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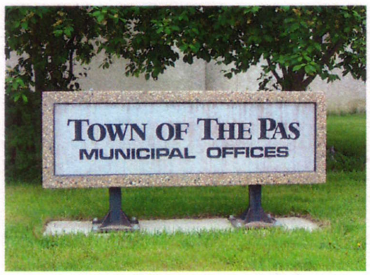

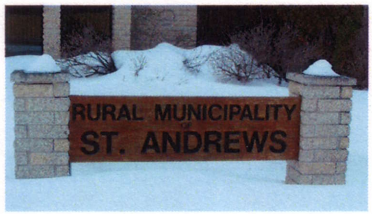

ASSOCIATION OF MANITOBA MUNICIPALITIES
MANITOBA MUNICIPAL ENERGY EFFICIENCY PROJECT
FINAL COMPARISON REPORT - REV. 1
JANUARY 2007

KGS GROUP

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

KGS GROUP

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January 5, 2007

File No. 05-1285-01-1000.13

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

ATTENTION: Mr. Tyler MacAfee

RE: Municipal Energy Efficiency Study Comparison Report

Dear Mr. Tyler MacAfee:

Enclosed is the Association of Manitoba Municipalities Energy Efficiency Project Final Comparison Report – Rev. 1. This revised version includes the final changes made to Flin Flon and the Pas. This submission effectively replaces the previous submission dated November 30, 2006.

Included with this submission are 8 hard copies of the report and 8 copies on compact disk in PDF format. The PDF file consists of the entire report, including the Executive Summary, Sections 1 to 5 and Appendix A and B.

We thank you for giving us the opportunity to work on this project.

Yours truly,

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

RBB/mg
Enclosure

STRUCTURAL▪GEOTECHNICAL▪ENVIRONMENTAL▪HYDRAULICS▪HYDROGEOLOGY▪MUNICIPAL▪MECHANICAL▪ELECTRICAL
3RD FLR. – 865 WAVERLEY ST., WINNIPEG, MANITOBA, R3T 5P4 PH: (204) 896-1209 FAX: (204) 896-0754
SUITE 301A, 1001 WILLIAM ST., THUNDER BAY, ONTARIO, P7B 6M1 PH: (807) 623-2195 FAX: (807) 473-5671

EXECUTIVE SUMMARY

The objective of this comparison report was to assess the energy usage in 159 buildings in 14 Municipalities throughout the Province of Manitoba. Buildings were grouped together in six classifications (arenas/community centres, curling rinks, community halls, fire halls, municipal offices and municipal shops) to compare energy usage in similar building types. In comparing energy densities and energy saving opportunities among similar building types, certain trends were observed and are discussed throughout this report.

The following summarizes common energy saving opportunities that were identified throughout the study:

- Lighting – Replacing the interior and/or exterior lighting with more energy efficient lights and fixtures. These upgrades resulted in better paybacks for building types that were occupied more often such as Municipal Offices and Municipal Shops.
- Envelope – This involves measures that would reduce the heat loss through the building's windows, doors, walls and roof. Older buildings benefited more from these upgrades; however, almost every building in the study required new weather-stripping or caulking on at least one window or door.
- Motors – Replacing low efficiency motors with higher efficiency motors. This upgrade was common for motors in ice plants in arenas and curling rinks.
- HVAC – Improving current heating, ventilating and air conditioning systems. Aside from Municipal Shops and Fire Halls where there was no potential for energy savings in improving ventilation systems due to currently low ventilation rates, these upgrades were recommended for most building types.

In addition to energy and cost savings, other benefits would result from these upgrades:

- 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).

This comparative analysis between similar building types allowed for differences and similarities to be discussed. A summary of the municipalities' views on the study is also included at the end of this report.

MMEP AUDITORS

Energy Audit:

Ray Bodnar
KGS Group
865 Waverley Street
Winnipeg, Manitoba, R3T 5P4
Phone: (204) 896-1209
Fax: (204) 896-0754
Email: Rbodnar@kgsgroup.com

Joel Lambert
KGS Group
865 Waverley Street
Winnipeg, Manitoba, R3T 5P4
Phone: (204) 896-1209
Fax: (204) 896-0754
Email: Jlambert@kgsgroup.com

Tibor Takach
KGS Group
Suite 310-2365 Albert Street
Regina, Saskatchewan, S4P 4K1
Phone: (306) 545-1777
Fax: (306) 545-1829
Email: Ttakach@kgsgroup.com

MMEP PARTNERS

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

FUNDING

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Sustainable Development Innovations Fund

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Additional support for the MMEP Project is provided by Manitoba Conservation, Sustainable Development Innovations Fund.

ACKNOWLEDGEMENTS

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

- Municipality of Birtle
- Town of Carberry
- Town of Carman
- Rural Municipality of Grahamdale
- Town of Niverville
- Municipality of Manitou
- Village of Cartwright and Rural Municipality of Roblin
- Town of Roblin
- Rural Municipality of Stanley
- Rural Municipality of St. Andrews
- Town of Swan River
- Rural Municipality of Whitemouth
- City of Flin Flon
- City of The Pas

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1.0 INTRODUCTION

1.1 BACKGROUND

An Energy study was completed on 159 buildings in 14 Municipalities throughout the Province of Manitoba. The study consisted of performing audits on each building, identifying energy saving opportunities and calculating energy savings, implementation costs and payback periods for each opportunity. The results from these studies were summarized in comprehensive reports, one for each Municipality and were presented to the individual Municipalities.

1.2 OBJECTIVES

The objective of the energy and water efficiency study was to determine energy, water and wastewater efficiency opportunities that could enable each Municipality to reduce operating costs, conserve resources and reduce greenhouse gas emissions. The goals for performance improvements in each Municipality were to decrease the average energy use by 35% and decrease water consumption by 30%.

The objective of this comparison report is to provide a summary of results for 159 buildings audited in the energy and water efficiency study. This will include a summary and comparison of the energy consumption and potential savings in the 14 municipalities included in the study and comparisons of similar building types found in each municipality. In comparing similar building types, the results were analyzed to determine trends found in common building types and common recommendations for each type of building.

1.3 SCOPE OF PROJECT

This report summarizes the current energy use indices for all of the buildings audited in the 14 Municipalities as well as existing energy saving measures in place at each building. The potential energy savings identified in the building audits are also included. The buildings have also been grouped together in classifications (ex: fire halls, municipal offices, public works shop, etc.) to compare energy usage in similar classifications as well as energy saving opportunities. The Municipalities' views on this study are also discussed.

2.0 ENERGY CONSUMPTION FOR AUDITED BUILDINGS

2.1 SUMMARY OF AUDITED BUILDINGS

A summary of all 159 buildings included in the audit for all 14 Municipalities is presented in Table 1. For each building, the age of the building, energy consumption, area, energy density and potential savings identified in the audits are displayed. The last column lists the energy efficiency measures that exist in the various buildings of each municipality.

Table 1: Summary of Audited Buildings in 14 Municipalities

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type*	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Birtle	Birtle District Community Centre	~ 1975	137	2,845	E	391,166	$21,681	80,792	$4,851	None
	Birtle Community Hall	1959	175	418	E	72,960	$5,139	22,654	$1,360	High pressure sodium lamps.
	Birtle Curling Club	Unknown	130	975	E	126,864	$6,886	32,141	$1,930	Insulated metal doors; timer on rink lighting.
	Fire Hall	1995	96	446	E	43,020	$3,104	26,792	$1,609	R20 insulation in walls; R40 insulation in roof; vehicle doors are insulated.
	Sewage Lift Station	1960	2,138	25	E	53,640	$3,917	13,193	$792	None
	Resource Centre CDC and Municipal Office	1997	164	437	E	71,600	$5,035	58,629	$3,520	New roof, walls and windows; heat recovery ventilators (HRVs).
	Municipal Garage	1982	306	171	E	52,240	$3,720	34,499	$2,071	Insulated vehicle doors.
	Birdtail Country Museum	1902	103	325	E	33,540	$2,421	16,254	$976	Upgraded roof insulation; some new triple pane windows.
	Recycling Depot	Unknown	460	18	E	8,200	$801	4,392	$264	None
	Tourist Information Building	~ 1900	34	137	E	4,690	$537	2,612	$157	Metal insulated doors.
	Water Treatment Plant	~ 1960	1,609	79	E	126,740	$8,594	26,104	$1,567	Insulated door.
	Reservoir	1976	1,612	34	E	54,060	$3,939	14,108	$847	None
	North Hill Booster Station	1976	1,193	20	E	23,860	$1,908	2,347	$141	None
	South Hill Booster Station	1988	220	20	E	4,400	$494	1,833	$110	None
	Total for Municipality			**5,949**		**1,066,980**	**$68,175**	**336,350**	**$20,195**	
	Average Percent Savings**							**41%**	**32%**	
Carberry	Office Building	~ 1990	232	336	E, NG	77,854	$4,540	32,791	$1,653	R20 insulated walls; R40 insulated roof; insulated metal door c/w weather stripping.
	Old Office Building	1907	625	192	E, NG	119,973	$5,905	103,746	$4,821	None
	Town Shop	~ 1970	278	432	E, NG	120,253	$5,456	98,271	$4,556	R40 insulated roof in areas; 2 good insulated new vehicle doors.
	Carberry Community Hall	1961	215	824	E, NG	177,374	$8,019	72,696	$3,431	new triple pane windows; high efficiency electric furnace c/w AC; high efficiency gas furnace; some new T5 indoor lighting.
	Museum Carberry Cultural Centre	~ 1935	121	480	E, NG	58,210	$3,011	22,623	$1,072	upgraded insulation in walls.
	Restroom Building	~ 1965	395	33	E	13,030	$1,091	7,571	$455	None
	Fire Hall	~ 1985	201	440	E, NG	88,326	$4,471	45,553	$2,106	R20 insulation in walls; low flow showers.
	Recycling Depot	~ 1965	200	390	E, NG	78,115	$3,655	27,600	$1,269	None
	Carberry Plains Community Centre	1971	282	4,081	E, NG	1,151,867	$56,204	289,460	$15,067	geothermal system; heated area walls have R20 insulation; R40 roof insulation over lounge area; some low flow water fixtures; some metal halide lighting; most outdoor lighting on photocells; LED exit signs.
	Total for Municipality			**7,208**		**1,885,002**	**$92,351**	**700,311**	**$34,430**	
	Average Percent Savings**							**51%**	**48%**	

Table 1: Summary of Audited Buildings in 14 Municipalities (Continued)

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type*	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Carman	Carman and Dufferin Arena	~ 1960	261	4,153	E, NG	1,082,782	$41,242	256,192	$12,254	LED exit signs; insulated piping in select areas.
	Fire Hall	~ 1955	465	203	E, NG	94,482	$4,660	29,028	$1,343	None
	Golden Prairie Arts Council	~ 1900	271	252	E	68,400	$4,764	80,415	$2,774	None
	Boyne Regional Library	1915	387	447	E, NG	172,955	$8,504	106,841	$5,068	None
	Municipal Garage	~ 1985	464	465	E, NG	215,909	$10,607	78,941	$3,834	None
	Municipal Landfill	Unknown	831	123	E, NG	101,790	$4,576	33,754	$1,556	None
	Museum	Unknown	67	401	E, NG	27,021	$1,589	8,001	$389	some walls have R20 insulation.
	Carman Aquatic Centre	Unknown	750	528	NG	396,104	$17,257	158,749	$7,259	natural gas boiler at 81% efficiency.
	Water Treatment Plant	Unknown	830	608	E, NG	504,938	$24,600	79,367	$4,171	some high efficiency motors.
	Total for Municipality			**7,180**		**2,664,381**	**$117,799**	**831,288**	**$38,648**	
	Average Percent Savings**							**43%**	**37%**	
Grahamdale	St. Martin Recreation Centre	1991	55	1,427	E	77,940	$5,166	37,225	$2,235	lobby walls have R20 insulation; hot water tank has pipe insulation.
	Camper Community Hall	1984	93	567	E	52,920	$3,761	8,309	$499	triple pane window; temperature manually turned down to 10°C when unoccupied.
	Moosehorn Community Hall	1970	152	592	E	90,168	$6,127	30,326	$1,821	R20 wall insulation; R40 roof insulation.
	Grahamdale Community Centre	~ 1975	140	603	E	84,172	$6,275	71,794	$4,310	R20 wall insulation.
	Faulkner Community Hall	~ 1990	97	708	E	69,024	$5,445	12,401	$745	R20 wall insulation; R50 roof insulation; temperature lowered to 15°C when unoccupied; new 2-stage furnaces.
	Steep Rock Community Hall	Unknown	25	353	E	8,940	$817	2,322	$139	None
	St. Martin Community Hall	~ 1985	177	557	E	98,784	$6,814	32,566	$1,955	R40 roof insulation; parts of the walls have R20 insulation; temperature kept at 18°C when unoccupied; auto flush urinals.
	Gypsumville Memorial Hall	1950	177	400	E	70,845	$5,099	63,663	$3,822	R20 wall insulation; R40 insulated sloped roof; some triple pane windows; count down timers on the exhaust fans; low flow sinks.
	Moosehorn Curling Rink	~ 1975	158	836	E	132,060	$7,930	70,748	$4,248	R20 fibreglass wall insulation; good insulation in roof; HRV for lobby area.
	Moosehorn Fire Hall	~ 1979	263	191	E	50,320	$3,595	24,837	$1,491	R20 batt insulation in the walls; R40 fibreglass insulation in roof; metal insulated doors c/w weather stripping.
	Gypsumville Fire Hall	~ 1984/1990	169	288	E	48,720	$3,476	4,686	$281	R20 fibreglass insulation in walls; overhead doors are well insulated and c/w weather stripping.
	Moosehorn Administration Building	~ 1965	163	150	E	24,478	$1,942	16,506	$991	one new door; some three pane windows.
	Moosehorn Heritage Museum	Unknown	18	327	E	5,930	$616	1,025	$62	None
	Camper New Horizons Seniors Centre	~ 1985	80	126	E	10,090	$892	2,294	$138	R25 wall insulation; R40 roof insulation; metal insulated doors; three pane windows; temperature lowered when building unoccupied.
	Moosehorn Senior Citizens Handicraft Centre	Unknown	99	265	E	26,320	$1,981	5,975	$359	some triple pane windows; programmable thermostat.
	Faulkner Seniors Centre	~ 1993	100	102	E	10,180	$899	3,716	$223	R20 wall insulation; R40 roof insulation; metal insulated doors; three pane PVC windows; temperature lowered when building unoccupied.
	Total for Municipality			**7,492**		**860,891**	**$60,836**	**388,393**	**$23,319**	
	Average Percent Savings**							**39%**	**32%**	

