

**CITY OF IQALUIT
LOCAL ACTION PLAN FOR REDUCING GREENHOUSE GAS EMISSIONS**



**PREPARED BY:
DEBBIE NIELSEN
SUSTAINABLE INITIATIVES COORDINATOR
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EXECUTIVE SUMMARY

In November 2002, City Council passed a resolution endorsing the City of Iqaluit's participation in the Federation of Canadian Municipalities' Partners for Climate Protection Program. In doing so, the City committed to reducing its greenhouse gas emissions from all municipal operations within 10 years. With this decision, Iqaluit joined over 100 other Canadian municipalities in their efforts to stave off the impacts of global warming and take responsibility for their energy consumption and contribution to rising levels of greenhouse gas emissions in the world's atmosphere.

The Local Action Plan represents the completion of the third step of five in the Partners for Climate Protection Program. This report is a planning document, intended to guide the municipality towards implementing strategic measures to reduce its greenhouse gas emissions. As implementation begins and the City's population increases, the Local Action Plan will most likely evolve and need to be adapted to remain relevant for the municipality.

An increasing number of municipalities are making energy reduction a priority and are not only reducing greenhouse gas emissions, but are also being rewarded by numerous economic, social and environmental benefits. As Iqaluit works towards meeting its emissions reduction target it will save money, increase economic development, create jobs, improve air quality, conserve resources, demonstrate leadership and increase awareness of climate change issues.

Natural sources of greenhouse gases exist in the atmosphere and are vital for trapping the sun's reflected heat from the earth's surface. However, science confirms that the world's mean global temperature is on the rise, due to a significant increase in atmospheric greenhouse gases. The increased level of greenhouse gases is contributed to human activity, namely the burning of fossil fuels (such as gas, coal and oil). This has led most of the world's industrial countries to participate in the international Kyoto Protocol, which aims to reduce greenhouse gas emissions at a world-wide level.

It is important to note that although the scientific community supports the theory of global climate change, it is unable to predict its full impacts. Research does indicate that the arctic will be one area of the world most adversely affected by a global rise in temperature. Presently, the arctic is experiencing polar cap and permafrost melting, and ice thinning due to climate change. These conditions are impacting the life cycles of marine species, causing sea levels to rise, and creating unpredictable weather patterns. In turn, these changes have serious implications to the City's built form and are effecting how the people of Iqaluit live on the land.

Partners for Climate Protection Program was designed to provide municipalities with a framework to set and meet greenhouse gas reduction targets. This program is comprised of the following five steps: Milestone 1 - completing a greenhouse gas emissions inventory, Milestone 2 - setting a reduction target, Milestone 3 - developing an action plan, Milestone 4 - implementing the plan, and Milestone 5 - monitoring success. The City of Iqaluit received funding from Indian and Northern Affairs Canada to complete the first three milestones of the program. This report represents the completion of Milestone 3.

An inventory of emissions from all municipal operations was conducted in November of 2003. By calculating fuel and electricity consumption for water and sewage facilities,

municipal buildings, fleet vehicles, and streetlights, it was determined that the City produced almost 5 million kilograms of greenhouse gas emissions and spent approximately \$1.3 million on electricity and fuel in the year 2000. Based on a preliminary review of potential reduction measures, a reduction target of 20 percent by the year 2014 is recommended for the City of Iqaluit. By reaching this reduction target, the City can reduce its emissions by 1 million kilograms per year, at an estimated cost savings of \$330,000 for the municipality.

The Sustainability Plan is a component of the Local Action Plan that provides a framework of long-term goals and suggested reduction measures to help the City reduce greenhouse gas emissions. The long-term goals set out in this report propose that measures be taken to ensure that the recommendations of the Local Action Plan are supported by City of Iqaluit's General Plan, plans for existing and future infrastructure, and operational policies for staff.

Reduction actions are those measures that have the greatest potential to directly reduce the City's greenhouse gas emissions. The measures that have been suggested in this report are based on research, consultations with municipal staff and recommendations from individuals with expertise in energy management and issues related to climate change. They are not meant to serve as steps for implementation, but as suggestions for developing an implementation plan. It is strongly recommended that the City conduct energy audits on its main buildings as a starting point to reducing greenhouse gas emissions.

Suggested reduction measures are organized under the headings of waste and sewage facilities, buildings, vehicle fleet, streetlights and solid waste. They are a combination of measures that address the City's existing energy demand and suggest options for new development and/or alternative initiatives. Demand management involves reducing existing energy consumption. Alternative energy initiatives are options for meeting Iqaluit's future demand for energy through renewable energy projects and the application of innovative technologies to future development. Although these initiatives would require more planning, they have the greatest potential of demonstrating Iqaluit's ability to be a leader in energy efficiency. Tables 5 through 8 list the suggested reduction actions for the City's municipal operations.

Implementing the Local Action Plan is the municipality's next step to meeting its reduction target and represents Milestone 4 of the Partners for Climate Protection Program. It is recommended that the City undertake the following steps in order to put the Local Action Plan into motion: hire a project coordinator to implement the plan, develop a steering committee, conduct audits on municipal buildings, create an implementation schedule and work plans for individual reduction measures, develop a financial plan, create a communication strategy, and complete a community action plan.

In order to ensure the Local Action Plan is effective in reducing GHG emissions while maintaining project continuity, the City will need to monitor its progress. As the last step in fulfilling its requirements to Partners for Climate Projection Program, it should complete yearly GHG inventories, record benefits that result from implementation, record fuel consumption for individual vehicles, and develop an energy database.

The aim of this Local Action Plan is to provide the municipality with a starting point for reducing greenhouse gas emissions. In order to implement the plan, continued support from City Council, municipal staff, and stakeholders is required. Efforts to put this plan

into motion and maintain momentum will be rewarded many times over by, among other benefits, cost and energy savings. As the City of Iqaluit works towards meeting its reduction target, it will establish itself as a leader in the north for managing energy consumption and will join other world leaders in actively addressing climate change issues.

ACKNOWLEDGEMENTS

The City of Iqaluit received funding from Indian and Northern Affairs Canada's *Aboriginal and Northern Climate Change Program* to participate in Partners for Climate Protection Program. This funding allowed the municipality to hire a Sustainable Initiatives Coordinator to complete Milestones 1 to 3 of the program. This report is a result of that funding.

The Federation of Canadian Municipalities provided funding for the Regional Program Facilitator, Dale Robertson, to come to Iqaluit and work with the Sustainable Initiatives Coordinator. Mr. Robertson was generous with his time and provided his guidance in conducting the emissions inventory and setting a reduction target.

The Inuit Circumpolar Conference was instrumental in helping the municipality receive its funding from Indian and Northern Affairs Canada. In particular, the City of Iqaluit would like to acknowledge the support of Sheila Watt-Cloutier.



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SECTION 1.0 BACKGROUND

The City of Iqaluit became the 100th participant in the Federation of Canadian Municipalities' Partners for Climate Protection Program and committed to reducing greenhouse gas (GHG) emissions from municipal operations within ten years. Partners for Climate Protection Program is designed to guide municipalities towards successfully meeting reduction targets. This report includes the results of Milestones 1 to 3 of the program, which involved completing a GHG inventory, setting a reduction target, and developing a local action plan for the City of Iqaluit.

1.1 PURPOSE OF THE LOCAL ACTION PLAN

The Local Action Plan is a guiding document that sets out a comprehensive and integrated plan to engage City Council, municipal staff and community stakeholders in reducing the City of Iqaluit's GHG emissions. This plan is the beginning of Iqaluit's commitment to reducing the impacts of climate change. It is meant to guide and prompt the municipality, and eventually the community, to take action towards becoming a more energy efficient and sustainable capital city. It is a working document that will need to be revised as reduction measures are implemented, and as the City evolves and changes over time.

Municipalities generate a substantial amount of GHG emissions through their daily operations. Energy is consumed to heat and light buildings, operate vehicle fleets, collect and treat wastewater, truck and pipe potable water, collect solid waste, and run streetlights. Although the energy consumed and the amount of GHG emissions produced is substantial, there are many reduction measures the municipality can implement to meet its reduction target.

This plan includes a rationale for its development and identifies the benefits and co-benefits that can be accrued from reducing energy consumption. It documents the results of the emissions inventory and the basis for the recommended reduction target. To help meet this target, the plan outlines reduction goals and actions that are specific to the City of Iqaluit. Finally, it includes recommendations for implementation and monitoring the City's overall progress in reducing its GHG emissions.

1.2 BENEFITS OF IMPLEMENTING THE LOCAL ACTION PLAN

The City of Iqaluit will gain numerous financial, environmental and social benefits by working towards meeting its reduction target. The follow is an overview of some of the quantifiable and qualitative benefits the City could expect from fulfilling its commitment to Partners for Climate Protection Program.

COST SAVINGS

Any reduction in energy consumption will not only reduce GHG emissions, but will also reduce costs for the City of Iqaluit. For example, a 20 percent reduction in GHG emissions has the potential to save the municipality a significant amount of costs associated with energy reduction. As the City gains momentum in reducing energy consumption, it will continue to benefit from cumulative cost savings.

Energy conservation will not only reduce costs and improve energy performance, but will also extend the life of existing municipal infrastructure. The City of Iqaluit incurs high costs for installing and maintaining infrastructure, and consumes large amounts of energy for operating its municipal facilities. Iqaluit's projected population growth will significantly increase the demand for municipal services. However, if the City can reduce its present energy consumption by implementing reduction measures and adopting sustainable technologies, it will reduce the demands on municipal infrastructure. In turn, this will delay the need for capital expansion and reduce the municipality's overall operational and maintenance costs.

Any investment the City makes now in energy efficiency measures and technologies has the potential to save the municipality a significant amount of money over the lifetime of the development. This is because facilities typically provide service over 30 to 40 years, and construction costs represent only 8 percent of a building's costs over its lifetime. Therefore, operating costs represent 92 percent of a building's lifetime costs (this includes costs for operation, maintenance and repairs).¹ With a rapid population growth projected, the City of Iqaluit is in an excellent position to explore energy efficiency measures for the construction and design of new buildings and infrastructure.

ECONOMIC DEVELOPMENT

Many municipalities are experiencing economic spin-offs from implementing energy efficiency and alternative energy initiatives. For example, the Piikani Nation in Broket, Alberta invested in a 900 kW wind turbine. This turbine generates enough clean, emission-free electricity to supply 450 homes.² The project has generated much interest and recently the Piikani Nation was contracted to host a conference for Indian and Northern Affairs Canada for approximately 150 delegates.

