the PEMBINA institute

City of Dawson Creek Community Energy Planning

Municipal Operations Energy Baseline Report

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Table of Contents

1 Introduction 3
2 Scope 4
3 Data Sources 6
4 Energy Consumption 8
5 Energy Costs 13
6 Greenhouse Gas Emissions 17
7 Next Steps 21
Appendix A – Data Tables 25

Table of Figures

Figure 1 – Energy Consumption for all Municipal Operations 9
Figure 2 – Energy Consumption for the Airport & Other Buildings 9
Figure 3 – Energy Consumption for Cultural Centres 10
Figure 4 – Energy Consumption for Emergency Services 10
Figure 5 – Energy Consumption for Engineering and Public Works Buildings 11
Figure 6 – Energy Consumption for Recreation Centres 11
Figure 7 – Energy Consumption for Engineering and Public Works Infrastructure 12
Figure 8 – Energy Costs for all Municipal Operations 13
Figure 9 – Energy Costs for the Airport & Other Buildings 14
Figure 10 – Energy Costs for Cultural Centres 14
Figure 11 – Energy Costs for Emergency Services 15
Figure 12 – Energy Costs for Engineering and Public Works Buildings 15
Figure 13 – Energy Costs for Recreation Centres 16
Figure 14 – Energy Costs for Engineering and Public Works Infrastructure 16
Figure 15 – Greenhouse Gas Emissions for all Municipal Operations 17
Figure 16 – Greenhouse Gas Emissions for the Airport & Other Buildings 18
Figure 17 – Greenhouse Gas Emissions for Cultural Centres 18
Figure 18 – Greenhouse Gas Emissions for Emergency Services 19
Figure 19 – Greenhouse Gas Emissions for Engineering and Public Works Buildings 19
Figure 20 – Greenhouse Gas Emissions for Recreation Centres 20
Figure 21 – Greenhouse Gas Emissions for Engineering and Public Works Infrastructure 20

1 Introduction

This energy baseline report examines current and future energy consumption patterns for the municipal operations of Dawson Creek. Understanding these patterns facilitates the assessment of different energy options and helps identify financial and environmental risks that could be faced in the future. Inadequate consideration of these energy issues can lead to missed opportunities for efficiency and supply improvements, which will impose unnecessary costs for the city.

This study serves as the first phase in Dawson Creek's multi-step approach to developing and implementing a community energy plan. Focusing on municipal operations in the first phase allows Dawson Creek to make sure that any internal opportunities are identified and addressed before engaging the broader community. Four key areas remain to be addressed in subsequent phases of the project:

- Analyze specific opportunities using the results of the municipal operations baseline study, and implement beneficial infrastructure and policy changes (including the adoption of energy performance and environmental targets).
- Engage the residents, businesses, and industry of Dawson Creek to understand their needs and concerns as they relate to undertaking energy planning in the entire community.
- Prepare baseline studies for these sectors to understand key opportunities for cost savings and greenhouse gas reductions.
- Analyze specific opportunities in the broader community, and work with key stakeholders to develop and adopt targets and an implementation plan.

The baseline report begins with a discussion of the project scope (section 2), followed by a brief description of the methodology (section 3). Sections 4, 5, and 6 then present the existing energy consumption, energy costs, and resulting greenhouse gas (GHG) emissions for municipal operations. The report then closes with some key conclusions that have arisen from the analysis to date and help provide direction on further investigation and action (section 7).

2 Scope

The analysis in this baseline report is limited to Dawson Creek's municipal operations, which include buildings, other infrastructure, and non-stationary applications (transportation and mobile equipment). Tables 1, 2 and 3 provide lists of what is included under each of these areas, and also show the energy sources that they each rely on. For each of these energy sources, the report looks at the amount of energy consumed on an annual basis, the cost of that energy, and the resulting GHG emissions. This report does not cover public transit, public schools, or local air pollutants.

	Energy Source			
Energy Demand	**Electricity**	**Natural Gas**	**Gasoline**	**Diesel**
Recreation Facilities				
Kin Arena	✓	✓		
Memorial Arena	✓	✓		
Curling Rink	✓	✓		
Swimming Pool	✓	✓		
Kin Park	✓			
Ball Diamonds	✓			
Cultural Centres				
Youth Centre	✓	✓		
NAR Park	✓	✓		
Exhibition Grounds	✓	✓		
Emergency Services				
Fire Hall	✓	✓		
RCMP Station	✓	✓		
RCMP Telecom	✓	✓		
Engineering & Public Works				
Public Works Yards	✓	✓		
Water Treatment Plant	✓	✓		
Other	✓			
Airport & Other Buildings				
Terminal	✓	✓		
Hanger	✓	✓		
Fuel Facility	✓	✓		
Terminal Maintenance Bldg	✓	✓		
City Hall	✓	✓		

Table 1 – Buildings included in baseline and their respective energy sources

	Energy Source			
Energy Demand	**Electricity**	**Natural Gas**	**Gasoline**	**Diesel**
Water Supply				
Arras Pumping Station	✓			
Devereaux Pumping Station	✓			
Water Distribution				
Alaska Highway Booster	✓			
Parkhill Booster	✓	✓		
Pouce Coupe Booster	✓			
Sewage				
Water Treatment Pond	✓			
Small (5hp) Lift Stations (4)	✓			
Main Lift Station	✓			
Streetlights				
Owned by City	✓			
Owned by Province	✓			
Owned by BC Hydro	✓			

Table 2 – Other infrastructure included in baseline and their respective energy sources

	Energy Source			
Energy Demand	**Electricity**	**Natural Gas**	**Gasoline**	**Diesel**
Light Duty City Vehicles			✓	✓
Heavy Duty City Vehicles			✓	✓
Emergency Service Vehicles			✓	✓
Other City Equipment			✓	✓

Table 3 – Non-stationary energy consumption included in baseline and their respective energy sources

3 Data Sources

This section summarizes the procedures used to collect the necessary data on energy consumption and costs (GHG emissions are based on consumption figures). In all cases, City staff were extremely helpful in their willingness to supply data directly, and help in the collection and interpretation of data from the following sources:

- *Electricity* – BC Hydro
- *Natural Gas* – Pacific Northern Gas (PNG)
- *Gasoline and Diesel* – Dawson Co-operative Union

Monthly electricity consumption was available online using the BC Hydro website, and this report presents the annual consumption from November 2003 to October 2004 (November and December 2004 were not available). Cost data for the corresponding period was obtained from the City's financial records, although the frequency of billing periods did not always match the time period for consumption exactly because of bi-monthly billing or variable dates for meter readings. Natural gas consumption supplied electronically by PNG was not normalized for each calendar month, and due to inconsistent metering frequencies and dates, the consumption data needed to be scaled to 366 days. The cost data, taken from the City's records, only shows total expenditures for the calendar year 2004, and may represent billing periods that don't total exactly 366 days.

There is a high degree of confidence in the accuracy of the total consumption and cost figures for municipal operations, but less so when the data is disaggregated to specific end-uses such as individual buildings. The reason for this uncertainty is that certain electricity and natural gas meters are used for multiple facilities and the billing amounts are allocated to each facility for budgeting purposes. For example, folio number 43001 records electrical consumption of both City Hall and the Fire Department. The billing for this meter is split between two different Dawson Creek Accounts, with 75% of costs attributed to city hall, and 25% attributed to the fire department. The problem is that actual consumption for each facility cannot be traced, and assumptions must be made as to how much electricity is in fact consumed by each building (in this report, 75% of kWh consumption is attributed to City Hall and 25% to the Fire Department). Further discussion on this issue and recommended solutions are discussed in Section 6.

Moving to gasoline and diesel, combined purchases and costs were supplied by the Co-op. This data was not ideal, because they were not able to provide figures on a monthly basis or separated into diesel and gasoline categories. Additionally, because the City makes bulk purchases for the Public Works yard, the sales records will not match exactly with consumption. As a complementary data source, the City provided detailed mileage records for certain vehicles and the breakdown of diesel and gasoline dispensed from the public works yard. This information helped estimate the fuel split between diesel and gasoline (needed to estimate greenhouse gas emissions), but was still not ideal because no information on cardlock consumption was available.

As with the electricity and natural gas data, confidence in the overall consumption and cost figures is high. That confidence decreases as the figures are disaggregated into diesel and gasoline, and the level of uncertainty was too high to justify presenting estimates of cost or consumption for individual vehicles or even groups of vehicles.

The GHG emissions associated with the consumption of electricity, natural gas, and diesel and gasoline were calculated using the following emissions intensity factors.

- *Electricity* – The emissions intensity used in this report is 28.59 g carbon dioxide equivalent (CO_2e) per kWh, which is substantially lower than most Canadian provinces due to its high percentage of hydroelectricity. This value is an average of previous years reported in Canada's Greenhouse Gas Inventory (2002) because the value varies substantially from year to year depending on the snowmelt available.
- *Natural Gas* – The emissions intensity used in this report is 1902.63 g CO_2e/m^3 of natural gas, or 0.056124 tonnes CO_2e per GJ of natural gas. This value was obtained from Canada's Greenhouse Gas Inventory (2002).
- *Diesel and Gasoline* – The emissions intensity used in this report for diesel and gasoline are 2.793 kg CO_2e per L and 2.508 kg CO_2e per L respectively. Both values were obtained from Canada's Greenhouse Gas Inventory (2002).

4 Energy Consumption

This section presents the energy consumption for Dawson Creek's municipal operations. Figure 1 groups the results into eight broad categories: airports & other buildings, cultural centres, emergency services, engineering & public works buildings, recreation centres, water & sewer infrastructure, street lighting, and non-stationary. Following this, Figures 2 through 7 take each broad category and look at the constituent parts (the data available do not permit a detailed figure for street-lighting or non-stationary sources to be provided). The data underlying each chart is available in Appendix A.

