City of Lawndale

Municipal Greenhouse Gas Emissions Inventory Report

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February 2010

City of Lawndale 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" pledge.[3] By committing to reduce global warming emissions cities will be implementing solutions to make themselves more sustainable and energy efficient. In the spring of 2008 the South Bay Cities Council of Governments (SBCCOG) coordinated efforts to respond to AB 32 by assisting South Bay cities with the process of conducting a GHG emissions inventory. In this way, South Bay cities will be in a better position to respond to the challenges and impact legislation related to climate change. Additionally, GHG inventories will be a useful tool to help South Bay cities measure their progress to meet regional reduction goals.

South Bay cities began the process of assessing their GHG emissions by joining ICLEI—Local Governments for Sustainability, an international association of city and county governments that have made a commitment to sustainable development.[4] Through ICLEI, South Bay cities gained access to tools and resources such as the Clean Air Climate Protection (CACP) software, which enables cities to quantify their emissions. By joining ICLEI and adopting a resolution, South Bay cities have committed to ICLEI's Five Milestone Climate Protection Methodology, which includes: conducting a baseline emissions inventory and forecast, adopting an emissions reduction target for

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

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

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

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

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 Lawndale will take to reduce its impact on the 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

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.

used to establish and organize its emissions by "scopes."[7] In this way, a city can separately account for its direct and indirect emissions in a tiered fashion. It also establishes a foundation for following reporting standards in the LGOP.

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

D. Inventory Methodology

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

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

E. Key Highlights and Findings

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

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.

- The City of Lawndale generated approximately 542 metric tons of CO_2e in the baseline year, 2005; this amount is equivalent to the GHG emissions generated from the electricity use of 70.4 homes for one year.[14]
- There was an overall 14.2% increase in GHG emissions between the baseline year 2005 and the interim year 2007. This was largely due to scope 3 transportation related sources in the employee commute sector.
- Emissions resulting from electricity use increased 5.5%, and emissions resulting from natural gas consumption increased 23% between the years 2005 and 2007.
- Emissions resulting from City fleet vehicles increased 18% between the years 2005 and 2007.
- Under a business-as-usual scenario, the City can expect emissions to rise to 674 metric tons of CO2e by 2012 that is equivalent to the annual GHG emissions from 129 passenger vehicles; and 716 metric tons of CO2e by 2015, equivalent to the annual GHG emissions from 137 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

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

program requirements.

II. Local Government Profile Information

A. Local Government Description

The City of Lawndale is a general law city. Rather than having a city charter it is organized and operates in accordance with guidelines in state laws. Like most general law cities, Lawndale is governed by a five-member, part-time City Council and operates under a City Council/Manager form of government. In this form of government, a full time City Manager administers the affairs of the City under the direction of the City Council. The City Manager, in turn, exercises control over and supervises all departments and divisions of the City government and all appointive officers and employees, with the exception of the City Clerk and City Attorney. In addition to the professional staff, the City Council is supported by a number of appointed commissions and committees, each being responsible for advising and assisting the City Council within certain prescribed areas.

The City's mission statement: In partnership with the community we server, the City of Lawndale is dedicated to providing leadership, quality services, and a safe environment.

Local Government History

The City of Lawndale is a thriving community of about 33,000 residents. The City is approximately 2 square miles and is bordered by the cities of Hawthorne, Redondo Beach and a Los Angeles County unincorporated district. Predominantly a farming community, the township was incorporated as a City on December 28, 1959.

Primary Services

Department	Primary Services
Administration	General Administration –City Clerk, City Manager, City Council and Finance.
Lawndale Sheriffs Department	Contract Law enforcement that provides safety and security within the community.
Fire Services	Contracted with Los Angeles County Fire District.
Public Works	City Staff that maintains the community as a whole, post signs/notices, oversees City clean-up projects, and engineering projects.
Planning	Staff reviews and approves new development projects within the City as well as enforces building regulations per the City's Zoning Ordinance.
Building & Safety	Contracted with Los Angeles County for structural engineering plan-check, permitting, and inspections.
Community Services	Staff organizes and plans community events, provides recreational activities for city residents
Transit	Contract service that is provided by the Lawndale Beat.

III. Municipal Emissions Inventory Results

A. Inventory Introduction and Results

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

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

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

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

2005

Baseline Year

Results from the 2005 municipal inventory represent the year chosen as a baseline year, which will serve as a

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

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

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

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

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

In 2005, the City of Lawndale GHG emissions totaled 542 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 70.4 homes for one year. Looking at the scopes within the table, 25% (scope 1 total) were emissions generated from a combination of natural gas use for buildings and facilities and fuels for the vehicle fleet. Emissions emitted from electricity use accounted for 53.7% (scope 2 total) of the total emissions. The smallest portion 21.3% (scope 3 total) were emissions due to a combination of employee commuting and waste (refuse collected from City bins).

Energy/Fuel use and cost information has been listed for the purpose of planning and tracking energy measures' cost effectiveness. During 2005, the City of Lawndale used 1,099,526 kWh of electricity at a cost of $115,290. In this same year, the City consumed 2,989 therms of natural gas costing $4,158.

Table 1. Municipal Inventory Summary 2005[19]

Lawndale 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	13	2.4%	Natural gas	2,989 therms	$4,158	250
City Vehicle Fleet						
City Vehicle Fleet[20]	**122**	**22.6%**	-	-	**$22,453.43**	**1,981**
	41		Gasoline	4,506.81 gal	$11,574.10	559
	5		Diesel	473.03 gal	$1,320.33	66
	76		CNG	10,920 gal equiv.	$9,559	1,356
Total Scope 1 Emissions	**135**	**25%**	**-**	**-**	**$26,611.43**	**2,231**
Scope 2 Emissions						
Buildings & Facilities[21]						
Buildings & Facilities	41	7.6%	Electricity	279,281 kWh	$49,747	464
Streetlights & Traffic Signals						
Traffic Signals/Controllers	74	13.7%	Electricity	244,376 kWh	$25,219	829
Streetlights[22]	163	30.2%	Electricity	535,924 kWh	$36,153	1,829
Park/Other Outdoor Lighting	11	2.0%	Electricity	36,175 kWh	$3,439	123
Water Delivery						
Sprinkler/Irrigation Control	1	0.2%	Electricity	3,770 kWh	$732	13
Total Scope 2 Emissions	**290**	**53.7%**	**-**	**1,099,526 kWh**	**$115,290**	**3,258**
Scope 3 Emissions						
Employee Commute						
Employee Commute	**56**	**10.3%**	**-**	**104,009 VMT**	n/a	**760**