There are potential opportunities for the City of Iqaluit to enter into partnerships to implement alternative energy projects. The Government of Nunavut released its draft climate change strategy in November 2003, and became the first territory or province to sign the federal government's Memorandum of Understanding (MOU) for Cooperation on

¹ Federation of Canadian Municipalities, *The Business Case for Cutting Greenhouse Gas Emissions from Municipal Operations*, June 2003

² Government of Canada (A Joint Publication of Indian and Northern Affairs Canada, Public Works Canada, Government Services, and Natural Resources Canada), *Sharing the Story: Aboriginal and Northern Energy Experiences*, November 2003, p. 46

Climate Change Issues. With the signing of the MOU, the Government of Nunavut agreed to explore alternative and renewable energy development. As part of Nunavut Power Corporation’s new energy strategy, it is exploring options for alternative energy supplies for the territory. These initiatives could potentially lay the groundwork for future development of alternative energy projects with the Government of Nunavut and/or Nunavut Power Corporation, to produce a source of clean, emission-free power for the City of Iqaluit.

JOB CREATION

Improving existing infrastructure and implementing new technologies has the potential to create new jobs. A study by the Pembina Institute in Calgary shows that energy efficiency initiatives create more jobs than any other energy-related sector of the job economy.³ One reason for increased job numbers in the energy efficiency and alternative energy supply sectors may be due to the fact



that these activities tend to be more labor intensive. However, it is theorized that the key factor in increased job creation is from the “re-spending” of money earned from energy savings. The City of Iqaluit has an opportunity to “re-spend” money saved from implementing energy-saving measures. Several municipalities have created a “green fund” and use money saved from implementing reduction measures to purchase technology and equipment, and/or hire staff to carry out new projects.

IMPROVED AIR QUALITY AND HEALTH

By reducing the consumption of fossil fuels, the City of Iqaluit will produce fewer emissions of pollutants and improve air quality. Annual costs of health care due to illnesses caused by ozone and airborne particulate matter and loss in productivity can have substantial economic repercussions. For example, research shows that air pollution resulted in \$10 billion in economic damages for Ontario residents in the year 2000.⁴

RESOURCE CONSERVATION

When GHG emissions are reduced, so are the many environmental impacts that result from producing diesel-generated energy. When environmental considerations are incorporated into municipal planning, Iqaluit makes more efficient use of its resources. All efforts to reduced energy consumption will help protect its natural environment and overall, the City will experience cleaner air, water and soil.

³ Federation of Canadian Municipalities, *The Business Case for Cutting Greenhouse Gas Emissions from Municipal Operations*, June 2003

⁴ Ontario Medical Association, *The Illness Costs of Air Pollution in Ontario*, 2000. <http://www.oma.org/phealth/icap.htm>

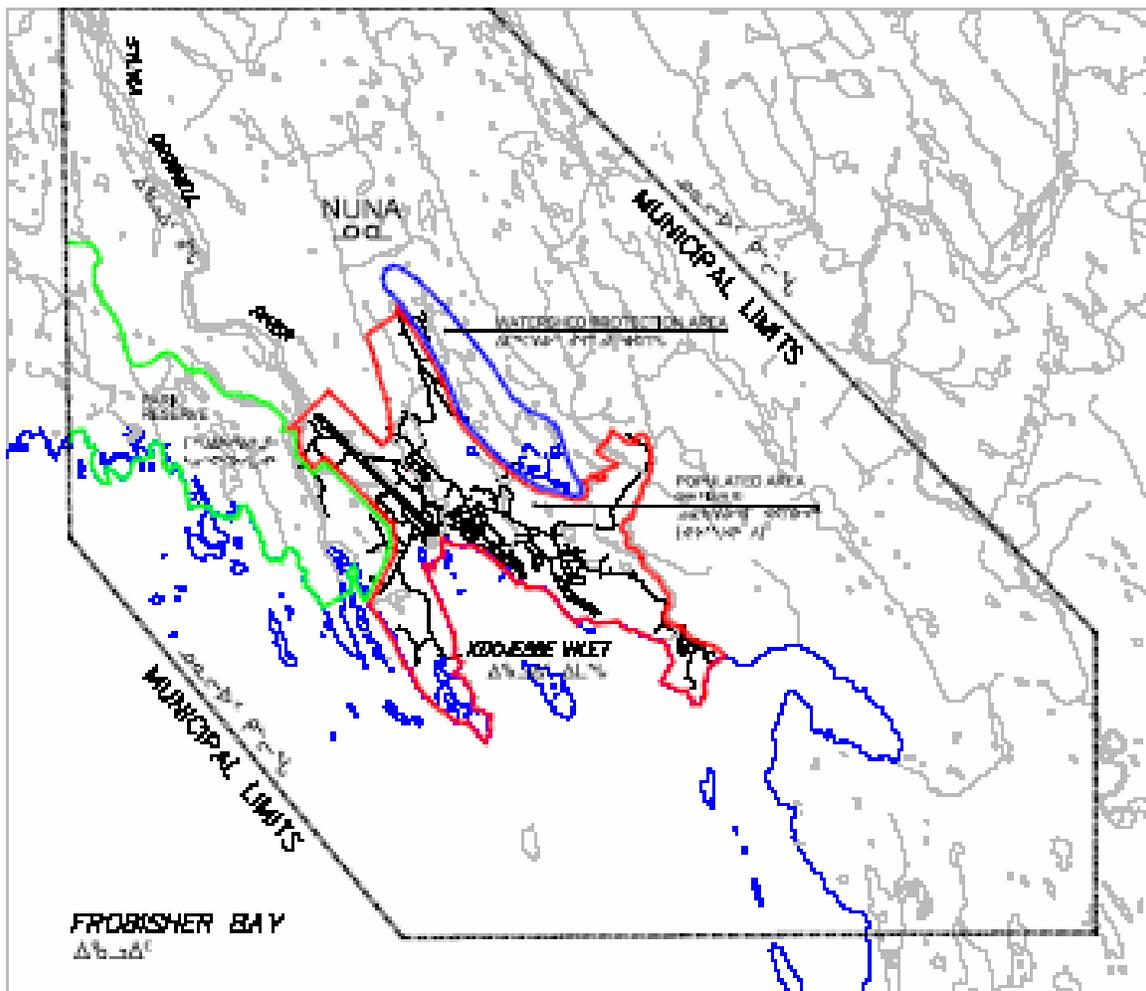
DEMONSTRATING LEADERSHIP AND INCREASING AWARENESS OF CLIMATE CHANGE

The City of Iqaluit's commitment to reducing GHG emissions will have implications that reach beyond the benefits described above. By fulfilling its commitment to Partners for Climate Protection Program, the City shows real leadership and can influence other communities to take action. As the capital of Nunavut and the first community in the Territory to enter into this partnership, Iqaluit's work on climate change issues has tremendous potential to influence and inspire other arctic communities to reduce their energy consumption.

1.3 LOCAL CONTEXT

Iqaluit is the capital city of Canada's newest territory, Nunavut, created in 1999, and represents an expansive and largely Inuit territory. Although Iqaluit is the smallest capital city in Canada, it is the largest community in Nunavut with a much higher non-Inuit population than any other community in the Territory (Inuit represent approximately 60 percent of Iqaluit's population). Iqaluit has an important role as the major business, administrative, health, education and transportation centre, serving all 28 of Nunavut's communities. It houses the Legislative Assembly, and many Government of Nunavut and Government of Canada offices. It also offers numerous other services and facilities, including a hospital, college campus, museum, research centres, hotels, restaurants and an airport. Beyond populated areas lay parks and undeveloped hinterland, where traditional and recreational activities occur. The boundaries of the City encompass an area of 52.34 square kilometers.

FIGURE 1 CITY OF IQALUIT MAP



1.4 DEMOGRAPHICS

Iqaluit experienced a 32 percent increase in population between 1986 and 1996, making it one of the fastest growing communities in Canada. In 2001, Census recorded a population of 5,236 for Iqaluit. Based on projected growth rates, today's population is estimated to be 6,200 and this figure is expected to almost double by the year 2022 (see Table 1 below).

TABLE 1: POPULATION PROJECTIONS TO 2022 IN 5-YEAR INCREMENTS

Year	Low ¹	Medium ²	High ³
2001	5,500	5,500	5,500
2002	5,638	5,695	5,711
2007	6,323	6,720	6,835
2012	7,091	7,819	8,179
2017	7,953	8,983	9,788
2022	8,919	10,169	11,713

¹ Application of annual growth rates for Nunavut from *Economic Outlook* (Conference Board of Canada)

² Application of average 5-year annual growth rates from *Nunavut: Community Population Projections, March 2000* (Nunavut Bureau of Statistics)

³ Application of annual growth rates projected for the *Solid Waste Management Plan* (JL Richards & Assoc., 2002)

The City of Iqaluit has a staff of approximately 120. With an annual budget of \$14.5 million per year, it runs all standard municipal programs, including solid waste management, facilities management, land-use planning, and community economic development.

The municipality operates 30 buildings, which include office buildings, garages, recreational facilities, an emergency services building, staff residences, a dog pound, and all facilities associated with water and sewer services. There are 68 vehicles in the City of Iqaluit's fleet.

1.5 NATURE OF THE COMMUNITY

In order to provide municipal services in this unique arctic community, Iqaluit is faced with a number of challenges due to its existing infrastructure, physical environment and climate. Some of these challenges are as follows:

1. **EXISTING INFRASTRUCTURE DOES NOT HAVE THE CAPACITY TO MEET PROJECTED POPULATION INCREASES WITHIN THE NEXT 10 YEARS:** Expanding municipal services to meet the demand of a rapid growth in population will have substantial financial and environmental implications for the City. Iqaluit will incur increased costs to upgrade the power generation plant, water and sewage treatment facility, landfill and roads to accommodate new development. With an increased level of energy and automobile use, the amount of GHG emissions generated has the potential to rise significantly.

2. **DEVELOPMENT IN IQALUIT IS STRONGLY INFLUENCED BY ITS PHYSICAL ENVIRONMENT:** The City's land is comprised of a series of parallel rock ridges that are interspersed with valleys of varying widths. Most of Iqaluit's built form is located on its largest area of level land. Since available level land is limited, newer developments have occurred in areas with steep slopes. Development in sloping areas poses more challenges and is much more expensive to service. As a result, the City of Iqaluit is faced with the challenge of trying to minimize expensive infrastructure costs and detrimental impacts on the natural environment.



3. **PRESENT TRUCKED SERVICE OF WATER AND SEWAGE IS COSTLY AND INEFFICIENT:** The City of Iqaluit provides all buildings with municipal water and removes and transports wastewater to the treatment facility. These services are provided either through the piped utilidor system or by trucks. At present, approximately 62 percent of the City's buildings are connected to the utilidor and the remaining 38 percent are on trucked service. A significant amount of energy is expended to provide trucked water and sewage service for approximately 423 households.

