City of Hawthorne

Municipal Greenhouse Gas Emissions Inventory Report

Prepared by:

South Bay Cities Council of Governments

5033 Rockvalley Road
Rancho Palos Verdes, CA 90275

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City of Hawthorne Municipal Inventory Report

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How to read this report:

The following emissions inventory report includes data for the years 1990, 2005, and 2007. It is organized however starting with the year 2005 because it is the baseline year that will be used to set emission goals. The next year discussed is 2007, an interim year that shows progress made since the baseline year. Lastly, 1990 data is included to review historical GHG levels. Emissions data located in the appendix D is organized in the same way to maintain consistency.

I. Executive Summary

A. Project Background

There are a number of actions taking place in the State of California with respect to climate change and the reduction of greenhouse gas emissions (GHG). With the passage of the California Global Warming Solutions Act of 2006 Assembly Bill (AB) 32 the State of California established a 'first-in-the-world' comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of GHG emissions. The legislation directs the California Air Resources Board (CARB) to oversee its implementation, requiring California to reduce its GHG emissions to 1990 levels by 2020. Local governments in the State of California have an important role to play in helping the State reach its reduction goals.

Since the passage of AB 32 the framework of emissions reduction strategies have been adopted in the AB 32 Scoping Plan. The Scoping Plan includes a range of actions both mandated and voluntary, providing the main strategies for California to meet its reduction goal. The plan encourages local governments to set a GHG reduction target and develop a plan of action for government and community-wide emissions. More recently, Senate Bill (SB) 375 provides a path to achieve AB 32 through transportation (one of the largest sources of GHG emissions) and land use strategies.[1] The bill takes a regional approach to achieving results and establishes a process for CARB to develop GHG emissions reduction targets for each region. While there is no specific number that a local government must reduce its emissions to, it is still crucial that local governments develop strategies to reduce their emissions and comply with regional targets as they develop.

The increasing interest in climate change has engendered South Bay communities to form active, involved citizen groups that have advocated that their cities begin the process of creating Climate Action Plans.[2] A number of South Bay cities signed the "Cool Cities" pledge.[3] By committing to reduce global warming emissions cities will be implementing solutions to make themselves more sustainable and energy efficient. In the spring of 2008 the South Bay Cities Council of Governments (SBCCOG) coordinated efforts to respond to AB 32 by assisting South Bay cities with the process of conducting a GHG emissions inventory. In this way, South Bay cities will be in a better position to respond to the challenges and impact legislation related to climate change. Additionally, GHG inventories will be a useful tool to help South Bay cities measure their progress to meet regional reduction goals.

South Bay cities began the process of assessing their GHG emissions by joining ICLEI—Local Governments for Sustainability, an international association of city and county governments that have made a commitment to sustainable development.[4] Through ICLEI, South Bay cities gained access to tools and resources such as the Clean Air Climate Protection (CACP) software, which enables cities to quantify their emissions. By joining ICLEI and adopting a resolution, South Bay cities have committed to ICLEI's Five Milestone Climate Protection Methodology, which includes: conducting a baseline emissions inventory and forecast, adopting an emissions reduction target for the forecast year, developing a local Climate Action Plan, implementing the local Climate Action Plan, and monitoring and verifying results. These milestones are the five steps the City of Hawthorne will take to reduce its impact on the environment and promote change within the community.

1 See appendix F for more information on Climate Change legislation.

2 ICLEI-Local Governments for Sustainability was formerly known as the International Council for Local Environmental Initiatives, defines a Climate Action Plan (CAP) as a set of policies and measures designed to meet emissions reduction targets by a designated target year. A CAP must include a timeline, breakdown of actions and estimated benefits of each action compared to the baseline, a description of financing mechanisms, and an assignment of responsibility to departments and staff, and should incorporate public awareness and education efforts.

3 The Cool Cities Pledge was developed to encourage cities to endorse the U.S. Mayors Climate Protection Agreement and create their own greenhouse gas reduction activities.

4 Visit the ICLEI website to learn more about the organization at http://www.icleiusa.org/about-iclei/iclei-by_region/california-region

Another resource utilized to conduct the municipal inventory was the Local Government Operations Protocol (LGOP).[5] The protocol was developed in partnership by ICLEI, the California Air Resources Board (CARB), the California Climate Action Registry (CCAR), and The Climate Registry (TCR) to enable local governments to measure and report emissions in a consistent and transparent way. The protocol is a program neutral guide that was developed so that cities can follow internationally recognized GHG accounting and reporting principles.

B. Purpose of Conducting a GHG Emissions Inventory

One of the first steps a city takes towards protecting the environment from global warming and promoting environmental stewardship is to identify and account for the sources of emissions in its own backyard including municipal and community-wide emissions. Conducting an emissions inventory creates a pathway for cities to develop emissions documentation to better manage foreseeable regulatory programs at the Federal, State or regional levels. By being proactive and creating this documentation cities can begin to refine the collection and management of emissions data thereby improving the quality of future inventories. A municipal inventory allows a city to quantify the emissions it is responsible for from individual buildings and facilities, vehicle fleet, transit, waste, etc., giving the City insight into the relationship between improving efficiency and reducing emissions. Once a municipal inventory has been completed a city can identify and evaluate specific areas within municipal operations that are inefficient to then target. Utilizing the inventory to document and formulate a plan of action to address these inefficiencies gives the City an opportunity to lead by example, and promote education and outreach within the community.

C. Scope of the GHG Emissions Inventory

To create an inventory, data was gathered for the years 1990, 2005, and 2007. The year 2005 was selected as the baseline year and will serve as a reference year to measure future progress and establish short-term and long-term reduction target years. Although an estimate of 1990 data is shown to capture historical GHG emissions, and where possible, to be used for the purpose of comparing data between years, a reduction target should be set from the baseline year. The year 2005 was chosen because it allowed the City to gather the earliest, most accurate and reliable data. Data was also collected for the year 2007. This year is considered an interim year to monitor energy use changes that may have occurred since the baseline year 2005. It is useful to review data from this year because it shows progress made that will count towards any reduction goal set. Additionally and where available, data was also collected from the year 1990 to estimate the City's historical GHG emissions. The year 1990 is significant in that it represents a reference year for several key pieces of climate change legislation such as the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol agreement, and the U.S. Mayors' Climate Protection Agreement.[6] However, it was difficult to find accurate data going back as far as 1990 and so comparisons have been made in areas where data is reliable. The precise emissions emitted in 1990 were unable to be determined, thus the decision was made to use the baseline year 2005 data as the benchmark for setting targets.

Following the LGOP guidance for local governments, the City selected an operational control approach to define its organizational boundaries. What this means is that the City identified what emissions it should account for in its municipal inventory based on what facilities and operations it owns or controls. The City's operational boundaries are used to establish and organize its emissions by "scopes."[7] In this way, a city can separately account for its direct and indirect emissions in a tiered fashion. It also establishes a foundation for following reporting standards in the LGOP.

The City gathered information from a variety of sources, including consumption data from utility companies, fuel data

5The Local Government Operations Protocol can be viewed with this link http://www.climateregistry.org/resources/docs/protocols/industry/local-gov/lgo_protocol_september2008.pdf

6 See appendix F for descriptions on climate change legislation.

7 See section 3, Inventory Results Introductions for more information on scopes of emissions.

from internal city records, data on waste and other services from contract service providers. A characterization study from the California Integrated Waste Management Board was utilized to capture waste composition and employee commute surveys were administered to capture emissions data from vehicle miles traveled[8] where no records were available. This data was then utilized to quantify GHG emissions. Following ICLEI program-specific requirements, this report is considered to be a Quick Action Report[9] which entails reporting on three of the six internationally-recognized GHGs regulated under the Kyoto Protocol.[10] The benefit of this reporting option is that it allows a city to capture the majority of its emissions while familiarizing staff with the process of conducting an inventory so that in the future a more detailed level of reporting can be accomplished. The more comprehensive report entails accounting for all six Kyoto Protocol Gases. When the City conducts its re-inventory to ensure that it is inline with its emission reduction goals, the City will be able to consider producing a comprehensive report by adding data on the additional gases.

D. Inventory Methodology

This Quick Action report includes municipal results for the three years inventoried; including detailed reports, located in appendix A, for each year, which shows the GHGs separately as prescribed by ICLEI in the LGOP. As a framework for this report, the LGOP was utilized as a resource as was the Local Government Operations Standard Inventory Report Template. ICLEI provided the technical assistance and the software to accomplish the municipal inventory. The CACP 2009 software is consistent with LGOP standards with respect to the emission coefficients[11] and methodology employed by the software to calculate the equivalent GHGs. It is important to note that GHG emissions with different global warming potential are shown as one roll-up number known as a carbon dioxide equivalent unit (CO_2e).[12] It helps to simplify by looking at just one number for climate action planning; however, ICLEI believes that the most accurate description of emissions requires separate accounting by scope,[13] which can be found in appendix A of this report.

The inventory results should be thought of as an approximation of the GHG emissions emitted in the years inventoried. The results should be used as a policy and planning tool rather than a precise measurement of GHGs. All the data sources used to capture the equivalent emissions emitted, also referred to as activity data, have been noted in the appendix B. This shows transparency when accounting for emissions. Similarly, appendix C discloses the formulas and emissions factors used to arrive at the equivalent GHG emissions. To the extent possible, recommended data and methods in the LGOP were used, but in some cases the suggested alterative methods were necessary to use when recommended data could not be found, appendices B and C give a description of the data and methodologies used.

E. Key Highlights and Findings

- The City of Hawthorne generated approximately 4,989 metric tons of CO_2e in the baseline year, 2005; this is equivalent to the GHG emissions generated by electricity use of 692 homes for one year.[14]
- There was an overall 7.5% decrease in GHG emissions between the baseline year 2005 and the interim year 2007.

8 See Appendices B and C for a description of data sources and methodologies used.

9 To read more about ICLEI's Quick Action Report see Appendix C in the Local Government Operations Protocol. The Quick Action Report entails reporting only on Carbon dioxide (CO2); Methane (CH4); Nitrous oxide (N2O).

10 The internationally-recognized greenhouse gases regulated under the Kyoto Protocol are Carbon dioxide (CO2); Methane (CH4); Nitrous oxide (N2O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); and Sulfur hexafluoride (SF6), Local Government Operations Protocol, page 11.

11 Coefficients or emissions factors as they are known are multiplied by the data in order to arrive at an equivalent GHG emissions number.

12 Equivalent Carbon Dioxide (CO2e) the universal unit for comparing emissions of different GHGs expressed in terms of the GWP of one unit of carbon dioxide, Local Government Operation Protocol, Glossary.

13 See ICLEI Reporting Requirements, Appendix C, Local Government Operations Protocol.

14 The EPA Greenhouse Gas Equivalencies Calculator was utilized to help visualize and understand GHG emission results.

- Emissions resulting from electricity use decreased 16.6% and emissions resulting from natural gas consumption decreased 3.5% between the years 2005 and 2007.
- Results from the employee commute survey indicate 33.3% of respondents are interested in participating in a ridesharing program.
- Under a business-as-usual scenario, the City can expect emissions to rise to 4,760 metric tons of CO_2e by 2012 that is equivalent to the annual GHG emissions from 910 passenger vehicles; and 4,955 metric tons of CO_2e by 2015, equivalent to the annual GHG emissions from 947 passenger vehicles if the City does nothing to reduce its emissions.

E. Future Steps

The next step will be to conduct a community-scale inventory to assess GHG emissions related to residential, commercial, industrial, transportation, and waste sectors. Once completed, these inventories provide the basis for the creation of a Climate Action Plan, which will include measures and policies to reduce emissions in both municipal operations and through community actions.

Climate action work is important and with the municipal inventory complete, the City can select a short and long-term reduction target for municipal operations. Before deciding on a target, the City should review the business-as-usual forecast graph, located in section three, to see what its emissions will look like in the years 2012 and 2015. The City will also want to think about measures and policies that might be included in the climate action plan to reach an adopted goal. Located in section four, is a summary of the City's existing and planned efforts to get the process started. It is important to anticipate and leave enough time to achieve whatever goal is set. An example of a short-term reduction target might be 20% below 2005 baseline levels by the year 2012. In general, ICLEI recommends the further away a target year the more emissions the City will want to reduce. A good example of an end date of a long-term target that is in-line with the State's AB 32 target would be 2020. How the City goes about adopting a reduction target depends on what works best for the City.

Being proactive is the best way to curb GHG emissions and positively influence change within the community. The Climate Action Plan development requires several steps and may include creating a review committee, defining current measures, developing new measures, developing an implementation plan, community outreach strategies, and developing ongoing tracking. Now is a good time to consider what municipal measures and policies planned or existing should be included in the climate action plan. It is important to consider time, resources, cost, and the possible GHGs reduction scenario of each individual measure, as they will all be factors in the decision-making process for the City to reach its goals. The formation of a Green Task Force is a good place to get the development of this process started.

Now that the first step has been taken, it is vital to continue to develop inventory reporting skills. It is up to the City how often they re-inventory GHG emissions, but ICLEI recommends doing so every few years to make sure the City stays on target to reach short and long-term goals. Refining the gathering and management of data for the next inventory should start with good internal communication between departments working together to ensure that the appropriate records are set aside or entered into the new ICLEI data collection forms. Working together is the best way to fine tune reporting skills and work towards creating a comprehensive report as outlined in the LGOP under ICLEI program requirements.

II. Local Government Profile Information

Local Government Description

The Mayor is elected to a two-year term and City Council members are elected to four-year terms on an overlapping basis. Thus two Council seats and the Mayor's seat are up for re-election every two years. The Mayor and City Council also serve as the governing body of the Community Redevelopment Agency, Parking Authority, Housing Authority and Financing Authority. They also serve as members of the Hawthorne Cable Usage Corporation.

Local Government History

Hawthorne's first known residents were Indians of the Shoshonian group, occupying the South Bay area as early as the 1500's. In its early days, Hawthorne was advertised as the town between the City and the sea and it held a special appeal for those who wished to raise poultry and grow vegetables. Since then the City of Hawthorne has grown from a small rural community to a well rounded mixture of business, industries, and homes. Hawthorne is now a diverse community of nearly 90,000 people. It covers 5.89 square miles and is home to 9 public parks, 16 public schools, and a municipal airport.