Table 1: Summary of Audited Buildings in 14 Municipalities (Continued)

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Niverville	Arena	1967	212	2,757	E, NG	583,979	$31,044	177,295	$8,746	some new windows; high efficiency gas furnace; premium efficiency compressor motors.
	Curling Rink	~ 1970	76	1,002	E, NG	76,315	$3,703	31,972	$1,486	insulated rink door; metal insulated doors; setback programmable thermostat; low flow urinal.
	Town Office	1956/1985	294	214	E, NG	62,886	$3,417	40,997	$1,986	new part of building has R20 wall insulation & R40 roof insulation; three pane windows.
	Works & Operations, Fire Hall, & RCMP	1988/1997	210	970	E, NG	203,635	$9,846	57,101	$2,907	R20 wall insulation; 94% efficient gas boiler; motorized dampers.
	Water Treatment Plant	2003	617	21	E	12,960	$1,089	5,690	$436	insulated metal doors c/w weather stripping; temperature lowered during winter season.
	Heritage Centre	1996/2002/ 2004	207	2,935	E, NG	608,669	$31,037	95,987	$4,591	R20 wall insulation; R40 roof insulation; some triple pane windows; one high efficiency gas furnace; programmable thermostats and LED exit signs.
	Picnic Shelter	2001	72	47	E	3,392	$554	1,786	$107	low flow urinals.
	Total for Municipality			**7,945**		**1,551,836**	**$80,690**	**410,828**	**$20,259**	
	Average Percent Savings**							**40%**	**33%**	
Manitou	Arena	~ 1972	132	2,453	E, P	322,720	$26,071	89,554	$6,373	R20 wall insulation in lobby; R48 insulation in attic; 3 geothermal heat pumps for space heating & cooling; metal halide lighting.
	Manitou Opera House	1930	247	260	E	64,200	$4,438	50,771	$3,048	primarily R20 wall insulation; acceptable roof insulation; 3 geothermal heat pumps; auto shut off sinks.
	Campground	~ 1995	276	23	E	6,410	$446	3,163	$190	None
	Child Care Centre	~ 1946	386	111	E	43,070	$3,113	15,786	$948	triple pane windows.
	Fire Hall & Municipal Garage	~ 1975	292	279	E, P	81,309	$6,826	51,847	$4,316	FH: R22 wall insulation; insulated vehicle door.
	Heritage Building	~ 1920	20	46	E	920	$278	513	$31	exterior lights are on timer.
	Library	1989	159	148	E	23,590	$1,801	20,599	$1,451	R22 wall insulation (not basement); R50 insulation in attic; triple pane windows; temperature setback.
	Sewage Lift Station	~ 1960	1,173	23	E	27,246	$1,917	4,252	$261	doors insulated; metal halide outdoor light.
	Municipal Adm. Bldg & Recycling Depot	1997	157	232	E	36,531	$2,683	16,401	$985	R28 wall insulation; triple pane windows; geothermal system to ground loop; HRV; low flow sinks.
	Swimming Pool	2003	113	415	E, P	47,047	$3,904	5,902	$354	R20 wall insulation; well insulated doors; geothermal heat pump for heating & cooling; heat saver pool chemical used to save water loss; process motors run during occupancy only.
	Water Treatment Plant	1963	670	144	E, P	96,716	$6,762	21,151	$1,270	metal insulated exterior doors; motorized air damper; one high efficiency distribution pump motor.
	Total for Municipality			**4,134**		**749,759**	**$58,239**	**279,939**	**$19,227**	
	Average Percent Savings**							**45%**	**36%**	

Table 1: Summary of Audited Buildings in 14 Municipalities (Continued)

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type*	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Cartwright & Roblin	Water Treatment Plant	~ 1960	666	138	E	91,960	$6,473	23,582	$1,416	new roof; insulated double door set; high pressure sodium light.
	Sewage Lift Station	~ 1960	1,642	9	E	14,790	$1,510	1,007	$60	insulated walls and roof; motorized dampers.
	Cartwright Centennial Auditorium	1967	177	511	E	90,480	$6,498	16,808	$1,009	LED exit signs; water to air heat pumps.
	Cartwright Community Centre Arena	1959	88	1,763	E	155,700	$10,961	36,960	$2,234	Geothermal heating & cooling for ice plant; metal halide & T8 lighting; LED exit signs.
	Cartwright Curling Rink	1999	178	362	E	64,560	$3,815	4,772	$286	R20 fibreglass batt insulation in walls; R40 blow-in insulation in roof; insulated pedestrian doors; geothermal heat pump; soft water collected from roof for ice flooding; some indoor T8 lighting; ice temperature sensor; uniform ice thickness maintained.
	Municipal Office Building	1957	163	206	E	33,610	$5,035	17,479	$1,049	triple pane windows.
	Municipal Shop	1987	175	362	E	63,480	$4,266	42,654	$2,561	R20 fibreglass batt insulation in walls.
	Lakeland Regional Library	~ 1930	184	107	E	19,660	$1,535	8,011	$481	R20 insulation in walls; R40 insulation in roof.
	Fire Hall & Ambulance Garage	~ 1990	136	325	E	44,110	$3,079	7,536	$452	R20 insulated walls; R40 insulated roof; triple pane windows; temperature manually lowered in training room & shop when unoccupied; low flow sinks.
	Mather Skating Rink	1967	39	1,895	E	73,860	$4,896	48,822	$2,931	relatively new electric forced air furnace.
	Mather Hall	Unknown	152	254	E	38,700	$2,821	3,968	$238	R20 (parts R40) insulated walls; R40 insulated roof; metal insulated back pedestrian door.
	Recycling Depot	1959	22	80	E	1,800	$336	882	$53	heated to 60°F during occupancy only; LED exit signs; outdoor light on sentinel.
	Total for Municipality			**6,012**		**692,710**	**$51,225**	**212,481**	**$12,770**	
	Average Percent Savings**							**32%**	**23%**	
Roblin	Large Arena & Small Arena	1970	99	3,835	E, NG	379,312	$18,324	253,254	$15,036	metal halide lights in rink area.
	Swimming Pool Office, Change Rooms & Plant Room	1999	1,585	248	E, NG	393,083	$16,444	100,297	$4,626	82% efficient gas pool boiler.
	Community Centre	1995	199	1,346	E, NG	267,836	$13,328	15,566	$935	R20 insulated walls; R40 insulated roof; programmable thermostats; ventilation shut off during unoccupied times; all low flow water fixtures; T8 and high pressure sodium lighting; occupancy sensors for washroom lights; photocells for outdoor lights.
	Library	1984	224	234	E, NG	52,547	$3,162	26,008	$1,379	pedestrian door with insulation & weather stripping; programmable thermostat.
	Town Administration Building	1984	195	368	E, NG	71,742	$4,116	33,395	$1,753	
	Recycling Depot	~ 1960	281	467	E, NG	131,458	$5,678	100,298	$4,666	one vehicle door with good insulation & weather stripping; back draft damper.
	Fire Hall	1978	365	446	E, NG	162,897	$7,575	68,066	$3,373	R20 insulated walls; pedestrian doors are well insulated c/w weather stripping; back draft damper on wall exhaust fan; low flow toilets & urinal.
	Public Works Shop	1962	460	301	E, NG	138,505	$6,510	88,523	$4,348	None
	Water Treatment Plant	1959	2,437	110	E, NG	268,084	$13,237	55,951	$2,860	new roof but no insulation upgrade; VFDs; high pressure sodium & metal halide exterior lights.
	Lift Station #1	1959	3,276	23	E	76,691	$5,480	47,743	$2,867	metal insulated pedestrian door.
	Lift Station #2	2000	389	21	E	8,100	$847	2,746	$165	metal insulated pedestrian door.
	Pumphouse #1	1985	4,813	20	E	96,580	$6,134	20,737	$1,245	R20 wall insulation; metal insulated double doors c/w weather stripping; motorized damper; metal halide exterior light.

Table 1: Summary of Audited Buildings in 14 Municipalities (Continued)

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type*	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Cont'd Roblin	Pumphouse #2	1985	3,832	20	E	76,900	$5,442	21,068	$1,265	R20 wall insulation; metal insulated double doors c/w weather stripping; motorized damper; metal halide exterior light.
	Campground Office	~ 1980	119	69	E	8,200	$775	5,787	$361	None
	Total for Municipality			**7,508**		**2,131,935**	**$107,052**	**839,439**	**$44,879**	
	Average Percent Savings**							**44%**	**41%**	
Stanley	Municipal Office Building	~ 1940	538	378	E, NG	203,368	$9,357	75,687	$3,782	metal insulated rear pedestrian door; some triple pane windows; high pressure sodium/metal halide exterior lighting on sentinel.
	Municipal Shop	1988	164	585	E, NG	95,958	$5,514	66,721	$3,279	R28 wall insulation; all overhead & pedestrian doors are insulated; triple pane windows; HRVs on humidistat; low flow urinal; high pressure sodium lights for exterior.
	Total for Municipality			**963**		**299,326**	**$14,871**	**142,408**	**$7,061**	
	Average Percent Savings**							**53%**	**50%**	
St. Andrews	Old Fire Hall	1974	223	141	E	31,520	$2,333	19,964	$1,199	3 new insulated pedestrian doors; low flow sink.
	Fire Hall #1	1985	332	321	E, NG	106,669	$4,613	50,758	$2,370	R20 insulated walls; pedestrian & vehicle doors are insulated; triple pane windows.
	Municipal Administrative Building	1988/1911	273	673	E, NG	183,358	$10,342	75,440	$3,846	Office has R28 perimeter insulation (walls); doors are all in good condition & insulated; some triple pane windows; back draft dampers; low flow toilets.
	Municipal Repair Shop	~ 1960	348	465	E, NG	161,831	$7,191	131,412	$6,182	motorized intake dampers; back draft dampers; outdoor lighting on photocell.
	Fire Hall #2	1991	402	733	E, NG	294,807	$13,343	129,831	$6,037	R24 insulated walls; triple pane windows; high efficiency furnaces in meeting room & lounge areas; emission detectors.
	Northend Fire Hall #3	1995/1975	265	907	E, NG	240,278	$11,525	65,711	$3,065	92% efficient gas furnace in meeting room.
	St. Andrews Community Club	~ 1954	247	3,135	E, NG	775,735	$35,659	118,945	$5,643	new RTUs c/w economizers for heating & cooling; 80% efficient gas furnace; some auto shut off sinks; LED exit signs; metal halide lights in rink; some T8 lighting in washrooms w/ occupancy sensors; ice plant dumps ice outside building.
	Petersfield Curling Club	1991	286	1,737	E, NG	496,370	$23,078	123,131	$5,731	R20 insulation in perimeter walls; some insulated metal doors c/w weather stripping; back draft damper on wall fan in ice room.
	Total for Municipality			**8,112**		**2,290,568**	**$108,083**	**715,192**	**$34,073**	
	Average Percent Savings**							**43%**	**42%**	
Swan River	Municipal Administration Buildings	~ 1940	281	372	E	104,400	$6,950	52,008	$3,123	some triple pane windows; RTU c/w economizer; HRV for offices; exhaust fan in basement c/w back draft damper.
	Town Garage	1974	469	637	E, NG	298,621	$15,099	229,580	$10,524	vehicle & pedestrian doors are insulated c/w weather stripping; triple pane windows; T8 indoor lighting.
	Water Plant & Lift Station #1	~ 1974	1,857	257	E, NG	477,238	$27,099	102,914	$4,708	wall & roof insulation upgraded; overhead door insulated; some high efficiency indoor lighting; three distribution pump motors are high efficiency premium motors; VFD; backwash pump motor high efficiency type; metal insulated pedestrian door; temperature lowered during winter months; exterior metal halide light.
	Lift Station #2	Unknown	1,210	9	E	11,240	$1,054	3,900	$234	metal insulated pedestrian door c/w weather stripping; temperature lowered during winter months, exterior metal halide light.
	Lift Station #3	~ 1970	1,603	9	E	14,890	$1,301	4,217	$253	metal insulated pedestrian door c/w weather stripping; temperature lowered during winter months, exterior metal halide light.