For ease of comparison, all consumption figures have been converted to MWh and each category's consumption is broken into the different fuels. Dawson Creek municipal operations consumed a total of 18,301 MWh of energy in 2004 (8,468 MWh of electricity, 7,813 MWh or natural gas, and 2,020 MWh of gasoline and diesel). This consumption was dominated by the city's recreation centres, followed by water and sewer infrastructure.

Comparing these results with energy consumption figures from other municipalities can be desirable, but it is a difficult task because the information needed to make that comparison is not typically readily available. To provide a valid comparison, a municipality would need to be similar in size to Dawson Creek and in a similar climate, and the baseline needs to clearly document the types of buildings within the baselines scope (this declaration would need to include the size of the buildings, the fuel mix, the purpose and intensity of use, and the age). Without this more detailed information, it is impossible to tell if higher energy consumption is an indication of lower efficiency, greater use, or different building types. These challenges can be mitigated if energy intensities are available (i.e. MWh / m^2 of floorspace), but these figures were not collected as part of this research.

The site visits to most city buildings and interviews with staff did help develop a qualitative assessment of building energy performance. For the most part, the buildings were relatively well constructed, but without any special attention to energy concerns in the design, the typical performance is likely comparable to the regional average. The relatively high level of awareness of energy issues and maintenance concerns among key staff has likely served to keep that energy performance closer to design levels than if the focus had not been there.

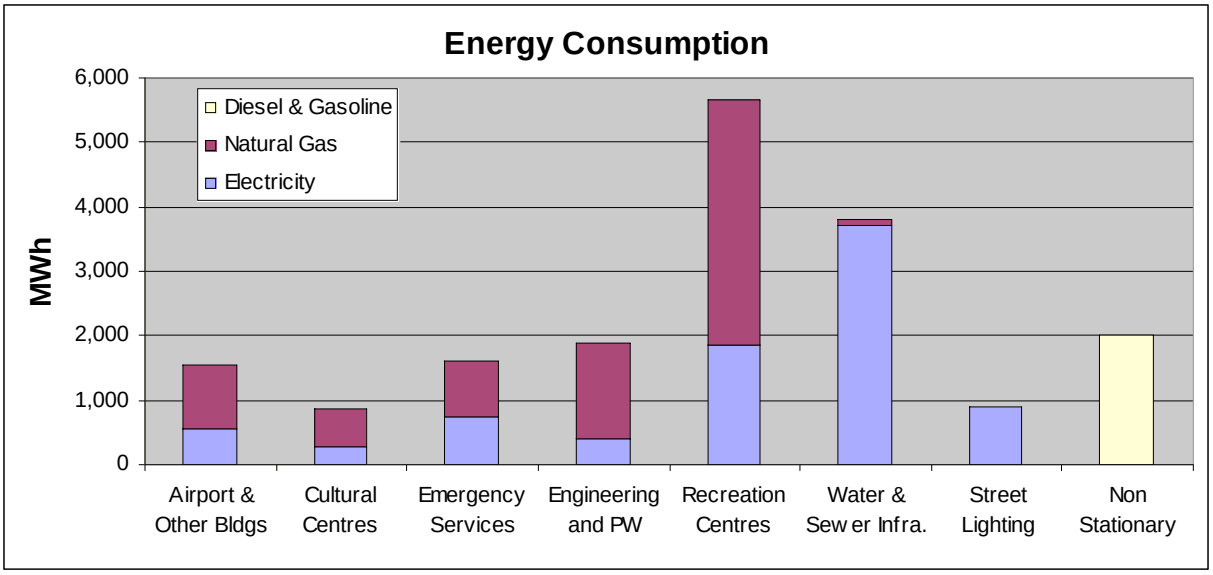

Figure 1 – Energy Consumption for all Municipal Operations

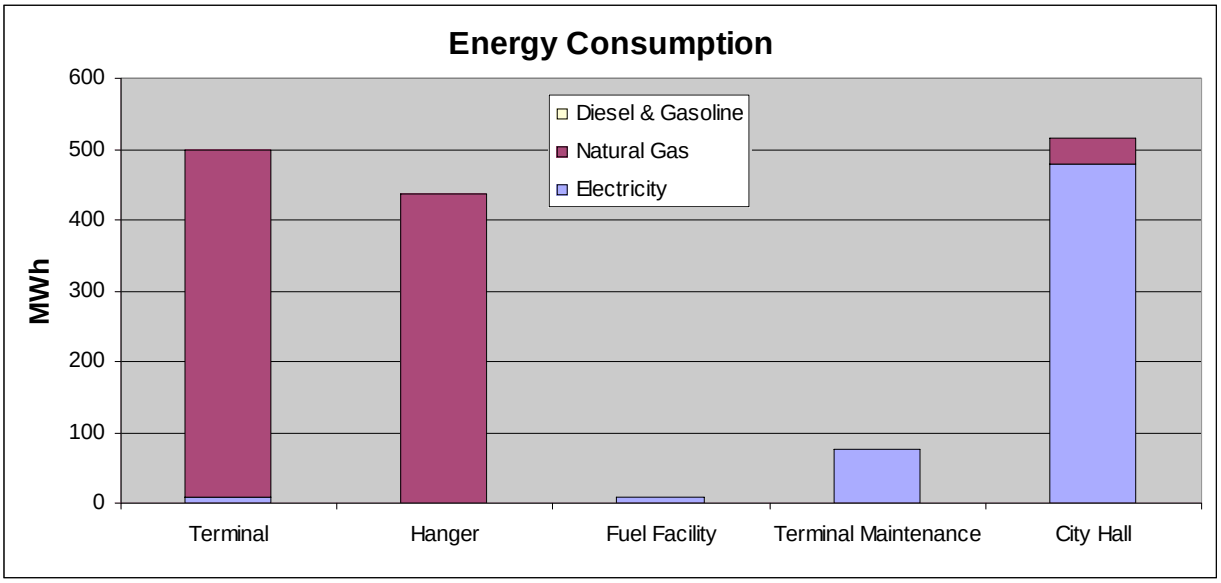

Figure 2 – Energy Consumption for the Airport & Other Buildings[1]

[1] The airport terminal and hanger's reliance on natural gas and city hall's reliance on electricity indicated in the figures is not reflective of reality, but the precise error could not be tracked down from existing records. The energy consumption for these three buildings may also crossover with the RCMP station and firehall in Figure 4. See recommendation 1 in section 6 for further discussion.