Primary Services

Department	Primary Services
Administration	General Administration –City Clerk, City Manager, City Council and Finance.
Police Department	Hawthorne has its own police department.
Fire Services	Contracted with Los Angeles County Fire District.
Business License and Code Enforcement	Business license, code enforcement, graffiti removal and animal control.
Planning	Land use entitlements and permitting performed by City Planning Department staff.
Building & Safety	Inspection, permitting and plan check.
Public Works	Engineering, parks and recreation, maintenance and airport divisions. Public Works oversees maintenance and construction within all public right-of-ways and airport, contract trash and street sweeping services. This includes parks and recreation facilities and City maintenance yards.
Transit	Contract with Gardena Transit for senior transportation.

III. Municipal Emissions Inventory Results

A. Inventory Introduction and Results

Depicted in this section are tables and graphs that represent and illustrate an approximation of the GHG emissions levels for the three years of data collected. As mentioned in the executive summary, the data findings are expressed in CO_2-equivalent, which is an estimated sum or roll-up number for GHGs with different global warming potential,[15] to make it easier to review, plan, and set targets. Appendix A gives a detailed account of individual GHGs separately, by scope, for the purpose of establishing good reporting habits. Based on LGOP reporting standards, GHG emissions are organized according to their scope.[16] Scopes are determined based on what control approach[17] a local government chooses to define its boundaries. The LGOP recommends an operational approach for local governments wherein a city defines its scopes by what they own and operate. In this way, the City can account for direct and indirect emissions separately.

Direct emissions are associated with scope 1 and are deemed within the City's control. They are generated by fixed equipment used to produce heat or power from the stationary combustion process and mobile combustion of fuels from city fleet vehicles.

Cities also have a level of control over activities that are associated with indirect emissions, known as scope 2. These emissions are associated with the consumption of purchased electricity, steam, heating, or cooling.[18] The difference between the scopes is that these sources are owned or controlled by another entity. Still, a city will want to develop measures to reduce emissions within this scope. Indirect emission are also associated with scope 3, however scope 3 emissions are related to activities that the City does not own or operate, such as emissions from contracted services, employee commuting, or waste disposal. As an ICLEI member, scope 3 reporting is considered optional, but good to include as it may be policy relevant. City staff decided what data to include for contract provides (Scope 3 emissions) based on whether the information was obtainable, reliable, and relevant.

Tables 1 through 3 are organized by scope, sector, and source of emissions. The data is shown in metric tons of CO_2-equivalent, adjacent is the percentage represented by each sector, source of emissions, energy and fuel use, the equivalent one million British thermal units, and the cost where data was available. This information is shown for the purpose of targeting, planning, and then tracking energy and cost-saving measures. To learn where specific data was obtained and how it was computed, refer to the appendices sections B and C.

2005

Baseline Year

Results from the 2005 municipal inventory represent the year chosen as a baseline year, which will serve as a foundation for setting short and long-term emissions reduction targets. For this year, there was sufficient data available to conduct an accurate inventory. It is important to keep in mind that scope 3 emissions included in the baseline year are estimates based upon information provided by contract service providers and from surveying employees and should not be thought of as a precise measurement of GHGs, but rather as policy relevant information that the City may want to consider when developing or evaluating measures or policies.

15 Each greenhouse gas has a different global warming potential based on its ability to trap heat in the atmosphere, CO_2e is the universal unit for comparing emissions of different GHGs global warming potential, see LGOP appendix E, page 166 for more details.

16 The Local Government Operations Protocol follows categorization standards developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

17 Definitions of inventory approaches are discussed in the LGOP, page 14.

18 See Local Government Operations Protocol for details, page 22.

In 2005, the City of Hawthorne GHG emissions totaled 4,989 metric tons of CO_2e. This number includes both direct and indirect sources of emissions, as shown in Table 1. This total is equivalent to the GHG emissions emitted from the electricity use of 692 homes for one year. Looking at the scopes within the table, the smallest portion 24.8% (scope 1 total) were emissions generated from a combination of natural gas use for buildings and facilities, generators, and fuels for the vehicle fleet. Emissions emitted from electricity use accounted for 48.5% (scope 2 total) of the total emissions. The second largest portion 26.7% (scope 3 total) were emissions due to a combination of employee commuting, contract service vehicles, and waste (refuse collected from City bins).

Energy/Fuel use and cost information has been listed for the purpose of planning and tracking energy measures' cost effectiveness. During 2005, the City of Hawthorne used 7,937,649 kWh of electricity at a cost of $1,064,380. In this same year, the City used 52,696 therms of natural gas costing $52,268.

Table 1. Municipal Inventory Summary 2005[19]

Hawthorne Municipal GHG Emissions 2005						
Sector	**MT CO_2e**	**Percent CO_2e (% CO_2e)**	**Source**	**Energy/Fuel Use**	**Energy/Fuel Use Cost**	**Energy Equivalent** (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities	283	5.7%	Natural Gas	52,696 therms	$52,268	5,313
Emergency Generators	2	0.0%	Diesel	217 gal	-	30
City Vehicle Fleet						
City Vehicle Fleet	**961**	**19.1%**	-	-	**$287,228.21**	**13,532**
	860		Gasoline	97,566.6 gal	$263,495.24	11,976
	54		Diesel	5,892.7 gal	$15,986.56	725
	47		CNG	6,681.1 gal	$12,406.30	831
Total Scope 1 Emissions	**1,246**	**24.8%**	**-**	**-**	**$344,156**	**18,875**
Scope 2 Emissions						
Buildings & Facilities						
Buildings & Facilities[20]	1,136	22.8%	Electricity	3,740,538 kWh	$500,784	12,765
Airport Facilities						
Airport Facilities	34	0.7%	Electricity	110,351 kWh	$16,520	377
Streetlights & Traffic Signals						
Traffic Signals/Controllers	196	3.9%	Electricity	644,313 kWh	$67,679	2,193
Streetlights[21]	926	18.6%	Electricity	3,048,792 kWh	$430,877	10,405
Park & Other Outdoor Lighting	44	1.0%	Electricity	145,488 kWh	$23,812	497
Water Delivery						
Sprinkler/Irrigation Control	2	0.0%	Electricity	5,447 kWh	$2,082	19
Water Pumps	74	1.5%	Electricity	242,720 kWh	$22,626	828
Total Scope 2 Emissions	**2,412**	**48.5%**	**-**	**7,937,649 kWh**	**$1,064,380**	**27,084**
Scope 3 Emissions						
Employee Commute						
Employee Commute	**802**	**16.1%**	**-**	**1,504,238 VMT**	n/a	**11,081**

19 For each inventory summary see appendix D, Emissions Data, to review individual energy use and cost per item.

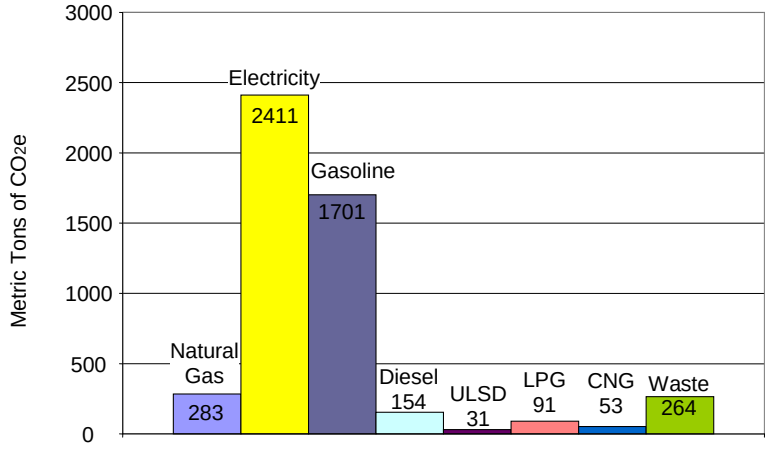
20 Building & Facility accounts may include lights and water delivery devices located on the same metered account.

21 City owned streetlights and Southern California Edison owned streetlights have been combined in the total shown here. See appendix D, Emissions Data, to review individual emissions in the Streetlights and Traffic Signals category.

	794		Gasoline	1,490,277 VMT	-	10,943
	2		Diesel [22]	2,452 VMT	-	23
	6		CNG	11,509 VMT	-	115
Vehicles—Contract Service Providers						
Contract Service Vehicles	**265**	**5.3%**	-	-	n/a	**3,760**
	47		Gasoline	5,220 gal	-	648
	97		Diesel	9,200 gal	-	1,331
	30		Diesel (ULSD)	3,000 gal	-	416
	91		LPG	14,899 gal	-	1,365
Solid Waste						
Waste	264	5.3%	-	3,715 tons	n/a	n/a
Total Scope 3 Emissions	**1,331**	**26.7%**	-	-	-	**14,841**
Total Emissions	**4,989**	**100%**	-	**-**	**-**	**60,800**

Figure 1 illustrates emissions by source. Electricity was the highest source of emissions followed by gasoline and natural gas. Waste resulted in the fourth largest source of emissions. It was estimated that 3,715 tons of waste generated by city operated and owned facilities was sent to a landfill. A breakdown of the waste composition can be found in appendix D, based on a solid waste characterization study for public administration from the California Integrated Waste Management Board website.

Figure 1. Emissions by Source 2005
(including all direct and indirect sources)



Figures 2 and 3 illustrate a percentage breakdown of each sector from Table 1. ICLEI asks its members to report on scopes 1 and 2 where scope 3 is optional; therefore, data is organized to reflect this criteria. Figure 2 shows all scopes, where as Figure 3 concentrates only on scopes 1 and 2 – functions that a city has more influence on. Figure 2 indicates 5.3% of emissions are from contract service vehicles that work within the City's boundaries, 5.3% from waste, and 16.1% are the result of employee commuting. While a city may not have the same degree of control over these sources, there is still an opportunity to create initiative programs or policies that will engender climate-friendly practices. Figure 3 is comprised of natural gas, fuels, and electricity generated emissions. Electricity in scope 2 accounts for 65.9% of emissions and scope 1 emissions from fuel and natural gas sources accounts for the remaining 34.1% of emissions.

22 Diesel and ULSD have been combined in the total shown here. See appendix D, Emissions Data, to review emissions per fuel type.

Figure 2. Emissions by Sector 2005
(including all direct and indirect sources from scopes 1, 2, & 3)

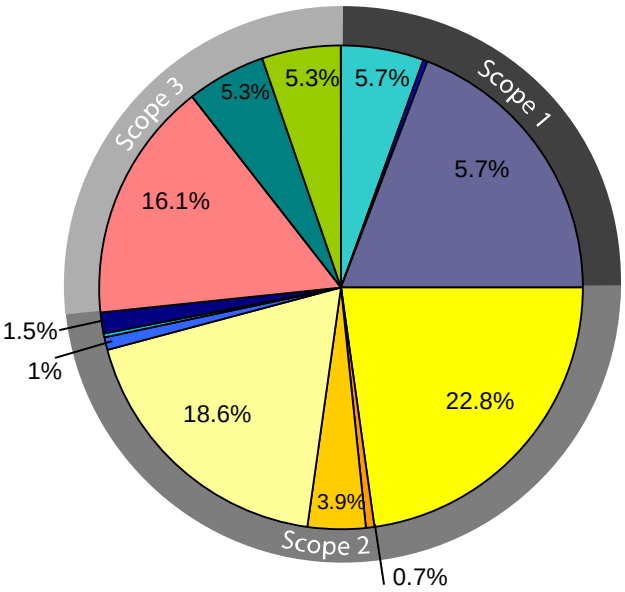
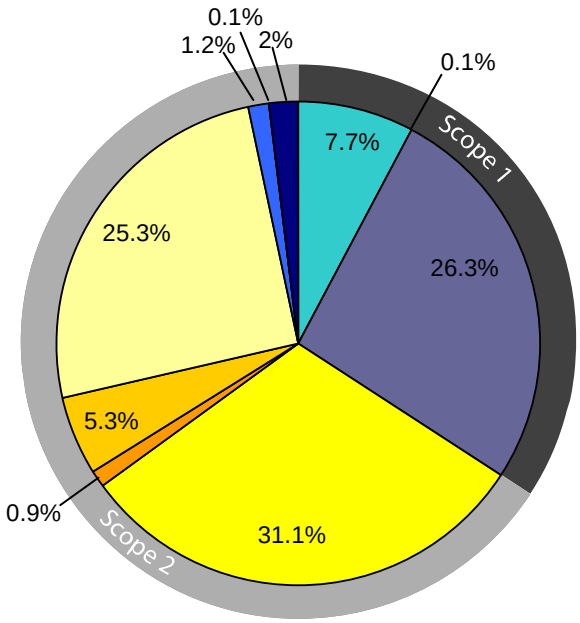
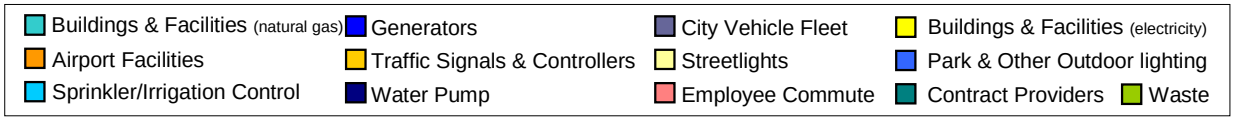


Figure 3. Emissions by Sector 2005
(including only direct and indirect sources from scopes 1 and 2)





2007

Interim Year

The year 2007 was chosen as an interim year to review any energy use changes that may have occurred since the baseline year. ICLEI recommends cities re-inventory every year or two (or as often as possible) to ensure the City is keeping on track with its target. As with the data in 2005, the table below is organized by scope, sector, source of emissions, energy and fuel use, and cost to capture a broad picture of the data.

In 2007, the City of Hawthorne GHG emissions totaled 4,614 metric tons of CO_2e including both direct and indirect sources of emissions—this number is equivalent to the emissions produced from 523,723 gallons of gasoline consumed. The year 2007 represents a 7.5% decrease in emissions from the baseline year. Looking at the scopes within the table, emissions generated from natural gas and fuel sources accounted for 28.4% (scope 1 total) of the emissions inventoried in 2007. Emissions from electricity use decreased from the baseline year contributing 43.6% (scope 2 total) to the total emissions. The smallest portion of emissions came from a combination of employee commuting, contract service vehicles, and waste at 28% (scope 3 total).

