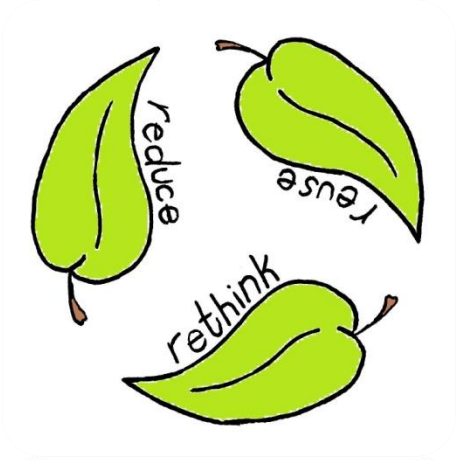

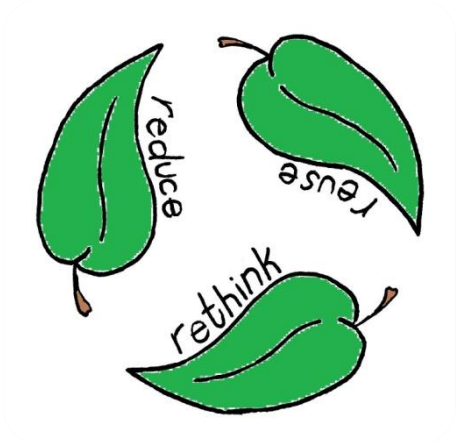

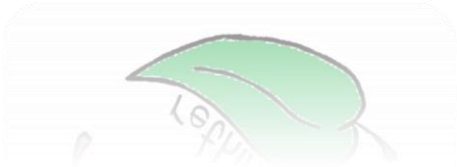

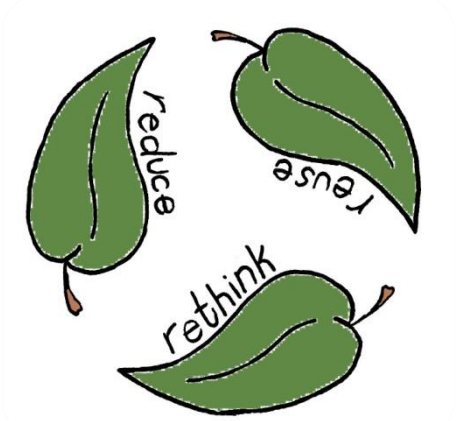

5 Year Energy Conservation and Demand Management Plan

by:

The Township of Havelock-Belmont-Methuen

Approved by Council on June 9th, 2014

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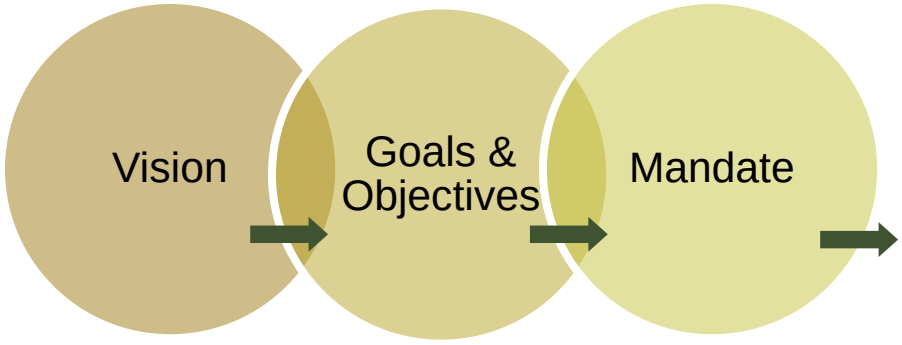


ENERGY CONSERVATION STRATEGY

VISION

> To create an environmentally sustainable municipality that serves the Township of Havelock-Belmont-Methuen in an environmentally conscious manner through the implementation of energy management awareness, effective operational practices, and energy efficient technologies.

GOALS & OBJECTIVES

The establishment of strategic goals and objectives will assist with guiding, achieving, and continuing the vision of an environmentally sustainable municipality.

Over the duration of the next five years the Energy Conservation and Demand Management Plan (CDM Plan) of the Township of Havelock-Belmont-Methuen will strive to attain the following goals:

1. Establish a working environment committed to improved conservation practices.
2. Improve equipment/ machinery reliability, maintenance costs and energy efficiency.
3. Reduce green house gas emissions produced by operations within municipal facilities.
4. Reduce the total energy consumption in municipal facilities over the next five years.
5. Maximize the municipality's fiscal situation through direct and indirect energy savings as a result of efficiently managing energy consumption.

In order to obtain the above goals the following objectives have been established:

- Conduct energy audit(s) within the next three years in those municipal facilities that acquire the highest operating costs and/or GHG emissions.
- Examine the possibility of introducing energy efficient operating processes within the next three years for those municipal facilities that acquire the highest operating costs and/or GHG emissions.
- Explore retrofit opportunities to existing municipal equipment and/or machinery with high consumption usage over the duration of the next four years that will assist in reducing maintenance costs and energy consumption while increasing efficiency.
- Seek energy efficient technologies that reduce energy consumption and green house gas emissions within the next four years for municipal utilities infrastructure projects such as LED streetlights.
- Initiate an Energy and Environmental Awareness Program within the course of the next five years that involves employees in environmental and energy conservation/ demand management awareness initiatives.