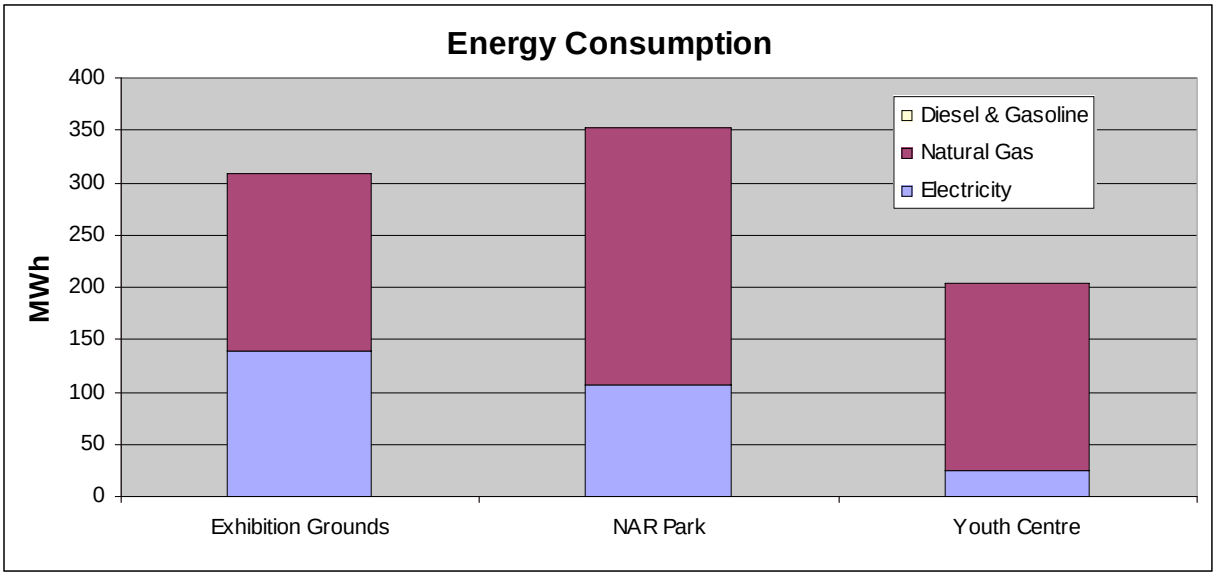

Figure 3 – Energy Consumption for Cultural Centres

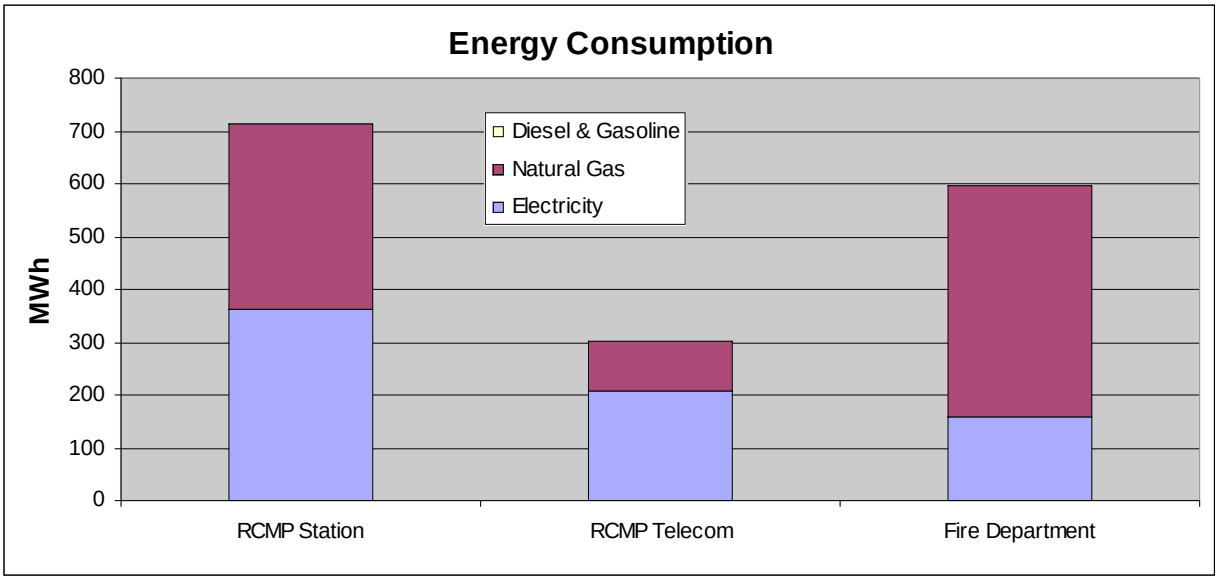

Figure 4 – Energy Consumption for Emergency Services

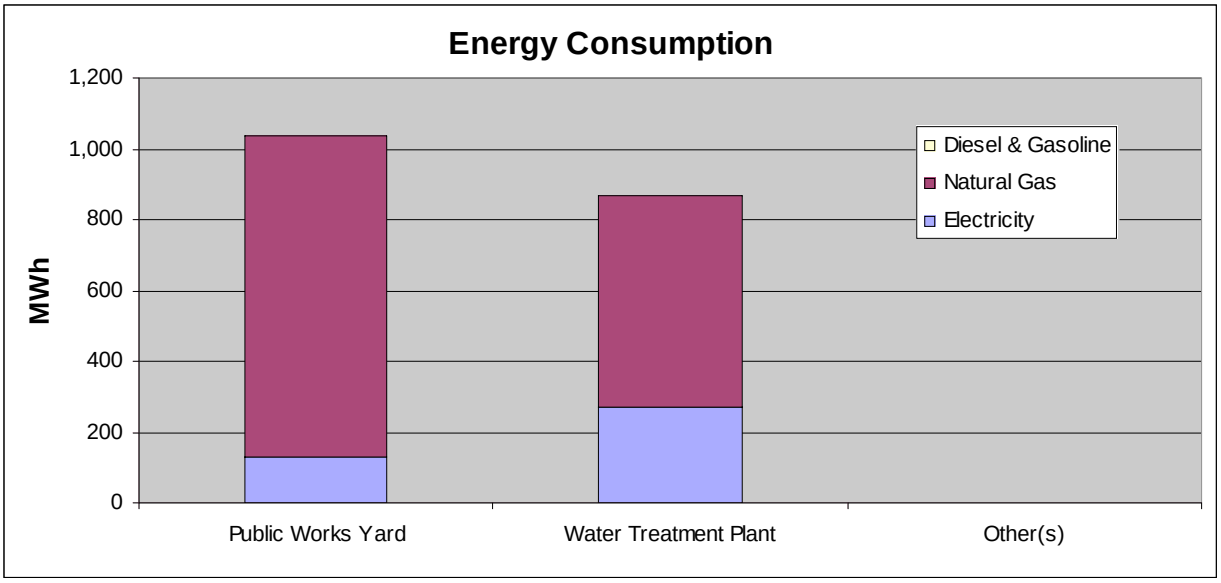

Figure 5 – Energy Consumption for Engineering and Public Works Buildings

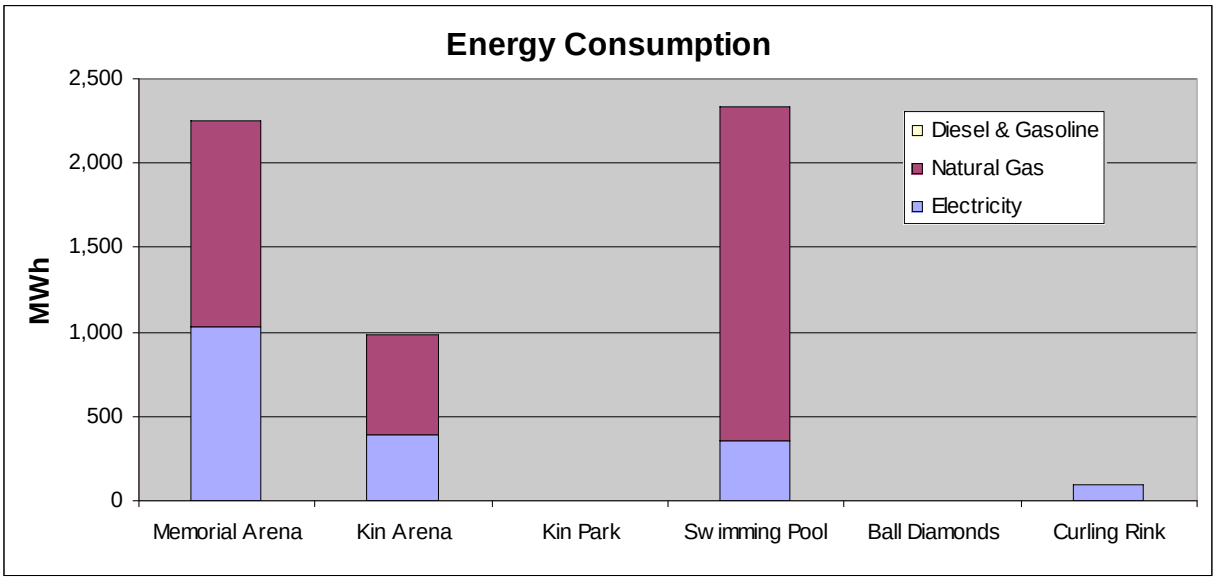

Figure 6 – Energy Consumption for Recreation Centres[2]

[2] Although no natural gas consumption is associated with the curling rink in the figure, the rink's actual consumption is assumed to be included in an aggregated meter for either Memorial or Kin Arena.

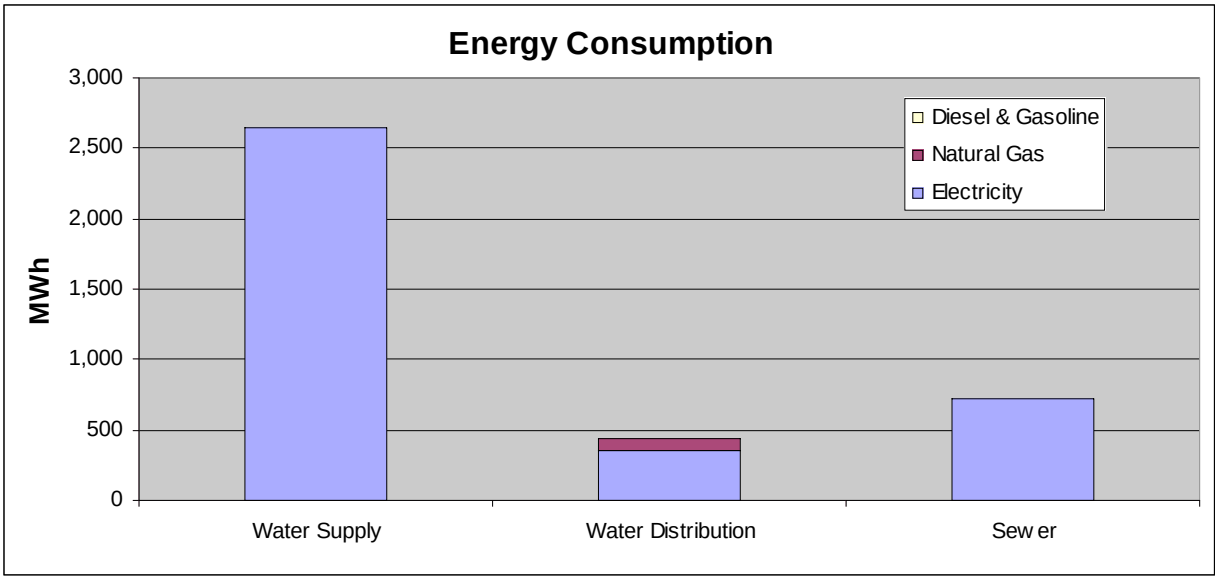

Figure 7 – Energy Consumption for Engineering and Public Works Infrastructure

5 Energy Costs

This section presents the energy costs for Dawson Creek's municipal operations using the same categories of buildings, infrastructure and equipment defined in Section 4. All units have been standardized to thousands of 2004 dollars, and each category is separated into the different fuels. The data underlying each chart is available in Appendix A.

Dawson Creek municipal operations spent a total of $920,000 on energy in 2004 ($514,000 on electricity, $258,000 on natural gas, and $148,000 on gasoline and diesel). These costs were dominated by the city's recreation centers, water & sewer infrastructure, street-lighting, non-stationary sources. The distribution does not parallel the corresponding energy consumption figure (Figure 1) because the different energy sources do not cost the same per unit of energy. In this case, electricity and gasoline/diesel are more expensive than natural gas, which increases the relative importance of the groupings more reliant on these fuels. The high cost of street lighting would not have been expected based on energy consumption, but the average electricity cost for street lighting is particularly high.

