

City of Piedmont

Baseline Greenhouse Gas Emissions  
Inventory Report

*December 2006*



Conducted by ICLEI's Cities for Climate Protection® Campaign  
in partnership with the City of Piedmont

# **City of Piedmont Baseline Greenhouse Gas Emissions Inventory**

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## **Acknowledgements**

This Greenhouse Gas Emissions Inventory Report was completed through the generous support of many individuals and organizations. The staff at the City of Piedmont has been most helpful in gathering the data and doing the subsequent analysis. Particular thanks go to Kevin Jackson, Assistant Planner at the City of Piedmont.

Many thanks are also due to StopWaste.Org. Their generous support of ICLEI and the jurisdictions in Alameda County was instrumental to this project's success.

## **I. Introduction**

Since the early 1990's scientific consensus holds that the world's population is releasing greenhouse gases faster than the earth's natural systems can absorb them. These gases are released as by-products of fossil fuel combustion, waste disposal, energy use, land-use changes, and other human activities. This release of gases, such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), creates a blanket around the earth that allows light to pass through but traps heat at the surface preventing its escape into space. Known as the greenhouse effect or global climate change, models show that this phenomenon will lead to a 2°F to 10°F temperature increase over the next 100 years. Already the Intergovernmental Panel on Climate Change warns that most of the warming observed over the last 50 years is attributable to human activities.

Changes in the earth's temperature will have impacts for residents of Alameda County, California. These impacts could include:

- Warmer weather associated with increased heat waves
- Wetter weather with an increase in annual rainfall of 20% to 30% leading to more serious storm events
- Rising sea levels that will threaten coastal infrastructure, ecosystems, and water supplies
- Decrease in the Sierra snow pack that will effect fresh water availability and tourism opportunities
- Increase in insect born diseases

Although one city cannot independently resolve the issue of climate change, local governments can make a positive impact through cumulative local action. Cities and counties have the ability to reduce greenhouse gas emissions through effective land use and transportation planning, wise waste management, and the efficient use of energy.

### *A. Baseline Emissions Inventory Report: Purpose*

This report presents the results of the City of Piedmont's baseline greenhouse gas emissions inventory. The inventory was conducted by ICLEI – Local Governments for Sustainability in partnership with the City of Piedmont. The purpose of the baseline emissions inventory is to determine the levels of greenhouse gas emissions that the City of Piedmont emits in its base year, 2005, on a municipal level and a community-wide level. This information will be used to help the city adopt an emissions reduction target and develop an emissions reduction action plan. The inventory provides important information on the jurisdictions emissions profile so that subsequent emissions reduction strategies can be tailored to the community's specific situation.

### *B. The Alameda County Climate Protection Project*

In June 2006 the City of Piedmont, along with 10 other local governments in Alameda County, committed to becoming a member of ICLEI and participating in the Alameda County Climate Protection Project. The project was launched by ICLEI in partnership with StopWaste.Org and the Alameda County Conference of Mayors. In committing to the project, the City of Piedmont embarked on an ongoing, coordinated effort to reduce the emissions that cause global warming, improve air quality, reduce waste, cut energy use and save money.

### *C. ICLEI and the Cities for Climate Protection Campaign*

ICLEI's mission is to improve the global environment through local action. The Cities for Climate Protection® (CCP) Campaign is ICLEI's flagship campaign designed to educate and empower local governments worldwide to take action on climate change. ICLEI provides resources, tools, and technical assistance to help local governments measure and reduce greenhouse gas emissions in their communities and their internal municipal operations.

ICLEI's CCP Campaign was launched in 1993 when municipal leaders, invited by ICLEI, met at the United Nations in New York and adopted a declaration that called for the establishment of a worldwide movement of local governments to reduce greenhouse gas emissions, improve air quality, and enhance urban sustainability. The CCP Campaign achieves these results by linking climate change mitigation with actions that improve local air quality, reduce local government operating costs, and improve quality of life by addressing other local concerns. The CCP Campaign seeks to achieve significant reductions in U.S. greenhouse gas emissions by assisting local governments in taking action to reduce emissions and realize multiple benefits for their communities.

ICLEI uses the performance-oriented framework and methodology of the CCP Campaign's Five Milestones to assist U.S. local governments in developing and implementing harmonized local approaches for reducing global warming and air pollution emissions, with the additional benefit of improving community livability. The milestone process consists of:

- Milestone 1: Conduct a baseline emissions inventory and forecast
- Milestone 2: Adopt an emissions reduction target
- Milestone 3: Develop a Climate Action Plan for reducing emissions
- Milestone 4: Implement policies and measures
- Milestone 5: Monitor and verify results

In 2006 the City of Piedmont adopted a resolution to take action for climate protection and officially joined ICLEI's Cities for Climate Protection Campaign.

## **II. Emissions Inventory**

### *A. Reasoning, Methodology & Model*

ICLEI's Cities for Climate Protection methodology enables local governments to systematically estimate and track greenhouse gas emissions from energy use and waste related activities at the community-wide scale and those resulting directly from municipal operations. The municipal operations inventory is a subset of the community-scale inventory.

Once completed, these inventories provide the basis for creating an emissions forecast and reduction target, and enable the quantification of emissions reductions associated with implemented and proposed measures.

#### *1. Emissions Analysis Software*

To facilitate local government efforts to identify and reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) Software package with Torrie Smith Associates. This software estimates emissions derived from energy consumption and waste generation within a community. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of equivalent carbon dioxide units, or eCO<sub>2</sub>. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of eCO<sub>2</sub>.

The emissions coefficients and methodology employed by the software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National GHG Emissions Inventories), the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form 1605), and, for emissions generated from solid waste, the U.S. EPA's Waste Reduction Model (WARM).

The CACP software has been and continues to be used by over 200 U.S. cities and counties to quantify the reduction in their greenhouse gas emissions. However, it is worth noting that, although the software provides cities/counties with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation, rather than an exact value.

