

March 2018



# Background Report: Infrastructure



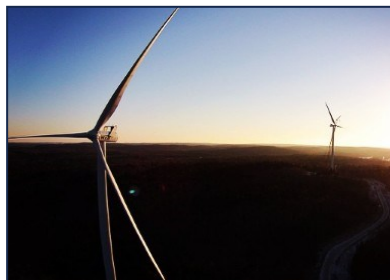
Background Report 6 of 9  
**Prepared by West Hants Planning  
and Development Department**

## Executive Summary

As effective infrastructure and services are imperative to the operation of the Municipality of the District of West Hants (West Hants) it is beneficial to document the available infrastructure and services, the challenges they may face, and some of the opportunities for improvement.

Infrastructure in West Hants includes potable water, sanitary and storm sewer, waste management, power, and transportation.

Achieving sustainable infrastructure and services in the face of climate change, legislative change and requests from residents and businesses is very difficult. Council always needs to make choices. Examining the costs and benefits of maintaining or expanding infrastructure or services either geographically or by urgency of access is critical in order to ensure benefits outweigh costs in the longer term.



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# 1. Water

In the *Statement of Provincial Interest Regarding Drinking Water* the Province specifies that a safe supply of drinking water is a basic requirement for all Nova Scotians. In West Hants, over one third of households receive water through municipal infrastructure, with the remaining households having private wells. The Department of Environment is responsible for all matters regarding well water, including permits and quality issues. In the recent past, water has been an issue for those on wells in West Hants with many wells running dry. West Hants has provided a potable water-filling station at the Municipal Building which is used by both individuals and contractors.



## 1.1 Central Water Services

West Hants provides central water services in the Growth Centres of Falmouth and Three Mile Plains, and in the community of Hantsport. Wentworth Road, between the Town of Windsor (Windsor) boundary and the Fundy Gypsum plant at Wentworth Creek, also receives water services due to the proximity to Windsor.

There are three municipal water supply areas which provide water for West Hants: French Mill Brook, Mill Lakes and Davidson Lake.

The French Mill Brook watershed is 2,814 acres (1,138.82 hectares) and supplies water to approximately 780 households in the Falmouth Growth Centre.

Windsor's Mill Lakes water supply is 4,394 acres (1,778.45 hectares) and serves over 1,000 households in Three Mile Plains and the serviced portion of Wentworth Road.

The Davidson Lake watershed is approximately 329 acres (133 hectares) and supplies water for approximately 600 households in Hantsport.

All three water supply areas are now designated Protected Water Areas under the Nova Scotia Environment Act. Regulations for these designated areas are generally determined in consultation with a local advisory committee and affect activities such as swimming, boating, fishing, clear cutting, mining and residential uses.

Council established a zone in the Land Use By-law to protect water quality in these three (3) water supply areas. The zone limits the types, size and location of developments in order to prevent contamination during construction and during the use of the property.

Council's policy, as expressed in the present Municipal Planning Strategy, states that Municipal water services will not be extended beyond the service area boundaries of the Three Mile Plains and Falmouth Growth Centres and the Windsor-West Hants Joint Industrial Park. This policy was created to ensure efficiency and cost-effectiveness in providing Municipal water services. The Hantsport water service was created by the former Town; there is no policy regulating the expansion of the system or requiring new developments to be connected to the system.

New developments within areas that can be serviced in West Hants must be serviced at the developer's cost. In addition, Council's policy requires that if an area is to be serviced with water, sewer be provided at the same time, if at all possible.

These policies encourage concentrated development within the Growth Centres and the Industrial Park, which decreases the cost of servicing.

### *Water Conservation Rebate Program*

The Falmouth and Three Mile Plains-Wentworth water utilities are able to offer customers a rebate on their water invoices if they install low-flow fixtures. Replacing older fixtures with low-flow options can reduce water consumption which will delay the expansion of treatment facilities, help the environment and reduce household water expenses. A rebate can be issued to each water utility account for one low-flow showerhead (\$5.00) and for one low-flow toilet (\$40.00) Most other municipalities do not offer this type of incentive. In future, West Hants could consider requiring new buildings or renovations to include low-flow fixtures.

## **2. Sanitary Sewer Service**

Sanitary sewer services are provided in the Growth Centres of Falmouth and Three Mile Plains and in the community of Hantsport.

The sewer system in Three Mile Plains serves approximately 900 households, with pumping stations which move the sewage to a treatment plant located in Windsor.



The Falmouth sewer treatment plant is located near the Avon River Causeway, and serves approximately 600 households.

The wastewater from approximately 600 households in Hantsport is treated at a plant located, owned and operated by the Municipality of the County of Kings, with an agreement in place for cost-sharing between the municipalities.

