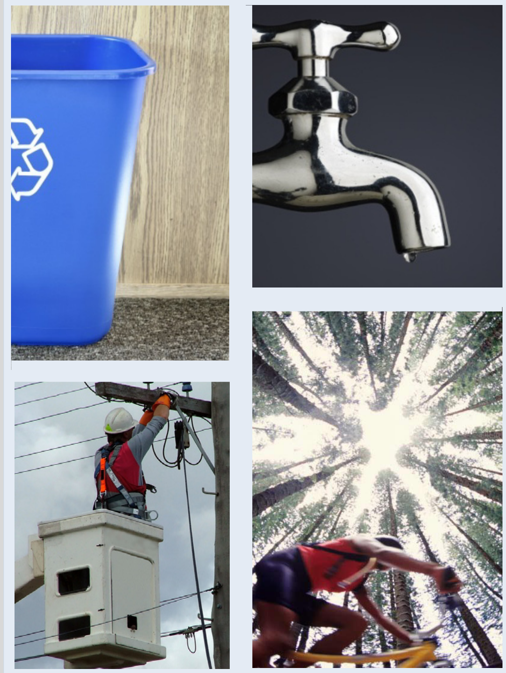
Greenhouse Gas Inventory

for the City of Auburn, Washington

prepared by

CASCADIA
CONSULTING GROUP



"The City Council of the City of Auburn acknowledges its support for actions of local, regional, national, and global level sustainability by nurturing Auburn to be environmentally, economically, and socially vital...."

Council Resolution 4368
July 7, 2008

August 2010

CITY OF
AUBURN
WASHINGTON

Acknowledgments

Mayor and City Council

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Lynn Norman, Councilmember

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ICLEI – Local Governments for Sustainability

King County Metro

Puget Sound Energy

Puget Sound Regional Council

Sound Transit

Valley Regional Fire Authority

Cascadia

Michelle Caulfield, Dominique Gómez, and Christy Shelton of **Cascadia Consulting Group** compiled this report with the help of many staff members at the City of Auburn. Cascadia gratefully acknowledges Mayor Lewis and the members of the Auburn City Council for their support of this project.

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Acronyms and Abbreviations

ARRA	American Recovery and Reinvestment Act
CACP	Clean Air and Climate Protection
CAFE	Corporate Average Fuel Economy
COP 15	United Nations Climate Change Conference held in Copenhagen, December 2009
CTR	Commute Trip Reduction
eGRID	EPA Emissions & Generation Resource Integrated Database
EPA	United States Environmental Protection Agency
FTE	Full time equivalent employee
GHG	Greenhouse gas
GHGP	Greenhouse Gas Protocol
GTEC	Washington State's Growth and Transportation Efficiency Center
ICLEI	ICLEI - Local Governments for Sustainability; previously the International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
LGOP	Local Government Operations Protocol
LID	Low impact development
MPG	Miles per gallon
$mtCO_2e$	Metric tons of carbon dioxide equivalent
NACAA	National Association of Clean Air Agencies
PSE	Puget Sound Energy
PSRC	Puget Sound Regional Council
VFD	Variable frequency drive
VMT	Vehicle Miles Traveled
VRFA	Valley Regional Fire Authority
WARM	EPA WAste Reduction Model
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute
WSDOT	Washington State Department of Transportation

Executive Summary

In 2007, City of Auburn Mayor Peter Lewis signed the U.S. Mayors' Climate Protection Agreement, formalizing Auburn's commitment to reduce greenhouse gas emissions. In June 2009, the City of Auburn contracted with Cascadia Consulting Group to conduct the City's first greenhouse gas inventory. The inventory was designed to help the City understand current impacts, set targets, and measure progress in its municipal and community carbon footprints. Cascadia conducted inventories for the City's municipal operations and the Auburn community as a whole using ICLEI's Clean Air and Climate Protection software. In consultation with City staff, Cascadia established 2008 as the baseline year for conducting measurements and setting targets. This report summarizes inventory results, forecasts emissions for 2015 and 2030, discusses emissions reduction targets, and provides recommendations for municipal actions and options for community best practices.

The **City of Auburn's municipal operations** generated approximately 10,000 metric tons of carbon dioxide equivalents ($mtCO_2e$) in the base year 2008. The emissions inventory covered the following *sectors*: building energy use, fleet fuel consumption, electricity used by water and wastewater pump stations, solid waste, refrigerants, traffic and street lights, business travel, and employee commuting. Emissions *sources* included electricity consumption, natural gas, gasoline, and diesel. At the municipal level, building energy use generated the most emissions, accounting for 34% of the City's total. Electricity consumption was the single largest source of emissions, representing 56% of total municipal emissions.

In 2008, the **Auburn community** generated just over 840,000 $mtCO_2e$. The *sectors* for the community inventory included transportation; solid waste; and residential, commercial, and industrial energy use. Again, *sources* included electricity consumption, natural gas, gasoline, and diesel. For the community inventory, transportation was the largest sector contributor, accounting for more than 40% of total emissions for the year 2008. Electricity use was the single largest source of emissions. Electricity use in residential, commercial, and industrial buildings accounted for over 40% of emissions.

Cascadia also forecasted emissions for the years 2015 and 2030, based on current use and growth rates. The forecast estimates emissions for a scenario in which no significant actions to reduce emissions take place. Largely due to the high rate of population growth projected in the City, community and municipal emissions are expected to increase approximately 10% by 2015 and approximately 40% by 2030, unless Auburn takes significant actions to reduce its emissions. All actions that the City of Auburn takes to reduce emissions will improve this "worst-case scenario" forecast of emissions.

As Auburn moves forward by setting emissions reduction goals, several existing frameworks can offer guidance, including scientific frameworks (based on necessary emissions reductions to stabilize global temperatures) and political action frameworks. The prevailing framework for the past decade has been the Kyoto Protocol, which stipulates a 7% reduction of emissions below 1990 levels by 2012. More recently, prominent frameworks – including Washington State's reduction goals and the federal government's reduction standards (from a recent Executive Order) – set longer-term goals based on more recent base years. We recommend using 2008 as a baseline year from which to set reduction goals, given the detailed inventory data available for 2008 as well as the current state and federal trends toward using more recent base years.

Greenhouse Gas Inventory

Background and Key Objectives

Conducting a baseline greenhouse gas (GHG) inventory is an important first step toward understanding and taking steps to reduce emissions in the City of Auburn. Key objectives for this project include:

- Producing an accurate and well-documented baseline inventory that can be reproduced in future years.
- Obtaining a better understanding of the most significant greenhouse gas sources at the municipal and community levels.
- Collecting the data necessary to inform climate action planning efforts, including potential policy action by the Auburn City Council to set targets for reducing emissions.
- Making recommendations for reducing emissions from municipal operations.
- Identifying best practices that reduce community emissions.

This report presents the methodology and results for Auburn's municipal and community greenhouse gas inventories for the baseline year of 2008. It also includes emissions forecasts for 2015 and 2030 and provides information on setting goals to reduce emissions. The discussion of emissions reduction goals is followed by a look at what Auburn is already doing to reduce emissions from municipal sources, recommendations for further action, and a section on community best practices for climate action.

Greenhouse Gas Inventory Methodology

This section provides an overview of the methodology for Auburn's community and municipal inventories. Planning for and conducting the inventories included these three primary steps:

1. **Define the scope and set the base year.**
2. **Collect data.**
3. **Analyze data and calculate emissions.**

The sections below explain each of these steps in more detail.

STEP 1. DEFINE THE SCOPE AND SET THE BASE YEAR

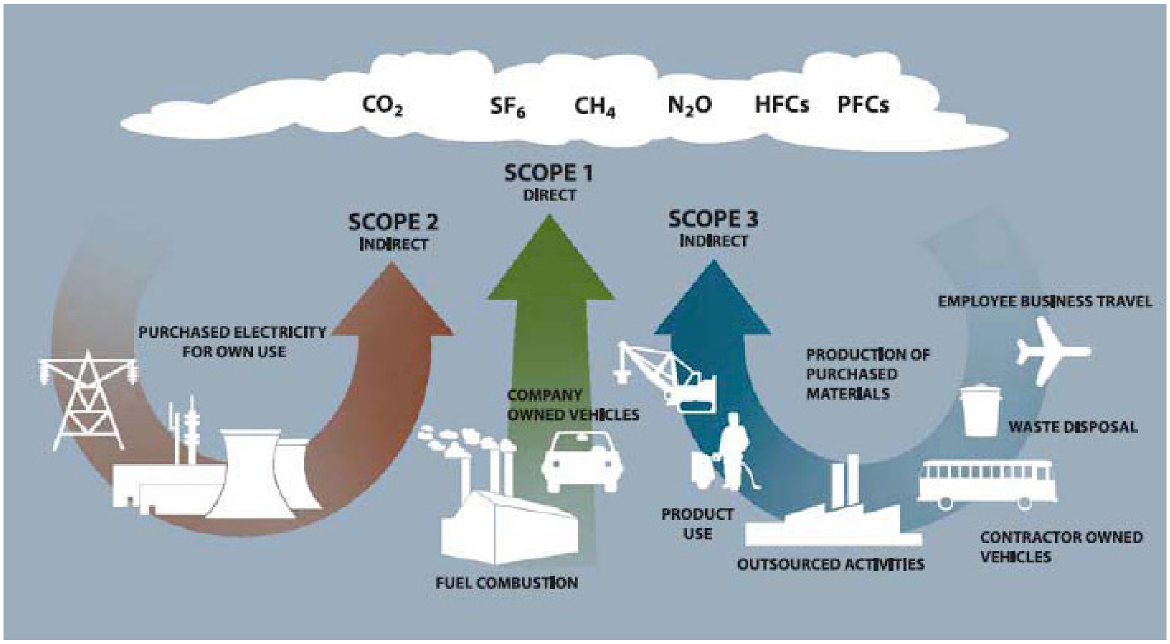
The first step in conducting a greenhouse gas inventory is to determine which activities to include in the inventory and to draw boundaries. Using a standard methodology, including consistent boundaries, allows for inventory results and benchmarking that can be compared with other entities conducting similar inventories. In 1998, the World Resources Institute (WRI), an environmental think tank, and the World Business Council for Sustainable Development (WBCSD), a coalition of 200 international companies focused on sustainable development, convened the Greenhouse Gas Protocol (GHGP), a nongovernmental organization dedicated to addressing the need for standardized methods for GHG accounting. In 2001, the GHGP released *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*. Now widely used as the basis for greenhouse gas accounting, this protocol delineates emissions sources using the three following scopes:

> **Scope 1** includes all direct sources of greenhouse gas emissions that originate from equipment and facilities owned or operated by the entity. Scope 1 sources include fuels burned through on-site combustion (such as natural gas consumption in buildings or fleet diesel and gasoline consumption), on-site refrigerant losses, and electricity produced on the site, if applicable.
>
> **Scope 2** includes all indirect greenhouse gas emissions from electricity, heat, or steam imported from other entities.
>
> **Scope 3** includes all other indirect sources of greenhouse gas emissions that may result from the activities of the institution but that occur from sources owned or controlled by another company or entity, such as emissions from leased spaces, business travel and employee commuting (when not conducted in an organization's own fleet); embodied emissions in material goods purchased by the institution; emissions from solid waste disposal; and emissions from vendor services such as shipping or catering.

The World Resources Institute developed Figure 1 below to illustrate this method for drawing boundaries for inventories.[1] WRI and WBCSD suggest that entities separately account for and measure emissions from Scopes 1 and 2 at a minimum.

[1] *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (Revised Version), World Resources Institute and World Business Council for Sustainable Development, Figure 3. "Overview of scopes and emissions across a value chain." Available online at http://www.ghgprotocol.org/files/ghg-protocol-revised.pdf

Figure 1: Overview of Emissions Sources and Scopes



Graphic courtesy of World Resources Institute

While most municipal and community inventories generally follow the three scopes outlined above, more specific guidelines are needed for the special situations common to inventories of communities and city government operations, which differ from GHG accounting for individual businesses. The sections below describe these considerations in more detail.

Municipal Inventory

In consultation with City staff, Cascadia determined that the *Local Government Operations Protocol* (LGOP) was the most appropriate guide for Auburn's municipal inventory. Although this protocol generally adheres to the principals and methods outlined in *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*, the LGOP is specifically tailored for local governments and offers guidance on how to draw system boundaries, what activities and information to include in the greenhouse gas inventories, and how to translate collected data into greenhouse gas emissions. The California Air Resources Board, California Climate Action Registry, ICLEI—Local Governments for Sustainability, and The Climate Registry developed the LGOP and released it in September 2008. Using this protocol better enables Auburn to compare its greenhouse gas inventory with other municipalities that have drawn similar boundaries by following the LGOP, although no two inventories are exactly alike.[2]

The LGOP recommends that cities measure emissions using an "operational control approach" in which emissions from buildings, equipment, and activities under their own operational control are the basis of the emissions inventory. The LGOP states that this approach "most

[2]In particular, emissions inventories may look very different depending on what community service operations a city is responsible for. These operations may include water conveyance, wastewater treatment, public transit operation, solid waste collection, and landfilling. Of these services, Auburn is responsible for only water conveyance.

accurately represents the emissions sources that local governments can influence."[3] Based on this approach, facilities and activities over which the City of Auburn has operational control (including the authority to introduce operating policies) are included as Scope 1 or 2 emissions. Other emissions sources are included as "optional" Scope 3 emissions.

Following the guidelines provided in the LGOP, emissions from activities at buildings owned and operated by the City of Auburn are included as Scope 1 and 2 emissions. These buildings include City Hall, police and parks facilities, and other buildings that are owned by the City and primarily house City staff and are used for City functions. Similarly, emissions from municipal operations such as water pumps, street and traffic lights, and vehicle fleet use are included as Scope 1 or 2. While the City does own a municipal airport, the emissions from the airport are considered Scope 3 because the City does not operate the airport.[4] Similarly, several buildings that the City owns but leases to tenants are included in the inventory but are considered Scope 3 emissions. This category includes City-owned spaces that are leased to the Valley Regional Fire Authority, the Auburn Chamber of Commerce, and the Auburn Avenue Theater, among others. Employee commuting, business travel, and waste disposal are also included as Scope 3 emissions. More information on each of these emissions sources is provided below.

Municipal Scope. The municipal inventory includes greenhouse gas emissions from sources under the operational control of the City of Auburn. Primary emissions sources include the following list. Most of the data from the municipal inventory is also included in the community inventory (all electricity and natural gas consumption, solid waste, and vehicle use within City boundaries).:

- **Building energy use.** Includes natural gas and electricity consumption in City-owned buildings. Natural gas that is combusted on-site is considered Scope 1, and electricity is considered Scope 2. City-owned spaces that are leased and operated by outside tenants are included as Scope 3 emissions.
- **Vehicle fleet.** Includes gasoline, diesel, propane, and other fuels used in both on-road and off-road vehicles and equipment. All emissions from fleet vehicles are considered Scope 1.
- **Street lights and traffic signals.** Includes electricity used by street lights and traffic signals. All emissions from municipal electricity consumption are considered Scope 2.
- **Water and sewer pump stations.** Includes electricity used by water and wastewater pump stations. All emissions from municipal electricity consumption are considered Scope 2.
- **Solid waste.** Includes all solid waste produced by municipal operations including waste from City-owned facilities, street cleaning, and parks.

[3] *Local Government Operations Protocol: For the Quantification and Reporting of Greenhouse Gas Emissions Inventories*, Version 1.1, May 2010, p. 14. California Air Resources Board, California Climate Action Registry, ICLEI—Local Governments for Sustainability, The Climate Registry. Available online at http://www.icleiusa.org/action-center/tools/local-government-operations-protocol-version-1.1/.

[4] The Auburn Municipal Airport is operated by an outside contractor which has control over maintenance, utility payments, and daily operations.

Emissions are based on greenhouse gas emissions from solid waste decomposition in landfill. All solid waste emissions from municipal wastes are considered Scope 3.[5]

- **Refrigerants.** Includes refrigerants used in building and vehicular air conditioning. All refrigerant-based emissions from City-owned facilities and fleet vehicles are considered Scope 1.
- **Employee commuting.** Includes employee travel to the City of Auburn for work each day not conducted in City-owned vehicles. All emissions from employee commuting are considered Scope 3.
- **Business travel.** Includes employee travel for City business not conducted in City-owned fleet. Does not include daily commuting to and from City for work each day. May be within City boundaries or outside City boundaries. All emissions from business travel are considered Scope 3.

Community Inventory

At the time of conducting the Auburn greenhouse gas inventory, the California Air Resources Board, California Climate Action Registry, ICLEI—Local Governments for Sustainability, and The Climate Registry reported that they were in the early stages of creating a Community Greenhouse Gas Inventory Protocol. As no documents have been released yet, the City of Auburn's community protocol is based largely on ICLEI standards and common standards used by other ICLEI members and available for review in their completed community inventory reports. Community inventories typically include energy use within city boundaries, solid waste produced in city boundaries, and vehicle miles traveled on roads within city boundaries.

Because the emissions from the community are from a variety of residential, commercial, industrial, and municipal sources, the emissions from the community inventory do not fall into Scope 1, 2, and 3 categories which are used for an entity measuring its own emissions, such as the City's municipal operations inventory.

Community Scope. The community inventory includes greenhouse gas emissions sources throughout the City and also includes Auburn's municipal operations. Primary emissions sources include:

- **Residential energy use.** Includes natural gas and electricity consumption from residences within the City of Auburn's boundaries.
- **Commercial energy use.** Includes natural gas and electricity consumption from commercial buildings within the City of Auburn's boundaries.
- **Industrial energy use.** Includes natural gas and electricity consumption from industrial facilities within the City of Auburn's boundaries.
- **Transportation**. Includes vehicle miles traveled on roads within the City of Auburn's boundaries. Does not differentiate between trips made by City residents, trips that originate or end in City boundaries, and other drive-through traffic (such as trips through Auburn's boundaries on State Routes 167 and 18).

