
City of Carson



Municipal Greenhouse Gas Emissions Inventory Report

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City of Carson GHG Emissions 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" pledge³ including the City of Carson. 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 Carson will take to reduce its impact on the

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.iclei.org/about-iclei/iclei-by_region/california-region

environment and promote change within the community.

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.

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.

The City gathered information from a variety of sources, including consumption data from utility companies, fuel data 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 traveled⁸ 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 Report⁹ 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 coefficients¹¹ 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 (CO₂e).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 alternative 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 Carson generated approximately 7,508 metric tons of CO₂e in the baseline year, 2005; this amount is equivalent to the GHG emissions generated from the electricity use of 1,041 homes for one year.¹⁴
- There was an overall 9.3% decrease in GHG emissions between the baseline year 2005 and the interim year

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.

2007. This was largely due to scope 1 and 3 fuel sources.

- Emissions resulting from electricity use decreased 7.1% and emissions resulting from natural gas consumption decreased 2.2% between the years 2005 and 2007.
- Results from the employee commute survey indicate 42.2% of respondents are interested in participating in a ridesharing program.
- Under a business-as-usual scenario, the City can expect emissions to rise to 7,122 metric tons of CO₂e by 2012 that is equivalent to the annual GHG emissions from 1,362 passenger vehicles; and 7,331 metric tons of CO₂e by 2015, equivalent to the annual GHG emissions from 1,402 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 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 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 City of Carson was incorporated on February 20, 1968 and later adopted the City motto of "Future Unlimited." Carson is located in the South Bay area of Los Angeles County and covers approximately 20 square miles.

Carson is a general law city with a council-city manager form of government. The City Council serves as the governing and policy making body of the City. The City Council appoints a City Manager to serve as the chief administrative officer of the City. The City Manager acts as the chief advisor to the City Council; implements City Council decisions; acts as liaison between City Council and other agencies; and directs and coordinates the City resources and workgroups. The City's resources are administered by the City Manager and have been organized around four major workgroups: Economic Development, Development Services, Public Services and Administrative Services.

The City of Carson has been incorporating "green" practices for several years. The process to create a citywide comprehensive program began in 2007 when the Environmental Commission recommended that the city become part of the Sierra Club's "Cool Cities" Campaign to solve global warming. As a result of the City Council's endorsement of the U.S. Mayors Climate Protection Agreement, city staff began efforts to reduce the City's greenhouse gas emissions and formed a "Green Task Force" composed of the City Manager, General Managers, and key staff members who would be in the position to identify the city's current "green" programs, assist with the emissions inventory, and create an environmental action plan for the City.

Local Government History

Almost 200 years after the founding of Rancho San Pedro the citizens of the land voted to officially incorporate their community as an independent city on Tuesday, February 6, 1968. Voters were offered two choices on the City's name: Carson and Dominguez, the two leading family names in the history of Rancho San Pedro. By a narrow vote of just 318 votes, the citizens chose the name Carson. Voters also elected the first Carson City Council on that Tuesday in 1968: the first Mayor of Carson along with four other Council members.

Prior to incorporation, when essential facilities were needed in the South Bay, Carson, an unincorporated area with little political representation, often ended up as the dumping ground of its neighbors. Many of the prime building sites in Carson have a previous history as landfills or former refineries. By the time Carson incorporated as a city, its landscape was pockmarked with dozens of refuse dumps, landfills, and auto dismantling plants. The City's history since 1968 has, to a large extent, been the history of struggling to deal with problems caused by late incorporation. Following its incorporation, Carson closed down most of the unwanted facilities that had been foisted upon the city in the past. The City has been successful in reclaiming many areas formerly considered unusable. As a result of enforcing a strict building and landscaping code and working to attract successful new commercial ventures, most of the heavy industry of the past has been replaced. Beautification efforts by the city have resulted in numerous landscaped center medians, lighting projects, street improvements and public parks.

Primary Services

Department	Primary Services
Administration	City Council, City Manager, City Clerk, City Attorney, Finance and Human Resources.
Police Department	Contracted with Los Angeles County Sheriff's Department
Fire Services	Contracted with Los Angeles County Fire Department
Development Services	The Development Services Group is responsible for the management, administration and oversight of the engineering, public works, transportation, building and safety, and safety operations of the City. These divisions are responsible for the design, construction, operation and maintenance of the City's infrastructure system as well as the processing of entitlements for all private development.
Economic Development Services	The Economic Development Services Group is responsible for the daily operations of the Planning Division, Redevelopment Agency, Business Development, Job Development and Housing and Community Development Block Grant programs.

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 CO₂-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 approach¹⁷ 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 emissions 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 providers (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 CO₂-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

¹⁵ Each greenhouse gas has a different global warming potential based on its ability to trap heat in the atmosphere, CO₂e 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.

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.

In 2005, the City of Carson GHG emissions totaled 7,508 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 1,041 homes for one year. Looking at the scopes within the table, the smallest portion 20.4% (scope 1 total) were emissions generated from a combination of natural gas use for buildings and facilities and from fuels for the vehicle fleet. Emissions emitted from electricity use accounted for 37.9% (scope 2 total) of the total emissions. The largest portion 41.8% (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, City of Carson used 9,343,142 kWh of electricity at a cost of \$1,027,166. In this same year, the City consumed 100,215 therms of natural gas costing \$100,382.

Table 1. Municipal Inventory Summary 2005¹⁹

Carson 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	533	7.1%	Natural Gas	100,215 therms	\$ 100,382	10,021
Emergency Generators	0	0.0%	Diesel	20 gallons	-	3
City Vehicle Fleet						
City Vehicle Fleet	1,001	13.3%	-	-	-	13,936
	726		Gasoline	80,708 gallons	-	10,026
	234		Diesel (ULSD)	23,088 gallons	-	3,202
	4		LPG	700 gallons	-	64
	37		CNG	5,185 gal equiv.	-	644
Total Scope 1 Emissions	1,534	20.4%	-	-	\$ 100,382	23,960
Scope 2 Emissions						
Buildings & Facilities						
Buildings & Facilities ²⁰	1,801	24%	Electricity	5,926,851 kWh	\$ 668,058	20,424
Streetlights & Traffic Signals						
Traffic Signals/Controllers	170	2.3%	Electricity	560,234 kWh	\$ 66,580	1,912
Streetlights ²¹	613	8.2%	Electricity	2,019,871 kWh	\$217,988	6,894
Park Lighting ²²	218	2.9%	Electricity	718,653 kWh	\$42,528.95	2,453
Water Delivery						
Sprinkler/Irrigation Control	35	0.5%	Electricity	113,970 kWh	\$27,897.85	398
Water Pumps	1	0.0%	Electricity	3,563 kWh	\$ 4,113.60	12
Total Scope 2 Emissions	2,838	37.9%	-	9,343,142 kWh	\$ 1,027,166	32,093

¹⁹ 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.

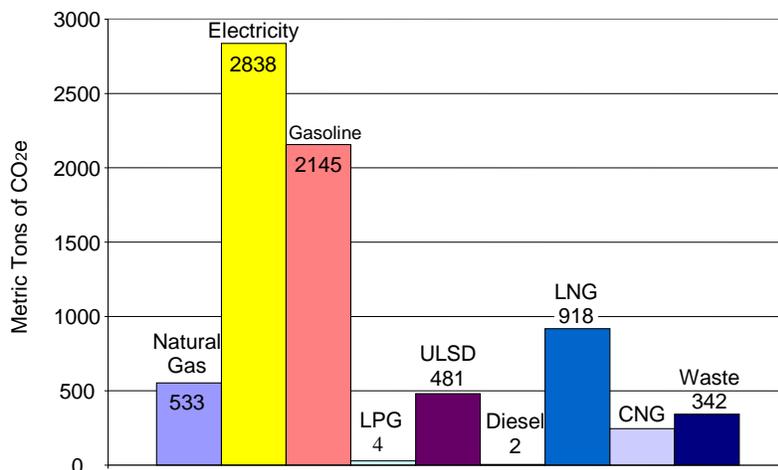
²¹ City owned streetlights and Southern California Edison owned streetlights have been combined in the total shown here. See appendix D, Emissions Data, to review individual emissions in the Streetlights and Traffic Signals category.

²² Park lighting includes area and outdoor lighting for parks.

Scope 3 Emissions						
Employee Commute						
Employee Commute	1,391	18.5%	-	2,683,517 VMT	n/a	19,178
	1,386		Gasoline	2,676,223 VMT	-	19,107
	2		Diesel	2,830 VMT	-	26
	3		CNG	4,464 VMT	-	45
Vehicles—Contract Service Providers						
Contract Service Vehicles	1,403	18.7%	-	-	n/a	18,513
	33		Gasoline	3,616 gallons	-	449
	247		Diesel (ULSD)	24,321 gallons	-	3,373
	918		LNG	189,858 gallons	-	11,177
	205		CNG	28,288 gal equiv.	-	3,514
Solid Waste						
Waste	342	4.6%	-	1,347.70 tons	n/a	n/a
Total Scope 3 Emissions	3,136	41.8%	-	-	-	37,691
Total Emissions	7,508	100%	-	-	\$ 1,127,548	93,744

Figure 1 illustrates emissions by source. Electricity was the highest source of emissions followed by gasoline. Waste resulted in the sixth largest source of emissions. It was estimated that 1,347.70 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 18.7% of emissions are from contract service vehicles that work within the City’s boundaries, 4.6% from waste, and 18.5% 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 64.9% of emissions and scope 1 emissions from fuel and natural gas sources accounts for the remaining 35.1% of emissions.