To ensure efficiency and cost-effectiveness, Council has determined that Municipal sewer services will not be extended beyond the service area boundaries of the Three Mile Plains and Falmouth Growth Centres and the Windsor-West Hants Joint Industrial Park.

Hantsport sewer was developed by the former Town, and there is no policy regulating the expansion of the system or requiring new developments to be connected to the system.

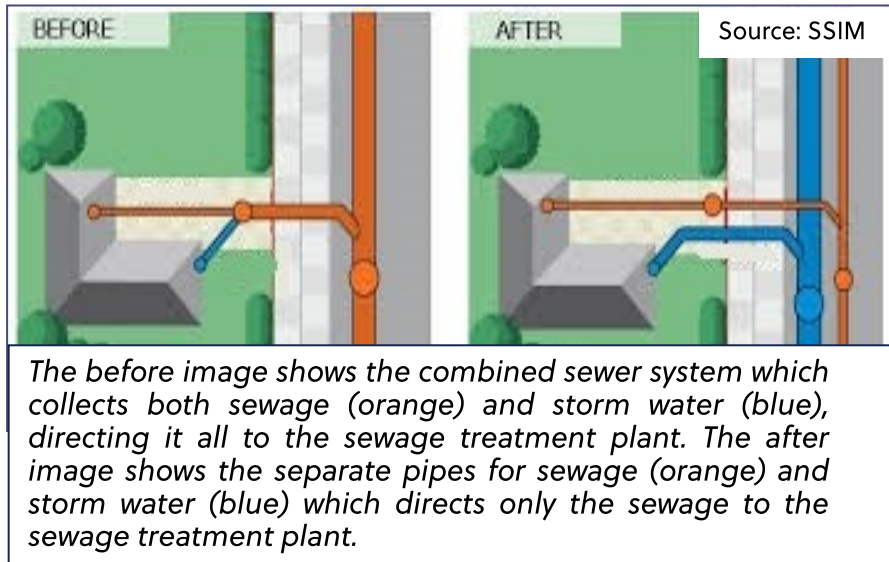
Just as for water, throughout West Hants developers must pay for the installation of municipal sewer systems in areas which can be serviced with sewer.

### **2.1 Storm Water Management**

Storm water is precipitation that is not absorbed by vegetation or the ground. In the more developed areas of West Hants an increase in hard surfaces such as roads and buildings results in more precipitation ending up as storm water runoff.

There are storm water catch basins to collect local runoff within some streets in Garlands Crossing, as well as Clover Lane and Shetland Road in Falmouth. Some areas of Hantsport have combined sewers, which means storm water and sewage waste water are collected in the same pipes and sent to the treatment plant (Figure 1). Treating storm water

Figure 1: Combined vs. Separate Sewers



reduces the sewage treatment plant's capacity to treat sewage waste water. Replacement of these combined sewers is being carried out when opportunity arises in conjunction with infrastructure updates. In 2017, separation of combined sewers was done in some areas of Hantsport, such as Holmes Hill Road, School Street and Chittick Avenue. In other areas, storm water runoff is collected through ditches which flow through to local water courses.

When storm water runs over surfaces, it can collect pollutants such as sediment, bacteria, pesticides, metals and petroleum by-products. Once the drainage system reaches capacity, storm water can cause flooding of roadways, damage to properties, and erosion in streams.

In 2016, a Storm Water Management Plan was developed for the Falmouth Growth Centre. It outlines the causes of the flooding experienced in Falmouth, the location of the problem areas, and methods of managing the storm water. The plan suggests Council create policies that would encourage low-impact and cluster developments to reduce storm water run-off. Retention ponds are also suggested as a possible mitigation option.

To address similar issues, a storm water management plan is currently being developed for Hantsport.

### 3. Solid Waste Management and Recycling

Divert NS is a non-profit corporation which manages 75 recycling depots in the Province. In 2015-16, Divert Nova Scotia reported assisting the diversion of 112,000 tonnes of organic waste and 55,000 tonnes of recyclable material from Nova Scotia landfills. West Hants has a comprehensive recycling and composting program, and offers residents information regarding recycling of



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electronics and household hazardous waste. In 2015-16 the West Hants diverted 2,063 tonnes of garbage and 762 tonnes of recyclables from the landfill.

### 3.1 Solid Waste

Household solid waste is collected every second week, with a maximum of 6 bags per household each collection, and delivered to the Cogmagun landfill site. In 2015-16 it was calculated that each resident of West Hants generated on average 225 kg per year, which is significantly lower than the approximately 560 kg per person per year before recycling and composting programs were introduced in the Municipality. The Solid Waste Management By-Law provides penalties for refusing to sort waste, illegal dumping, littering and burning garbage. A zone was created to allow existing landfill operations; expanded or new landfill areas may only be located through a public process.

