Town of Natick, MA

Greenhouse Gas Emissions Analysis

FY2004 & FY2007
Government Operations
Emissions Inventory

Prepared for the Town of Natick, Massachusetts by
ICLEI – Local Governments for Sustainability

August 20, 2008

Credits and Acknowledgements

Town of Natick

Data for the greenhouse gas emissions inventory discussed in this report was compiled by Robert Bois, the Environmental Coordinator for the Town of Natick. Special thanks also go to Natick Business Manager William Chenard for his extensive support gathering energy and financial data. The following individuals also contributed to the data collection: Jim Connolly of Connolly Bus Company, Janice Dangelo, Robert Graham, and Rob McBride of FMC Arenas.

ICLEI – Local Governments for Sustainability

This report and greenhouse gas emissions analysis was prepared by Jonathan Crowe, Program Associate for the Northeast and Mid-Atlantic Capacity Center of ICLEI – Local Governments for Sustainability, U.S.A. Invaluable oversight and assistance was also provided by Senior Program Officer Melissa Stults.

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1. Introduction

In March of 2007, the Town of Natick joined ICLEI – Local Governments for Sustainability and made a commitment to climate protection. Through this commitment, Natick recognized the profound effect that greenhouse gases emitted by human activity are having on the Earth's climate, as well as the Town's opportunity to reduce these emissions, both through its government operations and by inspiring change throughout the community. Through energy efficiency in its facilities and vehicle fleet, alternative clean energy sources, waste reduction efforts, land use and transit planning, and other activities, the Town of Natick can achieve multiple benefits, including saving energy and money, reducing emissions, and preserving the quality of life in the community.

In the past few years, the Town of Natick has already begun curbing energy consumption and emissions throughout its municipal operations. Between the fiscal years 2004 and 2007, Natick's government operations greenhouse gas emissions estimates show a drop from 12,084 to 11,332 metric tonnes, a decrease of 6.2%. This report details the energy use from each of those years and briefly outlines some of the measures and factors contributing to this decrease. Additionally, this document represents completion of the government greenhouse gas emissions inventory, a first and major step in the ICLEI five-milestone process. Presented here are estimates of greenhouse gas emissions resulting from the Town's internal government operations. Due to data availability, community data is not presented in this report. Data presented in this report serves as both a measurement of the success of energy-reduction activities to date, as well as a baseline against which Natick can compare future performance.

1.1 Climate Change Background

A balance of naturally occurring gases dispersed in the atmosphere determines the Earth's climate by trapping solar heat. This phenomenon is known as the greenhouse effect. Modern human activity, most notably the burning of fossil fuels for transportation and electricity generation, introduces large amounts of carbon dioxide and other gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperature to rise and affecting global climate patterns.

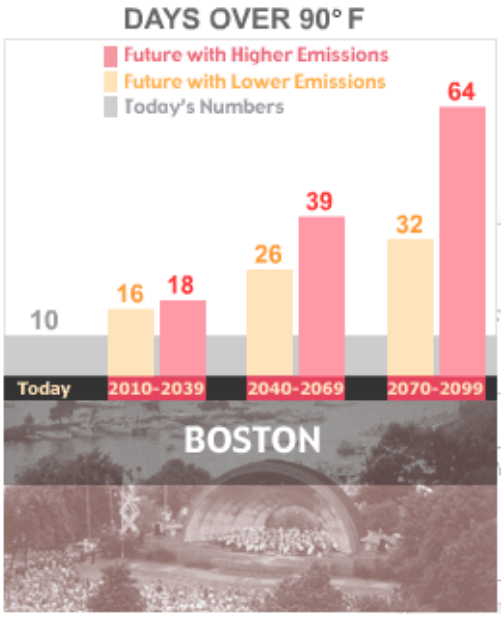
The greenhouse effect is necessary; it is responsible for the unique mix of atmospheric gases that make life on earth possible. However, overwhelming evidence suggests that human activities are increasing the concentration of greenhouse gases in the atmosphere, causing a rise in global average surface temperature and consequent climate change. In their latest report, the Intergovernmental Panel on Climate Change, the international community's most respected assemblage of scientists, found that climate change is a reality and that human activities are largely responsible for increasing concentrations of global warming pollutants[1]. Additionally, the National Science Foundation, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, the Department of Energy, and the Bush Administration have acknowledged the role of human activity in exacerbating climate change.

[1] Source: www.ipcc.ch/

Recognizing the role human activities have on climate change, communities worldwide are voluntarily working to reduce greenhouse gas emissions as the local level. The impacts of these actions are far reaching as local governments have direct control over the emissions from municipal operations, as well as substantial influence over community sectors.

In addition, it is local governments who will bear much of the burden of adapting to climate change impacts. Massachusetts communities can expect a variety of challenges resulting from precipitation changes, more extreme temperatures, coastal flooding, and air quality problems. The Union of Concerned Scientists (UCS) has estimated the climate impacts on Massachusetts communities based on two scenarios: 1) a lower-emissions scenario in which substantial shifts to clean energy technologies cause emissions to decline by mid-century; and 2) a higher emissions scenario in which continued heavy reliance on fossils fuels causes heat-trapping emissions to rise rapidly over the course of the century.[2]

Under the high emissions scenario, the UCS reports that average Massachusetts temperatures will rise between 8ºF and 12ºF in the winter, and 6ºF to 14ºF in the summer by the end of the 21st Century (with roughly half that warming occurring under the lower-emissions scenario). Massachusetts could also see a dramatic increase in the number of dangerously hot days from roughly one day per year over 100ºF currently to between 6 and 24 days per year over 100ºF under the lower and higher emissions scenarios. These changes could have a profound impact on local emergency response capacities and public health among vulnerable populations such as the poor and elderly.



Source: Union of Concerned Scientists, "Confronting Climate Change in the U.S. Northeast – Massachusetts."

Precipitation patterns could change significantly as well, resulting in a 20-30% increase in winter precipitation, a substantially high portion of which would fall as rain. A higher occurrence of mixed precipitation and freezing rain would create a substantial burden on city resources as roads and walkways need additional maintenance to clear ice and repair damage. The decrease in winter snowpack, coupled with higher temperatures and decreased summer rainfall could make 1-3 month summer droughts an annual event. Managing water consumption and coordinating conservation efforts represents an additional burden on municipal staff and a potentially hazardous scenario for the public in periods of extended drought.

[2] Data presented in this section is from the Union of Concerned Scientists report titled "Confronting Climate Change in the U.S. Northeast – Massachusetts."

