

**Municipality of Anchorage  
Baseline Greenhouse Gas Emissions Inventory  
Base Year 2008**

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## **Baseline Section Table of Contents**

Executive Summary .....	Pg. 3
Introduction.....	Pg. 4
Current Initiatives .....	Pg. 7
Government Buildings .....	Pg. 8
Employee Commute .....	Pg. 11
Outdoor Lighting .....	Pg. 12
Vehicle Fleet .....	Pg. 14
Waste .....	Pg. 17
Water and Wastewater .....	Pg. 19
Summary .....	Pg. 20

## **Figures Table of Contents**

Table 1. Total emissions from MOA operations in 2008 by sector .....	Pg. 3 & 4
Graph 1. Total emissions from 2008 MOA operations by sector and percentage .....	Pg. 5
Table 2. Government buildings subsector emissions summary .....	Pg. 8
Table 3. Government buildings equiv. CO <sub>2</sub> % of MOA building sector .....	Pg. 8
Table 4. Government building sector emission summary .....	Pg. 9
Table 5. Employee commute emissions by fuel type in 2008 .....	Pg. 11
Table 6. Time series comparison for employee commute .....	Pg. 11
Table 7. Government outdoor lighting subsector emissions summary .....	Pg. 12
Table 8. Government outdoor lighting sector emissions summary .....	Pg. 12
Table 9. Vehicle fleet emissions by fuel type in 2008 .....	Pg. 14
Table 10. Vehicle fleet emissions by department in 2008 .....	Pg. 14
Table 11. Time series comparisons for vehicle fleet .....	Pg. 15
Table 12. Government waste sector emissions summary .....	Pg. 17
Table 13. Water and wastewater emissions by fuel type in 2008 .....	Pg. 19
Table 14. Time series analysis for water and wastewater .....	Pg. 20

## **Appendix Table of Contents**

Appendix 1. Acronyms and key terms .....	Pg. 21
Appendix 2. Government greenhouse gas emissions in 2008 report by source .....	Pg. 22
Appendix 3. Government greenhouse gas emissions in 2008 report by subsector.....	Pg. 23
Appendix 4. Government greenhouse gas emissions time series report .....	Pg. 28
Appendix 5. Contact information and acknowledgements.....	Pg. 29

## Executive Summary

The Municipality of Anchorage (MOA) conducted a greenhouse gas (GHG) emissions inventory with a 2008 base year in order to quantify the results of initiatives to reduce the MOA’s current carbon footprint, place those initiatives into a broader strategic plan, and measure reductions going forward.

The MOA conducted the carbon baseline because it is a signatory of the U.S. Mayors Climate Protection Agreement. Over 710 U.S. Mayors have signed the agreement. Under the agreement, Anchorage must attempt to meet or beat the Kyoto Protocol targets of 7% reduction from 1990 levels by 2012, encourage their state governments and federal government to meet or beat the Kyoto Protocol targets, and urge the U.S. Congress to pass greenhouse gas reduction legislation establishing a national emissions trading system. The greenhouse gas emissions inventory is the first step for Anchorage to begin measuring the reductions of greenhouse gases as the MOA strives to meet the 7% reduction goal by 2012.

The MOA chose to adopt the framework developed by the Local Governments for Sustainability (ICLEI) for measuring progress toward reduction goals because of its wide use, standardized methodology, and proven results. The ICLEI strategy has been adopted worldwide by over 1,000 communities working toward meet Kyoto Protocol carbon emission reduction targets.

As a signatory to ICLEI, the MOA has agreed to follow the five milestone program.

Milestone 1: Conduct a baseline GHG inventory and forecast

Milestone 2: Adopt an emissions reduction target

Milestone 3: Develop a Climate Action Plan for reducing emissions

Milestone 4: Implement the Action Plan

Milestone 5: Monitor and verify results

This report marks the completion of Milestone 1 and lays the ground work for continued work in reducing Anchorage’s contribution to climate change.

According to our calculations, the Municipality of Anchorage government operations produced 294,830 tonnes of eCO<sub>2</sub> in 2008.