#### *2. Inventory Sources and Data Collection Process*

An inventory of greenhouse gas emissions requires the collection of information from a variety of sectors and sources. For community electricity and natural gas data, ICLEI consulted Pacific Gas & Electric Company (PG&E). The Metropolitan Transportation Commission (MTC), Bay Area Air Quality Management District (BAAQMD), and Bay Area Rapid Transit (BART) served as sources of transportation data. Solid waste data was gathered from StopWaste.Org, Waste Management, Inc., Alameda County Industries, Republic Services, Inc. and the U.S. Environmental Protection Agency (U.S. EPA).

Kevin Jackson, Assistant Planner at the City of Piedmont, coordinated the City's municipal data collection process.

These data were entered into the software to create a community emissions inventory and a municipal emissions inventory. The community inventory represents all the energy used and waste produced within the City of Piedmont and its contribution to greenhouse gas emissions. The municipal inventory is a subset of the community inventory, and includes emissions derived from internal government operations. There are two main reasons for completing separate emissions inventories for community and municipal operations. First, the government is committed to action on climate change, and has a higher degree of control to achieve reductions in its own municipal emissions than those created by the community at large. Second, by proactively reducing emissions generated by its own activities, the Piedmont government takes a visible leadership role in the effort to address climate change. This is important for inspiring local action in Piedmont as well as for inspiring other communities.

The City of Piedmont’s inventory is based on the year 2005. When calculating Piedmont’s emissions inventory, all energy consumed within the city limits was included. This means that, even though the electricity used by Piedmont’s residents is produced elsewhere, the energy and emissions associated with it appears in Piedmont’s inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community.

***B. Inventory Results***

The results below represent the City of Piedmont’s completion of the first milestone of ICLEI’s CCP campaign.

***1. Community Emissions Inventory***

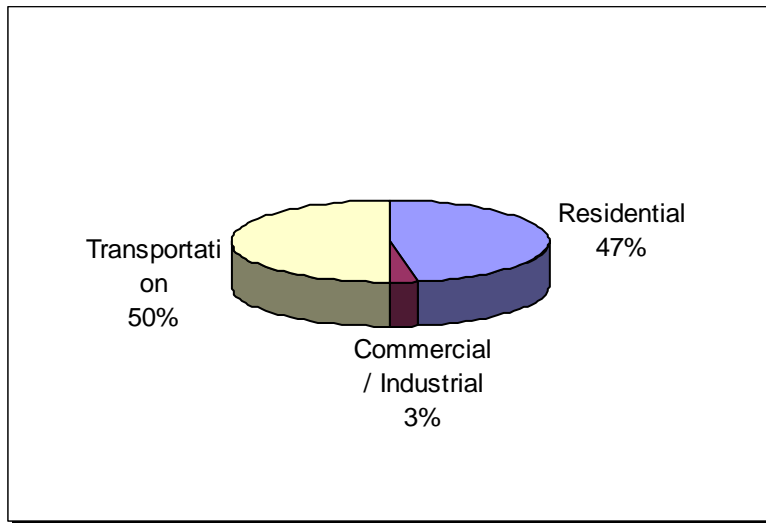
In the base year 2005, the City of Piedmont emitted approximately 59,092 tons of eCO<sub>2</sub> from the residential, commercial/industrial, transportation and waste sectors. Burning fossil fuels in vehicles and for energy use in buildings and facilities is a major contributor to Piedmont’s greenhouse gas emissions. Fuel consumption in the transportation sector is the single biggest source of emissions, contributing 50.0% of total emissions. Table (1) and Figure (a) below show Piedmont’s total greenhouse gas emissions from all major sources for the year 2005. The residential and commercial/industrial sectors represent emissions that result from electricity and natural gas used in both private and public sector buildings and facilities. The transportation sector includes emissions from private, commercial and fleet vehicles driven within the City’s geographical boundaries as well as the emissions from transit vehicles and the city-owned fleet. Because an estimated 74.60% of the methane produced from Piedmont’s solid waste is believed to be recovered (either captured perpetually under the liner of the landfill or captured and then flared), waste emissions appear to be slightly negative. However, the benefits gained from recycling and the associated “upstream” energy use far outweigh sending waste to the landfill (see a more in depth explanation under “Solid Waste Emissions,” page 10).

**Table (1): Piedmont Community Emissions Summary**

Potential Sources	Equiv eCO <sub>2</sub> (tons)	Energy (MMBtu)
Residential	27,898	424,768
Commercial/Industrial	1,622	22,768
Transportation	29,571	344,072
<b>TOTAL</b>	<b>59,092</b>	<b>791,609</b>

Source: CACP Model output

**Figure (a): Piedmont Community Greenhouse Gas Emissions - Year 2005**



Source: CACP Model output

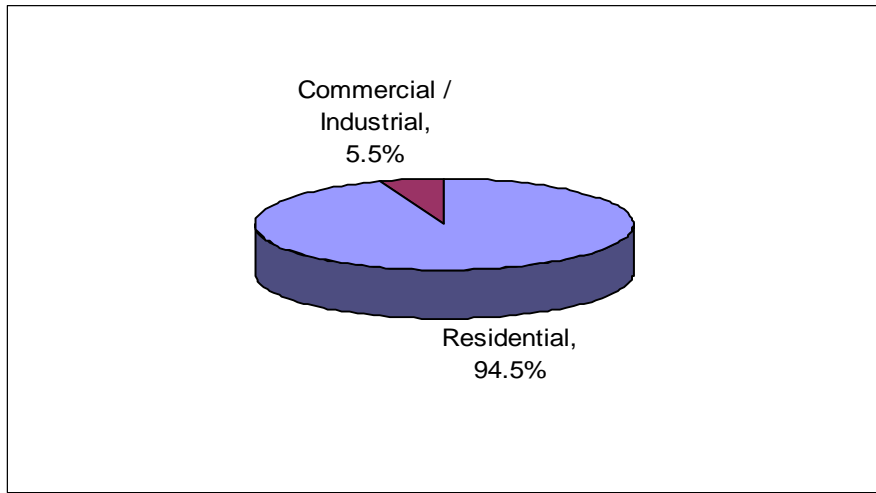
### **Energy / Stationary Source Emissions**

In 2005, Piedmont's total stationary energy consumption was about 36,228,573 kWh of electricity and 3,238,895 therms of natural gas. Stationary energy use by all sectors (residential, commercial and industrial activities) accounts for 49.9% of total greenhouse gas emissions in Piedmont. These emissions are a result of the combustion of fossil fuel. Piedmont's stationary energy use resulted in a total of approximately 29,520 tons of eCO<sub>2</sub> emissions in 2005.