In 2007, the City of Hawthorne used 6,889,242 kWh of electricity costing approximately $1,136,818. In this same year, the City used 51,307 therms of natural gas at a cost of $47,161.

Table 2. Municipal Inventory Summary 2007

Hawthorne Municipal GHG Emissions 2007						
Sector	**MT CO_2e**	**Percent CO_2e (% CO_2e)**	**Source**	**Energy/Fuel Use**	**Energy/Fuel Use Cost**	**Energy Equivalent** (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities	273	6.0%	Natural Gas	51,307 therms	$47,161	5,130
Emergency Generators	2	0.0%	Diesel	226 gal	-	32
City Vehicle Fleet				-		
City Vehicle Fleet	**1,034**	**22.4%**	-	-	**$347,803.50**	**14,498**
	864		Gasoline	98,950.6 gal	$290,793.51	12,026
	81		Diesel	8,081 gal	$24,892.3	1,111
	47		CNG	6,792.6 gal	$12,511.92	827
	42		Jet Fuel	4,299 gal	$19,605.77	534
Total Scope 1 Emissions	**1,309**	**28.4%**	**-**	**-**	**$394,964.50**	**19,660**
Scope 2 Emissions						
Buildings & Facilities						
Buildings & Facilities[23]	953	20.7%	Electricity	3,277,372 kWh	$487,449	11,186
Airport Facilities						
Airport Facilities	28	0.6%	Electricity	94,807 kWh	$15,681	324
Streetlights & Traffic Signals						
Traffic Signals/Controllers	91	2.0%	Electricity	309,493 kWh	$44,774	1,056
Streetlights[24]	890	19.3%	Electricity	3,039,554 kWh	$534,591	10,374
Park & Other Outdoor Lighting	2	0.0%	Electricity	6,637 kWh	$35,983	23
Water Delivery						
Sprinkler/Irrigation Control	0	0.0%	Electricity	130 kWh	$1,569	0
Water Pumps	47	1.0%	Electricity	161,249 kWh	$16,771	550
Total Scope 2 Emissions	**2,011**	**43.6%**	**-**	**6,889,242 kWh**	**$1,136,818**	**23,513**
Scope 3 Emissions						
Employee Commute						
Employee Commute	**775**	**16.8%**	**-**	**1,448,643 VMT**	n/a	**10,720**
	766		Gasoline	1,434,494 VMT	-	10,575
	3		Diesel [25]	2,641 VMT	-	30
	6		CNG	11,508 VMT	-	115
Vehicles—Contract Service Providers						
Contract Service Vehicles	**265**	**5.7%**	-	-	n/a	**3,760**
	47		Gasoline	5,220 gal	-	648
	97		Diesel	9,600 gal		1,331
	30		Diesel (ULSD)	3,000 gal	-	416
	91		LPG	14,899 gal	-	1,365
Solid Waste						
Waste	254	5.5%	-	3,580 tons	n/a	n/a
Total Scope 3 Emissions	**1,294**	**28%**	-	-	-	**14,480**
Total Emissions	**4,614**	**100%**	-	**-**	**$1,531,782.50**	**57,653**

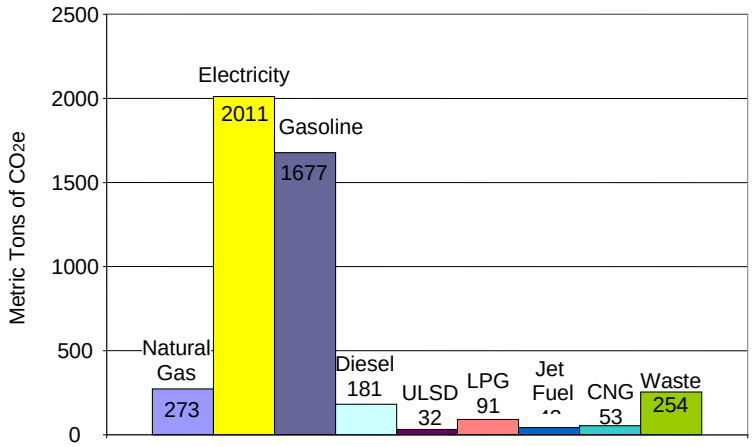
23 Building & Facility accounts may include lights and water delivery devices located on the same metered account.

24 City owned streetlights and Southern California Edison owned streetlights have been combined in the total shown here.

25 Diesel and ULSD have been combined in the total shown here. See appendix D, Emissions Data, to review emissions per fuel type.

Figure 4 shows an increase in emissions from diesel fuel sources. Emissions from electricity, gasoline, and natural gas decreased while CNG and LPG fuel sources remained the same. It was estimated that 3,580 tons of waste generated by city operated and owned facilities was sent to a landfill.

Figure 4. Emissions by Source 2007
(including all direct and indirect sources)



Similar to 2005, Figures 5 and 6 illustrate a percentage breakdown of each sector from Table 2. Figure 5 indicates 5.7% of emissions are from contract service vehicles, 5.5% from waste, and 16.8% of emissions resulted from employee commuting. Figure 6 shows electricity in scope 2 accounts for 60.6% of emissions and fuels and natural gas from scope 1 contributed to the remaining 39.4% of emissions.

Figure 5. Emissions by Sector 2007
(including all direct and indirect sources from scopes 1, 2, & 3)

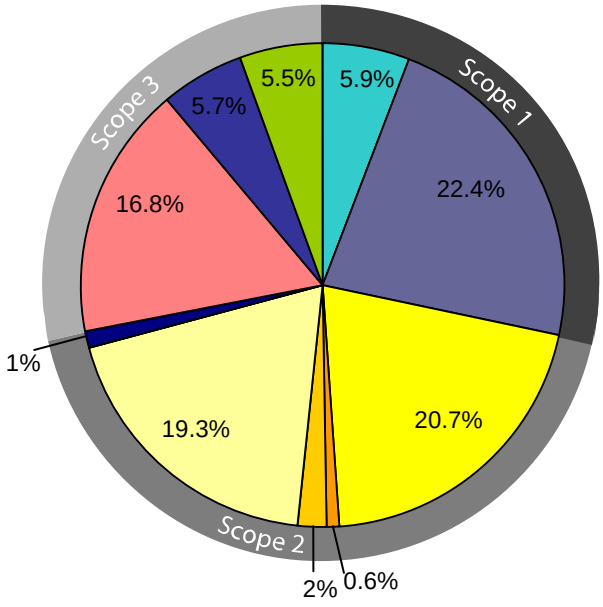
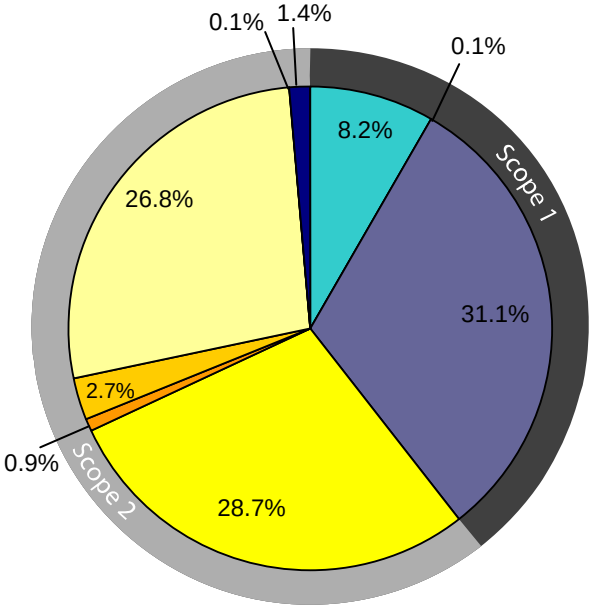
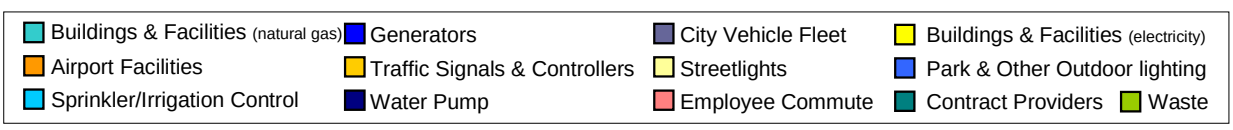


Figure 6. Emissions by Sector 2007
(including only direct and indirect sources from scopes 1 and 2)





1990

Historical Year

Looking back to 1990, this year is a benchmark for several key pieces of climate change legislation, such as the Kyoto Protocol as mentioned in the executive summary. Located in appendix F are brief descriptions pertaining to some of the historical policies that have set 1990 as a benchmark for reducing GHG emissions. Data was collected for this year to review, where possible, the historical GHG levels; however, it was difficult to find accurate data, with the exception of electricity, and "back-casting" or creating a rough estimate of emissions is not recommended in the LGOP.[26] Therefore comparisons have been made in areas where data is reliable. As suggested in the protocol, it is better to concentrate on developing a high-quality, comprehensive inventory with reliable data rather then back-casting to 1990. As previously stated the reduction target should be set from 2005 levels, but the 1990 information has been included to make GHG level comparisons with recent years where possible.

Based on the data that was available for 1990, the GHG emissions identified totaled 4,209 metric tons of CO2e, as shown in Table 3. This number is equivalent to the annual GHG emissions from 771 passenger vehicles. Looking at the scopes within the table, emissions emitted from electricity use accounted for 58.9% (scope 2 total) of the total. Emissions generated by employee commuting contributed 41.1% (scope 3 total) to the remaining total.

Table 3. Municipal Inventory Summary 1990

Hawthorne Municipal GHG Emissions 1990						
Sector	**MT CO_2e**	**Percent CO_2e (% CO_2e)**	**Source**	**Energy/Fuel Use**	**Energy/Fuel Use Cost**	**Energy Equivalent** (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities[27]	2	0.0%	Natural Gas	1,027 therms	$52,268	57
Emergency Generators	2	0.0%	Diesel	217 gal	-	30
Total Scope 1 Emissions	**4**	**0.0%**	**-**	**-**	**$52,268**	**87**
Scope 2 Emissions						
Buildings & Facilities						
Buildings & Facilities[28]	1,282	30.5%	Electricity	2,726,637 kWh	$276,124	9,306
Airport Facilities						
Airport Facilities	266	6.3%	Electricity	566,541 kWh	$54,878	1,934
Streetlights & Traffic Signals						
Traffic Signals/Controllers	395	9.4%	Electricity	841,206 kWh	$86,911	2,871
Park & Other Outdoor Lighting	19	0.5%	Electricity	41,280 kWh	$4,722	141
Water Delivery						
Sprinkler/Irrigation Control	17	0.4%	Electricity	36,160 kWh	$4,143	123
Water Pumps	128	3.0%	Electricity	271,680 kWh	$22,324	927
Wastewater Facilities						
Water Treatment Facility	366	8.7%	Electricity	779,590kWh	$92,288	2,661
Total Scope 2 Emissions	**2,473**	**58.9%**	**-**	**5,263,094 kWh**	**$541,390**	**17,963**

26 See LGOP inventory guidelines, page 12.

27 Due to Southern California Gas Company document retention policies official 1990 customer records are no longer available only casual records were located.

28 Building & Facility accounts may include lights and water delivery devices located on the same metered account.

Scope 3 Emissions						
Employee Commute						
Employee Commute	1,732	41.1%	Gasoline	3,039,200 VMT	n/a	23,679
Total Scope 3 Emissions	**1,732**	**41.1%**	-	**-**	-	**23,679**
Total Emissions[29]	**4,209**	**100%**	-	**-**		**41,729**

29 The summed total shown here does not reflect the total emissions emitted in the year 1990 because not all of the data from this year could be located.

B. Emissions Trends

Represented in Table 4 are the emissions trends from 1990 to 2005 (where reliable data existed) and emissions trends from 2005 to 2007 organized by source of emission.

Between a 15-year span from 1990 to 2005 electricity emissions have decreased by 2.4%. Improvements shown in buildings & facilities and traffic signals & controllers may be the result of energy efficiency technology upgrades. Emissions from employee commuting decreased 54.1%.[30]

From 2005 to 2007 overall emissions from electricity use decreased 16.6%. Emissions from natural gas use decreased by 3.5% (refer to appendix D, to review energy use per building). Fleet sources from gasoline and diesel increased. Fuel sources from contract service vehicles remained the same. Employee commute emissions from gasoline vehicles decrease 3.4% and emissions from waste decreased 3.7%.