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

20 See appendix D, Emissions Data, to review fuel emissions per department.

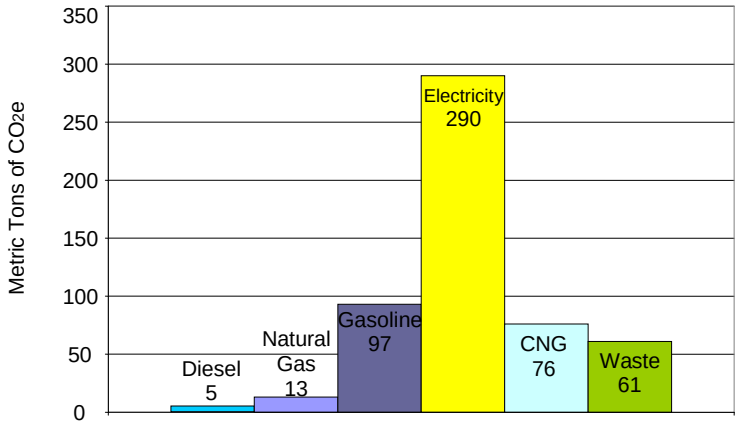
21 In some cases, building & facility accounts include lights and water delivery devices located on the same metered account.

22 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.

	56		Gasoline	103,960 VMT	-	759
	-		Diesel	49 VMT	-	1
Solid Waste						
Waste	61	11%	-	242 tons	n/a	-
Total Scope 3 Emissions	**117**	**21.3%**	-	-	-	**760**
Total Emissions	**542**	**100%**	-	**-**	**$141,901.43**	**6,249**

Figure 1 illustrates emissions by source. Electricity was the highest source of emissions followed by gasoline and CNG. Waste resulted in the fourth lowest source of emissions. It was estimated that 242 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 11% of emissions are from waste and 10.3% 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 68.2% of emissions and scope 1 emissions from fuel and natural gas sources accounts for the remaining 31.8% of emissions.

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

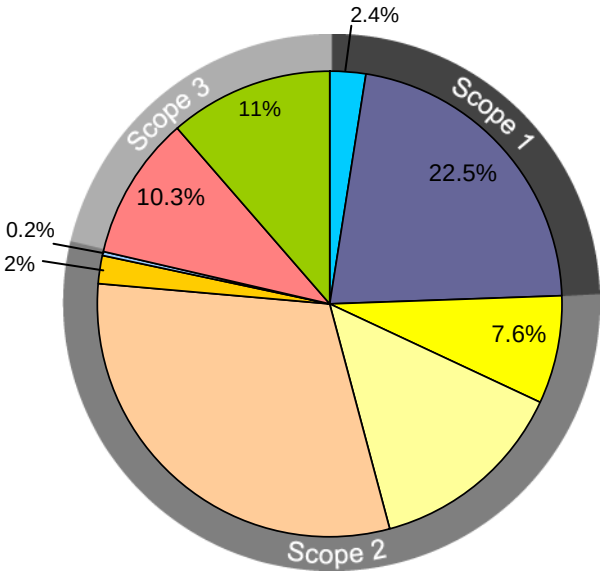
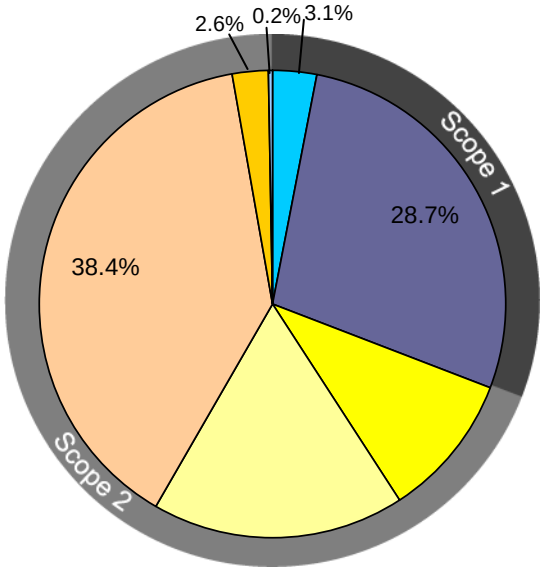
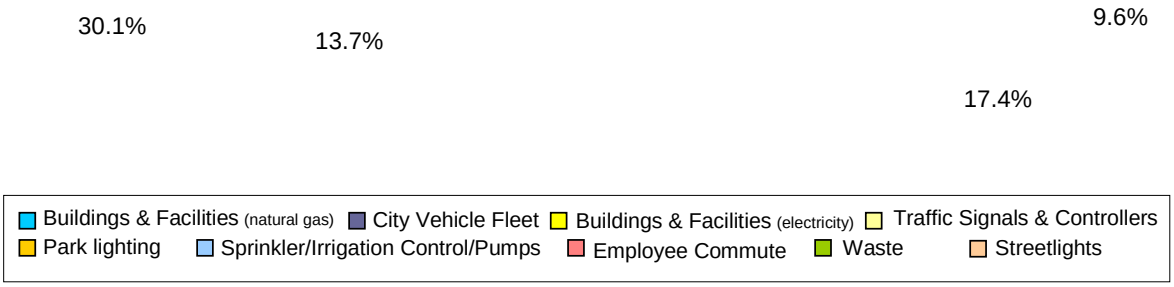


Figure 3. Emissions by Sector 2005
(including only direct and indirect sources from scopes 1 and 2)





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 Lawndale GHG emissions totaled 619 metric tons of CO_2e including both direct and indirect sources of emissions—this number is equivalent to the emissions produced from 69,629 gallons of gasoline consumed. The year 2007 represents a 14.2% increase in emissions from the baseline year. This was largely due to scope 3 transportation related sources in the employee commute sector. Looking at the scopes within the table, emissions generated from natural gas and fuel sources accounted for 25.9% (scope 1 total) of the emissions inventoried in 2007. Emissions from electricity use contributed 49.4% (scope 2 total) to the total emissions. The smallest portion of emissions came from a combination of employee commuting and waste at 24.7% (scope 3 total).

In 2007, the City of Lawndale used 1,053,016 kWh of electricity at a cost of $131,748. In this same year, the City consumed 3,128 therms of natural gas at a cost of $4,096.