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

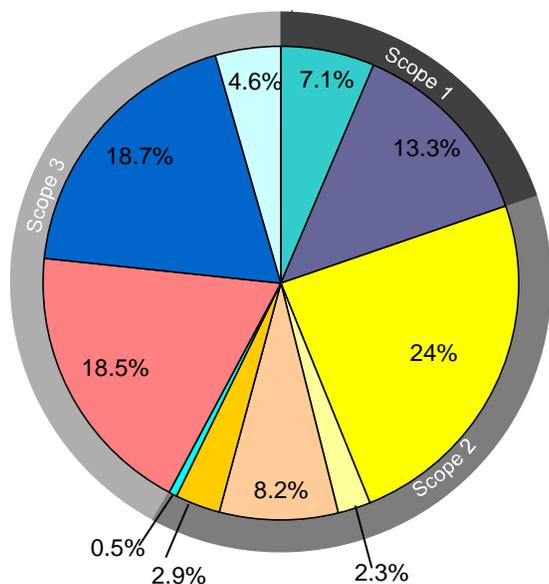
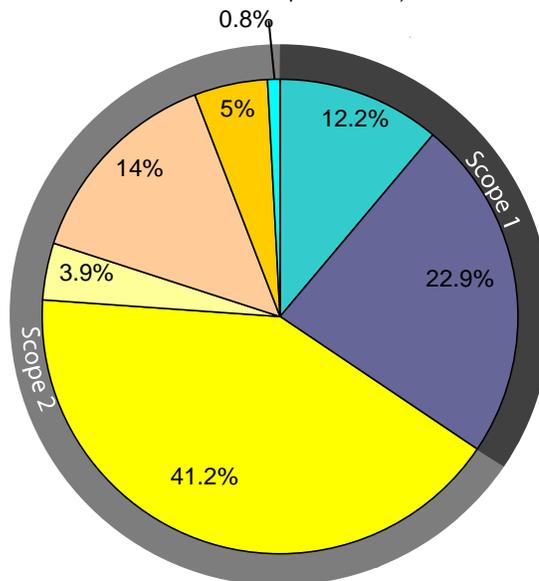


Figure 3. Emissions by Sector 2005
(including only direct and indirect sources from scopes 1 and 2)



Buildings & Facilities (natural gas)	City Vehicle Fleet	Buildings & Facilities (electricity)	Traffic Signals & Controllers
Streetlights	Parking Lighting	Sprinkler/Irrigation Control	Water Pump
Employee Commute	Contract Providers	Waste	

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 Carson GHG emissions totaled 6,805 metric tons of CO₂e including both direct and indirect sources of emissions—this number is equivalent to the emissions produced from 772,418 gallons of gasoline consumed. The year 2007 represents a 9.3% decrease in emissions from the baseline year. Looking at the scopes within the table, emissions generated from natural gas and fuel sources accounted for 20.5% (scope 1 total) of the emissions inventoried in 2007. Emissions from electricity use decreased from the baseline year contributing 38.8% (scope 2 total) to the total emissions. The largest portion of emissions came from a combination of employee commuting, contract service vehicles, and waste at 40.8% (scope 3 total).

In 2007, the City of Carson used 9,009,631 kWh of electricity costing approximately \$1,202,389. In this same year, the City consumed 98,149 therms of natural gas at a cost of \$97,460.

Table 2. Municipal Inventory Summary 2007²³

Carson Municipal GHG Emissions 2007						
Sector	MT CO ₂ e	Percent CO ₂ e (% CO ₂ e)	Source	Energy/Fuel Use	Energy/Fuel Use Cost	Energy Equivalent (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities	521	7.7%	Natural Gas	98,149 therms	\$97,460	9,795
Emergency Generators	0	0.0%	Diesel	20 gallons	-	3
City Vehicle Fleet						
City Vehicle Fleet	869	12.8%	-			12,128
	611		Gasoline	68,040 gallons	-	2,968
	217		Diesel (ULSD)	21,405 gallons	-	8,452
	4		LPG	700 gallons	-	64
	37		CNG	3,474 gal equiv.	-	644
Total Scope 1 Emissions	1,390	20.5%	-	-	\$97,460	21,926
Scope 2 Emissions						
Buildings & Facilities						
Buildings & Facilities ²⁴	1,658	24.4%	Electricity	5,673,224 kWh	\$773,200	19,328
Streetlights & Traffic Signals						
Traffic Signals/Controllers	143	2.1%	Electricity	487,502 kWh	\$67,906	1,664
Streetlights ²⁵	599	8.8%	Electricity	2,047,301 kWh	\$274,767	6,987
Park Lighting ²⁶	209	3.1%	Electricity	714,964 kWh	\$56,147	2,440
Water Delivery						
Sprinkler/Irrigation Control	24	0.4%	Electricity	83,424 kWh	\$26,836	285
Water Pumps	1	0.0%	Electricity	3,216 kWh	\$3,533	11
Total Scope 2 Emissions	2,634	38.8 %	-	9,009,631 kWh	\$1,202,389	30,715
Scope 3 Emissions						
Employee Commute						
Employee Commute	1,333	19.6%	-	2,595,612 VMT	n/a	18,433
	1,328		Gasoline	2,588,055 VMT	-	18,356
	2		Diesel	3,092 VMT	-	32
	3		CNG	4,464 VMT	-	45
Vehicles—Contract Service Providers						
Contract Service Vehicles	1,091	16%	-	-	n/a	14,411
	37		Gasoline	4,061 gallons	-	504
	45		Diesel (ULSD)	4,394 gallons	-	609
	804		LNG	166,358 gallons	-	9,784
	205		CNG	28,288 gal equiv.	-	3,514
Solid Waste						
Waste	357	5.2%	-	1,409.26 tons	n/a	n/a
Total Scope 3 Emissions	2,781	40.8%	-	-	-	32,844
Total Emissions	6,805	100%	-	-	\$1,299,849	85,485

23 See appendix D, Emissions Data, to review individual energy use and cost per item.

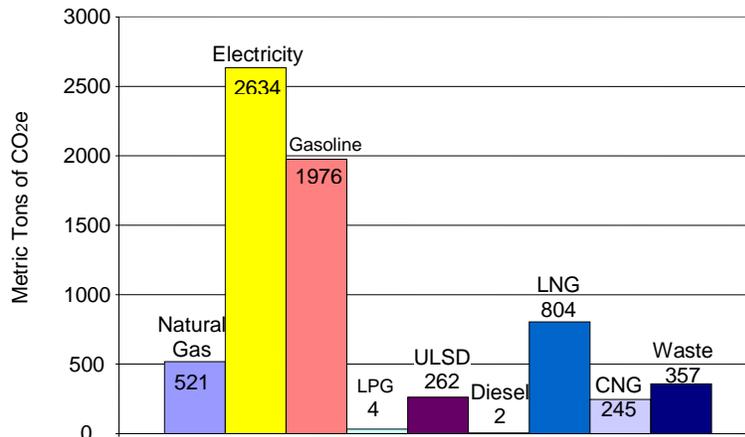
24 Building & Facility accounts may include lights and water delivery devices located on the same metered account.

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

26 Park lighting includes area and outdoor lighting for parks.

Figure 4 shows an increase in emissions from waste. Emission sources from electricity, natural gas, gasoline, LNG, and ULSD decreased while CNG, diesel, and LPG fuel sources remained the same. It was estimated that 1,409.26 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 19.6% of emissions are from contract service vehicles, 5.2% from waste, and 16% of emissions resulted from employee commuting. Figure 6 shows electricity in scope 2 accounts for 65.5% of emissions and fuels and natural gas from scope 1 contributed to the remaining 34.6% of emissions.

