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ASSOCIATION OF MANITOBA MUNICIPALITIES
MANITOBA MUNICIPAL ENERGY, WATER AND WASTE
WATER EFFICIENCY PROJECT
TOWN OF NIVERVILLE
FINAL REPORT
MARCH 2006

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

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March 8, 2006 File No. 05-1285-01-1000.5

Association of Manitoba Municipalities
1910 Saskatchewan Avenue West
Portage la Prairie, Manitoba
R1N 0P1

RE: Municipal Energy, Water, and Wastewater
Efficiency Studies for Niverville – Final Report

Dear Mr. Tyler MacAfee:

Enclosed is the Final Report of the Manitoba Municipal Energy, Water and Wastewater Efficiency Study for the Town of Niverville with all comments incorporated.

Included with this submission are 10 hard copies of the report (3 in color, 7 in black and white) and 10 copies on compact disk in PDF format with searchable text functionality, as requested in the “Request for Proposal”. The PDF file consists of the entire report, including the Executive Summary, Sections 1 to 12, and Appendix A to G.

We thank you for giving us the opportunity to work on this project and look forward to continuing this work with the other Municipalities.

Yours Truly,

R. B. Bodnar, P.Eng.
Senior Mechanical Engineer/ Department Head

RBB/af

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EXECUTIVE SUMMARY

The objective of this study was to determine energy, water, and wastewater efficiency opportunities that could enable the Town of Niverville to reduce operating costs, conserve resources, and reduce greenhouse gas emissions.

An energy and water efficiency audit was conducted on nine buildings in the Town of Niverville. An audit was also done on the water distribution and wastewater collection systems. Throughout the course of these audits, water, wastewater, and energy efficiency opportunities were analyzed to determine the Town's potential for energy and water savings. The saving opportunities were separated into the following categories:

- Lighting – Replacing the interior and/or exterior lighting with more energy efficient lights and fixtures.
- Envelope – This involves measures that would reduce the heat loss through the building's windows, doors, walls, and roof.
- Motors- Replacing low efficiency motors with higher efficiency motors.
- HVAC- Improving current heating, ventilating and air conditioning systems.
- Process Equipment: Potential upgrades to ice plants and water / waste water treatment plants
- Water – Replacing high flow water fixtures with water efficient fixtures.

Table E1 shows the energy and water consumption for each of the buildings for the period from October 2004 to October 2005. This year was selected as it represents a typical year for energy and water consumption. In addition, the most recent year was selected since the conditions of the buildings throughout this time most closely resemble the buildings' current conditions. The Works and Operations, the Fire Hall and the RCMP Office are contained in one building and share the same electrical and gas accounts; therefore, they are grouped together in Table E1. The buildings included in this audit use both electricity and natural gas for energy. The "Energy Density" column in this table is the total energy consumed in the building divided by the area of the building. This is useful in comparing the energy consumption among the different buildings in Niverville. The pie chart displays the percentage of total energy density for each of the buildings. It ranges from a high of 36.5% for the Water Treatment Plant to a low of 4.3% for the Picnic Shelter.

Tables E2 (a) and (b) show overall energy and water saving opportunities for all nine buildings in the Town of Niverville. These tables also include approximate product and installation prices for each measure, both with and without incentives (refer to Appendix D for a list of Manitoba Hydro incentives) and simple payback years. The "Simple Payback Years" column is the overall payback period and may vary for individual buildings.

From the energy saving opportunities table (Table E2(a)) it can be seen that the total potential for energy savings in all nine buildings is 411,705 kWh, or 27% of the current total energy consumption.

There were three main issues that were noted during the course of this study that limited the potential for additional energy savings:

- The buildings have little or no ventilation (ex: Fire Hall).

- Some of the buildings are unheated (ex: Picnic Shelter, Hockey Rink).
- Some of the buildings are infrequently used (ex: Curling Rink).

The water saving opportunities table (Table E2(b)) shows the percent water savings, water savings in litres/year, cost savings, and payback years. The percentages shown in this table indicate percent water savings that would result from replacing the current water fixtures in all of the buildings with water efficient fixtures. The water savings in litres per year are based on estimates of the various buildings' occupancies. The cost of water is taken as $0.64 per cubic meter.

The results and recommendations from the water and wastewater audit are shown in Chapter 12 of this report. From the water system audit, it was determined that Niverville's Water Treatment Plant produced a total of 10,007 m^3 of water from February 1, 2004 to June 28, 2005, while only 8,830 m^3 of this water was consumed. The remaining 1,116 m^3 of water is considered water losses due to either leakage in the system, inaccurate water meters, or unauthorized water use. Reducing the water losses will reduce chemical costs required for water treatment, reduce electrical energy consumed by the pumps, and extend the life of the facility.

The sewer system in Niverville is a combined collection system for both sewage and storm water that is pumped into a lagoon located south of the town. It was determined that approximately 20% of the flow through the sewer system is due to infiltration of storm water. Reducing this infiltration will reduce pumping costs and extend the life of the lagoon. For this reason, it is recommended that the Town take measures to reduce the amount of infiltration into the system. This can be done by: sealing manholes; lining pipes; and disconnecting rain leaders, sump pumps, and weeping tiles from the sanitary sewer system. It is also recommended that a study be conducted to determine the feasibility of developing a separate storm water system.

In addition to energy, water, and cost savings, other benefits would result from implementing the saving opportunities recommended throughout this report:

- Reduction in CO_2 emissions resulting in reduced contribution to climate change– the percent reduction is shown at the bottom of each of the energy saving opportunity tables.
- Lowered maintenance costs – (e.g. replacing the current lights with longer lasting bulbs).
- Improved physical comfort – (e.g. reducing infiltration into buildings).
- Delayed need to increase water and wastewater treatment plant capacities.

Table E1 Energy Consumption for the Period from October 2004 – October 2005

Site	Energy Density (kWh/m^2)	% of Total Energy Density	Area (m^2)	Electricity		Natural Gas		TOTAL ENERGY	
				kWh	Cost	kWh	Cost	kWh	Cost
Arena	212	12.5%	2,757	286,860	$19,351	297,119	$11,693	583,979	$31,044
Curling Rink	76	4.5%	1,002	10,170	$901	66,145	$2,802	76,315	$3,703
Town Office	294	17.4%	214	19,210	$1,513	43,676	$1,904	62,886	$3,417
Works & Operations, Fire Hall, & RCMP	210	12.4%	970	45,450	$3,278	158,185	$6,568	203,635	$9,846
Water Treatment Plant	617	36.5%	21	12,960	$1,089	0	$0	12,960	$1,089
Heritage Centre	207	12.3%	2,935	279,600	$17,389	329,069	$13,648	608,669	$31,037
Picnic Shelter	72	4.3%	47	3,392	$554	0	$0	3,392	$554
Totals	1,689	100%	7,945	588,529	$39,773	1,296,473	$52,578	1,885,002	$92,351

Percentage of Total Energy Density for Buildings in Niverville

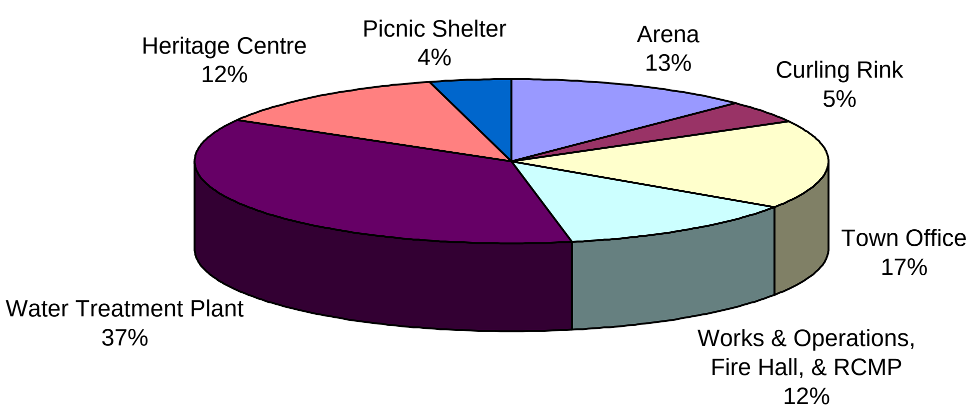

Table E2 (a) Summary of Energy Saving Opportunities for all 9 Buildings in Niverville

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
LIGHTING & PARKING LOT CONTROLLERS											
Replace EXIT incandescent lamps with LED modules.	24	$50	$5	$80	$3,557	$2,326	5,676	$341	10.4	6.8	Arena, Curling Rink, Town Office, and Heritage Centre.
Retrofit 2' x2 T12 fluorescents with T8 ballast and tubes.	8	$50	$30	$55	$958	$775	674	$40	23.7	19.2	Heritage Centre.
Retrofit 4' x1 T12 fluorescents with T8 ballast and tubes.	15	$50	$30	$55	$1,796	$1,454	703	$42	42.6	34.5	Town Office.
Retrofit 4' x2 T12 fluorescents with T8 ballast and tubes.	154	$55	$35	$65	$21,067	$17,556	15,824	$950	22.2	18.5	Arena, Town Office, Works & Operations, Fire Hall, RCMP, Heritage Centre, and Picnic Shelter.
Retrofit 4' x4 T12 fluorescents with T8 ballast and tubes.	14	$60	$40	$65	$1,995	$1,676	2,623	$158	12.7	10.6	Town Office.
Retrofit 8' x2 T12 fluorescents with T8 ballast and tubes.	60	$75	$40	$75	$10,260	$7,866	22,527	$1,353	7.6	5.8	Works & Operations and Fire Hall.
When replacing interior incandescents, replace them with compact fluorescents.	16	$13	$8	$0	$237	$146	793	$48	5.0	3.1	Arena, Curling Rink, and Water Treatment Plant.
Replace interior incandescents with compact fluorescents.	17	$15	$10	$13	$543	$446	3,386	$203	2.7	2.2	Town Office and Works & Operations.
Install parking lot controllers.	9	$100	$75	$150	$2,565	$2,309	2,160	$130	19.8	17.8	Works & Operations/Fire Hall/RCMP and Heritage Centre.
Lighting & Parking Lot Controllers Subtotal					**$42,977**	**$34,552**	**54,367**	**$3,264**			
ENVELOPE											
Weatherstrip pedestrian doors.	25	$15	$15	$50	$1,853	$1,853	29,620	$1,364	1.4	1.4	Arena, Curling Rink, Town Office, Works & Operations, Fire Hall, Water Treatment Plant, and Heritage Centre.

Table E2 (a) Summary of Energy Saving Opportunities for all 9 Buildings in Niverville

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
Weatherstrip double pedestrian doors/vehicle doors.	3	$30	$30	$100	$445	$445	9,813	$448	1.0	1.0	Arena and Curling Rink.
Caulk vehicle doors.	6	$15	$15	$50	$445	$445	10,744	$491	0.9	0.9	Works & Operations and Fire Hall.
Replace and weatherstrip pedestrian doors.	2	$350	$350	$100	$1,026	$1,026	1,414	$65	15.9	15.9	Curling Rink.
Replace and seal windows.	31	$18,300	$15,362	$5,500	$27,132	$23,783	20,828	$1,023	26.5	23.3	Town Office, Works & Operations, Fire Hall, RCMP, Water Treatment Plant, and Heritage Centre.
Upgrade wall and/or roof insulation.	3	$10,200	$10,200	$10,200	$23,256	$23,256	24,725	$1,130	20.6	20.6	Arena and Town Office.
Envelope Subtotal					**$54,156**	**$50,806**	**97,145**	**$4,520**			
HVAC											
Install programmable thermostat; Setback temp to 15 ^{o}C (59 ^{o}F).	4	$300	$300	$300	$2,736	$2,736	21,221	$1,004	2.7	2.7	Arena and Works and Operations.
Setback temperature to 10 ^{o}C (50 ^{o}F).	1	$0	$0	$0	$0	$0	877	$53	0.0	0.0	Water Treatment Plant.
Replace furnace with 95% efficient furnace.	3	$1,400	$1,400	$1,400	$9,576	$9,576	42,418	$1,939	4.9	4.9	Arena, Curling Rink, Town Office.
Replace unit heater in hall with a high efficiency furnace.	1	$1,100	$1,100	$1,100	$2,508	$2,508	14,174	$648	3.9	3.9	Arena.
Install 200 cfm HRVs.	5	$950	$950	$1,000	$11,115	$11,115	54,342	$2,483	4.5	4.5	Arena, Town Office, and Heritage Centre.
Install 1000 cfm HRVs	1	$4,500	$4,500	$2,000	$7,410	$7,410	6,723	$307	24.1	24.1	Works & Operations.
Replace BDD with motorized dampers.	4	$400	$400	$400	$3,648	$3,648	4,075	$186	19.6	19.6	Arena and Curling Rink.
Install a solar wall (not included in totals).	1	$35,275	$21,380	$20,300	$63,356	$47,515	11,075	$506	125.2	93.9	Works & Operations.

Table E2 (a) Summary of Energy Saving Opportunities for all 9 Buildings in Niverville

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
Install high efficiency RTUs with CO_2 sensors.	8	$22,800	$22,800	$6,840	$85,363	$85,363	58,958	$2,694	31.7	31.7	Heritage Centre.
Install vehicle emissions sensor.	1	$850	$850	$200	$1,197	$1,197	6,723	$307	3.9	3.9	Works & Operations.
Replace boiler with high efficiency boiler.	1	$5,000	$5,000	$1,000	$6,840	$6,840	3,754	$225	30.3	30.3	Fire Hall.
Install geothermal heating system (not included in totals).	1	$16,000	$16,000	$11,000	$30,780	$30,780	28,161	$1,287	23.9	23.9	Town Office.
Install outdoor thermostat to control ventilation in arena.	1	$600	$600	$600	$1,368	$1,368	23,576	$1,416	1.0	1.0	Arena.
HVAC Subtotal					**$131,761**	**$131,761**	**236,843**	**$11,262**			
HOT WATER											
Install water efficient metering faucets.	15	$309	$309	$150	$7,844	$7,844	5,713	$306	25.6	25.6	Arena and Heritage Centre.
Install water efficient showerheads.	8	$21	$21	$50	$648	$648	5,178	$237	2.7	2.7	Arena.
Fix leaking shower	1	$242	$242	$150	$447	$447	4,471	$204	2.2	2.2	Arena.
Replace water heater with instantaneous water heater.	2	$300	$300	$900	$2,736	$2,736	3,969	$181	15.1	15.1	Town Office, Works & Operations.
Water Subtotal					**$11,674**	**$11,674**	**19,332**	**$929**			
MOTORS											
When replacing 50 HP compressor motor, replace it with a high efficiency motor.	1	$800	$800	$0	$912	$912	1,974	$119	7.7	7.7	Arena.
When replacing 30 HP compressor motor, replace it with a high efficiency motor.	1	$400	$400	$0	$456	$456	884	$53	8.6	8.6	Arena.
When replacing 15 HP brine pump motor, replace it with a high efficiency motor.	1	$200	$200	$0	$228	$228	1,160	$70	3.3	3.3	Arena.
Motors Subtotal					**$1,596**	**$1,596**	**4,018**	**$241**			

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	1,551,846	$80,691	180.2
Estimated Annual Savings	411,705	$20,217	58.5
Percent Savings	27%	25%	32%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).
**** This is the overall payback period and may vary for individual buildings (refer to tables throughout report for payback years for a specific building).

Table E2 (b) Summary of Water Saving Opportunities for the Town of Niverville

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years	Related Buildings
		Capital	Labour						
Install water efficient metering faucets.	27	$309	$150	$14,128	80%	182,780	$117	120.8	Arena, Curling Rink, Town Office, Works & Operations, Heritage Centre, and Picnic Shelter.
Install water efficient toilets.	28	$284	$150	$13,853	55%	572,982	$367	37.8	Arena, Curling Rink, Town Office, Works & Operations, Heritage Centre, and Picnic Shelter.
Install water efficient showerheads.	8	$21	$50	$648	29%	138,180	$88	7.3	Arena.
Fix leaking shower	1	$242	$150	$447	100%	119,311	$76	5.9	Arena.

* The total cost column includes 14% taxes.

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Manitoba Conservation
Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration
Manitoba Culture, Heritage, and Tourism

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ACKNOWLEDGEMENTS

KGS Group and the MMEP partners gratefully acknowledge the valuable contributions the following people have made in providing their time, helpful suggestions, and participation in this energy and water efficiency project:

- Jim Buys, Municipal Administrator
- Harry McKnight (Town Office)
- Gil Leclerc (Arena and Curling Rink)
- Steven Neufeld (Heritage Centre)
- Jim Schapansky (Works & Operations, Fire Hall, and RCMP)

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1.0 INTRODUCTION

1.1 BACKGROUND

Energy and water conservation is becoming more important as environmental concerns grow and energy costs increase. For this reason it is important to perform energy, water, and wastewater efficiency audits to identify practical efficiency improvement opportunities and determine the capital costs and payback periods associated with these implementations.

An energy and water efficiency audit was conducted on nine buildings in the Town of Niverville to determine how each of these buildings could reduce both energy and water consumption. In addition, the water distribution and wastewater collection systems were audited to determine what opportunities exist for improving the systems' efficiencies.

1.2 OBJECTIVE

The objective of this study was to determine energy, water, and waste water efficiency opportunities that could enable the Town of Niverville to reduce operating costs, conserve resources, and reduce greenhouse gas emissions. All nine buildings in the Town of Niverville were analyzed separately and the results are presented in separate sections throughout this report. The water and wastewater systems are discussed in Section 12.

1.3 METHODOLOGY

The buildings were toured on November 24 and 25, 2005 by Mr. Ray Bodnar, P.Eng. and on October 24, 2005 by Mr. Tibor Takach, P.Eng., both of KGS Group Engineering Consultants. Tibor toured the Water Treatment Plant to study the water and wastewater systems while Ray toured the other eight buildings to perform the water and energy efficiency audits. The water and energy efficiency audits involved a walkthrough of each of the buildings to determine the current condition of the building's envelope (walls, roof, windows, and doors), lighting, water fixtures, heating, ventilation and air conditioning (HVAC) systems, and motors.

During the building tours, the auditors met with Niverville's municipal administrator Jim Buys to discuss the study objectives for identifying energy, water, and wastewater saving opportunities, and to provide information on existing incentive programs. At this time, it was determined that there is a project underway for an addition to the Heritage Centre. Details of this will be discussed in Section 7.3. While auditing the buildings, whenever possible, on-site training was done to inform the staff on energy and/or water saving opportunities in specific buildings and to point out maintenance issues where applicable.

Using the information collected during the audit, available drawings of the buildings, historical weather data, and the hydro bills from the past 12 months, calculations were performed to determine how each of the buildings are consuming energy and water. Several assumptions were made throughout these calculations including occupancies, room temperatures, and envelope conditions (see Inventory Sheets in Appendix A). When no drawings were available, wall/roof R-values were assumed based on discussions with site personnel or based on knowledge of other buildings of similar type/age to the building surveyed.

Energy Saving Opportunities (ESOs) were developed for each building and are presented in tables throughout this report showing energy savings, cost savings, installation costs, and simple payback periods. Simple Payback periods are calculated as the total installation cost divided by the annual cost savings. The installation costs include the capital costs, both with and without incentives (see Appendix D for list of Manitoba Hydro incentives), and the labour costs for the installation using standard contractor rates. The total energy savings, the percent energy savings, and the associated costs are presented at the end of each ESO table. It should be noted that the energy savings and capital cost estimates are preliminary. For complex measures such as geothermal heating/cooling, a more detailed investigation would be required to confirm capital and installation costs for this system.

An environmental benefit that results from reducing energy consumption is a reduction in CO_2 emissions. CO_2 is a greenhouse gas and thus contributes to global warming. By reducing natural gas and electrical energy consumption, CO_2 emissions are reduced. At the bottom of each ESO table, the total CO_2 reduction resulting from the energy savings is shown. This was calculated using a CO_2 emissions calculator produced by Natural Resources Canada.

Many of the ESOs have low installed costs and payback periods of less than two years. Once the implementation phase begins, these ESOs are the most attractive measures. However, in order to maximize long-term savings and efficiencies for the buildings, implementation of the more capital-intensive measures with the longer payback periods is necessary. These items will become more attractive as energy costs increase in the future. It is recommended that the savings associated with the short payback ESOs be reinvested annually as a means to help finance the more expensive options.

Water Saving Opportunities (WSOs) are also presented in this report. The WSOs include installing water efficient sink faucets, toilets, urinals, and showers. The water savings are shown as percentages of the current fixtures water consumption and in litres per year (based on estimates of the building's occupancy). Cost savings and simple payback years were also calculated and are shown for individual buildings throughout the report.

The water and wastewater systems in the Town of Niverville were analyzed and results and recommendations are discussed in Section 12 of this report. In addition to an overview of the water and wastewater systems, several recommendations are made to help the Town monitor water consumption and losses and reduce operating costs.

2.0 NIVERVILLE CENTENNIAL ARENA

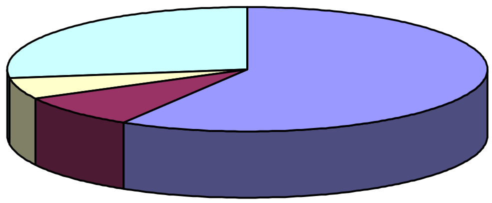
2.1 BACKGROUND

The Niverville Centennial Arena, constructed in 1967, is a 30,000 square foot structure with metal cladding on the outside walls. The Arena consists of an unheated hockey rink, four dressing rooms, a hall, lounges on both the main floor and the second floor with windows facing the rink, five washrooms, an ice plant room, and a zamboni room. The rink is used from the middle of October until the end of March and the main floor lounge, office and hall are used year round.

Photo 1 – Niverville Centennial Arena

The Arena uses natural gas for heating both the building and the water, and electricity for lighting and to run the mechanical equipment. The total natural gas and electrical energy consumed in the previous year was 287,000 kWh and 297,000 kWh, respectively. The largest portion of energy is used for heating as can be seen in the pie chart below. However, the ice plant motors also consume a significant portion of the annual energy consumption.

Energy Breakdown (% of Total kWh) for the Niverville Centennial Arena



The washrooms in the Niverville Centennial Arena contain a total of 10 toilets, 8 sinks, and 3 urinals. There are also nine showers in the dressing rooms. In addition to the water consumed by the water fixtures, a large portion of the annual water consumption is used to flood the rink. There are five gas water heaters that heat the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tanks.

2.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 1 and 2 show a summary of both the energy and water saving opportunities for the Niverville Arena. The following assumptions were made in determining the annual savings:

- The hockey rink is occupied from the middle of October until the end of March for approximately 65 hours per week.
- The hall is occupied for approximately 50 evenings per year.
- The lobbies and office are occupied full time (40 hours/week) year round plus whenever the rink is in use.
- The temperature of the reception area is maintained at 21°C (70°F) and the rink area is unheated.
- For the purpose of water consumption, the typical occupancy of the arena is taken as 30.
- The exit lamps are on 24 hours per day year round and the outdoor lights are on 12 hours per day year round.
- The motor on the brine pump for the ice plant runs at 80% utilization.
- The motors on the ice plant's compressors run at 80% utilization.

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Table 1 Energy Saving Opportunities for the Niverville Centennial Arena

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Replace EXIT incandescent lamps with LED modules.	11	$50	$5	$80	$1,630	$1,066	2,602	$156	10.4	6.8
Retrofit 4' x2 T12 fluorescents in hall with T8 ballast and tubes.	19	$55	$35	$65	$2,599	$2,166	1,978	$119	21.9	18.2
Retrofit 8' x2 T12 fluorescents on main floor with T8 ballast and tubes.	19	$75	$40	$75	$3,249	$2,491	12,269	$737	4.4	3.4
When replacing interior incandescents, replace them with compact fluorescents.	6	$13	$8	$0	$89	$55	406	$24	3.7	2.2
Lighting Subtotal					**$7,567**	**$5,778**	**17,254**	**$1,036**		
ENVELOPE										
Weatherstrip pedestrian doors.	4	$15	$15	$50	$296	$296	4,248	$194	1.5	1.5
Weatherstrip double pedestrian doors/vehicle doors.	2	$30	$30	$100	$296	$296	6,284	$287	1.0	1.0
Upgrade roof insulation	1	$2,800	$2,800	$2,800	$6,384	$6,384	11,137	$509	12.5	12.5
Upgrade wall insulation	1	$5,500	$5,500	$5,500	$12,540	$12,540	10,212	$467	26.9	26.9
Envelope Subtotal					**$19,517**	**$19,517**	**31,881**	**$1,457**		
HVAC										
Install programmable thermostat; setback temp to 15 ^{o}C (59 ^{o}F).	3	$300	$300	$300	$2,052	$2,052	18,835	$861	2.4	2.4
Replace furnace with 95% efficient furnace.	1	$1,400	$1,400	$1,400	$3,192	$3,192	13,162	$601	5.3	5.3
Replace unit heater in hall with a high efficiency furnace.	1	$1,100	$1,100	$1,100	$2,508	$2,508	14,174	$648	3.9	3.9
Install HRVs.	2	$950	$950	$1,000	$4,446	$4,446	40,172	$1,836	2.4	2.4
Replace BDD with motorized dampers.	2	$400	$400	$400	$1,824	$1,824	2,009	$92	19.9	19.9
Install outdoor thermostat to control ventilation in arena.	1	$600	$600	$600	$1,368	$1,368	23,576	$1,416	1.0	1.0
HVAC Subtotal					**$15,390**	**$15,390**	**111,927**	**$5,453**		
HOT WATER										
Install water efficient metering faucets.	8	$309	$309	$150	$4,183	$4,183	2,566	$117	35.7	35.7
Install water efficient showerheads.	8	$21	$21	$50	$648	$648	5,178	$237	2.7	2.7
Fix leaking shower.	1	$242	$242	$150	$447	$447	4,471	$204	2.2	2.2
Water Subtotal					**$5,278**	**$5,278**	**12,215**	**$558**		

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
MOTORS										
When replacing 50 HP compressor motor, replace it with a high efficiency motor.	1	$800	$800	$0	$912	$912	1,974	$119	7.7	7.7
When replacing 30 HP compressor motor, replace it with a high efficiency motor.	1	$400	$400	$0	$456	$456	884	$53	8.6	8.6
When replacing 15 HP brine pump motor, replace it with a high efficiency motor.	1	$200	$200	$0	$228	$228	1,160	$70	3.3	3.3
Motors Subtotal					**$1,596**	**$1,596**	**4,018**	**$241**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	583,979	$31,044	61.9
Estimated Annual Savings	177,295	$8,746	19.5
Percent Savings	30%	28%	32%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 2 Water Saving Opportunities for the Niverville Centennial Arena

Description	Qty	Installed Cost/Unit ($)		Total Cost ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years
		Capital	Labour					
Install water efficient metering faucets.	8	$309	$150	$4,186	80%	68,464	$44	95.5
Install water efficient toilets.	10	$284	$150	$4,948	55%	176,266	$113	43.9
Install water efficient showerheads.	8	$21	$50	$648	29%	138,180	$88	7.3
Fix leaking shower	1	$242	$150	$447	100%	119,311	$76	5.9

* The total cost column includes 14% taxes.