1.6 DESCRIPTION OF PARTNERS FOR CLIMATE PROTECTION PROGRAM

Partners for Climate Protection is a program of the Federation of Canadian Municipalities that was developed to encourage and help municipalities undertake initiatives to reduce GHG emissions. Its ultimate goal is to reduce GHG emissions from municipal operations by 20 percent and community emissions by 6 percent within ten years of joining the program.

Partners for Climate Protection is a five-step program designed to guide municipalities towards reaching their reduction targets. The program's five steps are as follows:

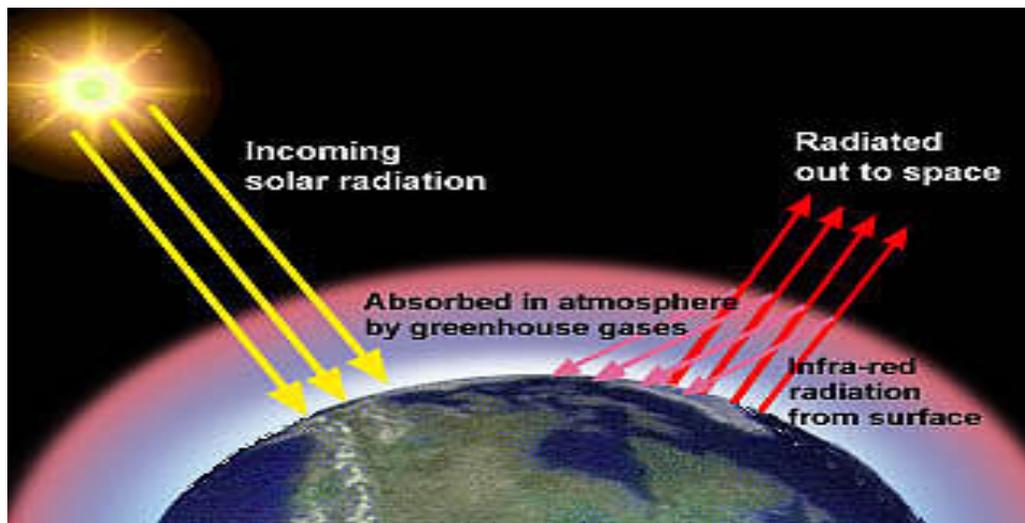
- MILESTONE ONE:** Complete a GHG emissions inventory for both municipal and community operations
- MILESTONE TWO:** Set a reduction target
- MILESTONE THREE:** Develop a local action plan that outlines how the reduction target will be met
- MILESTONE FOUR:** Implement the local action plan
- MILESTONE FIVE:** Measure progress by monitoring and reporting emission reductions

Section 2.0 Climate Change and Greenhouse Gas Emissions

Research has shown that a significant rise in the level of atmospheric GHG has increased our global temperature. This increase in global temperature has been documented over a sufficient period of time to provide reasonable assurance that temperature changes are attributable to GHG influences. Although a small number of skeptics still exist, Canada's scientific community largely supports the theory of global climate change. This has led to support at the federal, provincial and territorial government levels, and ultimately to Canada's participation in the Kyoto Protocol. Supported almost unilaterally by the world's industrialized nations (the United States being one exclusion), the Kyoto Protocol aims to reduce GHG emissions world-wide. In 1998, Canada signed the Kyoto Protocol, along with 159 other countries, and committed to reducing its emissions by 6% below 1990 levels by the year 2012.

The diagram below provides a graphical representation of how solar radiation is re-radiated from the earth's surface to the atmosphere, and then radiated back to the earth. GHG occur in the atmosphere naturally, allowing the earth to maintain some heat from solar radiation. The main source of GHG produced by humans comes from the burning of fossil fuels in order to heat homes, run vehicles and operate appliances. It is the increased level of GHG in the atmosphere from these human activities that has resulted in more heat being retained in the atmosphere, thereby increasing the world's average temperature.

FIGURE 2 SOLAR RADIATION



Of all the GHG produced from human activity, carbon dioxide (CO₂) is produced in the greatest abundance. Scientists have tracked levels of CO₂ and have found a considerable rise in atmospheric levels since the Industrial Revolution. It has been theorized, and concluded by most scientists, that this rise is directly attributed to an increase in the combustion of fossil fuels. These increased levels of CO₂ and other GHG are paralleled by global rises in temperature.

FIGURE 3 RISES IN ATMOSPHERIC CARBON DIOXIDE

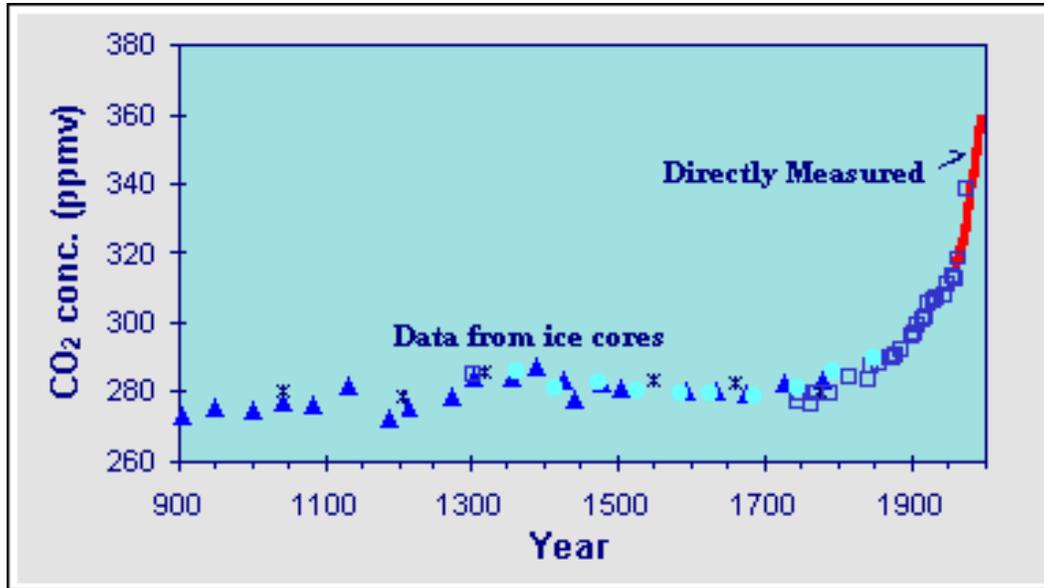
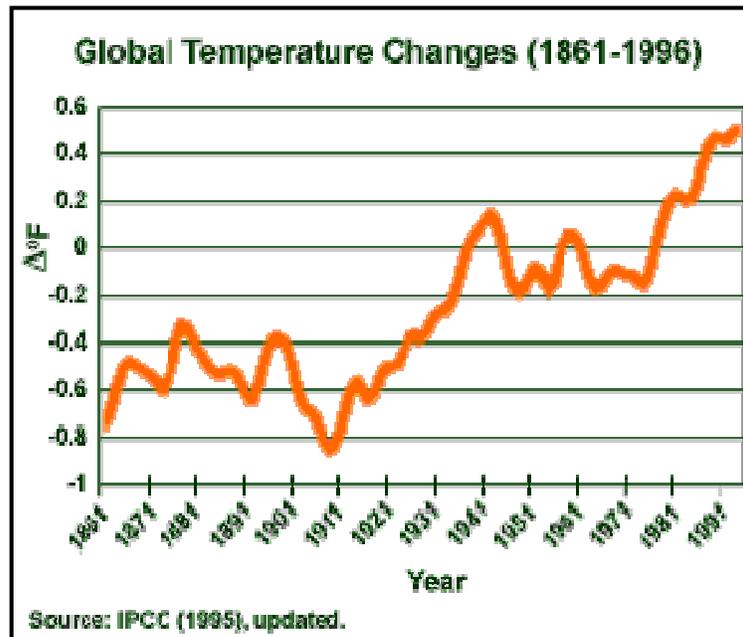


FIGURE 4 GLOBAL TEMPERATURE CHANGES



2.1 REDUCING GHG EMISSIONS

Research suggests and the world's scientific community supports the theory that climate change has been almost exclusively the result of human activity, namely the combustion of fossil fuels. In the industrialized nations, we have become accustomed to using fossil fuels in almost every aspect of our lives. In Canada, a nation with a harsh climate and considerable transportation needs, we are one of the world's biggest consumers of energy. Although we have made some strides in recent years, there remain numerous opportunities to become more efficient by reducing our energy consumption.

The City of Iqaluit has already taken important steps towards reducing GHG emissions. It joined the Federation of Canadian Municipalities' Partners for Climate Protection Program and is committed to engaging its residents, municipal staff, City Council and stakeholders to work together to meet national reduction targets. Through its efforts, the City is demonstrating meaningful and responsible leadership that will be well received by the community of Iqaluit.



2.2 IMPACTS OF GLOBAL WARMING ON THE ARCTIC

Although the world's understanding of the full impacts of global warming is in its infancy, many scientists conclude that the arctic is an area that is expected to be most affected. The third Assessment Report of the Inter-Governmental Panel on Climate Change initiated by the UN reported that the

arctic is highly vulnerable to the impacts of climate change and has low adaptive capacity. Ice thinning, and permafrost and polar cap melting will have serious impacts on the life cycles of marine species, cause sea levels to rise, and make weather patterns and ice thickness unpredictable.

The environmental changes resulting from climate change will have serious implications on municipal infrastructure. A rise in sea level will erode Iqaluit's landmass where homes, buildings and municipal facilities are located. Permafrost melting will cause slumping and shifting, and result in damage to structures, roads and pipes. These changes will impact on the health and safety of the residents of Iqaluit and have serious financial implications for the City.

Unpredictable weather patterns and ice thickness resulting from a rise in global temperature, has already impacted how the people of Iqaluit live on the land. The Inuit who rely on traditional knowledge to hunt and fish are having increasing difficulties in

predicting weather patterns and ice thickness, and this had resulted in accidents and even deaths.⁵

The life cycles of arctic fish and game have already been impacted by climate change. Arctic char stocks are depleted, and due to changes in ice formation, migratory routes for caribou, polar bear and seals have changed. These changes not only impact the ability of people to hunt, but they also have serious implications for the survival of these species. On November 14, 2003, the *Nunatsiaq News* reported that if climate change results in the Hudson Bay being ice-free for most of the year, polar bears will disappear from that part of the world. According to a study conducted by Dr. Ian Stirling of the Canadian Wildlife Service, a reduction in sea ice over the past 20 years has significantly reduced the amount of time polar bears have to hunt. This has compromised the overall health of the polar bear population and has resulted in female bears having fewer cubs.⁶

⁵ Climate, Nature, People: Indicators of Canada's Changing Climate, Canadian City Council of Ministers of the Environment, Winnipeg, Manitoba, 2003, ISBN: 1896997-29-5, p. 6.

⁶ George, Jane, *Scientist Warns of Climatic Threat to Polar Bears*, Nunatsiaq News, Iqaluit: November 14, 2003.