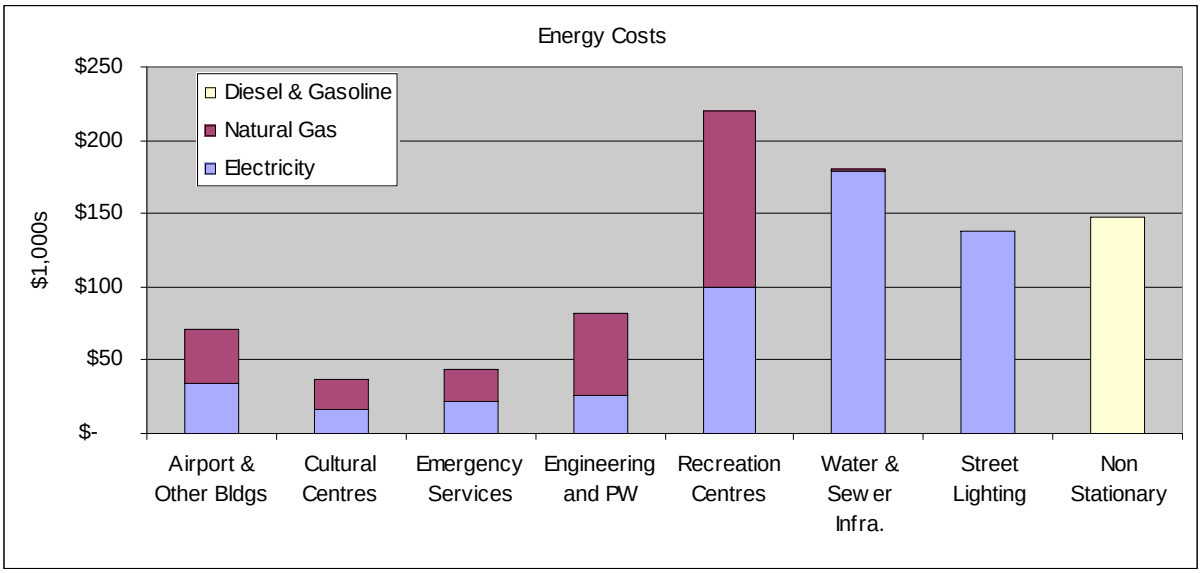

Figure 8 – Energy Costs for all Municipal Operations

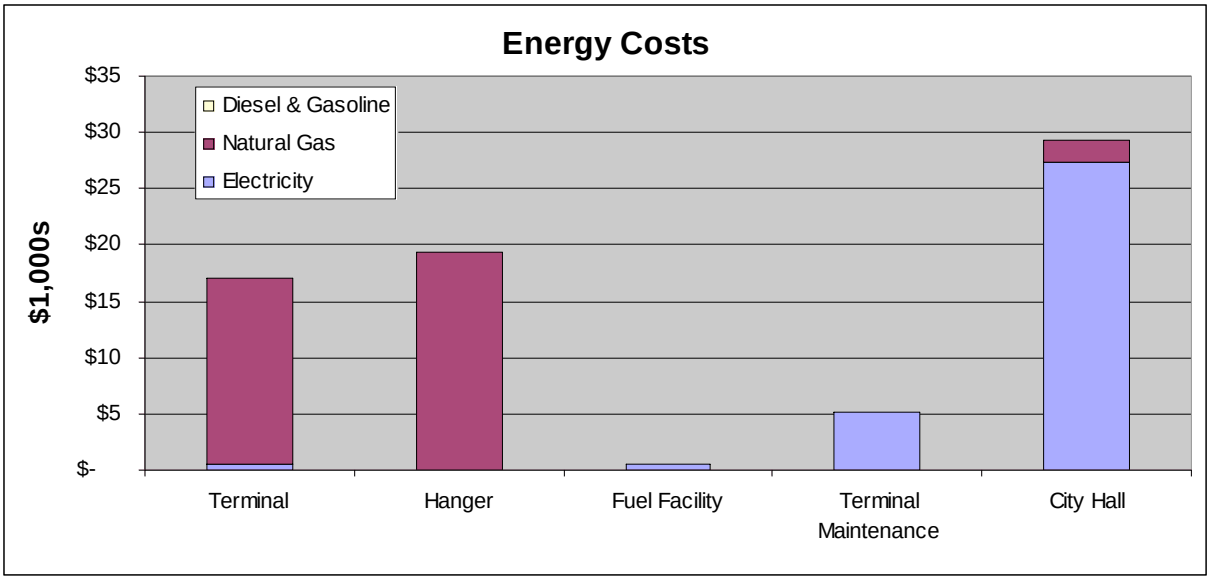

Figure 9 – Energy Costs for the Airport & Other Buildings[3]

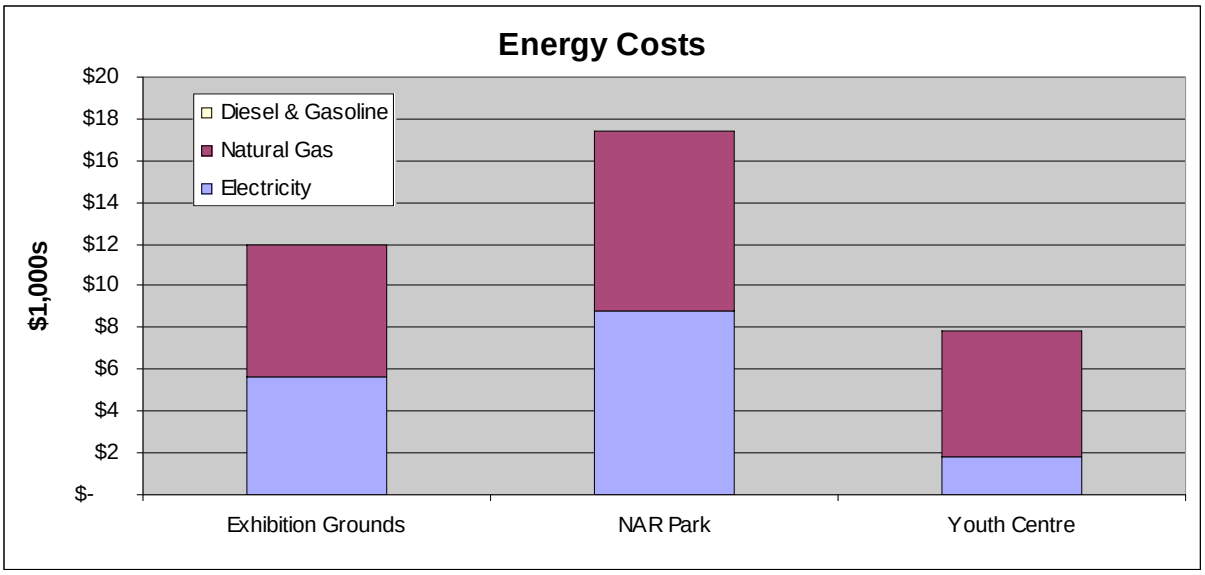

Figure 10 – Energy Costs for Cultural Centres

[3] See footnote 1 with Figure 2 for further discussion.