2.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary for the Arena is shown in Appendix B, Table B.1.3. The energy saving opportunities in terms of lighting with the shortest payback periods include replacing the

8' T12 fluorescent lamps in the lobby and dressing rooms on the main floor and replacing the incandescent light bulbs with compact fluorescent bulbs. Both these energy saving opportunities have payback periods of less than five years.

Envelope

The only windows in the Arena are those from the first and second floor lobbies to the rink. The windows on the second floor are new and therefore do not need to be replaced. The energy savings from replacing the windows on the main floor are shown in Table B.1.4. The payback for this recommendation was high and therefore is not included in Table 1 above. Several of the doors to outside require weather-stripping; new weather-stripping would eliminate heat loss through the cracks around the doors.

The insulation in the roof is approximately R-25. Upgrading this to R-38 would require minimal labour and would result in large annual energy savings. Upgrading the wall insulation from R-12 to R-20 is also shown in Table 1. The payback period for this upgrade is longer due to the much higher installation costs. Table B.1.4 in Appendix B shows details on these calculations.

HVAC

There are large opportunities for energy savings in terms of the heating and ventilation systems. Installing setbacks on the thermostats could result in energy savings with a very short payback. The thermostats should be programmed such that the temperature is reduced to 15°C (59°F) when the building is unoccupied. The furnace in the dressing room is old and inefficient; replacing this with a high efficiency furnace would result in large energy savings with a short payback period. Similarly, the unit heater in the hall could be replaced with a high efficiency furnace to help save in annual energy used for heating.

Heat recovery ventilators (HRVs) could be installed to preheat the intake air to both the furnaces. This would save approximately half the energy used to heat the fresh air entering the furnaces.

Replacing the back draft damper on the exhaust in the hall with a motorized damper would eliminate any cold air leakage into the hall.

Installing an outdoor thermostat to control the ventilation in the arena could help reduce the load on the compressors and condensers in the ice plant. When the outdoor temperature is between –5 ^{o}C and –15 ^{o}C, the ventilation fan in the arena will turn on and the outdoor air will help to maintain the ice temperature. With the outdoor air cooling the ice, the load on the refrigeration system will be reduced resulting in significant energy savings in running the ice plant. Since there is no heat in the arena, this extra ventilation will not require any additional heating.

Motors

The energy savings shown in the Motors section of Table 1 represent the savings that would result from replacing the ice plant motors with premium efficiency as opposed to standard efficiency motors once the current ones require replacement.

Water

Table 2 above shows the water savings, cost savings and payback years that would result from replacing the current fixtures with water efficient fixtures. More detailed calculations can be found in Table B.1.5 in Appendix B.

One of the showers is leaking and should be fixed. In addition, replacing the sink faucets, the toilets, and the showerheads with water efficient fixtures would result in 29% to 80% water savings.

Other Opportunities

The following is a list of energy saving opportunities for the ice plant that would help reduce annual costs associated with ice production:

- Natural ventilation of the rink in the winter saves energy by reducing the run time of the refrigeration equipment.

- Ensure that the water used for flooding is pure – salts lower the freezing point of water and air in water acts like an insulation, making it harder for the brine in the slab to freeze the top layer of the ice.

- Keep the ice thin (1 inch thick) because excessive ice thickness increases the load on the compressor. Shaving ice helps to reduce the ice thickness and removes concentrations of impurities. When shaving ice, take the ice shavings outside to be melted as opposed to melting the shavings in a heated area of the building.

- Maintain the brine at a specific gravity of 1.2 to 1.22 for optimum energy use and maintain the brine temperature as high as possible.

- Significant amounts of energy can be saved by recovering heat from the refrigeration equipment and using it for flood water heating, space heating, domestic water heating, or ice melting.

For additional information, refer to the Manitoba Hydro "Guidelines for Operators of Manitoba's Rinks and Arenas", available for downloading from the following website:

http://www.hydro.mb.ca/sing_with_ps/recreation_manitoba_rinks.pdf

3.0 CURLING RINK

3.1 BACKGROUND

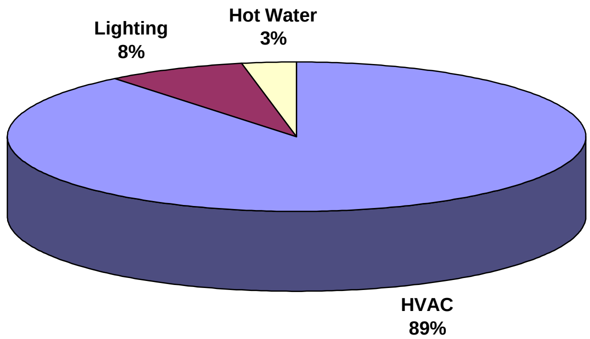
The Niverville Curling Rink, built in approximately 1970, is a 10,800 square foot building with masonry walls in the front and galvanized steel on the back wall, the side walls, and the roof. The walls and roof of the rink have approximately one inch of insulation (R4) and the indoor lobby has approximately 2 inches of insulation (R8). The Curling Rink is occupied from the middle of December until the end of March.

The curling rink has no ice plant. Ice is formed naturally throughout the winter when the outdoor temperature permits.

Photo 2 – Niverville Curling Rink

The annual natural gas and electrical energy consumption for the Curling Rink in the previous year was 66,145 kWh and 10,170 kWh, respectively. The pie chart below shows the portions of the total energy consumption used for lighting, water heating, and building heat. Since the Curling Rink is only occupied 3% of the time, the energy consumption for hot water and lights is quite low.

Energy Breakdown (% of Total kWh) for the Curling Rink



The washrooms in the Curling Rink contain a total of 3 toilets, 4 sinks, and 1 urinal. A gas hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

3.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 3 and 4 show a summary of energy and water saving opportunities for the Curling Rink. The following assumptions were made in the analysis:

- The Curling Rink is occupied for 18 hours per week from the middle of December until the end of March.
- The basement hall is occupied for 6 hours per week year round.
- The temperature of the lobby and basement is maintained at 15°C (59°F).
- During occupancy, the rink is maintained at 0 °C (32 °F).
- For the purpose of water consumption, the typical occupancy of the Curling Rink is 40.
- The exit lamps are on 24 hours per day year round and the outdoor lights are on 12 hours per day year round.

Table 3 Energy Saving Opportunities for the Curling Rink

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Replace EXIT incandescent lamps with LED modules.	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8
Replace main floor incandescents with compact fluorescents.	8	$13	$8	$0	$119	$73	335	$20	5.9	3.6
Lighting Subtotal					**$1,008**	**$654**	**1,754**	**$105**		
ENVELOPE										
Replace and weatherstrip the side doors from rink to outside (2).	2	$350	$350	$100	$1,026	$1,026	1,414	$65	15.9	15.9
Weatherstrip back doors from rink to outside (2 ped, 1 veh).	4	$15	$15	$50	$296	$296	961	$44	6.7	6.7
Weatherstrip door from basement to rink area (1).	1	$15	$15	$50	$74	$74	6,199	$283	0.3	0.3
Weatherstrip double front doors.	1	$30	$30	$100	$148	$148	3,529	$161	0.9	0.9
Envelope Subtotal					**$1,545**	**$1,545**	**11,653**	**$533**		
HVAC										
Replace furnace with high efficiency furnace.	1	$1,400	$1,400	$1,400	$3,192	$3,192	16,498	$754	4.2	4.2
Install motorized dampers on exhausts.	2	$300	$300	$300	$1,368	$1,368	2,066	$94	14.5	14.5
HVAC Subtotal					**$4,560**	**$4,560**	**18,565**	**$848**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	76,315	$3,704	12.2
Estimated Annual Savings	31,972	$1,486	5.5
Percent Savings	42%	40%	45%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 4 Water Saving Opportunities for the Curling Rink

Description	Qty	Installed Cost/Unit ($)		Total Cost ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years
		Capital	Labour					
Install water efficient metering faucets.	4	$309	$150	$2,093	80%	13,037	$8	250.9
Install water efficient toilets.	3	$284	$150	$1,484	55%	42,195	$27	55.0

* The total cost column includes 14% taxes.

3.3 GENERAL RECOMMENDATIONS

Lighting

Since the Curling Rink is rarely occupied, replacing the T12 lighting is not recommended. The only energy saving opportunities in terms of lighting are to replace the incandescent exit signs with LEDs and to replace the incandescent light bulbs with compact fluorescent bulbs. Some of the exit signs are broken or turned off; this is a safety hazard and should be addressed immediately. The lighting analysis summary table is shown in Appendix B as Table B.2.3.

Envelope

There are two portions of this building that will be discussed separately: the rink area, and the indoor area.

For the rink portion of the building, the walls and roof have very little insulation and what is left of the insulation is water damaged. The exterior doors are old and have large cracks and holes throughout. If this portion of the building were heated regularly, there would be a large potential for heat savings by upgrading the envelope. However, the rink is currently only heated during occupancy (approximately 10% of the winter) and therefore, upgrades to the envelope have a long payback period.

The indoor portion of this building includes the main floor lounge, kitchen, washrooms, and the basement. The door from the basement to the rink area has a large gap underneath; sealing this gap would result in significant energy savings with a very short payback period. Similarly, the weather-stripping around the front doors of the Curling Rink should be replaced to reduce heat loss due to infiltration. Although the wall and roof have very little insulation, upgrading this insulation to R20 would be costly with a long payback period.

HVAC

The furnace in the basement is very old and is running at approximately 65% efficiency. Replacing this furnace with a high efficiency furnace would result in almost 30% savings in annual heating bills.

Another opportunity for energy savings is in installing motorized dampers on the exhaust vents. This would eliminate the cold air leakage through the existing back draft dampers.

Water

The water analysis summary is shown in Table B.2.5 in Appendix B. Replacing the high flow fixtures with water efficient fixtures would save between 55 and 80% of their current water consumption with long payback periods.

Other Issues

The curling rink has an exhaust fan but no air intakes. This has caused a build-up of moisture within the rink insulation. Intakes with motorized dampers should be added to allow for proper ventilation of the rink area. Ventilation can be controlled by a dehumidistat that would control the exhaust fan and air intakes.

4.0 TOWN OFFICE

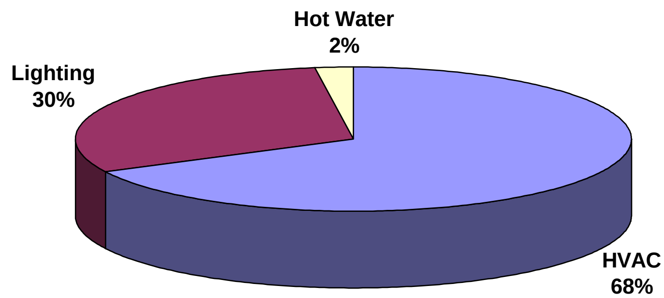
4.1 BACKGROUND

The Town Office was built in 1956 of 2" x 4" studs with brick exterior walls and drywall on the interior. In 1985, an addition was built, adding an extra 30 feet to the length of the building. The office is now 2,300 square feet and is occupied from Monday to Friday from 8am until 5pm.

Photo 3 – Town Office

The Town Office uses natural gas for heating and hot water, and uses electricity for lighting. The electrical and natural gas energy consumption for the previous year was 19,210 kWh and 43,676 kWh, respectively. The total energy was used for lighting, water heating, air conditioning, and heating. The energy breakdown is shown in the pie chart below.

Energy Breakdown (% of Total kWh) for the Town Office



The washrooms in the Town Office contain a total of 2 toilets and 2 sinks. A 150 litre gas hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

4.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 5 and 6 show summaries of the energy and water efficiency improvement opportunities for the Town Office. The following assumptions were made in the calculations:

- The office is occupied from Monday to Friday, from 8am to 5pm.
- The temperature of the office is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the office is 3.
- The exit lamps are on for 24 hours per day year round and the exterior lights are on 12 hours per day year round.

Table 5 Energy Saving Opportunities for the Town Office

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Retrofit 4' x 1 T12 fluorescents with T8 ballast and tubes.	15	$50	$30	$55	$1,796	$1,454	703	$42	42.6	34.5
Retrofit 4' x 2 T12 fluorescents with T8 ballast and tubes.	14	$55	$35	$60	$1,835	$1,516	1,312	$79	23.3	19.3
Retrofit 4' x 4 T12 fluorescents with T8 ballast and tubes.	14	$60	$40	$65	$1,995	$1,676	2,623	$158	12.7	10.6
Replace interior incandescents with compact fluorescents.	13	$15	$10	$13	$408	$333	2,713	$163	2.5	2.0
Replace incandescent EXIT signs with LEDs.	2	$50	$5	$80	$296	$194	473	$28	10.4	6.8
Lighting Subtotal					**$6,330**	**$5,173**	**7,823**	**$470**		
ENVELOPE										
Replace, seal, and weatherstrip windows.	10	$5,300	$4,602	$1,600	$7,866	$7,071	7,228	$330	23.8	21.4
Weatherstrip pedestrian doors	2	$15	$15	$50	$148	$148	4,151	$190	0.8	0.8
Upgrade wall insulation	1	$1,900	$1,900	$1,900	$4,332	$4,332	3,376	$154	28.1	28.1
Envelope Subtotal					**$12,346**	**$11,551**	**14,755**	**$674**		
HVAC										
Replace furnace with high efficiency furnace.	1	$1,400	$1,400	$1,400	$3,192	$3,192	12,758	$583	5.5	5.5
Install HRV.	1	$950	$950	$1,000	$2,223	$2,223	4,497	$206	10.8	10.8
Install geothermal heating system (not included in totals).	1	$16,000	$16,000	$11,000	$30,780	$30,780	28,161	$1,287	23.9	23.9
HVAC Subtotal					**$5,415**	**$5,415**	**17,255**	**$789**		
HOT WATER										
Replace hot water tank with instantaneous water heater.	1	$300	$300	$900	$1,368	$1,368	1,164	$53	25.7	25.7
Water Subtotal					**$1,368**	**$1,368**	**1,164**	**$53**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	62,886	$3,417	8.4
Estimated Annual Savings	40,997	$1,986	7.1
Percent Savings	65%	58%	85%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 6 Water Saving Opportunities for the Town Office

Description	Qty	Installed Cost/Unit ($)		Total Cost ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years
		Capital	Labour					
Install water efficient metering faucets.	2	$309	$150	$1,047	80%	5,766	$4	283.6
Install water efficient toilets.	2	$284	$150	$990	55%	32,658	$21	47.3

* The total cost column includes 14% taxes.

4.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis results for the Town Office can be found in Appendix B, Table B.3.3. The energy saving opportunities with the shortest payback periods are to replace the incandescent light bulbs with compact fluorescent bulbs and to replace the incandescent exit signs with LED exit signs.

Due to the high installation cost associated with replacing the T12 lamps with T8 ballasts and tubes, the payback periods for these upgrades are high.

Envelope

A large amount of heat is being lost through the building's envelope. Weather-stripping the pedestrian doors would eliminate some of this heat loss with a short payback period. In addition, replacing the old windows with new triple pane windows would reduce the heat loss through the windows and through the cracks around the windows. The insulation in the old portion of the building is only R12. The energy savings and payback period resulting from upgrading this insulation to R20 is shown in Table 5.

HVAC

The Town Office's furnace is old and inefficient. Replacing this furnace with a new high efficiency furnace would result in large energy savings with a short payback period. In addition, installing a heating recovery ventilator to preheat the fresh air intake to the furnace would reduce the amount of energy required to heat this intake air to room temperature.

A geothermal heating system was also investigated for this facility. The existing gas furnace would be replaced with a water-to-air heat pump connected to a closed loop ground water system. A geothermal heat pump is one of the most energy efficient and environmentally friendly electric heating and cooling systems available. The cost to install this system would be approximately $30,000 but would save $1,300 per year on heating (28,161 kWh) resulting in a payback period of less than 24 years.

Water

The hot water tank is continuously losing heat to the surroundings. Since there are only two sinks in this facility, an instantaneous water heater could be installed to replace the current hot water tank and thus eliminate the heat loss from the tank.

Replacing the high flow water fixtures with water efficient fixtures would save from 55% to 80% of the current fixtures' water consumption. This water analysis is shown in Appendix B, Table B.3.5.

Maintenance

Inspection of the basement revealed that there is a problem with water entering the basement. This is likely due to surface run-off outside and should be corrected immediately to prevent mould formation.

The air conditioning condenser located outside required cleaning, as did the furnace filters. These items should be addressed as noted in Section 9.

5.0 WORKS & OPERATIONS, FIRE HALL, AND RCMP OFFICE

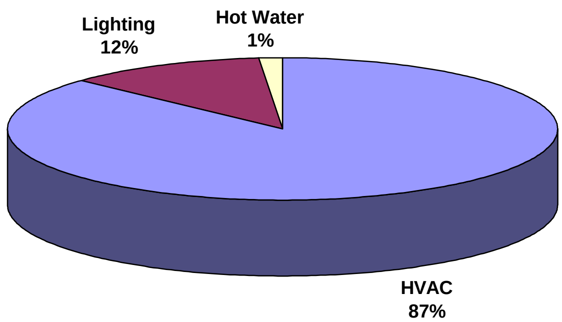
5.1 BACKGROUND

This 10,440 square foot building houses three separate facilities: Works and Operations, the Fire Hall, and the RCMP Office. The exterior walls are metal paneling with 6" of insulation and either drywall or metal liner on the interior walls. The Works and Operations section consists of a garage on the main floor and an office and storage room on the second floor. This portion of the building was constructed in 1988. More recently, in 1997, the Fire Hall and the RCMP office were added on.

Photo 4 – Works & Operations, Fire Hall, and RCMP Office

The Works and Operations and the Fire Hall garages have in-floor heating while the RCMP Office, the meeting room, and the second floor office are heated with electric baseboards. The three facilities share the same natural gas and electricity accounts. In the previous year, the natural gas and electrical energy consumption were 158,195 kWh and 45,450 kWh, respectively. The pie chart below shows the breakdown of energy consumption for this building.

Energy Breakdown (% of Total kWh) for the Works & Operations, the Fire Hall, and the RCMP



Water for filling the fire trucks is stored in two 7,500 litre, 2 m high plastic storage tanks. The majority of the building's water consumption is used in the wash bay and to fill the fire trucks. There are also two sinks and two toilets in the washrooms. A 190 litre gas hot water tank heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

5.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 7 and 8 show summaries of the energy and water saving opportunities for the building. The following assumptions were made in the calculations:

- Works and Operations is occupied from Monday to Friday, from 8am to 5pm.
- The Fire Hall is occupied intermittently for 20 hours per week.
- The RCMP is occupied for 7 hours a day, 5 days a week.
- The temperature of the three facilities is maintained at 21°C (70°F).
- For the purpose of water consumption, typical occupancy of the building is assumed to be 10.

Table 7 Energy Saving Opportunities for Works & Operations, the Fire Hall, & the RCMP Office

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Works & Operations										
Replace 8'x2 T12 fluorescents with T8 ballasts and tubes.	23	$125	$100	$125	$6,555	$5,900	7,937	$477	13.8	12.4
Replace 4'x2 T12 fluorescents with T8 ballasts and tubes.	13	$55	$35	$60	$1,704	$1,408	2,484	$149	11.4	9.4
Replacing interior incandescents with compact fluorescents.	4	$15	$10	$13	$128	$105	674	$40	3.2	2.6
Fire Hall										
Replace 8'x2 T12 fluorescents with T8 ballasts and tubes.	18	$125	$100	$125	$5,130	$4,617	2,321	$139	36.8	33.1
Replace 4'x2 T12 fluorescents with T8 ballasts and tubes.	15	$55	$35	$60	$1,967	$1,625	608	$37	53.8	44.5
RCMP										
Replace 4'x2 T12 fluorescents with T8 ballasts and tubes.	5	$55	$35	$60	$656	$542	355	$21	30.8	25.4
Install Parking Lot Controller.	1	$100	$75	$150	$285	$257	240	$14	19.8	17.8
Lighting Subtotal					**$16,424**	**$14,452**	**14,620**	**$878**		
ENVELOPE										
Works & Operations										
Replace and caulk window.	3	$500	$410	$300	$912	$809	518	$24	38.5	34.2
Weatherstrip pedestrian doors.	3	$15	$15	$50	$222	$222	4,306	$197	1.1	1.1
Caulk vehicle doors.	4	$15	$15	$50	$296	$296	6,889	$315	0.9	0.9
Fire Hall										
Replace and caulk windows.	3	$1,000	$820	$600	$1,824	$1,619	1,060	$48	37.6	33.4
Weatherstrip and caulk pedestrian doors.	2	$15	$15	$50	$148	$148	2,570	$117	1.3	1.3
Caulk vehicle doors.	2	$15	$15	$50	$148	$148	3,855	$176	0.8	0.8
RCMP										
Replace and caulk windows.	3	$1,000	$820	$600	$1,824	$1,619	891	$41	44.8	39.8
Envelope Subtotal					**$5,375**	**$4,862**	**20,088**	**$918**		
HVAC										
Works & Operations										
Install programmable thermostat for second floor office; setback temperature to 15 ^{o}C (59 ^{o}F).	1	$300	$300	$300	$684	$684	2,386	$143	4.8	4.8
Install 1,000 cfm HRV.	1	$4,500	$4,500	$2,000	$7,410	$7,410	6,723	$307	24.1	24.1
Install a vehicle emissions sensor.	1	$850	$850	$200	$1,197	$1,197	6,723	$307	3.9	3.9
Install solar wall on east face of building (not included in totals).	1	$35,275	$21,380	$20,300	$63,356	$47,515	11,075	$506	125.2	93.9
Fire Hall										
Replace boiler with high efficiency boiler.	1	$5,000	$5,000	$1,000	$6,840	$6,840	3,754	$225	30.3	30.3
HVAC Subtotal					**$16,131**	**$16,131**	**19,587**	**$983**		
HOT WATER										
Install instantaneous water heater	1	$300	$300	$900	$1,368	$1,368	2,805	$128	10.7	10.7
Water Subtotal					**$1,368**	**$1,368**	**2,805**	**$128**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	203,645	$9,846	29.8
Estimated Annual Savings	57,101	$2,907	7.7
Percent Savings	28%	30%	26%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 8 Water Saving Opportunities for Works & Operations, the Fire Hall, and the RCMP Office

Description	Qty	Installed Cost/Unit ($)		Total Cost ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years
		Capital	Labour					
Install water efficient metering faucets.	2	$309	$150	$1,047	80%	5,242	$3	312.0
Install water efficient toilets.	2	$284	$150	$990	55%	29,689	$19	52.1

* The total cost column includes 14% taxes.

5.3 GENERAL RECOMMENDATIONS

Lighting

There are only two energy saving opportunities in terms of lighting with a less than 10 year payback period. One of the opportunities is to replace the 4' T12 fluorescent lamps in the wash bay of the Works & Operations with 4' T8 lamps and ballasts and install occupancy sensors. An occupancy sensor is a switch that automatically turns the lights on when either motion or heat is detected; this will ensure that the lights are turned off when the wash bay is unoccupied. The other energy saving opportunity with a less than 10 year payback period is to replace the incandescent bulbs in the Works & Operations with compact fluorescent bulbs.

Envelope

The envelope of this building has pedestrian doors that are losing heat due to poor weather-stripping. The weather-stripping on the vehicle doors was recently replaced and is therefore in good condition. Installing new weather-stripping on the pedestrian doors would reduce the heat losses through the cracks around these doors with a short payback period. Replacing the windows would also result in energy savings; however, the payback period for this upgrade is long. If the windows are not replaced, they should be re-caulked to prevent cold air leakage into the building.

HVAC

Another recommendation that would result in large savings with a short payback period is to install a programmable thermostat on the second floor of the Works and Operations that would reduce the temperature to 15°C (59°F) when the building is unoccupied.

The only room with ventilation is the Works and Operations; however, the ventilation for this room is rarely used due to poor heat recovery with the in-floor heating system. One option that was investigated was to install a solar wall on the east face of this building to pre-heat the intake air. The solar wall covers the entire east surface of the building and uses free heating from the sun to heat the make up air. In addition, the solar wall also reduces building heat loss during the winter. On the east wall, heat lost to the cavity between the building and the exterior metal panels of the solar wall is captured by the incoming air and returned to the building. The energy savings that would result from installing the solar wall are shown in Table 7. Unfortunately, the high installation cost associated with this opportunity results in a very high payback period.

Another option for Works and Operations is to install a heat recovery ventilator (HRV) to pre-heat the intake air with the exhaust air. In addition, a vehicle emissions sensor could be installed to control the ventilation such that the room is ventilated only when required.

The boiler used for in-floor heating in the Fire Hall is a mid-efficiency boiler (84%). Replacing this with a high efficiency boiler would save 10% of the annual heating requirements.

Water

Table 8 shows the water savings that would result from replacing the current water fixtures with water efficient fixtures. Table B.4.5 in Appendix B shows more detailed results from this analysis.

Other Issues

A health and safety concern for this building is that there is currently no ventilation in the Fire Hall. Ventilation is important for the health and safety of occupants as it helps to reduce the level of air pollutants such as carbon monoxide, carbon dioxide and, for the case of a fire hall, vehicle emissions.

Maintenance

It is very important to maintain the correct level of corrosion inhibitors in the in-floor heating systems. This should be checked annually. Omitting this maintenance procedure will result in fouling of the heating loops and reduced efficiency of the heating system.

6.0 WATER TREATMENT PLANT

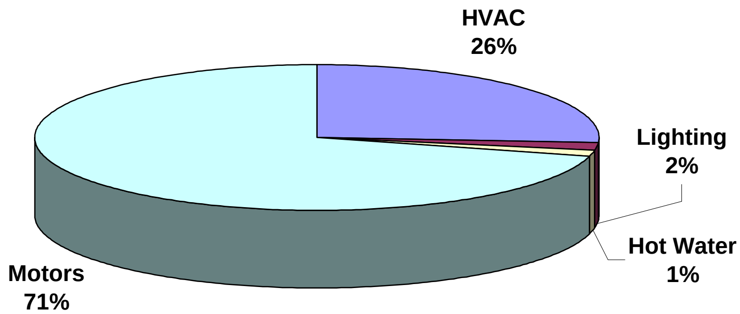
6.1 BACKGROUND

The Water Treatment Plant is a 220 square foot building constructed of 2”x4” studs, plywood interior sheeting and a stone façade exterior. The Water Treatment Plant houses two water-distribution pumps, three raw water well pumps, and a chemical feed pump. The building is occupied intermittently for servicing.