Table 2. Municipal Inventory Summary 2007

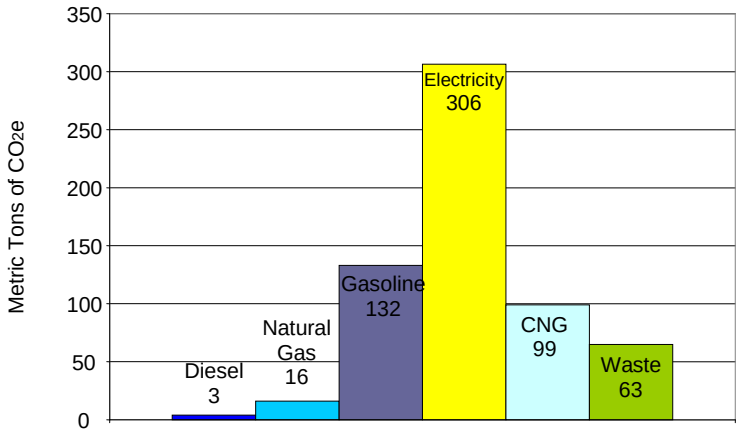
Lawndale Municipal GHG Emissions 2007						
Sector	**MT CO_2e**	**Percent CO_2e (% CO_2e)**	**Source**	**Energy/Fuel Use**	**Energy/Fuel Use Cost**	**Energy Equivalent** (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities	16	2.6%	Natural gas	3,128 therms	$4,096	296
City Vehicle Fleet						
City Vehicle Fleet[23]	**144**	**23.3%**	-	-	**$25,980.55**	**2,393**
	42		Gasoline	4,685.68 gal	$13,810.43	582
	3		Diesel	256.57 gal	$850.22	36
	99		CNG	14,287 gal equiv.	$11,319.90	1,775
Total Scope 1 Emissions	**160**	**25.9%**	**-**	**-**	**$30,077**	**2,689**
Scope 2 Emissions						

23 See appendix D, Emissions Data, to review fuel emissions per department.

Buildings & Facilities[24]						
Buildings & Facilities	87	14.1%	Electricity	305,570 kWh	$56,080	1,022
Streetlights & Traffic Signals						
Traffic Signals/Controllers	56	9%	Electricity	192,091 kWh	$23,302	656
Streetlights[25]	145	23.4%	Electricity	494,589 kWh	$45,881	1,688
Park/Other Outdoor Lighting	17	2.7%	Electricity	58,220 kWh	$5,766	199
Sector	**MT CO_2e**	**Percent CO_2e (% CO_2e)**	**Source**	**Energy/Fuel Use**	**Energy/Fuel Use Cost**	**Energy Equivalent** (MMBtu)
Water Delivery						
Sprinkler/Irrigation Control	1	0.2%	Electricity	2,546 kWh	$719	9
Total Scope 2 Emissions	**306**	**49.4%**	**-**	**1,053,016 kWh**	**$131,748**	**3,574**
Scope 3 Emissions						
Employee Commute						
Employee Commute	**90**	**14.5%**	**-**	**172,057 VMT**	n/a	**1,249**
	90		Gasoline	171,941 VMT	-	1,246
	-		Diesel	116 VMT	-	3
Solid Waste						
Waste	63	10.2%	-	247 tons	n/a	-
Total Scope 3 Emissions	**153**	**24.7%**	-	**-**	-	**1,249**
Total Emissions	**619**	**100%**	-	**-**	**$161,825**	**7,512**

Figure 4 shows an increase in emissions from all sources with the exception of diesel fuel. It was estimated that 247 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)



24 In some cases, building & facility accounts 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. See appendix D, Emissions Data, to review individual emissions in the Streetlights and Traffic Signals category.

Similar to 2005, Figures 5 and 6 illustrate a percentage breakdown of each sector from Table 2. Figure 5 indicates 10.2% of emissions are from waste and 14.5% of emissions resulted from employee commuting. Figure 6 shows electricity in scope 2 accounts for 67.1% of emissions and fuels and natural gas from scope 1 contributed to the remaining 32.9% of emissions.

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

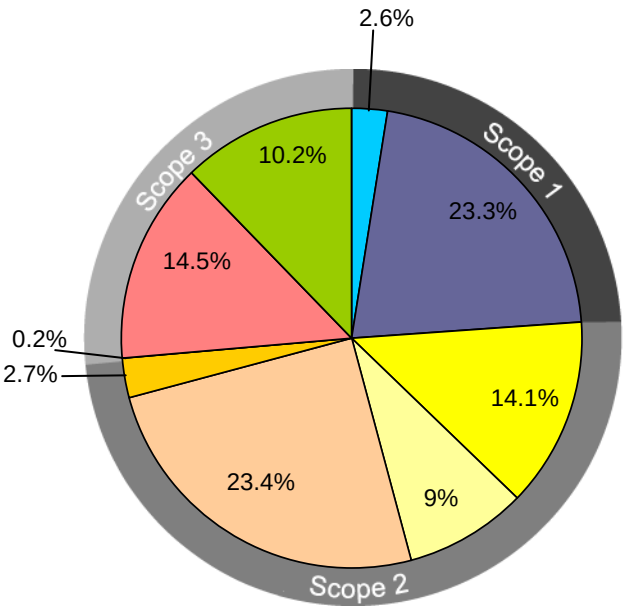
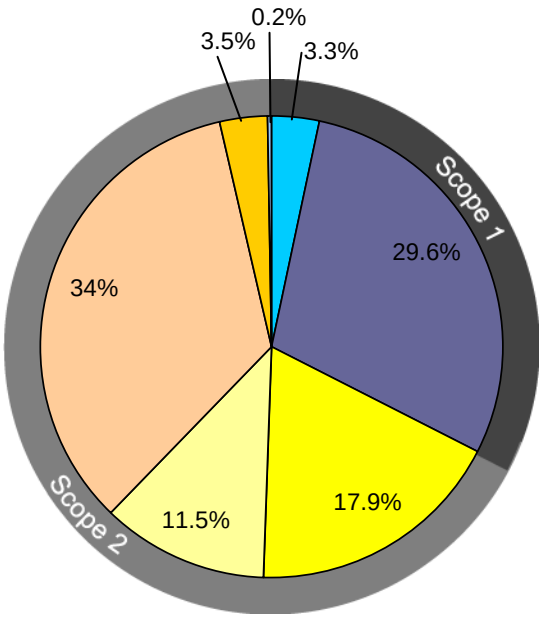


Figure 6. Emissions by Sector 2007
(including only direct and indirect sources from scopes 1 and 2)



Buildings & Facilities (natural gas) | City Vehicle Fleet | Buildings & Facilities (electricity) | Traffic Signals & Controllers | Park lighting | Sprinkler/Irrigation Control/Pumps | Employee Commute | Waste | Streetlights

1990
Historical Year

Looking back to 1990, this year is a benchmark for several key pieces of climate change legislation, such as the Kyoto Protocol as mentioned in the executive summary. Located in appendix F are brief descriptions pertaining to

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

Based on the data that was available for 1990, the GHG emissions identified totaled 284 metric tons of CO2e, as shown in Table 3. This number is equivalent to the annual GHG emissions from 54.3 passenger vehicles. Looking at the scopes within the table, emissions generated from natural gas contributed 0.3% (scope 1 total) to the total emissions.[27] Emissions emitted from electricity use accounted for 99.7% (scope 2 total) of the total. The City of Lawndale used 615,338 kWh of electricity costing $67,109. In this same year, the City consumed 178 therms of natural gas.