### 3.2 Recycling

In 1998, the Province of Nova Scotia banned recyclables and food waste from entering landfills. Plastics and paper are picked up every second week from households in West Hants with a limit of 10 bags each collection. Recyclable materials are transported to a recycling depot in Kentville.

Since 2008, electronic waste such as televisions and computers have been recycled in Nova Scotia. These items are not accepted at the roadside, but can be dropped off at a recycling depot.

Household Hazardous Waste (HHW) such as oil containers and paint cans must be taken to the Cogmagun landfill site for recycling.

### 3.3 Composting

Residents of West Hants have been responsible for composting food waste using back yard composters since 1998. However, starting in April 2018, green carts for organic food recycling will be provided to each household in West Hants. It will be the option of each resident to either backyard compost or place food waste in the green cart for collection. It is expected that household collection of organic waste will increase the material composted by 18% over back yard composting.

### 3.4 Septage Lagoon

West Hants also operates a septage lagoon in Cogmagun, adjacent to the landfill site. This can be used by anyone within the Municipality who has a septic tank pumped out. The septage lagoon consists of a two stage process which takes approximately 1 year to process the waste.

## 4. Emissions

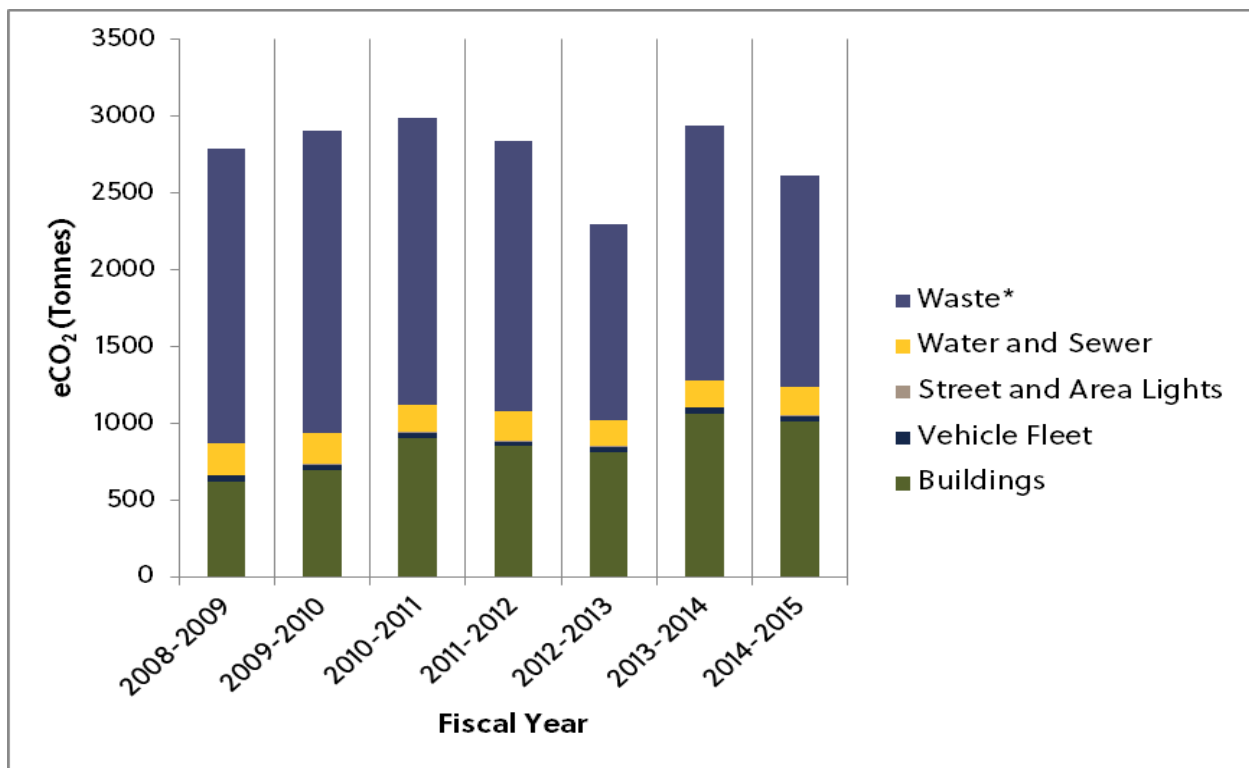
It has been determined that almost half of the country's emissions and air pollutants are influenced by municipal governments, either directly or indirectly. Emissions under direct influence by the municipality are known as corporate emissions, which include emissions from municipally owned infrastructure such as buildings and vehicles. Emissions under

indirect influence of the municipality are known as community emissions, which can include transportation and waste management.