Table 1. Total emissions from MOA operations in 2008 by sector

	Equiv CO2 (tonnes)	Equiv CO2 (%)	Energy (MMBtu)	Cost (\$)
Buildings	34,747	11.8	337,855	\$5,052,130
Vehicle Fleet	18,448	6.3	214,764	\$6,168,680
Employee Commute	9,189	3.1	107,886	\$0
Streetlights	15,570	5.3	79,365	\$3,033,346
Water/Sewage	15,942	5.4	141,272	\$2,614,992
Waste	200,933	68.2		\$0
Total	294,830	100	881,142	\$16,869,148

## Introduction

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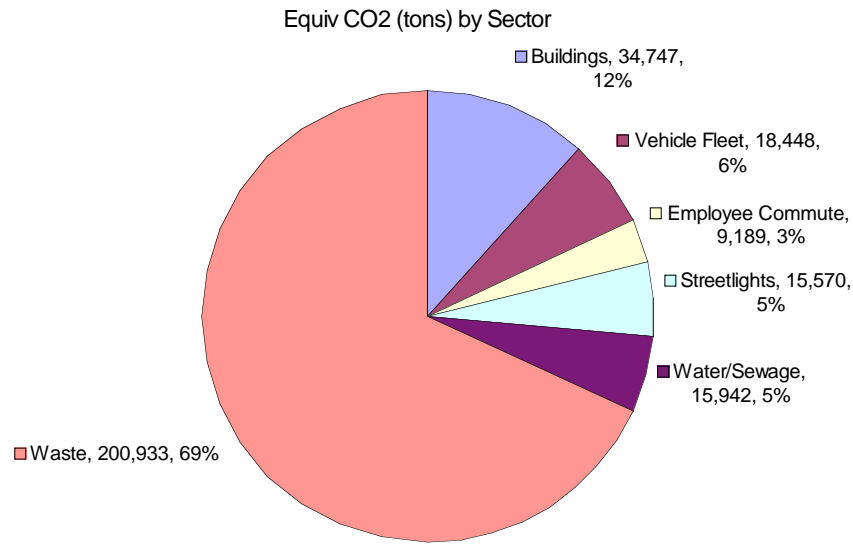
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Graph 1. Total emissions from 2008 MOA operations by sector and percentage



### What is a Greenhouse Gas Emissions Inventory?

A Greenhouse Gas Emissions Inventory quantifies the amount of GHG emitted in a geographic area over a specific period of time. This study quantifies GHG emissions for Anchorage Municipal Operations for the years 2008 and 2000.

Six greenhouse gases, with various heat trapping properties, are currently regulated under the Kyoto Protocol. This report follows the standard convention of reporting all emissions in equivalent CO<sub>2</sub> (eCO<sub>2</sub>) units. This method allows us to make unit to unit comparisons with ease.

### Method and Results

ICLEI developed the Clean Air Climate Protection (CACP) software to assist local governments establish their emissions inventories. We used the CACP protocol to guide our inventory efforts concerning data source collection, calculations and methodology. We also relied on the advice and expertise of ICLEI employee Amy Shatzkin, the Pacific Northwest Regional Program Officer.

The inventory includes information for two years: 2008 and 2000. 2008 emissions were calculated to get a clear understanding of our current emissions and 2000 emissions were calculated to establish a trend line, understand historical changes and identify and reductions that have already been made.

The ICLEI protocol has two analysis options: Government Analysis or Community Analysis. This baseline seeks to quantify emissions from government operations only. We chose to focus on government operations because the MOA maintains direct control of these operations and can therefore make emissions reductions. The MOA's emissions reduction progress can serve as an example for the private sector in Anchorage.

The Government Analysis includes emissions from six sectors: Buildings, Vehicle Fleet, Employee Commute, Outdoor Lighting<sup>1</sup>, Water and Wastewater, and Waste. In the following sections we provide detailed information about each of the six sectors.

*We caution readers to keep in mind that any figures presented in this report are estimations. All calculations depend on numerous assumptions and we were often limited by the quantity and quality of available data. It is best to think of these figures as an approximation, best suited for its use as a policy tool than as a precise measurement.*

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<sup>1</sup> Outdoor Lighting is named Streetlights in the CACP software; however we felt that Outdoor Lighting was more appropriate.

## **Current Initiatives**

The Municipality has several initiatives underway to reduce greenhouse gas emissions in the areas of policy, energy efficiency, solid waste reduction and diversion, and transportation and land use planning.