Table 1: Summary of Audited Buildings in 14 Municipalities (Continued)

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type*	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Cont'd Swan River	Lift Station #4	Unknown	1,758	9	E	16,336	$1,398	1,960	$118	metal insulated pedestrian door c/w weather stripping; temperature lowered during winter months, exterior metal halide light.
	Lift Station #5	Unknown	622	9	E	5,780	$668	744	$45	metal insulated pedestrian door c/w weather stripping; temperature lowered during winter months, exterior metal halide light.
	Centennial Arena	1967	300	3,398	E, NG	1,018,910	$60,063	123,011	$7,451	non-rink areas have R20 insulated walls & R40 insulated roof; some new insulated doors; HRV in dressing rooms; back draft dampers & motorized intake dampers; T8 lighting present; LED exit signs; high efficiency brine pump & fan condensers; ice temperature sensor.
	Swim Pool Outdoor	1973	330	498	E, NG	164,107	$8,731	37,609	$1,939	back draft damper in washrooms' exhaust fans; one efficient exit sign.
	Town Fire Hall	1974	405	307	E, NG	124,291	$7,391	60,395	$2,867	setback thermostats available.
	Library	2002	134	610	E, NG	81,636	$5,073	39,486	$2,187	R20 insulated walls; R40 insulated roof; doors well insulated and weather stripped; triple pane and high efficiency double pane windows; high efficiency gas furnaces; A/C and HRV; T8 lighting with occupancy sensors in washrooms; outdoor lighting on photocell; LED exit sign.
	Total for Municipality			**6,115**		**2,317,449**	**$134,827**	**655,824**	**$33,449**	
	Average Percent Savings**							**33%**	**28%**	
Whitemouth	Municipal Office Building	~ 1935	296	256	E	75,815	$4,868	44,135	$2,650	R40 insulated roof; most doors are metal and well insulated; a few triple pane windows; temperature manually setback in council chamber when unoccupied; low flow sinks & urinal; high pressure sodium/metal halide lighting.
	Municipal Shop #1	~ 1972	155	245	E	38,078	$2,399	19,365	$1,163	R20 insulated walls; doors well insulated; metal halide outdoor light.
	Municipal Shop #2	~ 1960	4	178	E	797	$108	0	0	metal halide outdoor light.
	Hospital St. Lift Station	Unknown	185	9	E	1,720	$417	0	0	None
	Short St. Lift Station	Unknown	868	9	E	8,060	$846	0	0	None
	Small Garage	1978	163	36	E	5,910	$613	3,230	$194	insulated pedestrian door.
	Fire Hall	~ 1940	290	164	E	47,470	$3,404	20,807	$1,249	new metal insulated pedestrian door.
	Waterline Pumphouse	~ 1994	1,797	25	E	44,930	$3,333	1,232	$74	insulated pedestrian doors; temperature kept at 50°F during winter months; high pressure sodium/metal halide light.
	Waste Management Facility #1	1997	145	398	E	57,830	$3,541	16,717	$1,007	R20 insulated walls; R40 insulated roof; one well insulated overhead door; double pane PVC windows;low flow urinal & sink; high pressure sodium/metal halide exterior lights.
	Waste Management Facility #2	1998	212	515	E	109,100	$6,680	76,540	$4,595	R20 insulated walls; R40 insulated roof; overhead doors well insulated; one insulated pedestrian door; high pressure sodium/metal halide exterior lights.
	Total for Municipality			**1,835**		**389,710**	**$26,209**	**182,026**	**$10,932**	
	Average Percent Savings**							**31%**	**27%**	
Flin Flon	Airport Terminal	1969	719	292	E, P,O	210,193	$15,032	89,490	$6,071	insulated vehicle door.
	Airport Garage	1970	529	281	E, P,O	148,638	$10,625	101,123	$6,971	low flow sink.
	Sweeper Building & Sand Storage	1970	2,124	221	E, P,O	468,682	$26,899	95,615	$5,894	new triple pane window (Sweeper Building).
	Whitney Forum (Arena)	1960	1,025	2,868	E, P,O	2,939,677	$181,551	575,801	$32,839	6" wall insulation added; R30 insulated roof; HRV in dressing rooms; 4 new electric tanks in dressing rooms c/w demand control; primarily low flow water fixtures w/ auto shut off feature; T8 lighting in dressing area; metal halides in rink; some compact fluorescents & upgraded exit signs; shaved ice dumped outside already; high efficiency compressors & brine pumps; brine pumps on ice temperature sensor; high efficiency condenser fan.

Table 1: Summary of Audited Buildings in 14 Municipalities (Continued)

Municipality	Building	Year Constructed	Energy Density (kWh/m^2)	Area (m^2)	Energy Type*	TOTAL ENERGY CONSUMPTION IN 2005		POTENTIAL ANNUAL SAVINGS		Existing High Efficiency Components
						kWh	Cost ($)	kWh	Cost ($)	
Cont'd Flin Flon	Community Centre	1958	275	2,212	E, P,O	607,624	$36,930	432,778	$24,861	triple pane slider windows on third floor; AHU c/w economizer for Senior's Centre.
	Aqua Centre (Fitness Centre)	1974	902	1,050	E, P,O	947,171	$50,054	63,527	$4,081	None
	Flin Flon Public Library	1967	517	417	E, P,O	215,310	$13,815	74,878	$4,496	RTUs have economizers; furnaces have economizers; 7 day time clock on A/C units.
	Public Safety Building - RCMP Offices	1980	468	1,074	E, P,O	502,740	$26,801	108,381	$6,542	R20 insulated walls; R30 insulated roof; triple pane windows; countdown timer on RCMP washroom exhaust fans; truck bay exhaust c/w motorized dampers to intake; some low flow toilets; high efficiency exit sign; AHU c/w economizer.
	City Hall	1983	255	1,051	E, P,O	268,320	$15,711	62,968	$3,781	R30 insulated walls; R49 insulated roof; triple pane windows; RTUs c/w economizer; energy efficient exit signs.
	Sewage Treatment Plant	2005	615	841	E, P,O	517,055	$34,679	29,536	$2,031	R-20 insulated walls; R-40 insulated roof; insulated doors; T8 lighting; high pressure sodium lighting; LED exit signs; high efficiency motors; instantaneous water heaters.
	Cliff Lake - Water Treatment Plant	~ 1950	7,109	67	E, P,O	478,440	$28,147	77,397	$4,647	exterior metal halide lights; motorized dampers.
	Heating Plant #1	~ 1950	19,661	168	E, P,O	3,295,130	$183,425	1,155,797	$65,408	exterior metal halide lights.
	Heating Plant #2	~ 1950	20,888	134	E, P,O	2,794,812	$155,286	1,134,132	$64,107	high efficiency motors.
	Heating Plant #3	~ 1950	1,163	146	E, P,O	170,110	$10,927	46,267	$2,904	motorized dampers; some high efficiency pumps.
	Total for Municipality			**10,822**		**13,563,901**	**$789,883**	**4,047,690**	**$237,265**	
	Average Percent Savings**							**30%**	**30%**	
The Pas	Arena	1976	265	4,071	E,P	1,079,910	$52,225	104,035	$5,602	R27 insulated walls; insulated doors; DDC control on HVAC; countdown timer on vent; CO2 & CO sensors in rink; new propane water heater c/w storage tanks; low flow toilets; auto shutoff low flow showers; midflow sinks; all T8 & metal halide lighting; all energy efficiency exit signs.
	Campground	Unknown	226	144	E	32,610	$2,428	7,907	$541	metal insulated exterior doors c/w weather stripping.
	Curling Rink	1976	327	1,304	E,P	426,187	$25,076	85,472	$6,104	insulated pedestrian door.
	Fire Hall & Municipal Admin. Building	1971	323	1,145	E,P	369,708	$22,696	170,071	$10,522	R24 insulated walls; compact fluorescent light; some new double pane windows; A/C only RTU on timer; countdown timer on chamber ventilation; exhaust fans in washrooms.
	Friendship Centre	1971	207	508	E	105,000	$7,172	56,171	$3,319	None
	Library	1929	586	246	E	144,240	$9,225	106,005	$6,364	None
	Municipal Garage	1974	147	802	E	118,249	$8,139	80,746	$4,200	insulated metal overhead & pedestrian doors; T8 lights; high pressure sodium/metal halide lights; compact fluorescents.
	Museum	Unknown	182	1,113	E	203,040	$12,765	140,518	$8,437	metal & wood insulated pedestrian doors.
	Swim Pool Indoor	1970	482	632	E	304,920	$17,086	18,381	$1,104	2 auto shutoff sinks; metal halide/high bay lights in pool.
	Water Treatment Plant	Unknown	2,205	780	E,P	1,719,660	$89,153	127,353	$7,403	some high pressure sodium/metal halide lights.
	Total for Municipality			**10,003**		**4,503,524**	**$245,964**	**896,660**	**$53,596**	
	Average Percent Savings**							**38%**	**35%**	
TOTALS						**34,967,972**	**$1,956,204**	**10,638,829**	**$587,477**	

* In the "Energy Type" column, E represents electrical energy, NG represents natural gas, P represents propane and O represents fuel oil.

** The "Average Percent Savings" is the average of all the individual buildings' percent savings in each Municipality.

2.2 ENERGY EFFIENCY TRENDS BETWEEN BUILDINGS

As shown in Table 1, differences exist between Municipalities and between building types when it comes to energy efficiency. Buildings constructed in the last 10 years are generally more energy efficient than older buildings. Some older buildings have been upgraded while others remain unchanged since their construction 30 years or more ago. Buildings such as water treatment plants and pumping stations have very large energy densities as a result of their small building area and high horsepower equipment. The following is a brief summary of each Municipalities' data, explanations for different energy densities, and comparisons with other Municipalities.

Town of Birtle:

All 14 buildings audited in Birtle strictly used electric energy. Three of the buildings are approximately 100 years old, four approximately 50 years old and five in the 35 year range. Only two of the buildings were built in the last 10 years. The buildings had few existing high efficiency components. Due to their age few of the buildings had the appropriate insulation in the walls and roof; R20 and R40 respectively. Others had insulated doors, some high efficiency lighting, triple pane windows and low flow water fixtures.

Town of Carberry:

In the 9 buildings audited in Carberry, a combination of electricity and natural gas fuels were used. Five of the buildings were well over 40 years in age, including the Old Office Building which is considered a heritage building at nearly 100 years old. Four buildings were constructed in the last 35 years. Many of the 9 buildings have had renovations since their original construction including adding a geothermal heating system in Carberry Plains Community Centre, new insulation and energy efficient lighting in the Carberry Community Hall and minor upgrades in both the Office and Old Office Buildings.

Town of Carman:

Nine buildings were inspected for the energy audit in the Town of Carman. A combination of electricity and natural gas was used by these buildings. Four of the buildings have an unknown construction age. Two of the facilities, the Golden Prairie Arts Council and Boyne Regional Library are considered heritage type buildings at nearly 100 years in age. Only one building, the

Municipal Garage, was built in the last 25 years. Many of the audited buildings have no existing high efficiency building components, and thus have high potential energy saving opportunities. In addition, several of the facilities are occupied for a minimum number of hours, despite their high energy consumption.

R.M. of Grahamdale:

Twenty buildings were audited from this RM, all using electric energy exclusively. Half of the audited buildings are over 35 years in age, whereas the rest are less than that. Many of the facilities have been renovated, including insulation upgrades, addition of new efficient furnaces, triple pane windows and insulated doors. Despite the presence of existing energy efficient building components, there remains high potential for savings in the buildings due to their large sizes and current consumption.

Town of Manitou:

A combination of electric energy and propane was used by the 14 buildings audited in the Town of Manitou. Six of the buildings have been built in the last 20 years, whereas others are significantly older. The latter group have had recent renovations performed, including upgrading wall and roof insulations, installing a geothermal heating system in both the Arena and Manitou Opera House and some general mechanical upgrades. Except for the Campground Facility which is only operational during the summer season, the remainder of the buildings have existing high efficiency building components in them.