[5] Solid waste collection is conducted by an outside contractor, and emissions from contracted solid waste collection vehicles are not included in the municipal inventory. These vehicles are included in total transportation emissions within the community of Auburn in the community inventory. Emissions from upstream manufacturing of goods consumed in City operations or in the community are not included in the inventory.

- **Solid waste**. Includes emissions from the solid waste produced by Auburn's residential, commercial, and industrial sectors. Waste from municipal operations is included in the commercial sector. Does not include emissions from solid waste collection services, which are included in "transportation" emissions.

Setting a Base Year

Equally important as determining boundaries is setting a base year and determining which year to inventory. Considerations include which years offer a complete and accurate data set and will be representative of the general level of annual emissions, providing a useful base year to forecast emissions for future years. The City of Auburn, in consultation with Cascadia Consulting Group, decided to conduct inventories of the years 2007 and 2008 as they offered the most complete data sets. On January 1, 2008, the City of Auburn annexed the Lea Hill and West Hill communities, which were formerly part of unincorporated King County. Given this change in the City's boundaries, the City of Auburn designated the 2008 calendar year as its base year. A secondary consideration was that a more complete data set was available for the year 2008. (Data regarding 2007 business travel were not available. Commuting data for 2007 were available only for employees who worked at Auburn City Hall.)

STEP 2. COLLECT DATA

Collecting data is often the most time-intensive step of conducting a greenhouse gas inventory. Many Auburn staff members, working with utility providers and other vendors, provided extensive sets of data for the various facilities and activities included in the municipal and community inventories.

The City of Auburn's Planning & Development Department coordinated data collection for the inventory. The main sources of data included utility bills and fleet records. Table 1 shows key data elements and sources for the community and municipal inventories. For more information, see *Appendix A: Detailed Data Sources*.

Table 1: Data Collection Elements and Sources

Main Data Elements	Data Sources
Community	
Electricity and natural gas usage	Puget Sound Energy (PSE)
Vehicle miles traveled	Puget Sound Regional Council
Street traffic counts	City of Auburn Department of Public Works
Solid waste	City of Auburn, Department of Finance; drawn from Waste Management, Allied Waste, and Murrey's Disposal
Municipal	
Utility invoices	City of Auburn Department of Finance and Puget Sound Energy
Vehicle fleet records	City of Auburn Maintenance & Operations Department
Employee business travel miles traveled	City of Auburn departmental reimbursement records
Employee commuting miles traveled	Commute Trip Reduction Survey, web survey of City of Auburn employees
Solid waste	City of Auburn estimation based on size of container and frequency of pick-up by building

Emissions sources with special considerations regarding data sources are discussed below.

Leased Space Emissions

Emissions from leased spaces (facilities owned by the City but operated by outside entities), including the municipal airport, are considered an "optional" Scope 3 emission in the LGOP and are included in this base year inventory. Because the City does not pay utility bills directly for these spaces, the City requested permission from tenants to obtain these utility records.

Business Travel

Similar to utility information in leased spaces, business travel information was not tracked in a central form or location prior to this project. For this reason, business travel information was calculated by reviewing reimbursed expenses in each department. Business travel data were collected only for the base year of 2008 to streamline the process during preparation of this inventory.

Utility Use at Individual Facilities

Utility use at individual facilities was calculated based on meter data from PSE electricity and natural gas invoices collected by the City of Auburn Finance Department. During the collection effort, it was determined that not all meter numbers were initially correlated with individual buildings. Cascadia worked with the Finance Department, PSE, and building managers to link unidentified meter numbers with the correct buildings.

Employee Commuting

The data collected on employee commuting habits led to slightly different calculation methodologies for the 2007 and 2008 inventories. For the 2007 inventory, employee commuting practices were based on the findings of Auburn's Commute Trip Reduction (CTR) survey.[6] Because the CTR survey covered only employees that worked at Auburn City Hall, it was scaled to estimate commuting emissions from all City employees based on the ratio of total City of Auburn full-time equivalent employees (FTEs) versus the FTE count that took the survey. For the year 2008, Cascadia surveyed all City staff members employed during the time of conducting the inventory (summer 2009) who were also employed by the City during the year 2008. Over 370 staff, or 84% of employees, completed the online survey regarding their commuting habits. While calculations of commuting emissions based on these two sources were as consistent as possible, the 2007 CTR survey reported data in aggregate and did not allow for the same level of specificity of emissions calculations as the online survey for 2008. In addition, the 2007 CTR survey only provided information for City employees that worked at Auburn City Hall, and may not accurately reflect the commuting habits of employees commuting to different buildings.

Solid Waste

Through contracts with waste haulers for residential and commercial waste collection, the City of Auburn receives free waste pick-up from its municipal operations. Waste tonnages from municipal operations were not tracked for 2007 or 2008. City of Auburn staff estimated waste tonnages based on the size of containers and frequency of collection for each City building.

STEP 3. ANALYZE DATA AND CALCULATE EMISSIONS

In consultation with Cascadia, the City of Auburn chose to use the ICLEI Clean Air and Climate Protection (CACP) software for the Auburn inventory. In 2001, ICLEI developed the CACP tool in partnership with the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency. The software is intended to help local governments conduct greenhouse gas inventories, quantify the benefits of specific initiatives to reduce GHGs, and create climate action plans for their communities and municipal operations.

With the release of the Local Government Operations Protocol, ICLEI worked to update the original CACP software to more closely follow the methods, standards, and data requirements that the LGOP specified.

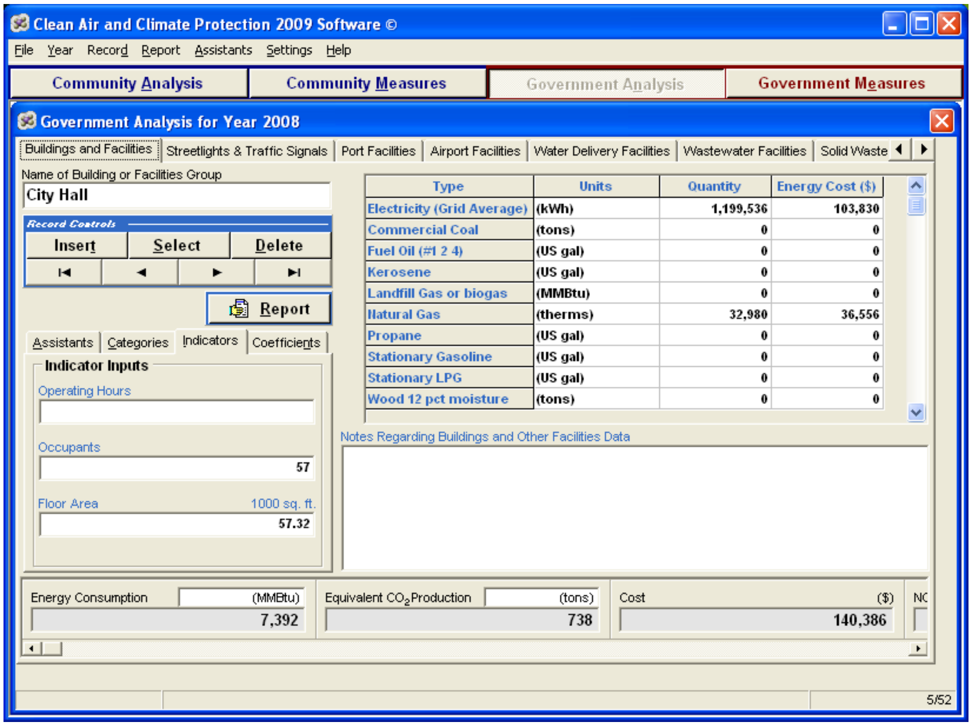
The CACP software, which is in use by over a dozen municipalities in Washington and many more throughout the U.S., offered the most standard and comparable methodology for the City. As an ICLEI member, Auburn will have continued technical assistance and access to CACP updates for future inventories, making this an attractive tool for future greenhouse gas inventories.

To supplement the CACP tool, Cascadia also developed in-house tools to facilitate the inventory calculations. These tools included a web-based commuting survey to capture employee commuting and an Excel-based module to help calculate emissions from both the employee

[6] City employees complete a CTR survey every two years. The Washington State Department of Transportation requires all Washington organizations with more than 100 employees to complete a CTR report, as mandated by the state's Commute Trip Reduction laws.

commuting survey and the Commute Trip Reduction survey (the *Data Collection* section provides more information about these sources of data). These tools will also be available to the City for future inventory calculations.

Figure 2. Screenshot of the CACP Tool Showing 2008 Energy Use Data for Auburn's City Hall



Entering and Analyzing Data

While the CACP software has many emissions factors and data pre-loaded to facilitate greenhouse gas calculations, several decisions had to be made prior to adding city-specific data. In these decisions, Cascadia consulted with the LGOP, City of Auburn staff, ICLEI staff, and other city inventories in the region to standardize the inventory to the extent possible.

First, Cascadia and City staff determined which emissions factors were appropriate for electricity use in the City of Auburn. While the CACP software has electricity emissions factors pre-filled for a number of utilities, no emissions factors for the Northwest were pre-loaded in the CACP tool. Accordingly, the City of Auburn had two possible sources of emissions factors for electricity. The first source of data is actual emissions reports from the City's utility provider, Puget Sound Energy (PSE). The second source of data is the U.S. Environmental Protection Agency's Emissions & Generation Resource Integrated Database (eGRID). USEPA compiles and updates the eGRID database of regional emissions factors every few years. The most recent eGRID data (eGRID 2007 Version 1.1) refers to emissions from the year 2005.

Though Puget Sound Energy supplies electricity to the City of Auburn, the consultant team, in consultation with City staff, chose to use eGRID emissions data for several reasons. First, while PSE publishes information on its own fuel mix, nearly two-thirds of the electricity it provides is purchased from other utility providers.[7] Thus, using PSE's specific emissions factor based on its own fuel production may not accurately reflect the emissions from purchased energy. Second, having a common regional emissions factor facilitates comparisons among greenhouse gas inventories of different cities.

Another decision involved determining the appropriate "level" for entering data into the CACP tool. While some data were only available at one level (for instance, the community electricity and natural gas information from PSE covered aggregate use citywide), other data were available in more detail. For instance, fleet data could be entered into the CACP by individual vehicle, by vehicle type, or by department. In consultation with City staff, Cascadia chose to enter data at the department level wherever possible in order to provide some additional detail on the source of emissions while keeping in mind the need to efficiently replicate the inventory in the future.

A final decision in data entry was to determine which other indicators to include. Wherever possible, Cascadia included supplementary information to help track progress and develop relevant metrics. For instance, wherever possible, square footage information was included for each building.

After working with Auburn staff to determine the most appropriate emissions factors, level of detail, and additional indicators, Cascadia staff members entered all collected data into the CACP tool. Information was checked for accuracy, and ICLEI staff members were consulted where anomalies existed. One major adjustment was made regarding solid waste data, as discussed in the *Solid Waste Discussion* on page 31.

Once model selection and data input were completed, municipal and community greenhouse gas emissions were calculated using the CACP software. Emissions are reported in metric tons of carbon dioxide equivalent ($mtCO_2e$), the standard unit used in the LGOP and other greenhouse gas reporting.

[7] Puget Sound Energy, "Electricity: Overview." Available online at http://www.pse.com/energyEnvironment/energysupply/Pages/EnergySupply_ElectricityOverview.aspx. Accessed August 2009.

Key Findings

This section presents the key findings from Auburn's community and municipal greenhouse gas inventories. These results are intended to provide an understanding of Auburn's greenhouse gas impacts, including the sources and sectors contributing to the city's emissions. The findings will also assist the City in any future climate action planning efforts and provide the ability to track progress in reducing greenhouse gas emissions in future years.

MUNICIPAL INVENTORY

Auburn's municipal inventory is a measure of all greenhouse gas emissions produced by the City of Auburn's municipal facilities and operations in a given year. Cascadia calculated Auburn's greenhouse gas inventories for the years 2007 and 2008. In 2007, the City's operations generated an estimated total of 9,000 mtCO_2e.[8]

As Figure 3 illustrates, water/wastewater operations and building operations are the largest emissions sectors for municipal operations.[9] *Sectors* are industry or activity types such as transportation, industrial energy use, or waste. In addition to emissions sectors, emissions *sources* are energy types such as electricity, natural gas, diesel, and gasoline. Figure 4 shows electricity is the single largest source of emissions, accounting for 61% of emissions from municipal operations. Building emissions for the year 2007 include the municipal airport and other leased spaces for 2007.[10] Business travel was not included in the 2007 inventory.

[8] Although emissions tonnages are presented in tables and graphs as exact figures, all reported emissions in this report are estimates.

[9] The use of pie charts to represent emissions is not intended to indicate that 100% of emissions are accounted for. This is an estimate of emissions, and while Scope 1 and2 emissions are as complete as possible, only a few key Scope 3 emissions sources are included in the inventory. Each pie chart in this document is meant to only represent the emissions measured in this inventory based on the boundaries recommended by the LGOP.

[10] The Valley Regional Fire Authority (VRFA), which leases space from the City, was established in 2007. The VRFA merged the City-run Auburn Fire Department with other regional fire departments to create a separate entity. Although the VRFA was established in 2007, its utility use was not separated from the City until 2008. Thus, energy consumption from the VRFA are included in both inventories, but only marked as 'leased space' in 2008.

Figure 3: 2007 Municipal Inventory by Emissions Sector ($mtCO_2e$)

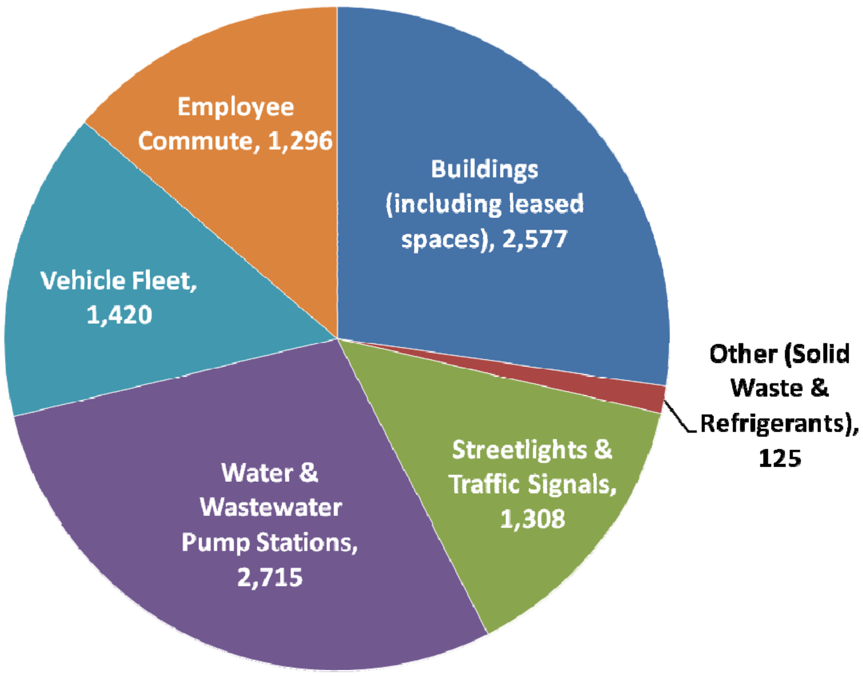
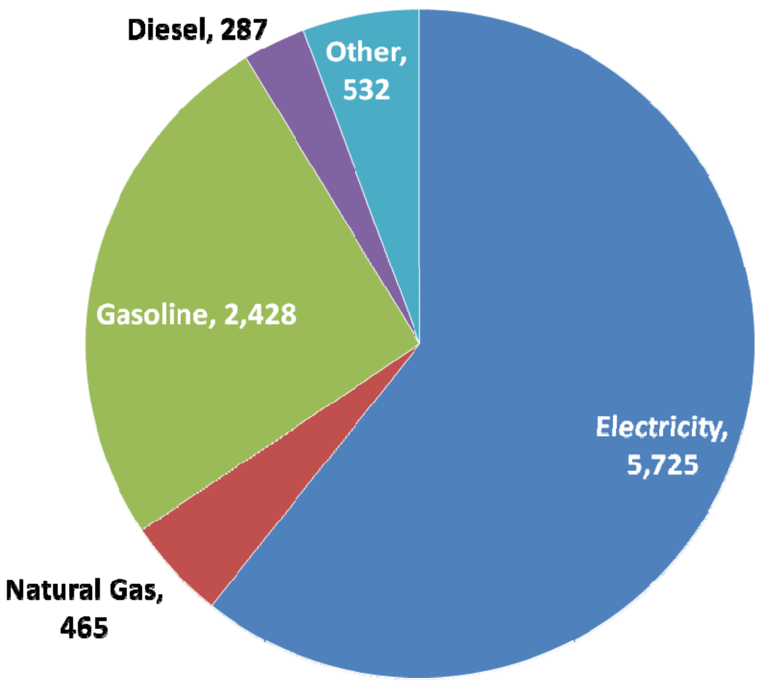


Figure 4: 2007 Municipal Inventory by Emissions Source ($mtCO_2e$)*



"Other" includes solid waste and refrigerants.