Table 4. Emissions Trends 1990-2005 and 2005-2007

Electricity	**MTCO_2e 1990**	**MT CO_2e 2005**	**Percentage Change**	**MT CO_2e 2005**	**MT CO_2e 2007**	**Percentage Change**
Buildings & Facilities	1282	1136	-11.3%	1136	953	-16.1%
Airport Facilities	266	34	-87.2%	34	28	-17.6%
Traffic Signals & Controllers	395	196	-50.3%	196	91	-53.5%
Streetlights	-	926	-	926	890	-3.8%
Park & Other Outdoor Lighting	19	44	+131.5%	44	2	-95.4%
Sprinkler/Irrigation Control	17	2	-88.2%	2	-	-
Water Pumps	128	74	-42.1%	74	47	-36.4%
Water Treatment Facility	366	-	-	-	-	-
Total	**2,473**	**2,412**	**-2.4%**	**2,412**	**2,011**	**-16.6%**
Natural Gas						
Buildings & Facilities	2	283	-	283	273	-3.5%
Fuel						
Gasoline, City Vehicle Fleet	-	860	-	860	864	+0.4%
Diesel, City Vehicle Fleet	-	54	-	54	81	+50%
CNG, City Vehicle Fleet	-	47	-	47	47	-
Jet Fuel, City Vehicle Fleet	-	-	-	-	42	-
Gasoline, Contract Services	-	47	-	47	47	-
Diesel, Contract Services	-	97	-	97	97	-
ULSD, Contract Services	-	30	-	30	30	-
LPG, Contract Services	-	91	-	91	91	-
Gasoline, Employee Commute	1732	794	-54.1%	794	767	-3.4%
Diesel, Employee Commute	-	2	-	2	3	+50%
CNG, Employee Commute	-	6	-	6	6	-
Waste						
Waste	-	264	-	264	254	-3.7%

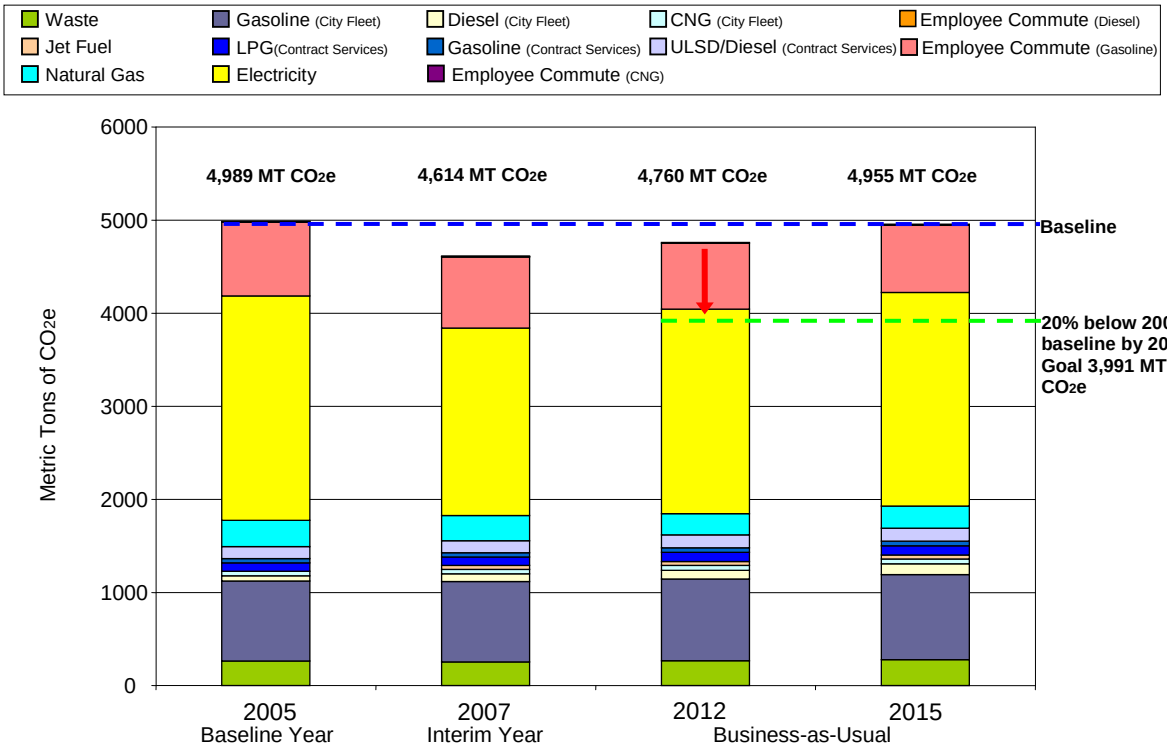
30 Employee commute estimates were based on the number of staff employed by the city in 1990 and the average annual VMT from the 2005 survey responses (refer to appendix C, for additional information).

C. Forecasting and Setting GHG Emissions Reduction Targets

The business-as-usual forecast shown in Figure 7 is a prediction of the likely increase in GHG emissions from municipal operations and services. The emissions shown here represent the business-as-usual forecast for the years 2012 and 2015 if the City does nothing to decrease its GHG emissions. The City can expect GHG emissions levels to increase to 4,760 metric tons of CO_2e by 2012 and 4,955 metric tons of CO_2e by 2015. Several indicators are taken into consideration for predicting anticipated emissions growth, such as, energy usage trends between the baseline year and the interim year (where possible historical year data is taken into account), assumptions about future energy consumption based on the expansion of municipal facilities and operations, new programs that may increase the use of energy, and any anticipated increase in municipal staff. By developing a business-as-usual forecast of emissions, the City can identify a target year to reduce emissions and develop the appropriate measures and policies to target specific areas.

To ensure the City reaches its emission reduction goal it may be helpful to look at individual measures that are planned for implementation and quantify those measures in order to see how much of a reduction can be expected from a given measure. Figure 7 illustrates a possible reduction scenario based on a reduction goal of 20% below the 2005 baseline levels by 2012. ICLEI recommends setting a long-term target (15-20 years) from the baseline year and a short-term or interim target every 2-3 years to make certain the City continues to reduce its emissions. The further away the goal, the larger amount of reductions should be targeted. The blue line represents the baseline year 2005 calculations from which a reduction target can be determined. The green line represents a possible reduction scenario. If the City were to set an emission target 20% below 2005 levels the goal would be to reduce emissions to 3,991 metric tons of CO_2e.

Figure 7. Business-as-Usual Forecast[31]



31 The Business-as-Usual (BAU) forecast includes emissions from scopes 1, 2, and 3. A compound annual growth rate formula and the weighted averages between data sets were used to forecast municipal operation growth. Emission factors from 2007 were used to determine the equivalent CO_2e emissions. The metric tons of CO2e totals listed here are summed totals of the estimated emissions of each gas based on their global warming potential.

IV. Summary of Measures and Policies

There are a variety of ways in which the City of Hawthorne is moving towards becoming a more sustainable city. Policies, measures and plans the City is currently working on will help the City reach its adopted emissions reduction goals. Below is a summary of historic and current measures organized into categories to help with the planning of the climate action document.

A. Energy Efficiency

Lighting retrofit: The City continues to upgrade all lighting regularly, utilizing the most efficient technologies available.

LED Traffic Signals: All traffic signals throughout the City were converted to LED (light emitting diodes) in 2006, which use less than half the electrical power as compared to conventional light bulbs.

Operations upgrades: A comprehensive energy audit and efficiency program was initiated in1999 and completed in 2009. Contracted to Honeywell, this program included replacement of lighting fixtures, upgraded HVAC, and a partial traffic signal LED retrofit. The municipal pool's boiler was replaced in 2008 and a newer, more efficient emergency backup generator was installed at City Hall in 2009.

South Bay Energy Leader Program: Hawthorne is the only city in the South Bay to achieve Gold Level status in the South Bay Energy Leader program. This represents a 10% increase in energy savings compared to 2003 among City facilities, businesses and community.

B. Solid Waste and Recycling

Hazardous Waste: The City hosts an annual HHW collection event in conjunction with Los Angeles County and actively promotes the County's S.A.F.E. Collection Centers. The City is also home to seven used oil collection centers.

Recycling Program: All commercial, residential and multi-family customers are offered free recycling service. The City works to actively promote recycling to businesses and residents via a variety of media. Residents are provided curbside collection of recyclables and green waste. The City introduced a new multi-family dwelling recycling program that seeks to provide recycling options to properties that have historically avoided recycling. This program has resulted in an additional 20 tons of recycling annually. The City has also installed nearly 12,000 square feet of Rubber Sidewalk, made of 100% recycled tires.

C. Sustainable Development

New projects are assessed case-by-case for potential sustainability.

D. Urban Forests

City staff offers free parkway trees to all residents and hosts community tree planting events.

E. Water Usage and Conservation

Reclaimed Water: The City of Hawthorne uses 24 million gallons of reclaimed water annually throughout its parks and landscaped areas. Smart irrigation controllers are used extensively and drought-tolerant plants are used throughout median islands.

Solar-powered irrigation controllers: The City also uses solar-powered irrigation controllers in many of its median islands.

F. Storm Water Management

National Pollutant Discharge Elimination System (NPDES): The City is in full compliance with all NPDES requirements. Public Works and Building and Safety staff are all trained in storm water management, both in regards to use of best management practices (BMPs) as well as recognizing illicit discharges. All public and private projects are plan reviewed, to provide the required level of BMPs necessary for each project. Outreach ad education targets residents and businesses.

G. Vehicle Fleet and Contract Services

Fuel-Efficient Vehicles: The City closely complies with all AQMD and CARB regulations. The City fleet utilizes 30 alternative fuel vehicles.

Contract Service Fuel-Efficient Vehicles: The City requires its street sweeping and waste hauling contractors to use alternative fuel vehicles.

H. Community Involvement

Environmental Program: The Public Works Department's Environmental Program partners with homeowners groups, service organizations, utility companies and other agencies to promote environmental awareness. This includes public events, workshops, and product giveaways.

I. Education and Outreach

City Newsletter: City residents receive a quarterly newsletter detailing the City's recycling and resource conservation programs. Past newsletters have included things such as "10 ways to reduce your footprint" and "10 Tips for Greener Gift Giving."

Earth Day: The City hosts an annual Earth Day event that brings together environmental organizations, community groups and local schools. The event is free and features both entertainment and environmental education.

SBESC: The City works with the South Bay Environmental Services Center (SBESC) to increase the City's energy efficiency by promoting educational outreach and introducing energy efficient technologies for businesses and residents.

Community Cable: The City's community cable channel runs regular environmental awareness segments as well as public service announcements and features on environmental issues.

Appendix A—Greenhouse Gas Municipal Inventory Details

A. Greenhouse Gas Report 2005—Baseline Year

The year 2005 represents the baseline year for the GHG inventory and will be used to set an emissions reduction target and track progress of emissions goals. Below are the GHG inventory details. This level of reporting is referred to as a quick action report wherein three of the six internationally-recognized GHGs regulated under the Kyoto Protocol (carbon dioxide, methane, and nitrous oxide) are reported separately in metric tons and aggregated with other gases not listed here to show the CO_2e summed totals of the estimated emissions of gases with different global warming potentials (see appendix E of LGOP). The control approach was utilized to define the City's scopes of emissions.

Reporting year: 2005
Protocol Used Local: Government Operation Protocol, version 1.0
Control Approach: Operational Control

GHG Emissions Summary (All Units in Metric Tons)

Buildings & Other Facilities					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	**285**	284	0.02689	0.00055
Scope 2	Purchased Electricity	**1136**	1129	0.04920	0.01866

Streetlights and Traffic Signals					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**1166**	1158	0.05047	0.01914

Water Delivery					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**76**	74	0.00326	0.00124

Vehicle Fleet					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Mobile Combustion	**961**	943	0.09001	0.03684
Scope 3	**Contract Services**				
	Universal Waste Systems	**30**	30	0.00006	0.00008
	Clean Street	**91**	86	0.00602	0.01596
	LA County Fire Department	**104**	103	0.00062	0.00077

Airport Facilities					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**34**	33	0.00145	0.00055

Solid Waste					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Contract Services				
	Universal Waste Systems	264	264	12.10567	-

Employee Commute					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Employee Commute	**802**	783	0.05495	0.05752

Transit Fleet					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Gardena Transit	**40**	39	0.00071	0.00039

Total Emissions					
		CO_2e	CO_2	CH_4	N_2O
	Scope 1	**1246**	1127	0.11690	0.03739
	Scope 2	**2412**	2394	0.10438	0.03959
	Scope 3	**1331**	1305	12.16803	0.05791

B. Greenhouse Gas Report 2007— Interim Year

The year 2007 represents data collected from an interim year to review any changes in GHG emissions that may have occurred since the baseline year. The recommended operational control approach was used to define the City's boundaries. Below are the GHG inventory details. This level of reporting is referred to as a quick action report wherein three of the six internationally-recognized GHGs regulated under the Kyoto Protocol (carbon dioxide, methane, and nitrous oxide) are reported separately in metric tons and aggregated with other gases not listed here to show the CO_2e summed totals of the estimated emissions of gases with different global warming potentials (see appendix E of LGOP). The control approach was utilized to define the City's scopes of emissions.

Reporting year: 2007
Protocol Used Local: Government Operation Protocol, version 1.0
Control Approach: Operational Control

GHG Emissions Summary (All Units in Metric Tons)

Buildings & Other Facilities					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	**275**	274	0.02600	0.00053
Scope 2	Purchased Electricity	**953**	953	0.04311	0.01635

Streetlights and Traffic Signals					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**983**	976	0.04414	0.01674

Water Delivery					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**47**	46	0.00212	0.00081

Airport Facilities					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**28**	27	0.00125	0.00047

Vehicle Fleet					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Mobile Combustion	**1034**	1016	0.11389	0.03984
Scope 3	**Contract Services**				
	Universal Waste Systems	**30**	30	0.00006	0.00008
	Clean Street	**91**	86	0.00602	0.01596
	LA County Fire Department	**104**	103	0.00062	0.00077

Solid Waste					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Contract Services				
	Universal Waste Systems	254	254	12.56217	-

Employee Commute					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Employee Commute	**775**	758	0.05015	0.04930

Transit Fleet					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Contract Grand Transit	**40**	39	0.00071	0.00039

Total Emissions					
		CO_2e	CO_2	CH_4	N_2O
	Scope 1	**1309**	1290	0.13989	0.04037
	Scope 2	**2011**	2002	0.09062	0.03437
	Scope 3	**1294**	1270	12.61973	0.0665

C. Greenhouse Gas Report 1990—Historical Year

The year 1990 represents a reference year for several key pieces of climate change legislation such as the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol agreement, and the U.S. Mayors' Climate Protection Agreement. Where available and reliable information could be found historical GHG emissions have been recorded below. Carbon dioxide, methane, and nitrous oxide are reported separately in metric tons and aggregated with other gases not listed here to show the CO_2e summed totals of the estimated emissions of gases with different global warming potentials (see appendix E of LGOP). The control approach was utilized to define the City's scopes of emissions.

Reporting year: 1990
Protocol Used Local: Government Operation Protocol, version 1.0
Control Approach: Operational Control

GHG Emissions Summary (All Units in Metric Tons)

Buildings & Other Facilities					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	**4**	3	0.00048	0.00002
Scope 2	Purchased Electricity	**1282**	1279	0.04983	0.01732

Streetlights and Traffic Signals					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**414**	412	0.01601	0.00560

Water Delivery					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**145**	143	0.00559	0.00195

Wastewater Facilities					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**366**	364	0.01414	0.00495

Airport Facilities					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**266**	264	0.01028	0.00360

Employee Commute					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Employee Commute	**1732**	**1678**	**0.15302**	**0.16327**

Total Emissions					
		CO_2e	CO_2	CH_4	N_2O
	Scope 1	**4**	**3**	**0.00048**	**0.00002**
	Scope 2	**2473**	**2050**	**0.07984**	**0.02782**
	Scope 3	**1732**	**1678**	**0.15302**	**0.16327**

Appendix B—Activity Data Disclosure

Listed below are the data sources. Activity data refers to consumption data such as fuel or electricity use which results in GHG emissions. In an effort to establish good reporting habits, improve the quality of future inventories, and to comply with the overarching reporting principles mentioned in the LGOP - relevance, completeness, consistency, transparency, and accuracy - this information has been recorded. This information is grouped by scope and source of emission. Descriptions of data sources and the methodology used to obtain information are listed here. Indicated in the upper right-hand corner is the methodology used and whether or not it is a recommended or alternative method as prescribed by the LGOP. In this way, the City will be able to improve its data collection process if an alternative method is listed. It is important to note that scope 3 emissions are considered optional reporting.