SECTION 3.0 EMISSIONS INVENTORY AND REDUCTION TARGET

In order to determine levels of GHG emissions produced by the City of Iqaluit, an inventory of electricity and fuel consumption was conducted. The inventory provided valuable information for identifying the municipality's significant GHG emission sources. This information was used to identify relevant reduction actions for the City. It also represents a reference point for tracking future GHG reductions.

The emissions inventory tracked the following three principal GHG: carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄), which are expressed as a CO₂ equivalent (eCO₂). Typically, these emissions are generated from:

- **BURNING FOSSIL FUELS** to operate municipal buildings, facilities and vehicles; and
- **DECOMPOSITION OF ORGANICS** in landfills.

3.1 METHODOLOGY FOR EMISSIONS INVENTORY

To calculate emissions for the City of Iqaluit, data was collected for each GHG source (electricity, gasoline, diesel, and heating oil). The energy consumed was allocated by use to include water and sewage facilities, municipal buildings, vehicle fleet, and streetlights. The data used to calculate electrical and fuel oil consumption was based on accurate tabulations from actual energy invoices for every electric meter and fuel oil invoice paid by the City. Litres of fuel oil and kilowatt hours of electricity were recorded, as well as, all energy costs associated with their use.

It is important to note that the data used to calculate electrical and fuel oil consumption was based on tabulations from energy invoices for the year 2002. To get an estimate for the baseline year of 2000, all sources of consumption from the 2002 records that did not occur in 2000 were removed. These included the new arena, dog pound and new wastewater treatment plant. It was assumed that consumption in the remaining facilities was the same in 2000 as it was in 2002.

Although any quantity of solid waste that is landfilled has the potential of contributing to methane production from decomposition, Iqaluit's permafrost level essentially retards the decomposition process. Therefore, this inventory does not quantify any emissions for the decomposition of waste.

Torrie Smith Software, a GHG emissions inventory software, was used to assist in the calculation of GHG emissions. The software was used to calculate kilograms of the CO₂ emissions equivalent produced by the City based on energy consumption.⁷

3.2 EMISSION COEFFICIENTS

Once electricity and fuel consumption were tabulated, emission coefficients were applied to determine the amount of GHG produced by each source and use. The following table provides the emission coefficients used to determine the number of kilograms of GHG emissions produced by the City of Iqaluit.

⁷ Torrie Smith Associates Inc., 1999, *Cities for Climate Protection – Greenhouse Gas Emissions Software Version 3*. Software program developed for Partners for Climate Protection Program, www.torriesmith.com

TABLE 2 EMISSIONS COEFFICIENTS

SOURCE	CO ₂ Coefficient	N ₂ O Coefficient	TOTAL COEFFICIENT (kg eCO ₂ / litre)
GASOLINE	2.36	.268	2.62
DIESEL	2.73	.118	2.85
HEATING OIL (#2)	2.83	0	2.83

Please note: Electricity use has been included in the inventory in a non-traditional manner, by calculating the GHG produced based on the fuel used by the diesel generating station. This approach eliminates the need to estimate the performance of generation, transmission and distribution of the power.



3.3 SUMMARY OF EMISSIONS

The following table is a summary of the municipality’s emission adjusted for the base year of 2000. Kilowatt hours of electricity and litres of gasoline are converted into a #2 oil equivalent in order to determine the kilograms of GHG produced by each municipal use. Appendix A, *Detailed Breakdown of Energy Consumption and Total Costs by Use*, provides a

breakdown of total energy consumption and costs for individual water and sewage facilities, buildings, vehicle fleet and streetlights.

TABLE 3 GHG EMISSIONS INVENTORY

USE	GHG SOURCE			CONSUMPTION (LITRES #2 OIL EQUIVALENT)	KILOGRAMS OF GHG PRODUCED	COST
	KWh	Gas (L)	Fuel Oil (L)	Litres	Kg eCO ₂	\$
WATER & SEWAGE	389,573		621,306	102,790 + 621,306 = 724,096	2,063,674	\$461,190
BUILDINGS	980,942		260,505	258,824 + 260,505 = 519,329	1,480,088	\$446,434
VEHICLE FLEET - GASOLINE		142,742		131,222	373,984	\$81,909
VEHICLE FLEET - DIESEL			270,431	270,431	770,728	\$154,886
STREET- LIGHTS	322,000			84,960	242,136	\$150,035
TOTALS	1,692,515	142,742	1,152,242	1,730,038	4,930,610	\$1,294,454

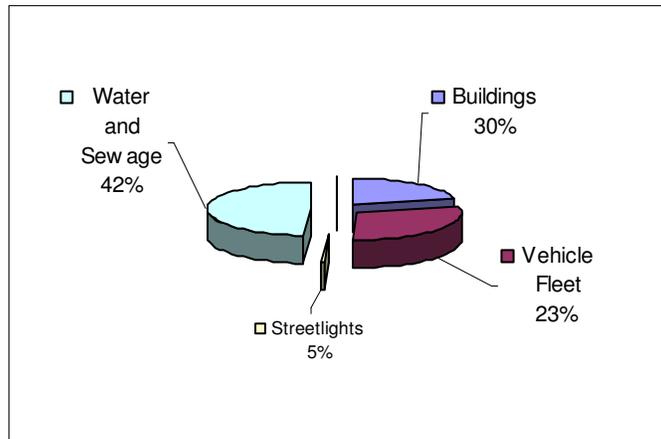
TABLE 4 CITY OF IQALUIT'S EMISSIONS FOR 2004 AND 2014

TOTAL EMISSIONS			
BASE YEAR	GHG EMISSIONS (KILOGRAMS ECO ₂)	FORECAST YEAR	FORECAST OF GHG EMISSIONS (KILOGRAMS ECO ₂)
2000	4,930,610	2014	3,944,488

FIGURES 5 TO 8 CHARTS FOR EMISSIONS AND COSTS

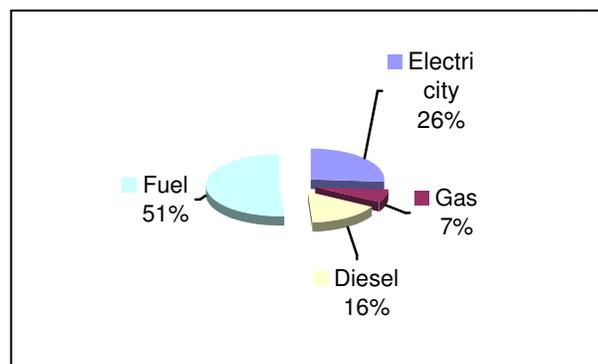
For illustration purposes, the following pie charts give a graphical representation of total GHG emissions and costs by use (water and sewage, buildings, vehicle fleet and streetlights) and source (fuel oil, diesel, gasoline and electricity).

FIGURE 5 EMISSIONS BY USE



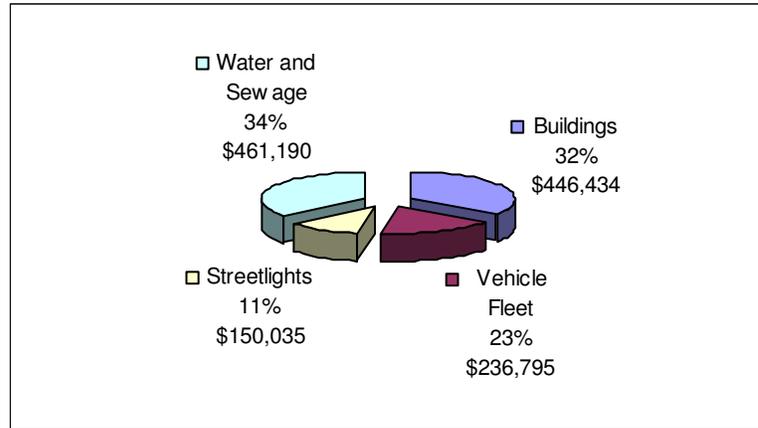
Operating the water and sewage facilities create the greatest amount of emissions, 40 percent more than is created to operate municipal buildings.

FIGURE 6 EMISSIONS BY SOURCE



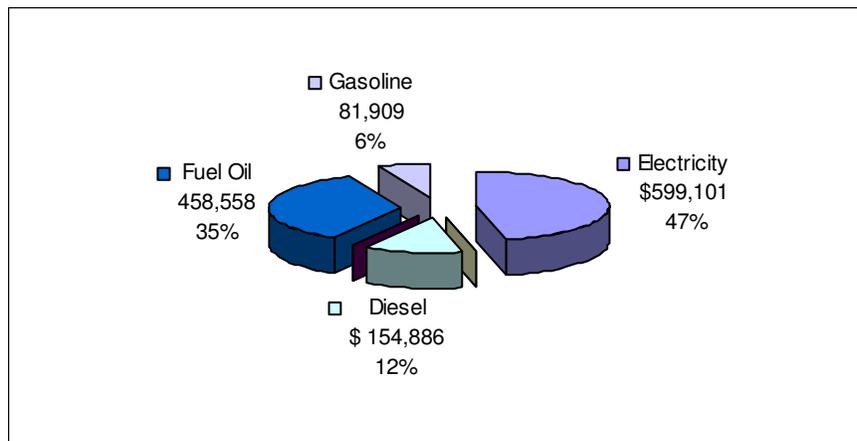
Fuel oil consumption creates the greatest amount of emissions than any other source, accounting for 51 percent of total emissions produced by the City.

FIGURE 7 ENERGY COSTS BY USE



Water and sewage facilities and buildings have the highest operating costs for the municipality, accounting for 66 percent of the City’s total operating costs combined. The operating costs for these uses in the baseline year was \$907,624.

FIGURE 8 ENERGY COST BY SOURCE



Although electricity use only represents 26 percent of emissions produced by the City, it is the most expensive energy source.

3.4 REDUCTION TARGET

A set reduction target provides a starting point from which the City of Iqaluit can track its progress in reducing GHG emissions. The Federation of Canadian Municipalities suggests a target of 20 percent reduction within 10 years. This reduction target is below the chosen baseline year (in this study we have adjusted data to reflect emissions from 2000), regardless of any growth over the 10 years. It is important for the municipality to set a reduction target to fulfill the requirements of PCP. However, since participation in the program is voluntary, the target can be adjusted as the Local Action Plan is implemented.

A number of municipalities participating in PCP have complete GHG inventories and set reduction targets. In all cases, these municipalities have set 20 percent reduction targets for municipal operations. Table 5 lists reduction targets set by participating municipalities.