Figure 5: 2008 Municipal Inventory by Emissions Sector ($mtCO_2e$)

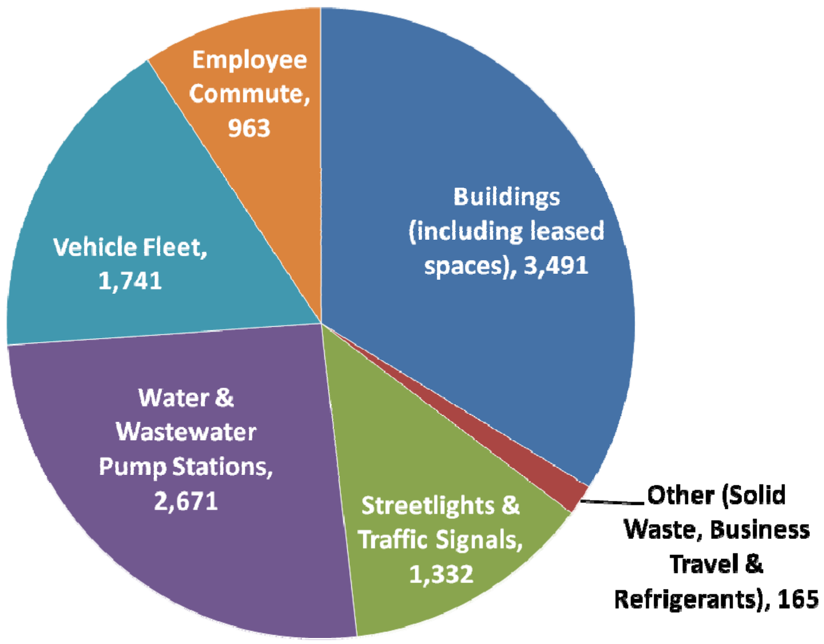
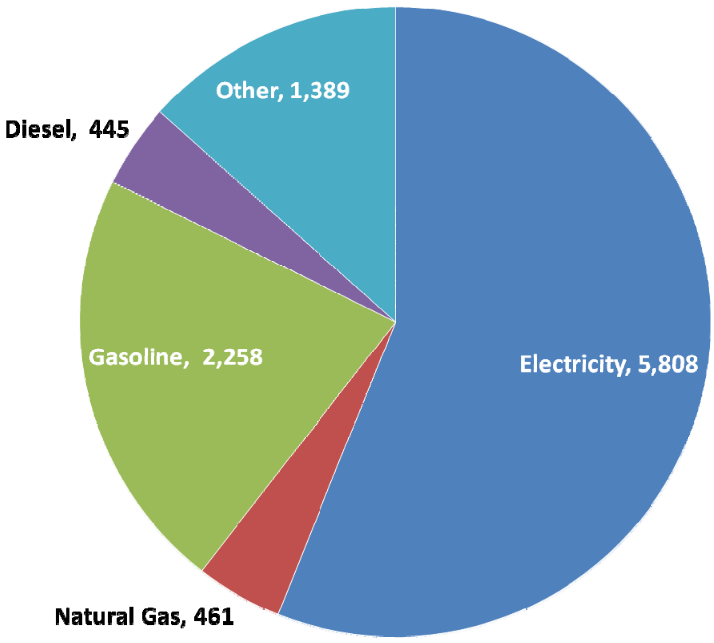


Figure 6: 2008 Municipal Inventory by Emissions Source ($mtCO_2e$)



**Other sources include solid waste, refrigerants, and business travel.*

As in 2007, buildings and water/wastewater operations are the sectors responsible for the most emissions. Electricity use is the single largest source of emissions, representing 56% of total emissions. The inventory for the baseline year 2008 includes emissions from all leased spaces including the municipal airport.

While overall emissions grew from 2007 to 2008, the rough breakdown of emissions by source and sector stayed largely the same. In both inventories, building energy use, electricity use for water and wastewater pump stations, and emissions from the vehicle fleet were the the largest emissions sectors. Electricity use was the largest source of emissions, accounting for 56% of total emissions in the base year 2008. Table 2 shows the changes by source and sector.

Table 2: Comparison between 2007 and 2008 Municipal Emissions by Sector and Source

Sector & Source	2007 $mtCO_2e$ Emitted	2008 $mtCO_2e$ Emitted	% Change
Buildings – Electricity	1,623	1,725	6%
Buildings – Natural Gas	465	461	-1%
Vehicle Fleet – Diesel	287	424	48%
Vehicle Fleet – Gasoline	1,132	1,317	16%
Water/Wastewater – Electricity	2,715	2,671	-2%
Streetlights and Traffic Signals – Electricity	1,308	1,332	2%
Employee Commute – Gasoline & Diesel*	1,296	963	-26%
Waste	121	114	-6%
Refrigerants	3	4	33%
Business Travel	0	47	n/a
Leased Buildings – Electricity & Natural Gas**	489	1305	n/a

**A different methodology was used to calculate employee commuting from 2007 to 2008.For more information, see the* Employee Commuting *section on page 11.*
***The number of leased buildings changed from 2007 to 2008. Most notably, the account for the Valley Regional Fire Authority was not considered "leased space" until 2008. See the footnote on page 14 for more information.*

As Table 2 shows, vehicle fleet emissions, both from gasoline and diesel consumption, were the areas with the greatest growth in emissions from 2007 to 2008. Refrigerant emissions (from air conditioning refrigerant losses) also increased from 2007 to 2008. Given that refrigerants are a small source of overall emissions, however, this change represents a relatively small difference in overall emissions (less than 1 $mtCO_2e$). Emissions from employee commuting appear to have decreased over 25% from 2007 to 2008. However, the emissions from employee commuting were calculated using different data sources (see *Step 2. Data Collection* on page 9).

While 2007 offers a valuable data point, given that a more complete data set was available for 2008 and given the annexation of Lea Hill and West Hill at the start of 2008, the inventory for the year 2008 is considered a more accurate metric from which to measure progress in future years.

BASE YEAR (2008) MUNICIPAL EMISSIONS

Figure 5 on page 16 shows Auburn's municipal emissions broken down by sector and source. *Scope* is also a helpful framework to detail emissions sources (see discussion on page 5 for more information). Figure 7 and Table 3 show emissions by scope and sector.

Figure 7: 2008 Municipal Emissions by Scope ($mtCO_2e$)

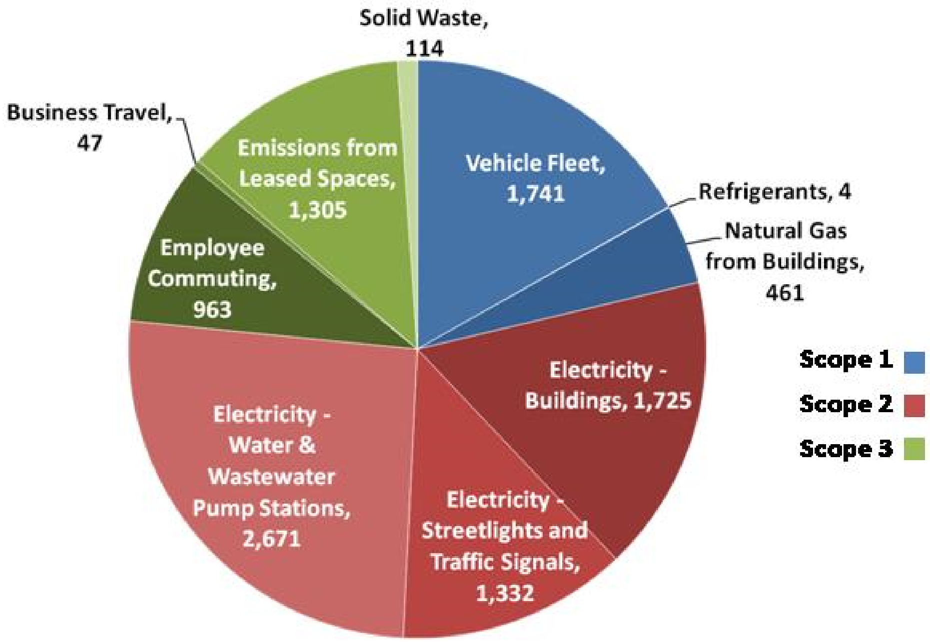


Table 3: 2008 Municipal Emissions by Scope

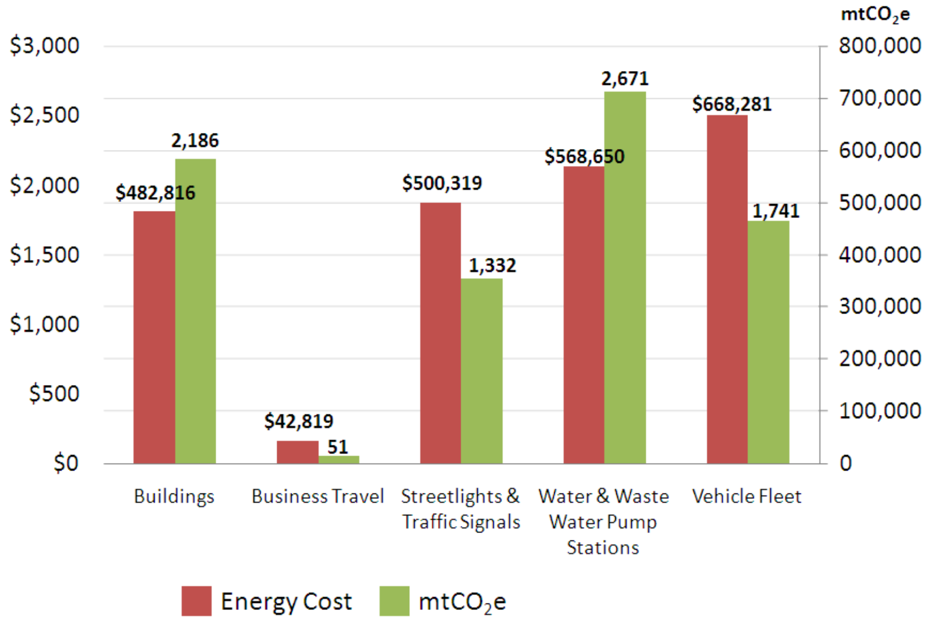
Scope	Sector	$mtCO_2e$	$mtCO_2e$
Scope 1	Vehicle Fleet	1,741	2,206
	Natural Gas (part of Building Energy Use)	461	
	Refrigerants	4	
Scope 2	Electricity – Buildings	1,725	5,728
	Electricity – Streetlights and Traffic Signals	1,332	
	Electricity – Water & Wastewater Pump	2,671	
Scope 3	Employee Commuting	963	2,429
	Business Travel	47	
	Emissions from Leased Spaces	1,305	
	Solid Waste	114	

Scope 2 emissions, or electricity use for City-owned and operated facilities, are the largest source of emissions at approximately 6,000 $mtCO_2e$, or 55% of total emissions. **Scope 1** emissions, which include emissions from the vehicle fleet, refrigerant losses, and natural gas usage at City-owned and operated buildings account for roughly 2,000 $mtCO_2e$, or 21% of all

emissions. **Scope 3** emissions, which include emissions from employee commuting, business travel, leased spaces, and solid waste account for approximately 2,000 mtCO_2e, or 22% of total emissions. Emissions from each of these sectors, as well as data on cost and other metrics, are provided in more detail below.

Municipal emissions from 2008 result primarily from energy use in different sectors (e.g., employee commuting, building energy use). In addition to the resulting greenhouse gas emissions, energy consumption in each sector represents a significant portion of the City operations budget. Figure 8 shows the relative costs and emissions from energy consumption in each sector. While electricity consumption at water and wastewater pump stations represents the largest contributor to overall emissions at approximately 2,700 mtCO_2e, fuel to power Auburn's vehicle fleet represents the largest energy cost to the City at $668,281 annually.

Figure 8: 2008 Municipal Emissions and Costs by Sector



In addition to cost, other metrics allow for comparison across years and benchmarking with similar municipal operations. Table 4 provides metrics for Auburn's overall municipal greenhouse gas inventory and for the City's specific sectors and sources. Metrics and information on the emissions from each sector are provided in more detail in the following section.

Table 4: Key Metrics for the 2008 Municipal Inventory

Sector	2008 $mtCO_2e$ Emitted	Cost ($)
Building Emissions (per 1000 sq ft)	9.90	$10.30
Vehicle Fleet Emissions (per FTE)	3.91	$10.90
Streetlight and Traffic Signal Emissions (per light)	0.50	$3.70
Water/Sewage Emissions (per capita)	0.04	$8.42
Water Emissions (per 1000 gallon)	0.01	$1.07
Waste Emissions (per FTE)	0.11	n/a*
Employee Commute (per FTE)	2.16	n/a*
Business Travel (per FTE)	0.11	$96.22
Overall Emissions (per capita)	0.15	n/a

**The City of Auburn pays for neither waste disposal from municipal operations (free municipal solid waste pickup is included in the City's waste contract) nor employee commuting costs.*

Buildings

City buildings contribute about one-third (34%) of Auburn's municipal footprint. Table 5 shows the emissions per square foot of the ten buildings with the highest emissions per square foot.

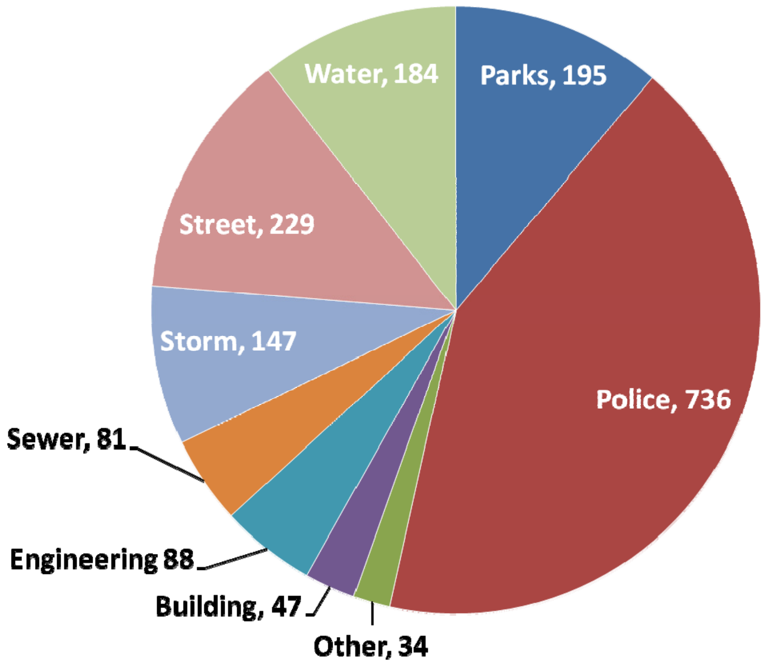
Table 5: Emissions and Energy Cost per 1000 sq ft for 10 Buildings with Highest Energy Use per sq ft

Buildings and Facilities	$mtCO_2e$/1,000 sq ft	$/1000 sq ft
Veteran's Memorial Building	11	$2,287
City Hall	12	$2,449
Isaac Evans Restroom	12	$2,798
Justice Center	13	$2,820
Parks Recreation and Arts Administration Building	17	$2,873
Senior Center	14	$3,085
Vet's Restroom	11	$3,162
Brannan Restroom	29	$16,830
Game Farm Park #1 (restroom)	78	$29,920
Game Farm Park #2 (restroom)	16	$32,479

Vehicle Fleet

Auburn's fleet contributes nearly 2,000 mtCO_2e to the City's overall municipal footprint, representing roughly 17% of the 2008 municipal emissions. Figure 9 shows the breakdown of emissions by department.

Figure 9: 2008 Vehicle Fleet Emissions by Department or Division (mtCO_2e)*

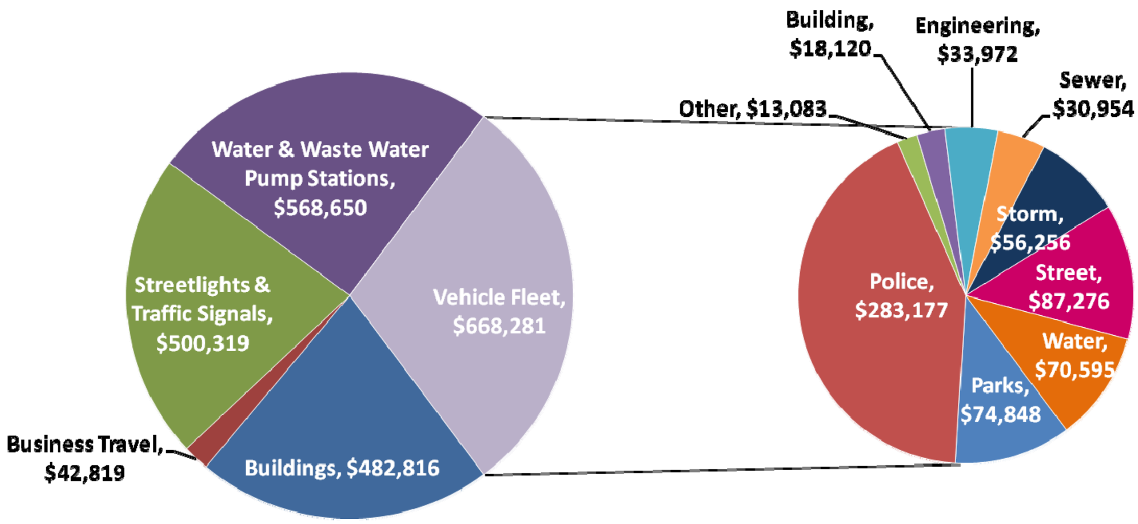


** "Other" includes emissions from the following departments: Finance, Legal, Planning, Solid Waste, Equipment Rental, Mayor, and Court/Probation. Table 6 shows the emissions from the fleet use of those departments.*

Cost

Auburn's vehicle fleet is a significant source of municipal energy costs. In 2008, vehicle fuel costs accounted for 30% of Auburn's energy-related costs (total costs also include buildings, streetlights and traffic signals, water and wastewater pump stations, and business travel). Figure 10 shows a detailed cost breakdown of 2008 municipal fleet costs.

Figure 10: 2008 Municipal Energy Costs with Additional Detail on Fleet Costs by Department or Division



** "Other" includes emissions from the following departments: Finance, Legal, Planning, Solid Waste, Equipment Rental, Mayor, and Court/Probation.*

Fuel efficiency is a useful indicator of greenhouse gas impacts. Table 6 shows the average fuel efficiency for fleet vehicles used in 2008 by department.