A. Buildings & Other Facilities

Scope 1 Stationary Combustion

Description:	**Recommended Method**
Consumption data was obtained from Southern California Gas Company. For 1990, Southern California Gas no longer possesses official customer records going back that far due to document retention policies. SoCalGas located some casual records that go back to 1990 which was the basis for the gas information provided for 1990. Generator fuel data was provided by city staff.	Known Natural Gas use
Reference: Chauncy Tou, Energy Programs Advisor Customer Programs, Southern California Gas Company, 213-244-2833, ctou@semprautilities.com.	

Scope 2 Purchased Electricity

Description:	**Recommended Method**
Consumption data was obtained from Southern California Edison.	Known electricity use
Reference: Larry Sutton, Account Executive, Southern California Edison, 714-973-5660 PAX 52660 Maya R. Aubrey, Analyst-Program/Project, Southern California Edison, (909) 357-6536 PAX 16036, Maya.Aubrey@sce.com.	

B. Street Lighting and Traffic Signals

Scope 2 Purchased Electricity

Description:	**Recommended Method**
Consumption data was obtained from Southern California Edison. Note: Accounts owned by SCE were included but recorded separately.	Known electricity use
Reference: Larry Sutton, Account Executive, Southern California Edison, 714-973-5660 PAX 52660 Maya R. Aubrey, Analyst-Program/Project, Southern California Edison, (909) 357-6536 PAX 16036, Maya.Aubrey@sce.com.	

C. Water Delivery and Wastewater

Scope 2 Purchased Electricity

Description:	**Recommended Method**
Consumption data was obtained from Southern California Edison.	Known electricity use

Reference: Larry Sutton, Account Executive, Southern California Edison, 714-973-5660 PAX 52660
Maya R. Aubrey, Analyst-Program/Project, Southern California Edison, (909) 357-6536 PAX 16036, Maya.Aubrey@sce.com.

D. Vehicle Fleet

Scope 1 Mobile Combustion

Description:	**Recommend Method**
City staff collected data from fuel tracking system records.	known fuel use

Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

E. Solid Waste Facilities

Scope 3 Waste Related

Description:
All sent to Puente Hills Landfill. Estimated methane recovery efficiency is reported at 93% by Charles Robinson from Sanitation Districts.

City of Hawthorne
2007—3580 Refuse, 190 tons recycling
2005—3715 Refuse ,194 tons recycling

No records could be found for 1990 City operated and owned facilities.

Solid Waste Characterization was obtain from the California Integrated Waste Management Board http://www.ciwmb.ca.gov/wastechar/BizGrpCp.asp

Reference: Arnie Shadbehr, Public Works Department, ashadbehr@cityofhawthorne.org

F. Employee Commute

Scope 3 Employee Commute

Description:
Employee commute results were determined by conducting a survey of employee commute distance, mode and frequency for the years 2007 and 2005. The online website Survey Monkey was utilized to conduct the survey www.surveymonkey.com

Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

G. Other Scope 3 Emissions

Scope 3 Emissions From Contracted Services

Description: Clean Street Sweeping, Vehicle Fleet Clean Street Sweeping provided information on vehicle type, number of vehicles, and fuel quantity for the Clean Street Sweeping vehicles that operate within the City's boundaries.
Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

Scope 3 Emissions From Contracted Services

Description: Universal Waste Systems, Vehicle Fleet Universal Waste Systems provided information on vehicle type, number of vehicles, and fuel quantity for the Universal Waste Systems vehicles that operate within the City's boundaries.
Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

Scope 3 Emissions From Contracted Services

Description: LA County Fire Department, Vehicle Fleet The LA County Fire Department provided information on vehicle type, number of vehicles, and fuel quantity for vehicles that operate within the City's boundaries.
Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

Scope 3 Emissions From Contracted Transit Services

Description: Gardena Municipal Bus Line, Transit Van City staff provided information on vehicle type, number of vehicles, and fuel quantity for Gardena Transit van's that operate within the City's boundaries.
Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

Appendix C—Methodology/Emissions Factors Disclosure

It is considered good practice to disclose all methodologies employed to calculate emissions. Listed below are the formulas used to determine the equivalent emissions. Emissions factors refer to a unique value used to determine the amount of a GHG emitted on a per unit activity basis. They are used to convert activity data, like energy usage, into the associated GHG emissions.[32] In compliance with the LGOP and ICLEI program reporting requirements listed below and organized by scope are descriptions of computational methods and emission factors used to arrive at the equivalent GHG emissions. Indicated in the top right corner is the method used and whether it is considered to be a recommended or alternate method based on the LGOP standards. In this way, the City will be able to improve its data collection where an alternative method is listed. It is important to note that scope 3 emissions are considered optional reporting.

A. Scope 1 Stationary Combustion

Description of Computational Method:	**Recommended Method**
Table G.1 of the LGOP, Default factors for CO2 emissions, pg. 170 and Table G.3 of the LGOP, Default CH4 and N2O emissions factors by fuel type and sector, pg. 172.	Default emission factors, Table G.1 and Table G.3 of the LGOP

Criteria Air Pollutants, Table 3. NERC Western Systems Coordinating Council/CNV 1990- 2005
2007 inventory-2005 CAP emissions factors
2005 inventory-2005 CAP emissions factors
1990 inventory-1990-2003 emissions factors

Reference: Consumption data was provided by Chauncy Tou, Energy Programs Advisor Customer Programs, Southern California Gas Company, 213-244-2833, ctou@semprautilities.com.

B. Scope 1 Mobile Combustion

Description of Computational Method:	**Recommended Method**
City staff provided data on known fuel use and cost from fuel tracking system records. For 2005, CNG and LPG fuel data could not be located therefore 2007 information was used as proxy data for the 2005 inventory.	Emissions factors by Model Year, Table G.10 of the LGOP

Emissions Factors from Tables G.9, G.10, and G.12 of the LGOP were used, Default for Highway Vehicles by Model Year, pgs. 179-186.

Reference: Data was provided by Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

C. Scope 2 Purchased Electricity

Description of Computational Method:	**Recommended Method**
Table G.5 Utility-Specific Verified Electricity CO_2 Emissions Factors (2000-2006), LGOP pg. 174.	Utility-Specific verified emission factors used

For 2005 inventory Southern California Edison, 2005 emission factors were used; For 2007, inventory Southern California Edison, 2006 emissions factors were used.

TableG.6 California Grid Average Electricity Emissions Factors (1990-2004) emissions factors from the year 2004 was used for both 2005 and 2007.

32 A full description of emissions factor can be found on page 27 of the Local Government Operations Protocol. Emission factors are determined by means of direct measurement, laboratory analyses or calculations based on representative heat content and carbon content.

The year 1990 emissions factors from Table G.6 were used for the 1990 inventory.

Reference: Consumption data provided by Larry Sutton, Account Executive, Southern California Edison, 714-973-5660 PAX 52660 and Maya R. Aubrey, Analyst-Program/Project, Southern California Edison, (909) 357-6536 PAX 16036, Maya.Aubrey@sce.com.

D. Scope 3 Waste Related Emissions

Description of Computational Method:
2007—1409.26 Refuse
2005—1347.70 Refuse
Only refuse data was included in the inventory and was provided by Universal Waste Systems.

There was an estimated 93% methane recovery at the landfill where the waste was taken.

No records could be found for 1990 City operated and owned facilities.

Solid Waste Characterization for public administration was obtain from the California Integrated Waste Management Board http://www.ciwmb.ca.gov/wastechar/BizGrpCp.asp

Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

E. Scope 3 Employee Commute

Description of Computational Method:

Alternative Method
Alternative emissions factors, Table G.13, LGOP

The online website Survey Monkey was utilized to conduct an employee commute the survey http://www.surveymonkey.com.
For 2007 and 2005 some proxy year data was used from the years 2006 and 2008.

It was estimated that on average employees worked 46.5 weeks, which means 28 days were deducted from the 260 possible working days in a year. It was assumed that these absences were due to vacation, sick, personal, and holiday.

Respondents who drove city vehicles, or were not employed by the City in the years surveyed, walked, bicycled, or used another form of transportation were excluded from the emissions inventory.

2007—365 FT and PT employees with 288 responses is a 79% response rate. The remaining 21% of VMT was estimated based on survey responses for a total VMT of 1,448,643. Assumptions: gasoline, drove alone, passenger vehicle (1.26 x 1,149,717=1,448,643 Total VMT)

2005—370 FT and PT employees with 245 responses is a 66.2% response rate. The remaining 33.8% of VMT was estimated based on survey responses for a total VMT of x. Assumptions: gasoline, drove alone, passenger vehicle (1.51 x 996,184=1,448,643 Total VMT)

1990—There were 655 FT and PT employees in 1990. The number of employees and the average annual VMT from the 2005 survey responses were used to estimate the year 1990. Assumptions: gasoline, drove alone, passenger vehicle. Total VMT 3,039,200.

Reference: Doug Krauss, Public Works Department, 310-349-2987, dkrauss@cityofhawthorne.org

Appendix D—Emissions Data

The municipal inventory report was based on data collected from electricity, natural gas consumption, fuels, and other sources listed in the tables below as reference. Information is organized to be consistent with the order of the report, e.g., baseline year, interim year, and historical year. Emissions sources are organized according to source, equivalent metric tons of carbon dioxide emissions, energy equivalent in MMBtu, energy/fuel use, and cost where known.[33]

Sources of Emissions 2005	Source	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Energy/ Fuel Use	Energy/ Fuel Use Cost ($)
Buildings and Facilities						
Ainsworth Center	Electricity	60	1.2	669	196,140 kWh	$29,356
Castle Recreation Building	Electricity	3	0.1	32	9,341 kWh	$1,327
	Natural Gas	3	0.1	50	497 therms	$670
City Hall	Electricity	216	4.3	2424	70,218 kWh	$93,237
	Natural Gas	44	0.9	828	8,277 therms	$8,289
City Yard Equipment Division	Electricity	12	0.3	140	41,052 kWh	$5,921
	Natural Gas	7	0.1	128	1,282 therms	$1,586
CNG Site	Electricity	2	0	22	6,360 kWh	$4,098
	Natural Gas	49	1.0	927	9,274 therms	$8,033
Hawthorne Pool	Electricity	81	1.6	910	266,720 kWh	$37,988
	Natural Gas	18	0.4	346	3,462 therms	$3,308
Memorial Center	Electricity	83	1.7	935	273,840 kWh	$45,826
	Natural Gas	66	1.3	1233	12,333 therms	$12,311
Old Police Department	Electricity	36	0.7	408	119,498 kWh	$18,375
	Natural Gas	8	0.2	143	1,431 therms	$1,697
Police Department	Electricity	427	8.6	4795	1,404,872 kWh	$161,374
	Natural Gas	82	1.7	1546	15,462 therms	$14,793
SBWIB	Electricity	147	3.0	1657	485,520 kWh	$56,669
Sherman Lodge	Electricity	4	0.1	42	12,348 kWh	$2,007
Street Division Facility	Electricity	8	0.2	86	25,314 kWh	$3,607
Generators:						
City Hall Generator	Diesel	0	0	3	20 gal	n/a
Police Generator	Diesel	2	0	27	197 gal	n/a
Parks:						
Park Maintenance Yard	Electricity	3	0.1	37	10,728 kWh	$1,582
Eucalyptus Park	Electricity	17	0.3	187	54,820 kWh	$8,494
Glasgow Park	Electricity	4	0.1	46	13,345 kWh	$2,195

33 Source of data CACP software output.

Holy Glen Park	Electricity	12	0.2	134	39,277 kWh	$9,903
	Natural Gas	2	0	31	308 therms	$463
Ramona Park	Electricity	0	0	4	1,276 kWh	$344
Snack Shack	Natural Gas	0	0.0	6	62 therms	$191
Tennis Courts	Electricity	7	0.1	79	23,226 kWh	$6,317
Thorpe Park Facilities	Electricity	1	0	12	3,526 kWh	$1,002
	Natural Gas	2	0	46	462 therms	$773
Youth Camp Facilities	Electricity	13	0.3	146	42,840 kWh	$11,104
Building 9	Natural Gas	1	0.0	28	277therms	$59
Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	196	3.9	2193	644,313 kWh	$67,679
Streetlights:						
Streetlight City Owned	Electricity	137	2.7	1536	450,092 kWh	$34,442
Streetlight SCE Owned	Electricity	789	15.8	8869	2,598,700 kWh	$396,435
Park Lighting:						
Park & Other Outdoor Lighting	Electricity	40	0.8	448	131,232 kWh	$21,747
Airport Facilities						
Airport	Electricity	34	0.7	377	110,351 kWh	$16,520
Water Delivery						
Sprinkler/Irrigation Control	Electricity	2	0	19	5,447 kWh	$2,082
Water Pump	Electricity	74	1.5	828	242,720 kWh	$22,626
Vehicle Fleet						
Administrative	CNG	8	0.2	139	1,115 gal	$2,054
Building and Safety	CNG	2	0.0	37	298 gal	$671
	Gasoline	12	0.2	169	1,357 gal	$3,044
Cable TV	Gasoline	2	0	29	234 gal	$538
CDBG	Gasoline	2	0	25	199 gal	$455
	Diesel (OFF ROAD)	6	0.1	80	578 gal	$1,499
BL/Code Enforcement	CNG	2	0	42	337 gal	$595
	Gasoline	13	0.3	180	1,452 gal	$3,329
Community Relations	CNG	0	0	3	22 gal	$40
	Gasoline	2	0	26	213 gal	$487