In 2008, the Anchorage Assembly passed a “zero waste” resolution addressing city government operations and a sustainable building initiative requiring new public construction to meet LEED standards. The Municipality has aggressively adopted and implemented new lighting specifications for high-efficiency outdoor lighting such as LED streetlights and trail lighting, and is currently developing municipal facility retrofits to reduce energy waste in major public facilities. The Municipality adopted a recycling plan in 2008 that implements curbside recycling service for residential customers, adds new drop-off locations for recyclables, implements school recycling, and more. The Municipality is also addressing sustainability in transportation and land use, including the ongoing development of a Regional Transit Authority and the recent completion of bike and pedestrian plans.

These initiatives demonstrate Anchorage’s commitment to meeting its targets and set the city apart as a Northern leader in efficiency and waste reduction.

## Government Buildings

2008 emissions from government buildings are 34,747 tonnes eCO<sub>2</sub> or 11.8% of all MOA eCO<sub>2</sub> emissions. The government building sector includes emissions from natural gas and electricity used to heat and light MOA operated buildings and park facilities.

### Results

In 2008 the MOA spent \$5 million on 337,855 MMBtu (million British Thermal Units) of energy to heat and light its facilities. The use of 337, 855 MMBtu of energy resulted in the creation of 34,747 tonnes eCO<sub>2</sub>, which is 11.8% of all emissions related to MOA activity (Table 2).

Table 2: Government buildings subsector emissions summary

2008 Buildings	Equiv CO2 (tonnes)	Equiv CO2 (%)	Energy (MMBtu)	Cost (\$)
Administration	1,789	0.6	10,416	\$ 226,207
Contract Buildings	12,225	4.1	120,021	\$1,580,857
Fire	3,007	1	30,700	\$ 475,993
Library	2,773	0.9	21,817	\$ 342,609
Parks & Rec.	3,436	1.2	34,952	\$ 558,173
Police	2,814	1	23,480	\$ 473,497
Public Works	5,594	1.9	63,646	\$ 879,946
Transportation	3,108	1.1	32,824	\$ 514,847
Total	34,747	11.8	337,855	\$5,052,130

Contract buildings produce the greatest portion of the MOA's building sector emissions, 35%; however make up only 8% of the total buildings. The second greatest emitter is Public Works facilities, which has the greatest number of buildings, 26. The Transportation group also stands out as an anomaly; with only 4 buildings, 5% of the total number of buildings, producing nearly 9% of the building sectors emissions (Table 3).

Table 3: Government buildings equiv CO2 % of MOA building sector

2008 Buildings	Equiv CO2 (tonnes)	Equiv CO2 (% of MOA building sector)	# of Buildings	% of buildings
Total	34,747	100.0	84	100.0%
Contract Buildings	12,225	35.2	7	8.3%
Public Works	5,594	16.1	26	31.0%
Parks & Rec.	3,436	9.9	21	25.0%
Transportation	3,108	8.9	4	4.8%
Fire	3,007	8.7	16	19.0%
Police	2,814	8.1	6	7.1%
Library	2,773	8.0	2	2.4%
Administration	1,789	5.1	2	2.4%



## Historical Comparison

Since 2000, eCO<sub>2</sub> emissions have risen 7%, from 32,461 tonnes eCO<sub>2</sub> in 2000 to 34,747 tonnes eCO<sub>2</sub> in 2008. Costs have also risen from \$4.1 million in 2000 to \$5.05 million in 2008, an increase of 22.2%. (Table 4). The 2000 figures represent 82 MOA operated facilities, while the 2008 figures represent 84 buildings.

Table 4: Government building sector emission summary

<b>2000</b>				
Buildings Sector	Equiv CO2 (tonnes)	Equiv CO2 (%)	Energy (MMBtu)	Cost (\$)
Electricity	20,158	7.3	102,746	\$2,402,793
Natural Gas	12,304	4.4	199,143	\$1,730,385
Subtotal	32,461	11.7	301,890	\$4,133,178
<b>2008</b>				
Buildings Sector	Equiv CO2 (tonnes)	Equiv CO2 (%)	Energy (MMBtu)	Cost (\$)
Electricity	20,251	6.9	103,220	\$2,871,665
Natural Gas	14,496	4.9	234,635	\$2,180,465
Subtotal	34,747	11.8	337,855	\$5,052,130
<b>Percent Change ((2008-2000)/2000)</b>				
Electricity	0.46%	-5.48%	0.46%	19.51%
Natural Gas	17.82%	11.36%	17.82%	26.01%
Subtotal	7.04%	0.85%	11.91%	22.23%

## Method

Electricity and natural gas consumption data was collected from the multiple local utilities. For the government facilities, North of Tudor Rd. and West of Boniface Pkwy., electricity data was acquired from Municipal Light & Power (ML&P). For those facilities outside this corner of Anchorage, electricity data was acquired from either Chugach Electric Authority (CEA) or Matanuska Electric Authority (MEA). Natural gas data for all MOA facilities was provided by Enstar Natural Gas Co.