Table 6: 2008 Fleet Detailed Report by Department or Division

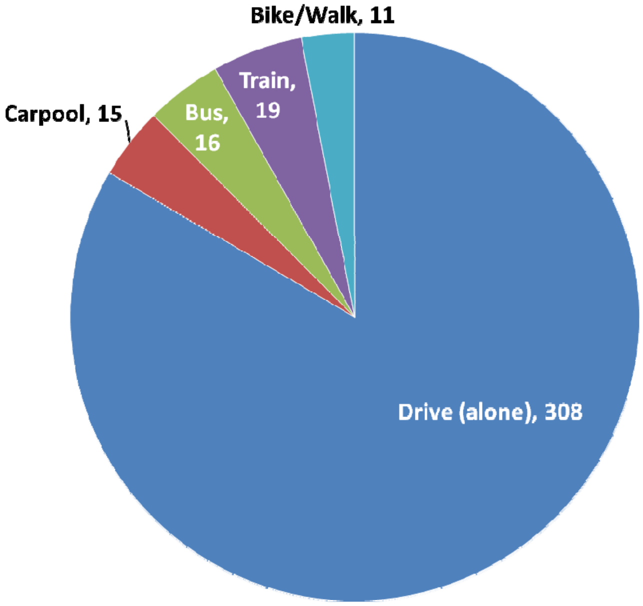
Department	$mtCO_2e$	Fuel Costs	Mileage-weighted Fuel Efficiency *
Building	47	$18,120	11.0
Court/Probation	11	$4,368	12.3
Engineering	88	$33,972	10.4
Equip Rental	8	$2,988	14.7
Finance	1	$373	15.9
Legal	0	$76	21.0
Mayor	8	$2,998	18.7
Parks	195	$74,848	11.1
Planning	2	$712	29.7
Police	736	$283,177	9.0
Sewer	81	$30,954	8.5
Solid Waste	4	$1,568	38.7
Storm	147	$56,256	8.5
Street	229	$87,276	7.3
Water	184	$70,595	10.0

**Does not include off-road vehicles. Fuel efficiency is calculated by dividing total miles traveled in on-road vehicles by fuel purchased for on-road vehicles. The Solid Waste Division primarily used one of three Toyota Priuses, which accounted for their high mileage-weighted fuel efficiency of 38.7 mpg.*

Employee Commuting

Employee commuting makes up roughly 9% of Auburn's municipal inventory. Auburn employees use various forms of transportation for commuting, including driving, carpooling, taking the bus, taking the train, walking, and biking. Figure 11 shows the employee mode split (each mode is represented by the number of employees that participate in that mode at least once per week).

Figure 11: Auburn Employee Commuting Habits by Staff Member Participation in Various Modes (at least once per week)



Business Travel

At less than 50 mtCO_2e in 2008, business travel accounts for less than half of 1 percent of Auburn's overall inventory, but it does represent over $40,000 in expenses to the city. Table 7 shows the miles, emissions, and cost by mode of business travel.

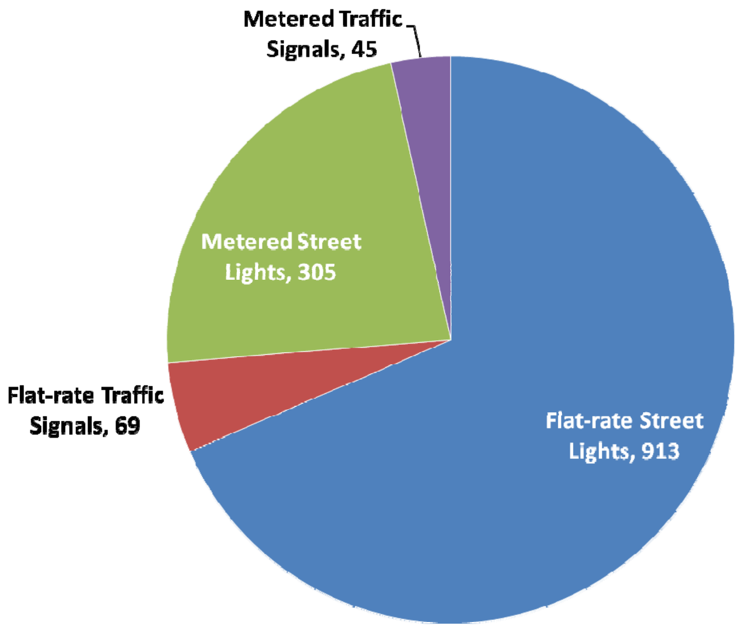
Table 7: Miles, Emissions, and Cost for 2008 Business Travel

Mode	Miles	Emissions (mtCO_2e)	Cost
Ferry	280	0.1	$12
Train	747	0.1	$301
Car	42,042	16.6	$24,322
Plane	128,645	29.6	$18,185
Total	171,714	46.4	$42,819

Street and Traffic Lights

Cumulatively, street and traffic lighting make up 12% of the total municipal inventory. The City has two kinds of street and traffic lights: metered and flat-rate. Electricity use for metered lights is measured by PSE, and the City pays for these lights based on monthly electricity consumption. Flat-rate lights are not metered; the City pays PSE a flat monthly rate for these lights. The split between metered and flat-rate lights and street versus traffic light greenhouse gas impacts is shown in Figure 12.

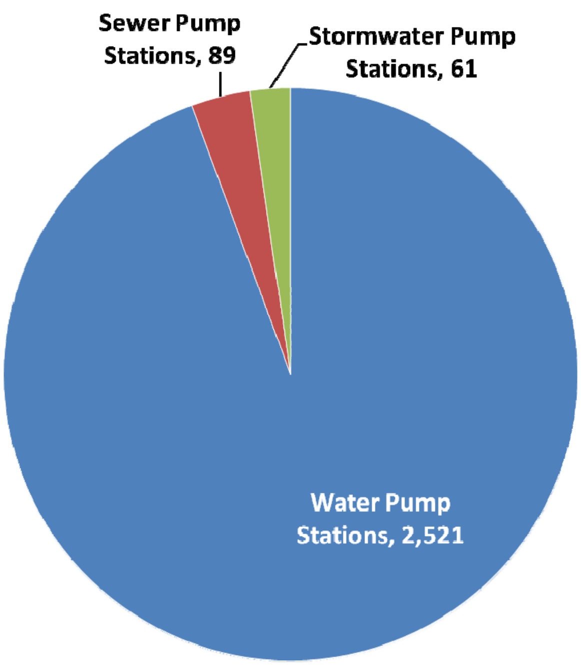
Figure 12: Greenhouse Gas Impacts from Street and Traffic Lights (mtCO_2e)



Water and Wastewater Pump Stations

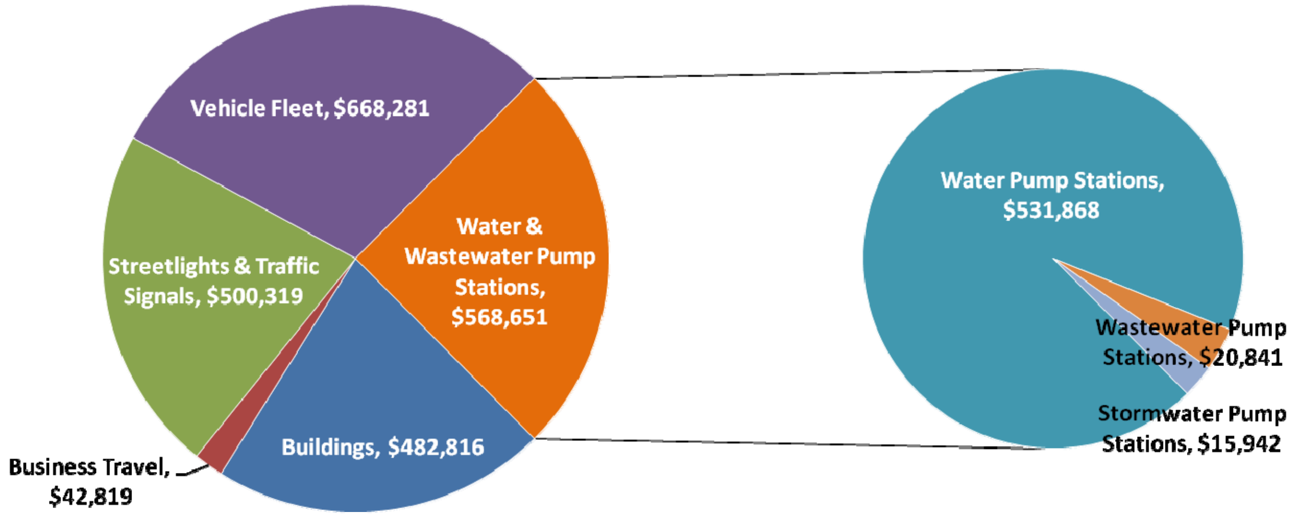
Auburn does not have a wastewater treatment plant within its boundaries, so emissions from the treatment of water and wastewater are not included in Auburn's municipal inventory (the City of Auburn is served by the King County Wastewater Treatment Division). However, Auburn does operate municipal water pumps. The energy used to pump and deliver clean water, remove wastewater from the community, and pump excess stormwater contributed nearly 3,000 mtCO_2e to Auburn's municipal inventory in 2008, roughly 26% of Auburn's total municipal inventory. As Figure 13 indicates, 94% of these emissions result from water delivery.

Figure 13: Emissions from Energy Used at Water, Wastewater, and Stormwater Pump Stations (mtCO_2e)



In 2008, water pump stations delivered nearly 500 million gallons of water. As shown in Figure 5 on page 16, the City generated roughly 0.01 mtCO_2e of GHG emissions per 1,000 gallons of freshwater pumped. In addition to these emissions, the electricity used at water, wastewater, and stormwater pump stations cost the City of Auburn $568,651 in 2008**.** Figure 14 shows that the delivery of freshwater to Auburn residents and businesses accounts for 94% of pump station costs and 24% of Auburn's total municipal energy costs.

Figure 14: 2008 Municipal Energy Costs with Additional Detail on Water Pump Station Costs



Waste

According to the ICLEI CACP software, emissions from solid waste produced by the City of Auburn contributed just over 100 mtCO_2e to Auburn's emissions in 2008, or less than 1% of the municipal inventory. For a more thorough discussion of emissions from waste, see *Solid Waste Discussion* on page 31. Regardless of the methodology used to calculate emissions from waste, several metrics can help track progress in waste reduction.

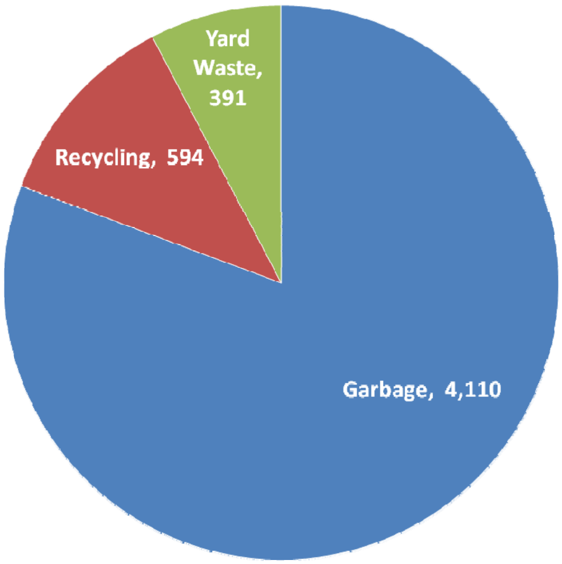
At the time of the inventory, solid waste tonnages generated by municipal operations at City buildings were not tracked. As part of its solid waste contact, the City receives free solid waste pick-up at all City buildings, and thus the City has not receive invoices indicating garbage, recycling, or yard waste tonnages. Solid waste tonnages generated at City buildings were estimated based on the size of containers and the frequency of collection (see Table 8).

Table 8: 2008 Solid Waste Tonnage Estimates by Building/Activity

Building	Garbage (tons)	Recycling (tons)	Yard Waste (tons)
Auburn Airport	28	28	0
General Services Administration	42	28	1
Mountain View Cemetery	42	6	3
Parks Recreation and Arts Administration Building	42	56	1
Auburn Maintenance & Operations	42	42	105
Golf Course - Maintenance	56	6	0
Litter and Illegal Dumping from City Streets	106	0	0
Justice Center	112	4	1
Parks Maintenance & Operations	112	10	168
Senior Center	112	56	1
City Hall	168	225	1
Golf Course - Clubhouse	225	42	0
Street Sweepings/Decant Facility	972	0	0
City of Auburn Parks	2,050	91	112

Based on the estimates of solid waste tonnages, the City of Auburn achieved a 19% recycling rate in the year 2008 for municipal waste generation.[11] Figure 15 shows the breakdown of total garbage, recycling, and yard waste disposed based on City estimates.

Figure 15: 2008 Estimated Solid Waste Disposal by Type



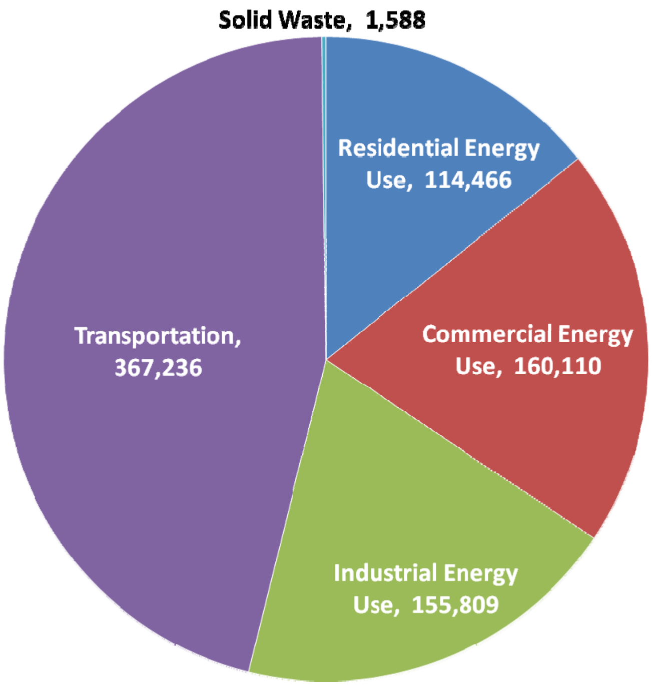
[11] More information on solid waste and recycling is provided in the *Municipal Recommendations* on page 50.

COMMUNITY INVENTORY

Auburn's community inventory is a measure of the greenhouse gas emissions resulting from activities within the city limits. The inventory was compiled for both 2007 and 2008; as noted previously. A key difference between the two years was the increase in the physical size and population of the City of Auburn at the beginning of 2008 with the annexations of Lea Hill and West Hill.

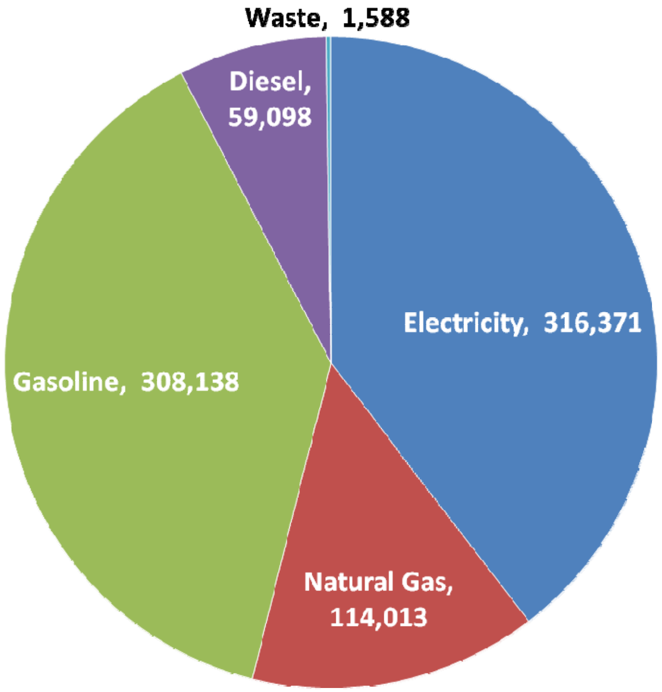
In 2007, the Auburn community generated approximately 800,000 metric tons of carbon dioxide equivalents (mtCO_2e). Figure 16 and Figure 17 show the breakdown of community emissions by sector and source.[12] As in the municipal inventory, *sectors* are industry or activity types such as transportation, industrial energy use, or waste. Emissions *sources* are energy types such as electricity, natural gas, diesel, and gasoline.

Figure 16: 2007 Community Inventory by Emissions Sector (mtCO_2e)



[12] Although emissions tonnages are presented in tables and graphs as exact figures, all reported emissions in this report are estimates.

Figure 17: 2007 Community Inventory by Emissions Source ($mtCO_2e$)



Transportation accounts for approximately 367,000 $mtCO_2e$, or 46% of the Auburn's community emissions for 2007. This figure corresponds with similar estimations of transportation's impact in other regional and statewide inventories. The State of Washington estimates that transportation makes up 48% of emissions statewide. Commercial energy use was the second largest sector contributing to community emissions, accounting for approximately 160,000 $mtCO_2e$, or 20% of total community emissions. Electricity and gasoline were the two largest emissions sources in 2007, accounting for 40% and 39% of the inventory, respectively.

In the base year 2008, the Auburn community generated 843,000 $mtCO_2e$. Figure 18 and Figure 19 show the breakdown of 2008 community emissions by source and sector.