Photo 5 – Water Treatment Plant

This building uses electricity exclusively for heating, lighting, hot water, and to power the motors. A total annual energy consumption of 12,960 kWh was consumed in the previous year. The following pie chart shows the energy breakdown for the Water Treatment Plant.

Energy Breakdown (% of Total kWh) for the Water Treatment Plant



The only water fixture in this facility is a single sample sink. The water for this sink is heated using a small, 6 gallon electric water heater.

6.2 ENERGY SAVING OPPORTUNITIES

Table 9 below shows a summary of the energy saving opportunities for the Water Treatment Plant. The following assumptions were made in the calculations:

- The building is only occupied 1 hour per week year round.
- The temperature is maintained at 15°C (59°F).

Table 9 Energy Saving Opportunities for the Water Treatment Plant

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When replacing the interior incandescents, replace them with compact fluorescents.	2	$13	$8	$0	$30	$18	53	$3	9.4	5.8
Lighting Subtotal					**$30**	**$18**	**53**	**$3**		
ENVELOPE										
Weatherstrip metal pedestrian door.	1	$15	$15	$50	$74	$74	688	$41	1.8	1.8
Replace and seal windows.	7	$5,600	$4,820	$800	$7,296	$6,407	4,949	$297	24.6	21.6
Envelope Subtotal					**$7,370**	**$6,481**	**5,638**	**$338**		
HVAC										
Set temperature down to 10 °C (50 °F).	1	$0	$0	$0	$0	$0	1,565	$94	0.0	0.0
HVAC Subtotal					**$0**	**$0**	**1,565**	**$94**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	12,960	$1,089	0.39
Estimated Annual Savings	5,690	$436	0.17
Percent Savings	44%	40%	44%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

6.3 GENERAL RECOMMENDATIONS

Lighting

The only energy saving opportunities for the Water Treatment Plant in terms of lighting are in replacing the incandescent light bulbs with compact fluorescent bulbs. Since the indoor fluorescent T12 lights are only used for approximately 1 hour per week, replacing these lights would not result in significant energy savings. The lighting analysis summary for this building is shown in Appendix B, Table B.5.3.

Envelope

The pedestrian door is well insulated, however, it should be properly sealed to reduce infiltration. Table 9 shows energy savings that would result from replacing the double pane windows with triple pane windows and providing an air tight seal around the perimeter. Further details are shown in Appendix B, Table B.5.4.

HVAC

Reducing the temperature in the Water Treatment Plant to 10 ^{o}C (50 ^{o}F) throughout the winter would result in large energy savings with no capital or labour costs.

7.0 HERITAGE CENTRE

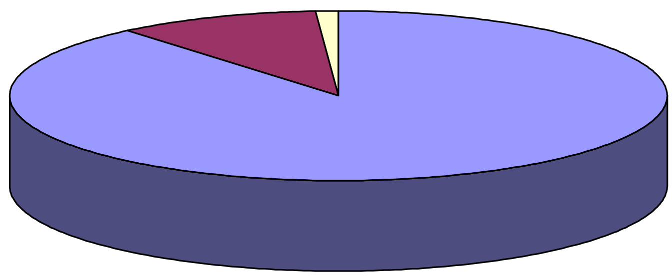
7.1 BACKGROUND

The Heritage Centre houses three separate facilities: a medical clinic (MC), Nutri-health offices (NH), and a banquet hall (BH). All three facilities have been recently re-constructed; the banquet hall was completed in 1996, the medical clinic in 2002, and the Nutri-health offices in 2004. The total area of the complex is over 30,000 square feet.

Photo 6 – Heritage Centre

The natural gas and electrical energy consumption for this complex in the previous year was 279,600 kWh and 329,069 kWh, respectively. This total energy is split between lighting, heating, and water heating as shown in the pie chart below.

Energy Breakdown (% of Total kWh) for the Heritage Centre



The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the water heater storage tanks.

7.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 10 and 11 show the energy and water saving opportunities for the Heritage Centre. The following assumptions were made in the analysis:

- The Medical Clinic is occupied from Monday to Friday for 45 hours per week.
- The Nutri-health offices are occupied for 40 hours per week.
- The Banquet Hall is used for approximately 100 events per year (5 hours/event).
- For the purpose of water consumption, the typical occupancy of the Banquet Hall is 300, the occupancy of the Nutri-Health Offices is 25, and the occupancy of the Medical Clinic is 12.
- The exit lamps are on 24 hours per day year round and the exterior lights are on for 12 hours a day year round.

Table 10 Energy Saving Opportunities for the Heritage Centre

Description	Qty	Installed Cost/Unit ($)			Total Cost ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI)	Capital (WI)	Labour	NI	WI	kWh	$	NI	WI
LIGHTING & PARKING LOT CONTROLLERS										
MC: Retrofit 4' x 2 T12 fluorescents with T8 ballast and tubes.	80	$55	$35	$60	$10,488	$8,664	7,301	$438	23.9	19.8
MC: Retrofit 2' x 2 T12 fluorescents with T8 ballast and tubes.	8	$50	$30	$55	$958	$775	674	$40	23.7	19.2
BH: Retrofit Exit Signs with LED modules.	5	$50	$5	$80	$741	$485	1,183	$71	10.4	6.8
Install parking lot controllers.	8	$50	$5	$80	$1,186	$775	1,920	$115	10.3	6.7
Lighting & Parking Lot Controllers Subtotal					**$13,372**	**$10,699**	**11,077**	**$665**		
ENVELOPE										
BH: Replace and seal windows.	1	$4,900	$3,890	$1,600	$7,410	$6,258	6,182	$283	26.2	22.2
BH: Weatherstrip pedestrian doors.	8	$15	$15	$50	$593	$593	6,948	$318	1.9	1.9
Envelope Subtotal					**$7,410**	**$6,258**	**13,130**	**$600**		
HVAC										
MC: Install HRV.	1	$950	$950	$1,000	$2,223	$2,223	2,120	$97	22.9	22.9
NH: Install HRV.	1	$950	$950	$1,000	$2,223	$2,223	7,553	$345	6.4	6.4
NH: Install new high efficiency RTU with CO_2 sensors.	1	$17,000	$17,000	$5,100	$25,194	$25,194	27,469	$1,255	20.1	20.1
BH: Install new high efficiency RTU with CO_2 sensors.	7	$5,800	$5,800	$1,740	$60,169	$60,169	31,489	$1,439	41.8	41.8
HVAC Subtotal					**$89,809**	**$89,809**	**68,632**	**$3,136**		
HOT WATER										
Install water efficient metering faucets.	10	$309	$309	$150	$5,233	$5,233	3,737	$224	23.3	23.3
Water Subtotal					**$5,233**	**$5,233**	**3,737**	**$224**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	608,669	$31,037	67.4
Estimated Annual Savings	95,987	$4,591	15.1
Percent Savings	16%	15%	22%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 11 Water Saving Opportunities for the Heritage Centre

Description	Qty	Installed Cost/Unit ($)		Total Cost ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years
		Capital	Labour					
Install water efficient toilets.	7	$284	$150	$3,459	55%	271,875	$174	19.9
Install water efficient metering faucets.	7	$309	$150	$3,663	80%	84,000	$54	68.1

* The total cost column includes 14% taxes

7.3 GENERAL RECOMMENDATIONS

Lighting & Parking Lot Controllers

The lighting in the Nutri-health offices is all energy efficient lighting and therefore, no upgrades are recommended. For the medical clinic and the banquet hall, the only upgrades with a less than 10 year payback period are to replace the incandescent exit signs in the banquet hall with LEDs and to install parking lot controllers on the plugs in the parking lot.

Parking lot controllers save energy by automatically adjusting the power at the car plugs depending on the temperature. The outlets that are currently used for Christmas lights are not good candidates for controllers. The recommendation is to install the parking lot controllers on the plugs on the north side of the building. The lighting analysis summary can be found in Table B.6.3.

Envelope

Since the Nutri-health offices and the medical clinic have been recently re-constructed, the envelopes of these buildings are in good condition. However, the doors and windows in the banquet hall are older and require new weather-stripping and sealant. Replacing the windows with new, triple pane windows would also result in energy savings but the payback period for this upgrade is long.

HVAC

Heating recovery ventilators (HRVs) are recommended in both the medical clinic and the Nutri-health offices. HRVs use the exhaust air from the building to preheat the fresh air intake into the furnace. The energy savings from this installation are shown in Table 10 above.

The rooftop units (RTUs) for the banquet hall and Nutri-health are standard efficiency units. Replacing these units with higher cooling efficiency units and installing CO_2 sensors to control the ventilation would result in large energy savings. The CO_2 sensors would ensure that the rooms are only ventilated when necessary.

Water

Water savings would result from installing water efficient water fixtures in the banquet hall's washrooms. Although the calculated payback period shown in Table 10 for replacing the sink faucets is high, this value does not consider the reduction in cost due to water savings.

Future Renovations

There is currently a project underway for an atrium to be added to the south end of the Heritage Centre. The atrium is being designed by MMP Architects and will incorporate measures for energy and water reduction methods. In addition, a geothermal heating system is being considered for this complex.

8.0 PICNIC SHELTER

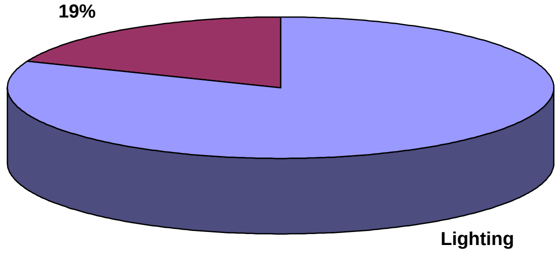
8.1 BACKGROUND

The Picnic Shelter was constructed in 2002 and houses two washrooms, a storage room, and a sheltered area with picnic tables. The total area of the building is 504 square feet. The picnic shelter is occupied during the summer months only and, therefore, does not have any heating.

Photo 7 – Picnic Shelter

This building uses electricity exclusively for lighting and water heating. In the previous year, the total electrical energy consumption was 3,392 kWh. The breakdown of this energy is shown in the following pie chart.

Energy Breakdown (% of Total kWh) for the Picnic Shelter



The washrooms in the Picnic Shelter contain a total of 4 toilets, 4 sinks, and 2 urinals. A 175 litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

8.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 12 and 13 show the energy and water saving opportunities for the Picnic Shelter. The following assumptions were made in the analysis:

- The lights in the washrooms of the picnic shelter are on for 24 hours per day throughout the summer.
- For the purpose of water consumption, the typical occupancy is 20 people, for 32 hours per week.

Table 12 Energy Saving Opportunities for the Picnic Shelter

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Capital (NI*)	Capital (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Retrofit 4' x2 T12 fluorescents with T8 ballast and tubes and wire to door lock timer.	8	$55	$35	$65	$1,394	$1,212	1,786	$107	13.0	11.3
Lighting Subtotal					**$1,394**	**$1,212**	**1,786**	**$107**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	3,392	$554	0.1
Estimated Annual Savings	1,786	$107	0.05
Percent Savings	53%	19%	50%

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

Table 13 Water Saving Opportunities for the Picnic Shelter

Description	Qty	Installed Cost/Unit ($)		Total Cost ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)	Simple Payback Years
		Capital	Labour					
Install water efficient metering faucets.	4	$309	$150	$2,093	80%	6,272	$4	521.4
Install water efficient toilets.	4	$284	$150	$1,979	55%	20,300	$13	152.3

* The total cost column includes 14% taxes

8.3 GENERAL RECOMMENDATIONS

Lighting

Since the majority of the picnic shelter's energy consumption is for lighting, a significant reduction in the shelter's annual energy consumption would result from replacing the T12 fluorescent lamps with T8s. In addition, the door locks are currently on a timer such that the doors are locked throughout the night. Wiring the indoor lights to this timer would ensure that the lights are shut off throughout the night.

Water

From Table 13 it can be seen that installing water efficient metering faucets and toilets in the washrooms would reduce the fixtures' water consumption by 80% and 55%, respectively.

9.0 GENERAL UPGRADES AND MAINTENANCE RECOMMENDATIONS FOR REDUCING ENERGY AND WATER CONSUMPTION

The following energy and water saving opportunities exist in many buildings including those toured in this study. The saving opportunities are generic in nature and include both capital upgrades (Sections 9.1 to 9.4) and maintenance activities (Section 9.5) that will result in energy / water savings for all the buildings.

9.1 LIGHTING AND ELECTRICAL

Light Switches – Place signs or stickers adjacent to switches to remind occupants to shut off switches when leaving rooms unoccupied. Occupancy sensors can be provided to shut off lights automatically when not in use. Timers can also be used in a similar fashion.

Fluorescent Lighting Systems – T12 lights should be upgraded to premium T8 or T5 electronic ballasts and lamps. This may be done when current T12 ballasts need replacement or in a planned retrofit program. Use cold-weather rated ballasts for retrofits in areas where the temperature is below 15°C (59°F). When selecting T8 electronic ballasts, please refer to Manitoba Hydro's Power Smart Lighting program for current listings of eligible ballasts. Contact Manitoba Hydro for details.

EXIT Signs – Replace all incandescent exit signs with 3W LED signs.

Incandescent Bulbs – All incandescent bulbs should be converted to compact fluorescents. Compact fluorescent bulbs last approximately 10 times longer than incandescents and save up to 75% of the energy costs.

Exterior Lights – Compact fluorescent bulbs do not function at low temperatures, therefore, the exterior lights should be replaced with high-pressure sodium lighting. High-pressure sodium lights are the most energy efficient type of lighting available today. Savings of approximately 50% would result from replacing exterior incandescent fixtures with these high-pressure sodium lights. Photo cells should be considered for automatically shutting off outdoor lights during day light conditions.

Parking Lot Controllers – Parking lot controllers save energy by automatically adjusting the power at the car plugs depending on the outside temperature.

Other Recommendations - Dispose of all fluorescent lamps and ballasts through a recycling company to reduce toxins entering the landfills.

Refer to Appendix D for a list of Manitoba Hydro's Power Smart incentives and listings of other incentive programs.

9.2 BUILDING ENVELOPE

Window/Door Infiltration – Seal drafts on windows and doors. This can be done by installing or upgrading weather-stripping, or with removable silicone caulking such as “Draft Stop” or “Peel and Seal”. Doors with high usage should be inspected twice per year for damaged weather stripping.

Window/Door Replacement – Windows and doors with low R-values should be considered for replacement. Manitoba Hydro offers incentives for new windows.

Wall / Roof Insulation – The wall insulation in older buildings typically has a resistance of R-12 or less. Large energy savings would result from upgrading this insulation to R-20. Similarly, roof insulation should be upgraded to R40. In addition to the energy savings, upgrading insulation also extends the life of a building by avoiding the rotting of wood framing from the development of mould and mildew in the walls. Vapour barriers in walls can also be upgraded at the same time to reduce infiltration.

Electrical Outlets – Install draft-reducing foam pads in all electrical receptacles.

9.3 HEATING, VENTILATION, AND AIR CONDITIONING

Temperature Control – Use programmable electronic thermostats where appropriate. Use the recommended “set-back” and “set forward” temperatures during unoccupied periods. A 3°C “set-back” over a 12 hour period can reduce heating costs by 4%. Terminate ventilation during un-occupied periods.

Air Conditioning – Reduce the cooling load on the air conditioner by keeping the facility a few degrees warmer and using fans at workstations to augment cooling of personnel. Provide an economizer to supply “free cooling” when it is cool outside and air conditioning is required.

Remove or insulate wall or window-mounted air conditioners for the winter season.

HVAC Ductwork – Seal duct joints with duct tape to reduce losses of heated or cooled air where the ducts traverse cold or hot areas respectively. Insulate duct work passing through unconditioned spaces.

Thermostat Equipped Electric Baseboard Heaters – Mark the thermostat “normal” setting to provide a visual cue as to when they are on or set too high.

9.4 WATER CONSUMPTION

Excessive water usage wastes energy, increases water / sewage treatment costs and further risks damage to the environment.

Toilet Tanks – Install flush volume reduction devices in existing toilet tanks to reduce the quantity of water used per flush by about 25%. "Early closing flapper valves" are inexpensive and are easily installed**.**

Toilets – When replacing older toilets or installing new ones, use high efficiency, low-flush volume models that require only 6 L (1.3 Imp. gal.) per flush. Refer to the toilet and drainline reports on the Canadian Water and Wastewater Association (CWWA) website for advice in selecting a toilet that will perform well.

Hot Water – In facilities where large volumes of hot water are not required, set the hot water tank thermostat to 55°C (131°F). A reduction from 60°C to the recommended value of 55°C saves approximately 3% of the energy related to hot water generation. Insulate the first 2 meters (6 ft) of the cold water line and as much of the hot water distribution lines as practical, particularly where hot water lines traverse cold spaces.

Shower Controls – In facilities where large amounts of water are used, consider retrofitting single actuator, short cycle (adjustable), self-closing control valves, with pressure-balancing temperature controls to reduce water consumption. These controls limit flow and allow for a preset water temperature (recommended 40°C) for the showers in order to reduce water heating costs and wastage of water.

Auto-Shut Off Fixtures - Consider using spring loaded fixtures that automatically shut off water flow in public areas.

Tankless Water Heaters – Consider replacing the hot water storage tanks with instantaneous water heaters to avoid storage tank losses and save energy.

9.5 MAINTENANCE

Maintenance activities are important to ensure that the equipment in a building is operating efficiently and to reduce the potential for future equipment breakdown. One option is to hire a maintenance contractor to perform inspections four times annually to clean, lubricate, test, and adjust the building's HVAC equipment.

The following is a list of HVAC maintenance procedures that should be performed two to four times annually:

Heating/Ventilation Systems

- Change filters
- Inspect belts
- Inspect and clean heating coils
- Inspect operation of blower

- Inspect and lubricate motor and fan bearings
- Inspect and lubricate fresh air, exhaust air, and return air dampers

Air Conditioning/Ice Plant Systems

- Clean outdoor condensers
- Clean filters
- Check refrigerant and oil levels
- Inspect ice plant and refrigerant piping for leaks
- Inspect and lubricate brine pumps
- Inspect and lubricate motorized and back draft dampers
- Inspect A/C operation and adjust as required

10.0 IMPLEMENTATION OF ENERGY AND WATER SAVING OPPORTUNITIES

10.1 IMPLEMENTATION

The energy and water saving opportunities suggested in this report range from simply changing a light bulb to installing a geothermal heating system. Some of the simpler recommended upgrades can be completed in-house while others would require hiring a contractor to complete the work. Major renovation projects will require a consulting engineer to design and help implement the upgrade. The various energy/water saving opportunities discussed throughout this report are separated into three levels of implementation: (1) in-house implementations, (2) contractor implementations, and (3) consulting engineer implementations. The following sections discuss which upgrades fall into each of these three categories.

In-House Implementations

Some of the energy saving opportunities can be completed in-house. Replacing the incandescent light bulbs with compact fluorescent bulbs involves simply replacing the bulb and could easily be done by one of the building's maintenance personnel. Installing weather-stripping around the doors and sealing the windows could also be done in-house. For the saving opportunities that involve replacing the doors, some could be done in-house while for others, such as the vehicle doors, it is best to hire a contractor.

Contractor Implementations

The majority of the energy saving opportunities will require a contractor. In terms of lighting, replacing the T12s with T8s involves replacing the ballast as well as the bulbs. An electrician should be hired to complete this function. Replacing the exterior incandescent lights with high-pressure sodium lights and replacing the exit incandescent lamps with LED modules involve replacing the fixture and will therefore require an electrician.

Upgrades on a building's envelope not mentioned in the "In-House Implementations" section should be done by a contractor. This includes replacing windows and vehicle doors, and upgrading the wall and/or roof insulation.

In terms of HVAC, a contractor should be hired to install programmable thermostats and motorized dampers.

Electricians should be hired to replace motors with high-efficiency motors.

For the water saving opportunities involving installing water efficient fixtures, a contractor will likely be required. Insulating the hot water tank, and installing an instantaneous water heater will also require a contractor.

Consulting Engineer Implementations

The energy saving opportunities for the Town of Niverville that require a consultant to implement are the geothermal heating system and the solar wall. The geothermal heating system will require a detailed site investigation, bore hole testing, and energy modeling of the building to properly size the geothermal system.

Consulting services should also be considered for any major upgrades to building and services.

10.2 FINANCING

There are several incentive programs listed in Appendix D of this report that will help finance the implementation of the energy and water saving opportunities. In the “Energy Saving Opportunity” tables throughout this report, the capital costs are listed both with and without incentives. The incentives in these tables are from Manitoba Hydro’s Power Smart Incentives and apply to energy efficient lighting and windows, wall insulation upgrades, and geothermal heating systems. For more information on these incentives, contact your local Manitoba Hydro Energy Services Coordinator or the contact listed in Table D.1.

Table D.2 lists other incentive programs that are available for energy saving upgrades. These programs are:

- Energy Innovators Initiative: Energy Retrofit Assistance (ERA)
- Municipal Rural Infrastructure Fund (MRIF)
- Renewable Energy Development Initiative (REDI)

- Community Places Program
- Sustainable Development Innovations Fund (SDIF)

For further information on these programs refer to the website listed in the table.

Members of the Association of Manitoba Municipalities also have the option of purchasing products and services in bulk at reduced prices through the Municipality Trading Company of Manitoba Limited. Details of this can be found in Appendix G of this report.

10.3 POLITICAL FRAMEWORK

General Municipal Environment in Manitoba

In Manitoba, municipal elections are set every 4 years. The next municipal election will be in October 2006, which may mean that some councils will see a change in members. However, we do not expect this to have a major impact on the plans to implement the recommendations of this report.

There are currently no Provincial or Federal targets or goals set that municipalities must achieve. 'Green Projects' have become common in Manitoba and often programs like the Municipal Rural Infrastructure Fund (MRIF) targets such projects. Details of this project are included in Appendix D of this report. Manitoba has been a leader in energy efficiency and many municipalities have partnered with other levels of government and companies like Manitoba Hydro on innovative projects. We believe the MMEP project is an excellent example of an innovative project and believe all of the participating communities are receptive to innovative ideas because they have agreed to participate.

A recent trend in municipal government has been toward longer-term planning. This is seen with the recent changes to the provincial Planning Act and the requirements for community sustainability plans in the New Deal agreement. The recommendations in this report certainly complement this direction.

Political Environment in Niverville

Niverville is one of the fastest growing communities in Manitoba and is undergoing continuous development. The knowledge gained from this efficiency study will therefore be useful in future development projects. Future plans for this town include an expansion to the Heritage Centre including an atrium, swimming pool, assisted living complex, and a new curling rink and arena. The saving opportunities discussed throughout this report can be implemented into these new projects, resulting in energy and water efficient buildings.

The Chief Administrative Officer of Niverville expressed a great deal of interest in this study and in implementing some of the more cost-effective measures in the coming year. The Town has already shown it's interest in building environmentally friendly infrastructure as was seen in the Nutri-health offices and in the geothermal heating system planned for the expansion of the Heritage Centre.

A potential barrier that could affect the implementation of the opportunities discussed throughout this report is a change in council members. It is important that the information gained here be passed on as new members enter the council and current members leave.

11.0 PERFORMANCE VERIFICATION

Following the implementation of the recommended energy and water saving opportunities, it is important to continuously monitor the annual energy consumption to keep a record of the resulting energy savings.

Appendix F contains a spreadsheet and graph for each of the buildings audited. These spreadsheets should be used as a tool to monitor the energy consumption on a monthly basis. The first five columns in each spreadsheet are for year 2004-2005 and have already been completed.

Following the implementation of the measures discussed in this report, the energy consumption should be recorded. The year headings may need to be re-entered, depending on when the implementations are completed. The monthly electrical energy consumption in kWh taken from the building's electricity bill should be recorded in the "Billed Elec. Energy" column and the monthly gas consumption in m^3 should be recorded in the "Billed Natural Gas" column. The monthly energy consumption for heating depends on the outdoor temperatures for that month. The "Billed Energy Consumption" is therefore normalized to the year 2004-2005 such that a fair comparison can be made.

The normalized energy consumption is determined as follows:

$$NEC = TEC \times (\%\, Energy\, Used\ \ for\ Heating) \times \left(\frac{HDD(present)}{HDD(2004-2005)} \right) \\ + TEC \times (1 - \%\, Energy\, Used\ \ for\ Heating)$$

Where *NEC* is the Energy Normalized to year 2004-2005, *TEC* is the total energy consumption and *HDD* is the heating degree-days.

The heating degree-days (HDD) for a given day are the number of Celsius degrees that the mean temperature is below 18°C. This data can be found for the city of Winnipeg on the following website:

http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=11&Day=18

Once the "Billed Elec Energy", the "Billed Natural Gas", and "HDD" columns are filled in, the "Energy Normalized to 2004-2005" column is automatically calculated and the graph is updated. From this graph, the energy consumption can be monitored on a monthly basis to ensure that the upgrades are resulting in a reduction in energy consumption.

12.0 WATER AND SEWER AUDIT

12.1 WATER SYSTEM OVERVIEW

The Niverville water treatment plant was built in early 2004 and draws its water from three wells located immediately adjacent to the water treatment plant. Three raw water pumps pump the water from the wells, through a treatment system that chlorinates the groundwater, and then into a reservoir. From the reservoir, the water is distributed via two distribution pumps. The water plant services the Fifth Avenue Estates subdivision in the Town of Niverville, and does not provide fire prevention services. The remainder of the Town obtains water from individual wells at each residence and business. There is a water meter located downstream of the distribution pumps that measures the water produced by the system and there are 43 water meters that measure the water consumed by the Fifth Avenue Estates subdivision. The average daily production of water is 16.46 m^3/day while, according to meter information provided, the average daily consumption is 14.52 m^3/day.

Tables 14(a), (b), and (c) show the amount of water produced and consumed over the period from February 1, 2004 to June 28, 2004, as well as the estimated costs.