1.2 ICLEI – Local Governments for Sustainability[3]

Through its membership in ICLEI, Natick has committed to locally advancing climate protection by reducing energy consumption and greenhouse gas emissions. In doing so, the Town of Natick has joined an international movement of more than 470 local government nationwide and more than 800 communities worldwide. In addition to the Town of Natick, ICLEI members include 33 Massachusetts municipalities including the nearby communities of Boston, Worcester, Lincoln, Lexington, Waltham, and Newton.

ICLEI provides its members a framework for identifying and reducing greenhouse gas emissions through a five milestone process:

(1) Conduct an inventory of local greenhouse gas emissions;
(2) Establish a greenhouse gas emissions reduction target;
(3) Develop an action plan for achieving the emissions reduction target;
(4) Implement the action plan; and,
(5) Monitor and report on progress.

This report represents completion of the government emissions inventory, the largest component of the first ICLEI Milestone, and provides a foundation for future work to reduce greenhouse gas emissions throughout Natick's municipal operations.

2. Greenhouse Gas Emissions Inventory

The first step toward reducing greenhouse gas emissions is to identify current levels and sources of emissions, known as a baseline analysis. A baseline analysis helps inform the selection of a reduction target and possible reduction measures by identifying the areas of government operations with the greatest opportunities. A baseline inventory also allows the effectiveness of future reduction measures to be determined by quantifying the change in emissions.

2.1 Methodology and Model

ICLEI helps local governments systematically track energy and waste-related activities in the community, and to calculate the relative quantities of greenhouse gases produced by each activity and sector. The inventory methodology involves performing two assessments: a community-wide assessment, and a separate inventory of government facilities and activities. This report includes discussion and analysis of emissions from government facilities and activities only.

Once completed, the emissions inventory provides the basis for an emissions forecast, the establishment of a reduction target, and the quantification of emissions reductions associated with proposed measures.

[3] ICLEI was formerly known as the International Council for Local Environmental Initiatives, but the name has been changed to ICLEI – Local Governments for Sustainability.

Natick's government emissions inventory is based on data provided by various departments and organizations (see "Credits & Acknowledgments" above) and analysis provided by ICLEI staff. Because the Town of Natick has already been active in implementing emissions reductions measures, this emissions inventory covers both fiscal years (FY) 2004 and 2007. These years were selected based on the availability of data and a desire to illustrate the impact of measures implemented between those years.

2.1.1 CACP Software

To facilitate community efforts to reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) software package with the State and Territorial Air Pollution Program Administrators (STAPPA), the Association of Local Air Pollution Control Officials (ALAPCO), and Torrie Smith Associates. This software calculates emissions resulting from energy consumption and waste generation. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Greenhouse gas emissions are aggregated and reported in terms of equivalent carbon dioxide units, or CO2e. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide on a per molecule basis in its capacity to trap heat, so the CACP software converts one ton of methane emissions to 21 tons of carbon dioxide equivalents. The CACP software is also capable of reporting input and output data in several formats, including detailed, aggregate, source-based, and time-series reports.

The emissions coefficients and methodology employed by the CACP software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605).

The CACP software has been, and continues to be, used by over 470 U.S. cities, towns, and counties to reduce their greenhouse gas emissions. However, it is worth noting that, although CACP has provided the Town of Natick with a sophisticated and effective tool for measuring and analyzing emissions, the model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. Hence the specific data generated by the model should be viewed as reliable approximations of actual emissions but not an exact measurement.

2.1.2 Emissions Scopes

When calculating Natick's emissions inventory, all energy consumed in the course of government operations was included. This means that, even though the electricity used by Town facilities is produced elsewhere, this energy and the emissions associated with it appears in the inventory. In greenhouse gas emissions measurement terms, this is referred to as Scope 1 and Scope 2 emissions.

Scope 1 Emissions, or "direct" greenhouse gas emissions, refers to emissions that are physically released within the Town of Natick. This includes emissions from natural gas, heating oil, diesel, and gasoline burned in Natick facilities and Town-operated vehicles and equipment.

Scope 2 Emissions, or "indirect" greenhouse gas emissions, refers to emissions that are associated with the consumption of purchased or acquired electricity, steam, heating, or cooling For Natick, Scope 2 includes emissions associated with purchased electricity only.

Scope 3 Emissions are other indirect greenhouse gas emissions not covered in Scope 2, which generally cannot be directly influenced by Town personnel. This includes upstream and downstream emissions created during the production, transportation, and disposal of purchased materials, fuels, and goods, emissions from transportation-related activities in vehicles not owned or controlled by the Town. Common examples include employee commute and business travel, waste disposal, and other outsourced activities.

Note that this report covers Scopes 1 and 2 only. ICLEI considers reporting Scope 3 Emissions to be optional due to the difficulty collecting comprehensive data on Scope 3 activities. Waste was not included due to lack of available data distinguishing waste generated through government operations from community waste.

The decision to calculate emissions in the manner discussed above reflects the general philosophy that a community should take responsibility for the impacts associated with its energy consumption, regardless of whether or not the energy generation occurs within its geographic borders.

For simplicity of analysis, the majority of this report discusses Scope 1 and Scope 2 Emissions in the aggregate only. A detailed breakdown by Scope may be found in Appendix 1.

2.2 Government Inventory Results

2.2.1 Overview of Inventory Results

Total greenhouse gas (GHG) emissions for Natick's government operations were 12,084 metric tons (tonnes) in 2004 and 11,332 tonnes in 2007. In both years, roughly 70% of these emissions came from energy used in municipal buildings. As expected, emissions associated with electricity consumption represent the largest portion of all government operations emissions, making up roughly 44% in each year. These trends are discussed in detail below and shown in the accompanying tables and figures.

As shown in Table 1, despite a 7.8% decrease in energy use between 2004 and 2007, total energy expenditures increased from about $2 million to roughly $2.4 million, an increase of 19.2%. Much of this increase in expenses can be attributed to the rapidly rising costs of heating fuels, especially heating fuel oil. Section 2.2.2 provides a more detailed analysis for each fuel.