Figure 18: 2008 Community Inventory by Emissions Sector ($mtCO_2e$)

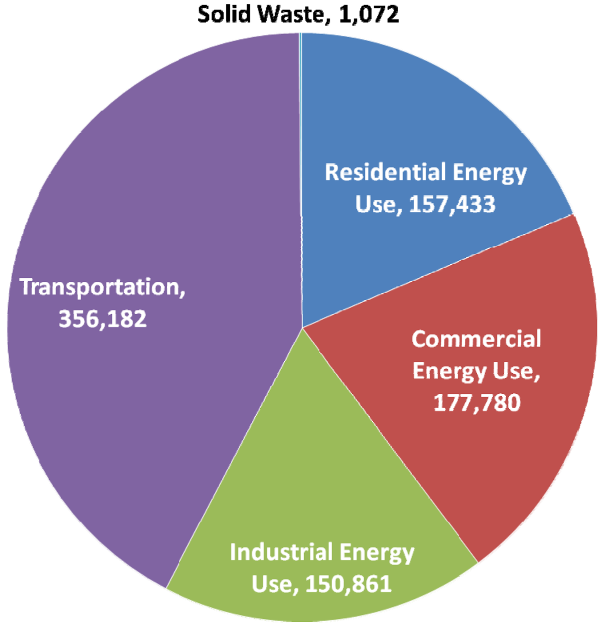
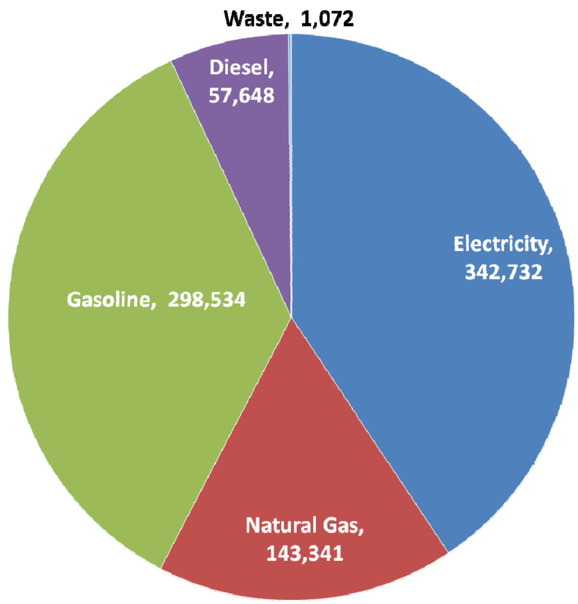


Figure 19: 2008 Community Inventory by Emissions Source ($mtCO_2e$)



Similar to the 2007 inventory, 2008 transportation emissions account for approximately 356,000 $mtCO_2e$, or 42%, of the city's community emissions for 2008. Commercial energy use was the second largest sector contributor to community emissions, accounting for approximate 178,000 $mtCO_2e$, or 21% of total community emissions. Electricity was the single largest emissions source in 2008. Electricity emissions accounted for 41% of the community inventory, or 343,000 $mtCO_2e$. Gasoline was the second largest source of emissions, accounting for 35% of the community inventory by source.

Solid waste, as calculated by the ICLEI CACP software, accounts for less than 1% of the total community inventory. A full discussion of the greenhouse gas impact of solid waste and alternative calculations to the CACP methodology is provided under *Solid Waste Discussion* below.

While estimated emissions from transportation and solid waste decreased from 2007 to 2008, all other emissions sectors increased during this time period. Part of this increase may be due to the annexation of Lea Hill and West Hill, which expanded the City of Auburn's boundaries on January 1, 2008. Table 9 provides a comparison between 2007 and 2008 community emissions by source and sector.

Table 9: Comparison between 2007 and 2008 Community Emissions by Sector and Source

Sector & Source	2007 $mtCO_2e$ Emitted	2008 $mtCO_2e$ Emitted	% Change
Residential- Electricity	80,341	107,332	34%
Residential- Natural Gas	34,125	50,100	47%
Commercial- Electricity	125,522	131,123	4%
Commercial- Natural Gas	34,587	46,657	35%
Industrial- Electricity	110,508	104,277	-6%
Industrial- Natural Gas	45,301	46,584	3%
Transportation- Diesel	59,098	57,648	-2%
Transportation- Gasoline	308,138	298,534	-3%
Waste	1,588	1,072	-32%
Total	799,209	843,328	6%

Solid Waste Discussion

The solid waste section of the CACP tool has several inputs. First, a user specifies the total waste production in tons. In this inventory, the community of Auburn generated roughly 47,000 tons of municipal solid waste during 2008. Second, the user determines which "waste disposal technology" is used for solid waste management. Options include Uncollected, Open Dump, Open Burning, Managed Landfill, Controlled Incineration, and Compost. Auburn's municipal solid waste is sent to the King County's Cedar Hills Landfill, a managed landfill. Then, the user specifies the waste composition mix by percentage of the following: Paper Products, Food Waste, Plant Debris, Wood or Textiles, and All Other Waste. Data for this field for the City of Auburn came from the King County Waste Monitoring Program, *2007 Waste Characterization Study*, June 2008. Lastly, the CACP tool requires a methane recovery rate for the managed landfill. King County reports that Cedar Hills attains a 90% methane capture rate.[13]

[13] Personal Communication Mizanur Rahman, Ph.D., MBA, P.Eng., Engineer III and Project Manager, Engineering Services Section, Solid Waste Division, King County Dept. of Natural Resources & Parks. August 04 2009.

Based on this data, the original reports from the CACP tool indicated that solid waste production in the community inventory resulted in net negative emissions (or emissions reductions). This calculation was largely dependent on the default data regarding the landfill carbon sequestration rates and the high methane capture at Cedar Hills. Although the high methane capture certainly decreases overall emissions, the greenhouse gas inventory results should not indicate that increasing waste production results in lowering overall emissions. To address this issue, ICLEI staff suggested that the default sequestration rates be lowered in the CACP model. With lower sequestration rates, the CACP model analysis showed some net emissions (albeit small) from solid waste production. Based on these updated sequestration rates, the nearly 39,000 tons of solid waste disposed by Auburn was responsible for approximately 2,042 mtCO_2e. The compost produced by the community was responsible for a net negative -906 mtCO_2e, for a net total of 1,072 mtCO_2e from solid waste. The ICLEI tool does not account for recycling tonnages.

A 2009 USEPA report notes that material production and waste management are responsible for 42% of U.S. emissions.[14] The CACP tool's emissions from waste do not account for any upstream processing or embodied emissions of products or for the energy used for waste collection or processing. The emissions shown in this inventory are only from decomposition of waste in a landfill. A more thorough review of the emissions associated with materials consumed in the City of Auburn was beyond the scope of this inventory. Some additional information on emissions reductions from recycling is provided in the *Municipal Recommendations* section on page 49.

Discussion of Community Inventory

Auburn's community inventory shows that, like Washington State as a whole, transportation emissions are the largest contributor to community emissions. Although transportation emissions actually decreased between 2007 and 2008, transportation emissions account for over 40% of the overall footprint of the community for both inventory years. The largest emissions source for the 2008 inventory was electricity.

With 2008 as a base year, the City has the ability to track progress in reducing emissions. The development of key metrics also allows for comparison across years. Table 10 provides key metrics for Auburn's overall community emissions in relevant categories.

[14] "Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices," U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, September 2009. Available online at http://www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf. Accessed October 2009.

Table 10: Key Metrics for 2008 Community Inventory

Sector	2008 Inventory Metric ($mtCO_2e$)
Residential emissions per household	5.22
Residential emissions per capita	2.33
Commercial and Industrial emissions per employee	14.66
Waste emissions per capita	0.02
Overall Community emissions per capita	12.50

In addition to key metrics, viewing Auburn's community emissions in relation to county, state, and federal emissions may provide context. Table 11 shows annual emissions estimates for the world, the United States, Washington State, King County, and the City of Auburn. Auburn makes up a little more than 0.003% of global emissions, while accounting for less than 0.001% of the world population. More locally, Auburn is responsible for 3.7% of King County's emissions while comprising 3.6% of the population. For more information about emissions in King County and emissions reduction goals on the international, federal, state, and county level, see *Emissions Forecast and Reduction Goals* on page 34.

Table 11: Auburn Annual Community Emissions in Context[15]

Locations	$mtCO_2e$	% World GHG Emissions	Population	% World Population
World	27,000,000,000	100.0%	6,700,000,000	100.0%
United States	7,100,000,000	26.3%	299,000,000	4.5%
Washington State	84,000,000	0.31%	6,550,000	0.10%
King County	23,000,000	0.09%	1,875,500	0.03%
City of Auburn	843,328	less than 0.01%	67,500	less than 0.001%

[15] Adapted from *King County 2007 Climate Action Plan*, p. 52. Available online at http://your.kingcounty.gov/exec/news/2007/pdf/climateplan.pdf. Accessed September 2009. Additional data from The World Bank, http://geo.worldbank.org/, and U.S. Census Bureau, Population Division, http://www.census.gov/popest/estimates.html. These estimates are provided to give a sense of the City of Auburn's place in a larger global greenhouse gas context and does not represent a precise comparison of all emissions.

Emissions Forecast and Reduction Goals

Emissions Forecast

According to the Puget Sound Regional Council (PSRC), Auburn is one of the ten fastest growing cities in the Puget Sound region.[16] To determine how emissions levels for the community and municipal inventory are likely to change, Cascadia calculated an emissions forecast for the years 2015 and 2030 based on baseline year (2008) data. Emissions forecasts are calculated by scaling baseline emissions (calculated in the inventory) to approximate the rate of growth of key indicators including population, economic growth, and energy demand. To provide a long-range forecast of emissions, Cascadia staff reviewed available data sources and identified 2030 as the longest-term goal with reliable forecasts for population, economic growth, and energy demand. 2015 was chosen as an interim year to provide a view of shorter-term emissions changes.

Based on population forecast data from PSRC and energy information from the U.S. Department of Energy's Energy Information Administration, initial forecasts show that community emissions are projected to increase 11% by 2015 and 43% by 2030, in the absence of new efforts to reduce emissions.[17] During this time period, population is estimated to increase 11% by 2015 and 35% by 2030. Figure 20 shows the increase in each area from 2008 levels to 2015 and 2030 projections. Emissions from municipal operations are likely to increase at a slightly lower rate, as shown in Figure 21. Table 12 on page 36 provides more detail on the changes in both inventories.

[16] *Puget Sound Trends,* Puget Sound Regional Council. Released October 2008.

[17] Population data from: 2*006 Sub-County (Small Area) Forecasts of Population and Employment, Central Puget Sound Region,* Puget Sound Regional Council. Released October 26, 2006..
Energy data from: *Annual Energy Outlook 2009, Supplemental Tables to the Annual Energy Outlook 2009, Updated Reference Case with ARRA,* Energy Information Administration. Released April 2009. Available online at http://www.eia.doe.gov/oiaf/aeo/supplement/stimulus/regionalarra.html. Accessed September 2009.

Figure 20: Community Emissions Forecast for 2015 and 2030 (in $mtCO_2e$)

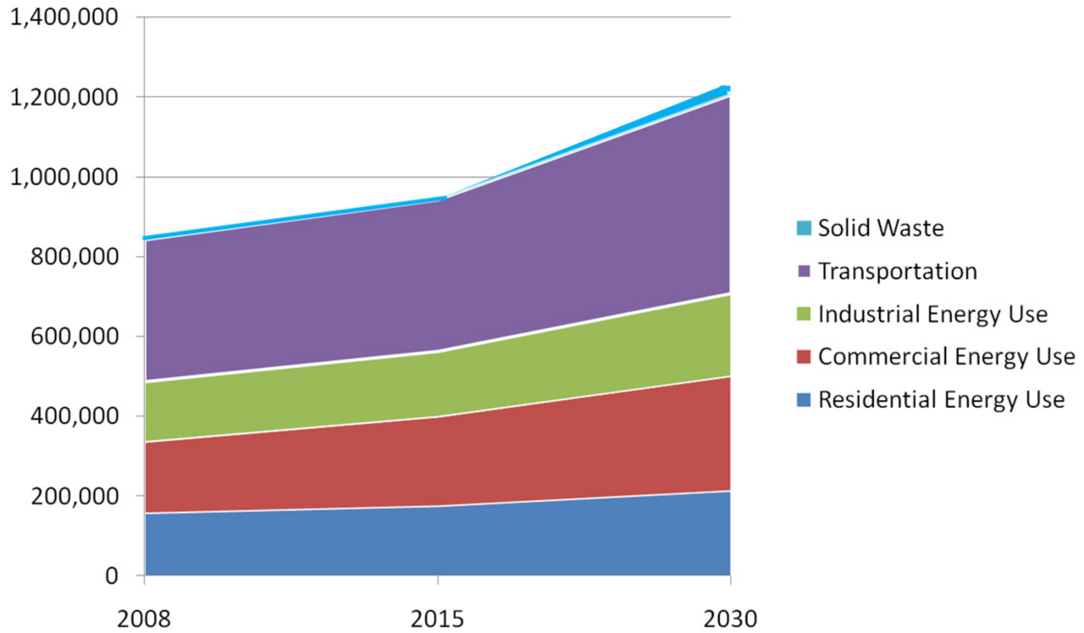
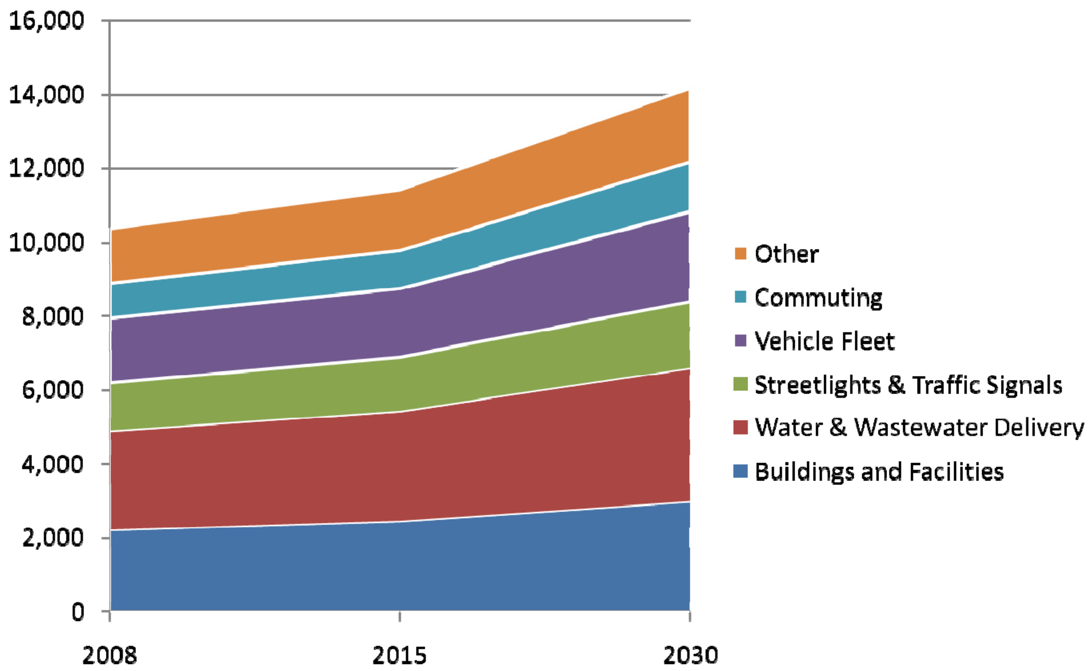


Figure 21: Municipal Emissions Forecast for 2015 and 2030 (in $mtCO_2e$)*



**"Other" includes Solid Waste, Business Travel, and Refrigerants.*

Table 12: Community and Municipal Inventory Forecasts for 2015 and 2030 without Action to Reduce Emissions

	2008 ($mtCO_2e$)	2015 ($mtCO_2e$)	% Change (to 2015 from 2008 levels)	2030 ($mtCO_2e$)	% Change (to 2030 from 2008 levels)
Municipal					
Buildings and Facilities	2,186	2,433	10.1%	2,961	35.5%
Water & Wastewater Delivery	2,671	2,972	10.1%	3,618	35.5%
Streetlights & Traffic Signals	1,332	1,482	10.1%	1,804	35.5%
Vehicle Fleet	1,741	1,859	6.4%	2,436	39.9%
Commuting	963	1,028	6.4%	1,348	39.9%
Other (Solid Waste, Business Travel, and Refrigerants)	1,469	1,635	10.1%	1,990	35.5%
Total	10,362	11,410	9.2%	14,157	36.6%
Community					
Residential Energy Use	157,433	175,192	10.1%	213,246	35.5%
Commercial Energy Use	177,780	223,275	20.4%	287,060	61.5%
Industrial Energy Use	150,861	163,524	7.7%	207,029	37.2%
Transportation	356,182	380,381	6.4%	498,398	39.9%
Solid Waste	1,072	1,193	10.1%	1,452	35.5%
Total	843,328	943,565	10.6%	1,207,184	43.1%

Background on Emissions Reduction Frameworks

Several types of emissions reduction frameworks can inform and guide the City of Auburn as it sets its emissions reduction goals. The first type of framework is **science-based** in that it bases the emissions reduction targets on the necessary reductions to stabilize greenhouse gas levels and minimize climate change impacts. One such example is the recommendations put forth by the Intergovernmental Panel on Climate Change (IPCC). The IPCC recommends a reduction of 50-85% below 1990 levels in worldwide emissions to stabilize global temperature at an increase of no more than 2.5 degrees Celsius.

A second type of framework is a **political action** emissions reduction agreement, such as the Kyoto Protocol or the U.S. Mayors' Climate Protection Agreement. Both of these agreements recommend that governments strive to reduce emissions to 7% below 1990 levels by 2012. The Kyoto Protocol goals were reviewed during the United Nations Climate Change Conference (COP 15) held in Copenhagen in December 2009. The meeting in Copenhagen did not produce an updated reduction agreement.

A third framework **blends** political considerations, climate science, and greenhouse gas inventory data. For example, the State of Washington and King County have set emissions reduction goals based in part on existing political frameworks such as the Kyoto Protocol and in part on an examination of their own emissions inventories to evaluate the realistic opportunities. Table 13 shows examples of these three frameworks.