The City of Piedmont receives its electricity from Pacific Gas & Electric Company (PG&E). The 2005 emissions coefficients for electricity provided by PG&E are included in the notes in Appendix B. The types of power sources that make up a utility's electricity generation mix have a significant impact on a city's greenhouse gas emissions. A coal fired power plant, for example, releases 1.3 tons of eCO<sub>2</sub> per megawatt-hour of electricity generated versus 0.7 tons for gas turbines and 0 tons for renewable sources such as solar, wind, or hydroelectric power.

Figure (b) shows the breakdown of greenhouse gas emissions by sector for both electricity and natural gas combined. Of the total 29520 tons of eCO<sub>2</sub> emitted due to stationary energy use, 94.5% was from residential buildings and 5.5% was from commercial/industrial buildings.

**Figure (b): Piedmont Community Greenhouse Gas Emissions Breakdown (Residential and Commercial/Industrial) - Year 2005**



Source: CACP Model output

### **Residential**

In 2005, Piedmont's 11,100 residents consumed 32,055,282 kWh of electricity, or about 8413 kWh per household, and 3,153,644 therms of natural gas, or about 828 therms per household. This consumption resulted in a release of 27,898 tons of eCO<sub>2</sub>. Major residential energy uses include refrigeration, lighting and water heating.

### **Commercial/Industrial**

In 2005, Piedmont's commercial/industrial sector buildings consumed 4,173,291 kWh of electricity and 85,251 therms of natural gas. This consumption resulted in a release of 1,622 tons of eCO<sub>2</sub> into the atmosphere.

### **Transportation Emissions**

The transportation sector is responsible for about 50% of Piedmont's greenhouse gas emissions. Motor vehicles driven within the City's geographical boundaries emitted approximately 29,571 tons of eCO<sub>2</sub> in 2005.

Calculations for transportation emissions are based on figures for total vehicle miles traveled (VMT) in the City of Piedmont. MTC supplied the necessary VMT data, while BAAQMD provided data that enabled us to break down total VMT by percentage driven by a given vehicle type.

### **Solid Waste Emissions**

In 2005, Piedmont sent approximately 8,335 tons of solid waste to landfills. Piedmont also has recycling and composting measures in place; however, due to lack of data availability, the emissions impact of these practices is not included in this analysis.

The way in which ICLEI's CACP software calculates solid waste emissions deserves detailed explanation. The software is designed to be used in communities with a variety of waste disposal methods, including open dumping, landfilling and incineration. The emissions calculations from waste disposal are based on the U.S. EPA's Waste Reduction Model (WARM) and are consistent with national

standards. The CACP software calculates waste sector emissions based on a number of factors, including: the methane recovery factor at the landfills to which the city’s solid waste is sent; the total amount of solid waste sent to the landfill(s); the composition of the waste sent to the landfill(s); and emissions coefficients derived from the WARM model.

A weighted average of the methane recovery factors for the landfills to which Piedmont sends its waste equals approximately 74.6%. This estimate is based on data supplied by the U.S. EPA’s Landfill Methane Outreach Program (LMOP).

Based on emissions coefficients for the waste sector, and because more than 74.6% of the methane produced from Piedmont’s solid waste is estimated to be recovered (either captured perpetually under the liner of the landfill or captured and then flared), waste emissions appear to be slightly negative, -2,519 tons of eCO<sub>2</sub> in 2005.

However, because the model does not capture the emissions credit achieved through the city’s recycling efforts, we are choosing to “zero out” the emissions credit attributed to landfilling for the purposes of this inventory. Zeroing out the emissions credit for landfilling is consistent with the action taken by a number of ICLEI members, including the City and County of San Francisco.

*Furthermore, the benefits gained from recycling and the associated reduction in “upstream” energy use far outweigh sending waste to the landfill.* For example, if Piedmont recycled an additional 20,000 tons of waste, then the City would reduce its annual eCO<sub>2</sub> emissions by an additional amount of 53,000 tons.

Recycling reduces CO<sub>2</sub> emissions because manufacturing products with recovered materials avoids emissions from the energy that would have been used during extraction, transporting and processing of virgin raw materials. Recycling paper also conserves forests, which contribute to carbon sequestration – a process that removes carbon from the atmosphere and stores it for long periods of time. Both forests and organic material in the soil sequester carbon.

Further, recent studies have begun to question the U.S. EPA’s estimates for the amount of methane that is actually captured by methane recovery systems at landfills. Many hypothesize that the efficiency with which methane recovery systems capture methane is currently overestimated, and that much more of the potent greenhouse gas is actually escaping from landfills into the atmosphere. The CACP software is designed to follow EPA guidelines and the tool will be updated appropriately when those guidelines change.

Table (2) shows the approximate breakdown of the materials Piedmont sent to landfills in 2005. Organic materials such as food and yard waste disposed of in landfills decompose and emit methane, a greenhouse gas 21 times more potent than CO<sub>2</sub>. Materials that do not breakdown and release greenhouse gases are aggregated into the “All Other Waste” category.

