



# City of Revelstoke

## Corporate Energy and Greenhouse Gas Emission Inventory and Reduction Strategy



March 2011



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# Executive Summary

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Greenhouse gases that accumulate in the earth's atmosphere act as a blanket which prevents the sun's heat from escaping. While these gases are necessary for life to exist on earth, an increase in greenhouse gases in the last century has resulted in a trend toward global warming. As a result, countries around the world are creating policies and examining methodologies to reduce our reliance on fossil fuels and to create a low carbon society, reducing the release of carbon dioxide into the atmosphere.

The Federation of Canadian Municipalities administers the Partners for Climate Protection Program that sets a five milestone approach to measure greenhouse gas emissions and take action to reduce energy consumption and emissions. The five milestones are:

1. Create a greenhouse gas inventory and forecast.
2. Set an emission reduction target.
3. Develop a local action plan that outlines how emissions and energy use will be reduced.
4. Implement the action plan.
5. Monitor progress and report results.

The program is part of ICLEI (International Council for Local Environmental Initiatives) Local Governments for Sustainability, Cities for Climate Protection Network, which involves more than 900 communities worldwide. The City of Revelstoke became a member of the Partners for Climate Protection Program in 2006.

The Government of British Columbia has also implemented legislation, policies and actions to address climate change. One of the actions at the municipal level was to create the voluntary Climate Action Charter and a joint Provincial Government –UBCM Green Communities Committee to support local governments in planning and implementing climate change initiatives. The Climate Action Charter commits signatory municipalities to become carbon neutral in municipal operations by 2012. To be carbon neutral means there is no net release of carbon or greenhouse gas emissions into the atmosphere as a result of city operations. Being carbon neutral with current technologies is difficult. As a result, it is achieved through a combination of reductions and offsets. The steps to being carbon neutral are:

1. **Measure** greenhouse gas emissions
2. **Reduce** where possible
3. **Offset** the remaining emissions by purchasing carbon offsets
4. **Report** to the Provincial-UBCM Green Communities Committee on the above actions

The City of Revelstoke signed the Climate Action Charter in the fall of 2008.

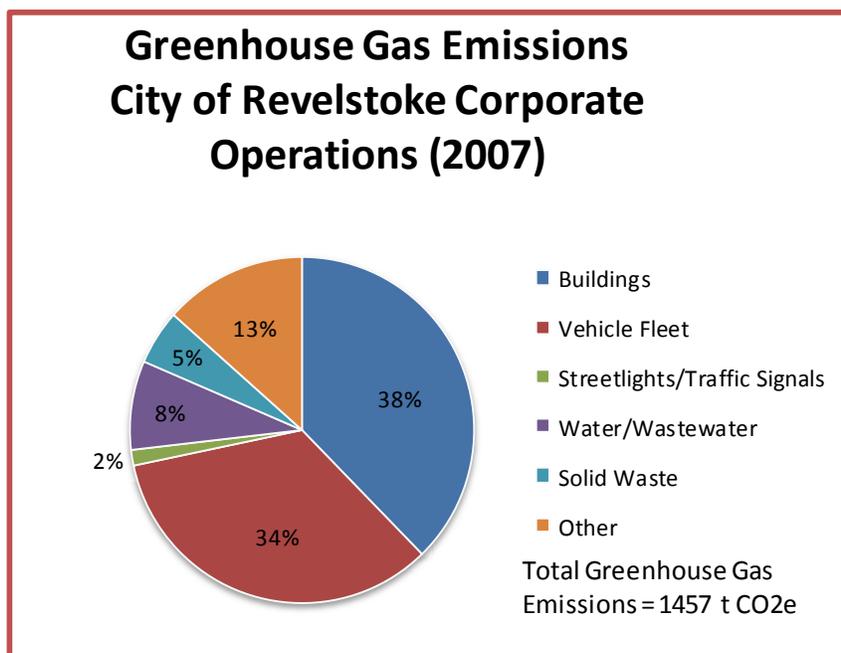
International standards for creating a greenhouse gas emission inventory for municipal operations follow the International Local Government GHG Emissions Analysis Protocol. Following this protocol, a municipality is responsible for emissions where they have financial or operational control, and therefore

the ability to make changes. Under the Climate Action Charter, the joint Provincial-UBCM Green Communities committee has established criteria based on “traditional services”, a group of services that municipalities typically provide and are responsible for to be carbon neutral.

This report has been written to meet the criteria of the Local Government GHG Emission Analysis Protocol and to achieve Milestones 1-3 of the Partners for Climate Protection Program for corporate operations. This includes a greenhouse gas emissions inventory and forecast, a reduction target, and an energy and emissions reduction strategy. The report also identifies emissions that the City will be responsible for to meet the commitment made under the Climate Action Charter to be carbon neutral by 2012.

By creating a greenhouse gas emissions inventory, a local government can quantify its energy consumption, energy spending and the resulting greenhouse gas emissions or carbon footprint. Data was gathered for each of the following sectors:

- Municipal Buildings
- Vehicle Fleet
- Streetlights/Traffic Signals
- Water/ Wastewater
- Corporate Solid Waste
- Other.



**Figure 1: Greenhouse Gas Emissions per Sector, City of Revelstoke Corporate Operations Inventory, 2007.**

The “Other” sector compiles emissions mainly from Revelstoke Community Forest Corporation, and contracted out services, over which the City has financial or operational control.

A baseline year of 2007 was chosen to be consistent with the Community Energy and Emission Inventory (CEEI) done by the province, which quantifies energy consumption and greenhouse gas emissions for the community as a whole.

Data was also collected for 2008 and 2009.

The total greenhouse gas emissions for all sectors of corporate operations in 2007 were 1457 tonnes CO<sub>2</sub>e. The breakdown of emissions for each sector can be seen in Figure 1. From this inventory, the emissions that are a result of “traditional services”, and need to be measured under the Climate Action Charter are 1178 tonnes CO<sub>2</sub>e. These are the emissions that will need to be reduced or offset to be carbon neutral in corporate operations in 2012.

A greenhouse gas emission forecast was done for corporate operations for the ten year period 2007 to 2017. Forecasting is done using a “business-as-usual” approach, predicting population growth and the resulting impact on municipal services. Forecasting is difficult, particularly in Revelstoke, where the impact on population growth over the next ten years is unclear since the opening of Revelstoke Mountain Resort in 2007. While forecasting is challenging, it aids in setting reduction targets, which are absolute reductions from the baseline year of 2007.

The forecasted emissions for 2017 is an estimated increase of approximately 248 tonnes CO<sub>2</sub>e. This is a “business-as-usual” approach based on operations in 2007 and does not take into account reduction actions that have occurred since 2007, or changes in technology that may occur.

Collecting data on greenhouse gas emissions, energy and energy spending aids in identifying opportunities to reduce energy, save money and reduce emissions. Figure 2 shows greenhouse gas emissions, energy consumption and spending for

each sector in 2007. The “Other” and “Solid Waste” categories have been omitted for this comparison.

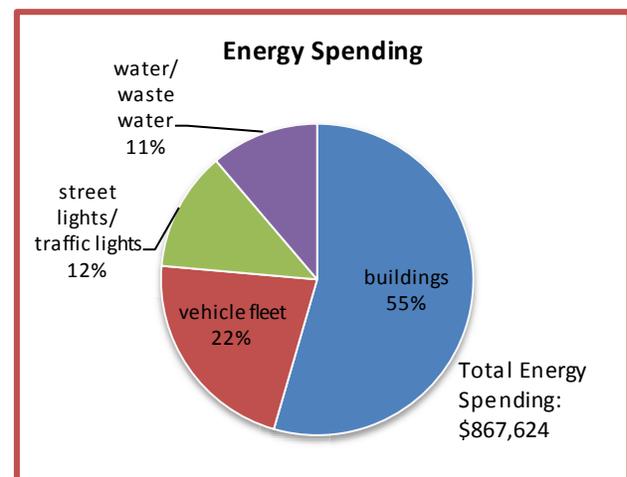
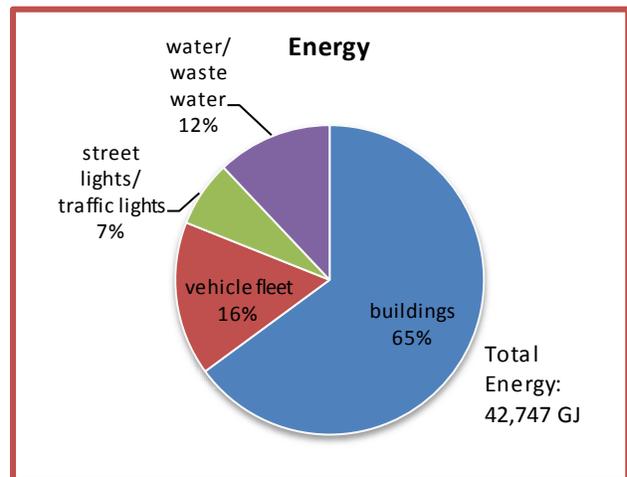
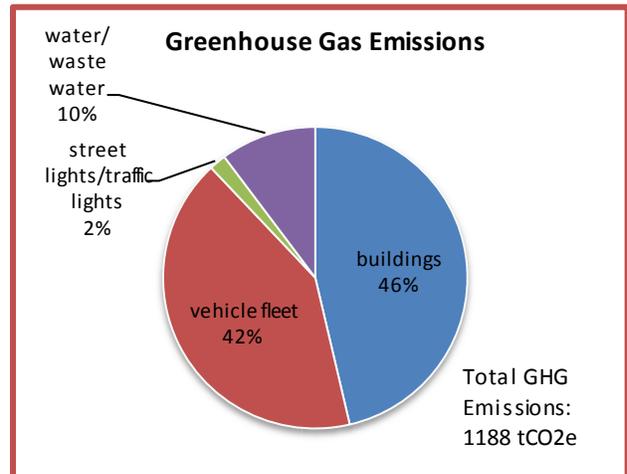


Figure 2: Greenhouse Gas Emissions, Energy and Energy Spending by Sector, City of Revelstoke Corporate Operations, 2007.

To gain a further understanding of energy used in corporate operations, the emissions, energy consumption and energy spending are compared for each of the five energy sources, electricity, propane, district heating, gas and diesel. This comparison is seen in Figure 3.

Greenhouse gas emissions calculated for electricity are the resulting emissions from the creation of electricity, while emissions from gasoline, diesel, and propane are emissions as a direct result of combustion of fuel. District heating in Revelstoke is heat produced from the burning of waste wood or biomass. Although biomass is considered carbon neutral, propane is also used for district heating to meet peak demands. The greenhouse gas emissions for district heating are a result of the propane used.

Reductions in each energy type impact greenhouse gas emissions and energy spending differently. While a reduction in electricity will save money, it will not have a large impact on reducing emissions. A reduction in vehicle fuel or propane will have a much greater impact on reducing emissions and may also save on energy spending. A balanced approach is needed to address reduction actions which evaluate cost to implement, energy and cost savings and reduction in greenhouse gas emissions.

A review of each sector of corporate operations, resources available through the Partners for Climate Protection Program, the BC Climate Action Toolkit, actions and policies implemented in other communities, the Carbon Neutral Kootenay Action Guide and consultation with municipal staff was conducted to identify actions to reduce energy consumption and decrease emissions.

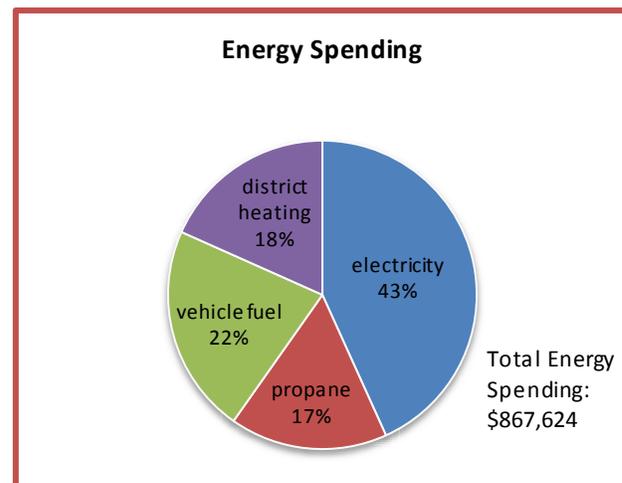
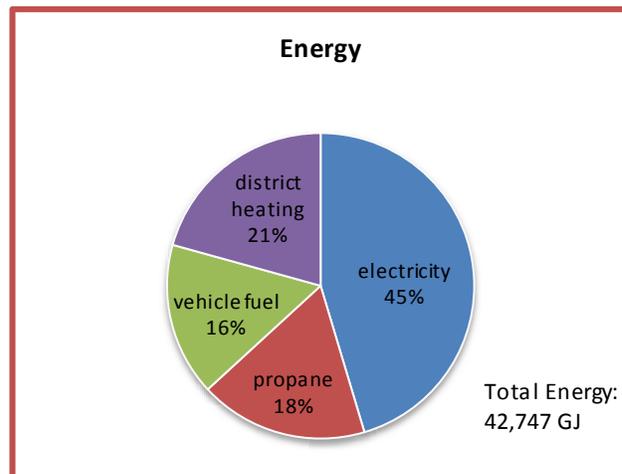
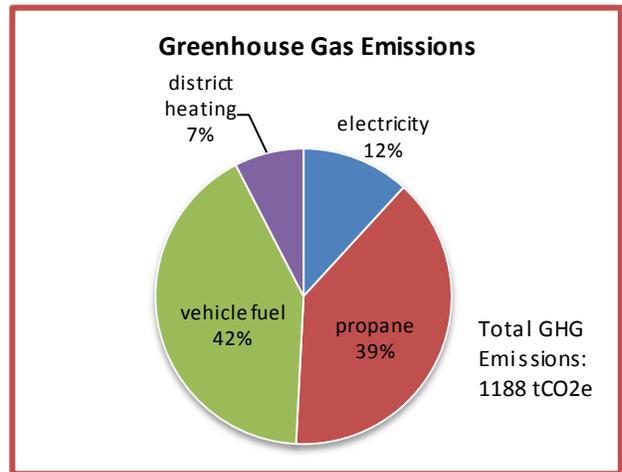


Figure 3: Greenhouse Gas Emissions, Energy and Energy Spending by Energy Source, City of Revelstoke Corporate Operations 2007.

Fifteen recommended actions have been identified:

**1. Conduct comprehensive energy audits and opportunity assessments of all municipal buildings**

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Using a qualified Energy Advisor conduct energy audits to assess opportunities to increase energy efficiencies, save money and reduce greenhouse gas emissions. Areas that should be considered include HVAC energy cost savings strategies, lighting recommendations and building envelope improvements.

**2. Establish a Green Building Policy**

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Establish a Green Building policy which commits the City to achieve a given standard that reduces energy consumption and greenhouse gas emissions when building new buildings or retrofitting existing buildings.

**3. Implement an Energy Efficient Equipment Policy**

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An Energy Efficient Equipment Policy would commit the City to purchase equipment such as appliances, office equipment and consumer electronics that are energy efficient.

**4. Implement a Corporate Idle Reduction Policy including driver education and awareness**

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Implement a Corporate Idle Reduction Policy which is directed toward all City staff including contracted out snow removal. Driver education and awareness of idling reduction practices can lead to reduced fuel consumption and will show leadership to the community as a whole.

**5. Ensure vehicle data collection and preventative maintenance scheduling are in place.**

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Ensuring vehicle data is collected including tracking of kilometers travelled, fuel consumed and downtime, allows for evaluation of fuel efficiency and life cycle costing of vehicles in the fleet.

**6. Establish a Fuel Efficient Vehicle Purchasing Policy**

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When purchasing vehicles use “right sizing” and life cycle costing. Determine what the vehicle is being used for and whether a more fuel efficient vehicle can be purchased.

**7. Consider alternative fuels and technologies**

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Evaluate options, cost and feasibility to use a non-food grade biodiesel in the city vehicle fleet.

**8. Continue to improve energy efficiency in streetlights and traffic signals**

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Evaluate the capital cost, cost savings and payback period for replacing lights in signs and ornamental lighting with more energy efficient bulbs.

### 9. Optimize operation of water and waste water infrastructure

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Continue to improve energy efficiency in water and wastewater infrastructure.

