Annual VMT is calculated by multiplying the daily VMT by 347 to account for reduced vehicle activity on the weekends.				
⁴ CO ₂ = CO ₂ equivalents; <i>Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change</i> (Solomon, S., D., et.al., 2007).				
Source: Fehr & Peers, March, 2013.				

Source: Fehr and Peer Report of 03/19/2013

Assessment of GHG Emission Trends Since 1990

California's Global Warming Solutions Act (AB32) of 2006 calls for statewide GHG emission reduction and establishes a goal of reducing emissions to 1990 emission levels by 2020. Staff's preliminary estimate is that the Community's GHG emissions in 2012 are 28% below 1990 emission levels based on estimated mobile fuel use and consumption of electricity and natural gas as outlined in Table 2 below.

Table 2: Community and City Greenhouse Gas Emission Estimates for 1990, 2005 and 2012

Emissions Drivers	Greenhouse Gas Emissions (000's of MT) (City Operations and Community)			% Change 2012 vs.	
	1990	2005	2012	1990	2005
Natural Gas	194	166	160	-18%	-4%
Electricity	186	160	75	-60%	-53%
Mobile Combustion*	382	372	335	-12%	-10%
Other**	100***	100	49	-	-
Total	862	798	619	-28%	-22%

* Consultant estimates based on population, employment, vehicle miles travelled and vehicular emission profiles

** Includes landfill, refuse and water WQCP emissions

*** This estimate for 1990 is held at the same level as that of 2005, to be revised at a later time

In addition to the emission reduction goals, the City's CPP also had other goals. These goals are tabulated below along with the progress made in achieving those goals.

CPP Goals	Update on Progress
Incorporate carbon reduction into the City's Comprehensive Plan goals to ensure continuity with other City priorities	The new CPP is expected to be developed in coordination with the update to the City's Comprehensive Plan. This coordinated development process will be ready for Council consideration later in 2013
Explore and evaluate a policy whereby all of the Palo Alto Utilities would become climate neutral and enable customers to choose climate neutrality through various voluntary mechanisms.	The City developed PaloAltoGreen volunteer program, and the program became the nation's top-ranked voluntary renewable energy program. In March 2013 Council approved the Carbon Neutral Plan for electricity supply for all customers starting in 2013.
Maintain and report GHG inventories on a regular basis	Staff has compiled and reported on annual GHG emissions inventory of City operations to national registries (CCAR, TCR) since 2005. Since 2010, Utilities has also been reporting to CARB.
Promote participation by Palo Alto businesses in GHG inventory efforts	A number of large companies in the City quantify their carbon footprint and the City assists them in providing utility related emission coefficients. Staff will continue to be active in Sustainable Silicon Valley, Joint Venture Silicon Valley, Santa Clara County Sustainable Office, California Air Resource Board (CARB), GreenCitiesCALIFORNIA, and other related regional and state forum.

A more detailed list of accomplishments by the City is provided in Attachment D. It summarizes many of the City's sustainability efforts, and includes the following sections.

- I. Utilities Operations
- II. Sustainable Purchasing, IT and Administrative Practices
- III. City Fleet Operations
- IV. City Facilities Operations and Capital Projects; Public Works Projects
- V. Green Building
- VI. Zero Waste and Landfill Operations
- VII. Water Quality Control Plant (WQCP) Operations
- VIII. Education, Motivation, and Community participation

City's Sustainability Policy and organizational structure is described in Attachment E. Description of Transportation and Land-use related activities are provided in Attachment F.

Cost-Benefit Analysis and Impacts on City Budget

The City undertakes cost-benefit analyses to prioritize GHG emission reduction actions for large projects. For example, when evaluating efficiency and conservation programs Utilities uses a 'Total Resource Cost'⁹ approach. The WQCP's decision to replace chlorine disinfection with an Ultra-Violet light based disinfection process was based on a life-cycle cost assessment. Replacement of street lights with Light Emitting Diode (LED) based fixtures had an 8-year payback on the investment. Though most of the City Hall building capital projects were justified based on non-energy efficiency related factors (maintaining occupant comfort and extending the life of the building), when selecting energy consuming equipment such as boilers, lighting, and motors for various applications, cost-effective energy efficiency improvement was an integral part of the decision making process. In evaluating alternate fueled vehicles for the City fleet, a similar analysis is undertaken. As a result of these efforts, the City's saved an estimated \$500,000 in utilities and vehicle fuel costs in 2012.

The City will continue to emphasize cost-effectiveness whenever making purchasing decisions and will continue to include the cost of carbon in such assessments.

How the Climate Protection Plan fits into other Environmental Sustainability Efforts

The CPP intersects with and influences many other environmental sustainability programs and initiatives. For example, the Zero Waste plan calls for an increase of the diversion rate of several categories of solid waste which will significantly reduce Community GHG emissions. Another example is the Urban Forest Master Plan, where there are not only benefits from the carbon sequestration properties of an urban canopy, but value could also be garnered by reducing air-conditioning related energy costs by strategically locating trees to shade buildings. The Carbon Neutral electricity plan was also driven by the community's desire to reduce its carbon footprint. Attachment D provides an update on all these activities and results to date.

⁹ The Total Resource Cost test measures the net costs of efficiency programs based on the total costs of the program, including both the participant and utility costs, and includes cost of carbon. .