Town of Niverville:

Natural gas and electricity were used by the nine audited buildings in Niverville. Several of the buildings have been renovated with upgrades to various building components including insulation and adding geothermal heating systems. All of the buildings have existing high efficiency building components. Therefore, potential energy savings may seem lower then other Municipalities since the Town of Niverville has already implemented several of the energy saving opportunities prior to this audit. Only one building, the Town Office, is older then 50 years. Three were constructed in the last 10 years and three fall in the 20-40 year range.

Village of Cartwright & R.M. of Roblin:

Of the 14 buildings audited in this Municipality, only two were constructed in the last 16 years. All of the facilities use electricity and have existing high efficiency components. Therefore, for several of the facilities potential energy saving opportunities were limited and below the projected 35% energy savings of the audit.

Town of Roblin:

Fourteen facilities were audited in the Town of Roblin. Electric energy and natural gas were consumed by the town. Two of the facilities were constructed in the last 10 years and another five in the last 20 years. These buildings already had a significant amount of high efficiency components in them, reducing the number of potential energy saving opportunities. Others such as the Arenas and Recycling Depot could save over 65% of their current energy consumption with the recommended energy saving opportunities that were listed in the audit.

R.M. of Stanley:

Only two buildings were audited in the R.M. of Stanley, the Municipal Office Building and the Municipal Shop. Both used a combination of electricity and natural gas energy and had a number of existing high efficiency building components. Constructed in the 1940s, the Municipal Office Building already contained a number of high efficiency components including a metal insulated door, triple pane windows and high pressure sodium/metal halide exterior light. At the time of the audit, there were plans for an addition and renovations to the facility, including a lighting upgrade. Built in 1988, the Municipal Shop already had several energy efficient building components including: R28 insulation in the walls, insulated doors, triple pane windows, HRVs, high efficiency lighting and boiler. Significant energy saving opportunities were identified for this building, including installing a geothermal heating system. A potential 70% of the existing energy may be saved by these energy saving opportunities, most with paybacks less than 10 years.

R.M. of St. Andrews:

The seven audited buildings in St. Andrews use both electricity and natural gas. Five of these facilities were constructed in the last 40 years, with a number of renovations having occurred in recent years. All of the buildings have high efficiency building components to varying degrees. High efficiency lighting, insulated walls/roof, low flow water fixtures and triple pane windows were the common features in the buildings. For the buildings with a greater amount of high efficiency components: Northend Fire Hall #3, St. Andrews Community Club and Petersfield Curling Club, potential energy savings were below the desired 35% goal of the audit.

Town of Swan River:

Twelve buildings were audited in the Town of Swan River. A combination of natural gas and electricity were used in these facilities. Only the Library was constructed in the last 10 years. Except for the Municipal Administration Building which was built 65 years ago, the rest of the buildings fall in the 30-35 age. All of the buildings had existing high efficiency building components to varying degrees. Well insulated walls and roofs, insulated doors and efficient lighting were the prevalent features in these buildings.

R.M. of Whitemouth:

Ten buildings were audited in the R.M. of Whitemouth, all consuming electric energy. Approximately half of the buildings were constructed pre-1970 and the remainder post-1970. Two were built in the last 10 years. No noted renovations were undertaken in any of the facilities since their original construction. Except for the Waterline Pump house, a building that is rarely occupied, the remainder of the facilities show potential energy savings near or over 30% of their current energy use.

City of Flin Flon:

Sixteen facilities were audited in the City of Flin Flon, several being occupied for long periods of time creating very large energy density values. The City of Flin Flon is a higher energy consumer than the other municipalities and towns because it is constructed on solid rock and their watermains require heating to prevent freeze up. A combination of electricity, propane and oil were used by various buildings. Six of the buildings were constructed 45 to 55 years ago, and two were built in the last 10 years. The remainder fall in the 20 to 40 year range. The most recently constructed facility was the Sewage Treatment Plant in 2005. A minimal number of

renovations have been performed on the buildings since their original construction, the most notable occurred in 1990 when new dressing rooms and roof insulation upgrade were done for the Whitney Forum (Arena).

City of The Pas:

Eleven buildings using a combination of electricity and propane energy were audited in The Pas. Original construction for most of the facilities were in the 1970s, with only the Library older then that being built in 1929. The Arena had a complete renovation, except the ice plant in 2005. This included the addition of new dressing rooms, DDC control, new walls and roof insulations and upgraded windows and HVAC system. Therefore, potential energy saving opportunities for this building were limited to a 10% of its existing energy consumption. Except for the Friendship Centre and the Library, the remaining buildings all had existing high efficiency features ranging from well insulated walls/roof to T8 lighting.

3.0 ENERGY SAVING OPPORTUNITIES

Several energy saving opportunities exist in the different municipal buildings. Energy saving opportunities were categorized into one of two categories: short term and long term energy saving opportunities. Categorization was determined on the estimated payback period for a given energy saving opportunity. Those with payback periods under 5 years were classified as short term opportunities, whereas anything longer fell into the long term category.

The following energy and water saving opportunities exist in many buildings including those toured in this study. The saving opportunities listed below are generic in nature and include both capital upgrades and maintenance activities that will result in energy savings for the buildings.

3.1 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 to 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 incandescent bulbs 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. Photocells should be considered for automatically shutting off outdoor lighting 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 A for a list of Manitoba Hydro's Power Smart incentives and listings of other incentive programs.

3.2 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". This should be maintained annually.

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 on 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 R-40. 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.

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

3.3 HEATING, VENTILATION, AND AIR CONDITIONING

Temperature Control – Use programmable electronic thermostats when 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 augments 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 Baseboards Heaters – Mark the thermostat "normal" setting to provide a visual cue as when they are on or set too high.

3.4 WATER CONSUMPTION

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

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.

3.5 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.

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

Building Envelope

- Caulk window and door frames
- Check and replace weather-stripping annually

3.6 FINANCING

There are several incentive programs listed in Appendix A of this report that will help finance the implementation of the energy and water saving opportunities. Manitoba Hydro incentives, shown in Table A1, are available for energy efficient lighting, windows, wall and roof insulation upgrades, HVAC equipment (furnaces, air conditioners, boilers) and geothermal heating systems. For more information on these incentives, contact your local Manitoba Hydro Energy Services Coordinator or the contact listed in Appendix A.

Table A2 in Appendix A 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 Municipalities Trading Company of Manitoba Ltd. (MTCML). Details on this can be found in Appendix A of this report.

4.0 COMPARISON OF SIMILAR BUILDINGS

There are a number of building types that are common amongst the various Municipalities. Comparison of these specific buildings allows us to illustrate the differences and similarities between the Municipalities.

4.1 COMPARISON OF ARENAS/COMMUNITY CENTRE

Of the fourteen Municipalities audited, only two, the Rural Municipalities of Whitemouth and Stanley, did not have Arena buildings on their listings. The following table lists the Municipalities with Arenas along with the following information: energy density (kWh/m^2), energy consumption (kWh), potential energy savings (kWh and %).

Table 2: Comparison of Arenas/Community Centres

Municipality	Year Constructed	Energy Density (kWh/m^2)	Energy Consumption in 2005 (kWh)	Potential Annual Energy Savings (kWh)	Potential Energy Savings (%)
Birtle	~ 1975	137	391,166	80,792	21%
Carberry	1971	282	1,151,867	289,460	25%
Carman	~ 1960	261	1,082,782	256,192	24%
Niverville	1967	212	583,979	177,295	30%
Manitou	~ 1972	132	322,720	89,554	28%
Cartwright	1959	88	155,700	36,960	24%
Roblin	1970	99	379,312	253,254	67%
St. Andrews	~ 1954	247	775,735	118,945	15%
Swan River	1967	300	1,018,910	123,011	12%
Flin Flon	1960	1,025	2,939,677	575,801	20%
The Pas	1976	265	1,079,910	104,035	10%
Average		**277**			**25%**

Built in 1975, Birtle's District Community Centre uses only electric energy and is occupied for approximately 1800 hours for six months of the year. The facility is 2,845 m^2 in area with a moderate energy density of 137 kWh/m^2. In the last year, 391,166 kWh of energy was consumed by the arena. No major renovations have taken place since the initial construction. Proposed energy saving opportunities for this arena would save nearly 81,000 kWh per year.

In comparison, the Carberry Plains Community Centre uses both electricity and natural gas. Constructed in 1971, the arena was renovated in 1994 including installing a geothermal heating system. The building is occupied for approximately 1248 hours per year and consumed 1,151,867 kWh of energy in the previous year. The facility is 4,081 m^2 in size, with an energy density of 282 kWh/m^2. Although this building has geothermal heating, the energy density is still high when compared with community centres in other municipalities. The high density in likely due to the presence of a heated outdoor swimming pool, which consumes a large amount of energy and an additional ice plant for the curling rink. Potential energy savings for the centre would be nearly 290,000 kWh per year, 25% of its current energy consumption.

The Carman and Dufferin Arena was built pre-1960 and uses both electric and natural gas energies. The building is used on average 3,624 hours per year and consumed 1,082,782 kWh of energy last year. A minimal amount of existing high efficiency building components were in the facility, allowing for a potential energy savings of 256,192 kWh/year. The arena is a 4,153 m^2 in area with a corresponding energy density of 261 kWh/m^2. The energy density for this building is one of the highest of the buildings listed in Table 2. This could be explained by the long hours for which the building is occupied and by the poor condition of the building's envelope.

The Town of Niverville's Arena was built in 1967 with additions of dressing rooms and ice plant in 1980 and 1985 respectively. Both electricity and natural gas energies are used by the arena. In the previous year 583,979 kWh of energy was consumed for the 2,757 m^2 facility. The Arena has a 212 kWh/m^2 energy density and potential energy savings of 177,295, 30% of the current energy consumption.

Originally constructed in 1972, the Manitou Arena has undertaken the following renovations: adding geothermal heating and cooling in 1997, installing a zamboni room in 2000 and change rooms in 2003. The 2,453 m^2 building uses a combination of propane and electric energies. In the previous year 322,720 kWh of energy was consumed by the Arena resulting in a relatively low energy density of 132 kWh/m^2. In addition to the renovations stated, numerous high efficiency building components already exist in the Arena. Nevertheless, potential energy savings for the Arena still amount to 28% of the existing consumption at 89,554 kWh per year.

The Cartwright Community Centre Arena in the R.M. of Cartwright and Roblin was built in 1959 and has geothermal heat pumps used for heating, cooling and for the ice plant. In the previous year the 1,763 m^2 Arena consumed 155,700 kWh of electricity producing an energy density of only 88 kWh/m^2. The low energy density is due to the high energy efficiency attained from using geothermal heat pumps. Occupied for 70 hours per week for five months of the year, potential energy saving opportunities for the building are nearly 40,000 kWh per year.

The Municipality of Roblin has a 3,835 m^2 Arena that was originally constructed in 1970. The building was occupied for 1530 hours in the previous year, consuming 379,312 kWh of natural gas and electric energies. The large arena is kept cool throughout the winter resulting in a low energy density of 99 kWh/m^2 for this building. Despite this low energy density, substantial energy savings are available for this building. Over 253,000 kWh of energy may be saved annually, 67% of its current consumption.

Originally built in 1954, the 3,135 m^2 St. Andrews Community Club underwent renovations in 2005 including installing a new high efficiency furnace, new doors for the building and the addition of occupancy sensors for washroom lighting. In addition to these noted renovations, the building had a number of existing high efficiency components that had been installed throughout the years. Therefore, the opportunity for potential energy savings were lower than the desired 35% goal of the audit. Approximately 15% of the current energy consumption, 118,945 kWh, could be saved each year. The facility is occupied on average for 1660 hours per year.

Built in 1967, the Centennial Arena in Swan River is a 3,398 m^2 building that consumes both natural gas and electricity. In the previous year 1,018,910 kWh of energy was used by the building, generating a significant energy density of 300 kWh/m^2. Despite the original age of the Arena, a number of renovations have occurred including: the addition of a waiting room in 1988, new locker room and offices in 1999 and a new ice plant and zamboni room in 2005. In addition, the building has numerous existing high efficiency components within it, including well insulated walls and roof, high efficiency lighting and pumps and insulated doors. Therefore, potential energy savings were only 12% of the current consumption or 123,011 kWh per year.

The Whitney Forum (Arena) in Flin Flon has a very large energy density of 1,025 kWh/m^2. Built in 1960, the facility used 2,939,677 kWh of energy, a combination of electricity and oil, and was occupied for approximately 4,224 hours last year. One possible explanation for the high energy density is that the ice plant is shared with the curling rink and thus a portion of the energy included in the Arena's bills was actually consumed by the curling rink. Other reasons why the energy density is so large for this facility is that compared with the other Arenas, this building is occupied for very long hours. This increases the energy consumed by the lights, the water fixtures and the ice plant. New dressing rooms were added in 1990 along with an upgrade in roof insulation. In addition the facility has several high efficiency building components, reducing the number of applicable energy saving opportunities. Twenty percent of the current energy consumption, 575,801 kWh could be potentially saved annually from the Arena.