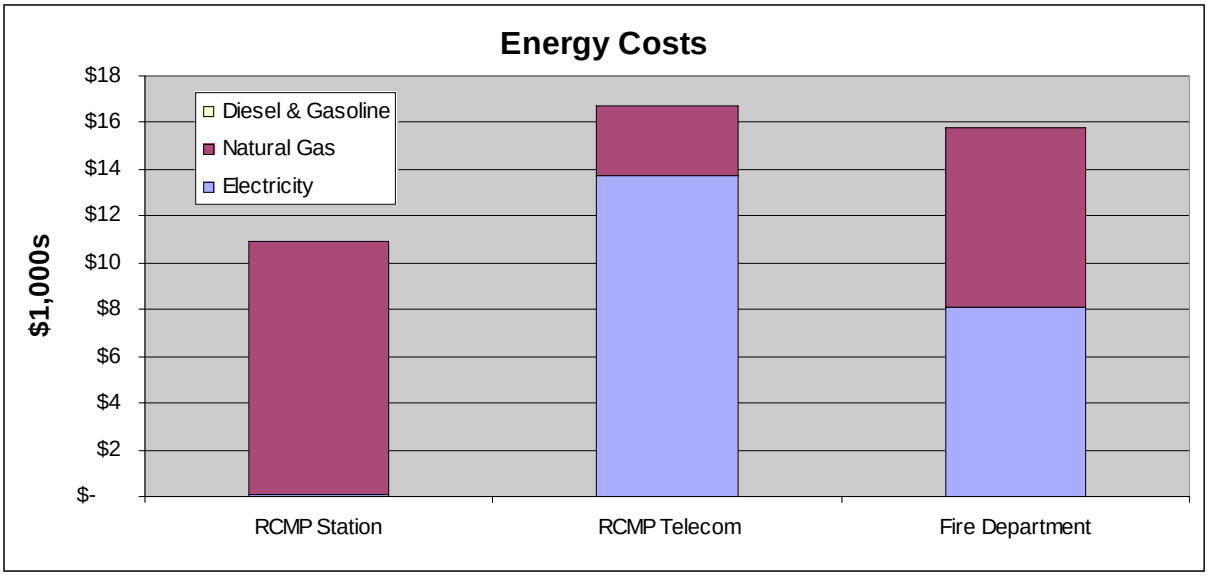

Figure 11 – Energy Costs for Emergency Services

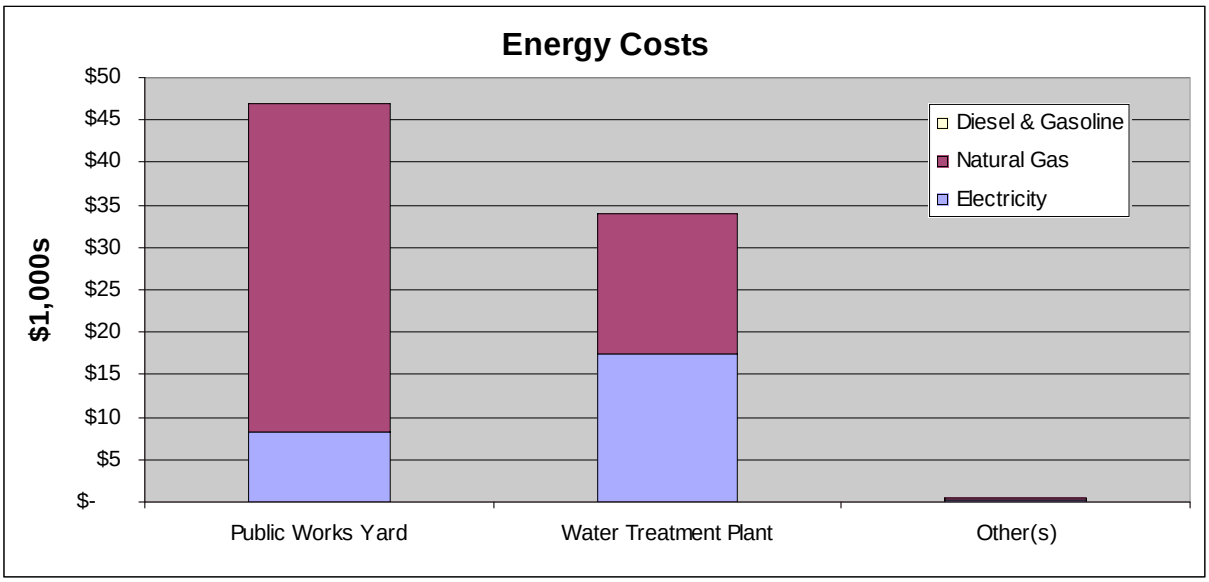

Figure 12 – Energy Costs for Engineering and Public Works Buildings

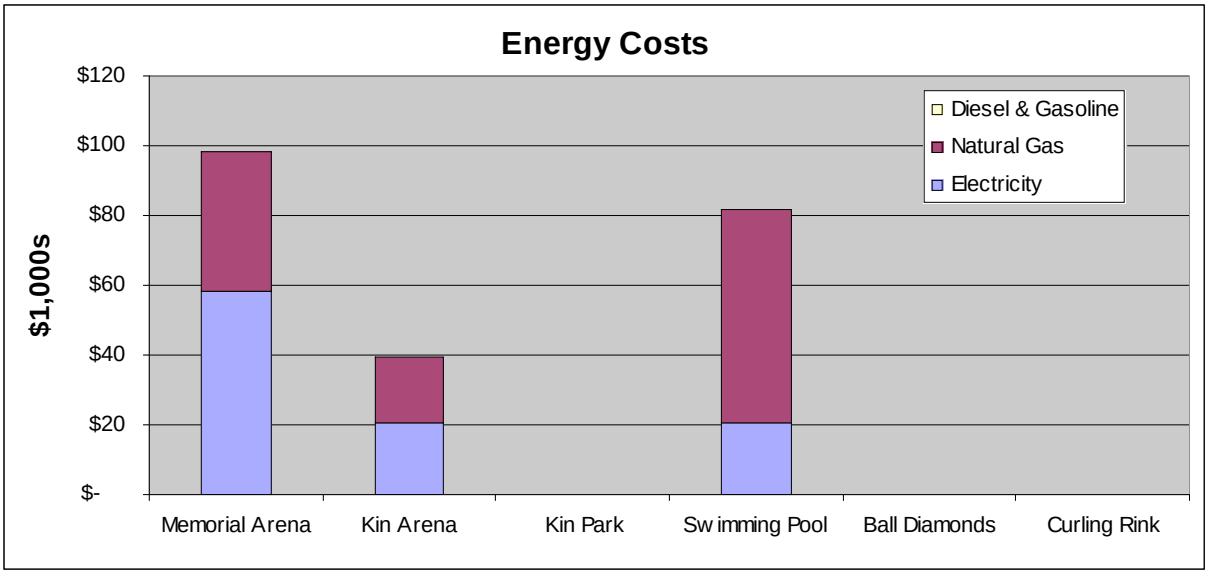

Figure 13 – Energy Costs for Recreation Centres[4]

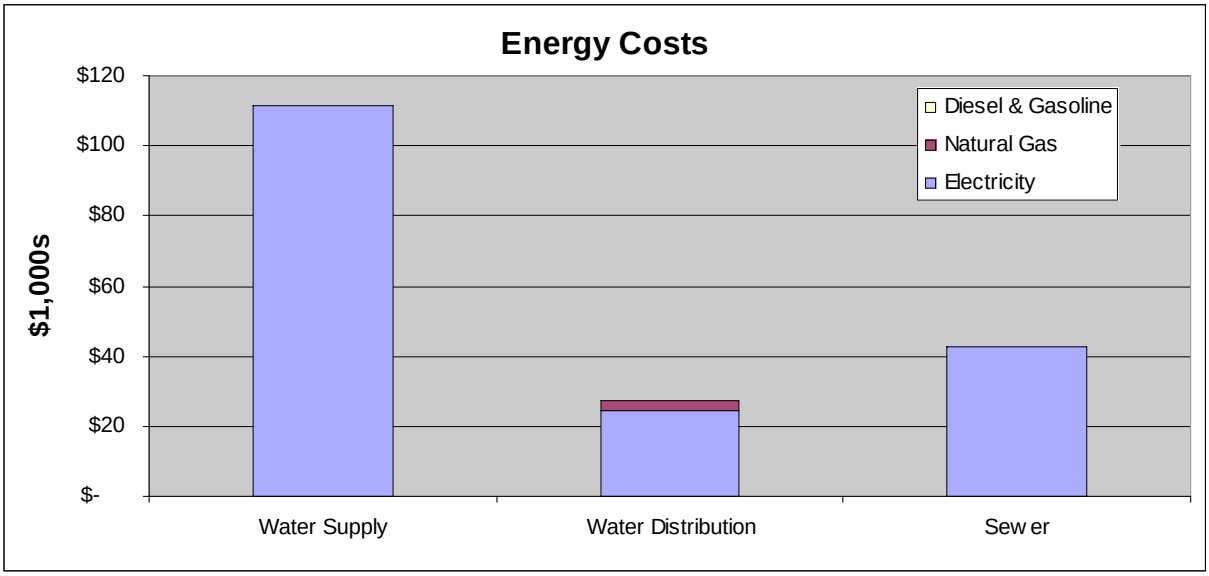

Figure 14 – Energy Costs for Engineering and Public Works Infrastructure

[4] Although no costs are associated with the curling rink in the figure, the rink's actual costs are assumed to be included in an aggregated meter for either Memorial or Kin Arena.

6 Greenhouse Gas Emissions

This section presents the greenhouse gas emissions for Dawson Creek's municipal operations using the same categories of buildings, infrastructure and equipment defined in Sections 4 and 5. All units have been standardized to tonnes of CO_2e per year, and each category is separated into the different fuels.

Dawson Creek municipal operations produced a total of 2,346 tonnes greenhouse gas emission in 2004 (242 tonnes from electricity, 1,579 tonnes from natural gas, and 526 tonnes from gasoline and diesel). These emissions were dominated by the city's recreation centers, and non-stationary sources; the groupings that consumed the most natural gas and gasoline and diesel which are more GHG intensive energy sources than hydro electricity. The groupings that are more dependant on electricity (e.g. water and sewer infrastructure and street lighting) have relatively low GHG emissions because BC Hydro's electricity grid is primarily hydro-electricity.