### 10. Encourage water conservation

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Expand existing water conservation measures.

### 11. Reduce solid waste through diversion

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Increase the number of recycling containers at municipal facilities. Place containers directly beside waste garbage containers to increase the ease of recycling.

### 12. Encourage energy and emissions reduction in contracted out services

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Include contractors in energy and emissions initiatives including anti-idling awareness programs, and alternative fuels. Require all new contracts to provide fuel consumption data.

### 13. Ensure ownership of the plan

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Ensure there are adequate staff resources to implement and monitor the plan and that energy and emission reductions are recorded and communicated to the community.

### 14. Engage municipal staff

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Engaging staff and achieving “buy-in” are important for successfully implementing actions where a behavioural change is required. Through workshops ensure an understanding of greenhouse gas emissions and impact on global warming and climate change. Through further municipal engagement, potential obstacles, alternatives or missed opportunities in general operations may be identified.

### 15. Establish an Energy and Emissions Reduction Program

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Establish an Energy and Emissions Reduction Program to finance some of the initiatives and actions that have been identified in this report. Funding of \$20,000 annually, beginning in 2012, would allow for reduction projects that will further reduce emissions and save on the cost of paying carbon offsets in 2012.

The Partners for Climate Protection Program recommends setting a reduction target of 20% from baseline over a ten year period for corporate operations. Given the reduction potential in the above actions it is recommended that Revelstoke adopt a 20% reduction target from 2007 baseline by 2020. However, this target should be re-evaluated in 5 years, in the event the community sees a much larger increase in population and demand on municipal services compared with the assumptions used to create the energy and emissions forecast. The year 2020 was chosen as a target year to be consistent with the year chosen in the Community Energy and Emissions Plan (CEEP).

Many of the recommended actions require increased education and awareness, and research toward implementation of new “Green” policies, which will not require a lot of funding. Until energy audits and opportunity assessments are completed for municipal buildings and water/waste water infrastructure, it is unclear what opportunities exist and what the financial impact might be.

The funds in an Energy and Emission Reduction Program (recommendation 15) will likely be adequate funding for completion of energy audits on most, if not all, municipal buildings. Following completion of this opportunity assessment, an implementation strategy for the plan should be completed that details potential projects, a timeline, capital cost, payback period, energy saved and resulting cost savings and greenhouse gas reduction. Potential funding opportunities for implementation of the plan are detailed in the report.

It is not completely clear at this time what it will cost to be carbon neutral in corporate operations in 2012. Currently the cost of carbon offsetting by Pacific Carbon Trust, a British Columbia Provincial Crown Corporation is \$25/tonne CO<sub>2</sub>e. Assuming this cost, carbon offsetting based on 2007 emissions will be \$29,450. Based on 2007 energy consumption, the Carbon Action Revenue Incentive Plan (CARIP) funding in 2012 will be approximately \$24,900. The CARIP is a grant equal to 100% of the provincial carbon tax paid as a direct expenditure by a local government.

As different options to offset carbon under the Climate Action Charter are being developed it will be important to address possible ways to meet carbon offset requirements through investing in Revelstoke Community Energy Corporation (RCEC) and Revelstoke Community Forest Corporation (RCFC).

To allow for monitoring of the reduction actions identified in this report, and to quantify emission reductions and identify successes, it is important to annually track energy consumption, emissions and energy spending in an updated spreadsheet. It is important that emissions related to “traditional services” that fall under the City’s carbon obligations under the Climate Action Charter are readily identified.

Options for potential funding for implementation of the recommended actions and toward completion of Milestone 4 (Implementation) and Milestone 5, (Monitoring Progress and Reporting) of the Partners for Climate Protection Program are detailed in this report.

# Acknowledgements

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The City of Revelstoke would like to acknowledge the Carbon Neutral Kootenay Project, an initiative jointly funded by the Regional Districts of Central Kootenay, East Kootenay and Kootenay Boundary and the Columbia Basin Trust and implemented by the Sheltair Group (now Stantec) and The Community Energy Association. The City of Revelstoke was one of 28 municipalities included in this project.

A spreadsheet and initial compilation of data completed by the Carbon Neutral Kootenay project was built upon to create this energy and greenhouse gas emissions inventory. Also, the “Carbon Neutral ACTION guide, A Starting Point for Local Governments” developed by the Carbon Neutral Kootenay project formed a framework to identify potential energy and emissions reduction opportunities.

Thank you to City staff for their input, for providing data, and answering many questions. Particular thanks to Elaine Greenwood, and Tina Miertsch for gathering and inputting data.

The following people were also instrumental in providing the necessary data to complete this energy and emissions inventory:

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- Darrel O’Shaughnessy, Commissionaires
- John Franks, Revelstoke Golf Course
- Horst Miola, Williamson Lake Campground
- Margaret Pacaud, Visual Arts Society

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# 1.0 Introduction

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## 1.1 Climate Change and Greenhouse Gases

Climate change refers to variations in the earth's atmosphere over time including global or regional changes in temperature, pressure or weather. One type of climate change that has been observed in recent decades is global warming. Scientific findings of the Intergovernmental Panel on Climate Change (IPCC) indicate "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperature widespread melting of snow and ice, and rising global average sea level".<sup>1</sup>

It is widely recognized that global warming is caused by an increase in greenhouse gases in the atmosphere as a result of human activity. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide and other gases. These gases accumulate in the atmosphere to form an invisible blanket-like layer that traps heat within the atmosphere. Although greenhouse gases are necessary to trap the heat needed to make life on earth possible, it is when their balance is changed that global warming is created.

This balance is thrown off by human activity that increases greenhouse gases into the atmosphere, such as the burning of fossil fuel or decreases in carbon sinks that reduce the levels of carbon dioxide, like deforestation. The main greenhouse gases emitted by human activity are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Each gas has a greenhouse gas potential, where some have more impact as a greenhouse gas compared to others. For example, the greenhouse gas potential for methane is 21 times that of CO<sub>2</sub>. To allow for a better understand and tracking of greenhouse gases, all gases are expressed in terms of their potential in relation to CO<sub>2</sub> or their CO<sub>2</sub> equivalent, CO<sub>2</sub>(e).

## 1.2 Partners for Climate Protection

The Partners for Climate Protection Program is the Canadian component of ICLEI's (International Council for Local Environmental Initiatives) Local Governments for Sustainability, Cities for Climate Protection network, which involves more than 900 communities worldwide. The program is administered through the Federation of Canadian Municipalities and is a network of Canadian municipal governments that have committed to reducing greenhouse gases and taking action on climate change. Currently 210 Canadian municipalities are members, with 65 of them being in British Columbia.

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<sup>1</sup> International Panel for Climate Change, "Summary for Policymakers", Climate Change 2007: Synthesis Report, [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf), assessed on-line October 20, 2010.

The program consists of a five milestone framework to be completed for both the local government's corporate operations and for the community as a whole:

1. Create a greenhouse gas inventory and forecast.
2. Set an emission reduction target.
3. Develop a local action plan that outlines how emissions and energy use will be reduced.
4. Implement the action plan.
5. Monitor progress and report results.

To date, 21 municipalities in British Columbia have completed at least the first three milestones for corporate operations, and 11 municipalities have also completed these milestones for the community as a whole. The City of Vancouver and the Resort Municipality of Whistler are the only municipalities in British Columbia to have completed all five milestones for both corporate operations and the community as a whole.<sup>2</sup>

### 1.3 British Columbia's Climate Action Plan

The Provincial government has recently created a number of programs and legislation to take action on climate change. Bill 44 (2007) Greenhouse Gas Reduction Target Act has established a province wide greenhouse gas emissions reduction target of 33% below 2007 levels by 2020, and a reduction of 80% by 2050.

A Provincial Climate Action Plan has been developed to meet these targets, and is aimed at reducing greenhouse gas emissions in all sectors of the province's economy, requiring all ministries and other public sector organizations to be carbon neutral by 2010.

Recognizing that local governments have influence over approximately half of the provinces greenhouse emissions, the provincial government created:

1. **Bill 27 (2008) Local Government (Green Communities) Statutes Amendment Act** which requires local governments include reduction targets, policies and actions in their Official Community Plans by May 31<sup>st</sup> 2010 and in Regional Growth Strategies by May 31<sup>st</sup> 2011. Bill 27 also gives local governments a number of tools to help reduce greenhouse gas emissions, conserve energy and work toward creating more compact and sustainable communities. These include expanded Development Cost Charge authority, new development permit area designations and greater authority to vary off-street parking.

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<sup>2</sup> Federation for Canadian Municipalities, Partners for Climate Protection. <http://fmv.fcm.ca/Partners-for-Climate-Protection/milestones/British-Columbia.asp>, assessed on-line October 2010.

2. **The Climate Action Charter** a voluntary charter, where signatories commit to:
  - Being carbon neutral in their municipal operations by 2012.
  - Measuring and reporting on their community greenhouse gas emission profile (currently being completed by the Community Energy Emission Initiative (CEEI) through the Ministry of the Environment).
  - Creating complete, compact and more energy efficient communities.

## 1.4 Carbon Neutrality

Under the Climate Action Charter the joint Provincial Government –UBCM Green Communities Committee was created to support local governments in planning and implementing climate change initiatives toward being carbon neutral in their operations by 2012. To be carbon neutral in corporate operations means there is no net release of carbon or greenhouse gas emissions into the atmosphere as a result of city operations. Being carbon neutral with current technologies is difficult. As a result carbon neutrality is reached through a combination of reductions and offsets. The steps to being carbon neutral are:

1. **Measure** the GHG emissions in corporate operations
2. **Reduce** the emissions where possible
3. **Offset** the remaining emissions by purchasing carbon offsets
4. **Report** to the Provincial-UBCM Green Communities Committee on the above actions

A carbon offset is a reduction in carbon that occurs by others through a project or activity, often referred to as a carbon credit. To become carbon neutral the local government is required to purchase qualified carbon offsets or greenhouse gas reduction projects. The criteria for a local government greenhouse gas reduction project are currently under review by the Green Communities Committee.<sup>3</sup>

## 1.5 Community Profile

Revelstoke is located within the Columbia Mountains in the Interior of British Columbia, approximately midway between Calgary and Vancouver. The City is located on the Columbia River, nestled between the Monashee mountain range to the West and the Selkirk mountain range to the East, with a population estimated to be 8,125.<sup>4</sup> Although Revelstoke is located along two main transportation corridors, the Trans-Canada Highway and the mainline of the Canadian Pacific Railway, the City is relatively isolated, with the closest community in any direction being approximately an hour away.

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<sup>3</sup> The Workbook, Helping Local Governments Understand How to be Carbon Neutral in their Corporate Operations, UBCM, Province of British Columbia, September 2010.

<sup>4</sup> City of Revelstoke's webpage, [www.cityofrevelstoke.com](http://www.cityofrevelstoke.com), assessed on-line, October 2010.

Revelstoke is a vibrant mountain community that takes pride in its beautiful mountain setting and many recreational and cultural opportunities. Revelstoke Mountain Resort opened in 2007, with additional expansion in 2008, boasting the longest vertical ski run in North America.

## 1.6 Revelstoke Community Energy Corporation (RCEC)

Revelstoke is a leader in district heating, being the first City in British Columbia in 2005 to build a biomass-fired district heating system. Revelstoke Community Energy Corporation is a wholly owned subsidiary of the City of Revelstoke and provides district heating to ten buildings in the community, including the Community and Aquatic Center, City Hall and the Arena.

Wood waste from the local mill, Downie Timber Ltd., is used in a biomass boiler to provide steam for Downie's kilns and heat for district heating. Using locally produced renewable fuel reduces the community's dependence on non-renewable fossil fuels, primarily propane. The burning of biomass is considered carbon neutral because the emitted carbon dioxide would have eventually been released in natural processes when the biomass died and decayed, and is therefore considered to be part of the natural carbon cycle.<sup>5</sup> Emissions related to the burning of propane which is used to manage peak demand and ensure a reliable heating source needs to be accounted for when determining the greenhouse gas emissions related to district heating.

District heating was initially studied as a means of diverting wood waste from a beehive burner at Downie's saw mill. The resulting district heating system has improved air quality, created increased energy self-sufficiency, reduced energy costs, created local employment, retained energy revenue in the community and reduced greenhouse gas emissions.<sup>6</sup>

## 1.7 Revelstoke's Commitment to Climate Change

The City of Revelstoke has showed a commitment to tackling environmental concerns and addressing climate changes through the following actions:

- The City of Revelstoke's vision statement includes "Revelstoke will be a leader in achieving a sustainable community by balancing environmental, social and economic values within a local, regional and global context".<sup>7</sup>

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<sup>5</sup> International Local Government GHG Emissions Analysis Protocol (IEAP), Version 1.0 (October 2009) - ICLEI

<sup>6</sup> Revelstoke Community Energy Corporation, A Community Partnership in Energy Innovation, [http://www.cityofrevelstoke.com/pdf/RCEC%20brochure\\_100110.pdf](http://www.cityofrevelstoke.com/pdf/RCEC%20brochure_100110.pdf), assessed on-line December 7, 2010.

<sup>7</sup> City of Revelstoke Official Community Plan, July 2009

- In June of 2006 the City of Revelstoke joined the Partners for Climate Protection program (Appendix A) and in the fall of 2008 became a signatory to the Climate Action Charter.
- A list of goals and targets relating to solid waste management, air quality, water, and climate change and energy conservation have been included in the Revelstoke and Area Community Development Action Plan (2007).
- A community wide greenhouse gas reduction target of 6% below 2007 levels by 2020, a sustainability framework with a list of goals, and a Smart Growth Development Checklist were adopted into the Official Community Plan in 2010.
- A Community Energy and Emission Plan (CEEP) and a District Energy Expansion Pre- Feasibility Study (DEEP) for Revelstoke Community Energy Corporation (RCEC) are being completed.
- The City of Revelstoke has contracted an Environmental Sustainability Coordinator.

## 1.8 Objectives of the Corporate Greenhouse Gas Emissions Inventory and Reduction Strategy

The objectives of this report are to:

- Provide a better understanding to municipal staff and City Council regarding climate change and the City's obligations under the Climate Action Charter and the Partners for Climate Protection program.
- Show leadership by the City of Revelstoke in addressing corporate emissions and actions.
- Meet the criteria for Milestones 1, 2 and 3 of the Partners for Climate Protection Plan for corporate emissions (The Community Energy and Emission Plan (CEEP) is addressing community emissions).
- Develop a greenhouse gas emission inventory that also meets the criteria of the provincial Climate Action Charter.
- Develop a set of actions that will reduce energy consumption, decrease expenditure on energy and reduce greenhouse gas emissions.
- Provide an understanding of the City's financial obligations to becoming carbon neutral in its operations by 2012.
- Address key environmental priorities identified in the Revelstoke and Area Community Development Action Plan 2007: greenhouse gas inventory and reduction plan, water conservation, municipal energy conservation practices, and 'green' building bylaws.
- Provide guidance on implementing the plan and possible funding opportunities.

## 2.0 Energy and Greenhouse Gas Emissions Inventory – Milestone One

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### 2.1 Methodology

An inventory of greenhouse gas emissions has been compiled following the criteria established by the International Local Government Greenhouse Gas Emission Analysis Protocol (IEAP). This protocol has been developed by ICLEI Local Governments for Sustainability, and is informed by a number of documents including ISO 14064 Greenhouse Gases Series of Standards. This protocol requires all emissions are attributed to the organization that has financial or operational control of the activity, since they have the ability to make changes that will impact the level of emissions.

Fuel consumption data and activity estimates have been collected for each of the sectors in Table 1 for municipal operations as detailed by the Partners for Climate Protection outline.<sup>8</sup> An additional sector “Other” has been added which is detailed in section 2.8. Data for 2007, 2008 and 2009 was collected and entered into a spreadsheet developed by the Carbon Neutral Kootenays Project.