In 2007, the Union of Nova Scotia Municipalities (UNSM) created and released a workbook for municipalities across Nova Scotia to track emissions. The Corporate Energy and Emissions workbook calculates the CO<sub>2</sub> equivalent emissions from municipal buildings, vehicles, street lights, water and sewage, and waste. Each fiscal year the municipality utilizes this spreadsheet to calculate the annual corporate greenhouse gases and air pollutants produced. Data is collected from invoices and other reports.

As shown in Figure 2, the total equivalent CO<sub>2</sub> (eCO<sub>2</sub>) emissions have not varied significantly since the baseline year (2008-2009), however the distribution has changed. Buildings and waste are the largest contributors to municipal eCO<sub>2</sub> emissions. Between the baseline year and the 2014-2015 fiscal year, there has been a significant reduction in the eCO<sub>2</sub> emissions associated with waste (reduced by 549 t eCO<sub>2</sub>). This could be due to the Municipality heavily advertising recycling programs which has led to a decrease of recyclable materials in landfills. However, over the same period, building emissions have increased by 389 t eCO<sub>2</sub>. New buildings have been added to the Municipality, such as the Brooklyn Fire Hall, and heating costs may have increased due to colder winter weather.

**Figure 2: West Hants CO<sub>2</sub> Equivalent Emissions by Year**



\*The waste numbers are for community waste (sourced from residential, commercial, institutional and construction) disposed at the West Hants landfill and is not corporate waste. Corporate waste would only include waste generated by municipal operations.

Due to an increase in renewable energy sources, Nova Scotia emission factors for electricity have been falling since 2007. This means that although energy consumption may increase, greenhouse gas emissions could still decrease.

## 5. Power and Telecommunications

In 1992, the privately-owned Nova Scotia Power Inc. was created from the government-owned Nova Scotia Power Corporation. This privatization unified operations and stabilized electricity costs. Now, Nova Scotia Power provides 95% of the electricity in the Province, serves approximately 500,000 customers and produces over 10,000 gigawatts (GW) of electricity per year.



In recent years, stricter greenhouse gas and emission standards have helped shift power generation in Nova Scotia towards more renewable sources. There is an increasing emphasis on renewable sources such as wind and biomass (Figure 3), as opposed to reliance on coal, which produced over two-thirds of the electricity in the Province.

The Renewable Electricity Regulations of the Nova Scotia Electricity Act specify that by 2020 renewable sources must contribute 40% of the energy generation in the Province, which may result in more applications to West Hants for wind turbine, solar panel, or other renewable energy sites.

**Figure 3: Percentage of Energy Generated in Nova Scotia by Source**

Source of Energy Generated in Nova Scotia	2007	2017	2020 Forecast
<b>SOIL FUELS</b>	75%	55%	38%
<b>NATURAL GAS and OIL</b>	13%	16%	6%
<b>HYDRO and TIDAL</b>	7%	8%	20%
<b>WIND</b>	1%	14%	18%
<b>BIOMASS</b>	1%	2%	1%
<b>IMPORTS</b>	3%	5%	16%
<b>OTHER (i.e. SOLAR, etc.)</b>			1%

\*All values come from Nova Scotia Power Inc. website (November 29, 2017) <https://www.nspower.ca/en/home/about-us/todayspower.aspx#>

## 5.1 Wind Turbines

Wind energy is a growing source of clean electric power generation. It is an infinite natural renewable resource as it is not depleted when it is used to generate electricity. Additionally, unlike fossil fuel burning, wind energy does not produce harmful emissions that are proven to cause health issues and contribute to greenhouse gas emissions. New wind turbine sites in Nova Scotia can repurpose underutilized land and create a demand for local labour.

To reduce the reliance on non-renewable energy sources, Council has created policies to consider residential and utility-scale wind turbines within West Hants. Utility-scale turbines (production rating over 100 kilowatts (kW)) have a larger production capacity and are usually larger than residential turbines. Turbines and wind farms with a rating over 2 megawatts (MW) require a Provincial, and occasionally Federal, environmental assessment.

In West Hants, temporary experimental turbine sites are permitted outside Growth Centres, Villages and Hamlets, with permanent installations to be considered by Council through a public process. Allowing temporary wind turbine installations enables adjacent property owners and the surrounding community to become accustomed to the idea of wind turbines before they are considered as a permanent feature.

The Hantsport Land Use By-Law allows residential wind turbines in any zone under certain conditions. Utility-scale turbines are not allowed within the boundaries of the former Town.

West Hants currently has two (2) wind farms: Ellershouse Wind Farm and the Martock Ridge Community Wind Farm.