The government buildings sector was split into eight categories: administration, contract buildings, fire, library, parks & rec., police, public works, and transportation.

The categories include the following type of facilities:

- Administration: Eagle River and Anchorage City Halls
- Contract buildings: Anchorage Golf Course, Ben Boeke and Dempsey Anderson Ice Arena, Dena'ina Center, Egan Center, Performing Arts Center, and the Sullivan Arena
- Fire: Fire stations, fire vehicle maintenance, fire training center, and fire dispatch
- Library: Loussac and Girdwood library
- Parks & Rec.: Parks and Rec. Administration, Community centers, park buildings
- Russian Jack greenhouses, and the Fine Arts Museum

- Police: Police Headquarters, substations, and training center
- Public Works: Road maintenance, Weatherization program, Animal Control Shelter, and Merrill Field
- Transportation: transit administration, warm storage, and transit maintenance

### **Study Limitations**

No one MOA entity is responsible for recording all MOA facility electricity and natural gas use. Therefore we were forced to rely on the local utilities information databases to provide electricity and natural gas consumption data. The major hiccup in this method was matching the MOA building numbering scheme with the utility provided data, especially when the addresses provided by the utilities did not match that provided by the MOA numbering scheme. It also became very complicated to deal with multiple meters and account numbers relating to one or more facilities.

## Employee Commute

In 2008 total emissions from Employee Commute is 9,189 tonnes eCO<sub>2</sub>, or 3.1% of the total MOA emissions. The Employee Commute sector includes energy use and emissions associated with travel to and from work by municipal employees.

### Results

In 2008, MOA employees generated a total of 9,189 tonnes eCO<sub>2</sub> by using 107,886 MMBtu of energy commuting; 95% of the emissions are from gasoline, while diesel makes up the other 5%. These emissions make up 3.1% of total MOA emissions (Table 5).

Table 5. Employee commute emissions by fuel type in 2008

Fuel Type	Equiv CO <sub>2</sub> (tonnes)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)
Diesel	418	0.1	4,798
Gasoline	8,771	3	103,088
Total	9,189	3.1%	107,886

### Historical Comparison

Since 2000, emissions have increased approximately 1%, from 9,101 tonnes eCO<sub>2</sub> in 2000 to 9,189 tonnes eCO<sub>2</sub> in 2008 (Table 6). Total Passenger Miles increased from 14.61 million in 2000 to 15.7 million in 2008. In addition to an increase in total passenger miles, employees have tended to shift to larger, less fuel efficient vehicles.

Table 6. Time series comparison for employee commute

Employee Commute	2000	2008	Percent Change
eCO <sub>2</sub> (tonnes)	9,101.00	9,189.30	0.97
Energy (MMBtu)	106,326.50	107,885.80	1.5
Cost (\$)	0.00	0.00	

### Method

To gather information on employee commuting patterns, a survey was emailed to 100 randomly selected employees; 47 responses were received. The information was used to infer commuter habits about the MOA's 3112 employees.

The survey included questions about distance traveled to work, mode of travel, type of vehicle and type of fuel. Historical travel patterns from the year 2000 were also requested. From this information the total annual passenger miles traveled by fuel type and vehicle type for municipal employees for each year was estimated.

### Study Limitations

As with any survey, the strength of our inferences are limited by the quantity and quality of our survey data. For example, due to its close proximity to the Downtown Transit Center and the free bus pass program, it is reasonable to believe that a larger proportion of City Hall employees commute to work by transit than other Municipal employees. Unfortunately, we were not able to survey City Hall employees separately.

## Outdoor Lighting

2008 Emissions from outdoor lighting are 15,570 tonnes eCO<sub>2</sub> or 5.3% of all MOA eCO<sub>2</sub> emissions. The outdoor lighting sector includes emissions related to street, outdoor, park, and trail lighting.