Economic Development and City's GHG Reduction Goals

Based on input from Council last year, staff has begun a preliminary assessment of the impact of the City's GHG reduction goals on the community's economic activities. While this is a broad and complex topic to assess in detail, the following observations could be made based on state-wide assessments and community level developments in recent years.

The State of California in its economic analysis of the impact of regulations in implementing GHG emission reductions measures related to state law AB32 concluded that:

"...successful implementation of measures designed to reduce greenhouse gas emissions by increasing the efficiency with which California uses all forms of energy and by reducing its dependence on the fossil fuels that produce greenhouse gases...will mean that we can achieve the goals of AB 32 without adversely affecting the growth of California's economy over the next decade, especially as the state recovers from the current economic downturn."¹⁰

In addition, the following examples demonstrate that the Community's forward looking sustainability goals only strengthen community cohesion and contributes to Palo Alto's economic and social vitality:

- The community surveys conducted (2012) when developing the electric Carbon Neutral Plan and participation in the PaloAltoGreen program indicate that there is wide support in Palo Alto to pay a little more for sustainable growth and to reduce the Community's GHG emissions.
- Utility bill savings accruing from efficiency and conservation measures undertaken by Palo Alto residents (since 2007) are estimated at approximately \$5 million per year.¹¹ This savings was likely deployed in other areas of the community activity spurring economic growth.
- The growth of cleantech companies in Palo Alto and Silicon Valley has clearly added to the economic vitality of the community. An interesting anecdotal example is the launch of the Utilities Emerging Technology (Test Bed) Program, which influenced a start-up company's decision to locate and grow its operation in Palo Alto.¹²

¹⁰ Updated Economic Analysis of California's Climate Change Scoping Plan. Air Resources Board, March 2010.

¹¹ See Fig D-4 in Attachment D, which shows that per capita electricity, natural gas and water consumption has reduced considerably since 2007.

¹² Autogrid, Inc., a Stanford based start-up, located its offices in Palo Alto and signed its first contract from the City to assist with the Commercial Customer Electricity Demand Response program, and at present has two dozen employees.

Future Vision for the Climate Protection Plan

In the coming year, in coordination with the development of the City's Comprehensive Plan, staff expects to develop a new CPP. It is anticipated that the new CPP will demonstrate Palo Alto's leadership role by addressing the state's aspirational GHG reduction goal of 80% reduction (from 1990 levels) by 2050, a stretch goal set by the California Governor's order S-3-05 of June 2005¹³. The CARB is expected to begin regulatory proceedings to examine how to reach this goal in 2013, though actual recommendations may be years away.

In order to contribute toward such an ambitious goal, attention will have to be paid to the topics of:

- switching fuel sources from natural gas and gasoline/diesel to carbon neutral electricity;
- continued emphasis on conservation and efficient use of fossil fuels;
- smart transportation/land-use development;
- enhanced building codes and standards; and
- encouraging the development and deployment of breakthrough greening technologies through collaborative programs with the technology community.

Adaptation to Climate Change

In addition to such GHG emissions reduction efforts, Palo Alto will also play a leadership role in developing regional approaches and state/national level efforts to adapt to the impacts of climate change.

Low-lying areas of Palo Alto (generally east of Louis Road) are subject to tidal flooding and mandatory flood insurance purchase requirements due to the inadequacy of the network of earthen levees along the San Francisco Bay shoreline. The risk of tidal flooding will rise in the future due to anticipated increases in sea level associated with global climate change. Although Palo Alto has lessened the risk to lives and private and public infrastructure by preserving large areas east of Highway 101 as dedicated open space, there are still several thousand mostly residential parcels within the tidal floodplain.

The City's primary response to sea level rise will be to advocate for raising and strengthening of the system of Bayfront levees. The two agencies with primary responsibility for improving the levees are the US Army Corps of Engineers (Corps) and the Santa Clara Valley Water District (District). The Corps-sponsored South San Francisco Bay Shoreline Study is addressing the need for levee improvements in the South Bay. This study has been progressing at a very slow rate, however, due to a lack of federal funding. The District has taken steps to accelerate the improvements through the use of local funding and State grant monies. The District has received a grant from the State Department of Water Resources to conduct design and environmental assessment of local levee improvements. In addition, the District ballot measure approved in the November 2012 election has \$20 million earmarked for the study and design of levee improvements in Santa Clara County. Palo Alto staff continues to stay engaged in ongoing

¹³ Since CARB is also expected to delve into ways of meeting this long term aspirational 80% reduction goal for the state in 2013, the development of the new CPP could also be coordinated with this state effort.

discussions with the District, as well as the San Francisquito Creek Joint Powers Authority and the City of Mountain View, on the need for levee improvements to protect the community from the impacts of sea level rise.

New Governance for Sustainability

In the past year, staff has institutionalized new organizational elements to facilitate the movement to sustainability. Attachment E discusses the enhanced sustainability governance structure to continue to spur sustainability action within City operations and the Community, and to provide leadership at the regional and national level. The hiring of a Chief Sustainability Officer will help to coordinate the efforts already underway and in planning future City departmental initiatives.

NEXT STEPS

Each department within the City will continue to work on sustainability projects in their individual areas and in coordination with one another. Upon the recruitment of the new Chief Sustainability Officer, an update CPP will be developed in coordination with the development of City's updated Comprehensive Plan, and under the umbrella of the new sustainability governance structure.