**Table 1: Sectors in Municipal Operations**

Municipal Operations
Buildings
Vehicle Fleet
Streetlights/Traffic Signals
Water/Wastewater
Solid Waste
Other

### 2.2 Emission Factors

In the majority of cases, the most significant greenhouse gas emissions in a local government inventory are carbon dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O).<sup>9</sup> Gases that have been identified as greenhouse gases have been given a global warming potential compared to that of CO<sub>2</sub>, resulting in greenhouse gas inventories being expressed as an overall amount of tonnes of carbon dioxide

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<sup>8</sup> Developing Inventories for Greenhouse Gas Emissions and Energy Consumption: A Guidance Document for Partners for Climate Protection in Canada, Federation for Canadian Municipalities (FCM)

<sup>9</sup> International Local Government GHG Emissions Analysis Protocol (IEAP) Version 1.0 (October 2009)

equivalent or CO<sub>2</sub>(e). Emission factors have been calculated to take into account all of the greenhouse gases generated from a given energy use and given a value in CO<sub>2</sub>e. The tonnes of CO<sub>2</sub>e emission can be calculated for a specific fuel type by multiplying the fuel consumed by its emission factors.

Ex: Fuel consumed x emission factor = GHG emission in CO<sub>2</sub>e

$$420 \text{ L of gasoline} \times 0.00238 \text{ tCO}_2\text{e/L} = 1 \text{ tonne CO}_2\text{e}$$

A direct emission factor calculates the emissions as a result of directly burning a fuel, as in the case of diesel, gasoline, and propane. An indirect emission factor, as in the case of electricity, represents the emissions in the production of the electricity. The emission factor for solid waste calculates the landfill gases of CO<sub>2</sub> and methane as a result of the anaerobic decomposition of biomass.

The emission factors used in this inventory are taken from the initial inventory done by the Carbon Neutral Kootenay Project. The emission factors and sources are detailed in the chart below.

**Table 2: Emission Factors for 2007 – 2009. Adopted from the Carbon Neutral Kootenays Energy Consumption Greenhouse Gas Emissions Inventory.**<sup>10</sup>

Energy Source	GHG emission Factor	Units	Source	notes
BC Hydro	26	tonnes CO <sub>2</sub> e/GWh	Smart tool for Carbon Neutral Government	BC Hydro 3 year average intensity of BC
Propane	0.00154 0.061 0.025	tonnes CO <sub>2</sub> e/L tonnes CO <sub>2</sub> e/GJ GJ/L	Environment Canada. Canada's GHG Emissions Inventory.	
Natural Gas	0.051	tonnes CO <sub>2</sub> /GJ	Terasen Gas	
Gasoline	0.00238 0.036	tonnes CO <sub>2</sub> e/L GJ/L	Environment Canada. Canada's GHG Emissions Inventory	
Diesel	0.00279 0.038	tonnes CO <sub>2</sub> e/L GJ/L	Environment Canada Canada's GHG Emissions Inventory	
Biodiesel (B5)	0.00265 0.0377	tonnes CO <sub>2</sub> e/L GJ/L	Environment Canada Canada's GHG Emissions Inventory	Tailpipe emissions only, prorated from diesel emissions, based on biodiesel content
Biodiesel (B10)	0.00251 0.0377	tonnes CO <sub>2</sub> e/L GJ/L	Environment Canada Canada's GHG Emissions Inventory	
Biodiesel (B20)	0.00223 0.0377	tonnes CO <sub>2</sub> e/L GJ/L	Environment Canada Canada's GHG Emissions Inventory	
Solid Waste	0.482	tonnes CO <sub>2</sub> e/tonne of solid waste	PCP/ICLEI spread sheet tool	

<sup>10</sup> Carbon Neutral Kootenays, Local Governments and First Nations Reducing Emissions Energy Consumption Greenhouse Gas Emissions Inventory for Revelstoke, draft report April 2010.

## 2.3 Municipal Buildings Emissions Inventory

Electricity, district heating and propane consumption, resulting greenhouse gas emissions and costs were compiled for municipal buildings and buildings owned by the City. Data was collected from an Account History Record provided by BC Hydro and billing information from Terasen Gas and Revelstoke Energy Corporation (RCEC).

### 2.3.1 Electricity

Electricity consumption, greenhouse gas emissions and expenses for electricity used for Municipal Buildings are detailed in Table 3.

Table 3: Municipal Buildings - Electricity Consumption, Greenhouse Gas Emissions, and Cost

Buildings	Electricity (kWh)			GHG Emissions (tonnes CO <sub>2</sub> e)			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
City Hall	105,720	120,840	124,440	2.75	3.14	3.23	7,484	8,823	9,563
Public Works	135,353	147,440	131,600	3.52	3.83	3.42	9,470	10,327	9,806
RCMP	281,600	220,160	243,200	7.32	5.72	6.32	17,111	15,273	17,309
Community/ Aquatic Center	1,438,040	1,142,440	1,144,000	37.38	29.70	29.74	71,501	62,998	66,989
Fire Station	135,840	137,520	156,000	3.53	3.58	4.06	11,777	12,842	14,566
Arena/Curling Rink	834,480	767,880	784,080	21.70	19.96	20.39	45,235	43,713	47,566
Revelstoke Museum	21,778	18,841	24,888	0.57	0.49	0.65	1,557	1,421	1,944
Courthouse	353,600	332,640	303,280	9.19	8.65	7.89	18,031	19,136	18,462
Century Vallen	0	0	1,008	0	0	.03	0	0	92
Golf Course	148,882	166,768	145,296	3.87	4.34	3.78	10,495	12,227	11,700
Visual Arts Center	27,981	30,147	33,544	0.73	0.78	0.87	2,060	2,278	2,642
Forestry Museum	16,197	12,689	11,670	0.42	0.33	0.30	1,171	974	941
Williamson Lake campground	42,543	47,422	47,094	1.11	1.23	1.22	3,571	4,245	4,228
Townley building	2,051	3,201	1,827	0.05	0.08	0.05	195	285	194
Queen's Park washrooms	2,197	973	519	0.06	0.03	0.01	371	252	212
Centennial Park washrooms	4,241	4,500	23,640	0.11	0.12	0.61	428	419	1977
Grizzly Plaza washrooms	11,144	16,204	14,782	0.29	0.42	0.38	829	1198	1161
Beruschi Park amenity building	13,487	11,475	19,598	0.35	0.30	0.51	984	837	1495
<b>Total</b>	<b>3,575,134 kWh</b>	<b>3,181,140 kWh</b>	<b>3,210,466 kWh</b>	<b>93.0 tCO<sub>2</sub>e</b>	<b>82.7 tCO<sub>2</sub>e</b>	<b>83.5 tCO<sub>2</sub>e</b>	<b>\$202,270</b>	<b>\$197,248</b>	<b>\$210,847</b>

### 2.3.2 District Heating

The Community and Aquatic Center, and the Arena use district heating. City Hall was connected at the end of 2009, and since it only used district heating for two weeks in 2009, it was not included in the 2009 data. Although district heating is predominately fueled by biomass, which is considered carbon neutral, the facility also utilizes propane to manage peak energy needs. A portion of the propane used by Revelstoke District Energy Corporation has been partitioned to each of the facilities using district heating according to their consumption.<sup>11</sup> It should be noted that the large increase in propane consumption seen in 2009 was a result of a fire at RCEC. Historically RCEC utilizes 85% biomass and 15% propane in its operations.<sup>12</sup> Energy consumption, propane petitioning, greenhouse gas emissions and cost for district heating for municipal building are detailed in Table 4.

The information collected for each of these years is based on actual propane consumption at RCEC in each year, and a distribution to each facility based on their proportion of total consumption of the steam produced at the facility. It may be appropriate in future inventory years to establish an emission factor for RCEC, based on historic propane/biomass consumption using the methodology described in the Local Government Protocol (2009).

**Table 4: Municipal Buildings – District Heating Consumption, Cost and Propane Used.**

District heat	MWh			GJ			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
<b>Arena</b>	323.5	342.0	322.0	1164.6	1231.2	1159.2	30,004	31,789	31,568
<b>Community/Aquatic Center</b>	2,131.9	2,281.1	1,937.9	7,674.8	8,211.9	6,976.4	128,936	135,650	128,791
<b>Total</b>	<b>2455.4</b> MWh	<b>2623.1</b> MWh	<b>2259.9</b> MWh	<b>8839.4</b> GJ	<b>9443.1</b> GJ	<b>8135.6</b> GJ	<b>\$158,940</b>	<b>\$167,439</b>	<b>\$160,359</b>

District heat	Propane used at RCEC(GJ)			GHG Emissions		
	2007	2008	2009	2007	2008	2009
<b>Arena</b>	194.3	326.0	375.8	11.9	19.4	22.9
<b>Community/Aquatic Center</b>	1,280.3	2,180.0	2,910.0	78.1	129.5	177.5
<b>Total</b>	<b>1,475</b> GJ	<b>2,506</b> GJ	<b>3,285.8</b> GJ	<b>90</b> tCO <sub>2</sub> e	<b>152.9</b> tCO <sub>2</sub> e	<b>200.4</b> tCO <sub>2</sub> e

<sup>11</sup> Information provided by Larry Marchand, RCEC Operations Manager.

<sup>12</sup> Information provided by Larry Marchand, RCEC Operations Manager.

### 2.3.3 Propane

Propane consumed, resulting greenhouse gas emissions and cost are detailed in Table 5. Although the Community and Aquatic Center and the Arena are connected to district heating, propane is utilized in the kitchen at the Community Center and large propane overhead heaters are used in the stands at the Arena. Propane consumption at the Golf Course is used for cooking. At Williamson Lake Campground a small amount of propane is used for cooking and the remainder is used to provide hot water for showers. Propane is purchased in bulk at Williamson Lake Campground and, since it is not necessarily used in the year purchased has been averaged over the three years. The Golf Course, Williamson Lake Campground and the Visual Arts Center are not directly operated by the City, but are included since they are City owned.

Propane consumption per year varies depending on winter temperatures. As previously mentioned, propane consumption and costing data was taken from Terasen gas accounts. In some cases a meter reading was not taken each month, which was the case between Nov 2008 and Feb 2009. In this case an average for propane consumption was used for each month. More accurate consumption data could be calculated by determining average daily temperatures during this time period, but was not done at this time.

**Table 5: Municipal Buildings - Propane Consumption, Greenhouse Gas Emissions, and Cost**

Building	Propane (GJ)			GHG Emissions (CO <sub>2</sub> e)			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
<b>City Hall</b>	483.9	565.6	438.4	29.5	34.5	26.7	8,873	12,592	8,543
<b>Public Works Buildings</b>	1,587.8	2,323.6	1,606.6	96.9	141.7	98.0	28,432	48,567	30,214
<b>RCMP</b>	903.9	938.9	899.4	55.1	57.3	54.9	16,359	20,471	16,578
<b>Community/Aquatic Center</b>	68.9	55.8	83.3	4.2	3.4	5.1	1,559	1,539	1,772
<b>Fire Station</b>	476.1	523.4	473.4	29.0	31.9	28.9	8,710	11,320	9,133
<b>Arena/Curling Rink</b>	787.7	836.2	852.9	48.0	51.0	52.0	15,144	19,803	16,508
<b>Revelstoke Museum</b>	463.0	552.8	463.5	28.2	33.7	28.3	8,475	12,021	8,884
<b>Courthouse</b>	465.2	728.4	723.9	28.4	44.4	44.2	8,497	15,975	13,917
<b>Golf Course</b>	237.4	306.9	285.0	14.5	18.7	17.4	4,512	7,552	4,580
<b>Visual Arts Center</b>	486.3	385.4	331.1	29.7	23.5	20.2	8,746	8,672	6,269
<b>Williamson Lake Campground</b>	65.2	65.2	65.2	4.0	4.0	4.0	2,137	2,137	2,137
<b>Total</b>	6025 GJ	7282 GJ	6223 GJ	367.5 tCO <sub>2</sub> e	444.1 tCO <sub>2</sub> e	379.7 tCO <sub>2</sub> e	\$111,444	\$160,649	\$118,535

## 2.4 Vehicle Fleet Emissions Inventory

The municipal vehicle fleet consists of 76 vehicles. Gasoline and diesel consumption was collected from records of liters consumed through bulk purchase used at the public works yard and through invoice records from a local service station. Quantity and cost of propane used at the arena for the zamboni was calculated from invoice records. Table 4 details gasoline, diesel and propane consumed, resulting greenhouse gas emissions and cost.

**Table 6: Vehicle Fleet – Fuel Consumption, Greenhouse Gas Emissions, and Cost**

	2007			2008			2009		
	Liters	tCO <sub>2</sub> e	Cost	Liters	tCO <sub>2</sub> e	Cost	Liters	t CO <sub>2</sub> e	Cost
<b>Diesel</b>	135,211	377.2	(est.)139,547	113,482	316.6	127,858	145,622	406.3	121,313
<b>Gasoline</b>	47,330	112.6	(est.) 47,826	50,348	119.8	56,587	53,007	126.2	47,543
<b>Propane</b>	(est.) 3,020	4.6	2,807	(est.) 2,699	4.2	2,882	(est.) 2,710	4.2	3,050
<b>Total</b>	<b>185,561</b> L	<b>494.4</b> tCO <sub>2</sub> e	<b>\$190,180</b>	<b>166,529</b> L	<b>440.6</b> tCO <sub>2</sub> e	<b>\$187,327</b>	<b>201,339</b> L	<b>536.7</b> tCO <sub>2</sub> e	<b>\$171,906</b>

## 2.5 Streetlights/Traffic Signals Emissions Inventory

This sector includes outdoor lighting such as lighting for parking lots, signs and traffic signals. Data from this sector has been taken from the inventory spreadsheet completed by the Carbon Neutral Kootenay Project. The information was collected from an Account History Record provided by BC Hydro. The accounts have been grouped into the following categories: sign lighting, ornamental street lighting, general street and area lighting, and traffic signals. Electricity consumption, greenhouse gas emissions and cost for each category are detailed in Table 7.

**Table 7: Streetlights/Traffic Signals – Electricity Consumption, Greenhouse Gas Emissions, and Cost**

Category	Electricity (kWh)			GHG Emissions (CO <sub>2</sub> e)			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
<b>Sign lighting</b>	16,300	19,944	20,286	0.42	0.52	0.53	1,444	1,762	1,864
<b>Ornamental Street lighting</b>	422,167	432,392	431,314	10.98	11.24	11.21	26,083	27,787	29,178
<b>General street and area lighting</b>	378,712	379,129	363,573	9.85	9.86	9.45	79,599	83,145	86,092
<b>Traffic signals</b>	5,261	9,643	8,898	0.14	0.25	0.23	419	717	704
<b>Total</b>	<b>822,440</b> kWh	<b>841,108</b> kWh	<b>824,071</b> kWh	<b>21.4</b> tCO <sub>2</sub> e	<b>22.0</b> tCO <sub>2</sub> e	<b>21.5</b> tCO <sub>2</sub> e	<b>\$107,545</b>	<b>\$113,411</b>	<b>\$117,838</b>

## 2.6 Water/Wastewater Emissions Inventory

Emissions in this sector include all activities related to water treatment and waste water or sewage. Table 8 details electricity consumption, greenhouse gas emissions and cost related to providing drinking water. The increase in electricity consumption seen in 2009 is a result of additional water being provided by the well at the golf course. Table 9 details propane consumption, greenhouse gas emissions and cost related to heating at the water treatment plant. Table 10 provides data relating to electricity consumption for wastewater. The increase seen in 2009 is a result of the sewer expansion to Revelstoke Mountain Resort and upgrades to the sewer treatment plant.