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

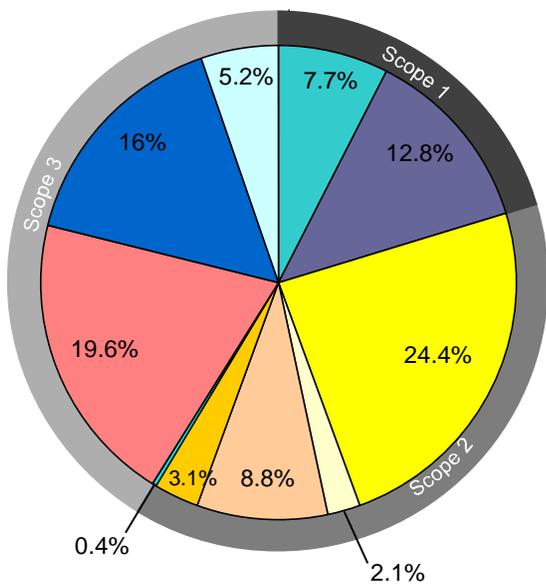
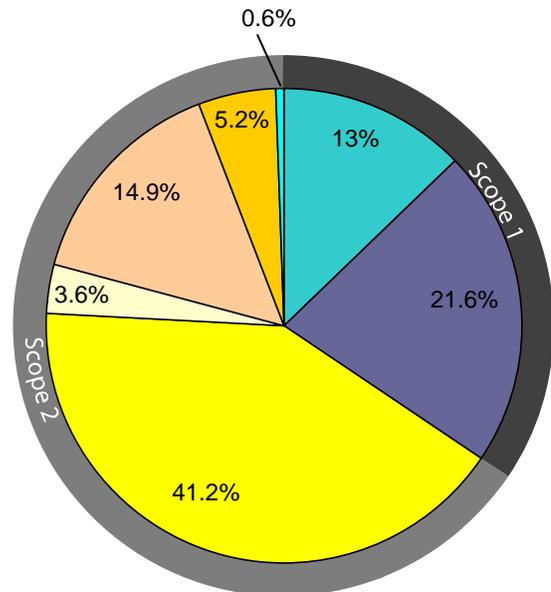


Figure 6. Emissions by Sector 2007
(including only direct and indirect sources from scopes 1 and 2)



Buildings & Facilities (natural gas)	City Vehicle Fleet	Buildings & Facilities (electricity)	Traffic Signals & Controllers
Streetlights	Parking Lighting	Sprinkler/Irrigation Control	Water Pump
Employee Commute	Contract Providers	Waste	

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.²⁷ 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 than 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 4,558 metric tons of CO₂e, as shown in Table 3. This number is equivalent to the annual GHG emissions from 835 passenger vehicles. Looking at the scopes within the table, emissions emitted from electricity use accounted for 71.2% (scope 2 total) of the total. Emissions generated by employee commuting contributed 28.7% (scope 3 total) to the remaining total.

Table 3. Municipal Inventory Summary 1990²⁸

Carson Municipal GHG Emissions 1990						
Sector	MT CO ₂ e	Percent CO ₂ e (% CO ₂ e)	Source	Energy/Fuel Use	Energy/Fuel Use Cost	Energy Equivalent (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities ²⁹	1	0.0%	Natural Gas	277 therms	n/a	28
Total Scope 1 Emissions	1	0.0%	-	277 therms	-	28
Scope 2 Emissions						
Buildings & Facilities						
Buildings & Facilities ³⁰	2,438	50.5%	Electricity	5,623,766 kWh	\$563,943.23	17,699
Streetlights & Traffic Signals						
Traffic Signals/Controllers	707	14.7%	Electricity	1,504,942 kWh	\$156,025.76	5,136
Park Lighting	274	5.7%	Electricity	582,286 kWh	\$65,524.62	1,987
Water Delivery						
Sprinkler/Irrigation Control	12	0.2%	Electricity	25,895 kWh	\$8,238.76	88
Water Pumps	7	0.1%	Electricity	15,119 kWh	\$1,993.81	52
Total Scope 2 Emissions	3,438	71.2%	-	7,752,008 kWh	\$795,726.18	24,962
Scope 3 Emissions						
Employee Commute						
Employee Commute	1,119	28.7%	Gasoline	1,962,981 VMT	n/a	15,294
Total Scope 3 Emissions	1,119	28.7%	-	-	-	15,294
Total Emissions³¹	4,558	100%	-	-	\$795,726.18	40,284

27 See LGOP inventory guidelines, page 12.

28 See appendix D, Emissions Data, to review individual energy use and cost per item.

29 Southern California Gas located some records that go back to 1990 which was the basis for the gas information provided for 1990.

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

31 The summed total shown here does not reflect the total emissions emitted in the year 1990 as not all of the data from 1990 was available.

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 17.4%. Improvements shown in buildings and facilities may be the result of energy efficiency technology upgrades. Emissions from employee commuting increased 23.8%.³²

From 2005 to 2007 overall emissions from electricity use decreased 7.1%. Emissions from natural gas use decreased by 2.2% (refer to appendix D, to review energy use per building). Fleet source emissions from gasoline and diesel decreased while emissions from CNG and LPG remained the same. Fuel sources from contract service vehicles decreased with the exception of gasoline sources which increased by 12.1%. Employee commute emissions decrease 4.1% and emissions from waste sources increased 4.3%.

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

Electricity	MTCO ₂ e 1990	MT CO ₂ e 2005	Percentage Change	MT CO ₂ e 2005	MT CO ₂ e 2007	Percentage Change
Buildings & Facilities	2,438	1,801	-26.1%	1,801	1,658	-7.9%
Traffic Signals & Controllers	707	170	-75.9%	170	143	-15.8%
Streetlights	-	613	-	613	599	-2.2%
Park Lighting	274	218	+20.4%	218	209	-4.1%
Sprinkler/Irrigation Control	12	35	+191.6%	35	24	-31.4%
Water Pumps	7	1	-85.7%	1	1	-
Total	3,438	2,838	-17.4%	2,838	2,634	-7.1%
Natural Gas						
Buildings & Facilities	1	533	-	533	521	-2.2%
Fuel						
Gasoline, City Fleet	-	726	-	726	611	-15.8%
Diesel (ULSD), City Fleet	-	234	-	234	217	-7.2%
CNG, City Vehicle Fleet	-	37	-	37	37	-
LPG, City Vehicle Fleet	-	4	-	4	4	-
Gasoline, Contract Services	-	33	-	33	37	+12.1%
Diesel, Contract Services	-	247	-	247	45	-81.7%
LNG, Contract Services	-	918	-	918	804	-12.4%
CNG, Contract Services	-	205	-	205	205	-
Gasoline, Employee Commute	1,119	1,386	+23.8%	1,386	1,328	-4.1%
Diesel, Employee Commute	-	2	-	2	2	-
CNG, Employee Commute	-	3	-	3	3	-
Waste						
Waste Management	-	342	-	342	357	+4.3%

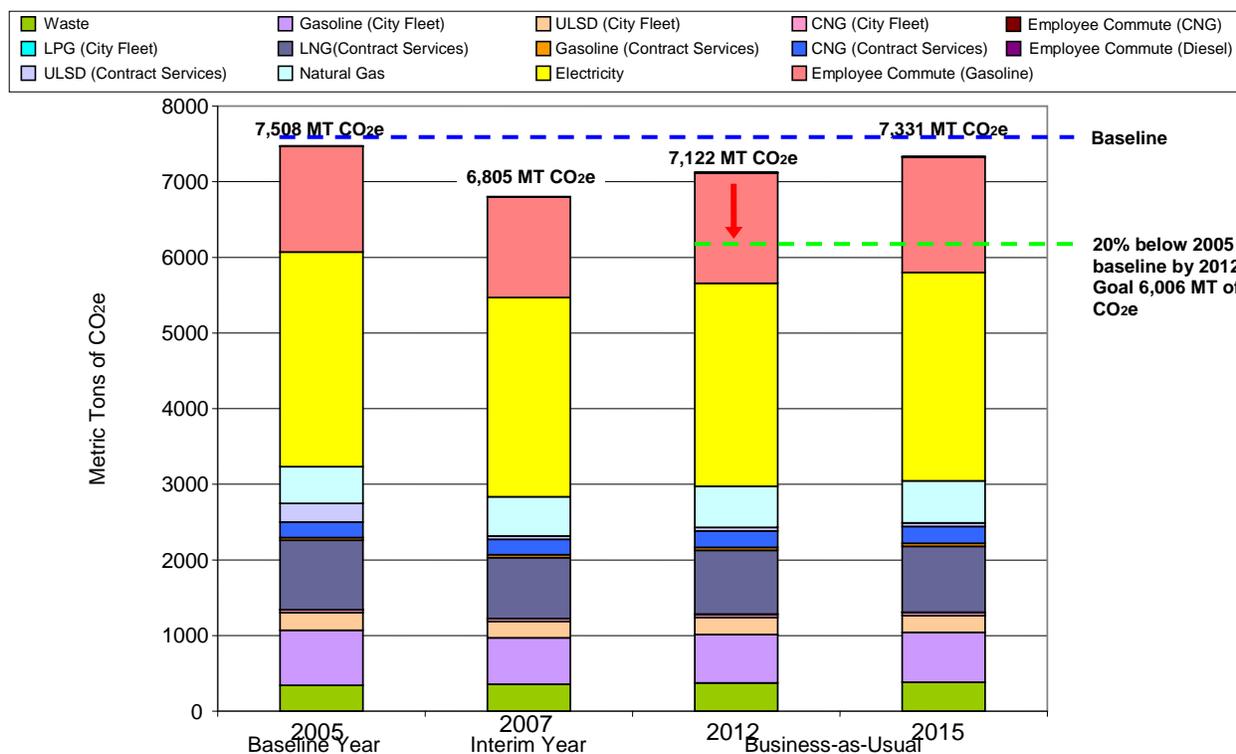
³² Employee commute estimates were based on the number of staff employed by the city in 1996 (proxy year data) and the average annual VMT from the 2005 survey responses (refer to appendix C, for additional information).

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 7,122 metric tons of CO₂e by 2012 and 7,331 metric tons of CO₂e 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 6,006 metric tons of CO₂e.