### Results

In 2008, the MOA had a total of 16,785 streetlights; 5136 CEA, 2713 ML&P, and 836 MEA metered streetlights and 4600 CEA and 3500 ML&P flat-rated streetlights. To allow for easier calculations, average electricity consumption per light pole per year was calculated at 1368 kWh pole<sup>-1</sup>year<sup>-1</sup>. In 2008 metered streetlights used a total of 11,080,800 kWh and flat-rated streetlights used 11,881,080 kWh. A total of 22,961,880 kWh was used by Anchorage's streetlights in 2008.

Of the 15,570 tonnes eCO<sub>2</sub> produced by the MOA operated outdoor lighting, 98.7% or 15,375 tonnes came from street lights. The other 1.3% is comprised of outdoor, park, and trail lighting (Table 7). For this section, streetlight information was the focus of our data gathering; however some additional lighting information was gathered with the building sector.

Table 7: Outdoor lighting subsector emissions summary

<b>2008 Streetlights</b>	<b>Equiv CO2 (tonnes)</b>	<b>Equiv CO2 (%)</b>	<b>Energy (MMBtu)</b>	<b>Cost (\$)</b>
Outdoor lighting	12	0	63	\$ 1,709
Parks	150	0.1	765	\$ 25,899
Street lights	15,375	5.2	78,366	\$3,000,000
Trails	33	0	170	\$ 5,738
Total	15,570	5.3	79,365	\$3,033,346

### Historical Comparison

Since 2000, eCO<sub>2</sub> emissions from outdoor lighting has risen 54%, from 10,076 tonnes eCO<sub>2</sub> in 2000 to 15,570 tonnes eCO<sub>2</sub> in 2008. Streetlights also grew as a proportion of the total MOA emissions from 3.6% in 2000 to 5.3% in 2008. The results show a dramatic increase in costs from 2000 to 2008; however the cost for CEA streetlights is not included in the 2000 figure (Table 8).

Table 8: Outdoor lighting sector emissions summary

<b>2000</b>				
Outdoor lighting Sector	Equiv CO2 (tonnes)	Equiv CO2 (%)	Energy (MMBtu)	Cost (\$)
Electricity	10,076	3.6	51,358	\$ 963,372
Subtotal	10,076	3.6	51,358	\$ 963,372
<b>2008</b>				
Outdoor lighting Sector	Equiv CO2 (tonnes)	Equiv CO2 (%)	Energy (MMBtu)	Cost (\$)
Electricity	15,570	5.3	79,365	\$3,033,346
Subtotal	15,570	5.3	79,365	\$3,033,346
<b>Percent Change ((2008-2000)/2000)</b>				
Electricity	54.53%	47.22%	54.53%	214.87%

### Method

For the outdoor lighting sector, utilities data was used from Municipal Light & Power (ML&P), Chugach Electric Authority (CEA), and Matanuska Electric Authority (MEA).

### Study Limitations

The approximately 23 million kWh (kilowatt hours) represents only streetlights and does not account for traffic lights and signals operated by the MOA. Some of the streetlights sector is comprised of park facilities data collected with the government buildings sector. Some parks and trails have no buildings, so their electricity is exclusively for outdoor lighting. Additionally, separating outdoor lighting electricity use from park facility electricity use was very difficult.

## Vehicle Fleet

Total emissions from the Vehicle Fleet in 2008 are 18,448 tonnes of eCO<sub>2</sub>, or 6.3% of total annual emissions. This sector includes all emissions from fuel combustion in municipally operated vehicles.

### Results

In 2008, the MOA spent \$6.2 million on 214,764 MMBtu of energy to run its fleet. This produced 18,448 tonnes eCO<sub>2</sub>, which is 6.3% of the entire MOA's carbon emissions (Table 9).

Table 9. Vehicle fleet emissions by fuel type in 2008

Vehicle Fleet Sector	Equiv CO <sub>2</sub> (tonnes)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)	Cost (\$)
CNG	11	0	164	0.00
Diesel	8,908	3	102,643	3,173,304
Diesel (ULSD)	821	0.3	9,463	293,085
Gasoline	8,708	3	102,494	2,702,291
<b>Total:</b>	<b>18,448</b>	<b>6.3</b>	<b>214,764</b>	<b>6,168,680</b>

Emissions information was analyzed by department. Fleet Services includes a large proportion of the Municipality's vehicles because it services a large number of departments and programs<sup>2</sup>. The Department of Public Transportation, the largest departmental emitter, is responsible for public transit in the Municipality and approximately 2/3 of its emissions are from People Mover transit busses.