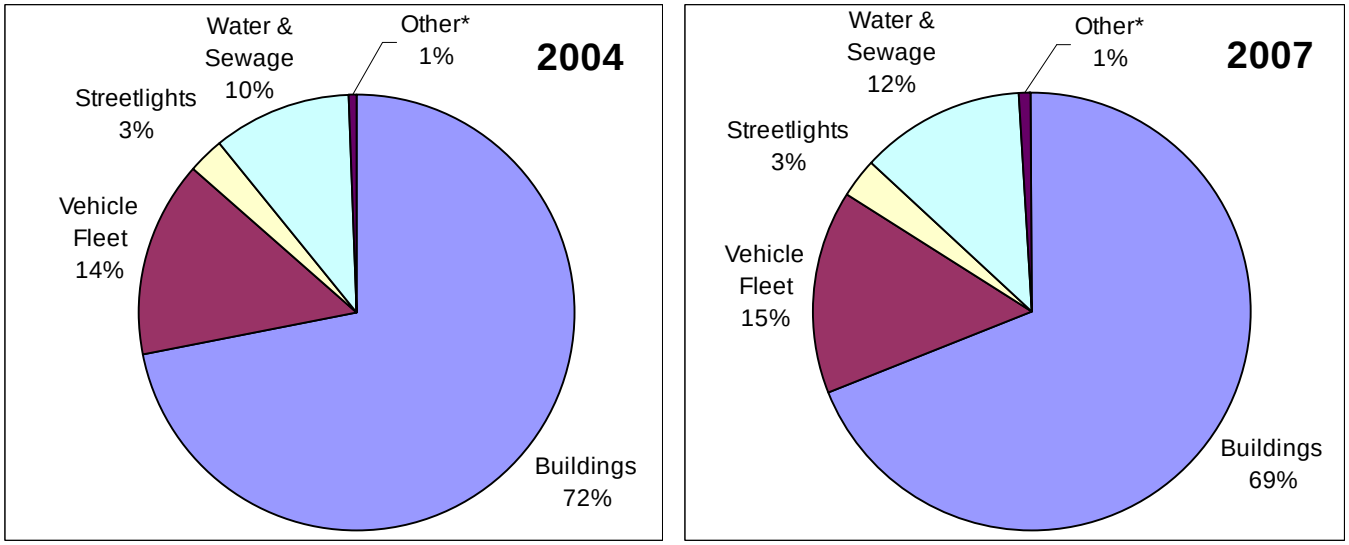
Rising energy costs represent a significant challenge for Natick, but make energy-saving measures far more cost-effective. These measures have the potential to produce both an environmental benefit as well as a net cost reduction for the town, allowing limited funds to be allocated to other needs.

Table 1 - 2004 & 2007 Town of Natick Government Operations Emissions Summary by Sector

	GHG Emissions (tonnes CO2e)		Energy Equivalent (million Btu)		Cost ($)	
Sector	**2004**	**2007**	**2004**	**2007**	**2004**	**2007**
Buildings	8,698	7,803	103,091	91,281	$1,471,451	$1,688,212
Vehicle Fleet	1,730	1,699	22,157	21,766	$221,960	$409,364
Streetlights	345	345	2,836	2,836	$45,705	$45,705
Water & Sewer	1,229	1,397	10,364	11,723	$292,677	$270,411
Other*	83	88			$10,500	$21,362
TOTAL	**12,085**	**11,332**	**138,448**	**127,606**	**$2,042,293**	**$2,435,053**
% Change from '04		-6.2%		-7.8%		19.2%

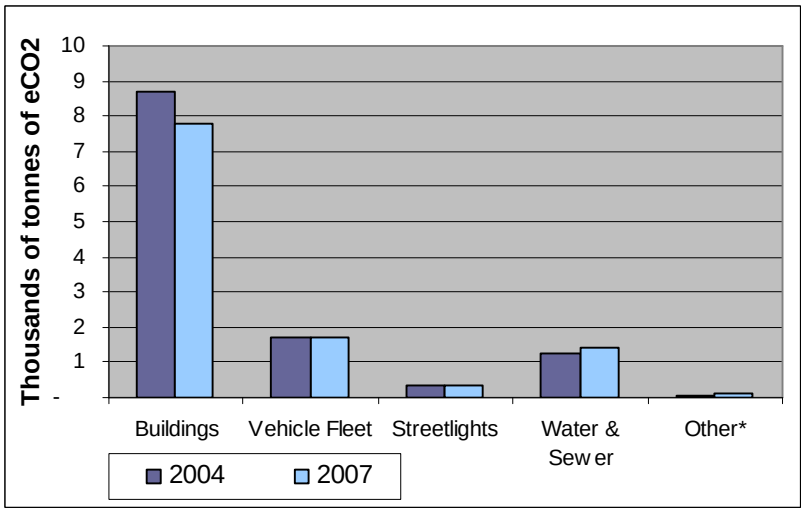
*Other includes gasoline and diesel fuel used in Town-owned and operated equipment.

Figure 1a & 1b - Percent of Government Operations Emissions by Sector



*Other includes gasoline and diesel fuel used in Town-owned and operated equipment

Figure 1c – Total Government Operations Greenhouse Gas Emissions by Sector



*Other includes gasoline and diesel fuel used in Town-owned and operated equipment

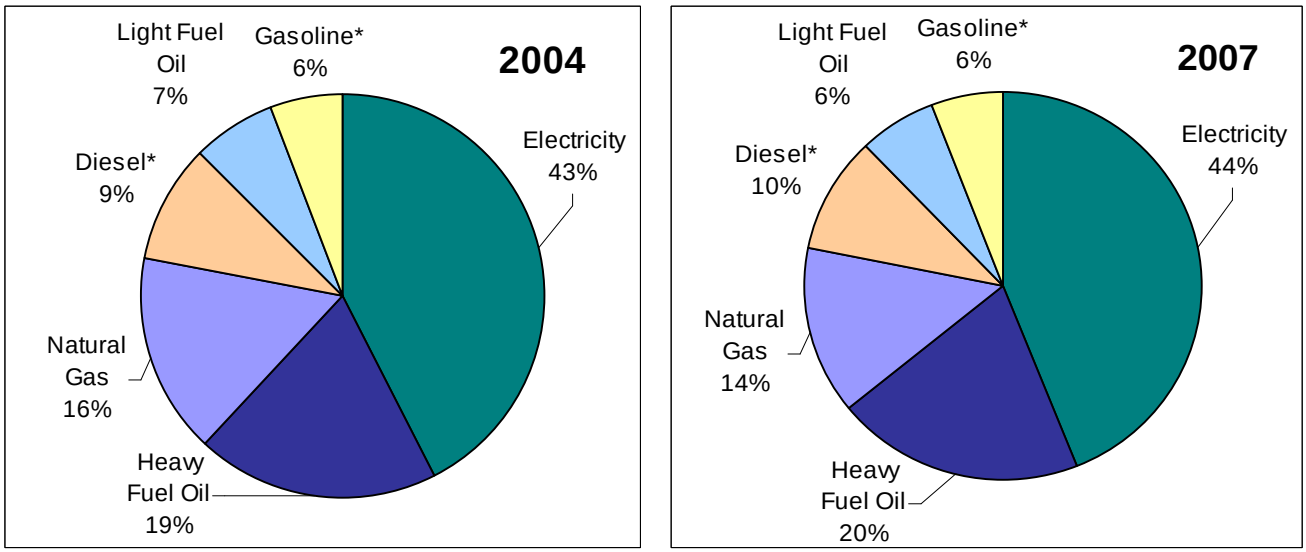
In both years the vast majority of GHG emissions come from building energy use, a trend common in municipalities. As shown in Figures 1a & 1b, emissions from the building sector made up 69 - 72% of total emission. Vehicle fleet and water & wastewater management emissions were also significant, representing 14.3 - 15% and 10.2 - 12.3% of emissions respectively. Figure 1c shows the emissions changes from 2004 to 2007 in each sector.