Table 14(a) Monthly Water Production (m^3)

Month	Water Produced* (m^3)	Operation Hours	
		Distribution Pump 1	Distribution Pump 2
February, 2004	269	144	0
March, 2004	312	4	162
April, 2004	355	109	67
May, 2004	374	188	0
June, 2004	468	81	118
July, 2004	983	0	343
August, 2004	698	121	271
September, 2004	540	236	0
October, 2004	566	247	0
November, 2004	572	73	139
December, 2004	641	0	228
January, 2005	616	238	0
February, 2005	556	216	0
March, 2005	621	61	203
April, 2005	669	0	244

Month	Water Produced* (m^3)	Operation Hours	
		Distribution Pump 1	Distribution Pump 2
May, 2005	790	262	17
June, 2005**	977	100	179
TOTALS	**10,007**	**2,080**	**1,971**

* Water production is measured from the water meter located downstream of the distribution pumps.
**Only includes June 1 to June 28.

Table 14(b) Water Costs from Feb 1, 2004 to June 28, 2005

Description	Cost
Pumping Costs*	$545
Chemical Costs	$100
Maintenance Costs	$5,775
Average Cost per Cubic Meter	$0.64

*Based on pump hours and Manitoba Hydro's rate of $0.06 per kWh for General Service Small clients.

Table 14(c) Water Losses and Associated Costs from Feb 1/04 to June 28/05

Description	Amount
Total Water Produced (m^3)	10,007
Total Water Consumed (m^3)*	8,830
Meter Inaccuracies (m^3)**	61
Total Water Losses (m^3)	1,116
Percent Water Losses	11.16%
Unit Cost per Cubic Meter	$0.64
Cost of Water Losses***	$715.98

* Water consumption is measured from water meters located at the residences and businesses in the Fifth Avenue Estates subdivision.
** Probable amount of water used but not accounted for by client water meters estimated using accuracy figures published by the American Water and Wastewater Association (AWWA) journal.
** Based on the Average Cost per Cubic Meter.

Based on information provided, the Town lost approximately $716 due to unaccounted for water loss over the period from February 1, 2004 to June 28, 2005, or approximately $510 annually. This cost may be inaccurate since the error on the distribution meter was unknown, and the overall error on the client water meters was estimated.

Water Meters

The water meter in the water treatment plant is an Endress & Hauser Promag 50 mag meter that was installed in 2004 when the plant was constructed. In the serviced subdivision, there are 43 water meters that are all 5/8" in size. These water meters were also installed in 2004.

There is currently no program in place to test the water meters for accuracy, but it is assumed that they are still measuring accurately due to their recent installation. According to an article written by Michael Yee in the American Water and Wastewater Association Journal, meters with plastic components that are 2 years old are still approximately 99.32% accurate. Over time, however, the accuracy of the meters will be reduced and it is recommended that the Town look into eventually developing a program to test the accuracy of the water meters. Since meters almost always underestimate water flow when they become inaccurate, inaccurate meters will tend to overestimate the unaccounted for water losses within the distribution system. In addition, inaccurate meters will result in clients not being billed for the full amount of water that they use.

Pumps

Both of the distribution pumps are located within the water treatment plant. Table 15 lists the relevant available pump data.

Table 15 Water Pump Data

Function	Motor Size (hp)	Motor Age (Years)	Manufacturer	Model Number
Primary Distribution Pump	3	3	Grundfos	75S30-5
Secondary Distribution Pump	3	3	Grundfos	60S30-5

Water Rates

Meters are read on a quarterly basis and these readings are entered into a Microsoft Access database that keeps track of clients' billing histories. There is a $9.00 service charge per quarter, and a charge of $3.25 per 1000 imperial gallons ($0.715 per cubic meter) of water consumed.

Maintenance Programs

There is currently no scheduled maintenance program in place; however, the facility and equipment are inspected daily when the daily water meter reading is taken. Any problems that arise are dealt with as soon as possible.

The system was not designed with the capacity for flushing lines. As such, the lines have not been flushed since they were installed. Since the system is relatively new, no leak detection program has been initiated and there are currently no plans for developing a leak detection program as part of routine distribution system maintenance. There have been no recorded breaks in the system since its construction. Consideration should be given for the provision of flushing and swabbing capabilities.

12.2 WATER SYSTEM AUDIT RESULTS

In general, community water rates should be set at a level that covers the cost of supplying water to clients, including treating the water, distributing the water, maintaining the treatment and distribution systems, and replacing key pumping and process equipment. Reducing the amount of water lost can have an impact on the overall cost of water treatment.

By reducing the amount of water losses, the Town will realize savings through reduced chemical costs related to treating the water, and reduced electrical costs associated with a reduction in the amount of pumping required to supply the water. Over a long-term prospect, the overall life of the facility and major process components can be extended, reducing the replacement frequency and equipment maintenance requirements.

A program for checking meter accuracy can also increase revenues for the Town by ensuring that customers are being billed for the actual amount of water they use. This program will not actually change the amount of water a client uses, it simply allows the Town to bill for the correct amount and recover production costs that would otherwise be attributed to unaccounted losses.

Although the distribution system is quite new and no line breaks have been detected thus far, a program of regular scheduled leak detection can help prevent water loss from occurring in the future.

12.2.1 Unaccounted-For Water Loss

As calculated from the data supplied by the Town of Niverville, the Town has an unaccounted-for water loss of approximately 11.2% over the period from February 2004 to June 2005.
There are several factors that could account for this water loss:

Leakage

Every distribution system experiences some amount of leakage, even if it is relatively new, as is the case with the Niverville distribution system. According to Environment Canada, municipalities that have an unaccounted-for water loss exceeding 10 to 15 percent find that a leak detection program is cost-effective. Environment Canada goes on to report that some studies have shown that for every $1.00 spent in communities with leak detection programs, up to $3.00 can be saved. Since Niverville is on the cusp of the 10 to 15 percent range, it is recommended that the Town develop a leak detection program for use in the near future.

Meter Accuracy

It is important to check not only client water meters, but the water meter at the treatment plant as well. If the production water meter is inaccurate, the Town will not have reliable data on the amount of water it is treating. This can lead to problems when trying to assess the amount of unaccounted-for water leaving the system, as more water will be leaving the system than is actually recorded.

As for the client water meters, ensuring they are accurate will increase revenues for the Town since clients will be paying for the actual amount of water used. Accurate client meters will also allow the Town to better assess the amount of unaccounted-for water leaving the system, since water that would be unaccounted-for if the meters were inaccurate would actually be included in water consumption data.

If the Town is not fully aware of the amount of water lost from the system, it is much more difficult to develop a leakage prevention program.

Other

Since the water distribution system is fairly new and there have been no water main breaks or water main flushing, the only other main factor that could contribute to unaccounted-for water loss is unauthorized water use.

12.2.2 Maintenance Program

It is recommended that the Town develop a program for testing the accuracy of client water meters. One cost-effective method would be to hire a summer student that would test the accuracy of the meters.

The Town should inspect the main water treatment plant meter and complete meter calibration on a routine basis. This will allow the Town to have accurate records pertaining to total water production and will give some indication as to whether leaks or breaks have occurred in the distribution system, which would be evidenced through an increase in overall water production without a corresponding increase in water consumption.

12.2.3 Potential Cost Savings

From data received, the Town of Niverville's water treatment and distribution system appears to be running quite efficiently. It is possible to reduce the amount of unaccounted for water loss in the system; however, according to Environment Canada this may not be cost-effective. Even if the amount of unaccounted for water loss were reduced to approximately half of its current volume through methods such as a client meter calibration program and a leakage detection program, the estimated cost savings would only be $225 annually. At this point in time, the cost in reducing the unaccounted-for water loss is greater than the cost of treating and distributing the unaccounted-for water.

12.3 SEWER SYSTEM OVERVIEW

The Town of Niverville's sewage collection system is a combined sewer system that was constructed in 1971. The system consists of approximately 6 miles of mostly concrete piping, with access to the sewer system provided by approximately 120 manholes. There are a total of four lift stations that pump the sewage to a two-cell lagoon located south of the town. The Edelweiss and Arena Road lift stations pump sewage to the 3rd Avenue lift station, which then pumps sewage to the lagoon while the 4th Street lift station, which runs parallel to the other three, pumps sewage directly to the lagoon.

The lagoon system consists of a primary cell with a storage capacity of 56,000 m^3 and a secondary cell with a storage capacity of 110,000 m^3. The secondary cell is discharged to the Tourand Creek.

Niverville's sewage system is a combined sewer system. Sump pumps in houses built after 1996 discharge into this sewer system and according to data received, much of the water diverted by weeping tiles also ends up in this sewer system. This means that both sewage and storm water runoff flow through the system, which results in much higher flows being discharged to the lagoon.

There are no meters that measure the volume of sewage; therefore, pump hours were used in order to develop an estimate of the system's annual cost. Using pump hours (along with pump specifications) to estimate flows can be inaccurate and is affected by pump plugging, worn impellers and other conditions, which result in less volume of sewage pumped than would be expected for the recorded time frame. This will result in an exaggerated volume of sewage pumped. Another problem encountered with using pump hours is that the actual operating conditions were unknown and therefore, peak operating conditions were assumed. Once again, this could lead to an exaggeration of the volume of sewage pumped. The estimated annual costs of the sewage system are shown in Table 16.

Table 16(a) Wastewater Treatment Costs by Location from Feb 1/04 to June 28/05

Location	Hours of Pumping	Volume Pumped (m^3)	Cost of Pumping
3rd Avenue SLS	2953.98	319,029	$1,322.20
4th Street SLS	796.89	83,195	$267.51
Arena Road SLS*	147.33	Unknown**	$19.12
Edelweiss SLS	128.11	Unknown**	$22.36

*The value for annual pump hours is extrapolated from available data.
**Pump information unavailable at time of report.

Table 16(b) Wastewater Treatment Total Costs from Feb 1/04 to June 28/05

Description	Cost
Annual Pumping Cost*	$1,631.20
Annual Lagoon Maintenance	$12,800.00
Annual Sewer System Maintenance	$12,000.00
Total Annual Cost	$26,431.20
Total Cost per Cubic Meter	$0.07

*Based on pump hours and Manitoba Hydro's rate of $0.06 per kWh for General Service Small clients.

Pumps

There are four lift stations located throughout Niverville that help move the sewage to the lagoon. The two smaller lift stations are located in Edelweiss Park and on Arena Road. The two larger lift stations are located on 4th Street South and 3rd Avenue South. As was previously mentioned, the two smaller lift stations pump sewage to the 3rd Avenue station and then to the lagoon while the 4th Street lift station acts in parallel to the other three and pumps sewage directly to the lagoon.

If the amount of sewage flowing through the system decreased, there would be savings associated with reduced pumping costs. Savings by reducing the flow through the Edelweiss and Arena Road lift station would be multiplied since not only would there be savings at these lift stations, but also at the 3rd Avenue lift station.

Currently, the Town does not estimate the annual volume of sewage that is pumped by the lift stations, but pump operation times are recorded periodically. Table 17 provides the relevant pump data.

Table 17 Lift Station Pump Data

Location	Power (hp)	Manufacturer
Edelweiss Park Pump 1	3.9	Flygt
Edelweiss Park Pump 2	3.9	Flygt
Arena Road Pump 1	2.9	Flygt
Arena Road Pump 2	2.9	Flygt
4th Street South Pump 1	7.5	Flygt
4th Street South Pump 2	7.5	Flygt
3rd Avenue South Pump 1	20	Flygt
3rd Avenue South Pump 2	10	Flygt

Sewer Rates

Every household in Town is charged $6.60 per quarter for sewage treatment, with adjustments being made for businesses.

Maintenance Programs

There is currently no scheduled maintenance program in place. Any problems that arise are dealt with as soon as possible.

12.4 SEWER SYSTEM AUDIT RESULTS

There is insufficient data available in order to provide a detailed assessment of the sewer system. Since most of the community receives their water through unmetered well systems, there is no information available on the amount of wastewater entering the sewage system from these residences and businesses. As such, the volume of storm water infiltrating the system or the costs involved with pumping and treating this added water cannot be accurately determined.

Due to the fact that Niverville operates a combined sewer system, there will be a large discrepancy in the volume of water pumped to the lagoon over the course of a year. These variations will be caused by precipitation entering the system through sump pumps, weeping tiles, or infiltration.

It is difficult to determine the average dry and wet weather flows for the system since information on the amount of sewage pumped is not available for large portions of the year. Since all the sewage flows through either the 3rd Avenue South lift station or the 4th Street South lift station, estimates for the volume of sewage passing through these two lift stations during dry and wet weather flow were interpolated from the given data using the peak design flows of the pumps at the lift stations.

From this interpolation, infiltration appears to account for nearly twenty percent of the flow through the sewage system. It is recommended that the Town take measures to reduce the amount of infiltration into the system. This can include sealing manholes; lining pipes; and disconnecting rain leaders, sump pumps, and weeping tiles from the sanitary sewer system. Also, a study should be conducted to determine the feasibility of other alternatives, such as developing a separate storm water sewer system. Reducing infiltration will reduce pumping costs and extend the effective life of the lagoons.

Maintenance Program

The Town may wish to start a scheduled maintenance program, such as actively replacing old pipe, to help minimize potential problems with the sewer system and to spread out the cost of repairing and replacing old piping.

Routine maintenance should be conducted on lift station pumps to inspect, remove blockages, check wear, etc. It is easier and cheaper to replace the impellers of a pump than continue pumping at a reduced rate for an extended period of time.

By-Laws

In order to limit the amount of storm water entering the sewer system, the Town should consider instituting a by-law that prohibits any future hook-ups of sump pumps or weeping tiles to the sewer system. This may require the construction of a storm sewer system, but it will greatly decrease the amount of water entering the lagoons, and will decrease pumping costs since less water will be flowing through the sanitary sewer system.

12.5 PUBLIC EDUCATION

Providing public education will create a better understanding of the water and wastewater treatment systems. If residents are aware of the processes and costs involved with treating and distributing drinking water and collecting and treating sewage, they will be more accepting of cost reduction efforts. A program that highlights the environmental and monetary benefits of water use reduction can help the community gain support for initiatives such as installing water meters, low flush toilets, or water saving shower heads; fixing leaky taps and toilets; only watering lawns once per week; and using drip irrigation for trees and shrubs.

12.6 RECOMMENDATIONS

The following is a list of recommendations for the Town of Niverville:

1. Develop a program for assessing the accuracy of water meters.
2. Develop a program for scheduled leak detection of the water distribution system.
3. Commence determining the annual unaccounted-for water loss percentage to determine when a leakage prevention program would be justified.
4. Develop a routine maintenance program for the lift station pumps to ensure they continue to work at an efficient level.
5. Seal manholes and line sewer pipes to reduce the effects and costs of infiltration entering the sanitary sewer system.
6. Conduct a study on the feasibility of options such as creating a separate storm water sewer system.
7. Install flow meters at the sewage lift stations and take daily meter readings so that the amount of water entering the lagoons is known.
8. Install flow meters that measure the wastewater produced at the Fifth Avenue Estates Subdivision so that a more complete water audit could be conducted in the future.
9. Establish a by-law that prevents the connection of sump pumps or diversion of water from weeping tiles into the sewer system.
10. Provide public education on the water and wastewater treatment systems as discussed in Section 12.5.

APPENDIX A

INVENTORY SHEETS

TABLE OF CONTENTS – APPENDIX A

BUILDING INSPECTION INVENTORY

Revision 2

Municipality: Niverville	**Date: November 25, 2005**
Toured By: Ray Bodnar & Meghan Guyot	**Construction Date: 1967**
Building: Arena	**Renovations: 1980 – hall & dressing rooms built. 1985 – Ice plant added.**
Address: Arena Road SE 36 7 3 E 3	
L x W x H: Rink: 280' x 106' x 28'. **Area: 29,680 sq. ft.**	
Building Capacity:	
Building Floor Plan: Main floor: Rink, 4 dressing rooms, hall, office, zamboni room, ice plant room, lounge, 5 washrooms. **Upstairs: lounge.**	**Occupied Times: Rink: Mid Oct – March 30 – Mon-Fri, 4pm-11:30pm, Sat – 8:30am-11pm, Sun 10am-11pm. Hall – approx 50 bookings/year for 5 hours each. Office & Lounge: Rink times plus 40 hours/week year round.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal Clad exterior. Rink – no insulation (unheated). Heated area R value unknown
Roof Type/R-value: R=25 over heated areas.
Door Type/weather stripping: Hall – outside: single ped. door – needs stripping, dbl ped door – needs stripping. Back of lobby-outside: single ped. door – needs stripping. Zamboni room: 1 ped needs stripping,
1 vehicle door needs stripping. 2nd floor lounge – outside – 1 ped. door needs weather -stripping.
Window type/caulking: 2nd floor lounge – rink : new windows as of 2005. Main floor lounge – rink: 20 - 31.5" x 27" & 2 – 21.5" x 27", old double pane.
Other:
MECHANICAL
Heating System: Hall: 2 gas unit heaters, 50 MBH (only 1 used). SE Mech Room: Keeprite high efficiency gas furnace, 125/99 MBH. SW Mech Room: 20 year old gas furnace, 160/128 MBH.
Cooling System: None
Ventilation System: Manual exhaust fan in hall.
HVAC Controls: 3 thermostats (non programmable)
HVAC Maintenance/Training:
Water Supply System: Well
Domestic Hot Water System: SW Mech Room: 3 gas water heaters (50 Usgal, 42 MBH high eff.; 40 Igal, 45 MBH, standard eff.; 227L, 52 MBH, standard eff.). SE Mech Room: 1 gas water heater 75 Usgal, 75 MBH input turbo sandblaster. Zamboni room – 1 water heater.
Water Fixtures: WR1: 2 h.f. sinks, 2 h.f. toilets. **WR2**: 1 h.f. sink, 3 h.f. toilets. **WR3**: 2 h.f. sinks, 3 h.f. toilets. **WR4**: 2 h.f. sinks, 1 h.f. toilet, 2 l.f. urinals. **WR5**: 1 h.f. sink, 1 h.f. toilet, 1 l.f. urinal.

ELECTRICAL
Indoor Lighting: Ice Rink: 36 Metal Halides. Main Floor: 19 - 8' x 2 T12s (60W), 19 – 4' x 2 T12s (34W), 1-100W Incandescent, 4 – 40W Incand., 20 – 4' x 4 T12s (34W). Upstairs: 5 – 8' x 2 T12s (75W).
Outdoor Lighting: 4+2 spotlights on sign
Exit Signs: 11 incandescent exit signs
Motors: See process systems
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Ice Plant: 2 compressors – 50 HP, 94% eff., 2206 hours/year & 30 HP, 91% eff., 1647 hours/year. 1 Brine Pump – 15 HP, Continuous operation (Sep 29 – Apr 1, 24/7). 4 Condenser fans.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Electricity & Gas
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville		**Date: November 25, 2005**
Toured By: Ray Bodnar & Meghan Guyot		**Construction Date: approx. 1970**
Building: Curling Rink		**Renovations:**
Address: Arena Road SE 36 7 3 E 4		
L x W x H: Rink – 157' x 58' x 23', Lounge – 29' x 58' x 9'	**Area: Rink = 9,106 sq. ft., Lounge = 1,682 sq. ft., Total = 10,788 sq. ft.**	
Building Capacity: 40		
Building Floor Plan: Curling Rink – Natural Ice Surface. **Main Floor: Lounge, kitchen, & washrooms.** **Basement: Hall, bar, & furnace/water heater room.**		**Occupied Times: Current Occupancy - closed in summer, dec 15 – march 30 - 3 nights/week for 6 hours per night. Planned Occupancy – add 6 hours per week year round.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Masonry in front, metal clad sides. Side walls - R = 3 in rink, R = 8 in lounge. Front and back Walls – R = ?
Roof Type/R-value: Metal clad roof. R=3 over rink, R=8 over lounge**.**
Door Type/weather stripping: Lounge – rink: metal ins. door w/ window. Front doors : double metal ins. doors – replace stripping. Rink-outside: 4 pedestrian doors – large gaps and holes in two of these doors, all of them require
stripping. Vehicle door (11.5'x12') – requires stripping. Basement door – rink: 1" gap underneath – weather-strip.
Window type/caulking: Lounge-rink: 8 - 58" x 58" double pane – caulking good.
Other:
MECHANICAL
Heating System: 1 old gas furnace, 120,000 BTU, 60% efficiency. 2 gas unit heaters in rink.
Cooling System: None
Ventilation System: 1 kitchen exhaust, 2 washroom exhausts, 1 curling rink exhaust, 1 lounge exhaust. No intakes!
HVAC Controls: 1 programmable thermostat, already set back.
HVAC Maintenance/Training:
Water Supply System: Water well
Domestic Hot Water System: Gas water heater, 20 feet of uninsulated pipe.
Water Fixtures: Women's – 2 h.f sinks, 2 h.f. toilets. Men's – 2 h.f. sinks, 1 h.f. toilet, 1 l.f. urinal.

ELECTRICAL
Indoor Lighting: Lounge: 8 – 4’ x 2 T12s (40W), 5 – 100W Incand. Washrooms: 4 – 4’ x 2 T12s (40W). Kitchen: 3 – 100W Incand. Rink: 10 metal halides. Furnace room: 1 100W Incand. Basement: 23 – 60W Incand., 3 floodlights.
Outdoor Lighting: 4 Flood Lights
Exit Signs: 6 Incandescent Exit Signs
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Gas and electricity
NOTES
No intake air, humidity a problem in rink. **Hook duct from furnace up to hole in wall.** **Some exit lights are broken/turned off.** **Payback periods should be less than 10 years.**

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville	**Date:** November 24, 2005
Toured By: Ray Bodnar, Harry Mc Knight	**Construction Date:** WO: 1988; RCMP & Fire Hall: 1997
Building: Town Office	**Renovations:** The front part of the building extending back south 20 ft. is 1956. The rest is 1985.
Address: 86 Main Street	
L x W x H: 50' x 46' x 10' h **Area:** 2300 SF	
Building Capacity: 10	
Building Floor Plan: Office and council chamber	**Occupied Times:** 8-5, Monday – Friday.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Old part – front extending back 20Ft. is 2" x 4" walls on the north, east, and west faces. Rest of blding is 2 x 6 construction
Roof Type/R-value: Sloped shingle roof. Possibly R40
Door Type/weather stripping: 2 good ped doors no caulking with 7/10 stripping.
Window type/caulking: WO: 10 – 26" x 52" 1990 3 pane no caulking – replace? 7/10 stripping – leaky.
Other: Some water damage noted in basement with potential for mould.
MECHANICAL
Heating System: 15 year old gas furnace standard eff. 65%
Cooling System: High eff. condenser
Ventilation System: 6" round air intake and 2 broan washroom exhaust fans.
HVAC Controls: 7 day programable stat
HVAC Maintenance/Training: Condenser is dirty, maintenance plan required.
Water Supply System: well water from next door.
Domestic Hot Water System: WO: 150 L gas water tank.
Water Fixtures: 2 sinks and 2 toilets – high flow

ELECTRICAL
Indoor Lighting: T12 – 4’ x 4 –34 W- 14; 2 x 4’ – 14; 1 x 4’ – 15; 4 – 60 W incandescent, 9 -100 W flood lights
Outdoor Lighting: One
Exit Signs: 2 old style
Motors:
Parking Lot Plugs: 2 plugs
OTHER BUILDING SYSTEMS
Ceiling fans
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Gas and hydro
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville	**Date:** November 24, 2005
Toured By: Ray Bodnar, Jim Schapansky	**Construction Date:** WO: 1988; RCMP & Fire Hall: 1997
Building: Works & Operations, RCMP & Firehall all inside this building.	**Renovations:** WO were constructed first with fire hall added later. No major renovations.
Address: 309 Main Street	
L x W x H: See Below — **Area:** See below	
Building Capacity: WO: 4, FH: 10, RCMP: 2	
Building Floor Plan: WO: garage & office: 100' x 60' x 16' h & 20' x 60' second floor office/storage. RCMP: 2 rooms: 20' x 18' x 10' h. FH: 60 x 38 x 16 garage plus 30 x 20 meeting room. Total area = 10,440 SF	**Occupied Times:** WO: 8-5, Monday – Friday. RCMP varies 7 hrs/day, 5 days/week. FH: intermitent

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal clad exterior 6" walls with metal liner inside except drywall in offices.
Roof Type/R-value: Metal clad inside and out, assume R30.
Door Type/weather stripping: WO: 3 good ped doors caulked with 5/10 stripping, 4 -16' x 14' insulated vehicle doors good stripping, no caulking. FH: 2 ped doors 5/10 stripping, no caulking, veh doors need caulking, stripping good.
Window type/caulking: WO: 1 – 38" x 46" 3 pane no caulking – replace? FH: 2- 38" x 35" same as WO. RCMP: 2- 38" x 35" same as WO.
Other:
MECHANICAL
Heating System: WO: 94% eff. gas boiler for in-floor heating, electric baseboards in second floor office. FH: 84% eff. gas boiler for in-floor heating, electric baseboards in meeting room and RCMP.
Cooling System: Window unit in RCMP only.
Ventilation System: WO: 2 intake motorized dampers and 1 exhaust fan with motorized damper on manual switch. No ventilation in RCMP and FH.
HVAC Controls: Manual switch on WO ventilation. Standard stats in FH meeting room (1) and RCMP (2).
HVAC Maintenance/Training: Boiler treatment must be maintained annually for both boilers.
Water Supply System: well. There are 2 – 2000 gal 10' dia. X 6' high plastic tanks for storage inside the building. Sweating is an issue.
Domestic Hot Water System: WO: 190 L gas water tank, 45 MBH

Water Fixtures: 2 sinks and 2 toilets – high flow

ELECTRICAL
Indoor Lighting: WO: T12 – 8' x 2 – 23; 2 x 4' – 13; 4 – 100 W incandescent. FH: T12 – 8' x 2 – 18; 2 x 4' – 15. RCMP: T12 : 2 x 4' – 5
Outdoor Lighting:
Exit Signs: None
Motors:
Parking Lot Plugs: 2 plugs WO, 1 plug RCMP
OTHER BUILDING SYSTEMS
Due to poor heat recovery for in floor heating system, ventilation is seldom used in WO. Heated ventilation is required with combustibles detector to purge vehicle smoke and welding smoke (health issue). Ventilation required in FH and RCMP.
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville	**Date:** October 24, 2005
Toured By: Tibor Takach, J.R. Shapansky	**Construction Date:** 2003
Building: Water Treatment Plant	**Renovations:** None – Building is recent construction
Address: Hampton Drive	
L x W x H: 7m x 3m x 3m (paced) — **Area:** 21 m^2	
Building Capacity:	
Building Floor Plan: Two rooms: Sample room approximately 3m x 4m; pump room approximately 4m x 4m.	**Occupied Times:** Approximately 1 hr/day

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: • 2x4 construction; plywood interior sheeting; vapour barrier, fiberglass batt insulation, exterior; manufactured exterior stone façade, exterior sheeting material unknown.
Roof Type/R-value: • 2x4 truss roof, plywood ceiling, vapour barrier, cedar shingles, roof sheeting; passive roof ventilation.
Door Type/weather stripping: • 36" insulated metal door, weather stripping, small door sweep but will be replaced by new door sweep. Operations personnel indicate snow passes through the corner of the doorway in the winter.
Window type/caulking: • seven identical windows located in both the sample room and the pump room. • Windows consist of double pane, sliding casement windows, PVC frame, insulation filling gaps between window frame and rough opening, no interior window molding installed. • 4 windows located in the pump room; 3 windows located in the sample room • Window dimensions are 2 ½ ft wide by 6 ft high.
Other:
MECHANICAL
Heating System: • 1 – 4 foot electrical baseboard unit located in sample room, rated capacity unknown • 1 – 4 foot electrical baseboard unit located in pump room, rated capacity unknown • Room temperature maintained at approximately 15*C throughout winter months
Cooling System: • No cooling system in place
Ventilation System: • Ventilation provided by windows and doord
HVAC Controls: • Thermostat located in rooms to control interior temperature
HVAC Maintenance/Training:
Water Supply System:

- System pressure

Domestic Hot Water System:

- Model DEL 6102, 120V, 1500 W, 1 phase, 150 psi, 22.7 L (6 usgal) electric water heater

Water Fixtures:

- Single sample sink with hot/cold fixture located in sample room.