The Pas's Arena was built in 1976 and uses a combination of electricity and propane energies. The facility was completely renovated in 2005 including the addition of dressing rooms, DDC control, new wall and roof insulation, triple pane windows and upgrade to the HVAC system. In the previous year the 4,071 m^2 Arena consumed 1,079,910 kWh of energy generating a 265 kWh/m^2 energy density. The facility is already quite efficient in its building components and operations. Therefore, potential energy savings were very low at 10% of the current energy consumption or 104,035 kWh each year.

Lessons Learned

After analysing the energy consumption data among the eleven Arenas, several trends were observed. The Arenas that were occupied for longer hours, such as in Flin Flon and Swan River, tended to have higher energy densities. These Arenas also showed better paybacks for upgrades to the lighting, since the lights are on for longer hours. Another factor that had a large effect on energy consumption in Arenas was whether or not the rink area was heated. Some of the Arenas had no heat in the rink area (eg. Niverville) and thus consumed less energy, while others maintained the rink area well above freezing throughout the winter (eg. Flin Flon).

Common upgrades that have been made to several of the Arenas during renovations include the installation of geothermal heat pumps (e.g. Carberry, Manitou and Cartwright) and lighting upgrades (e.g. Carberry, Carman and Roblin).

From the results of the audit, some common recommendations for Arenas that showed high potential for energy savings included the following:

- Improvements to the zamboni water heating systems.
- Dumping ice shavings from the rink outside as opposed to melting it indoors.
- Ventilating the rink area to reduce the load on the ice plant.
- Replacing ice plant motors with high efficiency motors.

4.2 COMPARISON OF CURLING RINKS

Six of the 14 Municipalities have Curling Rinks included in their audits. Table 3 shows the details of six curling rinks including their Municipality, energy density, consumption and potential savings (kWh and %).

Table 3: Comparison of Curling Rinks

Municipality	Year Constructed	Energy Density (kWh/m^2)	Energy Consumption in 2005 (kWh)	Potential Annual Energy Savings (kWh)	Potential Energy Savings (%)
Birtle	Unknown	130	126,864	32,141	25%
Grahamdale	~ 1975	158	132,060	70,748	54%
Niverville	~ 1970	76	76,315	31,972	42%
Cartwright	1999	178	64,560	4,772	7%
St. Andrews	1991	286	496,370	123,131	25%
The Pas	1976	327	426,187	85,472	20%
Average		**193**			**29%**

Birtle's Curling Club was built in 1959 and used 72,960 kWh of electricity last year. New insulation was added to the facility about 20 years ago, increasing the energy efficiency of the building's shell. On average, the 418 m^2 facility is occupied for 462 hours a year and has an energy density of 175 kWh/m^2. In addition to the upgraded insulation, the curling club had existing high pressure sodium lighting. Potential energy savings for this building were 32,141 kWh per year, 25% of the current energy consumption.

The Moosehorn Curling Rink in Grahamdale was built in the late 1970s. An 838 m^2 facility, 132,060 kWh of electricity was consumed by the rink last year. Occupied for 392 hours a year, the building already had the following high efficiency components: good insulation in both the

walls and roof and an HRV for the lobby area. Despite these components, a substantial amount of energy could be saved annually. Approximately 70,748 kWh of electricity, 54% of the current energy could be saved by implementing energy saving opportunities that were listed in the Municipality's Audit. This large potential for energy savings is mostly due to the recommendation to install a geothermal heating system, which would save over 60% of the current energy consumed for heating this building.

Built in 1970, the Curling Rink in Niverville is a 1,002 m^2 facility that used a combination 76,315 kWh of electricity and natural gas last year. The rink is occupied for 312 hours per year and had few existing high efficiency energy components in place making it optimal for substantial energy savings. Potential energy savings for the Curling Rink amount to 42% of the current energy consumption, 31,972 kWh per year. Several of these energy saving opportunities would be feasible both with minimal capital expense and short payback periods. Niverville's curling rink has the lowest energy density of all the curling rinks audited. Reasons for this include the low hours of occupancy for this building and the fact that the rink area is unheated and does not have an ice plant.

Recently constructed in 1999, the Cartwright Curling Rink is an efficient facility. Occupied on average 456 hours per year, the 362 m^2 building used 64,560 kWh of energy in the previous year. The rink was built with the following energy efficient components in place: R20 insulated wall, R40 insulated roof, geothermal heat pump, efficient indoor lighting, ice temperature sensor and well insulated doors. For this reason and the relatively young age of the facility, potential energy savings were a low 7% of the current consumption or 4,772 kWh per year.

The Petersfield Curling Rink in St. Andrews is the largest curling rink listed in Table 3 at 1,737 m^2. Constructed in 1991, 496,370 kWh of natural gas and electricity was consumed in the previous year. The rink is occupied for 1,145 hours per year and has a significant energy density at 286 kWh/m^2. The facility already had a number of existing high efficiency components including well insulated perimeter walls, high efficiency furnaces and insulated doors. Therefore, despite the size and occupancy of the facility, potential energy savings were limited to 25% of the current energy consumption, 123,131 kWh per year.

A 1,304 m^2 facility, the Curling Rink in The Pas was built in 1976 with the second floor added in 1985 along with a separate rooftop unit (RTU) for the lounge area. Occupied for 1,456 hours per year, the longest of all the curling rinks, the building consumes both electricity and propane. In the previous year, 426,187 kWh of energy was used by the rink giving an energy density of 327 kWh/m^2. The high energy density for this building compared with the other curling rinks audited could be attributed to the long occupancy hours and the poor insulation in the walls and the roof. Despite its size and occupancy, potential energy savings were a moderate 20% of the existing consumption, 85,472 kWh per year.

Lessons Learned

The average energy density for the Curling Rinks was considerably lower than for the Arenas; this is likely due to Curling Rinks having fewer hours of occupancy, fewer occupants, and having smaller rink surface areas and thus less load on the ice plants.

As was found with the Arenas, the Curling Rinks with longer hours of occupancy consumed more energy per square meter. The Curling Rinks in The Pas and St. Andrews are occupied for more than twice as many hours per year than the rinks in the other Municipalities, which is one explanation for the higher energy densities for these two facilities. Other factors that affect the energy densities in Curling Rinks are whether or not they have ice plants and if the rink areas are heated. The rink in Niverville, for example, has no ice plant and is unheated most of the time, which is why the energy density is so low for this facility.

The most common recommended upgrades for the Curling Rinks were to improve the efficiency of the heating systems and reduce the heat losses through the buildings' envelopes. The recommendations with the shortest paybacks included weather-stripping windows and doors and installing programmable thermostats to control the indoor temperature. These recommendations often had paybacks of less than one year. Upgrading lighting, on the other hand, often resulted in long payback periods for Curling Rinks since these facilities were often only occupied throughout the winter and therefore the lights were turned off for most of the year.

4.3 COMPARISON OF COMMUNITY HALLS

Community Halls are a common building type in rural Municipalities. In the 14 Municipalities audited, six had community halls on their audit lists. The R.M. of Grahamdale alone had six community halls/centres on their listing. Table 4 provides a listing of the community halls, including their energy consumption and potential savings.

Table 4: Comparison of Community Halls

Municipality	Year Constructed	Energy Density (kWh/m^2)	Energy Consumption in 2005 (kWh)	Potential Annual Energy Savings (kWh)	Potential Energy Savings (%)
Birtle	1959	175	72,960	22,654	31%
Carberry	1961	215	177,374	72,696	41%
Grahamdale - Camper Community Hall	1984	93	52,920	8,309	16%
Grahamdale - Moosehorn Community Hall	1970	152	90,168	30,326	34%
Grahamdale - Grahamdale Community Centre	~ 1975	140	84,172	71,794	85%
Grahamdale - Faulkner Community Hall	~ 1990	97	69,024	12,401	18%
Grahamdale - Steep Rock Community Hall	Unknown	25	8,940	2,322	26%
Grahamdale - St. Martin Community Hall	~ 1985	177	98,784	32,566	33%
Cartwright	Unknown	152	38,700	3,968	10%
Roblin	1995	199	267,838	15,570	6%
Flin Flon	1958	275	607,624	432,778	71%
Average		**155**			**34%**

Grahamdale's Steep Rock Community Hall had the lowest energy density at 25 kWh/m^2. This community hall used the least amount of energy, 8,940 kWh of electricity in the previous year and is a smaller sized facility at 353 m^2. The highest energy density of all the community halls audited was the hall in Flin Flon, with an energy density of 275 kWh/m^2. This particular community hall used the greatest of energy, 607,624 kWh, including electricity, propane and oil.

This high consumption is attributed to high usage and the fact the hall is 2 stories tall. In addition, the 1,177 m^2 building was constructed in 1958, nearly 50 years ago.

A 2,845 m^2 facility, the Birtle District Community Centre was built in 1975/76. In the previous year the facility was occupied for six months of the year for 1,800 hours and consumed 391,166 kWh of electricity. Potential energy saving opportunities for the centre amount to 21% of the current energy consumption or 80,762 kWh per year.

The Town of Carberry has a Community Hall that was constructed in 1961. Recent upgrades to the building this year included the addition of triple pane windows, high efficiency electric and gas furnaces, new roof, upgraded insulation and energy efficient indoor lighting. The 824 m^2 building used a combination of electricity and natural gas in the previous year amounting to 177,374 kWh. The hall is occupied on average for 1,248 hours a year. Potential energy savings for this building are a substantial 41% of the hall's current energy use. Approximately 72,696 kWh of energy could be saved annually by implementing the energy saving opportunities outlined in the audit report for the Town of Carberry.

The R.M. of Grahamdale had six separate community centres/halls that were audited. All six facilities strictly used electric energy for their operations. Moosehorn Community Hall was built in 1970 with an addition installed 20 years ago. A 592 m^2 hall, the building used 90,168 kWh of electricity last year and was occupied for approximately 400 hours. Despite its moderate size, the hall still had a energy density of 152 kWh/m^2. Potential savings for the building were a significant 34% of the current energy use or 30,326 kWh annually.

The Grahamdale Community Centre was built approximately 30 years ago. Occupied for 408 hours per year, the 603 m^2 facility used 84,172 kWh of electric energy last year. With R20 insulated walls and a moderate energy density of 140 kWh/m^2, this building showed substantial energy opportunity savings during the audit. Over 71,900 kWh of energy could be saved annually, 85% of the current energy consumption.

Constructed recently in 1990, the Faulkner Community Hall is a 708 m^2 facility which had several pre-existing components built into it. These included well insulated high efficiency walls and roof, 2-stage furnaces which were installed in 1999 and lowering the building temperature

during non-occupancy. The building was occupied for 416 hours last year and consumed 69,024 kWh of electricity generating a low energy density of 97 kWh/m^2. Potential savings for this facility were limited amounting to only 18% of the existing energy consumption or 12,401 kWh per year.

A 567 m^2 building, the Camper Community Hall was built in 1984 and consumed 52,920 kWh of electricity last year. On average the hall is occupied for 416 hours per year, with a small energy density of 93 kWh/m^2. The hall already has a triple pane window and the temperature is manually lowered to 10°C when un-occupied reducing on energy consumption. Potential savings for this facility were only 8,309 kWh per year or approximately 16% of its current consumption.

The oldest building in the R.M. of Grahamdale, Steep Rock Community Hall is 353 m^2 in size and includes a boarding house that is occupied throughout the summer. The building is occupied on average 720 hours per year and consumed 8,940 kWh of electricity last year. The energy density of this building was the lowest of all the Community Halls audited at 25 kWh/m^2. The reason for this is that the heating bills for the boarding house were not available and are thus not included in these calculations. Another reason for low energy consumption is that the hall is kept very cool throughout the winter and is rarely occupied. Due to its low existing energy consumption, potential savings were limited to approximately 26% of the current use or 2,322 kWh of electricity per year.

St. Martin Community Hall was constructed in 1985 as a 557 m^2 facility. The building had well insulated roof and walls, auto flush urinals and when un-occupied the temperature was manually lowered to reduce energy consumption. On average the hall is occupied for 612 hours per year and used 98,784 kWh of electricity last year. With an energy density of 177 kWh/m^2, this building had the potential for significant energy saving opportunities. Over 32,500 kWh of energy could be saved annually from this hall, 33% of the current energy use.

Mather Hall in the R.M. of Cartwright and Roblin is a 254 m^2 facility that on average is occupied for 416 hours a year. In the previous year the building consumed 38,700 kWh of electricity and had an energy density of 152 kWh/m^2. The hall already had pre-existing well insulated, R20 and R40, wall and roof in addition to a well insulated metal pedestrian door. Therefore, potential

savings for the building were very limited and are only 10% of the current consumption or 3,968 kWh per year.