Table 3. Municipal Inventory Summary 1990

Lawndale Municipal GHG Emissions 1990						
Sector	**MT CO_2e**	**Percent CO_2e (% CO_2e)**	**Source**	**Energy/Fuel Use**	**Energy/Fuel Use Cost**	**Energy Equivalent** (MMBtu)
Scope 1 Emissions						
Buildings & Facilities						
Buildings & Facilities	1	0.3%	Natural gas	178 therms	n/a	10
Total Scope 1 Emissions	**1**	**0.3%**	**-**	**178 therms**	**-**	**10**
Scope 2 Emissions						
Buildings & Facilities[28]						
Buildings & Facilities	166	58.5%	Electricity	365,163 kWh	$39,867	1,203
Streetlights & Traffic Signals						
Traffic Signals/Controllers	90	31.7%	Electricity	191,674 kWh	$20,309	654
Park/Other Outdoor Lighting	27	9.5%	Electricity	58,501 kWh	$6,843	200
Total Scope 2 Emissions	**283**	**99.7%**	**-**	**615,338 kWh**	**$67,109**	**2,057**
Total Emissions[29]	**284**	**100%**	-	**-**	**$67,109**	**2,067**

26 See LGOP inventory guidelines, page 12.

27 Southern California Gas no longer possesses official customer records going back to 1990 due to document retention policies. SoCalGas located some records that go back to 1990 which was the basis for the gas information provided for 1990.

28 In some cases, building & facility accounts include lights and water delivery devices located on the same metered account.

29 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 increased 2.4%. The percentage change for natural gas has not been listed since only casual records could be found for 1990 and was difficult to compare with 2005 where complete records existed.

From 2005 to 2007 overall emissions from electricity use increased 5.5%. Emissions from natural gas use increased by 23% (refer to appendix D, to review energy use per building). City fleet sources from gasoline and CNG increased by 2.4% and 30.2% respectively, while emissions from diesel fuel sources decreased 40%. Employee commute emissions from gasoline sources increased by 60.7%. Emissions from waste sources increased by 3.2%.

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

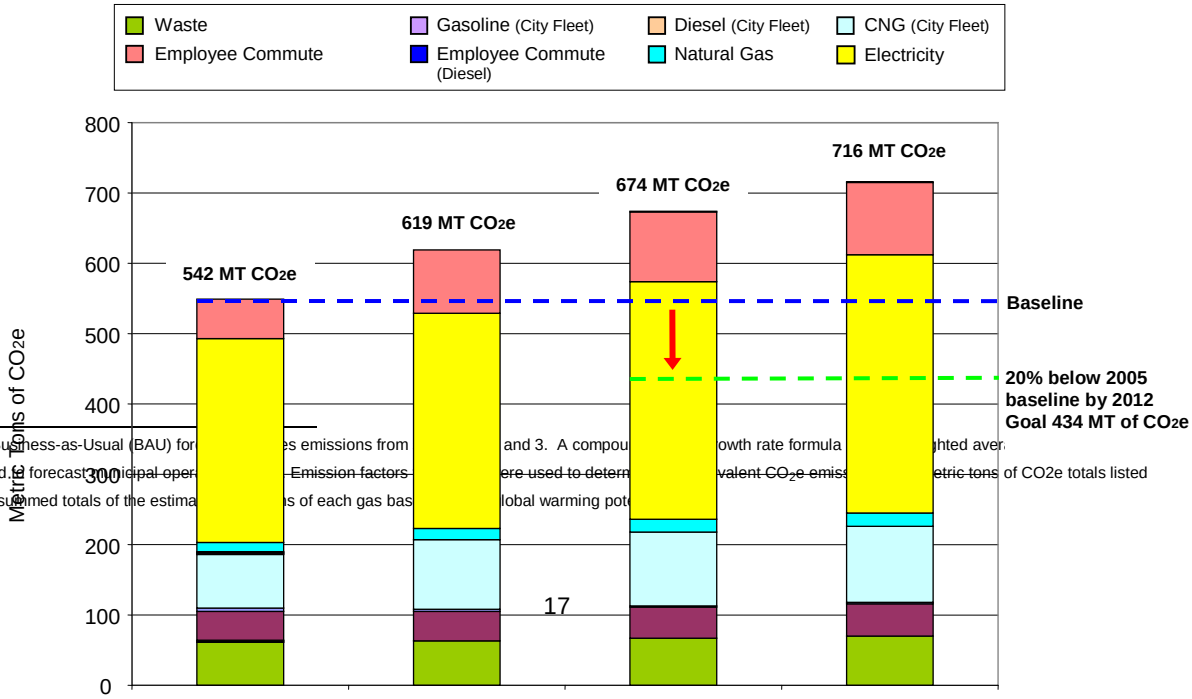
Electricity	**MTCO_2e 1990**	**MT CO_2e 2005**	**Percentage Change**	**MT CO_2e 2005**	**MT CO_2e 2007**	**Percentage Change**
Buildings & Facilities	166	41	-75.3%	41	87	+112.1%
Traffic Signals & Controllers	90	74	-17.7	74	56	-24.3%
Streetlights	-	163	-	163	145	-11%
Park/ Other Outdoor Lighting	27	11	-59.2	11	17	54.5%
Sprinkler/Irrigation Control	-	1	-	1	1	-
Total	**283**	**290**	**+2.4%**	**290**	**306**	**+5.5%**
Natural Gas						
Buildings & Facilities	1	13	-	13	16	+23%
Fuel						
Gasoline, City Vehicle Fleet	-	41	-	41	42	+2.4%
Diesel, City Vehicle Fleet	-	5	-	5	3	-40%
CNG, City Vehicle Fleet	-	76	-	76	99	+30.2%
Gasoline, Employee Commute	-	56	-	56	90	+60.7%
Waste						
Waste	-	61	-	61	63	+3.2%

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 674 metric tons of CO_2e by 2012 and 716 metric tons of CO_2e by 2015. Several indicators are taken into consideration for predicting anticipated emissions growth, such as, energy usage trends between the baseline year and the interim year (where possible historical year data is taken into account), assumptions about future energy consumption based on the expansion of municipal facilities and operations, new programs that may increase the use of energy, and any anticipated increase in municipal staff. By developing a business-as-usual forecast of emissions, the City can identify a target year to reduce emissions and develop the appropriate measures and policies to target specific areas.