In order for the reduction target to be meaningful, it must be achievable within the City’s financial and human resource capacity. In an effort determine an achievable reduction target, a preliminary review of potential reduction measures was conducted (see Appendix B: *Potential Reduction Measures*). It is important to note that potential energy savings are estimates for illustration purposes and are not based on any completed assessments. Following the recommendation of the Federation of Canadian Municipalities, the examples set other municipalities participating in PCP, and based on a preliminary review of reduction measures, **a target of 20 percent is recommended for the City of Iqaluit by the year 2014.**

TABLE 5 EMISSION TARGETS OF MUNICIPALITIES PARTICIPATING IN PCP

MUNICIPALITY	CORPORATE EMISSIONS TARGET	COMMUNITY EMISSIONS TARGET
Edmonton (2001)	20 % below 1990 levels by 2008	6 % below 1990 levels
Fort Smith (1997)	20 % below 1990 levels by 2005	
Guelph	20 % below 1994 levels by 2010	6 % below 1992 levels by 2010
Hamilton (1998)	20 % below 1990 levels by 2005	
New Glasgow (1999)	20 % below 1990 levels by 2008	
Ottawa (1995)	20 % below 1990 levels by 2005	20 % below 1990 levels by 2005
Regina (2003)	20 % below 1990 levels by 2005; 1 % annual reduction thereafter until 2012	6 % 1990 levels by 2012
Whitehorse (2003)	20 % below 1990 levels by 2013	6 % below 1990 levels by 2013

⁸

⁸ The City of Whitehorse’s Local Action Plan to Reduce GHG Emissions for City Operations and the Community, 2003, page 17.

SECTION 4.0 SUSTAINABILITY PLAN

The Sustainability Plan provides a framework to help the City of Iqaluit reach its reduction target. This part of the Local Action Plan will evolve as reduction measures are implemented. By outlining long-term goals and reduction actions, the Sustainability Plan will provide guidelines and suggestions to facilitate the reduction of GHG emissions.

4.1 LONG-TERM GOALS

Long-term goals suggest changes to the operation of the municipal government that through recommended actions would have the long-term effect of reducing GHG emissions. These goals would most likely be implemented over a period greater than five years.

LONG-TERM GOAL 1.0

Ensure the City of Iqaluit's General Plan supports the recommendations of the Local Action Plan

ACTION 1.1

- Develop an Environmental Plan that details policies to guide future development in a sustainable manner

ACTION 1.2

- Develop energy standards for all new municipal buildings (Natural Resources Canada's Office for Energy Efficiency provides funding through its Commercial Building Incentive Program to help cover extra development costs when buildings are constructed to a standard 25% better than the Model National Energy Code for Buildings)

Action 1.3

- Recommend changes to development by-laws to reflect sustainable options

ACTION 1.4

- Change criterion for awarding development approvals to include energy efficiency standards

LONG-TERM GOAL 2.0

Ensure the City of Iqaluit's existing and planned infrastructure supports the recommendations of the Local Action Plan

ACTION 2.1

- Develop an Infrastructure Plan that identifies limitations to existing infrastructure and makes recommendations for sustainable improvements and new developments

Action 2.2

- Develop a Water and Sewage Management Plan that prioritizes modifications and upgrades to existing facilities and makes recommendations for the development of new facilities



LONG-TERM GOAL 3.0

Ensure operational policies for staff support the recommendations of the Local Action Plan

ACTION 3.1

- Develop a “Green” Office Policy to encourage energy and waste reduction in daily municipal operations

ACTION 3.2

- Develop a “Green” Procurement Policy to purchase office materials and equipment that meet the Energy-Efficient Star Standards <www.energystar.gov/> (contact Office of Energy Efficiency, Natural Resources Canada for their guide on purchasing energy efficient equipment, www.oeenrcan.gc.ca)

ACTION 3.3

- Systematically review all equipment and develop a logical repair and upgrade schedule that focuses on proactive and sustainable approaches to improvements

4.2 GREENHOUSE GAS REDUCTION ACTIONS

Reduction actions are quantitative and qualitative initiatives that have the potential to directly reduce the City of Iqaluit's GHG emissions. Numerous options exist to help municipalities meet their reduction targets and the success of any action plan depends on its applicability to the specific municipality. The following recommendations are specific to Iqaluit's financial and human resource capacities, built form and climatic conditions.

Reduction measures have been organized by source under the following headings: water and sewage facilities, buildings, vehicle fleet, streetlights and solid waste. A table of recommended reduction measures has been created for each source that lists the reduction action, a description and/or benefits of the action and steps for consideration.

Each source has been further divided into reduction measures for (a) managing energy demand for existing facilities and services, and where applicable, (b) options for new development and/or alternative initiatives. In addition to managing Iqaluit's energy demand, there exist many exciting opportunities to implement alternative energy measures to meet the City's energy needs. Many municipalities are not only implementing energy efficiency projects, but are also developing renewable energy projects, such as wind power, solar energy, small hydro and district heating (see *Section 1.2, Benefits of Reducing GHG Emission – Economic Development*).

Reduction actions will vary in their capacity to save energy and the costs associated with implementation. This report does not attempt to prioritize individual reduction actions, but does recommend conducting audits as a first step to implementation. Also, it should be noted that this report is a planning document and not an implementation plan. These suggested reduction measures are not based on any completed audits or assessments.

4.2.1 WATER AND SEWAGE FACILITIES

Iqaluit’s water and sewage facilities are responsible for 42% of the City’s GHG emissions (see Figure 4, *Emissions by Use*). These facilities use a combination of fuel oil and electricity at a total cost per annum of \$461,190 (see Appendix A: *Detailed Breakdown of Energy Consumption and Costs by Use*). This accounts for 34% of the City’s total energy costs.

Reduction actions that focus on demand management through water conservation programs and technologies or leakage reduction can have the highest GHG emission reduction impact. Research shows that these reduction measures can decrease demand by as much as 25%, thereby significantly reducing the amount of energy required to treat and distribute water.⁹

TABLE 6 REDUCTION ACTIONS FOR WATER & SEWAGE FACILITIES

CODE	ACTION	DESCRIPTION AND/OR BENEFITS	STEPS FOR CONSIDERATION
Goal 1: To reduce water and energy consumption in existing facilities			
WS1	Conduct energy audits for main facilities	Since proper audits have not been conducted to date, this step is crucial to determine more specific and technical reduction measures.	<ul style="list-style-type: none"> • Explore funding options for audits, such as FCM’s Green Municipal Funds (www.fcm.ca) • Develop an auditing schedule to prioritize building audits
WS2	Reduce temperature in water loop	The temperature of the water in the loop is set for about 9 C°. It is recommended that the delivery temperature be reduced to less than 5 C°. The Public Works Department in Rankin Inlet lowered the temperature in their water loop to 4.5 C°. Also, the utilidor connections in this community do not have heat trace tape.	<ul style="list-style-type: none"> • Conduct a preliminary engineering assessment • Contact the Public Works Department for Rankin Inlet
WS3	Develop a leak detection and maintenance program	Leak reduction and regular maintenance of the water distribution system will significantly reduce water and energy consumption. The Public Works Department would be responsible for optimizing the system through regular maintenance and monitoring.	<ul style="list-style-type: none"> • Research other leak detection and maintenance programs in the north (the City of Whitehorse is presently developing a leak detection program) • Create a maintenance and leak detection schedule

⁹ Marbec Resource Consultants Ltd., *Identification of Potential GHG Emission Reductions of Infrastructure Guide Best Practices*, Final Report, 2002, 222 Somerset Street West, Suite 300, Ottawa, Ontario, K2P 2G3

WS4	Implement water conservation technologies, and methods such as low-flow toilets, toilet dams, faucets restrictors/aerators, water recycling systems and leaky tap repairs	A variety of simple technologies exist to provide significant water and energy savings. Devices that target reducing the need for hot water have the greatest impact for reducing GHG emissions. Green Municipal Enabling Funds Project 2603 is a feasibility study that examines innovative technologies for water distribution systems - www.fcm.ca .	<ul style="list-style-type: none"> • Research conservation technologies for Iqaluit's municipal systems • Develop a retrofit schedule that includes a cost/benefit analysis
WS6	Explore the feasibility of upgrading wastewater treatment motors and pumps	A number of more efficient motors and pumps for lift stations and pump houses are available. For example, a duty pumps is a small pump that consumes less energy than regular pumps.	<ul style="list-style-type: none"> • Research energy efficient wastewater motors and pumps • Contact Natural Resources Canada's Office of Energy Efficiency for a listing of energy efficient equipment at www.oe.nrcan.gc.ca
WS7	Develop a water conservation program	An educational program for Iqaluit would be an effective and relative inexpensive tool for reducing water consumption. Regina's water conservation program successfully reduced GHG emissions from electricity used in water treatment by more than 1,700 tonnes per year, resulting in an economic saving of about \$600,000 for the municipality. ¹⁰	<ul style="list-style-type: none"> • Consult the <i>Water Wise</i> website - www.waterwiser.org for educational materials on water conservation
WS8	Explore the feasibility of a water metering program	Research shows that sending price signals via water metering is a highly effective means to reduce water consumption. Metering can reduce consumption by 20 to 50 %, and reduce the amount of wastewater that has to be treated by about 10 %. ¹¹ When implemented with other conservation technologies and programs, water consumption can be reduced by 40%. ¹²	<ul style="list-style-type: none"> • Research water metering programs (many municipalities have adopted water metering programs to conserve consumption; a 1991 study showed that 56% of Canada's urban population was metered¹³)

¹⁰ Climate Change Solutions Web Site: www.climatechangesolutions.com

¹¹ Federation of Canadian Municipalities, *Towards Sustainability: Municipal Infrastructure and Water Efficiency*, Sheila Keating-Nause. *In Forum*, 1999, Vol. 23, p.34

¹² Climate Change Solution Web Site: www.climatechangesolutions.com

¹³ Environment Canada's Freshwater Web Site: www.ec.gc.ca/water

Goal 2: To ensure energy efficient technologies are implemented in all new buildings and facilities			
WS9	Adopt best practices for new wastewater treatment plant	Many municipalities are adopting energy efficient technologies for wastewater treatment facilities and incurring cost and energy savings. Facilities that use such technologies can reduce energy use, improve water quality and make beneficial use of waste heat.	<ul style="list-style-type: none"> • Review best practices from other municipalities (Green Municipal Enabling Funds Project 1841 is a feasibility study conducted in St. Catherines, Ontario that examined innovative techniques for treating wastewater - www.fcm.ca) • Explore use of waste heat in a cogeneration system
WS10	Explore the feasibility of installing gray water recycling units for City-owned lots not on the utilidor	Recently, gray water recycling units, called <i>Healthy Home Systems</i> , were installed in a number of homes in Apex. Potentially, these units can save the municipality 75% of costs for trucked service by reducing water delivery and wastewater pick-up requirements.	<ul style="list-style-type: none"> • Contact <i>Creative Communities Research Inc.</i>, (416) 466-5172. to learn more about <i>Healthy Home Systems</i> • Research options for grey water recycling units

4.2.2 BUILDINGS

Iqaluit’s municipal buildings are responsible for 30% of the City’s GHG emissions (see Figure 1, *Emissions by Use*). These buildings use a combination of fuel oil and electricity at a total cost per annum of \$446,434 (see Appendix A: *Detailed Breakdown of Energy Consumption and Costs by Use*). This accounts for 32% of the City’s total energy costs. The cost of electricity and fuel oil to operate City Hall is \$220,924, accounting for almost half of the total annual energy cost of all municipal buildings.