The Community Centre in the Town of Roblin is a relatively new building, having been constructed in 1995. With an average occupancy of 480 hours per year, in the previous year the 1,346 m^2 building consumed 267,836 kWh of electricity and natural gas. Due to its recent construction, the community center had a number of pre-existing high efficiency building components including: R20 insulated walls, R40 insulated roof, low flow water fixtures, programmable thermostats and efficient lighting. Therefore, energy savings were very limited for this already efficient building and only 6% of the existing energy could be saved.

The Community Centre in the City of Flin Flon is an older building, having been constructed in 1958. Renovations were performed in 1985 and included new windows and an air handling unit complete with an economizer. On average the office portion is occupied for 4,732 hours, the auditorium for 1,560 hours and the second floor for 728 hours. In the previous year the building consumed 607,624 kWh in electricity and oil. The energy density for this building is the highest of all the community halls audited due to the long occupancy hours, tall building structure (2 stories) the inefficient oil steam boiler used for heating and the poor insulation in the walls and roof. Substantial energy savings were available for this building in part to its age and type of fuel (oil) used. Over 430,000 kWh of energy, 71% of its current energy use, could be saved annually.

Lessons Learned

From Table 4 it can be seen that Community Halls have a low average energy density (155 kWh/m^2) when compared with Arenas and Curling Rinks. The lower energy densities are a result of Community Halls having very low hours of occupancy and not having ice plants.

The most obvious trend for Community Halls is that in general, the older buildings were less energy efficient than the newer ones and thus had higher energy densities.

Common recommendations for energy efficient upgrades for Community Halls were to reduce heat losses through the buildings' envelopes by either upgrading insulation or weather-stripping

windows and doors. Replacing thermostats with programmable thermostats also showed excellent savings for community halls, since the halls were mostly unoccupied and programmable thermostats automatically setback the room temperature during unoccupied times. Recommendations for lighting upgrades tended to have longer paybacks due to the lights being on for so few hours every year.

4.4 COMPARISON OF FIRE HALLS

Twelve of the fourteen Municipalities audited had at least one Fire Hall on their audit list. The R.M. of Grahamdale and R.M. of St. Andrews have two and three Fire Halls, respectively. The following table shows the differences between energy consumption, energy density and potential energy savings (in kWh and %) for the various Fire Halls.

Table 5: Comparison of Fire Halls

Municipality	Year Constructed	Energy Density (kWh/m^2)	Energy Consumption in 2005 (kWh)	Potential Annual Energy Savings (kWh)	Potential Energy Savings (%)
Birtle	1995	96	43,020	26,792	62%
Carberry	~ 1985	201	88,326	45,553	52%
Carman	~ 1955	465	94,482	29,028	31%
Grahamdale - Moosehorn Fire Hall	~ 1979	263	50,320	24,837	49%
Grahamdale – Gypsumville Fire Hall	~ 1984/1990	169	48,720	4,686	10%
Niverville	1988/1997	210	203,635	57,101	28%
Manitou	~ 1975	292	81,309	51,847	64%
Cartwright	~ 1990	136	44,110	7,536	17%
Roblin	1978	365	162,897	68,066	42%
St. Andrews - Fire Hall #1	1985	332	106,669	49,128	46%
St. Andrews - Fire Hall #2	1991	402	294,807	129,831	44%
St. Andrews - Northend Fire Hall #3	1995/1975	265	240,278	65,711	27%
Swan River	1974	405	124,291	60,395	49%
Whitemouth	~ 1940	290	47,470	20,807	44%
The Pas	1971	323	369,708	170,071	46%
Average		**281**			**41%**

Constructed in 1995, Birtle's Fire Hall is a 446 m^2 facility with well insulated, R20 and R40, walls and roof respectively. In addition, the building already had well insulated vehicle doors. On average the hall is occupied for 520 hours per year and used 43,020 kWh of electricity last year. The combination of a well insulated envelope and low hours of occupancy resulted in a low energy density for this fire hall when compared to the other fire halls audited. Despite its relatively recent construction and existing high efficiency components, significant potential energy savings were identified during the audit amounting to 26,792 kWh per year or 62% of the current consumption.

The Fire Hall in Carberry was built in 1985. In the previous year the 440 m^2 building was occupied for 208 hours and consumed 88,326 kWh of electricity and natural gas combined. Despite the pre-existing low flow showers and well insulated walls, potential energy savings for this hall amounted to 52% of the current energy consumption or 45,553 kWh per year.

The Town of Carman had one Fire Hall on their audit list, approximately 48-50 years in age. The 203 m^2 building was occupied on average for 104 hours last year and used a combination 94,482 kWh of electricity and natural gas. From this the energy density for the building was calculated at 465 kWh/m^2, a significant amount for a small, rarely occupied facility. Possible explanations for the high energy density for this building are that the envelope is in very poor condition with very little insulation and that the gas heater is very inefficient. Potential energy savings were identified as 31% of the current energy use, 29,028 kWh per year.

The R.M. of Grahamdale had two separate Fire Halls on their audit list. The Moosehorn Fire Hall was built in 1979 and is occupied for approximately 336 hours per year. The 191 m^2 hall had well insulated walls, roof and metal doors. In the previous year, 50,320 kWh of electricity was consumed by the Fire Hall. There was a number of pre-existing high efficiency building components in this Fire Hall including: R20 insulated walls, R40 insulated roof and metal insulated doors. However, substantial potential energy savings were identified during the audit. Nearly 25,000 kWh of energy or 49% of the current energy use could be saved by implementing the energy saving opportunities that were outlined in the Municipality's report.

The second Fire Hall in Grahamdale, Gypsumville Fire Hall was constructed in two phases. The west half of the building was constructed in 1984 and the east half in the 1990s. This allowed

for the entire facility to have R20 insulated walls and well insulated over head doors complete with weather stripping, thereby reducing the amount of potential energy savings available to only 10% of the current consumption, 4,686 kWh per year.

The Town of Niverville houses its Fire Hall & RCMP and Works & Operations facilities all under one building. The two areas were constructed at different times with the former in 1997 and the latter in 1988. The Fire Hall portion of the building is occupied for 1,040 hours per year and consumed 203,635 kWh of electricity and natural gas last year. Existing high efficiency building components include the following: R20 wall insulation, high efficiency natural gas boiler and motorized back draft dampers. Still, potential energy savings for the Fire Hall amounts to 28% of the current energy consumption or 57,101 kWh per year.

The Manitou Fire Hall & Municipal Garage are housed together under one facility. Constructed in 1975, the building uses a combination of electricity and propane for fuel. In the previous year the Fire Hall was occupied for 1,040 hours and consumed 81,309 kWh of energy, a combination of electricity and propane. Since propane was the primary source of fuel for the building, a substantial amount of potential energy savings were identified during the audit. Over 51,000 kWh of energy would be saved by the ESOs described in Manitou's Audit Report. This translates into a 64% energy saving.

The Fire Hall in the R.M. of Cartwright & Roblin was built in 1990, a relatively recent construction. Both the fire hall and ambulance garage are housed under the same facility as one building. The 325 m^2 Fire Hall used 44,110 kWh of electricity last year during its occupancy, 520 hours per year. The building already had well insulated roof and walls, triple pane high efficiency windows, low flow sinks and manually lowering of the temperature during non-occupancy. All of these components along with the young age of the facility and low occupancy made it difficult to locate significant energy saving opportunities. Approximately 7,500 kWh of energy could be energy saving opportunities, 17% of the current energy consumption.

A 446 m^2 facility, the Fire Hall in Roblin was constructed in 1978 and used a combination 162,897 kWh of natural gas and electricity last year. Occupied for 416 hours per year, the Fire Hall already had well insulated walls and pedestrian doors and low flow toilets. However,

despite these high efficiency components, energy saving opportunities for building were substantial at 42% of the current energy use or a savings of 68,066 kWh per year. The primary source of fuel for the building was natural gas with a small amount of electricity used for lighting and water heating. Equipment using natural gas are usually at a lower efficiency then their electric counterparts, particularly those nearly 20 years in age, attributing to the high potential savings projected for the Fire Hall.

The Municipality of St. Andrews had three separate Fire Hall facilities on their audit listing. Fire Hall #1 is a 321 m^2 building that strictly uses natural gas. In the previous year the building consumed 106,669 kWh of natural gas energy and was occupied for 1,560 hours. A mezzanine level was added at a later date. The building has well insulated doors, pedestrian and vehicle, triple pane windows, and insulated walls. However, potential energy savings are still a substantial 46% of the current energy consumption. Due to the use of natural gas, equipment efficiency is lower then what for electric operated equipment. Therefore projected energy savings are much greater.

Constructed in 1991, Fire Hall #2 is a 733 m^2 building that is occupied on average for 608 hours per year. In the previous year the building consumed 294,807 kWh of energy, primarily natural gas and to a lesser extent electricity. High efficiency furnaces in areas, along with triple pane windows and R24 insulated walls were some of the energy efficient building components present in Fire Hall #2. However, due to high infiltration with the building's doors and windows, along with the primary use of natural gas, potential energy savings for the Fire Hall #2 amount to nearly 130,000 kWh per year, 44% of the current energy use.

The Northend Fire Hall #3 was built in two sections. The older portion is approximately 30 years old and the newer portion along with the Public Works area was constructed in 1995. The entire facility is 907 m^2 is size and is occupied on average 416 hours per year and consumed 240,278 kWh of natural gas and electricity last year. The facility had an existing high efficiency, 92%, natural gas furnace, which reduced energy savings. Potential energy savings for the Northend Fire Hall #2 is an estimated 27% of the current energy use or 65,711 kWh per year.

The Town of Swan River has a 307 m^2 Fire Hall that was constructed in 1974. Other then existing setback thermostats, the building has no high efficiency components within it. Occupied on average for 2,340 hours per year, in the previous year the Fire Hall consumed

124,291 kWh of energy, a combination of natural gas and electricity. The age of the facility, along with the high occupancy and lack of high efficiency components made this building a prime candidate for the energy audit. Significant energy savings were identified in the Fire Hall and amount to 49% of the existing consumption, over 60,000 kWh per year.

An old facility, the Fire Hall in Whitemouth was built in the 1940s and has not had any major renovations performed on it. Other then one new metal insulated pedestrian door, the building has no high efficiency components in it. On average the building is occupied for 130 hours per year and in the previous year consumed 47,470 kWh of electric energy. Potential energy saving opportunities for this building were significant at nearly 21,000 kWh per year, 44% of the current energy consumption.

The Fire Hall in The Pas shares its space with the Municipal Administration Office. Total area of the building is 1,145 m^2 with original construction having occurred in 1971. Occupied on average for 2,340 hours per year, a combined total 369,708 kWh of electricity and propane was used last year. A limited number of high efficiency building components was already in place in this facility including: R24 insulated walls, some high efficiency lighting and some new double pane windows. The energy density for this Fire Hall is in the top 40% of all the other Fire Halls audited at 323 kWh/m^2. Potential energy savings are a substantial 170,071 kWh per year for this Fire Hall or 46% of the current energy consumption.

Lessons Learned

As shown in Table 5, the average energy density for the Fire Halls included in this study was high at 281 kWh/m^2. The large energy densities are likely a result of poor building envelopes and high temperature settings. Many of the Fire Halls lose large amounts of heat due to infiltration through cracks around the vehicle and pedestrian doors. In addition, the Fire Halls tend to maintain warm space temperatures to keep the fire trucks warm throughout the winter.

The common trend for Fire Halls was that the newer halls or those that have been recently renovated tended to have lower energy densities. Some issues that arose throughout the audits that limited the potential for energy savings in Fire Halls was that many of the halls were under-

ventilated and did not meet code requirements. The Fire Halls were also rarely occupied, which limited the potential for energy savings with replacing lights.

A typical recommendation for Fire Halls was to weather-strip and caulk the vehicle and pedestrian doors. This upgrade showed excellent savings with short payback periods. Another common recommendation for Fire halls was to replace leaky backdraft dampers with motorized dampers. This would help to reduce heat loss due to infiltration through old dampers.

4.5 COMPARISON OF MUNICIPAL OFFICES

Eleven of the fourteen Municipalities had Municipal Offices/Administration Buildings on their audit listing. The Town of The Pas combined their Fire Hall and Municipal Office into one facility. Therefore, for the purpose of this report, the building was listed under Fire Halls and discussed in that previous category. Table 6 displays the various data for the different Municipal Offices, including their energy density, energy consumption and potential energy savings.