**Table (2): Piedmont Waste Composition**

Waste Type	Waste Share
Paper Products	22.7%
Food Waste	13.7%
Plant Debris	17.9%
Wood/Textiles	12.8%
All Other Waste	32.9%
<b>Total</b>	<b>100%</b>

Source: StopWaste.Org

## 2. Municipal Operations Emissions Inventory

ICLEI's emissions analysis software and methodology enable a jurisdiction to inventory the emissions that result from municipal operations. As was noted earlier, the municipal inventory is a subset of the community inventory.

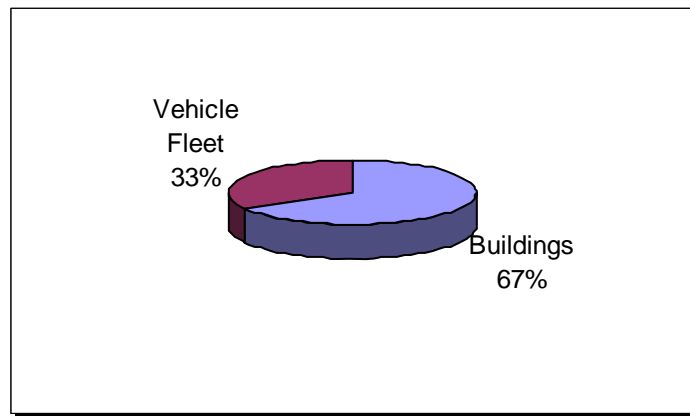
In the base year of 2005, Piedmont's municipal operations generated 1,377 tons of eCO<sub>2</sub>. As Table (3) and Figure (c) show, the City's energy use in buildings accounted for the majority of emissions, followed by the vehicle fleet.

**Table (3): Piedmont Municipal Emissions Summary**

Potential Sources	Equiv eCO <sub>2</sub> (tons)	Energy (MMBtu)
Buildings	918	12,826
Vehicle Fleet	458	5,318
TOTAL	1,377	18,144

Source: CACP Model output

**Figure (c): Piedmont Municipal Greenhouse Gas Emissions – Year 2005**



Source: CACP Model output

Municipal emissions in Piedmont constitute about 2.3% of Piedmont's total emissions. Local government emissions typically fall between 1 to 5 percent of overall community emissions. As a minor contributor to total emissions, actions to reduce municipal energy use may have a limited impact on Piedmont's overall community emissions levels. However, municipal action has symbolic value and demonstrates leadership that extends beyond the magnitude of emissions actually reduced.

### **Energy/Stationary Source Emissions**

In 2005, Piedmont municipal buildings and facilities consumed 2,437,312 kWh of electricity and 45,076 therms of natural gas, which resulted in a release of 918 tons of eCO<sub>2</sub> emissions into the atmosphere.

### **Transportation Emissions**

The City's vehicle fleet consumed approximately 42,339 gallons of gasoline equivalent and emitted about 458 tons of eCO<sub>2</sub>. The municipal fleet includes all vehicles owned and operated by the City of Piedmont plus some contractor vehicles performing City functions (e.g., Waste Management garbage trucks).

### **Solid Waste Emissions**

The City sent 182 tons of solid waste to landfills in 2005. Based on available data and the methodology employed by U.S. EPA’s WARM model, municipal waste emissions appear to be slightly negative at -39 tons of eCO<sub>2</sub>. As was discussed in the section on community solid waste emissions (see page 10), this negative number will be zeroed out for the purpose of this inventory.

**Table (4): Piedmont’s Emissions Summary**

Piedmont’s Emissions Summary		
	<b>Community Analysis</b>	<b>Municipal Operations Analysis</b>
Base year	2005	2005
Quantity of eCO <sub>2</sub> emissions in base year (tons)	59,092	1,377

Source: CACP Model Output

### **III. Forecast for Greenhouse Gas Emissions**

Based on the community and municipal operations emissions inventories developed for Piedmont for the base year 2005, the next step was to forecast future emissions for the year 2020. The emission forecast represents a business-as-usual prediction of how greenhouse gas (GHG) emissions may change in the City of Piedmont over time for the community sector.

The forecast projects the growth (or reduction) in greenhouse gas emissions that will occur in a given future year. Projections are based on the assumption that energy consumption will grow as population increases. For the community analysis, the forecast was conducted by applying population growth factors to Piedmont’s base year residential, commercial/industrial, and transportation data. For the municipal government analysis, no growth was anticipated in the municipal government operations. Table (5) provides an emissions summary for Piedmont’s base year and forecast year.

**Table ( 5): Piedmont’s Emissions Summary**

Piedmont’s Emissions Summary		
	<b>Community Analysis</b>	<b>Municipal Operations Analysis</b>
Base year	2005	2005
Indicators used to generate forecast	0.11% (Annual population growth rate based on ABAG data)	No growth anticipated
Quantity of eCO <sub>2</sub> emissions in base year (tons)	59,092	1,377
Forecast year	2020	2020
Business-as-usual projection of eCO <sub>2</sub> emissions in 2020 (tons)	59,366	1,377

Source: CACP Model Output and ABAG

Conducting an emissions forecast is essential for setting an emissions reduction target, since the amount of GHG emissions Piedmont pledges to reduce will be derived from projected emissions.

## **IV. Conclusion**

This baseline greenhouse gas emissions inventory report represents a “snapshot” of the greenhouse gases that the City of Piedmont emits in its base year, 2005, on a community-wide level and a municipal level. The report also approximates the greenhouse gases that the City will emit in the year 2020.

This information will be used to help the City adopt an emissions reduction target and develop a climate action plan. The climate action plan consists of policies and measures that, when implemented, will serve to get the City to its target. The inventory also serves to inform the City regarding the major sources of greenhouse gas emissions. For example, the community-wide inventory for the City of Piedmont reveals that the transportation sector is responsible for 50% of total emissions.

The inventory also reveals the fact that in Piedmont, like most cities, the municipal government emissions represent a small percentage of community-wide emissions, in this case only 2.3%. That being said, by proactively reducing emissions generated by its own activities, the Piedmont government takes a visible leadership role in the effort to address climate change. This is important for inspiring local action in Piedmont as well as for inspiring action in other communities.