ELECTRICAL

Indoor Lighting:

- Sample room - 2, 100W incandescent light fixtures
- Pump room - 2 double lamp fluorescent light fixtures. Do not appear to be energy efficient models

Outdoor Lighting:

Exit Signs:

- none

Motors:

Parking Lot Plugs:

- 1 exterior electrical outlet.

OTHER BUILDING SYSTEMS

PROCESS SYSTEMS

- Distribution pump #1, Model # 60S30-5, 3hp, 230 V, 3450 rpm, single phase
- Distribution pump #2, Model # 75S30-5, 3hp, 230V, 3450 rpm, single phase
- Three raw water wells, Assumed to be Goulds Pumps. Request pump rating info from Niverville
- Hydropro Water System tank , Model V250, bladder type pressure tank
- Endress & Hauser, Promag 50, Magnetic flow meter, 85-260 VAC, 50-60 hz, 15 V A/W
- 1 – Pulsatron, Pulsafeeder chemical feed pump, Series E plus, Model LPA3MA-VTC1-XXX, 12 gpd @ 100psi (1.89 lph @ 7 bar), 115 VAC, 50/60hz, 0.6 A, Single phase

BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)

- Main power supply – 200 A
- No gas service provided at this facility

NOTES

- Distribution system pressure is maintained at approximately 40-60 psi
- No raw water pump information was available from the Town at the time of the visit. Have requested the information and am awaiting response.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville	**Date:** November 25, 2005
Toured By: Ray Bodnar	**Construction Date:** 1996
Building: Heritage Centre – Banquet Halls	**Renovations:** Atrium and Seniors Complex planned for future
Address: 111 Second Avenue	
L x W x H: 112' x 95' **Area: 10,640 sq. ft.**	
Building Capacity: 225/hall x 2	
Building Floor Plan: 2 banquet halls, washrooms, and a kitchen	**Occupied Times:** 80 to 100 events/yr 5 hrs/event

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Stuccoed exterior, 6" walls
Roof Type/R-value: R value unknown., assume R40
Door Type/weather stripping: 8 ped doors, caulking required, stripping is 7/10
Window type/caulking: 1 – 90" x 80" double pane, curved top. 3 – 90 x 56 2 pane, 2 – 40 x 56 2 pane need caulking.
Other:
MECHANICAL
Heating System: 7 Lennox RTU's the same plus 1- 2 ton unit. See photos for model numbers.
Cooling System: See above
Ventilation System: economizers on RTU's, kitchen grease exhaust fan, no MUA
HVAC Controls: programmable thermostats for each RTU
HVAC Maintenance/Training:
Water Supply System: Well water system with filtration and UV disinfection.
Domestic Hot Water System: 300 MBH, 91 gal water heater
Water Fixtures: 7 sinks, 7 toilets, high flow, 3 urinals (3.6 L/F)

ELECTRICAL
Indoor Lighting: 47 – 4' x 2 T12s in kitchens and service areas,T8's in hallways.
Outdoor Lighting:
Exit Signs: 5 old style
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Gas and hydro
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville		**Date: November 25, 2005**
Toured By: Ray Bodnar & Meghan Guyot		**Construction Date: 2002**
Building: Heritage Centre – Medical Clinic		**Renovations:**
Address: 111 Second Avenue		
L x W x H: 70' x 25'	**Area: 1,750 sq. ft.**	
Building Capacity: 12		
Building Floor Plan:		**Occupied Times: Mon&Fri – 8:30am-5pm, Tue&Thu – 8:30am-7pm, Wed – 8:30am-4pm (approx 45 hours/week)**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Stuccoed exterior, R 20.
Roof Type/R-value: R40.
Door Type/weather stripping: Double glass front door – good condition, single ped. back door – good condition.
Window type/caulking: Windows next to front doors – 2 – 18" x 78" double pane. Window in front – 41" x 66" double pane. Window in back – 56" x 89" double panes (includes 3 panels).
Other:
MECHANICAL
Heating System: 1 high-efficiency gas furnace, 1 electric furnace.
Cooling System: 2 condensers outside.
Ventilation System: Intake to gas furnace
HVAC Controls: 2 programmable thermostats
HVAC Maintenance/Training:
Water Supply System:
Domestic Hot Water System: Electric water heater
Water Fixtures: 3 sinks, 3 toilets

ELECTRICAL
Indoor Lighting: 40 – 4' x 2 T12s, 8 – 2' x 2 T12s, 6 pot lights, 3 large pot lights.
Outdoor Lighting: 1 hps in back.
Exit Signs: 4 LEDs
Motors:
Parking Lot Plugs: 9 (for cars and xmas lights)
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville		**Date:** November 25, 2005
Toured By: Ray Bodnar		**Construction Date:** 2004
Building: Heritage Centre – Nutri-Health Office		**Renovations:**
Address: 111 Second Avenue		
L x W x H: 120 x 80 x 2 floors	**Area**: 19,200 sq. ft.	
Building Capacity: 50		
Building Floor Plan: Office		**Occupied Times:** 8 hrs/day, 5 days/week

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal Cladd and concrete block, R24
Roof Type/R-value: R40
Door Type/weather stripping: 2 ped doors, good condition
Window type/caulking: 3 pane high efficiency.
Other:
MECHANICAL
Heating System: 1 Lennox RTU replaced the Engineered Air Unit and HRV shown on the construction drawings. See photo for model number.
Cooling System: See above
Ventilation System: economizers on RTU.
HVAC Controls: Zone All DDC system with access to all building zones, limited access to RTU control.
HVAC Maintenance/Training:
Water Supply System: See Banquet Hall
Domestic Hot Water System: See Banquet Hall
Water Fixtures: low flow type

ELECTRICAL
Indoor Lighting: T8's throughout
Outdoor Lighting: photocell control
Exit Signs: LED type
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
Note this building was designed by MMP Architects and is considered to be energy and water efficient. LEED certification is being considered. **Future Project:** An Atrium is being designed for the south end of the facility. It is being designed by MMP Architects and will incorporate LEED measures for energy efficiency and water reduction methods. LEED certification is being considered with a geothermal heating system.
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Gas and hydro
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Niverville		**Date: November 25, 2005**
Toured By: Ray Bodnar & Meghan Guyot		**Construction Date: 2001**
Building: Picnic Shelter		**Renovations:**
Address: Hespeler Park		
L x W x H: 28' x 18' x 8'	**Area: 504 square feet**	
Building Capacity:		
Building Floor Plan: Outdoor picnic shelter, men's and women's washrooms, storage room.		**Occupied Times: Summer**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value:
Roof Type/R-value:
Door Type/weather stripping:
Window type/caulking:
Other:
MECHANICAL
Heating System: None
Cooling System: None
Ventilation System: None
HVAC Controls: None
HVAC Maintenance/Training:
Water Supply System: Water well
Domestic Hot Water System: 175 L, 3000 W, electric water heater
Water Fixtures: Men's Washroom – 2 h.f. sinks, 1 h.f. toilet, 2 l.f. urinals. Women's Washroom – 2 h.f. sinks, 3 h.f. toilets.

ELECTRICAL
Indoor Lighting: 8-4'x2 T12s (34W), 1 incandescent bulb.
Outdoor Lighting: 1 incandescent?
Exit Signs: None
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Electricity
NOTES

APPENDIX B

TABLES TO CALCULATE ENERGY SAVINGS

TABLE OF CONTENTS – APPENDIX B

Table B.1.1 - Energy Breakdown for the Arena

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	337,481	58%
Lighting	50,388	9%
Hot Water	32,767	6%
Motors	163,343	28%
Total	**583,979**	

Table B.1.2 (a) - Electricity Usage for Arena

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	99	49	22,680	$408	$1,049	$1,862
November	98	48	59,040	$399	$1,900	$3,160
December	92	42	44,220	$349	$1,553	$2,725
January	93	43	40,680	$358	$1,470	$2,744
February	95	45	34,980	$374	$1,337	$2,513
March	95	45	38,220	$374	$1,413	$2,629
April	94	44	30,540	$366	$1,233	$2,319
May	0	0	4,980	$0	$299	$391
June	0	0	2,640	$0	$159	$231
July	11	0	3,600	$0	$216	$297
August	0	0	2,700	$0	$162	$235
September	0	0	2,580	$0	$155	$245
TOTAL		**316**	**286,860**	**$2,629**	**$10,947**	**$19,351**

Table B.1.2 (b) - Natural Gas Consumption for Arena

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	873	9,035	$409
November	2,314	23,949	$948
December	3,640	37,673	$1,430
January	6,601	68,318	$2,528
February	5,738	59,387	$2,355
March	4,287	44,369	$1,597
April	3,352	34,692	$1,266
May	1,533	15,866	$645
June	0	0	0
July	109	1,128	$247
August	171	1,770	$149
September	90	931	$117
TOTAL	**28,708**	**297,119**	**$11,693**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.1.3 - Lighting Analysis Summary for the Arena

Description	Quantity	Current Conditions: Annual Energy Consumption (kWh)	Current Conditions: Annual Cost	After Improvements: Annual Energy Consumption (kWh)	After Improvements: Annual Cost
Fluorescents - Convert 4' T12s to 4' T8s (19x2)	38	5,809	$349	3,831	$230
Fluorescents - Convert 4' T12s to 4' T8s (20x4)	80	840	$50	554	$33
Fluorescents - Convert 75W 8' T12s to 8' T8s (19x2)	38	12,725	$764	7,608	$457
Fluorescents - Convert 60W 8' T12s to 8' T8s (5x2)	10	1,154	$69	858	$52
Metal halides in ice rink	36	22,464	$1,349	22,464	$1,349
100W Incandescents - convert to compact fluorescents	2	312	$19	87	$5
40W Incandescents in dressing rooms - Convert to compact fluorescents	4	250	$15	69	$4
Outdoor lighting	6	3,942	$237	3,942	$237
Exit Signs - Convert Incandescents to LEDs	11	2,891	$174	289	$17
TOTALS		**50,388**	**$3,025**	**39,702**	**$2,384**

Annual Energy Savings (kWh)	**10,686**
Annual Cost Savings	**$642**
Percent Annual Energy Savings	**21%**

These calculations are assuming that the rink is occupied for 1560 hours/year, the lounge & office for 3640 hours/year, and the hall is occupied 50 hours/year.

The Exit signs are assumed to be on 24 hours a day, 365 days per year

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

Table B.1.4 (a) Window and Door Replacement Calculations for the Arena

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace old double pane windows from lounge to rink with triple pane windows (20 - 31.5"x27" & 2 - 21.5"x27")	126.188	2.000	6,055	$277	6.25	1,938	$89	4,118	$188
TOTALS			**6,055**	**$277**		**1,938**	**$89**	**4,118**	**$188**

Table B.1.4 (b) Window and Door Infiltration Calculations for the Arena

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Weatherstrip single pedestrian doors (4).	12	0.05	125	41	14,496,058	4,248	$194
Weatherstrip double pedestrian doors (1).	6	0.05	125	20	7,248,029	2,124	$97
Weatherstrip vehicle door in zamboni room (1).	11.75	0.05	125	40	14,194,057	4,160	$190
TOTALS						**10,532**	**$194**

Table B.1.4 (c) Wall/Roof Insulation Upgrade for the Arena

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade roof insulation	8480	25.000	32,554	$1,488	38	21,417	$979	11,137	$509
Upgrade wall insulation	3192	12.000	25,529	$1,167	20	15,317	$700	10,212	$467
TOTALS			**32,554**	**$1,488**		**21,417**	**$979**	**11,137**	**$509**

The crack length around the pedestrian doors is the length of the base of the door
The lobbies, hall, and office are assumed to be kept at 70 F
The rink area is unheated.

Table B.1.5 - Water Usage for the Arena

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	8	1.7	53,488	1.60	85,580	0.32	17,116	68,464	2,566	$117
Toilets	10	0.6	24,313	13.25	322,141	6.00	145,875	176,266	NA	NA
Urinals	3	0.8	9,725	3.80	36,955	3.80	36,955	0	NA	NA
Showers	8	0.2	7,294	66.25	483,174	47.30	344,994	138,180	5,178	$237
Leaking Shower	1	Leaking	Leaking	0.06gpm	119,311	0.00	0	119,311	4,471	$204
Total					**1,047,161**		**544,940**	**502,221**	**12,215**	**$558**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	10	20	
Number of Toilet Uses/day	3	1	
Number of Toilets	10	10	
Toilet Uses/hour/fixture	0.375	0.25	0.625
Number of Sinks	8	8	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.46875	1.25	1.71875
Number of Urinals	3	3	
Number of Urinal Uses/day	0	1	
Urinal Uses/hr/fixture	0	0.833333	0.833333
Number of Showers	8	8	
Number of Shower Uses/day	1	1	
Shower Uses/hr/fixture	0.078125	0.15625	0.234375

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	85,580	3,207
Showers	602,486	22,578
Total	**688,066**	**25,785**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 gallons per flush

Table B.1.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Arena

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings (kWh)
Setback Thermostats to 59 F	73.29%	10711.26	9,080	168,741	18,835

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (KWH)
Replace furnace with high efficiency furnace	1	0.65	0.95	13,162
Replace unit heater in hall with high efficiency furnace	1	0.65	0.95	14,174

Description	Quantity	Flow Rate (cfm)	Heat Loss (kWh)	Energy Savings for 1 HRV (kWh)	Energy Savings for all HRVs (kWh)
Install HRVs	2	400	40,172	20,086	40,172
Install motorized dampers	2	20	2,009	1,004	2,009

Description	Current Energy Used by Ice Plant (kWh)	% of Operting Time Savings	Energy Savings (kWh)
Install outdoor thermostat to run exhaust fans in rink when outdoor temp is between -5 ^{o}C and -15 ^{o}C.	117,882	20%	23,576

Table B.1.7 Energy Consumption and Savings Calculations for Motors in Arena

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
Compressor 1	50	40	2,206	94%	42.6	31.74	70,012	1.20	0.89	1,974
Compressor 2	30	24	1,647	91%	26.4	19.67	32,394	0.72	0.54	884
Brine Pump	15	12	4,320	85%	14.11	10.52	45,461	0.36	0.27	1,160
Condenser Fan 1	5	4	1,103	85%	4.70	3.51	3,869	0.12	0.09	99
Condenser Fan 2	5	4	1,103	85%	4.70	3.51	3,869	0.12	0.09	99
Condenser Fan 3	5	4	1,103	85%	4.70	3.51	3,869	0.12	0.09	99
Condenser Fan 4	5	4	1,103	85%	4.70	3.51	3,869	0.12	0.09	99
TOTALS							**163,343**			**4,413**

Table B.2.1 - Energy Breakdown for Curling Rink

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	67,995	89%
Lighting	6,046	8%
Hot Water	2,275	3%
Total	**76,315**	

Table B.2.2 (a) - Electricity Usage for Curling Rink

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	640	$0	$38	$61
November	0	0	600	$0	$35	$58
December	0	0	570	$0	$33	$56
January	0	0	1,130	$0	$66	$93
February	0	0	1,770	$0	$104	$136
March	0	0	940	$0	$55	$81
April	0	0	1,460	$0	$86	$116
May	0	0	600	$0	$36	$59
June	0	0	470	$0	$28	$50
July	0	0	620	$0	$37	$61
August	0	0	910	$0	$55	$80
September	0	0	460	$0	$28	$50
TOTAL		**0**	**10,170**	**$0**	**$600**	**$901**

Table B.2.2 (b) - Natural Gas Consumption for Curling Rink

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	221	2,287	$107
October	93	963	$51
November	918	9,501	$397
December	940	9,729	$406
January	1,256	12,999	$535
February	1,645	17,025	$683
March	856	8,859	$361
April	238	2,463	$128
May	0	0	$0
June	126	1,304	$69
July	78	807	$47
August	20	207	$21
TOTAL	**6,391**	**66,145**	**$2,802**

Notes

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.2.3 - Lighting Analysis Summary for the Curling Rink

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Fluorescents - Convert 4' T12s to 4' T8s (12x2)	24	684	$41	412	$25
Rink metal halides	10	1,080	$65	1,080	$65
Main Floor Incandescents - Convert to compact fluorescents	8	466	$28	130	$8
Basement Incandescents - Convert to compact fluorescents	26	487	$29	122	$7
Outdoor Incandescents	4	1,752	$105	1,752	$105
Exit Signs - Convert Incandescents to LEDs	6	1,577	$95	158	$9
TOTALS		**6,046**	**$363**	**3,654**	**$219**

Annual Energy Savings (KWH)	**2,392**
Annual Cost Savings	**$144**
Percent Annual Energy Savings	**40%**

These calculations are assuming that the rink is occupied from Dec 15 to March 30 (3 nights/week) and the basement is occupied for 6 hours/week.

The Exit signs are assumed to be on 24 hours a day, 365 days per year.

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

Table B.2.4 (a) Window and Door Replacement Calculations for Curling Rink

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace old 7'x3' doors from rink to outside with a new insulated door (2)	42	1.578	142	$6	6.67	33	$2	108	$5
Replace windows from lounge to rink (8 - 58"x58")	186.889	2.000	8,939	$409	6.25	2,861	$131	6,079	$278
TOTALS			**9,081**	**$415**		**2,894**	**$132**	**6,187**	**$283**

Table B.2.4 (b) Window and Door Infiltration Calculations for Curling Rink

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Side doors (2) from rink to outside (2 inch gaps underneath & 2" dia hole)	6	2	NA	227	4,457,452	1,306	$60
Pedestrian door from basement to rink (1 inch gap underneath)	3	1	NA	56	19,613,415	5,748	$263
Back doors from rink to outside (2 ped, 1 veh)	49	0.05	125	167	3,280,646	961	$44
Double front doors	10	0.05	125	34	12,041,006	3,529	$161
TOTALS						**11,545**	**$528**

Table B.2.4 (c) Wall/Roof Insulation Upgrade for Curling Rink

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade roof & wall insulation around rink	12000	4	15,958	$729	20	7,660	$350	8,298	$379
Upgrade roof & wall insulation around indoor area	2095	8	25,057	$1,145	20	10,023	$458	15,034	$687
TOTALS			**41,015**	**$1,874**		**17,683**	**$808**	**23,332**	**$1,066**

The rink is assumed to be kept at 32 F when occupied, the indoor areas are assumed to be kept at 59 F at all times.

Table B.2.5 - Water Usage for Curling Rink

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	4	4.4	10,185	1.60	16,296	0.32	3,259	13,037	489	$22
Toilets	3	3.3	5,820	13.25	77,115	6.00	34,920	42,195	NA	NA
Urinal	1	7.5	4,365	3.80	16,587	3.80	16,587	0	NA	NA
Total					**93,411**		**38,179**	**55,232**	**489**	**$22**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	20	20	
Number of Toilet Uses/day	3	1	
Number of Toilets	3	3	
Toilet Uses/hour/fixture	2.50	0.83	3.33
Number of urinal uses/day	0	3	
Number of urinals	1	1	
urinal uses/hour/fixture	0	7.5	7.5
Number of Sinks	4	4	
Number of SInk Uses/day	3	4	
Sink Uses/hr/fixture	1.88	2.50	4.38

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	16,296	611
Total		**611**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 gallons per flush

The current urinals consume 1 gpm

Table B.2.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Curling Rink

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (KWH)
Replace furnace with high efficiency furnace	1	0.65	0.95	16,498
Replace furnace with high efficiency furnace	1	0.65	0.95	3,900

Description	QTY	Leakage (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Install motorized dampers on washroom exhausts	2	10	3,525,327	1,033	$47
Install motorized dampers on lounge exhaust	1	10	3,525,327	1,033	$47
Install motorized dampers on rink exhaust	1	20	392,040	115	$5

Table B.3.1 - Energy Breakdown for Town Office

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	42,527	68%
Lighting	18,925	30%
Hot Water	1,434	2%
Total	**62,886**	

Table B.3.2 (a) - Electricity Usage for Town Office

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	0	0	1,450	$0	$85	$115
November	0	0	1,920	$0	$113	$146
December	0	0	1,500	$0	$88	$118
January	0	0	2,150	$0	$126	$162
February	0	0	1,530	$0	$90	$120
March	0	0	1,310	$0	$77	$105
April	0	0	1,530	$0	$90	$121
May	0	0	1,500	$0	$90	$121
June	0	0	1,340	$0	$80	$110
July	0	0	2,140	$0	$128	$165
August	0	0	1,090	$0	$65	$93
September	0	0	1,750	$0	$105	$138
TOTAL		**0**	**19,210**	**$0**	**$1,137**	**$1,513**

Table B.3.2 (b) - Natural Gas Consumption for Town Office

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	87	900	$49
November	316	3,271	$147
December	540	5,589	$238
January	937	9,698	$405
February	759	7,855	$327
March	635	6,572	$271
April	501	5,185	$216
May	246	2,546	$116
June	87	900	$51
July	3	31	$13
August	81	838	$49
September	28	290	$25
TOTAL	**4,220**	**43,676**	**$1,904**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.3.3 - Lighting Analysis Summary for Town Office

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Indoor Fluorescents - Convert 4' T12s to 4' T8s (14x2)	28	3,853	$231	2,541	$153
Indoor Fluorescents - Convert 4' T12s to 4' T8s (14x4)	56	7,705	$463	5,082	$305
Indoor Fluorescents - Convert 4' T12s to 4' T8s (15x1)	15	2,064	$124	1,361	$82
Indoor 100 W Incandescents - Convert to Compact Fluorescents	9	2,948	$177	826	$50
Indoor 60 W Incandescents - Convert to Compact Fluorescents	4	786	$47	197	$12
Outdoor Lighting	1	263	$16	263	$16
Exit Signs - Convert Incandescents to LEDs	2	526	$32	53	$3
Parking lot plug-ins	2	780	$47	390	$23
TOTALS		**18,925**	**$1,136**	**10,711**	**$643**

Annual Energy Savings (kWh)	**8,213**
Annual Cost Savings	**$493**
Percent Annual Energy Savings	**43%**

The Town Office is occupied Monday to Friday, 9 hours a day year round (3276 hours per year)

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

Table B.3.4 (a) Window and Door Replacement Calculations for Town Office

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace windows with new triple pane windows (10)	94	3.000	3,522	$161	6.25	1,691	$77	1,831	$84
TOTALS			**3,522**	**$161**		**1,691**	**$77**	**1,831**	**$84**

Table B.3.4 (b) Window and Door Infiltration Calculations for Town Office

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Pedestrian doors (2)	10	0.05	125	34	14,164,375	4,151	$190
Windows (10)	33	0.025	50	44	18,413,688	5,397	$247
TOTALS						**9,548**	**$436**

Table B.3.4 (c) Wall/Roof Insulation Upgrade for Town Office

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade wall insulation	900	12.000	8,440	$386	20	5,064	$231	3,376	$154
TOTALS			**8,440**	**$386**		**5,064**	**$231**	**3,376**	**$154**

The office is assumed to be kept at 70 F

Table B.3.5 - Water Usage for Town Shop

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	2	0.7	4,505	1.60	7,207	0.32	1,441	5,766	216	$13
Toilets	2	0.7	4,505	13.25	59,685	6.00	27,027	32,658	NA	NA
Total					**66,892**		**28,468**	**38,423**	**216**	**$13**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	1	2	
Number of Toilet Uses/day	3	4	
Number of Toilets	2	2	
Toilet Uses/hour/fixture	0.1875	0.5	0.6875
Number of Sinks	2	2	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.1875	0.5	0.6875

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	7,207	270
Total		**270**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 gallons per flush

Table B.3.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Town Office

Description	Current Efficiency	New Efficiency	Current Energy Used to Heat	Heat Savings
Replace furnace with high efficiency furnace	0.65	0.95	42,527	12,758

Description	QTY	Leakage (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Annual Heat Savings (kWh)	Cost
Provide HRV	1	200	30,687,805	8,994	4,497	$411

Description	Annual Energy Savings (kWh)	Annual Cost Savings ($)	Installation Cost	Simple Payback Years
Install Geothermal Heating System	28,161	$1,287	$30,780	23.92

Table B.4.1 - Energy Breakdown for Works & Operations, Fire Hall, & RCMP Office

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	176,947	87%
Lighting	23,647	12%
Hot Water	3,051	1%
Total	**203,645**	

Table B.4.2 (a) - Electricity Usage for Works & Operations, Fire Hall, & RCMP Office

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	3,460	$0	$203	$249
November	0	0	2,780	$0	$163	$204
December	0	0	5,030	$0	$295	$354
January	0	0	4,600	$0	$270	$325
February	0	0	6,880	$0	$403	$478
March	0	0	3,890	$0	$228	$278
April	0	0	4,360	$0	$255	$311
May	0	0	2,880	$0	$173	$215
June	0	0	4,090	$0	$246	$298
July	0	0	1,980	$0	$119	$154
August	0	0	3,520	$0	$211	$259
September	0	0	1,980	$0	$119	$154
TOTAL		**0**	**45,450**	**$0**	**$2,684**	**$3,278**

Table B.4.2 (b) - Natural Gas Consumption for Works & Operations, Fire Hall, & RCMP Office

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	294	3,043	$191
November	1,279	13,237	$559
December	1,715	17,750	$716
January	4,290	44,400	$1,671
February	2,954	30,573	$1,159
March	2,723	28,182	$1,043
April	784	8,114	$357
May	909	9,408	$415
June	129	1,335	$132
July	0	0	$0
August	76	787	$190
September	132	1,366	$134
TOTAL	**15,285**	**158,195**	**$6,568**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.4.3 - Lighting Analysis Summary for Works & Operations, Fire Hall, & RCMP Office

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
WO: Fluorescent Lamps- Convert 8' T12s to 8' T8s (23x2)	46	12,486	$750	4,549	$273
WO: Fluorescent Lamps- Convert 4' T12s to 4' T8s (13x2) with occupancy sensors	26	2,981	$179	497	$30
WO: 100W Incandescents - Convert to compact fluorescents	4	936	$56	262	$16
FH: Fluorescent Lamps- Convert 8' T12s to 8' T8s (18x2)	36	4,343	$261	2,022	$121
FH: Fluorescent Lamps- Convert 4' T12s to 4' T8s (15x2)	30	1,529	$92	920	$55
RCMP: Fluorescent Lamps- Convert 4' T12s to 4' T8s (5x2)	10	892	$54	537	$32
Parking lot controllers	1	480	$29	240	$14
TOTALS		**23,647**	**$1,420**	**9,027**	**$542**

Annual Energy Savings (kWh)	**14,620**
Annual Cost Savings	**$878**
Percent Annual Energy Savings	**62%**

The Works & Operations is occupied Monday-Friday from 8-5.