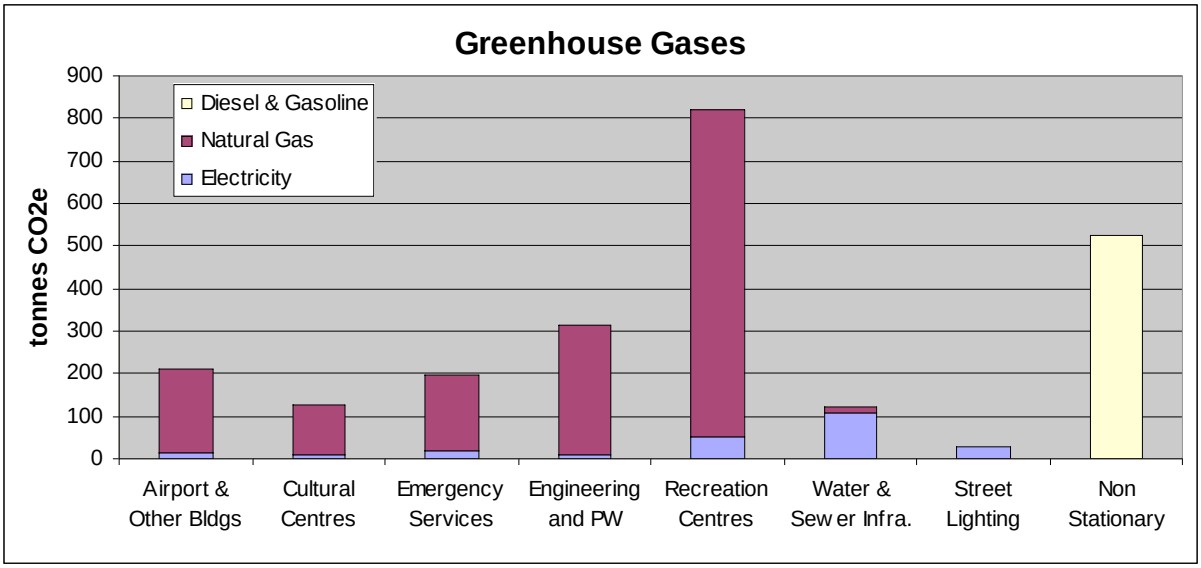

Figure 15 – Greenhouse Gas Emissions for all Municipal Operations

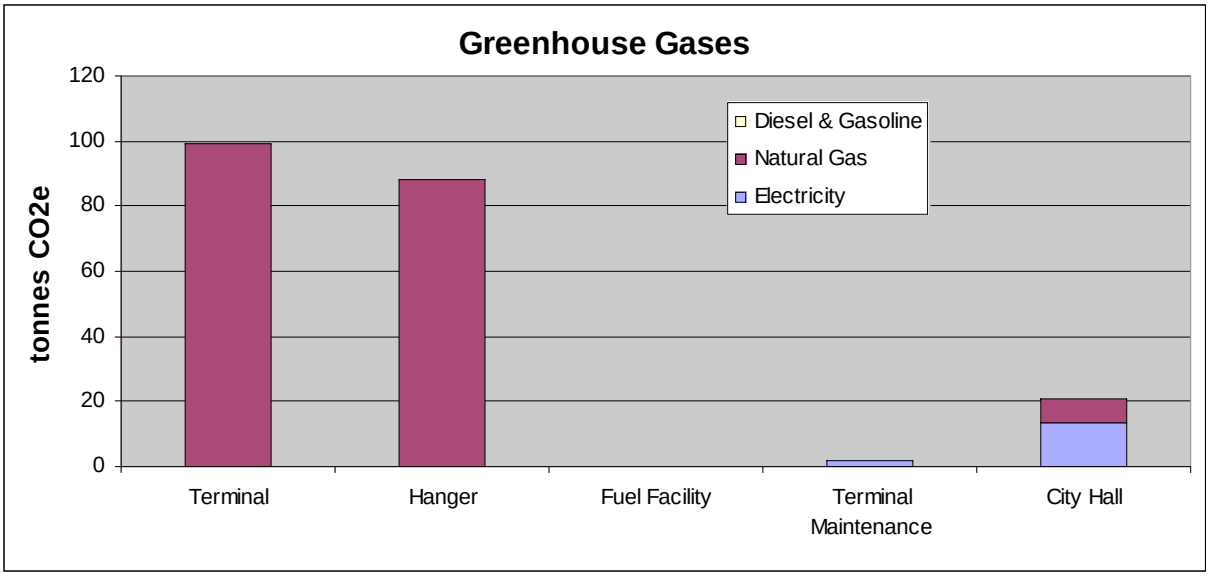

Figure 16 – Greenhouse Gas Emissions for the Airport & Other Buildings[5]

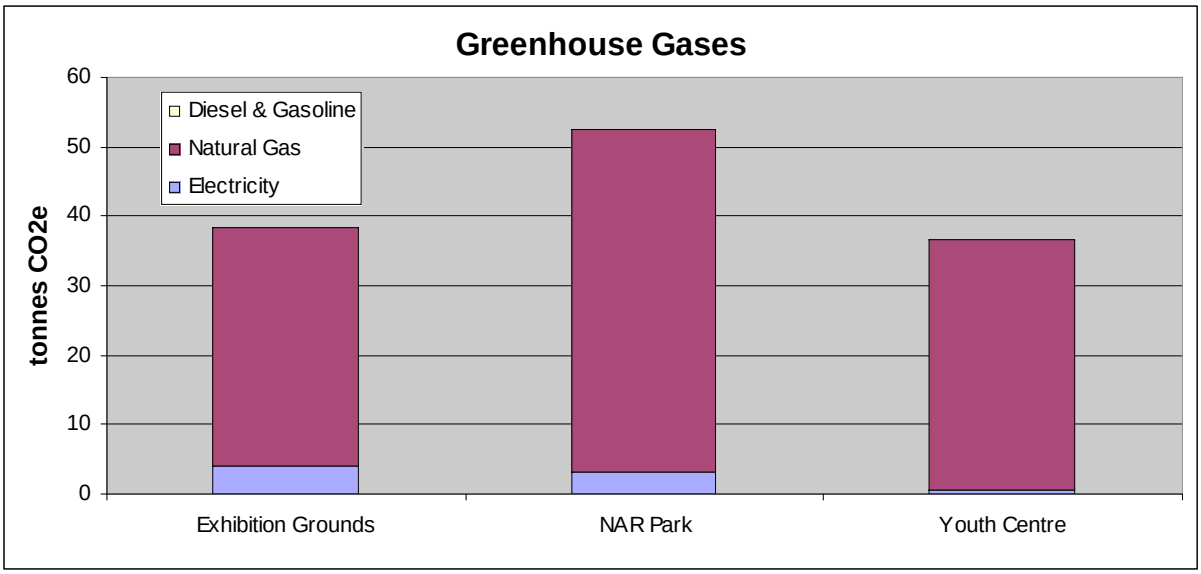

Figure 17 – Greenhouse Gas Emissions for Cultural Centres

[5] See footnote 1 with Figure 2 for further discussion.