Table 2 - 2004 & 2007 Town of Natick Government Operations Emissions & Expenditures by Fuel

Sector	Greenhouse Gas Emissions (tonnes CO2e)		Energy Equivalent (million Btu)		Percent of Energy Equivalent	
	2004	2007	2004	2007	2004	2007
Electricity	5,148	4,984	42,321	40,977	31%	32%
Heavy Fuel Oil	2,352	2,278	28,266	27,379	20%	21%
Natural Gas	1,946	1,569	34,715	27,995	25%	22%
Diesel*	1,135	1,129	13,706	13,562	10%	11%
Light Fuel Oil	807	695	10,767	9,265	8%	7%
Gasoline*	696	676	8,674	8,428	6%	7%
TOTAL	**12,084**	**11,331**	**138,449**	**127,606**	**100%**	**100%**

* Gasoline & diesel emissions from equipment (83 tonnes in 2004 and 88 tonnes in 2007) were reported in the aggregate and are allocated here based on the proportions of each fuel used.

Figure 2a & 2b – Percent of Government Operations Emissions by Fuel



* Gasoline & diesel emissions from equipment (83 tonnes in 2004 and 88 tonnes in 2007) were reported in the aggregate and are allocated here based on the proportions of each fuel used. Also note that these segments are larger than the "vehicles" sector shown in Figures 1a and 1b due to a small amount of diesel used in building generators

Table 2 shows the emissions, energy, and expenses from each type of greenhouse gas-producing fuel used in Town operations. Figures 2a and 2b show the percent of all government emissions coming from each fuel. Comparing the percent of energy shown in Table 2 with the percentages of emissions shown in Figures 2a and 2b illustrates impacts of using different types of fuels. For example, more emissions on a per-MMBtu basis are associated with electricity consumption, which comprised only 31-33% of the energy used in Town operations, but made up about 44% of its emissions. Natural gas, a cleaner fuel, shows the opposite trend, making up 22-25% of energy use but contributing only 14-16% of emissions. Other fuels contribute emissions more proportionate to the amount of energy used.

2.2.2 Building Emissions Inventory Results

This section provides details of energy use and costs by fuel type and Town department within the buildings sector. For ease of reference, Town facilities were grouped by department or use, as outlined below:

Department	**Facilities Included**
Schools:	Bennett Hemenway, Brown, Johnson, Kennedy, Lilja, Memorial, Wilson Schools, and Natick High School
Water & Sewer:	Sewer pumps, water pumps, and Springvale water treatment facilities
Community:	Cole Recreation Center, Ice Rink, and Lincoln Courthouse (senior center)
Public Safety:	East, south, and west Natick fire stations and police & fire headquarters
Streetlight:	All town-wide streetlights
Library:	Bacon Library and Morse Institute
Town Hall:	Town hall
DPW:	Recycling Center, DPW Yard, Windsor Garage, and LFNR Garage
Lighting:	Various outdoor, non-street lighting

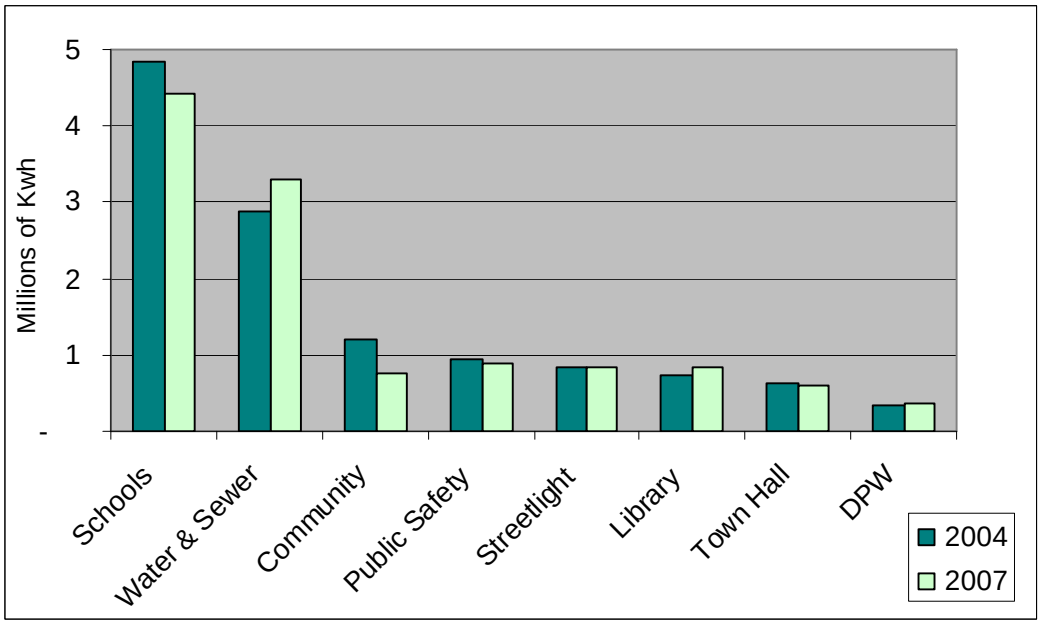
Tables 3a – 3e (and accompanying Figures 3a – 3e) show building energy use by fuel type and total energy expenditures.