Figure 7. Business-as-Usual Forecast³³



³³ 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 CO₂e 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 Carson 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

Compressed workweek schedule: City hall is closed every Friday to contribute to energy conservation and cost savings at facilities.

Lighting retrofit: Energy efficient LED bulbs are used for holiday street lighting and the City Hall perimeter. All down lights at City Hall have been retrofitted, and t-8 lamps have been added in the City Hall basement offices.

Operations upgrades: Modifications to City operations include updating pool systems to eliminate 24 hour running of pool equipment, installation of vending machine controllers to eliminate 24-hour operation of air conditioning and lights on machines, and the upgrade of 80% of back-pack blowers to low frequency (low emission units through the AQMD). In addition, staff has been educated to turn off lights, computers, and any other equipment when not in use. Future upgrades include traffic light synchronization to minimize traffic idling, and the installation of solar panels on the roof of the City's Community Center. The City also plans to obtain an updated energy audit so that the City can take advantage of the newest products and information on the market today.

LED Traffic Signals: Conversion of all of the traffic signal lights to LED (light emitting diodes), which use less than half the electrical power as compared to conventional light bulbs.

Energy Manager Position: Develop an Energy Manager position in the City to handle the upcoming shortages of all utilities.

B. Solid Waste and Recycling

Recycled Waste: The City's recycling efforts are comprehensive and include residential curbside recycling, commercial recycling, and green waste and composting. Like solid waste, virtually all of the City's recycled waste is managed through a contract with Waste Management.

Residential Waste Collection: A 3-cart service wherein Waste Management provides residents with three sorting containers for trash, green waste, and recyclables.

Hazardous Waste: On its website, the City highlights locations and opportunities for residents and businesses to dispose of household hazardous waste (HHW) and electronic waste (E-waste). The City promotes the use of the S.A.F.E. Collection Center in San Pedro for hazardous materials that residents wish to dispose.

Public Recycling Bins: Outdoor recycling containers have been implemented in five city parks.

Office Products: The City utilizes office supplies that are mainly recycled, eco-friendly, and biodegradable including recycled copier paper, hand towels, custodial and other office products. Paper recycling bins are provided for one wing of City Hall. Additional work stations at City Hall, Corporate Yard, and the Community Center have been identified for recycling container implementation.

C. Sustainable Development

Programs: Existing programs include the Carson Street Master Plan and the adoption of the Los Angeles County's Green Building Program is also proposed.

Street Improvements and Rehabilitation: The Public Works Department utilizes Rubberized Asphalt (ARHM) for the overlaying of finished surface in all rehabilitated streets. The design mix for this Asphalt Concrete (A.C.) includes recycled crumb rubber from recycled tires. Rubberized Slurry Seal (REAS) is also used for surface treatment in all recommended streets to extend the life expectancy of the existing pavement. The design mix for this Slurry includes recycled crumb rubber from recycled tires. If recommended by a project soil engineer, use of Full Depth Reclamation (FDR) procedure for streets reconstruction sections is also encouraged. This method allows the recycling in place of existing street pavement sections including a portion of the sub grade and reuses the same materials after utilizing a mixing treatment with cement or asphalt, and is then used as a new street section, then overlaid with rubberized asphalt (ARHM). The benefits of this method include minimizing earth moving (excavation, hauling), reducing landfill disposal, and utilization of existing materials which reduces the need for new resources.

New Buildings: Current and future public and private buildings will include design criteria specified by a Leadership in Energy and Environmental Design (LEED) certification. Current LEED certified buildings include a British Petroleum office building, Watson Land Company headquarters and industrial buildings, and the City's proposed Corporate Yard.

Street Lighting: The City proposes to utilize solar power for street lighting.

Products and Services: The City's Graffiti and Paint crews have converted to Eco-friendly paints. Future proposals include electronic paychecks and increased electronic services such as payments via the City's website.

D. Urban Forests

Pesticides: The City has currently eliminated all toxic, non-environmental pesticides and now utilizes "Eco-Smart" insect spray that meets the Natural Organic program guidelines.

Carson Xeriscape Drought Tolerant Garden: In 1994, the City was recognized with an award from the American Planning Association, for the establishment of the City's Xeriscape Drought Tolerant Garden.

Community Gardens: Future proposals include establishment of community gardens.

E. Water Usage and Conservation

Water Conservation Ordinance: The City is proposing a new Water Conservation Ordinance. The ordinance places restrictions, such as limited watering hours on residents and businesses as well as additional restrictions for different drought response levels.

Building and Landscaping Upgrades: Smart irrigation controllers are currently utilized for City landscaping areas to allow the City to be more precise with the watering schedule. The City has installed Cal-sense irrigation system. With this system in place, a 30% reduction of overall water use is projected. To the extent possible, the City's landscaped areas utilize drought tolerant plants to save water.

Street Improvements and Rehabilitation: The Public Works Department recommends installation of reclaimed (recycled) water irrigation systems in street medians and parks for future use when the main lines of the reclaimed water are placed into service by the water agency. Installation of underground water reservoirs in tree well areas along city streets, known as an Alternative Sub-Irrigation System (ASIS) is also recommended as ASIS reduces water consumption by as much as 80%. This reduces irrigation installation costs, eliminates the damage caused by excess water, and reduces the maintenance cost of using water tank trucks.

F. Storm Water Management

National Pollutant Discharge Elimination System (NPDES): The City actively participates in the National Pollutant Discharge Elimination System (NPDES) requirements.

Storm Drains: The storm drain system is screened to identify and eliminate illicit connections and discharges—only clean water should be discharged to the storm drain system. Catch basins are cleaned and stenciled with the ‘No Dumping – Drains to the Ocean’ marker.

G. Vehicle Fleet and Contract Services

Fuel-Efficient Vehicles: The City utilizes CNG (Compressed Natural Gas) vehicles.

Contract Service Fuel-Efficient Vehicles: Several of the City’s bus fleet have been replaced with CNG (compressed natural gas) buses.

H. Community Involvement

Green Task Force: The City has formed a “Green Task Force” composed of the City Manager, General Managers and key staff members who would be in the position to identify the City’s current “green” programs, assist with the emissions inventory, and create an environmental action plan for the City.

Environmental Commission: The Environmental Commission is an advisory body which makes recommendations to the City Council directly or through other jurisdictional bodies such as the Planning Commission. The Environmental Commission meets monthly and consists of seven members, each a resident of the City of Carson. The Carson Municipal Code highlights duties that the Environmental Commission shall undertake which include, but are not be limited to, consultation and advise with public officials, promotion and accomplishment of designated environmental programs and the review of proposed local legislation which may have bearing upon environmental factors affecting the City of Carson (e.g., text amendments, Environmental Impact Reports).

I. Education and Outreach

Education: The City proposes to partner with West Basin water in educating local students on water conservation. In addition, a community outreach program is proposed to educate the public on utility savings for home and business.

Newsletter: The City has published a staff newsletter regarding green practices. Each issue includes a section to educate the City staff on sustainable, energy-saving practices. It is proposed to circulate the newsletter to the public and business owners.

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.

Environmental Education Workshops: The City has hosted an Environmental Education Workshop (2007) and proposes to host another workshop in 2009. Goals of the workshop include sharing information with the community, educating the public on environmental issues that affect Carson and provide a link between the public and local environmental agencies.

Staff Education: Staff has met with a representative from the US Green Building Council regarding the LEED certification process for the City's Green Task Force team members. In addition, City staff has attended various green workshops to better understand the different approaches to green practices. Furthermore, one staff member actively attends meetings of the South Bay Green Task Force.

CSUDH: Increase interaction and information sharing with the local university, California State University Dominguez Hills (CSUDH), regarding the City's environmental efforts.

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 CO₂e 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 ₂ e	CO ₂	CH ₄	N ₂ O
	Stationary Combustion	533	531	0.05014	0.00100
Scope 2	Purchased Electricity	1,801	1789	0.07796	0.02957

Streetlights and Traffic Signals					
Scope 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	1,001	996	0.04339	0.01646

Water Delivery					
Scope 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	36	35	0.00155	0.00059

Vehicle Fleet					
Scope 1		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Mobile Combustion	1,001	983	0.10879	0.05409
Scope 3	Contract Services				
	Waste Management	1,167	1095	1.46911	0.13160
	Street Sweep	205	186	0.38541	0.03431

Solid Waste					
Scope 3		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Contract Services				
	Waste Management Services	342	342	16.27575	-

Employee Commute					
Scope 3		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Employee Commute	1,391	1358	0.08670	0.09883

Total Emissions					
		CO ₂ e	CO ₂	CH ₄	N ₂ O
Scope 1		1,534	1514	0.15893	0.05509
Scope 2		2,838	2820	0.1229	0.04662
Scope 3		3,136	2981	18.2168	0.26474

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 CO₂e 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 ₂ e	CO ₂	CH ₄	N ₂ O
	Stationary Combustion	521	519	0.04901	0.00098
Scope 2	Purchased Electricity	1,658	1647	0.07450	0.02826

Streetlights and Traffic Signals					
Scope 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	951	945	0.04275	0.01621

Water Delivery Facilities					
Scope 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	25	25	0.00114	0.00043