The Ellershouse Wind Farm (Figure 4) was created in 2015 and currently has seven (7) turbines producing up to 16 megawatts (MW) of electricity for the surrounding community. An expansion of an additional seven (7) turbines was approved for this wind farm in 2017.

The second wind farm is the Martock Ridge Community Wind Farm which has a capacity of six (6) megawatts (MW) produced by three (3) turbines.

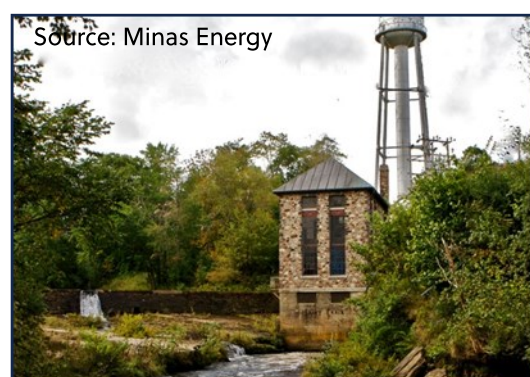
## 5.2 St. Croix Hydro Electric System

The St. Croix Hydro Electric power plant is owned by the Minas Basin Pulp and Power Company Ltd (Figure 5). The plant was built by Roy Jodrey, whom in 2011 was named the first Energy Pioneer by the Maritimes Energy Association. The system's main purpose was to provide power to the company's paper mill located 25 kilometers away in Hantsport

Figure 4: Ellershouse Wind Turbine



Figure 5: St. Croix Hydro System



In December 2012, the Minas Basin Pulp and Power mill closed; however the hydroelectric system is still in operation. The power is sold to CKF Inc. in Hantsport, a sister company of Minas Basin Pulp and Power.

### 5.3 Avon Hydro Electric System

Located near Vaughan, the Avon Hydro System (Figure 6) has been in operation since 1928 and is one of 17 located in Nova Scotia. It produces power from the Avon River and is operational 24 hours a day during the winter, reducing hours to about 16 hours a day when water levels are lower. The system produces enough power for 2,500 households per year. The plant, also built by Roy Jodrey, is now owned and operated by Nova Scotia Power.

Figure 6: Avon Hydro System



### 5.4 Future Sources

West Hants could encourage future renewable energy sources by providing general recommendations in the Municipal Planning Strategy for siting of solar, biomass, hydro and other renewable sources. Additionally, Council could recommend that new industrial, commercial or institutional developments source a portion of their electricity from renewable energy, or offer a discounted rate for development or building permits if the development includes energy saving equipment or renewable energy generation in a proposal. These provisions would encourage the use of renewable energy and could provide more technical construction jobs in the area.

In Nova Scotia there are two major renewable energy projects that will diversify energy sources: the Maritime Link and Cape Sharp Tidal.

#### ***Maritime Link***

The Maritime Link will further diversify Nova Scotia's energy sources and allow Nova Scotia to receive hydroelectricity from Newfoundland and Labrador through 170 kilometers of transmission cables located under the ocean. The project involves the creation of transmission lines from the Muskrat Falls station in Labrador, under the Cabot Strait to Cape Breton, and installation of overhead transmission lines in both provinces.

#### ***Cape Sharp Tidal***

In 2010, the Cape Sharp Tidal project began in the Bay of Fundy with one in-stream turbine (Figure 7) producing enough energy for 500 households. There are now two 2MW turbines used in this demonstration project to produce electricity for the Province. In total, this project has removed the need to burn approximately 2,000 tonnes of coal,

Figure 7: Cape Sharp Tidal Turbine



further eliminating 6,000 tonnes of carbon dioxide emissions from the atmosphere.

## 5.5 Telecommunication Towers

Telecommunication towers enable service providers to broadcast television, radio, internet, and telephone services. Industry Canada regulates telecommunication facilities; however, West Hants is required to be consulted before new towers are installed. In West Hants, telecommunication towers are directed towards industrial, resource and agriculture lands.

## 6. Transportation

### 6.1 Roads

Roads and streets in West Hants are divided into five types: regional, arterial, collector, local and private. Some are maintained by West Hants, and others by Nova Scotia Department of Transportation and Infrastructure Renewal.



Highway 101, which connects Halifax to Yarmouth through the Annapolis Valley, is the only regional road in West Hants. In the Municipal Planning Strategy, Council has expressed its intention to promote carpooling by encouraging the development of car parks at the four (4) interchanges which connect to local communities. Currently, a designated car pool parking lot is provided only at Exit 4.