Electricity

Table 3a - Town of Natick Government Operations Electricity Consumption by Department

	Electricity Use			Electricity Cost		
	(kWh)	(kWh)	% change	($)	($)	% change
Department	**2004**	**2007**	**04 - '07**	**2004**	**2007**	**04 - '07**
Schools	4,849,640	4,427,281	-9%	$535,395	$574,400	7%
Water & Sewer	2,876,921	3,290,855	14%	$286,465	$262,552	-8%
Community	1,202,528	757,498	-37%	$131,326	$88,680	-32%
Public Safety	936,070	897,260	-4%	$73,946	$54,514	-26%
Streetlight	830,996	830,996	0%	$45,705	$45,705	0%
Library	742,395	825,883	11%	$59,555	$52,751	-11%
Town Hall	618,139	597,060	-3%	$64,676	$43,711	-32%
DPW	343,253	357,937	4%	$31,431	$29,344	-7%
TOTAL	**12,399,942**	**11,984,770**	**-3%**	**$1,228,499**	**$1,151,658**	**-6%**

Figure 3a - Town of Natick Government Operations Electricity Consumption by Department



A number of energy-saving measures already implemented by various departments are reflected in this analysis. For example, significant renovations in the Natick Ice Rink were primarily responsible for the 37% drop in electricity use in the "Community" category. Similarly, Natick schools and other town buildings have undergone significant energy reductions through lighting replacements and other energy-saving measures. The electricity use reduction from 2004 to 2007 for Schools was confirmed using the EPA Energy Star Benchmark software. In fact, two Natick schools (Memorial and Kennedy) ranked in the top 25 percentile of schools compared nationally in the Energy Star Program. Extended operating hours at the Morse Institute Library resulted in a slight increase in electricity consumption in 2007. Finally, the Springvale Water Treatment facilities underwent expansions which doubled their treatment capacity, resulting in an increase in electricity consumption that is surprisingly small for such a large increase in capacity. In general, the per Kwh cost for electricity varies depending on individual building rate codes for delivery (NSTAR), the bulk supply cost (Trans-Canada) and the time of use (peak versus off-peak).

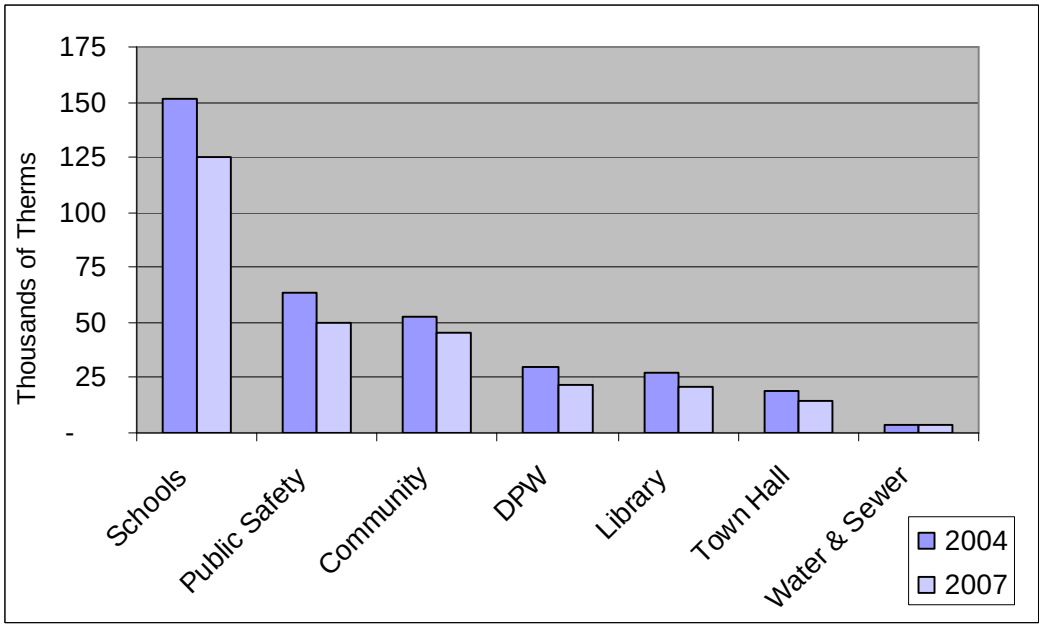
Natural Gas

Table 3b - Town of Natick Government Operations Natural Gas Consumption by Department

	Natural Gas Use			Natural Gas Cost		
	(therms)	(therms)	% change	($)	($)	% change
Department	**2004**	**2007**	**04 - '07**	**2004**	**2007**	**04 - '07**
Schools	160,361	125,056	-23%	$143,550	$201,560	40%
Public Safety	63,444	49,635	-22%	$68,921	$71,521	4%
Community	52,462	45,070	-14%	$62,793	$64,767	3%
DPW	29,541	21,712	-27%	$32,670	$31,592	-3%
Library	27,140	20,475	-25%	$29,258	$26,430	-10%
Town Hall	19,241	14,485	-25%	$20,903	$20,855	0%
Water & Sewer	3,961	3,515	-11%	$4,754	$5,170	9%
TOTAL	**356,150**	**279,948**	**-21%**	**$362,849**	**$421,895**	**16%**

Note: Not all departments have facilities that use natural gas. Departments with zero consumption were excluded.

Figure 3b - Town of Natick Government Operations Natural Gas Consumption by Department



As with electricity, natural gas consumption shows a substantial decrease from 2004 to 2007. While 2007 was a warmer year than 2004, the average Massachusetts Heating Degree Days (HDD) only changed from 6,346 HDD to 6,012 HDD in 2007, a drop of only 5%.[4] Hence the 21% decrease in natural gas consumption can only partially be explained by seasonal variation. This seems to indicate that measures taken in the schools, ice rink, and other departments have resulted in a significant reduction in overall consumption. These measures include improved

[4] National Oceanic and Atmospheric Administration, Historical Climatology Series 5-1, Monthly State, "Regional, and National Heating Degree Days", July 2003 through June 2005 and 2007/2008 preliminary data.