MANDATE

The Township of Havelock-Belmont-Methuen recognizes energy conservation and demand management as a strategic initiative in which increased energy efficiency and effectiveness will achieve cost savings and reduced environmental impact. We will demonstrate leadership to attain a sustainable, self-supporting, clean and efficiently operated community.

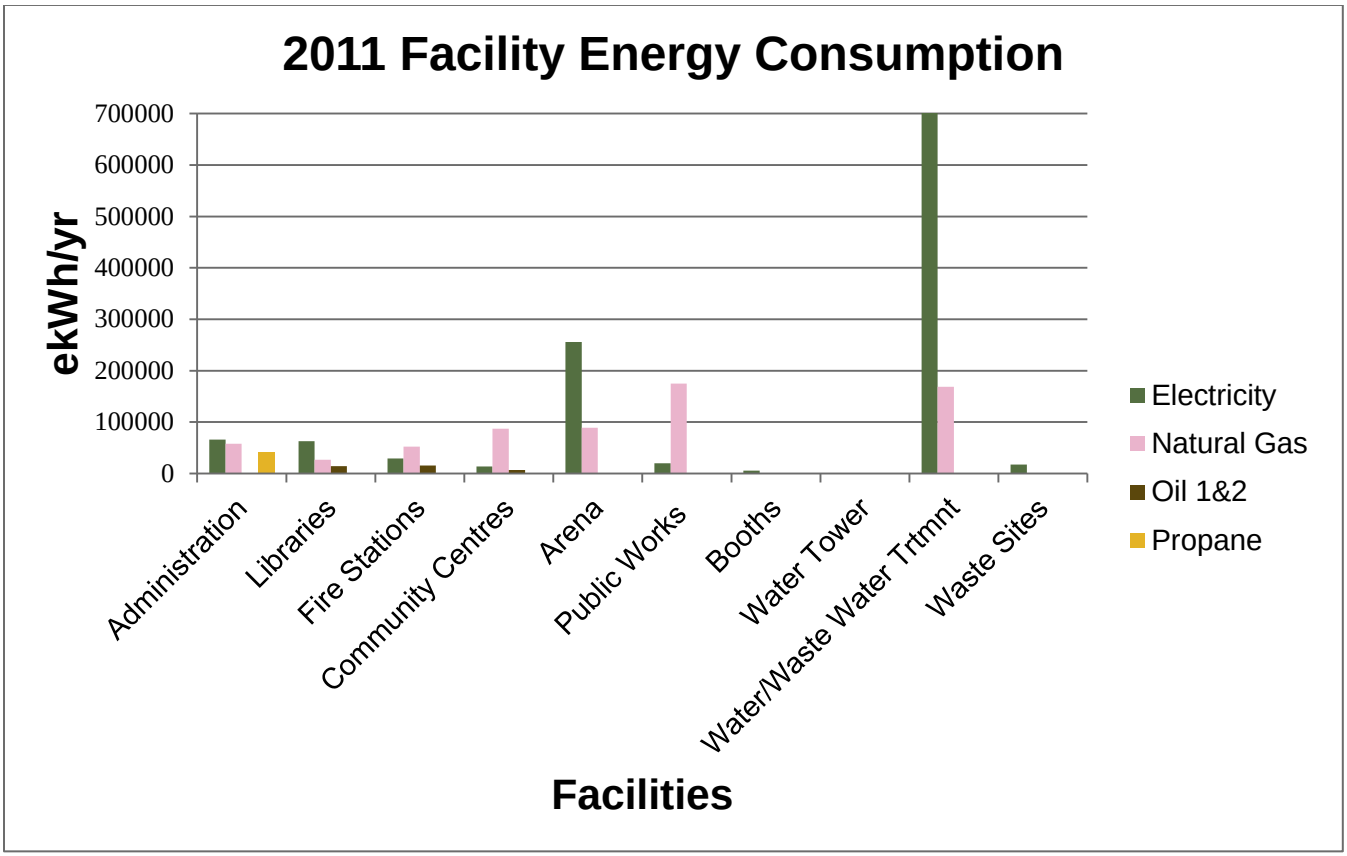
Council Resolution:

THAT the Energy Conservation and Demand Management Plan be approved as presented on the June 9, 2014 Regular Council Meeting.