	Diesel (OFF ROAD)	1	0	10	69 gal	$178
Engineering	Gasoline	3	0.1	38	308 gal	$706
Equipment	CNG	1	0	16	130 gal	$239
	Gasoline	10	0.2	142	1,146 gal	$2,607
Finance	Gasoline	10	0.2	139	1,116 gal	$2,590
	Gasoline(OFF ROAD)	0	0	5	39 gal	$83
Graffiti	Gasoline	24	0.5	331	2,661 gal	$6,073
	Gasoline(OFF ROAD)	0	0	4	34 gal	$78
Housing	CNG	1	0	20	159 gal	$294
JPTA	Gasoline	2	0	22	178 gal	$421
Park Maintenance	Diesel	8	0.2	109	928 gal	$2,158
	Gasoline	79	1.6	1108	8,746 gal	$19,981
	Diesel (OFF ROAD)	4	0.1	55	256 gal	$1,081
Planning	CNG	1	0	12	97 gal	$178
Police	CNG	32	0.6	562	3,815 gal	$8,336
	Diesel	1	0	11	77 gal	$63
	Gasoline	574	11.5	8003	65,897 gal	$188,144
	Gasoline (OFF ROAD)	29	0.6	402	3,238 gal	$7,336
Street & Building Maintenance	Diesel	27	0.5	369	3,356 gal	$9,188
	Gasoline	85	1.7	1179	9,489 gal	$21,557
Airport Vehicles						
	Diesel	4	0.1	55	398 gal	$1,067
	Gasoline	11	0.2	148	1,208 gal	$2,635
	Diesel (OFF ROAD)	3	0.1	36	261 gal	$741
	Gasoline (OFF ROAD)	0	0.0	2	20 gal	$217
Vehicle Fleet-Contract Services						
Contract-Clean Street Sweep	LPG	91	1.8	1365	14,899 gal	n/a
Contract-LA Count Fire Dept	Diesel	97	2.0	1331	9,600 gal	n/a
	Gasoline	6	0.1	89	720 gal	n/a
Contract-Universal Waste Systems	Diesel ULSD	30	0.6	416	3,000 gal	n/a
Transit Fleet-Contract Services						
Gardena Transit	Gasoline	40	0.8	559	4,500 gal	n/a
Employee Commute						

Drove Alone	CNG	6	0.1	115	11,509 VMT	n/a
	Diesel ULSD	1	0	15	2,093 VMT	n/a
	Gasoline	755	15.2	10,404	1,417,061 VMT	n/a
	Gasoline (OFF ROAD)	6	0.1	81	14,462 VMT	n/a
Carpool	Gasoline	33	0.7	458	58,255 VMT	n/a
Public Transportation	Diesel	1	0	8	359 VMT	n/a

Waste						
Waste Management	Carbon Dioxide	254	5.1	n/a		n/a
Sources:	Food Waste	38				
	Paper Products	269				
	Plant Debris	37				
	Wood/Textiles	13				

Sources of Emissions 2007	Source	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Energy/ Fuel Use	Energy/ Fuel Use Cost ($)
Buildings and Facilities						
Ainsworth Center	Electricity	45	1.0	530	155,432 kWh	$24,361
Castle Recreation Building	Electricity	1	0.0	10	2935 kWh	$643
	Natural Gas	0	0	4	36 therms	$162
City Hall	Electricity	204	4.0	2374	695,578 kWh	$99,695
	Natural Gas	58	1.1	1085	10,853 therms	$7,900
City Yard Equipment Division	Electricity	12	0.2	142	41,502 kWh	$6,883
	Natural Gas	7	0.1	137	1,366 therms	$1,671
CNG Site	Electricity	2	0	23	6,756 kWh	$3,695
	Natural Gas	58	1.1	1085	10,853 therms	$7,900
Hawthorne Pool	Electricity	41	0.9	482	141,141 kWh	$23,890
	Natural Gas	10	0.2	193	1,929 therms	$2,192
Memorial Center	Electricity	80	1.7	928	271,947 kWh	$49,052
	Natural Gas	71	1.5	1339	13,392 therms	$12,324
Old Police Department	Electricity	12	0.3	144	42,209 kWh	$11,308
	Natural Gas	2	0	39	387 therms	$540
Police Department	Electricity	392	8.5	4575	1,340,354 kWh	$169,080
	Natural Gas	90	1.9	1693	16,934 therms	$15,413
SBWIB	Electricity	111	2.4	1298	380,400 kWh	$47,666
Sherman Lodge	Electricity	2	0	26	7,716 kWh	$1,401

Street Division Facility	Electricity	8	0.2	89	26,172 kWh	$4,265
Generators:						
City Hall Generator	Diesel	0	0	3	20 gal	n/a
Police Generator	Diesel	2	0	29	206 gal	n/a
Parks:						
Park Maintenance Yard	Electricity	2	0	27	7,788 kWh	$1,397
Eucalyptus Park	Electricity	10	0.2	115	33,700 kWh	$6,008
Glasgow Park	Electricity	3	0.1	40	11,588 kWh	$2,174
Holy Glen Park	Electricity	14	0.3	162	47,533 kWh	$18,377
	Natural Gas	3	0.1	48	483 therms	$662
Ramona Park	Electricity	0	0	3	780 kWh	$310
Snack Shack	Natural Gas	0	0.0	7	69 therms	$199
Tennis Courts	Electricity	5	0.1	57	16,800 kWh	$5,754
Thorpe Park Facilities	Electricity	1	0	13	3,761 kWh	$1,148
	Natural Gas	3	0.1	62	615 therms	$918
Youth Camp Facilities	Electricity	13	0.2	148	43,280 kWh	$10,344
Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	91	1.8	1056	309,493 kWh	$44,774
Streetlights:						
Streetlight City Owned	Electricity	130	2.8	1517	444,440 kWh	$41,610
Streetlight SCE Owned	Electricity	760	16.4	8857	2,595,114 kWh	$492,981
Park Lighting:						
Park & Other Outdoor Lighting	Electricity	2	0	23	6,637 kWh	$30,898
Airport Facilities						
Airport	Electricity	28	0.5	324	94,807 kWh	$15,681
Water Delivery						
Sprinkler/Irrigation Control	Electricity	0	0	0	130 kWh	$1,569
Water Pump	Electricity	47	1.0	550	161,249 kWh	$16,771
Vehicle Fleet						
Administrative	CNG	2	0.1	44	358 gal	$660
Building and Safety	Gasoline	10	0.2	144	1,556 gal	$3,327
Business license	CNG	7	0.2	133	1602 gal	$1,972

	Gasoline	7	0.1	96	395 gal	$2,272
Cable TV	Gasoline	2	0	21	170 gal	$491
CDBG	Gasoline	0	0	3	24 gal	$71
	Diesel (OFF ROAD)	4	0.1	53	381 gal	$1,160
Code Enforcement	CNG	3	0.1	49	395 gal	$728
	Gasoline	14	0.3	199	1,602 gal	$4,627
Community Relations	CNG	3	0.1	47	380 gal	$699
	Gasoline	5	0.1	65	168 gal	$1,511
	Diesel (OFF ROAD)	1	0	11	76 gal	$240
Engineering	Gasoline	9	0.2	119	959 gal	$2,703
Equipment	CNG	1	0	10	84 gal	$155
	Gasoline	12	0.3	163	1,311 gal	$3,862
Finance	Gasoline	17	0.4	234	1,882 gal	$5,425
	Gasoline (OFF ROAD)	0	0	7	55 gal	$167
Graffiti	Gasoline	28	0.5	389	3,130 gal	$9,068
	Diesel (OFF ROAD)	1	0	17	120 gal	$363
Housing	Gasoline	0	0	5	40 gal	$74
Park Maintenance	Gasoline	87	1.7	1217	9,794 gal	$31,208
	Diesel(OFF ROAD)	9	0.2	118	853 gal	$2,677
	Gasoline (OFF ROAD)	8	0.2	118	946 gal	$2,733
Planning	Gasoline	1	0	11	85 gal	$157
Police	CNG	24	0.5	422	3,397 gal	$6,257
	Diesel	1	0	12	83 gal	$279
	Gasoline	533	10.4	7413	62,417 gal	$173,034
	Gasoline (OFF ROAD)	18	0.4	254	11 gal	$9,090
	Jet Fuel (OFF ROAD)	41	0..8	534	4,299 gal	$19,606
Street & Building Maintenance	Diesel	56	1.1	770	5,549 gal	$17,270
	Gasoline	96	1.9	1338	10,766 gal	$31,020
	Diesel (OFF ROAD)	0	0	3	23 gal	$75
	Gasoline (OFF ROAD)	3	0.1	42	338 gal	$1,022
Airport Vehicles						
	CNG	7	0.1	122	983 gal	$1,810
	Diesel	0	0	2	18 gal	$57
	Gasoline	10	0.2	142	1,144 gal	$3,319
	Diesel (OFF ROAD)	9	0.2	125	897 gal	$2,825
	Gasoline(OFF ROAD)	2	0	23	186 gal	$552

Vehicle Fleet-Contract Services						
Contract-Clean Street Sweep	LPG	91	1.8	1365	14,899 gal	n/a
Contract-LA Count Fire Dept	Diesel	97	1.9	1331	9,600 gal	n/a
	Gasoline	6	0.1	89	720 gal	n/a
Contract-Universal Waste Systems	Diesel ULSD	30	0.6	416	1,500 gal	n/a
Transit Fleet-Contract Services						
Gardena Transit	Gasoline	40	0.9	559	4,500 gal	n/a
Employee Commute						
Drove Alone	CNG	6	0.1	115	11,508 VMT	n/a
	Diesel ULSD	1	0	15	2,093 VMT	n/a
	Gasoline	705	15.2	9736	1,318,801 VMT	n/a
	Gasoline (OFF ROAD)	7	0.1	93	16,554 VMT	n/a
Carpool	Gasoline	54	1.2	746	99,140 VMT	n/a
Public Transportation	Diesel	1	0	12	548 VMT	n/a
Waste						
Waste Management	Carbon Dioxide	264	5.2			n/a
Sources:	Food Waste	38				
	Paper Products	269				
	Plant Debris	37				
	Wood/Textiles	13				

Sources of Emissions 1990	Source	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Energy/ Fuel Use	Energy/ Fuel Use Cost ($)
Buildings and Facilities						
Castle Recreation Building	Electricity	3	0.1	19	5,472 kWh	$720
	Natural Gas	0	0.0	0	2 therms	n/a
City Hall	Electricity	454	11.0	3295	965,400 kWh	$92,720
	Natural Gas	0	0.0	7	74 therms	n/a
City Yard Equipment Division	Electricity	15	0.4	109	31,848 kWh	$3,845
	Natural Gas	0	0.0	3	28 therms	n/a
Fire Department	Electricity	148	3.6	1078	315,855 kWh	$28,545
Hawthorne Pool	Natural Gas	4	0.1	73	727 therms	n/a
Memorial Center	Electricity	280	6.8	2044	598,800 kWh	$66,595

Old Police Department	Electricity	290	7	2105	616,740 kWh	$55,886
	Natural Gas	0	0.0	3	33 therms	n/a
Sherman Lodge	Electricity	3	0.1	22	6,360 kWh	$819
Street Division Facility	Electricity	14	0.4	99	29,148 kWh	$3,798
Generators:						
City Hall Generator	Diesel	0	0.0	7	20 gal	n/a
Police Generator	Diesel	2	0.0	27	197 gal	n/a
Parks:						
Park Maintenance Yard	Electricity	5	0.1	36	10,536 kWh	$1,277
Holy Glen Park	Electricity	21	0.5	155	45,297 kWh	$9,350
	Natural Gas	0	0.0	0	1 therm	n/a
Memorial Center	Electricity	281	6.8	2044	598,800 kWh	$66,595
	Natural Gas	1	0.0	15	153 therms	n/a
Ramona Park	Electricity	1	0	4	1,110 kWh	$243
Snack Shack	Natural Gas	0	0.0	0	1 therm	n/a
Tennis Courts	Electricity	14	0.3	101	29,484 kWh	$3,391
Thorpe Park Facilities	Electricity	5	0.1	39	11,387 kWh	$1,579
	Natural Gas	0	0.0	1	9 therms	n/a
Youth Camp Facilities	Electricity	28	0.7	202	59,200 kWh	$7,242
Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	395	9.6	2871	841,206 kWh	$86,911
Park Lighting:						
Park & Other Outdoor Lighting	Electricity	19	0.5	141	41,280 kWh	$4,722
Airport Facilities						
Airport	Electricity	266	6.5	1934	566,541 kWh	$54,878
Water Delivery						
Sprinkler/Irrigation Control	Electricity	17	0.4	123	36,460 kWh	$4,143
Water Pump	Electricity	128	3.1	927	271,680 kWh	$22,324
Waste Water Facilities						
Water Treatment	Electricity	366	6.8	2,661	779,590kWh	$92,288
Employee Commute						
Drove Alone	Gasoline	1732	42.0	23679	3,039,200 VMT	n/a

Criteria Air Pollutants[34]

Municipal operations are also responsible for emitting criteria air pollutants which have been linked to various environmental and public health problems. The CACP software generates data on these emissions as shown in the tables below.[35] Actions taken to reduce emissions will also reduce criteria air pollutants as well.