To ensure the City reaches its emission reduction goal it may be helpful to look at individual measures that are planned for implementation and quantify those measures in order to see how much of a reduction can be expected from a given measure. Figure 7 illustrates a possible reduction scenario based on a reduction goal of 20% below the 2005 baseline levels by 2012. ICLEI recommends setting a long-term target (15-20 years) from the baseline year and a short-term or interim target every 2-3 years to make certain the City continues to reduce its emissions. The further away the goal, the larger amount of reductions should be targeted. The blue line represents the baseline year 2005 calculations from which a reduction target can be determined. The green line represents a possible reduction scenario. If the City were to set an emission target 20% below 2005 levels the goal would be to reduce emissions to 434 metric tons of CO_2e.

Figure 7. Business-as-Usual Forecast[30]



30 The Business-as-Usual (BAU) for[illegible]es emissions from [illegible] and 3. A compou[illegible]owth rate formula [illegible]ghted aver[illegible] were used to forecast municipal oper[illegible] Emission factors [illegible]ere used to determ[illegible]valent CO_2e emiss[illegible]etric tons of CO2e totals listed here are summed totals of the estima[illegible]s of each gas bas[illegible]lobal warming pote[illegible]

2005 Baseline Year | 2007 Interim Year | 2012 | 2015 Business-as-Usual

IV. Summary of Measures and Policies

There are a variety of ways in which the City of Lawndale 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 Sensors: City Hall offices have been fitted with motion sensor lights to conserve electricity.

B. Solid Waste and Recycling

Recycling Program: Residents can drop off fluorescent light bulbs, paint containers, and batteries at the City Public Works yard on designated days to be recycled. The City of Lawndale and Consolidated Disposal Services offer both commercial businesses and multi-family complexes free recycling services.

Public Beverage Container Recycling Bins: Placed at most City parks, office locations, and transit stops are separate beverage recycling collection containers alongside trash cans.

No Drugs Down the Drain: Through flyers and web site postings, the City actively encourages residents to properly dispose of their unused and expired non-controlled substances.

Composting: The City has partnered with Environmental Charter High School (ECHS) and hosted composting classes in the spring of 2009.

C. Sustainable Development

The City of Lawndale has adopted the Los Angeles Counties regulations (Title 24) regarding energy efficiency for new developmental projects within city boundaries.

D. Urban Forests

The Lawndale Redevelopment Agency has recently developed a neighborhood park known as Hopper Park located along 4415 163rd Street. In addition, the agency is in the process of redeveloping another neighborhood park known

as Hogan Tot Lot.

The City of Lawndale also requires residential properties to maintain open space areas through mandatory setback areas. All front setback areas within the City of Lawndale are required to have at least 50% of the area be landscaped. In addition, the City encourages the use of drought tolerant plants and hardscape materials.

E. Water Usage and Conservation

Drought Tolerant landscaping: The City of Lawndale has water efficient landscape standards that regulate irrigation systems and encourage drought tolerant plants to be placed in landscaped areas of residential properties. In addition, the City has planted drought tolerant plants and utilizes reclaimed water to irrigate the landscaped medians along Hawthorne Boulevard.

Water Conservation Ordinance: The City of Lawndale has a water conservation ordinance that provides a list of requirements such as restrictions on landscape irrigation, which is only permitted between the hours of five p.m. and ten p.m., that residents must follow to conserve water.

Building Upgrades: City Hall locations utilize low-flush toilets as well as energy efficient appliances (i.e., dish washers) that reduce water consumption.

F. Storm Water Management

National Pollutant Discharge Elimination System (NPDES): The City actively participates in the National Pollutant Discharge Elimination System (NPDES) requirements. In addition, the Planning Department has been working with developers on reducing impervious surface areas on construction projects throughout the City.

The City has storm water pollution prevention management practices for landscaping, gardening, pest control, swimming pool and spa maintenance, automotive repair facilities, painting and construction that are enforced by the City's municipal services and Community Development Department.

G. Vehicle Fleet

Fuel-Efficient Vehicles: The City uses alternative fuel sources such as compressed natural gas to fuel a portion of the City's vehicle fleet. In addition, the City has purchased four hybrid vehicles.

H. Education and Outreach

Green Task Force: The City of Lawndale has created an internal green task force that is charged with the responsibility of providing information about being environmentally friendly. The task force is currently creating a sustainable website for the City, which will provide information on energy efficiency, rebates, recycling, and e-waste removal.

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

Green Website: The City is developing a green website that provides information on energy rebates, recycling, and ways to be energy efficient.

Appendix A—Greenhouse Gas Municipal Inventory Details

A. Greenhouse Gas Report 2005—Baseline Year

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

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

GHG Emissions Summary (All Units in Metric Tons)

Buildings & Other Facilities					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	**13**	**13**	**0.00132**	**0.00003**
Scope 2	Purchased Electricity	**41**	**41**	**0.00179**	**0.00068**

Streetlights and Traffic Signals					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**248**	**246**	**0.01074**	**0.00407**

Water Delivery					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**1**	**1**	**0.00005**	**0.00002**

Vehicle Fleet					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Mobile Combustion	**122**	**116**	**0.10217**	**0.00968**

Solid Waste					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Contract Services				
	Consolidated	**61**	**61**	**2.92014**	**-**

Employee Commute					
Scope 3		CO_2e	CO_2	CH_4	N_2O
	Employee Commute	**56**	**53**	**0.00324**	**0.00397**

Total Emissions					
		CO_2e	CO_2	CH_4	N_2O
	Scope 1	**135**	**129**	**0.10349**	**0.00971**
	Scope 2	**290**	**288**	**0.01258**	**0.00477**
	Scope 3	**117**	**114**	**2.92338**	**0.00397**

B. Greenhouse Gas Report 2007— Interim Year

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

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

GHG Emissions Summary (All Units in Metric Tons)

Buildings & Other Facilities					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	**16**	**16**	**0.00154**	**0.00004**
Scope 2	Purchased Electricity	**87**	**86**	**0.00395**	**0.00147**

Streetlights and Traffic Signals					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**218**	**216**	**0.00980**	**0.00372**

Water Delivery					
Scope 2		CO_2e	CO_2	CH_4	N_2O

	Purchased Electricity	**1**	**1**	**0.00003**	**0.00001**

Vehicle Fleet

Scope 1		CO_2e	CO_2	CH_4	N_2O
	Mobile Combustion	**144**	**138**	**0.13306**	**0.01144**

Solid Waste

Scope 3		CO_2e	CO_2	CH_4	N_2O
	Contract Services				
	Consolidated	**63**	**63**	**2.98294**	**-**

Employee Commute

Scope 3		CO_2e	CO_2	CH_4	N_2O
	Employee Commute	**90**	**88**	**0.00496**	**0.00575**

Total Emissions

	CO_2e	CO_2	CH_4	N_2O
Scope 1	**160**	**154**	**0.13460**	**0.01148**
Scope 2	**306**	**303**	**0.01378**	**0.0052**
Scope 3	**153**	**151**	**2.98790**	**0.00575**

C. Greenhouse Gas Report 1990—Historical Year

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

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

GHG Emissions Summary (All Units in Metric Tons)

Buildings & Other Facilities					
Scope 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	**1**	**0.55023**	**0.00005**	**0.00000**
Scope 2	Purchased Electricity	**166**	**164**	**0.00639**	**0.00224**

Streetlights and Traffic Signals					
Scope 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	**117**	**116**	**0.00454**	**0.00159**

Total Emissions				
	CO_2e	CO_2	CH_4	N_2O

Scope 1	**1**	**0.55023**	**0.00005**	**0.00000**
Scope 2	**283**	**280**	**0.01093**	**0.00383**

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

Description:
Consumption data was obtained from Southern California Gas Company.