Table 10. Vehicle fleet emissions by department in 2008

Vehicle Fleet	Equiv CO <sub>2</sub> (tonnes)	Energy (MMBtu)	Cost (\$)
Anchorage Fire Department Fleet	1,319	15,223	\$470,402
Anchorage Water and Wastewater Utility	361	4,209	\$121,190
Fleet Services	6,636	77,511	\$2,151,290
Merrill Field Fleet	145	1,672	\$45,268
Municipal Light & Power	685	7,998	\$215,117
Public Transportation/People Mover	9,164	106,531	\$3,118,857
Port of Anchorage	129	1,490	\$46,555
<b>Total:</b>	<b>18,439</b>	<b>214,634</b>	<b>\$6,168,679</b>

<sup>2</sup> Fleet Services includes all Municipal vehicles from the following departments: Parks and Recreation, Eagle River Parks and Recreation, Department of Neighborhoods, Health and Human Services, Memorial Park Cemetery, Traffic, Safety Department, Risk Management, Planning, Project Management & Engineering, Property Appraisal, Purchasing, Safety Department, Treasury, Mayor's Office, City Hall, Anchorage Police Department, Heritage Land Bank, Girdwood Parks and Recreation, Development Services, Fleet and Facility Maintenance, Street Maintenance.

## Historical Comparisons

It is extremely difficult to make reliable comparisons between 2000 and 2008 because Fleet Services could not provide information for 2000, which represents a substantial portion of the entire fleet. We can nevertheless see the dramatic impact of rising fuel prices between 2000 and 2008. Although Energy and eCO<sub>2</sub> approximately doubled over this time, Cost increased by a factor of six (Table 11).

Table 11. Time series comparisons for vehicle fleet

Vehicle Fleet	2000	2008	Percent Change
eCO <sub>2</sub> (tonnes)	8,609	18,448	114.3
Energy (MMBtu)	99,976	214,764	114.8
Cost (\$)	1,045,128	6,168,680	490.2

## Methodology

Eight departments were contacted to gather information on the Municipal Fleet: Fleet Services, Merrill Field, Anchorage Water and Wastewater Utility, Anchorage Fire Department, the Port of Anchorage, the People Mover, Municipal Light & Power, and Solid Waste Services. This report includes information from each fleet, except for Solid Waste Services.

The CACP software provides information on criteria air pollutants in addition to information on CO<sub>2</sub> emissions, which vary by type of technology used, so the CACP software requires fuel information to be entered by vehicle type. The vehicle types include: Full size Auto, Mid-Size Auto, Sub-Compact/Compact Auto, Heavy Truck, Light Truck/SUV, Motorcycle, Passenger Vehicle, Vanpool Van and Transit Bus. This methodology provides a unique challenge, because fuel records are not traditionally broken down by vehicle type.

Personnel from each fleet provided slightly different forms of information. Some were able to provide precise information on the gallons of fuel, cost of fuel and type of fuel for each vehicle type. Others were only able to provide a dollar figure for their total fuel costs from a given year. In each case, information was used on the average price of fuel for the year and information about the composition of each fleet to estimate fuel use per vehicle type.

Emissions information was analyzed by fuel type; most of the MOA fleets used gasoline and diesel exclusively, however some use compressed natural gas (CNG) or ultra low sulfur diesel. People Mover and Fleet Services each have a small fleet of vehicles that run on Compressed Natural Gas. The fuel use of these vehicles is not recorded, so information on total vehicle miles traveled was used to determine emissions from these vehicles. Unfortunately this method does not allow the cost of CNG fuel to be estimated.

**Study Limitations**

The study is limited by the quality of information about fuel usage. There is no system or mechanism to accurately and regularly report fuel usage by the Municipal Departments. In place of accurate data, we often had to rely on anecdotal evidence and general estimates. A data collection mechanism should be developed, not only to more accurately calculate our emissions, but also to get an accurate and transparent picture of operational costs.

The study is further limited by a lack of information for some fleets. Information for Solid Waste Services was not included in this study. SWS has an extensive fleet of waste transfer vehicles and landfill vehicles. Efforts should be made to include information from this fleet in future inventories.



## Government Waste

2008 emissions from government waste are 200,933 tonnes eCO<sub>2</sub>, or 68.5% of total MOA emissions. The government waste category includes emissions based on the quantity of waste hauled to the landfill and the composition of the waste stream.