Table 13: Existing Frameworks for Emissions Reduction Goals

Entity/Agreement	Emissions Reduction Goal	Notes/Source
Intergovernmental Panel on Climate Change	Recommends a 50-85% permanent reduction below 1990 levels by 2050 to stabilize carbon dioxide levels at 450 parts per million	IPCC 4th Assessment Report, Working Group III
Kyoto Protocol	7% below 1990 levels by 2012	United Nations Framework Convention on Climate Change, Kyoto Protocol, 1997
U.S. Conference of Mayors' Climate Protection Agreement	7% below 1990 levels by 2012	Some 900 mayors across U.S. have signed on (including Auburn's Mayor Peter Lewis)
U.S. Federal Government	28% below 2008 baseline by 2020 for Scope 1 & 2 emissions	Executive Order – Federal Leadership in Environmental, Energy, and Economic Performance, E.O. 13514, October 5, 2009
State of Washington	Reduce to 1990 levels by 2020, 25% below 1990 levels by 2035, 50% below 1990 levels by 2050	Executive Order 07-02 Washington Climate Change Challenge
Washington State Departments	15% below 2005 emissions levels by 2020, 36% below 2005 levels by 2035, 57.5% below 2005 levels by 2050 or 70% below the expected 2050 emissions[18]	Senate Bill 5560 (2009-10) Regarding state agency climate leadership
State of California	Reduce to 1990 levels by 2020, 80% below 1990 levels by 2050	Executive Order S-03-05, Establishing Greenhouse Gas Emissions Reduction Targets
King County	80% below 2007 levels by 2050	Part of the Cool Counties initiative

[18] Reductions of this level are estimated to be needed in order to meet the targets set in Executive Order 07-02 using a more current baseline year (2005).

Emissions Reductions Goals of Local Municipalities

As the City of Auburn sets emissions reduction targets, examples from other local jurisdictions may be helpful in understanding the regional context for emissions reduction goals. Table 14 shows the inventory results and emissions reduction goals for 11 local municipalities. Of these local jurisdictions, Bellingham has set the most aggressive target of 70% below year 2000 emissions levels by 2020. A common emissions reduction target, 7% below 1990 levels by 2012, follows the example of the Kyoto Protocol and the subsequent U.S. Conference of Mayors' Climate Protection Agreement (of which the City of Auburn is a signatory). For most cities, if the city's mayor signed the U.S. Conference of Mayors' Climate Protection Agreement and did not set a separate goal through Council Resolution or other means, the Mayors' Climate Protection Agreement goal is listed as the goal for both their municipal and community inventory.

Table 14: Local Municipalities' Reduction Goals for their Municipal Emissions

Municipality	Base Year	Municipal Inventory ($mtCO_2e$)	Population in Base Year	Emissions per capita	Emission reduction goal
Anacortes	2000	12,219	14,557	0.84	15% below 2000 levels by 2020
Bellingham	2000	19,945	67,171	0.3	70% below 2000 levels by 2020
Bellevue	2001	14,716	109,569	0.13	7% below 1990 levels by 2012
Edmonds	1999	2,645	39,515	0.07	None available
Kirkland	2000	5,422	45,054	0.12	20% below 2005 levels by 2020
Lynnwood	2001	11,182	33,847	0.33	7% below 1990 levels by 2012
Seattle	1990	*	563,374	-	7% below 1990 levels by 2012
Spokane	2005	70,835	195,629	0.36	30% below 2005 levels by 2030
Tacoma	1990	113,880	176,664	0.64	7% below 1990 levels by 2012
Vancouver	2006	45,925	143,560	0.32	7% below 1990 levels by 2012
Washougal	2008	2,360	11,326	0.21	None available

** The City of Seattle's community inventory was calculated before the development of a common municipal inventory calculation method. The results of this inventory are not comparable with the City of Auburn's municipal inventory.*

Table 15 shows the community emissions reduction targets of seven local jurisdictions. There are fewer examples of community emissions reduction targets because fewer Washington cities have measured community emissions and made emissions reduction targets publicly available. The City of Spokane has set an aggressive target of 30% below 2005 levels by 2020. Like the municipal inventory reduction targets, a common emissions reduction target, 7% below 1990 levels by 2012, follows the example of the Kyoto Protocol and the subsequent U.S. Conference of Mayors' Climate Protection Agreement.

Table 15: Local Municipalities' Reduction Goals for their Community Emissions

Municipality	Base Year	Community Inventory ($mtCO_2e$)	Population in Base Year	Emissions per capita	Emission reduction goal
Anacortes	2000	178,910	14,557	12	15% below 2000 levels by 2020
Bellingham	2000	950,793	67,171	14	28% below 2000 levels by 2020
Bellevue	2001	1,692,197	109,569	34	7% below 1990 levels by 2012
Lynnwood	2001	11,182	33,847	12	7% below 1990 levels by 2012
Seattle	1990	7,187,000	563,374	13	7 % below 1990 levels by 2012
Spokane	2005	3,229,308	195,629	17	30% below 2005 levels by 2030
Tacoma	1990	5,109,675	176,664	28	7% below 1990 levels by 2012

Discussion of Auburn's Inventory and Forecast

MUNICIPAL INVENTORY AND FORECAST

Emissions from building energy consumption (including leased buildings), travel in the City's vehicle fleet, and energy used by water and wastewater pump stations account for over 7,900 $mtCO_2e$ or nearly 80% of emissions from municipal operations. Therefore, aggressive energy-saving measures in these areas – such as building system optimization, energy efficiency retrofits, fuel-efficiency requirements, and vehicle maintenance best practices – may dramatically reduce emissions. Furthermore, the City has direct control over these emissions sources and can readily implement energy-saving measures. While the municipal inventory is likely to increase in the absence of new efforts to reduce emissions, population growth is unlikely to affect overall municipal emissions at the same rate as community emissions.

As the City takes action to reduce emissions, it is also worth noting that initiatives that reduce energy consumption generally will reduce costs as well. Although many efforts may require upfront investment, they will also help the City cut total operating costs over time.

COMMUNITY INVENTORY AND FORECAST

The main sources of emissions in the community of Auburn as a whole are transportation and energy use from industrial, commercial, and residential sources. Transportation is the single largest emissions source, but building energy use is more significant when taken as a whole (instead of broken into residential, commercial, and industrial). While the City can encourage Auburn residents and businesses to reduce energy consumption and reduce vehicle miles, the City does not have direct control over most of the emissions in the community inventory. Initiatives to encourage energy conservation include educational campaigns regarding utility partnerships and energy efficiency rebates or changing city code to support energy efficiency in new and existing buildings. Commute trip reduction campaigns, improving and increasing bike lanes, increasing the number of park-and-ride spaces, and improving access to public transportation are examples of ways to help reduce vehicle miles traveled. While important, these activities may not generate reductions quickly.

Furthermore, due in part to Washington State's efforts to reduce emissions statewide through the Growth Management Act, the City of Auburn will likely take on significant population growth over the next decade. This population growth within the City of Auburn helps the state to meet its own emissions reduction goals through increased urban density and reduced land sprawl, but may mean that even if Auburn significantly reduces emissions reductions per person, its overall (or absolute) emissions may continue to grow. This situation does not mean that the City cannot take important action to reduce emissions from community sources, but it may suggest that an absolute emissions reduction goal will be difficult to reach.

Recommendations for Emissions Reduction Targets

AUBURN'S EXISTING COMMITMENT: U.S. CONFERENCE OF MAYORS' CLIMATE PROTECTION AGREEMENT

In 2007, City of Auburn Mayor Peter Lewis signed the U.S. Mayors' Climate Protection Agreement. By signing this agreement, Mayor Lewis committed the City of Auburn to the following three actions:

> **1.** Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
> **2.** Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol -- 7% reduction from 1990 levels by 2012; and
> **3.** Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system[19]

This agreement is a good starting point for Auburn in considering emissions reductions targets. Although the agreement includes a quantitative target, the emphasis of the agreement is on taking action rather than on the specific numerical goal, particularly now that there is a relatively short time frame for meeting the target (by 2012). Given this time frame, many other cities that are signatories of the U.S. Mayors' Climate Protection Agreement have followed up on their commitment with longer-term goals, often linked to more recent base years. Locally, this group includes Bellevue, Bellingham, Kirkland, and Spokane. In addition, many of these cities specify separate goals for community and municipal operations, which the U.S. Mayors' Climate Protection Agreement does not distinguish. For more information on these reduction goals, see Table 14 on page 38 and Table 15 on page 39. Thus, in setting emissions reduction targets, Auburn can look to many examples that use the U.S. Mayors' Climate Protection Agreement as a starting point but set longer-term emissions reduction targets (beyond 2012), with more recent baselines and separate targets for municipal and community reductions.

CHOOSING A BASELINE YEAR

Emissions reduction targets are usually framed as a reduction target of a certain percentage below an entity's base year inventory. The baseline year for the Auburn community and municipal inventory was 2008. The inventory baseline year, 2008, is most likely the best baseline year for the emissions reduction targets as well. While 1990 is a common baseline year for

[19] U.S. Conference of Mayors' Climate Protection Agreement. Available online at http://www.usmayors.org/climateprotection/agreement.htm. Accessed October 2009.

emissions reduction targets (following from the Kyoto Protocol), there are several reasons that 2008 is a more appropriate reduction goal base year for the City of Auburn.

First, to use 1990, the City would need to "backcast" to estimate emissions from 1990. Like forecasting, backcasting (estimating emissions from years previous to an inventory) is not an exact science. While population and other data could be used to estimate 1990 emissions levels, 2008 data will be far more accurate. Second, although many of the example emissions reduction frameworks provided in Table 13, Table 14, and Table 15 use the Kyoto framework and set 1990 as a baseline, using 1990 as a baseline year is becoming less common in more recent emissions reduction frameworks. Planned reductions in the recent Executive Order for federal agencies and the 2009 Washington State legislation for state agencies use more recent base years (2008 and 2005, respectively).[20] Given these trends, Cascadia recommends Auburn set an emissions reduction goal that references the baseline inventory of 2008, a year for which actual inventory data exists.

COMMUNITY VS. MUNICIPAL REDUCTION TARGETS

Given the differences in the level of control and influence that the City has over the community and municipal inventories, Auburn should consider setting separate targets for the municipal and community inventories.

Based on the many opportunities for emissions reduction that may also yield significant cost savings and other benefits, Auburn is well-placed to join with other climate leaders in the Puget Sound region to set an aggressive reduction target for its municipal emissions. Many energy and cost-saving programs, incentives, and rebates can support local governments in saving energy and reducing greenhouse gas emissions, including energy efficiency projects that may qualify for federal stimulus or other grant funding. The City should consider setting an emissions reduction goal close to the State's goals for its own agencies – 15% below 2005 emissions levels by 2020, and 36% below 2005 levels by 2035, using the City's own baseline year of 2008.

As part of the State of Washington's emissions reduction strategy through the Growth Management Act, the City of Auburn expects to increase its population in the coming decades. While Auburn's growth and the growth of other urban centers may help Washington to reduce overall emissions through concentrating population in urban centers, helping to reduce sprawl and decrease transportation emissions, this growth poses an additional challenge for Auburn to reduce net community emissions.

Nevertheless, the City can build on existing efforts and look to successful initiatives in other cities for ways to reduce emissions from both municipal and community sources. More detail on taking action is provided in the next sections.

[20] See Table 13 Existing Frameworks for Emissions Reduction Goals on page 37 for more detail.

Taking Action to Reduce Greenhouse Gas Emissions

Auburn’s greenhouse gas inventory offers a solid foundation for taking action. As with the inventory, this section addresses emissions both from the City’s **municipal** operations and from the larger Auburn **community**. It includes the following sections:

- **Recommendations to reduce the emissions from Auburn’s municipal operations.** The City of Auburn’s major greenhouse gas emissions arise from energy use in buildings, fleet travel, business travel and commuting, water and wastewater pumping, street and traffic lighting, and waste generation.

- **Best practices that affect community emissions.** Emissions in the community inventory stem from energy used (electricity and natural gas); solid waste produced by residential, commercial, and industrial sectors; and transportation that takes place within Auburn’s city boundaries.

Options to reduce emissions from community and municipal sources are discussed in detail in the next section. A section on *Next Steps* follows, summarizing main themes and providing some guidance on how to establish priorities and implement key strategies.

Municipal Recommendations

BUILDING ENERGY CONSUMPTION

Auburn Making Strides

Auburn is already taking several steps to reduce energy consumption at municipal facilities. These actions include:

- Turning off computers at night.
- Using LED lights for display signs.
- Installing occupancy sensors in many City buildings.
- Currently working to upgrade heating and air conditioning system in City Hall.
- Using VendorMiser (a device that reduces energy use on vending machines by connecting machine lighting to a motion sensor) on soda dispensing machines.
- Purchasing Energy Star-certified replacement appliances wherever possible.
- Designing to achieve a LEED Silver rating for a planned future Community Center.
- Conducting audits of building energy use.

Recommendations

Even with Auburn's current actions to reduce energy use, the City's 2008 municipal inventory showed that City building energy use was responsible for over a third of total municipal emissions and cost the City nearly $500,000 in utility charges. Furthermore, utility invoices indicated that just nine buildings were responsible for over 80% of all building emissions. Key opportunities to reduce emissions from building energy use include the following actions.

- **Implement energy efficiency management and performance monitoring systems**. The U.S. Environmental Protection Agency and U.S. Department of Energy's Energy Star Portfolio Manager is a free online tool to track building energy and water use. To use Portfolio Manager, the City can set up a free account, enter basic information about each building such as square footage and location, and then upload monthly energy and water consumption from bills. Using Portfolio Manager will help the City monitor building performance, identify efficiency opportunities, and benchmark against similar buildings. Using this online tool will also streamline future greenhouse gas inventories by providing all necessary municipal building energy use data in a single easy-to-use database.[21]

Focus on Key Buildings

The City of San Diego focused on key buildings to reduce energy use. Upgrades at the City's Operations Center included new heat-reducing window awnings, efficient T8 fluorescent lighting with daylight and occupancy sensors, and a high-efficiency air conditioning system with programmable thermostats. The retrofit has reduced energy consumption by 38%, saving the City $14,000 a year.

http://www.sandiego.gov/environmental-services/energy/programsprojects/saving/retrofits.shtml

[21] ENERGY STAR, "Portfolio Manager." Available online at https://www.energystar.gov/istar/pmpam/. Accessed September 2009.

- **Install additional motion sensor-controlled lighting in municipal building spaces.** The City has begun to use motion sensors in City buildings to reduce energy consumption in unoccupied spaces. Auburn should continue to add motion sensors; bathrooms, kitchens, and conference rooms are often key opportunities for electricity savings.

- **Work with utilities to conduct energy audits of all City buildings and identify cost-effective updates and retrofits.** Auburn can work with utilities to continue to improve the energy efficiency of municipal buildings. The City has also secured funding to hire a Resource Conservation Manager in partnership with Puget Sound Energy, Washington State University, and the City of Federal Way. The Resource Conservation Manager can lead this effort, and the City can ensure the RCM has access to City records, to staff assistance, and to the City Council to present findings and recommendations.

- **Focus on key buildings including City Hall, the Justice Center, and the Senior Center.** Prioritizing retrofits and upgrades at key buildings will provide the quickest return on investment. These three buildings represent the largest energy consumers of all City buildings and are all included in an energy audit produced by McKinstry (Rough Order of Magnitude, March 2010). Continuing to work with McKinstry and investing in efficiency at these buildings can have a significant impact on Auburn's overall municipal footprint.

FLEET

Auburn Making Strides

Auburn is reducing emissions from fleet driving in several ways. These reductions include the following efforts:

- Practicing preventative maintenance practices to ensure that vehicles run as efficiently as possible (e.g., regularly checking tire pressure, replacing air filters regularly, keeping tires aligned).
- Encouraging employees to use the most fuel-efficient vehicle possible for a task and to carpool when possible.
- Purchasing smaller, more fuel-efficient vehicles where possible.

Recommendations

Transportation using fleet vehicles accounts for 17% of the overall emissions from municipal operations and the largest energy expense for the sectors evaluated in the inventory. While the City is already taking steps to upgrade vehicles, significant opportunities remain to reduce emissions and costs associated with fleet miles.

Hybrid Police Vehicles

The police fleet of the City of Mountlake Terrace currently includes hybrid vehicles. Other cities around the country have also purchased hybrid vehicles for police use, including cities in New York, Hawaii, North Carolina, New Jersey, Utah, Texas, and California. The City of Mercer Island estimates that replacing two Crown Victoria models with hybrid Toyota Highlanders will save $4,000 a year and reduce emissions by 13 $mtCO_2e$ annually.

http://www.cityofmlt.com/cityHappenings/pdf/pressReleases/2009_PR/090123_NewHybridVehicle.pdf

http://www.mercergov.org/files/05%20Sustainability.pdf

In 2008, the Auburn fleet included 141 light trucks and 65 passenger cars. Table 16 on page 46 compares the fuel efficiency and weighted fuel efficiency (based on how many miles were driven in each vehicle) of on-road vehicles to federal Corporate Average Fuel Economy (CAFE) standards for that model year. CAFE standards were established by the U.S. Energy Policy and Conservation Act of 1975.

These data indicate the significant opportunity for the City to increase fuel efficiency by continuing to "swap out" less efficient vehicles for more efficient ones and by creating policies for employees to use the most fuel-efficient vehicles whenever possible. In addition to the specific vehicles and fuels used, driving and maintenance practices can also affect fuel efficiency.

Specific recommendations for Auburn to increase fuel efficiency of its fleet through smart vehicle choices and best management practices include the following.