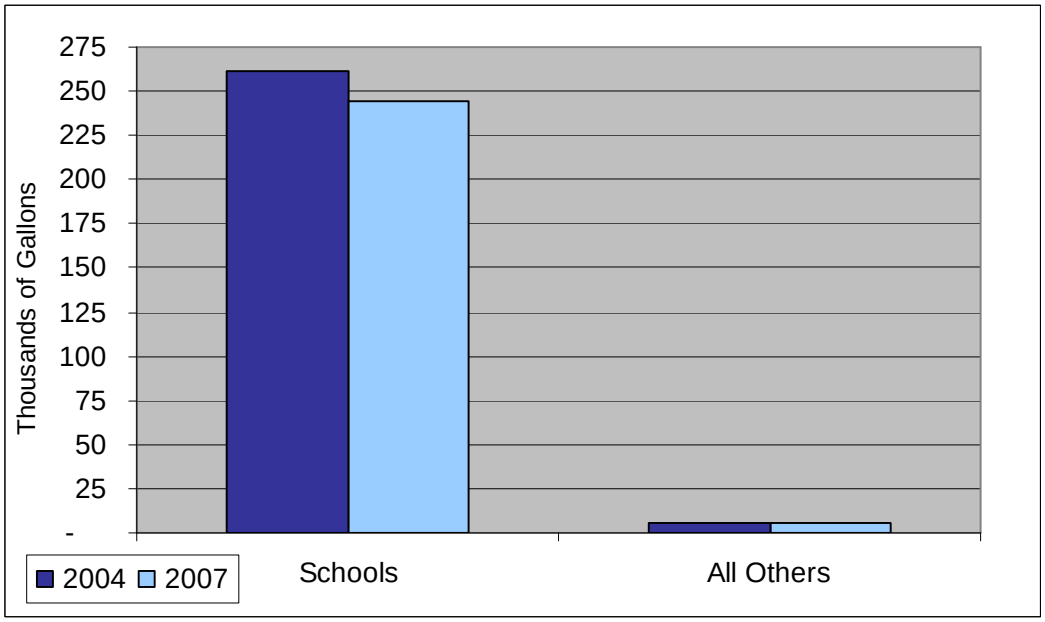
management of building HVAC systems and energy efficiency improvements in various buildings. Schools (Select Energy and Hess) and General Government (NSTAR) had different natural gas suppliers from 2004 to 2007.

Heating Oil & Generator Fuel

Table 3c - Town of Natick Government Operations Building Fuel Consumption by Department (1)

	Building Fuel Use			Building Fuel Cost		
	(gals)	(gals)	% change	($)	($)	% change
Department	**2004**	**2007**	**04 - '07**	**2004**	**2007**	**04 - '07**
Schools	258,787	230,683	-11%	$213,379	$418,897	96%
Library (2)	3,337	3,337	0%	$2,929	$7,575	159%
Water & Sewer	1,225	1,149	-6%	$1,458	$2,689	84%
DPW	503	402	-20%	$599	$940	57%
Public Safety	102	288	182%	$121	$674	457%
TOTAL	**263,945**	**235,859**	**-11%**	**$218,486**	**$430,774**	**97%**

Figure 3c - Town of Natick Government Operations Building Fuel Consumption (1)



Notes: (1) Table 3c and Figure 3c combine multiple fuel types including #4 Fuel Oil (Heavy Fuel Oil), #2 Fuel Oil (Light Fuel Oil), and small quantities of Low Sulfur Diesel or Ultra-Low Sulfur Diesel, which are used in building generators. (2) Bacon library consumption was estimated for 2004 and cost per gallon was estimated for both years using the average unit cost of other Town facilities.

As with natural gas, a comparison of heating oil consumption and cost changes from 2004 and 2007 demonstrates the daunting impact of rising energy prices, but to an even more extreme degree. Despite a respectable 11% drop in consumption shown in Table 3c, expenses nearly doubled. Converting facilities to natural gas heating could help curb rising energy expenses while also providing a substantial environmental benefit. Emissions from #4 Fuel Oil in

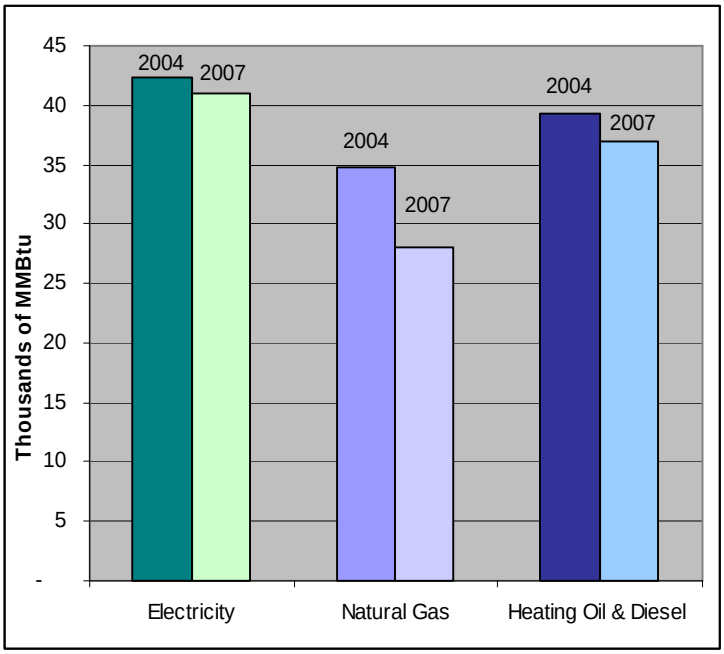
particular are extremely carbon-intensive: heavy fuel oil emissions from Natick High School and the Kennedy School alone represent over 20% of the total GHG emissions from all government operations. See Appendix 2 for a detailed break-down by building and fuel type.

Total Building Energy Consumption & Costs by Fuel

Table 3d - Town of Natick Government Operations Energy Consumption and Costs by Energy Type

	Total Energy Costs		Total Consumption	
	($)	($)	MMBtu	MMBtu
Fuel Type	2004	2007	2004	2007
Electricity	$1,228,499	$1,151,658	42,321	40,978
Natural Gas	$362,849	$421,895	34,715	27,995
Heating Oil & Diesel	$218,486	$430,774	39,256	36,868

Figure 3d - Town of Natick Government Operations Consumption and Costs by Energy Type