**Table 8: Water – Electricity Consumption, Greenhouse Gas Emissions, and Cost**

Water Location	Electricity kWh			GHG Emissions CO <sub>2</sub> e			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
Water Reservoir Gate house	10,299	6,421	7,502	0.27	0.17	0.20	764	510	614
Arrow Heights Water tank	4,448	4,309	3,829	0.12	0.11	0.10	362	364	347
Arrow heights PRV	48,780	54,180	52,920	1.27	1.41	1.38	3,600	3,947	4,035
Golf Course Chlorination building	34,793	65,827	119,567	0.90	1.71	3.11	3,293	6,538	10,902
Greeley Water Treatment Plant	274,320	274,320	286,920	7.13	7.13	7.46	19,303	19,918	22,235
<b>Total</b>	<b>372,640 kWh</b>	<b>405,057 kWh</b>	<b>470,738 kWh</b>	<b>9.7 tCO<sub>2</sub>e</b>	<b>10.5 tCO<sub>2</sub>e</b>	<b>12.2 tCO<sub>2</sub>e</b>	<b>\$27,322</b>	<b>\$31,277</b>	<b>\$38,133</b>

**Table 9: Water – Greeley Water Treatment Plant, Propane Consumption, Greenhouse Gas emissions and Cost**

	Propane (L)			Propane (GJ)			GHG Emissions tCO <sub>2</sub> e			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Greeley Water Treatment Plant	62,339 L	72,454 L	57,389 L	1559 GJ	1811 GJ	1435 GJ	96 tCO <sub>2</sub> e	112 tCO <sub>2</sub> e	88 tCO <sub>2</sub> e	\$31,917	\$44,044	\$37,878

Table 10: Waste water – Electricity Consumption, Greenhouse Gas Emissions, and Cost

Waste Water	Electricity kWh			GHG Emissions tCO <sub>2</sub> e			Cost		
	2007	2008	2009	2007	2008	2009	2007	2008	2009
3 <sup>rd</sup> St. Lift Station	13,798	9,306	12,284	0.36	0.24	0.32	1,006	719	980
Oscar St. sewer pump	14,888	19,923	12,271	0.39	0.52	0.32	1,082	1,497	986
Burke drive Lift station	7,275	8,058	7,293	0.19	0.21	0.19	560	632	606
Front/Wales lift station	46,101	45,701	46,351	1.20	1.19	1.21	3,237	3,352	3,540
Downie Lift station	133,680	140,040	149,880	3.48	3.64	3.90	10,256	10,907	12,342
Edward lift station	3,960	4,140	4,140	0.10	0.11	0.11	327	355	369
Camozzi Rd Lift station	0	0	10,200	0	0	0.27	0	0	826
Airport Rd Lift station			15,420	0	0	0.40	0	0	1,224
Sewer Treatment Plant – Chlorine building	17,061	26,632	16,380	0.44	0.69	0.43	1,232	1,938	1,273
Sewer Treatment Plant – 600V	0	252,000	749,280	0	6.55	19.5	0	11,964	37,714
Sewer treatment plant	383,200	247,360	0	9.96	6.43	0	20,310	13,899	0
<b>Total</b>	<b>619,963 kWh</b>	<b>753,160 kWh</b>	<b>1,023,499 kWh</b>	<b>16.1 tCO<sub>2</sub>e</b>	<b>20.0 tCO<sub>2</sub>e</b>	<b>26.7 tCO<sub>2</sub>e</b>	<b>\$38,010</b>	<b>\$45,263</b>	<b>\$59,860</b>

## 2.7 Solid Waste Emissions Inventory

Solid waste generated at all municipal facilities including buildings and parks are included in the corporate inventory. Solid waste generated by the community is not included, but waste deposited by the community at public facilities is included. An estimate is used based on the number of bins at municipal buildings, their size, and frequency of pickups. Consideration has been given for increased frequency of pick up during seasonal events. Tipping fees from 2010 summer data have been used to calculate ball park and event waste. Data has also been collected for the waste from underground garbage cans at Woodenhead Park and the amount is estimated based on tipping fees.

Wood waste collected at the Public Works yard has been excluded, since it is being diverted from the landfill. It is assumed that bins are full and that 1 cubic yard = 75kg.<sup>13</sup> There has been very little change in the diversion of recycling or organic waste between 2007 and 2010, except for a recycling/bear bin in front of the community center and small recycling wire baskets on the decorative garbage containers in the downtown core in 2009. The emissions from waste calculated below are an estimate and are generally a very small part of a municipal operations emission inventory.<sup>14</sup> As a result, the data below is being used as an estimate for greenhouse gas emissions for 2007, 2008 and 2009. Emissions from solid waste are a calculation of the carbon dioxide and methane released at the landfill over time as a result of the anaerobic decomposition of biomass or biological materials.

**Table 11: Solid Waste – Greenhouse Gas Emissions**

Bin	Size and number of bins (yard <sup>3</sup> )	Frequency of pickup/week	Total annual volume (yard <sup>3</sup> )	Annual mass (kg)	Conversion to tonnes	tonnes CO <sub>2e</sub>
Arena	1-6 yard	2	624	46,800	46.8	22.6
Public Works	3- 4 yard	1	624	46,800	46.8	22.6
RCMP	1-3 yard	1	156	11,700	11.7	5.6
Rec. Center	1-3 yard	3	468	35,100	35.1	16.9
Ball Park	1-4 yard	1/week July – Sept. <sup>15</sup>	48	3,600	3.6	1.7
Ball Park	1-4yard	1/week April - October	112	8,400	8.4	4.0
Woodenhead Park	Avg 425 kg	Every 6 weeks (May-Nov). <sup>16</sup>		2,975	3.0	1.4
<b>Total</b>				<b>155,375</b>	<b>155.4</b>	<b>74.8</b>

<sup>13</sup> Average weight of municipal waste collected in Revelstoke, conversation with contractor and waste hauler Brett Renaud.

<sup>14</sup> Developing Inventories for Greenhouse Gas Emissions and Energy Consumption: A Guidance Document for Partners for Climate Protection in Canada, FCM, ICLEI.

<sup>15</sup> Based on volume picked up in 2009 and 2010.

<sup>16</sup> Based on weight in 2010.

## 2.8 Other Sector Emissions Inventory

Emissions included in this section are related to the operation of:

1. Revelstoke Community Energy Corporation
2. Revelstoke Community Forest Corporation
3. Contracted out services by the municipality

Revelstoke Community Energy Corporation (RCEC) is an owned and operated subsidiary of the City of Revelstoke. Greenhouse gas emissions attributed to office space for RCEC have been included in this sector. Propane consumed at RCEC to produce district heating has been partitioned to each of the municipal buildings using district heating based on consumption and was accounted for in the Municipal Building Sector. The remaining propane consumed at RCEC that is used to produce district heating for other buildings in the community should be accounted for in the community wide energy and emissions inventory.

Revelstoke Community Forest Corporation (RCFC) is also an owned and operated subsidiary of the City of Revelstoke. Electricity used at the log sorting yard, propane and electricity for office space and the diesel used to operate a loader at the log sorting yard have been included. Emission from forestry and land use changes, which aims to quantify the release and sequestration of CO<sub>2</sub> by trees, has not been included in this inventory.

Contracted out services, over which the City exerts control include:

- Snow removal which is contracted out based on number of hours. The fuel consumed has been estimated based on hours of operation and typical fuel efficiency for the vehicles used.
- Collection of waste from bins used at municipal buildings. The contractor has estimated the fuel used to provide this service at .5L to service a bin.
- Bylaw enforcement, provide by Commissionaires.
- Office space used by the Economic Development Department and the Council Chambers.

Table 12 Other – Fuel Consumption and Greenhouse Gas Emissions

Other	2007		2008		2009	
	fuel	tCO <sub>2</sub> e	fuel	tCO <sub>2</sub> e	fuel	tCO <sub>2</sub> e
<b>RCEC and RCFC:</b>						
Office space RCEC and RCFC	22.3 GJ (propane)	1.36	16.5 GJ (propane)	1.00	24.4 GJ (propane)	1.49
	13,760 kWh	0.36	12,638 kWh	0.33	14,455 kWh	0.38
Log yard	6,839 kWh	0.18	9,461 kWh	0.25	9,103 kWh	0.24
Loader at log sorting yard	30,103 L (diesel)	83.98	24,294 L (diesel)	67.78	15,466 L (diesel)	43.15
<b>Contracted Services:</b>						
Snow removal (estimate)	36,168L (diesel)	100.91	36,168L (diesel)	100.91	36,168L (diesel)	100.91
Solid waste collection (estimate)	176 L (diesel)	0.49	176L (diesel)	0.49	176L (diesel)	0.49
Commissionaires	1,654 L (est. gasoline)	3.9	1,242L (gasoline)	3.0	2,067L (gasoline)	4.9
<b>Office space:</b>						
Council Chambers	54.0 GJ (propane)	3.3	57.4 GJ (propane)	3.5	84.8 GJ (propane)	5.2
	5,776 kWh	0.15	2,495 kWh	0.07	4,916kWh	0.13
Economic Development (estimate)	3,950kWh	0.10	3,950kWh	0.10	3,950kWh	0.10
<b>Total</b>		<b>194.8 tCO<sub>2</sub>e</b>		<b>177.5 tCO<sub>2</sub>e</b>		<b>157.0 tCO<sub>2</sub>e</b>

## 2.9 Greenhouse Gas Emission Inventory Summary

Table 13 below summarizes the greenhouse gas emissions for all sectors in the inventory for 2007, 2008 and 2009. A trend toward increased emissions can be seen. The overall increase in emissions observed is predominately a result of increases seen in municipal buildings. This sector is the most volatile, changes as a result of weather and propane consumption in district heating can have a large impact on total emissions.

Table 13: Summary of Greenhouse Gas Emissions in all Sectors

Sector	2007	2008	2009
<b>Municipal Buildings</b>	550.5	679.7	663.6
<b>Vehicle Fleet</b>	494.4	440.6	536.7
<b>Streetlights/Traffic signals</b>	21.4	22.0	21.5
<b>Water/Wastewater</b>	121.8	142.5	126.9
<b>Solid Waste</b>	74.8	74.8	74.8
<b>Other</b>	194.8	177.5	157
<b>Total</b>	<b>1457 tCO<sub>2</sub>e</b>	<b>1537 tCO<sub>2</sub>e</b>	<b>1581 tCO<sub>2</sub>e</b>

## 2.10 Climate Charter Considerations

The greenhouse gas emissions inventory methodology used for calculating local government operations under the Climate Action Charter is based on “traditional services”.<sup>17</sup> This model was established based on services that most communities provide, to allow for equality between local governments to meet their commitment to carbon neutrality. A joint Provincial and UBCM committee has established traditional services to include:

- Administration and governance
- Drinking, storm and waste water
- Solid waste collection, transport and diversion
- Roads and traffic operation
- Arts, recreation and cultural services
- Fire protection

Categories included in this greenhouse gas inventory that are not considered “traditional services” and are out of scope include:

1. Revelstoke Community Energy Corporation
2. Revelstoke Forestry Corporation
3. Courthouse
4. Revelstoke Golf Course
5. RCMP building, and
6. Municipal solid waste

The resulting emissions from the above list have been subtracted from the total inventory to determine the emissions the City will be responsible for to meet the Climate Action Charter commitment of carbon neutrality in 2012. These emissions are listed in Table 14, and are the emissions that the City will be required to offset if they are not reduced.

**Table 14: Greenhouse Gas Emissions from “Traditional Services”, which the City will be responsible for to be carbon neutral in its operations in 2012.**

Year	2007	2008	2009
<b>Total tCO<sub>2</sub>e</b>	1178 tCO <sub>2</sub> e	1254 tCO <sub>2</sub> e	1326 tCO <sub>2</sub> e

<sup>17</sup> The Workbook, Helping Local Governments Understand How to be Carbon Neutral in their Corporate Operation, Union of British Columbia Municipalities, revised September 2010.  
[www.toolkit.bc.ca/sites/default/files/Carbon%20Neutral%20Workbook%20v%202.pdf](http://www.toolkit.bc.ca/sites/default/files/Carbon%20Neutral%20Workbook%20v%202.pdf), assessed October 22, 2010.

## 2.11 How does Revelstoke Compare to Other Communities?

It is difficult to compare greenhouse gas inventories between communities, as each community is unique. The piped fuel options for the community, district heating options, winter temperatures, snow removal, recreational facilities, population and area size all impact the amount and type of fuel used and the emissions released. A municipal operation that relies predominantly on hydroelectricity for heating and experiences mild winters will have much lower emissions than one that uses predominantly propane or natural gas for heating and experiences cold winter temperatures. Furthermore, natural gas produces approximately 15% less greenhouse gas emissions compared with propane.

What is included in an energy and emissions inventory may also vary from community to community. Whether an inventory includes contracted out services or is completed to meet obligations under either the Climate Action Charter or the Partners for Climate Protection program will impact total emissions.

Caution should be used when making comparison between communities. It is more important to establish a baseline and create actions to make improvements and reductions in energy consumption and emissions specific for each community.

Given these considerations, greenhouse gas emissions profiles for Golden,<sup>18</sup> Nelson,<sup>19</sup> Salmon Arm,<sup>20</sup> Whistler,<sup>21</sup> and Dawson Creek<sup>22</sup> have been included for comparison. The corporate inventory for the Municipality of Smithers, a community which shares many similarities to Revelstoke, has not been completed at this time.

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<sup>18</sup> Energy Consumption Greenhouse Gas Emissions Inventory, Town of Golden, Carbon Neutral Kootenays, 2008.

<sup>19</sup> City of Nelson Greenhouse Gas Reduction Plan Corporate Operations, May 2010

<sup>20</sup> City of Salmon Arm, Energy and Greenhouse Gas Emissions Study, Urban Systems, October 2008

<sup>21</sup> Summary Report of Whistler's 2006 Greenhouse Gas Inventory, FCM/ICLEI Partners for Climate Protection Program "Milestone Five", October 2007.

<sup>22</sup> On the Path to Carbon Neutral: Dawson Creek's Strategy, March 2009.

**Table 15: Comparison of Greenhouse Gas Emissions with other British Columbia Municipalities**

Municipality	Population	Year	GHG Emission (CO <sub>2</sub> e)
Golden	4,373	2008	652 tonnes
Nelson	9258	2007	1,395 tonnes
<b>Revelstoke</b>	<b>8125</b>	<b>2007</b>	<b>1,457 tonnes</b>
Salmon Arm	17,000	2007	2,000 tonnes
Whistler	8,896	2006	2,331 tonnes
Dawson Creek	12,000	2007	3,200 tonnes

## 2.12 Baseline Year

2007 has been selected as the baseline year to be consistent with the Community Energy and Emissions Inventories (CEEI) that was completed by the Province. A baseline year establishes a starting point from which to set a goal or reduction target.

As data is collected for future years, it will be important to ensure that 2007 is a typical year to establish as a baseline.

## 2.13 Greenhouse Gas Emissions Forecast

A community or corporate greenhouse gas emissions inventory will develop over time as changes occur in the community. A greenhouse gas emission forecast allows for insights into potential changes that will impact emissions and aids in setting an appropriate reduction target.

A reduction target is not based on a per capita quantity of emissions. If a municipality is expecting a large increase in new buildings, vehicles or services that will consume energy and create more emissions, the reduction from baseline will need to take into account all of the new emissions, plus reduce the existing target to see a net reduction.

It is not possible to predict the future, but by forecasting emissions for a ten year period from baseline, it is possible to estimate the increase in emissions for a “business-as-usual” scenario and gain an understanding of reductions needed to reach a given target. Forecasting also allows insights into what future emissions might look like if no action is taken.

Forecasting is particularly difficult in the case of the City of Revelstoke. It is challenging to predict the impact the development of Revelstoke Mountain Resort will have on population growth and the need for additional infrastructure and services.

The population growth scenario in the “Revelstoke Backgrounder Report”,<sup>23</sup> selected in the Official Community Plan indicates a total population increase of approximately 4.5% per year. For the purpose of greenhouse gas emission forecasting in municipal operations, a more conservative population growth of 2.3% per year has been used, which is consistent with the population growth numbers used in the Community Energy and Emissions Plan. This increase takes into account total population growth, including base, in-migrant and resort equivalent population. It is important to include all aspects of projected population growth. While not necessarily increasing the base population substantially, these aspects of population growth will place additional demands on municipal infrastructure and services. It is important to recognize that predicting future growth is very difficult, but important to consider when predicting the impact on municipal infrastructure and the resulting energy consumption and emissions.

A “business-as-usual” forecast is required to meet the requirements for Milestone 1 (Create a greenhouse gas inventory and forecast) of the Partners for Climate Protection Program. The forecast is used to predict what greenhouse gas emission might be in ten years, based on the operational situation in 2007, and does not take into account reduction actions that may have already occurred, or are planned, or changes in technology.

This forecast will allow for a better understanding of an appropriate reduction target needed to meet the requirements of Milestone 2 (Set an emissions reduction target) of the Partners for Climate Protection Program.