Criteria Air Pollutants 2005	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	4,341	2,256	2,359	296	1,862
Streetlights & Traffic Signals	3,401	2,269	2,154	242	1,873
Airport Facilities	98	65	62	7	54
Water Delivery	220	147	139	16	121
Vehicle Fleet	8,790	387	61,406	6,752	238
Employee Commute	4,788	282	52,971	5,443	108
Transit Fleet	201	9	1,949	189	5
Total	21,839	5,415	121,040	12,944	4,261

Criteria Air Pollutants 2007	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	3,904	1,980	2,091	265	1,635
Streetlights & Traffic Signals	2,973	1,983	1,883	211	1,638
Airport Facilities	84	56	53	6	46
Water Delivery	143	95	91	10	79
Vehicle Fleet	8,667	400	61,489	6,672	231
Employee Commute	4,310	266	50,785	5,130	100
Transit Fleet	201	9	1,949	189	5
Total	20,282	4,790	118,340	12,483	3,734

Criteria Air Pollutants 1990	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	2,476	1,905	1,537	182	1,438
Streetlights & Traffic Signals	757	614	488	56	462
Airport Facilities	486	394	313	36	297
Water Delivery	264	214	170	19	161
Wastewater Facilities	512	415	330	38	313
Employee Commute	13,196	564	153,283	16,169	250
Total	17,691	4,106	156,121	16,499	2,921

34 To review definitions and acronyms for criteria air pollutants refer to appendices sections G and H.

35 Source of data CACP software output.

Indicator Inputs

Indicator inputs is a term used by ICLEI to describe statistics such as the number of employees that work in a building or how many streetlights are in the City. The CACP software is able to provide an additional analysis based on the statistics entered such as energy use per square foot. These statistics are not necessary to calculate GHGs but they are able to provide additional information which can be useful for tracking progress over time.[36]

Sources of Emissions 2005		Equiv CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Buildings and Facilities				
Ainsworth Center– Electricity				
	Per 1000 sq. ft.	0	0	$1.10
	Per hour of operation	0	0.2	$9.40
	Per occupant	6	66.9	$2,935.60
City Hall–Electricity				
	Per 1000 sq. ft.	0	0.1	$1.90
	Per hour of operation	0.1	1.2	$44.80
	Per occupant	2.2	24.2	$932.40
City Hall–Natural Gas				
	Per 1000 sq. ft.	0	0	$0.20
	Per hour of operation	0	0.4	$4.00
	Per occupant	0.4	8.3	$82.90
Memorial Center– Electricity				
	Per 1000 sq. ft.	0	0	$1.00
	Per hour of operation	0	0.3	$14.70
	Per occupant	2.1	23.4	$1,145.70
Memorial Center– Natural Gas				
	Per 1000 sq. ft.	0	0	$0.30
	Per hour of operation	0	0.4	$3.90
	Per occupant	1.6	30.8	$307.80
Police Department– Electricity				
	Per 1000 sq. ft.	0	0	$1.50
	Per hour of operation	0.1	1.1	$36.80
	Per occupant	2.8	32	$1,075.80
Police Department– Natural Gas				
	Per 1000 sq. ft.	0	0	$0.10
	Per hour of operation	0	0.4	$3.40
	Per occupant	0.5	10.3	$98.60
Park Maintenance Yard– Electricity				
	Per 1000 sq. ft.	0	0	$0.20
	Per hour of operation	0	0	$0.80
	Per occupant	0.7	7.3	$316.40
Street Division Facility– Electricity				
	Per 1000 sq. ft.	1.4	15.7	$655.80
	Per hour of operation	0	0	$1.70
	Per occupant	1.5	17.3	$721.40
Solid Waste				
Universal Waste Systems				
	Per employee	0.7	0	n/a
Sector Average				
	Per employee	1.4	0.7	n/a

36 Source of data CACP software output.

Sources of Emissions 2007		Equiv CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Buildings and Facilities				
Ainsworth Center– Electricity				
	Per 1000 sq. ft.	0	0	$0.90
	Per hour of operation	0	0.2	$7.80
	Per occupant	4.5	53	$2,436.10
City Hall–Electricity				
	Per 1000 sq. ft.	0	0	$2.10
	Per hour of operation	0.1	1.1	$47.9
	Per occupant	2	23.7	$997.00
City Hall–Natural Gas				
	Per 1000 sq. ft.	0	0	$0.10
	Per hour of operation	0	0.3	$2.50
	Per occupant	0.3	5.2	$51.80
Memorial Center– Electricity				
	Per 1000 sq. ft.	0	0	$1.10
	Per hour of operation	0	0.3	$15.70
	Per occupant	2	23.2	$1,226.30
Memorial Center– Natural Gas				
	Per 1000 sq. ft.	0	0	$0.30
	Per hour of operation	0	0.4	$4.00
	Per occupant	1.8	33.5	$308.10
Police Department– Electricity				
	Per 1000 sq. ft.	0	0	$1.60
	Per hour of operation	0	0.5	$19.30
	Per occupant	2.6	30.5	$1,127.20
Police Department– Natural Gas				
	Per 1000 sq. ft.	0	0	$0.10
	Per hour of operation	0	0.4	$3.50
	Per occupant	0.6	11.3	$102.80
Park Maintenance Yard– Electricity				
	Per 1000 sq. ft.	0	0	$0.20
	Per hour of operation	0	0	$0.70
	Per occupant	0.5	5.3	$279.40
Street Division Facility– Electricity				
	Per 1000 sq. ft.	0	0	$0.30
	Per hour of operation	0	0	$2.10
	Per occupant	1.5	17.9	$853.00
Solid Waste				
Universal Waste Systems				
	Per employee	0.7	0	n/a
Sector Average				
	Per employee	1.4	0.7	n/a

Sources of Emissions 1990		Equiv CO_2 (tonnes)	Energy (MMBtu)	Cost ($)
Buildings and Facilities				
City Hall–Electricity				
	Per 1000 sq. ft.	0	0.1	$1.90
	Per hour of operation	0.2	1.6	$44.60
	Per occupant	4.5	32.9	$927.20
City Hall–Natural Gas				
	Per 1000 sq. ft.	0	0	$0.00
	Per hour of operation	0	0	$0.00
	Per occupant	0	0.1	$0.00
Memorial Center– Electricity				
	Per 1000 sq. ft.	0	0	$1.50
	Per hour of operation	0.1	0.7	$21.30
	Per occupant	7	51.1	$1,664.90
Memorial Center– Natural Gas				
	Per 1000 sq. ft.	0	0	$0.00
	Per hour of operation	0	0	$0.00
	Per occupant	0	0.4	$0.00
Park Maintenance Yard– Electricity				
	Per 1000 sq. ft.	0	0	$0.20
	Per hour of operation	0	0	$0.60
	Per occupant	1	7.2	$255.40
Street Division Facility– Electricity				
	Per 1000 sq. ft.	0	0	$2.00
	Per hour of operation	0	0	$1.80
	Per occupant	2.7	19.9	$759.60

Appendix E—Results from Employee Commute Survey

An employee commute survey was conducted for the years 2007 and 2005 in order to gather scope 3 GHG emissions based on vehicle miles traveled by employees. In 2007, there were approximately 300 full-time employees and 65 part time employees; however, only 288 employees that took the survey worked for the City in 2007 resulting in a 79% response rate. For 2005, there were 320 full-time employees and 50 part time employees; however, there were only 245 employees that took the survey who worked for the City in 2005 resulting in a 66.2% response rate. To capture the remaining VMT for the total number of employees that worked in those years, estimates were derived from the survey responses. Assumptions for the estimated portion include: employees drove alone in gasoline run passenger vehicles.[37]

Employee commute information is considered policy relevant and may be utilized to reduce GHG emissions through potential measures captured in the climate action plan. Additionally, this information may be useful for planning strategies to comply with SB 375.[38] For questions 5 and 15, the miles were grouped to identify individuals that were potential walkers, cyclists, carpools, public transit users, and vanpoolers: 0-1 (potential walkers), 2-3 miles (potential bicyclists; 4-8 miles (potential transit users); 9-19 (potential carpoolers); and 20-40 miles and above (long distance carpools and vanpools).

Based on information provided by respondents in the year 2007, 79% of employees traveled 1,149,717 vehicle miles. Within the 79% response rate, 9.0% of employees carpooled to the worksite, 46.2% of them were two-person carpools, and 22.2% of employees lived within a range of 4 to 8.9 miles from the worksite. Results from question 11 indicate 33.3% of all respondents who were surveyed are interested in participating in a ridesharing program.

In the year 2005, 66.2% of employees traveled 996,184 vehicle miles. Within the 66.2% response rate, 3.2% were in two person carpools and 29.4% of employees lived within a range of 4 to 8.9 miles.

A. 2007 Survey Results[39]

1. Employee Information

	Response Percent	Response Count
Name:	100.0%	291
Dept:	99.7%	290
answered question		291
skipped question		0

37 See appendix C to review details on estimated VMT.

38 See appendix F for description of the legislation.

39 Survey Monkey, an online survey website, was utilized to conduct the survey and generate graphs www.surveymonkey.com

2. What city did you live in?

	Response Percent	Response Count
City:	100.0%	291
ZIP Code:	100.0%	291
answered question		291
skipped question		0

Cities Listed in Survey:

Apple Valley, Arcadia, Bellflower, Brea, Calabasas Cali, Carson, Compton Corona, Costa Mesa, Culver City, Cypress, Downey, E Los Angeles, El Segundo, Fontana, Fountain Valley, Gardena, Harbor City, Hawthorne, Huntington Beach, Inglewood, La Habra, La Mirada, Laguna Niguel, Lancaster, Lawndale, Lomita, Long Beach, La Brea, Lakewood, Las Vegas,
Lawndale, Lennox, Lomita, Long Beach, Los Angeles, Manhattan Beach, Mission Viejo, Monterey Park, Moreno Valley, Norwalk, Orange, Paramount, Pasadena, Rancho Palos Verdes, Redondo Beach, Rialto, Riverside, Rosamondo, San Pedro,
Santa Monica, Studio City, Sunset Beach, Temecula, Temple City, Torrance, Trabuco Canyon, Venice West Los Angeles

3. Did you work for the city in 2007?

	Response Percent	Response Count
Yes	99.0%	288
No	1.0%	3
answered question		291
skipped question		0

4. What was your workweek schedule?

	Response Percent	Response Count
3/36 work week (2 days off)	12.4%	36
4/40 work week (1 day off)	13.4%	39
9/80 work week (1 day off every other week)	49.5%	144
Regular work week	5.2%	15
Part time work week	15.1%	44
Other (such as fire personnel compressed schedules)	5.2%	15
answered question		291

5. On average, how many miles did you travel to work round trip each day?

1,149,717 vehicle miles traveled represents a 79% response rate
(1,448,643 estimated total VMT based on number of full-time and part-time employees)

Commute distance range from worksite (one way)	Response Percent	Response Count
0-1.9 miles	6.9%	20
2-3.9 miles	8.7%	25
4-8.9 miles	22.2%	64
9-19.9 miles	20.3%	60
20-40.9 miles	21.2%	61
41 miles and above	20.1%	58
Number of respondents that worked for the city in 2007		288

6. On average, how many days a week did you...

Day(s) a week	1	2	3	4	5	6	7	Response Count
Drive alone to work?	5.1% (14)	4.7% (13)	16.1% (44)	11.5% (59)	50.4% (138)	1.1% (3)	1.1% (3)	274
Carpool/Vanpool to work?	26.9% (7)	19.2% (5)	11.5% (3)	11.1% (3)	26.9% (7)	3.8% (1)	0.0% (0)	26
Take public transportation to work?	30.0% (3)	10.0% (1)	20.0% (2)	0.0% (0)	40.0% (4)	0.0% (0)	0.0% (0)	10
Bicycle to work?	33.3% (3)	33.3% (3)	11.1% (1)	11.1% (1)	11.1% (1)	0.0% (0)	0.0% (0)	9
Walk to work?	33.3% (2)	33.3% (2)	16.7% (1)	0.0% (0)	16.7% (1)	0.0% (0)	0.0% (0)	6
Use another form of transportation to get to work?	50.0% (1)	0.0% (0))	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	2
Noncommuting (such as 24 shift where you sleep at station)?	16.7% (1)	83.3% (5)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	6
answered question								291
skipped question								0

7. If you carpooled/vanpooled, how many other people traveled with you on average? (including you)

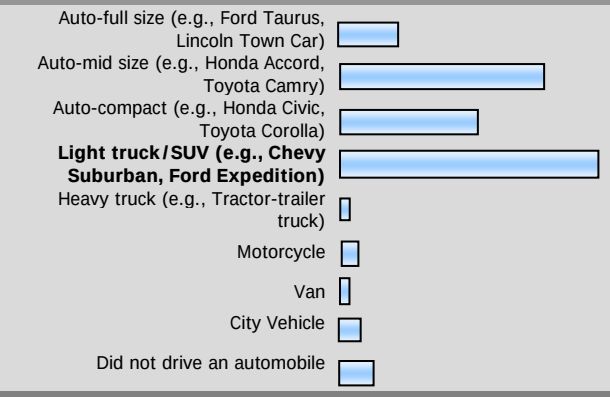
9.0% of respondents who worked for the city in 2007 participated in carpooling	Response Percent	Response Count
2 person	46.2%	12
3 person	11.5%	3
4 or more	43.3%	11
answered question		26

skipped question	262

8. If you used Public Transportation, what is the name of the public transit system?

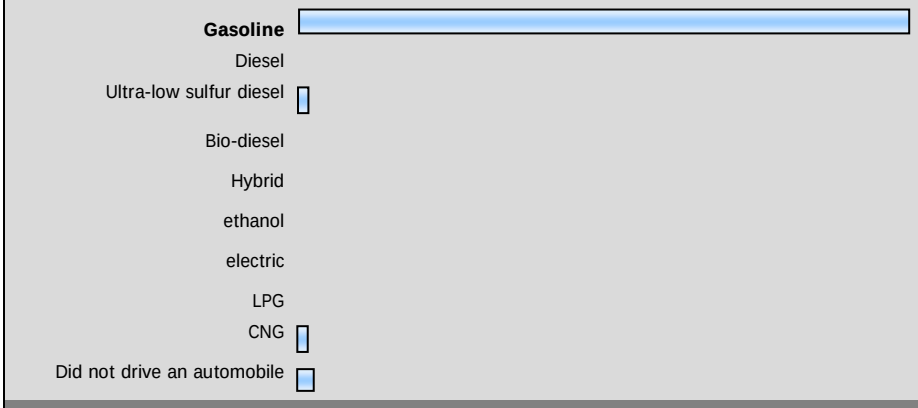
Metro, MTA, Freeway Flyer Bus, Torrance Transit	Response Count
	8
answered question	8
skipped question	283

9. If you drove, what type of vehicle did you drive most often?



	Response Frequency	Response Count
Auto-full size (e.g., Ford Taurus, Lincoln Town Car)	8.9%	26
Auto-mid size (e.g., Honda Accord, Toyota Camry)	26.8%	78
Auto-compact (e.g., Honda Civic, Toyota Corolla)	18.2%	53
Light truck/SUV (e.g., Chevy Suburban, Ford Expedition)	**36.4%**	**106**
Heavy truck (e.g., Tractor-trailer truck)	0.3%	1
Motorcycle	2.4%	7
Van	3.4%	10
City Vehicle	1.0%	3
Did not drive an automobile	3.4%	10
answered question		291
skipped question		0

10. For the vehicle you drove most often, what type of fuel does it use?



	Response Percent	Response Count
Gasoline	**92.6%**	**279**
Diesel	0.0%	0
Ultra-low sulfur diesel	0.3%	1
Bio-diesel	0.0%	0
Hybrid	0.0%	0
ethanol	0.0%	0
electric	0.0%	0
LPG	0.0%	0
CNG	0.3%	1
Did not drive an automobile	3.4%	10
answered question		

skipped question	0

11. Would you be interested in participating in a ridesharing program i.e., carpooling, vanpooling, walking, bicycling, or using public transit to commute to work?