Recommended Method
Known Natural Gas use

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.

Generator fuel data was provided by City staff, Steven Farmer.

Reference: Chauncy Tou, Energy Programs Advisor Customer Programs, Southern California Gas Company, 213-244-2833, ctou@semprautilities.com.
Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

Scope 2 Purchased Electricity

Description:
Consumption data was obtained from Southern California Edison.

Recommended Method
Known electricity use

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

B. Street Lighting and Traffic Signals

Scope 2 Purchased Electricity

Description:
Consumption data was obtained from Southern California Edison.

Note: Accounts owned by SCE were included but recorded separately.

Recommended Method
Known electricity use

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

C. Water Delivery

Scope 2 Purchased Electricity

Description:
Consumption data was obtained from Southern California Edison.

Recommended Method
Known electricity use

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

D. Vehicle Fleet

Scope 1 Mobile Combustion

Description:
City staff collected data from departmental records and accounts payable.

Recommend Method
Known fuel use from accounts payable

Reference: Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

E. Solid Waste Facilities

Scope 3 Waste Related

Description:
City staff provided information on the volume and frequency of waste collected from city building/facility bins.
2007—247 tons
2005—242 tons
No records could be found for 1990 City operated and owned facilities.

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

Reference: Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

Scope 3 Employee Commute

Description: Employee commute results were determined by conducting a survey of employee commute distance, mode, and frequency for the years 2007 and 2005. The online website Survey Monkey was utilized to conduct the survey www.surveymonkey.com
Reference: Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

Appendix C—Methodology/Emissions Factors Disclosure

It is considered good practice to disclose all methodologies employed to calculate emissions. Listed below are the formulas used to determine the equivalent emissions. Emissions factors refer to a unique value used to determine the amount of a GHG emitted on a per unit activity basis. They are used to convert activity data, like energy usage, into the associated GHG emissions.[31] In compliance with the LGOP and ICLEI program reporting requirements listed below and organized by scope are descriptions of computational methods and emission factors used to arrive at the equivalent GHG emissions. Indicated in the top right corner is the method used and whether it is considered to be a recommended or alternate method based on the LGOP standards. In this way, the City will be able to improve its data collection where an alternative method is listed. It is important to note that scope 3 emissions are considered optional reporting.

A. Scope 1 Stationary Combustion

Description of Computational Method: 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.	**Recommended Method** Default emission factors, Table G.1 and Table G.3 of the LGOP
Criteria Air Pollutants, Table 3. NERC Western Systems Coordinating Council/CNV 1990- 2005 2007 inventory-2005 CAP emissions factors 2005 inventory-2005 CAP emissions factors 1990 inventory-1990-2003 emissions factors	
Reference: Data was provided by Chauncy Tou, Energy Programs Advisor Customer Programs, Southern California Gas Company, 213-244-2833, ctou@semprautilities.com.	

31 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.

B. Scope 1 Mobile Combustion

Description of Computational Method: City staff provided fuel data based on known f fuel use from fuel tracking system.	**Alternative Method** Alternative emissions factors, Table G.13 of the LGOP

Alternate Emissions Factors were used based on Table G.13 of the LGOP, Alternate Methodology for Highway Vehicles by Inventory Year, pg. 180.

Reference: Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

C. Scope 2 Purchased Electricity

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

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

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

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

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

D. Scope 3 Waste Related Emissions

Description of Computational Method:
For both years, waste estimates were based on the volume and frequency of waste collected from City building/facility bins. Assumptions: containers were 100% full at time of pick-up. For 2007, municipal employee growth rates were utilized to estimate changes in waste generated from City operated buildings.

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

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

Reference: Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

E. Scope 3 Employee Commute

Description of Computational Method: The online website Survey Monkey was utilized to conduct an employee commute the survey http://www.surveymonkey.com	**Alternative Method** Alternative emissions factors, Table G.13, LGOP

It was estimated that on average employees worked 49 weeks annually—15 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 or partial excluded from the emissions inventory.

2007—66 FT/PT employees with 54 responses is a 82% response rate. The remaining 18% of VMT was

estimated based on survey responses for a total VMT of 172,057. Assumptions: gasoline, drove alone, passenger vehicle (1.21x 142,196 =172,057 Total VMT) 2005—50 FT/PT employees with 31 responses is a 62% response rate. The remaining 38% of VMT was estimated based on survey responses for a total VMT of 104,009. Assumptions: gasoline, drove alone, passenger vehicle (1.61x 64,602=104,009 Total VMT)
Reference: Christopher Wilson, Assistant Planner, Community Development Dept., 310-973-3240, cwilson@lawndalecity.org

Appendix D—Emissions Data

The municipal inventory report was based on data collected from electricity, natural gas consumption, fuels, and other sources listed in the tables below as reference. Information is organized to be consistent with the order of the report, e.g., baseline year, interim year, and historical year. Emissions sources are organized according to source, equivalent metric tons of carbon dioxide emissions, energy equivalent in MMBtu, energy/fuel use, and cost where known.[32]

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	8	1.4	85	24,768 kWh	$168,030
	Natural Gas	10	1.9	195	1947 therms	$2,464
City Misc.	Electricity	6	1.1	66	19,477 kWh	$3,333
Jane Adams Park	Natural Gas	0	0.1	8	80 kWh	$222
LA County Library	Electricity	1	0.3	16	4,680 kWh	$817
Neighborhood Watch Building	Electricity	0	0	1	387 kWh	$211
Park Facilities	Electricity	9	1.6	96	28,128 kWh	$10,364
Public Works Facilities	Electricity	17	3.2	194	56,840 kWh	$8,968
	Natural Gas	3	0.5	47	472 therms	$659
Emergency Generator	Diesel	0	0.1	6	45 gal	n/a
Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	74	13.8	829	242,936 kWh	$24,696