**Appendix A – Data Summary Reports, Data Sources, Assumptions and Notes  
for the Municipal Inventory**

# Piedmont

## Government Greenhouse Gas Emissions in 2005

### Summary Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)	Cost (\$)
<b>Buildings</b>	918	66.7	12,826	0
<b>Vehicle Fleet</b>	458	33.3	5,318	0
<b>Waste</b>	0	0.0		0
<b>Total</b>	1,377	100.0	18,144	0

# Government Greenhouse Gas Emissions in 2005

## Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)	Cost (\$)
<b>Buildings</b>				
<b>Piedmont, CA</b>				
<i>All Government Facilities</i>				
Electricity	640	46.5	8,318	0
Natural Gas	278	20.2	4,508	0
<b>Subtotal All Government Facilities</b>	<b>918</b>	<b>66.7</b>	<b>12,826</b>	<b>0</b>

## Notes:

1. The PG&E coefficient set is based on the PG&E-specific eCO<sub>2</sub> emissions factor for 2005 and default criteria air pollutant emissions factors for the 2004 Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set. The PG&E coefficient set does not have emissions factors for CH<sub>4</sub> and N<sub>2</sub>O as the eCO<sub>2</sub> emissions factor includes CH<sub>4</sub> and N<sub>2</sub>O emissions in CO<sub>2</sub> equivalents.
2. The eCO<sub>2</sub> emissions factor is pending independent verification and certification by the California Climate Action Registry; the confirmed eCO<sub>2</sub> factor will be made public by CCAR at the end of 2006, at which time the emissions factor used in this analysis should be updated if it has changed.
3. Industrial consumption data is reported within the Commercial sector due to PUC confidentiality rules that prohibit the release of such data in certain cases.

## Data Sources:

1. Electricity and natural gas data provided on October 4, 2006 by Kevin Jackson, Assistant Planner, City of Piedmont, kjackson@ci.piedmont.ca.us, (510) 420-3050
2. Request for electricity and natural gas data processed by Greg San Martin, Climate Protection Program Manager, PG&E, GJS8@pge.com, (415) 973-6905, and Jasmin Ansar, Manager, Environmental Policy, PG&E, JxA2@pge.com, (415) 973-4570
3. PG&E-specific eCO<sub>2</sub> emissions factor of 0.525 lbs/kWh (or 262.5 short tons CO<sub>2</sub>/GWh) of delivered electricity in 2005 provided by Greg San Martin

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated October 7, 2006

Data summary file: City of Piedmont GHG Data.xls

<b>Subtotal Buildings</b>	<b>918</b>	<b>66.7</b>	<b>12,826</b>	<b>0</b>
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**Vehicle Fleet**

<b>Piedmont, CA</b>				
<i>Fire Department</i>				
Gasoline	5	0.4	60	0
Diesel	20	1.4	228	0
<b>Subtotal Fire Department</b>	<b>25</b>	<b>1.8</b>	<b>287</b>	<b>0</b>
<i>Police Department</i>				
Gasoline	103	7.5	1,206	0
<b>Subtotal Police Department</b>	<b>103</b>	<b>7.5</b>	<b>1,206</b>	<b>0</b>
<i>Public Works</i>				
Gasoline	35	2.5	409	0

## Government Greenhouse Gas Emissions in 2005 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)	Cost (\$)
Diesel	17	1.2	196	0
<i>Subtotal Public Works</i>	52	3.8	605	0
<i>Recreation Department</i>				
Gasoline	17	1.2	199	0
<i>Subtotal Recreation Department</i>	17	1.2	199	0

## Notes:

1. Annual VMT by vehicle is approximated by dividing the vehicle's mileage by its age.
2. Fuel consumption by equipment is not included in this analysis.
3. The City of Piedmont also owns an electric vehicle. Its electricity consumption is not included in this sector, but is most likely captured in the Buildings sector.

## Data Sources:

1. Fleet VMT data by vehicle type provided on September 29, 2006, 2006 by Kevin Jackson, Assistant Planner, City of Piedmont, kjackson@ci.piedmont.ca.us, (510) 420-3050

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated October 4, 2006

Data summary file: City of Piedmont GHG Data.xls

### *Waste - Richmond Sanitary Service*

Diesel	262	19.0	3,021	0
<i>Subtotal Waste - Richmond Sanitary Service</i>	262	19.0	3,021	0

## Notes:

1. The City of Piedmont does not own or operate the Richmond Sanitary Service fleet. However, it is included in the government emissions inventory because waste hauling is an essential municipal service. This record comprises the portion of fuel consumed by the Richmond Sanitary Service fleet for all service within the city, including the commercial/industrial, residential and government sectors.

## Data Sources:

1. Fuel consumption and fleet data provided to Kevin Jackson, Assistant Planner, City of Piedmont, kjackson@ci.piedmont.ca.us, (510) 420-3050, by Janna Coverston, Richmond Sanitary Service CoverstonJ@repsrv.com

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated October 31, 2006

Data summary file: City of Piedmont GHG Data.xls

<b>Subtotal Vehicle Fleet</b>	458	33.3	5,318	0
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### **Waste**