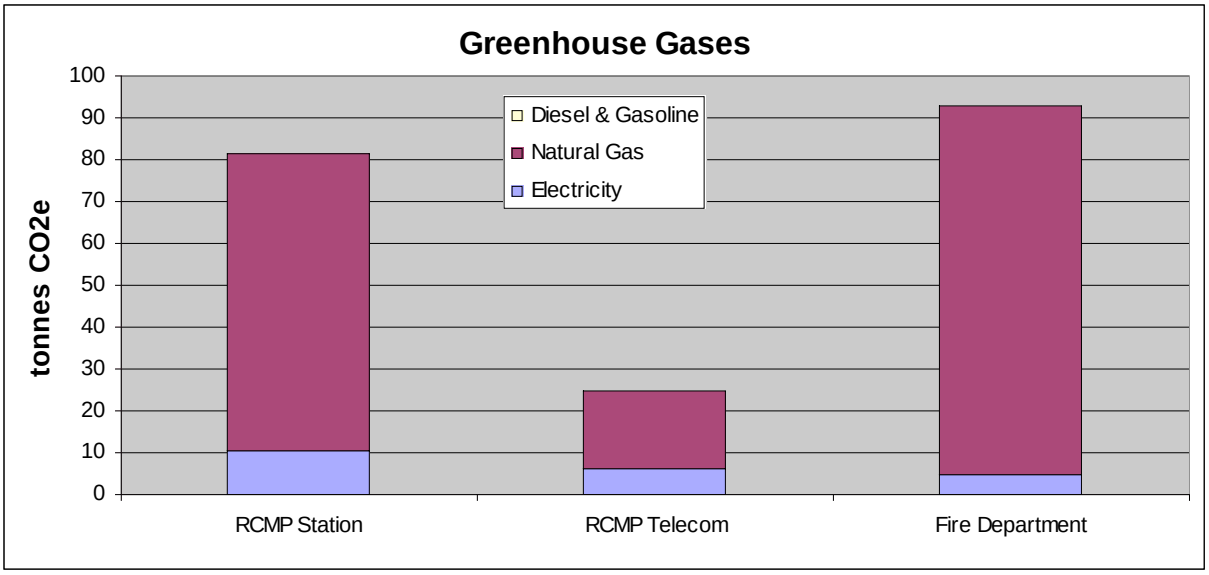

Figure 18 – Greenhouse Gas Emissions for Emergency Services

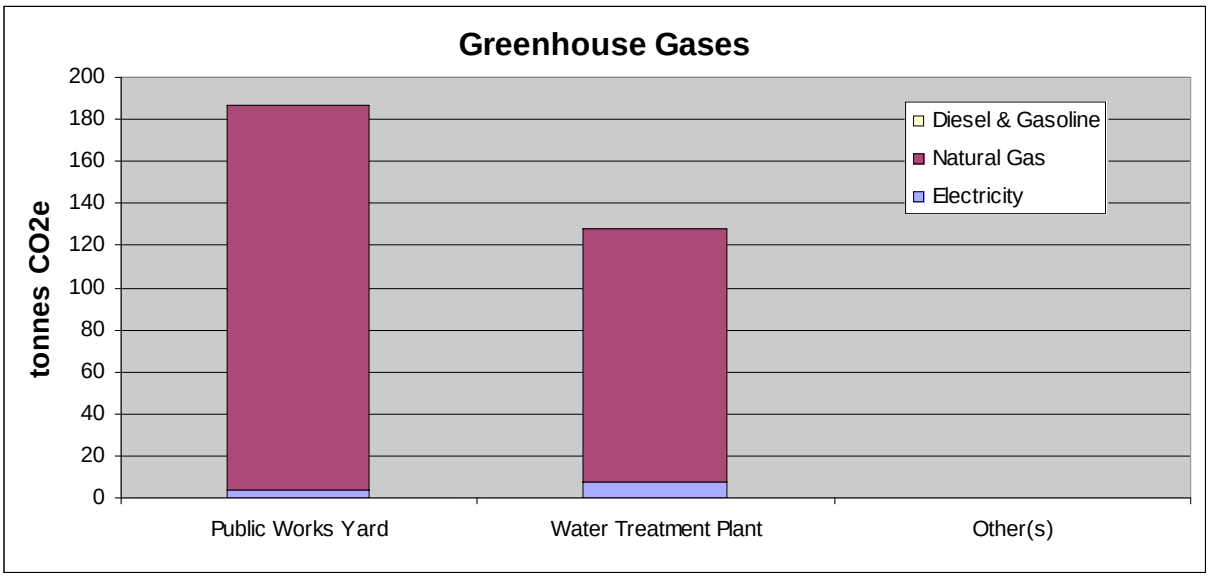

Figure 19 – Greenhouse Gas Emissions for Engineering and Public Works Buildings

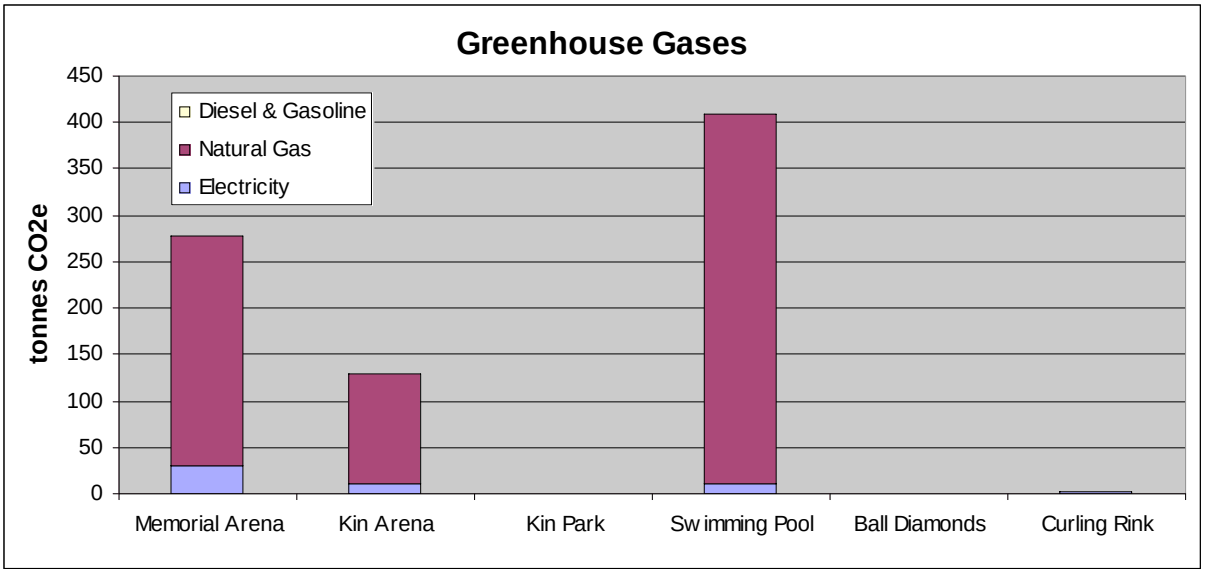

Figure 20 – Greenhouse Gas Emissions for Recreation Centres[6]

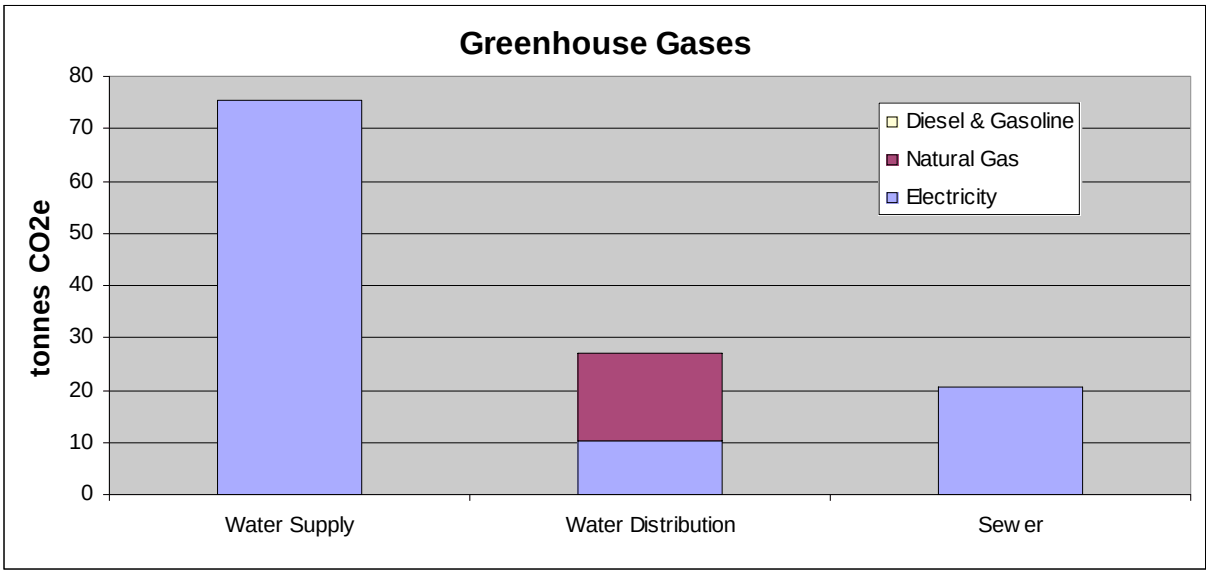

Figure 21 – Greenhouse Gas Emissions for Engineering and Public Works Infrastructure

[6] Although no greenhouse gas emissions are associated with the curling rink in the figure, the rink's actual emissions are assumed to be accounted for in an aggregated meter for either Memorial or Kin Arena

7 Next Steps

To conclude the baseline report, this section outlines seven recommended investigations and opportunities that have arisen from the baseline study. The next steps will be to discuss and prioritize these options with City staff and council.

1 – Data Management Systems

Justification – Data is currently tracked for financial purposes but not for managing energy consumption. Some of the specific challenges include: buildings sharing energy meters, meter records not being clearly linked to a building or infrastructure, and non-existent energy consumption data for some areas. This project has worked through most of these issues to produce the baseline, but there are still considerable uncertainties, and it would be just as much work to push through it again in the future, which is not conducive to tracking the performance of Dawson Creek buildings, infrastructure, and transportation. Without a clear path to update baseline findings it is impossible to know how effective different initiatives are performing and whether or not new opportunities for improvement might be available. Ideally, Dawson Creek staff should be able to manage this information efficiently without the need to hire external consultants.

Proposed Action – Pembina would work with BC Hydro, and PNG to determine exactly what is involved in clearly linking individual buildings/facilities with individual energy meters, and then making sure that data is passed to Dawson Creek in a manner that is conducive to easy analysis. A similar investigation could also be conducted with the Co-op for transportation issues, but based on discussions with Public Works this investigation may already be underway.

2 – Vehicle Purchasing Policies

Justification – As the city grows, so will the size of its fleet, thus new vehicle purchases will be an ongoing expense. As such, it makes sense to ensure that all vehicles purchases are made in a manner that minimizes life cycle costs to the City and also carries through on the City's environmental commitments (see investigation 6).

Proposed Action – Pembina would provide a simple software tool that could be used to compare different vehicles to see which offered the expected lowest cost to the City over the vehicle's lifespan. The tool would be easily adapted to different purchasing decisions, and would help staff trade-off capital, operating, and fuel costs, including providing some straightforward sensitivity analysis to these costs. The tool would also show the GHG emissions associated with the different vehicle options and help staff include them in the decision making process if desired.

3 – Retrofits study

Justification – Dawson Creek has previously taken advantage of BC Hydro programs to retrofit existing municipal buildings. These endeavors have primarily focused on recreational facilities, and have resulted in significant operating savings for the City. These programs are no longer as easily accessed, but there would still appear to be considerable opportunities for improvements in energy efficiency in Dawson Creek's buildings and as such it makes sense find ways to finance those improvements.

Proposed Action – Pembina will work with Dawson Creek to enroll in Natural Resources Canada's Energy Innovators Initiative (EII) program. This program applies to commercial buildings and public institutions, and is designed to facilitate energy efficiency retrofits in existing buildings. The application would be targeted at the Energy Retrofit Assistance program in both the planning and implementation streams. Participants are eligible to receive up to 50% of eligible costs for planning projects and up to 25% of eligible costs for implementation projects[7]. The application procedure is designed to take one to three months depending on the nature of the project. Pembina would also be interested in engaging the City on designing a financing scheme that would enable ongoing support for energy efficiency improvements.

4 – Cost Benefit Analysis of Wind Energy Purchases

Justification – The Peace Energy Co-op is pursuing the development of a wind farm on Bear Mountain close to Dawson Creek. This type of project would bring low-impact, renewable energy to BC Hydro's grid (in addition to being the Province's first wind power), and could also provide a significant employment boost to the Dawson Creek area. Dawson Creek has the opportunity to support this development by agreeing to purchase a certain amount of power from the development. Through this support, the City would be able to take some credit for the environmental and employment benefits of the development.

Proposed Action – Pembina would work with BC Hydro to understand what is involved in having Dawson Creek work through a memorandum of understanding that would promise to purchase a certain amount of power from the wind farm. BC Hydro would continue to supply the City's electricity. This investigation would be accompanied by an analysis of the financial impacts to the City (based on the anticipated price premium associated with wind energy), the estimated employment created by the project, and the anticipated GHG reductions by eliminating the need for other sources of energy.

[7] Planning Example: The total energy consumption for Dawson Creek buildings (gas and electricity) is approximately 34,000 GJ. If the municipality contracted an experienced energy professional to complete a detailed feasibility study of energy efficiency retrofits for these buildings, the EII program would provide 50% of those costs, as long as it is less than $1 per GJ and less than the maximum of $25,000.