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<sup>23</sup> Revelstoke Backgrounder, A Status Report for the Comprehensive Review of the Official Community Plan, The Resort Planning Group, Brent Harley and associates Inc. 2008.

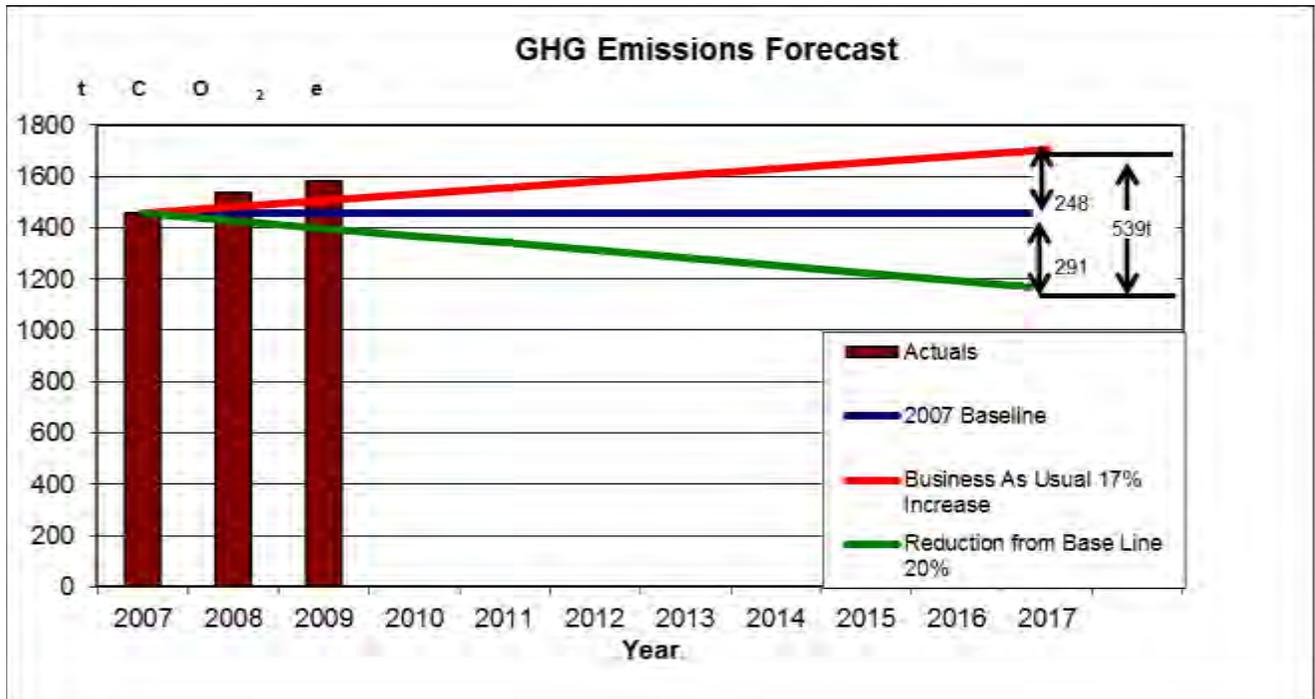
**Table 16: "Business- as- usual" greenhouse gas emissions forecasted increase in emission in 2017**

Sector	Forecasted Changes	Emissions increase 2017 (tCO <sub>2</sub> e)
Municipal Buildings	<ul style="list-style-type: none"> <li>• Tourism center being planned.</li> <li>• Upgrades or replacement of Arena<sup>24</sup></li> <li>• Increase in buildings expected to be less than populations growth and is estimated to increase by 1.5% per year</li> </ul>	88
Vehicle Fleet	<ul style="list-style-type: none"> <li>• Addition of curbside recycling anticipated in 2011 or 2012</li> <li>• Estimated increase of 2% per year</li> </ul>	108
Streetlights/Traffic Signals	<ul style="list-style-type: none"> <li>• New development will require street lighting</li> <li>• Traffic lights not expected to increase as a result of recommendations in the Master Transportation Plan</li> <li>• Estimated increase of 2% per year</li> </ul>	5
Water/Wastewater	<ul style="list-style-type: none"> <li>• Unclear, current wastewater system is reaching capacity.</li> <li>• Assume will mirror population growth of 2.3% per year</li> </ul>	31
Solid Waste	<ul style="list-style-type: none"> <li>• Expected to mirror building growth, plus additional park space at 2% per year</li> </ul>	16
Other	<ul style="list-style-type: none"> <li>• Increase in emissions from RCFC is not population dependent and have been excluded for forecasting purposes.</li> <li>• Increases in contracted out service included in this category have been accounted for in the vehicle fleet and buildings sectors.</li> </ul>	0
Total increase from baseline		248 t CO <sub>2</sub> e

The forecast indicates an increase of 248 tCO<sub>2</sub>e over the next 10 years or an increase in greenhouse gas emission of 17% over the 2007 baseline, shown in Table 15. A 20% reduction in emissions over a 10 year period is the recommended reduction target by Partners for Climate Protection for corporate operations, requiring a total reduction of 539t CO<sub>2</sub>e from the "business-as-usual" scenario to meet this target. This can be seen in Figure 4.

<sup>24</sup> City of Revelstoke, Park, Recreation and Culture Master Plan, Pre-Final Draft, Released December 17, 2010, HB Lanarc Consultants Ltd with GDH Solutions.

Figure 4: Greenhouse Gas Emission Forecast, showing “business-as-usual” and 20% reduction scenarios.



## 3.0 Energy and Emissions Reduction Plan and Reduction Target – Milestones Two and Three

### 3.1 Why reduce energy consumption and greenhouse gas emissions?

By taking action on climate change and reducing greenhouse gas emissions in corporate operations the City of Revelstoke can:

#### Take a leadership role

By taking action in corporate operations the City shows leadership in reducing emissions and will help to build a community focused on conservation. Taking a leadership role in corporate reduction and communicating success can spark interest in the City’s work being done to reduce community-wide

emissions and can also motivate community members to reduce their own emissions.<sup>25</sup> This will be important to help garner support as the City moves toward implementing recommendations and policies identified in the Community Energy and Emissions Plan (CEEP).

#### **Take responsibility to address global warming**

Reducing energy consumption and emissions helps to reduce the effects of global warming, improve air quality and build a more resilient and sustainable community. It has been estimated that up to half of Canada's greenhouse gas emissions are under direct or indirect control or influenced by municipal governments.<sup>26</sup> This would include both actions in a municipality's corporate operations as well as policies, bylaws and actions that influence emissions of the community as a whole.

#### **Reduce energy consumption, improve energy efficiency and reduce cost in operations**

Some actions that reduce energy consumption, or improve energy efficiency will directly result in cost savings while others may have an initial investment and a longer pay back period. For example, investment in energy retrofits for buildings may have significant upfront cost that takes several years to pay back, but after the payback period, the buildings will continue to be more energy efficient and continue to have lower energy costs.

#### **Reduce the cost of paying carbon offsets**

To meet the City's obligations to become carbon neutral in its operations by 2012, the City will be required to purchase carbon offset in 2012. For every tonne of CO<sub>2</sub>e that is reduced the City will also reduce this financial obligation.

## **3.2 Energy Savings verse Greenhouse Gas Emission Reduction**

To understand how energy reductions will impact emissions it is necessary to compare energy consumption, emissions and energy spending by sector (Figure 2, Executive Summary) and by energy source (Figure 3, Executive Summary). The five energy sources used in municipal operations are electricity, propane, district heating, gasoline and diesel. These comparisons allow for better understanding of the impact of reduction actions and insights into creating an emission reduction strategy.

Electricity in British Columbia is predominately created using hydro, which results in low greenhouse gas emissions, while energy consumed from diesel, gasoline and propane creates much higher emissions.

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<sup>25</sup> The Workbook, Helping Local Governments Understand How to be Carbon Neutral in their Corporate Operations, UBCM, 2009

<sup>26</sup> Federation Canadian Municipalities, Partners for Climate Protection, <http://fmv.fcm.ca/Partners-for-Climate-Protection/>, assessed on-line October 12, 2010.

The sector Streetlights/Traffic lights uses only electricity, so contributes a small amount of emissions to the total inventory.

Actions that reduce electricity have a small impact on greenhouse gas emissions, but can have a large impact on energy spending. As the province implements the Clean Energy Act, the greenhouse gas emissions as a result of providing electricity in British Columbia will further decrease and the impact of actions that reduce electricity consumption will have a smaller effect on reducing greenhouse gas emissions. While this is the case, reducing electricity consumption should be encouraged, as it helps foster a culture of conservation, reducing environmental impacts, saving on energy spending and helping to further reduce greenhouse gas emissions.

Energy consumed from the combustion of propane, gasoline, and diesel has a much greater impact on greenhouse gas emissions. Municipal buildings which use propane for heating and the City's vehicle fleet contribute a much great amount of greenhouse gas emissions to the total inventory.

Actions that reduce the use of propane or reduce the need for propane, like switching to district heating will reduce energy spending and also have a large impact on greenhouse gas reductions, which reduces the cost of purchasing carbon offsets.

Using biofuels like bio diesel will reduce diesel consumption and will likely have an increase in energy spending, but have a greater impact on reducing greenhouse gas emissions, improve air quality and reduce the cost of purchasing offsets.

When evaluating energy and emission reductions actions it is important to take into consideration both energy spending and greenhouse gas emission reductions.

### 3.3 Methodology

Resources available through the Partners for Climate Protection Program, the BC Climate Action toolkit website, actions and policies implemented in other communities, consultation with municipal staff and a review of the greenhouse gas inventory were considered in developing a set of recommended actions for the City of Revelstoke's corporate operations.

The action sequence identified in the Carbon Neutral ACTION guide<sup>27</sup> listed below was considered for each of the sectors in the greenhouse gas emissions inventory:

1. Reduce behavioural losses
2. Consider energy in operations and maintenance
3. Efficient equipment
4. Renewable energy

Each of the actions was then identified as being one of four types:<sup>28</sup>

1. **Direct** actions that a local government identifies and implements.
2. **Policy** initiatives that define key principles and activities for guiding future actions.
3. **Catalyst** measures which serve to enhance a culture of conservation, waste reduction and sustainability.
4. **Implementation** measures that aid in the success of the plan.

## 3.4 Emission Reduction Actions in Place and Future Opportunities

### 3.4.1 Municipal Buildings

The City of Revelstoke operates and/or owns 18 buildings as seen in Table 3. The operation of municipal buildings account for 550 tCO<sub>2</sub>e or 38% of the total greenhouse gas inventory in 2007. Excluding the “Other” and “Solid Waste” sectors from the inventory this accounts for 46% of emissions, 65% of energy consumed and 55% of energy spending in corporate operations. These sectors have been excluded because it is not possible to calculate energy and energy spending for solid waste and it is very difficult for the “Other” category.

Local governments typically have direct control over their buildings and since retrofits and green design can often be cost-neutral, municipal buildings are often a good sector for a local government to focus on to reduce energy consumption.<sup>29</sup>

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<sup>27</sup> Carbon Neutral ACTION Guide, A starting Point for Local Governments, The Carbon Neutral Kootenays (CNK) Project, April 2010

<sup>28</sup> Carbon Neutral ACTION Guide, A starting Point for Local Governments, The Carbon Neutral Kootenays (CNK) Project, April 2010.

<sup>29</sup> BC Climate Action Toolkit, Green Efficient Civic Buildings, <http://www.toolkit.bc.ca/solution/civic-buildings>, assessed on-line December 2010.

Figure 5 shows the total greenhouse gas emissions from electricity and propane (including the portion of propane used by district heating) for ten of the municipal buildings.

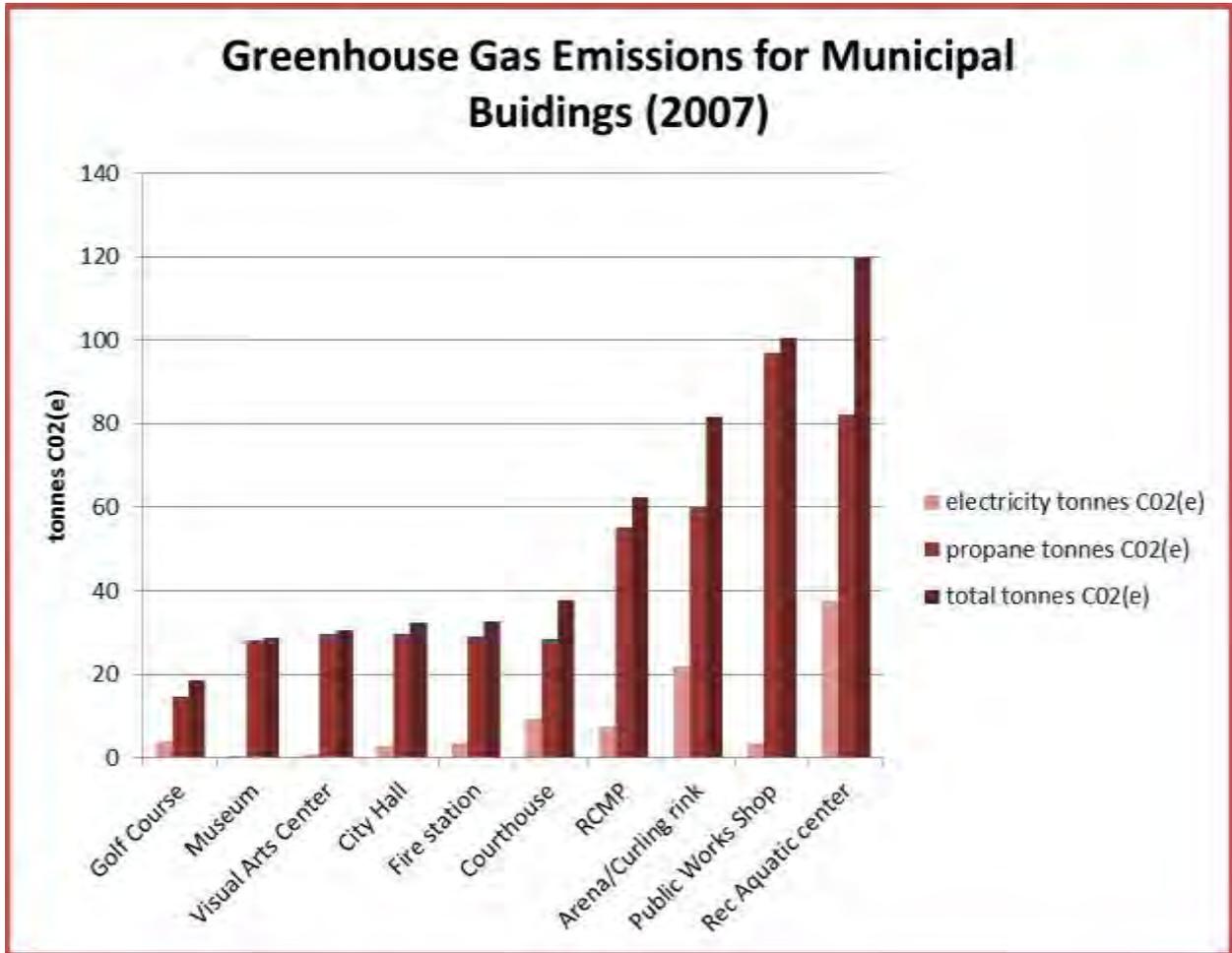


Figure 5: Total greenhouse gas emissions for each municipal building in 2007.

Recreation centers and arenas are generally large consumers of energy. The Community and Aquatic Center, and the Arena both take advantage of being hooked to district heating. Utilizing district heating in these two facilities has resulted in a reduction of approximately 550 tonnes of CO<sub>2</sub>e emissions compared with using propane.<sup>30</sup>

Propane at the Golf Course and at the Community Center is used for cooking. Some of the propane used at the Public Works Shop and at the Arena is used for large overhead heaters.

<sup>30</sup> Assuming propane consumption at RCEC in 2007, and the use of a high efficiency boiler with a seasonal boiler efficiency of 85%.

Caution needs to be taken when comparing municipal buildings, since their functions vary so widely. In any case by doing this comparison it aids in identifying possible means of reducing energy and where to begin.