#### **Piedmont, CA**

#### *Government Waste*

#### *Disposal Method - Managed Landfill*

Paper Products	0	0.0		0
Food Waste	0	0.0		0
Plant Debris	0	0.0		0

## Government Greenhouse Gas Emissions in 2005 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)	Cost (\$)
Wood/Textiles	0	0.0		0
<b>Subtotal Government Waste</b>	<b>0</b>	<b>0.0</b>		<b>0</b>
Notes:				
1. In 2005, the City of Piedmont's government operations sent an estimated 161.56 tons of solid waste to landfills. Because 74.6% of the methane produced by Piedmont's solid waste is estimated to be recovered, waste emissions appear to be negative: -35 tons of eCO <sub>2</sub> . Many cities choose to eliminate this emissions "credit" by replacing the waste tonnage input data with zero. StopWaste.Org urged ICLEI to do so for the purposes of this inventory. For future reference, the notes below include the original waste data that resulted in the negative emissions number.				
2. Piedmont used the CACP Software default waste composition:				
a. Paper products: 38.0%				
b. Food Waste: 13.0%				
c. Plant Debris: 10.0%				
d. Wood/Textiles: 4.0%				
e. All Other Waste: 35.0%				
3. The weighted average methane recovery factor for Piedmont (74.6%) is based on tonnage hauled to each landfill.				
Data Sources:				
1. Landfill data ( <i>included in the notes above</i> ) provided to Kevin Jackson, Assistant Planner, City of Piedmont, kjackson@ci.piedmont.ca.us, (510) 420-3050, by Janna Coverston, Richmond Sanitary Service CoverstonJ@repsrv.com				
2. Waste characterization data based on CACP Software default waste characterization				
3. Methane recovery factors for individual landfill sites ( <i>explained in the notes above</i> ) provided by Victoria Ludwig, Program Manager EPA Landfill Methane Outreach Program, Ludwig.Victoria@epamail.epa.gov				
Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org				
Last updated December 13, 2006				
Data summary file: City of Piedmont GHG Data.xls				
<b>Subtotal Waste</b>	<b>0</b>	<b>0.0</b>		<b>0</b>
<b>Total</b>	<b>1,377</b>	<b>100.0</b>	<b>18,144</b>	<b>0</b>

**Appendix B – Data Summary Reports, Indicator Report, Data Sources,  
Assumptions and Notes for the Community Inventory**

# Piedmont

## Community Greenhouse Gas Emissions in 2005

### Summary Report

	<b>Equiv CO<sub>2</sub></b> <b>(tons)</b>	<b>Equiv CO<sub>2</sub></b> <b>(%)</b>	<b>Energy</b> <b>(MMBtu)</b>
<b>Residential</b>	27,898	47.2	424,768
<b>Commercial</b>	1,622	2.7	22,768
<b>Transportation</b>	29,571	50.0	344,072
<b>Waste</b>	0	0.0	
<b>Total</b>	59,092	100.0	791,609

## Community Greenhouse Gas Emissions in 2005 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
<b>Residential</b>			
<b>Piedmont, CA</b>			
<i>Residential</i>			
Electricity	8,415	14.2	109,404
Natural Gas	19,484	33.0	315,364
<i>Subtotal Residential</i>	27,898	47.2	424,768
<b>Subtotal Residential</b>	27,898	47.2	424,768
<b>Commercial</b>			
<b>Piedmont, CA</b>			
<i>Commercial</i>			
Electricity	1,095	1.9	14,243
Natural Gas	527	0.9	8,525
<i>Subtotal Commercial</i>	1,622	2.7	22,768
<b>Subtotal Commercial</b>	1,622	2.7	22,768

## Notes:

1. The PG&E coefficient set is based on the PG&E-specific eCO<sub>2</sub> emissions factor for 2005 and default criteria air pollutant emissions factors for the 2004 Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set. The PG&E coefficient set does not have emissions factors for CH<sub>4</sub> and N<sub>2</sub>O as the eCO<sub>2</sub> emissions factor includes CH<sub>4</sub> and N<sub>2</sub>O emissions in CO<sub>2</sub> equivalents.
2. The eCO<sub>2</sub> emissions factor is pending independent verification and certification by the California Climate Action Registry; the confirmed eCO<sub>2</sub> factor will be made public by CCAR at the end of 2006, at which time the emissions factor used in this analysis should be updated if it has changed.
3. Industrial consumption data is reported within the Commercial sector due to PUC confidentiality rules that prohibit the release of such data in certain cases.

## Data Sources:

1. Electricity and natural gas data provided on October 4, 2006 by Kevin Jackson, Assistant Planner, City of Piedmont, kjackson@ci.piedmont.ca.us, (510) 420-3050
2. Request for electricity and natural gas data processed by Greg San Martin, Climate Protection Program Manager, PG&E, GJS8@pge.com, (415) 973-6905, and Jasmin Ansar, Manager, Environmental Policy, PG&E, JxA2@pge.com, (415) 973-4570
3. PG&E-specific eCO<sub>2</sub> emissions factor of 0.525 lbs/kWh (or 262.5 short tons CO<sub>2</sub>/GWh) of delivered electricity in 2005 provided by Greg San Martin

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated October 7, 2006

Data summary file: City of Piedmont GHG Data.xls

## Community Greenhouse Gas Emissions in 2005

### Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
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#### Transportation

##### Piedmont, CA

##### *Community Transportation*

Gasoline	18,823	31.9	220,183
Diesel	10,748	18.2	123,889
<b>Subtotal Community Transportation</b>	<b>29,571</b>	<b>50.0</b>	<b>344,072</b>

##### Notes:

1. VMT data for 2005 is not currently available. The estimated 2005 VMT data was calculated by applying an annual population growth rate to 2004 MTC VMT data. The annual population growth rate is extrapolated from the Association of Bay Area Governments' population projection data for 2000-2020 as published in Projections 2005.
2. The VMT data provided by MTC includes Daily VMT (DVMT) for weekdays only. VMT including weekends is calculated with the MTC's weekdays/weekends VMT ratio: 1.1489. Hence Annual VMT = DVMT x (number of weekdays in the base year) + DVMT/1.1489 x (365 - number of weekdays in the base year).
3. The VMT by fuel and vehicle type is calculated using Alameda County VMT % (by vehicle type) and the default CACP fleet breakdown by fuel type.