- **Join Evergreen Fleets.** Coordinated by the Puget Sound Clean Air Agency, Evergreen Fleets provides members with tools, best practices, and "green star" certification for greening fleets.[22] Benefits include lower operating costs, reduced emissions, improved operating efficiency, and recognition. Current membership includes more than 50 public and private entities in Washington State.
- **Purchase the most fuel-efficient vehicles possible.** Appropriately sizing vehicles is the first step to greater fuel efficiency.
- **Establish a commitment to purchase the greenest options possible.** Hybrid, E-85 Flex Fuel (a motor fuel blend of 85 percent ethanol and 15 percent gasoline), biodiesel, and natural gas vehicles are readily available in a variety of diverse applications to meet the needs of many fleets. Auburn has already demonstrated a commitment in this direction by purchasing several hybrid vehicles.
- **Formalize vehicle use policies.** The City currently has informal vehicle use policies to encourage employees to choose the most fuel-efficient vehicle appropriate for a given errand or task. Auburn should formalize this policy to increase travel in fuel-efficient vehicles and decrease travel in less fuel-efficient vehicles.
    - Look across Auburn's departments to ensure that vehicles are appropriately scaled to the need. The Parks, Police, and Street departments are among those with the lowest fuel efficiencies and highest annual mileage. While the duties of these departments often require larger vehicles, there may be instances in which smaller vehicles can be substituted.
    - A review of the information collected for the Auburn inventory points to the potential benefits of having vehicle choice policies. The data shows that while the City does have several hybrid vehicles, the average fuel efficiency of the 15 most used vehicles (not including the police fleet) is 11 miles per gallon. City staff drove the City's Toyota Prius hybrid vehicles an average of 5,000 miles each, compared to an average of nearly 16,500 miles in the three most used (non-Police) vehicles overall. Table 17 on page 47 provides more detail on the 15 most used non-police vehicles.

[22] Evergreen Fleets. Available online at http://www.evergreenfleets.org/. Accessed September 2009.

- **Formalize best management practices for fleets and facilities.** Auburn should build on existing policies to implement best management practices for maintaining and using fleet vehicles and formalize these practices as policy. This effort may include establishing and enforcing a "no idle" policy. (The EPA estimates that idling diesel trucks consume 0.8 gallons of fuel per hour when idling.) In addition, Auburn can formalize the regular preventive maintenance including keeping tires inflated, monitoring fuel filters, and changing motor oil regularly to ensure that these practices continue.

- **Capitalize on the upcoming electric vehicle investments and programs in the Puget Sound region.** Some $22 million in electric vehicle infrastructure investments will be coming to the Puget Sound region in the next several years through American Recovery and Reinvestment Act (ARRA) funds for the Nissan/eTec pilot grant,[23] the Puget Sound Clean Cities Coalition grant,[24] and Energy Efficiency and Conservation Block Grant funds to specific jurisdictions for electric vehicles and plug-in stations (including Auburn, Bellevue, and King County). Auburn should be aggressive about leveraging these opportunities to improve its overall fleet efficiency with additional electric vehicles and to foster greater citizen adoption of electric vehicles (see *Community Measures*).

- **Work to increase the fuel efficiency of the police fleet.** As in most cities, Auburn's Police Department is the largest fleet user. In 2008, the Auburn police fleet traveled roughly 777,000 miles and used 83,000 gallons of gas for a total of over $283,000 in fuel costs. The average fuel efficiency of the 15 most used police vehicles, shown in Table 18 on page 47, was 8 miles per gallon. While the effectiveness of the police fleet is of utmost importance, Auburn can save money and reduce greenhouse gas emissions by driving the more fuel-efficient vehicles already in the fleet and by upgrading to hybrid and efficient vehicles wherever possible.

- **Promote alternative modes**. Look into the feasibility of making a bicycle and helmet available to City employees for short work trips.

Table 16: On-Road Vehicles by Fuel Efficiency in Comparison to Federal CAFE Standards

	Average Model Year	Average Fuel Efficiency	Average Fuel Efficiency (Weighted)[25]	CAFE Standard
Light Trucks	2004	10.9 mpg	9.5 mpg	20.7 mpg
Passenger Cars	2005	14.7 mpg	10.2 mpg	27.5 mpg

[23] The EV Project Overview, http://www.theevproject.com/overview.php
[24] US Department of Energy, "Recovery Act Announcement: Secretary Chu Announces Nearly $300 Million in Clean Cities Grants to Support Clean Fuels, Vehicles, and Infrastructure Development." Available online at http://apps1.eere.energy.gov/news/progress_alerts.cfm/pa_id=232. Accessed February 2010.
[25] Fuel efficiency is weighted by how many miles were driven in each vehicle.

Table 17: Average Fuel Efficiency, Miles Traveled, and Fuel Consumption of 15 Most Used (Highest Mileage) Vehicles in Auburn Fleet (not including police fleet)

Department	Vehicle Make	MPG	2008 Mileage	Fuel Consumption (gallons)
Street	Mitsubishi Flatbed	12	18,600	1,512
Mayor	Chrysler Town & Country	19	16,437	879
Water	Ford Service Truck	7	14,353	2,142
Street	Ford Dump Truck	7	14,340	1,938
Parks	Ford F150	11	14,253	1,320
Storm	Ford Truck	9	13,708	1,523
Water	Chevy Van	10	13,638	1,378
Parks	Mitsubishi	40	13,425	333
Engineering	Ford F150	10	13,132	1,372
Parks	Ford F150	10	12,815	1,350
Sewer	Ford Ranger	12	12,363	1,022
Parks	Ford Ranger	14	12,044	889
Street	Chevy P/U	9	11,804	1,312
Engineering	Chevrolet 1/2 Ton P/U	12	11,575	965
Parks	Ford Van	21	10,950	534

Table 18: Average Fuel Efficiency, Miles Traveled, and Fuel Consumption of 15 Most Used (Highest Mileage) Vehicles in Auburn Police Fleet*

Vehicle Make	Fuel Efficiency (MPG)	2008 Mileage	Fuel Consumption
Ford Crown Victoria	8	30,901	3,806
Ford Crown Victoria	8	29,658	3,726
Ford Crown Victoria	8	28,158	3,657
Ford Crown Victoria	9	28,083	3,206
Ford Crown Victoria	8	27,285	3,628
Ford Crown Victoria	8	26,298	3,415
Ford Crown Victoria	9	26,257	2,984
Ford Crown Victoria	8	25,554	3,079
Ford Crown Victoria	8	23,390	2,888
Ford Crown Victoria	11	23,169	2,207
Ford Crown Victoria	8	22,902	3,054
Chevy Tahoe	10	22,847	2,377
Ford Crown Victoria	8	22,789	2,885
Ford Crown Victoria	7	22,744	3,116
Ford Crown Victoria	8	20,181	2,523

**Staff from the Maintenance & Operations Department provided information on fuel efficiency, mileage, and fuel consumption for all fleet vehicles. Fuel efficiency varies by make, model, and model year. Maintenance & Operations staff were not able to provide the model year for each vehicle.*

WATER

Auburn Making Strides

Auburn is responsible for delivering clean water to residents, managing stormwater, and conveying wastewater to the King County wastewater treatment plant. The City has already implemented many best practices including the following:

- Using inclining block rate structure for water bills to promote conservation.
- Fully metering the entire water system.
- Implementing a low-flow showerhead giveaway program, estimated to save 2 million gallons of water annually.
- Establishing goals to become a leader in water conservation and becoming a member of the Partnership for Water Conservation.
- Putting in place policies to reduce irrigation needs for public and private landscaping, including use of timed sprinklers and rain sensors.
- Having infrastructure monitoring and improvements such as leak detection and repair, estimated to save 6.6 million gallons annually and reduce the City's leakage rate to 8.4%.
- Using variable-frequency drives (VFD) on water pumps to save energy.

Recommendations

Electricity used to pump water and wastewater represents 25 percent of Auburn's municipal greenhouse gas emissions. These activities also translate into significant energy costs to the city – the second largest sector in the inventory, just behind vehicle fleets. The City has direct control over these activities and equipment, and it can use utility rebates to help offset upfront costs and achieve a greater return on investment over a shorter period of time. Water conservation as a whole will also become an increasingly important strategy for local governments to adapt to the impacts of climate change on water availability. Below are some key recommendations to reduce greenhouse gas emissions associated with the use and transport of water and wastewater in Auburn.

- **Reduce the amount of water that needs to be treated.** Use low impact development (LID) techniques to capture rainwater where it falls, thereby minimizing the amount of stormwater captured in storm drains and subsequently pumped to nearby creeks and rivers. Permit LID techniques by applicants and develop materials to educate applicants about how these techniques might be applied. Create incentives to foster LID techniques where possible.

- **Minimize the amount of water being delivered.** Auburn can reduce water demand by promoting conservation measures such as expanding the existing efficient fixture upgrade program for residences and other customers; offering rebates or other incentives for residents and business to install water-saving devices; and promoting efficient irrigation techniques with major water users such as golf courses, parks, and schools. For more information, see US EPA's WaterSense Program.[26]

[26] EPA WaterSense, www.epa.gov/watersense.

- **Improve the efficiency of equipment to treat, store, and transport water.** Continue to retrofit pump stations with high efficiency motors, variable-frequency drives, and controls, beginning with planned pump replacements and expansions. When the City of Bremerton added variable-frequency drives to pumps, PSE paid for 50% of project costs. The City saw a payback period of 1.5 years and cut pump energy use by 80%.[27]

- **Continue to locate and fix leaks.** In the City's 2008 *Water Use Efficiency* report to the Washington State Department of Health, Auburn city engineers estimated an 8.4% leakage rate in its distribution system, or an annual volume of 264 million gallons.[28] While the City is meeting its targets in this area, it could take further action to reduce its leakage rate.

- **Ensure sources can provide adequate capacity.** Auburn's *Comprehensive Water Plan* indicates that declines have been observed in the production of several supply wells.[29] Pumps at these wells may operate in excess of the available supply, using energy that does not translate into water supply.

SOLID WASTE

Auburn Making Strides

The City has infrastructure to recycle a wide range of materials in all City buildings, and it recently added food waste composting to several buildings in December 2008. The City was able to achieve a 19% recycling rate in 2008, meaning that of all municipally generated waste, the City diverted approximately 19% by volume to recycling or composting.[30] Other examples of steps Auburn is already taking to reduce waste are listed below.

- Recycling in City buildings, including food scraps and compostables in six City buildings.
- Providing recycling infrastructure in most public parks.
- Recycling electronic waste, automotive parts, and rechargeable batteries.
- Using double sided printing.
- Using e-mail for employee and vendor communication.
- Sharing office equipment (cameras, laptops, projectors) to reduce consumption.
- Using water filtration instead of water bottles at City buildings.
- Providing durable dishes in each City facility lunch room to reduce consumption on paper goods.
- Conducting waste audits of City buildings, parks, and facilities.

[27] Personal Communication with Tom Baker, Electronics Technician, City of Bremerton Electronics Department, May 15, 2009.
[28] *Annual Water Use Efficiency Performance Report Form*, 2008. Available online at http://www.auburnwa.gov/Assets/PW/AuburnWA/Docs/WaterUseEfficiencyReport.pdf. Accessed September 2009.
[29] *Comprehensive Water Plan*, 2008. Available online at http://weblink.auburnwa.gov/ElectronicFile.aspx?docid=160537. Accessed September 2009.
[30] The estimates are based on the size and frequency of collection of waste, recycling, and yard waste containers at City buildings in 2008. The City did not track actual waste tonnages in 2008 as waste collection is included in the City's waste contract.

Recommendations

While emissions from waste are only a small part of the municipal emissions based on the model used for Auburn's inventory, USEPA's WAste Reduction Model (WARM) indicates that increasing the recycling rate to 50% by diverting an additional 1,000 tons to recycling and an additional 500 tons to compost/yard waste would reduce waste-related emissions by over 1,800 mtCO_2e a year.[31] Auburn can get started with the steps below.

- **Track waste production at City buildings by requiring the City's hauler to report waste, recycling, and compost tonnages on monthly basis.** Share cost and tonnage information with building staff during educational campaigns.
- **Continue to conduct waste audits of City buildings, parks, and facilities.** Continuing to monitor progress and identifying key target materials will help focus the City's efforts and increase recycling over time.
- **Based on waste audit results, determine what additional infrastructure is needed to increase diversion.** Continue to add compost bins to City facilities where possible, especially in facilities that have food service areas (e.g., Golf Course Clubhouse, Senior Center, parks). Work with food vendors at City parks to use compostable or recyclable serviceware.
- **Add a waste and recycling component to the City's new employee training** to ensure that employees are aware of recycling policies and waste prevention procedures (e.g., duplex printing, electronic communication).

STREET AND TRAFFIC LIGHTS

Auburn Making Strides

To reduce energy consumption associated with street and traffic lights, Auburn has worked to replace approximately 95% of City traffic signals with LED lights. Efforts are underway to convert approximately 1,000 streetlights along arterial streets within the City to lower-wattage LED fixtures.

Recommendations

Electricity used to power street and traffic lights accounted for over 1,300 mtCO_2e in Auburn's 2008 municipal inventory, and cost the City $500,000. Street and pedestrian lights are the next frontier for lighting efficiency for municipalities. Governments across the country are using ARRA funds to pilot some of these new technologies. Auburn should continue to monitor these new technologies as well as local demonstrations to assess street lighting efficiencies.

- **Where possible, switch to metered traffic and street lights to take advantage of the cost savings from efficient fixtures (including LED lights).** The City pays a significant amount more on "flat-rate" lighting. Wherever possible, the City should move to metered street lighting and then upgrade to energy-efficient LED bulbs to reduce costs and emissions.

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[31] Unlike the CACP calculations, WARM includes upstream emissions calculated through a life-cycle analysis. The inclusion of upstream emissions greatly increases the emissions associated with waste.

- **Investigate solar-powered fixtures.** Solar panels can help power street lights, reducing emissions and saving utility costs after an initial investment.

EMPLOYEE COMMUTING

Auburn Making Strides

The City of Auburn is addressing emissions from employee commuting through participation in Washington's Commute Trip Reduction programs. This includes filling out the Commute Trip Reduction survey and offering employees a $50/month subsidy for taking public transit.

Recommendations

Auburn can continue to reduce single occupancy vehicle miles through several initiatives that encourage carpooling and reduce commuting miles.

- **Encourage employees to use alternative transportation for commuting.** Review the City's policies on public transportation passes and determine whether increasing public transportation subsidies could increase the use of public transportation.

- **Where possible, encourage biking by providing bike racks, showers, and locker rooms in all major City buildings.** Adding bike lockers and shower rooms to public buildings will allow City staff and visitors to travel to work by bike. Bike facilities can help buildings to qualify for Leadership in Energy and Environmental Design (LEED) points.

Four Day Work-Week

The State of Utah switched to a four day work week during 2008. Over the first year, the "4/10" weeks saved$2.3 million in energy and fleet costs and $4.1 million in overtime pay.

http://www.dhrm.utah.gov/Working4Utah_FinalReport_Dec2009.pdf

- **Add a carpooling feature to the employee intranet.** Such a feature could help employees identify possible carpool options.

- **Encourage flex-work policies that reduce commuting.** Wherever possible, make "flex" schedule options available to employees. Possible schedules include four ten-hour days, or working remotely at least one day a week.

Community Best Practices

The City of Auburn has more control over greenhouse gas emissions from its own municipal activities than emissions from the community as a whole. The City, however, can take steps to promote and provide incentives for GHG reductions throughout the broader community. **Transportation** and **building energy use** were by far the largest contributors to Auburn's communitywide GHG inventory in 2008, representing about 40% and 60% of emissions, respectively. The discussion below addresses these two categories as well as **solid waste**, which, though its impacts are smaller, offers significant opportunities for savings.

The following sections highlight examples of **best practices** from other jurisdictions around the region and the nation. The lists are not intended to be prescriptive recommendations or to be exhaustive, but rather they offer illustrative examples the City may consider in planning new initiatives that aim to reduce emissions from the larger Auburn community.

TRANSPORTATION

Transportation accounted for more than 40% of Auburn's community emissions for the base year inventory in 2008. Transportation in the community inventory includes all emissions from vehicle miles traveled on roads within city boundaries. These emissions are not limited to vehicle miles traveled by Auburn residents, although residents are certainly responsible for a portion of the total. While many transportation patterns and overall emissions will depend on larger regional planning and national fuel efficiency standards, cities can take several steps to reduce transportation emissions in their communities. Reducing transportation emissions can involve changes increasing vehicle and travel system efficiency, using alternative fuels, and reducing vehicle miles traveled (VMT) or demand management. Best practices for reducing GHG emissions from transportation include the following examples.

- **Cities around the nation are successfully using many transportation demand management and commute trip reduction strategies** to reduce vehicle miles traveled and increase the use of alternative modes. Broad efforts include improving transit access and frequency, supporting ridesharing, improving infrastructure to support walking and biking, and compact and transit-oriented development or smart growth. For example, Washington State's Growth and Transportation Efficiency Center (GTEC) program works with local governments, businesses, schools, and neighborhoods to encourage commuters to ride transit, carpool, vanpool, walk, bike, telecommute, and use other commute options besides driving alone. In Tukwila, the GTEC program involves an area wide transit flexpass, vanpools, marketing, parking management, bus and rail transit stations, and sidewalk and roadway improvements for pedestrians and bicyclists.[32] Some cities have had success with downtown circulators or shuttles connecting significant employment, education, and retail centers. For example, in Emeryville, California,

[32] Washington State Department of Transportation, "Growth and Transportation Efficiency Centers." Available online at http://www.wsdot.wa.gov/TDM/GTEC.htm. Accessed February 2010.

local businesses fund Emery Go Round, a entirely privately funded shuttle connecting rapid transit and rail to the business district.[33]

- **Electric vehicles and other forms of clean mobility offer opportunities for reducing GHG emissions associated with commuting, freight movement, and other travel.** The federal government is investing more than $20 million in the Puget Sound region through the eTec/Nissan's EV Project and other federal funding.[34] Local governments can position themselves for EV infrastructure investments, including public charging stations and "smart" vehicle-to-grid connections for EVs.

- In addition to leading by example through their own use of electric vehicles and development of supportive infrastructure, **cities can use rebates, special parking spaces or reduced fees, permitting, and other incentives to promote and support cleaner cars and fuels** among residents and businesses. For example, electric vehicles in Sacramento, California are eligible for free parking and recharging in designated facilities.[35] Washington State offers a sales tax exemption for the purchase of new vehicles that exceed 40 miles per gallon, and the City of Aspen, Colorado offers a $100 rebate on license registration for hybrid vehicles.