TABLE 7 REDUCTION ACTIONS FOR BUILDINGS

CODE	ACTION	DESCRIPTION AND/OR BENEFITS	STEPS FOR CONSIDERATION
Goal 1: To reduce energy consumption in all municipal buildings			
B1	Conduct energy audits for main municipal buildings	Energy audits would identify means to reduce energy consumption for individual buildings. Since proper audits have not been conducted to date, this step is crucial to determine more specific and technical reduction measures.	<ul style="list-style-type: none"> • Explore funding options for audits, such as FCM’s Green Municipal Funds - www.fcm.ca • Develop an auditing schedule to prioritize building audits
B2	Develop a building retrofit program	Once buildings have been audited, a retrofit schedule will prioritize reduction actions based on potential energy savings, implementation costs and required human resource capacity. Suggested retrofits can be implemented incrementally, depending on available resources.	<ul style="list-style-type: none"> • Consult FCM’s <i>Municipal Building Retrofit Guide</i>- www.fcm.ca
B3	Adjust air handling units	All air handling units operate continuously, even during evenings and weekends when most buildings are not in use. Adjusting these units to operate only when buildings are in use would significantly reduce energy consumption.	<ul style="list-style-type: none"> • Explore options for adjusting air handling units
B4	Make buildings more air tight to prevent heat loss	A substantial amount of heat is lost through leaks in a building’s envelope. A large proportion of these leaks can be fixed easily and inexpensively with caulking.	<ul style="list-style-type: none"> • Contact Tim MacLeod, Senior Technical Officer, Government of Nunavut about conducting blower door tests to detect sources of air loss (telephone: 975-5422)

B5	Install automatic thermostats	<p>Night setback and temperature reduction during hours that buildings are not occupied will produce substantial savings with no inconvenience to building users. The technology for automatic thermostats is well proven and a number of products are available. Automatic thermostats can reduce energy consumption by 3 – 7 % in buildings used on a regular basis and 15 % in buildings without regular scheduled use.</p>	<ul style="list-style-type: none"> • Research costs for purchasing and installing automatic thermostats • Develop a schedule for installing thermostats in individual buildings, beginning with those that have the highest potential cost savings
B6	Upgrade lighting to use energy efficient lamps	<p>Replace exit lights with LED lamps</p> <ul style="list-style-type: none"> • Incandescent lamps use 10 times more energy than LED lamps • LED lamps last approximately 20 years <p>Replace all F-40 fluorescent lights with T-8 lights</p> <ul style="list-style-type: none"> • T-8 fluorescent lights use 40% less energy than F-40 lights <p>Replace incandescent lamps with fluorescent lamps</p> <ul style="list-style-type: none"> • Fluorescent lamps use only a fraction of the energy of an incandescent lamp and last 10 times longer¹⁴ 	<ul style="list-style-type: none"> • Conduct an inventory of lights to determine the number of lamps that need replacing • Develop a lighting retrofit schedule
B7	Install separate temperature controls in City Hall	<p>City Hall consumes more energy than any other municipal building due to the nature and frequency of its use. A lot of heat is lost through the fire station's bay doors and, as a result, it is difficult to keep this area warm. Adversely, the offices on the second floor often get too hot and, as a result, fans are turned on and windows are opened. If separate temperature controls were installed it would eliminate the need to cool the upstairs in order to maintain some heat in the fire station.</p>	<ul style="list-style-type: none"> • Investigate the cost of installing separate temperature controls • Conduct a simple cost analysis to determine what the pay back period would be for installing separate temperature controls
B8	Develop and implement an energy reduction program for municipal staff	<p>An educational program would help make municipal staff aware of the energy savings for turning off lights, fan and computers, and shutting all windows at night. The program could develop into an inter-departmental challenge to encourage participation and ensure success.</p>	<ul style="list-style-type: none"> ▪ Research models for energy reduction programs (contact Clean Nova Scotia at www.clean.ns.ca and Office of Energy Efficiency, Natural Resources Canada (<i>Energy Management Employee Awareness</i>) at www.oeo.nrcan.gc.ca)

¹⁴ Light Pollution Abatement Site, Calgary Centre, Royal Astronomical Society of Canada, www.syz.com/rasc/lp/greengas.php

Goal 2: To ensure all new municipal buildings use energy efficient technologies		
B-8	Develop a sustainable, energy efficient City Hall	<p>Using energy efficient technologies to design a new City Hall would not only save the municipality money and energy, it would create many economic development spin-offs (see Section 1.2, <i>Benefits of Reducing GHG Emissions</i>). Research shows that development costs of a new building represent only 8 % of the overall operational and maintenance costs over the lifetime of that building.¹⁵ Therefore, the development of an energy efficient building could most likely be justified by comparing its costs to the operational and maintenance costs of City Hall.</p> <ul style="list-style-type: none"> • Research options for energy efficient building designs • Conduct an energy/financial audit for maintaining the present City Hall over an new sustainable building • Contact Natural Resources Canada's Office of Energy Efficiency regarding their incentive programs - www.oee.nrcan.gc.ca



¹⁵ Federation of Canadian Municipalities, *The Business Case for Cutting Greenhouse Gas Emissions from Municipal Operations*, June 2003

4.2.3 VEHICLE FLEET

Iqaluit’s vehicle fleet is responsible for 23% of the City’s GHG emissions (see Figure 1, *Emissions by Use*). It uses almost twice as much diesel fuel as gasoline at an annual cost of \$236,795 (see Appendix A: *Detailed Breakdown of Energy Consumption and Costs by Use*). This accounts for 23% of the City’s total energy costs.

Fuel for the City’s vehicle fleet is drawn from bulk tanks and, therefore, consumption for individual vehicles is not recorded. As a result, it is not possible to determine vehicle fuel consumption by use or individual vehicle consumption.

TABLE 8 REDUCTION ACTIONS FOR VEHICLE FLEET

CODE	ACTION	DESCRIPTION AND/OR BENEFITS	STEPS FOR CONSIDERATION
Goal 1 : To reduce overall fuel consumption of vehicle fleet			
VF1	Examine vehicle fleet to ensure each vehicle is the appropriate size for its use and to determine if any unneeded or highly inefficient vehicles can be eliminated from the fleet	By conducting an inventory and assessment of vehicles, the City can determine the most efficient size and number of fleet vehicles. Many municipalities are reducing GHG emissions by downsizing and improving the efficiency of their fleets. The City can complete the process over time, by eliminating vehicles that are seldom used, replacing inefficient vehicles and/or choosing not to replace older vehicles when they expire.	<ul style="list-style-type: none"> • Conduct an inventory and assessment of vehicle fleet • Develop a schedule to eliminate/replace inappropriate vehicles
VF2	Develop a summer anti-idling program for non-essential vehicles	The City of Peterborough implemented an anti-idling campaign in conjunction with a driver’s education program and reduced the average idling time of the municipality’s vehicles by more than 70 %. ¹⁶ A successful anti-idling program would need to consider Iqaluit’s cold temperatures. One option may be to consider installing programmable devices that will turn engines off after a set amount of time has expired and/or once the engine block has dropped to a certain temperature.	<ul style="list-style-type: none"> • Research anti-idling programs that have been successful in northern climates • Contact Office of Energy Efficiency, Natural Resources Canada for their anti-idling tool kit, www.oeenrcan.gc.ca

¹⁶ Natural Resources Canada’s Office of Energy Efficiency, “The City of Peterborough: Low Cost Fleet Management Solutions Achieve Major Results”, *Fleet Smart Profiles*

VF3	Develop a vehicle tuning program for all municipal vehicles	Regular tuning of fleet vehicles helps reduce pollution, improve vehicle efficiency, and reduce operating and maintenance costs.	<ul style="list-style-type: none"> • Research vehicle tuning programs
VF4	Optimize routes for water and sewage trucks	Since approximately 38% of Iqaluit's buildings (423 units) are on trucked service, it would be very cost effective to ensure that truck routes are optimized for efficiency. The City of Peterborough experienced 8.5 % reduction in energy consumption over a two year period through route optimization and less vehicle idling. ¹⁷	<ul style="list-style-type: none"> • Assess vehicle routes to ensure their efficiency
VF5	Explore the feasibility of installing programmable devices in all emergency vehicles to prevent engine blocks from getting too cold during the winter months	Emergency vehicles are plugged into block heaters inside the fire station continuously throughout the winter months and as a result consume a significant amount of energy. A compromise to having the vehicles plugged for 24 hours, 7 days a week would be to fit them with programmable devices that would intermittently access a charge from the block heater when the temperature of the engine drops to a set level.	<ul style="list-style-type: none"> • Research options and costs for programmable starting devices (Contact the Office of Energy Efficiency regarding the "Intelligent Parking Lot Controller" for engine block heaters, www.oee.nrcan.gc.ca)
Goal 2: To explore alternative energy initiatives for new fleet vehicles			
VF6	Explore the feasibility of implementing an alternative fuel project	A number of municipalities are exploring alternative fuel options (Saskatoon recently conducted a bio-diesel feasibility study).	<ul style="list-style-type: none"> • Explore the economic feasibility of developing a small alternative fuel pilot project

¹⁷ Rees, Terry, *Sustainable Peterborough's Energy Efficiency and Conservation Case Study*, Peterborough, Ontario 2001, (705) 745-1094

4.2.4 STREETLIGHTS

Iqaluit's streetlights are responsible for 5% of the City's GHG emissions (see Figure 1, *Emissions by Use*). They use electricity at a total cost per annum of \$150,035 (see Appendix A: *Detailed Breakdown of Energy Consumption and Costs by Use*). This accounts for 11% of the City's total energy costs.