Vehicle Fleet					
Scope 1		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Mobile Combustion	869	854	0.09764	0.04295
Scope 3	Contract Services				
	Waste Management	886	822	1.28839	0.11709
	Street Sweep	205	186	0.38541	0.03431

Solid Waste					
Scope 3		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Contract Services				
	Waste Management Services	357	357	17.0192	-

Employee Commute					
Scope 3		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Employee Commute	1,333	1305	0.07830	0.08389

Total Emissions					
		CO ₂ e	CO ₂	CH ₄	N ₂ O
Scope 1		1,390	1373	0.14665	0.04393
Scope 2		2,634	2617	0.11839	0.0449
Scope 3		2,781	2726	18.80885	0.1514

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 CO₂e 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 ₂ e	CO ₂	CH ₄	N ₂ O
	Stationary Combustion	1	1	0.00014	0.00000
Scope 2	Purchased Electricity	2,438	2425	0.09409	0.03293

Streetlights and Traffic Signals					
Scope 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	981	976	0.03787	0.01325

Water Delivery Facilities					
Scope 2		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Purchased Electricity	19	19	0.00074	0.00026

Employee Commute					
Scope 3		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Employee Commute	1,119	1084	0.09883	0.10545

Total Emissions					
		CO ₂ e	CO ₂	CH ₄	N ₂ O
	Scope 1	1	1	0.00014	0.00000
	Scope 2	3,438	3420	0.1327	0.04644
	Scope 3	1,119	1084	0.09883	0.10545

Appendix B—Activity Data Disclosure

Listed below are the data sources. Activity data refers to consumption data such as fuel or electricity used 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

<p>Description: Consumption data was obtained from Southern California Gas Company.</p> <p>Southern California Gas no longer possesses official customer records going back to 1990 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.</p> <p>Generator fuel data was provided by city staff.</p>	<p>Recommended Method Known Natural Gas use</p>
<p>Reference: Chauncy Tou, Energy Programs Advisor Customer Programs, Southern California Gas Company, 213-244-2833, ctou@semprautilities.com.</p>	

Scope 2 Purchased Electricity

<p>Description: Consumption data was obtained from Southern California Edison.</p>	<p>Recommended Method Known electricity use</p>
<p>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.</p>	

B. Street Lighting and Traffic Signals

Scope 2 Purchased Electricity

<p>Description: Consumption data was obtained from Southern California Edison.</p> <p>Note: Accounts owned by SCE were included but recorded separately.</p>	<p>Recommended Method Known electricity use</p>
<p>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.</p>	

C. Water Delivery and Wastewater

Scope 2 Purchased Electricity

<p>Description: Consumption data was obtained from Southern California Edison.</p>	<p>Recommended Method Known electricity use</p>
<p>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.</p>	

D. Vehicle Fleet

Scope 1 Mobile Combustion

<p>Description: City staff collected data from departmental and fuel tracking system records. Bulk fuel purchasing data was used to quantify emissions.</p>	<p>Recommend Method known fuel use</p>
<p>Reference: Denny Bacon, Denny Bacon, Public Works Program Administrator, 310-847-3520, dbacon@carson.ca.us</p>	

E. Solid Waste Facilities

Scope 3 Waste Related

<p>Description: Ms. Janetzke provided waste data and landfill information. Since 2004, El Sobrante Landfill has operated 3 gas-to-energy generators that transform landfill gas into energy. By converting waste gas into energy, El Sobrante Landfill is managing its waste in a more effective and efficient manner. The landfill gas is collected and processed in an environmentally responsible way and provides electricity, which would otherwise come from the use of fossil fuels. El Sobrante Landfill generates approximately 3.84 megawatts of electricity, which is then fed directly into the local Southern California Edison grid where it is used to meet the power demands of approximately 6,000 local homes a year.</p> <p>City of Carson 2007—1409.26 Refuse 2005—1347.70 Refuse</p> <p>No records could be found for 1990 City operated and owned facilities.</p> <p>Solid Waste Characterization was obtain from the California Integrated Waste Management Board http://www.ciwmb.ca.gov/wastechar/BizGrpCp.asp</p>
<p>Reference: Crystal Janetzke, Waste Management 310-522-6593</p>

F. Employee Commute

Scope 3 Employee Commute

<p>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</p>
<p>Reference: Cara Rice, Transportation Services Manager, (310) 952-1756, crice@carson.ca.us</p>

G. Other Scope 3 Emissions

Scope 3 Emissions From Contracted Services

<p>Description: Clean Street, Vehicle Fleet City staff provided information on fuel quantity of vehicles that operate within the City's boundaries.</p>
<p>Reference: Denny Bacon, Denny Bacon, Public Works Program Administrator, 310-847-3520, dbaon@carson.ca.us</p>

<p>Description: Waste Management, Vehicle Fleet Ms. Janetzke provided information on vehicle type, number of vehicles, fuel quantity, and fuel cost for the Waste Management vehicles that operate within the City's boundaries.</p>
<p>Reference: Crystal Janetzke, Waste Management 310-522-6593, CJanetzke@wm.com</p>

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.³⁴ 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

<p>Description of Computational 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.</p> <p>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</p>	<p>Recommended Method Default emission factors, Table G.1 and Table G.3 of the LGOP</p>
<p>Reference: Consumption data was provided by Chauncy Tou, Energy Programs Advisor Customer Programs, Southern California Gas Company, 213-244-2833, ctou@semprautilities.com.</p>	

B. Scope 1 Mobile Combustion

<p>Description of Computational Method: City staff provided bulk fuel data on known fuel use from departmental and 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.</p>	<p>Alternative Method Alternative emissions factors, Table G.13 of the LGOP</p>
<p>Alternate Emissions Factors were used based on Table G.13 of the LGOP, Alternate Methodology for Highway Vehicles by Inventory Year, pg. 180.</p>	
<p>Reference: Data was provided by Denny Bacon, Denny Bacon, Public Works Program Administrator, 310-847-3520, dbacon@carson.ca.us</p>	

C. Scope 2 Purchased Electricity

<p>Description of Computational Method: Table G.5 Utility-Specific Verified Electricity CO2 Emissions Factors (2000-2006), LGOP pg. 174.</p> <p>For 2005 inventory Southern California Edison, 2005 emission factors were used; For 2007, inventory Southern California Edison, 2006 emissions factors were used.</p>	<p>Recommended Method Utility-Specific verified emission factors used</p>
<p>Table G.6 California Grid Average Electricity Emissions Factors (1990-2004) emissions factors from the year 2004 was used for both 2005 and 2007.</p>	

³⁴ 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 Waste Management.

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

There was an estimated 75% methane recovery at the landfill where the waste was taken, LGOP page 93.

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: Crystal Janetzke, Waste Management 310-522-6593, CJanetzke@wm.com

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>

Utilizing employee benefits information, 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—900 FT and PT employees with 466 responses is a 52% response rate. The remaining 48% of VMT was estimated based on survey responses for a total VMT of 2,595,612. Assumptions: gasoline, drove alone, passenger vehicle (1.92 x 1,351,881=2,595,612 Total VMT)

2005—902 FT and PT employees with 401 responses is a 44.4% response rate. The remaining 55.6% of VMT was estimated based on survey responses for a total VMT of 2,683,517. Assumptions: gasoline, drove alone, passenger vehicle (2.25 x 1,192,674=2,683,517 Total VMT)

1990—Proxy year data from 1996 was used to estimate emissions. There were 654 FT and PT employees in 1996. 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.

Reference: Cara Rice, Transportation Services Manager, (310) 952-1756, crice@carson.ca.us and Melanie-Dawn Bawolski, Senior Human Resources Analyst, (310) 952-1736 Ext 1110, mbawolsk@carson.ca.us

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.³⁵

Sources of Emissions 2005	Source	Equiv CO ₂ (tonnes)	Equiv CO ₂ (%)	Energy (MMBtu)	Energy/ Fuel Use	Energy/ Fuel Use Cost (\$)
Buildings and Facilities						
City Hall	Electricity	393	5.3	4416	1,294,028 kWh	\$153,942
	Natural Gas	128	1.7	2405	24,045 therms	\$24,215
Community Center	Electricity	573	7.7	6437	1,886,096 kWh	\$226,615
	Natural Gas	244	3.3	4589	45,891 therms	\$43,995
Corporate Yard	Electricity	199	2.7	2235	654,978 kWh	\$88,221
	Natural Gas	50	0.7	948	9,478 therms	\$10,065
Parks:						
Anderson Park	Natural Gas	1	0.0	13	134 therms	\$268
Calas Park	Electricity	32	0.4	362	105,930 kWh	\$6,074
	Natural Gas	2	0	36	357 therms	\$543
Carriage Crest Park	Electricity	32	0.4	357	104,680 kWh	\$6,072
	Natural Gas	1	0	13	124 therms	\$267
Carson Park	Electricity	38	0.5	424	124,358 kWh	\$7,898
	Natural Gas	15	0.2	291	2,906 therms	\$2,917
Carson Park Pool Facilities	Electricity	24	0.3	270	79,080 kWh	\$9,581
Del Amo Park	Natural Gas	4	0.1	80	801 therms	\$974
Dolphin Park	Electricity	56	0.8	629	184,298 kWh	\$46,576
	Natural Gas	4	0.1	71	709 therms	\$967
Dominguez Park	Electricity	7	0.1	83	24,183 kWh	\$1,610
	Natural Gas	45	0.6	846	8,458 therms	\$8,293
Mills Park	Electricity	17	0.2	196	57,360 kWh	\$8,382
	Natural Gas	1	0	10	98 therms	\$221
Scott Park	Electricity	106	1.5	1189	348,300 kWh	\$19,682
	Natural Gas	33	0.5	625	6,252 therms	\$6,166
Stevenson Park	Electricity	85	1.1	957	280,293 kWh	\$49,942
	Natural Gas	5	0.1	95	950 therms	\$1,358
Veterans Park	Electricity	238	3.2	2673	783,267 kWh	\$43,464

³⁵ Source of data CACP software output.