### *What Actions has the City of Revelstoke already taken?*

- City Hall was connected to district heating at the end of 2009 resulting in a reduction of approximately **25 tCO<sub>2</sub>e/ year**
- Soft starts have been installed at the Arena
- Computer system controls have been installed in some municipal buildings.
- An energy reclaim system is being installed at the community center with an anticipated reduction of approximately 5744 GJ of energy/year<sup>31</sup> or approximately **55tCO<sub>2</sub>e/year**.
- A feasibility study is being conducted for expansion of RCEC to include future buildings in the community and possibly additional municipal buildings.
- An energy efficient computer system (Thin Client) was installed at City Hall in 2008.
- The City of Revelstoke is a BC Hydro Power Smart member.

### *Recommended Reduction Measures:*

#### **Action 1: Conduct Comprehensive Energy Audits and Opportunity Assessments on all Municipal Buildings - Direct**

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Contract a qualified Energy Advisory to conduct comprehensive energy audits and opportunity assessments on all municipal buildings, beginning with the public works buildings, museum and the arena. This assessment should include opportunities for energy reduction, cost savings, and greenhouse gas reduction. Areas that should be addressed include HVAC energy cost savings strategies, lighting recommendations, and building envelope. Consideration should also be given to the use of the large propane overhead heaters in the stands at the arena and alternative means of heating water for showers at Williamson Lake including a heat on demand system or solar heating.

Evaluate using Energy Service Companies (ESC) to provide this service. Energy Service companies are private firms that offer technical and financing services for energy efficiency investment. In some cases an ESC will provide the up-front money for retrofits of a building in return for a portion of the annual energy savings.<sup>32</sup>

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<sup>31</sup> Revelstoke Recreation Center Energy Retrofit Proposal, Coral Engineering Limited

<sup>32</sup> Community Energy Association Funding Guide 2010, August 25, 2010, <http://www.communityenergy.bc.ca/news/funding-your-community-energy-and-climate-change-initiatives-2010-update>, assessed on-line December 2010.

Recommendations that have been made for municipal buildings in other communities following a comprehensive energy audit include:

- install weather stripping on doors and windows
- install high efficiency ceiling insulation
- install occupancy light sensors
- reduce lighting by reducing the number of bulbs where lighting is excessive
- replace T12 lamps with T8 lamps and replace magnetic ballasts with electronic ones
- replace all incandescent bulbs with compact fluorescent bulbs
- computerize building automation systems
- install programmable thermostats

Following the completion of energy audits, establish a list of projects including capital cost, payback period, energy and cost savings and greenhouse gas emission reduction potential.

Evaluate projects using a triple bottom line approach that considers the environmental, social and economic impacts of the project. Also use life cycle costing, which considers the full cost of a project over its lifetime, including initial cost and operating and maintenance costs.

This should be done in conjunction with recommendation # 17 of the Parks, Recreation and Culture Master Plan, Pre-Final Draft, December 17, 2010, which recommends developing a life-cycle maintenance plan for the City's recreation and cultural facilities.

## Action 2: Establish a Green Building Policy

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Establish a Green Building policy that commits the construction of new buildings to a given standard that reduces energy consumption and greenhouse gas emissions. This policy should also commit to meeting a given standard when retrofitting existing buildings.

A Green Building policy shows a commitment by the City to sustainability and leadership to the community as a whole. Reference should be made to the recently adopted "Sustainability Checklist" and to a third party rating systems like LEED for green buildings and ASHRAE 90.1 for energy efficiency standards. A municipality with a Green Building policy in place is The City of Richmond.<sup>33</sup>

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<sup>33</sup> Sustainable "High Performance" Building Policy – City Owned Facilities, City of Richmond, BC, December 2004. [http://www.richmond.ca/\\_shared/assets/011905\\_item210292.pdf](http://www.richmond.ca/_shared/assets/011905_item210292.pdf), assessed on-line December 3, 2010.

### Action 3: Implement an Energy Efficient Equipment Policy

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This policy can be included in a Green Building Policy or on its own. It commits the municipality to purchasing equipment such as appliances, office equipment and consumer electronics that are energy efficient. In some cases this can be tied to a third party rating like energy star®. This can also include saving energy by turning off equipment at night or configuring computers to enter low power modes when not in use.<sup>34</sup>

#### 3.4.2 Vehicle Fleet

The vehicle fleet is made up of 76 vehicles ranging in age from 1977 to 2009. Fuel consumed in this sector contributes 34% of the emissions in the total inventory. Excluding the “Other” and “Solid Waste” sectors the vehicle fleet comprises 42% of greenhouse gas emissions, 16% of energy consumption, and 22% of energy spending.

The vehicle fleet sector has been identified as a strategic focal point for reducing a municipality’s greenhouse emissions. Through fleet management and the creation of a more fuel efficient fleet, there is a direct cost savings, reduction in greenhouse gases and improvement in air quality.<sup>35</sup>

In January 2010, the Province of British Columbia enacted regulations requiring a renewable and low carbon fuel requirement for gasoline and diesel. The requirement for gas is a five percent annual average beginning in 2010 and diesel a 5% annual average by 2012, implemented over a three year period.<sup>36</sup> It should be noted that this is a provincial average and does not necessarily mean that renewable fuel will be used in the fuel sold in Revelstoke.

#### *What Actions has the City of Revelstoke already taken?*

- The City of Revelstoke adopted an anti-Idling bylaw in May 2008.
- 8 vehicles in the fleet were fitted with a GPS system in 2010.
- A bulk card lock fuel containment system has been installed at Public Works.

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<sup>34</sup> BC Climate Action toolkit, <http://toolkit.bc.ca/tool/energy-efficient-equipment-policy>, assessed on-line Jan 6, 2011.

<sup>35</sup> BC Climate Action Toolkit, <http://www.toolkit.bc.ca/solution/fuel-efficient-fleets>, assessed on-line September 20, 2010

<sup>36</sup> Government of British Columbia, Ministry of Energy, Mines and Petroleum Resources, British Columbia’s Renewable and Low Carbon Fuel Requirements regulation, <http://www.empr.gov.bc.ca/RET/RLCFRR/Pages/default.aspx>, assessed on-line September 22, 2010

### *Recommended Reduction Measures:*

#### **Action 4: Implement a Corporate Idle Reduction Policy Including Driver Education and Awareness – Catalyst/Policy**

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Implement an idling awareness and reduction program which communicates corporate idling policies that are directed toward all City staff including contracted out snow removal.

Local governments across BC have seen a 10% reduction in fuel use as a result of idling reduction strategies.<sup>37</sup>

Idle reduction education programs have been developed and are available through Idle Free BC<sup>38</sup>, and Natural Resources Canada's Fleet Smart program.<sup>39</sup> Also, previous research and work has been completed by the City's Air Quality committee to develop an education package directed at reducing idling in the City of Revelstoke.

*Case Study: City of Williams Lake*  
Following the implementation of a Vehicle/Equipment Idle Free Policy (Appendix B) in April 2006, the City of Williams Lake has realized huge savings, by not only reducing GHG emissions, but also reducing operating costs. They now use less fuel and are able to extend service intervals due to reduced vehicle and equipment downtime. After one year they saw an average of 20% savings in maintenance costs and fuel consumption was reduced by an average of 20%.

While the City of Revelstoke has an anti-idling bylaw, it is currently not being enforced and there has been limited education and awareness to accompany the bylaw. A recommendation identified in the Community Energy and Emissions Plan (CEEP) is to continue to promote the Idle Free campaign and improve awareness and enforcement of the initiative. An idling awareness and education program developed for municipal staff would show leadership by the City and could be expanded to the community as a whole.

Driving techniques and driver's behaviour can also have a significant impact on the fuel efficiency of a vehicle and reduce maintenance costs (Case Study, City of Williams Lake).<sup>40</sup> Education and awareness

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<sup>37</sup> Jim Vanderval, Innovations in the Transportation Sector, Fraser Basin Council. [http://www.fraserbasin.bc.ca/programs/documents/BCCleanAir2007/E3\\_Fleet.pdf](http://www.fraserbasin.bc.ca/programs/documents/BCCleanAir2007/E3_Fleet.pdf), assessed on-line November 21, 2010.

<sup>38</sup> Idle Free BC, <http://www.idlefreebc.ca/resources/index.php>, assessed on-line November 5, 2010.

<sup>39</sup> Natural Resources Canada, Fleetsmart, <http://fleetsmart.nrcan.gc.ca/>, assessed on-line November 1, 2010.

<sup>40</sup> Idling Reduction in the City of Williams Lake, BC Climate Action Toolkit, [http://www.toolkit.bc.ca/success-story/williams\\_lake](http://www.toolkit.bc.ca/success-story/williams_lake), assessed on-line September 10, 2010.

around “green” driving techniques fosters a culture of conservation and can demonstrate leadership to the broader community.

Route planning in daily operations can decrease kilometers traveled. The addition of a GPS system to eight vehicles in the fleet will allow a better understanding of vehicle movement and also help quantify current idling practices.

The bulk card lock fuel containment system installed at Public Works contains both gasoline and diesel. Prior to its installation, gasoline was purchased at a specific service station. Having gasoline available at the Public works yard will reduce the kilometers travelled for refueling.

Reducing fuel consumption through the above measures will reduce greenhouse gas emissions, and improve air quality. A 10% reduction in fuel use would result in a reduction of approximately **49 tCO<sub>2</sub>e emissions** and a savings of approximately \$18,500 per year.

### Action 5: Ensure Vehicle Data Collection and Preventative Maintenance Scheduling is in Place – Direct

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Establish a data management system to track kilometers travelled, fuel consumed and downtime, to monitor vehicles in the fleet and allow for an evaluation of fuel efficiency and life cycle costing for each vehicle. Ensure preventative maintenance schedules for each vehicle are followed and recorded. Following the collection of vehicle data determine whether a fleet review by E3 Fleets (Energy Environment Excellence) would be valuable.

E3 Fleets is a program offered by the Fraser Basin Council, a non-profit organization that provides information on improving energy efficiency and reducing greenhouse gas emissions in vehicle fleets as well as fleet reviews and a fleet rating system. It would be valuable for the City of Revelstoke to become a member of E3 fleets.

The installation of a bulk card lock system will allow for ease of tracking fuel consumption per vehicle.

### Action 6: Establish a Fuel Efficient Vehicle Purchasing Policy

When purchasing new vehicles use “right sizing”. Determine what the vehicle is being used for, how often it is needed for each purpose, and can an alternate more fuel efficient vehicle be used. Use life cycling costing in making purchasing decisions.

This policy could be included with an Idle Reduction policy as part of an overall Green Vehicle Policy. A Green Vehicle Policy has been adopted by the City of Dawson Creek (Appendix C).

### Action 7: Consider Alternative Fuels and Technologies - Direct

Evaluate options to use a non-food grade biodiesel B20, (20% biodiesel, 80% regular diesel) during the summer months and B5 (5% biodiesel, 95% regular diesel) during colder months.

Evaluate the impact of different blends on vehicle warranties, and on older vehicles in the fleet. Determine available feed stocks or sources of bio diesel and effectiveness in Revelstoke’s climate. Determine the cost of fuel and possible partnerships with neighbouring communities for delivery of fuel to Revelstoke.

Explore options to include contractors supplying services to the City, including snow removal. To allow for more cost effectiveness in purchasing look at the possibility of forming partnerships with other large consumers of diesel in the community, including the School District #19, Parks Canada, Downie Timber and Revelstoke Community Forest Corporation.

Using biodiesel reduces emissions and improves air quality. The resulting emission reduction is dependent on the blend of bio diesel, the type of vehicle used and the feedstock used to make the fuel. Assuming a B5 blend and using the emission factor in Table 2, converting the City Fleet to a B5 blend would reduce emission by approximately **19 t CO<sub>2</sub>e/year**. Further reduction would be realized by using B10 or B20 in warmer months (Case Study, City of Kelowna).<sup>41 42</sup>

*Case Study: City of Kelowna and Bio-diesel*  
*The City of Kelowna is currently using B5, B10 and B20 blends of bio diesel in their City fleet. B5 is being used in the coldest months and B20 in the summer months. They have not experienced any problems with their vehicles and are seeing the same fuel efficiency as using regular diesel. The City of Kelowna has seen a reduction of approximately 250t CO<sub>2</sub>e in their vehicle fleet, predominately as a result of using bio-diesel. The cost for bio diesel is dependent on the blend being used. The cost per liter of unblended B100 is \$1.15/L compared to \$.71 for diesel in the Okanogan area in December 2010.*

Evaluate and consider new technologies as they become available, converting vehicles to alternative fuel powered engines where possible and appropriate.

<sup>41</sup> Conversation Alf Soros, Equipment Manager, City of Kelowna.

<sup>42</sup> Conversation Bill Clydesdale, 4 Refuel.

### 3.4.3 Streetlight/Traffic Signals

The Streetlight and Traffic Signals sector contributes 2% of the greenhouse gas emissions in the total greenhouse gas inventory and 2% of emissions, 7% of energy consumption and 12% of energy spending, excluding the “Other” and “Solid Waste” sectors. The only energy source used in this sector is electricity.

#### *What Actions has the City of Revelstoke already taken?*

- The City of Revelstoke has undertaken an adaptive lighting study in conjunction with BC Hydro. The study indicated the initiative is cost prohibitive at this time, with a payback period nearing 20 years and exceeding the life span of the fixtures required.
- As lights are needed to be changed, they are being replaced with more energy efficient fixtures.

#### *Recommended Reduction Measures:*

#### **Action 8: Continue to Improve Energy Efficiency in Streetlights and Traffic Signals – Direct**

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Continue to improve energy efficiency in street lights and traffic signals. Evaluate the capital cost, cost savings and payback period in replacing lights in signs, and ornamental lighting with more energy efficient fixtures.

When evaluating street lighting, consider the Dark Skies community goal in the OCP that reduces unneeded lights during the day and night and encourages directional lighting to retain the quality of the dark sky.

### 3.4.4 Water/Wastewater

Energy and greenhouse gas emissions related to the provision of drinking water and the treatment of wastewater accounts for 8% or 122t CO<sub>2</sub>e of greenhouse gas emissions in the total inventory accounting for 10% of emissions, 12% of energy consumed and 11% of energy spending, after the “Other” and “Solid Waste” sectors have been excluded. While the majority of energy consumed in this sector is from electricity, the water treatment plant uses propane for heating.

The current waste water treatment system is operated using aerated lagoons. It is estimated, based on current water consumption patterns, this system will need to be converted to a more space efficient process around 2014.<sup>43</sup> This is based on a greater anticipated population growth than used for this

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<sup>43</sup> City of Revelstoke, *Liquid Waste Management Plan – Stage 2*, draft 4, July 2010, Dayton and Knight Ltd., Consulting Engineers.

report. Changes to waste water treatment needs and the impact on future emissions should be re-evaluated in 5 years' time.

However, by reducing water consumption there is a decrease in both the need for treated drinking water and for the treatment of waste water, which may delay the need for additional waste water infrastructure. Energy and emission reduction measures recommended for this sector fall into two categories, improving efficiencies and water conservation measures. Many of the initiatives identified for this sector are detailed further in the City of Revelstoke Water Conservation Study, January 2007.<sup>44</sup>

### *What Actions has the City of Revelstoke already taken?*

- The City promotes water conservation through annual mail outs and on the City website.
- A watering restriction is in place.
- Reservoir pots are used for hanging plants to decrease the need for watering.
- Variable speed drives have been installed on the pumps used to the water supply system. In the waste water system only some of the pump stations have drives installed.
- The City has developed a Water Conservation Strategy.
- The City has a Liquid Waste Management Plan.
- The City has installed timers and moisture sensors on about 80% of its irrigation systems.

### *Recommended Reduction Measures:*

#### **Action 9: Optimize Operation of Water and Waste Water Infrastructure – Direct**

Improve the energy efficiency of the current water and wastewater infrastructure:

1. Conduct an energy audit of the water treatment plant to assess energy reduction opportunities.
2. Assess the reduction potential of installing variable speed drives at pumping stations.
3. Assess and fix water lines with existing leaks.
4. Include provisions for the sewage treatment expansion in a green building and infrastructure policy.
5. Assess where current storm sewers can be separated from the waste water system.