5 – City Hall Solar Hot Water Heating

Justification – Through an ongoing partnership with the BC Sustainable Energy Association, Dawson Creek has shown an interest in the development of solar hot water heating technology in the city. To help publicize the city's commitment and provide an opportunity for residents to see the technology, City Hall represents an excellent opportunity for a demonstration installation. Using natural gas consumption information collected as part of this report, Taylor Munro Solar Water Systems helped prepare the following quote for a solar hot water system on City Hall. These numbers are somewhat uncertain because of the confusion around meter records for City Hall discussed in Section 3.

City Hall Domestic Hot Water Demand = 32.25 GJ / year

Percentage of Demand Met by System = 65%

System Requirements = 2-collector SunCoil system

Capital & Shipping Costs = $3,695

Installation Costs = $1,000

Natural Gas Savings (GJ/year) = 20.8 GJ / year

Natural Gas Savings ($/year) = $185 / year – based on current prices of $8.886 / GJ

Greenhouse Gas Emissions Reductions = 1.1 tonnes CO_2e / year

Discount Rate = 6%

Net Present Value (35 year design life) = -$2,015

Although the negative net present value indicates that this is not cheaper than natural gas heating under current market conditions, the project is still recommended because the expected loss is quite small, and there is significant demonstration value for commercial and residential developers. Also, from the city's perspective, it may also be possible to obtain financial support from the Federation of Canadian Municipalities and the Renewable Energy Deployment Initiative, which covers 25% of solar hot water heating installation costs.

Proposed Action – Engage potential contractors to refine the above economic analysis of the project to ensure that any financial losses won't be too significant. Key areas of concern are making sure the heating load has been estimated accurately, and ensuring that the installation costs include enough resources to cover any demonstration needs. Once comfortable with the project costs, it is recommended that the City submit a request for funding support to the Federation of Canadian Municipalities (proposed action number 6) and the Renewable Energy Deployment Initiative, and then proceed with the selection of a contractor.

6 – FCM Application to Support Broader Community Engagement

Justification – The work completed in this study is just one step in a multi-phased approach to addressing energy issues in both municipal operations, but also in the

broader municipality. To undertake these additional steps will require ongoing investment of time and resources from Dawson Creek, but it is not necessary for them to bear the entire burden. The Federation of Canadian Municipalities (FCM) is mandated to support municipal sustainability initiatives in Canadian municipalities, and energy planning and implementation projects are eligible for funding from their Green Municipal Enabling Fund (GMEF).

Proposed Action – The Pembina Institute will work with Dawson Creek to prepare an application to the FCM's GMEF. The application will be designed to follow through on the recommendations of the municipal operations baseline report, while initiating the community energy planning process for other sectors.

7 – Understanding the Environmental/Economic Trade-offs

Justification – Throughout the analysis to date on this project, one of the key challenges has been attempting to understand the importance the City places on economic and environmental ramifications of different decisions. In cases where an opportunity offers an environmental benefit at less cost than current practice the decision is an easy one, but in cases where the environmental benefit costs more, the tradeoff becomes more difficult and it would be valuable for Dawson Creek to work through these issues explicitly. It will be particularly important to have an answer to these question articulated when the energy planning initiative is expanded beyond municipal operations.

Proposed Action – Pembina would like to begin a dialogue with the City to frame a discussion that will help the City understand and articulate their environmental priorities and how they want to trade those off against environmental concerns. From a GHG perspective (which has been the environmental focus of this work), this could lead to joining the Partners for Climate Protection program operated by the Federation of Canadian Municipalities and ultimately adopting emission reduction targets and a plan to achieve those reductions. Alternatively, the discussion could take a broader environmental focus and examine different sustainability frameworks such as The Natural Step.

Appendix A – Data Tables

All of the data underlying the charts in sections 4, 5, and 6 are presented in the following tables.

Table A.1 – Energy Consumption, GHGs, and Costs – All Municipal Operations

	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
Airport & Other Bldgs	571.9	16.4	33.5	961.8	194.3	37.8	0.0	0.0	0.0	1533.7	210.7	71.3
Cultural Centres	269.9	7.7	16.2	594.6	120.1	20.9	0.0	0.0	0.0	864.5	127.9	37.1
Emergency Services	729.6	20.9	22.0	879.0	177.6	21.4	0.0	0.0	0.0	1608.6	198.5	43.4
Engineering and PW	399.6	11.4	26.0	1501.9	303.4	55.5	0.0	0.0	0.0	1901.4	314.9	81.5
Recreation Centres	1871.0	53.5	99.7	3792.9	766.3	119.8	0.0	0.0	0.0	5663.9	819.8	219.4
Water & Sewer Infra.	3717.1	106.3	178.3	83.0	16.8	2.5	0.0	0.0	0.0	3800.1	123.0	180.9
Street Lighting	909.1	26.0	138.2	0.0	0.0	0.0	0.0	0.0	0.0	909.1	26.0	138.2
Non Stationary	0.0	0.0	0.0	0.0	0.0	0.0	2020.5	525.8	147.9	2020.5	525.8	147.9
Total	8468.2	242.1	513.9	7813.2	1578.6	258.0	2020.5	525.8	147.9	18301.9	2346.5	919.8

Table A.2 – Energy Consumption, GHGs, and Costs – Airport and Other Buildings

	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
Terminal	8.7	0.3	0.6	489.8	99.0	16.5	0.0	0.0	0.0	498.5	99.2	17.1
Hanger	0.0	0.0	0.0	436.1	88.1	19.3	0.0	0.0	0.0	436.1	88.1	19.3
Fuel Facility	8.7	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	8.7	0.2	0.5
Terminal Maintenance	74.9	2.1	5.1	0.0	0.0	0.0	0.0	0.0	0.0	74.9	2.1	5.1
City Hall/???	479.5	13.7	27.4	35.9	7.2	2.0	0.0	0.0	0.0	515.4	21.0	29.3
Total	571.9	16.4	33.5	961.8	194.3	37.8	0.0	0.0	0.0	1533.7	210.7	71.3

Table A.3 – Energy Consumption, GHGs, and Costs – Cultural Centres

	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
Exhibition Grounds	138.1	3.9	5.6	171.0	34.6	6.3	0.0	0.0	0.0	309.2	38.5	11.9
NAR Park	106.5	3.0	8.8	245.2	49.5	8.6	0.0	0.0	0.0	351.7	52.6	17.4
Youth Centre	25.2	0.7	1.8	178.4	36.0	6.0	0.0	0.0	0.0	203.6	36.8	7.8
Total	269.9	7.7	16.2	594.6	120.1	20.9	0.0	0.0	0.0	864.5	127.9	37.1

Table A.4 – Energy Consumption, GHGs, and Costs – Emergency Services

	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
RCMP Station	362.3	10.4	0.1	351.0	70.9	10.8	0.0	0.0	0.0	713.3	81.3	10.9
RCMP Telecom	208.8	6.0	13.7	92.0	18.6	3.0	0.0	0.0	0.0	300.8	24.5	16.7
Fire Department	158.5	4.5	8.1	436.1	88.1	7.6	0.0	0.0	0.0	594.6	92.6	15.8
Total	729.6	20.9	22.0	879.0	177.6	21.4	0.0	0.0	0.0	1608.6	198.5	43.4

Table A.5 – Energy Consumption, GHGs, and Costs – Public Works Buildings

	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
Public Works Yard	129.9	3.7	8.2	905.5	183.0	38.7	0.0	0.0	0.0	1035.4	186.7	46.9
Water Treatment Plant	269.0	7.7	17.4	596.1	120.4	16.7	0.0	0.0	0.0	865.1	128.1	34.1
Other(s)	0.7	0.0	0.3	0.3	0.1	0.2	0.0	0.0	0.0	1.0	0.1	0.5
Total	399.6	11.4	26.0	1501.9	303.4	55.5	0.0	0.0	0.0	1901.4	314.9	81.5

Table A.6 – Energy Consumption, GHGs, and Costs – Recreation Facilities												
	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
Memorial Arena	1027.9	29.4	58.5	1229.1	248.3	39.8	0.0	0.0	0.0	2257.0	277.7	98.3
Kin Arena	394.1	11.3	20.6	587.0	118.6	18.9	0.0	0.0	0.0	981.1	129.9	39.5
Kin Park	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1
Swimming Pool	356.6	10.2	20.3	1976.8	399.4	61.1	0.0	0.0	0.0	2333.3	409.6	81.5
Ball Diamonds	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
Curling Rink	91.8	2.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	91.8	2.6	0.1
Total	1871.0	53.5	99.7	3792.9	766.3	119.8	0.0	0.0	0.0	5663.9	819.8	219.4

Table A.7 – Energy Consumption, GHGs, and Costs – Water and Sewer Infrastructure												
	Electricity			Natural Gas			Gasoline and Diesel			All Energy		
	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO_2e)	Cost ($1000's)	Consumed (MWh)	GHGs (tonnes CO2e)	Cost ($1000's)
Water Supply	2642.4	75.5	111.2	0.0	0.0	0.0	0.0	0.0	0.0	2642.4	75.5	111.2
Water Distribution	353.1	10.1	24.5	83.0	16.8	2.5	0.0	0.0	0.0	436.1	26.9	27.1
Sewer	721.6	20.6	42.6	0.0	0.0	0.0	0.0	0.0	0.0	721.6	20.6	42.6
Total	3717.1	106.3	178.3	83.0	16.8	2.5	0.0	0.0	0.0	3800.1	123.0	180.9