The Fire Hall is occupied intermittently (approximately 20 hours/week)

The RCMP office is occupied for 7 hours per day, 5 days per week.

The exit signs are on 24/7.

The outdoor lights are on 12 hours per day year round.

Table B.4.4 (a) Window and Door Replacement Calculations for Works & Operations, Fire Hall, & RCMP Office

Description	Existing				New			Savings	
	Area (ft^2)	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
WO: Replace old 3 pane window with a new, insulated 3 pane window	12	3.000	315	$14	6.25	151	$7	164	$7
FH: Replace old 3 pane windows with new, insulated 3 pane windows	18	3.000	536	$25	6.25	257	$12	279	$13
RCMP: Replace old 3 pane windows with new, insulated 3 pane windows	18	3.000	450	$21	6.25	216	$10	234	$11
TOTALS			**851**	**$39**		**409**	**$19**	**443**	**$20**

Table B.4.4 (b) Window and Door Infiltration Calculations for Works & Operations, Fire Hall, & RCMP Office

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
WO: Weatherstrip pedestrian doors (3)	15	0.05	125	51	14,691,772	4,306	$197
WO: Caulk vehicle doors (4)	60	0.025	50	82	23,506,836	6,889	$315
WO: Caulk window (1)	3	0.025	50	4	1,207,990	354	$16
FH: Weatherstrip & caulk pedestrian doors (2)	20	0.025	50	27	8,768,423	2,570	$117
FH: Caulk vehicle doors (2)	30	0.05	50	41	13,152,634	3,855	$176
FH: Caulk windows (2)	6	0.025	50	8	2,667,062	782	$36
RCMP: Caulk windows (2)	6	0.025	50	8	2,240,332	657	$30
TOTALS						**19,412**	**$821**

The building is assumed to be kept at 70 F

Table B.4.5 - Water Usage for Works & Operations, Fire Hall, & RCMP Office

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	2	0.9	4,095	1.60	6,552	0.32	1,310	5,242	196	$12
Toilets	2	0.9	4,095	13.25	54,259	6.00	24,570	29,689	NA	NA
Total					**60,811**		**25,880**	**34,930**	**196**	**$12**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	2	2	
Number of Toilet Uses/day	3	4	
Number of Toilets	2	2	
Toilet Uses/hour/fixture	0.4	0.5	0.9
Number of Sinks	2	2	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.375	0.5	0.875

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	6,552	246
Total		**246**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 gallons per flush

Table B.4.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Works & Operations, Fire Hall, & RCMP Office

	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings
Setback Thermostats to 59 F	73.29%	10399.5	8,841	21,720	2,386

Description	Quantity	Flow Rate (cfm)	Energy Required to Heat Intake Air (kWh)	Energy Savings from Solarwall (kWh)	Energy Savings from upgrading wall insulation	Total Energy Savings from Solarwall
Install Solarwall on East Face of Building	1	2000	13,443	9,207	1,868	11,075

Description	Current Efficiency	New Efficiency	Current Energy Used to Heat	Heat Savings
Replace boiler in fire hall with high efficiency boiler.	0.84	0.95	34,132	3,754

Description	QTY	Leakage (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Annual Heat Savings (kWh)
Install 1000 cfm HRV	1	2000	45,881,709	13,447	6,723
Install a combustible detector	1	2000	45,881,709	13,447	6,723

Notes:

The Solarwall calculations are assuming that the Works & Operations is ventilated 30% of the time it is occupied.

Table B.5.1 - Energy Breakdown for the Water Treatment Plant

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	3,371	26%
Lighting	242	2%
Hot Water	175	1%
Motors	9,172	71%
Total	**12,960**	

Table B.5.2 (a) - Electricity Usage for the Water Treatment Plant

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	0	0	340	$0	$20	$41
November	0	0	1,220	$0	$71	$99
December	0	0	1,410	$0	$83	$112
January	0	0	1,880	$0	$110	$144
February	0	0	1,950	$0	$114	$148
March	0	0	830	$0	$49	$73
April	0	0	1,270	$0	$74	$103
May	0	0	890	$0	$53	$79
June	0	0	10	$0	$1	$19
July	0	0	1,500	$0	$90	$121
August	0	0	10	$0	$1	$19
September	0	0	1,650	$0	$99	$131
TOTAL		**0**	**12,960**	**$0**	**$765**	**$1,089**

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.5.3 - Lighting Analysis Summary for the Water Treatment Plant

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Indoor 100W incandescent bulbs - convert to compact fluorescents.	2	73	$4	20	$1
Indoor T12 Fluorescents - Convert 8' T12s to 8' T8s (2x2)	4	169	$10	79	$5
TOTALS		**242**	**$15**	**99**	**$6**

Annual Energy Savings (kWh)	**143**
Annual Cost Savings	**$9**
Percent Annual Energy Savings	**59%**

These calculations are assuming that the Water Plant is occupied for 1 hour a day (365 hours per year).

Table B.5.4 (a) Window and Door Replacement Calculations for the Water Treatment Plant

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace double pane windows with triple pane windows (7 - 2.5'x6')	105	2.000	3,265	$149	6.25	1,045	$48	2,220	$101
TOTALS			**3,265**	**$149**		**1,045**	**$48**	**2,220**	**$101**

Table B.5.4 (b) Window and Door Infiltration Calculations for the Water Treatment Plant

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Metal pedestrian door (1)	3	0.05	125	10	2,347,996	688	$31
Seal windows (7)	30	0.025	50	41	9,313,718	2,730	$125
TOTALS						**3,418**	**$156**

The temperature of the Water Plant is assumed to be kept at 59 F

The crack length around the doors is taken as the length of the base

The crack length around the windows is taken as a quarter of the perimeter

Table B.5.5 Energy Savings with Heating, Ventilating, and Air Conditioning for Water Treatment Plant

Description	% of Time Unoccupied	HDD below 59 F	HDD below 50 F	Current Energy Used to Heat	Heat Savings (kWh)
Setback Thermostats to 59 F	95.83%	9,080	6,615	3,371	877

Table B.5.6 Energy Consumption and Savings Calculations for Motors in Water Treatment Plant

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
Distribution Pump 1	3.0	2.4	1,535	91%	2.6	1.90	2,923	0.07	0.05	82
Distribution Pump 2	3.0	2.4	1,563	91%	2.6	1.97	3,074	0.07	0.05	84
Raw Water Pump 1	2.5	2.0	584	91%	2.35	1.75	1,024	0.06	0.04	26
Raw Water Pump 1	2.5	2.0	584	91%	2.35	1.75	1,024	0.06	0.04	26
Raw Water Pump 1	2.5	2.0	584	91%	2.35	1.75	1,024	0.06	0.04	26
Chemical Feed Pump	0.3	0.2	584	91%	0.24	0.18	102	0.01	0.00	3
TOTALS							**9,172**			**247**

Table B.6.1 - Energy Breakdown for Heritage Centre

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	541,761	89%
Lighting	59,334	10%
Hot Water	7,573	1%
Total	**608,669**	

Table B.6.2 (a) - Electricity Usage for Heritage Centre

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	52	2	7,920	$17	$464	$573
November	76	26	29,280	$216	$1,204	$1,644
December	87	37	36,080	$308	$1,363	$1,930
January	79	29	31,760	$241	$1,262	$1,738
February	79	29	27,360	$241	$1,159	$1,621
March	80	30	27,280	$250	$1,157	$1,628
April	62	12	23,120	$100	$1,060	$1,352
May	60	10	21,200	$83	$1,040	$1,305
June	65	15	17,760	$125	$928	$1,226
July	97	47	20,960	$391	$1,034	$1,649
August	81	31	16,800	$258	$891	$1,334
September	72	22	20,080	$183	$1,012	$1,388
TOTAL		**290**	**279,600**	**$2,413**	**$12,573**	**$17,389**

Table B.6.2 (b) - Natural Gas Consumption for Heritage Centre

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	427	4,419	$241
November	839	8,683	$543
December	3,013	31,184	$1,198
January	7,682	79,506	$3,089
February	5,975	61,839	$2,261
March	4,782	49,492	$1,932
April	3,563	36,876	$1,341
May	2,063	21,351	$844
June	1,368	14,158	$868
July	724	7,493	$451
August	490	5,071	$359
September	869	8,994	$521
TOTAL	**31,795**	**329,069**	**$13,648**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.6.3 - Lighting Analysis Summary for the Heritage Centre

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
MC: Fluorescents - Convert 4' T12s to 4' T8s (40x4)	160	18,346	$1,101	11,045	$663
MC: Fluorescents - Convert 2' T12s to 2' T8s (8x2)	16	1,310	$79	636	$38
MC: LED Exit Signs - No change required	4	105	$6	105	$6
BH: Fluorescents - Convert 4' T12s to 4' T8s (47x2)	94	2,303	$138	1,387	$83
BH: Convert incandescent Exit signs to LEDs	5	1,314	$79	131	$8
BH: T8 Fluorescent lamps - No Change Required	20	2,454	$147	2,454	$147
BH: Chandeliers	10	2,500	$150	2,500	$150
NH: T8 Fluorescent lamps - No Change Required	120	14,726	$884	14,726	$884
NH: LED Exit Signs - No change required	4	105	$6	105	$6
Outdoor lights on photocell	10	6,570	$394	6,570	$394
Parking lot plugs install parking lot controllers.	8	3,840	$231	1,920	$115
Parking lot plugs (east side)	12	5,760	$346	2,880	$173
TOTALS		**59,334**	**$3,562**	**44,460**	**$2,669**

Annual Energy Savings (kWh)	**14,874**
Annual Cost Savings	**$893**
Percent Annual Energy Savings	**25%**

These calculations are based on the assumptions that:

The medical clinic is occupied for 45 hours a week year round
The nutrihealth offices are occupied for 40 hours a week year round
The banquet halls are occupied for 100 functions every year (5 hours each function)

Table B.6.4 (a) Window and Door Replacement Calculations for the Heritage Centre

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
BH: Replace double pane windows with triple pane windows (3-90"x56")	105	2.000	4,944	$226	6.25	1,582	$72	3,362	$154
BH: Replace double pane windows with triple pane windows (2-40"x56")	31.11	2.000	1,465	$67	6.25	469	$21	996	$46
TOTALS			**6,409**	**$293**		**2,051**	**$94**	**4,358**	**$199**

Table B.6.4 (b) Window and Door Infiltration Calculations for the Heritage Centre

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
BH: Weatherstrip single pedestrian doors (8).	20	0.05	125	68	23,706,550	6,948	$318
BH: Seal windows (6)	13.125	0.025	50	18	6,222,969	1,824	$83
TOTALS						**8,771**	**$318**

The crack lengths around the doors in the banquet hall are taken as a quarter of the perimeter

The temperature of the Banquet Hall is assumed to be 21 ^oC (70 ^oF)

Table B.6.5 - Water Usage for Heritage Centre

Fixtures	Qty	Est. # of Uses/Hr/Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Medical Clinic										
Sinks	3	1.8	12,285	0.32	3,931	0.32	3,931	0	0	$0
Toilets	3	1.8	12,285	6.00	73,710	6.00	73,710	0	NA	NA
Banquet Hall										
SInks	7	18.8	65,625	1.60	105,000	0.32	21,000	84,000	3,148	$189
Toilets	7	10.7	37,500	13.25	496,875	6.00	225,000	271,875	NA	NA
Urinals	3	18.8	28,125	3.80	106,875	3.80	106,875	0		
Total					**77,641**		**77,641**	**0**	**3,148**	**$0**

Frequency at Which Fixtures are Used			
Banquet Hall	**Females**	**Males**	**Totals**
Number of People	150	150	
Number of Toilet Uses/day	3	1	
Number of Toilets	7	7	
Toilet Uses/hour/fixture	8.04	2.68	10.71
Number of Urinal Uses/day	0	3	
Number of Urinals	3	3	
Urinal Uses/hour/fixture	0.00	18.75	18.75
Number of Sinks	7	7	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	8.04	10.71	18.75
Medical Clinic			
Number of People	6	6	
Number of Toilet Uses/day	3	4	
Number of Toilets	3	3	
Toilets Uses/hour/fixture	0.75	1.00	1.75
Number of Sinks	3	3	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.75	1.00	1.75

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	108,931	4,082
Total		**4,082**

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals are water efficient and consume 1 gallon per flush

Table B.6.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Heritage Centre

Description	Quantity	Flow Rate (cfm)	Heat Loss (kWh)	Energy Savings for HRV (kWh)
Install HRV in medical clinic	1	200	4,240	2,120
Install HRV in Nutrihealth	1	600	15,106	7,553
Install CO_2 sensors on RTUs for banquet hall	7	6750	39,654	19,827
Install CO_2 sensors on RTUs for nutrihealth	1	600	13,092	6,546

Description	% Improvement on Efficiency	Energy Used for Cooling	Energy Savings
Install high efficiency RTU for banquet hall (EER = 9.5 to EER =11)	14%	83,300	11,662
Install high efficiency RTU for Nutrihealth (EER = 9 to EER =10.8)	14%	149,450	20,923

Table B.7.1 - Energy Breakdown for the Picnic Shelter

	Energy Consumption (kWh)	% of Total Energy Consumption
Lighting	3,146	93%
Hot Water	734	22%
Total	**3,392**	

Table B.7.2 (a) - Electricity Usage for Picnic Shelter

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	0	0	260	$0	$15	$44
November	0	0	202	$0	$12	$40
December	0	0	61	$0	$4	$13
January	0	0	157	$0	$9	$55
February	0	0	61	$0	$4	$13
March	0	0	132	$0	$8	$54
April	0	0	229	$0	$13	$42
May	0	0	674	$0	$40	$73
June	0	0	62	$0	$4	$31
July	0	0	923	$0	$55	$90
August	0	0	62	$0	$4	$31
September	0	0	569	$0	$34	$66
TOTAL		**0**	**3,392**	**$0**	**$202**	**$554**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.7.3 - Lighting Analysis Summary for the Picnic Shelter

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (KWH)	Annual Cost
Indoor fluorescents - convert 4' T12s to 4' T8s (8x2)	16	2,258	$136	472	$28
Indoor Incandescent - Replace with Compact fluorescent	1	12	$1	3	$0
Outdoor Lights	1	876	$53	876	$53
TOTALS		**3,146**	**$189**	**1,351**	**$81**

Annual Energy Savings (kWh)	**1,795**
Annual Cost Savings	**$108**
Percent Annual Energy Savings	**57%**

The picnic shelter is assumed to be occupied throughout the summer for 60 hours/week

Table B.7.4 - Water Usage for the Picnic Shelter

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	4	2.2	4,900	1.60	7,840	0.32	1,568	6,272	235	$11
Toilets	4	1.3	2,800	13.25	37,100	6.00	16,800	20,300	NA	NA
Urinals	2	1.9	2,100	3.80	7,980	3.80	7,980	0	NA	NA
Total					**44,940**		**18,368**	**26,572**	**235**	**$11**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	10	10	
Number of Toilet Uses/day	3	1	
Number of Toilets	4	4	
Toilet Uses/hour/fixture	0.9	0.3	1.3
Number of Urinal Uses/day	0.0	3.0	
Number of Urinals	2.0	2.0	
Urinal Uses/hour/fixture	0.0	1.9	1.9
Number of Sinks	4	4	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.9375	1.25	2.1875

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	7,840	294
Total		**294**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 gallons per flush

The current urinals are assumed to consume 1 gpm

APPENDIX C

WATER EFFICIENCY

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Leaks

- A leak of one drop per second wastes 10,000 litres of water per year. A toilet that runs after a flush can waste 200,000 litres of water per year. Fixing a hot water leak will save energy as well as water.

- Check for differing water meter readings at bedtime and in the morning. If no water has been intentionally used, a difference in meter readings indicates a leak.
- If a few drops of food colouring put in your toilet tank seep into the toilet bowl (without flushing), check the flapper valve, valve seat and flapper lift chain for the source of the leak.
- Conduct a periodic "leak check" a minimum of twice a year on water using fixtures and appliances, including outside hose connections. Replace worn washers, O-rings and faulty fixtures.

On-Site Wastewater Systems

- Wise water management is necessary. All septic systems have limitations and water conservation should be practiced.
- Do not use substitutes for toilet paper. These products may not decompose in the tank and could clog the system.
- Perform regular maintenance checks on your entire system, including regular pump outs of the septic tank and inspection of the disposal field for signs of saturation or leakage.

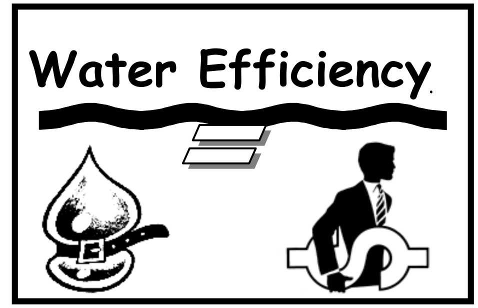
For More Information, Please Contact:

Water Efficiency Coordinator
Pollution Prevention
Manitoba Conservation
123 Main Street, Suite 160
Winnipeg MB R3C 1A5

Phone: (204) 945-8980 or
1-800-282-8069 ext. 8980
Fax: (204) 945-1211
E-mail: lliebgott@gov.mb.ca

Publication Number: 98-06E

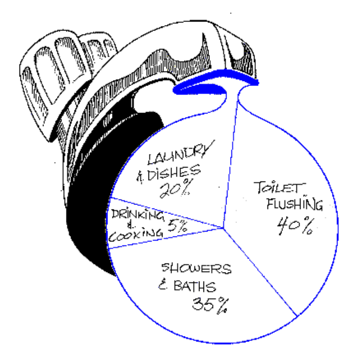
Pollution Prevention
Manitoba Conservation



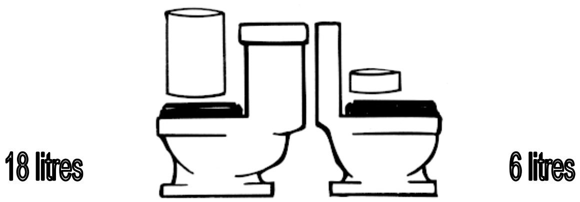
Water Use

How you can reduce yours!

- Save money.
- Delay the need to expand our water and wastewater treatment plants.
- Prolong the life of in-ground sewage disposal systems, i.e., septic fields.
- Protect our water sources.



Bathroom



- Replace toilets that flush 13 to 26 litres of water with 6 litre or dual flush toilets, cutting water used by toilets by half or more. See www.cwwa.ca for toilet performance ratings. In the mean time, reduce water per flush in toilets by up to 35% by installing early closure devices (don't use bricks – as they break down, pieces interfere with the flapper seal).
- Refrain from using the toilet to dispose of trash.
- A partially filled tub uses less water than a long shower; a short shower uses less than a full tub.
- Replace your 20 litre per minute showerhead with a low-flow 9.5 litre per minute showerhead. You'll use less than half the water.
- Make it a habit to be finished your shower in less than 5 minutes.
- Install a water conserving 3.5 litre per minute aerator on your bathroom tap.
- When shaving, rinse the razor in a cup or a partially filled sink instead of letting the tap run.
- Brush teeth using a glass of water to rinse.

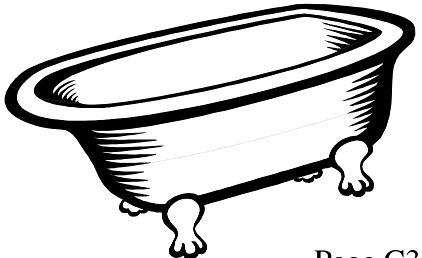
Kitchen & Laundry

- Install a water saving 9 litre per minute aerator on the kitchen tap.
- Rinse dishes in a stoppered sink or basin, not with running water.
- Wash vegetables in a basin or stoppered sink, then quickly rinse using running water.
- Keep drinking water in the fridge. Wash the container and change the water every few days.
- Thaw food in the fridge rather than under a running tap. This conserves both energy and water.

- Compost organic wastes instead of using a sink garbage disposal.
- Buy a low water use dishwasher to save on energy, water and detergent costs.
- Wash only full loads of laundry and dishes.
- Front loading washing machines use less water than top-loading washers do. If unavailable, choose a clothes washer with a suds saver, and water saving cycle.

General Water Use

- Only use water treatment or softening systems, if required. If possible, only use softened water for bathing and cleaning – use unsoftened water for cooking, drinking and watering plants.
- Ensure a water softener regenerates only when the resin is exhausted.
- Turn the system off if you will be away for more than a few days.
- Insulate hot water tank and pipes to reduce the need to run water until it is hot. Install a heat trap on the pipe above your water heater to save energy and water.
- Know location of sink, toilet and main shut off valves in case a pipe or water heater blows, or so you can turn off your water when you are away.
- If your water pipes tend to freeze, do not let the tap run continuously. This wastes water, and overloads sewer systems. Instead, install heat tape or connect a pump-back reservoir system (discuss options with your plumber, electrician or call Manitoba Conservation).



APPENDIX D

INCENTIVE PROGRAMS

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Table D.1 Manitoba Hydro Power Smart Incentives

Item	Incentives	Contacts
Compact Fluorescents	$5 - Non-reflectorized screw in lamp, $10 - Reflectorized screw-in lamp, $45 - New hard wired fixture	Cheryl Pilek at cdpilek@hydro.mb.ca or 204-474-3615
T8 Electronic Fluorescents	T8 Premium Ballast - $20, T8 Standard Ballast - $15, T8 Dimmable Ballast - $60, 8 Foot T8 Ballast - $35	Cheryl Pilek at cdpilek@hydro.mb.ca or 204-474-3615
LED Exit Signs	$45 per new sign	Cheryl Pilek at cdpilek@hydro.mb.ca or 204-474-3615
High Pressure Sodium Lighting	The lesser of $500 per kilowatt saved or $100 of lighting fixture cost	Cheryl Pilek at cdpilek@hydro.mb.ca or 204-474-3615
Parking Lot Controllers	$25 for each controlled circuit	May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813
Air Barrier System	$0.46 per square foot or $5 per square meter of net wall area	May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813
Windows	Depends on replacement window's U-Value and net window area	May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813
Geothermal Heat Pump	Manitoba Hydro will pay up to half the cost of a feasabillity study to help decide whether a geothermal heat pump is the right choice for you building. Manitoba Hydro also offers a custom incentive towards the capital cost of your heat pump system, based on the energy savings calculated in the feasability study.	Domenic Marinelli at dmarinelli@hydro.mb.ca or 204-474-4273

Notes

For general information and information kits contact:
Power Smart for Business
Phone: 474-3676
Email Address: powersmartforbusiness@hydro.mb.ca

Table D.2. Other Incentive Programs

Program Name	Eligibility	What Type of Projects are Available	Ref. Page	Available Funding	Funding Maximums	Deadline For Applications	Prospect of Funding	Project Sponsor	Contact	Email	Website
Energy Innovators Initiative: Energy Retrofit Assistance (ERA)	Comm. & Institutional Bldgs. Aboriginal, northern, rural or remote communities may receive special consideration.	Projects that reduce energy consumption. Includes costs for project planning and development, materials and labour, monitoring and tracking and staffing training and awareness.	13	$7.50/GJ (277.8 kW H)	up to 25% of costs based on energy savings ($250,000 max)	On-going	Good	NRCan	MarieLynn Tremblay	Marie_Lyne.Tremblay@nrcan-rncan.gc.ca	http://oee.nrcan.gc.ca/commercial/financial-assistance/existing/retrofits/implementation.cfm?attr=0
Municipal Rural Infrastructure Fund (MRIF)	All MB local governments	Projects that construct, restore or improve infrastructure that ensures sustainable use and management of water and wastewater resources. Projects that construct, restore or improve public arts and heritage infrastructure, such as museums, heritage sites, sites for performings arts, and cultural or community centres. - See detailed program info for more info. Program has many requirements and caveats.	23, 46, 54		2/3 of the approved costs	On-going	Good	Canada-Manitoba Infrastructure Programs		infra@gov.mb.ca	http://www.infrastructure.mb.ca/e/index.html
Renewable Energy Development Initiative (REDI)	…Municipalities…, solar air/water heating, biomass	Projects involving solar air or water heating and clean burning biomass combustion projects.	25	25% of purchase and install of qualifying system	$80,000	31-Mar-07		NRCan		redi.penser@nrcan.gc.ca	http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=455
Community Places Program	Non-profit community organizations in MB, except public schools, universities, hospitals, nursing homes, monnercial coops, federal, provincial and city of Winnipeg departments.	Projects involving the upgrading, construction or acquisition of community facilities available to the general community. Priority given to proposals for critical repairs to extend the life of existing well-used facilities. Projects must provide lasting, long-term benefits to the community.		Up to 50% of first $15,000 and 1/3 of the rest of project	$50,000			Manitoba Culture, Heritage and Tourism	Varies by region	www.gov.mb.ca/chc/grants	http://www.gov.mb.ca/chc/grants
Sustainable Development Innovations Fund (SDIF)	Municipal corporations, local governments, private and non-profit organizations and businesses	Sustainable community development, Eco-efficiency initiatives, environmental stewardship. Emphasis on youth involvement, first nations and northern communities.	55		$50,000 (usually $25,000 or less)		fair	Manitoba Conservation		sdif@gov.mb.ca	http://www.gov.mb.ca/conservation/pollutionprevention/sdif/index.html

APPENDIX E

TRANSPORTATION AND EQUIPMENT EFFICIENCY

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Transportation and Equipment Efficiency for Small Municipalities (< 10,000 population).