CURRENT ENERGY STATE

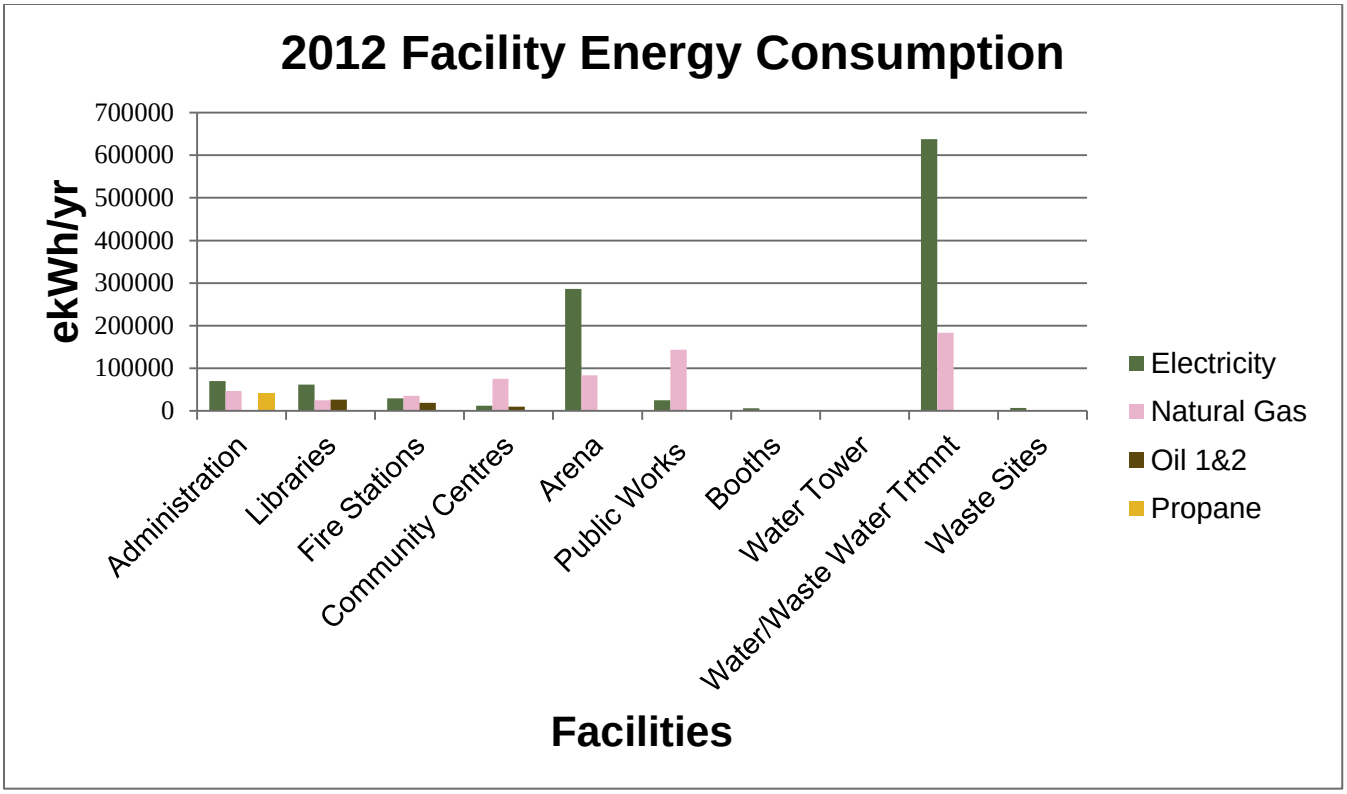
ANNUAL ENERGY CONSUMPTION SUMMARY

Figure 1



Annual consumption of **1,923,735.57** kilowatt-hours of energy (ekWh/yr)

Figure 2



Annual consumption of **1,830,023.94** kilowatt-hours of energy (ekWh/yr)

The two (2) previous column charts, figures 1 and 2 display the energy consumption amounts in kilowatt-hours per year for the years (2011 and 2012) for various municipal facilities in the Township of Havelock-Belmont-Methuen. The energy consumption amounts were for all fuel/energy types used within the municipality; Electricity, Natural Gas, Oil and Propane.

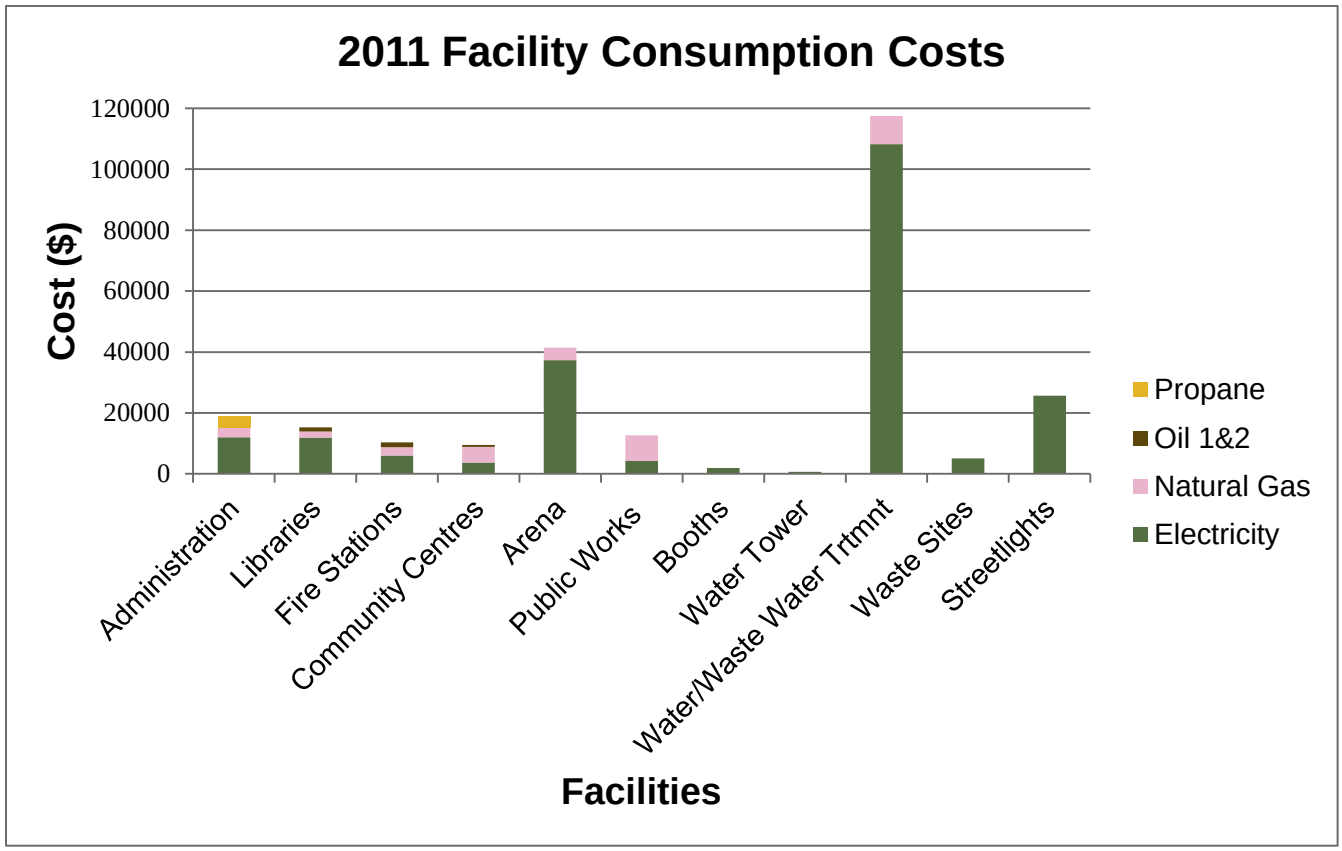
Over the duration of 2011 and 2012 the operations within the municipality which acquired the greatest energy consumption from greatest to least are as follows:

1. Water/Waste Water Treatment
2. Arena
3. Public Works

Note that streetlights are not included in the annual energy consumption summary as a majority of the municipality's streetlights are unmetered so the exact kilowatt-hours (kWh) are unknown.

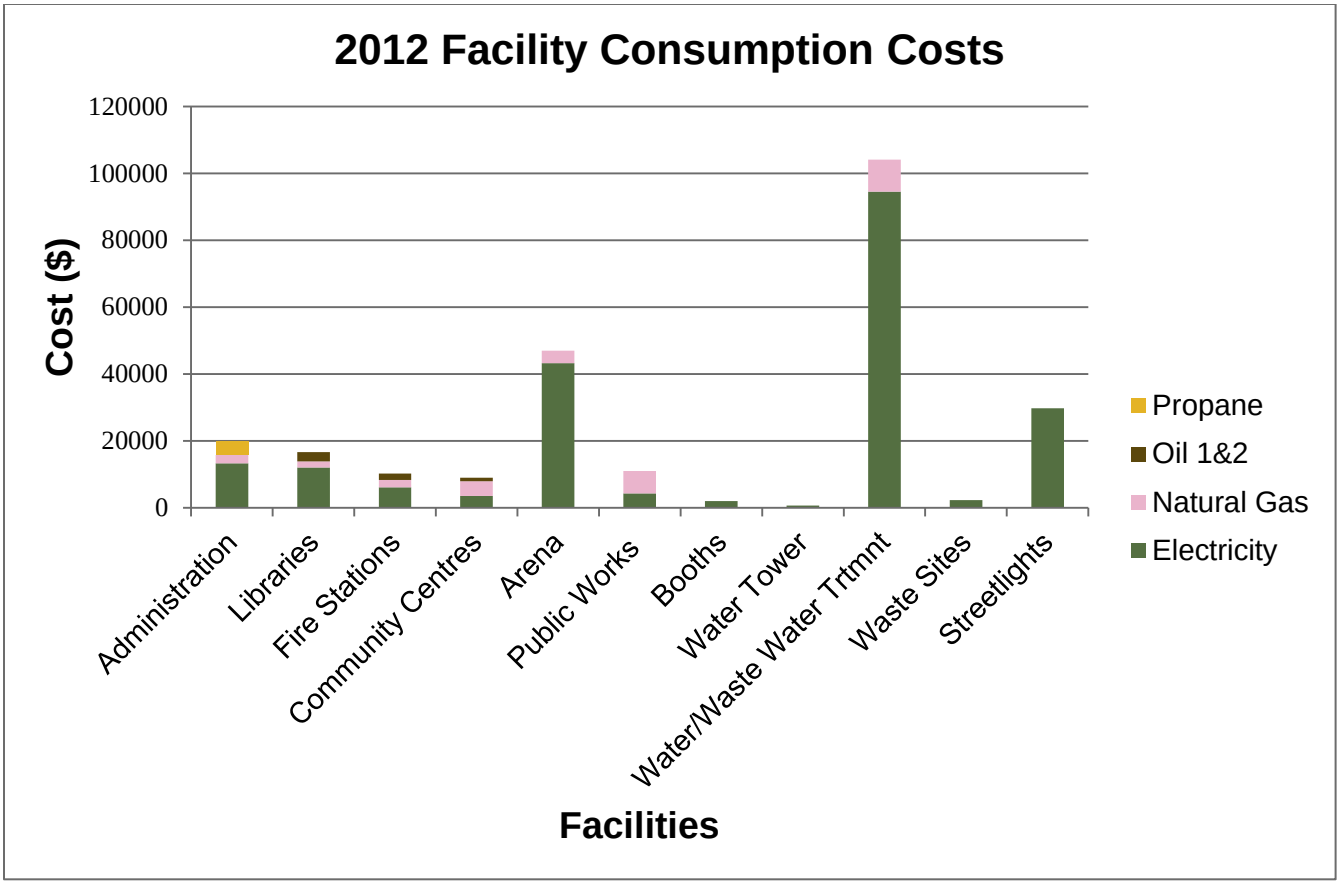
ANNUAL CONSUMPTION COST SUMMARY

Figure 3



Annual consumption cost of **$ 259,012.91**

Figure 4