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<sup>44</sup> City of Revelstoke Water Conservation Study, January 2007, Dayton and Knight Ltd.

## Action 10: Encourage Water Conservation – Direct/Catalyst

Expand on existing water conservation measures by:

1. Developing education and awareness information for municipal staff and extend to the community as a whole.
2. Including low flow water fixtures in a green building policy
3. Installing residential water meters and a fee for water usage.
4. Develop a baseline for current water consumption and set a community wide water reduction target.
5. Exploring existing incentives and funding opportunities for community wide retrofits with low flow water fixtures.

### *Case Study: City of Vernon Water Efficiency*

*Over the past 20 years The City of Vernon's water efficiency program has saved the City millions of dollars and reduced water consumption by 30%. The City has promoted water efficiency by:*

- *Implementing universal water metering for residential customers;*
- *Enforcing sprinkler regulations;*
- *Distributing Waterwise brochures;*
- *Planting drought tolerant gardens;*
- *Distributing free low flow shower heads;*
- *Providing free in-home water audits;*
- *Using reclaimed municipal waste water for irrigation; and*
- *Commencing a rebate program for low flush toilets.*

Further information and resources are available at a number of websites including the Water Bucket website,<sup>45</sup> the British Columbia Small Community Infrastructure Sustainability website<sup>46</sup> and the provincial Living Water Smart website.<sup>47</sup> See Case Study City of Vernon.<sup>48</sup>

### 3.4.5 Solid Waste

The greenhouse gas emissions identified in the inventory as a result of corporate solid waste is estimated to be 74.8 tCO<sub>2</sub>e, representing 5% of emissions in the inventory.

Currently the City of Revelstoke with the Columbia Shuswap Regional District are investigating options to provide curbside recycling. This may result in a recycling transfer station near Revelstoke, increasing the ease of recycling materials.

<sup>45</sup> Water bucket, Sustainable Approaches to Water Resources [www.waterbucket.ca](http://www.waterbucket.ca), assessed November 5, 2010

<sup>46</sup> British Columbia's home page for Small Community Infrastructure Sustainability, [www.bc.smallcommunityinfrastructure.ca](http://www.bc.smallcommunityinfrastructure.ca), assessed November 2, 2010.

<sup>47</sup> Living Water Smart, [www.livingwatersmart.ca/](http://www.livingwatersmart.ca/).

<sup>48</sup> City of Vernon, Jennifer Nichols, BC Climate Action Toolkit Content Manager, Fraser Basin Council

Some of the garbage collected at the Public Works yard includes residential waste dropped off by residents that have missed garbage collection day or have limited ability to secure garbage from bears. A reduction in the amount of residential waste collected at public works will likely occur with community wide curbside recycling.

#### What Actions has the City of Revelstoke already taken?

- Recycling containers are available at Woodenhead Park and the Community Center.
- Wire recycle baskets have been attached to the decorative garbage containers in the downtown core.
- The City of Revelstoke and the Columbia Shuswap Regional district are currently looking at options to implement a curbside recycling program.

#### *Recommended Reduction Measures:*

##### **Action 11: Reduce Solid Waste through Diversion - Direct**

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Continue to divert solid waste from the landfill by increasing recycling containers at municipal facilities. Place recycling containers directly beside waste garbage containers to increase the ease of recycling. Key areas to target are the community center, arena, special events and the ball fields.

### 3.4.6 Other

The “Other” sector predominately compiles emissions related to RCFC and contracted out services. Since the City has operational and in some cases financial control over some categories in this sector, it is important to address reduction potential in these areas. This sector accounts for 195 tCO<sub>2</sub>e or 13% of the total greenhouse gas emissions.

##### **Action 12: Encourage Energy and Emission Reduction in Contracted Out Services – Catalyst/Policy**

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Due to the small size of Revelstoke it is not feasible to provide monetary incentives for contractors who have more fuel efficient vehicles. However, it is possible to encourage contractors to be conscience of energy consumption by requiring all new contracts provide fuel consumption data for the service provided. Also, include contractors and the Revelstoke Forest Corporation in corporate anti-idling awareness programs, energy conservation initiatives and alternative fuels such as bulk purchased bio diesel.

### 3.5 Setting a Reduction Target

By setting a greenhouse gas emissions reduction target, the City will show leadership in establishing goals and commitments to climate change as well as establishing a target to measure successes by.

The Climate Action Charter does not require a municipality to set a reduction target for corporate operations, but encourages reductions in emissions to reduce the expense of purchasing carbon offsets. The Partners for Climate Protection model recommends a reduction target of 20% from baseline over a ten year period. The Community Energy Association of BC recognizes that a target for a specific local government is influenced by the aspirations of the population, the unique energy situation of the local government, as well as the cost and economic development potential of the reduction actions.<sup>49</sup>

As indicated in the Emissions Forecasting section of this report, to achieve a 20% reduction from 2007 baseline emissions, the City would need to reduce emissions by 291 tonnes CO<sub>2</sub>e. Based on the “business as usual” emission forecast, the City would have to further reduce 248 tonnes CO<sub>2</sub>e to see a net reduction of 20% in 2017.

It is difficult to quantify the greenhouse gas reduction potential of the actions recommended in this report, particularly before completion of energy audits for municipal buildings. Emission reduction quantified through district heating at City Hall, the heat reclamation system at the Aquatic Center and vehicle fleet recommendations indicate a reduction potential of 148 tonnes CO<sub>2</sub>(e).

Based on the:

1. Revelstoke and Area Community Development Action Plan (2007), which identified the development of a greenhouse gas emissions inventory and forecast and an effective means to reduce emission for municipal buildings and operations with the highest priority;
2. Greenhouse gas emissions reduction potential identified in this report; and
3. Recommendations by the Partners for Climate Protection Program,

it is recommended that a reduction target of 20% from baseline 2007 greenhouse gas emission by 2020 be adopted. However, this should be re-evaluated in 5 years in the event the City sees a much larger increase in population growth and demand on municipal services compared with the assumptions in this report. The year 2020 was chosen to be consistent with the target year chosen in the Community Energy and Emissions Plan (CEEP).

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<sup>49</sup> Community Energy Association of British Columbia, <http://www.communityenergy.bc.ca/set-a-target>, assessed on-line November 21, 2010

## 4.0 Plan Implementation

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### Action 13: Ensure Ownership of the Plan - Direct

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Who will ensure the plan is carried out and available funding opportunities are taken advantage of?

While reducing energy and greenhouse gas emissions are important in taking action on climate change in the long run, they can often be overlooked as it is not urgent in the day-to-day operations of a municipality. It is important a staff member is responsible to ensure the actions and implementation of the plan are being met, and that reductions that occur in corporate operations are recorded and communicated to the community.

### Action 14: Engage Municipal Staff - Catalyst

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Engagement of staff and “buy-in” are very important for successfully implementing actions where a behavioural change is required.

Workshops to ensure an understanding of greenhouse gas emissions and their impact on global warming and climate change can help raise awareness and foster an environment of conservation, encouraging involvement and ownership to the plan. Through further municipal engagement, potential obstacles and alternatives or missed opportunities to reduce energy in general operations may be identified.

### Action 15: Establish an Energy and Emissions Reduction Program -Implementation

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An Energy and Emissions Reduction Program could be used to finance some of the initiatives and actions that have been identified in this report. Funding of \$20,000 annually beginning in 2012, would allow for reduction projects that will further reduce emissions and save on the cost of paying carbon offsets in 2012. \$20,000 would likely be adequate funds to cover the cost of municipal building audits in the first year.

In some communities, savings realized by energy and emissions reduction projects have been set aside to further stimulate additional reduction actions. The District of Saanich created a Carbon Neutral Reserve Fund to prepare for carbon neutrality commitments leading up to 2012. The funds sets aside are based on the market value of offsetting the carbon footprint of their corporate operations. The

funding is used for local initiatives that reduce emissions and in turn reduce the cost to be carbon neutral in 2012.<sup>50</sup>

The City of Fernie has established an Energy Efficiency Reserve which has identified CARIP funds, money from the Gas Tax fund, as well as quantified savings from energy reduction actions in municipal buildings as a source of funding. It is anticipated that a recent retro fit to the Aquatic Center will save \$70,000 annual in natural gas cost, which would then go into the Energy Efficiency Reserve as a source of funding for further energy and emissions reductions.<sup>51</sup>

## 4.1 Implementation Strategy

To ensure successful implementation of the reduction strategy, it will be important to establish a detailed plan with targeted dates for the actions identified. Many of the recommended actions require education and awareness and will not require a lot of funding. It is unclear what opportunities will be identified to increase energy efficiency in municipal building or in water/wastewater infrastructure until comprehensive energy audits have been completed. . In some cases, funding agencies will cover this cost if funding is received for actions as a result of the audit.

Following the completion of building audits, potential projects should be evaluated based on capital cost, payback period, energy saved and resulting cost savings and greenhouse gas reduction. Life cycle costing, which considers the full cost of the project over its lifetime, including initial cost and operating and maintenance costs should be considered. Potential funding opportunities for implementation of the plan are further detailed in the next section.

## 4.2 Resources and Potential Funding Opportunities

The Community Energy Association and the Federation for Canadian Municipalities have published a Funding and Resources Guide: *Funding Your Community Energy and Climate Change Initiative, a guide to funding and resources for British Columbia Local Government, July 2010.*<sup>52</sup>

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<sup>50</sup> FCM, Webinar series October 28, 2010, Carbon Neutral Local Government.  
[http://gmf.fcm.ca/files/Webinars/2010/October-28-2010/District\\_of\\_Saanich-En.pdf](http://gmf.fcm.ca/files/Webinars/2010/October-28-2010/District_of_Saanich-En.pdf).

<sup>51</sup> Conversation with Lisa Talavia-Spencer, Director of Corporate Administration Services, City of Fernie, April 19, 2011.

<sup>52</sup> <http://www.communityenergy.bc.ca/sites/default/files/CEA%20Funding%20Guide%202010-August%2025%202010.pdf>, assessed on-line December 9, 2010.

The guide provides useful resources and a comprehensive list of programs which local governments in British Columbia are eligible. The programs provide financial incentives for climate action, energy planning efficiency and renewable energy projects.

Possible funding opportunities listing in the above guide include:

1. **ecoENERGY Retrofit – Buildings**, Natural Resources Canada, provides financial incentives to offset the costs of implementing energy efficient retrofits.
2. **Power Smart Continuous Optimization Program**, BC Hydro, may provide some funding for building audits and building retrofits. Funding may also be available toward hiring an Energy Manager in conjunction with neighbouring communities, where sufficient savings potential is demonstrated.
3. **Towns for Tomorrow**, Ministry of Community Development Infrastructure and Finance Division, focuses on local governments with a population under 15,000. Grants range from 75-80% of eligible cost depending on the size of the community. Based on its current population the City of Revelstoke would qualify for 75% funding.

### 4.3 Federation of Canadian Municipalities Green Municipal Fund

The Government of Canada endowed the Federation of Canadian Municipalities with \$550 million to establish the Green Municipal Fund. This fund provides below market loans and grants to support municipal initiatives that improve air, water and soil quality and protect the climate. Funding is available for plans, studies and projects. Grants are available for sustainable community plans, feasibility studies and field tests, while a combination of grants and loans are available for capital projects related to brownfields, energy, transportation, waste and water.<sup>53</sup>

### 4.4 Carbon Action Revenue Incentive Plan (CARIP)

The Climate Action Revenue Incentive Program is designed to offset the carbon tax paid by local governments who have committed to being carbon neutral in their corporate operations by 2012. To be eligible to receive a grant equal to 100% of the provincial carbon tax paid as a direct expenditure a local government must:

- Sign the Climate Action Charter.
- Report publicly on their plan and progress toward meeting their climate action goals.
- Apply annually, reporting actions that have occurred, and provide fuel consumption data.<sup>54</sup>

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<sup>53</sup> Updated Green Municipal Funding Offer for Capital Projects, FCM, GMF, July 2010.

<sup>54</sup> Government of British Columbia, Ministry of Community, Sport and Cultural Development, Climate Action Revenue Incentive \program (CARIP), <http://www.cscd.gov.bc.ca/lgd/greencommunities/carip.htm>, assessed on-line December 15, 2010.

The development of this greenhouse gas inventory and the exercise of collecting data on all fuel consumed in operations will allow for ease in applying for the CARIP in future years.

Based on direct fuel consumed in corporate operations in 2007, the CARIP in 2012 is estimated to be approximately \$24,900.<sup>55</sup>

## 4.5 Community Works Fund

The Community Works Fund often referred to as “Gas Tax Fund”, is a transfer of money to local governments that is collected by the Federal government through gas tax. Many of the actions identified in this plan qualify under this fund. The funding provides local governments with a source of stable, predictable and long-term funding towards environmentally sustainable municipal infrastructure, with the key environmental outcomes aimed at reduced greenhouse gas emissions, cleaner water and cleaner air.<sup>56</sup>

# 5.0 Plan Monitoring and Reporting

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## 5.1 Reporting

In 2011, the Carbon Neutral Kootenay Project Phase 2, of which the City of Revelstoke is included, is creating a revised spreadsheet and data base to compile greenhouse gas emissions for corporate operations. The current spreadsheet does not allow for input of energy costing, contracted out services, district heating or other services that have been identified in the “Other” sector of this inventory. Municipal staff are providing input to ensure the new spreadsheet addresses concerns and difficulties that arose in preparing this inventory.

By annually adding data to the inventory, and encouraging tracking of data during the year, it will allow for an annual report or snapshot of emissions to identify changes that have occurred, quantify reductions and show successes. An annual report should review the recommended actions in this report and comment on progress and obstacles that have been identified. Annual input of energy

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<sup>55</sup> Based on proposed tax rate July 1, 2011 of \$25/tonne of CO<sub>2</sub>e emissions and July 1, 2012 of \$30/tonne of CO<sub>2</sub>e emissions, Government of British Columbia, Ministry of Small Business and Revenue, [http://www.sbr.gov.bc.ca/documents\\_library/notices/British\\_Columbia\\_Carbon\\_Tax.pdf](http://www.sbr.gov.bc.ca/documents_library/notices/British_Columbia_Carbon_Tax.pdf), assessed on-line December 15, 2010.

<sup>56</sup> Gas Tax Agreement, Canada-British Columbia – Union of British Columbia Municipalities, Agreement on the transfer of federal gas tax revenues under The New Deal for Cities and Communities, 2005-2015, Infrastructure Canada, <http://www.infcc.gc.ca/ip-pi/gtf-fte/agree-entente/agree-entente-bc-eng.html>, assessed on-line December 17, 2010.

consumption data will also simplify the reporting required by City staff when applying to receive the CARIP.

## 5.2 Climate Action Charter Considerations

The Province of British Columbia created a SMARTTool for calculation of greenhouse gas emissions to address the Climate Action Plan commitment requiring Public Sector Organizations to be carbon neutral by 2010. The SMARTTool has been piloted by 21 local governments as a means of creating a web based greenhouse gas emissions inventory and reporting tool. While it is unclear whether all local government will be required to purchase and report using this methodology, the province does not intend to mandate the SMARTTool at this time, but in the future, will need to ensure that there is consistency among other tools being used and that all local governments are counting the same emissions in the same way.<sup>57</sup>

While the greenhouse gas emissions that the City of Revelstoke are responsible for under the Climate Action Charter have been identified in this inventory, it will be important when annually entering data to ensure that they are easily identified.

## 5.3 Carbon Offsetting

The Joint Provincial-UBCM Green Communities Committee has developed a framework to help define how a local government can achieve carbon neutrality in its operations through carbon offsetting. While the framework is still being developed, it aims to balance the interests of local governments in keeping investment in greenhouse gas reduction projects local and practical, with the need for credibility.<sup>58</sup>

The framework is based on three options for local government to achieve carbon neutrality:

1. Purchasing offsets from a list of credible providers.
2. Undertaking a Green Communities Committee supported local project.
3. Developing an alternative local government project.