	Natural Gas	1	0	10	9 therms	\$133
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Generators:

City Hall Emergency Generators	Diesel	0	0	1	9 gal	
Community Center Generator	Diesel	0	0	1	7 gal	
Veterans Park Emergency Generators	Diesel	0	0	1	4 gal	

Streetlights & Traffic Signals

Traffic Signals/Controllers	Electricity	170	2.3	1912	590,234 kWh	\$66,580
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Streetlights:

Streetlight City Owned	Electricity	334	4.5	3754	1,099,843 kWh	\$85,901
Streetlight SCE Owned	Electricity	279	3.7	3140	920,028 kWh	\$132,087

Park Lighting:

Park Lighting	Electricity	218	2.9	2453	718,653 kWh	\$42,529
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Water Delivery

Sprinkler/Irrigation Control	Electricity	35	0.5	389	113,970 kWh	\$27,898
Water Pumps / Other	Electricity	1	0	12	3,563 kWh	\$4,114

Vehicle Fleet

City Fleet	CNG	37	0.5	644	5,185 gal	
	Diesel ULSD	234	3.1	3202	23,088 gal	
	Gasoline	103	9.7	1423	80,708 gal	
	LPG	4	0.1	64	700 gal	

Vehicle Fleet-Contract Services

Street Sweeper Vehicles	CNG	205	2.7	3514	28,288 gal	
Waste Management Vehicles	Diesel ULSD	247	3.3	3373	24,321 gal	
	Gasoline	2	0.4	33	3,616 gal	
	LNG	918	12.3	11177	189,858 gal	

Employee Commute

Drove Alone	CNG	3	0.0	45	4,464 VMT	
	Diesel	2	0.0	15	2,325 VMT	
	Gasoline	1330	17.8	18331	2,574,599 VMT	
	Gasoline (OFF ROAD)	1	0	15	2,697 VMT	

Carpool	Gasoline	55	0.7	761	98,926 VMT
Public Transportation	Diesel	1	0.0	11	505 VMT

Waste

Waste Management	CO2	342			1,347.70 tons n/a
	Sources:				
	Food Waste	36			
	Paper Products	258			
	Plant Debris	36			
	Wood/Textiles	12			

Sources of Emissions 2007	Source	Equip CO2 (tonnes)	Equip CO2 (%)	Energy (MMBtu)	Energy/ Fuel Use	Energy/ Fuel Use Cost (\$)
Buildings and Facilities						
City Hall	Electricity	419	6.2	4884	1,431,019 kWh	\$179,813
	Natural Gas	178	2.6	3342	33,416 therms	\$30,135
Community Center	Electricity	522	7.7	6091	1,784,779kWh	\$242,123
	Natural Gas	160	2.3	2,999	29,991 therms	\$31,927
Corporate Yard	Electricity	203	3	2367	693,611 kWh	\$94,515
	Natural Gas	68	1	1283	12,834 therms	\$11,885
Parks:						
Anderson Park	Natural Gas	1	0.0	20	199 therms	\$338
Calas Park	Electricity	28	0.4	324	94,830 kWh	\$7,245
	Natural Gas	3	0	51	511 therms	\$688
Carriage Crest Park	Electricity	24	0.4	278	81,540 kWh	\$6,239
	Natural Gas	1	0	20	202 therms	\$353
Carson Park	Electricity	27	0.4	315	92,253 kWh	\$7,351
	Natural Gas	17	0.2	320	3,195 therms	\$3,116
Carson Park Pool Facilities	Electricity	11	0.2	129	37,656 kWh	\$5,934
Del Amo Park	Natural Gas	4	0.1	79	186 therms	\$1,223
Dolphin Park	Electricity	50	0.7	587	171,910 kWh	\$45,168
	Natural Gas	3	0.0	53	529 therms	\$699
Dominguez Park	Electricity	8	0.1	90	26,288 kWh	\$2,076
	Natural Gas	30	0.4	563	5,630 therms	\$5,478
Mills Park	Electricity	21	0.3	248	72,630 kWh	\$10,745
	Natural Gas	1	0	13	127 therms	\$261
Scott Park	Electricity	87	1.3	1010	296,028 kWh	\$22,499

	Natural Gas	26	0.4	484	4,835 therms	\$4,972
Stevenson Park	Electricity	69	1	810	247,436 kWh	\$48,230
	Natural Gas	23	0.3	424	4,241 therms	\$4,396
Veterans Park	Electricity	21	0.3	248	643,244 kWh	\$101,261
	Natural Gas	9	0.1	165	1,653 therms	\$1,989

Generators:

City Hall Emergency Generators	Diesel	0	0	1	9 gal	
Community Center Generator	Diesel	0	0	1	7 gal	
Veterans Park Emergency Generators	Diesel	0	0	1	4 gal	

Streetlights & Traffic Signals

Traffic Signals/Controllers	Electricity	143	2.1	1664	487,502 kWh	\$67,906
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Streetlights:

Streetlight City Owned	Electricity	323	4.7	3769	1,104,308 kWh	\$106,149
Streetlight SCE Owned	Electricity	276	4	3218	942,993 kWh	\$168,618

Park Lighting:

Park Lighting	Electricity	209	3	2440	714,964 kWh	\$56,147
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Water Delivery

Sprinkler/Irrigation Control	Electricity	24	0.4	285	83,424 kWh	\$26,836
Water Pumps / Other	Electricity	1	0	11	3,216 kWh	\$3,533

Vehicle Fleet

City Fleet	CNG	37	0.5	644	5,184 gal	
	Diesel	217	3.2	2968	21,405 gal	
	Gasoline	611	8.9	8452	68,050 gal	
	LPG	4	0.1	64	700 gal	

Vehicle Fleet-Contract Services

Street Sweeper Vehicles	CNG	205	3	3514	28,288 gal	
Waste Management Vehicles	Diesel ULSD	45	0.7	609	4,394 gal	
	Gasoline	37	0.5	504	4,061 gal	
	LNG	804	11.7	9794	166,358 gal	

Employee Commute

Drove Alone	CNG	31	0.5	555	4,464 VMT
	Diesel	24	0.3	322	2,325 VMT
	Gasoline	1260	18.4	17412	2,461,868 VMT
	Gasoline (OFF ROAD)	1	0	15	2,697 VMT
Carpool	Gasoline	67	1	929	123,490 VMT
Public Transportation	Diesel	8	0.1	106	767.95 VMT

Waste

Waste Management	CO2	357			1,409.26 tons	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						
City Hall	Electricity	668	14.6	4848	1,420,320 kWh	\$142,254
Community Center	Electricity	920	20.2	6682	1,957,680 kWh	\$178,418
Corporate Yard	Electricity	220	4.8	1594	467,120 kWh	\$43,242
	Natural Gas	0	0	6	60 therms	n/a
Parks:						
Calas Park	Electricity	50	1.1	360	105,420 kWh	\$11,762
Carriage Crest Park	Electricity	34	0.7	244	71,620 kWh	\$7,917
Carson Park	Electricity	52	1.1	379	110,969 kWh	\$12,945
Carson Park Pool Facilities	Electricity	42	0.9	302	88,630 kWh	\$8,194
Del Amo Park	Natural Gas	0	0	3	28 therms	n/a
Dolphin Park	Electricity	102	2.2	740	216,720 kWh	\$24,120
	Natural Gas	0	0	0	2 therms	n/a
Dominguez Park	Electricity	12	0.3	87	25,578 kWh	\$2,956
	Natural Gas	1	0	18	183 therms	n/a
Mills Park	Electricity	28	0.6	205	60,180 kWh	\$6,731
Scott Park	Electricity	23	0.5	164	486,120 kWh	\$54,675
Stevenson Park	Electricity	28	0.6	203	59,373 kWh	\$6,836
	Natural Gas	0	0	0	4 therms	n/a
Veterans Park	Electricity	260	5.7	1891	554,036 kWh	\$63,894

Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	707	15.5	5136	1,504,942 kWh	\$156,026
Park Lighting:						
Park Lighting	Electricity	274	6.0	1987	582,286 kWh	\$65,525
Water Delivery						
Sprinkler/Irrigation Control	Electricity	12	0.3	88	25,895 kWh	\$8,239
Water Pumps / Other	Electricity	7	0.2	52	15,119 kWh	\$1,994
Employee Commute						
Drove Alone	Gasoline	1119	24.5	15294	1,962,981 VMT	n/a

Criteria Air Pollutants³⁶

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.³⁷ 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	6,950	3,573	3,765	468	2,945
Streetlights & Traffic Signals	2,924	1,951	1,852	208	1,610
Water Delivery	104	70	66	7	57
Vehicle Fleet	15,297	257	53,876	5,966	483
Employee Commute	87,842	497	96,214	9,876	201
Total	113,117	6,348	155,773	16,525	5,296

Criteria Air Pollutants 2007	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	6,669	3,415	3,605	448	2,815
Streetlights & Traffic Signals	2,881	1,922	1,824	205	1,586
Water Delivery	77	51	49	5	42
Vehicle Fleet	9,720	355	44,246	4,927	228
Employee Commute	7,986	465	92,074	9,287	188
Total	27,333	6,208	141,798	14,872	4,859

Criteria Air Pollutants 1990	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	4,452	3,606	2,867	326	2,717
Streetlights & Traffic Signals	1,790	1,451	1,153	131	1,093
Water Delivery	35	29	23	3	21
Employee Commute	8,523	364	99,004	10,443	161
Total	14,800	5,450	103,047	10,903	3,992

³⁶ To review definitions and acronyms for criteria air pollutants refer to appendices sections G and H.