Table 6: Comparison of Municipal Offices

Municipality	Year Constructed	Energy Density (kWh/m^2)	Energy Consumption in 2005 (kWh)	Potential Annual Energy Savings (kWh)	Potential Energy Savings (%)
Birtle	1997	164	71,600	58,629	82%
Carberry	~ 1990	232	77,854	32,791	42%
Carberry	1907	625	119,973	103,746	86%
Grahamdale	~ 1965	163	24,478	16,506	67%
Niverville	1956/1985	294	62,886	40,997	65%
Manitou	1997	157	36,531	16,401	45%
Cartwright	1957	163	33,610	17,479	52%
Roblin	1984	195	71,742	33,395	47%
Stanley	~ 1940	538	203,368	75,687	37%
St. Andrews	1988/1911	273	282,640	75,440	27%
Swan River	~ 1940	281	104,400	52,008	50%
Whitemouth	~ 1935	296	75,815	44,135	58%
Flin Flon	1983	255	268,320	62,968	23%
Average		**280**			52%

Constructed in 1997, the 437 m^2 Resource Centre CDC and Municipal Office in Birtle is occupied on average for 2,080 hours per year. In the previous year, the building consumed

71,600 kWh of electricity producing an energy density of 164 kWh/m^2. With its relatively recent construction, the office had a number of high efficiency building components including: new roof, high efficiency windows and well insulated walls. However, despite these high efficiency components, potential energy savings for the building still amount to a substantial 58,629 kWh per year, 82% of the existing energy consumption. The primary reason for this large number is due to the installation of a geothermal heating system as an energy saving opportunity along with programmable setback thermostats and motorized back draft dampers. The energy saving opportunities with the HVAC component of this building generated the largest portion of the savings.

The Town of Carberry had two Municipal Offices on its audit building list. Constructed in 1907, the Old Office Building is a heritage building that is occupied for approximately 2,080 hours per year. In the previous year the facility consumed 119,973 kWh of a combination of natural gas and electricity. A limited amount of renovations occurred 30 years ago, however none appeared to include installing high efficiency components in the building. For this reason combined with the age of the building, potential energy savings for the Old Office Building are 103,746 kWh per year or 86% of the current energy use. In particular, savings for the building's envelope and HVAC are substantial with replacing old inefficient equipment and reducing infiltration losses.

The second Office Building in Carberry is a newer facility, constructed in 1990 with minor renovations having taken place approximately 3 years ago. This building is occupied for 2,080 hours per year and consumed 77,854 kWh of energy, a combination of natural gas and electricity, last year. Potential savings for this building are substantial, considering the age, at 42% of the existing consumption or nearly 33,000 kWh per year. Significant portion of the savings are from the building's lighting component. Despite the recent construction of the facility, the lighting is not energy efficient. Upgrading all of the lighting, including the parking lot controllers and exit signs accounts for nearly 11,000 kWh of annual savings.

The Moosehorn Administration Building in the R.M. of Grahamdale is approximately 40 years old and is occupied for 40 hours each week, year round. The building is 150 m^2 in size and used 24,478 kWh of electricity in the previous year. Other then one new pedestrian door and a few triple pane windows, there are no high efficiency components within the building. Potential

energy savings for this facility therefore are a substantial 16,506 kWh per year or 67% of the current energy use.

Niverville's Town Office was originally constructed in 1956 with more work added in 1985. The 214 m^2 is in use for 3,276 hours a year and uses both natural gas and electric energy. In the previous year, 62,886 kWh of energy was consumed by the facility. The newer portion of the building, built in 1985, has R20 wall insulation and R40 roof insulation. In addition the building has high efficiency triple pane windows. Potential energy savings for this building are nearly 41,000 kWh per year or 65% of the current energy use.

In Manitou, the Municipal Administration Building and Recycling Depot are housed in the same facility. The building was completely renovated in 1997. The Municipal Administration area is occupied for 2,340 hours per year and uses both electricity and propane energy. In the previous year, 36,531 kWh of energy was consumed by the 232 m^2 building. The facility already had the following high efficiency components: R28 wall insulation; triple pane windows; low flow sinks; HRV and a geothermal system. Despite these components, potential energy savings are over 16,000 kWh per year, 45% of the existing energy use.

The Municipal Office Building in the R.M. of Cartwright & Roblin was originally built in 1957 with an addition installed in 2002. The only existing high efficiency building component are triple pane windows for this 206 m^2 facility. Occupied for 2,412 hours yearly, the facility used 33,610 kWh of electricity last year. Substantial potential energy savings were identified during the audit of this building, nearly 17,500 kWh annually or 52% of the current energy consumption.

The Town Administration Building in the Municipality of Roblin was constructed in 1984. The 368 m^2 facility is occupied on average 2,080 hours per year and used 71,742 kWh of energy, natural gas and electric, last year. Other then one well insulated pedestrian door and a programmable thermostat, there are no existing high efficiency building components in the facility. Therefore, energy savings were a significant 33,395 kWh per year, 47% of the existing energy billed.

The Municipal Office Building in Stanley is an old 378 m^2 facility, built in the 1940s. Occupied for approximately 2,080 per year the building already has the following high efficiency

components: metal insulated pedestrian door; some triple pane windows; high pressure exterior light on a sentinel. In the previous year, 203,368 kWh of energy was consumed by this building, as a combination of electric and natural gas. Due to the age of the building, combined with the minimal amount of upgrades and the use of natural gas fuel, potential energy savings are nearly 76,000 kWh, 37% of its existing energy.

St. Andrews Municipal Administrative Building was originally constructed as a Museum in 1911. In 1988 the Office portion was added on. During this time the museum was completely renovated. The entire facility is 673 m^2 in area and used 282,640 kWh of energy last year, a combination of electric and natural gas. The Office portion is occupied for 1,950 hours per year and has R28 insulated walls, well insulated doors, low flow toilets and some triple pane windows. Potential energy saving opportunities for this building are nearly 75,500 kWh per year or 27% of the current energy use.

The Municipality of Swan River's 372 m^2 Municipal Administration Building was constructed in the 1940s. Some renovations have occurred over the years including the addition of a few triple pane windows, a roof top unit complete with an economizer and exhaust fans. Occupied for 2,080 hours per year, both electricity and natural gas are used by the building. In the previous year, 104,400 kWh of energy, combined, was used, generating an energy density of 281 kWh/m^2. Due to the age of the facility and the lack of upgrades to building equipment, potential energy savings are 50% of the current energy consumption, over 52,000 kWh per year.

The R.M. of Whitemouth has the oldest Municipal Office Building on the list, approximately 70 years old. A 256 m^2 facility, it is in use for 2,600 hours per year and consumed 75,815 kWh of electricity last year. The building already has the following high efficiency components within it: R40 insulated roof, metal insulated doors, some triple pane windows, manual setback of thermostats when unoccupied, low flow sinks and urinal, high pressure sodium lighting. Despite these components, the lack of equipment upgrades resulted in very high potential energy savings of 44,135 kWh. This is 58% of the current energy consumption.

City Hall in Flin Flon is a 1,051 m^2 brick building that was constructed just over 20 years ago. The total annual energy consumption was 268,320 kWh or 255 kWh/m^2. This amount is slightly

lower than the average energy density for all the offices audited in this study. This could be due to the large amount of insulation in both the walls (R30) and the roof (R50), thus providing excellent resistance to heat loss in the winter through the building's envelope.

Lessons Learned

The offices included in this study had a wide range of ages from 1907 for the Old Office Building in Carberry to 1997 for Birtle and Manitou's Municipal Offices. Again it was found that the older buildings tended to have a higher energy density than the newer ones. This is particularly obvious when comparing the two office buildings in Carberry; the Old Office Building (1907) had an energy density of 625 kWh/m^2, while the new office building (1990) had an energy density of 232 kWh/m^2. The newer buildings have better insulation in the walls and roofs, newer windows and doors, and have more efficient heating systems than the older buildings.

Compared to the other municipal buildings, the offices often had more energy efficient systems such as heat recovery ventilators (HRVs), more energy efficient lighting and better envelopes. Since these buildings were occupied more regularly, there was a higher potential for energy savings with certain upgrades including the installation of: high efficiency lighting, parking lot controllers, HRVs, water efficient sink faucets, and higher efficiency air conditioning systems.

4.6 COMPARISON OF MUNICIPAL SHOPS

Eleven of the fourteen Municipalities had Municipal Shops/Garage on their building audit lists. The R.M. of Whitemouth had two separate Municipal Shops on their listing. The following table describes the details with each of the buildings including their energy density, energy consumption and potential energy savings.

Table 7: Comparison of Municipal Shops

Municipality	Year Constructed	Energy Density (kWh/m^2)	Energy Consumption in 2005 (kWh)	Potential Annual Energy Savings (kWh)	Potential Energy Savings (%)
Birtle	1982	306	52,240	34,499	66%
Carberry	~ 1970	278	120,253	98,271	82%
Carman	~ 1985	464	215,909	78941	37%
Cartwright	1987	175	63,480	42,654	67%
Roblin	1962	460	138,505	86523	62%
Stanley	1988	164	95,958	66721	70%
St. Andrews	~ 1960	348	185,244	131,412	71%
Swan River	1974	469	298,621	229,580	77%
Whitemouth - #1	~ 1972	155	38,078	19,365	51%
Whitemouth - #2	~ 1960	4	797	234	29%
Flin Flon	1970	529	148,638	101,123	68%
The Pas	1974	147	118,249	80,746	68%
Average		**285**			**60%**

The Municipal Garage in Birtle is a 171 m^2 facility built in 1982. Other then insulated vehicle doors, the building has no other high efficiency components and has had no renovations. On average the garage is occupied for 40 hours per week, year round and in the previous year it used 52,240 kWh of electric energy. Substantial potential energy saving opportunities were identified during the audit, with savings surpassing 34,400 kWh per year or 66% of the current energy use.

Built in 1970, the Town Shop in the Municipality of Carberry is a 432 m^2 that is occupied for 2,080 hours per year. In the previous year the building used 120,253 kWh of energy, most of it as natural gas and to a lesser extent electricity. Areas of the shop have R40 insulation in the roof and there are two well insulated vehicle doors. However, no other high efficiency building components are present nor have there been any renovations resulting in significant potential energy saving opportunities surpassing 98,000 kWh per year. This is approximately 82% of the energy the building currently uses.

Carman's Municipal Garage is a 465 m^2 facility that was built in 1985. Occupied for an average 2,600 hours per year, the garage used 215,909 kWh of energy last year, a combination of natural gas and electricity. There are no high efficiency existing building components in the

garage. Potential energy savings are nearly 79,000 kWh or 37% of the current energy use for the garage.

The Municipal Shop in the R.M. of Cartwright & Roblin is a 362 m^2 building that was constructed in 1987. The only high efficiency component is R20 batt insulation within the walls. Geothermal heating system had been previously considered for in floor heating, but was abandoned due to high capital expense. Occupied for approximately 1,535 hours per year, the shop used 63,480 kWh of electric energy last year. Potential energy savings for the Municipal Shop are over 42,500 kWh per year, 67% of the current energy use.

Roblin's Public Works Shop was built in 1962 as a 301 m^2 facility. The shop has a high efficient natural gas unit heater, 80% efficiency already in place. In use for 2,626 hours per year the shop consumes natural gas and to a lesser extent electricity. In the previous year 138,505 kWh of energy was used by the Public Works Shop. With the lack of high efficiency building components combined with the age of the building, potential annual energy savings for this shop exceed 86,000 kWh per year, 62% of the current annual amount. In addition, with the higher consumption of natural gas fuel, a larger amount of energy could be saved due to the lower efficiency of gas fuel equipment.

The R.M. of Stanley had only two buildings on its audit list, one being a Municipal Shop. A 585 m^2 facility that was constructed in 1988, the shop has a the following existing high efficiency components within it: well insulated pedestrian and overhead doors; R28 wall insulation; triple pane windows; 80% efficient natural gas boiler complete with motorized dampers and high pressure sodium lighting. Geothermal heating was previously considered, but was not implemented due to high expense. The R.M. has expressed an interest in implementing geothermal heating for the Municipal Shop if the capital expense is lower and or if incentives were available. The shop uses both natural gas and electricity for its operation and is occupied for approximately 1,980 hours annually. In the previous year 95,958 kWh of energy was used by the shop. This produces an energy density of 164 kWh/m^2 for the building. Potential energy savings for this Municipal Shop are nearly 67,000 kWh, 70% of the current use. This substantial energy savings includes the installation of the geothermal system which by itself saves 36,500 kWh per year.

The R.M. of St. Andrews has a Municipal Repair Shop that was built in the 1960s. A 465 m^2 building, it has had some insulation added to it in recent years along with motorized intake and back draft dampers along with outdoor lighting placed on photocells. The shop shares electric energy with other buildings. In the previous year the shop was occupied for 2,470 hours and used 185,224 kWh of natural gas. The electricity was charged to the other facilities. Due to the age of the facility, the lack of upgrades in particular to equipment, and the primary use of natural gas energy substantial energy savings were available for this shop. Nearly 131,500 kWh of energy would be saved by the energy saving opportunities listed in the R.M.'s audit, 71% of the current energy it uses.