TABLE 9 REDUCTION ACTIONS FOR STREETLIGHTS

CODE	ACTION	DESCRIPTION AND/OR BENEFITS	STEPS FOR CONSIDERATION
Goal 1: To increase the energy efficiency of existing streetlights			
SL1	Examine existing streetlights to ensure efficient operation and placement	Research shows that 30 to 50 % of the light we produce is used improperly. ¹⁸ By examining existing streetlights, the City can determine if lights are misdirected, placed in unneeded areas, and/or running longer than needed.	<ul style="list-style-type: none"> • Work in partnership with Nunavut Power Corporation to develop a schedule to examine existing streetlights
Goal 2: To ensure streetlights in new developments are energy efficient			
SL2	Adopt energy efficient legislative measures for street lighting requirements in new developments	By proactively ensuring that new developments use energy efficient streetlights, the City can save costs and energy, and eliminate the need for future lighting retrofits.	<ul style="list-style-type: none"> • Develop a “business case” to demonstrate the benefits of adopting energy efficient street lighting requirements

¹⁸ Light Pollution Abatement Site, Calgary Centre, Royal Astronomical Society of Canada, www.syz.com/rasc/lp/greengas.php

4.2.5 SOLID WASTE

Presently, Iqaluit’s solid waste is transported to the landfill site and compressed. In most communities the decomposition of solid waste is a major contributor of GHG emissions due to the production of methane in the decomposition process. However, in Iqaluit and other northern communities permafrost impedes this process, resulting in a virtually emission-free landfill. Nevertheless, since there are considerable emissions produced in the production and delivery of products, and when transporting solid waste to the landfill, it is important to promote waste reduction in Iqaluit.

TABLE 10 REDUCTION ACTIONS FOR SOLID WASTE

CODE	ACTION	DESCRIPTION AND/OR BENEFITS	STEPS FOR CONSIDERATION
Goal 1 : To reduce the amount of solid waste going to the landfill			
SW1	Develop an office waste reduction program	By encouraging waste reduction, the City is reducing the amount of materials that need to be landfilled and/or recycled. A waste reduction program might involve adopting a “green” procurement policy, reusing paper for draft documents, adopting a regulation to make double-sided photocopies mandatory, and creating of a “wasteless” meeting policy.	<ul style="list-style-type: none"> • Research office waste reduction programs (contact Clean Nova Scotia - www.clean.ns.com)
SW2	Increase participation in the municipal recycling program	A successful educational campaign has the potential to increase participation in Iqaluit’s recycling program.	<ul style="list-style-type: none"> • Develop a funding proposal to FCM’s Green Funds to expand/improve the recycling program – www.fcm.ca • Research waste reduction programs (contact Clean Nova Scotia for educational materials - www.clean.ns.ca)
SW3	Explore the feasibility of creating a municipal composting program	By eliminating organics from the waste stream, the amount a waste going to the landfill is significantly reduce.	<ul style="list-style-type: none"> • Contact the Iqaluit Community Greenhouse Society about creating a partnership to develop a centralized composting program • Research successful centralized composting initiatives (contact the Halifax Regional Municipality’s Solid Waste Department – www.region.halifax.ns.ca)

SECTION 5.0 NEXT STEPS: IMPLEMENTATION AND MONITORING SUCCESS

5.1 IMPLEMENTATION

An implementation plan will help put the Local Action Plan into motion, and is a vital component to meeting the City of Iqaluit's GHG reduction target. The Local Action Plan is a working document and the implementation component will evolve as suggestions are put into action. The following are implementation recommendations for the City's consideration.

5.1.1 STAFFING AND COMMITTEE REQUIREMENTS

It is recommended that a project coordinator be hired to fulfill the objectives of the Partners for Climate Protection Program and to complete Milestone 4 and 5. This person would report to the Director of Planning and Lands and be responsible for implementing the Local Action Plan and monitoring the City's progress towards meeting its reduction target. Hiring a project coordinator would ensure the Local Action Plan is put into motion and maintains momentum, thus significantly increasing the municipality's chances of reaching its reduction goal. The project coordinator would help communicate the objectives of the plan to and gain support of City Council, municipal staff and stakeholders.

After a project coordinator is in place, a steering committee should be created to help implement the goals of the Local Action Plan. The steering committee would be comprised of City Council members, project partners, stakeholders and residents of Iqaluit. It would support and guide the work of the project coordinator and provide a broad cross-section of skills and resources. The steering committee would be key to communicating the Local Action Plan's objectives to the resident of Iqaluit and other communities in Nunavut.

5.1.2 AUDITS

It is highly recommended that audits be conducted on the municipality's main buildings and facilities, as a starting point for implementation. Since this report represents the first document aimed at addressing the City's GHG emissions, audits would detail recommendations for reducing energy consumption that are relevant to specific buildings. Due to Iqaluit's limited financial and human resources, it is essential to conduct audits to provide a strategic and expert diagnosis of what steps need to be taken to meet the reduction target.

5.1.3 IMPLEMENTATION SCHEDULE AND WORK PLANS

Following the completion of audits, an implementation schedule should be developed. This schedule would prioritize reduction actions and provide a project time-line to help ensure the Local Action Plan moves forward.

In order to develop the implementation schedule, the City needs to establish criterion for prioritizing reduction actions. With the help of the auditor, the City may wish to identify those measures with the highest potential to reduce GHG emissions or those actions with the lowest implementation costs. The work of implementing the Local Action Plan

will be completed incrementally over time, however prioritizing reduction actions and systematically working through the plan will help ensure its success over the long-term.

Once the implementation schedule is developed and action items prioritized, work plans should be developed for each reduction action. These work plans would detail the necessary steps for implementation, identify required resources, and provide cost estimates and projected energy savings. Work plans could be integrated into the project time-line and would basically provide a “how-to” guide for implementing individual reduction actions.

5.1.4 FINANCIAL PLAN

A number of options exist for financing the implementation of reduction measures. Since initiatives will have varying costs and payback periods, it is important to consider potential savings over the lifetime of the improvement. The City of Iqaluit may decide to conduct simple cost analyses to identify reduction measure costs and help determine the type of financing required. Once the costs of implementation are identified, the City can prepare a financial plan to detail costs, payback periods, potential savings, measures that can be incorporated into existing City projects, and alternative funding sources.



The following are two main options for financing reduction measures:

1. **ALTERNATIVE FUNDING SOURCES:** There are many potential funding programs and resources available. Most of these options require applicants to develop a proposal that identifies how their project fits with the criterion of the funding program. Appendix C: *Potential Funding Sources* highlights a number of the more relevant programs and resources available to municipalities for implementing climate change initiatives. Also, the following two funding guides are available on-line and detail a number of existing programs and resources.
 - A) ***The Alternative Funding Programs and Resource Guide 2003*** was prepared by the Federation of Canadian Municipalities' Centre for Sustainable Community Development. It lists over 100 programs and identifies program goals, eligibility and focus, contact information, and level of support available. A copy of this guide can be downloaded from the Federation of Canadian Municipalities' web site at www.fcm.ca
 - B) ***Green Sources*** is an environmental funding guide prepared by Environment Canada. It details information on programs that provide assistance, labour costs or in-kind donations. A copy of this guide can

be downloaded from Environment Canada's web site at www.ec.gc.ca/fund_e.html

2. **INTERNAL FUNDS:** The City may explore incorporating implementation costs into existing projects or expenditures. For example, the City has a fortuitous opportunity to explore and implement energy efficient upgrades with its new infrastructure program and for its proposed retrofits to the wastewater treatment plant.

Another internal option for financing is through the creation of a *revolving fund*. Once the municipality begins to save money through the implementation of reduction measures, it can reinvest this money into new projects that will continue to accumulate savings and reduce energy consumption. Toronto, Edmonton and Regina are among some of the municipalities that have used cost savings achieved through decreased energy consumption to fund initiatives. Each of these municipalities has been very successful in establishing revolving funds to spearhead energy efficient retrofits and maintain project momentum.¹⁹

5.1.5 COMMUNICATION STRATEGY AND PROJECT SUPPORT

The success of the Local Action Plan is dependent on an effective communication strategy that ensures the approval and support of City Council, municipal staff, stakeholders, and the community at large. In order to be effective, the communication strategy should implement mechanisms that promote positive interaction among a diversity of viewpoints from within the municipality. A good strategy will increase awareness of climate change issues and provide opportunities for various community organizations and individuals to participate in the implementation of the plan. Through broad-based participation, the strategy would also ensure local knowledge is respected and incorporated into the project.

By developing and implementing a successful communication strategy, project support will be inevitable. The strategy should involve a series of meetings, information forums, and public consultations to engage a diversity of individuals and organizations in the project.

5.1.6 COMMUNITY ACTION PLAN

In order to fulfill the objectives of Partners for Climate Protection Program and to be eligible to receive national recognition for Iqaluit's achievements through the Federation of Canadian Municipalities and CH2M Hill's *Sustainable Community Awards*, the City should consider completing an inventory, forecast and local action plan for the community of Iqaluit. Although participation in the program is voluntary, the Local Action Plan will not be considered complete unless it includes the community component. This report signifies the completion of the corporate component of the project and could be used as a model for a community action plan.

¹⁹ Marbec Resource Consultants Ltd., *Identification of Potential GHG Emission Reductions of Infrastructure Guide Best Practices*, Final Report, 2002, 222 Somerset Street West, Suite 300, Ottawa, Ontario, K2P 2G3

TABLE 11 ACTION ITEMS FOR IMPLEMENTATION

The following table summarizes action items for implementation.

	DESCRIPTION
ACTION 1	➤ Secure funding to hire a project coordinator to implement the Local Action Plan
ACTION 2	➤ Create a steering committee
ACTION 3	➤ Secure funding to have audits conducted on main buildings and facilities
ACTION 4	➤ Develop implementation schedule to provide a project time-line and prioritize reduction actions
ACTION 5	➤ Develop detailed work plans for reduction actions
ACTION 6	➤ Prepare a financial plan to identify implementation costs, payback periods, potential savings and specific funding options
ACTION 7	➤ Develop a communication strategy to create awareness of the City's initiatives
ACTION 8	➤ Develop a local action plan for the community of Iqaluit

5.2 MONITORING SUCCESS

To ensure the City reaches its reduction target, it is essential to routinely monitor its progress throughout the implementation phase. With proper monitoring measures in place, the municipality can quantify reductions to determine energy and cost savings, and identify any co-benefits that result from energy reduction.

In order to monitor progress in reducing GHG emissions, the City needs to allocate resources to collect and maintain relevant data. The following table outlines suggested initiatives that the City can employ to monitor the implementation of the Local Action Plan.

TABLE 12 ACTIONS FOR MONITORING PROGRESS

	DESCRIPTION
ACTION 1	➤ Complete yearly inventories to record GHG emissions from all municipal operations that follow a consistent methodology
ACTION 2	➤ Record benefits that result from implementing reduction measures, such as reduced costs and the increased use of innovative and alternative technologies
ACTION 3	➤ Develop a system for recording the number of kilometers traveled for each City vehicle (at present, there is no means to track fuel consumption for individual vehicles)
ACTION 4	➤ Develop and maintain a database to house all information related to energy use and the reduction of GHG emissions; the database

	<p>should contain, but not be limited to the following information:</p> <ul style="list-style-type: none">• Yearly emissions inventories• Reduction measures implemented and associated energy savings• Long-term goals implemented• Cost savings and other benefits of energy reduction• Funding applications• Funding and financing received• Internal funding allocated• Innovative and/or alternative technologies implemented• Project partners and stakeholders involved
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CONCLUSION

In order to meet its 20 percent reduction target by the year 2014, a collaborated effort from municipal staff, City Council, and community stakeholders is required. The City of Iqaluit has a tremendous opportunity to become a leader in the north for reducing energy consumption and demonstrating its commitment to reducing its GHG emissions. The development and operation of municipalities is definitely moving in the direction of energy efficiency, and this direction has proved to have innumerable benefits.