³⁷ Source of data CACP software output.

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 900 full-time and part-time employees; however, there were 466 employees that took the survey worked for the City in 2007 resulting in a 52% response rate. For 2005, there were 902 full-time and part-time employees; however, there were 401 employees that took the survey who worked for the City in 2005 resulting in a 44.4% 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.³⁸

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 375.³⁹ For questions 5 and 15, the miles were grouped to identify individuals that were potential walkers, cyclists, carpools, public transit users, and vanpoolers: 0-1.9 (potential walkers), 2-3.9 miles (potential bicyclists; 4-8.9 miles (potential transit users); 9-19.9 (potential carpools); and 20-40.9 miles and above (long distance carpools and vanpools).

Based on information provided by respondents in the year 2007, 52% of employees traveled 1,351,881 vehicle miles. Within this response rate, 19.3% of employees carpooled to the worksite, 82.2% of them were two-person carpools; and 28.5% of employees lived within a range of 4 to 8.9 miles from the worksite (potential transit users). Results from question 11 indicate 42.2% of all respondents who were surveyed are interested in participating in a ridesharing program.

In the year 2005, 44.4% of employees traveled 1,192,674 vehicle miles. Within this response rate, 20.4% of employees carpooled to the worksite, 84.2% of them were two-person carpools; and 28.7% of employees lived within a range of 4 to 8.9 miles from the worksite (potential transit users).

A. 2007 Survey Results⁴⁰

1. Employee Information		
	Response Percent	Response Count
Name: <input type="text"/>	100.0%	531
Dept: <input type="text"/>	99.1%	526
	<i>answered question</i>	531
	<i>skipped question</i>	0

³⁸ See appendix C to review details on estimated VMT.

³⁹ See appendix F for description of the legislation.

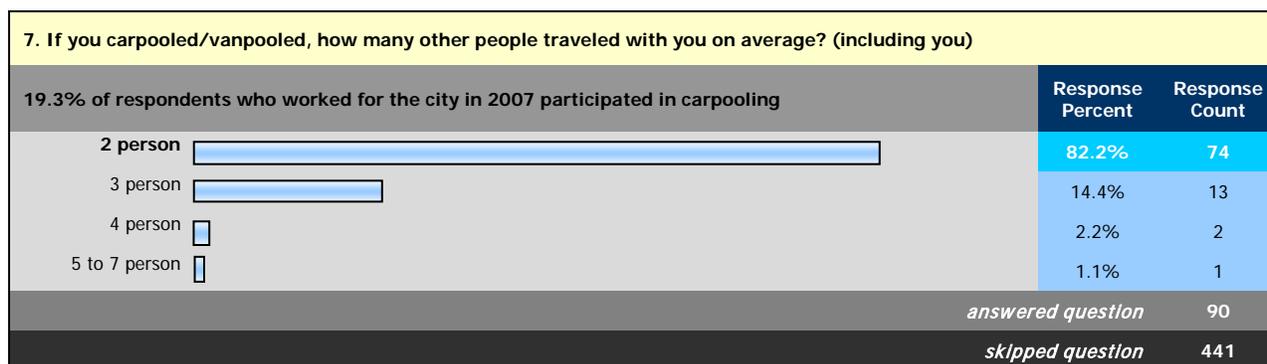
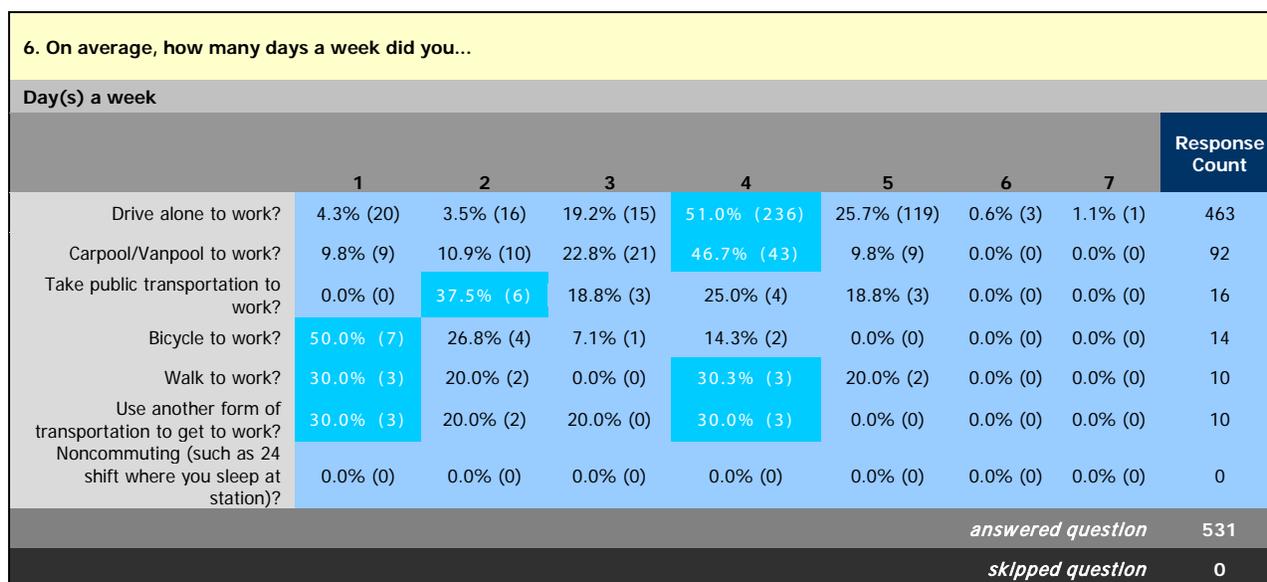
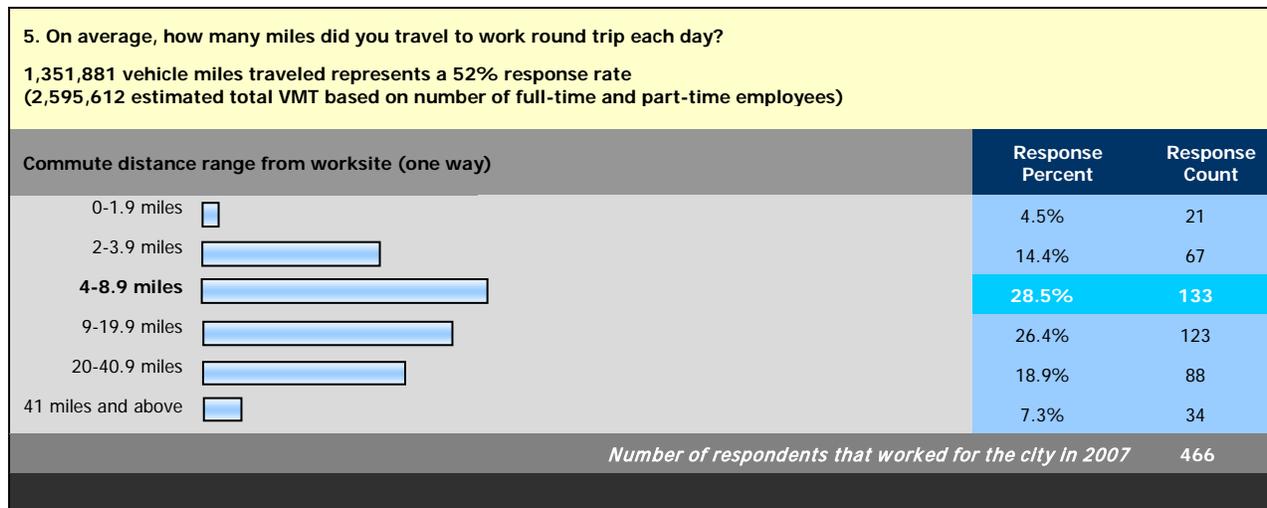
⁴⁰ Survey Monkey, an online survey website, was utilized to conduct the survey and generate graphs www.surveymonkey.com