In 2017, a project to twin Highway 101 from Three Mile Plains to Falmouth was registered for environmental assessment by the Nova Scotia Department of Transportation and Infrastructure Renewal, and approved by the Minister of Environment. This project will include twinning 9.5 km, from Exit 5 to Exit 7. It is anticipated to take approximately five (5) years to complete. In January 2018, an announcement was made stating that the provincial and federal governments will contribute \$34.5 million each toward the project. Funding for upgrades to the aboiteau and floodgates was not included in this announcement, however is expected once the design phase is complete. The Causeway was created in 1968 to protect Windsor and Falmouth from flooding. The Nova Scotia Department of Agriculture controls the causeway floodgates.

### **Maintenance**

The majority of public roads in West Hants are owned and maintained by the Nova Scotia Department of Transportation and Infrastructure Renewal. Maintenance includes services related to ditching, driveways, culverts and paving. West Hants contributes to the maintenance costs of approximately 34 km of local streets built before 1995 in West Hants and the 14.7 km of paved streets in Hantsport (Figure 8). In 1995, Provincial legislation was enacted to place the responsibility for ownership and maintenance of all new local or subdivision streets on municipalities. The Province hoped the legislation would encourage municipal units to plan for more concentrated development in order to provide cost-effective and efficient servicing.

**Figure 8: West HAntsy Owned and Maintained Roads**

Area	Street Names		
<b>FALMOUTH</b>	Clover Lane	Fundy Court	Halewood Drive
	Jocelyn Lee Court	Julie Court	Linden Court
	Mountain View Drive	Shetland Road	Southview Court
<b>CURRYS CORNER</b>	Katie Court		
<b>GARLANDS CROSSING</b>	Annie May Court	Bailey Drive	Edward Drive
	Irven Drive	Merriweather Crescent	Gossie Loop
	Jared Court	Underwood Road (from Civic 142 to end)	
<b>HANTSPORT</b>	All roads with the exception of Pleasant Street, Tannery Road, Bog Road, Bishopville Road as these streets are split between the County and Department of Transportation		
<b>THREE MILE PLAINS</b>	Cooper Lane	Swinamer Drive	

### *Private Roads*

Private roads are any roads not owned by the Province or West Hants, and for subdivision purposes are limited to the General Resource (GR) Zone. Both year-round and seasonal dwellings are permitted on private roads, but Municipal services such as garbage collection and snow plowing are not provided. As these roads are not constructed to as high a standard as public roads, problems will arise if Council wishes to provide services on private roads.

There are five individual Associations that West Hants collects a fee from to maintain the private roads located within their Association (Figure 9).

**Figure 9: Associations that Own Private Roads in West Hants**

Association	Roads Maintained by Association		
<b>Chateau Village Owners Association</b>	Chateau Lane	Alpine Way	
	Village Path	Summit Ridge	
	White Tail Pass	Snowy Owl Trail	
<b>Falls Lake West Owners Association</b>	Pioneer Drive		
<b>Chalet Hamlet Property Owners Association</b>	Forest Heights Road	Pine Wood Close	
	Maple Lane Road	Middle Lake	South Road
	Pine Hill Drive		
<b>Blomindon View Association</b>	Tidal Drive	Saubren Lane	
<b>North Canoe Lake Cottage Association</b>	Canoe Lake Cove Road		

## 6.2 Truck Routes

Truck routes are established to give large commercial and industrial vehicles a specific route to travel within an area. They are usually chosen because of road capacity and bridge weight restrictions or to maintain a quieter environment on residential streets. West Hants has a variety of roads designated as truck routes with weight designations.

The Hantsport Municipal Planning Strategy outlines the intended creation and continuation of a truck route to divert traffic from the non-industrial areas within the community, but this has not been constructed.

## 6.3 Parking and Loading Requirements

In documents which regulate both West Hants and the former Town of Hantsport, developers are required to provide parking and loading spaces in accordance with specified standards.

Some places in Nova Scotia have removed minimum parking requirements for a variety of reasons such as the lack of available space in commercial areas. Council also could consider removing this requirement.

## 6.4 Trails

West Hants currently owns and/or manages 492.5 acres (199 hectares) of parks and open space land, including seven (7) public trails, each with distinctive properties, providing residents options for recreation and enjoyment.

The old Dominion Atlantic Railway line which offered travel from Halifax to Yarmouth from 1894 until the 1990s could be an option for future trail expansion throughout West Hants. The line is currently not in use as a rail line and is privately owned. Many municipalities in Nova Scotia have converted old railway lines into trails such as the rail to trail project in Musquodoboit Harbour, Halifax Regional Municipality (Figure 10).

The Active Transportation Plan for the Avon Region (2015), outlines ways to increase active transportation in West Hants and Windsor. Suggestions include wayfinding, education, collaboration, and phasing of priority active transportation routes. The recommendations of the report will be incorporated in the Municipal Planning Strategy review where possible.