Annual consumption cost of **$ 252,137.29**

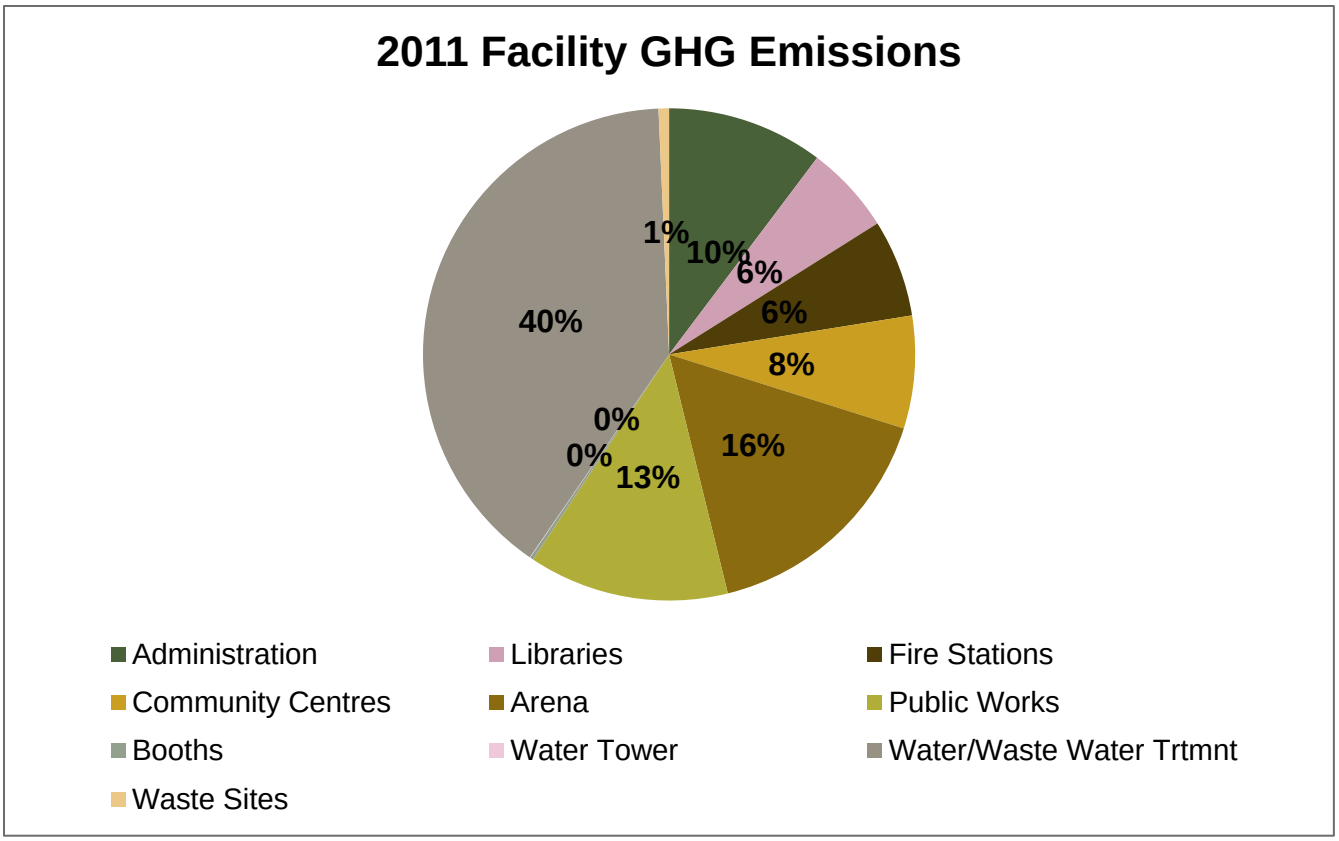
The two (2) previous column charts, figures 3 and 4 display the consumption cost amounts for the years (2011 and 2012) for various municipal facilities in the Township of Havelock-Belmont-Methuen. The consumption cost amounts were for all fuel/energy types used within the municipality; Electricity, Natural Gas, Oil and Propane.