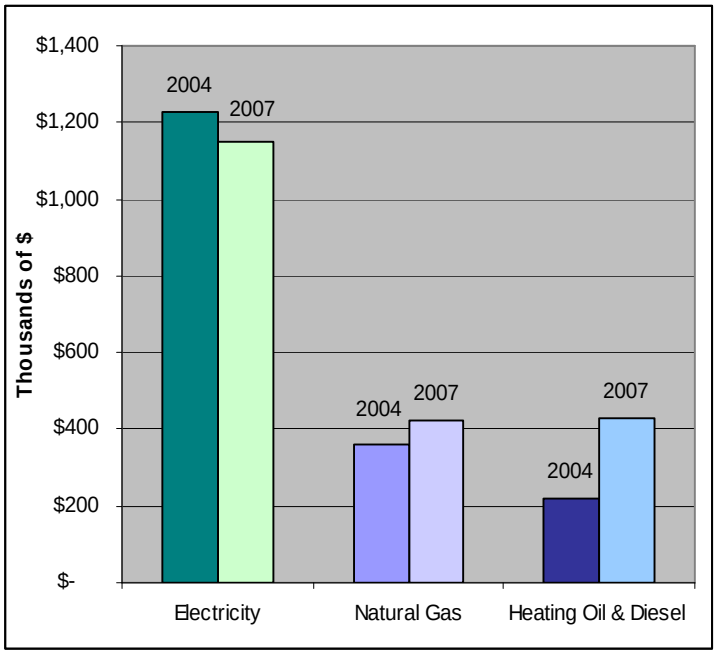


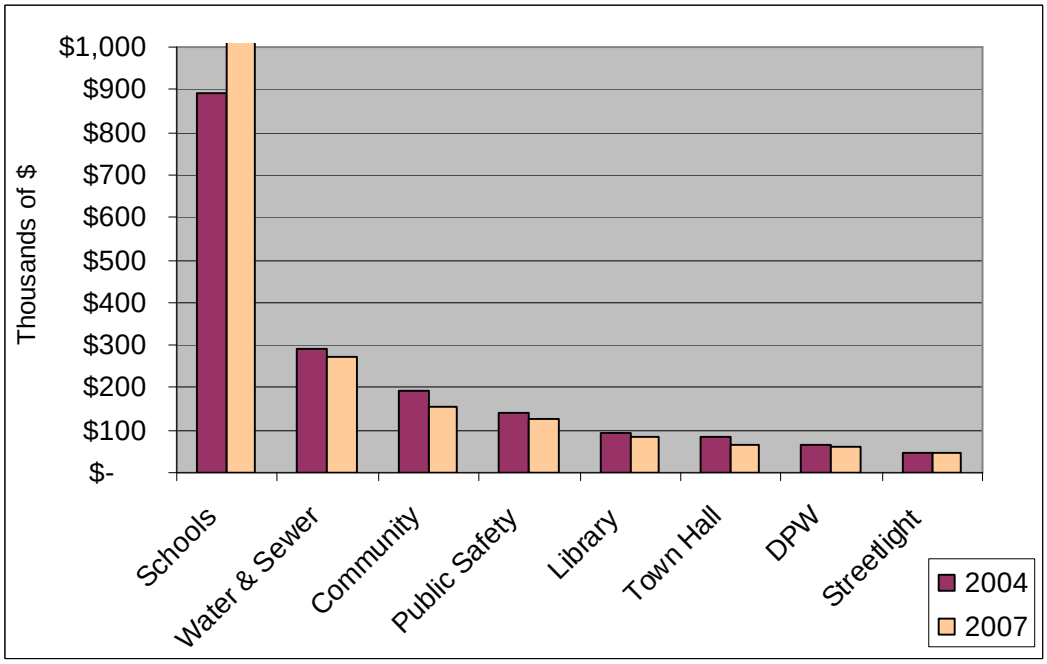
Table 3d and Figure 3d shows the trend of falling energy consumption, coupled with rising energy expenditures in most categories of energy use. Despite rising electricity costs nationwide, a 5-year supply contract with Trans-Canada starting in the second half of 2004 secured Natick electricity price, allowing costs to fall slightly during the period of this analysis.

Total Building Energy Costs by Department

Table 3e - Town of Natick Government Operations Energy Costs by Department

	Total Energy Costs		
	($)	($)	% change
Department	**2004**	**2007**	**04 - '07**
Schools	$ 892,324	$1,194,857	34%
Water & Sewer	$ 292,677	$ 270,411	-8%
Community	$ 194,119	$ 153,447	-21%
Public Safety	$ 142,988	$ 126,709	-11%
Library	$ 91,741	$ 86,756	-5%
Town Hall	$ 85,579	$ 64,566	-25%
DPW	$ 64,700	$ 61,876	-4%
Streetlight	$ 45,705	$ 45,705	0%
TOTAL	**$1,809,833**	**$2,004,327**	**11%**

Figure 3e - Town of Natick Government Operations Energy Costs by Department



Despite rising heating oil and natural gas costs, the energy expenses for most departments are predominantly electricity costs. Hence the cost decreases shown in Table 3a outweigh the increases shown in the other fuel types. The notable exception to this is energy expenditures for Natick Schools which increase despite strong decreases in energy consumption. This is primarily a result of rising costs for fuel oil, particularly #4 Fuel Oil which is used in large quantities by the Natick High School and Kennedy School.

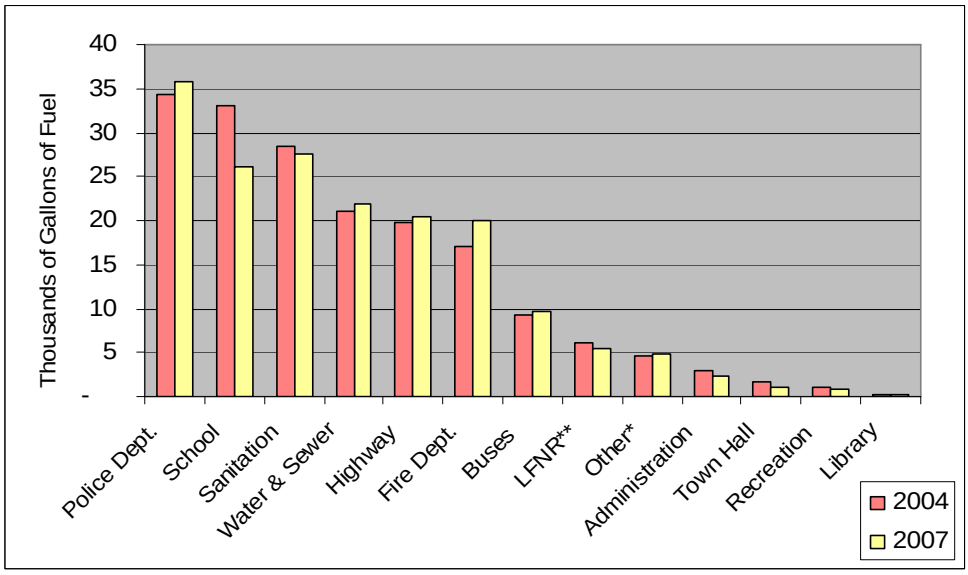
2.2.3 Vehicle Emissions Inventory Results