Figure 10: Example of a Rail to Trail Project in Musquodoboit Harbour



Source: News 95.7

## 7. Infrastructure Challenges and Opportunities

As the daily life of many residents is dependent on infrastructure which supports provision of services for water, sanitary sewer and power, it is essential that it is always in working order. It is equally as important to identify some challenges and opportunities which could be addressed to ensure the critical infrastructure remains in working order in the future.

### 7.1 Water and Sanitary Sewer

In dry summer months it can be challenging to provide central water services, and private wells often run short of water. A drought in September 2016 caused extremely low water levels, which led to water restrictions. In the drier times of year it is important to remind the public of ways to conserve water, such as reducing the water spent on watering lawns, filling swimming pools and washing vehicles. As earlier noted, West Hants could amend the Building Code Act By-Law to require new developments or renovations to include low-flow fixtures. Council could also consider selling rain barrels to residents and businesses at cost to encourage the collection of rainwater for outdoor use, creating a waterless urinal rebate for commercial and institutional customers, and providing conservation tips with the water bills.

The Municipal water and sanitary sewer infrastructure is aging. Pipes and connections need to be well maintained, and older infrastructure must be replaced to prevent breaks and interruption to service. The Public Works Department monitors and manages the replacement of this infrastructure in West Hants.

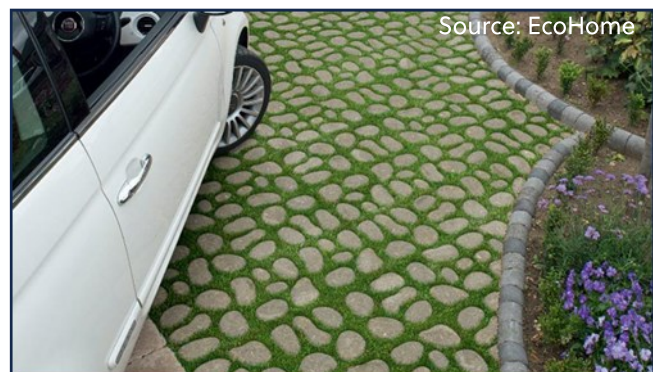
Storm water management plans for areas with sanitary sewer services are important as they outline ways to help reduce the storm water entering the sewage treatment plant. Reduced loads on the plant increase the likelihood the plant will be able to handle the flow. Combined storm water and sewer lines were common in the past, and are being separated as infrastructure is upgraded.

Additional measures can be taken to reduce storm water runoff, such as encouraging developments to use surfaces that water can move through to keep as much storm water as possible on the property (Figure 11 and 12).

**Figure 11: Pervious Concrete**



**Figure 12: Permeable Pavers**



## 7.2 Power and Emissions

By 2020, according to the Renewable Electricity Regulations of the Nova Scotia Electricity Act, 40% of the energy generated in Nova Scotia must be from renewable sources. The West Hants Integrated Community Sustainability Plan (ICSP) (2010) and Municipal Climate Change Action Plan (MCCAP) (2013) support this goal by encouraging the use of renewable energy sources, reducing West Hants' energy consumption and improving energy efficiency.

The MCCAP also sets specific emission reduction targets for West Hants, including reducing the Greenhouse Gas (GHG) emissions associated with electricity generation by 30% below the 2008-2009 baseline year by 2020, and a 45% reduction by 2030.

In addition to material mentioned in Section 4.4, the development of renewable energy sites in West Hants could repurpose underutilized land and has the potential to create local jobs.

Although total energy costs account for just over 1% of the Municipal budget, it is important to track Municipal emissions to enable West Hants to determine in which areas it can reduce emissions, which in turn could result in financial savings and operation costs. Employing actions to reduce emissions and energy consumption could also stimulate residents to do the same, reducing community emissions. West Hants has not conducted the inventory since 2015, possibly due to the dissolution of the former Town of Hantsport into West Hants, however it will begin to be collected again in the future.

## 7.3 Transportation

The Canadian Infrastructure Report Card (2016) stated that one quarter of municipal roads in Canada are over capacity and deteriorating at an alarming rate. As well, MCCAP determined that transportation infrastructure was most at risk of flooding due to climate change, and is susceptible to erosion in certain locations. A planning student from Dalhousie University focused her thesis on the impacts of projected flood levels on the infrastructure in Windsor and West Hants. The projections are the estimated extreme total sea levels, which includes "High High Water Large Tide" projected sea level rise for 2055, and a storm surge for a 100-year storm. Major road connections and facilities would be flooded under the 9.6m in her projection for 2055 (Figure 13). Flood levels for individual sites need to be considered by Council, along with flood levels for road networks that can cut off access to vital facilities and services.