Over the duration of 2011 and 2012 the operations within the municipality which acquired the greatest consumption costs from greatest to least are as follows:

1. Water/Waste Water Treatment
2. Arena
3. Streetlights

ANNUAL GREENHOUSE GAS (GHG) EMISSIONS SUMMARY

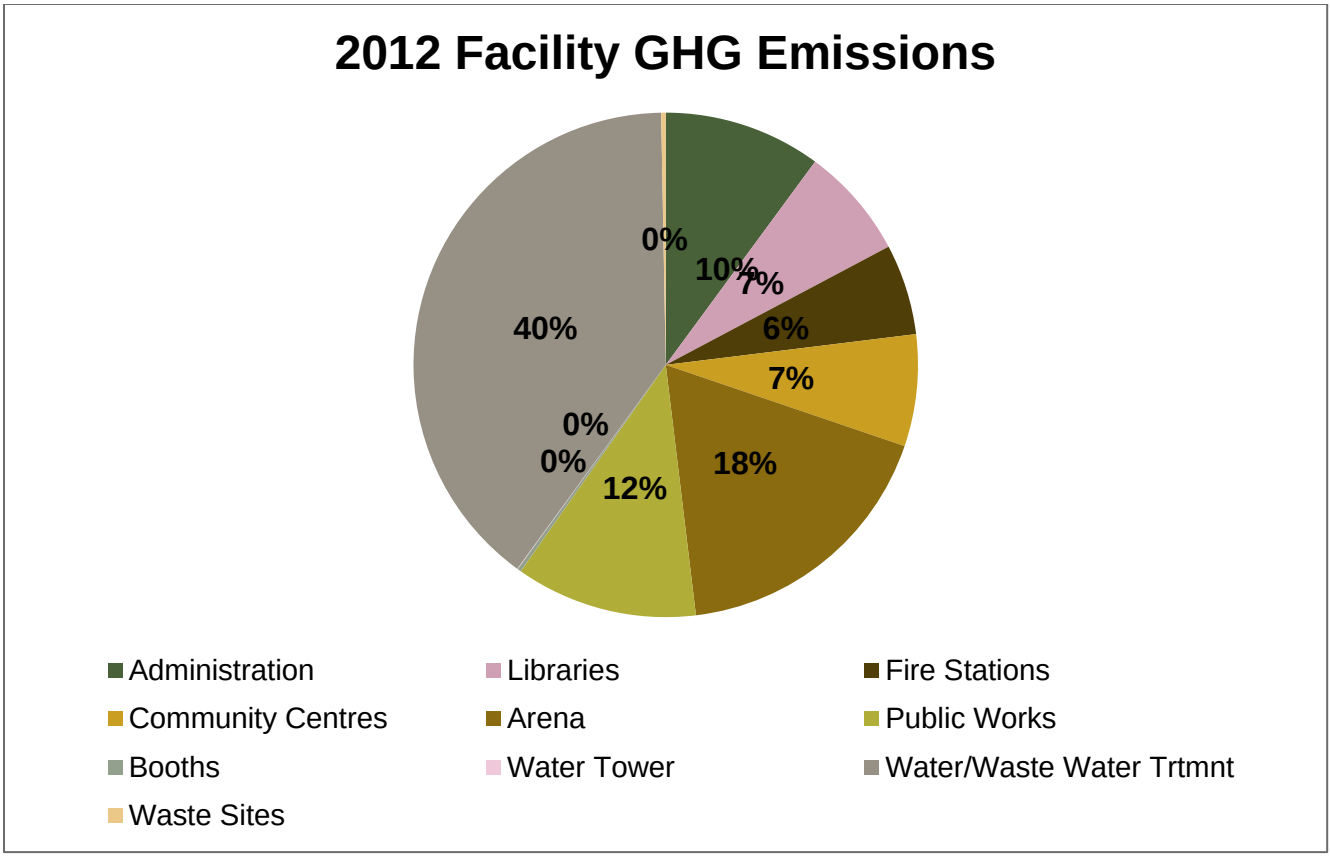
Figure 5



Annual GHG emissions of **251,324.55** kg CO2e per year

Note some calculations may differ slightly due to changes in coefficient calculations.

Figure 6



Annual GHG emissions of **239,624.77** kg CO2e per year

The two (2) previous pie charts figures 5 and 6 display the GHG emissions for the years (2011 and 2012) for various municipal facilities in the Township of Havelock-Belmont-Methuen. The GHG emission percentages were based on all fuel/energy types used within the municipality; Electricity, Natural Gas, Oil 1 & 2, and Propane.

Over the duration of 2011 and 2012 the operations on average that acquired the greatest GHG emissions from greatest to least are as follows:

1. Water/Waste Water Treatment
2. Arena
3. Public Works

Note that streetlights are not included in the annual GHG emissions summary as a majority of the municipality's streetlights are unmetered so the exact kilowatt-hours (kWh) are unknown therefore the exact GHG emissions produced annually from streetlights are also unknown.

The facility categories displayed in the previous 6 charts include the following facilities/ operations:

Facility Categories	Facilities/ Operations
Administration	Municipal Office and Medical Centre
Libraries	Havelock Library, Cordova Library, and Kasshabog Lake Library
Fire Stations	Havelock Fire Hall and Cordova Fire Hall
Community Centre's	Stone Hall, Town Hall, and Cordova Recreational Hall
Arena	Arena
Public Works	Public Works Garage, Village Garage, and Salt Shed
Booths	Arena/Park Booth and Information Booth
Water Tower	Water Tower
Water/Waste Water Treatment	Well 3, Well 1 & 4, Pumping Station and Waste Water Treatment Plant
Waste Sites	6th Line Waste Site, Oak Lake Waste Site, and Jack Lake Waste Site
Streetlights	Cordova Street Lights, Village Street Lights, Lions Park Lights, Ball Field Lights, Stop Lights (West End), Kosh Lake Beach Lights, Rotary Park Lights, 9 Con Lot 6, and 6th Line Lights.