Table 4 Town of Natick Vehicle Fleet & Equipment Fuel Consumption & Emissions

	Gasoline Consumption		Diesel Consumption *		Total Fuel Cost		Energy Equivalent		GHG Emissions	
	(gal)		(gal)		($)		(MMBtu)		(tons CO2e)	
Department	**2004**	**2007**	**2004**	**2007**	**2004**	**2007**	**2004**	**2007**	**2004**	**2007**
Police Dept.	34,420	35,837	-	-	45,090	82,425	4323	4501	335	348
School	3,239	3,909	29,730	22,298	39,622	61,168	4034	3220	317	252
Sanitation	1,389	-	27,076	27,551	34,039	64,468	3478	3371	273	265
Water & Sewer	11,974	11,777	9,022	10,054	26,421	50,613	2605	2709	202	210
Highway	2,816	1,417	17,077	18,981	24,010	47,674	2437	2501	191	197
Fire Dept.	1,835	3,176	15,308	16,732	20,619	46,457	2098	2446	165	192
Buses	1,324	-	7,926	9,728	11,167	22,763	1133	1190	89	94
LFNR **	3,440	2,927	2,583	2,540	7,580	12,674	747	678	58	53
Other ***	3,570	4,359	1,022	446	5,892	11,070	573	602	44	46
Administration	2,860	2,242	-	-	3,747	5,157	359	282	28	22
Town Hall	1,732	961	-	-	2,269	2,210	218	121	17	9
Recreation	459	492	524	389	1,225	2,041	122	109	9	9
Library	-	-	233	275	277	643	28	34	2	3
Total	**69,057**	**67,096**	**110,500**	**108,993**	**221,960**	**409,364**	**22157**	**21766**	**1730**	**1699**
%Change from '04		-2.8%		-1.4%		84.4%		-1.8%		-1.8%

*Diesel fuel consumed in 2004 was low sulfur diesel (LSD, 500 ppm S) and in 2007 was Ultra-Low Sulfur Diesel (ULSD, 15ppm S)
** LFNR is Land Facilities & Natural Resources
***Other includes vehicles identified in DPW Fleet Management Reports as "Engineering," "Equipment Main," and "Rental-Other."

Figure 4 Town of Natick Vehicle Fleet Fuel Consumption



*Other includes vehicles identified in DPW Fleet Management Reports as "Engineering," "Equipment Main," and "Rental-Other."
** LFNR is Land Facilities & Natural Resources

While most departments experienced a small net increase in fuel consumption, these increases were more than outweighed by a large decrease in diesel consumption in the school bus fleet. This is due to a change in contract terms requiring Connolly Bus Company to meet new 2007 federal emissions standards, which Connolly chose to meet through vehicle replacements. As with heating fuels, the rising cost of gasoline increased total fleet fuel expenditures by 84% from $221,960 in 2004 to $409,364 in 2007.

2.2.4 Criteria Air Pollutant Emissions Inventory Results

Table 5 Town of Natick Government Operations Criteria Air Pollutant Emissions

Sector	NO_X (lbs)		SO_X (lbs)		CO (lbs)		VOCs (lbs)		PM_{10} (lbs)	
	2004	**2007**	**2004**	**2007**	**2004**	**2007**	**2004**	**2007**	**2004**	**2007**
Buildings	41,360	37,464	146,123	136,146	26,036	24,496	3,788	3,549	17,029	15,335
Vehicle Fleet	20,793	18,719	847	208	51,311	50,116	5,576	5,399	800	600
Streetlights	660	563	1,414	1,048	988	1,010	111	113	872	816
Water/Sewage	2,525	2,421	4,919	4,155	3,631	4,185	455	504	3,045	3,252
Other*	-	-	-	-	2,101	2,070	286	273	37	33
Total	**65,338**	**59,168**	**153,304**	**141,557**	**84,067**	**81,878**	**10,217**	**9,838**	**21,784**	**20,037**

*Other includes gasoline and diesel fuel used in Town-owned and operated equipment

The energy consumed in Natick government operations was also responsible for the release of criteria air pollution in the amounts shown above. These pollutants have been linked with various environmental and public health hazards including asthma and other respiratory illnesses. Many of the potential actions the Town might take to reduce greenhouse gas emissions will have a positive impact in reducing these pollutants as well.

3. Conclusion and Next Steps

In passing a resolution to join ICLEI, the Town of Natick made a formal commitment to reduce its emissions of greenhouse gases. This report details some of the progress to date meeting those goals and also lays the groundwork for future activities by establishing baseline emissions levels against which future progress can be demonstrated.

Following the ICLEI methodology, we recommend that the Town of Natick next conduct an inventory of community-wide emissions, forecast anticipated future emissions from both government and community operations, and set a target for future greenhouse gas reductions. The Town should also begin to do more detailed quantification of emissions reduction measures that have already been implemented. Quantifying past measures will help Natick focus future resources on areas where the biggest and most cost-effective reductions can be made and will further demonstrate the many benefits of climate action.

After setting an emissions reduction target, ICLEI recommends that the Town identify potential new emissions reduction measures that might be implemented in the future, including energy efficiency, clean energy, vehicle fuel efficiency or alternative fuel use, trip reduction strategies, waste reduction, and other projects. These measures will provide even greater value to the community and help Natick establish itself as a local municipal leader in climate protection.

Appendix 1 Emissions Details for Sector by Greenhouse Gas

(Units in metric tonnes)

BUILDINGS		2004				2007			
		CO2e	CO2	CH4	N2O	CO2e	CO2	CH4	N2O
Scope 1	Direct Emissions	5089.000	5088.588	0.382	0.029	4529.000	4528.644	0.329	0.027
Scope 2	Indirect Emissions	3608.000	3607.623	0.318	0.060	3273.000	3272.658	0.288	0.054

STREETLIGHTS		2004				2007			
		CO2e	CO2	CH4	N2O	CO2e	CO2	CH4	N2O
Scope 2	Indirect Emissions	345.000	344.964	0.030	0.006	345.000	344.964	0.030	0.006

WATER & WASTEWATER		2004				2007			
		CO2e	CO2	CH4	N2O	CO2e	CO2	CH4	N2O
Scope 1	Direct Emissions	34.000	33.995	0.003	0.002	31.000	30.996	0.003	0.002
Scope 2	Indirect Emissions	1194.000	1193.875	0.105	0.020	1366.000	1365.857	0.120	0.023

VEHICLE FLEET		2004				2007			
		CO2e	CO2	CH4	N2O	CO2e	CO2	CH4	N2O
Scope 1	Direct Emissions	1730.000	-	-	-	1700.000	-	-	-

OTHER EMISSIONS		2004				2007			
		CO2e	CO2	CH4	N2O	CO2e	CO2	CH4	N2O
Scope 1	Direct Emissions	83.000	-	-	-	88.000	-	-	-

TOTAL EMISSIONS		**2004**				**2007**			
		CO2e	CO2	CH4	N2O	CO2e	CO2	CH4	N2O
Scope 1	Direct Emissions	6936.000				6348.000			
Scope 2	Indirect Emissions	5147.000				4984.000			
Total		12083.000				11332.000			

Appendix 2 Detailed Inventory Reports

(Please refer to the attached reports)