### Results

In 2008, 343,478 tons of waste was brought to the Anchorage Regional Landfill (ARL). This will produce, over its lifetime, 200,933 tonnes eCO<sub>2</sub> or 68% of 2008 total MOA eCO<sub>2</sub> emissions. Paper products produce the largest portion of waste, 178,761 tonnes eCO<sub>2</sub>, or 60.6% of total 2008 emissions. Plant debris and wood/textiles deposited in the landfill cause a sequestering of CO<sub>2</sub> (Table 3).

### Historical Comparison

Since 2000, total waste has declined 2%, from 348,807 tons in 2000 to 343,478 tons in 2008. Since 2000, waste related emissions have declined 1.5%, from 204,051 tonnes eCO<sub>2</sub> in 2000 to 200,933 tonnes eCO<sub>2</sub> in 2008 (Table 12).

Table 12: Government waste sector emissions summary

<b>2000</b>		
Waste Sector	Equiv CO <sub>2</sub> (tonnes)	Equiv CO <sub>2</sub> (%)
Food Waste	35,463	12.8
Paper Products	181,535	65.6
Plant Debris	-28,14	-1
Wood/Textiles	-10,132	-3.7
Subtotal	204,051	73.8
<b>2008</b>		
Waste Sector	Equiv CO <sub>2</sub> (tonnes)	Equiv CO <sub>2</sub> (%)
Food Waste	34,921	11.8
Paper Products	178,761	60.6
Plant Debris	-2,771	-0.9
Wood/Textiles	-9,977	-3.4
Subtotal	200,933	68.2
<b>Percent Change ((2008-2000)/2000)</b>		
Food Waste	-1.53%	-7.81%
Paper Products	-1.53%	-7.62%
Plant Debris	-1.53%	-10.00%
Wood/Textiles	-1.53%	-8.11%
Subtotal	-1.53%	-7.59%

### Method

The Anchorage Regional Landfill (ARL) is owned and operated by the Municipality of Anchorage and all waste handled there is considered part of the Government Emissions, as outlined in ICLEI's protocol.

The software calculates net lifetime greenhouse gas emissions from waste disposed of in the active year. The total does not include waste already in the landfill from previous years and cannot account for any greenhouse gas emission reduction measures that may be completed at a later date.

Methane from anaerobic decomposition is currently flared at the ARL. The ICLEI protocol considers this equal to capturing 75% of Methane emissions.

Waste composition data from the ARL's 1997 composition study was used. The composition study included five categories: Paper (43%), Food (9%), Plant Debris (5%), Wood/Textiles (12%) and Other (31%). The Other category includes tires, construction and demolition debris, other than wood, metals, plastics, and anything else that doesn't fit into the other categories.

### **Study Limitations**

One limitation of the waste sector was that only one waste composition study has been conducted by Solid Waste Services. The survey was conducted in 1997, but is the only available estimate for both 2008 and 2000. Additionally, only the ARL was included, however many extinct landfills exist in town and were not included in the study. Also, originally we wished to include only waste generated exclusively from MOA operations; however this proved unsuccessful because this data is currently not collected.

## Water and Wastewater

Emissions from Water and Wastewater in 2008 are 15,942 tonnes eCO<sub>2</sub>, or 5.4% of total emissions. The Water and Wastewater sector includes all fuel and electricity used to treat and pump water and wastewater by the Anchorage Water and Wastewater Utility (AWWU) for the entire city of Anchorage.

### Results

In 2008, the MOA spent \$2.61 million on 141,272 MMBtu to treat and pump water and wastewater to the residents of Anchorage. This produced 15,942 tonnes eCO<sub>2</sub> or 5.4% of all MOA emissions. Two-thirds of the emissions are related to electricity use and the other one-third is related to natural gas use (Table 13).

Table 13. Water and wastewater emissions by fuel type in 2008

Water & Wastewater Sector	Equiv CO <sub>2</sub> (tonnes)	Equiv CO <sub>2</sub> (%)	Energy (MMBtu)	Cost (\$)	% of Sector Emissions
Electricity	10,530	3.6	53,672	\$ 1,900,582	66.1%
Natural Gas	5,412	1.8	87,600	\$ 714,410	33.9%
Subtotal	15,942	5.4	141,272	\$ 2,614,992	100.0%

### Historical Comparison

Since 2001, the cost of moving and treating water and wastewater has increased 38.5% from \$1.88 million in 2001 to \$2.61 in 2008. The burden of the cost increase is shared by both fuel types. The total cost of electricity increased by \$316,365 and the total cost of natural gas increased \$410,421. The amount of energy used has also increased dramatically, 61.3%, from 87,567 MMBtu in 2001 to 141,272 MMBtu in 2008. Equivalent CO<sub>2</sub> emissions have increased 29%, from 12,333 tonnes eCO<sub>2</sub> in 2001 to 15,941 tonnes eCO<sub>2</sub> in 2008 (Table 14).