A review of the annual energy consumption, annual consumption costs and annual GHG emissions summaries for the facilities within the Township of Havelock-Belmont-Methuen indicate that the facilities and operations of the municipality that are most costly, consume greater energy consumption and produce greater GHG emissions are of significance to energy conservation and demand management.

Therefore the Energy Conservation and Demand Management Plan will focus a large percentage of measures towards those facilities and operations which include the Water/Waste Water Treatment Facility, Arena, and Streetlights over the duration of the next 5 years.

PROPOSED ENERGY MEASURES

WASTE WATER TREATMENT FACILITY

The Township will investigate energy efficient retrofitting options using new technology and consider upgrades to older equipment and/or machinery within the facility.

The township will explore the following possibilities:

- Installation of devices to limit demand by prioritizing loads so they are not all starting at once creating a high demand load (this will reduce the power factor / efficiency factor which is a major factor in the calculations involved with the new hydro one billing system)
- Installation of soft starts on large motors to minimize the power demand required at one time when a motor turns on
- Installation of Variable Frequency Drives (VFD) controllers on the SBR Blower Motors to reduce the speed of the drives, reduce the electrical load (demand charges), and provide the ability to ramp the motor/pumps up and down to reduce heat load on the equipment which results in reduced repairs and extends the lifetime of the equipment
- Installation of a power monitoring system to monitor the usage of motors within the plant and establish historical trending data to assist with benchmarking electrical use for each motor (also assists with flagging motors that have an increase in consumption so that repairs can be made)
- Replace lights that are greater than T8 style with high efficiency lights to reduce electrical usage
- Installation of a UV lighting control system to improve efficiencies

ARENA

The Township will conduct an energy audit within the Arena to determine possible improvements that could be made to reduce energy consumption and demand requirements. The Township will explore incentives/ funding opportunities that may assist with the cost of an energy audit.

The townships energy audit of the facility will examine some of the following:

- Low-cost/ no-cost efficiency improvements i.e. reduce heating temperature to spectator areas when unoccupied, adjusting ice temperatures for different activities, unplugging unnecessary appliances (phantom loads)
- Retrofitting of new technology or features to older equipment and/or machinery i.e. the use of variable frequency drives (VFDs), high efficiency motors and soft-start mechanisms/controllers
- Energy efficient appliance purchasing i.e. soft drink machines, refrigerators, energy efficient hand dryers and low flow toilets
- Energy efficient hot water heaters i.e. instant hot water heaters or tankless heaters instead of standing hot water tanks and natural gas water heaters instead of electric heaters
- Energy efficient heat exchangers i.e. gravity film heat exchangers for any waste water locations such as showers
- High efficiency lighting improvements i.e. arena ice surface lamps and change room occupancy sensors
- Waste heat recovery from refrigeration process to direct wasted heat for other purposes
- Shifting load improvements i.e. the installation of timers on certain equipment where feasible to assist in shifting loads from on-peak to off-peak time of day to take advantage of off-peak hours of day
- Energy efficient operating processes i.e. ice startup and shutdown dates

STREET LIGHTS

In 2005 the Township completed a Street Light Betterment Project in which approximately 153 street lights were replaced with High Pressure Sodium (HPS) lights. Since then use of high-power white-light, Light Emitting Diode (LED) lighting has been on the rise due to its high energy efficiency rating, longer life expectancy and quality of illumination. LED lights have reduced environmental effects compared to other forms of lighting.

Below is a comparison of the traditional HPS lighting and LED lighting:

Light Type Comparison HPS vs. LED	
Life Expectancy	LED lighting outlasts HPS lighting by a factor of 10 – 15 years. The life expectancy of LED streetlights is approximately 20 years compared to the approximant 5 year life span of HPS streetlights. The operational life of LED lights is 50,000 hours or more with some lasting 100,000 hours while HPS lights last about 20,000 hours maximum. This results in reduced maintenance costs for lamp breakdowns and replacements.
Illumination / Beam Angle	HPS lights have a 360 degree lighting angle so much of the light is wasted. LED lighting acquires a directional output of light, in other words the light is directed towards the road surface that is intended to be lit. This is due to light guiding pillars used on LED lights to guide the light. Therefore the effective light emitted by an LED is much higher than HPS lights. Due to the directional light produced by the natural LED white light the effects of light pollution and sky glow are significantly reduced.
Maintenance Costs	LED lights are known to be more durable and able to withstand environmental effects than that of HPS lights. They also take a longer period of time to begin to decay.
Ignition Time	HPS lights need approximately 5 – 10 minutes to heat up until they are producing their highest luminance whereas LED lights are instant as they do not acquire the need for preheating.
Safety	LED lights work within the low voltage power supply which makes it less likely to get a electric shock than that of a HPS light.
Energy Efficiency	LED lights produce more lumens per watt than HPS lights in other words more light for less watts.

Colour Rendering Index	The Colour Rendering Index (CRI) of a light determines how natural an object looks when lit. The CRI of white LED is over 75 where some well encapsulate LED lights can reach over 90. Lights with a higher CRI allow and object to be seen as it would in the daylight even when placed in the darkness. HPS lights acquire a much lower CRI of less than 23.
Colour Temperature	The colour temperature of LED lights can range from warm white, pure white and cold white. The colour temperature of HPS lights can only produce a yellow light which can distraught your perception of objects. The pure white colour temperature of LED lights is good for street lighting as it makes you see as you would in the daytime therefore increasing safety, visibility and clarity to both pedestrians and motorists.
Environment	HPS lights contain 1 to 22 mg of mercury as well as lead. Both of these substances are highly dangerous if contaminated water or food is exposed to humans or wild life. LED lights are mercury free and contain no toxic chemicals as they are made of inorganic semiconductor materials.