2. What city did you live in?		
	Response Percent	Response Count
City: <input type="text"/>	100.0%	531
ZIP Code: <input type="text"/>	100.0%	531
<i>answered question</i>		531
<i>skipped question</i>		0

Cities Listed in Survey:
 Anaheim, Arcadia, Artesia, Bell Gardens, Bellflower, Carson, Cerritos, Compton, Corona, Costa Mesa, Covina, Culver City, Cypress, Downey, East Rancho Dominguez, Fullerton, Garden Grove, Gardena, Glendale, Hacienda Heights, Harbor City, Hawthorne, Hermosa, Beach, Huntington Beach, Inglewood, Irvine, Los Angeles, La Habra, La Mirada, Laguna Hills, Lake Elsinore, Lakewood, Lancaster, Lawndale, Lomita, Long Beach, Los Alamitos, Lynwood, Mission Viejo, Monterey Park, Moreno Valley, Newport Beach, Norwalk, Ontario, Orange, Palmdale, Paramount, Pico Rivera, Rancho Cucamonga, Rancho Palos Verdes, Redondo Beach, Rialto, San Bernardino, San Clemente, San Pedro, Seal Beach, Signal Hill, South Gate, Temecula, Torrance, Wilmington

3. Did you work for the city in 2007?		
	Response Percent	Response Count
Yes <input type="checkbox"/>	94.2%	500
No <input type="checkbox"/>	5.8%	31
<i>answered question</i>		531
<i>skipped question</i>		0

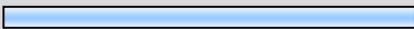
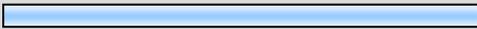
4. What was your workweek schedule?		
	Response Percent	Response Count
3/36 work week (2 days off) <input type="checkbox"/>	3%	16
4/40 work week (1 day off) <input type="checkbox"/>	46.3%	246
9/80 work week (1 day off every other week) <input type="checkbox"/>	0.4%	2
Regular work week <input type="checkbox"/>	11.9%	63
Part time work week <input type="checkbox"/>	37.1%	197
Other (such as fire personnel compressed schedules) <input type="checkbox"/>	2.1%	11
<i>answered question</i>		531



8. If you used Public Transportation, what is the name of the public transit system?		Response Count
Carson Transit, Compton Transit, Torrance Transit, MTA, Carson Circuit, Gardena Transit, Long Beach Transit		32
<i>answered question</i>		32
<i>skipped question</i>		499

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)	12.2%	65
Auto-mid size (e.g., Honda Accord, Toyota Camry)	33.3%	177
Auto-compact (e.g., Honda Civic, Toyota Corolla)	18.5%	98
Light truck/SUV (e.g., Chevy Suburban, Ford Expedition)	28.5%	151
Heavy truck (e.g., Tractor-trailer truck)	1.7%	9
Motorcycle	0.9%	5
Van	3.2%	17
City Vehicle	0.9%	5
Did not drive an automobile	2.8%	15
<i>answered question</i>		531
<i>skipped question</i>		0

10. For the vehicle you drove most often, what type of fuel does it use?		
	Response Percent	Response Count
Gasoline	96.4%	512
Diesel	0.6%	3
Ultra-low sulfur diesel	0.2%	1
Bio-diesel	0.2%	1
Hybrid	0.8%	4
ethanol	0.2%	1
electric	0.0%	0
LPG	0.0%	0
CNG	0.2%	1
Did not drive an automobile	2.3%	12
<i>answered question</i>		531
<i>skipped question</i>		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 	42.2%	224
No 	57.8%	307
<i>answered question</i>		531
<i>skipped question</i>		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. 	74.4%	395
No—Click next and complete information for 2005. 	7.7%	41
Other—Did not work for the city in 2005, skip the 2005 section and go to the end and hit done. 	18.3%	97
<i>answered question</i>		531
<i>skipped question</i>		0

13. What city did you live in?		
	Response Percent	Response Count
City: 	100.0%	51
ZIP Code: 	98.0%	50
<i>answered question</i>		51
<i>skipped question</i>		480
Cities Listed in Survey:		
Anaheim, Arcadia, Artesia, Bell Gardens, Bellflower, Carson, Cerritos, Compton, Corona, Costa Mesa, Culver City, Cypress, Downey, East Rancho Dominguez, Gardena, Glendale, Hacienda Heights, Harbor City, Hermosa, Beach, Huntington Beach, Inglewood, Irvine, Los Angeles, La Habra, La Mirada, Laguna Hills, Lake Elsinore, Lakewood, Lancaster, Lawndale, Lomita, Long Beach, Los Alamitos, Lynwood, Mission Viejo, Monterey Park, Moreno Valley, Newport Beach, Norwalk, Ontario, Orange, Palmdale, Paramount, Pico Rivera, Rancho Cucamonga, Redondo Beach, Rialto, San Bernardino, San Clemente, San Pedro, Seal Beach, Signal Hill, South Gate, Temecula, Torrance, Wilmington		

14. What was your workweek schedule?			Response Percent	Response Count
3/36 work week (2 days off)	<input type="checkbox"/>		1.9%	1
4/40 work week (1 day off)	<input checked="" type="checkbox"/>		42.3%	22
9/80 work week (1 day off every other week)	<input type="checkbox"/>		5.8%	3
Regular work week	<input type="checkbox"/>		13.5%	7
Part time work	<input type="checkbox"/>		34.6%	18
Other (such as fire personnel compressed schedules)	<input type="checkbox"/>		1.9%	1
<i>answered question</i>				52
<i>skipped question</i>				479

15. On average, how many miles did you travel to work round trip each day?			Response Percent	Response Count
1,192,674 vehicle miles traveled represents a 44.4% response rate (2,683,517 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	<input type="checkbox"/>		4.2%	17
2-3.9 miles	<input type="checkbox"/>		14.5%	58
4-8.9 miles	<input checked="" type="checkbox"/>		28.7%	115
9-19.9 miles	<input type="checkbox"/>		25.2%	101
20-40.9 miles	<input type="checkbox"/>		19.2%	77
40 miles and above	<input type="checkbox"/>		8.2%	33
<i>Number of respondents that worked for the city in 2005</i>				401

16. On average, how many days a week did you...								
Day(s) a week								Response Count
	1	2	3	4	5	6	7	
Drive alone to work?	10.0% (4)	7.5% (3)	7.5% (3)	40.0% (16)	27.5% (11)	7.5% (3)	0.0% (0)	40
Carpool/Vanpool to work?	5.6% (1)	27.8% (5)	16.7% (3)	38.9% (7)	11.1% (2)	0.0% (0)	0.0% (0)	18
Take public transportation to work?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Bicycle to work?	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Walk to work?	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Use another form of transportation to get to work?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Noncommuting (such as 24 shift where sleep at fire station)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
<i>answered question</i>								50
<i>skipped question</i>								481

17. If you carpooled/vanpooled, how many other people traveled with you on average? (including you)			
20.4% of respondents who worked for the city in 2005 participated in carpooling		Response Percent	Response Count
2 person		84.2%	69
3 person		13.4%	11
4 person		1.2%	1
5 to 7 person		1.2%	1
<i>answered question</i>			82
<i>skipped question</i>			449

18. If you used Public Transportation, what is the name of the public transit system?		Response Count
Blue Line, Carson Transit, MTA, Carson Circuit, Long Beach Transit		19
<i>answered question</i>		19
<i>skipped question</i>		512

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)	12.0%	6
Auto-mid size (e.g., Honda Accord, Toyota Camry)	22.0%	11
Auto-compact (e.g., Honda Civic, Toyota Corolla)	18.0%	9
Light truck/SUV (e.g., Chevy Suburban, Ford Expedition)	40.0%	20
Heavy truck (e.g., Tractor-trailer truck)	2.0%	1
Motorcycle	0.0%	0
Van	4.0%	2
City Vehicle	4.0%	2
Did not drive an automobile	0.0%	0
<i>answered question</i>		50
<i>skipped question</i>		481

20. For the vehicle you drove most often, what type of fuel does it use?		
	Response Percent	Response Count
Gasoline	100.0%	49
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
<i>answered question</i>		49
<i>skipped question</i>		482

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.⁴¹

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.

⁴¹ 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 (UNFCCC) 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 Acronyms⁴²

Btu	British thermal unit
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
FE	Fuel Economy
GHG	greenhouse gas
HFC	hydrofluorocarbon
MMBtu	1 million British thermal unit
NO _x	oxides of nitrogen
N ₂ O	nitrous oxide
PFC	perfluorocarbon
PM ₁₀	particulate matter smaller than ten microns in diameter
SF ₆	sulfur hexafluoride
SO _x	sulfur oxides
VOC	volatile organic compounds

Appendix H—Glossary of Terms⁴³

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	CO ₂ 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 (CO ₂)	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 CO ₂ is equal to 1.)

⁴² Abbreviations and acronyms are from the Local Government Operations Protocol, version 1.0

⁴³ 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 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 (CH ₄)	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 (N ₂ O)	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 CO ₂ 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 (SF ₆)	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.