Table 14. Time series analysis for water and wastewater.

Water/Wastewater	2001	2008	Percent Change
eCO <sub>2</sub> (tonnes)	12,333	15,942	29.3
Energy (MMBtu)	87,567	141,272	61.3
Cost (\$)	1,888,206	2,614,992	38.5

### Methodology

AWWU purchasing personnel provided electricity and natural gas bills for 2008 and 2001. This included information about total price as well as total energy usage (cubic feet of natural gas and kilowatt hours of electricity) for each month. AWWU did not pay its own utility bills in the year 2000, so 2001 was used instead.

### Study Limitations

The study is limited in its scope. We do not include any emissions from the decomposition of the wastewater. Although we are not aware of any local government that has attempted to quantify these emissions, the topic may warrant further investigation.

## **Baseline Summary**

The Municipality of Anchorage generated 294,830 tonnes eCO<sub>2</sub> in 2008 at a cost of \$16,869,148. This figure represents emissions related to MOA operated buildings and facilities, vehicle fleet, employee commuting, street and outdoor lighting, water and wastewater handling by Anchorage Water and Wastewater Utility, and waste disposed of in the Anchorage Regional Landfill operated by Solid Waste Services.

With the completion of this report, the MOA should continue ICLEI's Five Milestone Program on Milestone 2, adopting an emissions reduction target and work towards Milestone 3, developing an Anchorage Climate Action Plan.

The MOA should also encourage better record keeping procedures for energy use and cost, in order to facilitate future greenhouse gas emissions inventories. The MOA should conduct another emissions inventory in 2012 in order to monitor carbon emission reductions.

## Appendices

### Appendix 1. Acronyms and key terms

- ARL - Anchorage Regional Landfill
- CACP - Clean Air and Climate Protection software
- CEA - Chugach Electric Authority
- CNG - Compressed Natural Gas
- eCO<sub>2</sub> - Equiv CO<sub>2</sub> – Equivalent Units CO<sub>2</sub>
- GHG - Greenhouse gas
- ICLEI - Local Governments for Sustainability
- kWh - kilowatt hour
- MEA - Matanuska Electric Authority
- ML&P - Municipal Light & Power
- MMBtu – Million British Thermal Units
- MOA - Municipality of Anchorage

Appendix 2. Government greenhouse gas emissions in 2008 report by source

		Equiv CO (tonnes)	Equiv CO (%)	Energy (MMBtu)	Cost (\$)
<b>Buildings Sector</b>					
	Electricity	18,371	6.9	103,220	2,871,665
	Natural Gas	13,151	4.9	234,635	2,180,465
	Subtotal	31,522	11.8	337,855	5,052,130
<b>Vehicle Fleet Sector</b>					
	CNG	10	0	164	0
	Diesel	8,081	3	102,643	3,173,304
	Diesel (ULSD)	745	0.3	9,463	293,085
	Gasoline	7,900	3	102,494	2,702,291
	Subtotal	16,735	6.3	214,764	6,168,680
<b>Employee Commute Sector</b>					
	Diesel	380	0.1	4,798	
	Gasoline	7,957	3	103,088	
	Subtotal	8,336	3.1	107,886	
<b>Streetlights Sector</b>					
	Electricity	14,125	5.3	79,365	3,033,346
	Subtotal	14,125	5.3	79,365	3,033,346
<b>Water &amp; wastewater Sector</b>					
	Electricity	9,553	3.6	53,672	1,900,582
	Natural Gas	4,910	1.8	87,600	714,410
	Subtotal	14,462	5.4	141,272	2,614,992
<b>Waste Sector</b>					
	Food Waste	31,680	11.8		0
	Paper Products	162,170	60.6		0
	Plant Debris	-2,514	-0.9		0
	Wood/Textiles	-9,051	-3.4		0
	Subtotal	182,284	68.2		0
<b>Total</b>		267,465	100	881,142	16,869,148