##### Data Sources:

1. Citywide VMT data provided on July 18, 2006 by Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC) [hbrazil@mtc.ca.gov](mailto:hbrazil@mtc.ca.gov), (510) 817-5747
2. VMT by vehicle type data provided on July 5, 2006 by Amir Fanai, Principal Air Quality Engineer, Bay Area Air Quality Management District, [AFanai@baaqmd.gov](mailto:AFanai@baaqmd.gov)
3. Population and household indicator data are published by the Association of Bay Area Governments

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, [brooke.lee@iclei.org](mailto:brooke.lee@iclei.org)  
Last updated October 11, 2006

<b>Subtotal Transportation</b>	<b>29,571</b>	<b>50.0</b>	<b>344,072</b>
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#### Waste

##### Piedmont, CA

##### *ADC*

*Disposal Method - Managed Landfill*

Plant Debris	0	0.0	
<b>Subtotal ADC</b>	<b>0</b>	<b>0.0</b>	

##### Notes:

1. In 2005, the City of Piedmont sent an estimated 692.7 tons of ADC to landfills. Because 74.6% of the methane produced by Piedmont's solid waste is estimated to be recovered, waste emissions appear to be negative: approximately -464 tons of eCO<sub>2</sub>. Many cities choose to eliminate this emissions "credit" by replacing the waste tonnage input data with zero. StopWaste.Org urged ICLEI to do so for the purposes of this inventory. For future reference, the notes below include the original waste data that resulted in the negative emissions number.
2. Piedmont's ADC tonnage by landfill:
  - a. Altamont: 3.91 tons
  - b. Keller Canyon: 0.01 tons
  - c. Potrero Hills: 6 tons
  - d. Redwood: 2.95 tons
  - e. West Contra Costa: 679.83
3. Piedmont's waste composition:
  - a. Plant Debris: 99.1%
  - b. All Other Waste: 0.9%

## Community Greenhouse Gas Emissions in 2005 Detailed Report

Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
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4. The weighted average methane recovery factor for Piedmont (74.6%) is based on total tonnage hauled to each landfill.

**Data Sources:**

1. Landfill data (*included in the notes above*) provided on July 20, 2006 by Meghan Starkey, Senior Program Manager, Alameda County Waste Management Authority (StopWaste.org), mstarkey@stopwaste.org, (510) 614-1699
2. Waste characterization data (*included in the notes above*) is based on the 2000 Alameda County Waste Characterization study available online at <http://www.stopwaste.org/home/index.asp?page=590>
3. Methane recovery factors for individual landfill sites (*explained in the notes above*) provided by Victoria Ludwig, Program Manager EPA Landfill Methane Outreach Program, Ludwig.Victoria@epamail.epa.gov

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated December 13, 2006

Data summary file: City of Piedmont Community Waste Data 2005.xls

### Community-wide Waste

### Disposal Method - Managed Landfill

Paper Products	0	0.0	
Food Waste	0	0.0	
Plant Debris	0	0.0	
Wood/Textiles	0	0.0	
<b>Subtotal Community-wide Waste</b>	<b>0</b>	<b>0.0</b>	

**Notes:**

1. In 2005, the City of Piedmont sent an estimated 7642.13 tons of non-ADC solid waste to landfills. Because 74.6% of the methane produced by Piedmont's solid waste is estimated to be recovered, waste emissions appear to be negative: -2,055 tons of eCO<sub>2</sub>. Many cities choose to eliminate this emissions "credit" by replacing the waste tonnage input data with zero. StopWaste.Org urged ICLEI to do so for the purposes of this inventory. For future reference, the notes below include the original waste data that resulted in the negative emissions number.
2. Piedmont's waste tonnage by landfill:
  - a. Altamont: 200 tons
  - b. Keller Canyon: 170 tons
  - c. Vasco Road: 840 tons
  - d. West Contra Costa: 6,373 tons
  - e. Other landfills: 59 tons
3. Piedmont's waste composition:
  - a. Paper products: 22.7%
  - b. Food Waste: 13.7%
  - c. Plant Debris: 17.9%
  - d. Wood/Textiles: 12.8%
  - e. All Other Waste: 32.9%
4. The weighted average methane recovery factor for Piedmont (74.6%) is based on tonnage hauled to each landfill. Other landfills include B & J/Hay Road, Potrero Hills and Redwood. These landfills receive less than 1% of the total waste from the City of Piedmont.
5. Recycling and compost tonnage has been omitted from this analysis as complete recycling and compost data was not available.

**Data Sources:**

1. Landfill data (*included in the notes above*) provided on July 20, 2006 by Meghan Starkey, Senior Program Manager, Alameda County Waste Management Authority (StopWaste.org), mstarkey@stopwaste.org, (510) 614-1699
2. Waste characterization data (*included in the notes above*) is based on the 2000 Alameda County Waste Characterization study available online at <http://www.stopwaste.org/home/index.asp?page=590>
3. Methane recovery factors for individual landfill sites (*explained in the notes above*) provided by Victoria Ludwig, Program Manager EPA Landfill Methane Outreach Program, Ludwig.Victoria@epamail.epa.gov

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated December 13, 2006

Data summary file: City of Piedmont Community Waste Data 2005.xls

## Community Greenhouse Gas Emissions in 2005 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
<b>Subtotal Waste</b>	0	0.0	
<b>Total</b>	59,092	100.0	791,609

# Piedmont

## Community Greenhouse Gas Emissions in 2005

### Indicators Report

	Equiv CO <sub>2</sub> (tons)	Energy (MMBtu)
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#### Residential

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 Residential

*Per household*

7.3

111.5

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 Sector Average

*Per capita*

2.5

38.3

*Per household*

7.3

111.5

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#### Commercial

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 Sector Average

*Per capita*

0.1

2.1

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#### Transportation

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 Sector Average

*Per capita*

2.7

31.0

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#### Waste

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 Sector Average

*Per capita*

0.0

**Appendix C – Data Summary Reports, Data Sources, Assumptions and Notes  
for the Community Emissions Forecast**

# Piedmont

## Community Greenhouse Gas Emissions in 2020 Summary Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
<b>Residential</b>	28,371	47.8	431,967
<b>Commercial</b>	1,650	2.8	23,154
<b>Transportation</b>	29,345	49.4	341,930
<b>Waste</b>	0	0.0	
<b>Total</b>	59,366	100.0	797,051