32 Source of data CACP software output.

Streetlights:						
City Owned Streetlights	Electricity	159	29.8	1788	523,864 kWh	$34,893
Streetlight SCE Owned	Electricity	4	0.7	41	12,060 kWh	$1,260
Other Outdoor Lighting:						
Park/Other Outdoor Lighting	Electricity	11	2.1	123	36,175 kWh	$3,439
Water Delivery						
Sprinkler/Irrigation Control	Electricity	1	0.2	13	3,770 kWh	$732
Vehicle Fleet						
Cable Dept	Gasoline	1	0.1	7	56.12 gal	$148
Community Services	Gasoline	15	2.8	209	1,684 gal	$4,274
	CNG	16	3.1	290	2,337 gal equiv.	$2,046
Municipal Services	Gasoline	16	3	222	1789.5 gal	$4,575
	CNG	49	9.2	872	7,021.56 gal equiv.	$6,146
Public Works	Gasoline	9	1.7	121	976.92 gal	$2,577
	Diesel	5	0.9	66	473.03 gal	$1,320.33
	CNG	11	2	194	1,561.56 gal equiv.	$1,367
Employee Commute						
Drove Alone	Gasoline	55	10.1	751	102,735 VMT	n/a
Carpool	Gasoline	1	0.1	8	1,225 VMT	n/a
Public Transportation	Diesel	0	0	1	49 VMT	n/a
Solid Waste						
Refuse	Carbon Dioxide	61	10.2	0		
Sources:	Food Waste	7				
	Paper Products	46				
	Plant Debris	6				
	Wood/Textiles	2				

Sources of Emissions 2007	Source	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Energy/ Fuel Use	Energy/ Fuel Use Cost
Buildings and Facilities						
City Hall	Electricity	51	7.8	596	174,630 kWh	$26,855
	Natural Gas	13	2	241	2405 therms	$2,821
City Misc.	Electricity	3	0.5	35	10,199 kWh	$2,019

Jane Adams Park	Natural Gas	1	0.1	15	150 therms	$281
Municipal/Community Services	Electricity	6	0.9	72	20,973 kWh	$3,633
Park Facilities	Electricity	9	1.4	104	30,336 kWh	$9,875
Public Works Facilities	Electricity	17	2.6	201	58,800 kWh	$10,107
	Natural Gas	2	0.2	29	285 therms	$542
Roger Anderson Park	Electricity	1	0.1	8	2,262 kWh	$539
Emergency Generator	Diesel	0	0.1	6	45 gal	n/a
Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	56	8.6	656	192,091 kWh	$23,302
Streetlights:						
City Owned Streetlights	Electricity	135	20.6	1577	461,934 kWh	$39,345
Streetlight SCE Owned	Electricity	29	4.4	334	97,965 kWh	$15,199
Other Outdoor Lighting:						
Park/Other Outdoor Lighting	Electricity	17	2.6	199	58,220 kWh	$5,766
Water Delivery						
Sprinkler/Irrigation Control	Electricity	1	0.1	9	2,546 kWh	$719
Vehicle Fleet						
Cable Dept	Gasoline	1	0.1	8	63.46 gal	$189
Community Services	Gasoline	19	2.9	266	2,143 gal	$3,186
	CNG	21	3.3	380	3,057 gal equiv.	$2,422
Municipal Services	Gasoline	17	2.6	237	1905.33 gal	$5,891
	CNG	14	2.2	254	2,043 gal equiv.	$1,619
Public Works	Gasoline	5	0.8	71	573.48 gal	$1,758
	Diesel	3	0.4	36	256.57 gal	$850.22
	CNG	64	9.8	1141	9,186.74 gal equiv	$7,279
Employee Commute						
Drove Alone	Gasoline	85	13.7	1172	160,573 VMT	n/a
Carpool	Gasoline	5	0.8	74	11,368 VMT	n/a
Public Transportation	Diesel	0	0	3	116 VMT	n/a
Solid Waste						
Refuse	Carbon Dioxide	63	10.2		247 tons	n/a

Sources:	Food Waste	7
	Paper Products	47
	Plant Debris	7
	Wood/Textiles	2

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	95	33.4	688	201,690 kWh	$19,506
	Natural Gas	1	0.2	10	96 therms	n/a
Jane Adams Park	Natural Gas	0	0	0	2 therms	n/a
LA County Library	Electricity	4	1.5	30	8,837 kWh	$1,097
Little League Park	Electricity	4	1.4	29	8,394 kWh	$1,045
Neighborhood Watch Building	Electricity	4	1.4	28	8,224 kWh	$1,028
Park Facility	Electricity	21	7.5	154	45,144 kWh	$5,163
Public Work facilities	Electricity	21	7.4	153	44,800 kWh	$5,275
	Natural Gas	0	0	1	96 therms	n/a
Roger Anderson Park	Electricity	1	0.4	8	2,260 kWh	$362
Sheriff Station	Electricity	16	5.5	113	33,060 kWh	$3,801
Streetlights & Traffic Signals						
Traffic Signals/Controllers	Electricity	90	31.7	654	191,641 kWh	$20,206
Other Outdoor Lighting:						
Park/Other Outdoor Lighting	Electricity	27	9.7	200	58,501 kWh	$6,843

Criteria Air Pollutants[33]

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.[34] 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	190	84	93	13	70
Streetlights & Traffic Signals	724	483	458	52	399
Water Delivery	3	2	2	0	2
Vehicle Fleet	259	17	3,644	273	11
Employee Commute	337	20	3,715	382	8
Total	1,513	606	7,912	720	490

Criteria Air Pollutants 2007	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	342	180	186	24	149
Streetlights & Traffic Signals	660	441	418	47	364
Water Delivery	2	2	1	0	1
Vehicle Fleet	289	16	4374	308	11
Employee Commute	523	32	6118	618	12
Total	1,816	671	11,097	997	537

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

34 Source of data CACP software output.

Criteria Air Pollutants 1990	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Building and Facilities	304	245	195	22	185
Streetlights & Traffic Signals	215	174	138	16	131
Total	519	419	333	38	316

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 66 full-time and part-time employees; however, only 54 employees that took the survey worked for the City in 2007 resulting in a 82% response rate. For 2005, there were 50 full-time and part-time employees; however, there were only 31 employees that took the survey who worked for the City in 2005 resulting in a 62% 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.[35]

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.[36] 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 carpoolers); and 20-40.9 miles and above (long distance carpools and vanpools).

Based on information provided by respondents in the year 2007, 82% of employees traveled 142,196 vehicle miles. Within the 82% response rate, 7.4% of employees carpooled to the worksite, 100% of them were two-person carpools, and 24.1% of employees lived within a range of 9 to19.9 miles from the worksite (potential carpoolers). Results from question 11 indicate 34.4% of all respondents who were surveyed are interested in participating in a ridesharing program.

In the year 2005, 62% of employees traveled 64,602 vehicle miles. Within the 62% response rate, 3.2% of employees carpooled to the worksite, 100% of them were two-person carpools, and 29% of employees lived within a range of 9 to 19.9 miles from the worksite (potential carpoolers).