Municipal governments may wish to:

- Assess Regulatory, Standards & Industry "Best Practices" to ensure compliance and demonstrated "Due Diligence". Includes Provincial, Federal, Society of Automotive Engineers (SAE), Canadian Standards Association (CSA), American National Standards Institute (ANSI), Workplace Safety & Health audits, Safety inspections, Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods regulation (TDG), etc.

- Review current fuelling habits & education on "economical operation" (Driver training, minimal idling, proper lubricants for seasonal operation etc.)

- Review "Alternative Fuel" options, e.g., Diesel and Biodiesel, Propane, Compressed Natural Gas (CNG). Note: Electric Vehicles are not an option yet due to initial cost and the prevailing ambient temperatures experienced in Manitoba

- Consider recycling initiatives for disposal of Fleet Waste Stream products, eg. tires, lubricating oil, anti-freeze, aerosol cans, paints, controlled products, ferrous & non-ferrous scrap metal, plastics etc.

Other Opportunities:

Transportation Demand Management

- Education & awareness programs on ride-sharing, telecommuting & teleconferencing

Encouragement of Alternative Modes of Transportation

- Possibility of van based transit or "pool" operations for commuting within towns & outlying areas. May be viable for transporting groups of employees to & from work locations

- Provision of bike racks, lockable bike containers or small fenced compounds at key locations

- Education & awareness programs on vehicle emissions, "fuel saving" driving habits etc.

Traffic & Parking Management

- Possibility of synchronizing traffic lights (if installed) and implementing parking fees etc. to manage parking

CHOOSING A VEHICLE

Vehicle Construction

The following points are important when considering fuel efficiency.

- A five speed manual transmission is about 5% more efficient than an automatic.
- Smaller engines use less fuel.
- Front wheel drive vehicles are lighter and therefore more fuel efficient than rear wheel drive vehicles
- SUV's tend to have low fuel efficiency
- Front wheel drive vehicles provide better traction than rear wheel drive in most cases.
- Small engines with a turbocharger can help make up the power difference between large and small engines by using energy from hot exhaust.

Vehicle Ratings

The Office of Energy Efficiency of Natural Resources Canada, issues a list of the most fuel efficient vehicles in each of a number of categories. See their website for the latest list.

Extra Features

Air conditioning, power steering, and roof racks are some of the big energy using extras. Air conditioning can increase your fuel consumption by 10 to 20 percent in city driving. A fully loaded roof rack can add 25% to your fuel costs. Even empty, it will add about 1% due to wind resistance

DRIVING ECONOMICALLY

Driving technique is critical to fuel economy.

- Maintain recommended tire pressure to maximize fuel efficiency and tire life.
- Keep your engine well tuned and maintained.
- One minute of idling uses more fuel than restarting the engine.
- Avoid jack-rabbit starts.
- An open sun roof and open windows increase air resistance, especially on the highway. Use the car's ventilation system instead.
- Most cars use 10% less fuel when driven at 55 miles per hour as opposed to 62, or 90 kilometers as opposed to 100.
- Adjust your speed in advance of changes in traffic flow. Take your foot off the accelerator and progressively gear down rather than accelerating up to a stop sign and breaking hard.

ENGINE BLOCK HEATERS - IS THERE A SAVINGS?

- In sub-freezing temperatures, the first 15 to 20 minutes of driving, after a cold start cause the engine to use about 30% more fuel than a warm engine.
- A timer can be installed for your vehicle's block heater to start warming the engine a couple hours before you head out.
-

- With the cost of electricity accounted for, you should still come out ahead, over the course of a winter.

FUEL OPTIONS

- Diesel engines are more fuel efficient than gasoline engines, as Diesel contains 10% more energy per unit volume than gasoline. Higher diesel engine costs are offset by increased fuel economy and engine life.
- Many fleet operators are converting their vehicles to biodiesel for cost advantages and a cleaner burn.
- There are many advantages to a dual-fuel system, which allows you to switch between gasoline and propane or natural gas with the flick of a switch.
- Hybrid vehicles…

From the Office of Energy Efficiency, Natural Resources Canada:

Buying a Fuel-Efficient Vehicle

- Fuel consumption can vary widely from one vehicle to the next. Whether you're buying new or used, the choices you make today will either save you money (through reduced fuel consumption) or cost you money for years to come.

- How big is big enough? It's always a good idea to avoid buying more vehicle than you need. Larger vehicles tend to be heavier and have bigger and more powerful engines, so consider buying the most fuel-efficient vehicle that meets your everyday needs.

- If you're buying a new vehicle, check the EnerGuide label for its fuel consumption rating. EnerGuide labels are now affixed to all new light-duty vehicles sold in Canada.

- Fuel consumption ratings for all new cars, light-duty trucks and vans sold in Canada are also available in the free Fuel Consumption Guide. You can download a PDF version of the Guide, or call 1 800 387-2000 to order your free copy. Past editions are available, so you can also check fuel consumption ratings for used vehicles.

- Have a look at the list of the most recent winners of the EnerGuide Awards, presented each model year to the manufacturers of the most fuel-efficient vehicles in different classes – two-seater, subcompact, compact, mid-sized and large cars, as well as station wagons, vans, pickup trucks and special purpose vehicles.

- Your choice of transmission will directly affect the cost of the vehicle and its fuel consumption. As a general rule, a manual transmission is more fuel efficient than an automatic, assuming you shift properly. If you buy an automatic, the more gears, the better.

- Four-wheel drive and all-wheel drive offer superior traction and braking under slippery conditions, but the weight and friction of additional drivetrain parts can increase fuel consumption by 5 to 10 percent compared with two-wheel drive vehicles. How often would you need to use this option, and is it worth the extra fuel cost for as long as you own the vehicle?

- Under normal driving conditions, smaller engines deliver better fuel economy than larger engines. Choose the smallest engine that meets your everyday needs.

- Are you willing to pay a fuel penalty for as long as you own your vehicle just to have the convenience of options such as power windows, seats and mirrors? Many options increase fuel consumption by adding weight, increasing aerodynamic drag, or drawing extra power from the engine.

- Do you really need an air conditioner? Operating an air conditioner in hot weather can increase fuel consumption by more than 20 percent in city driving. Consider using the car's ventilation system and options such as a sunroof and tinted glass.

- For most drivers, cruise control saves fuel on the highway by keeping your speed constant and avoiding inadvertent speeding.

- Explore your fuel options. Will a fuel-efficient diesel vehicle meet your needs? What about propane or natural gas, which produce fewer greenhouse gas emissions and are cheaper to use than gasoline or diesel fuel? Ethanol fuel blends are also widely used by Canadian motorists. And hybrid vehicles, which use a combination of high-power batteries and an internal combustion engine, are beginning to appear on the North American market.

Please note – this list of websites is not comprehensive. They have not been reviewed for accuracy, but may provide ideas and options appropriate for some municipalities.

Other vehicle and equipment information can be found on the Internet at:
http://oee.nrcan.gc.ca/publications/infosource/home/index.cfm?act=category&PrintView=N&Text=N

http://www.betterroads.com/articles/NewProds/oct05bid.htm

http://www.edmunds.com/advice/specialreports/articles/102946/article.html

http://www.betterroads.com/articles/NewProds/oct05bid.htm

http://snow.grounds-mag.com/ar/grounds_maintenance_september_2/

http://www.missoulian.com/articles/2003/11/15/news/local/news03.txt

http://rocktoroad.com/grader.html

http://news.thomasnet.com/fullstory/29180/3281

http://www.forester.net/gx_0501_graders.html

http://www.epa.gov/greenkit/quick_start.htm#greenfleet

Self Audit

Municipal Operations -Efficiency Survey

(Transportation, Road Repair, Snow Clearance, Waste Disposal, etc.)

Name of Organisation: ____________________________

Address: ____________________________

____

____

Contact Name: ____________________________

Phone No. ______________

Name of person completing form: ______________________________

Date: ______________________

Vehicles and Construction Equipment						
	Gasoline	**Diesel**	**CNG**	**Propane**	**Other**	**Total**
Total Fuel Usage L/Year						
Greenhouse Gas Emissions (tonnes)						

Fuel Use Minimization Considerations

- What type of vehicles/equipment, if any, are you planning to replace in the next few years?___________________________________
____
____
- Can you downsize these vehicles/equipment?
Comments:____
____
____
- Can you make process or other changes to minimize use of, or eliminate these vehicles/equipment? Comments:_________________
____
____
- Do you have a policy in place to make fuel efficiency one of the vehicle/equipment purchase requirements? Yes ___ No ___
- Have you made operational changes such as reducing idling time of vehicles and equipment, and using block heaters and timers to reduce warm up time?
Yes ___ No ___
- Have you encouraged more energy efficient driving behaviour through training, policies, and ongoing reminders? Yes ___ No ___
- Do you have procedures in place to detect and rectify leakage of above-ground and under-ground fuel storage tanks? Yes __ No ___
- Do you use automatic shut-off fill nozzles at pumps? Yes ___ No ___

Comments

APPENDIX F

ENERGY CONSUMPTION MONITORING SPREADSHEETS AND GRAPHS

TABLE OF CONTENTS – APPENDIX F

Table F.1 - Energy Consumption Monitoring Data for the Arena

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	22,680	873	31,715	340.7	31,715			0		#DIV/0!			0		#DIV/0!
November	59,040	2,314	82,989	525.4	82,989			0		#DIV/0!			0		#DIV/0!
December	44,220	3,640	81,893	970.3	81,893			0		#DIV/0!			0		#DIV/0!
January	40,680	6,601	108,998	1116	108,998			0		#DIV/0!			0		#DIV/0!
February	34,980	5,738	94,367	816.7	94,367			0		#DIV/0!			0		#DIV/0!
March	38,220	4,287	82,589	735.1	82,589			0		#DIV/0!			0		#DIV/0!
April	30,540	3,352	65,232	293.2	65,232			0		#DIV/0!			0		#DIV/0!
May	4,980	1,533	20,846	214.9	20,846			0		#DIV/0!			0		#DIV/0!
June	2,640	0	2,640	41.3	2,640			0		#DIV/0!			0		#DIV/0!
July	3,600	109	4,728	12	4,728			0		#DIV/0!			0		#DIV/0!
August	2,700	171	4,470	20.5	4,470			0		#DIV/0!			0		#DIV/0!
September	2,580	90	3,511	89.5	3,511			0		#DIV/0!			0		#DIV/0!
TOTAL	286,860	28,708	583,979	5175	583,979	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.1 - Energy Consumption Monitoring Graph for the Arena

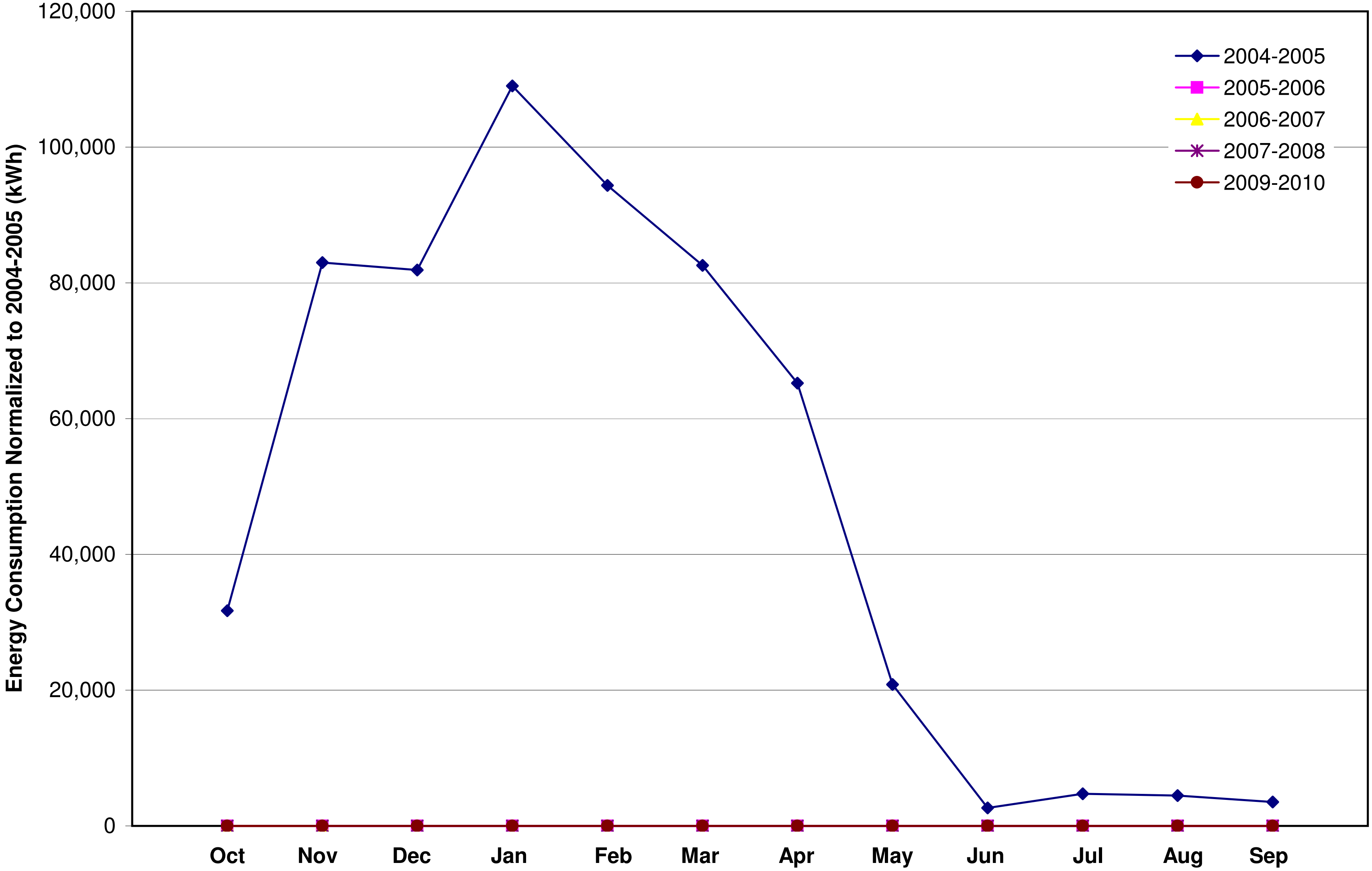


Table F.2 - Energy Consumption Monitoring Data for the Curling Rink

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	640	221	2,927	340.7	2,927			0		#DIV/0!			0		#DIV/0!
November	600	93	1,563	525.4	1,563			0		#DIV/0!			0		#DIV/0!
December	570	918	10,071	970.3	10,071			0		#DIV/0!			0		#DIV/0!
January	1,130	940	10,859	1116	10,859			0		#DIV/0!			0		#DIV/0!
February	1,770	1,256	14,769	816.7	14,769			0		#DIV/0!			0		#DIV/0!
March	940	1,645	17,965	735.1	17,965			0		#DIV/0!			0		#DIV/0!
April	1,460	856	10,319	293.2	10,319			0		#DIV/0!			0		#DIV/0!
May	600	238	3,063	214.9	3,063			0		#DIV/0!			0		#DIV/0!
June	470	0	470	41.3	470			0		#DIV/0!			0		#DIV/0!
July	620	126	1,924	12	1,924			0		#DIV/0!			0		#DIV/0!
August	910	78	1,717	20.5	1,717			0		#DIV/0!			0		#DIV/0!
September	460	20	667	89.5	667			0		#DIV/0!			0		#DIV/0!
TOTAL	10,170	6,391	76,315	5175	76,315	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.2 - Energy Consumption Monitoring Graph for the Curling Rink

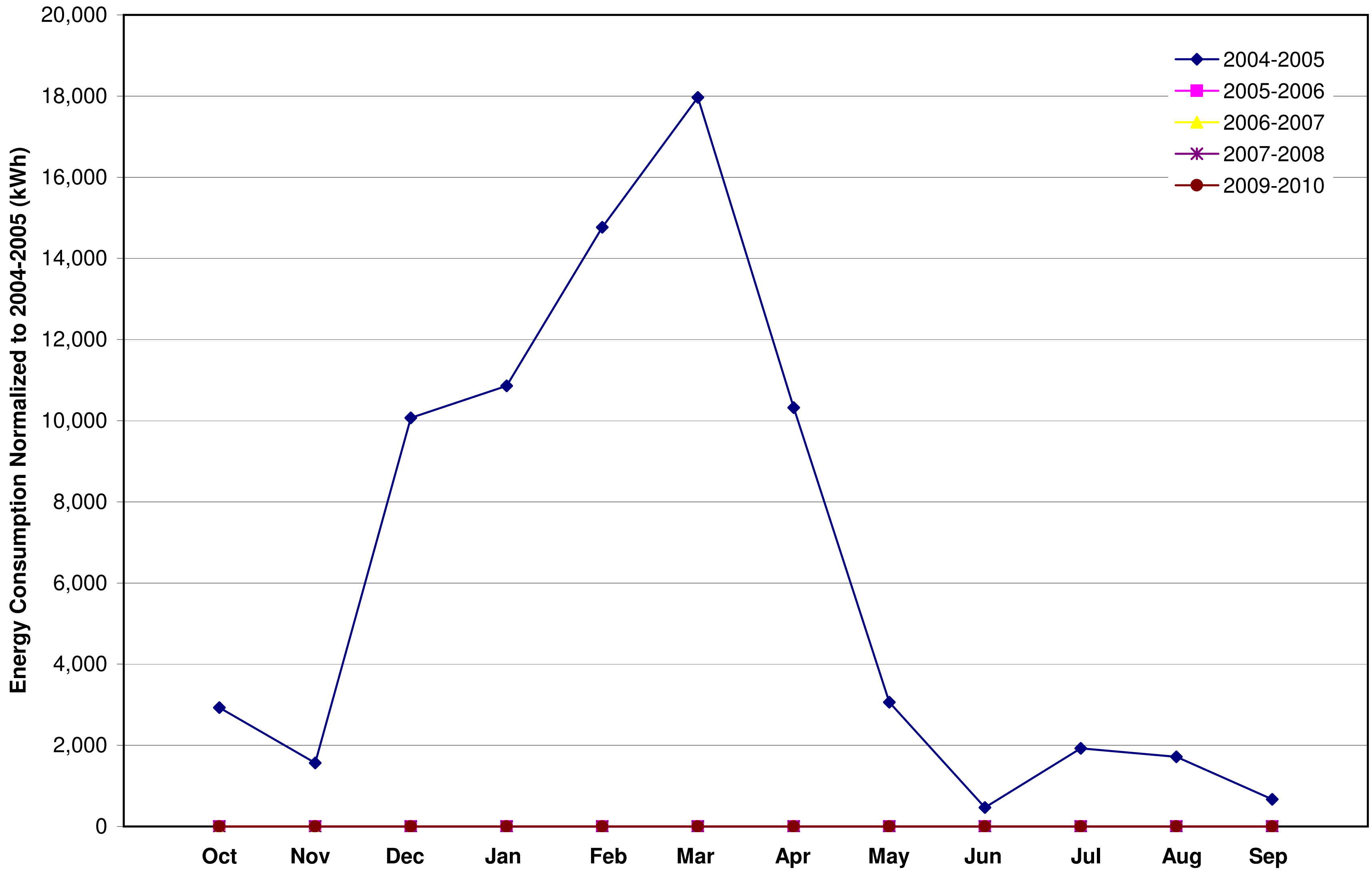


Table F.3 - Energy Consumption Monitoring Data for the Town Office

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	1,450	87	2,350	340.7	2,350			0		#DIV/0!			0		#DIV/0!
November	1,920	316	5,191	525.4	5,191			0		#DIV/0!			0		#DIV/0!
December	1,500	540	7,089	970.3	7,089			0		#DIV/0!			0		#DIV/0!
January	2,150	937	11,848	1116	11,848			0		#DIV/0!			0		#DIV/0!
February	1,530	759	9,385	816.7	9,385			0		#DIV/0!			0		#DIV/0!
March	1,310	635	7,882	735.1	7,882			0		#DIV/0!			0		#DIV/0!
April	1,530	501	6,715	293.2	6,715			0		#DIV/0!			0		#DIV/0!
May	1,500	246	4,046	214.9	4,046			0		#DIV/0!			0		#DIV/0!
June	1,340	87	2,240	41.3	2,240			0		#DIV/0!			0		#DIV/0!
July	2,140	3	2,171	12	2,171			0		#DIV/0!			0		#DIV/0!
August	1,090	81	1,928	20.5	1,928			0		#DIV/0!			0		#DIV/0!
September	1,750	28	2,040	89.5	2,040			0		#DIV/0!			0		#DIV/0!
TOTAL	19,210	4,220	62,886	5175	62,886	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.3 - Energy Consumption Monitoring Graph for the Town Office

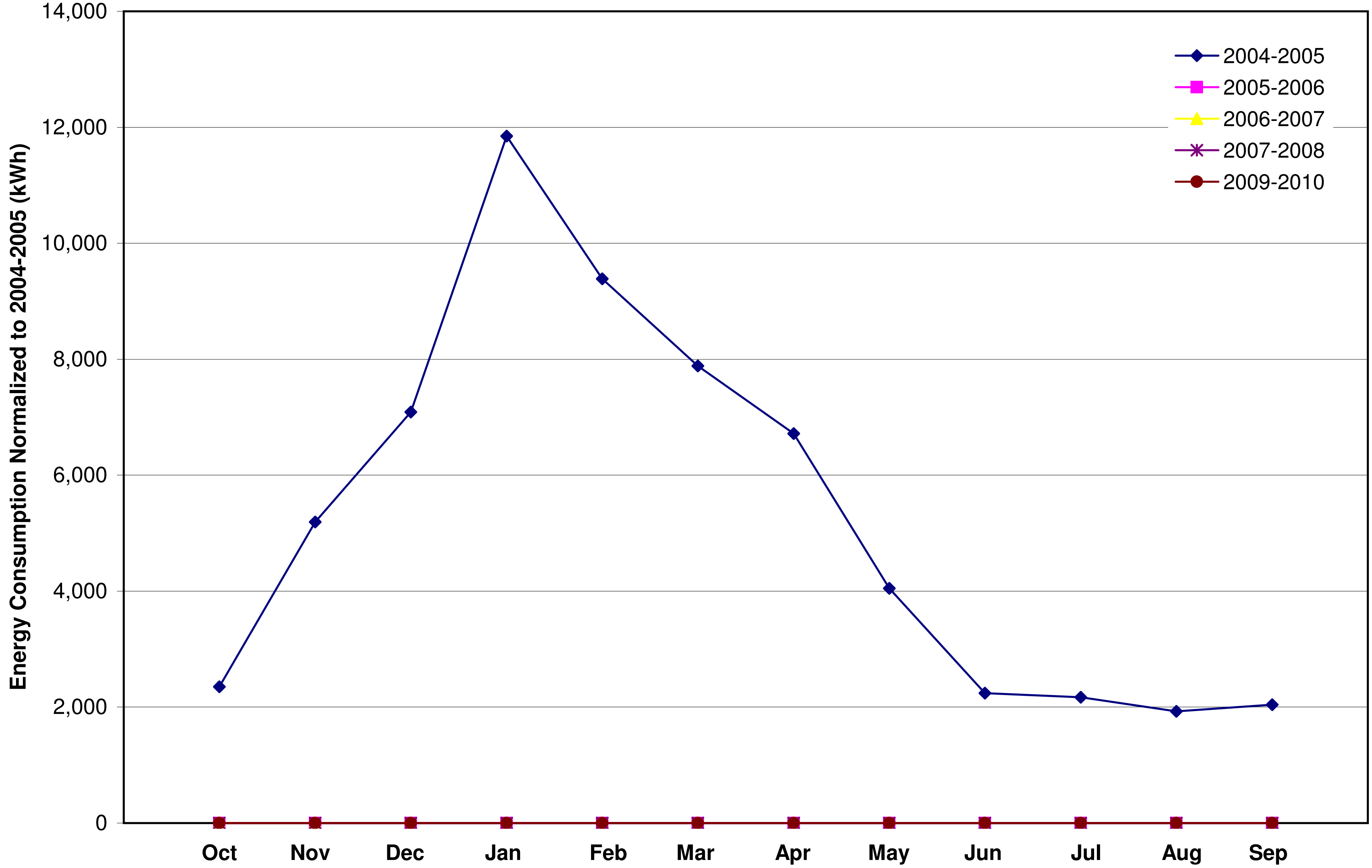


Table F.4 - Energy Consumption Monitoring Data for the Works & Operations, Fire Hall, and RCMP Office

Month	2004-2005					2005-2006					2006-2007				
	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
October	3,460	294	6,503	340.7	6,503			0		#DIV/0!			0		#DIV/0!
November	2,780	1,279	16,017	525.4	16,017			0		#DIV/0!			0		#DIV/0!
December	5,030	1,715	22,780	970.3	22,780			0		#DIV/0!			0		#DIV/0!
January	4,600	4,290	49,000	1116	49,000			0		#DIV/0!			0		#DIV/0!
February	6,880	2,954	37,453	816.7	37,453			0		#DIV/0!			0		#DIV/0!
March	3,890	2,723	32,072	735.1	32,072			0		#DIV/0!			0		#DIV/0!
April	4,360	784	12,474	293.2	12,474			0		#DIV/0!			0		#DIV/0!
May	2,880	909	12,288	214.9	12,288			0		#DIV/0!			0		#DIV/0!
June	4,090	129	5,425	41.3	5,425			0		#DIV/0!			0		#DIV/0!
July	1,980	0	1,980	12	1,980			0		#DIV/0!			0		#DIV/0!
August	3,520	76	4,307	20.5	4,307			0		#DIV/0!			0		#DIV/0!
September	1,980	132	3,346	89.5	3,346			0		#DIV/0!			0		#DIV/0!
TOTAL	45,450	15,285	203,645	5175	203,645	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Month	2007-2008					2008-2009					2009-2010				
	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.4 - Energy Consumption Monitoring Graph for the Works & Operations, Fire Hall, and RCMP Office