At present, the arctic is experiencing the effects of climate change and therefore, the time is now for the City of Iqaluit to begin working towards becoming a more efficient, sustainable city. Due to its rapid population growth, Iqaluit has much to gain by making conscience and informed decisions to reduce energy consumption. In doing so, it can begin accruing the many economic, social and environmental benefits that will result from its efforts.

APPENDIX A: DETAILED BREAKDOWN OF ENERGY CONSUMPTION AND TOTAL COSTS BY USE

WATER AND SEWAGE

WATER & SEWAGE	ELECTRICITY (kWh)	TOTAL COST OF ELECTRICITY (\$)	FUEL OIL (L)	TOTAL COST FUEL OIL (\$)	TOTAL COSTS (\$)
WATER TREATMENT PLANT	10,5900	34,678	436,437	226,956	261,634
WATER PUMP STATION 2	18,195	5653	121,410	63,136	68,789
WATER STATION BOOSTER	132,240	48,890	51,727	26,899	75,789
SEWAGE LIFT STATION 1	62,100	20,502			20,502
SEWAGE LIFT STATION 2	22,400	8267			8267
RECIRCULATION STATION	9900	4831			4831
BUILDING 222	15,071	4758	11,732	6101	10,859
MANHOLES	23,767	10,519			10,519
TOTALS	389,573 kWh	\$138,098	621,306 L	\$323,092	\$461,190

BUILDINGS

BUILDING	ELECTRICITY (kWh)	TOTAL COST OF ELECTRICITY (\$)	FUEL OIL (L)	TOTAL COST FUEL OIL	TOTAL COSTS (\$)
GARAGE BLDG. 621	27,319	8187	62,210	32,350	40,537
BLDG. 113 C-D	4306	1711	5094	2649	4360
BLDG. 226, ELDERS' CENTRE	12,023	3889	4691	2439	6328
BLDG. 3040, OKPIK CENTRE	4833	1843	8039	4180	6023
CURLING CLUB	128,640	43,177			43,177
SWIMMING POOL	104,940	34,794			34,794
FUEL PUMPING STATION W-40	5635	2087			2087
WEST 40 SHACK	16,573	5233			5233
BLDG. 1549, MUNICIPAL GARAGE	108,080	33,416	40,270	20,941	54,357
WAREHOUSE	3346	1435			1435
962 PANEL, ARCTIC VENTURES	4536	1462			1462
OLD ARENA AND ZAMBONI ROOM	545,800	167,675	102,399	53,249	220,924
APEX GARAGE	11,479	3708	35,360	18,388	22,096
BLDG. 145A	3432	2351	1810	941	3292
BLDG. 149 A			632	329	329
TOTALS	980,942 kWh	\$310,969	260,505 L	\$135,466	\$446,434

VEHICLE FLEET

VEHICLE FLEET	GASOLINE (L)	TOTAL COST OF GASOLINE (\$)	DIESEL (L)	TOTAL COST OF DIESEL (\$)	TOTAL COSTS (\$)
DIESEL MOTIVE FUEL			253,437	145,032	145,032
GASOLINE MOTIVE FUEL	142,742	81,909			81,909
DAY TANKS			15,083	8716	8716
DAY TANKS (LANDFILL SITE)			1911	1138	1138
TOTAL	142,742 L	\$81,909	270,431 L	\$154,886	\$236,795

STREETLIGHTS

	ELECTRICITY(kWH)	TOTAL COST (\$)
STREETLIGHTS	322,000 kWH	\$150,035

APPENDIX B: POTENTIAL REDUCTION MEASURES

The following tables list sources of emissions, suggested means to reduce emissions, and considerations for implementing the reduction measure. It is important to note that potential energy saving are estimates for illustration purposes and are not based on any completed assessments.

WATER & SEWAGE FACILITIES

REDUCTION MEASURE	CONSIDERATIONS FOR IMPLEMENTING REDUCTION MEASURE	POTENTIAL ENERGY SAVINGS	POTENTIAL COST SAVINGS
Reduce temperature in water loop	Requires an engineering assessment	25% = 180,000 L	\$115,300
Implement conservation measures in facilities	Requires research into conservation measures	10% = 72,400 L	\$46,119
Adopt new technologies such as low flush toilets	Requires research into conservation technologies	10% = 72,400 L	\$46,119

BUILDINGS

REDUCTION MEASURE	CONSIDERATIONS FOR IMPLEMENTING REDUCTION MEASURE	POTENTIAL ENERGY SAVINGS	POTENTIAL COST SAVINGS
Implement conservation measures, such as adjusting air intake systems	Numerous opportunities with measurable results and minimal expenditures	15% = 78,000 L	\$66,965
Adopt new technologies, such as LED lighting	Some capital investment required	5% = 26,000 L	\$22,322

VEHICLE FLEET

REDUCTION MEASURE	CONSIDERATIONS FOR IMPLEMENTING REDUCTION MEASURE	POTENTIAL ENERGY SAVINGS	POTENTIAL COST SAVINGS
Eliminate unneeded vehicles	Requires an inventory and assessment of vehicle fleet	10% of Diesel = 27,000 L 10% of Gas = 14,000 L	\$15,487 + \$8,190 = \$23,677
Develop an anti – idling program	Requires the development of an educational program and buy-in from municipal staff	5% Diesel = 13,000 L 5% of Gas = 7,000 L	\$7,744 + \$4096 = \$11,840
Develop a vehicle tuning program	Reduces pollution, improves efficiency and reduces costs	10% of Diesel = 27,000 L 10% of Gas = 14,000 L	\$15,487 + \$8,190 = \$23,677
Develop a more efficient route for trucked water and sewage	Requires assessment of vehicle routes	5% Diesel = 13,000 L 5% of Gas = 7,000 L	\$7,744 + \$4096 = \$11,840

TOTAL ESTIMATES OF POTENTIAL ENERGY AND COST SAVINGS

USE	TOTAL POTENTIAL ENERGY SAVINGS	TOTAL POTENTIAL COST SAVINGS
BUILDINGS	104,000 L	\$89,287
WATER & SEWAGE	324,800 L	\$207,538
VEHICLE FLEET	80,000 L	\$46,464
TOTALS	508,800 L	\$343,289
VEHICLE FLEET - GASOLINE	42,000 L	\$24,576
POTENTIAL TOTAL COST SAVINGS PER YEAR		\$367,865

An estimate of potential reduction measures is a summation of the numbers in the *POTENTIAL ENERGY SAVINGS* column. Once implementation begins, some of the reduction measures will affect others. It is important to realize that if all reduction measures are implemented, one retrofit will reduce the potential savings of another, and it would therefore not be possible to save the total savings identified. To balance for this, an adjustment to the total savings must be made to compensate for the potential overlap. The final estimate of potential savings is therefore set as 80% of the sum of individual savings.

$$508,800 \text{ litres oil} \times 80 \% = 407,040 \text{ litres oil}$$

$$42,000 \text{ litres gasoline} \times 80 \% = 33,600 \text{ litres gasoline.}$$

The number of kilograms of GHG emission can be calculated by applying the relevant GHG emission coefficient.

$$407,040 \text{ litres oil} \times 2.85 = 1,151,923 \text{ kg eCO}_2$$

$$33,600 \text{ litres gasoline} \times 2.62 = + 88,032 \text{ kg eCO}_2$$

$$= 1,239,955 \text{ kg eCO}_2$$

$$\text{\$367,865 (total cost savings)} \times 80 \% =$$

$$\text{\$294,292 per year}$$

1,239,955 kg eCO₂ represents an approximate 25 percent reduction in GHG emissions.

Based on these preliminary estimations, it seems reasonable to set a reduction target of 20% by the year 2014.

APPENDIX C: POTENTIAL FUNDING SOURCES

GREEN MUNICIPAL ENABLING FUNDS, FEDERATION OF CANADIAN MUNICIPALITIES

- Provides funding to carry out feasibility studies for innovative initiatives
Web site: www.fcm.ca

GREEN MUNICIPAL INVESTMENT FUNDS, FEDERATION OF CANADIAN MUNICIPALITIES

- Provides funding for the implementation of innovative environmental initiatives through low interest loans
Web site: www.fcm.ca

ABORIGINAL CLIMATE CHANGE ACTION PROGRAM, DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS CANADA

- Provides funding for communities to undertake climate change initiatives
Web site: www.climatechange.gc.ca

COMMERCIAL BUILDING INCENTIVE PROGRAM, OFFICE OF ENERGY EFFICIENCY, NATURAL RESOURCES CANADA

- Offers financial assistance for the incorporation of energy efficiency features in new commercial and institutional buildings
Web site: www.oeenrcan.gc.ca

ENERGY INNOVATOR INITIATIVE, OFFICE OF ENERGY EFFICIENCY, NATURAL RESOURCES CANADA

- Encourages energy efficient commercial and institutional building retrofits
Web site: www.oeenrcan.gc.ca

AFFORDABILITY AND CHOICE TODAY (ACT) PROGRAM

- Provides funding to community teams made up of builders, developers, architects, planners, municipal staff, and others to reduce barriers to building better homes
Web site: www.actprogram.com

RENEWABLE ENERGY & ELECTRICAL DIVISION, OFFICE OF ENERGY EFFICIENCY, NATURAL RESOURCES CANADA

- Administers renewable energy projects such as Renewable Energy Deployment Initiative, Wind Power Production Incentive, and Renewable Energies Technology Program
Web site: <http://www.nrcan.gc.ca>

CANADA MORTGAGE AND HOUSING CORPORATION

- Provides in-kind and financial support for technical advice or involvement at a research level, and organizes design charettes
Web site: <http://www.cmhc-schl.gc.ca>

MUNICIPAL RURAL INFRASTRUCTURE FUND, CANADA, AND STRATEGIC INVESTMENT FUND, INFRASTRUCTURE CANADA

- Provides a host of funding programs to address provincial, territorial and municipal infrastructure needs

Web site: <http://www.infrastructurecanada.gc.ca>

Eco-ACTION: A COMMUNITY FUNDING PROGRAM OF ENVIRONMENT CANADA

- Provides financial support for community organizations with positive, measurable impacts on the environment; priority for funding is given to projects that focus on climate change

Web site: www.ec.gc.ca/ecoaction/