While this framework is being developed, it appears that all of the options require the offset be validated as a verified carbon offset. Options 2 and 3 require that the project be outside of a local government “traditional services”, which is the case with Revelstoke Community Energy Corporation

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<sup>57</sup> Meeting Your Carbon Neutral Commitment, Green Communities Committee update, presented at the 2010 UBCM Convention in Whistler on September 27, UBCM in Whistler 2010, 2010  
<http://toolkit.bc.ca/sites/default/files/CarbonOffsets%20-%20UBCMPresentation.pdf>

<sup>58</sup> BC Climate Action Toolkit, Carbon Neutral Local Government, <http://www.toolkit.bc.ca/carbon-neutral-government>, assessed on-line January 6, 2011.

(RCEC) and Revelstoke Community Forest Corporation (RCFC). It will be important in the future to look at options that will allow The City of Revelstoke's carbon offsetting to be invested locally in RCEC and RCFC.

It is unclear what the cost to purchase carbon offsets will be in 2012. Pacific Carbon Trust, a Crown Corporation of the Government of British Columbia, is currently selling carbon offsets at \$25/tonne CO<sub>2</sub>e emissions.<sup>59</sup>

Based on this rate and greenhouse gas emissions in 2007, the cost to purchase carbon offsets will be \$29,450, which is approximately equal to the money that will be received through the CARIP fund in 2012.

The Columbia Shuswap Regional District (CSRD) will be selling carbon offsets to Pacific Carbon Trust in 2011 as a result of a phased closure of the Salmon Arm landfill and the installation of an active landfill gas (methane) collection system, which through a partnership with Terasen will supply biogas to the grid. It is possible that these offsets will be offered to member municipalities of the CSRD for \$16/tonne CO<sub>2</sub>e, reducing the cost of carbon offsetting for the City.<sup>60</sup>

## 6.0 Conclusion

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By reducing energy consumption and the resulting greenhouse gas emissions in corporate operations, the City of Revelstoke will show leadership toward actions on climate change and act as a role model for the community as a whole. This will be increasingly important as the City moves forward to implement policies recommended in the Community Energy and Emissions Plan and the Sustainability Checklist.

The Climate Action Charter does not stipulate how a municipality should be carbon neutral in operations, the choice of reducing or simply paying carbon offset exists. Creating a comprehensive Energy and Greenhouse Gas Emissions Inventory and Reduction Strategy establishes an action plan for reductions. It stimulates the identification of further actions to reduce energy and emissions, as well as establishes a means to measure and evaluate successes.

By completing the actions listed in this report, The City of Revelstoke can reduce energy consumption and greenhouse gas emissions in corporate operations which will save money, improved air quality, reduce impacts on the environment, reduce the impact from fluctuations in energy prices and reduce the cost of paying offsets to meet obligations of the Climate Action Charter.

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<sup>59</sup> Pacific Carbon Trust, <http://www.pacificcarbontrust.com/BuyOffsets/tabid/64/Default.aspx>, assessed on-line January 6, 2011.

<sup>60</sup> Conversation with Darcy Mooney, Deputy Manager, Environmental and Engineering Services, Columbia Shuswap Regional District.

## 7.0 References

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BC Hydro, Power Smart

City of Revelstoke Official Community Plan, Adopted version July 6, 2009

City of Nelson, Greenhouse Gas Reduction Plan Corporate Operations, May 12<sup>th</sup>, 2010.

Community Energy Association (2008) – Community Energy and Emissions Planning: A guide for B.C. local governments. Vancouver, B.C.

Energy Efficiency and Buildings, A Resource for BC's Local Governments, Fraser Basin Council and Community Energy Association. Revised 2009.

Emission Factors for use in Reporting Public Sector Greenhouse Gas Emissions, Version 2, Climate Action Secretariat, Ministry of Environment, Shared Services BC, September 2009.

Five-Milestone Framework for Reducing Greenhouse Gas Emissions, Partners for Climate Protection, Federation for Canadian Municipalities, 2008

Green Building BC, Local Government Program, *How-To Guide, A guide to building retrofits that lower energy and water use and reduce greenhouse gas and waste generation*, Community Energy Association, Appendix A: Opportunities Checklist, <http://www.toolkit.bc.ca/resource/how-guide-guide-building-retrofits> assessed online October 26, 2010

Model Climate Change Action Plan, A template for completing a greenhouse gas reduction plan in the Partners for Climate Protection, Federation for Canadian Municipalities

Natural Resources Canada, <http://oee.nrcan.gc.ca/idling/index.cfm?fuseaction=idling.campaignSearchResults> information on anti-idling.

Webinar Sept 16, 2010 GMF Heavy duty delivers, Federation for Canadian Municipalities.

## 8.0 Appendices

### Appendix A: City of Revelstoke Resolution, Partners for Climate Protection

R-36-303

**CITY OF REVELSTOKE**  
**RESOLUTION**

MOVED BY: Councillor Johnston

SECONDED BY: Councillor Gibbs

WHEREAS the International Panel on Climate Change (IPCC) has observed that global average surface temperature has increased over the 20<sup>th</sup> Century by about 0.6 degrees Celsius, that snow cover and ice extent have decreased, that global average sea level has risen and ocean heat content has increased:

WHEREAS the IPCC concludes in its 2001 Third Scientific Assessment that “there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities”;

WHEREAS the IPCC projects that global average temperature will increase between 1.4 to 5.8 degrees Celsius by 2100 if current trends in greenhouse gas (GHG) emissions continue;

WHEREAS federal and provincial costs related to extreme weather events in Canada increased from \$500 million in 1980-1984 to \$5.3 billion in 1995-1999, exclusive of municipal costs not yet measured on a national basis;

WHEREAS greenhouse gases (carbon dioxide, methane, nitrous oxide), released from burning coal, oil and natural gas and from cutting trees and clearing land for agriculture and development, are the primary cause of climate change;

WHEREAS the Government of Canada ratified the Kyoto Protocol in December 2002, committing Canada to reducing GHG emissions by six per cent below 1990 levels by 2012;

WHEREAS the Federation of Canadian Municipalities (FCM) and ICLEI – Local Governments for Sustainability have established Partners for Climate Protection (PCP) to provide a forum for municipal governments to share their knowledge and experience with other municipal governments on how to reduce GHG emissions;

WHEREAS over 120 municipal governments across Canada representing more than 50 per cent of the population have already committed to reducing corporate and community GHG emissions through PCP;

::

WHEREAS PCP participants commit to working towards reducing GHG emissions in municipal operations by a suggested target of 20 per cent below 1994 levels, and a suggested target of six per cent reductions below 1994 levels throughout the community within ten years of joining the PCP initiative;

WHEREAS PCP is based on a five-milestone framework that includes completing GHG and energy use inventories and forecasts for community and corporate sectors, setting a GHG reduction target, developing and implementing a local action plan and monitoring the plan; and

WHEREAS municipal investments in building retrofits, community energy systems, water conservation, renewable energy technologies, waste reduction, landfill gas capture, fleet management and public transit reduce operating costs, help maintain community services, protect public health and contribute to sustainable community development while cutting GHG emissions contributing to climate change;

BE IT RESOLVED that the City of Revelstoke communicate to FCM its support for PCP and its interest in participating in PCP.

MOTION: CARRIED

*I hereby certify that the foregoing is a true and correct copy of a resolution passed by the Council of the City of Revelstoke on May 8, 2006.*

  
L. Ross McPhee  
Director of Corporate Administration

June 1, 2006  
Date Signed

## Appendix B: City of Williams Lake, Vehicle/Equipment Idle Free Policy

CITY OF WILLIAMS LAKE  
COUNCIL POLICY

195

ISSUED: APRIL 4, 2006  
PREPARED BY: MANAGER OF SHARED SERVICES  
AUTHORIZED BY: COUNCIL  
TITLE: VEHICLE/EQUIPMENT IDLE FREE POLICY  
PAGE: ONE HUNDRED & NINETY - FIVE (195)

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**1.0 Purpose:**

The City of Williams Lake is committed to reduce unnecessary vehicle/equipment idling as a means of reducing air pollution and fuel expense.

The purpose of this policy is to establish guidelines for unnecessary idling of municipal vehicles and equipment. Limiting idling times reduces air pollution and greenhouse gas emissions, and contributes to healthier work environments and the efficient use of city resources.

**2.0 Scope:**

This policy applies to all staff operating vehicles and equipment owned or leased by the City of Williams Lake and Transit buses.

**3.0 Definition****3.1 Idling**

Idling means the operation of a vehicle or equipment while they are not in motion and not being used to operate auxiliary equipment that is essential to the operation of the vehicle or equipment.

**3.2 Fuels**

For the purpose of this policy this includes all vehicles or equipment that run on fossil fuels which include gasoline, diesel, propane, hydrogen and natural gas.

**3.3 Vehicles**

For the purposes of this policy, vehicles or equipment refers to cars, light trucks, vans, heavy truck, snow equipment, transit buses, loaders, backhoes, street sweepers, and any other equipment operated by staff and utilizing fossil fuels.



**4.0 Procedures:****4.1 Manufacturer's Guidelines (Recommendations)**

Always follow the manufacturer's guidelines and recommendations for idling unless otherwise advised by Fleet Services.

**4.2 Initial Warm-Up****4.2.1 Gasoline and Alternative Fuel Vehicles**

Idle times up to 5 minutes are allowed for vehicles during their initial shift warm up and at subsequent times when the vehicle is being restarted after a prolonged period of shut down that results in vehicle conditions similar to those prior to initial shift warm up.

**4.2.2 Diesel Fueled Vehicles/Equipment**

Idle times up to 5 minutes are allowed for diesel fueled vehicles/equipment during their initial shift warm up, and at subsequent times when the vehicle/equipment is being restarted after a prolonged period of shut down that result in vehicle/equipment conditions similar to those prior to initial shift warm up.

**4.3 Operation of Equipment in the field****4.3.1 Gasoline and Alternative Fuel Vehicles**

No operator shall idle the engine of an unleaded fueled vehicle in excess of 1 minute, if the vehicle is stopped for a foreseeable period of time. Operators making multiple or frequent stops that require their vehicle to be stationary for time periods of several minutes may idle up to 3 minutes in such circumstances.

**4.3.2 Diesel Fueled Vehicles/Equipment**

No operator shall idle the engine of a diesel-fueled vehicle in excess of 3 minutes if the vehicle is stopped for a foreseeable period of time. Diesel fueled vehicles/equipment should only be turned off after enough time has passed to allow the proper circulation and cooling of the engine oil, coolant, and turbo chargers, not to exceed 3 minutes.

4.3.3 When engines must be left running for any reason, the operator must remain with the vehicle.



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**5.0 Exceptions**

This policy does not apply to the following vehicles, equipment or situations. Operators must use their own discretion in certain situations.

- 5.1 Emergency vehicles and equipment are exempted while engaged in operational activities such as fire, police, or ambulance services.
- 5.2 Vehicles assisting in an emergency activity are exempt.
- 5.3 Where engine power is necessary for an associated power need such as, but not limited to, electrical power, compressed air, and various power take-off devices such as auxiliary hydraulics.
- 5.4 Vehicles may idle for the purpose of defogging, defrosting or deicing windows. Idling must end when fog, frost, or ice conditions have been eliminated. When window ice or frost conditions are present, attempts to remove snow, ice or frost from the windows with a scraper must be attempted before idling.
- 5.5 Vehicles used solely to power emergency lighting and 2-way radios can operate the lighting for 30 minutes and can be idled at intervals to charge batteries. A large number of city vehicles have a dual battery system and the lighting can be operated for long periods without idling.
- 5.6 Staff may idle vehicles/equipment for the purpose of getting warm and/or dry if indoor accommodations are not available at the work site.
- 5.7 During the winter season with below zero temperatures and/or blizzard conditions, and during summer periods of extreme heat, extended idling periods may be necessary for the well being of the operator and passengers.
- 5.8 This policy does not apply to vehicles being serviced or inspected.
- 5.9 Where safety may be compromised by shutting down the engine, vehicles/equipment may idle at the discretion of the operator.
- 5.10 Transit vehicles, during the winter season with below zero temperatures and/or blizzard conditions, and during summer periods of extreme heat, extended idling periods may be necessary for the well being of the operator and passengers.



## Appendix C: City of Dawson Creek, Green Vehicle Policy

### GREEN VEHICLE POLICY

#### **Background**

In 2004, Dawson Creek completed a baseline study on its municipal energy consumption. One of the study's recommendations was the creation of a green vehicle policy that would guide vehicle purchasing decisions and operating practice in order to help reduce energy consumption. An overview of the different components and options for a green vehicle policy was prepared and presented to Dawson Creek in February, 2006. The policy that follows reflects the goals and direction that Dawson Creek chose from these options. For background information on each section, please see the *Dawson Creek Green Vehicle Policy Working Paper*.

#### **Rationale**

- Gasoline and diesel fuels used for transportation produce greenhouse gas (GHG) emissions that contribute to climate change, and local air emissions (Criteria Air Contaminants – CACs) that degrade local air quality. This policy will help to reduce vehicle emissions.
- New vehicles will be an ongoing expense in Dawson Creek. This policy will ensure that life cycle costs are considered for new vehicle purchases and that vehicle efficiencies are maximized.
- Many of the policy options described here can be adapted and expanded to the community level. This policy provides a starting point to engage on other transportation issues throughout the municipality.

#### **Goals and Objectives**

The goals and objectives of this policy are:

- To reduce emissions from the municipal vehicle fleet to levels that are 20% below 2004 levels by 2016 by:
  - Reducing idling
  - Reducing single occupancy trips
  - Purchasing more efficient vehicles and fuels
  - Right-sizing vehicles
- To consider the life cycle costs of municipal vehicle operations when purchasing vehicles.
- To maximize vehicle efficiency.
- To provide a framework for lessening the environmental impact of vehicle operations that can be expanded to the larger community.

#### **Guidelines**

##### **1. Purchasing**

###### *1.1. Rightsizing*

Vehicles should be purchased according to the average or usual anticipated use of the vehicle. Occasional vehicle needs that exceed the capacity of the vehicle purchased should be met through vehicle sharing or renting. The following use requirements should be considered when purchasing a vehicle:

- engine size
- vehicle weight
- average carrying capacity
- average passenger capacity
- average terrain

These use requirements should accompany and form part of any recommendation made to the Chief Administrative Officer and Chief Financial Officer under the Purchase of Capital Equipment

Policy.

### *1.2. Life cycle cost*

Life cycle costs should be considered for all vehicle purchases. Life cycle costs should include: capital costs, maintenance costs, fuel costs, and resale costs.

## 2. Fuel Choice

### *2.1. Fuel choice*

The lowest GHG emission fuel possible should be purchased for all vehicles in the fleet.

Consideration of fuels should include:

- purchasing low emission fuel for the whole fleet (i.e. low-sulphur gasoline or biodiesel)
- purchasing vehicles that run on alternative fuel sources

## 3. Operating

### *3.1. Idling*

Idling should be reduced among all municipal vehicles where possible. The following guidelines should be followed by all municipal vehicle operators:

- Reduce warm-up idling (no more than 30 seconds as long as windows are clear)
- It takes more gas to idle for more than 10 seconds than it does to restart your vehicle. If stopped for more than 10 seconds, vehicles should be turned off, except in the following circumstances:
  - In traffic
  - In the course of performing a specific duty that requires that the vehicle be left running
  - If the temperature is below -10C
  - If doing so would compromise human safety or the mechanical integrity of the vehicle

### *3.2. Vehicle sharing*

Single occupancy vehicle trips should be minimized. Vehicles should be shared between departments to ensure maximum efficiency for vehicle use.

### *3.3. Driver education*

Driving procedures to increase the efficiency of vehicle operations, including anti-idling, should be included in driver training programs that municipal staff are required to take.

## 4. Maintenance and monitoring

### *4.1. Maintenance*

Maintenance on municipal vehicles should continue to ensure that preventative maintenance continues to maximize the efficiency of all vehicle operations.

### *4.2. Monitoring*

All vehicles should be monitored to track fuel consumption, fuel costs, mileage, and maintenance costs.

## 5. Evaluation

### *5.1. Monitoring objectives*

The objectives in this policy should be measured at regular intervals to ensure that the policy is effectively moving Dawson Creek towards its goals.

### *5.2. Policy evaluation*

This policy should undergo regular evaluation to ensure that it is enabling Dawson Creek to move towards its goals.

**APPROVED BY COUNCIL:**

**DATE: May 29, 2006**