The Town Garage in Swan River was built in 1974 and is a 637m^2 building. Upgrades to the original facility included redoing the roof, adding 4" of Styrofoam insulation, installing triple pane windows and T8 lighting and well insulated doors. No upgrades have been made on the original HVAC/mechanical equipment within the facility. The garage is occupied for 2,340 hours on an annual basis and primarily consumes natural gas and to a lesser extent electric energy. In the previous year, 298,621 kWh of combined energies was used by the Town Garage. Potential energy savings for the building were well over the 30% goal of the audit at 229,580 kWh per year, 77% of the current use.

The Municipality of Whitemouth had two separate Municipal Shops on its building audit list. Both shops share electricity with the Municipal Office Building. Municipal Shop #1 is a 245 m^2 building that was constructed in 1972/73 and operates for 2,210 hours annually and used 38,078 kWh of electricity last year. Existing high efficiency building components for shop #1 include R20 insulated walls, well insulated doors and an outdoor metal halide light. No other energy efficient renovations or equipment upgrades have been performed. Therefore, substantial energy saving opportunities were available. Potential energy savings were nearly 19,400 kWh per year, over 50% of the current energy use. Municipal Shop #2 is a small 178 m^2 facility that was built in the late 1950s/early 1960s. This shop is occupied rarely, 260 hours per year and is unheated, which is why the building consumed only 797 kWh of electricity last year. Except for one metal halide exterior light, no other high efficient components are present in Shop #2. Due to the minimal occupancy of the facility, combined with the low energy density of 4 kWh/m^2 and low energy use, potential energy savings were significantly lower then for Shop #1. Still, 234 kWh of energy could be saved annually, 29% of the building's current use.

The City of Flin Flon has a 281 m^2 Airport Garage that was built in 1970. Occupied for 5,304 hours per year, the garage uses propane and electric energies. In the previous year the garage consumed 148,638 kWh of energy. Except for one low flow sink, no other high efficiency building components are present resulting in very large potential energy savings of 101,123 kWh annually. Approximately 68% of the current energy use, these savings account for upgrading the outdated inefficient mechanical/HVAC and lighting components within the garage.

The Pas had a 802 m^2 Municipal Garage on its audit list. Built in 1974 this garage already has metal insulated pedestrian and overhead doors and energy efficient lighting. Occupied for 2,080 hours annually, in the previous year the facility consumed 118,249 kWh of energy. No other upgrades were noted during the audit, providing substantial opportunity for potential energy savings. Nearly 81,000 kWh of energy could be saved from implementing the energy saving opportunities described in The Pas's audit; 68% of the current use.

Lessons Learned

Most of the Municipal Shops were old buildings with envelopes in very poor condition. There appeared to be a lack of importance given to these buildings by the Municipalities and therefore few upgrades have been made. For this reason, there was a very high potential for energy savings for the shops.

Many of the Municipal Shops kept the temperature settings high throughout the nights to melt the ice on the snowplows. This resulted in a large amount of energy being consumed for heating during unoccupied times. A common recommendation that was made for these buildings was to replace the furnaces with unit heaters or radiant heaters positioned in such a way that the majority of the heat was aimed at the snowplows to melt the ice. This would allow for the temperature setting to be reduced throughout the night while still ensuring the ice on the snowplows melted.

Another recommendation that was common for Municipal Shops was to weather-strip the vehicle doors, as they are frequently used. The long cracks around the perimeters of these doors leaked cold air in the winter and thus increased the load on the heating systems.

Similar to the Fire Halls, there tended to be a lack of ventilation in many of the shops, which limited the potential for energy savings with the buildings ventilation systems.

4.7 GENERAL CONCLUSIONS ON RECOMMENDED ENERGY SAVING OPPORTUNITIES

The following list summarises the conclusions that were made regarding recommended energy saving opportunities:

- Recommendations for upgrading lighting showed long payback periods for buildings with low occupancy.
- Older buildings tended to have higher energy densities and required more upgrades to their envelopes.
- Replacing dual pane windows with triple pane windows resulted in long payback periods and were not worthwhile.
- Upgrading weather-stripping and caulking around windows and doors resulted in energy savings with short payback periods. These upgrades were recommended for most buildings.
- Upgrading insulation in walls and roofs was only cost effective if upgrading was done when roof/walls were being replaced.
- Replacing thermostats with programmable thermostats showed excellent savings, especially in cases where the buildings were mostly unoccupied.
- When upgrading furnaces, air conditioners, unit heaters, etc. with higher efficiency units, it was often recommended that the upgrade be done when the current units required replacement.

5.0 MUNICIPALITIES' VIEWS ON THIS STUDY

5.1 POLITICAL FRAMEWORK

In Manitoba, municipal elections are set every 4 years. The last municipal election was in October 2006, which may mean that some councils have recently seen a change in members. However, we do not expect this to have a major impact on the plans to implement the recommendations of the energy and water efficiency reports assuming the information is passed on to new council members.

There are currently no Provincial or Federal targets or energy efficiency/reduction 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. 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. The MMEP project is an excellent example of an innovative project and all of the participating communities have proved to be receptive to innovative ideas, as they have agreed to participate in this project.

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 the energy and water efficiency reports certainly complement this direction.

5.2 POLITICAL ENVIRONMENT IN EACH MUNICIPALITY.

Municipality of Birtle:

The only energy efficiency improvement project that has taken place in the Municipality of Birtle was in upgrading the lighting and HVAC system in the Resource Centre CDC and Municipal Offices and upgrading the wall insulation. In this building, all the T12 fluorescent lamps and ballasts were converted to energy efficient T8s and HRVs were installed. The Chief Administrative Officer of Birtle expressed interest in this study and in using the results from this study to implement some of the more cost effective measures in the future.

Town of Carberry:

Until now there have been no energy efficiency audits performed in the Town of Carberry. However, there have been some energy efficient upgrades made to the Carberry Plains Community Centre. Included in these upgrades were the following: T8 fluorescent lights in the hockey lounge, energy efficient LED exit signs, upgrades to the roof insulation and installation of a geothermal heating system. The Chief Administrative Officer (CAO) of Carberry expressed interest in this study and in using the results from this study to implement some of the more cost effective measures in the future. In addition, the CAO for the Town of Carberry is also the CAO for North Cypress. The knowledge gained from this energy and water efficiency study will therefore be shared among both municipalities.

Town of Carman:

This study is the first energy and water efficiency study to take place in the Town of Carman. At the time of the site visit, a new change house for the Carman Aquatic Centre was in the plan for the immediate future. The knowledge gained from this study and from observing the energy and water savings that result from implementing the recommended upgrades will be valuable in the future when new buildings are developed.

Village of Cartwright and R.M. of Roblin:

The Village of Cartwright and the R.M. of Roblin have undergone some energy efficient upgrades in the past including a geothermal heating system in 3 of the 12 buildings audited in this study. This municipality is also considering upgrading the lighting in the Municipal Office and the heating system in the Municipal Shop. The knowledge gained from this efficiency study will therefore be useful in future energy efficient upgrades to the buildings. The Chief Administrative Officer of Cartwright and the R.M. of Roblin expressed interest in this study and in using the results from this study to implement some of the more cost effective measures in the future.

City of Flin Flon:

The City of Flin Flon has several plans for new facilities in the future. The knowledge gained from this efficiency study will therefore be useful in future development projects. The following projects are expected to occur in Flin Flon in the near future:

- The construction of a new Public Safety Building to replace the existing building
- Reconstruction of two of the heating plants.

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 Flin Flon expressed a great deal of interest in this study and in implementing some of the more cost-effective measures in the coming year. The City has already shown its interest in building environmentally friendly infrastructure. This was evident in the upgrades made to the Sewage Treatment Plant and the installation of heat recovery ventilator and T8 lighting in the Whitney Forum.

R.M. of Grahamdale:

This is the first energy and water efficiency study to take place in the R.M. of Grahamdale. Some of the newer buildings in this R.M. (seniors centres) stood out as they were constructed to current standards. Although there are currently no plans for new municipal buildings in Grahamdale, the knowledge gained from this study and from observing the energy and water savings that result from implementing the recommended upgrades will be valuable in the future when new buildings are developed. In addition, there is potential for this information to be shared with the surrounding regions.

Municipality of Manitou:

A growing community, Manitou is undergoing continuous development. They have shown great interest in promoting energy efficient building designs as demonstrated by their geothermal systems and LEED accredited Wellness Centre. Knowledge gained from this efficiency study will be useful in future development projects. Future plans for this town include the Pembina Wellness Centre; a new building that will house a daycare, wellness centre, pool and hall. This new facility will be constructed in accordance with LEED standards for improved efficiency. The saving opportunities discussed throughout this report may be implemented into this new project, along with future endeavours that the Town may undertake.

Town of 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 the report can be implemented into these new projects, resulting in energy 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 its 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.

Municipality of St. Andrews:

The Municipality of St. Andrews has shown marginal interest in the past in energy efficiency. In terms of energy efficiency, the lighting in the St. Andrews Community Club has been upgraded to energy efficient T8s. A new public works shop is being considered with possible implementation by 2009. There are also plans for renovations to current buildings including an addition to the Municipal Office Building sometime in the future. The knowledge gained from this study and from observing the energy savings that result from implementing the recommended upgrades will be valuable in these renovations and in the future when new buildings are developed.

R.M. of Stanley:

This is the first energy and water efficiency study to take place in the R.M. of Stanley. Some energy efficient measures that this R.M. has already implemented includes triple pane windows in the Municipal Office and Shop, HRVs in the Shop, and energy efficient exterior lighting. There are currently plans for renovations and an addition to the Municipal Offices. The knowledge gained from this study will therefore be useful in these development projects. The Chief Administrative Officer of Stanley expressed a great deal of interest in this study and in implementing some of the more cost-effective measures in the coming year. In particular, there are plans to upgrade T12 lighting to T8s once the audit is complete.

Town of Swan River:

The Town of Swan River has several plans for new facilities in the future. The knowledge gained from this efficiency study will therefore be useful in future development projects. The following projects are expected to occur in Swan River in the near future:

- The construction of a new Municipal Office to replace the existing building. The existing Municipal Office is outdated and too small. This project is likely to take place in 5 years.
- A new Wellness Centre is in the early planning stage but likely won't proceed for a few years.
- Cochrane Engineering is completing a study into the expansion of their wastewater treatment system including a new lagoon or a new wastewater treatment plant.

The saving opportunities discussed throughout the energy and water efficiency report for Swan River can be implemented into these new projects, resulting in energy and water efficient buildings. The Chief Administrative Officer of Swan River 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 its interest in implementing energy efficient measures. This was evident in the upgrades made to the Water Treatment Plant, the Library, and the installation of heat recovery ventilators in the Municipal Administration Building, the Town Garage, the Arena and the Library.

R.M. of Whitemouth:

The Chief Administrative Officer of the R.M. of Whitemouth expressed interest in this study and in using the results from this study to implement some of the more cost-effective measures in the future. The R.M. has already shown some interest in energy efficiency as was proven in the installation of two heat recovery ventilators in the Fire Hall. One concern that was expressed the by R.M. throughout the visit was in the light quality/quantity given by the energy efficient light fixtures. Town members were reassured that the light quality/quantity from T5 and T8 fixtures and LED exit signs is excellent.

Town of Roblin:

Knowledge gained from this efficiency study will be useful in future development projects for the Town of Roblin. The Town has already show interest in energy efficiency as was evident in their

Community Centre. This particular facility has a number of energy efficient building components including: well insulated roof and walls; programmable setback thermostats; low flow water fixtures; efficient lighting and occupancy sensors.

A potential barrier that could affect the implementation of the opportunities, for any of the Municipalities, is a change in council members. It is important that the information gained here be passed on as new members enter and current members leave the council.

City of The Pas:

The Pas has expressed interest in this study and in using these results to implement some cost-effective measures in the near future. Upcoming projects for the town include installing a high efficiency air-conditioner in the Fire Hall and upgrading the windows in the Civic Centre. The knowledge gained from this efficiency study will be useful in future development projects. A potential barrier that could affect the implementation of the energy saving opportunities discussed throughout the energy and water efficiency study report is a change in council members. It is important that the information gained here be passed on as new members enter and current members leave the council.

APPENDIX A

INCENTIVE PROGRAMS

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Table A.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	Kelly Epp at kepp@hydro.mb.ca or 204-474-4051
T8 Electronic Fluorescents	T8 Premium Ballast - $20, T8 Standard Ballast - $15, T8 Dimmable Ballast - $60, 8 Foot T8 Ballast - $35	Kelly Epp at kepp@hydro.mb.ca or 204-474-4051
LED Exit Signs	$45 per new sign	Kelly Epp at kepp@hydro.mb.ca or 204-474-4051
High Pressure Sodium Lighting	The lesser of $500 per kilowatt saved or $100 of lighting fixture cost	Kelly Epp at kepp@hydro.mb.ca or 204-474-4051
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 A.2. Other Incentive Programs

Program Name	Eligibility	What Type of Projects are Available	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.	$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.		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% 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.		$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 B

THE MUNICIPALITIES TRADING COMPANY OF MANITOBA LTD. REPORT

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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.

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.