	Response Percent	Response Count
Yes	33.3%	97
No	**66.7%**	**194**
answered question		291
skipped question		0

B. 2005 Survey Results

12. If you worked for the city in 2005, would you say your travel to work was about the same as 2007?

	Response Percent	Response Count
Yes—Skip the 2005 section and go to the end and hit done.	**68.9%**	**203**
No—Click next and complete information for 2005.	11.7%	34
Other—Did not work for the city in 2005, skip the 2005 section and go to the end and hit done.	18.3%	54
answered question		291
skipped question		0

13. What city did you live in?

	Response Percent	Response Count
City:	100.0%	35
ZIP Code:	98.0%	34
answered question		35
skipped question		256

Cities Listed in Survey:

Anaheim, Arcadia, Bell Gardens, Bellflower, Carson, Compton, El Segundo, Encino, Fountain Valley, Hawthorne, Huntington Beach, Lawndale, Lennox, Lomita, Long Beach, Los Angeles, Manhattan Beach, Orange County, Playa Del Rey, Redondo Beach, San Pedro, Santa Monica, Torrance, Whittier.

14. What was your workweek schedule?

	Response Percent	Response Count
3/36 work week (2 days off)	8.3%	3
4/40 work week (1 day off)	11.1%	4
9/80 work week (1 day off every other week)	**38.9%**	**14**
Regular work week	16.7%	6
Part time work	19.4%	7
Other (such as fire personnel compressed schedules)	5.6%	2
answered question		36
skipped question		255

15. On average, how many miles did you travel to work round trip each day?

996,184 vehicle miles traveled represents a 66.2% response rate
(1,504,238 estimated total VMT based on number of full-time and part-time employees)

Commute distance range from worksite (one way)	Response Percent	Response Count
0-1.9 miles	7.3%	18
2-3.9 miles	11.8%	29
4-8.9 miles	29.4%	72
9-19.9 miles	18.4%	45
20-40.9 miles	18.8%	46
40 miles and above	14.3%	35
Number of respondents that worked for the city in 2005		245

16. On average, how many days a week did you...

Day(s) a week	1	2	3	4	5	6	7	Response Count
Drive alone to work?	9.7% (3)	0.0% (0)	12.9% (4)	22.6% (7)	54.8% (17)	0.0% (0)	0.0% (0)	31
Carpool/Vanpool to work?	16.7% (1)	33.3% (2)	16.7% (1)	0.0% (0)	33.1% (2)	0.0% (0)	0.0% (0)	6
Take public transportation to work?	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0))	0.0% (0)	0.0% (0)	3
Bicycle to work?	50.0% (1)	0.0% (0)	0.0% (0)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Walk to work?	33.3% (0)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Use another form of transportation to get to work?	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Noncommuting (such as 24 shift where sleep at fire station)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
answered question								35
skipped question								256

17. If you carpooled/vanpooled, how many other people traveled with you on average? (including you)

3.3% of respondents who worked for the city in 2005 participated in carpooling	Response Percent	Response Count
2 person	100.0%	8
answered question		8
skipped question		283

18. If you used Public Transportation, what is the name of the public transit system?

Metro Bus, Carson Transit	Response Count
	1
answered question	2
skipped question	281

19. If you drove, what type of vehicle did you drive most often?

	Response Percent	Response Count
Auto-full size (e.g., Ford Taurus, Lincoln Town Car)	2.7%	1
Auto-mid size (e.g., Honda Accord, Toyota Camry)	24.3%	9
Auto-compact (e.g., Honda Civic, Toyota Corolla)	18.9%	7
Light truck/SUV (e.g., Chevy Suburban, Ford Expedition)	**35.1%**	**13**
Heavy truck (e.g., Tractor-trailer truck)	0.0%	0
Motorcycle	2.7%	1
Van	5.4%	2
City Vehicle	0.0%	0
Did not drive an automobile	10.8%	4
answered question		37
skipped question		254

20. For the vehicle you drove most often, what type of fuel does it use?

	Response Percent	Response Count
Gasoline	**89.9%**	**32**
Diesel	0.0%	0
Ultra-low sulfur diesel	0.0%	0
Bio-diesel	0.0%	0
Hybrid	0.0%	0
ethanol	0.0%	0
electric	0.0%	0
LPG	0.0%	0
CNG	0.0%	0
Did not drive an automobile	8.3%	3
answered question		36
skipped question		255

Appendix F—Climate Change Action

For reference, listed below are some of the key climate change policies that have been adopted at an international level as well as at State and Regional levels. [40]

AB 811, 2008—Gives counties and local governments authority to create benefit assessment districts which allow property owners to finance energy efficiency upgrades, such as solar panels, efficient air conditioning and ventilation systems, and tankless water heating equipment. Owners may enter a loan contract with a local government and pay it back through their property-tax bill. This legislation will help to reduce GHG emissions and stimulate energy efficiency upgrades.

SB 375 Steinberg, 2008—Advances the State's efforts to achieve the global warming goals consistent with AB 32. It aligns three critical policy areas of importance to local government: (1) regional long-range transportation plans and investments; (2) regional allocation of the obligation for cities and counties to zone for housing; and (3) a process to achieve greenhouse gas emissions reductions targets for the transportation sector.

SB 97 Dutton, 2007—States that GHGs and their effects are subject to the California Environmental Quality Act (CEQA). CEQA requires that agencies identify a given project's potentially significant effects on the environment and mitigate those significant effects whenever feasible. Public agencies such as local governments are therefore obligated to determine whether a given project's climate change-related impacts are significant and to mitigate any significant effects. CARB is responsible for recommending where the threshold of "significance" lies.

SB 107 Simitian, 2006—Requires investor-owned utilities (IOUs) to increase the share of renewable energy sources (e.g., wind, solar, geothermal) in their electricity mix to 20 percent by 2010. Known as the Renewables Portfolio Standard (RPS), the law is intended to decrease California's reliance on fossil fuel and reduce GHG emissions from the electricity sector. As of 2008, about 12 percent of California's electricity demand is met with renewable resources. Governor Schwarzenegger has since called for 33 percent of California's electricity to be provided by renewable sources by 2020.

AB 32 Nunez & Pavley, 2006– Institutes a mandatory limit on greenhouse gas emissions -- reducing emissions in California to 1990 levels by the year 2020 below forecasted levels. The bill also directs the California Air Resources Board (CARB) to establish a mandatory reporting system to track and monitor emission levels and requires CARB to develop various compliance options and enforcement mechanisms.

U.S. Mayors' Climate Protection Agreement, 2005—Creates a commitment to strive to meet or beat, by 2012, the Kyoto Protocol target of a seven percent reduction in greenhouse gas emissions below 1990 levels. The agreement was initiated by Seattle Mayor Greg Nickels.

AB 1493 Pavley, 2002—Requires the State Air Resources Board to develop and adopt regulations that achieve the maximum feasible reduction of greenhouse gases from vehicles primarily used for non-commercial transportation by January 2005.

40 The California Air Resources Board website was a source of information for the legislation listed above. To find more information on the legislation visit the website at http://www.arb.ca.gov/cc/cc.htm. For more information on the U.S. Mayors' Climate Protection Agreement visit their website at http://usmayors.org/climateprotection/agreement.htm. To learn more about AB 811 visit the Los Angeles County website at http://portal.lacounty.gov/wps/portal/lac/home.

Kyoto Protocol 1997—A protocol to the United Nations Framework Convention on Climate Change (UNFCC) requiring industrialized nations to reduce their collective greenhouse gas emissions 5.2% below 1990 levels. As of January 2007, 162 countries have ratified the Protocol, with the United States and Australia most notably absent from the list.

Rio Earth Summit in 1992—Created the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC is a milestone treaty on Climate Change that provides an overall framework for international efforts to mitigate climate change.

Appendix G—Abbreviations and Acronyms[41]

Btu	British thermal unit
CH4	methane
CO	carbon monoxide
CO2	carbon dioxide
CO2e	carbon dioxide equivalent
FE	Fuel Economy
GHG	greenhouse gas
HFC	hydrofluorocarbon
MMBtu	1 million British thermal unit
NOx	oxides of nitrogen
N2O	nitrous oxide
PFC	perfluorocarbon
PM10	particulate matter smaller than ten microns in diameter
SF6	sulfur hexafluoride
SOx	sulfur oxides
VOC	volatile organic compounds

Appendix H—Glossary of Terms[42]

Activity data	Data on the magnitude of a human activity resulting in emissions taking place during a given period of time. Data on energy use, fuel used, miles traveled, input material flow, and product output are all examples of activity data that might be used to compute GHG emissions.
Base year	A specific year against which an entity's emissions are tracked over time.
Base year emissions	GHG emissions in the base year.
Boundaries	GHG accounting and reporting boundaries can have several dimensions, i.e., organizational, operational and geographic. These boundaries determine which emissions are accounted for and reported by the entity.
Biogenic emissions from combustion	CO2 emissions produced from combusting a variety of biofuels and biomass, such as biodiesel, ethanol, wood, wood waste and landfill gas.
Calendar year	The time period from January 1 through December 31.
Carbon dioxide (CO2)	The most common of the six primary GHGs, consisting of a single carbon atom and two oxygen atoms, and providing the reference point for the GWP of other gases. (Thus, the GWP of CO2 is equal to 1.)

41 Abbreviations and acronyms are from the Local Government Operations Protocol, version 1.0

42 Definition are from the Local Government Operations Protocol, version 1.0 and ICLEI's Cities for Climate Protection Milestone Guide.

CO2 equivalent (CO2e)	The universal unit for comparing emissions of different GHGs expressed in terms of the GWP of one unit of carbon dioxide.
Control approach	An emissions accounting approach for defining organizational boundaries in which an entity reports 100 percent of the GHG emissions from operations under its financial or operational control.
Criteria Air Pollutants	The term criteria air pollutants refers to pollutants that are regulated under the U.S. Clean Air Act. As with carbon dioxide, the major sources of these pollutants are fossil fuels. Most measures that reduce carbon dioxide emissions also reduce criteria air pollutants. Criteria air pollutants include nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide (CO), sulfur oxides (SOx), and particulate matter smaller than ten microns in diameter (PM-10). The CACP software provides estimated emissions of CAPs as well as GHGs for emissions analyses and reduction benefits of measures.
Direct emissions	Emissions from sources within the reporting entity's organizational boundaries that are owned or controlled by the reporting entity, including stationary combustion emissions, mobile combustion emissions, process emissions, and fugitive emissions. All direct emissions are Scope 1 emissions, with the exception of biogenic CO2 emissions from biomass combustion.
Emission factor	A unique value for determining an amount of a GHG emitted on a per unit activity basis (for example, metric tons of CO2 emitted per million Btus of coal combusted, or metric tons of CO2 emitted per kWh of electricity consumed).
Facility	Any property, plant, building, structure, stationary source, stationary equipment or grouping of stationary equipment or stationary sources located on one or more contiguous or adjacent properties, in actual physical contact or separated solely by a public roadway or other public right-of way, and under common operational or financial control, that emits or may emit any greenhouse gas.
Global warming potential (GWP)	The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one mass-based unit of a given G GHG compared to one equivalent unit of carbon dioxide (CO2) over a given period of time.
Greenhouse gases (GHGs)	For the purposes of this Protocol, GHGs are the six gases identified in the Kyoto Protocol: carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).
Indirect emissions	Emissions that are a consequence of activities that take place within the organizational boundaries of the reporting entity, but that occur at sources owned or controlled by another entity. For example, emissions of electricity used by a manufacturing entity that occur at a power plant represent the manufacturer's indirect emissions.
Inventory	A comprehensive, quantified list of an organization's GHG emissions and sources.

Inventory boundary	An imaginary line that encompasses the direct and indirect emissions included in the inventory. It results from the chosen organizational and operational boundaries.
Methane (CH4)	One of the six primary GHGs, consisting of a single carbon atom and four hydrogen atoms, possessing a GWP of 21, and produced through the anaerobic decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.
Metric ton (MT, tonne)	Common international measurement for the quantity of GHG emissions, equivalent to about 2,204.6 pounds or 1.1 short tons.
Mobile combustion	Emissions from the combustion of fuels in transportation sources (e.g., cars, trucks, buses, trains, airplanes, and marine vessels) and emissions from non-road equipment such as equipment used in construction, agriculture, and forestry. A piece of equipment that cannot move under its own power but that is transported from site to site (e.g., an emergency generator) is a stationary, not a mobile, combustion source.
Nitrous oxide (N2O)	One of the six primary GHGs, consisting of two nitrogen atoms and a single oxygen atom, possessing a GWP of 310, and typically generated as a result of soil cultivation practices, particularly the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.
Operational boundaries	The boundaries that determine the direct and indirect emissions associated with operations within the entity's organizational boundaries.
Operational control	Full authority to introduce and implement operating policies at an operation.
Organizational boundaries	The boundaries that determine the operations owned or controlled by the reporting entity, depending on the consolidation approach taken.
Perfluorocarbons (PFCs)	One of the six primary GHGs, consisting of a group of man-made chemicals composed of one or two carbon atoms and four to six fluorine atoms, containing no chlorine. Originally introduced as alternatives to ozone depleting substances, PFCs have few commercial uses and are typically emitted as by-products of industrial and manufacturing processes. PFCs have very high GWPs and live a long time in the atmosphere.
Scope	Defines the operational boundaries in relation to indirect and direct GHG emissions.
Scope 1 emissions	All direct GHG emissions, with the exception of direct CO2 emissions from biogenic sources.
Scope 2 emissions	Indirect GHG emissions associated with the consumption of purchased or acquired electricity, heating, cooling, or steam.
Scope 3 emissions	All indirect emissions not covered in Scope 2. Examples include upstream

	and downstream emissions, emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, use of sold products and services, outsourced activities, recycling of used products, waste disposal, etc.
Stationary	Neither portable nor self propelled, and operated at a single facility.
Stationary combustion	Emissions from the combustion of fuels to produce electricity, steam, heat, or power using equipment (boilers, furnaces, etc.) in a fixed location.
Sulfur hexafluoride (SF6)	One of the six primary GHGs, consisting of a single sulfur atom and six fluoride atoms, possessing a very high GWP of 23,900, and primarily used in electrical transmission and distribution systems.
Therm	A measure of one hundred thousand (10^5) Btu.