The Highway 101 twinning project provides the opportunity for upgrades to the regional road in West Hants and to the aboiteau at the Avon River Causeway. It could also allow the Council to incorporate additional car parking lots to further

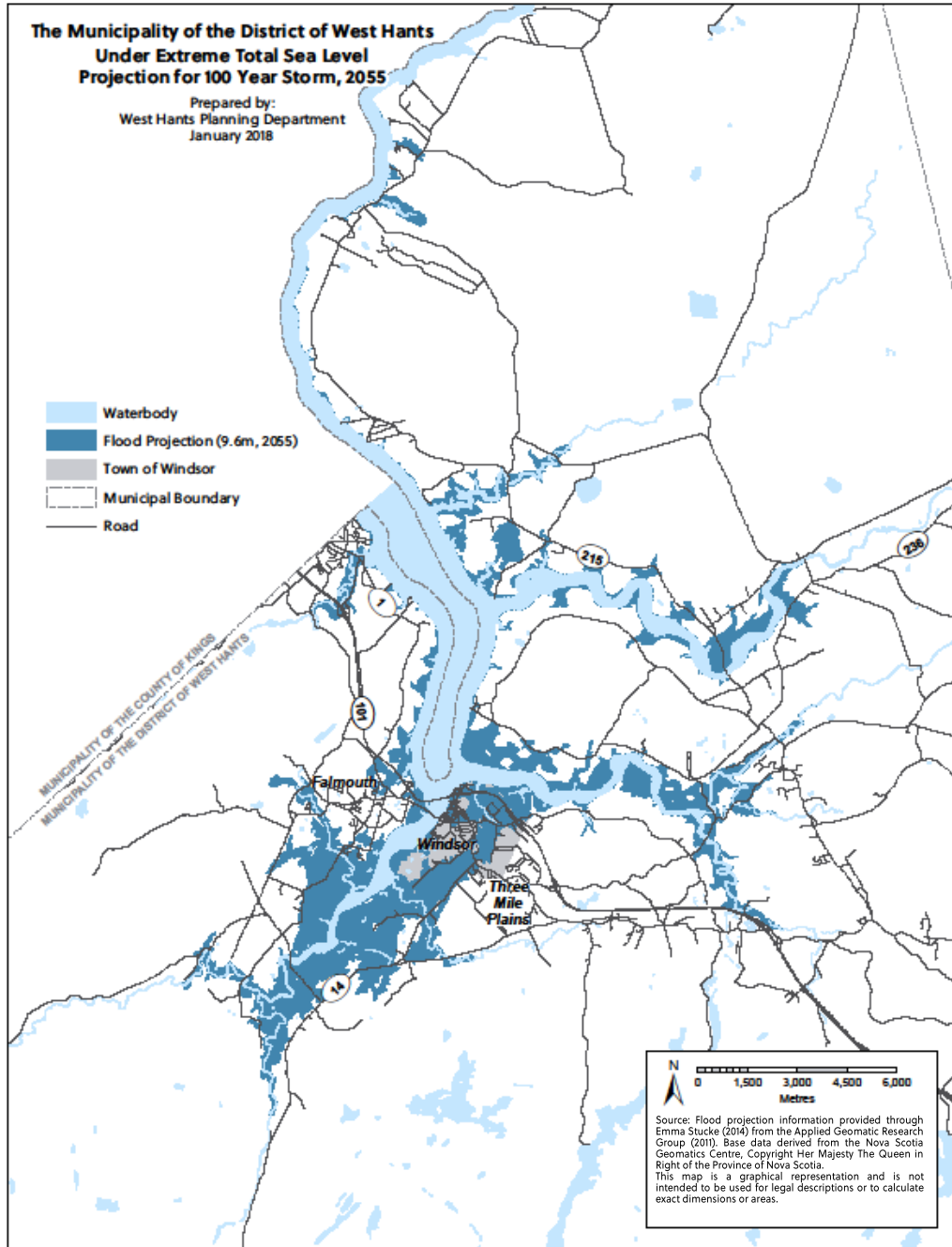
**Figure 14: Example of an On-Street Bicycle Lane**



promote carpooling.

The Municipal Integrated Community Sustainability Plan (ICSP) encourages the promotion of active transportation. Incorporating sidewalks or bicycle lanes in any future upgrades to arterial and collector streets (Figure 14), and converting the old Dominion Atlantic Railway line into a multi-purpose trail would provide residents this opportunity and encourage an active lifestyle .

**Figure 13: Extreme Total Sea Level Projection in West Hants for 100 year storm in 2055**



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