The Township will explore the replacement of the current High Pressure Sodium lights with Light Emitting Diode lights. Though the investment of LED lighting is of greater cost then the current HPS lights the benefits for improved efficiency goes much farther, as they will reduce hydro loads required for illumination purposes and reduce energy consumption consumed by the Townships street lights. In addition to energy efficiency and cost saving benefits such measure would reduce greenhouse gas (GHG) emissions currently produced.

ENERGY AND ENVIRONMENTAL AWARENESS PROGRAM

In order to establish a working environment committed to improved conservation practices the Township will work to establish an Energy and Environmental Awareness Program.

The program objective is to involve employees of the Township in energy conservation and demand management awareness and to provide an opportunity to identify environmental and energy efficiency improvements/ practices they note in their day-to-day activities.

The Energy and Environmental Awareness Program will focus on two key aspects which consist of Communication and Engagement.

1. **Communication:** Communicating energy conservation and environmentally responsible practices throughout the work place by use of facility posters and presentations during annual staff meetings on energy and environmental awareness. As the program progresses, updates of successful measures will be communicated to employees.

2. **Engagement:** Engaging employees of the Township through activities where they can assist with identification of energy and/or environmental improvements that they note in their day-to-day work activities. This could be done by surveys, energy quizzes, and facility walk-through discussions with the employees who are familiar with particular facilities.

COST & SAVINGS ESTIMATES

WASTE WATER TREATMENT FACILITY

Wastewater Treatment Facility retrofit costs and savings estimates have not been determined for this facility. These amounts cannot be established until an audit is conducted and exact measures have been selected for implementation at the facility. Subsequently, costs and savings estimates within the Energy Conservation and Demand Management Plan will be reported on an annual basis.

ARENA

Arena retrofit costs and savings estimates have not been determined for this facility. These amounts cannot be established until an audit is conducted and exact measures have been selected for implementation at the facility. Subsequently, costs and savings estimates within the Energy Conservation and Demand Management Plan will be reported on an annual basis.

STREET LIGHTS

Cost and savings estimates have not been determined yet for the replacement of current HPS lights with LED lights as a number of factors need to be explored. The engagement of an external consultant will be required to assist with this project. The cost and savings estimates within the Energy Conservation and Demand Management Plan will be reported to Council.

There may be several options for street light incentives/ funding opportunities when upgrading to LED lights in Ontario. The following opportunities will be further evaluated to assist with funding for the Townships upgrades to LED street lights.

1. **SaveONEnergy Retrofit Program** offered by the Ontario Power Authority (OPA) allows municipalities to apply for and receive government incentives for retrofitting their street lights with more energy efficient LED technology. The incentive is the greater of either; $400/kW of demand savings that reduce the Province's electricity peak load or $0.05/kWh of first year electricity savings

2. **Retrofit Program** offered by Hydro One is two levels of incentives providing up to 50% of project costs for energy efficiency lighting retrofits or per unit incentives of 100% of the material costs
3. **Federal Gas Tax Funds** may be used by the Township for environmentally sustainable municipal projects that improve the quality of the environment and contribute to reduced greenhouse gas emissions, clean water or clean air. LED street light replacement falls under the eligible project category of Community Energy Systems which includes retrofitting government infrastructure such as street lights.

ENERGY AND ENVIRONMENTAL AWARENESS PROGRAM

We are unable to determine a cost or savings estimate for the Energy and Environmental Awareness Program as this will be an ongoing process. Communication and engagement of employees is a vital part of the overall Plan. Achievements and successes will continue to improve conservation practices.

IMPLEMENTATION

CDM PLAN TIMELINE

The Energy Conservation and Demand Management Plan timeline is broken down in the following diagram:

MEASURE	FACILITY	2014	2015	2016	2017	2018	2019
Energy Audit	Arena	ACTIVE: Determine improvements to reduce energy consumption and demand requirements					
Energy Efficient Operating Processes	Arena	ACTIVE: Explore ice plant operations that may assist with decreasing operating costs and environmental impact					
Retrofit Opportunities	Waste Water Treatment Facility	ACTIVE: Investigate energy efficient retrofitting options, new technology or upgrades to older equipment/ machinery					
Energy Efficient Technologies	Infrastructure Street Lights	ACTIVE: Explore the replacement of current HPS lights with LED lights					
Energy and Environmental Awareness Program	All Facilities	ACTIVE: Establish a program that involves employees of the Township in energy conservation and demand management awareness					

MONITORING

The Township of Havelock-Belmont-Methuen will review and evaluate the Energy Conservation and Demand Management Plan and revise, update and report information on energy consumption, cost, and GHG emission reduction(s). The Plan will be updated as a minimum, every five (5) years.

ANNUAL ENERGY CONSUMPTION & GHG EMISSIONS DATA

APPENDIX A: 2011 ENERGY CONSUMPTION AND GREENHOUSE GAS EMISSIONS

APPENDIX B: 2012 ENERGY CONSUMPTION AND GREENHOUSE GAS EMISSIONS