## Community Greenhouse Gas Emissions in 2020 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
<b>Residential</b>			
<b>Piedmont, CA</b>			
<i>Residential</i>			
Electricity	8,557	14.4	111,258
Natural Gas	19,814	33.4	320,709
<i>Subtotal Residential</i>	28,371	47.8	431,967
<b>Subtotal Residential</b>	28,371	47.8	431,967
<b>Commercial</b>			
<b>Piedmont, CA</b>			
<i>Commercial</i>			
Electricity	1,114	1.9	14,485
Natural Gas	536	0.9	8,670
<i>Subtotal Commercial</i>	1,650	2.8	23,154
<b>Subtotal Commercial</b>	1,650	2.8	23,154

**Notes:**

1. The PG&E coefficient set is based on the PG&E-specific eCO<sub>2</sub> emissions factor for 2005 and default criteria air pollutant emissions factors for the 2004 Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set. The PG&E coefficient set does not have emissions factors for CH<sub>4</sub> and N<sub>2</sub>O as the eCO<sub>2</sub> emissions factor includes CH<sub>4</sub> and N<sub>2</sub>O emissions in CO<sub>2</sub> equivalents. The business-as-usual projections assume no change in the PG&E eCO<sub>2</sub> emissions factor.
2. The eCO<sub>2</sub> emissions factor is pending independent verification and certification by the California Climate Action Registry; the confirmed eCO<sub>2</sub> factor will be made public by CCAR at the end of 2006, at which time the emissions factor used in this analysis should be updated if it has changed.
3. Industrial consumption data is reported within the Commercial sector due to PUC confidentiality rules that prohibit the release of such data in certain cases.
4. Projections are based on the assumption that consumption (and therefore emissions) will grow as the population increases. The annual population growth rate is extrapolated from the Association of Bay Area Governments' population projection data for 2000-2020 as published in Projections 2005.

**Data Sources:**

1. Electricity and natural gas data provided on October 4, 2006 by Kevin Jackson, Assistant Planner, City of Piedmont, kjackson@ci.piedmont.ca.us, (510) 420-3050
2. Request for electricity and natural gas data processed by Greg San Martin, Climate Protection Program Manager, PG&E, GJS8@pge.com, (415) 973-6905, and Jasmin Ansar, Manager, Environmental Policy, PG&E, JxA2@pge.com, (415) 973-4570
3. PG&E-specific eCO<sub>2</sub> emissions factor of 0.525 lbs/kWh (or 262.5 short tons CO<sub>2</sub>/GWh) of delivered electricity in 2005 provided by Greg San Martin
4. Population and household indicator data are published by the Association of Bay Area Governments

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, brooke.lee@iclei.org

Last updated October 7, 2006

Data summary file: City of Piedmont GHG Data.xls

## Community Greenhouse Gas Emissions in 2020 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
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### Transportation

#### Piedmont, CA

#### Community Transportation

Gasoline	18,437	31.1	216,188
Diesel	10,908	18.4	125,742
<b>Subtotal Community Transportation</b>	<b>29,345</b>	<b>49.4</b>	<b>341,930</b>

Notes:

1. VMT data for 2005 is not currently available. The estimated 2005 VMT data was calculated by applying an annual population growth rate to 2004 MTC VMT data.
2. The VMT data provided by MTC includes Daily VMT (DVMT) for weekdays only. VMT including weekends is calculated with the MTC's weekdays/weekends VMT ratio: 1.1489. Hence Annual VMT = DVMT x (number of weekdays in the base year) + DVMT/1.1489 x (365 - number of weekdays in the base year).
3. The VMT by fuel and vehicle type is calculated using Alameda County VMT % (by vehicle type) and the default CACP fleet breakdown by fuel type.
4. Projections are based on the assumption that consumption (and therefore emissions) will grow as the population increases. The annual population growth rate is extrapolated from the Association of Bay Area Governments' population projection data for 2000-2020 as published in Projections 2005.

Data Sources:

1. Citywide VMT data provided on July 18, 2006 by Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC) [hbrazil@mtc.ca.gov](mailto:hbrazil@mtc.ca.gov), (510) 817-5747
2. VMT by vehicle type data provided on July 5, 2006 by Amir Fanai, Principal Air Quality Engineer, Bay Area Air Quality Management District, [AFanai@baaqmd.gov](mailto:AFanai@baaqmd.gov)
3. Population and household indicator data are published by the Association of Bay Area Governments

Data collected and entered by Brooke Owyang Lee, Program Assistant, ICLEI, [brooke.lee@iclei.org](mailto:brooke.lee@iclei.org)  
Last updated October 11, 2006

<b>Subtotal Transportation</b>	<b>29,345</b>	<b>49.4</b>	<b>341,930</b>
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### Waste

#### Piedmont, CA

#### ADC

*Disposal Method - Managed Landfill*

Plant Debris	0	0.0
<b>Subtotal ADC</b>	<b>0</b>	<b>0.0</b>

#### Community-wide Waste

*Disposal Method - Managed Landfill*

Paper Products	0	0.0
Food Waste	0	0.0
Plant Debris	0	0.0
Wood/Textiles	0	0.0
<b>Subtotal Community-wide Waste</b>	<b>0</b>	<b>0.0</b>

Notes:

## Community Greenhouse Gas Emissions in 2020 Detailed Report

	Equiv CO <sub>2</sub> (tons)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
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1. Given the fact that the community-wide waste and ADC tonnage were entered as zero tons in the base year inventory, the forecast for waste emissions is also zero. Reference 2005 Greenhouse Gas Emissions in 2005 waste sector notes for waste emissions analysis methodology and rationale.

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<b>Subtotal Waste</b>	0	0.0	
<b>Total</b>	59,366	100.0	797,051

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