35 See appendix C to review employee commute details.

36 See appendix F for description of the legislation.

A. 2007 Survey Results[37]

1. Employee Information

	Response Percent	Response Count
Name:	100.0%	64
Dept:	100.0%	64
answered question		64
skipped question		0

2. What city did you live in?

	Response Percent	Response Count
City:	100.0%	64
ZIP Code:	100.0%	64
answered question		64
skipped question		0

Cities Listed in Survey:
Hawthorne, Inglewood, La Mirada, Lakewood, Lawndale, Long Beach, Los Angeles, Manhattan Beach, Monrovia, Norwalk, Orange, Paramount, Redondo Beach, San Pedro, Santa Clarita, Torrance, West Covina, Whittier

3. Did you work for the city in 2007?

	Response Percent	Response Count
Yes	**84.4%**	**54**
No	15.6%	10
answered question		64
skipped question		0

4. What was your workweek schedule?

	Response Percent	Response Count
3/36 work week (2 days off)	3.1%	2
4/40 work week (1 day off)	**54.7%**	**35**
9/80 work week (1 day off every other week)	1.6%	1
Regular work week	4.7%	3
Part time work	29.7%	19

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

Other (such as fire personnel compressed schedules)	7.8%	5
answered question		64
skipped question		0

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

142,196 vehicle miles traveled represents a 82% response rate
(172,057 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	13%	7
2-3.9 miles	11.1%	6
4-8.9 miles	22.2%	12
9-19.9 miles	**24.1%**	**13**
20-40.9 miles	18.5%	10
41 miles and above	11.1%	6
Number of respondents that worked for the city in 2007		54

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

Day(s) a week

	1	2	3	4	5	6	7	Response Count
Drive alone to work?	8.2% (5)	1.6% (1)	4.9% (3)	**65.6% (40)**	11.5% (7)	4.9% (3)	3.3% (2)	61
Carpool/Vanpool to work?	50.0% (3)	33.3% (2)	0.0% (0)	16.7% (1)	0.0% (0)	0.0% (0)	0.0% (0)	6
Take public transportation to work?	0.0% (0)	**50.0% (1)**	0.0% (0)	0.0% (0)	**50.0% (1)**	0.0% (0)	0.0% (0)	2
Bicycle to work?	**50.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	**50.0% (1)**	0.0% (0)	0.0% (0)	2
Walk to work?	**40.0% (2)**	20.0% (1)	0.0% (0)	**40.0% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Use another form of transportation to get to work?	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Noncommuting (such as 24 shift where you sleep at station)?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
answered question								64
skipped question								0

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

7.4% of respondents who worked for the city in 2007 participated in carpooling	Response Percent	Response Count
2 person	100%	8
answered question		8
skipped question		56

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

Metro Green Line	Response Count
	3
answered question	3
skipped question	61

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)	6.3%	4
Auto-mid size (e.g., Honda Accord, Toyota Camry)	**34.4%**	**22**
Auto-compact (e.g., Honda Civic, Toyota Corolla)	20.3%	13
Light truck/SUV (e.g., Chevy Suburban, Ford Expedition)	29.7%	19
Heavy truck (e.g., Tractor-trailer truck)	0.0%	0
Motorcycle	0.0%	0
Van	0.0%	0
City Vehicle	1.6%	1
Didi not drive an automobile	7.8%	5
answered question		64
skipped question		0

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

	Response Percent	Response Count
Gasoline	**89.1%**	**57**
Diesel	0.0%	4
Ultra-low sulfur diesel	0.0%	1
Bio-diesel	0.0%	0
Hybrid	3.1%	2
ethanol	0.0%	0
electric	0.0%	0

LPG	0.0%	0
CNG	1.6%	1
Did not Drive an automobile	6.3%	4
answered question		64
skipped question		0

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

	Response Percent	Response Count
Yes	34.4%	22
No	**65.6%**	**42**
answered question		64
skipped question		0

B. 2005 Survey Results

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

	Response Percent	Response Count
Yes—Skip the 2005 section and go to the end and hit done.	**46.9%**	**30**
No—Click next and complete information for 2005.	6.3%	4
Other—Did not work for the city in 2005, skip the 2005 section and go to the end and hit done.	**46.9%**	**30**
answered question		64
skipped question		0

13. What city did you live in?

	Response Percent	Response Count
City:	100.0%	11
ZIP Code:	100.0%	11
answered question		11
skipped question		53

Cities Listed in Survey:

Gardena, Hawthorne, Inglewood, La Mirada, Lakewood, Lawndale, Long Beach, Los Angeles, Manhattan Beach, Monrovia, Norwalk, Orange, Paramount, Redondo Beach, San Pedro, Santa Clarita, Torrance, West Covina, Whittier

14. What was your workweek schedule?

	Response Percent	Response Count
3/36 work week (2 days off)	0.0%	0
4/40 work week (1 day off)	**54.5%**	**6**
9/80 work week (1 day off every other week)	9.1%	1
Regular work week	36.4%	4
Part time work	0.0%	0
Other (such as fire personnel compressed schedules)	0.0%	0
answered question		11
skipped question		53

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

64,602 vehicle miles traveled represents a 62% response rate
(104,009 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	16.1%	5
2-3.9 miles	13%	4
4-8.9 miles	25.8%	8
9-19.9 miles	**29%**	**9**
20-40.9 miles	9.6%	3
40 miles and above	6.4%	2
Number of respondents that worked for the city in 2005		31

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

Day(s) a week

	1	2	3	4	5	6	7	Response Count
Drive alone to work?	0.0% (0)	0.0% (0)	0.0% (0)	**54.5% (6)**	45.5% (5)	0.0% (0)	0.0% (0)	11
Carpool/Vanpool to work?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
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?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Walk to work?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
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
answered question								11

skipped question	53

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

3.2% of respondents who worked for the city in 2005 participated in carpooling	Response Percent	Response Count
2 person	100.0%	1
answered question		1
skipped question		63

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

	Response Count
	0
answered question	0
skipped question	64

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)	11.8%	2
Auto-mid size (e.g., Honda Accord, Toyota Camry)	29.4%	5
Auto-compact (e.g., Honda Civic, Toyota Corolla)	17.6%	3
Light truck/SUV (e.g., Chevy Suburban, Ford Expedition)	41.2%	7
Heavy truck (e.g., Tractor-trailer truck)	0.0%	0
Motorcycle	0.0%	0
Van	0.0%	0
City Vehicle	0.0%	0
answered question		17
skipped question		64

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

	Response Percent	Response Count
Gasoline	100.0%	11
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
answered question		11
skipped question		53

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. [38]

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

38 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.

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.

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

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

Appendix G—Abbreviations and Acronyms[39]

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

Appendix H—Glossary of Terms[40]

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

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

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

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

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

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