- **Parking policies—including minimums, maximums, on-street parking, and private parking—can support VMT reductions.** A number of cities use parking maximum ratios to limit the number of parking spaces included in new construction; some have also lowered or removed minimum parking requirements. These efforts can help "unbundle" the price of parking from the purchase price of a property and identify the cost of "free" parking. On-street parking prices and time limits can encourage parking turnover, facilitate business access, and support alternative modes of travel into downtown areas, as can taxes on private parking facilities. For example, Redmond uses parking maximums to help reduce single-occupant vehicle travel and support transit, ridesharing, biking, and walking; the parking maximums may be lowered further.[36] Free parking for hybrids, electric cars, and car-share vehicles can also support their use.

- **Car-sharing can reduce vehicle use when households (or businesses) are able to reduce the number of cars they own.** Studies in North America show that each car-sharing vehicle removes 15 private cars from the community, on average, reducing parking demand and VMT. [37] The cars they replace tend to be older, high polluters,

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[33] Emeryville Transportation Management Association, "Emery Go-Round." Available online at http://emerygoround.com/. Accessed February 2010.
[34] The EV Project, http://www.theevproject.com.
[35] City of Sacramento (California), "Parking Services: Electric Vehicles."Available online at http://www.cityofsacramento.org/transportation/parking/offstreetother.html; Hybrid Cars, "Hybrid and Plug-in Incentives and Rebates." Available online at http://www.hybridcars.com/local-incentives/region-by-region.html. Accessed February 2010.
[36] City of Redmond (Washington), "Downtown Redmond Parking Study." Available online athttp://www.redmond.gov/connectingredmond/studies/parkingstudy.asp. Accessed February 2010.
[37] Cohen, Adam P., Susan A. Shaheen, and Ryan McKenzie, *Carsharing: A Guide for Local Planners*, Research Report UCD-ITS-RP-08-16. Institute of Transportation Studies, University of California—Davis, 2008. Available online at http://pubs.its.ucdavis.edu/publication_detail.php?id=1240. Accessed February 2010.

while the car-share vehicles are typically high-efficiency, low-emission vehicles. In 1999, King County issued the first Request for Proposals for car-sharing services (and pledged support), and the result was the nation's first large-scale car-sharing program. Today, Zipcar (a private company) has hundreds of shared vehicles in Seattle, including hybrids, and is beginning to expand to the surrounding cities. Cities can encourage car-sharing through using and promoting car-sharing, adopting parking policies such as establishing designated parking locations for car-share vehicles, and encouraging car-sharing in new developments. For example, Philadelphia replaced its municipal fleet with car-sharing vehicles, and Seattle has designating parking spots for car-sharing vehicles.[38]

- **Replacing stop signs and traffic signals with roundabouts can reduce fuel use associated with stop-and-go traffic.** According to the Washington State Department of Transportation, roundabouts save lives, save time, and reduce carbon dioxide emissions by more than one-third when they replace well-suited traffic signals and stop signs. The nearby cities of Federal Way and Covington have several examples of modern roundabouts.[39] Other access management strategies can also improve roadway safety and reduce emissions.

- **Coordinating traffic lights can minimize idling and traffic congestion.** Optimizing traffic signals can reduce idling time and the need for acceleration and deceleration, in addition to reducing traffic in congestion areas. Portland's award-winning traffic signal optimization effort has saved more than 157,000 metric tons of carbon dioxide emissions in six years—the equivalent of removing 30,000 passenger vehicles from the road for an entire year.[40]

- **Community anti-idling campaigns or ordinances can reduce greenhouse gas emission and air pollution.** Many anti-idling ordinances apply to commercial vehicles, such as a delivery trucks and buses, but some rules can apply to all drivers, including passenger cars. For example, the City of Aspen adopted an ordinance limiting idling to five minutes with up to a $1,000 fine and conducted an "Idling Isn't Cool!" campaign to educate community members. No-idling signs on businesses and public places can also help remind drivers to reduce this emissions source.[41]

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[38] *Ibid*.

[39] Washington State Department of Transportation, see "Why Build Roundabouts?" section, http://www.wsdot.wa.gov/NR/rdonlyres/8C13D92B-A820-4669-A55F-7183678D6539/0/US395ColumbiaDrtoSR240Folio_07_29_2009.pdf; WSDOT, "Washington's Roundabouts," http://www.wsdot.wa.gov/Safety/roundabouts/washingtons.htm.

[40] "Smart City award goes to Portland Bureau of Transportation," City of Portland (Oregon), February 2010. Available online at http://www.portlandonline.com/mayor/?a=288204&c=49521. Accessed February 2010.

[41] City of Aspen and Pitkin County, "Engine Idling," Code Section 13.08.110, Title 13: Health and Quality of the Environment. Available online at http://www.aspenpitkin.com/Portals/0/docs/City/clerk/municode/COAspenT13.pdf. Accessed February 2010.

BUILDING ENERGY USE

In 2008, building energy use – including electricity and natural gas – from residential, commercial, and industrial sources accounted for roughly 60% of total community emissions, 40% of these emissions where from electricity consumption. The emissions from building energy use depend on several key factors including the mix of fuel used to create electricity, energy demand, and the efficiency with which energy is consumed. Accordingly, efforts to reduce emissions from energy consumption include increasing availability of renewable energy, conserving energy (decreasing demand), and increasing energy efficiency. While the City can exert more control over its own energy consumption and facilities, many local governments have also adopted best practices regarding building energy use in their communities. These initiatives provide valuable examples for the City of Auburn to consider.

- **Local government can partner with utilities to help link businesses and residents with rebates and other incentives to support energy audits, weatherization, and other building retrofits.** Puget Sound Energy offers a range of rebates for lighting, controls, HVAC, appliances, and other equipment and products. Cities can share information and promote rebate programs through their website, community events, and other venues to ensure that businesses and residents are aware of these programs.

- **Direct-install programs, though resource-intensive, can yield impressive energy efficiency gains.** Boulder, Colorado's ClimateSmart program conducts neighborhood "sweeps" that send teams door-to-door to conduct energy audits, provide education, weatherize homes, and install energy-efficient products, such as compact fluorescent light bulbs, low-flow showerheads and faucet aerators, water heater wraps, water pipe insulation, furnace filters, refrigerator/freezer thermometers, and setback thermostats.[42] Seattle City Light recently started a direct-install program for compact fluorescent light bulbs.

- **Funding and incentives support energy efficiency upgrades in homes and businesses.** Either on their own or in partnership with the private sector, cities can offer low-interest loans, energy-efficient mortgages, local improvement districts for energy efficiency, or bond measures. Jurisdictions can work to advance innovative repayment methods via utility bills or property taxes, a strategy the City of Berkeley pioneered as part of its Sustainable Energy Financing District.[43] Tax credits or "feebates" can also create incentives for energy efficiency. For example, Montgomery County, Maryland, offers a Green Building property tax credit for commercial buildings that achieve LEED-EB (Existing Building) certification.[44] Portland has proposed a fee on buildings that meet

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[42] City of Boulder, City of Longmont, and Boulder County (Colorado), ClimateSmart. Available online at http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=1058&Itemid=396. Accessed February 2010.

[43] City of Berkeley (California), "Berkeley FIRST: Financing Initiative for Renewable and Solar Technology."Available online at http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=26580. Accessed February 2010.

[44] Montgomery County (Maryland), "Property Tax Credit – Energy and Environmental Design." Available online at http://www.montgomerycountymd.gov/govtmpl.asp?url=/content/finance/CountyTaxes/Info%20Taxes/tax_credit_exempt.ASP#p19. Accessed February 2010.

only the state's minimum energy code requirement; funds collected would be used to waive the fee or provide rewards for new buildings that exceed the performance standards.[45]

- **Energy disclosure reporting requirements inform potential buyers or renters about the relative efficiency of a property and can create incentives for owners to retrofit their buildings.** Adopted in early 2010, Seattle's Energy Disclosure Ordinance requires large commercial and multifamily property owners to measure energy use and provide the City and prospective buyers or tenants with ratings to allow comparison across different buildings.[46] Disclosure mandates could include historical energy use, energy performance checklists, and/or energy performance ratings or labels. Making energy consumption data available provides useful information to potential tenants and investors and encourages property owners to reduce energy use where possible.

- **Integrating a green building or energy efficiency rating system into building codes can boost energy efficiency throughout the community.** For example, some cities have adopted LEED standards or Energy Star Building standards (or other similar standards) for their own buildings as well as new private developments.

- **Cities can enact mandates that require upgrades to commercial or residential buildings.** For example, Burlington, Vermont, has established minimum energy efficiency standards for both single- and multifamily rental properties.[47] Austin, Texas, has proposed mandatory upgrades for "energy hog" properties that use 50% more energy than the city's average building.[48]

- **Enacting policies to support and promote renewable energy and distributed generation technologies, such as solar panels and rooftop wind turbines, can help generate clean energy in urban settings.** Cities can support and encourage renewable energy through their own leadership as well as supportive regulations and permitting. For example, Sonoma County, California, developed an Energy Independence Program that includes financing, supportive policies, and other efforts to promote solar photovoltaic, solar thermal, and other efficiency and renewable energy improvements.[49] Efforts can include promotion of "net-zero" or even net-positive buildings that produce more energy than they consume.

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[45] City of Portland, "City of Portland Proposed High Performance Green Building Policy." Available online at http://www.portlandonline.com/bps/index.cfm?c=45879. Accessed February 2010.
[46] City of Seattle, "Energy Disclosure Ordinance identifies energy waste, gives property owners and tenants tools to improve energy efficiency," February 1, 2010. Available online at http://www.seattle.gov/mayor/newsdetail.asp?ID=10497&dept=48. Accessed February 2010.
[47] City of Burlington (Vermont) and Burlington Electric, Code of Ordinances, Article VII, "Minimum Energy Efficiency Standards Ordinance." Available online at http://www.ci.burlington.vt.us/planning/dguide/energy_efficiency.pdf. Accessed February 2010.
[48] Austin Energy, "Energy Conservation Audit and Disclosure (ECAD) Ordinance for Owners of Commercial Buildings." Available online at http://www.austinenergy.com/About%20Us/Environmental%20Initiatives/ordinance/commercial.htm. Accessed February 2010.
[49] Sonoma County Energy Independence, "Energy Independence Program." Available online at http://www.sonomacountyenergy.org/. Accessed February 2010.

SOLID WASTE

Waste represented only a small part of Auburn's community emissions. However, alternative methods of calculation such as the EPA's WAste Reduction Model (WARM) suggest that by reducing its waste stream, communities can substantially reduce upstream emissions associated with the manufacturing and transportation of materials.[50] While these emissions are not included Scope 1 or 2 inventories, and were not covered by Auburn's 2007 or 2008 inventory, the benefits in terms of greenhouse gas reductions are real.[51] Key opportunities for Auburn include actions that support source reduction efforts, increased recycling and composting, and efficiency in collection and processing.

- **Auburn's new solid waste contract slated for bid in 2012 offers a major opportunity for waste prevention and increased diversion.** The City's new waste contract offers an excellent opportunity to focus efforts on waste prevention, increased recycling, and food waste collection and reduce associated emissions. Best practices include adopting pay-as-you-throw garbage rate structures that embed the cost of recycling collection into the garbage fee and ensure communitywide organics collection. Contracts can also require haulers to estimate their carbon emissions from collection and processing and to identify the steps they will take to reduce emissions where possible. Cities can also partner with their waste hauler to provide business incentives and education and outreach that support recycling and composting.

- **Mandatory recycling and bans on the disposal of recyclable or compostable materials can increase diversion and enhance recovery of valuable materials.** For example, multiple cities in King County ban yard waste from disposal as garbage, and Seattle prohibits residents from disposing of recyclables and businesses from disposing of paper and cardboard in their garbage.[52] Including multifamily, commercial, and industrial buildings in recycling programs will expand their impact and improve consistency between home and workplace recycling. Local ordinances can also support reuse and recycling of construction and demolition materials.

- **Local campaigns encouraging recycling, composting, reuse, and source reduction can prevent waste—and its associated greenhouse gas impacts.** Communitywide or targeted promotional campaigns can focus on particular materials, practices, sectors, or geographic areas. For example, Seattle's ban on non-recyclable or compostable food-service packaging reduces waste going to the landfill and supports recycling and composting.[53]

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[50] U.S. Environmental Protection Agency, "WAste Reduction Model." Available online at http://www.epa.gov/climate/WARM/Warm_home.html; USEPA, "Climate Change – Waste." Available online at http://www.epa.gov/climatechange/wycd/waste/. Accessed February 2010.

[51] USEPA, "West Coast Forum on Climate Change, Waste Prevention, Recovery and Disposal." Available online at http://yosemite.epa.gov/r10/ECOCOMM.NSF/Programs/wcf. Accessed February 2010.

[52] City of Seattle, "Ban on Recyclables in Garbage." Available online at http://www.cityofseattle.net/UTIL/About_SPU/Recycling_System/History_&_Overview/Ban_on_Recyclables_in_Garbage/index.asp. Accessed February 2010.

[53] Resource Venture, "Seattle's New Food Packaging Requirements." Available online at http://www.resourceventure.org/foodpluscompostables. Accessed February 2010.

- **Commercial recycling or conservation assistance programs can help businesses reduce waste, shrink their carbon footprints, and save money.** For example, Portland Metro Area's Recycle at Work program provides information, resources such as recycling boxes, and technical assistance to help businesses reduce their waste.[54] Seattle's Resource Venture assists businesses with reducing waste, conserving water, and reducing energy use.[55]

[54] Metro (Oregon) Recycle at Work, http://www.recycleatwork.com/
[55] Resource Venture, www.resourceventure.org

Next Steps

Substantially reducing greenhouse gas emissions will require a sustained effort over time and a portfolio of actions and initiatives by Auburn, its citizens, and, indeed, communities across the nation and around the globe. The actions presented above provide Auburn with a menu of choices from which to forge a path forward and provide leadership on this vital issue.

It was beyond the scope of this study to evaluate each of these options in terms of GHG reductions achieved, cost-effectiveness, leverage, feasibility, and other related criteria. Therefore, the next step in this process is for Auburn to review and discuss these options, develop a short list that makes sense for the City, quantify potential savings and associated costs, and then establish priorities.

Auburn then will be in a strong position to formulate an action plan to reduce emissions in both the short and longer terms. With a plan in place, implementation can begin immediately, especially on some of the options that represent "low-hanging fruit." The City will then need to track and measure progress over time, reporting to its citizens and businesses on progress made toward a cleaner, sustainable, prosperous low-carbon future.

Evaluating Actions

An extensive analysis of climate protection actions was not a part of this study. As the City of Auburn moves forward to meet its climate protection goals, the following criteria should be considered when evaluating actions.

- **Reduction Potential:** total achievable GHG reduction potential.
- **Cost-effectiveness:** costs of implementation and the potential savings generated.
- **Feasibility:** ease of achievement and potential to overcome barriers.
- **Rapid Deployment:** opportunity to effect changes quickly.
- **Regional Impact:** level of opportunity in the Puget Sound region.

Appendix A: Detailed Data Sources

Municipal Inventory Data Sources	
Organization/ Department	**Data Supplied**
City of Auburn Cemetery	Cemetery vehicle fleet
City of Auburn Finance	Finance Department Liaison, requested data from PSE
City of Auburn Finance	Relevant PSE account numbers for Auburn facilities, cost information on PSE electric and natural gas accounts, list of business travel invoices used to pull records, fuel data
City of Auburn Engineering	Public Works greenhouse gas inventory liaison
City of Auburn Engineering	Electricity use for street and traffic lights
City of Auburn Golf Course	Golf course fleet data
City of Auburn Human Resources	Square footage, addresses of non-parks City facilities, PSE data release forms for renters living in COA properties, occupancy data
City of Auburn Maintenance & Operations	Auburn fleet data, fuel usage, refrigerants, pump station list
City of Auburn Maintenance & Operations	Auburn fleet data
City of Auburn Parks	Parks Facilities energy use, Parks Department travel
City of Auburn Parks	Parks Department liaison
City of Auburn Police	Police Department liaison, Police Department travel
City of Auburn Legal	Legal Department liaison, Legal Department travel
City of Auburn Finance Department	Solid waste data estimates (based on container size and frequency of pick-up)
City of Auburn White River Valley Museum	White River Valley Museum electricity and natural gas account numbers, cost information and data release
Puget Sound Energy	Electricity and natural gas consumption
King County Metro	Information on 2008 fuel use and passenger miles for commuting calculations
Pierce Transit	Information on 2008 fuel use and passenger miles for commuting calculations
Sound Transit	Information on 2008 fuel use and passenger miles for commuting calculations

Community Inventory Data Sources	
Organization/ Department	**Data Supplied**
Puget Sound Regional Council (PSRC)	2006 Average Weekday VMT in City of Auburn boundaries
City of Auburn Public Works	City of Auburn Traffic Counts
Puget Sound Energy	Community Electricity and Natural Gas Consumption
City of Auburn Finance Department	Data from Waste Management, Allied Waste Services, and Murrey's Disposal on community waste generation
City of Auburn Human Resources Department	CTR report (2007)

Other Data Sources	
Organization/Department	**Data Supplied**
City of Auburn Engineering Department	City transportation projects that may reduce greenhouse gases
City of Auburn Finance Department	Full time Employee counts for City of Auburn – used for metrics
City of Auburn Human Resources Department	City Facilities projects that may reduce greenhouse gases
City of Auburn Maintenance and Operations Department	Total gallons pumped by water pump stations – used for metrics
City of Auburn Mayor's Office	Demographic data, City economic development efforts
City of Auburn Planning & Development Department	City planning projects and city code changes that may reduce greenhouse gases
Washington State Department of Transportation (WSDOT)	WSDOT Internal Greenhouse Gas Inventory, WSDOT Annual Traffic Report (2008)
Washington Office of Financial Management	Information on Auburn population – used for metrics and forecasting
Puget Sound Regional Council	Information on expected population growth in region – used for forecasting
The Department of Energy, Energy Information Administration	Information on expected growth in energy demand by region and sector – used for forecasting