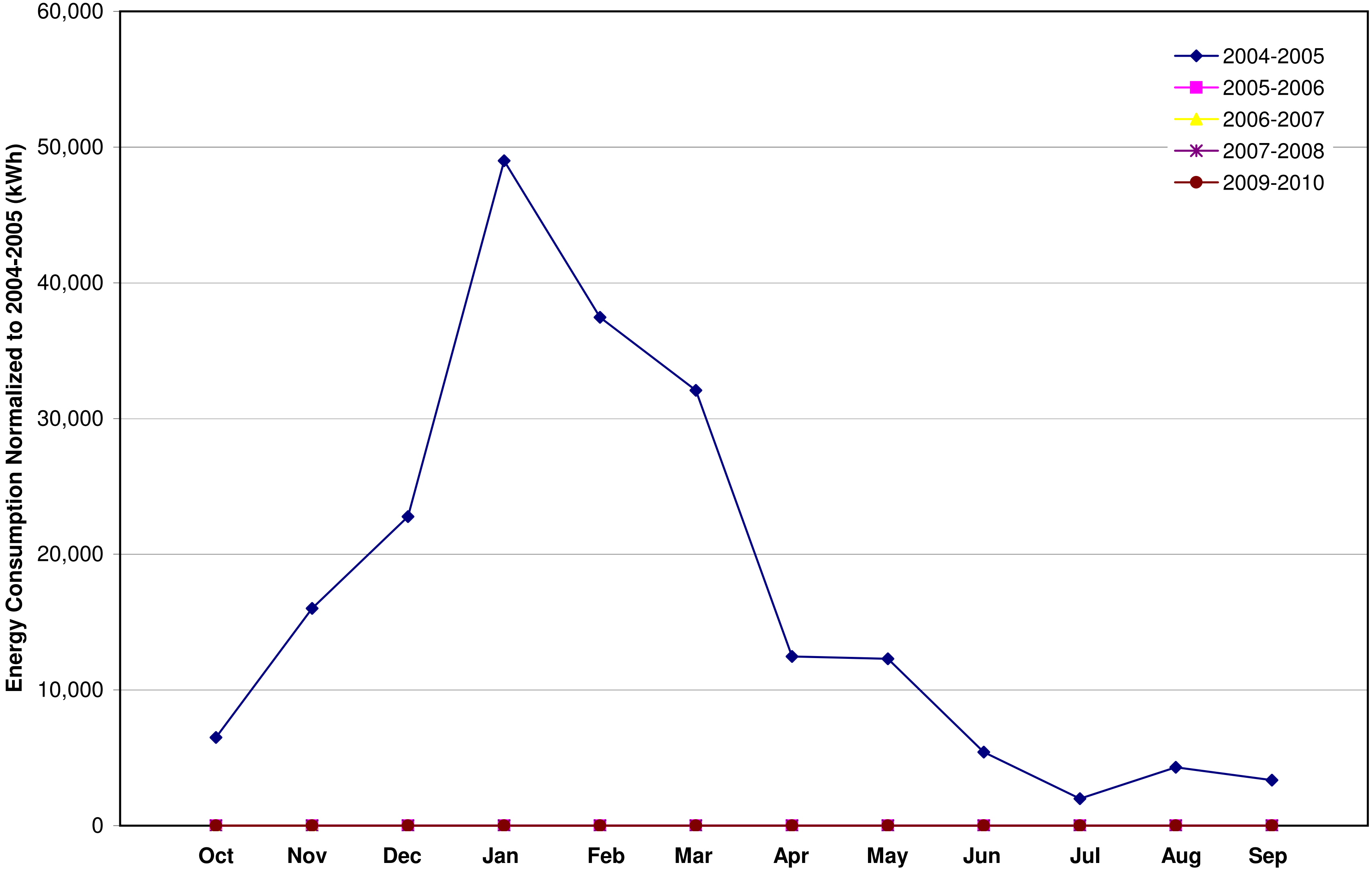


Table F.5 - Energy Consumption Monitoring Data for the Water Treatment Plant

	2004-2005					2005-2006					2006-2007				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
October	340	0	340	340.7	340			0		#DIV/0!			0		#DIV/0!
November	1,220	0	1,220	525.4	1,220			0		#DIV/0!			0		#DIV/0!
December	1,410	0	1,410	970.3	1,410			0		#DIV/0!			0		#DIV/0!
January	1,880	0	1,880	1116	1,880			0		#DIV/0!			0		#DIV/0!
February	1,950	0	1,950	816.7	1,950			0		#DIV/0!			0		#DIV/0!
March	830	0	830	735.1	830			0		#DIV/0!			0		#DIV/0!
April	1,270	0	1,270	293.2	1,270			0		#DIV/0!			0		#DIV/0!
May	890	0	890	214.9	890			0		#DIV/0!			0		#DIV/0!
June	10	0	10	41.3	10			0		#DIV/0!			0		#DIV/0!
July	1,500	0	1,500	12	1,500			0		#DIV/0!			0		#DIV/0!
August	10	0	10	20.5	10			0		#DIV/0!			0		#DIV/0!
September	1,650	0	1,650	89.5	1,650			0		#DIV/0!			0		#DIV/0!
TOTAL	12,960	0	12,960	5175	12,960	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.5 - Energy Consumption Monitoring Graph for the Water Treatment Plant

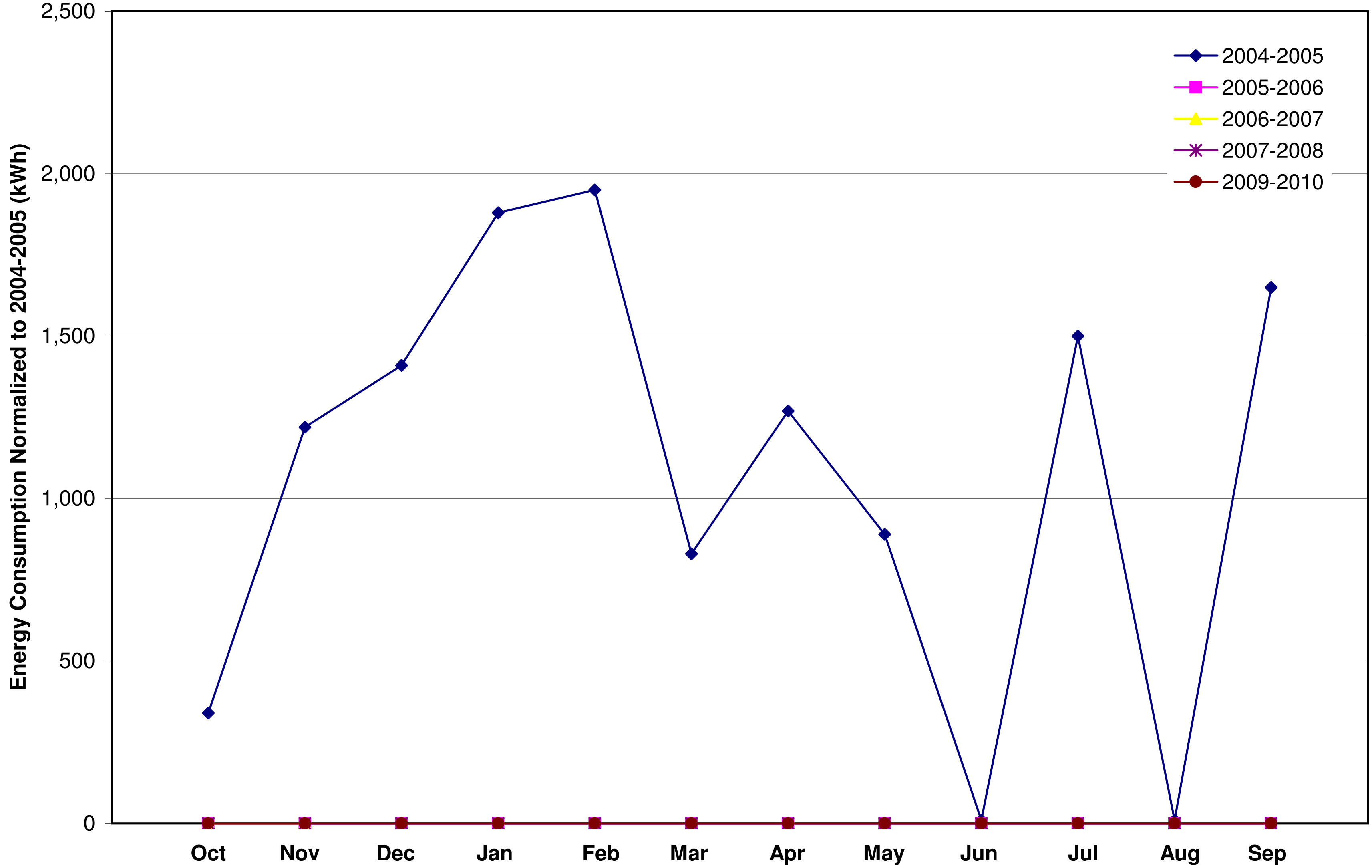


Table F.6 - Energy Consumption Monitoring Data for the Heritage Centre

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	7,920	427	12,339	340.7	12,339			0		#DIV/0!			0		#DIV/0!
November	29,280	839	37,963	525.4	37,963			0		#DIV/0!			0		#DIV/0!
December	36,080	3,013	67,264	970.3	67,264			0		#DIV/0!			0		#DIV/0!
January	31,760	7,682	111,266	1116	111,266			0		#DIV/0!			0		#DIV/0!
February	27,360	5,975	89,199	816.7	89,199			0		#DIV/0!			0		#DIV/0!
March	27,280	4,782	76,772	735.1	76,772			0		#DIV/0!			0		#DIV/0!
April	23,120	3,563	59,996	293.2	59,996			0		#DIV/0!			0		#DIV/0!
May	21,200	2,063	42,551	214.9	42,551			0		#DIV/0!			0		#DIV/0!
June	17,760	1,368	31,918	41.3	31,918			0		#DIV/0!			0		#DIV/0!
July	20,960	724	28,453	12	28,453			0		#DIV/0!			0		#DIV/0!
August	16,800	490	21,871	20.5	21,871			0		#DIV/0!			0		#DIV/0!
September	20,080	869	29,074	89.5	29,074			0		#DIV/0!			0		#DIV/0!
TOTAL	279,600	31,795	608,669	5175	608,669	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.6 - Energy Consumption Monitoring Graph for the Heritage Centre

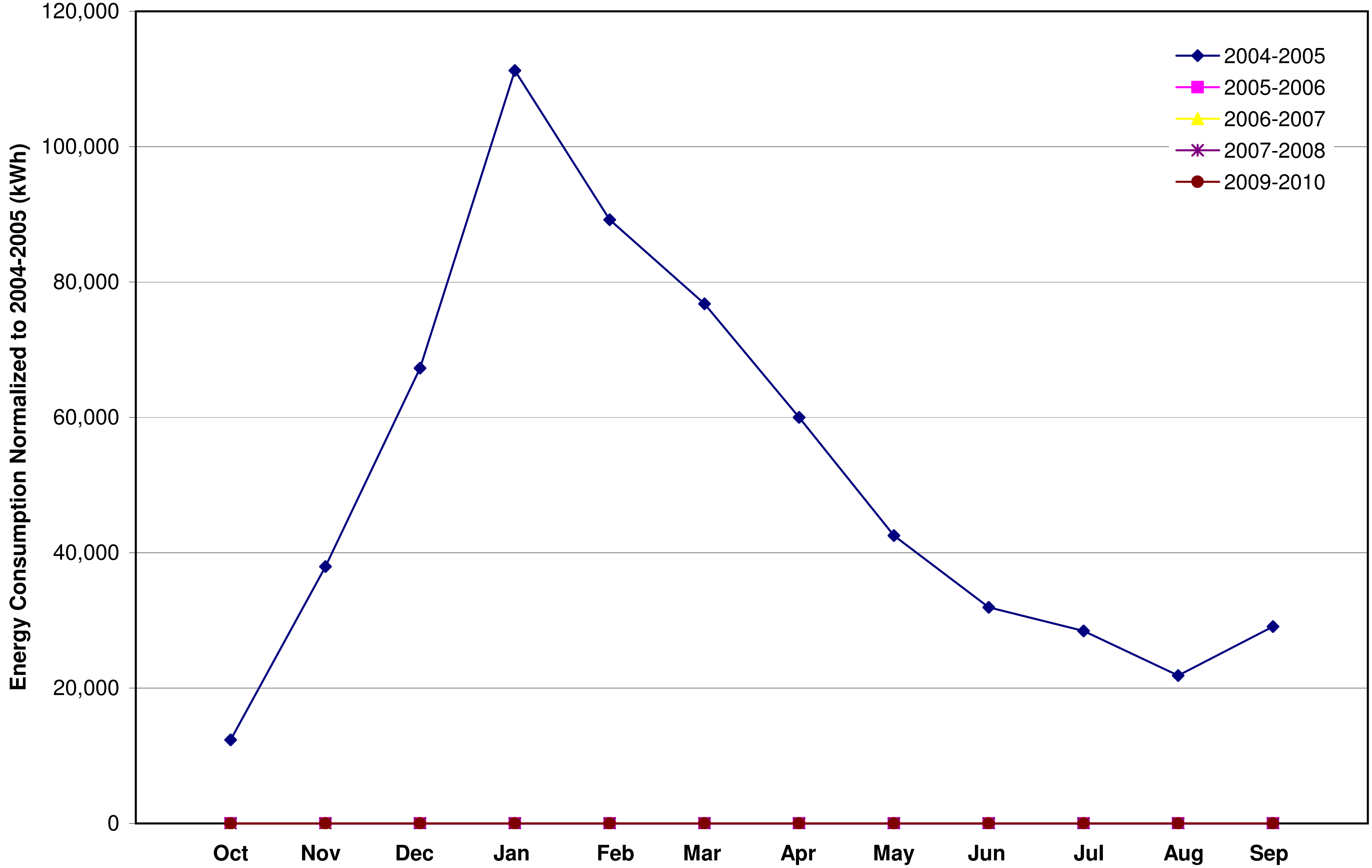


Table F.7 - Energy Consumption Monitoring Data for the Picnic Shelter

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	260	0	260	340.7	260			0		0			0		0
November	202	0	202	525.4	202			0		0			0		0
December	61	0	61	970.3	61			0		0			0		0
January	157	0	157	1116	157			0		0			0		0
February	61	0	61	816.7	61			0		0			0		0
March	132	0	132	735.1	132			0		0			0		0
April	229	0	229	293.2	229			0		0			0		0
May	674	0	674	214.9	674			0		0			0		0
June	62	0	62	41.3	62			0		0			0		0
July	923	0	923	12	923			0		0			0		0
August	62	0	62	20.5	62			0		0			0		0
September	569	0	569	89.5	569			0		0			0		0
TOTAL	3,392	0	3,392	5175	3,392	0	0	0	0	0	0	0	0	0	0

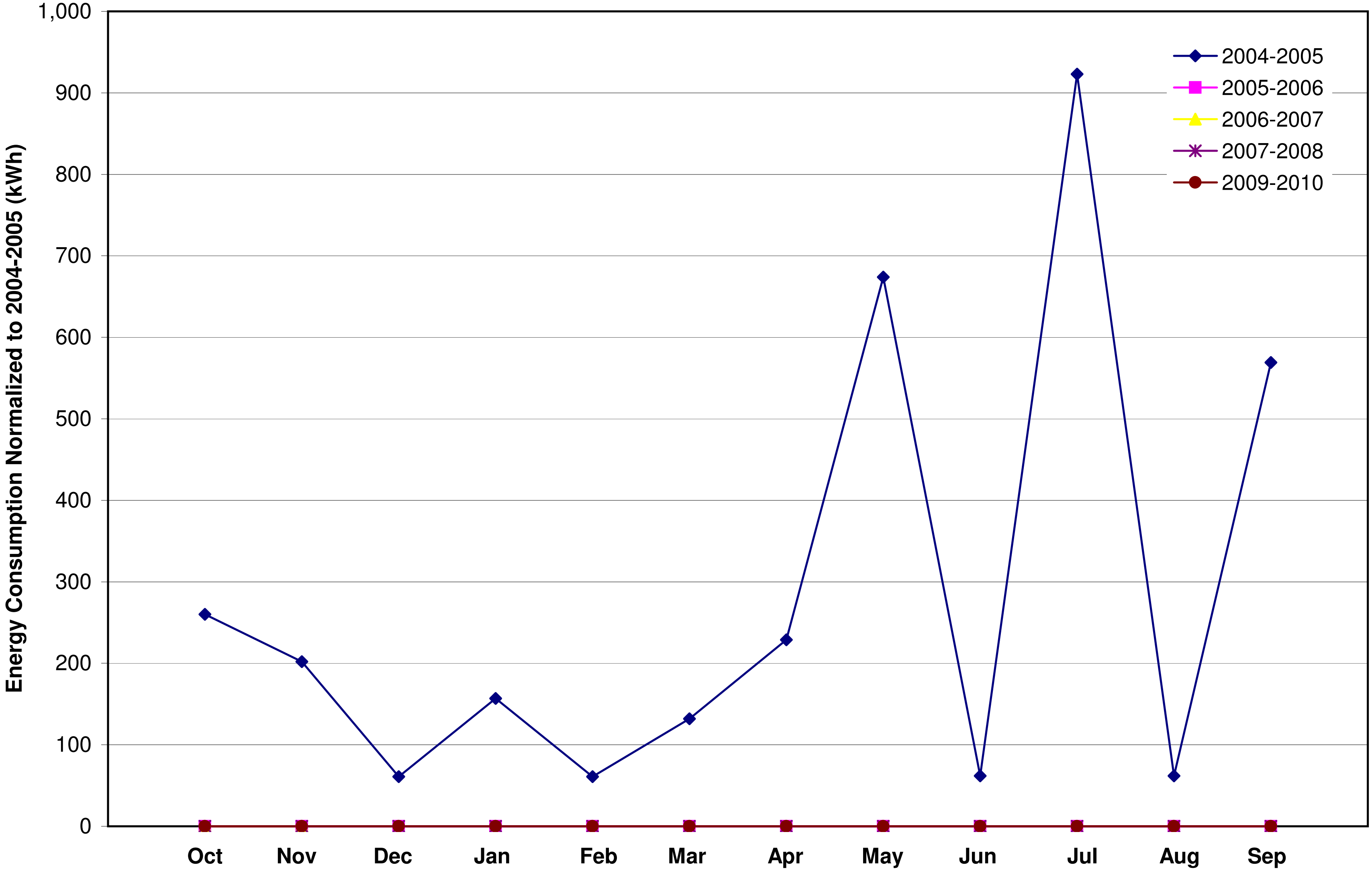
	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		0			0		0			0		0
October			0		0			0		0			0		0
November			0		0			0		0			0		0
December			0		0			0		0			0		0
January			0		0			0		0			0		0
February			0		0			0		0			0		0
March			0		0			0		0			0		0
April			0		0			0		0			0		0
May			0		0			0		0			0		0
June			0		0			0		0			0		0
July			0		0			0		0			0		0
August			0		0			0		0			0		0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F16) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.7 - Energy Consumption Monitoring Graph for the Picnic Shelter



Environment Canada Environnement Canada

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Daily Data Report for November 2005

Notes on Data Quality.

WINNIPEG THE FORKS
MANITOBA

Latitude: 49° 52' N Longitude: 97° 7' W Elevation: 230.00 m

Climate ID: 5023262 WMO ID: 71579 TC ID: XWN

Daily Data Report for November 2005

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days C	Cool Deg Days C	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
01†	8.8	2.8	5.8	12.2	0.0	M	M	0.0			<31
02†	10.5	1.1	5.8	12.2	0.0	M	M	0.4		29	37
03†	3.8	2.3	3.1	14.9	0.0	M	M	0.0			<31
04†	3.2	1.2	2.2	15.8	0.0	M	M	1.0			<31
05†	4.7	1.9	3.3	14.7	0.0	M	M	0.8			<31
06†	9.0	-1.5	3.8	14.2	0.0	M	M	0.0			<31
07†	6.2	0.5	3.4	14.6	0.0	M	M	0.0			<31
08†	4.0	-0.8	1.6	16.4	0.0	M	M	7.3		34	52
09†	2.6	-0.3	1.2	16.8	0.0	M	M	0.0		35	54
10†	8.9	-0.2	4.4	13.6	0.0	M	M	0.0			<31
11†	12.1	3.4	7.8	10.2	0.0	M	M	0.0			<31
12†	6.6	-0.2	3.2	14.8	0.0	M	M	0.0		2	41
13†	2.9	-4.2	-0.7	18.7	0.0	M	M	0.0		36	37
14†	0.9	-5.5	-2.3	20.3	0.0	M	M	1.8		7	39
15†	0.2	-9.5	-4.7	22.7	0.0	M	M	13.9		34	50
16†	-9.5	-17.1	-13.3	31.3	0.0	M	M	0.0		36	54
17†	-5.6	-20.3	-13.0	31.0	0.0	M	M	0.0			<31
18†	3.5	-7.4	-2.0	20.0	0.0	M	M	1.6			<31
19†	3.4	-2.9	0.3	17.7	0.0	M	M	0.7		35	37
20†	9.3	-1.3	4.0	14.0	0.0	M	M	0.0		27	32
21†	5.5	-2.4	1.6	16.4	0.0	M	M	0.0		36	43
22†	4.1	-3.2	0.5	17.5	0.0	M	M	0.0		19	32
23†	4.1	-13.4	-4.7	22.7	0.0	M	M	0.0		35	52
24†	-7.8	-13.5	-10.7	28.7	0.0	M	M	0.0		34	33
25†	-5.9	-10.6	-8.3	26.3	0.0	M	M	0.0			<31
26†	-4.0	-10.3	-7.2	25.2	0.0	M	M	0.0			<31
27†	-3.5	-10.0	-6.8	24.8	0.0	M	M	0.0		35	33
28†	-4.2	-11.4	-7.8	25.8	0.0	M	M	0.0		35	50
29†	-7.3	-11.3	-9.3	27.3	0.0	M	M	0.0		1	44
30†	-9.1	-12.6	-10.9	28.9	0.0	M	M	0.0			<31
Sum				**589.7**	**0.0**	**M**	**M**	**27.5**			
Avg	**1.9**	**-5.2**	**-1.7**								
Xtrm	**12.1**	**-20.3**								**35**	**54**

Legend

[empty] = No data available

M = Missing

F16

APPENDIX G

THE MUNICIPALITIES TRADING COMPANY OF MANITOBA LTD. REPORT

TABLE OF CONTENTS - APPENDIX G

Member Services

The Municipalities Trading Company of Manitoba Ltd. (MTCML) allows AMM members to purchase products and services at lower prices through the power of bulk buying. This year was another great success. Sales remained consistent and the stable pool of official suppliers continued to change and grow. The products sales have consistently remained between 6.5 and 7.4 million dollars for the last 4 years.

The MTCML provides a major source of revenue for the AMM and allows the AMM membership dues to remain one of the lowest in Canada. This past year, the MTCML was able to rebate another $350,000 to our members based on their MTCML sales, bringing the cumulative rebate over the past four years to $1,250,000.

M.T.C.M.L.

MTCML Official Suppliers

Official Suppliers are very important to the success of the MTCML. These suppliers offer hundreds of products and services that municipalities use. The Trading Company has individual contracts with each of these suppliers that ensure the best possible pricing for the purchasing members. In return, suppliers have direct contact with Manitoba's municipal market and can be a part of regular marketing opportunities through the AMM (mailings, Convention, trade shows, etc.) Each of our suppliers has shown long term commitment to the MTCML, creating a stable purchasing environment for the members of the AMM.

Corporate Members

At present fourteen companies make up the Corporate Members list of the AMM, five of these new for 2004/2005. These members assist the buying group in providing many services and hosting various events throughout the year.

> *Last year, the MTCML was able to rebate **$350,000** to our members based on their MTCML sales, bringing the total rebate over the past four years to **$1,250,000**.*

Major Programs

There are also two major buying programs offered by the Trading Company. These programs are owned by the AMM membership, managed by the AMM and each administered by a company that has expertise in the program area.

Petroleum Products Buying Group (PPBG)

AMM has entered into contracts with both Imperial Oil and Petro Canada, on behalf of all of our participating Members, for the supply of gasoline, diesel and lubricants. Our objective is to combat one-sided pricing advantages enjoyed by petroleum suppliers and to assist our Members to purchase fuel at a lower cost while still supporting the local fuel dealers. Currently there are 77 AMM Members who purchase over 6,000,000 litres of fuel each year and about 130 other municipalities in Saskatchewan and Alberta who purchase an additional 29,000,000 litres of fuel annually.

The concept of AMM purchasing large volumes of fuel on behalf of our Members and the careful analysis of industry pricing means fuel savings for member municipalities in all three provinces. At the same time, local fuel dealers are supported. The program is administered by Prairie Fuel Advisors Inc., who also act as our purchasing agent.

The only cost for joining the PPBG is 1.2¢ per litre for the fuel purchased and 10¢ per litre for lubricants. A municipality may withdraw from the PPBG at any time, and there is no cost to withdraw.

Member Services

M.T.C.M.L.

Insurance

All AMM members outside of Winnipeg participate in the insurance program, administered by Hayhurst Elias Dudek on behalf of the AMM. Coverage includes property/road machinery and equipment; crime (loss of money); comprehensive general liability; errors and omissions liability; environmental impairment (pollution) liability; fire vehicle insurance; plus accident insurance for Councils, fire departments, ambulance services, and other 'volunteers'.

A major part of the program is the $3,500,000 annual self-insurance loss pool that keeps premiums much lower than if individual municipalities purchased their own coverage. Insurance is purchased from various providers for coverage in excess of the $3,500,000 annual loss pool amount, to provide complete protection. This allows the opportunity for significant refunds in low-claims years.

Last year, the AMM was able to offer an average 5% reduction in our insurance rates. As well, as a result of excellent risk management by municipalities, the AMM was able to refund $918,000 to municipalities out of the insurance loss pool.

Official Suppliers have shown long-term commitment to the MTCML.

MTCML Official Suppliers

Acklands Grainger Inc.
Airmaster Sales
Armtec
Bridgestone Canada Inc.
CD Awards
Darwen Road Technologies Ltd.
Denray Tire
Dust Free Road Maintenance
Fort Distributors Ltd.
Grand & Toy
Guardian Traffic Services Manitoba Ltd.
Hayhurst Elias Dudek Inc.
Kal Tire
MTS
Michelin
Norquay Printers Ltd.
PCO Orkin Swat Team
Prairie Fuel Advisors Inc.
Shippam & Associates Inc.
Souris Rock Shop
Tirecraft
Westcon Equipment & Rentals
Westman Steel Industries

AMM Corporate Members

Borland Construction
Cochrane Engineering
Guertin Equipment
Hayhurst Elias Dudek
Innovative Municipal Products Inc.
Manitoba Aboriginal and Northern Affairs
Manitoba Heavy Construction Association
Manitoba Hydro
Manitoba Mixed Concrete Association
Manitoba Pork Council
Mazer Group Construction Equipment
Robert Watson, Attorney
Strong-Coley & Associates
Westcon Equipment & Rentals Ltd.